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A comparative analysis of the cardiovascular disease risk factor profiles of Pacific peoples and Europeans living in New Zealand assessed in routine primary care: PREDICT CVD-11

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Abstract

Aim To investigate the differences in the baseline cardiovascular disease (CVD) risk profiles of Pacific peoples and Europeans assessed in routine primary care practice by PREDICT, a web-based clinical decision support programme for assessing and managing CVD risk.

Methods PREDICT has been implemented in primary care practices from nine consenting PHOs in Auckland and Northland. Between 2002 and January 2009, over 70,000 CVD risk assessments were conducted. These analyses compare CVD risk factors for Pacific and European patients.

Results Baseline risk assessments were completed for 39,835 Europeans and 10,301 Pacific peoples aged 35-74 years. Over 85% of the Pacific cohort was comprised of the four main Pacific ethnic groups in New Zealand (Samoan, Tongan, Cook Island Maori and Niuean). Fijians (n=1341) were excluded from the analyses because of a likely misclassification error with Indian Fijians. On average, Pacific peoples in the PREDICT cohort were 4 years younger at the time of risk assessment than Europeans, and were overrepresented in areas of high socioeconomic deprivation. At risk assessment, Pacific men were 1.5 times as likely to be current smokers as European men, whereas similar or lower proportions of Pacific women smoked compared with European women. Pacific peoples were approximately three times more likely to have diabetes as Europeans. Pacific peoples had higher diastolic blood pressures and Pacific women had higher total cholesterol/HDL ratios. Both Pacific men and women had a significantly higher predicted risk of CVD in the next 5 years than Europeans, based on the Framingham risk score.

Conclusions The PREDICT programme has already generated the largest cohort of Pacific peoples ever to be studied in New Zealand. This comparative analysis of patients who have been screened highlights significant disparities in CVD risk factors for Pacific peoples particularly for diabetes in both sexes and for smoking in men. Targeting these modifiable risk factors will be important in addressing the widening inequalities in CVD outcomes between Pacific peoples and Europeans.

Despite a steady decline in the overall incidence and case-fatality of cardiovascular disease (CVD) since the 1980s,[1] certain population groups, including Pacific peoples, continue to experience a disproportionately high burden of CVD in New Zealand (NZ).[2] Relative inequalities between Pacific peoples and New Zealand Europeans

appear to be widening, so that CVD is now estimated to account for a third of the all-cause mortality gap between Pacific peoples and Europeans.[1]

It is likely that the disparities in CVD outcomes between Pacific peoples and Europeans are a result of a more adverse CVD risk factor profile among Pacific peoples. However, few studies profiling CVD risk factors in the NZ population have included sufficient numbers of Pacific peoples to draw any firm conclusions.[3,4]

PREDICT is a web-based CVD risk assessment and management programme that was developed to support CVD risk assessment and management in routine primary care practice.[5] It has previously been shown to increase the rate of risk assessment and risk factor documentation four-fold without increasing Māori and non-Māori disparities.[6,7]

Implemented in a number of primary health organisations (PHOs) throughout Auckland and Northland since 2002, PREDICT now has data on over 70,000 participants, including over 10,000 Māori, 12,000 Pacific peoples and 3000 South Asians. This large cohort has enabled analyses of the differences in CVD risk assessment and management between different ethnic groups, including Māori compared with non-Māori,[8] and people of Indian ethnicity compared with Europeans.[9]

Given this is the largest cohort of Pacific people ever generated in New Zealand, the study provides a unique opportunity to investigate the differences in the baseline CVD risk profiles of Pacific peoples and Europeans in a primary health care setting.

Methods

PREDICT was implemented opportunistically in primary care practices from nine consenting PHOs in Auckland and Northland in 2002. Study methods and data definitions have been described previously.[5]

The PREDICT software programme has been integrated with several of the most commonly used patient management systems. This enables systematically coded CVD risk data to be automatically extracted from a patient's electronic medical record and populated onto PREDICT templates. Gaps in the data required to undertake a formal CVD risk assessment are then completed by either the GP or practice nurse on the PREDICT templates, which are then automatically written back to the patient medical record. This data includes a patient's self-reported ethnicity or ethnicities. The patient's electronic medical record and their PREDICT template allow for up to three ethnicities to be entered.

