Obesity, diabetes and associated cardiovascular risk factors among Torres Strait Islander people

Abstract

Objective: To describe the lifestyle-related chronic disease and risk factor prevalence among Torres Strait Islander people of the Torres Strait and Northern Peninsula Area Health Service District and to compare this information with that available for the general Australian population.

Methods: Voluntary community-based screening for persons aged 15 years and older, including oral glucose tolerance test, anthropometry, health questionnaire, measurement of lipids and lipoprotein levels, blood pressure and urinary albumin to creatinine ratio.

Results: Nine communities participated in screening between 1993 and 1997. Five hundred and ninety-two participants (286 male and 306 female) identified as Torres Strait Islander. There were high prevalences of overweight (30%), obesity (51%), abdominal obesity (70%), diabetes (26%), hypercholesterolaemia (33%), albuminuria (28%), hypertension (32%) and tobacco smoking (45%). Only 8.5% of men and 6.5% of women were free of any cardiovascular risk factors (abdominal obesity, hypercholesterolaemia, hypertension, dyslipidaemia, smoking, diabetes, albuminuria). Comparisons of this information for Torres Strait Islander people with results from the AusDiab survey show rates of obesity three times higher and diabetes six times higher than for other Australians.

Conclusions: There is a very high prevalence of preventable chronic disease and associated risk factors among Torres Strait Islander people of the Torres Strait and Northern Peninsula Area.

Implications: Effective interventions to prevent and manage obesity, diabetes and associated cardiovascular risk factors are essential if the health of the Torres Strait Islander people is to improve. Such interventions could inform initiatives to stem the burgeoning epidemic of obesity and diabetes among all Australians.

(*Aust N Z J Public Health* 2002; 26: 144-9)

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Diabetes associated with obesity was first reported among people of the Torres Strait in the medical literature in 1961.[1] A study performed in the late 1970s reported diabetes prevalence of 19% in the outer islands and 13% in the Thursday Island and Northern Peninsula Area (NPA).[2] The community-based health screening reported here was initiated in response to the need for up-to-date health information identified by community leaders at a health planning meeting early in 1993.[3]

The Torres Strait and Northern Peninsula Area Health Service District (see Map 1) includes the islands of the Torres Strait as well as the Northern Peninsula Area on the tip of Cape York on the mainland. According to the 1996 Census,[4] there were 8,531 people living in the Torres Strait and Northern Peninsula Area of whom 6,850 (80%) identified as Indigenous, that is being of Torres Strait Islander, Aboriginal, or of mixed Aboriginal and Torres Strait Islander descent. Of this number, 83%, or 5,667 people, identify as Torres Strait Islanders. There are 16 Torres Strait Islander communities on 15 outer islands and five communities in the NPA, three of which identify as Aboriginal and two as Torres Strait Islander. In addition to these, a large proportion of the population live on Thursday Island and adjacent islands of the Thursday Island group.

Surveys were conducted in nine communities between September 1993 and May 1997 at the request of local Health Action Groups and/or community councils. This report describes the prevalence of diabetes and cardiovascular disease (CVD) risk factors in the 592 Torres Strait Islander people who participated in the screening.

