

Community screening for cardiovascular risk factors and levels of treatment in a rural Māori cohort

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Māori are the indigenous people of New Zealand (NZ), comprising approximately 15% of the national population. A major disparity exists between Māori and non-Māori in cardiovascular mortality, which remains the leading cause of premature death and disability in New Zealand.^{1,2} Furthermore, recent health statistics indicate that those living in rural areas are worse off than urban New Zealanders, including for prevalence of ischaemic heart disease.³ Rural Māori have a shorter life expectancy than urban Māori, with 1.2 years difference for women and 1.5 years difference for men.³ The combination of resource accessibility and ethnic disparities may additionally disadvantage rural Māori communities with respect to health outcomes.

Recent data on cardiovascular disease (CVD) and its risk factors in Māori has been obtained from mortality or hospital statistics,^{1,4} from diagnoses in general practice,⁵ and in urban Auckland communities,⁶⁻¹⁰ but we lack information about the state of Māori cardiovascular health in rural communities. In addition, disease rates and risk factors in indigenous population groups may be underestimated if these groups do not have equivalent access to health care or CVD screening. This underestimation will occur in studies based on clinical databases. It will also occur in population studies that rely on self-report of doctor-diagnosed conditions, such as the New Zealand Health Survey.¹¹ A study in 1962¹² assessed coronary heart disease as part of a wider health survey of

Abstract

Objectives: To document levels of cardiovascular disease (CVD), diagnosed and undiagnosed risk factors and clinical management of CVD risk in rural Māori.

Methods: Participants (aged 20-64 years), of Māori descent and self-report, were randomly sampled to be representative of age and gender profiles of the community. Screening clinics included health questionnaires, fasting blood samples, blood pressure and anthropometric measures. Data were obtained from participants' primary care physicians regarding prior diagnoses and current clinical management. New Zealand Cardiovascular Guidelines were used to identify new diagnoses at screening and Bestpractice© electronic-decision support software used to estimate 5-year CVD risk.

Results: Mean age of participants (n=252) was 45.7±0.7, 8% reported a history of cardiac disease, 43% were current smokers, 22% had a healthy BMI, 30% were overweight and 48% obese. Hypertension was previously diagnosed in 25%; an additional 22% were hypertensive at screening. Dyslipidaemia was previously diagnosed in 14% and an additional 43% were dyslipidaemic at screening. Type-2 diabetes was previously diagnosed in 11%. Glycaemic control was achieved in only 21% of those with type-2 diabetes. Blood pressure and cholesterol were above recommended targets in more than half of those with diagnosed CVD risk factors.

Conclusions: High levels of diagnosed and undiagnosed CVD risk factors, especially hypertension, dyslipidaemia and diabetes were identified in this rural Māori community.

Implications: There is a need for opportunistic screening and intensified management of CVD risk factors in this indigenous population group.

Key Words: cardiovascular risk factors, cardiovascular screening, Māori, indigenous health, rural health

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the rural Tuhoe iwi (tribe), disclosing a spectrum of metabolic ailments and undiagnosed coronary disease. Since then, mortality from premature coronary heart disease in NZ peaked in 1965-69 and has since fallen, largely associated with the declining population trends in systolic blood pressure, total blood cholesterol and smoking prevalence.¹³ Therefore, it is timely to reassess the current CVD health status and levels of treatment for CVD risk for Māori living in a rural community.

The Hauora Manawa/ Community Heart Study is a cohort study of heart disease in NZ, based on random selection from electoral rolls, sampled to be representative of the age and gender profiles within each participating community. The study has documented cardiovascular risk in Māori and will monitor the implementation of treatment programs, interventions, and outcomes for study participants over five years of follow up. Clinical diagnoses were established at baseline for all participants at screening clinics to determine levels of both diagnosed and undiagnosed risk factors. Baseline data from Māori living in a rural community in the Wairoa district are presented here.