PREDICT clinical data can be linked anonymously via an encrypted National Health Index (NHI) number to national hospitalisation and mortality datasets. The data can also be linked to the New Zealand Health Information Service (NZHIS) NHI dataset that holds details of date of birth, gender, ethnicity and socioeconomic status according to NZ Deprivation (NZDep) Index. The NZHIS-NHI dataset, like the PREDICT template, has provision for up to three ethnicity fields to be entered, so that one person in the PREDICT cohort could potentially have up to six ethnicities. It was decided that for these analyses, an "any Pacific" versus European comparison was likely to yield the most useful results. Therefore data from two distinct groups were extracted from the dataset. The "any Pacific" group was comprised of those participants whose six potential ethnicity fields contained at least one Pacific peoples group, defined according to the Ministry of Health's *Ethnicity Data Protocols for the Health and Disability Sector* as Level 2 codes 30 to 37.[10] The European comparison group was composed of those self-identifying as solely NZ European (Level 2 codes 10, 11 and 12).

Preliminary analysis, undertaken on Pacific subgroups, found that the Fijian subgroup was a clear anomaly, making up 11.4% of the Pacific group but only 4.1% of Pacific peoples in NZ.[11] The CVD risk profile of the Fijian subgroup was far closer to that of the South Asian cohort[9] than to the other Pacific subgroups, leading us to suspect that a misclassification error had occurred (i.e. that the Fijian group was made up of not only indigenous Fijians, but also Fijian Indians). The Fijian subgroup (Level 2 ethnicity code 36) was subsequently excluded from the analyses. The Pacific group therefore comprised Level 2 ethnicity codes 30 to 35, and 37.[10]

Classification of ethnicity gave priority to Pacific over European ethnicity, consistent with the prioritisation method used by Statistics New Zealand.[12] Fewer than 1% of patients in the Pacific cohort were recorded as having more than one Pacific ethnicity. These participants were assigned to the smaller Pacific group, as occurred in the 2001 NZ Census.[12] This method gave first priority to Niuean, followed by Cook Island Māori, Tongan and lastly Samoan ethnicity.

Only those aged 35 to 74 years were included in the analyses, in accordance with both current NZ guidelines, which state that the lower age range for CVD risk assessment is 35 years,[13] and the Framingham equation (used for CVD risk assessment), for which 74 years is the upper age limit.[14]

The data extracts for these analyses included all PREDICT first assessments from August 2002 until January 2009. All data were analysed using Stata 10.0 statistical software. Data were stratified according to sex and age group (35-44, 45-54, 55-64, 65-74 years). Risk ratios (RRs) with 95% confidence intervals (CIs) were calculated for Pacific peoples compared with Europeans using a binomial regression model that adjusted for quintiles of deprivation according to the NZDep01 Index. NZDep01 is a census based small area index of deprivation, which assigns a relative deprivation score to each meshblock in NZ according to nine variables from the 2001 Census that reflect eight dimensions of deprivation.[15]

The NZDep index is scored by decile, where decile 10 represents the 10% of meshblocks which are most deprived and decile 1 the least deprived. For these analyses, the proportions of Pacific peoples and Europeans were measured by quintile of deprivation for those aged 45-74 years in the PREDICT cohort. This was to enable comparison with the 2006 NZ Census estimates, which also included only those aged 45-74 years (J. Atkinson, Ministry of Health, personal communication).

Two-sample t-tests were used to calculate mean differences and 95% CIs for continuous data (blood pressure and lipid measurements) for different age groups. A linear regression model was used to adjust mean differences for age and deprivation when comparing total populations.

Ethical approval—The PREDICT research project was approved by the Northern Region Ethics Committee Y in 2003 (AKY/03/12/314) and the national Multi Region Ethics Committee in 2007 (MEC/07/19/EXP).

Results

Between 2002 and January 2009, baseline PREDICT CVD risk assessments were undertaken on 39,835 Europeans and 10,301 Pacific peoples aged between 35 and 74 years. Fijians (n=1341) were excluded from the Pacific cohort because of a likely misclassification error discussed previously. Table 1 shows the age structure of the PREDICT cohort by gender and ethnicity. Pacific peoples in the PREDICT cohort were younger than Europeans by just over 4 years, and in both ethnic groups females were approximately 3 years older than their male counterparts. A greater proportion of the Pacific (48.3%), compared with the European (42.7%), cohort were women.

