

Cardiovascular risk factors levels of Pacific people in a New Zealand multicultural workforce

David Schaaf, HRC Training Research Fellow; Robert Scragg, Senior Lecturer in Epidemiology; Patricia Metcalf, Biostatistician; Department of Community Health, University of Auckland, Auckland.

Abstract

Aims. To compare cardiovascular risk factors among the major Pacific Island communities participating in a New Zealand multicultural workforce survey.

Method. There were 650 employed Pacific Island participants (Samoan 357, Cook Islands 177, Tongan 71, Niuean 45), aged 40-65 years, who were interviewed in a work-based, cross-sectional survey. During an oral glucose tolerance test, blood samples were collected for determination of blood glucose and serum lipids. Participants provided information on smoking and leisure time physical activity. Blood pressure, weight and height were measured and body mass index calculated. Ten-year risk of cardiovascular disease was calculated using equations from the Framingham study.

Results. Among men, their ten-year risk of a cardiovascular event was similar for the four communities

compared (range 11.5% to 13.2%). However, individual risk factors did vary between the ethnic groups with Cook Island men having significantly higher total cholesterol, blood pressure and urinary microalbumin than other Pacific Island ethnic groups, while Tongan men were more likely to smoke and had lower HDL levels than other groups. Among women, Samoan and Cook Island participants had significantly higher ten-year cardiovascular risk scores (5.7%) than Niuean (4.4%) and Tongan (3.7%), due primarily to elevated total cholesterol levels.

Conclusion. Cardiovascular risk factor levels vary between Pacific Islands communities in New Zealand. Targeted interventions to specific Pacific communities may be more beneficial than the current homogeneous prevention strategy applied to all communities.

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Pacific Island people in New Zealand have high rates of coronary heart disease, hypertension and diabetes compared with Europeans.¹⁻⁴ The reasons for the high rates of cardiovascular disease in Pacific Island People are unclear. Ethnic differences in serum total cholesterol, which is a major risk factor of coronary heart disease among Caucasian populations, do not appear to be involved since Pacific Islands and Maori people have levels similar to Europeans.⁵ Cohort studies by Prior have shown that serum cholesterol in Pacific people is inversely related to total mortality (and probably also to cardiovascular mortality).⁶ In contrast, the same studies by Prior have identified systolic blood pressure as an important predictor of total mortality. High-density lipoprotein (HDL)-cholesterol could also be important, as HDL-cholesterol is lower in Pacific Islands and Maori people compared with Europeans.⁵

Lifestyle risk factors, such as increased body weights,⁷ increased cigarette smoking (men only), and decreased leisure time physical activity patterns¹ are also partly responsible for these higher cardiovascular disease rates in Pacific people. Increased body mass index (BMI) levels explain about half of the increased prevalence of hypertension³ and diabetes⁴ among Pacific Island peoples compared with Europeans. The Tokelau Island Migrant Study has shown that increased BMI levels after migration to New Zealand partly explain the increased prevalence of diabetes and hypertension among Tokelauans living in New Zealand.^{8,9} Lifestyle also affects HDL-cholesterol since levels of this lipid, normally low in Pacific people, were higher in Pacific Island than European participants in the Workforce Survey after adjusting for BMI, smoking, alcohol intake and leisure time physical activity.⁵ The latter finding suggests that ethnic difference in some or all of these lifestyle factors may explain the decreased Pacific Island HDL-cholesterol levels found in non-adjusted analyses reported above.⁵

Currently, very little is known about cardiovascular risk factors in each Pacific Island community living in New Zealand. They are typically considered as a single group by researchers and health agencies. However, there are important

differences in culture and lifestyle between Pacific Island communities, just as for the various immigrant European communities. It can not be assumed that cultural differences in lifestyle between Pacific Island communities are unrelated to cardiovascular risk. The aim of this paper is to determine whether levels of the major cardiovascular risk factors differ between representatives from the Samoan, Cook Island, Tongan and Niuean communities living in New Zealand.

