ORIGINAL SCIENTIFIC PAPER

QUANTITATIVE RESEARCH

# Cardiovascular disease risk management for Māori in New Zealand general practice

**Yulong Gu** PhD;[1] **Jim Warren** PhD;[2] **John Kennelly** MBChB, FRNZCGP, LLM(Hons);[3] **Pat Neuwelt** PhD, FRNZCGP, FNZCPHM;[4] **Matire Harwood** MBChB, PhD[4]

[1] National Institute for Health Innovation, School of Population Health, The University of Auckland, Auckland, New Zealand

[2] Department of Computer Science, The University of Auckland, Auckland

[3] Department of General Practice and Primary Health Care, The University of Auckland, Auckland

[4] Te Kupenga Hauora Māori (Department of Māori Health), The University of Auckland, Auckland

## ABSTRACT

**INTRODUCTION:** Māori are overrepresented in cardiovascular disease (CVD) mortality and morbidity statistics in New Zealand (NZ).

**AIM:** To examine cardiovascular risk (CVR) assessment and management for Māori, utilising Caring Does Matter (CDM) initiative data.

**METHODS:** Using 16 general practices' electronic medical records—which include ethnicity data—the rate of CVR screening, CVD medication treatment and adherence levels, and physiological measures for Māori patients at high CVR (≥15% five-year risk of a cardiovascular event) were compared to findings for Pacific and non-Māori/non-Pacific patients.

**RESULTS:** Records for 72 351 adults (10 358 Māori; 14%) showed that Māori patients have a poorer CVR assessment rate (46% at guideline-indicated age) than Pacific and non-Māori/non-Pacific groups; when assessed, a greater proportion of Māori patients (38%) were at high CVR. The proportion of high-CVR Māori patients being treated with oral antidiabetic medication (42%) was lower than for Pacific patients but higher than for non-Māori/non-Pacific patients. Lower rates of antihypertensive adherence were found for high-CVR Māori patients than for non-Māori/non-Pacific patients (although higher than for Pacific patients). The high-CVR Māori patients who adhered to CVD medications had lower blood pressure, total-to-HDL cholesterol ratio and HbA1c than non-adherers.

**DISCUSSION:** The association between higher medication adherence and better control of risk factors suggests that adherence should be further promoted by clinicians. More active CVR assessment, treatment and support of medication adherence in Māori attending general practices is justified, given their high mortality rate from CVD in comparison to the overall NZ population.

**KEYWORDS:** Antihypertensives; blood pressure; cardiovascular diseases; haemoglobin A, glycosylated; medication adherence

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**CORRESPONDENCE TO:**
**Yulong Gu**
National Institute for Health Innovation, School of Population Health, The University of Auckland, PB 92019 Auckland Mail Centre, Auckland 1142, New Zealand
h.gu@auckland.ac.nz

## Introduction

Māori are overrepresented in cardiovascular disease (CVD) mortality and morbidity statistics.[1] For example, the mortality from coronary heart disease among Māori in New Zealand (NZ) is three to four times higher than in the general population.[2] Cardiovascular risk (CVR) factors are particularly prevalent in Māori, including smoking, higher blood pressure (BP) and increased cholesterol levels;[3] moreover, after adjusting for age and sex differences, Māori adults have been shown to be 1.3 times as likely as non-Māori to be taking medication for hypertension, and diabetes prevalence among Māori is 7%.[4] A Māori-led primary health organisation (PHO) found that Māori were significantly more likely to have high CVR than non-Māori, and that 66% of those with either diabetes or established CVD were not meeting blood pressure or lipid management recommendations.[5] Despite the inequity and disparities being well recognised, a 2007 national survey of district health boards (DHBs) and PHOs highlighted the struggle to put equity

principles into practice, with the populations that conventional practitioners find hard to reach being often underserved.[6]

In light of their increased risk, NZ clinical practice guidelines recommend CVR assessment be undertaken in Māori 10 years earlier than for Pākehā (NZ Europeans):