Table 1. Numbers and proportions of Pacific peoples and Europeans in the PREDICT cohort by age group and gender

Age (years)	Pacific (n=10301)		European (n=39835)	
	Male (n=5324) n (%)	Female (n=4977) n (%)	Male (n=22816) n (%)	Female (n=17019) n (%)
35-44	1733 (32.5%)	831 (16.7%)	3570 (15.7%)	1492 (8.8%)
45-54	1758 (33.0%)	1915 (38.5%)	7665 (33.6%)	3980 (23.4%)
55-64	1244 (23.4%)	1429 (28.7%)	7300 (32.0%)	6996 (41.1%)
65-74	589 (11.1%)	802 (16.1%)	4281 (18.8%)	4551 (26.7%)
Mean age (SD)	51.7 (9.9)	54.9 (9.3)	55.9 (9.6)	59.2 (9.0)

Over 85% of the Pacific cohort was comprised of people from the four main Pacific ethnic groups in New Zealand (Samoan, Tongan, Cook Island Māori and Niuean), with the remaining 13% of Pacific peoples being identified as "Other Pacific" or "Pacific Not Further Defined (NFD)".

Table 2 presents the distribution of the PREDICT Pacific cohort in their respective Pacific subgroups with proportions compared with the 2006 NZ Census.[11] In the Census, Samoans made up almost 50% of the Pacific cohort, Tongans just under 20% and Niueans approximately 8%. The PREDICT Pacific cohort had a lower proportion of Cook Island Māori (13.3%) than reported in the 2006 Census (19.7%).[11]

Table 2. Numbers and proportions of Pacific subgroups in the PREDICT cohort compared with 2006 NZ Census

Pacific subgroup	Number (%) in PREDICT cohort (aged 35-74 years)	% of Pacific peoples in NZ Census** (aged 30-64 years)
Samoan	4933 (47.9%)	43,572 (49.4%)
Tongan	1724 (16.7%)	15,069 (17.1%)
Cook Island Māori	1366 (13.3%)	17,349 (19.7%)
Niuean	880 (8.5%)	6741 (7.6%)
Other Pacific	439 (4.3%)	5124 (5.8%)
Pacific Not Further Defined	959 (9.3%)	
Total	**10301 (100%)**	**88218**

**Ethnicity data from the 2006 NZ Census is based on a 'total response' output, rather than a prioritisation, method as used in our study.

Table 3 shows the proportions of Pacific and European people aged 45-74 living in each NZDep quintile in the PREDICT cohort compared with the 2006 NZ Census estimates (16). In both the PREDICT cohort and in the total NZ population, 77% of Pacific peoples live in the two most deprived NZDep quintiles (deciles 7-10) . However, while 38% of Europeans from the PREDICT cohort reside in deciles 7-10, only 29% of Europeans in the total NZ population reside in these deciles.

Table 3. Numbers and proportions of Pacific and European peoples in the PREDICT cohort (aged 45-74 years) compared to 2006 NZ Census by quintile of deprivation

NZDep Quintile	Pacific		European	
	PREDICT (n=7737)	NZ Census (n=41,451)	PREDICT (n=34,773)	NZ Census (n=957,327)
Quintile 1: NZDep 1-2	202 (2.6%)	1809 (4.4%)	7161 (20.6%)	25,8,816 (27.0%)
Quintile 2: NZDep 3-4	540 (7.0%)	3111 (7.5%)	7038 (20.2%)	25,315 (23.5%)
Quintile 3: NZDep 5-6	1028 (13.3%)	4494 (10.8%)	7392 (21.3%)	198,336 (20.7%)
Quintile 4: NZDep 7-8	2128 (27.5%)	9054 (21.8%)	6964 (20.0%)	166,971 (17.4%)
Quintile 5: NZDep 9-10	3826 (49.5%)	22977 (55.4%)	6085 (17.5%)	106,812 (11.2%)
Missing	13 (0.2%)	6 (0.0%)	133 (0.4%)	1077 (0.1%)

Tables 4 and 5 present the RRs with 95% CIs for three of the main CVD risk factors (smoking, diabetes and a prior history of CVD) for Pacific and European men and women in the PREDICT cohort, stratified by age group.