Submitted: October 2000
Revision requested: July 2001
Accepted: March 2002

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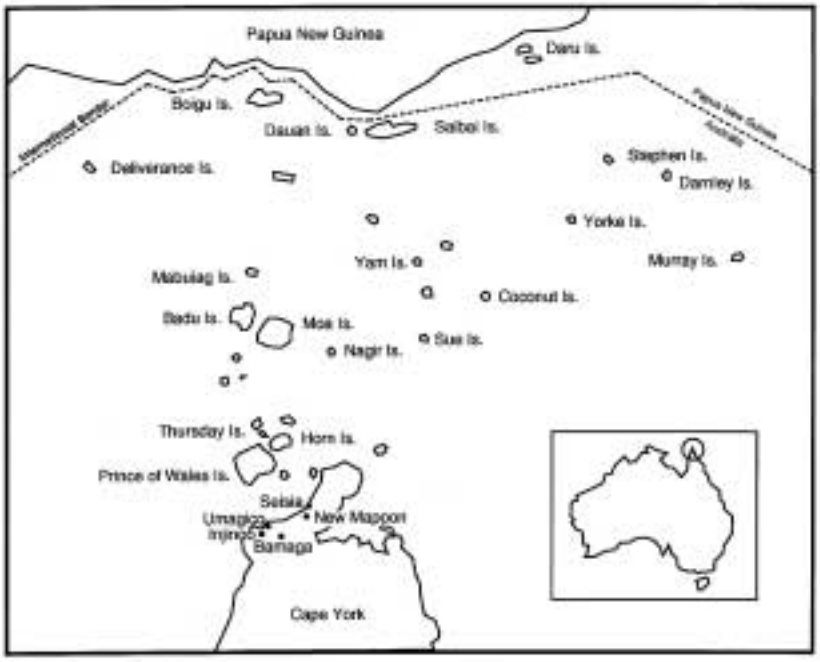


Map 1: The Torres Strait and Northern Peninsula Area Health Service District.

Methods

Participation in the surveys was voluntary and was offered to all residents aged 15 years and older. The guidelines set out by the National Health and Medical Research Council of Australia regarding research in Indigenous communities were followed. The Ethics Committee of the former Queensland Health Peninsula and Torres Strait Regional Health Authority gave ethical approval. The results of these surveys were reported back to the people of the Torres Strait and Northern Peninsula Area by way of individual reports to participants, reports to each community and (with the exception of the 1997 survey) a summary report to the Torres Strait and Northern Peninsula Area Diabetes Summit in June 1996.

Recruitment

A preliminary community consultation was conducted prior to each survey. The survey was conducted in a central location in each community, starting early each morning to facilitate participation while fasting. Recruitment activities by community health staff and the survey team, prior to and during the surveys, were supported by use of health centre records and local knowledge to identify all eligible residents and encourage participation.

Biochemical analysis and diagnostic criteria

Oral glucose tolerance tests (75 g glucose monohydrate) were performed early in the morning after a minimum of eight hours fasting. Impaired glucose tolerance (IGT), impaired fasting glucose (IFG) and diabetes are reported here according to World Health Organization 1999 criteria;[5] diabetes, fasting plasma glucose ≥7.0 mmol/L and/or 2 h post glucose load plasma glucose ≥11.1 mmol/L and/or current hypoglycaemic mediation; IGT, fasting plasma glucose less than 7.0 mmol/L and 2 h plasma glucose 7.8 to 11.0 mmol/L; IFG, fasting plasma glucose 6.0 to 6.9 mmol/L and 2 h plasma glucose less than 7.8 mmol/L. Known diabetic subjects, with diabetic status confirmed by fasting blood glucose measurement with a glucometer, did not receive a glucose tolerance test. Fasting blood samples were collected into fluoride-heparin (for glucose), lithium-heparin and serum tubes (for lipids). Circulating concentrations of glucose, cholesterol and triglycerides were assayed using standard enzymatic techniques (Boehringer-Mannheim, Mannheim, FRG) on a Hitachi 705 or 704 autoanalyser. High density lipoprotein (HDL) was isolated by precipitation of other lipoproteins with 15% polyethylene glycol (MW 6000). The following criteria were used to define abnormalities of circulating lipids:

- Hypercholesterolaemia; fasting total cholesterol ≥5.5 mmol/L.[6]
- Dyslipidaemia; fasting HDL cholesterol <1.0 mmol/L plus fasting triglycerides ≥2.0 mmol/L.[7]