- age 35+ for Māori, Pacific or Indo-Asian men;
- 45+ for Māori, Pacific, Indo-Asian women and men of non-Māori/non-Pacific/non-Indo-Asian ethnicities; and
- 55+ for women of non-Māori/non-Pacific/non-Indo-Asian ethnicities.[7]

There are data suggesting that more than 70% of eligible (i.e. guideline-indicated) NZ adults have had their CVR assessed;[8] and 64.7% of the eligible Māori population have completed a CVR assessment within the past five years.[9] However, the CVR assessment rate across the eligible NZ population varies from DHB to DHB, ranging from 19.8% to 66.2%, with the national average being 49%.[10]

In terms of CVR management interventions, studies have found good efficacy rates of antihypertensive medications in reducing cardiovascular and renal events.[11–14] However, low medication adherence is a significant obstacle to CVR management, with adherence approaching only 50%, particularly among lower socioeconomic groups.[15,16]

The Caring Does Matter (CDM) initiative (May 2012 to August 2013) was a programme funded by the NZ Ministry of Health Pacific Development Fund and aimed at improving adherence to CVD medication to lower CVR among Pacific people at high risk of CVD.[17] Fourteen general practices in Auckland and two practices in Northland participated in CDM. The CDM programme identified high-CVR patients and their CVD medication adherence status, through examining their electronic medical records (EMR) in general practice. This paper presents analysis of CVR management among Māori, utilising the CDM baseline data (including ethnicity information recorded in the practices' EMR). A profile of CVR management in Pacific people[18] and of the CDM intervention protocol[17] have been published elsewhere.

## WHAT GAP THIS FILLS

**What we already know:** Cardiovascular disease (CVD) is one of the leading causes of death and disability in the world. New Zealand (NZ) Māori have a higher risk for CVD and a higher disease mortality rate than the general NZ population.

**What this study adds:** Māori patients have the lowest CVR assessment rate, compared to Pacific people and non-Māori/non-Pacific patients, but are more likely to have a high CVR. There are substantial levels of poor medication adherence, particularly for cholesterol-lowering medication. The association between CVD medication adherence and CVR factors suggests that general practices should do more to actively support medication adherence in Māori.

## Methods

The study was approved by the Northern X Regional Ethics Committee (Ref. NTX/12/EXP/102) on 11 May 2012 and amended to include Māori CVR management assessment on 18 April 2013. Data were collected on enrolled and funded adults (only one NZ PHO receives capitation funding for a patient in a given quarter) aged 20 years or older from the 16 general practices between May and September 2012. General practices were selected on the basis of high Pacific caseload, willingness to participate in the CDM programme, and use of either MedTech32 or MyPractice EMR systems. The data extraction from the EMR system was undertaken by the researchers or practice staff, using Structured Query Language (SQL) statements that were developed for CDM. This paper examines the CVR management in three ethnic groups: Māori, Pacific, and non-Māori/non-Pacific. In the NZ context, Māori is a distinct ethnicity from 'Pacific' (the latter itself a rapidly growing group of ethnicities[19]). The Pacific group is analysed separately from other non-Māori ethnicities due to the high Pacific caseload in this study, which, if combined with other ethnicities in the analysis, would give a biased representation of the general non-Māori population in NZ. Prioritised ethnicity was used for defining which patients were Māori in the dataset, in keeping with the NZ Ministry of Health protocols for ethnicity data reporting.[20] Those whose EMR identified them as both Māori and Pacific among the three ethnicity codes were considered Māori in this analysis.

Data collected from the EMR could be matched to individuals by the practices for structured care of their own patients, but were de-identified for use in aggregate analysis by the researchers. The data included ethnicity, age, and gender; CVR screening results in the past five years; prescriptions over the past two years; and physiological measures of CVR factors, including BP (using the mean of the three most recent readings in the past five years), lipids and HbA1c (both using the most recent result over the past five years).