Methods

Participants

The Wairoa District is in rural Hawkes Bay on the east coast of the North Island of NZ with 61% of the population identifying as of Māori ethnicity. The Community Heart Study was carried out in Wairoa from May 2007 to December 2007. Full details of kaupapa Māori methodology, sample selection, recruitment and interviewing processes are published elsewhere.¹⁴ In brief, from the Wairoa District electoral roll, 541 participants, aged between 20 to 64 years, stratified by age and sex, were randomly selected among those who identified as being of Māori descent. Multiple recruitment approaches included invitation letters, follow-up letters, follow-up phone calls, media releases and door-knocking. A total of 252 Māori participants who self-identified as being of Māori ethnicity and were within the inclusion criteria attended the screening clinics. The overall response rate was 57.6% (95% CI 53.0, 62.2) and the cooperation rate (participation among those with whom contact was established) was 74.7% (95% CI 70.1, 79.3). The study was approved by the Multi-Region Ethics Committee (Reference MEC/06/03026) and all participants provided written, informed consent.

Screening clinics were held at the Wairoa Hospital Outpatients clinic from 6 am to 9 pm. All participants completed an interviewer-administered questionnaire providing demographic, personal and family medical history, current medications, smoking status, alcohol consumption, physical activity levels and socioeconomic data. Physical activity levels were assessed by asking the participant whether they were regularly physically active, defined as at least 30 mins of moderate activity each day for five or more days each week. Confirmation of prior diagnoses and current management of CVD risk factors were obtained from primary care physicians for all participants.

Two blood pressure measurements were taken while seated,

at least 20 minutes apart, using manual sphygmomanometers with appropriate cuff sizes. Height, weight, waist and hip measurements were taken, body composition analysis performed by bioimpedance using the Tanita Body Composition Analyzer, TBF 310 (Tanita Inc, Tokyo, Japan) and body mass index (BMI) calculated. The ranges for BMI were: healthy range = BMI \geq 18.5, $<$ 25.0 kg/m², overweight = BMI 25.0 – 29.9 kg/m² and obese = \geq 30.0 kg/m². Fasting blood samples were collected and assayed for full blood differential cell counts (Wairoa Hospital Laboratory, Hawkes Bay District Health Board); plasma lipid profiles, glucose, insulin, creatinine, homocysteine, urate and HbA1c (Canterbury Health Laboratories, Christchurch Hospital).

Smoking status categories were: Current smoker = current smoker at screening clinic, Ex-smoker = quit smoking for more than 12 months (those who had quit less than 12 months were not included in these classifications), Never smoker = never smoked in their lifetime.

A new diagnosis of hypertension and dyslipidaemia was made in those with levels above the reference ranges with no prior diagnosis and who were not receiving treatment. Hypertension was documented at screening if the average of the two blood pressure readings gave a SBP $>$ 140 mmHg or DBP $>$ 90 mmHg. Dyslipidaemia was diagnosed if the total cholesterol:HDL-cholesterol (TC:HDL) ratio was $>$ 4.0.

Normoglycaemic individuals were identified as those with glucose levels $<$ 6.0 mmol/L. Three methods were used to determine insulin resistance (IR) in individuals with no previous diagnosis of type-2 diabetes mellitus (DM2) and who were not receiving anti-hyperglycaemic medication. Firstly, the Homeostasis Model Assessment (HOMA) IR equation was used:

$$\text{HOMA1-IR} = (\text{FPI} \times \text{FPG})/22.515$$

(where FPI = fasting plasma insulin and FPG = fasting plasma glucose). Insulin resistance by HOMA was defined by any of the following criteria: BMI $>$ 28.9kg/m² or HOMA-IR $>$ 4.65 or a combination of BMI $>$ 27.5kg/m² and HOMA-IR $>$ 3.6.¹⁶ The McAuley formula was also used for determination of insulin resistance:

$$\text{exponent} (3.29 - 0.25\ln[\text{fasting insulin}] - 0.22\ln[\text{body mass index}] - 0.28\ln[\text{fasting triglycerides}].$$

Values \leq 6.3 M / mU / L in normoglycaemic individuals were classified as insulin resistant.¹⁷ Fasting insulin levels $>$ 12.2 mU/L (84.73 pmol/L) was also used as a definition of insulin resistance.¹⁷

