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more always better?

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in Christchurch, New
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2016: whither health equity?**

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Modifiable lifestyle factors that could reduce the incidence of colorectal cancer in New Zealand

Ann Richardson, James Hayes, Chris Frampton, John Potter

Aspects of our lifestyle can increase the risk of bowel cancer. By combining the results of international research and the prevalence of risk factors in New Zealand, it is possible to estimate the impact of reducing our exposure to these risk factors. If obesity, alcohol consumption, smoking and consumption of red and processed meats could be reduced, and physical activity could be increased among New Zealanders, it would reduce the risk of bowel cancer considerably.

Medicines information in New Zealand: current services and future potential

Chloë Campbell, Caroline Morris, Rhiannon Braund

Formal medicines information services are available in six hospitals, but the full potential of such services is yet to be realised in New Zealand. A nationally coordinated medicines information service that encompassed current health strategy goals—patient driven, whole team integration and the use of smart systems—could provide efficient, effective support across the health system for clinical problem-solving, continuing education and knowledge translation activities, contributing positively to the safe and effective use of medicines.

Key informant views on biobanking and genomic research with Māori

Maui Hudson, Kim Southey, Lynley Uerata, Angela Beaton, Moe Milne, Khyla Russell, Barry Smith, Phillip Wilcox, Valmaine Toki, Melanie Cheung, Waiora Port

With the growing use of genomic sequencing technologies, and moves towards developing large scale biobanks, Māori concerns about the ethical use of human samples for research projects has become a topical issue. This paper describes the key issues identified as part of a project looking at Māori views on biobanking and genomic research, and suggests a range of strategies to enhance Māori participation and build public trust in these activities.

Socio-demographic characteristics of New Zealand adult smokers, ex-smokers and non-smokers: results from the 2013 Census

Danny Tu, Rhiannon Newcombe, Richard Edwards, Darren Walton

In this study we described the smoking prevalence by key socio-demographic characteristics (age, gender, ethnicity, education, labour status, income and socioeconomic deprivation) in New Zealand in 2013, and make comparisons with 2006. Data on cigarette smoking and key socio-demographics variables were obtained from the 2013 New Zealand Census of Population and Dwellings. The findings suggest that the decline in smoking prevalence is accelerating in New Zealand, including among high priority groups like Māori, Pacific peoples and young adults.

Auckland: city of syphilis?

Sunita Azariah

One hundred and fifty-two cases of infectious syphilis were managed by the Auckland Regional Sexual Health Service in 2015, which is the largest number reported in recent decades. The majority of cases were diagnosed in gay or bisexual men but cases in heterosexuals have also increased significantly. Syphilis is a serious infection that may cause complication such as damage to the nervous system or miscarriage or still-birth if a woman is infected during pregnancy. As syphilis often does not cause symptoms it is recommended that tests for syphilis should always be included when screening people for sexually transmitted infections. Control of this syphilis outbreak requires provision of resource for a dedicated public health response, including regular screening of those at risk, timely treatment to reduce onward transmission, rigorous contact tracing and close follow-up of treated individuals to check for possible re-infection.

Elective surgical outcomes of patients in Christchurch, New Zealand

Jessica Taylor, Liane Dixon, Rebecca Pascoe, Bruce Dobbs, Ross Kennedy, Frank Frizelle

The aim of this study was to determine mortality after elective surgery at a total community level with inclusion of all patients undergoing elective surgery in Christchurch, within a calendar month. By day 30, after surgery 11 (0.2%) patients had died and by day 90 after surgery 27 (0.6%), patients had died, with the vast majority of deaths being due to progression of the underlying disease. This study shows a similar if not lower mortality than what has previously been reported for elective surgical procedures in other studies.

The New Zealand Health Strategy 2016: whither health equity?

Heather Came, Tim McCreanor, Claire Doole, Emma Rawson

Each year of delay in finding solutions to reduce the inequitable health status of Māori means more Māori die in situations that would not occur for New Zealand Europeans. The New Zealand Health Strategy talks about equity but fails to deliver useful action to stem the tide of potentially preventable deaths. Te Tiriti o Waitangi is our founding document and a blueprint for action. Tools to track inequities and institutional racism are available. Political will is required to end inequities.

Financing the Canterbury Health System post-disaster

Matthew Reid, Ramon Pink

After the Canterbury earthquakes in 2010 and 2011, the Canterbury Health System continued in its journey to be more patient-centred and joined up. However, continuing to improve health services in Canterbury has been difficult because of higher costs from the earthquakes, higher health needs in the population and a model of health funding that hasn't taken into account the effects of earthquake. This article argues that there is a need for a health funding strategy at the Ministry of Health after disasters that factor in a disaster's effects on the population, the difficulty of predicting the movement of people and the extra costs from disruption. This would create some stability in unstable times and allow, but would require, departure from the normal ways of funding health.

How 'modifiable' are 'modifiable risk factors' for cancer?

Christopher GCA Jackson, Diana Sarfati

Cancer is the leading cause of death in New Zealand and will continue to be so for the foreseeable future.^{1,2} Early detection and improved treatment will incrementally reduce the impact of cancer on our community. However, the only meaningful way to reduce cancer incidence is by primary prevention. We know what many of these risk factors are—we simply lack the ability (or will) to influence their prevalence.

In this week's edition of *The Journal*, Richardson *et al* calculate the population attributable fraction for modifiable risk factors for colorectal cancer. The known modifiable risk factors are obesity, excess alcohol consumption, physical inactivity, red and processed meat consumption and cigarette smoking. They ask the question—what proportion of colorectal cancer diagnoses could be prevented by eliminating lifestyle factors known to be risks for the disease?

Richardson *et al* identify the relative contributions of six known risk factors to the overall incidence of colorectal cancer. They calculate that 9% of all cases are attributable to obesity, 7% to alcohol (>5 units per day), 4% to insufficient physical activity, 3% to smoking, 5% to consumption of red meat and 3% to processed meat.

A tempting (and incorrect) headline summary might be that 31% of colorectal cancer cases could be prevented by behaviour change. Tabloids could pronounce that nearly 1,000 new colorectal cancers would be prevented if we could curb the scourge of overindulgence, inactivity and excess. The attributable risks are not mutually exclusive, so the equation is not summative so this would be a statistically incorrect conclusion. In spite of this, touting individual responsibility for the cancer burden would be prime political

fodder for those proposing that we should not take collective action nor a public health approach to reducing the impact of cancer in our community.

The unintended consequence of such reports is that the results could be used to “victim blame” those affected by cancer, initiating the insidious implication that those affected by cancer are somehow the authors of their own misfortune.³ In turn, this can create a sense that there is a need for individual responsibility rather than collective action, encouraging inertia in an area where effort is required.

There is little doubt that the major modifiable risk factors for cancer in New Zealand are tobacco, alcohol, obesity, diet and physical inactivity, infectious diseases (such as Human Papilloma Virus and Hepatitis B) and UV exposure.

We already have many of the tools required to reduce the impact of cancer on our community. It will take collective action and political will to implement these.

Concerted efforts to reduce tobacco consumption have gradually worked. Currently, 15% of non-Māori and 35.5% of Māori are smokers—so there remains room for improvement.⁴ This year has seen the introduction of plain packaging legislation. We have seen a commitment by the government to ongoing tax rises on tobacco. Counter to this, we have observed an expansion in the use of e-cigarettes. Although these can help some smokers quit, they can also result in re-normalisation of smoking behaviours and are thought to be gateway products for youth (particularly favoured varieties).^{5,6} There remains work to be done on smoke-free cars, Māori-specific initiatives and reducing supply.⁴

From 1 January 2017, HPV vaccination will be fully funded for those aged 9–26,

including boys and young men. Our current vaccination rates are approximately 61%, against a Ministry target of 90%.⁷ Expanding vaccination uptake will remain a priority.

Our rates of melanoma and skin cancer are world-leading, yet our collective efforts to minimise sun and UV exposure do not reflect our incidence. Charities such as the Cancer Society continue to lead harm-minimisation efforts, but participation in the SunSmart Schools programme are only 35% nationwide. Many employers do not see sun exposure as an industrial danger in the same way that noise or dust pollutants are, and sunscreen is not as ubiquitous as ear-defenders for outdoor workers.

Other measures such as restrictions on alcohol availability, minimum alcohol pricing or increasing alcohol excise tax are more controversial. Proposed restrictions on alcohol stir a particularly strong community reaction against “nanny state” interventions. A well-funded lobby that stands to lose financially may well have incentives to resist public-health based control measures. If we wish to reduce the burden of cancer in our community, we will need to confront the uncomfortable truth about the relationship between alcohol and the incidence of common cancers.

One of the greatest challenges of this century will be managing the obesity epidemic. New Zealand has the fourth highest childhood obesity rate in the OECD.⁸ The warning signs for cancer, as well as other diseases, are writ large. Mexico, the UK and several US states have introduced taxes on sugar-sweetened beverages. Whether this will have any long-term impact on obesity rates will be seen in time. Some schools and hospitals are already making policy decisions to exclude sweetened beverages from their on-site cafeterias. However, a more universal approach will

be needed if we are to tackle the issue at a national level.

As doctors, we are familiar with the challenges of promoting behaviour change as primary or secondary prevention in our clinics. However, our influence and responsibility extends beyond the consultation room. We have the opportunity to promote healthy food and beverage choices in our own hospitals, sunsmart behaviours in our children’s schools or at their sports days, advocating for increased shade areas with our public areas, and advocating to city councils as concerned citizens about smokefree outdoor spaces. As educated health professionals, our voices carry weight, and we need to ensure we are heard.

The challenge for political parties of all colours is to accept the reality that risk factors for cancer can be modified by a public health response. They must accept that individual responsibility is not a sufficient answer to the growing burden of cancer. We can and must follow an evidence-based approach to reducing the impact of known carcinogens. We must have the courage to build a platform of policies and to implement these even in the face of intense interest-group lobbying and unfavourable headlines. By continued inaction at the altar of personal choice, our leaders do not serve our communities well.

As medical professionals, we have the knowledge to contribute to a public debate and it is our duty to speak up and advocate for these policies so we can protect our community from future suffering and harm. We do not need to wait for a far off miraculous discovery to push back the tide of cancer.

We already know what we need to do. It’s time to get on and do it.

Competing interests:

Dr Jackson is medical director of the Cancer Society of New Zealand. The views expressed in this editorial do not necessarily reflect the views of the Cancer Society.

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Choose Wisely—is more always better?

Deborah Read, Derek Sherwood, Sue Ineson, for the Council of Medical Colleges

Shared decision-making between health professionals and patients as to what care is necessary is the focus of the Choosing Wisely New Zealand campaign, launched this month by the Council of Medical Colleges as part of its commitment to improving the quality of health care.

Choosing Wisely New Zealand is part of an international Choosing Wisely initiative that began in the US in 2012 by the American Board of Internal Medicine Foundation, Consumer Reports and nine medical specialty societies.¹ Subsequently, a number of countries including Canada, Italy, the Netherlands, Australia and England have developed their own versions of Choosing Wisely.² The goal of Choosing Wisely is to provide high-quality care, prevent harm and reduce the use of unnecessary care. In some instances, cost savings may result from those choices, whereas in others, care may be more appropriate, more timely or less inconvenient for patients.² The campaign is underpinned by professional values and responsibilities, and inter-health professional and health professional-patient conversations to reduce unnecessary care.

With the complexity of tests, treatments and procedures available to modern medicine, many do not always add value. Some are rendered redundant as others take their place but continue to be used in practice. Interventions that are not supported by evidence do not lead to high-quality care and may even cause harm. Reasons for unnecessary interventions include lack of time for shared decision-making,³ fear of missing a diagnosis or complaints, financial incentives, the way doctors are taught, patient expectations and avoiding the challenging conversation of telling patients they do not need specific tests or treatment.² An understanding of what lies behind unnecessary care is required to inform ways of reducing use of these interventions.⁴

Doctors in New Zealand work in a sector where there are resource limitations, so they have a responsibility to ensure the allocation of health resources is based on need and evidence.⁵ In a system where resources are constrained, it is unethical as well as inefficient to provide interventions which have no clinical value.

Effective Choosing Wisely programmes are clinician led.^{6,7} Health professionals can start to challenge themselves and their colleagues on the way they think about health care, questioning the notion 'more is always better'. They can start a conversation with their colleagues about what care is truly needed—identifying which practices are helpful and which are not.

Already a number of medical colleges, specialty societies and associations in New Zealand have come together to identify practices that warrant scrutiny, examining the evidence and drawing on the expert opinion of their members to develop a list of five recommendations of tests, treatments and procedures to question. Over 50 recommendations have been developed so far that are relevant to practice in New Zealand. These lists are available from the Choosing Wisely New Zealand website (www.choosingwisely.org.nz). Each recommendation is based on the best available evidence. These lists are not prescriptive but are intended as a guide to start a conversation about what is appropriate and necessary for an individual patient. Recommendations must be reviewed on an ongoing basis to ensure credibility.⁶

International experience has identified that multidisciplinary health professional involvement is also key to a successful Choosing Wisely campaign.² The Council of Medical Colleges has had initial discussions with national health professional organisations representing pharmacists, allied health professionals, nurses and midwives. Working with other health professionals will be a priority over the next year.

Patient/consumer engagement is central in reducing unnecessary interventions and hence the Council of Medical Colleges has partnered with Consumer NZ in the campaign. Some patient/consumer educational material has been developed to inform people why more care is not necessarily better and why certain interventions are no longer recommended. Health professionals need to hold conversations with patients to ensure they understand the evidence relating to the care being proposed so patients can make informed choices.

Patients/consumers should be encouraged to ask the four Choosing Wisely questions as part of their decision-making about their care:

1. Do I really need to have this test, treatment or procedure?
2. What are the risks (of having or not having it)?
3. Are there simpler, safer options?
4. What happens if I do nothing?

Implementation is best carried out at a local level from the bottom-up.⁷ This may involve an individual department or service selecting relevant recommendations that have already been developed, modifying these recommendations to suit local circumstances or deriving their own recommendations. Stinnett-Donnelly et al (2016) have developed a framework to assist selection based on complexity, value and controversy. The Council of Medical Colleges has produced guides to help colleges, specialty societies, associations and health care services develop and implement their own recommendations about interventions whose necessity should be questioned and discussed. Reported variations in doctors' attitudes across adult primary care recommendations suggest implementation efforts will need to be adapted to the identified barriers in implementing each Choosing

Wisely recommendation.³ Support for doctors in dealing with uncertainty associated with conservative management and that addresses drivers of unnecessary care may be beneficial.⁴

The impact of Choosing Wisely depends on how effective dissemination and uptake of the recommendations is. Evaluation is critical and needs to occur concurrently. This needs to be considered when developing and implementing a recommendation as, in some instances, the data needed for evaluation may not be readily available. Evaluation is easier if data can be obtained from pre-existing electronic systems and does not require manual record review, which is more resource-intensive. A range of measurement tools for assessing health professionals' awareness, attitudes and behaviour, and patient engagement and acceptance have also been identified.⁸

Evidence about the effectiveness of Choosing Wisely is starting to emerge. In Canada, provision of Choosing Wisely educational material in primary care waiting rooms improved knowledge around unnecessary care.⁹ Changes in frequency of Choosing Wisely services over the first two to three years have been mixed.^{7,10} Factors that affected success include senior leadership support, a bottom-up approach by clinical champions and financial incentives to cap hospital revenue expansion.⁷ Additional measures such as decision-making tools that assist informed discussion with patients and electronic best practice alerts rather than just the provision of information may be required to affect change.^{7,11} Decisions should be made on the best match between evidence about the benefits and harms of each intervention and the goals and preferences of the patient.¹¹ Don't do something because it can be done; do it if it is necessary for your patient.

Competing interests:

Dr Read reports personal fees from Council of Medical Colleges during the conduct of the study, and personal fees from Ministry of Health outside the submitted work; Dr Sherwood reports affiliation Council of Medical Colleges in New Zealand during the conduct of the study, and personal fees from Council of Medical Colleges in NZ, outside the submitted work; . Sue Ineson is contracted to the Council of Medical Colleges to act as their Executive Director and is involved in facilitating the Choosing Wisely Campaign In NZ . The Choosing Wisely in New Zealand campaign has received sponsorship from Ministry of Health and HQSC and other support is being sought.

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Modifiable lifestyle factors that could reduce the incidence of colorectal cancer in New Zealand

Ann Richardson, James Hayes, Chris Frampton, John Potter

ABSTRACT

AIM: To estimate population attributable fractions for modifiable lifestyle factors and colorectal cancer in New Zealand.

METHOD: Relative risks for lifestyle risk factors for colorectal cancer, and population data on the prevalence of exposure in New Zealand, were used to estimate the population attributable fraction (PAF) for each risk factor.

RESULTS: Six modifiable lifestyle risk factors were identified. The PAFs for these risk factors were 9% for obesity, 7% for alcohol, 4% for physical inactivity, 3% for smoking, 5% for consumption of red meat and 3% for processed meat. PAFs differed by ethnic group and sex. In women, the highest PAFs were 19% for obesity in Pacific women, 14% for obesity in Māori women, 7% for physical inactivity in Asian women, and 8% for obesity in European/other women. In men, the highest PAFs were 17% for obesity in Pacific men, 14% for high alcohol consumption in Māori men, 5% for physical inactivity in Asian men and 9% for high alcohol consumption in European/other men.

CONCLUSION: If obesity, alcohol consumption, smoking and consumption of red and processed meats could be reduced, and physical activity could be increased among New Zealanders, it would reduce the risk of colorectal cancer considerably.

Colorectal cancer accounts for almost 10% of cancer incidence worldwide,¹ and New Zealand is among the countries with the highest incidence rates in the world.² Each year there are about 3,000 registrations and 1,100 deaths from colorectal cancer in New Zealand.³ Incidence and mortality rates are lower for Māori than non-Māori, but rates for Māori and non-Māori females are starting to converge.³ Colorectal cancer incidence rates vary more than 20-fold worldwide, and changes occurring among populations migrating from low to high incidence areas within one or two generations suggest that lifestyle factors are important in determining risk.⁴ Substantial reductions in the incidence of colorectal cancer (more than 10% in the decade 2006 to 2016) have been projected for New Zealand, even in the absence of a national screening programme; however, the number of people diagnosed

with colorectal cancer each year will not decline, because of the increasing size and age of the population.⁵

This project was designed to identify modifiable lifestyle factors that could reduce the future incidence of colorectal cancer among New Zealanders. Ten years ago, Cox and Sneyd estimated the contribution to the control of colorectal cancer achievable from primary prevention, screening, early diagnosis and treatment in New Zealand.⁶ Since then, new estimates of the effects of certain modifiable lifestyle risk factors for colorectal cancer have been published.^{1,7}

The population attributable fraction (also known as the population attributable risk percent, or population etiological fraction) is the proportion of disease in the population due to a specific exposure that could be prevented if that exposure were eliminated.⁸ Population attributable fractions (PAFs)

help to identify the exposures that have the greatest impact on the health of a population. By comparing PAFs for different risk factors for a disease, the relative importance of the risk factors can be assessed. For a modifiable risk factor, the PAF also provides an indication of the maximum possible impact of primary preventive strategies.

The purpose of this research was to identify modifiable lifestyle factors for colorectal cancer among New Zealanders that could be amenable to primary preventive strategies. The results of this research can provide New Zealanders and their health providers with information to allow people to reduce their risk of colorectal cancer.

Method

Interpretation of a population attributable fraction (PAF) assumes that the association between the exposure and the disease is causal. Causal lifestyle factors for colorectal cancer have been identified; convincing evidence has been found for obesity, lack of physical activity, consumption of red meat, consumption of processed meat, alcohol and smoking.^{1,7} This project was not intended to provide a comprehensive literature review of these modifiable risk factors for colorectal cancer, but rather to identify robust estimates of relative risks with 95% confidence intervals, that could be used to calculate PAFs. Priority was given to statistically significant relative risks reported from well-designed systematic reviews, intervention studies or cohort studies, ahead of odds ratios reported from case-control studies. All the relative risks used in the PAF calculations were adjusted; we did not use crude relative risks.

Prevalence of lifestyle risk factors in New Zealand

Once the relative risk estimates for each lifestyle risk factor had been obtained from the literature, information on the prevalence of the risk factors in New Zealand was collected. The most recent information on the prevalence of each risk factor in New Zealand was obtained from New Zealand Ministry of Health publications and online data. Ministry of Health publications report

the results of population-based surveys such as the 2013/14 New Zealand Health Survey,⁹ the New Zealand Alcohol and Drug Use Survey¹⁰ and the 2008/09 New Zealand Adult Nutrition Survey.¹¹

It was not always possible to obtain prevalence estimates that aligned exactly with the exposure categories used to calculate the relative risks. Where it was not possible to obtain prevalence estimates that aligned exactly, we took a conservative approach in selecting prevalence estimates to avoid over-estimating PAFs.

Crude prevalence estimates (rather than age-standardised prevalence estimates) were used to calculate PAFs, as these provided the estimates of the actual proportion of the population or population subgroup exposed to each risk factor, which are required for calculating PAFs. Prevalence estimates for males and females and Māori, Pacific, Asian and European/other New Zealanders were used to calculate sex-specific and ethnic group-specific PAFs.

Calculation of population attributable fractions

Information about the prevalence of risk factors in New Zealand, and the estimates of relative risks abstracted from the literature, were used to calculate the population attributable fraction (PAF).

$$\text{PAF} = \frac{P_e (\text{RR}-1)}{P_e (\text{RR}-1)+1} \times 100\%$$

Where P_e = the prevalence of exposure to the risk factor

RR = the relative risk

To calculate 95% confidence intervals for the PAFs, we simulated normal or log-normal distributions for RR and P_e based on the CI calculated or provided from published sources. Pairs of RR and P_e values were then randomly selected from these distributions and a PAF calculated for each random selection.¹² From 10,000 calculated PAF values, the empirical distribution of PAF was then used to estimate a two-sided 95% CI. SPSS v22 (SPSS Inc., Armonk, NY, USA) was used for these simulations and calculations.

Results

Risk factors

Alcohol

Alcohol increases the risk of colorectal cancer, and there is a dose-response effect, with the risk increasing with the amount of alcohol consumed.^{1,13} The most recent estimate of the effect of alcohol on colorectal cancer comes from a pooled analysis of 66 epidemiological studies, where the relative risk for heavy drinking (>50g or >5 drinks per day, as a standard drink in New Zealand is 10g alcohol) is 1.44 (1.25–1.65).¹³

Diet

Consumption of red meat increases the risk of colorectal cancer, with a dose-response relationship shown in cohort studies.¹ A meta-analysis of 23 studies found an increased risk of colorectal cancer with consumption of red meat. The relative risk for the highest quartile of consumption of red meat compared with the lowest was 1.35 (1.21–1.51).¹⁴ Consumption of processed meat also increases the risk of colorectal cancer. The relative risk for the highest quartile of consumption of processed meat compared with the lowest was 1.31 (95% CI 1.13–1.51).¹⁴

Obesity

Obesity increases the risk of colorectal cancer; both general obesity (measured as BMI) or central obesity (measured as waist circumference).¹⁵ A recent systematic review compared the risk of colorectal cancer for the obese (BMI 30kg/m² or higher) vs normal (BMI less than 25kg/m²) category of BMI and reported a summary relative risk of 1.33 (1.25–1.42).¹⁵

Physical activity

Lack of physical activity is associated with an increased risk of colorectal cancer. Physical activity is associated with energy intake and partly determines BMI. A review on the effect of physical inactivity found that the relative risk of colon cancer for physical inactivity was 1.32 (1.23–1.39).¹⁶

Tobacco

Tobacco smoking is associated with increased colorectal cancer risk,¹ although this is restricted to a molecularly defined subset of colorectal cancer.¹⁷ A systematic review and meta-analysis of prospective studies of cigarette smoking and colorectal cancer¹⁸ found a summary relative risk

of 1.15 (1.00–1.32) for current versus never-smokers.

Information on the prevalence of risk factors in New Zealanders

Alcohol

In New Zealand 16.1% (15.2–17.0) of adults have a hazardous drinking pattern, as indicated by an Alcohol Use Disorders Identification Test (AUDIT) score of eight or more,⁹ the closest estimate available for New Zealanders to the relevant exposure category used in epidemiological studies of alcohol consumption and colorectal cancer.

Physical inactivity

The most recent estimates among New Zealanders of the prevalence of sedentary behaviour (defined as less than 30 minutes of physical activity in the last week) are derived from the most recent New Zealand Health Survey of adults aged 15 years and over.⁹ In the total population, 14.3% (13.3–15.5) of adults are physically inactive.

Obesity

Body mass index (BMI) is the most commonly used measure of body size. It is calculated by dividing weight (in kilograms) by height squared (in metres). Obesity is defined as a BMI of 30 or more.⁹ In New Zealand, 29.9% (28.9–30.9) of adults are obese.

Smoking

In New Zealand, 17.2% (16.4–18.1) of adults are current smokers. The prevalence of current smoking is defined as 'smoked more than 100 cigarettes in a lifetime and currently smoking at least once a month'.⁹

Red meat

Most of the total population aged 15 years and over (94.5%) reported eating red meat in the past four weeks, with 14.4% (12.7–16.1) eating red meat five or more times per week.¹¹ Estimates for consumption five or more times per week were not reported by ethnic group.

Processed meat

Processed meat was eaten in the past four weeks by 87.3% of the total population aged 15 years and over, with 8.6% (7.3–9.8) eating processed meat five or more times per week.¹¹ Estimates for consumption five or more times per week were not reported by ethnic group.

The PAF results for the total New Zealand population are shown in Table 1 and the ethnic group-specific results for New Zealand men and women are shown in Tables 2 and 3 respectively. In all three tables, the relative risks and prevalence estimates for each risk factor are as follows: for alcohol, the RR is for heavy drinking (>50g or >5 drinks/day) and prevalence estimates are for AUDIT scores of 8 and over; for smoking, the RR is for current vs never-smokers, and the prevalence estimates are for current smokers (smoked more than 100 cigarettes in lifetime and smoking at least once a month); for obesity, the RR is for obese (BMI 30kg/m² or higher) vs normal BMI (less than 25kg/m²), and the prevalence estimates are for obesity (BMI 30kg/m² or higher); for physical inactivity, the RR is for an activity level insufficient to meet the WHO recommendations for adults aged 18–64 years of at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week,¹⁹ and the prevalence estimates are for <30 minutes physical activity in the last seven days; for consumption of red meat, the RR is for the highest vs the lowest quartile of consumption and the prevalence estimates are for consumption of red meat five or more times per week; for consumption of processed meat, the RR is for the highest vs the lowest quartile of consumption and the prevalence estimates are for consumption of processed meat five or more times per week.

Because colorectal cancer is a common disease in New Zealand, with over 3,000 people diagnosed each year, even small changes in PAFs mediated by a reduction in the prevalence of risk factors could translate into appreciable numbers of New

Zealanders avoiding a diagnosis of colorectal cancer. Table 4 shows the reduction in numbers of people diagnosed with colorectal cancer each year if the prevalence of modifiable lifestyle risk factors in New Zealand was halved.

Discussion

In this study, six modifiable lifestyle risk factors were identified for colorectal cancer. These risk factors were 9% for obesity, 7% for alcohol, 4% for insufficient physical activity, 3% for smoking, 5% for consumption of red meat and 3% for processed meat.

Similar findings were seen in papers reporting PAFs for colorectal cancer in Australia and the UK.^{20,21} The Australian estimates are 9% for overweight and obesity, 9% for alcohol, 5% for insufficient physical activity, 6% for smoking and 18% for red and processed meat combined.²⁰ The UK estimates are 13% for overweight and obesity, 12% for alcohol, 3% for insufficient physical activity, 8% for smoking and 21% for red and processed meat combined.²¹ It is important to note that PAF estimates will differ across countries if the prevalence of modifiable risk factors differs, with the PAF increasing with the prevalence of the risk factor.

Fewer than half of New Zealand adults are physically active.⁹ The increasing prevalence of obesity in New Zealand has been attributed to changing dietary and physical activity patterns. Mean BMI in New Zealand adults increased since 1997, although this has levelled off recently, with more data required to confirm whether this represents a slowing in the increasing prevalence of

Table 1: Colorectal cancer modifiable lifestyle risk factors, prevalence (%) and population attributable fractions (PAF) (%) for the total New Zealand population.

Risk factor	Relative risk (95% CI)	Prevalence of risk factor (95% CI)	PAF (95% CI)
Alcohol	1.44 (1.25–1.65)	16.1 (15.2–17.0)	6.6 (3.6–9.6)
Smoking	1.15 (1.00–1.32)	17.2 (16.4–18.1)	2.5 (0.0–5.2)
Obesity	1.33 (1.25–1.42)	29.9 (28.9–30.9)	9.0 (6.7–11.2)
Physical inactivity	1.32 (1.23–1.39)	14.3 (13.3–15.5)	4.4 (3.1–5.6)
Red meat	1.35 (1.21–1.51)	14.4 (12.7–16.1)	4.8 (2.6–7.0)
Processed meat	1.31 (1.13–1.51)	8.6 (7.3–9.8)	2.6 (0.9–4.3)

Table 2: Colorectal cancer modifiable lifestyle risk factors, prevalence (%) and population attributable fractions (PAF) (%) for New Zealand men.