The CVR scores in the EMR are calculated using a range of products that integrate with the practice EMR systems and that are routinely employed by NZ general practices, including PREDICT™ [21] and BestPractice.[22] These products are based on variations of the Framingham model,[23] taking into account risk factors such as age and BP, with an increase in CVR of 5% added for Māori, Pacific and Indo-Asian people. For the present study, 'high CVR' is taken as constituting a five-year risk of a CVD event ≥15%, which in accordance with NZ CVD guidelines is the recommended threshold for drug treatment.[7] When a patient had multiple CVR assessments within the five-year period of data analysed, the most recent CVR assessment was used.

Determination of 'poor' or 'low' adherence to CVD medication was based on medication supply, as indicated in the most recent two years of EMR prescription data. Poor adherence was defined as medication possession ratio[24] (MPR; percent of days covered with a prescription) of less than 80% over the past 15 months, or with no prescription in the past six months. Adherence was calculated for antihypertensive, cholesterol and oral antidiabetic medications for patients with at least one prescription of that class over nine months (the 'run-in' period) prior to the five quarters immediately before baseline data collection. Patients without a prescription in the run-in period were excluded from judgment as 'low' or 'high' adherers, and were either considered as 'not treated', or a 'recent start' for a given medication class (the latter category was used if there were some prescriptions of that class in the recent 15 months). Code specific to the CDM programme was written using the SAS software package, Version 9.2 (SAS Institute Inc., Cary, North Carolina), to calculate MPR and to identify CVR management gaps (e.g. high CVR but low MPR, or no CVR recorded despite being of guideline-indicated age/ethnicity combination). The code adapted algorithms previously developed for quality audit of chronic condition management,[25] and for an earlier Pacific medication adherence promotion trial.[26]

Patient data were de-identified and analysed by ethnic group (Māori, Pacific, and non-Māori/non-Pacific) for the rate of CVR screening and CVR scores, treatment patterns (including rates of medication adherence), and physiological measures, including systolic blood pressure (SBP); diastolic blood pressure (DBP); HbA1c; and total cholesterol to HDL cholesterol ratio (TC/HDL) results, for those with high CVR. Statistical analyses used include normality tests, Chi-square tests, Kruskal-Wallis tests and Wilcoxon-Mann-Whitney *U* tests, with a significance level used in these analyses of 0.05. The median value and interquartile range (IQR) are reported for data not normally distributed; and the *p*-value is reported for all tests of significance.

## Results

### CVR assessment and scores in Māori, Pacific and non-Māori/non-Pacific

The EMR records included 38 174 women (5684 Māori) and 34 177 men (4674 Māori). Ethnicity data was recorded in 99.9% of these patients. A lower proportion of Māori, as compared to Pacific or non-Māori/non-Pacific patients, had an assessed CVR in the ≥20 age group and in the guideline-indicated age groups (Chi-square test, both $p<0.0001$, see also Table 1). Of those who had their CVR assessed, a higher proportion of Māori (38%) were found to have high CVR than Pacific people (34%) and non-Māori/non-Pacific people (30%); they were also younger. The median age for Māori with high CVR was 61 years, compared to 63 years for Pacific patients and 68 years for non-Māori/non-Pacific people.

### Treatment of Māori, Pacific and non-Māori/non-Pacific patients with high CVR

The proportion of Māori patients in the high-CVR group being treated with oral antidiabetic

*Table 1. Cardiovascular risk profile for enrolled Māori, Pacific and non-Māori/non-Pacific adults in the 16 general practices*

| Age groups | Ethnicity | No CVR assessment | | High CVR (≥15% 5-year risk of a cardiovascular event) | | Low CVR | |
|---|---|---|---|---|---|---|---|
| **20+** | Māori (n=10 358, or 14%; median age 40 years, IQR 23) | 7858 | 76% | 949 | 9% | 1551 | 15% |
| | Pacific (n=10 667, or 15%; median age 39 years, IQR 23) | 7192 | 67% | 1195 | 11% | 2280 | 21% |
| | Non-Māori/non-Pacific (n=51 326, or 71%; median age 46 years, IQR 26) | 37 434 | 73% | 4109 | 8% | 9783 | 19% |
| | **Total (N=72 351)** | **52 484** | **73%** | **6253** | **9%** | **13 614** | **19%** |
| **Having attained guideline-indicated age for assessment*** | Māori (n=5112) | 2773 | 54% | 928 | 18% | 1411 | 28% |
| | Pacific (n=5350) | 2145 | 40% | 1169 | 22% | 2036 | 38% |
| | Non-Māori/non-Pacific (n=22 909) | 10 499 | 46% | 3937 | 17% | 8473 | 37% |
| | **Total (n=33 371)** | **15 417** | **46%** | **6034** | **18%** | **11 920** | **36%** |