Absolute 5-year cardiovascular risk (%) was calculated using the Bestpractice[®] electronic decision support software (Bestpractice[®], 2005–09, Dunedin, NZ). Calculated risk categories were defined as: Low risk, $<$ 10%; moderate risk, 10-15%; high risk, 15-20%; very high risk, $>$ 20%. The national guidelines CVD risk charts commence risk calculation at age 35 years.¹⁸ CVD risk for participants $<$ 35 years was automatically calculated by Bestpractice[®]. Note that the Guidelines recommend a 5% adjustment be added to the CVD risk calculation for people of Māori ethnicity, and hence all participants in this study had at least 5% CVD risk scores.

The 2004 version of the NZ Cardiovascular Guidelines were in current usage at the time of screening and calculations of those who were within the risk factor targets for existing morbidities at

screening were based on the 2004 Guidelines, since these would have been used by doctors at the time of treatment and management. Revised 2009 NZ Cardiovascular Guidelines¹⁸ have since been published and modifications include the deletion of different BMI ranges for Māori, Pacific and European individuals, lower targets for TC:HDL ratio (4.0 vs 4.5 previously) and LDL-cholesterol (2.0 vs 2.5 mmol/L previously) and omission of the metabolic syndrome as a risk factor. These revised thresholds were applied to determine any subsequent, new diagnoses in the cohort.

Statistical analysis

All statistical analyses were performed using SPSS v13.0 (Chicago, Illinois, US). Data are expressed as mean \pm SEM or as percentages. Comparisons were carried out using analysis of variance or chi-square tests, as appropriate. Age and BMI were used as continuous covariates in analysis of variance. Significance levels were set as $p \leq 0.05$.

Results

Cardiac disease, diabetes and risk factors

The baseline characteristics of the 252 participants who attended the screening clinics in Wairoa are shown in Table 1. All except

five participants were registered with a General Practitioner (GP) at the time of screening, with 69% of participants having visited their doctor within the last six months and 85% having visited their doctor within the last 12 months.

Estimated five-year CVD risk scores in the cohort (Table 2) were 63% with low, 21% with moderate, 6% with high and 10% with very high CVD risk. The moderate to very high-risk CVD scores all occurred in participants aged 40 years and above. The key risk factors contributing to the overall CVD risk scores, age, BMI, blood pressure, cholesterol and family history were analysed further as described below.

Age is an established risk factor for CVD, and is included in the five-year CVD risk calculation. However, while the highest overall CVD risk was seen in older individuals, high levels of certain individual risk factors were evident in younger age groups. For example, males aged 30-34 years had high mean TC: HDL cholesterol ratios (5.4 ± 0.5) and blood pressures (systolic, 129 ± 5.4 mmHg, diastolic 87.7 ± 2.7 mmHg).

The mean BMI for the cohort was 30.7 kg/m^2 (Table 1) with 78% having a BMI in either the overweight or obese range. Similarly, body composition scales indicated that 20.4% were in the healthy range for percent body fat, 25.7% were in the overweight body fat range and 51.4% were in the obese range.

Table 1 – Baseline characteristics of the Wairoa cohort.