Risk factor	Relative risk (95% CI)	Prevalence of risk factor (95% CI) ¹	PAF (95% CI)
Alcohol	1.44 (1.25–1.65)	36.7 (32.7–41.0)	13.8 (7.9–19.7)
Māori		26.7 (20.7–33.6)	10.4 (5.3–15.5)
Pacific		5.3 (3.7–7.5)	2.3 (0.9–3.7)
Asian		22.7 (21.2–24.4)	9.0 (5.0–13.1)
European/other			
Smoking	1.15 (1.00–1.32)	39.5 (35.1–44.0)	5.6 (0.0–11.3)
Māori		28.3 (21.0–36.9)	4.0 (0.0–8.5)
Pacific		14.4 (11.1–18.5)	2.1 (0.0–4.5)
Asian		16.2 (14.9–17.7)	2.4 (0.0–4.9)
European/other			
Obesity	1.33 (1.25–1.42)	42.6 (39.0–46.2)	12.3 (9.2–15.5)
Māori		62.3 (55.8–68.4)	17.0 (12.8–21.1)
Pacific		14.6 (10.8–19.5)	4.6 (2.7–6.5)
Asian		28.3 (26.5–30.1)	8.5 (6.3–10.7)
European/other			
Physical inactivity	1.32 (1.23–1.39)	13.9 (11.1–17.2)	4.2 (2.8–5.7)
Māori		15.1 (11.1–20.3)	4.6 (2.6–6.5)
Pacific		15.4 (11.4–20.6)	4.7 (2.7–6.7)
Asian		11.0 (9.8–12.4)	3.4 (2.4–4.4)
European/other			
Red meat	1.35 (1.21–1.51)	15.7 (13.6–17.8)	5.2 (2.8–7.5)
Processed meat	1.31 (1.13–1.51)	12.0 (9.7–14.3)	3.6 (1.3–5.9)

Source: Ministry of Health 2016 online tables <http://www.health.govt.nz/publication/annual-update-key-results-2013-14-new-zealand-health-survey>

Table 3: Colorectal cancer modifiable lifestyle risk factors, prevalence (%) and population attributable fractions (PAF) (%) for New Zealand women.

Risk factor	Relative risk (95% CI)	Prevalence of risk factor (95% CI) ¹	PAF (95% CI)
Alcohol	1.44 (1.25–1.65)	24.8 (21.9–28.0)	9.8 (5.4–14.1)
Māori		12.3 (8.9–16.7)	5.1 (2.2–8.0)
Pacific		2.2 (1.0–4.1)	1.0 (0.0–1.9)
Asian		10.5 (9.1–11.9)	4.4 (2.3–6.5)
European/other			
Smoking	1.15 (1.00–1.32)	41.6 (38.6–44.7)	5.8 (0.2–11.9)
Māori		22.2 (17.7–27.4)	3.2 (0.3–6.7)
Pacific		2.3 (1.3–3.9)	0.3 (0.1–0.8)
Asian		14.3 (13.2–15.4)	2.1 (0.1–4.3)
European/other			
Obesity	1.33 (1.25–1.42)	48.2 (44.9–51.5)	13.7 (10.4–17.0)
Māori		70.8 (64.6–76.3)	18.9 (14.5–23.3)
Pacific		13.9 (11.0–17.4)	4.4 (2.8–5.9)
Asian		27.5 (25.9–29.1)	8.3 (6.2–10.4)
European/other			
Physical inactivity	1.32 (1.23–1.39)	17.7 (15.4–20.3)	5.4 (3.8–7.0)
Māori		26.1 (21.0–32.0)	7.7 (5.1–10.2)
Pacific		25.0 (19.8–31.1)	7.4 (4.8–9.9)
Asian		13.3 (11.8–14.9)	4.1 (2.9–5.3)
European/other			
Red meat	1.35 (1.21–1.51)	13.2 (11.1–15.3)	4.4 (2.3–6.5)
Processed meat	1.31 (1.13–1.51)	5.4 (4.1–6.6)	1.6 (0.5–2.8)

Source: Ministry of Health 2016 online tables <http://www.health.govt.nz/publication/annual-update-key-results-2013-14-new-zealand-health-survey>

Table 4: Effect of halving the prevalence of modifiable lifestyle risk factors on the number of people diagnosed with colorectal cancer in New Zealand each year.

Risk factor	Prevalence of risk factor (%)	Reduction in colorectal cancers diagnosed (number of people per year) ¹
Alcohol	8.0	102
Smoking	8.6	39
Obesity	15.0	141
Physical inactivity	7.2	69
Red meat	7.2	75
Processed meat	4.3	39

PAFs cannot be summed, because in any individual there may be more than one contributing cause of colorectal cancer (see Discussion).

obesity.⁹ There are large differences in the prevalence of obesity by ethnicity in New Zealanders (as shown in Tables 2 and 3).

Alcohol consumption is associated with an increased risk of colorectal cancer, and the prevalence of hazardous drinking has been declining in New Zealanders in recent years.⁹ Hazardous alcohol use markedly differs according to ethnic group (Tables 2 and 3). Among people who consume alcohol regularly, avoidance of hazardous drinking could have an important impact on colorectal cancer incidence. Because the prevalence estimate for alcohol was for hazardous drinking, our results will underestimate the true effect of alcohol on colorectal cancer (moderate to heavy drinking also increases the risk of colorectal cancer).

PAFs have limitations. PAF calculations require good estimates of the strength of association and the prevalence of risk factors, but it is not always possible to find population prevalence data that exactly reflect the risk factor measurements used in epidemiological studies. It is relevant that the PAFs we calculated for colorectal cancer in New Zealand are similar to those calculated for Australia and the UK.^{20,21}

A second limitation is that the individual contributions of causal factors must be considered when interpreting PAFs.²² A disease may have more than one cause (for instance, smoking, high cholesterol, lack of exercise and obesity may all contribute to cardiovascular disease in the same individual). This means that potentially, this person's illness could have been prevented

if any one of these risk factors had been absent, and the sum of the PAFs for these risk factors therefore, may add to more than 100%, reflecting the multi-causal nature of disease.²³ Thus, the PAF is best used as an indication of the *relative* importance of risk factors across a population and the possible impact of behaviour change.

Another limitation of PAFs is that confounding cannot be taken into account with the method for calculating PAF used in this paper; for instance, the association between obesity and colorectal cancer is plausibly confounded by lack of physical activity, but this cannot be adjusted for in the PAF calculation. A formula for calculating adjusted PAFs has been developed,²⁴ but it was inappropriate for this paper, as the relative risks were obtained from many separate studies rather than from a single study, and the prevalence estimates were obtained from routinely collected data.

Provided these limitations are borne in mind, the PAF is useful as an indication of the relative importance of modifiable risk factors and the potential impact of primary preventive strategies in a population. It also provides a way to apply the results from international epidemiological studies to the New Zealand population. For example, halving the prevalence of modifiable risk factors for colorectal cancer would mean 141 fewer cases of colorectal cancer due to obesity, 102 fewer due to alcohol, 69 fewer due to physical inactivity, 39 fewer due to smoking, 75 fewer due to consumption of red meat and 39 fewer due to consumption of processed meat each year in New Zealand.

Conclusion

The most important modifiable lifestyle risk factors for colorectal cancer in New Zealand are obesity and alcohol consumption. These findings have considerable public health relevance since they suggest that it is possible to prevent an appreciable proportion of colorectal cancer

by changing a few selected lifestyle factors. In addition to reducing the incidence of colorectal cancer, a reduction in obesity, alcohol consumption and smoking, and an increase in physical activity, would also reduce the incidence of other cancers, cardiovascular disease and diabetes in New Zealand.

Competing interests:

Nil.

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Medicines information in New Zealand: current services and future potential

Chloë Campbell, Caroline Morris, Rhiannon Braund

ABSTRACT

AIM: To determine the current availability and role of medicines information services in New Zealand.

METHOD: A 36-question online survey was used to collect quantitative data about four areas of medicines information service provision: structure, availability, users and governance. The pharmacy service leader of each of the 29 public hospitals was invited by e-mail to participate. If considered appropriate, another member of the pharmacy staff could be nominated to complete the survey on their behalf.

RESULTS: The response rate was 93% (n=27). All respondents accept medicines information questions from health professionals within their local hospital, with a large proportion (85%) also accepting questions from health professionals from primary care. However, active promotion of medicines information services is rare, and health professionals within local hospitals are the most frequent service users. Although six hospitals have a formal service with dedicated staff, medicines information provision by hospital pharmacists in New Zealand is predominantly informal.

CONCLUSION: The full potential of formal medicines information services is yet to be realised in New Zealand. Greater national co-ordination could enhance access to medicines information support and contribute positively to the safe and effective use of medicines across the health system.

Clinicians routinely make decisions to optimise outcomes from the use of medicines. Given the rate at which new information is produced, sustaining a current knowledge base for this decision-making is a challenging, if not impossible, endeavour.¹ The potential risks of medicines-related knowledge gaps range from sub-optimal therapeutic outcomes to the occurrence of preventable harm to patients, with a corresponding financial burden to health systems.

The optimal use of medicines is one of the core outcome goals of the 2007 government strategy *Medicines New Zealand*² and remains a government priority with a refreshed action plan (*Implementing Medicines New Zealand*) released last year.³ Reducing medication-related harm is also a government imperative, with medication safety comprising one of the major work streams for the Health Quality and Safety Commission.

Despite increasing ease of access to a seeming abundance of information via the

internet, a recent review found that there has been little change in the proportion of unmet information needs in clinical practice over the last three decades.⁴ It seems that improvements afforded by technology may have been off-set by more complex patients (aging population, multi-morbidity) and the increasing volume and complexity of medical knowledge.^{1,4}

In studies of information needs, treatment and pharmacology consistently rank as areas of high need,^{5,6} but lack of time for searching, inadequate access to appropriate resources and limited searching skills present major challenges to clinicians in practice.^{4,7}

Providing information about medicines is a core component of the professional role of pharmacists and an area of specialty practice that emerged in 1962 with the establishment of the first formal medicines information service in the US.⁸ Medicines information services, usually located in a hospital setting, are primarily designed to provide independent, unbiased infor-

mation in response to questions from health professionals. Trained staff integrate pharmacological and pharmaceutical knowledge, information retrieval and critical appraisal with clinical experience and individual patient context to help solve medication-related problems and optimise medicine therapy.⁹

Medicines information services have been shown to have a positive economic impact^{8,10,11} and to contribute positively to patient care, clinical outcomes and medicines safety.^{9,12-14} Answers provided by medicines information services are used in care of the current patient, but the information is also often applied in the care of future patients and shared with colleagues or trainees.^{9,12}

Although four medicines information centres were established in New Zealand hospitals in the early 1980s,¹⁵ information about the services they provide and to whom is lacking. This currently consists of a description of a single centre published in 2001¹⁶ and a national overview presented in a 2005 conference poster.¹⁷ The aim of this study was therefore to determine the current availability and role of medicines information services in New Zealand.

Methods

A questionnaire was developed to explore four broad areas: structure of service, service availability, service users and governance. Question development was informed by international standards for medicines information provision¹⁸⁻²⁰ and a previous survey.¹⁷ The questionnaire was piloted on two pharmacists with extensive hospital pharmacy experience. They

provided comments on clarity, layout, ease of completion and time to complete. Some items were slightly reworded as a result. The pharmacy service leader at each of the 29 public hospitals in New Zealand with an onsite pharmacy service was invited by e-mail to complete the final 36-question electronic survey.²¹ Invitees were given the option of delegating completion of the survey to another pharmacist with greater knowledge of medicines information provision in their hospital if they deemed this to be appropriate. The survey remained open for a total of eight weeks, with a reminder e-mail sent to non-responders after two weeks. A follow-up phone call was made to any remaining non-responders after four weeks. Ethical approval for this study was obtained via the University of Otago (reference number D14/300).

Results

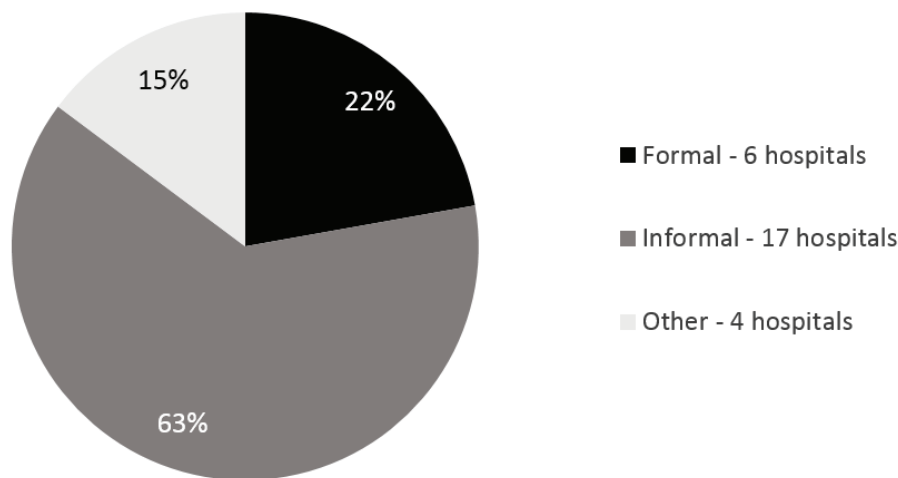
The final response rate was 93% (27/29). Two hospital pharmacy service leaders were unable to be contacted prior to closure of the survey. Based on the New Zealand Formulary listing of medicines information centres and personal knowledge that the non-responders were based in very small hospitals, it can be reasonably concluded they do not have formal medicines information services. All percentages quoted hereafter are based on a denominator of the 27 responding hospitals.

Service structure

A formal medicines information service is provided in six New Zealand public hospitals (22%) and an informal service in 17 (63%) (Figure 1 and Table 1). Four hospitals (15%) classified their approach to medicines information provision as 'other'.

Table 1: Definition of formal and informal medicines information provision.

Formal	Medicines information service with dedicated staffing of at least one full-time equivalent pharmacist, a dedicated phone line, documentation of questions received and the answers provided.
Informal	Medicines information service provided by pharmacists responding ad hoc to questions as part of ward duties or responding to phone calls to the pharmacy department.

Figure 1: Structure of medicines information provision in New Zealand hospitals.

The average staffing allocation for formal services was 1.6 pharmacist full-time equivalents (FTE), and the range 1–3 pharmacist FTE. The ‘other’ approaches that did not fit either the ‘formal’ or ‘informal’ categories were: two smaller hospitals with access to a formal medicines information service via a larger hospital within the same district health board (DHB); one hospital with a small dedicated staffing allocation for medicines information provision (0.3 pharmacist FTE) and one with a mobile phone specifically for receiving medicines information calls carried by clinical pharmacists on a roster basis.

Service availability

All respondents accept medicines information questions from health professionals within their own hospital, with 85% (n=23) accepting questions from their wider DHB catchment area. Just under half (41%, n=11) accept any medicines information questions. For others, the ability to respond is subject to workload (n=11), staffing (n=9), legal issues (n=7) or type of enquiry (n=12). Three of the six formal services accept questions from outside their DHB catchment area.

Promotion of medicines information services is very limited with just two of 27 respondents actively advertising the service; both were formal services. The advertising channels employed were: local intranet site (n=2), orientation sessions for new staff (n=2), internet site (n=1), regular newsletters or bulletins (n=1) and Grand Round or other teaching sessions (n=1).

Service users

Respondents rated the frequency with which questions were received from different professional groups on a five-point Likert scale ranging from ‘never’ to ‘very often’. Figures 2 and 3 illustrate that hospital-based health professionals are the most frequent users of the medicines information services provided by New Zealand hospital pharmacists; yet different patterns of use are observed between formal and informal/other services.

Figure 2 shows that consultants and hospital pharmacists are the most frequent users of formal medicines information services with all rating them as using the service ‘often’ or ‘very often’. They were followed by house surgeons (83%) and hospital nurses (83%), and then registrars (67%). In contrast, Figure 3 shows that the most frequent users of informal and ‘other’ medicines information services are house surgeons and hospital nurses with 71% and 62% of services, respectively, rating them as using the service ‘often’ or ‘very often’.

Service governance

All formal medicines information services have guidelines or standard operating procedures for responding to medicines information questions (100%, 6/6) and most make use of peer review to assure answer quality (67%, 4/6). Peer review is virtually absent in informal and ‘other’ services (5%, 1/21) but one third (33%, 7/21) have guidelines or standard operating procedures for answering medicines information questions.

Figure 2: Proportion of ‘formal’ medicines information services rating user group as ‘often’ and ‘very often’ users.

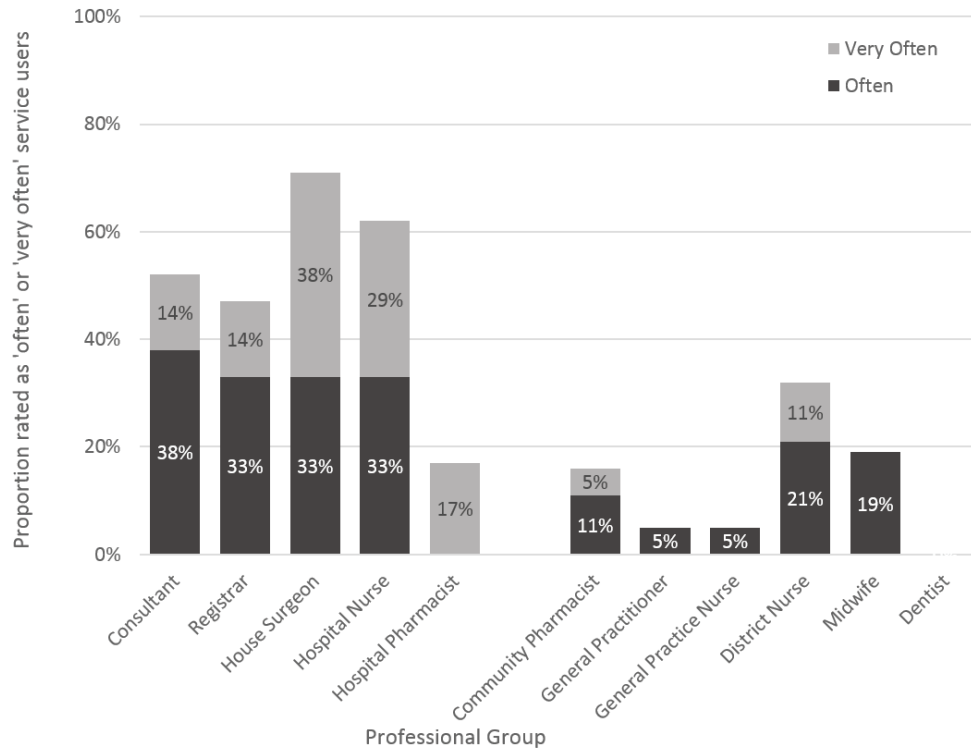
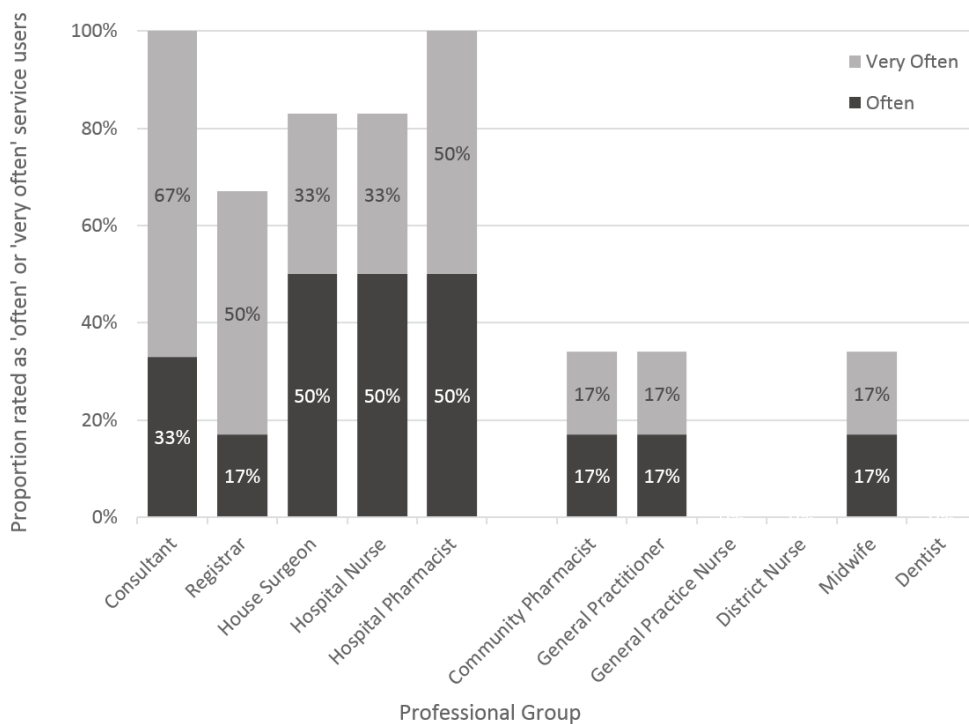


Figure 3: Proportion of ‘informal’ or ‘other’ medicines information services rating user group as ‘often’ and ‘very often’ users.



A survey to assess service user satisfaction is employed by half of formal services (50%, 3/6) and one of the other services (5%, 1/21).

A quarter of respondents (26%, 7/27) document the details of all medicines information questions received. This includes five of the six formal services. A quarter of respondents (26%, 7/27) do not document medicines information questions at all. A larger group (41%, 11/27) document only selected questions, such as those that are more complicated. Two services (7%, 2/27) document questions only when providing a written answer.

Formal medicines information services have specific training for their staff using either an in-house training package (n=3) or the New Zealand Medicines Information Training Workbook developed through the New Zealand Hospital Pharmacists' Association (n=3). Medicines information training for staff in hospitals where the approach is informal is much more variable.

Discussion

This study provides the first national overview of the availability and role of hospital-based medicines information services in New Zealand. There are six hospitals with a formal medicines information service provided for health professionals. The majority of hospitals have informal medicines information support provided by pharmacists as part of their day-to-day workload. The formal medicines information services in this study demonstrated features consistent with international standards for medicines information services such as specialist training for staff providing the service, documentation of questions and answers for future use, and quality assurance practices.^{18–20} These features contribute to provision of a robust and reliable service and are consistent with the working practices of other international services reported in the literature.²²

A variety of health professionals within and beyond the hospital setting use hospital-based medicines information support, although the most frequent users are hospital staff. House surgeons and hospital nurses are the professional groups showing the most frequent use

across all hospitals. Since junior doctors undertake a substantial proportion of all hospital prescribing and the early career years are a time of intense knowledge development, their high use of medicines information support services is not unexpected. Despite being identified as frequent users, it is possible that some junior doctors may be unaware of the support available from pharmacy teams as highlighted in a recent UK based analysis of the causes of prescribing errors.²³ The low advertising of medicines information services evident in these results could certainly contribute to sub-optimal awareness.

There is a paucity of research about nurses' need for information about medicines at the point of care.²⁴ The high level of use by hospital nurses in this study confirms the need for information and advice about medicines is not limited to prescribers.

A distinct pattern of use is evident in formal services where consultants and hospital pharmacists stand out as the most frequent users. This is consistent with the findings of Alkhaldi et al in their description of a medicines information service in a large UK teaching hospital²⁵ and likely reflects the specialist skills and resources accessible within such services. Questions from consultants tend to be more complex and take longer to answer.²⁵ The average time spent working on complex questions has been reported at nearly three hours in two recent international studies (157 minutes²⁵ and 178 minutes²⁶). This illustrates the real challenge for health professionals to find time for such research within their clinical duties, and emphasizes the time-saving role that medicines information services can play. Experienced medicines information professionals consume less time when answering medicines-related questions,²⁶ and the international trend of increasing question complexity suggests that time-saving considerations may become increasingly relevant.^{25,27} The documentation of questions and answers in a database by formal services in the present study may provide additional efficiencies due to ready retrieval of previous research in the event of a similar question.²⁸

Notwithstanding potential time-savings, Innes et al report that UK medicines information pharmacists often identify and

advise on aspects of medicines management not originally considered by an enquirer, and this is associated with improved medicines safety, patient care and outcomes.¹³ Thus, medicines information services offer a method to provide greater access to pharmacists' unique skills and knowledge, and promote collaborative patient care.

Health professionals in primary care are low users of hospital-based medicines information support services in New Zealand. This overall usage pattern is at odds with the pattern reported by an individual service in Christchurch fifteen years ago, where general practitioners (GPs) and community pharmacists accounted for 17% and 18% of questions respectively.¹⁶ The very low level of advertising identified in this study is a likely contributor to the low primary care use. Certainly, the Christchurch service reported a disproportionate increase in primary care enquiries as awareness of the service increased¹⁶ and the proportion of primary care questions to the Christchurch service remains high. In 2012, GPs accounted for 27% of questions and community pharmacists 16%.²⁹ Advertising is not the sole issue; the limited staffing allocation to medicines information services evident in the present study indicates that capacity for increased service to primary care in New Zealand is unlikely within present arrangements. This is an important consideration as GP enquiries have been previously found to be on a par with consultant enquiries in the UK in terms of time and complexity.²⁵

Given the potential benefits of medicines information services to clinical outcomes and medication safety, and the volume of prescribing that takes place, the concept of a medicines information service for primary care is attractive.^{9,12-14} A previous investigation in New Zealand highlighted medicines information as an important need of GPs.⁵ A coordinated approach where formal services provide medicines information support to clinicians (including pharmacists) in primary care and smaller hospitals may be a pragmatic solution. Examples of this type of approach can be found in the Scandinavian and the UK health care systems. In Scandinavia there is a network

of publicly funded, independent medicines information centres staffed by pharmacists and clinical pharmacologists, and attached to clinical pharmacology departments.²⁶ In the UK, a network of 220 medicines information centres based in hospital pharmacy departments and 14 regional centres work together to provide a 'virtual' national service.³⁰ Strategic coordination and collaboration between formal services, as well as the optimisation of natural links with clinical pharmacology and library services, would help ensure efficient use of scarce health resources. As pharmacists' roles within primary care are evolving, an ideal solution would retain and value existing local skills, knowledge and relationships, but provide support where needed. This may be in the form of access to resources, training or peer review. There is also potential to fill gaps in access and ensure that high quality medicines information support is available to health professionals all around the country. Information technology solutions that facilitate knowledge sharing could also play an important part—a shared online question and answer database has operated successfully in Scandinavia for decades.²⁸ Documenting questions and answers in a database provides additional benefits such as enabling more proactive work. For example, a cluster of similar enquiries may highlight an area warranting further education of health professionals, or tracking questions where limited evidence is available may provide impetus for future research.³¹

A strength of this study is the high response rate which provides an accurate picture of the New Zealand situation. One limitation was that user frequencies are based on best estimates for informal services due to variation in question documentation practices. The focus on hospital-based services could mean that other medicines information services available in primary care have been missed, although there appears to be no formal medicines information services based in New Zealand primary care. Areas for future research include the nature of medicines information needs in New Zealand primary care, including the medicines information needs of patients.

Conclusions

Formal medicines information services are available in six hospitals, but the full potential of such services is yet to be realised in New Zealand. Capacity is an issue due to limited staffing, but there are solutions available that would embody current health strategy goals—patient driven, whole

team integration and the use of smart systems. A nationally coordinated medicines information service could provide efficient, effective support across the health system for clinical problem-solving, continuing education and knowledge translation activities, contributing positively to the safe and effective use of medicines.

Competing interests:

Chloë Campbell was involved in development of a database application for recording medicines information enquiries that is currently in use in six New Zealand hospitals.

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Key informant views on biobanking and genomic research with Māori

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ABSTRACT

The aim of the Te Mata Ira project was to explore Māori views on biobanking and genomic research, and to identify ways to address Māori concerns over the collection and use of human tissue. Key informant interviews and workshops were conducted with Māori to identify Māori views in relation to biobanking and genomic research; and, informed by these views, interviews and workshops were conducted with Māori and non-Māori key informants (Indigenous Advisory Panel (IAP) members and science communities) to explore key issues in relation to Māori participation in biobanking and genomic research. Māori key informants identified the following as key deliberations: (1) the tension for Māori between previous well-publicised negative experiences with genomic research and the potential value for whānau and communities as technologies develop, (2) protection of Māori rights and interest, (3) focus on Māori health priorities, (4) control of samples and data, (5) expectations of consultation and consent and (6) a desire for greater feedback and communication. Māori and non-Māori key informants highlighted the need to enhance levels of Māori participation in the governance of genomic research and biobanking initiatives, and acknowledged that only by increasing the level of transparency and accountability in relation to these activities will Māori communities feel that their whakapapa, rights and interests are being appropriately protected.

Māori have been contributing to the debates about research ethics¹⁻³ and genetics⁴⁻⁸ for a number of years. Several studies exploring Māori views on genetic research⁹⁻¹³ and biobanking^{14,15} have described Māori perspectives on these types of research and the key issues that arise, including cultural issues,^{16,17} governance issues,^{18,19} consent processes,²⁰ social equi-poise,^{21,22} distribution of risks and benefits,^{2,23} tissue storage,^{16,24} analysis^{10,23} and interpretation of results.^{10,20,23}

*Te Ara Tika—Guidelines on Māori Research Ethics: A framework for researchers and ethics committee members*² established a framework for understanding the diverse views that inform Māori ethical deliberations and noted the heightened ethical sensitivities that exist for Māori in relation to the use of tissue and genetic information. However, the document did not provide substantive comment or practical advice for genetic researchers or biobanks

in relation to Māori cultural, ethical and legal parameters for these activities. Māori continue to consent for their tissue to be used in biomedical research projects,^{4,10,11,13} so it is important that their expectations of ethical research behaviour are reflected in developing guidelines. The Te Mata Ira research project explored the issues that Māori encounter when they choose to be involved in genomic research and biobanking with the aim of providing more substantive culturally appropriate guidance to researchers and communities alike.