Methods

Data were obtained from participants in the Workforce Diabetes Survey (WDS), a cross-sectional health screening survey of 5916 workers, aged 40-65 years, from 46 work-sites in Auckland and Tokoroa between 1988-1990. A detailed description of the study methods has been published previously.¹⁰ The main criterion for selecting companies was size (more than 50 staff of all ages). Eighty-eight per cent of the sample was from Auckland and twelve per cent from Tokoroa. Within Auckland, emphasis was placed on work-sites in south and central Auckland to ensure sufficient numbers of Maori and Pacific Island participants.

After fasting overnight, all participants underwent a two-hour glucose tolerance test (75 g polycose from Abbott Laboratories, Chicago, IL). During this test, they completed a self-administered questionnaire about sociodemographic characteristics, current health status, past medical history, current smoking status and ethnicity (by self-identification). A total of 650 Pacific Island participants, who identified themselves as Cook Island, Samoan, Tongan, or Niuean, took part in the survey. Samoans were the biggest group with 357 (205 males, 152, females), Cook Islands 177 (105 males, 72 females), Tongans 71 (55 males, 16 females) and Niueans 45 (32 males, 13 females). Their age distribution was: 40-44 years 38%, 45-49 years 31%, 50-54 years 20% and 55-64 years 11%. Excluded from this report are other Pacific Island participants (n= 15). The larger proportion of men to women reflects the work-based sampling frame.

Leisure time physical activity, at least weekly over the previous three months, was defined as vigorous if it made participants,

short of breath (i.e. aerobic), as moderate if it was non-aerobic, while participants who did neither were classified as inactive. This definition of activity, which is commonly used in epidemiological studies, is associated with serum levels of the major lipids.⁵ Blood pressure was measured twice, after a five-minute rest in the sitting position, with a Hawksley random zero sphygmomanometer and averaged. Weight (to the nearest 0.2 kg) and height (nearest 0.5 cm) were measured with shoes and heavy clothes removed. Blood lipids were measured on fasting serum samples. Commercial methods were used to measure total cholesterol and triglycerides (Technicon, Tarrytown, NY) and HDL cholesterol (Boehringer, Mannheim, Germany). LDL-cholesterol was calculated by the Friedwald formula for participants with fasting triglycerides ≤ 4.50 mmol/L.¹⁰ Blood glucose was measured by using a Cobas Fara centrifugal analyser (F Hoffmann-La Roche, Basle, Switzerland). The WHO criterion for epidemiological studies (two-hour glucose >11.1 mmol/L) was used to determine diabetes status.¹¹

Body mass index (BMI) was calculated by dividing weight (kg) by the square of height (m). A summary ten-year risk score of cardiovascular disease was calculated for each participant using equations from the Framingham Heart Study.¹² This was based on age, sex, systolic blood pressure, cigarette smoking status (current smoker or quit within last year), diabetes status (currently treated or undiagnosed) and serum total cholesterol.

Means or proportions, for all variables, were calculated using, respectively, PROC GLM and PROC FREQ in SAS.¹³ Variables which were not normally distributed (triglyceride and microalbuminuria) were logged and geometric means and tolerance factors (1.96 x standard error) calculated.

Results

Data for men and women, separately, are shown in Tables 1 and 2. Ethnic-specific mean ages did not differ between the four Pacific groups within each sex ($p>0.05$). Therefore, there was no need to adjust for age when making ethnic comparisons.

Cigarette smoking varied between Island groups among men, being highest for Tongan (56%) and lowest for Cook Island (33%) and Niuean (34%) (Table 1); while among women, who had smoking prevalences varying from 6% to 24%, there were

no significant ethnic differences (Table 2). Leisure time physical inactivity levels were similar for the four communities within each sex, although in contrast with smoking, women were more likely to be inactive than men. Ethnic-specific diabetes prevalences were also similar ($p>0.05$).