Variables	Males n=102	Females n=150	Total n=252
Mean Age (years)	46.7 \pm 1.2	45.0 \pm 0.9	45.7 \pm 0.7
BMI (kg/m ²) (n=251)	30.6 \pm 0.7	30.8 \pm 0.6	30.7 \pm 0.5
Healthy Range (<25.0kg/m ²), n (%)	22 (21.4)	33 (22.1)	55 (21.9)
Overweight (25.0 – 29.0 kg/m ²), n (%)	34 (33.0)	42 (28.2)	76 (30.3)
Obese (>30 kg/m ²), n (%)	47 (45.6)	73 (49.0)	120 (47.8)
Waist circumference, cm (n=250)*	101.9 \pm 1.71	94.6 \pm 1.41	97.5 \pm 1.11
Systolic blood pressure (mmHg)	136.2 \pm 1.6	127.2 \pm 1.6	129.6 \pm 1.3
Diastolic blood pressure (mmHg)	87.6 \pm 1.0	83.7 \pm 1.0	84.4 \pm 0.8
Current smoker, n (%)	35(34.3)	72(48.1)	107 (42.5)
Ex-smoker, n (%)	45(44.1)	52(34.7)	97(38.5)
Never smoker, n (%)	22(21.6)	26(17.3)	48 (19.0)
Regularly physically active, n (%)	78 (76.5)	94 (62.7)	172 (68.3)
Plasma glucose, mmol/L (n=217)*	6.1 \pm 0.2	5.5 \pm 0.1	5.8 \pm 0.1
Plasma insulin, pmol/L (n=215)*	64.6 \pm 7.1	66.1 \pm 4.5	65.6 \pm 3.9
HBA1c, % (n=249)*	6.5 \pm 0.1	6.2 \pm 0.1	6.3 \pm 0.07
Total cholesterol, mmol/L (n=217)*	5.2 \pm 0.1	5.0 \pm 0.1	5.1 \pm 0.1
LDL-cholesterol, mmol/L (n=214)*	3.3 \pm 0.1	3.1 \pm 0.1	3.2 \pm 0.1
HDL-cholesterol, mmol/L (n=217)*	1.2 \pm 0.03	1.3 \pm 0.03	1.2 \pm 0.02
Fasting triglycerides, mmol/L (n=217)*	1.7 \pm 0.1	1.4 \pm 0.1	1.5 \pm 0.1
Total cholesterol: HDL ratio (n=214)*	4.4 \pm 0.1	4.1 \pm 0.1	4.2 \pm 0.07
Prior Cardiac History, n (%)	11 (10.8)	8 (5.3)	19 (7.5)
Prior Diagnosis DM2, n (%)	12 (11.8)	15 (10.0)	27 (10.7)
Prior Diagnosis Hypertension, n (%)	27 (26.5)	36 (24.0)	63 (25.0)
Prior Diagnosis High Cholesterol, n (%)	19 (18.6)	17 (11.3)	36 (14.3)

Data expressed as mean \pm SEM for all continuous variables.

* Indicates data missing or excluded due to participant not fasting.

Mean systolic blood pressure (SBP) and diastolic blood pressure (DBP) for the cohort are shown in Table 1. Twenty-five per cent had been previously told by a doctor they were hypertensive. A new diagnosis of hypertension was made in an additional 22% of the cohort (n=56). Hence, a total of 47% (n=119) of the cohort had either a prior or a new diagnosis of hypertension.

Mean levels of total cholesterol (TC), LDL-cholesterol and TC: HDL ratios (Table 1) were all above the recommended ranges set by national cardiovascular guidelines.¹⁸ Approximately 14% of the cohort had been previously diagnosed with dyslipidaemia. At screening, 87% of the cohort had elevated fasting TC levels (>4.0 mmol/L). However, mean HDL-cholesterol levels were within the recommended range. To determine a new diagnosis of dyslipidaemia in those with no prior diagnosis and who were not receiving lipid-lowering medications, TC: HDL ratio >4.0 mmol/L was used, with 43% of the cohort having a TC: HDL ratio above this level. Therefore, 57% of the cohort had either a prior or a new diagnosis of dyslipidaemia.

In this cohort, 8% had a history of cardiac disease at screening (mean age 56.3 ± 1.7), defined as a history of myocardial infarction, angina, heart failure, coronary artery bypass graft (CABG) surgery, percutaneous transluminal coronary angiography (PTCA), pacemaker, other cardiac intervention or ischaemic stroke.

The proportion of previously diagnosed type-2 diabetes mellitus (DM2) was 11% (Table 1), with the majority aged between 50-59 years. Among those not diagnosed with diabetes and not receiving antihyperglycaemic treatment, a new diagnosis of Impaired Fasting Glucose (IFG) was made in 8%, with 2% of the cohort having fasting glucose levels >6.9 mmol/L. Also among non-diabetic participants, 22% had HBA1c levels >6.4% and 25% had fasting insulin levels >80 pmol/L.