Table 4. Risk ratios and 95% confidence intervals for smoking, diabetes and history of prior CVD for Pacific and European MALES stratified by age group and adjusted for deprivation (reference group is European)

	Age group	Pacific n (%)	European n (%)	Crude RR (95% CI)	Deprivation Adjusted RR (95% CI)
Smoking	35-44	528 (30.5%)	602 (16.9%)	1.81 (1.63 to 2.00)	1.30 (1.16 to 1.46)
	45-54	488 (27.8%)	1199 (15.6%)	1.77 (1.62 to 1.94)	1.22 (1.10 to 1.34)
	55-64	320 (25.7%)	977 (13.4%)	1.60 (1.43 to 1.79)	1.34 (1.19 to 1.50)
	65-74	91 (15.5%)	425 (9.9%)	1.56 (1.26 to 1.92)	1.22 (0.99 to 1.51)
Diabetes	35-44	268 (15.5%)	192 (5.4%)	2.88 (2.41 to 3.43)	2.68 (2.20 to 3.27)
	45-54	503 (28.6%)	543 (7.1%)	4.04 (3.62 to 4.51)	3.49 (3.10 to 3.94)
	55-64	504 (40.5%)	917 (12.6%)	2.69 (2.45 to 2.95)	2.85 (2.58 to 3.14)
	65-74	247 (41.9%)	826 (19.3%)	2.17 (1.94 to 2.43)	1.96 (1.75 to 2.20)
History of CVD	35-44	54 (3.1%)	111 (3.1%)	1.00 (0.73 to 1.38)	0.87 (0.63 to 1.21)
	45-54	160 (9.1%)	477 (6.2%)	1.46 (1.23 to 1.74)	1.34 (1.13 to 1.59)
	55-64	186 (15.6%)	1011 (13.9%)	1.08 (0.93 to 1.25)	1.03 (0.90 to 1.18)
	65-74	164 (27.8%)	1188 (27.8%)	1.00 (0.87 to 1.15)	0.96 (0.84 to 1.10)

Within the PREDICT cohort, Pacific men aged 35-64 were almost one-third more likely to smoke than their European counterparts, while Pacific women aged over 55 were approximately one-third less likely to smoke, after adjustment for deprivation. There were no differences in smoking prevalence between Pacific and European women aged 35-54.

In all age groups, Pacific men and women were significantly more likely than their European counterparts to be diagnosed with diabetes (approximately two to four times more likely to have diagnosed diabetes). For both ethnic groups, the prevalence of diabetes increased with age, with the highest prevalence of diabetes in Pacific women aged 65-74 years (approximately 50%). There were no consistent ethnic differences in the likelihood of having a prior history of CVD.

Table 5. Risk ratios and 95% confidence intervals for smoking, diabetes and history of prior CVD for Pacific and European FEMALES stratified by age group and adjusted for deprivation (Reference group is European)

	Age group	Pacific n (%)	European n (%)	Crude RR (95% CI)	Deprivation Adjusted RR (95% CI)
Smoking	35-44	168 (20.2%)	280 (18.8%)	1.03 (0.87 to 1.22)	0.85 (0.71 to 1.02)
	45-54	336 (17.6 %)	605 (15.2%)	1.15 (1.02 to 1.30)	0.91 (0.80 to 1.04)
	55-64	149 (10.4%)	831 (11.9%)	1.02 (0.87 to 1.19)	0.63 (0.53 to 0.74)
	65-74	46 (5.7%)	337 (7.4%)	0.77 (0.57 to 1.04)	0.63 (0.47 to 0.85)
Diabetes	35-44	240 (28.9%)	116 (7.8%)	3.56 (2.90 to 4.37)	2.87 (2.30 to 3.58)
	45-54	563 (29.4%)	331 (8.3%)	3.53 (3.12 to 4.00)	3.18 (2.79 to 3.64)
	55-64	585 (40.9%)	638 (9.1%)	3.33 (3.01 to 3.68)	4.04 (3.64 to 4.49)
	65-74	398 (49.6%)	682 (15.0%)	3.31 (3.00 to 3.65)	2.80 (2.52 to 3.10)
History of CVD	35-44	27 (3.3%)	33 (2.2%)	1.44 (0.87 to 2.38)	1.25 (0.73 to 2.14)
	45-54	91 (4.8%)	171 (4.3%)	1.11 (0.87 to 1.43)	0.91 (0.70 to 1.17)
	55-64	139 (9.7%)	513 (7.3%)	1.33 (1.11 to 1.59)	1.15 (0.96 to 1.38)
	65-74	128 (16.0%)	794 (17.5%)	0.91 (0.77 to 1.09)	0.82 (0.69 to 0.97)

Table 6 shows the mean differences with 95% CIs between Pacific and European patients in systolic and diastolic blood pressure and total cholesterol/HDL ratio, stratified by age group and sex.