There were also ethnic differences in biological variables. BMI was significantly higher in Samoan women compared to other women (Table 2), while there were no ethnic BMI differences in men. Systolic and diastolic blood pressures were significantly higher in Cook Island men compared with each of the three other ethnic groups (Table 1). Mean total cholesterol and LDL levels were highest in Cook Island men and women, while HDL-cholesterol was lowest in Tongan men. There were no significant ethnic differences in mean levels of fasting and two-hour plasma glucose, of fasting triglyceride, and of the ratio of total cholesterol to HDL cholesterol, among both men and women. Mean level of microalbuminuria was significantly higher in Samoan and Cook Island men compared to Tongan and Niuean (Table 1). The summary ten year risk score of cardiovascular disease (i.e. the probability of having a cardiovascular disease event within the next ten years) was higher in Samoan and Cook Island women than in Tongan and Niuean (Table 2). By contrast, there were no significant ethnic differences in risk score among men; while their ten year risk (range 11.5% to 13.2%) was more than double that of women (range 3.7% to 5.7%).

Discussion

These results show that there are differences in the levels of some cardiovascular risk factors between the Pacific Island communities in New Zealand. Among men, although their ten-year risk of a cardiovascular event was similar for the four communities compared, individual risk factors did vary between the ethnic groups. Cook Island men had significantly higher total cholesterol, blood pressure and urinary microalbumin than other Pacific Island ethnic groups; while Tongan men were more likely to smoke and had lower HDL levels than other groups. Among women, Samoan and Cook Island participants had higher ten year cardiovascular risk scores, due primarily to elevated total cholesterol levels, compared with Tongan.

Possible limitations in our sample include: its work-based sampling frame which may not be representative of the

Table 1. Comparison of cardiovascular risk factors among Pacific Island men aged 40-65 years.

Variable	Samoan	Cook Island	Tongan	Niuean
n	205	105	55	32
Age in years – mean (SE)	46.9 (0.4)	48.0 (0.5)	47.3 (0.7)	47.9 (1.0)
Smokers (%) ^a	46%	33%	56%	34%
Inactive leisure time (%)	47%	38%	47%	34%
Diabetes (%) [#]	8%	8%	5%	13%
	Means (SE)			
BMI (kg/m ²)	31.3 (0.3)	31.3 (0.4)	30.9 (0.6)	29.6 (0.8)
Blood pressure (mmHg)				
Systolic	126 (1.0)	133 (1.3) ^{STN}	126 (1.8)	126 (2.4)
Diastolic	81 (0.8)	86 (1.1) ^{STN}	79 (1.5)	78 (1.9)
Plasma glucose (mmol/L)				
Fasting	6.08 (0.16)	6.24 (0.22)	5.77 (0.30)	6.64 (0.40)
2 hour	5.76 (0.27)	6.13 (0.37)	5.19 (0.51)	6.47 (0.67)
Serum lipids (mmol/L)				
Total cholesterol	6.02 (0.08)	6.53 (0.11) ^{STN}	6.05 (0.15)	5.71 (0.20)
HDL-cholesterol	1.15 (0.02) ^c	1.25 (0.03)	1.10 (0.04) ^c	1.15 (0.05)
Triglycerides [§]	1.53 (1.08)	1.62 (1.12)	1.46 (1.16)	1.36 (1.22)
LDL-cholesterol	4.09 (0.08)	4.45 (0.11) ^s	4.25 (0.15)	3.86 (0.20)
Ratio Total/HDL	5.50 (0.11)	5.50 (0.16)	5.84 (0.22)	5.25 (0.28)
Microalbuminuria (mg/L) [¶]	11.8 (1.19) ^{TN}	15.2 (1.27) ^{TN}	6.7 (1.40)	6.3 (1.55)
Ten-year risk score of CVD	11.5%	12.9%	13.2%	11.6%

CVD: cardiovascular disease; ^aCurrent smokers plus those who stopped in last 12 months; ^bp-value for χ^2 test <0.05 ; ^cTreated plus undiagnosed diabetes; ^dGeometric mean (tolerance factor); ^e $p<0.05$ vs Samoan ^f $p<0.05$ vs Tongan ^g $p<0.05$ vs Niuean ^h $p<0.05$ vs Cook Island.

Table 2. Comparison of cardiovascular risk factors among Pacific Island women aged 40–65 years.