Of this cohort, 36% fitted the clinical criteria defining Metabolic Syndrome. Insulin resistance estimated with the HOMA-IR decision rules classified 48% as insulin resistant. Insulin resistance calculated using the McAuley formula,¹⁷ that incorporates fasting triglyceride, fasting insulin and BMI, classified 20% of the cohort as insulin resistant. Fasting insulin levels greater than 84.73 pmol/L (12.2 mU/L) indicated insulin resistance in 15%.

At screening 43% of the cohort were current smokers and 57% were non-smokers (never and ex-smokers) (Table 1). More males were ex-smokers (44%) compared to females (35%), however there was a trend ($p=0.07$) for higher calculated number of pack years

in males than females (6602.4±660.0 vs 5207.0±381.9 pack years respectively).

Family history is a known risk factor for heart disease. Of those with a personal cardiac history, 68% reported having first-degree family history of CVD. In DM2 patients, 48% reported a first-degree family history of DM2. In the cohort overall, including those both with and without a personal cardiac history or DM2, the rates of first-degree family history of CVD were 52% and first-degree family history of DM2 were 45%.

Levels of treatment

The optimal targets for those with known CVD, CVD risk >15% or DM2, according to the NZ CVD Guidelines in use at the time of screening were used to assess those achieving treatment targets. Among those with a prior cardiac history, 66% had previously diagnosed hypertension and dyslipidaemia and 20% had a prior diagnosis of DM2. Combined therapies of lipid-lowering and antihypertensives were received by 50% of this group. However, systolic and diastolic blood pressure targets were achieved in only 32% and 10% respectively. While total cholesterol and LDL-cholesterol targets were achieved in only around 20%, TC: HDL ratios were within the target range in 68% of this group due to the prevalence of HDL-cholesterol above the recommended level (>1.0 mmol/L) in this community.

A systolic blood pressure target of 130/80mmHg or less is recommended for those with diagnosed hypertension or in the high-risk categories of known CVD, diabetes or absolute CVD risk >15%.¹⁸ Of participants in this group (n=88) approximately half (n=43) were treated with antihypertensive medication, with 33% achieving both systolic and diastolic target blood pressures. Of those not receiving treatment (n=45), 29% were at target for systolic and 20% for diastolic blood pressure.

Previously-diagnosed high cholesterol was present in 14% at screening (n=36), with 58% of those on cholesterol-lowering medication (n=21). Of those on medication, targets were achieved by 10% for TC, 38% for LDL-cholesterol, 43% for triglycerides, and 67% achieved target TC: HDL ratios. Of those not currently on medication (n=15), 7% were within target for TC, 7% for LDL-cholesterol, 53% for triglycerides, while 27% achieved target TC: HDL ratios. Those on cholesterol-lowering drugs had significantly lower total cholesterol ($p=0.014$) and LDL-cholesterol ($p<0.001$) compared to participants not on medication, with significantly lower triglycerides levels observed in females only ($p=0.002$).

Among those with previously diagnosed DM2 (n=27), approximately two thirds were currently receiving treatment (n=19) and more than a third of those with DM2 were receiving both lipid-lowering and antihypertensive treatments at screening. However, glycaemic control (HBA1c level < 7.0%) was achieved in only 21% of those on treatment. Of treated diabetic patients, 16% were within target for systolic and diastolic blood pressure, while targets were achieved for TC, LDL-cholesterol and TC: HDL ratios in 11%, 26% and 55% respectively.

Table 2 - Mean five-year calculated CVD risk scores in the rural Wairoa Māori cohort.