IQR Interquartile range

* According to NZ guidelines: age 35+ for Māori/Pacific/Indo-Asian men; 45+ for Māori/Pacific/Indo-Asian women and men of other ethnicities; 55+ for women of other ethnicities

medication (42%) was lower than for Pacific patients in the high-CVR group (50%), but higher than for non-Māori/non-Pacific patients (33%) with high CVR (Chi-square test, $p<0.0001$). There was no significant difference in the proportions treated with antihypertensive or cholesterol-lowering medication among Māori, Pacific and non-Māori/non-Pacific patients at high CVR (antihypertensives, Chi-square test, $p=0.0741$; cholesterol-lowering medication, Chi-square test, $p=0.2017$; see also Table 2). In terms of CVD medication adherence level, there was significant variation by ethnic group, with Māori patients at high CVR having better antihypertensive medication adherence status than Pacific patients, but lower adherence than non-Māori/non-Pacific

*Table 2. Treatment and medication adherence profile for patients assessed as at high cardiovascular risk*

| Drug class | Ethnicity (n) | Not treated* | | Low adherence | | High adherence | | Recent start† | |
|---|---|---|---|---|---|---|---|---|---|
| **Antihypertensive medication** | Māori (949) | 190 | 20% | 110 | 12% | 558 | 59% | 91 | 10% |
| | Pacific (1195) | 210 | 18% | 178 | 15% | 677 | 57% | 130 | 11% |
| | Non-Māori/non-Pacific (4109) | 845 | 21% | 282 | 7% | 2645 | 64% | 337 | 8% |
| | Total (6253) | 1245 | 20% | 570 | 9% | 3880 | 62% | 558 | 9% |
| **Cholesterol-lowering medication** | Māori (949) | 288 | 30% | 205 | 22% | 384 | 40% | 72 | 8% |
| | Pacific (1195) | 327 | 27% | 220 | 18% | 535 | 45% | 113 | 9% |
| | Non-Māori/non-Pacific (4109) | 1133 | 28% | 719 | 17% | 1989 | 48% | 268 | 7% |
| | Total (6253) | 1748 | 28% | 1144 | 18% | 2908 | 47% | 453 | 7% |
| **Oral antidiabetic medication** | Māori (949) | 555 | 58% | 74 | 8% | 256 | 27% | 64 | 7% |
| | Pacific (1195) | 594 | 50% | 100 | 8% | 408 | 34% | 93 | 8% |
| | Non-Māori/non-Pacific (4109) | 2761 | 67% | 163 | 4% | 995 | 24% | 190 | 5% |
| | Total (6253) | 3910 | 63% | 337 | 5% | 1659 | 27% | 347 | 6% |

* No prescriptions in the relevant medication class in last two years

† If there are some prescriptions in the last 15 months, but none in the first nine months of the last two years, no further judgment about medication adherence has been made

patients; and Māori patients at high CVR had the poorest adherence status for cholesterol-lowering medication, as well as antidiabetic medications among the three groups (Table 3).

### Physiological measures in Māori, Pacific and non-Māori/non-Pacific patients with high CVR

Among the 6253 high-CVR patients, a total of 6044 (97%) had at least three BP readings in the past five years, with 6071 (97%) having TC/HDL results, and 4885 (78%) having HbA1c results recorded over that period. Most of the latest measurements were taken within the last 12 months; among the latest BP readings, 88% were taken in the last 12 months, as were 63% of the latest lipid results, and 70% of the latest HbA1c results. Within the high-CVR group, Māori had the highest TC/HDL and SBP (although the latter finding was not statistically significant), equal highest DBP (with Pacific patients), and second highest HbA1c (after Pacific patients). Table 4 provides a summary of physiological measures by ethnicity.