Background

Genomic research represents a new frontier for health research and provides a platform for personalised medicines (pharmacogenomics). The scale of biological samples required to adequately power genomic studies has led to significant growth, nationally and internationally, of both biobanks and genomic databases.²⁵⁻²⁹

Though genomic research has yet to fulfil the promise of personalised medicine, ethical discussions within Māori communities^{4,9,11,30} and among ethicists in the international domain^{31–34} are evolving to meet emerging challenges and technologies. Subsequently, there has been a proliferation of international genetic databases^{25,35} and national^{34,36} and international guidance documents^{37–39} suggesting various ways for governing them. Yet commercialisation practices and the return of individual results varies.^{14,28} Nevertheless, it is vital to include Indigenous ethical principles in genomic research, particularly given the existing storage of Indigenous genetic material and because it is possible that genomics could play a role in future contests over Indigenous people's claims of identity and rights.^{40–42}

Ethical controversies surrounding genetic studies, like the human genome diversity project,²³ the 'warrior gene'^{43,44} and the Arizona State University settlement with the Havasupai, a Native American tribe,⁴⁵ have prompted Indigenous critiques. These have included research by Indigenous Peoples Council on biocolonialism about the Havasupai^{15,46–48} and work undertaken by the National Congress of American Indians (NCAI) studying views of genetic health research in Indian Country.^{15,49–51} Researchers are also recognising the need for change, and a recent *Nature Reviews Genetics* paper by Gottweis, Chen⁵² called for biobanks to address issues of trust, benefit sharing, data security, privacy and practicing reciprocity.

The use of biobanks and sharing of research data across projects are also being discussed in New Zealand as a cost-saving measure, particularly in relation to a number of high-cost medicines associated with cancer treatment. In the past two years the Health Research Council of New Zealand (HRC) Ethics Committee was approached for guidance on both secondary and unspecified future use of data and human tissue as well as appropriate use of information databases, prompting the HRC to consider developing a data-sharing policy. Recent research by New Zealand's Virtual Institute of Statistical Genetics has also shown that sample sizes of 1,000,000–10,000,000 are needed to obtain sufficient evidence for

association, meaning extensive data sharing, including that relating to Māori genetic material, is required for genome-wide association studies.²⁶ In many instances the data being shared will be based on biological samples (genetic/genomic information) and pressure is increasing for anonymous datasets be placed in the public domain as a prerequisite for publication. Similarly, the linking of computerised medical records with genetic/genomic information and population-level genome sequencing is also on the horizon.

The speed of technological advance is outpacing the development of ethical oversight and it is apparent that in New Zealand much of the guidance on genetic research and data sharing is not specific enough to deal with emerging ethical issues associated with the types of genomic research now possible. The recent establishment of the Auckland Regional Tissue Bank (Auckland), Rare Diseases Tissue Bank (Dunedin), Melanoma Tissue Bank (Dunedin) and the Centre for Brain Research Biobank (Auckland) illustrate a shift towards developing more formal tissue storage facilities and the provision of more transparent consent processes for the ongoing use of tissue in research including genetic and genomic studies.

Methods

Three sets of participants contributed views to gain understanding about the genomic research and biobanking contexts, how Indigenous populations have fared in these contexts and strategies to regulate these contexts. Semi-structured interviews were held with seven Te Mata Ira International Advisory Panel (IAP) members until saturation was achieved. The panel members, who belong to Indigenous communities in Australia, Hawaii, Canada, US and New Zealand, represent a diverse range of research expertise in Indigenous health, health policy, medical genomics and bioinformatics. Given their diverse locations, IAP members were interviewed by telephone or skype. Five stakeholder workshops were conducted at Auckland, Christchurch and Dunedin (n=5). Two were science focussed workshops aimed at genetic researchers and biobank personnel (n=27, both Māori and non-Māori), and three

were Māori focussed workshops to gain views from Māori who have a role in health research, ethics or genetics (n=31).

The three key questions asked in the interviews and workshops were;

1. Why should Māori/Indigenous communities participate in biobanking and/or genomic research?
2. What are the key issues for Māori/Indigenous participation in biobanking and genomic research?
3. How might we address these issues?

The interviews and workshops were digitally audio-recorded, transcribed and summarised. Summaries were checked with IAP members to enhance validity. A guided thematic analysis—the process of coding empirical material to the research questions and emerging themes^{53,54}—was conducted across several key domains, including but not limited to potential benefits of participation, barriers to participation and expectations of behaviour. Answers to the first and second questions are detailed below. Because key informants answered question three while discussing issues prompted by question two, these findings are presented together.

Findings

Why should Māori participate in biobanking and genomic research?

The question of whether it is useful or appropriate for Indigenous/Māori communities to engage with new technologies continues to be the subject of discussion and debate. The views advanced by the three groups of participants reflect a wide range of opinions on the value of participation in genomic research and biobanking initiatives. The key opportunities outlined by participants provided by engaging in genomic research and biobanking are the potential;

1. to derive health outcomes
2. to increase understanding and trust in the science and scientists
3. to improve processes of research
4. to protect broader interests of the Māori community
5. to realise other opportunities

Potential health outcomes were described largely in relation to lessening the incidence and prevalence of disease, along with recognising that genomic medicine may be another type of health care that Māori communities can benefit from. Māori key informants considered the value of participation in two distinct ways, namely, individual value and community value. At an individual level, key informants spoke about the potential to enhance health outcomes for the individual seeking treatment and expressed a keen sense of altruism in wanting to be part of something that they believed may help others outside of their immediate family. Māori participation in genomic research was also described by some as a potential tool for reducing inequalities but only if it is applied at both the individual and the community levels in an appropriate manner, along with a clear understanding of the limitations of genomic research. The optimism about potential health gains was balanced by a recognition that genetic contributions towards health outcomes are only part of the answer and will be situated within a broader context of social determinants.

What is the ethical balance between doing genetic research and what we know about the impacts of inequalities and poverty? (Māori key informant, workshop)

The perceived link between enhanced treatment for disease and participation in genomic research was particularly pronounced in the discussion within the science workshops. Key informants in the science workshops explained that the current limited evidence on genetic variation between Māori tissue and other populations provides a unique opportunity and motivation for scientists to work with these communities in biomarker discovery. Māori participation is also seen as necessary to provide representative population wide data, something necessary to ensure that Māori communities directly benefit from genomic medicine in the future. Along with other limitations, Māori would only benefit if there were sufficient numbers of Māori participants and statistical power for Māori specific analyses to be conducted. Key informants in the science workshops also suggested increasing Māori samples

in biobanks would provide greater opportunities for Māori specific health priorities to be researched. They noted that Māori participation in genomic research and biobanking projects would require a greater level of trust in the people and processes responsible for the storage and use of tissue samples, as well as a greater level of transparency and culturally appropriate engagement from scientists.

Participation as a potential opportunity and facilitator of other community development and capacity building initiatives was also discussed. The benefits described included those arising through greater control such as ownership of intellectual as well as biological property, and were described in a way that strategically positions Indigenous communities as decision-makers including supporting aspirations for sovereignty.

Key informants also felt that it is important to consider the factors that motivate whānau to get involved in genetic research and how this impacts on their ability to ask critical questions about the nature of the project. Families with genetic concerns participate in the interest of their family's health as their primary focus is coping with the condition not how their genetic data might be used in the future.

If I've got it then I want my kids to be protected [from the disease] so it was a real whakapapa thing. It wasn't a raced based, community based, [or] Iwi based thing at all. They did it [genetic testing] because they thought, "If I have something genetically wrong and my kid inherits it...then I want my kid to know that and for that to drive practice" (Māori key informant, workshop).

Generally, the key informants that participated in the science workshops were more positive about the value of Māori participation in biobanking and genomic research in terms of improving the science and ensuring outcomes from research benefit Māori. The Indigenous Advisory Panel and the key informants at the Māori workshops were more reticent about the value of participation but recognised it has direct benefit for specific individuals and families, and that other collective interests could be addressed if Māori were more involved in governance and decision making to ensure the wider health benefits are realised.

What are the key issues related to Māori participation in biobanking and genomic research?

Protection of Māori rights and interests

Key informants described a legacy of mistrust created by examples of unethical engagement with Indigenous peoples in biomedical research, and this motivates Māori to evaluate genomic research projects with a greater degree of scrutiny. Māori research principles promoting community participation, culturally appropriate protocols and Māori involvement in research and governance provide the foundation for sound partnerships and quality research. Key informants spoke about the need to protect Māori interests through Māori control promoting concepts of power-sharing over benefit-sharing.

We'll get this right if we know that the control sits with Māori. Not individual Māori because actually that's a personal decision that they're making based on a personal perspective...But this stuff has to occur on a much bigger scale and it has to be able to shift this down [to the level of Māori community] otherwise it's of no value (Māori workshop).

Focus on Māori and Indigenous health priorities

Key informants questioned whether genomic research is what is needed to change negative health outcomes for Māori. Key informants recognised the usefulness of genetic information for some conditions; however, they were less convinced of its utility for key Māori health priorities—like diabetes or cardiovascular disease—where multiple genes and environmental factors contribute to its expression. If health status is considered within a determinants of health framework then there are other places you would put resources to address environmental and systemic factors impacting on individuals and populations. Key informants in the Māori workshops generally thought that prioritising funding for genomic research would divert resources away from public health research, which they believe had more immediate benefits for Māori communities.

They've got this information that they might have this gene contributing to whatever disease but then what do they do

with that information? How can they use that to improve health? (Key informant interview).

We are at the intervention stage in public health. So when you're putting resources into this unknown area when we've got all this mahi that we should be doing [it is mismatched] (Key informant, Māori workshop).

Robustness of genetic research methods

A number of the key informants had high levels of research expertise and were able to critique the framing and methods used in specific genomic research projects. Some of the concerns expressed include;

- a) the construction of racial or ethnic groupings for genetic comparisons,
- b) the attribution of familial characteristics to larger groupings,
- c) the analysis and interpretation of results and
- d) an interest in the scientific novelty rather than clinical application.

Inappropriate interpretation of results, as occurred with the 'Warrior Gene' hypothesis where polymorphisms in the monoamine oxidase A gene, were linked to aggressive behaviour in Māori, stigmatised the Māori community and reinforced negative stereotypes of researchers.^{20,55} One of the key challenges for genomic researchers when communicating results of genetic studies in specific ethnic populations is to ensure people understand that the use of the group to help identify a functional gene or phenotype does not mean that the phenotype is an ethnic marker, that is, a Māori gene. As a key informant in one of the Māori workshops explained, they had reframed their views of race and genetics on the basis of learning basic knowledge on genetics and admixture.

Genetics is not race based; it's familial. Māori are an admixed population...How do you know that that's our Māori genes? How come it's not our Scottish genes? (Māori key informant, workshop).

Because if you look at the Human Genome Project, for instance, we're from the family of Maui apparently...It's pretty much all Polynesian, brown people...but it just seems so racialised...They never find bad genes in the white population. It's always in the Māori group (Māori key informant, workshop).

Key informants also described how genetic analyses rarely recognised the broader social context and distracted attention from social determinants of health, including the impact of colonisation and poverty.

The truth is we didn't have diabetes before we had a western diet, so how can that be genetically right? Pakeha get diabetes and they get gout so we use prevalence and incidence rates to again racialise an illness which really is an illness of poverty...In genetics they never discuss poverty (Māori key informant, workshop).

Control over samples and data

Key informants described the importance of Māori involvement in decisions over access, storage and use of tissue and data. They could see the potential for Māori participation in genomic research shifting from being a subject of research and a provider of tissue towards greater participation in the research design and governance. Control over tissue and data ensures that it is used for research that directly benefits the community and in a manner that recognises its cultural significance. They spoke about the need for Māori to have more influence over the use of data and the direction of research.

Stewardship requires access to research and data to support developments within our communities. Engagement with research is a key activity related to accessing quality data in support of our aspirations for sovereignty (Key informant interview).

Some groups are exercising sovereignty by being involved in decisions on genetic research and biobanking (Key informant interview).

Increasing Māori participation in regulatory roles and strengthening Māori governance was potential mechanisms to improve the level of monitoring for researchers and biobanks in possession of Māori tissue. Possession of tissue was viewed as carrying strong implications in terms of stewardship and care. Key informants stated that it is important to be involved in the development of policies for these groups.

I think it comes back to accountability because whoever owns the keys to the freezer typically determines what happens to the samples, and if the person who had the keys to the freezer is not keeping [researchers] accountable to what was agreed on in the

first place then really they can do whatever they want (Māori key informant, workshop).

With the biobank...you almost need...like a Māori with veto powers on a committee that evaluates [the research] and says, "Look if you don't use the tissue for the purpose you signed up for in the beginning then nothing gets published because you...had the ability to be able to say I don't want this published". But I mean an Iwi group won't have the same [power] (Māori key informant, workshop).

Benefit sharing

Benefit sharing is an important element of the research relationship. Key informants recognised that benefits would not always be direct health improvements but thought there was scope to explore other possibilities through education, capacity building and intellectual property. Ownership of material and data was discussed as an issue related to potential development of commercial products. Key informants stated that both researchers and participants can realise benefits from a project and a balance needs to be found to ensure communities receive an equitable share of the benefits produced through genomic research.

So we need to think about it in the broader context, and then there's the ethics and the quality of the research, partnerships... and negotiation of benefits (International Advisory Panel).

Expectations of consultation and engagement

A desire to protect Māori/Indigenous rights and interests through the entire process of research informs their expectations of consultation. Key informants discussed the place of community engagement in the development of projects and the need for researchers to talk to the right individuals within communities. Appropriate consultation will provide an opportunity to negotiate issues of research design, sampling strategies, language, cultural support, research governance, review processes and publication protocols. Overall the use of appropriate research design was seen as a significant factor in the protection of Māori and Indigenous interests. Key informants spoke about Māori values informing the parameters around which tissue can be used. Health research has a number of best practice models which

emphasise the importance of early discussions with Iwi/Māori, which is especially relevant for this context given the complex nature of the studies and the ethical issues associated with it.

This is where having a conversation with Iwi becomes really important... We have groups that...don't necessarily know what it is they are saying yes to (Māori key informant, workshop).

Expectations of consent

Key informants suggested that community consent was required to gain support for the genomic project taking place. Māori communities needed access to someone who could 'translate' genomic research jargon into practical terms for consideration. The translator would have the ability to explain what the research is likely to provide to the community, what will not be provided and any risks associated with participation. Access to independent resources and guidelines would create a more transparent and safer process for communities.

You need somebody on your own team, Iwi need someone for themselves that actually can broker with the geneticists...you actually need someone who can talk the geneticist's language that actually understands what methods should be used (Māori key informant, workshop).

If you want to explore that uniqueness of a certain collective then you actually have to have that collectives consent, that way you can go forward...The academic freedom is seen as the sort of guiding principle by the researcher, like I don't need to be told by some community how to do my science (Non-Māori key informant, interview).

Key informants felt that individual consent provides a mechanism to both allow participation while also restricting certain activities that participants might not be comfortable with like sending tissue overseas and consent for future use. It is important to consider the timing of consent and allowing individuals time to discuss risks and benefits with family and friends. The recruitment process is a key part of the gaining informed consent. Māori involved in the direct recruitment of participants often felt their connection to those communities may have influenced peoples' decision to participate more than the information

provided. This can create a tension for the Māori recruiter who becomes responsible for the tissue, in the eyes of the community, even if they have no decision-making power within the project team.

Once again, who was the person who was getting the consent? It was actually Māori to Māori. You're sitting there, you're talking about it [genetic research project], we're selling it and they're buying in (Māori key informant, science workshop).

To me the biggest lesson I've learnt is that we shouldn't say anything. We should put them in front of our people and if our people don't like them they say no and then that's how it is (Māori key informant, science workshop).

Ongoing communication and feedback

Key informants explained how a lack of knowledge is seen as a key factor in creating barriers for both researchers and Māori participants. Key informants in the science workshops perceived that Māori reluctance to participate in genomic research is due to not knowing how genomic research works and that this can also lead to suspicion and misunderstanding. They also spoke about having a lack of knowledge on how to engage with Māori to ensure that effective consultation and negotiation is part of the process of research and biobanking. In contrast, key informants in the Māori workshops expressed frustration with the lack of feedback and information about the progress and outcomes of research projects and stated that this reinforced negative sentiments about researcher commitment to their communities.

Increasing the level of genetic literacy was identified as important in the context of having communities make more informed decisions about participation in genomic research. Education initiatives to increase awareness were seen as vital for both Māori and science communities. Increasing levels of cultural literacy within science communities should lead to a greater acknowledgement and respect for Māori views within the research project, enabling researchers to develop research questions that align with community health priorities, and implementation of research processes that support opportunities for Māori development.

[Guidance for scientists is important] to increase the comfort level of Indigenous people who are participants in biobanking and genomic research (Māori key informant interview, workshop).

Discussion

There are a small number of established biobanks in New Zealand that manage tissue for research purposes including genomic research but a much larger number of 'informal biobanks', research-based tissue collections, which have samples that have been consented for future use. As there is no register for biobanks or research-based tissue collections there is no way of knowing how many samples are in storage or how many of them have been provided by Māori participants. Few projects have specifically collected samples from Māori populations for genomic research, in part due to the challenge of ensuring Māori support. Notable exceptions include the Gout and Related Conditions Project in Ngāti Porou, the Rakaipaaka Health and Ancestry Study and Te Wai o Rona based in the Waikato. While Māori views on genetic research and biotechnologies indicate an increasing willingness to engage if there is a health benefit for the family or community,^{11,18,66} it was evident in the workshops that communities are also becoming more critical about the nature of participation and expectations of researchers.

Māori communities are often uneasy about participating in genomic research, based on past experiences where projects have operated outside the ethical boundaries agreed with communities. Projects led by Arizona State University and Institute of Environmental Science and Research did not end well for Indigenous communities and highlight the potential risks associated with engagement in genomic research. Researchers at Arizona State University (ASU) gathered blood samples from Havasupai Tribe in Arizona to search for a link to diabetes, but used the samples to look for other diseases and genetic markers. Researchers at the Institute of Environmental Science and Research Ltd initiated a Health and Ancestry study with the Ngāti Rakaipaaka tribe in New Zealand. The

primary researcher was the protagonist of the 'Warrior Gene' and while this incident was not directly associated with the study, it led to its demise. Indigenous and Māori researchers, and communities themselves are becoming increasingly vigilant in their expectations of research partners.

The value of participation

Māori views on the potential benefits of biobanking, genetics and genomic research are largely related to helping others. Māori cultural concepts, in particular the concept of *manaakitanga* (caring, kindness), is said to increase the likelihood of Māori agreeing to participate in genetic research.¹⁴ Believing that participation will help a family member or someone else in the community who is unwell is a key motivator for Māori participation in health-related biotechnologies.¹¹ Māori views on the value of partnership between Māori communities and genetic researchers are shown to be positive if the research is seen to be of benefit, particularly in areas such as predictive cancer testing.¹⁷

While there are concerns raised over the reductionist nature of genetics, the value of genetic testing for Māori may lie in finding solutions to immediate and severe health states¹⁸ and through predictive genetic tests that identify risks of developing disease.¹⁷ However, Māori recognise that health inequalities may not be adequately explained by genetics, and one potential consequence of genetic research is that it could contribute to diminishing support for equity-based policies that recognise the role of social justice in relation to inequalities.⁵⁵

The challenge of effective participation

The challenges for Māori communities in participating effectively in genomic research and biobanking projects reflect the broader political dynamic relating to Indigenous-State relationships and equitable access to resources, including research. It traverses the interface between *mātauranga* Māori and science, and touches on the difference between the 'value' associated with biological tissue, a *taonga* (treasure) in a cultural context and a biological resource in the science community. It is informed by a diverse range of Māori discourses, experiences and worldviews, and as there are numerous opportunities for misinterpretation and misunderstanding, an authentic

engagement should be underpinned by clear processes and values.⁵⁷

It is apparent that one of the effects of colonisation is a general marginalisation of Māori communities within the realms of education, limiting Māori capacity and capability to engage in research. This is especially true for the increasingly technical research projects conducted in scientific disciplines. The Māori key informants indicated that there was a general lack of understanding about genomic research and biobanking in their communities and also identified that there were limited opportunities for involvement in the research process. Becoming 'informed' is a significant challenge for both communities engaging with researchers and individuals considering participation in projects. The information imbalance reflects the power imbalance that exists between researchers and communities, a situation that can only be effectively mediated through the development of ethical relationships and use of culturally appropriate biobanking and research processes.^{58,59}

The increasingly complex and technical nature of genomic research creates challenges for effective communication between communities and researchers. A high degree of literacy and understanding is required to understand the contexts of the health condition, genetics and research for Māori communities to engage meaningfully in consultation and consent processes. One example of education initiatives that inform Indigenous communities is the National Congress of American Indians Genetics Resource Centre.

The alignment of Māori health priorities with scientific research agendas is two-fold. At a superficial level, it is about defining the scope, aligning the research inquiry with an area of Māori health need and identifying the potential benefits and risks. At a deeper level, it is about understanding the contribution of the research project to equitable health outcomes, which means a greater focus on the pathway to implementation, specifically for Māori communities. Existing inequalities in access to and provision of services within the health system mean that the development of new medicines or treatments does not automatically equate to a health gain. While the implementation pathway may not

be the direct responsibility of the researcher, involving Māori communities in determining the purpose of the research provides a key advocate for its implementation through tribal and other health services. Māori key informants in workshops indicated that it would be important to have the ability to steer research processes for Māori interests.

Māori involvement in the governance of research programmes provides opportunities for Māori interests to be promoted and protected. In the context of biobanks, decisions about the use of Māori tissue samples should be made by Māori members or committees who can assess the value of the proposed project and level of Māori support either through individual or collective Iwi consent. This oversight is likely to increase the level of confidence of potential donors that their tissue will be used in a culturally appropriate manner,⁶⁰ especially in relation to the inherent uncertainty associated with its 'future use' in a changing scientific and funding environment.

The key informants suggested that the overarching goals of any ethical framework should both provide a level of ethical oversight to protect the interests of participants and their communities, and educate the communities so that they can better determine how they might like to engage, or not, with genomic research and biobanking projects. The important issues that emerged from the key informants include;

- Research Purpose: Clarity, alignment with community priorities and keeping to scope of research question
- Outcomes: Community benefits, capacity building
- Benefits and Risks: Identification, realisation/mitigation, coercion
- Researchers talking about the issues to the right people at the right levels. Levels of engagement include individuals, communities and experts
- Opportunity to engage: Policies, capacity, involvement in design and questions, ongoing communication, research governance
- Control/ownership: Samples, data, intellectual property
- Governance of sample storage and use: Status—mana and wairua, access and storage, use and future use

- Governance of data: Use of data, data sharing
- Informing consent: Access to technical advice and support, increase in functional literacy, interactivity, access to information
- Language: Translation of science concepts, cultural contextualising
- Consent: Duration of use of tissue, specificity, timing, process, parameter
- Results: Use, interpretation, contextualisation, presentation
- Application to health service delivery: Action

The themes that emerged from this project echo issues identified in other Indigenous communities. Taualii⁶¹ proposed a GREAT Research model reiterating the importance of Governance, Re-consent, Education, Accountability, Transparency, Research priorities for Native Hawaiian communities. Improved consultation, consent and transparency of research intent, conduct and use of specimens and results among Alaska Native people was noted by Hiratsuka and others.⁶¹ Anderson and others⁶² mapped a series of issues complicating Aboriginal and Torres Strait Islander participation in genetic research, including issues with the research process, the research findings and the research samples. These studies highlight a common Indigenous interest in improving the processes of biobanking, genetic research and the practices of researchers.

Enhancing Māori participation in biobanking and genomic research

Various ethical guidelines now reference specific Indigenous principles and identify issues that should be resolved. Taniguchi and others⁶⁴ conducted a comparative analysis of Indigenous research guidelines for genomic research and found that no one document provided comprehensive guidance for all the issues. The continuing development of Indigenous research guidelines will be beneficial to both communities and researchers. Increasing the level of involvement in the governance of Indigenous biospecimens and genomic data is also on the agenda for Indigenous communities. This not only involves participation on governance structures for existing biobanks but also encourages the establishment of more enduring and co-ordinated

entities, including Indigenous biorespositories (ie Alaska Area Specimen Bank; International Collaborating Centre for Indigenous Peoples and Genomic Research, South Australian Medical and Health Research Institute) and biospecimen networks.

Governance structures provide a mechanism for protecting Māori interests and can both strengthen issues of mandate and consent as well as allay concerns about individual participants' consent being properly informed. This will include addressing historic project-based collections of biological samples that have been consented for future use, where the decision-making power defaults to the principal researcher and their institution. There is little transparency in relation to the governance of these research collections, which might be considered 'informal biobanks' and rarely any Māori participation in decisions about how the samples get used. The general uncertainty about future use provisions highlight the trust and accountability in the relationships established between research teams and communities and the importance of understanding the role of Māori communities in the protective functions of governance and consent. Discussions with the key informants in the science workshops illustrated that some biomedical researchers are becoming more aware of the importance of cultural protocols and the need to work with communities to ensure that research processes prevent the misuse of tissue.

Processes of consent that recognise collective decision-making^{5,43} and dynamic consent,^{65,66} including providing options for differential consent (to various components of a project or elements of future use) and supporting expectations to re-consent for future use, are more likely to be mandated by Māori and Indigenous communities.⁶¹ Strengthening governance and consent processes is also related to capacity building within Māori communities. The technical nature of genomic research, which requires high levels of literacy in relation to research, genetics and the health condition, are a barrier to public understanding. Access to good public education resources and targeted support for Māori communities will assist them to become informed and enhance their contributions

to the project. The 'education' of communities involves more than just upskilling people in the sciences. Māori communities hold knowledge that can contribute to understanding what is safe, necessary and possible in their communities.⁶⁷ Indeed, the advancement of health and wellbeing is reliant on the intelligent use of different types of knowledge so genomic science, public health, indigenous knowledge and other disciplines can provide useful contributions to this aim.

Conclusion

Māori views on biobanking and genomic research are evolving, as the points of engagement between these communities and researchers increase with the merging of the clinical and research contexts. A wide range of views are present in Māori communities from actively opposed to non-supporting, from ambivalent to conditionally supportive. There is a recognition that Māori individuals and whānau will engage with genomic research and biobanking if it is in their interests and that this should be supported within a framework that protects the broader interests of Māori communities at hapū, Iwi and national levels.

A range of concerns were expressed by key informants covering issues at individual, project and system levels. The protection of Māori rights and interests is of primary concern, as is the targeting of this type of research towards Māori health priorities. There was dissatisfaction with current engagement and a preference for a greater level of consultation and more dynamic and inclusive processes of consent. Ongoing control over samples and data was identified as a key consideration, including the robustness and interpretation of genomic research methods. Informed engagement is dependent on the level of knowledge about biobanking and genomic research highlighting the need for public education initiatives as well as ongoing communication and feedback about specific projects.

Effective engagement will not only require a more active process of consultation in the development of projects but a continuing relationship with hapū, Iwi and other Māori entities. The 'model of trust' which underpin

current approaches to biobanking will need to change to 'model of participation' to allow individuals, through dynamic consent, or communities, through participatory governance, to exercise their rights and interests in relation to biological tissue and data.

Establishing a robust social and cultural mandate for biobanking and genomic research is the key to enhancing Māori participation, a challenge for both Māori and New Zealand's medical science communities.

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Socio-demographic characteristics of New Zealand adult smokers, ex-smokers and non-smokers: results from the 2013 Census

Danny Tu, Rhiannon Newcombe, Richard Edwards, Darren Walton

ABSTRACT

AIM: To describe the smoking prevalence by key socio-demographic characteristics (age, gender, ethnicity, education, labour status, income and socioeconomic deprivation) in New Zealand in 2013 and make comparisons with 2006.

METHOD: Data on cigarette smoking and key socio-demographics variables were obtained from the 2013 New Zealand Census of Population and Dwellings. Age standardised smoking prevalence rates were calculated by gender, ethnicity and socioeconomic deprivation using the WHO Population Standard. Results were compared against 2006 Census data to identify changes in smoking prevalence.

RESULTS: In 2013, around one in seven (15.1%) of New Zealand adults aged 15 years and older reported that they were regular smokers (smoked one or more cigarettes per day), a 5.6% absolute decrease in the smoking prevalence since the previous Census in 2006. The number of regular adult smokers dropped from 597,792 in 2006 to 463,194 in 2013, a 22.5% decrease. Falls in smoking prevalence occurred among all demographic sub-groups, including Māori and young adults. There were substantial disparities in smoking by age, ethnicity and socio-economic status. Māori continue to have the highest age-standardised smoking prevalence (32.4%), with the highest prevalence (43.1%) among young Māori women aged 25 to 29 years. Decreases in smoking prevalence were greater between 2006 and 2013 than between 1996 and 2006.

CONCLUSION: The findings suggest that the decline in smoking prevalence is accelerating in New Zealand, including among high priority groups like Māori, Pacific peoples and young adults. This study confirms the value of census data for understanding patterns of tobacco use in New Zealand, to inform effective intervention development and monitoring progress towards the Smokefree 2025 goal.

Tobacco smoking remains a major preventable cause of mortality and morbidity in New Zealand.¹ One component of a comprehensive tobacco control programme is robust monitoring of tobacco use at a population level to determine the priority populations to target with interventions, monitor progress and assess the impact of tobacco control efforts.² The importance of monitoring has also been underscored through the Framework Convention on Tobacco Control.

In 2011 the New Zealand government adopted a goal of reducing the prevalence of smoking and the availability of tobacco

products to minimal levels by 2025.³ The goal is commonly interpreted as meaning that the smoking prevalence will fall below 5%.⁴ In this context, it is particularly important to have a robust method for tracking smoking prevalence in the population as a whole and within key demographic sub-groups.

Currently, information on smoking prevalence in New Zealand comes from a variety of sources, including nationally representative surveys such as the Ministry of Health's New Zealand Health Survey (NZHS) and the Health Promotion Agency's Health and Lifestyles Survey (HLS). Recent results

from these surveys suggest that the prevalence of tobacco use is declining, however, large disparities in smoking by ethnicity remain with less pronounced declines in smoking among high prevalence groups such as Māori.⁵ In New Zealand, a further monitoring mechanism is the national census, which uniquely includes questions on smoking status.

This paper reports on smoking data from the New Zealand Census of Population and Dwellings (the Census). The Census achieves 97.6% coverage of New Zealanders and so provides an important source of information to understand the impact of the tobacco control programme.⁶ This paper reports in detail on the latest census data in 2013, and makes selected comparisons with data from the 2006 Census to estimate recent changes in prevalence.