Age	Males	Females	All
20 – 29 years (n)	5.4 % (10)	5.1 % (20)	5.2 % (30)
30 – 39 years (n)	6.6 % (23)	6.1 % (33)	6.3 % (56)
40 – 49 years (n)	9.9 % (22)	8.0 % (41)	8.6 % (63)
50 – 59 years (n)	15.0 % (32)	10.8 % (43)	12.6 % (75)
60 – 65 years (n)	14.6 % (15)	16.7 % (13)	15.6 % (28)

Discussion

Within this rural Māori community we have identified high levels of undiagnosed CVD risk factors, especially hypertension, dyslipidaemia and insulin resistance, despite the majority of participants having recently attended their doctor. Furthermore, among those being treated for CVD risk factors, recommended targets were not achieved for a large proportion. This study highlights areas where there is scope for greater risk factor management to care for the health of the rural Māori population, by greater vigilance of a patient's risk factors and application of the recommendations for screening and risk factor management provided in the NZ CVD Risk Guidelines.

This study aimed to determine current levels of both diagnosed and undiagnosed risk factors within this indigenous community by conducting CVD screening clinics in a sector of the community that is often hard to reach. The sampling methodology has been previously reported¹⁴ and the cohort sampled to be representative of age and gender profiles of the Wairoa electorate. The response rate at 57.6% and cooperation rate at 74.7% is similar to prior study of insulin resistance in an adjacent rural Māori community in which screening clinics were also conducted.¹⁹

The prevalent CVD risk factors identified in this rural Māori cohort were high BMI, hypertension, high cholesterol, smoking and a family history of coronary heart disease. Previous prevalence studies of CVD and related morbidities in Māori communities have reported increased body mass, cholesterol levels, tobacco use and sedentary lifestyles as disparate between Māori and non-Māori.^{4,5,12,20} In the current study, approximately 70% of the cohort reported being physically active at the level recommended by national guidelines, compared to the national average of 51.6% for men and 51.9% for women in the 45-54 year age-group (around the mean age of the Wairoa cohort).¹¹ A review of national physical activity surveys reported that Māori are at least as active as European New Zealanders.²¹ Despite this, 80% percent of participants were classified as having a BMI above the healthy range (overweight or obese) compared to 63% of the general NZ population.¹¹

Current smoking rates (43%) were similar to recent national trends of smoking in Māori populations (45.4%).²² Although national rates of smoking have decreased since the first official recording of 36% in the mid-1970s, rates among Māori remain higher than in the general NZ population (currently 22%). There is a clear need to continue to target this risk factor. Since the findings of this study were presented to the local District Health Board, two Smoking Cessation facilitators have been employed in the Wairoa district.

The percentage of those with a prior cardiac history was 8%, markedly higher than the self-reported prevalence of ischaemic heart disease of 4.7% in Māori in a national survey.¹¹ Although there were small numbers in this subgroup, diagnoses of hypertension and high cholesterol were major factors associated with the presence of established cardiac disease. The high prevalence of reported family history of premature coronary heart disease suggests familial genetic predisposition may also be a contributing factor for CVD risk in this cohort.

Uncontrolled hypertension is a major risk factor for diseases of the heart and blood vessels.²³ A quarter of the cohort had diagnosed hypertension and an additional 22% of the cohort had high blood pressure at screening that had not been picked up previously. Blood pressure was elevated above targets in approximately two-thirds of the cohort who had a prior diagnosis of hypertension, prior cardiac history, DM2 or 5-year CVD risk greater than 15%, including in those who were receiving antihypertensive medication. A prior workforce study identified that BMI-adjusted means for blood pressure halved the BP difference between Māori and Europeans; however the difference was still significant, suggesting other factors acted as a driving force in increased blood pressure in this indigenous group.²⁴

Elevated cholesterol levels increase risk of ischaemic heart disease and ischaemic stroke.²⁵ The mean total cholesterol level for the Wairoa cohort was 5.1 mmol/L, slightly lower than the levels reported in Māori in the Auckland Diabetes Heart and Health Survey 2002-2003, which reported the mean for Māori overall being 5.45 mmol/L and for the 45-54 year age group (around the average age in the current study) being 5.52 mmol/L.⁷ Prior diagnoses of high cholesterol had been made in 14% with over half receiving lipid-lowering, statins or fibrate treatment at the time of screening. Another 43% were classified as dyslipidaemic at screening, based on the measurement of fasting TC: HDL ratios. Total cholesterol and LDL-cholesterol levels were above the recommended ranges, but protective HDL-cholesterol levels were also generally above the recommended level in this cohort.