Within the PREDICT cohort, Pacific women aged 35-54 had higher mean systolic blood pressures, but Pacific men aged over 55 and Pacific women aged over 65 had lower mean systolic blood pressures, compared with their European counterparts. By contrast, Pacific men and women in all age groups had significantly higher mean diastolic blood pressures than Europeans. While mean systolic blood pressure tended to increase with age in men and women of both ethnic groups, mean diastolic blood pressure tended to decrease with age.

European women over the age of 65 had the highest mean systolic blood pressure (139.5 mmHg), while the highest mean diastolic blood pressures (83.0 to 83.7 mmHg) were seen in Pacific men aged 35-54. Mean total cholesterol/HDL ratio also decreased with age in men and women of both ethnic groups.

Pacific women over 45 had significantly higher total cholesterol/HDL ratios than their European counterparts.

Table 6. Mean difference (standard deviation) for systolic and diastolic blood pressures and TC/HDL for Pacific and European participants stratified by age group and gender

	Age group	Male			Female		
		Pacific Mean (SD)	European Mean (SD)	Mean diff (95% CI)	Pacific Mean (SD)	European Mean (SD)	Mean diff (95% CI)
Systolic BP (mmHg)	35-44	128.4 (15.9)	128.5 (15.2)	-0.1 (-0.9 to 0.8)	127.6 (16.9)	125.4 (17.6)	2.3 (0.8 to 3.7)
	45-54	130.8 (16.7)	130.9 (16.4)	-0.1 (-0.9 to 0.8)	131.9 (18.3)	130.1 (17.3)	1.9 (0.9 to 2.8)
	55-64	133.9 (17.2)	135.4 (17.4)	-1.5 (-2.5 to -0.5)	134.3 (18.8)	134.4 (17.5)	-0.1 (-1.1 to 0.9)
	65-74	134.4 (17.8)	136.9 (17.3)	-2.5 (-4.0 to -1.0)	138.1 (19.3)	139.5 (17.6)	-1.4 (-2.7 to 0.0)
	Total – age & deprivation adjusted mean differences			-0.9 (-1.4 to -0.3)			0.6 (0.0 to 1.2)
Diastolic BP (mmHg)	35-44	83.0 (11.6)	81.7 (10.7)	1.3 (0.7 to 2.0)	81.2 (11.3)	78.9 (10.9)	2.4 (1.4 to 3.3)
	45-54	83.7 (11.4)	81.8 (10.4)	1.9 (1.3 to 2.4)	82.4 (11.1)	80.1 (10.2)	2.3 (1.8 to 2.9)
	55-64	82.0 (10.8)	81.4 (10.1)	0.6 (0.0 to 1.2)	81.3 (10.7)	79.8 (9.5)	1.5 (0.9 to 2.0)
	65-74	79.4 (10.4)	78.3 (9.4)	1.0 (0.2 to 1.9)	80.4 (10.8)	78.8 (9.5)	1.7 (0.9 to 2.4)
	Total – age & deprivation adjusted mean differences			1.2 (0.9 to 1.6)			1.8 (1.5 to 2.2)
Tot chol/HDL ratio	35-44	4.66 (1.53)	4.71 (1.44)	-0.05 (-0.13 to 0.04)	3.90 (1.15)	3.83 (1.32)	0.07 (-0.04 to 0.17)
	45-54	4.42 (1.31)	4.38 (1.31)	0.04 (-0.03 to 0.10)	3.85 (1.13)	3.75 (1.29)	0.10 (0.03 to 0.17)
	55-64	4.05 (1.24)	4.12 (1.21)	-0.07 (-0.15 to 0.00)	3.78 (1.07)	3.63 (1.11)	0.15 (0.09 to 0.21)
	65-74	3.82 (1.10)	3.82 (1.12)	0.00 (-0.10 to 0.09)	3.66 (1.16)	3.54 (1.09)	0.12 (0.04 to 0.21)
	Total – age & deprivation adjusted mean differences			-0.06 (-0.11 to -0.02)			0.05 (0.01 to 0.09)

Table 7 shows the mean Framingham 5-year CVD risk scores and mean differences in scores between Pacific peoples and Europeans by age group and sex.

In each age group, Pacific men and women had significantly higher 5-year CVD risk scores than their European counterparts. After adjusting for age, Pacific men had a 1.4% higher absolute risk, and Pacific women a 1.7% higher absolute risk, of experiencing a CVD-related event in the next 5 years compared to their European counterparts.