Method

The Census, conducted by Statistics New Zealand, is the official count of how many people and dwellings there are on census night in New Zealand. The Census has been conducted every five years since 1877, with only four exceptions. The most recent Census was not held as scheduled in March 2011 due to the disruption caused by the Christchurch earthquakes on 22 February 2011.⁷ Instead it was delayed until 5 March 2013.

Everyone in New Zealand on census night is required to complete a census form under the Statistics Act 1975.⁸ Two census forms are hand-delivered by the collectors prior to the census night, a dwelling form and an individual form for everyone who will be in the dwelling on census night. Collectors attempt to cover all dwellings including private and non-private dwellings, ie hotels, prisons, hospitals, camp grounds and cruise ships. Foreigners who are in New Zealand on census night are counted in the census. New Zealand residents who are overseas on census night are not included in the census. The data reported in this paper is for the 'usually resident' population and excludes foreign visitors.

The Census aims to cover the entire population of New Zealand, so it is not subject to sampling error. However, it may be subject to non-sampling error, which includes

undercounts, respondent errors, collection and processing errors. Statistics NZ has made every effort to reduce each of these error types.⁹ Two questions were asked in the 2006 and 2013 Censuses to determine smoking status: "Do you smoke cigarettes regularly? (that is, one or more a day)" and "Have you ever been a regular smoker of one or more cigarettes a day?" The definition of a regular smoker is someone who smokes cigarettes regularly (ie one or more cigarettes a day) currently. An ex-smoker is defined as someone who used to smoke regularly, but no longer does now. The definition for 'never smoked regularly' were people who had never been regular smokers. Smoking of pipes, cigars and cigarillos, other smoked substances such as marijuana and tobacco used for chewing were not included in these definitions.

Prevalence estimates were calculated for regular smokers, ex regular smokers and people who have never smoked regularly. People not answering one or both smoking questions were excluded from the analysis. Crude prevalence estimates were calculated by gender, age groups, ethnicity and categories of education level, employment status and income. Age standardised estimates using the direct method were calculated by gender, ethnic groups and area-based socioeconomic deprivation levels using the WHO World Standard Population.¹⁰ Crude prevalence estimates are provided for the 2013 data, and age standardised prevalence figures are provided when comparing data from 2006 and 2013.

Ethnic group

Ethnicity was derived using the total response method, which involved each participant in the Census being allocated to all ethnic groups that they identified with. This means that if a person identifies as being Māori and Chinese, they are classified as both Māori and Asian in the analysis.¹¹ Those people who gave no response and responses that could not be classified or did not provide the type of information asked for to the Census ethnic group question were coded as "Not elsewhere included". 5.5% of the subject population was coded to "Not elsewhere included" in the 2013 census ethnic group variable.¹² It was called "Not Specified" in this study.

Table 1: New Zealand Census 2006 and 2013 estimates of usually resident adult population, response and numbers stratified by smoking status.

	2006	2013	Change 2013–2006
Estimated adult (≥15 years) usually resident population	3,160,371	3,376,419	216,048
Total adults with Census smoking status	2,889,009	3,065,823	176,814
Not elsewhere included (%)	271,362 (8.6)	310,593 (9.2)	39,231
Regular smoker (%)	597,792 (20.7)	463,194 (15.1)	134,598
Ex-smoker (%)	637,293 (22.1)	702,015 (22.9)	64,722
Never smoked regularly (%)	1,653,924 (57.2)	1,900,617 (62.0)	246,693

Neighbourhood socioeconomic deprivation

The New Zealand Index of Socioeconomic Deprivation 2013 (NZDep2013) was used as a measure of neighbourhood socioeconomic deprivation and a proxy for individual socioeconomic position. NZDep2013 is an area-based index of deprivation that measures the level of socioeconomic deprivation for each neighbourhood (meshblock). It was created using nine variables from the 2013 Census: income, benefit receipt, transport (access to car), household crowding, home ownership, employment status, qualifications, support (sole-parent families) and communication (access to internet).¹³ This study presents results by NZDep 2013 deciles 1 to 10, with each decile containing 10% of small areas in New Zealand. Decile 1 represents people living in the least deprived 10% of areas, and decile 10 represents people living in the most deprived 10% of areas in New Zealand.

Non-response

The Census contains three types of non-responses relevant to this study. Firstly, there are national net undercounts. These are estimates of the number of people missed by the Census based on findings of a post-enumeration survey.⁶ Secondly, some people were included in the Census as substitute records with a limited range of imputed variables (not including smoking status) from either households, which were identified but where no census forms were received or for individuals where there was evidence that they existed but no form was completed. Thirdly, there were individuals who took

part in the Census but did not complete the smoking questions or did not complete them adequately.⁸ Categories two and three are described as ‘not elsewhere included’ and was 8.6% of the estimated adult resident population in 2006 and 9.3% in 2013 (Table 1). The net undercount of adults estimate was 2.1% in 2006 and 2.3% in 2013.¹³ Prevalence calculations in this paper use adults included in the Census with a valid smoking status as the denominator.

Results

Smoking prevalence by age and gender in 2013

In 2013, the crude prevalence of regular smokers aged 15 years and over in New Zealand was 15.1% (see Table 1). Smoking prevalence was higher in men (16.4%) than women (13.9%), and male smoking prevalence was higher than female prevalence in every age group (Table 2). Smoking prevalence peaked in the 25–29 year-old age group for men and 20–24 year-old group for women, and then declined progressively with age, more quickly from 55–59 years onwards. The greatest increase in smoking prevalence across the age groups was between 15–19 and 20–24 years in men and women.

In 2013, the crude prevalence of ex-regular smokers in New Zealand was 22.9%. Ex-regular smoking prevalence increased steadily across the age groups for males, and increased to a peak in the 65–69 year-old age group for females and then declined. Ex-smoker prevalence was higher among males, particularly in the older age groups. The prevalence of ‘Never smoked

Table 2: Crude prevalence of regular smokers, ex-smokers and never regular smokers, 2013 Census—by gender and age group.

Age group (years)	Regular smoker			Ex regular smoker			Never smoked regularly		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
15–19	11.1	9.7	10.4	2.6	3.0	2.8	86.3	87.3	86.8
20–24	22.9	19.8	21.4	9.1	10.5	9.8	68.0	69.7	68.9
25–29	24.4	19.3	21.7	15.5	17.0	16.3	60.1	63.7	62.0
30–34	22.1	16.8	19.3	19.9	21.2	20.6	57.9	62.1	60.1
35–39	20.0	15.9	17.8	21.4	22.7	22.1	58.6	61.4	60.1
40–44	19.6	16.8	18.1	22.4	23.6	23.0	57.9	59.7	58.9
45–49	18.5	16.6	17.5	24.1	23.3	23.7	57.4	60.1	58.8
50–54	17.5	16.5	17.0	27.3	25.4	26.3	55.2	58.0	56.7
55–59	15.3	13.8	14.5	31.5	26.8	29.0	53.2	59.5	56.4
60–64	12.2	11.2	11.7	35.2	27.6	31.3	52.6	61.2	57.0
65–69	10.3	9.4	9.8	40.7	29.9	35.2	49.1	60.6	55.0
70–74	7.4	6.7	7.0	43.6	27.8	35.4	49.1	65.5	57.6
75–79	5.0	4.8	4.9	45.5	25.7	34.9	49.6	69.4	60.2
80–84	3.6	3.4	3.5	48.6	24.7	35.2	47.8	71.9	61.3
85+	2.5	2.0	2.2	50.5	21.0	31.6	47.0	77.0	66.2
Total	16.4	13.9	15.1	24.6	21.3	22.9	59.0	64.7	62.0

Table 3: Smoking prevalence by age, gender and ethnic group, 2013 Census.

Age group (years)	European			Māori			Pacific peoples			Asian		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
15–19	10.2	8.8	9.5	21.2	22.3	21.7	13.6	10.3	11.9	4.1	1.9	3.0
20–24	22.2	19.6	20.8	37.9	41.3	39.7	31.6	26.4	28.9	12.9	4.3	8.8
25–29	23.5	19.8	21.6	41.4	43.1	42.4	35.1	29.7	32.3	15.9	4.0	9.7
30–34	20.7	16.8	18.6	36.5	40.3	38.6	33.1	27.8	30.3	16.7	3.5	9.8
35–39	18.4	15.2	16.7	34.1	37.8	36.1	29.4	24.3	26.7	14.4	3.0	8.2
40–44	17.7	16.0	16.8	34.7	40.1	37.7	29.4	23.3	26.2	14.5	2.9	7.9
45–49	16.7	15.7	16.2	33.1	39.6	36.6	28.7	22.1	25.2	14	2.7	7.7
50–54	15.9	15.6	15.8	31.6	38.4	35.3	26.8	21.0	23.7	13.9	2.7	7.8
55–59	13.9	13.1	13.5	27.2	32.7	30.2	23.9	16.6	20.2	13.1	2.5	7.3
60–64	11.3	10.7	11	21.0	26.3	23.8	22.2	10.9	16.4	10.5	1.8	5.9
65–69	9.8	9.3	9.5	17.8	21.2	19.6	18.5	8.8	13.6	8.2	1.3	4.6
70–74	7.0	6.6	6.8	11.9	15.5	13.8	14.1	5.5	9.4	7.0	1.4	4.1
75–79	4.7	4.7	4.7	7.5	11.1	9.5	9.0	4.9	6.6	5.7	2.0	3.7
80–84	3.5	3.3	3.4	5.5	6.9	6.2	7.4	3.2	4.8	4.3	1.2	2.7
85+	2.3	2.0	2.1	7.6	5.5	6.2	5.8	1.9	3.5	4.4	1.2	2.4
15+	14.7	13.1	13.9	30.5	34.7	32.7	26.2	20.5	23.2	12.8	3.0	7.6
Age-standardised rate	16.4	14.4	15.3	30.3	34.2	32.4	26.1	20.2	23	12.3	2.9	7.2

Table 3: Smoking prevalence by age, gender and ethnic group, 2013 Census (Continued).

Age group (years)	Middle Eastern/Latin American/African			Other ethnicity*			Ethnicity not specified		
	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)	Male (%)	Female (%)	Total (%)
15–19	6.5	3.4	5.0	9.0	5.4	7.6	18.4	13.4	16.5
20–24	17.2	7.7	12.7	20.4	15.5	18.5	28.1	22.2	26.1
25–29	19.8	8.4	14.0	22.0	16.3	19.8	29.1	19.3	25.0
30–34	16.9	6.4	11.5	21.7	18.3	20.4	24.3	17.5	21.5
35–39	16.7	5.9	11.1	19.3	16.9	18.3	27.7	15.1	22.4
40–44	17.0	5.0	11.3	18.2	17.4	17.9	26.7	21.4	24.2
45–49	17.5	8.3	13.1	16.6	16.4	16.5	20.4	18.5	19.7
50–54	17.8	9.0	13.4	14.3	15.9	15.1	20.8	14.6	18.5
55–59	15.7	8.0	11.7	13.2	13.6	13.3	17.4	19.5	18.3
60–64	11.9	7.2	9.8	8.3	9.6	8.9	14.1	12.6	13.4
65–69	9.0	5.4	6.7	5.7	9.7	7.3	10.2	11.5	11.1
70–74	6.5	4.8	5.6	3.3	5.6	4.2	7.9	6.3	7.1
75–79	2.8	2.5	2.7	4.4	4.6	4.2	9.9	6.8	8.2
80–84	9.1	3.6	3.9	2.2	5.6	3.9	2.9	5.1	4.1
85+	7.1	0.0	2.7	2.4	0.0	0.8	3.9	2.6	3.1
15+	15.7	6.7	11.2	14.8	13.8	14.4	19.5	13.8	17.0
Age-standardised rate	14.7	6.5	10.6	15.5	13.7	14.8	21.8	16.5	19.7

*Other Ethnicity category includes the response of “New Zealander”.

regularly’ was 62.0%, and was most common in the youngest age group. It was also more common in women compared to men—particularly among the older age groups.

Ethnicity

Among the major New Zealand ethnic groups, around one-third (32.7%) of Māori were regular smokers, followed by Pacific (23.2%), European (13.9%), ‘Other’ (14.4%) and Asian (7.6%) ethnic groups (see Table 3). Smoking prevalence peaked at 20–24 or 25–29 years for almost all ethnic groups, with extremely high prevalence among young adult Māori (eg over 40% among Māori women aged 20–34 years and Māori men aged 25–29 years). Smoking prevalence declined after 25–29 years among Māori men, but remained high for older Māori women (eg around 40% among Māori women aged 35–54 years). Smoking prevalence was similar for men and women among European, Māori and Pacific ethnic groups, but was much higher among men for Asian and Middle-Eastern/Latin and American/African ethnic groups.

Educational level

Smoking varied greatly by level of education (Table 4) with people with a higher qualification much less likely to smoke and those with no qualifications more likely to smoke among all ethnic groups. Smoking prevalence for those people with no qualification were more than four times higher than those people with bachelor degree and level 7 or higher qualification (23.9% vs. 5.5%).

Workforce, labour status and personal income

Smoking prevalence was markedly higher among people who were unemployed (30.0%) compared with those who worked full-time (15.9%), part-time (12.4%) or who were not in the labour force (12.9%) (Table 4). Smoking prevalence also differed by personal income status. The highest smoking prevalence was among those earning NZ \$30,001–\$50,000 per year (18.0%) and was lowest among those people earning NZ \$100,000 or more per year (5.9%).

Table 4: Crude smoking prevalence by gender, ethnic group, education status, workforce and labour status and personal income, 2013 Census.

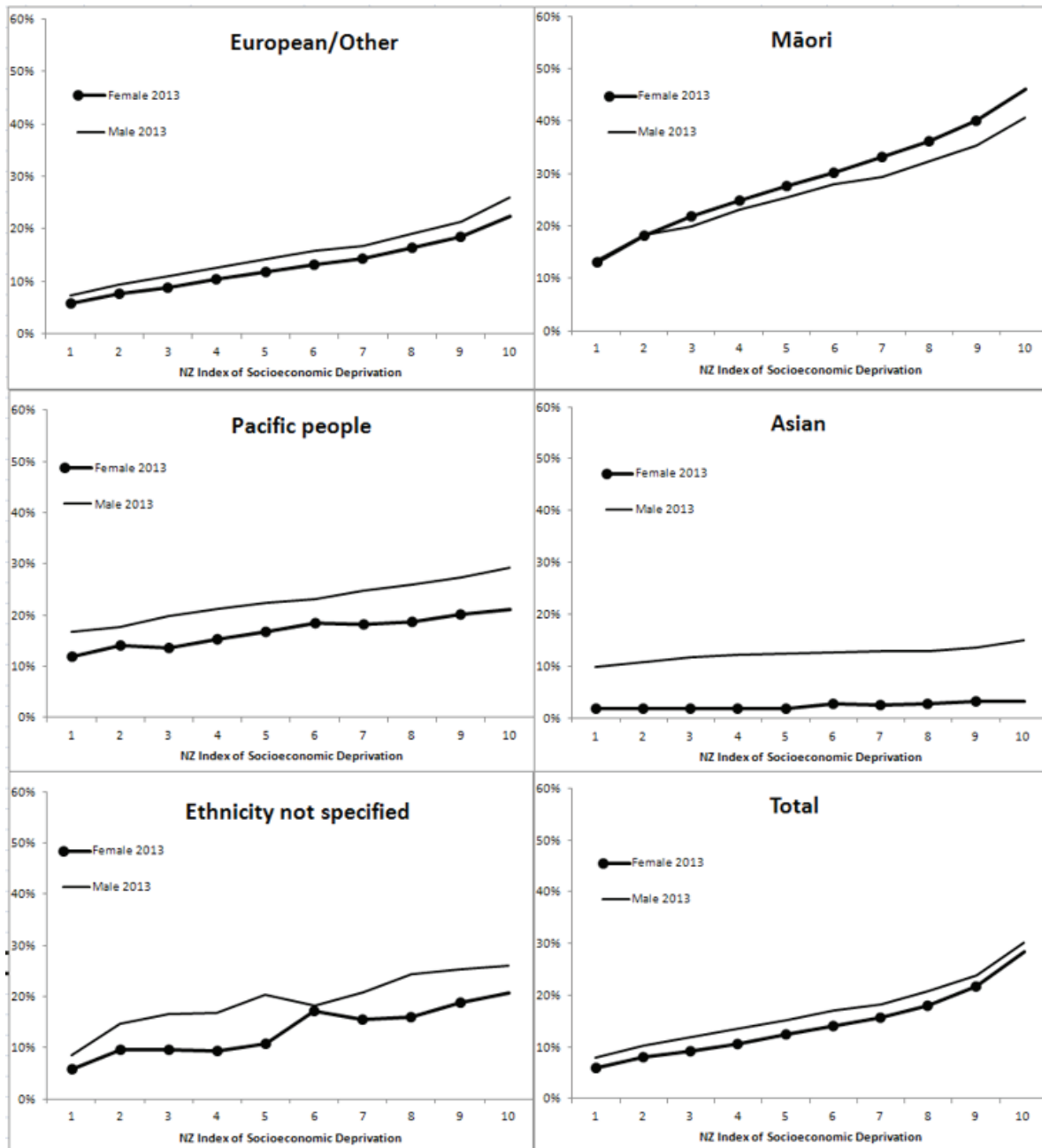
	European		Māori		Pacific peoples		Asian		Other ethnicity		Ethnicity not specified		Total		Total (%)
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	
Total	14.7	13.1	30.5	34.7	26.2	20.5	12.8	3.0	15.1	10.7	19.5	13.9	16.4	13.9	15.1
Education status															
No qualification	22.9	20.0	39.8	45.4	33.4	24.6	18.4	3.7	23.8	16.0	25.8	18.6	25.8	22.1	23.9
Overseas secondary school qualification	14.0	10.6	29.1	32.5	23.5	11.8	15.5	2.4	19.5	8.3	18.6	10.1	15.7	7.4	11.1
Level 1 to 3 certificate*	15.9	15.0	27.0	33.0	23.7	21.8	12.0	4.5	15.9	13.5	21.7	16.0	17.1	16.3	16.7
Level 4 to 6 certificate**	12.7	11.3	23.4	29.9	23.6	22.1	13.8	4.1	13.4	10.8	16.6	12.1	13.6	12.1	13.0
Bachelor degree and Level 7 qualification or higher	4.9	5.2	10.1	15.9	10.9	11.6	8.6	1.9	7.6	5.5	7.6	6.8	6.0	5.2	5.5
Workforce and labour status															
Full time	15.5	14.5	29.1	32.1	27.8	22.8	13.5	3.5	14.8	12.1	20.7	15.7	16.8	14.7	15.9
Part time	11.6	11.2	26.7	29.6	23.5	18.7	12.2	3.0	12.4	10.0	18.5	13.6	13.5	12.0	12.4
Unemployed	30.0	27.2	47.2	49.8	37.6	29.8	15.2	4.7	23.6	14.6	31.1	26.9	31.8	28.5	30.0
Not in the labour force***	11.9	11.3	28.4	35.0	20.8	16.7	11.0	2.3	15.0	8.8	16.2	11.5	13.9	12.2	12.9
Personal income															
Under \$15,001	15.7	12.8	32.4	33.7	24.2	16.9	11.8	2.3	16.4	8.7	21.5	14.5	17.8	13.2	15.0
\$15,001–\$30,000	16.3	14.6	35.5	39.5	31.0	24.8	15.5	3.8	18.0	13.5	19.4	12.8	18.3	16.0	16.9
\$30,001–\$50,000	19.5	14.8	32.9	34.7	29.0	24.5	15.3	3.9	18.9	13.4	23.1	15.4	20.6	15.4	18.0
\$50,001–\$70,000	14.5	10.5	23.4	24.3	24.0	20.9	11.1	2.9	14.1	10.3	17.3	8.1	15.1	10.8	13.2
\$70,001–\$100,000	9.1	7.5	15.4	17.1	17.3	16.3	7.9	2.5	8.8	7.6	11.3	8.3	9.4	7.7	8.8
\$100,001 or more	5.6	5.8	10.8	14.7	14.2	13.1	6.8	2.4	5.9	5.6	10.7	8.3	5.9	5.9	5.9

*The purposes of the certificate levels are to qualify individuals with: level 1—basic knowledge and skills for work, further learning and/or community involvement; level 2—introductory knowledge and skills for a field(s)/areas of work or study; level 3—knowledge and skills for a specific role(s) within fields/areas of work and/or preparation for further study.¹⁴

**The purposes of the certificate levels are to qualify individuals with: level 4—to work or study in broad or specialised field(s)/areas; level 5—theoretical and/or technical knowledge and skills within an aspect(s) of a specific field of work or study; level 6—theoretical and/or technical knowledge and skills within an aspect(s) of a specialised/strategic context.¹⁴

***Not in the labour force includes people who are in the working-age population (people aged 15 years and over), but are neither employed nor unemployed. For example, retired people; people with personal or family responsibilities, such as unpaid housework and childcare; people permanently unable to work due to physical or mental disabilities; people who are not actively seeking work.¹⁵

Figure 1: Crude prevalence of regular smokers by gender, ethnic group and level of deprivation, 2013 Census.



Socioeconomic deprivation

There was a strong relationship between smoking and area-based socioeconomic deprivation. The prevalence of regular smoking increased steadily across the deprivation deciles from least deprived (decile 1) to most deprived (decile 10) areas (Figure 1). The crude regular smoking prevalence among people living in the most-deprived (decile 10) areas was more than four times greater than among people living in the least-deprived (decile 1) areas among both males and females.

Changes between 2006 and 2013 Censuses: regular smokers

There were marked changes observed between the 2006 and 2013 Censuses (Table 5). The overall crude prevalence of regular smoking dropped in absolute terms by 5.6% from 20.7% in 2006 to 15.1% in 2013. The number of regular adult smokers dropped from 597,792 in 2006 to 463,194 in 2013, meaning there were 134,598 (22.5%) fewer regular smokers in New Zealand in 2013. Large absolute and relative declines in age-standardised smoking prevalence

Table 5: Smoking prevalence by gender and ethnic group, 2006 and 2013 Census.

Ethnic group	Gender	2006			2013			2006 vs 2013	
		Count (n)	Crude (%)	Age-standardised (%)	Count (n)	Crude (%)	Age-standardised (%)	Absolute difference between age-standardised rate (%)	Relative difference between age-standardised rate (%)
Total	Male	304,437	21.9	23.0	240,711	16.4	17.6	-5.4	-23.5
	Female	293,358	19.5	20.8	222,483	13.9	14.8	-6.0	-28.8
	Total	597,792	20.7	21.9	463,194	15.1	16.1	-5.8	-26.5
European	Male	189,786	20.3	22.0	160,974	14.7	16.4	-5.6	-25.5
	Female	193,671	18.6	20.6	157,641	13.1	14.4	-6.2	-30.1
	Total	383,457	19.4	21.2	318,612	13.9	15.3	-5.9	-27.8
Māori	Male	61,596	38.5	37.1	53,031	30.5	30.3	-6.8	-18.3
	Female	82,887	45.5	43.7	69,519	34.7	34.2	-9.5	-21.7
	Total	144,480	42.2	40.6	22,553	32.7	32.4	-8.2	-20.2
Pacific	Male	24,504	33.5	32.8	22,167	26.2	26.1	-6.7	-20.4
	Female	21,666	27.3	25.7	18,972	20.5	20.2	-5.5	-21.4
	Total	46,170	30.3	29.1	41,139	23.2	23.0	-6.1	-21.0
Asian	Male	21,999	18.1	17.2	21,432	12.8	12.3	-4.9	-28.5
	Female	6,672	4.8	4.5	5,556	3.0	2.9	-1.6	-35.6
	Total	28,671	11.1	10.4	26,988	7.6	7.2	-3.2	-30.8
Middle Eastern/ Latin American/ African	Male	2,460	20.3	19.2	2,607	15.7	14.7	-4.5	-23.4
	Female	1,074	9.6	9.1	1,080	6.7	6.5	-2.6	-28.6
	Total	3,537	15.1	14.2	3,684	11.2	10.6	-3.6	-25.4
Other ethnicity	Male	30,015	17.4	18.2	4,572	14.8	15.5	-2.7	-14.8
	Female	25,284	15.8	16.5	2,967	13.8	13.7	-2.8	-17.0
	Total	55,299	16.6	17.4	7,539	14.4	14.8	-2.6	-14.9
Not specified	Male	2,514	25.3	27.3	1,593	19.5	21.8	-5.5	-20.1
	Female	1,674	19.7	23.3	918	13.8	16.5	-6.8	-29.2
		4,188	22.7	25.7	2,514	17.0	19.7	-6.0	-23.3

occurred among both genders in almost all ethnicity groups.

There were some variations in the decreases in age-standardised prevalence between 2006 and 2013, with for example, prevalence reducing more in relative terms (28.8% vs 23.5%) and absolutely (6.0% vs 5.4%) in females compared to males. The relative percentage reduction was greater for European (27.8%) compared with Māori (20.2%) and Pacific people (21.0%), while

the absolute reduction was greater among Māori (8.2%) compared to European (5.9%) and Pacific people (6.1%) (Table 5).

Crude and age-standardised smoking prevalence fell among males and females for all ethnic groups between 2006 and 2013 (Table 5). The absolute reductions in age-standardised prevalence among males were similar (4.9%–6.8%) among European/other, Māori, Pacific and Asian ethnic groups. For females there was more

Figure 2: Smoking prevalence by age, gender and ethnic group, 2006 and 2013 Census.

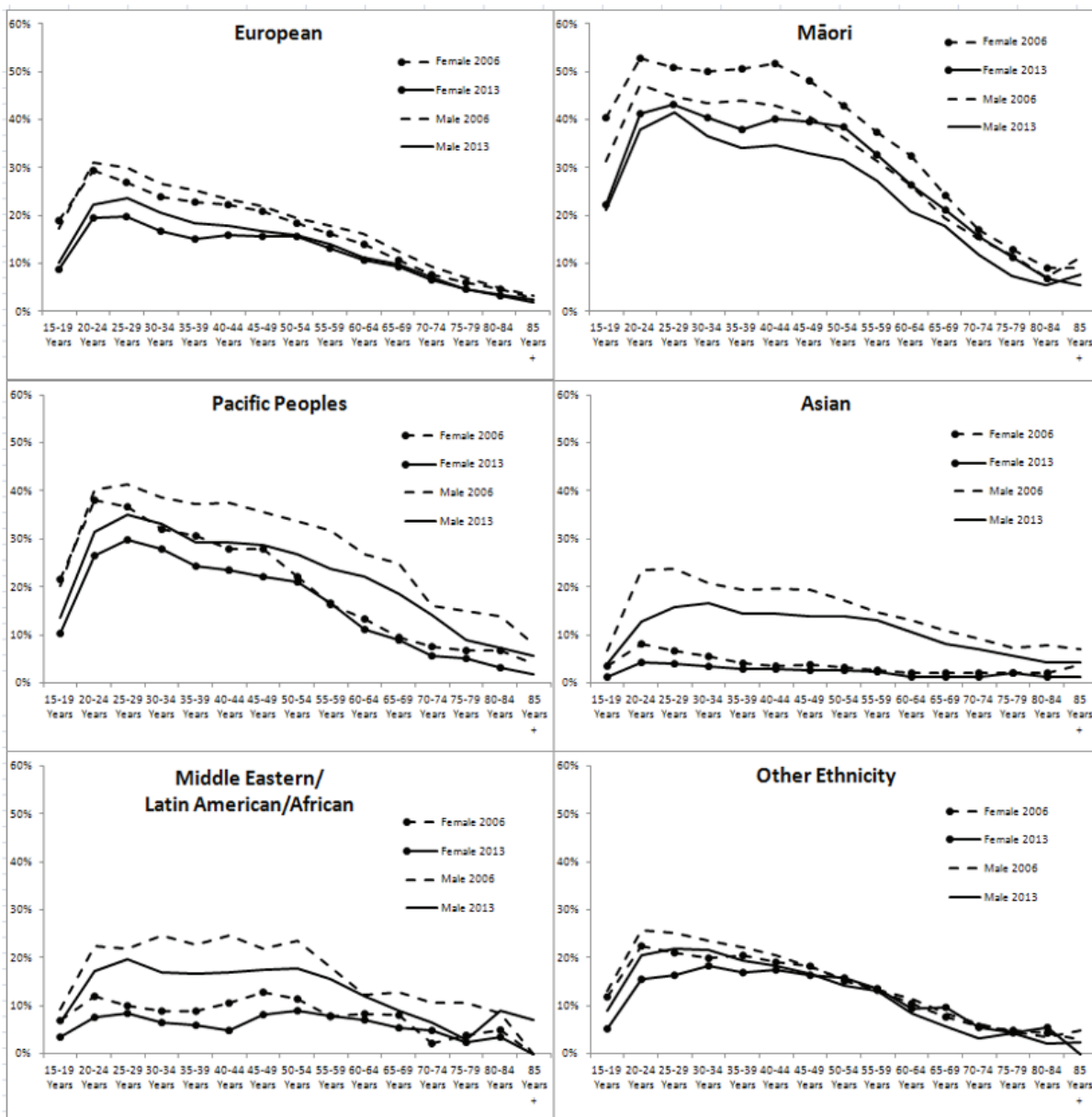


Figure 3: Prevalence of regular smokers, ex-smokers and never regular smokers by age group, 2006 and 2013 Census.