Albumin:creatinine ratio (ACR) was measured in early morning urine samples. Microalbuminuria was defined as ACR in the range 3.4 to less than 34 mg/mmol and macroalbuminuria as ACR equal to or greater than 34 mg/mmol.[8]

Anthropometric measurements

Body weight was recorded to the nearest 0.1 kg (UC300 digital electronic scales; A.N.D., Tokyo, Japan) and height to the nearest 0.1 cm (Harpenden anthropometer; Holtain Ltd, Crymych, UK). The criterion used to define overweight was Body Mass Index (BMI) 25 to less than 30 kg/m^2 and obesity BMI equal to or greater than 30 kg/m^2.[9] Waist and hip circumferences were measured to the nearest 0.1 cm. High waist-to-hip ratio (WHR) was defined as greater than 0.90 for men and 0.80 for women.[10]

Blood pressure and lifestyle information

Sitting blood pressure was measured using a Dinamap model 8100 automated blood pressure monitor (Critikon; Tampa FL, US)

Table 1: Prevalence (%) of CVD risk factors, stratified by gender and age.

	Women		Men		All
	15-34yr	≥35yr	15-34yr	≥35yr	
n	*148*	*158*	*139*	*147*	*592*
Overweight	28.4	23.7	31.2	34.9	29.4
Obesity	43.9	67.3[a]	39.1	53.4[b]	51.4
High waist:hip ratio	61.5	94.2[a]	31.2	89.7[a]	70.1
IGT	5.4	5.1	0.7	7.5[a]	4.7
Diabetes	8.8	55.7[a]	5.0	32.0[a]	26.2
Hypertension	4.8	50.0[a]	18.0	53.7[a]	32.1
Hypercholesterolaemia	17.7	39.1[a]	27.3	46.3[a]	32.8
Dyslipidaemia	15.0	28.2[a]	9.5	37.9[a]	22.9
Microalbuminuria	9.0	30.8[a]	5.1	29.2[a]	18.9
Macroalbuminuria	2.8	20.5[a]	2.2	9.7[b]	9.1
Smoking	43.9	30.6[b]	63.3	45.2[a]	45.3
Drinking	49.3	26.6[a]	76.3	53.7[a]	50.7
Exercise	57.5	59.8	22.5	52.8[a]	48.7

Notes:
(a) Within gender p≤0.005 between age groups.
(b) Within gender p<0.05 between age groups.

with the subject seated for at least five minutes prior to measurement. The mean of three consecutive readings was taken. Hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg and/or current anti-hypertensive medication.[11] Participants were asked if they currently smoked tobacco or drank alcohol.

Participants were asked about usual physical activity practices and were defined as being physically active if they participated in any physical activity vigorous enough to increase breathing rate at least three times a week for at least 20 minutes each time.

Statistical analysis

The Australian Bureau of Statistics, Census of Housing and Population,[4] 1996 (CData software) was used to describe the study population in the calculation of denominator numbers and in the calculation of age-adjusted prevalence rates (see Tables 2 and 3). The Torres Strait and Northern Peninsula Area Health Service District is represented by one statistical local area (Torres).

Statistical analysis was undertaken using the Statistical Package for Social Sciences (SPSS) version 10 and EpiInfo version 6. The statistical procedures used in this research included summary statistics, standard chi-squared analyses (see Table 1) and Mantel-Haenszel age-weighted chi-square test for trend analysis (see Table 2). Age-adjusted prevalences from the sample were compared with those from the AusDiab[12] survey by the use of indirectly standardised ratios (ISRs).[13] All reported *p*-values are two-sided and were considered to be significant where *p*-value was <0.05.

Results

Response ranged from 33% to 67% of the eligible Indigenous residents. Eighty per cent of participants identified as Torres Strait Islander (286 men and 306 women), 9.5% as Aboriginal and 10.2% as mixed Aboriginal and Torres Strait Islander descent. The results reported here refer only to those 592 participants who identified as Torres Strait Islander. Approximately 50% of the eligible Torres Strait Islander people in the nine communities participated. The survey sample comprised approximately 17% of the Torres Strait Islander population over 15 years of the district. The survey sample did not differ significantly from the district Indigenous

Table 2: Risk factor prevalence (%) stratified by diabetes status and gender.