Variable	Samoan	Cook Island	Tongan	Niuean
n	152	72	16	13
Age in years – mean (SE)	46.7 (0.4)	47.6 (0.6)	45.4 (1.3)	47.2 (1.4)
Smokers (%)*	24%	21%	6%	15%
Inactive leisure time (%)	55%	51%	69%	69%
Diabetes (%)*	9%	10%	0%	0%
	Means (SE)			
BMI (kg/m ²)	35.0 (0.5) ^c	32.6 (0.7)	31.9 (1.5)	32.3 (1.7)
Blood pressure (mmHg)				
Systolic	123 (1.1)	124 (1.6)	122 (3.6)	123 (3.8)
Diastolic	77 (0.7)	78 (1.1)	76 (2.4)	73 (2.6)
Plasma glucose (mmol/L)				
Fasting	6.07 (0.19)	6.02 (0.27)	5.53 (0.58)	5.46 (0.65)
2 hour	6.62 (0.33)	6.91 (0.48) ^N	5.71 (1.02)	4.48 (1.13)
Serum lipids (mmol/L)				
Total cholesterol	5.84 (0.10) ^T	6.04 (0.14) ^{TN}	5.14 (0.29)	5.28 (0.33)
HDL-cholesterol	1.29 (0.02)	1.29 (0.03)	1.18 (0.07)	1.33 (0.08)
Triglycerides	1.10 (1.08)	1.24 (1.12)	1.17 (1.25)	1.18 (1.38)
LDL-cholesterol	3.98 (0.08)	4.10 (0.12) ^T	3.36 (0.25)	3.51 (0.29)
Ratio Total/HDL	4.66 (0.10)	4.83 (0.15)	4.76 (0.31)	4.15 (0.35)
Microalbuminuria (mg/L)	8.4 (1.19)	8.8 (1.28)	6.8 (1.70)	5.8 (1.80)
Ten-year risk score of CVD	5.7% ^T	5.7% ^T	3.7%	4.4%

CVD: cardiovascular disease; *Current smokers plus those who stopped smoking in last 12 months; ^TTreated plus undiagnosed diabetes; ^NGeometric mean (tolerance factor); ^p_p<0.05 vs Tongan ^N_p<0.05 vs Niuean ^c_p<0.05 vs Cook Island.

wider Pacific population living in New Zealand (which also includes those receiving government benefits); the relatively small sample sizes for Tongan and Niuean participants which may have prevented the detection of other significant ethnic differences; and the assumption that the Framingham risk score can be applied to Pacific Islands people given evidence that serum cholesterol is not related positively to cardiovascular disease in Polynesians.⁶

Despite these possible concerns, previous cross-sectional studies carried out between 1978 and 1987 in 15 Pacific population groups from nine countries, excluding Tonga, have identified ethnic differences in cardiovascular risk factors similar to our findings.¹⁴ These studies observed higher levels of total cholesterol, blood pressure and BMI in Cook Island men compared with Samoan and Niuean. The findings in women, while not as consistent with our results, showed higher levels of total cholesterol, diastolic blood pressure and BMI in Cook Island and Samoan women than Niuean. In terms of lifestyle risk factors, Samoan men (75%) had a higher percentage of smokers compared with Cook Island (40%) and Niuean (63%), although these smoking prevalences are higher than those in our study (Table 1).

Overall, our results suggest that there are significant ethnic differences of cardiovascular risk factor levels between the four major Pacific Island groups in this survey, which may be due to cultural differences in lifestyle. This finding may have important policy implications for preventing cardiovascular disease in Pacific Islands people in New Zealand. If we are to reduce the high rates of cardiovascular disease events in Pacific Islands people in New Zealand we need to acknowledge that there are ethnic differences among Pacific Islands people communities in New Zealand. Each

community has a unique culture and lifestyle, just as for the various immigrant European communities. Targeting interventions to specific Pacific communities may be more beneficial than the current homogeneous strategy for prevention applied to all communities.

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Correspondence. David Schaaf, Department of Community Health, University of Auckland, Private Bag 92019, Auckland.

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