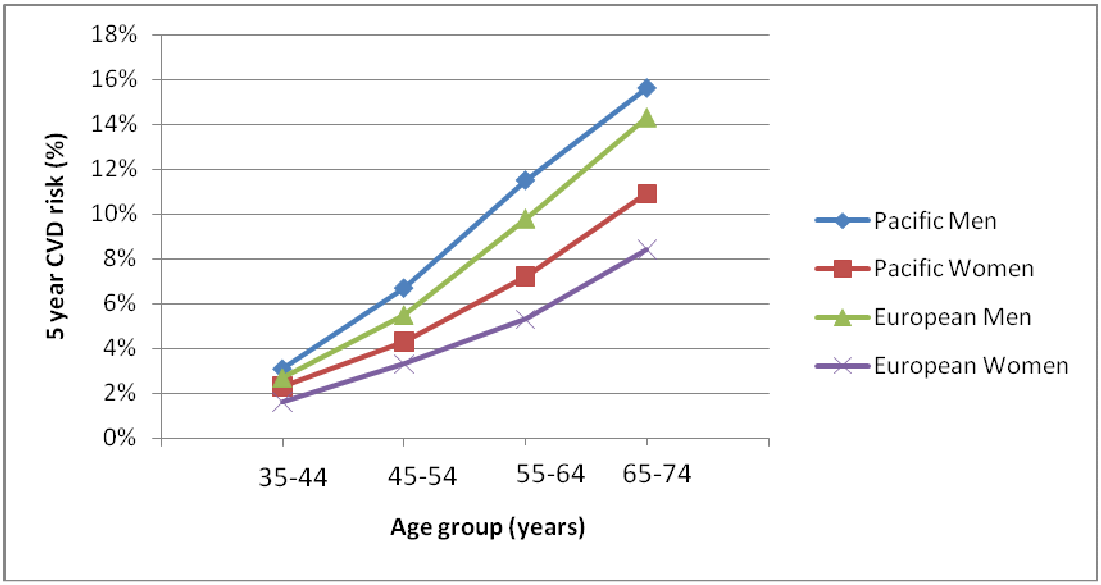
Figure 1 shows the 5-year absolute CVD risk trajectories of Pacific and European men and women according to age. In all age groups, Pacific men had the highest 5-year CVD risk and European women the lowest.

Table 7. Mean Framingham 5-year CVD risk scores* for Pacific peoples and Europeans, by age group and sex (Europeans are reference group for mean differences)

Sex	Age group	Pacific Mean (SD)	European Mean (SD)	Mean difference (95% CI)
Males	35-44y	3.1 (2.6)	2.7 (2.1)	0.4 (0.3 to 0.6)
	45-54y	6.7 (4.3)	5.5 (3.6)	1.3 (1.1 to 1.5)
	55-64y	11.5 (6.2)	9.8 (5.2)	1.7 (1.4 to 2.1)
	65-74y	15.6 (7.2)	14.3 (6.4)	1.3 (0.8 to 1.9)
	Total	Age adjusted mean difference in Framingham risk score: 1.4 (95% CI 1.2 to 1.5)		
Females	35-44y	2.3 (2.2)	1.6 (1.8)	0.7 (0.5 to 0.8)
	45-54y	4.3 (3.7)	3.3 (3.0)	1.0 (0.9 to 1.2)
	55-64y	7.2 (4.9)	5.3 (3.8)	1.9 (1.7 to 2.2)
	65-74y	10.9 (6.2)	8.4 (5.0)	2.5 (2.1 to 2.9)
	Total	**Age adjusted mean difference in Framingham risk score: 1.7 (95% CI 1.5 to 1.8)**		

*Note these scores do not include adjustments according to 2003 New Zealand Guidelines Group CVD guidelines.[13]

Figure 1. Absolute 5-year CVD risk in Pacific and European men and women by age group



Discussion

This paper reports the largest ever comparative analyses of CVD risk profiles between Pacific and European people living in New Zealand. Participants had all attended primary care practices where CVD risk assessments were undertaken (predominantly opportunistically) using the web-based clinical decision support programme PREDICT. Pacific peoples in the PREDICT cohort were significantly younger than Europeans, which was expected as current guidelines recommend that Pacific peoples start being CVD risk assessed 10 years earlier than Europeans.[13]

There were likely to be different selection factors operating for Pacific and European patients having a CVD risk assessment. The National Primary Medical care Survey (NatMedCa) reported that Pacific peoples have a lower average annual exposure to primary medical care than Europeans (74.7 minutes versus 93.5 minutes after adjusting for age);[16] therefore one may argue that Pacific peoples in our study may have been less likely than Europeans to receive an opportunistic CVD risk assessment. However, the NatMedCa study also found that Pacific patients attending primary care present with slightly fewer problems per visit than Europeans,[17] and current NZ CVD guidelines have identified Pacific peoples as a particular high-risk group that general practitioners should target for risk assessment.[13] Notwithstanding these potentially conflicting drivers, a comparison between the risk profiles of Europeans and Pacific peoples as seen in the primary health care context is both timely and appropriate.