	Non-diabetic	Diabetic	*p*[a]
Women			
n	*202*	*101*	
Obesity	53.0	74.3	0.048
Hypertension	21.7	44.8	<0.001
Hypercholesterolaemia	27.9	33.7	0.484
Dyslipidaemia	16.1	43.2	0.002
Microalbuminuria	15.4	39.2	0.004
Macroalbuminuria	8.3	19.5	0.032
Smoking	17.9	32.8	0.519
Men			
n	*230*	*54*	
Obesity	41.6	74.1	0.003
Hypertension	31.7	54.9	0.004
Hypercholesterolaemia	32.7	44.6	0.629
Dyslipidaemia	18.8	40.8	0.001
Microalbuminuria	15.3	18.1	0.332
Macroalbuminuria	3.6	15.9	0.006
Smoking	23.8	45.1	0.075

Notes:
Data are age-adjusted using the overall survey sample as the reference population.
(a) Age-weighted Mantel-Haenszel chi-square test.

population with respect to gender (52% women in both cases) or age distribution (p=0.432 for women, p=0.131 for men).[2] The age of Torres Strait Islander participants ranged from 15 years to 85 years for men and from 15 years to 87 years for women.

The prevalence of cardiovascular risk factors for men and women are shown in Table 1. More than 80% of people were either overweight or obese. The prevalence of obesity substantially exceeded the prevalence of overweight in both men and women. Overall, 51% of people were obese and 30% were overweight. Mean BMI for women was 31.5 (SD 6.9, range 18.3-55.8) and for men 29.7 (SD 5.6, range 18.8-54.9). Obesity and abdominal obesity were significantly more common in older compared with younger men and women. Among younger people, the prevalence of overweight (p=0.607) and obesity (p=0.412) was not significantly different between men and women. Among older people, overweight was more common in men (p=0.032) and obesity more common in women (p=0.014). Prevalence of abdominal obesity was particularly high with rates among younger (p<0.001) but not older (p=0.148) women exceeding those of men.

Twenty-six point two per cent of people had diabetes, 4.7% impaired glucose tolerance and 69.1% normal glucose tolerance. IGT was significantly more common in older compared with younger men but not among older compared with younger women. Diabetes was more common among older people in both men and women. Among younger people, the prevalence of IGT (p=0.015) but not diabetes (p=0.131) was significantly more common among women than men. Among older people, the prevalence of diabetes (p<0.001) but not IGT (p=0.148) was significantly more common among women than among men.

Hypertension was high among older men and older women. While the prevalence of hypertension among younger women was relatively low, among young men hypertension was significantly higher (p<0.005).

The prevalence of raised cholesterol and dyslipidaemia was high among older people, particularly older men. Hypercholesterolaemia and dyslipidaemia were significantly more common in older compared with younger men and women (see Table 1). Among younger people, the prevalence of hypercholesterolaemia (p=0.050) was significantly more common among men than among women, while dyslipidaemia was more prevalent among young women than among young men (p=0.016). Among older people, there was no significant difference in prevalence of hypercholesterolaemia (p=0.208) or dyslipidaemia (p=0.073) between men and women. However, both younger men and younger women had levels of raised cholesterol and dyslipidaemia consistent with increased risk of CVD.

Micro- and macro- albuminuria were more prevalent among older compared with younger men and women (see Table 1). However, younger men and women also exhibited significant levels of microalbuminuria. The prevalence of microalbuminuria did not differ by sex in either age group. Among older, but not younger, people, macroalbuminuria was more common in women (p=0.010).