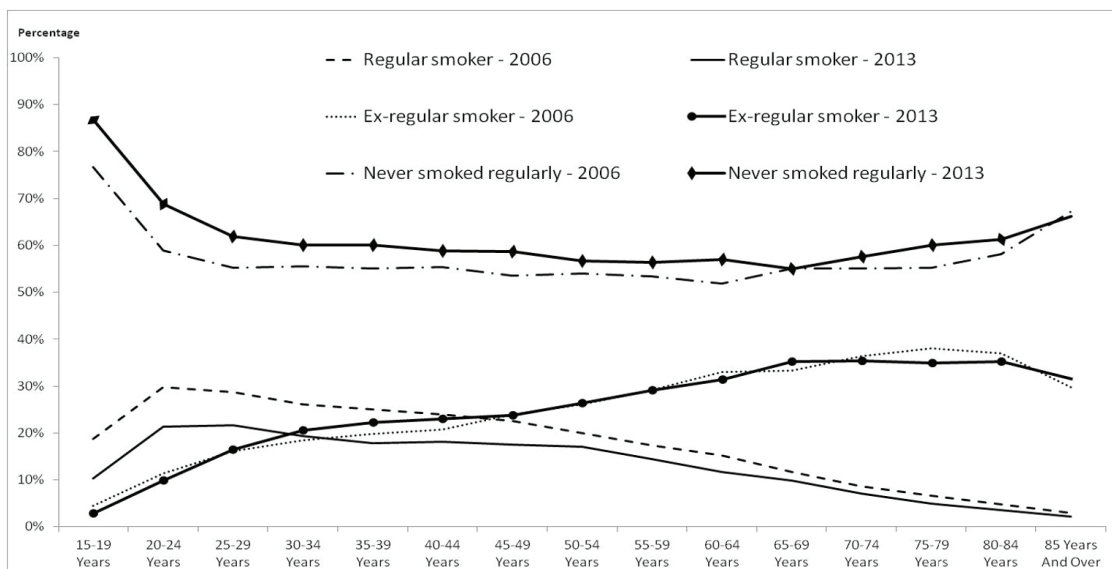


Table 6: Age-group specific smoking prevalence by gender, 2006 and 2013 Census.

Age group	2006		2013	
	Male (%)	Female (%)	Male (%)	Female (%)
15–19 Years	17.8	19.7	11.1	9.7
20–24 Years	31.6	28.1	22.9	19.8
25–29 Years	30.9	26.6	24.4	19.3
30–34 Years	28.2	24.3	22.1	16.8
35–39 Years	26.8	23.5	20.0	15.9
40–44 Years	25.1	22.8	19.6	16.8
45–49 Years	23.4	21.8	18.5	16.6
50–54 Years	20.8	19.0	17.5	16.5
55–59 Years	18.3	16.5	15.3	13.8
60–64 Years	16.3	14.2	12.2	11.2
65–69 Years	12.7	10.6	10.3	9.4
70–74 Years	9.3	7.9	7.4	6.7
75–79 Years	7.2	6.2	5.0	4.8
80–84 Years	5.1	4.6	3.6	3.4
85 Years +	3.6	2.8	2.5	2.0
15+ years	21.9	19.5	16.4	13.9
Age-standardised rate	23.0	20.8	17.6	14.8

variation in the absolute reduction in age-standardised prevalence, ranging from 9.5% among Māori to 1.9% among Asians among the four main ethnic groups.

Figure 2 shows that the decline in smoking prevalence between 2006 and 2013 for males and females were mostly more pronounced among younger age groups for all ethnic groups.

Figure 3 shows that smoking prevalence declined between 2006 and 2013 in all age groups, particularly in younger (less than 30 years) age groups. The greatest absolute (8.4%) and relative declines (44.7%) occurred among 15- to 19-year-olds from 18.8% in 2006 to 10.4% in 2013. The absolute (10.0%) and relative (50.7%) fall was greatest among females in this age group, from 19.7% in 2006 to 9.7% in 2013 (Table 6).

Changes ex- and never smokers between 2006 and 2013 Census

Ex-smoker prevalence was similar in both years for most age groups, while never

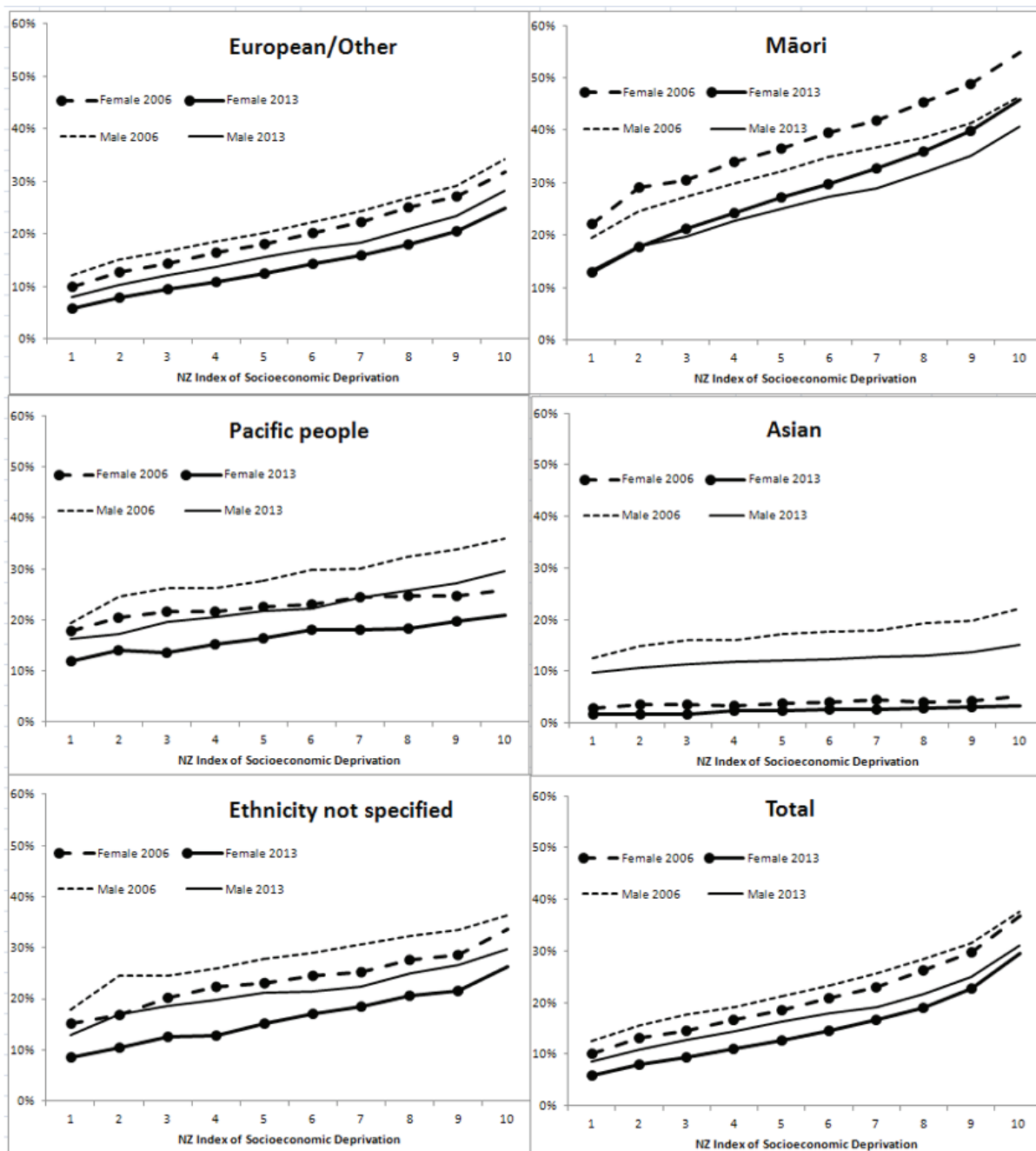
smoking prevalence increased, particularly among younger age groups (Figure 3). In 2013, the overall prevalence of ex-smokers in New Zealand was 22.9%; it was very similar in 2006 (22.1%). However, the proportion of people who had never smoked regularly was 62.0% in 2013, higher than the prevalence in 2006 (57.2%).

Smoking prevalence declined among both genders living in each individual socioeconomic deprivation deciles between the 2006 and 2013 Census. The absolute reduction in the age-standardised prevalence ranged from 4.0% to 6.8%. Similar declines were also found for all major ethnic groups across all deprivation deciles (Figure 4).

Discussion

This paper shows that there has been a decline in smoking prevalence from 20.7% to 15.1% between 2006 and 2013. This represents about 22.5% fewer smokers and an average fall of 0.8% in prevalence per year. The decline was observed across all age

Figure 4: Age-standardised smoking prevalence by gender, ethnic group and socioeconomic deprivation, 2006 and 2013 Census.



groups, genders, ethnicities and socio-economic status groups. The equivalent fall in prevalence between 1996 and 2006 was 3% from 23.7% to 20.7%, an average decline of 0.3% per year.¹⁶ However, smoking prevalence remains strongly patterned by age, ethnicity and socio-economic status, with smoking more prevalent among young adults aged 20 to 29 years, Māori and Pacific peoples and lower socio-economic groups.

The prevalence of regular smoking in this study are similar to the findings of the 2013/14 New Zealand Health Survey (NZHS), a nationally representative continuous survey conducted by New Zealand Ministry of Health. Its target population included New Zealand adult population aged 15 and over. The NZHS result showed the daily smoking prevalence was 15.5% (95 CI, 14.7%–16.3%) in 2013. The current smoking (smoke at

least monthly) prevalence was 17.2% (95 CI, 16.4%–18.1%). The NZHS also found a significant decrease in daily and current smoking in New Zealand since 2006/07. The daily and monthly smoking prevalence was 18.3% (95 CI, 17.4%–19.2%) and 20.1 (95 CI, 19.1%–21.1%) respectively in 2006/07,¹⁷ although the mean annual rate of decline in daily smoking from 2006/7 to 2013/14 based on the NZHS data was lower at between 0.4% and 0.5%.

The decreases in the smoking prevalence of young adults were much greater between 2006 and 2013 than between 1996 and 2006. For example, prevalence among 15–19 year-olds fell (absolute difference) by 8.4% and 20–24 year-olds by 8.5% between 2006–2013. The equivalent figures for 1996–2006 were 2.3% and 2.4%. Similarly, smoking prevalence among Māori fell (absolute difference) by 8.2% from 40.6% to 32.4% between 2006 and 2013, and Pacific people smoking prevalence by 6.1% from 29.1% to 23.0%. Between 1996 and 2006 the absolute decrease in smoking prevalence was only 1.5% among Māori and was not reported for Pacific peoples.¹⁶ The findings provide evidence that the decline in smoking prevalence accelerated between 2006 and 2013, and that the decline was occurring in all groups, including priority groups such as young adults and Māori, where smoking prevalence was previously reducing least.

The data also suggest that a substantial proportion of the decline in regular smoking prevalence is due to decreases in smoking initiation as evidenced by the large falls in prevalence among young adults and large increases in never smoking.

Between 2006 and 2013, New Zealand implemented some important tobacco control interventions, including a series of above inflation tax increases on tobacco products from 2010 onwards, legislation changes (eg retail display bans, smokefree prisons) and improved provision of smoking cessation products and services. It is likely that these interventions contributed to the decrease in smoking prevalence.

Our analysis also revealed persisting disparities in smoking prevalence between population sub-groups. For example, although we found Māori smoking prevalence has declined between 2006 and 2013 (from 40.6% to 32.4%), it was still far higher than for other

population groups. The findings on trends in Māori smoking prevalence contrast with the data from the recent New Zealand Health Survey (2012/13), which found no significant difference in Māori smoking prevalence between 2006/7 (42.1%, 95% CI: 39.9%–44.3%) and 2013/4 (40.6%, 95% CI: 38.0%–43.2%).⁵ The findings from the Census data showed that smoking also remained very high among Pacific peoples. The decline in Pacific smoking observed in our Census analysis (29.1% in 2006 to 23% in 2013) was also greater than the non-statistically significant fall reported in the New Zealand Health Survey (from 27.1% (95% CI 23.9–30.6) in 2006/7 to 25.1% (20.6–30.3) in 2013/14.⁵ The reasons for these differences are not clear, and have been examined in more depth in a companion paper.¹⁸ These findings highlight the need to continue to focus on implementing evidence-based interventions that address Māori and Pacific smoking to ensure the 2025 goal will be reached for all New Zealanders.¹⁹ As well as these high prevalence groups, it is worth noting that there are some population sub-groups with very low smoking prevalence, at or close to 5%, which is sometimes interpreted as a key target figure. For example, smoking prevalence was around 3% among Asian females, 5.5% among people with a degree and 6% among females living in the most affluent areas (NZDep decile one). These suggest that there are groups within the population who are already reaching the Smokefree 2025 goal of very low smoking prevalence.

This study found a high smoking prevalence for Māori women, both young adults and middle aged. Māori are disproportionately affected by the negative consequences of tobacco use from conception onwards,²⁰ and tobacco use negatively affects Māori health and development.²¹ Reasons why Māori women may have a high smoking prevalence compared with other population groups are complex. They include that Māori women are among the most socio-economically deprived groups in New Zealand,²² they often live in environments where smoking is commonplace and entrenched,²⁰ are more likely to be exposed to second-hand smoke and have lower cessation rates. Addressing ethnic inequalities in smoking for Māori women is likely to involve addressing the broader determinants in health (eg, improving income, housing, employment

and access to healthcare.²³) as well as tobacco control specific measures (policy, regulation, reducing initiation and increasing cessation).

Strengths and limitations

A strength of this study was that as a Census, the sample size is extremely large and the data are likely to be highly representative of the New Zealand population. Further, this study includes comparable data from two Censuses, using the same methodology, definitions and classifications. The level of non-response was similar in 2006 and 2013, so the changes in smoking prevalence are unlikely to have been greatly affected by differences in smoking among non-responders.

This study has a number of limitations. The first involves the definition of smoking status. The Census defines a regular smoker as someone who smokes cigarettes regularly (ie one or more cigarettes a day), so regular smoking approximates daily smoking. This will underestimate the prevalence of smoking in the population as it excludes non-daily and occasional smokers, and does not allow patterns of non-daily and occasional smoking to be described—in contrast to national surveys like the New Zealand Health Survey. Another limitation is that the estimates of smoker numbers are calculated from among the Census responders and do

not include smokers among those classified as 'Not elsewhere included'. Hence, these numbers will be an under-estimate.

Conclusion

This study suggest that the recent decline in smoking prevalence is accelerating in New Zealand, including among high priority groups like Māori, Pacific peoples and young adults. These findings are promising, as evidence of progress towards the goal of a smokefree New Zealand by 2025. However, the findings of substantial decreases in smoking prevalence among Māori and Pacific peoples between 2006 and 2013 contrast with those in the New Zealand Health Survey. The study confirms the importance and value of Census data in understanding the patterns of tobacco use in New Zealand. Access to accurate and reliable data aids the activities of those in the tobacco control sector to ensure effective tobacco control programmes are implemented. The data are particularly important for investigating smoking prevalence and trends, and progress towards the Smokefree 2025 goal in population sub-groups where this is not possible with reasonable statistical precision in general population surveys due to small numbers within the groups.

Competing interests:

Nil.

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Auckland: city of syphilis?

Sunita Azariah

ABSTRACT

AIMS: To briefly report on the large increase in cases of syphilis managed at Auckland Regional Sexual Health Service (ARSHS) in 2015. To raise awareness of syphilis as an emerging significant public health issue in Auckland.

METHOD: A search was conducted of the electronic patient management system at ARSHS for cases of syphilis diagnosed between 1st of January 2015 and 31st of December 2015. Those that fitted the Institute of Environmental Science and Research Ltd (ESR) case definitions for infectious syphilis were included and demographic, clinical and behavioural characteristics were described.

RESULTS: One hundred and fifty-two cases of infectious syphilis were managed at ARSHS in 2015, which was a 78% increase from the previous year. The crude incidence rate was 9.5 cases per 100,000 head of population. As in previous years, the majority of cases were male (92%) and most of these were gay or bisexual men (GBM). Thirty-nine percent of cases were asymptomatic and 22% of cases were diagnosed with another STI. Twenty-eight percent of GBM were co-infected with HIV. While the overall number of heterosexual cases was small (n=35); there was a 3.8-fold increase from the numbers diagnosed in 2014 (n=9).

CONCLUSION: The largest number of syphilis cases in recent decades was managed by the Auckland Regional Sexual Health Service in 2015. The increase in numbers is concerning as syphilis can enhance transmission and acquisition of HIV. Furthermore, other countries have noted increases in congenital syphilis cases when incidence in females has increased. It is important that all persons at risk of STI are tested for syphilis and that sexually active GBM in particular are tested regularly. Health professionals need to be made aware of who and when to test, and to refer or discuss any suspected cases with a specialist service as management of syphilis requires significant expertise.

Syphilis is a serious bacterial infection that can cause significant complications if undiagnosed and untreated.¹ Syphilis is usually sexually transmitted but can also be transmitted to the foetus or neonate if a pregnant woman is infected, resulting in serious perinatal morbidity and mortality.² Syphilis was once a common disease in the US and Europe in the 19th century when 8% to 14% of the population had serological evidence of having been infected. The widespread availability of penicillin after the Second World War led to a dramatic reduction in incidence.³ In New Zealand, the numbers of cases of syphilis were low for the latter part of the 20th century. A national rate was put at 3.0 cases per 100,000 in 1977 and no change in incidence was reported from sexual health clinics between 1986 and 1993.⁴ However, the total number of syphilis cases diagnosed annually in New Zealand is not known, as until recently the acquired immune deficiency syndrome (AIDS) was the only notifiable sexually transmitted condition. The recent passing of the Health

Protection Amendment Bill means that some sexually transmitted infections (STIs) such as syphilis will become notifiable.

STI surveillance data is provided voluntarily to the Institute of Environmental Science and Research Limited (ESR) by sexual health clinics (SHCs), family planning clinics (FPCs) and laboratories.⁵ Between 2000 to 2005, numbers notified annually to ESR varied but were low and remained below 50, ranging from 13 in 2000 to 47 cases in 2005. After 2005, numbers increased but fluctuated with a peak of 144 cases notified nationally in 2009.

Since 2013, ESR has been collecting enhanced sentinel site surveillance data on cases of infectious syphilis diagnosed in SHCs following a multi-centre pilot study that received ethics approval. Enhanced surveillance requires additional information on each case such as sexual behaviour and co-infections with other STIs including HIV.

In 2013, 81 cases of infectious syphilis were reported to ESR from SHCs in New Zealand.

The highest number of cases was in Auckland (41) followed by Canterbury (18 cases).⁶ The majority of cases in 2013 were diagnosed in gay and bisexual men (GBM). The numbers of reported cases continued to increase in 2014 with 141 cases notified to ESR; 85 of these were in Auckland.⁷ In 2015, an increase in cases of infectious syphilis treated by the Auckland Regional Sexual Health Service (ARSHS) was noted. The aim of this audit is to briefly report on the large increase in syphilis cases to draw attention to this alarming trend and to add some regional context to the annual ESR STI surveillance report.

Method

ESR reporting

The ARSHS sends a monthly report to the Institute of Environmental Science and Research Ltd (ESR) of numbers of sexually transmitted infection diagnoses including infectious syphilis. In addition, ESR requires an enhanced surveillance form to be completed for each case of infectious syphilis that is notified. The clinician managing the case is responsible for completing the form which includes demographic, behavioural, laboratory and clinical information specific to that case. The data on the surveillance form is anonymised but contains unique identifying codes in order to prevent duplication of data. ESR collates all the enhanced syphilis surveillance data from around the country for the annual STI surveillance report, which is usually published in the second half of each year.

Diagnosis of syphilis

Syphilis is due to infection with the spirochaete *Treponema pallidum*, which cannot be grown on conventional bacterial culture media. Therefore it is usually diagnosed serologically. If syphilis serology is requested the laboratory performs a screening treponemal EIA assay and if this is reactive, further supplementary testing is done in the form of a treponema pallidum particle agglutination assay (TPPA) and a rapid plasma reagin test (RPR, which is a non-specific serological test). Supplementary testing is important for confirmation and for staging purposes; however, distinction between infectious, non-infectious or treated syphilis also requires a full history and clinical assessment to properly interpret significance of results. The natural course of untreated disseminated syphilis is to resolve spontaneously and the person

becomes non-infectious to sexual contacts after one to two years.⁵

ARSHS database

ARSHS has maintained an excel database of all infectious syphilis cases diagnosed each year since 2013. The syphilis database is kept up to date by conducting a regular search of the ARSHS electronic patient management system (HCC) for new diagnoses of syphilis. The patient records for each case are then checked to ensure that the clinical history, assessment and laboratory results are consistent with the ESR case definitions for infectious syphilis⁷ and any incorrectly classified cases are re-coded as non-infectious, and ESR is notified so that they can amend their records. Additional data was added to the database for each case for the purposes of this study, including sexual behaviour, presenting symptoms, rapid plasma reagin (RPR) titre, source of referral, HIV serostatus and other STI diagnoses. Demographic, clinical and behavioural variables of those cases fitting the definition of infectious syphilis were then summarised.

ESR case definitions

There are four different categories of infectious syphilis that can be reported to ESR: primary, secondary, early latent and unknown duration. Confirmed cases must either have reactive serological tests for syphilis or have *Treponema pallidum* organisms detected from clinical lesions, as serology may sometimes be negative in cases of early syphilis. Cases are categorised according to presence or absence of symptoms into primary or secondary syphilis (symptomatic); or early latent syphilis or syphilis of unknown duration (asymptomatic). Primary and secondary syphilis cases must have presented with compatible clinical symptoms and signs such as genital ulceration or rash confirmed by examination. To be classified as early latent, cases must have had no clinical symptoms or signs of syphilis plus one of the following: a clear history of primary or secondary syphilis symptoms within the previous two years, a history of sexual contact with a confirmed case of infectious syphilis within the previous two years, a documented four-fold or greater rise in RPR titre (if history of previous treated syphilis) or documented seroconversion to reactive treponemal serology within the previous two years. Some cases are difficult to classify as there may be incomplete clinical

information or previous syphilis serology, however, it is known there is a clear relationship between RPR titre, infectiousness and duration of infection.⁸ To be classified as infectious of unknown duration, the case must have had no clinical signs or symptoms of syphilis, no previously documented reactive treponemal serology and a rapid plasma reagin (RPR) titre greater than 1:16.

The study was approved by the Northern A health and disability ethics committee: reference number 16/NTA/26.

Results

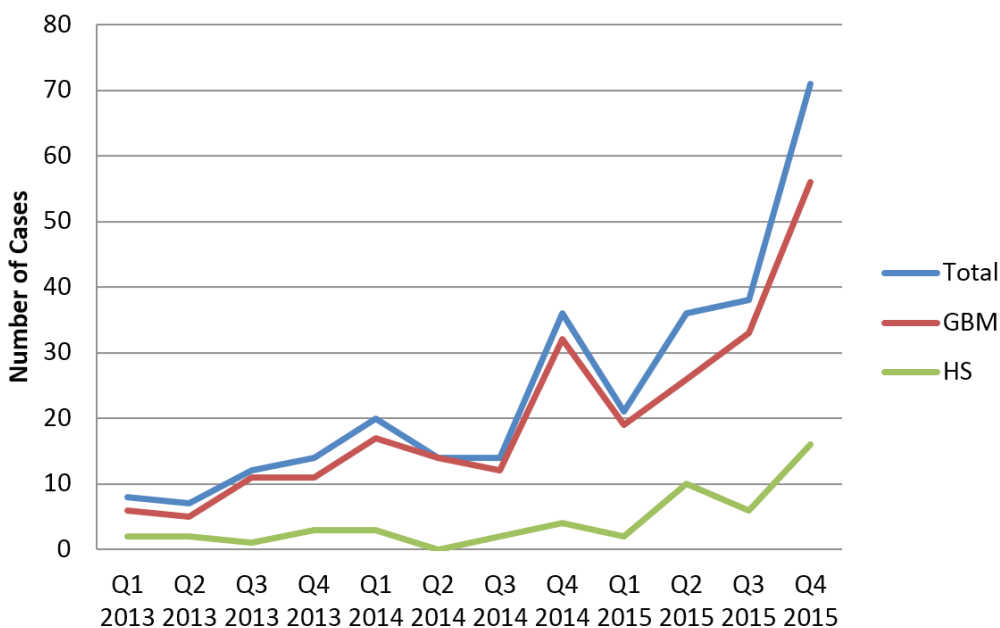
There were a total of 152 cases of infectious syphilis managed at ARSHS in 2015, which was a 78% increase from the previous year (84 cases). Three of these cases were re-infected within the same year, so there were 149 affected individuals. The crude incidence rate for cases of syphilis managed by ARSHS was 9.5 cases per 100,000 for the year 2015, based on Statistics New Zealand's Auckland region population estimate of 1,570,000 (June 2015). Figure 1 shows the dramatic increase in quarterly numbers of cases diagnosed at ARSHS from 2013 to 2015. Seventy-one cases (47%) presented in the last quarter of 2015 alone.

The summary of data is presented in Table 1—note that the denominator changes

depending on whether it is referring to demographics (149) or clinical characteristics of each case (152). As in previous years, the majority of cases were male (92%) and most of these were GBM. Seventeen men (11%) disclosed both male and female sexual contacts. Although the number of heterosexuals (HS) diagnosed in 2015 was small (35), numbers had almost quadrupled from the nine cases diagnosed at ARSHS in 2014 (data not shown).

Sixty percent of cases were diagnosed in people of European ethnicity. Most people presented to the service without a referral (53%), 30% were referred by their general practitioner (GP) and 1% were referred by the Infectious Diseases service. The majority of cases presented with symptoms (61%) of primary or secondary syphilis. Of the primary syphilis cases; 36 presented with penile ulcers, one presented with an oral lesion and five cases presented with anal ulcers. One patient was admitted to hospital with neurosyphilis. Just over one third of cases were also infected with HIV (all GBM), which was a similar proportion to previous years.⁴ Twenty-two percent of cases were diagnosed with another sexually transmitted infection (STI)—the most common being chlamydia—and 13 cases were diagnosed with more than one other STI.

Figure 1: Auckland quarterly syphilis diagnoses 2013–2015.



GBM = gay and bisexual men; HS=heterosexual.

Table 1: Summary of 2015 data.

Age range	n=149
Median age	18–72
Gender	n=149
Male	137 (92%)
Female	11 (7%)
Transgender	1
Ethnicity	n=149
European	89 (60%)
Māori	21 (14%)
Pacific peoples	7 (5%)
Asian	22 (15%)
Other ethnicity	5 (3%)
Declined	5 (3%)
Sexual behaviour	n=149
GBM	117 (77%)
Heterosexual males	24 (15%)
Heterosexual females	11 (8%)
HIV serostatus (GBM)	n=114
Negative	72 (63%)
Positive	42 (37%)
Symptoms	n=152
Yes	91(61%)
No	58 (39%)
Presentation	n=152
Primary	45 (30%)
Secondary	48 (32%)
Early latent	46 (30%)
Unknown duration	9 (6%)
Other	4 (2%)
Other STIs	n=152
Any STI	33 (22%)
Chlamydia	24 (15%)
Gonorrhoea	13 (9%)
Chlamydia and gonorrhoea	8 (5%)
Herpes	2 (1%)
NGU	3 (2%)
Genital warts	2 (1%)

Discussion

It would appear from these results that there has been a significant increase in infectious syphilis cases treated by the ARSHS. The 152 cases treated in 2015 is the largest number to date and is a worrying trend, particularly because the total number of cases in Auckland is likely to be higher due to under-reporting. A previous study

using laboratory data in Auckland found that 28% of identified cases were managed outside the regional sexual health service and so were not reported to ESR (unpublished data).⁹ That study found a crude incidence rate of 7.0 cases per 100,000 in 2007. These latest figures indicate this has increased to 9.5 cases per 100,000 in 2015. This compares to a national incidence rate of 3.1 cases per 100,000 diagnosed in sexual health clinics in 2014.¹⁰

Other developed countries have shown similar trends in notifications of infectious syphilis. In Australia 1,765 cases were notified in 2013, which was the highest number reported in recent surveillance. The rate of diagnoses for syphilis in males rose from 5.0 per 100,000 in 2004 to 14.0 per 100,000 in 2013 and was predominantly diagnosed in GBM.¹¹ In the US the national rate of reported primary and secondary syphilis cases was low at 2.1 cases per 100,000 in 2000. Since then the number of cases has increased every year with a national rate of 6.3 cases per 100,000 in 2014, mainly attributable to increased cases among GBM.¹² This trend has also been noted in the UK; there was a 33% increase in notified syphilis cases from 2013 to 2014, mainly in GBM.¹³ Alongside the increased syphilis incidence rates in developed countries there has also been increasing notifications for HIV in GBM. In New Zealand HIV prevalence rates in GBM are lower than most developed countries, and behavioural surveys between 2002 and 2014 show that high condom use is being sustained. However, multiple factors influence condom use in GBM as they are not a homogenous group. Those recruited for behavioural surveys online report less condom use, more complex sexual partnering patterns, are younger and more bisexually identified than those recruited offline. GBM recruited in sex on site venues report much higher rates of partner change than GBM recruited in other venues.¹⁴ Syphilis can enhance both the transmission and acquisition of HIV,¹⁵ so early diagnosis and treatment of identified cases may reduce an individual's risk of acquiring HIV. A study by Katz et al found that GBM were at higher risk of HIV after being diagnosed with another STI. Those diagnosed with early syphilis had an incident rate of 2.8 per

100 person years compared with an overall incidence rate of 0.4 per 100 person years.¹⁶ It is likely that behaviour change in some GBM is driving current increases in both syphilis and HIV incidence in New Zealand. The fact that 22% of ARSHS cases were diagnosed with another STI highlights the importance of comprehensive STI screening when testing for syphilis.

While GBM is the main group affected by syphilis, there is considerable concern in both the UK and US about increases in the numbers of congenital cases. In the US the syphilis rate in women fluctuated between 0.8 and 0.17 cases per 100,000 in the early part of the century until the period from 2013 to 2014 when there was a 22.7% increase in the syphilis rate in women.¹² In the UK between 2000 and 2007, diagnoses of syphilis in women increased by 474% (from 78 to 448). The increase in syphilis in women has been mirrored in both countries by corresponding increases in cases of congenital syphilis. In the US reported congenital syphilis rates increased from 9.1 cases per 100,000 in 2013 to 11.6 cases per 100,000 in 2014.¹² In the UK there has been a re-emergence of congenital syphilis, with about six cases per year reported in GUM clinics.¹⁷ There is a real concern this could happen in New Zealand, with the recent increased number of cases in heterosexuals, although only one congenital case has been reported in the literature in recent years.¹⁸ Syphilis serology is routinely performed as part of the first antenatal screen, however, this will not rule out syphilis acquired later in pregnancy and serological tests may be falsely negative if performed during incubating syphilis. The authors of the case report caution that "it is important to check maternal serology and consider this disease in any child with suspicious clinical findings, particularly if antenatal screening has not occurred, but even if the initial pregnancy screening on the mother has been negative".