### Physiological measures and medication adherence in Māori with high CVR

The Māori patients with high CVR who were prescribed antihypertensive medications in the last two years (irrespective of their adherence status) were found to have a higher median SBP than those not prescribed treatment. No significant difference in median DBP was found according to treatment status. A significantly lower median TC/HDL in Māori patients with high CVR who were prescribed cholesterol-lowering medications was observed, and a significantly higher median HbA1c in those prescribed with oral antidiabetic medication (Table 5). Among Māori patients with high CVR who were treated, adherers had better results (lower SBP, DBP, TC/HDL and HbA1c) than non-adherers (Table 6).

## Discussion

In an opportunistic assessment of a large cohort of Māori general practice patients in Auckland and Northland, we have found substantial oppor-

*Table 3. Adherence status of the treated patients at high cardiovascular risk by ethnicity*

| Drug class | Māori at high CVR % adherers | Pacific patients at high CVR % adherers | Non-Māori/non-Pacific patients at high CVR % adherers | Chi-square test p-values |
|---|---|---|---|---|
| **Antihypertensive medication** | 84% | 80% | 90% | p<0.0001 |
| **Cholesterol-lowering medication** | 65% | 71% | 73% | p=0.0002 |
| **Oral antidiabetic medication** | 78% | 80% | 86% | p=0.0003 |

CVR Cardiovascular risk

*Table 4. Physiological profile for patients at high cardiovascular risk by ethnicity*

| Physiological measures | Median (IQR) for Māori at high CVR | Median (IQR) for Pacific patients at high CVR | Median (IQR) for non-Māori/non-Pacific patients at high CVR | Kruskal-Wallis test p-values |
|---|---|---|---|---|
| **Systolic blood pressure** | 134.0 mm Hg (IQR 18.5) | 132.8 mm Hg (IQR 19.0) | 133.3 mm Hg (IQR 16.7) | p=0.1680 |
| **Diastolic blood pressure** | 80.0 mm Hg (IQR 11.7) | 80.0 mm Hg (IQR 12.7) | 76.7 mm Hg (IQR 10.0) | p<0.0001 |
| **TC/HDL** | 4.10 (IQR 1.70) | 4.00 (IQR 1.60) | 3.80 (IQR 1.60) | p<0.0001 |
| **HbA1c** | 48.6 mmol/mol (IQR 18.6) | 51.0 mmol/mol (IQR 19.7) | 45.0 mmol/mol (IQR 12.0) | p<0.0001 |

IQR Interquartile range
CVR Cardiovascular risk
TC/HDL Total cholesterol to HDL cholesterol ratio
HDL High density lipoprotein
HbA1c Glycosylated haemoglobin

*Table 5. Physiological profile for Māori patients at high cardiovascular risk by treatment status*

| Drug class | Physiological measure | Median (IQR) for treated patients | Median (IQR) for patients not treated | Wilcoxon-Mann-Whitney U test Z and p-values |
|---|---|---|---|---|
| **Antihypertensive medication** | Systolic blood pressure | 135.0 mm Hg (19.0) | 130.0 mm Hg (16.3) | Z=-4.2781, p<0.0001 |
| | Diastolic blood pressure | 80.0 mmHg (11.7) | 80.0 mmHg (12.0) | Z=-0.8390, p=0.4015 |
| **Cholesterol-lowering medication** | TC/HDL | 4.0 (1.8) | 4.4 (1.7) | Z=3.4674, p=0.0005 |
| **Oral antidiabetic medication** | HbA1c | 58.0 mmol/mol (20.0) | 43.0 mmol/mol (7.1) | Z=17.9778, p<0.0001 |

IQR Interquartile range
TC/HDL Total cholesterol to HDL cholesterol ratio
HDL High density lipoprotein
HbA1c Glycosylated haemoglobin