We did not assume that that the populations studied were representative of the New Zealand Pacific and European populations as a whole. However, analyses of the whole PREDICT cohort has indicated that prevalence of prior CVD and CVD risk distribution is reasonably close to estimates from other population-based studies in New Zealand.[7] Furthermore, aside from a lower proportion of Cook Island Māori, the composition of our Pacific cohort was similar to that of Pacific peoples in New Zealand, as reported in the 2006 New Zealand Census.[11]

The lower proportion of Cook Island Māori in our study may be explained in part by the fact that the people in the PREDICT cohort were recruited from PHOs in Auckland and Northland, and Cook Island Māori are more geographically spread through the country than the other Pacific groups.[18] Our analyses also show that the distribution among NZDep quintiles of Pacific peoples in the PREDICT cohort is similar to that of Pacific peoples in the New Zealand population, with over 75% of Pacific peoples residing in the two most deprived NZDep quintiles and less than 5% residing in the least deprived quintile.

Our results suggest that the PREDICT Pacific cohort is not too dissimilar to Pacific adults in New Zealand. The observation that 17% of Europeans in the PREDICT cohort live in NZDep deciles 9-10, compared to only 11% of the total New Zealand population, however, suggests that the PREDICT European cohort is more deprived than the general population, and therefore absolute differences in CVD risk factors between Pacific peoples and Europeans in New Zealand are likely to be even greater than those reported.

The almost two-fold higher prevalence of smoking among Pacific compared with European men in the PREDICT cohort is consistent with previous studies, including the 2006 Census[19] and the most recent NZ Tobacco Use Survey.[20] Adjusted analyses suggest that about half of this difference can be explained by differences in socio-economc deprivation. In the 2006 Census Pacific women aged 30 to 49 had higher smoking rates than their European counterparts (6-8% higher),[19] however we found smaller differences between Pacific and European women in these age groups (approximately 2%).

Our results for smoking rates among Pacific and European women aged over 55 were similar to those reported in the 2006 Census. Once deprivation had been accounted for, Pacific women aged over 55 were significantly less likely than their European

counterparts to smoke. The reasons for the differences in reported smoking rates among younger Pacific women in our study compared to the NZ Census are unclear. One possible explanation is that younger Pacific women may be more likely to underreport current smoking status than European women in a clinical setting.

We found a roughly three-fold higher prevalence of diabetes among Pacific peoples compared to Europeans; and this finding has been well documented since the 1990s).[21-23] However, like CVD mortality, it appears that relative inequalities in diabetes prevalence are widening. Studies in the 1990s reported that Pacific peoples had approximately double the risk of diabetes as Europeans;[21,22] our study and the Diabetes, Heart and Health (DHAH) Study 2002/03 suggest that the diabetes risk among Pacific peoples may have doubled again.[23]

The higher incidence of diabetes and smoking in Pacific compared with European people in this primary care cohort is mirrored by a similar higher prevalence in patients presenting to hospital with acute coronary syndromes in the PREDICT cohort catchment.[24]

Our finding that Pacific men have lower mean systolic blood pressures (1 mmHg lower), and both men and women had higher mean diastolic blood pressures (1-2 mmHg higher) compared with Europeans is consistent with results from the Fletcher Challenge-Auckland University Heart and Health Study, which reported that mean systolic blood pressures were 3 mmHg lower, and mean diastolic blood pressures were 2 mmHg higher, in Pacific peoples compared with Europeans.[25]

The Workforce Diabetes Survey (WDS) and the DHAH Study also reported higher mean diastolic blood pressures among Pacific peoples, but unlike our study, found that mean systolic blood pressures of Pacific peoples were also significantly (4-7 mmHg) higher than Europeans.[26,27] The consistent finding in all these studies is a higher diastolic blood pressure in Pacific peoples.