The principles of syphilis control have not really changed since the last century when better diagnostic tests and effective treatment became available.¹⁹ These include: regular screening of affected populations for timely diagnosis, correct treatment, follow-up over 12 months to ensure serological cure and rigorous partner notification. To enable this, health professionals need to be aware of who to screen (as a

large proportion of cases are asymptomatic), signs and symptoms of syphilis, how to manage and when to refer. As management of syphilis and interpretation of serology requires significant expertise including eliciting a full sexual health history; referral or discussion of cases with a specialist is strongly recommended if the practitioner has limited experience with syphilis.

In June 2015 an alert was sent to primary care practitioners and emergency departments from ARSHS and the Auckland regional public health service (ARPHS) with advice to: serologically screen all people at risk of STI for syphilis, to screen men who have sex with men at least annually and to refer or discuss any suspected cases with the regional sexual health service, as per New Zealand Sexual Health Society guidelines.²⁰ Also to test anyone presenting with a generalised body rash or with a rash affecting the palms of the hands or soles of the feet, pyrexia of unknown origin, unexplained persistent lymphadenopathy, unexplained liver function disturbance, patchy alopecia, unexplained neurological symptoms including meningitis, stroke syndromes and cranial nerve palsies. Advice to lead maternity carers (LMCs) was that maternal serological status be documented and that women who had had a change of sexual partner during pregnancy should be re-tested. It is probable that this public health alert was responsible for some of the increase in cases seen at ARSHS in the second half of 2015, as well as health promotion activities being carried out by the New Zealand AIDS Foundation around the same time period.²¹

So in conclusion, numbers of syphilis cases managed by the Auckland regional sexual health service are at their highest in recent decades. The increased numbers could be a precursor to a rise in congenital syphilis cases if this outbreak is not contained. As syphilis is often asymptomatic, it is important that all persons at risk of STI are tested and that sexually active GBM in particular are tested regularly, even if using condoms, as syphilis is easily transmitted through oral sex.²² Health professionals need to be made aware of who to test and how to refer any suspected cases to a specialist service, as management and interpretation of syphilis serology requires some expertise. Better surveillance and management will be possible once syphilis is made a notifiable condition.

Competing interests:

Nil.

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Elective surgical outcomes of patients in Christchurch, New Zealand

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ABSTRACT

AIM: Most studies assessing mortality after surgery have been undertaken in major public hospitals or are procedure specific. The aim of this study was to determine mortality after elective surgery at a total community level with inclusion of all patients undergoing elective surgery.

METHOD: This was a prospective study of all patients that underwent elective surgery in Christchurch, New Zealand, within a calendar month. For each patient, we collected demographic data, American Society of Anaesthesiologists physical status classification (ASA), type of anaesthetic and surgical specialty. The primary outcome was 30-day mortality and the secondary outcome was 90-day mortality.

RESULTS: Four thousand seven hundred and fifteen patients were included in this study. Two thousand five hundred and seventy-eight (55%) were female and the median age was 56 years (range 0–99 years). Three thousand one hundred and forty-two (67%) patients had a general anaesthetic. By day 30, 11 (0.2%) patients had died and by day 90, 27 (0.6%) patients had died. Of the 27 deaths within 90 days after surgery, one was possibly anaesthesia-related (0.02%), while the majority were due to progression of disease (18).

CONCLUSION: This study shows a lower mortality than what has previously been reported for elective surgical procedures when the denominator is the total community number of operations.

Elective surgery is increasingly common as people live longer and try to maintain their quality of life. The balance between the risks and benefits of an elective operation is an important consideration when deciding whether or not to proceed. The benefits are often relief of pain and increase in function; the risks however, are harder to qualify. There is limited data available and that which we have is often from major public hospitals, which often attract the more complex patients and a heavier workload. The real risk in a community is much harder to define, as many procedures are performed in private hospitals and other smaller public hospitals.

In a prospective study of non-cardiac surgical patients aged 70 years or older across Australia and New Zealand, the 30-day mortality was 5%.¹ This study is one of only a few that have prospectively analysed surgical outcomes across a wide range of specialties, and it was the largest study of its kind in Australasia. The results however,

may not be generalisable to younger patients or patients having surgery at private hospitals, and self-selection of participating hospitals means that they may not be representative of all hospitals in Australasia.

The American College of Surgeons National Surgical Quality Improvement Program (NSQIP) is the largest database of postoperative mortality worldwide. It has some limitations, including that large teaching hospitals are overrepresented and studies from it are retrospective in nature. Due to the differences in healthcare delivery in the US compared with Australasia, the data is unlikely to be applicable here. However, an NSQIP study did show a comparable 30-day mortality to the Australasian study.²

In New Zealand the Perioperative Mortality Review Committee (POMRC) has the role of providing advice to the Health Quality and Safety commission on how to reduce the number of perioperative deaths. POMRC uses Ministry of Health databases, which have the limitations of coding

accuracy and data completeness, and do not include patients that have been treated in private hospitals. POMRC reports have limited use because they are mainly focused on specific procedures.

Surgeons and anaesthetists have the important job of informing patients and their families of the risks of any procedure. This can be difficult given the limited contemporary local data available on perioperative mortality. The aim of this study was to determine the mortality after elective surgery at a total community level with inclusion of all patients undergoing elective surgery in Christchurch, New Zealand, forming the largest cohort of elective surgical patients in Australasia and allowing us to describe the mortality of different patient groups within the cohort.

Method

This study was conducted at eight hospitals in Christchurch during November 2014. Hospitals that participated were all Christchurch hospitals where surgery is undertaken (public hospitals: Christchurch Hospital, Christchurch Women's Hospital and Burwood Hospital; and private hospitals: Canterbury Charity Hospital, Christchurch Eye Surgery, Forte Health, St George's Hospital and Southern Cross Hospital). The University of Otago Human Ethics Committee approved this study and approval was also given by each participating hospital.

We studied all patients who underwent elective surgery. Elective surgery was defined as procedures scheduled on a routine elective operating list. Patients were identified for inclusion in the study from operating theatre lists at each hospital. No patients were excluded from the study. For each patient, we collected demographic data, National Health Index (NHI) number, American Society of Anaesthesiologists physical status classification (ASA), type of anaesthetic and surgical specialty. ASA was used as an indicator of preoperative comorbidity. Patients were classified by surgical specialty in a similar way to the Australasian study. For analysis, patients were classified into six age groups: <20 years, 20–34 years, 35–49 years, 50–64 years, 65–79 years and ≥80 years, and as either having had a general anaesthetic, sedation or local anaesthetic only.

The primary outcome was 30-day mortality defined as death within 30 days after surgery, and the secondary outcome was 90-day mortality defined as death within 90 days after surgery. Dates of deaths were determined by matching NHI numbers with death records held by the Ministry of Health. The clinical records of patients that died were reviewed in order to find the cause of death. A death certificate was obtained where the cause of death could not be determined. The cause of death was classified according to the system used by the Australian and New Zealand College of Anaesthetists (ANZCA) Mortality Working Group, which classifies deaths based on the degree to which the death was anaesthesia-related.³

Study data was de-identified. Data was pooled from all hospitals and analysed using computer software (Minitab® Release 14.11.1, Minitab Inc, PA, USA and StatView for Windows, Version 5.0.1, SAS Institute Inc, Cary, NC, USA).

Results

Four thousand seven hundred and fifteen patients were identified and included in this study. Two thousand seven hundred and fifty-eight (55%) were female and the median age was 56 years (range 0–99 years) (Table 1). By day 30, 11 (0.2%) patients had died and by day 90, 27 (0.6%) patients had died. Males and females had similar mortality. The highest mortality was in patients aged 80 years or older (30-day mortality 0.8% and 90-day mortality 2.1%). There were no deaths in patients aged younger than 35 years. Mortality did not vary by day of the week of surgery. There was no increase in mortality in patients that underwent surgery on a Friday compared with other days of the week.

The majority of patients had a general anaesthetic (3,142 patients, 67%) (Table 2). Patients who had sedation had a higher 30-day and 90-day mortality than patients who had a general anaesthetic or local anaesthetic only. In patients who had a general anaesthetic, 420 patients (13.3%) had severe systemic disease; that is, they were ASA 3 or 4. The 30-day mortality for these patients was 1.0% and the 90-day mortality was 1.9%. For patients that were ASA 1 or 2, the 30-day and 90-day mortality was 0.04% (one death out of 2,722 patients).

Table 1: Mortality by sex, ethnicity and age group.

	n	30-day mortality	90-day mortality
Sex			
Male	2,135 (45%)	7 (0.3%)	13 (0.6%)
Female	2,578 (55%)	4 (0.2%)	14 (0.5%)
Unknown	2 (0.04%)	0 (0.0%)	0 (0.0%)
Ethnicity			
European	4,105 (87.1%)	8 (0.2%)	24 (0.6%)
Māori	185 (3.9%)	1 (0.5%)	1 (0.5%)
Asian	124 (2.6%)	2 (1.6%)	2 (1.6%)
Other/Unknown	301 (6.4%)	0 (0.0%)	0 (0.0%)
Age group (years)			
<20	525 (11.1%)	0 (0.0%)	0 (0.0%)
20–34	568 (12.0%)	0 (0.0%)	0 (0.0%)
35–49	816 (17.3%)	1 (0.1%)	1 (0.1%)
50–64	1,268 (26.9%)	2 (0.2%)	4 (0.3%)
65–79	1,150 (24.4%)	5 (0.4%)	14 (1.2%)
≥80	384 (8.1%)	3 (0.8%)	8 (2.1%)
Unknown	4 (0.1%)	0 (0.0%)	0 (0.0%)
Total	4715	11 (0.2%)	27 (0.6%)

Values are number (proportion).

Table 2: Mortality by type of anaesthetic and ASA (for patients who had a general anaesthetic).

Type of anaesthetic	n	30-day mortality	90-day mortality
General anaesthetic	3,142 (67%)	5 (0.2%)	9 (0.3%)
ASA 1	1,457 (30.9%)	0 (0.0%)	0 (0.0%)
ASA 2	1,265 (26.8%)	1 (0.1%)	1 (0.1%)
ASA 3	401 (8.5%)	2 (0.5%)	5 (1.2%)
ASA 4	19 (0.4%)	2 (10.5%)	3 (15.8%)
Sedation	628 (13.3%)	4 (0.6%)	12 (1.9%)
Local anaesthetic only	727 (15.4%)	1 (0.1%)	5 (0.7%)
Unknown	218 (4.6%)	1 (0.5%)	1 (0.5%)

Values are number (proportion). ASA 1, a healthy patient with no systemic disease; ASA 2, mild to moderate systemic disease; ASA 3, severe systemic disease imposing functional limitation on patient; ASA 4, severe systemic disease, which is a constant threat to life.

When patients who had a general anaesthetic were categorised by age group and ASA, the highest 90-day mortality was patients aged 80 years or older that were ASA 4 (one death out of four patients, 25%) (Table 3). In patients aged 65 to 79 years and ASA 3 or 4, the 30-day mortality was 2.1% and the 90-day mortality was 3.5%, and in patients aged 80 years or older and ASA 3 or 4, the 30-day mortality was 1.2% and the 90-day mortality was 3.7%. There were no deaths of patients aged 65 years or older that were ASA 1 or 2.

The specialty that had the greatest representation in our cohort was endoscopy (948

patients, 20.1%) followed by orthopaedics (814 patients, 17.3%) (Table 4). Specialties that had one or more death were cardiology, cardiothoracic, general, neurosurgery, ophthalmology, plastics, urology, endoscopy and bronchoscopy. Neurosurgery had the highest 30-day mortality of 4.3% (two deaths out of 47 patients) followed by cardiothoracic surgery with a 30-day mortality of 2.4% (two deaths out of 41 patients).

Of the 27 deaths within 90 days after surgery, one was possibly anaesthesia-related (0.02%). Twenty-two deaths (0.5%) were not anaesthesia-related and the cause of death was unable to be assessed for

Table 3: Mortality by age group, type of anaesthetic and ASA (for patients who had a general anaesthetic).

30-day mortality												
Type of anaesthetic	Age group (years)											
	<20		20–34		35–49		50–64		65–79		≥80	
	n	Deaths	n	Deaths	n	Deaths	n	Deaths	n	Deaths	n	Deaths
General anaesthetic	437	0 (0.0%)	431	0 (0.0%)	603	0 (0.0%)	821	1 (0.1%)	661	3 (0.5%)	187	1 (0.5%)
ASA 1	310	0 (0.0%)	298	0 (0.0%)	343	0 (0.0%)	355	0 (0.0%)	138	0 (0.0%)	13	0 (0.0%)
ASA 2	110	0 (0.0%)	116	0 (0.0%)	214	0 (0.0%)	352	1 (0.3%)	379	0 (0.0%)	92	0 (0.0%)
ASA 3	17	0 (0.0%)	17	0 (0.0%)	45	0 (0.0%)	109	0 (0.0%)	135	1 (0.7%)	78	1 (1.3%)
ASA 4	0	0 (0.0%)	0	0 (0.0%)	1	0 (0.0%)	5	0 (0.0%)	9	2 (22.2%)	4	0 (0.0%)
Sedation	27	0 (0.0%)	46	0 (0.0%)	85	1 (1.2%)	193	1 (0.5%)	214	1 (0.5%)	60	1 (1.7%)
Local anaesthetic only	39	0 (0.0%)	62	0 (0.0%)	95	0 (0.0%)	200	0 (0.0%)	206	1 (0.5%)	124	0 (0.0%)
Unknown	22	0 (0.0%)	29	0 (0.0%)	33	0 (0.0%)	54	0 (0.0%)	69	0 (0.0%)	13	1 (7.7%)
90-day mortality												
Type of anaesthetic	Age group (years)											
	<20		20–34		35–49		50–64		65–79		≥80	
	n	Deaths	n	Deaths	n	Deaths	n	Deaths	n	Deaths	n	Deaths
General anaesthetic	437	0 (0.0%)	431	0 (0.0%)	603	0 (0.0%)	821	1 (0.1%)	661	5 (0.8%)	187	3 (1.6%)
ASA 1	310	0 (0.0%)	298	0 (0.0%)	343	0 (0.0%)	355	0 (0.0%)	138	0 (0.0%)	13	0 (0.0%)
ASA 2	110	0 (0.0%)	116	0 (0.0%)	214	0 (0.0%)	352	1 (0.3%)	379	0 (0.0%)	92	0 (0.0%)
ASA 3	17	0 (0.0%)	17	0 (0.0%)	45	0 (0.0%)	109	0 (0.0%)	135	3 (2.2%)	78	2 (2.6%)
ASA 4	0	0 (0.0%)	0	0 (0.0%)	1	0 (0.0%)	5	0 (0.0%)	9	2 (22.2%)	4	1 (25%)
Sedation	27	0 (0.0%)	46	0 (0.0%)	85	1 (1.2%)	193	3 (1.6%)	214	6 (2.8%)	60	2 (3.3%)
Local anaesthetic only	39	0 (0.0%)	62	0 (0.0%)	95	0 (0.0%)	200	0 (0.0%)	206	3 (1.5%)	124	2 (1.6%)
Unknown	22	0 (0.0%)	29	0 (0.0%)	33	0 (0.0%)	54	0 (0.0%)	69	0 (0.0%)	13	1 (7.7%)

Values are number (proportion). ASA 1, a healthy patient with no systemic disease; ASA 2, mild to moderate systemic disease; ASA 3, severe systemic disease imposing functional limitation on patient; ASA 4, severe systemic disease, which is a constant threat to life.

Table 4: Mortality by surgical specialty.

Surgical specialty	n	30-day mortality	90-day mortality
Cardiology	64 (1.4%)	1 (1.6%)	1 (1.6%)
Cardiothoracic	41 (0.9%)	1 (2.4%)	1 (2.4%)
Dental	75 (1.6%)	0 (0.0%)	0 (0.0%)
Endocrinology	1 (0.0%)	0 (0.0%)	0 (0.0%)
Otolaryngology	358 (7.6%)	0 (0.0%)	0 (0.0%)
General	451 (9.6%)	0 (0.0%)	1 (0.2%)
Gynaecology	429 (9.1%)	0 (0.0%)	0 (0.0%)
Maxillofacial	28 (0.6%)	0 (0.0%)	0 (0.0%)
Neurosurgery	47 (1.0%)	2 (4.3%)	2 (4.3%)
Obstetrics	43 (0.9%)	0 (0.0%)	0 (0.0%)
Ophthalmology	461 (9.8%)	3 (0.7%)	4 (0.9%)
Orthopaedics	814 (17.3%)	0 (0.0%)	0 (0.0%)
Paediatrics	44 (0.9%)	0 (0.0%)	0 (0.0%)
Plastics	477 (10.1%)	0 (0.0%)	4 (0.8%)
Urology	164 (3.5%)	0 (0.0%)	1 (0.6%)
Vascular	58 (1.2%)	0 (0.0%)	0 (0.0%)
Spinal	22 (0.5%)	0 (0.0%)	0 (0.0%)
Endoscopy	948 (20.1%)	4 (0.4%)	10 (1.1%)
Bronchoscopy	37 (0.8%)	0 (0.0%)	3 (8.1%)
Other	153 (3.2%)	0 (0.0%)	0 (0.0%)

Values are number (proportion).

four patients (0.1%). The one death that was possibly anaesthesia-related occurred in a patient aged 65–79 years who had undergone a neurosurgical procedure under local anaesthetic only.

Discussion

In this prospective observational study of patients undergoing elective surgery in Christchurch we found a 30-day mortality of 0.2% and 90-day mortality of 0.6%. In patients aged 65 years or older the 30-day mortality was 0.5%, and in patients aged 80 years or older the 30-day mortality was 0.8%. These results are not consistent with those of the Australasian study that found a 30-day mortality of 5% in patients aged 70 years or older; however, they are consistent with our expectation that the mortality of

patients in our cohort would be lower than that found in the Australasian study.

The Australasian study had some limitations that we think may have contributed to a high mortality. Large teaching hospitals were over represented, and no private hospitals were included. Some specialties such as neurosurgery and thoracic surgery may have been over represented because these types of surgery are usually only performed at large teaching hospitals. An NSQIP study reported that thoracic surgery had the highest mortality,² so patients undergoing thoracic surgery may have disproportionately contributed to the mortality. Patients operated on in public hospitals may have higher preoperative comorbidity, which would mean that the Australasian cohort might have included a

disproportionately high number of patients with a high ASA. Our study avoided these limitations by including all patients undergoing any type of surgery at all hospitals. We think that our findings are more likely to reflect the actual situation in New Zealand.

Most of the postoperative mortality data that is currently available is from retrospective reviews of administrative databases, and often these are focused on one specific procedure or specialty. One of the largest retrospective observational studies of postoperative mortality showed a postoperative mortality of 1.85% in patients undergoing elective open surgical procedures.⁴ Our mortality is significantly lower than this. One of the reasons for this may be that we included patients having laparoscopic and diagnostic procedures, which have a lower mortality than open procedures. There are few studies that have prospectively examined mortality across a range of surgical specialties. Most of these studies have used in-hospital mortality as the primary outcome. The first large prospective international study of surgical outcomes showed an in-hospital mortality of 4%.⁵ Some other older prospective studies of in-hospital mortality have shown similar high mortality rates.^{6,7} These studies included elective as well as urgent and emergency procedures, which may explain the high mortality. One of the most recent studies to prospectively examine 30-day mortality is a large study performed in the UK, which showed a 30-day mortality for elective surgery of 0.4%.⁸ Our results are consistent with these findings and the methods of this study were similar to ours. The largest US study to prospectively examine mortality data showed a 30-day mortality of 8% in patients aged 80 years or older and 3% in patients aged less than 80 years.² These figures are significantly higher than ours, however, the cohort in this study is unlikely to be representative of the whole population because only patients that underwent surgery at Veterans Affairs Medical Centres were included.

Advances in perioperative care and minimally invasive surgery have enabled older and sicker patients to have surgery. It is well known that increasing age and ASA are associated with increasing mortality. One study

previously mentioned showed that age and comorbidity were independent predictors of 30-day mortality and in patients aged 80 or older ASA was the strongest predictor of mortality.² Another study showed that patients that are ASA 4 are at 6.75 times the risk of death compared with patients that are ASA 1.⁵ In our study, 30-day and 90-day mortality increased with each increasing age group and ASA, which is consistent with the findings of other studies.^{2,5,6,9}

Sedation is often used as an alternative to general anaesthetic in patients who are considered to be at a too high risk to have a general anaesthetic, so these patients are likely to have high preoperative comorbidity. This may explain the higher mortality of these patients compared with the entire cohort. The high mortality in neurosurgery is likely to be multifactorial but is likely due to the complex nature of neurosurgery as well as the particularly high risk of death of some procedures. For example, in one study previously mentioned, craniotomy for brain tumor had one of the highest mortalities of all procedures at 16.3%.² The high mortality we saw in cardiothoracic surgery compared with other specialties is consistent with other studies.^{1,2,4}

The most recent review of anaesthesia-related mortality by the ANZCA Mortality Working Group showed that over a three-year period, the total number of deaths reported was 1,404, and of these, 112 (8.0%) were considered to be wholly or partly related to anaesthetic factors.³ Deaths included in this review are those that are reported to ANZCA mortality review committees, and these are usually only those that occur within 24–48 hours of an anaesthetic. We used the same system and found that 3.7% of our deaths were anaesthesia-related. Caution should be taken in comparing this figure to that found in the review due to the small numbers of deaths and the differences in the nature of the data. The importance of calculating this figure in our study is to highlight that some postoperative deaths are directly or indirectly related to anaesthesia, and in order to reduce perioperative mortality there must be a system by which all perioperative deaths are reviewed.

Number of deaths on the day of surgery and number of in-hospital deaths after

surgery are identified in the WHO guidelines for safe surgery 2009 as vital statistics that should be collected on a national level as indicators of performance of a health system. Clearly the WHO considers perioperative mortality data in providing insight into risks associated with surgery. We included both 30-day and 90-day mortality, given we would be able to review all deaths and identify the causes. As expected, the majority were due to progression of the underlying disease and only one was possibly anaesthesia-related.

This study has several limitations. Firstly, this data was collected over a one-month period, and this group of patients may not be representative of patients undergoing surgery year round. The data we collected did not allow us to calculate the association between particular comorbidities and mortality, nor particular complications and

mortality. The major strength of our study is that it has a large contemporary patient sample with prospective data on all patients, including a wide range of procedures being performed at both public and private hospitals. This is the largest study of this type to have been conducted in Australia and New Zealand.

This study provides a unique snapshot of perioperative mortality for patients undergoing elective surgery in Christchurch. We think the results are reassuring in that the mortality rates are similar if not lower than what has been shown in other similar studies. Even though we found what we consider a low mortality rate, this study serves as a reminder of the importance of considering the risks including death of a particular patient undergoing a particular procedure when counseling a patient about elective surgery.

Competing interests:

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The New Zealand Health Strategy 2016: whither health equity?

Heather Came, Tim McCreanor, Claire Doole, Emma Rawson

ABSTRACT

New Zealand's core health policy document—the New Zealand Health Strategy (NZHS)—was released in its final form in April 2016. This paper provides a critique of the strategy in particular, as it relates to health equity particularly for Māori. We introduce the five NZHS themes of—people powered, closer to home, value and high performance, one team and smart system—to focus on the aspirational goal of eliminating health inequities. Our critical framework is informed by Te Tiriti o Waitangi. We identified that the NZHS relies on the isolated efforts of committed individuals and organisations to achieve health equity and Te Tiriti engagement, rather than through a planned systems viewpoint. Evidence on health equity and Te Tiriti application suggests efforts need to be sustained, systematic and multi-levelled to be successful, rather than ad hoc and piecemeal.

Sixteen years since the launch of the initial New Zealand Health Strategy (NZHS)¹ New Zealand is still burdened with health inequities between Māori and Pākehā New Zealanders² entrenched through colonisation and more recent inequities between Pacific and European populations. Braveman and Gruskin³ define health equity as “the principle underlying a commitment to reduce—and, ultimately, eliminate—disparities in health and in its determinants”. Inequities are avoidable differences in health between groups. Starfield⁴ argues inequity is built into health systems and manifests as disparities of health outcomes between dominant and marginalised groups. To address inequities, she argues organisational practices, policies and systems must re-orient to and embed attitudes, practices and procedures that champion and naturalise a culture that is purposely designed to enact health equity.

The publication of the revised NZHS⁵ was an important opportunity to rethink how the health sector can help to lift the health status of the entire population, within the available resources, towards the agreed goal of achieving equitable health and social outcomes. The Ministry of Health team are to be commended for their consultation

efforts, talking face to face with over 2,000 people at meetings around the country. This paper offers a critique of the NZHS and its orientation to health equity in relation to Māori health, drawing upon Te Tiriti o Waitangi, a decolonisation lens^{6,7} and the framework of Health Promotion Forum, *Treaty Understanding of Hauora in Aotearoa New Zealand*.⁸ Our analytic framework articulates notions of social justice, partnership, self-determination and equity embodied in Te Tiriti as fundamental to, but inadequately realised, in NZHS 2016.

New Zealand health strategy

Building on NZHS 2000, NZHS 2016 revisited the guiding principles, retained a focus on health equity and acknowledged the importance of the Treaty of Waitangi. The detail of the NZHS centred around five interconnected strategic themes: i) people powered, ii) closer to home, iii) value and high performance, iv) one team and v) smart system. Under the rubric “Live well, stay well, get well”, the strategy proposes some signposts of where the sector should be in five and ten years' time in relation to each of the strategic themes and then outlines a roadmap of how to achieve those goals.

People powered encourages and empowers people to become ‘health smart’, strengthening their health literacy and efficacy. The NZHS proposed achieving this through people being supported to make active choices through facilities such as virtual technologies.

Closer to home concerns developing integrated and targeted services close to where people live, learn, work and play. The NZHS aims to achieve this through integrated services and population-based initiatives that have the flexibility to be both universal and targeted for different purposes. These initiatives will include addressing the determinants of health.

Value and high performance is centred on a commitment to quality improvement, performance measurement, transparency and an integrated operating model. The NZHS committed to remove the infrastructural, financial, physical and other barriers to effective service delivery.

One team is about developing high-trust and flexible teams, and nurturing leadership. The policy envisages an effective workforce that collaborates with researchers, develops talent and leadership, and strengthens the role of families as caregivers.

Smart system is about engaging in evidence-based practice, innovation and utilising smart standardised technology. NZHS will ensure reliable accurate online health records that people can access and contribute to.

Discussion

This critique addresses some overall equity and Te Tiriti issues raised by the NZHS, and then more specifically addresses aspects of the themes of the NZHS.

The aspirational wording around health equity throughout NZHS typified by the responsabilising slogan “Live well, stay well, get well”, is heartening in one sense but obscures the longstanding gap between rhetoric and practice. For example, historically, hospitals promised as part of crown land purchases were never provided,⁹ and many other possible improvements for Māori communities such as sanitation and safe water supplies were denied and persist. In the contemporary setting, a study

by Sheridan et al¹⁰ of DHB management of chronic health conditions observed slow translation of equity policy into practice, characterised by unsystematic patterns of change and inaction in the face of known inequity. A report from the Auditor-General¹¹ identified only one DHB as compliant on their Māori health reporting. The NZHS does not appear to transform this existing ad hoc approach.

The Ministry of Health has commissioned a range of tools and frameworks that are able to detect and address inequities across the health sector. For instance, Cram’s¹² framework for health equity for Māori identifies evidence-based recommendations for the whole health system, health providers and practitioners. These recommendations focus on the domains of leadership, knowledge and commitment and could have been incorporated into the NZHS roadmap. This would have ensured trackable equity targets rather than time-delayed, longer-term, high-level outcomes.

The Health Equity Assessment Tool¹³ and the Whānau Ora Impact Assessment¹⁴ to a lesser extent are both used by government agencies as mechanisms for predicting the equity impact of decision-making. Their mandatory use within funding and policy decision-making by staff with the necessary cultural and political competencies, would strengthen equity efforts for investment and critically, disinvestment decisions.

Central to addressing health equity in the colonial context of New Zealand is engagement with Te Tiriti o Waitangi¹⁵, as the founding document of our colonial state. Under Te Tiriti hauora (health) is recognised as a protected taonga (treasure) and equity (including in health) is guaranteed in Article 3. Although Treaty principles are embedded within health legislation and within the Māori health strategy—He Korowai Oranga,¹⁶ te Tiriti only makes a brief appearance in the NZHS as the basis of a “special relationship between Māori and the Crown”.⁵ The NZHS does not address Te Tiriti obligations explicitly and the persistence of health inequities between Māori and other New Zealanders is a serious breach of the agreement. As of April 2011,¹⁷ there have been over 89 Waitangi Tribunal claims related to the actions of Crown

ministers and officials in their administration of the health sector.

To improve enactment of Te Tiriti o Waitangi, the Ministry could be more explicit about how it engages with Māori as Treaty partners in administering the health sector. Being specific, enhances accountability and provides opportunities to monitor and track progress. The following questions adapted from TUHA-NZ (Treaty Understanding of Hauora in New Zealand)⁸ provide guidance.

- Article 1: How will hapū/Māori be involved in decision-making throughout the health sector?
- Article 2: How well are hapū/Māori aspirations reflected within the NZHS?
- Article 3: What specific actions will be undertaken to ensure health equity outcomes? How will they be monitored?
- Article 4: How well are Māori worldviews and values, including wairuatanga, reflected in the NZHS?