*Table 6. Physiological profile for treated Māori patients at high cardiovascular risk by medication adherence status*

| Drug class | Physiological measure | Median (IQR) for high adherence | Median (IQR) for low adherence | Wilcoxon-Mann-Whitney U test Z and p-values |
|---|---|---|---|---|
| **Antihypertensive medication** | Systolic blood pressure | 133.8 mm Hg (18.3) | 139.3 mm Hg (23.0) | Z=3.7628, p=0.0002 |
| | Diastolic blood pressure | 79.3 mm Hg (10.7) | 85.0 mm Hg (16.0) | Z=5.8490, p<0.0001 |
| **Cholesterol-lowering medication** | TC/HDL | 3.7 (1.5) | 4.5 (1.9) | Z=6.2768, p<0.0001 |
| **Oral antidiabetic medication** | HbA1c | 57.4 mmol/mol (18.6) | 66.1 mmol/mol (30.1) | Z=2.9070, p=0.0036 |

TC/HDL Total cholesterol to HDL cholesterol ratio

tunities for improved management of CVR. One area for improvement is in CVR assessment: 54% of Māori, 40% of Pacific and 46% of non-Māori/non-Pacific patients who were indicated for CVR assessment lacked an identifiable CVR assessment within the past five years (46% overall across ethnicities). This overall CVR assessment rate is slightly higher than the national average of 49% reported in the Ministry's 2011/12 Quarter Four figure (contemporary with the study data extraction time),[10] but still has ample room for improvement, particularly for Māori. Support has been provided by the Ministry of Health for CVR assessment activity, which is now used as a quality indicator. The Ministry of Health has set a target for DHBs to achieve 90% CVR assessment for indicated adults by July 2014.[27] Improvement in the assessment rate has been observed in recent audits, reaching 73% across all DHBs by the end of 2013.[28]

A higher proportion of Māori adults in our analysis were found to have high CVR, compared to non-Māori. Amongst those patients who were assessed and found to have a high CVR, unsurprisingly many had physiological measures well above desirable levels, based on their most recent readings. For example, fewer than half of patients assessed with a high CVR had achieved an SBP of 130 mmHg or lower, averaged over the last three readings. Moreover, there were substantial levels of poor medication adherence, particularly for cholesterol-lowering medication. The association between poor CVD medication adherence and poor CVD outcomes has been highlighted in the literature.[29] The significant association between CVD medication adherence and levels of related physiological measurements (BP, cholesterol and HbA1c) found in the present study suggests that practices should further support medication adherence as part of improved CVR management.

The profile of CVR management in Pacific people, including the medication adherence gaps in the high-CVR patients, has been reported previously;[18] the widened analysis in the current article highlights similar challenges for Māori. A number of key reports have already identified ways forward in meeting the challenge. The National Māori Health Action Plan recommends a stronger primary health care system, to

ensure Māori participate in easily accessible local primary health care services that improve their health, keep them well, and coordinate their ongoing care.[30] A regional Māori health action plan highlighted the importance of health education and health literacy.[9] Recent Kaupapa Māori Action Research also suggested that heart disease services must undertake work to improve Māori patients' understanding of the impact of lifestyle factors on CVR.[31] These studies underscore the need for Kaupapa Māori research that places Māori patients, and their need for excellent CVR assessment and management, at the forefront. Such research has the potential to inform the development of appropriate and effective interventions to improve CVR management among Māori in Aotearoa NZ, in order to achieve equitable CVD outcomes.

ity statistics.[1,3,6,35] However, improved management of risk factors by medication treatment is observed in the current study; for instance, 78% of Māori patients and 70% of non-Māori patients (including Pacific and other ethnic groups) with a history of known CVD were reported to have antihypertensive therapy prescribed by their GP in 2006,[3] while 80% of all patients (Māori and non-Māori) with an assessed ≥15% CVR score had at least one antihypertensive prescription in the two-year CDM evaluation period. This suggests an improvement in proactive management of CVR, especially for those identified at risk, and also reinforces the importance of CVR assessment in high-risk populations.