The version of the Framingham risk prediction equation used in New Zealand only uses systolic blood pressure. There may be implications for the calculation of CVD risk if raised diastolic blood pressure is a more important problem for Pacific peoples than raised systolic blood pressure. We plan to investigate the associations between blood pressure and CVD event risk in different ethnic groups using PREDICT follow-up data.

Previous studies have confirmed high serum cholesterol levels as a major risk factor for coronary heart disease in European populations,[28] but not for Pacific peoples.[29] Consistent with results from the WDS[30] the DHAH Study[27] and the 1997 National Nutrition Survey,[31] our study found higher mean total cholesterol/HDL ratios in Pacific compared to European women. Further research is needed investigating the relationship between serum cholesterol levels and coronary heart disease in Pacific peoples. We will undertake cohort analyses of lipid profiles and CVD events in different ethnic groups once we have anonymously linked PREDICT baseline data to routine laboratory data.

Given that Pacific peoples generally had a more adverse CVD risk factor profile than Europeans in this study, it is not surprising that the Framingham 5-year CVD risk scores were significantly higher in Pacific men and women of all ages compared to their European counterparts. The validity of the Framingham risk equation for Pacific

and other non-European peoples has been questioned in the past and, in 2003, the New Zealand Guidelines Group recommended a once only upward adjustment of 5% in 5-year CVD risk for Pacific, Maori and South Asian peoples.[13] However, this upward adjustment has been shown to lead to an overestimation of CVD risk.[32] A long-term objective of the PREDICT project is to develop cardiovascular risk prediction equations specific to these ethnic groups.

With a sample size of over 10,000 Pacific peoples and almost 40,000 Europeans, this is the largest and most complete study to date evaluating the differences in CVD risk factor profiles between Pacific peoples and Europeans in New Zealand. The WDS in the 1990s[3] and the DHAH Study 2002/03[4] also reported on differences in CVD risk between Pacific peoples and Europeans, but their sample sizes were much smaller (n=650 Pacific participants in the WDS, and n=1011 Pacific participants in the DHAH Study). The WDS was a workforce-based study, and may therefore have been biased by the "healthy worker effect", but the DHAH Study was population-based, and is perhaps more representative of the Pacific population in New Zealand than the PREDICT cohort. The DHAH Study however had its own limitations, with a response rate of approximately 61%.

Our study has several limitations. Firstly, PREDICT was designed primarily as a tool for use in routine clinical practice, and so the patient recruitment process for this research cannot be described. While most of the risk assessments were conducted opportunistically, some member practices of the participating PHOs may have used the programme systematically (eg. recruiting consecutive patients in the eligible age range).

Over the next few years, however, the patient recruitment process may become less of an issue. As 80% of the eligible population visit their GP every year, it is likely that the majority of enrolled patients within participatory PHOs will ultimately be included in the PREDICT cohort, particularly if proposed 2008/09 primary care performance indicators for CVD risk assessment are enacted.[7]

Secondly, blood pressure recordings in this study were based on the average of two measurements and we have no information on who measured the blood pressure or what type of sphygmomanometer was used. While the PREDICT measurements represent the 'real world' situation, ideal assessments would involve multiple standardised measurements taken with a well-calibrated instrument to accurately capture a person's usual blood pressure.[33]

Similarly lipid measurements were not assessed in a research-registered laboratory, although most measurements were done in one laboratory (Diagnostic MedLab) which has had continuous IANZ accreditation throughout, with ongoing internal and external quality control monitoring. Calibrators supplied by the manufacturer (Roche Diagnostics) are referenced back to primary international reference standards. The laboratory participates in the Royal Australasian College of Pathologists (RCPA) external quality assurance programme (QAP) and has performed well within target specifications for all lipid measurements (Cam Kyle, personal communication, 2009).

Despite these limitations, this comparative analysis of CVD risk factor profiles of Pacific and European patients assessed in primary care practice adds to what has been a limited body of knowledge about the CVD risk profile of Pacific peoples in New

Zealand. As the PREDICT dataset becomes larger and more complete, it will be possible to undertake more in-depth research on the CVD risk profiles of Pacific subgroups. The current analyses highlight significant disparities in CVD risk factors such as smoking, diabetes, diastolic blood pressure and lipid levels between Pacific peoples and Europeans in New Zealand. Targeting these modifiable risk factors must be a priority if gains are to be made in addressing the widening health inequalities between these two population groups.

Competing interests: None known.

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