Institutional racism is a pattern of differential access to material resources and power by race, which advantages and privileges one sector of the population while disadvantaging and marginalising another. It is a product of colonialism and remains a determinant of health¹⁸ that needs to be recognised as a critical site for action in any credible effort to address health inequities. With the growing body of evidence of racism within the New Zealand health sector,¹⁹ eliminating institutional racism should be central to efforts to achieve health equity. Establishing targets for change around this and investing in an evidence-based plan²⁰ could have provided focus for the sector.

The disciplines of public health and health promotion have long been champions of health equity²¹ but unfortunately, the roles of these key approaches are minimised within the NZHS. Strategically there is strong evidence of the cost effectiveness of spending in public health²² as a key vehicle for pursuing equity. Money invested in keeping people well leads to considerable savings in clinical treatment costs later. When executed well, public health programmes produce healthy, resilient communities, but disinvestment needs to be redressed and new funding streams dedicated.²³

In relation to the specific themes of NZHS.

People powered—Underpinning this theme lie Western notions of people taking individual responsibility for their health that orientates to a neoliberal agenda of decreasing state accountability. Reframing the theme to incorporate meaningful treaty partnership that acknowledges indigenous community standpoints about historically sourced contemporary harms, collective responsibility and accountability around health, could strengthen indigenous engagement and outcomes.²⁴

Closer to home—From a public health perspective more local provision is a helpful reversal of the rationalisation of services and concurs with the long-held understanding that equitable services need to be appropriately situated for accessibility. This is an indirect acknowledgement of a significant body of work, which suggests self-determining, tailored approaches work best for Māori.²⁵ In our analysis, this theme needs to encompass decolonisation initiatives and efforts to counter institutional racism.²⁰

From a Tiriti perspective the evidence demonstrating the impact of the social determinants of health, including colonisation and racism on health status, is robust and growing in relation to indigenous peoples.^{7,26,27} In relation to the determinants of health, the NZHS positively profiles the Ministry's investment into healthier housing. However, direction on addressing other key determinants remains unclear, and being explicit would enable work on these imperatives to be tracked and evaluated.

Value and high performance—Health provider performance is routinely monitored by government. It is less transparent from a quality improvement perspective as to how health funders and policy makers ensure quality within their own practice. Research by Cram¹² has identified multiple unexplored opportunities to strengthen the administration of the health sector that might reduce health inequities and improve outcomes from health investment.

Harris et al²⁸ argue racism is a significant barrier to quality service delivery and contrary to genuine Te Tiriti based partnership approaches. Mono-cultural practice or what Morrison²⁹ calls unconscious

incompetence, seems wide-spread within the administration and service delivery of the health sector. Inequities in practice can be invisible to those managing the system. In terms of doing something different, based on a review of the evidence, Came and McCreanor²⁰ recommend the development of a systems-wide plan for identifying, transforming and preventing racism as a barrier to health equity.

One team—The Ministry's ongoing investment into Māori health leadership has been positively evaluated³⁰ and in Tiriti terms is a constructive contribution to decolonisation and Māori self-determination. In considering the capacity and capabilities of the health sector in relation to health equity, generally it seems useful to invest in strengthening political and cultural competencies within the sector.³¹ These core competencies should be applicable to people functioning at all levels of the health system including decision-makers and policy makers.

The NZHS has retained Māori representation on district health boards (DHB) to enable Treaty partners' input into health decision making. Structurally strengthening Māori and Pacific input into health policy and decision-making through representation on all health advisory and reference groups might strengthen outcomes.³²

Smart system—To achieve equitable health and social outcomes, notions of evidence need to extend beyond Western bio-medical definitions to incorporate mātauranga Māori understandings of what protects and threatens health.³³ Best practice is a term widely used in the health sector and often refers to international frameworks as generated in the Northern hemisphere in studies that include no indigenous theorising or analysis. If we don't know what works best in a New Zealand context, it seems prudent to commission local research so we can ensure that interventions actually decrease health inequities. Given that access to technology

comes with its own built-in inequities, careful attention is needed to avoid having this imperative further exacerbate difficulties for Māori and other populations.

Conclusion

The stated high-level policy commitment to health equity in the NZHS engenders hope in our dynamic socio-economic, political and cultural environment. The political challenge facing the health sector is how to move the aspirations of the NZHS into everyday praxis. Research into health equity suggests that fragmented approaches will fail and that efforts need to be sustained, systematic and multi-levelled to be successful. The NZHS ignores this evidence and instead relies on the isolated efforts of committed individuals and organisations rather than addressing equity from a planned, systems viewpoint.

In the context of New Zealand, deep engagement with Te Tiriti o Waitangi, particularly addressing the specifics of the implications of Te Tiriti articles, needs to be the core platform of the NZHS and is essential for any credible effort to reduce inequities between Māori and non-Māori. Māori need to be structurally and consistently engaged in decision-making about health policy and investment decisions. The work practices of Crown ministers and officials needs to align with Te Tiriti to prevent further treaty breaches and Waitangi Tribunal proceedings.

Māori and Pacific communities have solutions about how to improve their respective health status. A commitment to Māori and Pacific-led solutions is missing in the NZHS. Institutional racism is a determinant of health for Māori and Pacific communities and a barrier to health equity. The NZHS was a chance for the government to get its house in order and this opportunity has been squandered.

Competing interests:

Nil.

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Financing the Canterbury Health System post-disaster

Matthew Reid, Ramon Pink

ABSTRACT

The Canterbury Health System has invested substantially in its transformation to a patient-centred, integrated system, enabling improved performance despite the significant and long-term impacts of the Christchurch earthquakes in 2010 and 2011. Questions have been raised about whether this transformation is sustainable and affordable.

We argue that there is a need for a post-disaster health funding strategy that takes into account the challenge of following population movements after a large natural disaster, and higher costs resulting from the disruption and the effect on the population. Such a strategy should also provide stability in an unstable environment. However, funding for health in Canterbury has followed a 'business as usual' model using the population-based funding formula, which we view as problematic. Additionally, increases in funding using that formula have been below the national average, which we believe is perverse.

Canterbury has received an additional \$84 million government in deficit funding since 2010/11, and this has covered part of the extra cost attributable to the earthquake. However, without system-wide integration and innovation that was underway before, and that has continued since the earthquakes, it is likely the Canterbury Health System would not have been able to meet the health needs of its population.

If health funding for Canterbury had continued to increase at the average rate applied across New Zealand over the past five years, deficit funding would not have been required.

After a major disaster, is Canterbury's integrating model financially sustainable?

The Canterbury Health System has become recognised recently for its transformation toward integration.¹ Better health outcomes and greater efficiency have been achieved through this integration, and the use of the resources of the health system where they can provide the most benefit to people. Across a range of measures, the Canterbury Health System has improved its performance, particularly in key areas such as acute admissions, acute occupied bed days, length of stay, seclusion rates in inpatient mental health and admissions to long-term aged residential care.

The Canterbury Clinical Network, a high functioning health system alliance formed in 2010, is at the centre of this transformation and has won awards from the

Institute of Public Affairs of New Zealand, including the Prime Minister's Award for Public Sector Excellence and Treasury Award for Excellence in Improving Public Value through Business Transformation in July 2015. Other health systems are taking up Canterbury's innovations with tools such as the Electronic Request Management System (ERMS), HealthOne (shared health record) and HealthPathways (an innovative suite of patient pathways) extending across the South Island and, in the case of HealthPathways, across Australasia. These innovations and the ongoing transformation journey are part of a culture that has allowed Canterbury to provide better, more timely care.

Keene et al² have recently refuted the unsustainability of national health spending over time, and have suggested that health funding in New Zealand is low relative to OECD countries and has fallen as a proportion of GDP. They argued for increasing health spending to address increasing need, and highlight that if health needs are not met, the resultant costs are

still borne by the economy when there is government underfunding of health.

In turn, we raise the question of whether the Canterbury Health System is financially sustainable in the post-disaster context of the last five years. In a normal environment, with population-based funding, this would be an easy question to answer. But Canterbury, since the 2010/11 earthquakes, has been a far from normal environment and therefore answering this question becomes complex.

Immediately prior to the February 2011 earthquake, Canterbury DHB was forecasting its first surplus in a number of years, largely achieved by reducing costs through reducing hospitalisation and entry to aged residential care. The Canterbury Health System had reduced hospitalisation by decreasing occupied bed days in aged residential care, combined with a reduction in acute medical admissions and length of stay resulting from increasing integration and managing care for people in the community through an acute demand hospital avoidance service. Bending downwards the otherwise constant upward trend in the occupancy of aged residential care beds was directly related to the new model of restorative home-based support implemented in Canterbury from 2009. In 2011 Canterbury was in the middle of implementing a step change improvement in home-based care. This involved an integrated nursing and home-based support model—to help older people to stay in their own homes longer—and planning for a new customised home-based rehabilitation model (now known as Community Rehabilitation Enablement & Support Team or CREST) to allow older people to get home earlier after admission to hospital while continuing their rehabilitation.

The February earthquake changed many things but not the strategic direction of the Canterbury Health System. The Canterbury Health System has proven to be resilient and responsive in the face of unprecedented challenges.

In meetings held after the 2011 earthquakes with the Ministry of Health (National Health Board), Canterbury DHB executives specifically proposed that funding increases, in the interests of stability, be held at the national average growth rate to provide a level of certainty against which to plan.

Another allocation method could have been proposed, such as an agreed fixed percentage growth rate. Indeed, there may have been some rationale for a growth rate higher than the national average. However, the national average growth rate would have reflected the relative position of Canterbury DHB in terms of funding increases over recent previous years. The Ministry did not respond to the proposal, and subsequently followed a 'business as usual' population-based funding approach. Using population-based funding in a post-disaster context seems unwise on several counts:

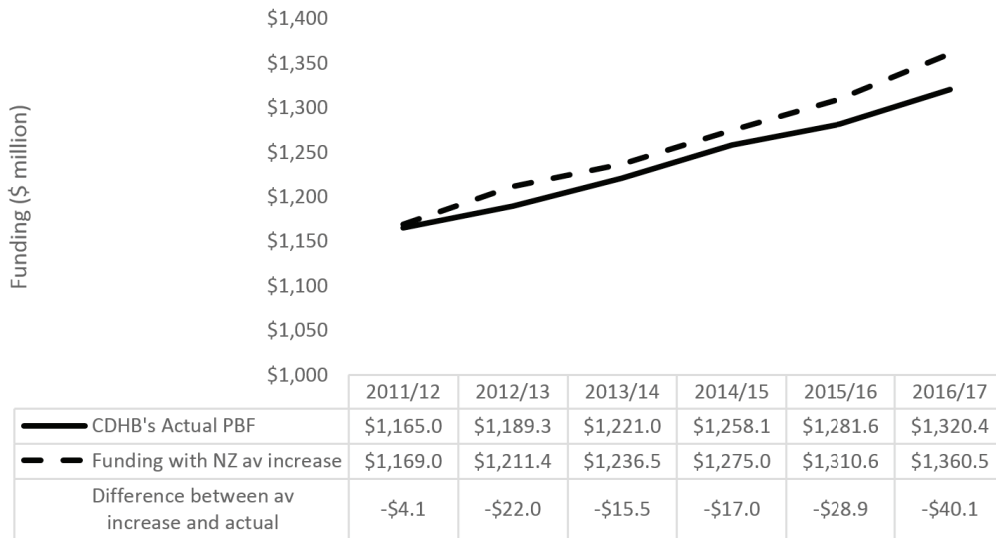
1. The likelihood that determining rapid changes in the Canterbury population over the next years was going to be challenging, and using a population-based funding formula would be consequently challenging;
2. When considering the likelihood of the health system having to carry higher costs than previously, related to
 - greater health needs among the population predicted by Gluckman³ and in international literature⁴⁻⁶ and
 - damage and disruption to services both in Canterbury's hospitals and for external health service providers;
3. A funding approach based solely on population estimates lacks stability and certainty in a post-disaster environment.

We address each of these factors in turn below.

Changes in the population

Firstly, we discuss the challenge of following population changes and the impact of those changes with New Zealand's population-based funding mechanism. This challenge was highlighted by evidence on population movement after a large-scale natural disaster, which predicted out-migration from Canterbury of less than 2.5% in the first one to two years, itself balanced by in-migration associated with post-disaster construction and background population increase.⁷ This was later reinforced in a report which highlighted the inappropriateness of using a population-based funding

Figure 1: Canterbury DHB funding 2011/12 to 2016/17 (\$ million).



formula (PBFF) in the context of rapid, short-term population changes related to a natural disaster.⁸ PBFF is a funding mechanism that is designed for a 'business as usual' environment marked by slowly changing demographic trends. However, Canterbury DHB was managing a health system in the middle of New Zealand's largest natural disaster and facing a challenging operating environment related to a population experiencing the consequences of ongoing earthquakes. The population challenge was exacerbated by the forced migration of 10,000 households from the red zone and the subsequent influx of the rebuild population.

If Canterbury DHB had received the national average increase in funding from 2011/12 to the current 2016/17 year it would

have received \$127.6 million more in population-based funding than what it actually received (Figure 1). This number is higher than the \$84 million in earthquake-related deficit support that Canterbury has received over the period since 2011/12 to ensure that it was able to break even each year.

The lower than average increase in funding needs to be considered in the context of the national district health board funding pool, which increases annually. There has been significant variation and lack of certainty in the share of the new funding that Canterbury has received each year with very low proportions of the new funding in three of the post-quake years and one year above average (Figure 2). This does not include the deficit funding provided by the government to allow break-even at each year end.

Figure 2: Population share and share of new funding in health.

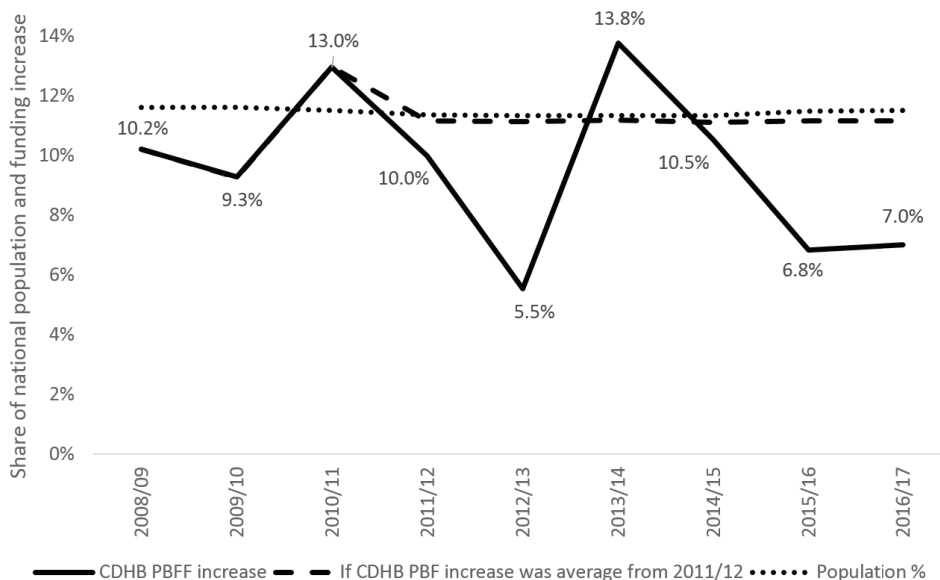
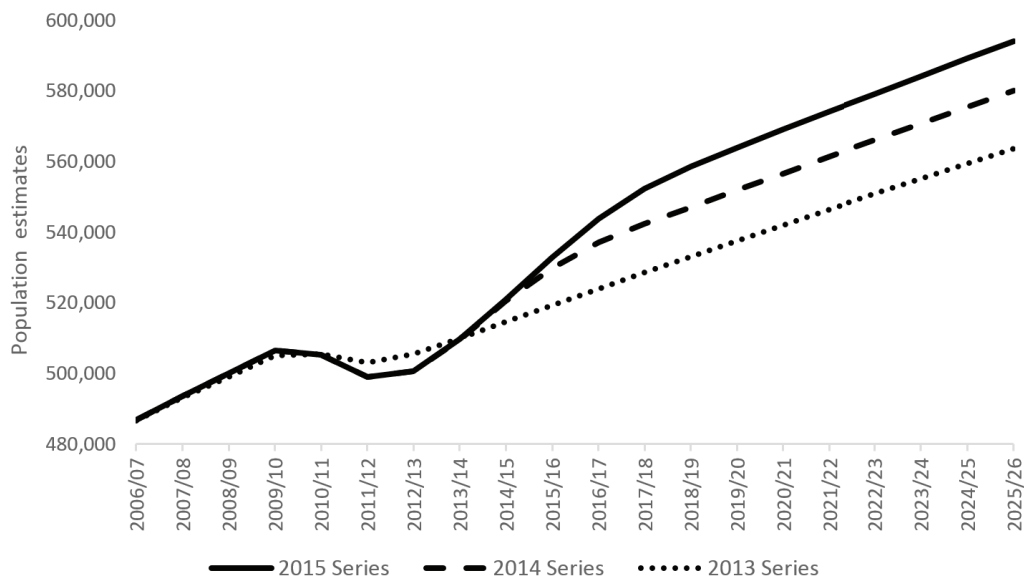


Figure 3: Canterbury DHB's annual predicted population changes with real growth 2011–2016.

In the 2016 budget, the government announced increased funding for health with an additional \$1.6 billion for district health boards over the next four years.⁹ Media releases included information for each district health board on the additional funding for 2016/17 and the increased investment over the last eight years; Canterbury will receive \$44 million additional funding in 2016/17 (including the mental health package announced in response to additional population need) and in total \$331 million over the last eight years.¹⁰ This equates to \$81 and \$609 per capita in Canterbury compared with \$99 and \$721 per capita on average nationally for 2016/17 and the last eight years, respectively.

Why did Canterbury receive less than the national average increase in funding? The population changed and moved rapidly, in ways close to what had been foreseen.⁷ Out-migration temporarily resulted in a 2% lower population than predicted pre-quake in the first two years after the earthquake, but with little change in older age groups (who tend to be heavier users of health services), considerable movement within Canterbury (from Christchurch to surrounding districts) and a subsequent return to population growth.^{8,11,12} The methodology used by Statistics New Zealand to project demographic changes has not kept up with these changes, and a number of changes were not captured, such as

the large commuting rebuild population. That Statistics New Zealand was struggling to manage with the volatility of the Canterbury population is evident in their annual estimates. Figure 3 shows that each year, population projections have had to be revised upwards as the previous year's forecasts were too low, a pattern not seen to the same extent in other DHBs.

This resulted in Canterbury's share of national PBFF reducing inappropriately, which was combined with increases in the funding at the lower end of the scale of potential increase. Given the post-earthquake context, lower than average funding increases seem illogical. Put simply, if funding for health in Canterbury had continued to increase at the average rate applied across New Zealand over the past five years, as had previously been the case, deficit funding for the earthquake would not have been required.

Higher costs

Secondly, funding is only part of the picture, and it's necessary to consider the post-disaster expenditure side of the equation. Within the context of a continuous focus on containing expenditure, it is reasonable to assume that the Canterbury earthquakes have had some identifiable operational impacts on Canterbury workforce and physical infrastructure, and indeed an independent review¹³ identified in

excess of \$100 million in additional operational expenditure directly attributable to the earthquakes.

Greater health needs, particularly in mental health, have required higher investment in response.¹⁴ These extra needs and resultant additional expenditure were predictable and could be anticipated from disasters of a similar scale.⁴ Increased demand for mental health services has arisen, particularly for the more vulnerable, either directly from the disaster event or indirectly (financial uncertainty, reduced quality or temporary housing, disruption in support networks or daily life).⁸

Additional operational costs resulted from the lease of new spaces for health workers who were forced to vacate damaged buildings, decanting services and support people, outsourcing and outplacing of surgery, support for access to community services. This expenditure was necessary to ensure the population continued to receive the health services they required. A portion of these increased costs have been reported quarterly to Treasury and the Ministry of Health, and in addition clear trends in sick leave and other staff-related costs have been identified that the DHB has had to absorb.

There have also been effects on the capacity of the health system to deliver health care. Staff have faced increased demand while the majority managed their own stressful situations. Community and primary health providers have been affected, requiring support from the DHB for higher costs to continue services. Secondary care has faced prolonged disruption resulting from ongoing repairs and replacement of facilities. Canterbury DHB has received government support for new building and repair projects for its facilities. Among these, a new Burwood Hospital has recently opened (though this was largely financed by the DHB through prudent fiscal management in previous years); a new acute services building is under construction; and construction will commence soon on a new outpatients building. Funding has come from Canterbury DHB accumulated depreciation, insurance pay-outs (although the maximum possible pay-out was at least \$150 million short of the assessed repair and rebuild costs) and the Ministry of Health. All of this then attracts an 8% per annum capital charge.

Need for stability and certainty

Lastly, Canterbury requested stability of funding in a period of considerable instability. Several agencies and government departments in Canterbury have discussed the need for a post-disaster framework for funding, which would recognise the scale of inherent uncertainty resulting from the earthquakes. This would recognise the unprecedented response necessary for this and similar sized disasters, and avoid extreme movements in funding, which create distraction when the focus should be on the population and patient's needs, as well as being detrimental to morale. A large amount of time and effort has been focused on arguing for adequate funding instead of on patient care, and on continued integration and innovation.

Conclusion

In summary, if Canterbury had not experienced the 2010/11 earthquakes, large additional costs would not have been incurred. It could have projected to experience the national average growth in funding, and would have received an additional \$127 million in funding; it would not have required deficit support. Canterbury would have continued to implement its inflight transformation to an integrated patient-centred health system, and over the last five years it would have delivered a financial surplus. In that case, therefore, it is possible to answer the question of sustainability and affordability in the affirmative. Is an integrating health system in Canterbury financially sustainable? Yes it is.

More broadly, lessons should be learned from the experience of Canterbury DHB in the years after the 2010/11 earthquakes. The adequacy of post-disaster policies including funding mechanisms is relevant to all of New Zealand, not just Canterbury. A similarly disruptive disaster could affect any area of New Zealand—earthquake, tsunami, volcanic eruption, flood or storm. Such disasters will require higher levels of spending in the years afterward. A stable post-disaster funding mechanism would enhance the capacity of all DHBs to respond to such an occurrence.

Competing interests:

Both authors work for Canterbury DHB.

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Tenosynovitis due to pseudogout

Hirofumi Yoshida

ABSTRACT

A 93-year-old woman acutely developed fever associated with pain and swelling around her left wrist. Physical examination revealed fusiform symmetric swelling of the entire digits, digits held in partial flexion, tenderness along the flexor tendon sheath and pain along the tendon with passive digits extension. Gram stain of collected fluid showed the presence of calcium pyrophosphate dihydrate crystals.

A 93-year-old woman was admitted for aspiration pneumonia following a right femoral fracture. During treatment with ampicillin/sulbactam, she presented with fever associated with pain and swelling around her left wrist. The patient's clinical examination was consistent with flexor tenosynovitis due to the presence of Kanavel's four classic signs (fusiform symmetric swelling of the entire digits, digits held in partial flexion, tenderness along the flexor tendon sheath, pain along the tendon with passive digits extension) at the wrist (Figure 1).¹ Although the fluid collected by the wrist arthrocentesis was an inadequate amount for culture, Gram stain revealed the absence

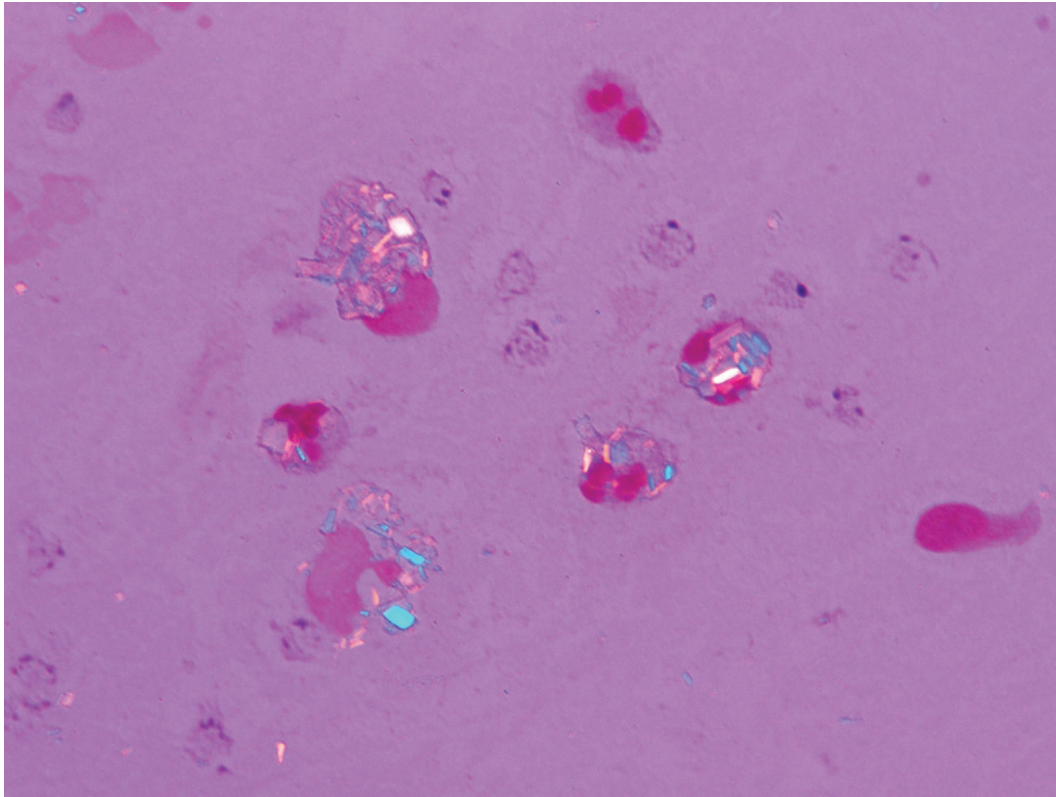
of bacteria but the presence of calcium pyrophosphate dihydrate crystals phagocytized by neutrophils under a polarising-light microscope (Figure 2). On the basis of clinical manifestations, the condition was diagnosed as tenosynovitis due to pseudogout. Her symptoms were resolved with a one-week course of a non-steroidal anti-inflammatory drug.

When the synovial fluid analysis is not available, an important role in the diagnosis may play a characteristic radiographic finding such as chondrocalcinosis, radiocarpal joint narrowing, sclerosis and subchondral cystic degeneration of the carpal bones.²

Figure 1:



Figure 2:



Competing interests:

Nil.

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Delayed recovery of adipsic diabetes insipidus (ADI) caused by elective clipping of anterior communicating artery and left middle cerebral artery aneurysms

Jeffrey Tan, Samuel Nodoro, Uchenna Okafo, Aoife Garrahy, Amar Agha, Danny Rawluk

ABSTRACT

Adipsic diabetes insipidus (ADI) is an extremely rare complication following microsurgical clipping of anterior communicating artery aneurysm (ACoA) and left middle cerebral artery (MCA) aneurysm. It poses a significant challenge to manage due to an absent thirst response and the co-existence of cognitive impairment in our patient. Recovery from adipsic DI has hitherto been reported only once. A 52-year-old man with previous history of clipping of left posterior communicating artery aneurysm 20 years prior underwent microsurgical clipping of ACoA and left MCA aneurysms without any intraoperative complications. Shortly after surgery, he developed clear features of ADI with adipsic severe hypernatraemia and hypotonic polyuria, which was associated with cognitive impairment that was confirmed with biochemical investigations and cognitive assessments. He was treated with DDAVP along with a strict intake of oral fluids at scheduled times to maintain eunatremia. Repeat assessment at six months showed recovery of thirst and a normal water deprivation test. Management of ADI with cognitive impairment is complex and requires a multidisciplinary approach. Recovery from ADI is very rare, and this is only the second report of recovery in this particular clinical setting.

Adipsic diabetes insipidus (ADI) is an extremely rare complication following microsurgical clipping of anterior communicating artery aneurysm (ACoA) and left middle cerebral artery (MCA) aneurysm. It poses a significant challenge to manage due to an absent thirst response and the co-existence of cognitive impairment in our patient. Recovery from ADI is an exceptional event which was reported only once before.¹ This case report discusses the investigations and treatment challenges encountered in our patient.

Case report

A 52-year-old city council worker with a history of clipping of left posterior commu-

nicating artery aneurysm 20 years prior was electively admitted for clipping of ACoA and left MCA aneurysm, which were found on surveillance imaging.

He has a strong family history of intracranial aneurysms, with his mother and three other siblings diagnosed with the same. He had no other medical comorbidities and was on no regular medications. Preoperatively, he was cognitively intact with no neurological deficits. He had a normal baseline urea and electrolytes, and his other pre-operative investigations were unremarkable.

The patient underwent a left pterional craniotomy and clipping of ACoA and left MCA aneurysms without any intraoperative

complications. On the first post-operative day he was found to be disorientated to place and time but not to person, with some impairment of his short-term memory. On further assessment, he was dysphasic and this was characterised by perseveration, paraphonia and difficulty following commands.

On the second post-operative day, his plasma sodium concentration rose to 160mmol/l (pre-operative sodium=137mmol/l) with a plasma osmolality of 338 mosm/kg (normal 290–295mosm/kg) and urine osmolality of 200mosm/kg. Twenty-four hour urine output was greater than 2,800ml. He had normal blood glucose, potassium and calcium levels. Despite the persistent hypernatremia, he denied thirst (he rated his thirst as one or two out of ten on a visual analogue scale with one being no thirst and ten maximum thirst) and did not drink unless prompted by the nursing staff. He was therefore diagnosed with ADI. Morning cortisol, gonadal and thyroid function were normal.

He was treated with S/C desmopressin (DDAVP) and intravenous 5 % dextrose at a rate of 125mls/hour with an additional oral fluid target of two litres per 24 hours. His plasma sodium corrected over the following five days and he was subsequently switched to oral DDAVP 0.2mgs twice daily and an oral fluid target of two litres per day.