The strength of this study lies in the fact that it involved analysis of a large number of Māori and Pacific general practice patients. Additionally, the data for the physiological measures in the general practice EMRs was a near-complete set, usually taken within the last 12 months. However, a number of limitations should be acknowledged. Firstly, the study involved a convenience sample of practices, and thus may not be generalisable to people enrolled at other general practices in NZ. The second limitation of this study is that there were possibly distortions of the data, due to out-of-date patient enrolment information in the EMRs, including the potential for some patients to be counted more than once if they were enrolled at more than one practice. This suggests a research opportunity to investigate the rate of such occurrences. However, of note, only one primary care provider can successfully claim the enrolment subsidy for a given patient in a given quarter, which provides an incentive for practices to keep enrolment information up to date. Anoth-

**New Zealand studies in recent years have highlighted disparities in cardiovascular disease risk management among ethnic groups, with high-risk groups over-represented in CVD mortality and morbidity statistics. However, improved management of risk factors by medication treatment is observed in the current study**

The use of clinical records as a platform to guide intervention and to close quality-of-care gaps for specific ethnicities, as applied for CDM, is similar to work undertaken in the Aboriginal and Torres Strait Islander communities in Australia.[32,33] The Kanyini audit of randomly selected case records of indigenous Australian adults highlighted gaps in CVD risk factor screening (e.g. for cholesterol and albumin/creatinine ratio levels), as well as in prescribing and treatment gaps (e.g. 40% of people with established CVD were not prescribed combination therapy of BP medicines, statins, and antiplatelet agents).[33] The Bettering the Evaluation and Care of Health (BEACH) survey findings also demonstrated these gaps, particularly highlighting gaps in lipid measurement and treatment.[34] NZ studies in recent years have highlighted disparities in CVR management among ethnic groups, with high-risk groups overrepresented in CVD mortality and morbid-

er study limitation relates to the known problems with the quality of general practice ethnicity data, which may have led to an undercount of Māori patients in participating practices.[36] Other high-risk groups have not been separated in the current analysis, due to low caseload numbers. As recorded in the EMR, only 5% of the non-Māori population included in the study were identified as Indo-Asians. We consider this insufficient to support a separate analysis; however, there is evidence that this group is also at greater risk from CVD than NZ Europeans.[28] Further analysis of the data might also be undertaken to inform age-specific strategies for risk management, as CVD risks rise significantly with age.[37]

Accurate audit of the EMR and collaboration between general practices gives a population health view of the clinical issues facing ethnic groups with serious inequities in health care. Expertise and time for population-based audit is a challenge for general practices in NZ. It is time to move to create Primary Care Research Networks and to secure these networks as places of learning, where doctors and patients in the community are united with science to search for answers that can provide a better basis for daily practice.[38] Poor medication adherence status in Māori and Pacific people represents a large gap in the way we deliver health care in NZ. Effective interventions targeting the medication adherence gaps are possible, but these can only be tested in collaborating groups of general practices and with results measured with a population health approach. Such interventions have the potential to improve the management of CVD risk factors for high-risk groups and to promote guideline-recommended CVR assessment and treatment. From a practical aspect of implementing the guideline recommendations, although screening CVR in people aged between 20 and 34 years is outside guideline recommendations, screening is frequently undertaken in high-risk groups, such as Māori and Pacific people, because of the opportunity for lifestyle education and influence.

In conclusion, general practices' EMRs have enabled assessment of the state of, and identification of gaps in, the management of CVR in Māori, Pacific and other ethnic groups in NZ. The findings have highlighted that Māori are less likely to have a CVR assessment undertaken, and when they are assessed they are more likely to have a high CVR. There are substantial levels of poor medication adherence, particularly for cholesterol-lowering medication. More active CVR assessment, treatment and support of medication adherence in Māori attending general practices is justified, given their high mortality rate from CVD in comparison to the overall NZ population.[2] Not only is such action justifiable, it is essential to address Māori health inequities in Aotearoa NZ.

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**COMPETING INTERESTS**
None declared.