The NZ Cardiovascular Guidelines recommend prescription of lipid-lowering, blood-pressure lowering and anticoagulants in those with known CVD history. In the current study, 50% of those with existing cardiac disease were treated with both lipid-lowering agents and antihypertensives. Participants with DM2 and CVD history all received combined therapies. Hence, levels of treatment in this rural cohort were better than previously published levels of 28% of those with CVD history alone,²⁶ and 66% in those with diabetes and CVD history.²⁷ Despite high rates of treatment, further treatment may be necessary to achieve target thresholds for blood pressure and cholesterol.

The proportion of previously diagnosed DM2 in the Wairoa cohort was 11%, higher than the self-reported national rate in Māori of 6%.¹¹ A study of rural Māori reported the rate of known diabetes of 7% and a further 3.6% were new diagnoses.¹⁹ However, the current levels were similar to an urban Māori population in The Diabetes Heart and Health Survey,¹⁰ with prevalence rates of known diabetes (12%) and new diagnoses in 4%. In our study, further investigation and confirmation of new DM2 was performed by the participant's doctor and are not reported here.

The spectrum of five-year CVD risk scores calculated for this cohort are similar to those reported for an urban Māori cohort.²⁸ In that study 65.2% were in the 0-10% low CVD risk category, 10.4% in the >10-15% moderate CVD risk, 9.9% in the ≥15% high CVD risk and 14.4% had very high CVD risk scores ≥20%. The current study found relatively more participants (21%) in the moderate risk

group and fewer (10%) in the very high risk group. Although derived from the Framingham scores, the NZ cardiovascular risk scores are not comparable to overseas populations as the algorithm is adjusted by adding 5% for individuals from certain high-risk categories, including Māori.¹⁸ The performance of the NZ risk assessment equation in predicting five-year CVD events, particularly for Māori, is currently undergoing scrutiny and reconsideration.²⁹⁻³¹ A large NZ analysis found the adjusted CVD risk scores overestimated the observed CVD risk across both high- and low-risk ethnic groups.³¹ In contrast, a separate, large diabetes cohort study found CVD events were substantially underestimated by the adjusted risk scores in DM2 patients, particularly Māori, and a new CVD risk score calculator was proposed.²⁹ Similarly, in The Strong Heart Study, a study of the indigenous American Indian population with high rates of diabetes and albuminuria, a specific 'risk calculator' has been developed.³² It is apparent that the derivation of CVD risk prediction equations that are equally valid across diverse ethnic groups may be challenging.

Since 2003, the guidelines for assessing cardiovascular risk for people living in NZ have recommended Māori men be screened at five-year intervals from the age of 35 years and Māori women from the age of 45 years, a decade earlier than NZ Europeans.¹⁸ Despite these national guidelines, the levels of undiagnosed risk factors identified in the current study indicate that systematic risk assessment followed by comprehensive risk management is still not optimal. A previous comparison of CVD risk in Māori and non-Māori enrolled in an Auckland primary healthcare organisation,⁵ found only 58% of those with known CVD had risk management data available.

This study highlights the persistent high rates of cardiovascular risk factors in a rural Māori community, particularly obesity, hypertension, dyslipidaemia, DM2 and smoking. Treatment of cardiovascular morbidities for Māori has greatly improved at primary health care level.⁵ The district is well served with general practices and the engagement with the physicians would appear to be good, based on the number who had recently attended their local doctor. However, this study would suggest that additional opportunities to conduct CVD screening could be seized on occasions when patients attended their doctor for illness or minor injury. Management of risk factors could be intensified further to achieve target levels within this rural Māori population. In conclusion, the large number of participants with previously undiagnosed hypertension and dyslipidaemia indicate that there needs to be regular and opportunistic screening of the population for blood pressure, cholesterol and diabetes markers, with intensive treatment of those risk factors in order to reduce the CVD burden on this indigenous group.

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