His recovery was further complicated with a tonic clonic seizure on the fifth post-operative day, which necessitated treatment with phenytoin, lorazepam and maintenance dosages of levetiracetam as seizure prophylaxis. CT brain revealed a new infarct in the left anterior frontal lobe. Cerebral angiography showed good occlusion of the previously clipped aneurysms, but moderate

vasospasm in the terminal left internal carotid, left A1, M1 and M2 segments with no stasis or vessel occlusion demonstrated.

His dysphasia improved considerably and he suffered no further seizures. Formal cognitive testing with the Galveston Orientation and Amnesia Test (GOAT) and the Montreal Cognitive Assessment (MoCA) demonstrated significant impairment (score of 58/100 and 21/30 respectively).

He was subsequently transferred to the National Rehabilitation Centre on a maintenance dose of DDAVP. He required ongoing prompting to maintain a fluid intake of 1.5–2 litres. His sodium remained normal.

He was readmitted six months later for a water deprivation test (DDAVP was held for 36 hours before the test). The test showed normal concentration of urine with a peak urine osmolality of greater than 700mOSm/kg, reduction in urine out to 30mls in the last hour together with normal thirst score of seven on a ten point thirst visual analogue scale. His plasma sodium remained unchanged and in the normal range throughout the test (Table 1).

Discussion

Water balance and osmolality are finely controlled via hypothalamic integration of signals from osmoreceptors, which leads to a corresponding neurosecretory vasopressin response. The organum vasculosum laminae terminalis (OVLT) is the site of the putative osmoreceptor² in the anterior hypothalamus that detects increase in plasma osmolality. Specifically, neurons in the dorsal cap of the OVLT in animal models are able to detect these changes in plasma osmolality and/or angiotensin II or relaxin in the bloodstream.³ It derives its vascular supply from small perforating branches of the anterior

Table 1: Results of water deprivation test.

Time (minutes)	Plasma sodium (mmol/L)	Plasma osmolality (mOsm/kg)	Urine osmolality (mOsm/kg)	Urine output (mls/hr)	Thirst score
0	144	306	580	50	2
180	144	304	540	150	2
360	144	307	204	50	3
450	145	305	650	50	6
510	144	305	716	30	7

cerebral artery and ACoA.⁴ Excitatory connections are said to project from the OVLT to the supraoptic nucleus (SON), which is the site of vasopressin synthesis, which then secretes vasopressin into the bloodstream from the posterior pituitary.

A deficient thirst sensation is also known to occur after damage to osmoreceptors in the anterior hypothalamus,^{5,6} which has neural connections to the cerebral cortex centres for thirst appreciation.³ Therefore, clipping of the anterior communicating artery aneurysm would potentially compromise the blood supply to these osmoreceptor cells. The combination of diabetes insipidus with the absence of thirst in response to hypernatremia but preservation of other hypothalamic function would suggest dysfunction of the osmoreceptor cells² rather than the SON, but possibly both.⁷

ADI is a potentially life-threatening condition and is associated with increased mortality compared to DI with intact thirst.⁸ The principal features are central diabetes insipidus due to vasopressin deficiency and absence of the normal physiological thirst response to plasma hyperosmolality (plasma sodium or tonicity).⁹ In a normal subject, in order to maintain water homeostasis, even a small increase in plasma osmolality will trigger a compensatory thirst response (resulting in increased water intake) and vasopressin secretion which increases renal water re-absorption¹⁰ thus restoring plasma osmolality to within its very narrow normal range. Patients with cranial DI are highly dependent on an intact thirst perception to stimulate compensatory water intake to replace urinary losses, and this explains why most patients with cranial DI but normal thirst have plasma sodium within or near the normal range if they have free access to water. Our patient clearly had adipsia (as evident by lack of drinking despite a very high plasma sodium and reporting a thirst score of one or two over ten despite significant dehydration) with absent or blunted vasopressin response (as evident by hypotonic polyuria despite a very high plasma sodium level). The response to exogenous vasopressin administration confirms this to be cranial DI. Most recently, copeptin,

which is a glycosylated peptide that is released from the hypothalamus, is being described as a novel biomarker in the diagnosis of polyuria-polydipsia syndromes. It is being evaluated in a multi-centre international study (NCT01940614) comparing it with the current gold standard water deprivation test.¹¹

ADI is also strongly associated with obesity and sleep-related disorders like apnoea, which can lead to progressive respiratory stress and compromise. This should be evaluated in all ADI patients with an Epworth sleepiness score, and these patients may benefit from early weight management programs if clinically indicated.⁸

There have only been a limited number of reported cases of adipsic/hypodipsic cranial DI^{8,12} or cognitive deficits^{13,14} relating to ACoA surgery in the literature. The true incidence of adipsic/hypodipsic DI following elective clipping of an ACoA aneurysm is unknown. Recovery of adipsic DI resulting from clipping of ACoA aneurysm is an exceptionally rare event, and to our knowledge has only been described once before. In a recently published case series of 12 patients with DI, Cuesta et al described a 51-year-old male had recovery of osmoregulated thirst and AVP secretion ten years post-clipping of ACoA aneurysm in the setting of a subarachnoid haemorrhage.¹ The difference in interval between onset and recovery in these two cases highlights the heterogeneous pattern of recovery seen in ADI and emphasises the importance for long-term surveillance.

There are several proposed mechanisms for recovery of thirst in ADI. In a case series of three paediatric patients with DI post-resection of craniopharyngioma in which recovery of thirst (and persistence of DI) occurred within nine months, the authors proposed that adipsia was demonstrative of neuronal contusion with the capacity to recover after time.¹⁵ However, recovery of thirst perception after a much longer interval has also been described and attributed to neural regeneration in the infarcted anterior hypothalamus supplied by the small perforating branches of the ACoM aneurysm.¹ Adipsia may also be exacerbated by, if not itself a manifestation of, cognitive impairment post-operatively.

Our patient responded well to DDAVP and hypotonic fluid intake, which is the first line treatment in cranial diabetes insipidus.¹⁶ The dosage of DDAVP varies among individuals¹⁷ but generally a low dose is advised initially, which can be increased as necessary.¹⁸ Chlorpropamide, which acts by increasing renal tubule's responsiveness to endogenous vasopressin¹⁹ and has been postulated to stimulate vasopressin secretion from the posterior pituitary,²⁰ could be supplemented in patients with residual ability to secrete Vasopressin, although in modern clinical practice, almost all patients with DI can

be managed long-term with oral or nasal Desmopressin. Regular measurements of plasma sodium are essential. Scheduled targeted intake of water is to be based on daily changes to body weight akin to another form of medication,²¹ however, this was made difficult by his cognitive impairment.

Conclusion

Management of ADI with cognitive impairment is complex and requires a multi-disciplinary approach. Recovery from ADI is very rare, and this is only the second report of recovery in this particular clinical setting.

Competing interests:

Nil.

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A case of bariatric surgery during pregnancy

Sarah Mavor, Melanie Lauti, Andrew D MacCormick

New Zealand has high rates of obesity, which is associated with reduced fertility.¹ Currently, bariatric surgery is the most effective treatment for obesity.² Sleeve gastrectomy is a commonly performed bariatric operation and involves excising the majority of the stomach.² Rapid and significant weight loss ensues, a less than ideal environment in which to nurture a fetus.³

When bariatric surgery is undertaken in women of reproductive age, patients are advised to delay pregnancy, with guidelines recommending a delay of at least one year.² Yet case reports of pregnancy within the first year of surgery are not uncommon.⁴ We report a case where the patient was unknowingly pregnant at the time of sleeve gastrectomy.

Case report

A 25-year-old woman weighing 135kg (BMI 47.2 kg/m²) with no obesity-related co-morbidities other than reduced fertility was referred for bariatric surgery. On specialist review, she had already lost 9kg

and was an appropriate candidate for sleeve gastrectomy. She was set a further 5kg weight loss goal.

Support to attain the preoperative weight loss goal was provided by the bariatric service. Once achieved, the patient undertook a very low calorie diet for three weeks prior to surgery, such that her weight on the day of surgery was 116kg (BMI 40.6 kg/m²).

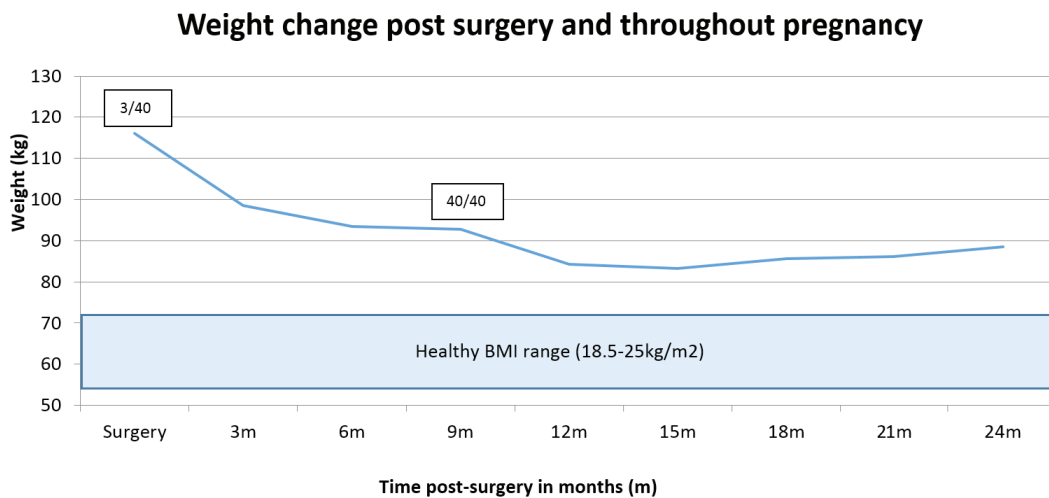
A routine sleeve gastrectomy was performed using a 34 French calibration bougie and dividing the antrum 5cm proximal to the pylorus. There were no surgical complications and she was discharged on day two.

An obstetric ultrasound confirmed a single live intrauterine pregnancy of seven weeks gestation, four weeks following sleeve gastrectomy indicating intercourse approximately three weeks prior to surgery had resulted in pregnancy. The patient was monitored throughout her pregnancy by the bariatric and high-risk obstetric teams (Table 1 and Figure 1).

Table 1: Nutritional intake and supplementation throughout pregnancy recorded at bariatric dietitian appointments.

Time post-surgery	1 month	2.5 months	5 months	7 months	9 months
Time of pregnancy	7/40	13/40	23/40	31/40	39/40
Weight (kg)	105	98.6	94.4	92.8	92.8
Estimated energy intake (kcal)	235	312	1,000–1,200	745	1,230
Estimated protein intake (g)	24	44	72	53	71
Fluid intake (L)	1–1.25	-	1.5	1.2	>1.5L
Supplements	Folic acid, iron, incomplete MV (MultiADE®), protein shake	Pregnancy MV (Elevit with iodine®), 1–2x protein shakes	Pregnancy MV (Elevit with iodine®), IM B12, iron, protein shake	Pregnancy MV (Elevit with iodine®), iron, calcium	Pregnancy MV (Elevit with iodine®), IM iron, calcium, Fortisip 2–3x day
Other relevant information	Light morning sickness, constipated	Nausea resolved, constipated	Constipation improving	Increased fatigue, reduced portions, discontinued protein shakes	

MV = Multivitamin, IM = Intramuscular.

Figure 1: Trend of weight loss from day of surgery, through pregnancy up to two years post-surgery.

The patient delivered a healthy boy 40 weeks and 4 days gestation, weighing 3,410g (50th percentile), 51.5cm in length (between 50th and 75th percentile) and head circumference of 36.5cm (between 75th and 91st percentile).⁵ He achieved all expected milestones during the first year of life.

Discussion

To our knowledge, this is the first case report to demonstrate the implications of increased fertility associated with weight loss occurring prior to bariatric surgery.

Weight loss before surgery is a routine requirement for many bariatric services. As this case highlights, it may be sufficient to improve fertility. This raises the question of whether day of surgery pregnancy screening for all female bariatric patients of child-bearing age should be routine.

Reports of antenatal maternal and/or fetal malnutrition following bariatric surgery are rare, but include neural tube defects (folate deficiency), intracranial haemorrhage (vitamin K deficiency), maternal night blindness, preterm birth and vision complications in the neonate (Vitamin A deficiency).⁶⁻⁸ Cases that have been reported were all observed in so called 'malabsorptive' procedures rather than the 'restrictive' sleeve gastrectomy.^{6,7} Maternal vitamin B-12 and iron deficiencies are commonly reported but without adverse outcomes.^{7,8} Overall there is no strong

evidence regarding maternal micronutrient deficiencies, with only suggestions for screening and monitoring for micronutrient deficiencies available.³ There is no conclusive evidence supporting the theory that pregnancy within the first year post-surgery is unsafe.⁴

A second reason for delaying pregnancy following bariatric surgery is to maximise weight loss following surgery.⁴ With pregnancy, the focus changes to weight gain to support adequate growth and development of the foetus. Ministry of Health guidelines for non-bariatric patients aim for a weight gain of between 5–18 kg depending on pre-pregnancy BMI; however, there are no guidelines on what would be appropriate in bariatric patients.⁹ Aiming for weight gain, or even to slow weight loss negates the goals of the surgery, and ultimately may reduce the overall weight loss achieved.

In this case, weight stabilised at six months following sleeve gastrectomy. Whereas the weight-loss phase would usually last up to between 12–18 months. Postnatally, the patient achieved 60% excess body weight loss at two years. This is comparable to previous findings at the same institution, where the average percentage excess weight loss at two years following surgery was 55%.¹⁰

Routine counselling and contraceptive advice should be given to all female patients of child-bearing age, not only in

the early stages following surgery but also pre-operatively. This will ensure patients are adequately informed of the potential increase in fertility associated with even preoperative weight loss. Preventing pregnancy prior to surgery until after the first

postoperative year will ensure appropriate lifestyle changes are maintained and weight loss is maximised to optimise surgical results. In addition, a high risk pregnancy at risk of nutritional deficiencies is avoided.

Competing interests:

Nil.

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Prevalence of postmenopausal hormone use in New Zealand women

Jacqueline Chesang, Ann Richardson, John Potter, Mary Jane Sneyd, Pat Coope

Postmenopausal hormone (previously called hormone replacement therapy or HRT) use was first introduced in the 1940s for the treatment of postmenopausal symptoms, and was oestrogen-based. An increase in the risk of endometrial cancer was observed among postmenopausal hormone (PMH) users, and in the 1980s, progesterone was added to counter this effect.¹ PMH use increased when it was shown in observational studies to confer protection against cardiovascular disease, dementia, loss of bone mineral density and osteoporosis. The findings of the Women's Health Initiative (WHI),² a large randomised clinical trial in 2002, that PMH does not decrease the risk of cardiovascular disease and may instead increase the risk of both cancer and cardiovascular disease, led to a widespread decline in the use of PMH.^{1,3}

In New Zealand, an increase in the use of PMH was noted from 1991 to 1997 among women aged 45 to 64 years (from 12% to 20% for current use and from 19% to 32% for ever-use).⁴ The most common indication for use, in both 1991 and 1997, was symptomatic relief, followed by prevention of osteoporosis.⁴ Of the women surveyed in 1991 and 1997, 26% and 27% respectively had undergone hysterectomy, and women in these groups were 2–3 times more likely to be current users of PMH than those with intact uteri. In addition, there was a change in the type of PMH used. Current use of oestrogen-progestin (EPT) preparations increased from 0.4% in 1991 to 29% in 1997, and use of oestrogen-only (ET) preparations in women with intact uteri decreased from 33% to 11%; in contrast there was a decrease in current use of EPT among women with history of hysterectomy from 21% to 15%.⁴

Following the publication of the findings of the WHI trial, a study was conducted

to assess whether the WHI findings had affected use of PMH among New Zealand women. The study observed a decline in current use of PMH among women aged 45–64 years (from 15% in June 2002 to 11% in December 2002).⁵ The most common reason for use was symptomatic relief, and for discontinuation of use was the findings of the WHI study. Among current PMH users, 64% had had hysterectomy in December 2002 and 58% in June 2002. In addition, ET was used by a higher proportion of women than was EPT and discontinuation of use was more common among EPT users.⁵ In these two studies participants were randomly selected from the electoral roll, and PMH included ET and EPT.^{4,5}

We conducted a New Zealand nationwide population-based study between 1 May 2013 and 31 October 2015,⁶ in which women aged 35–69 years were randomly selected from the electoral roll to reflect the age structure of New Zealand women at the 2013 census (the participants in this study were part of the control arm of a population-based case-control study investigating the association between use of contraceptives and ovarian cancer). Controls were identified using the electoral roll; they were sent a self-administered postal questionnaire, with telephone follow-up of non-respondents to two postal questionnaires. The response proportion among controls was 47% and, apart from having a higher level of education, the sociodemographic characteristics of the respondents were similar to those of the New Zealand female, usually resident population aged 35–69 years. Of 225 women aged 45–64 years who responded to the question on use of PMH, 11.6% (26/225) had ever-used PMH, and of them 46.2% (12/26) had had a hysterectomy. This is lower than the prevalence of ever-use in the study by Bilgrami et al,⁵ of

33% in June 2002 and 34% in December 2002. In our study we asked only about ever-use, so we were unable to compare results for current use of PMH with the earlier studies. The response proportion in our study was lower than in earlier studies, probably partly due to population mobility and declining use of landlines in New Zealand.⁶ It is possible that selection bias associated with the lower response proportion has caused our estimate of the prevalence of ever-use of PMH to be over- or under-estimated.

The prevalence of ever-use of PMH in 2013–2015 in New Zealand women aged 45–64 years was 11.6% (95% CI 7.7–16.5), compared with previous estimates of 19% in 1991, 32% in 1999 and 34% in 2002.^{4,5} In view of the risks associated with PMH, PMH should only be used briefly by symptomatic women and this use should be closely monitored. Population-based estimates of the prevalence of PMH use are useful for calculating population attributable fractions for diseases related to use of PMH.⁷

Competing interests:

Nil.

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Urinary alkalisers for cystitis—fact or fiction?

Lance Gravatt

In 2015, The Journal reported that over a 24-hour period at Auckland City Hospital there were 81 admissions with a diagnosis of urinary tract infection (UTI), which required a mean hospital stay of four days.¹ UTIs are a common diagnosis with significant morbidity and costs, as well as the risk of more serious complication such as pyelonephritis and sepsis.

Urinary alkalisers are frequently prescribed for symptomatic relief in patients with acute cystitis. The latest invitation for sole supply from PHARMAC states that over two million sachets of effervescent sodium citro-tartrate are funded per year in New Zealand.

However, a 2016 Cochrane Review found no evidence to support or refute the use of urinary alkalisers among 172 trials and concluded that *“Until relevant evidence is generated from randomised trials, the safety and efficacy of urinary alkalisers for the symptomatic treatment of uncomplicated UTI remains unknown”*.²

We sought to examine the evidence for urinary alkalisers that did not fit the Cochrane Review’s strict criteria for acceptance. While this evidence lacks robustness and is prone to intrinsic biases, it is the basis upon which New Zealand prescribing of urinary alkalisers should be assessed.

In 1984, a manufacturer’s study examined the efficacy of 4g sodium citrate three times daily for 48 hours in 205 women 18–65 years with clinical cystitis.³ Only 21% of

the patients had bacteriuria and there was no randomised control group. The authors concluded that “Patients with persisting bacteriuria tended not to have clinical benefit. However, half those with initial bacteriuria achieved symptomatic relief”.

A 2014 study of 50 women with interstitial cystitis were administered citrates orally, consisting of potassium citrate 463mg and sodium citrate 390mg, three times a day for 2–4 weeks in an open-label study.⁴ An increase in urine pH by 0.5–0.6 from the baseline was observed all day in the treatment phase. A decrease in the scores for most of the Kings Health Questionnaire (KHQ) domains was observed but these results were not significant, except for sleep/energy ($P<0.01$). When interpreting these results from non-controlled trials, it is important to note that a meta-analysis of placebo-controlled trials versus antibiotics in uncomplicated acute cystitis reported placebo clinical cure rates of 20–40%.⁵

UK NICE Guidelines note that:

“Although urine alkalinisation has been traditionally used to relieve the symptoms of urinary tract infection, there is a lack of good evidence to support its use”.

There may be a well-entrenched tradition of prescribing urinary alkalisers for acute cystitis, but it is important to bear in mind that there is a paucity of data to support its efficacy and remember the old adage that the most expensive medicine is the one that doesn’t work.

Competing interests:

Nil.

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Response to—Combating antimicrobial resistance demands nationwide action and global governance

Lance Gravatt

In general I applaud the initiatives suggested by the authors¹ with one exception.

“Perhaps most crucially, global efforts might eventually include a new supra-national UN-level coordinating body and an international treaty with strong implementation mechanisms that include rules, setting targets and holding nations to account.”

A global bureaucracy rarely delivers the desired outcomes and if it does, the time-frame is usually very protracted. The UN and UNICEF after decades of effort and money are still valiantly attempting to eliminate the most basic of infectious disease such as tetanus, measles and tuberculosis.² We can perhaps also look at the disappointing local results of the WHO Hand Hygiene Initiatives to reduce hospital-acquired infections in New Zealand as recently reported in *The Journal*.³ The failure to gain global agreement on climate change initiatives is a further example.

Moreover, the general constituencies of the UK and US have recently sent a strong anti-globalisation message at least as far as external governing bodies having the authority to hold a sovereign nation to account. We can also look to the reaction of sovereign nations and their peoples to the austerity measures imposed by the IMF and the European Troika and New Zealanders’ reactions to TPPA. I suggest that a grassroots approach is more likely to succeed.

If we look at our own treatment habits there is room for improvement in simple things with the power to have profound impacts. For example, New Zealand surgeons appear to have a penchant for pre-surgical skin decontamination using povidone-iodine. However, the latest of three consecutive meta-analyses report that chlorhexidine reduces both surgical site infection and skin contamination rates by about 30% more compared with povidone-iodine.⁴

We can also look at the widespread use in New Zealand of topical chloramphenicol for post minor surgical procedures. In the 2014–15 sole supply tender PHARMAC funded nearly 600,000 units of 1% chloramphenicol eye ointment. The 2016 International Wound Infection Institute Consensus Guidelines warn “Application of a single dose of topical chloramphenicol to high-risk sutured wounds after minor surgery produces a moderate absolute reduction in infection rate that is statistically, but not clinically, significant”.⁵

I respectfully suggest that New Zealand urgently establishes a National Antimicrobial Stewardship Commission that crosses the boundaries of human and veterinary use of vaccines, antibiotics and antiseptics. Such a Commission should be given the authority to draft regulations.

Competing interests:

Nil.

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Global governance is a key part of the solution to antimicrobial resistance (response to Gravatt)

Joshua Freeman, Nick Wilson, Scott Metcalfe, Peter Murray, Michael Baker

Dear Editor—we thank Dr Gravatt (<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2016/vol-129-no-1447-16-december-2016/7116>), responding to our 28 October editorial,¹ and fully agree there is an urgent need for more local, New Zealand-specific action on antimicrobial resistance (AMR). Our response is otherwise two-fold.

Firstly, global efforts and local/national efforts to address AMR are not mutually exclusive, and can be pursued in parallel. While global governance can seem unwieldy and take many years, it has delivered many major health and environmental successes:

- In infectious disease control—the complete global eradication of smallpox² and the cattle disease, rinderpest;³
- The near eradication globally of polio⁴ and Guinea worm;⁵
- A greatly enhanced global approach to assessment, reporting and responding to emerging infectious disease and related threats through the International Health Regulations 2005;⁶
- A successful global tobacco control treaty (the Framework Convention on Tobacco Control);⁷
- A highly successful treaty for control of chlorofluorocarbons threatening the ozone layer (the Montreal Protocol);⁸
- Relatively successful treaties to control nuclear weapons proliferation (Treaty on the Non-Proliferation of Nuclear Weapons), to ban nuclear weapons testing (Comprehensive Nuclear-Test-Ban Treaty), to ban both chemical and biological weapons and to ban cluster bombs/landmines;

- Limited but significant international progress on climate change (eg, the Paris Agreement of 2015).

The anti-globalisation sentiment referred to by Dr Gravatt is probably more nuanced than suggested. Opposition to the Trans-pacific Partnership Agreement (TPPA), for example, was based on opposition to a particular form of globalisation that required ceding of sovereignty to trans-national corporate interests, rather than a repudiation of all forms of global governance as such.^{9,10} In parallel with rising nationalism in some states, there is also a strong public sentiment that international agreements on issues like climate change are essential.¹¹ In an intensively integrated global economy, the need for international cooperation and coordination to address global health issues is greater than ever.

Secondly, antimicrobial stewardship is just one aspect of the AMR problem. The other, arguably more important aspect in our globalised world is the transmission of resistant organisms across international borders and into communities and healthcare settings as a result of travel, immigration and displacement.¹² This means that as well as national stewardship programmes, we need a national response plan to address specific AMR threats. This is analogous to response plans for emerging transmissible diseases such as Ebola and pandemic influenza (ie, plans that involve active surveillance coupled with targeted public health interventions).

We thank Dr Gravatt and the *Journal* for enabling this discussion, and welcome further comments on the important issue of controlling AMR.¹

Competing interests:

Scott Metcalfe and Peter Murray continue to be writing in their private capacities, but are also PHARMAC employees; views expressed, or not expressed, do not necessarily represent those of PHARMAC.

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The safety and efficacy of benzbromarone in gout

Benzbromarone is a potent uricosuric but is not widely available due to concerns about hepatotoxicity. In Aotearoa New Zealand, benzbromarone has been available since April 2013, subject to funding restrictions, for patients with inadequate urate-lowering response or intolerance to allopurinol and probenecid.

This multi-centre study was undertaken to review the safety and efficacy of benzbromarone in New Zealand. All patients who received funding for benzbromarone from 1 April 2013 to 30 September 2014 were identified. Prescribers were sent a questionnaire for each individual. Information on demographics, efficacy of previous urate-lowering drugs and reasons for discontinuation were collected. Information concerning dosage, effect on serum urate levels, adverse effects and liver function tests was recorded.

Data was available on 123 patients. The median dose of benzbromarone used was 100mgms/day. After six months treatment their urate levels were satisfactorily lowered. Adverse events included rash (4), diarrhoea (9), nausea (6) and urate stones in three. Liver function test abnormalities were uncommon and tended to be mild. Fourteen patient deaths were noted but none were considered to be related to the treatment.

The researchers concluded that benzbromarone provides useful urate-lowering efficacy and does not appear unsafe in patients with gout. Urate-lowering therapy prescribing requires further optimisation.

Internal Medicine Journal 2016; 46: 1075–1080

Early, goal-directed mobilisation in the surgical intensive care unit: a randomised controlled trial

Muscle weakness is as common as arterial hypotension in the surgical intensive care unit (SICU), and is predictive of adverse outcomes in critically ill patients. Hence this trial, which tested whether early mobilisation leads to improved mobility, decreased SICU length of stay and increased functional independence of patients at hospital discharge.

Two hundred eligible patients who had been mechanically ventilated for <48 hours and were expected to require ventilation for ≥24 hours were randomly assigned to receive standard treatment or early mobilisation.

No serious adverse events were seen in the early mobilisation cohort. It was shown that early, goal-directed mobilisation improved patient mobilisation throughout SICU admission, shortened patient length of stay in the SICU and improved patients' functional mobility at hospital discharge.

Lancet 2016; 388: 1377–88

Intensive blood-pressure lowering in patients with acute cerebral haemorrhage

An acute hypertensive response in patients with intracerebral haemorrhage is common and may be associated with haematoma expansion and increased mortality.

This study was designed to elucidate whether intensive blood pressure (BP) lowering produced better outcomes than more modest BP lowering in these patients. One thousand appropriate patients were allocated to either intensive BP lowering to 110–139mm Hg or the more modest standard treatment to 140–179mm Hg. The primary outcome of death or disability was observed in 38.7% of the intensive group and in 37.7% of the standard treatment group. Adverse effects were similar in both groups except for renal adverse effects, which were significantly worse in the intensive treatment group.

The treatment of participants with intracerebral haemorrhage to achieve a target systolic blood pressure of 110–139mm Hg did not result in a lower rate of death or disability than standard reduction to a target of 140–179mm Hg.

N Engl J Med 2016; 375: 1033–43

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Half a Century's Progress

December, 1916

October, 1916, points an epoch in the history of Parke, Davis and Co. The house was founded in 1866—just fifty years ago this month—largely upon the optimism of three or four determined men, backed by a capital that would seem insignificant today. There was nothing in its unpretentious origin to foretell the success of after-years. And by success we mean not merely material prosperity, but also that broader and more enduring success that is based upon goodwill and confidence.

Manufacturing pharmacy was then a crude, imperfect art. Bacteriology, pharmacology, and biological pharmacy were as yet unborn. There were no curative sera or vaccines in those days. Prophylaxis was in its infancy. Standardisation was unknown.

Fifty years have wrought marvellous changes in means and methods for the treatment of human ills. The materia medica has been amplified beyond the dreams of the earlier investigators. Knowledge of pathology has immensely broadened. The empiricism of the past has given way to

rational therapeutics, and medicine is taking its rightful place among the sciences.

In all these forward movements Parke, Davis and Co. have had some part—notably as discoverers of new vegetable drugs, as inventors of new chemical compounds, as pathfinders and producers in the field of biological manufacture, as investigators in original research, as pioneers in both chemical and physiological standardisation.

The past half-century, as we have intimated, has been remarkable in its contributions to the newer materia medica. What will the next fifty years bring forward? Time alone can write the answer. Ours is a progressive age. The science of medicine has not reached its highest development. The physician's armamentarium will be further enlarged and fortified. New remedial agents will come into being. Many existing products will be improved. And with the fulfilment of these conditions Parke, Davis and Co. (if we may judge the future by the past) are certain to be identified.

URL:

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2016/vol-129-no-1447-16-december-2016/7113>