Smoking was highly prevalent, with about 45% of the sample being current smokers. Smoking prevalence was significantly higher among younger people (see Table 1) and among men in both age groups. Low levels of regular physical activity were reported for more than half the survey sample in all age and sex-specific categories, except for young men who were significantly more likely to be active than were older men (see Table 1) or younger women (p<0.001).

Approximately half the participants drank alcohol, with older people and especially older women more likely to be abstainers.

After adjusting for age, most cardiovascular risk factors (obesity, abdominal obesity, hypertension, and dyslipidaemia) were more prevalent among people with diabetes than among those who were non-diabetic (see Table 2). Hypercholesterolaemia was not associated with diabetes either for men or for women. Unlike women, in men diabetes was not associated with greater prevalence of microalbuminuria but was associated with prevalence of macroalbuminuria.

Six point five per cent of women and 8.5% of men had no cardiovascular risk factors (see Figure 1) and 44.5% of women and 49.8% of men had three or more co-existing risk factors.

Table 3 shows comparison of risk factor prevalence among the 212 Torres Strait Islander men and 231 women in this study who were age 25 years and older, with the AusDiab[12] study of the general Australian population, 1999-2000. Data in Table 3 have been age-adjusted using the Indigenous population (25 years and older) of the Torres Strait as a reference population as population data by age is not available for Torres Strait Islander people only but is available for Indigenous people (those who identify as Aboriginal or Torres Strait Islander or as both Aboriginal and Torres Strait Islander).

While obesity is close to three times more prevalent among Torres Strait Islander people compared with other Australians, diabetes is more than six times as prevalent. The prevalence of both impaired glucose tolerance and impaired fasting glucose was significantly lower among Torres Strait Islander people.

Table 3: Comparison of age-adjusted prevalences from the AusDiab[14] survey and the Torres Study using indirectly standardised ratios (ISR).

	Prevalence (%)		ISR (95% CI)
	Torres Strait Islanders	AusDiab	
Obesity	55.7	19.5	2.9 (2.5-3.2)
IFG	2.9	5.1	0.6 (0.4-0.9)
IGT	5.6	8.8	0.6 (0.4-0.9)
Diabetes	33.1	5.6	6.2 (5.3-7.3)
Hypercholesterolaemia	37.2	47.7	0.8 (0.7-0.9)
LDL chol. ≥3.5 mmol/L	51.3	43.0	1.2 (1.0-1.4)
HDL chol. <1.0 mmol/L	52.9	11.9	4.4 (3.9-5.0)
Triglycerides ≥2.0 mmol/L	41.2	19.0	2.2 (1.9-2.5)
Hypertension	39.2	22.7	1.8 (1.6-2.1)
Current smoking	39.4	16.9	2.3 (2.0-2.7)

Hypertension was more prevalent among Torres Strait Islander people. There are differences also in the prevalence of lipid disorders: raised cholesterol is more prevalent in the general Australian population but raised triglygerides and low levels of high density lipoproteins are more prevalent among Torres Strait Islanders. Smoking was more than twice as common among the Torres Strait Islanders than the general population.

Discussion

The high prevalence of obesity reported here among Torres Strait Islanders is similar to that reported for Torres Strait Islander participants in the National Aboriginal and Torres Strait Islander Survey.[14] Comparison with the AusDiab information for the general Australian population highlights the higher prevalence of obesity among Torres Strait Islanders. Associated with this is the higher prevalence of diabetes, particularly among Torres Strait Islander women. While obesity is three times more prevalent among Torres Strait Islanders, diabetes is six times more prevalent. This disproportionate burden of diabetes may reflect the 'dose-response relationship' between BMI and the risk of developing diabetes[15] as both the prevalence and the degree of obesity are particularly high among Torres Strait Islander people. Conversely, the prevalence of IGT and IFG is relatively low among Torres Strait Islander people compared with other Australians, which perhaps reflects that these two populations are at different stages in the epidemic of obesity and diabetes.

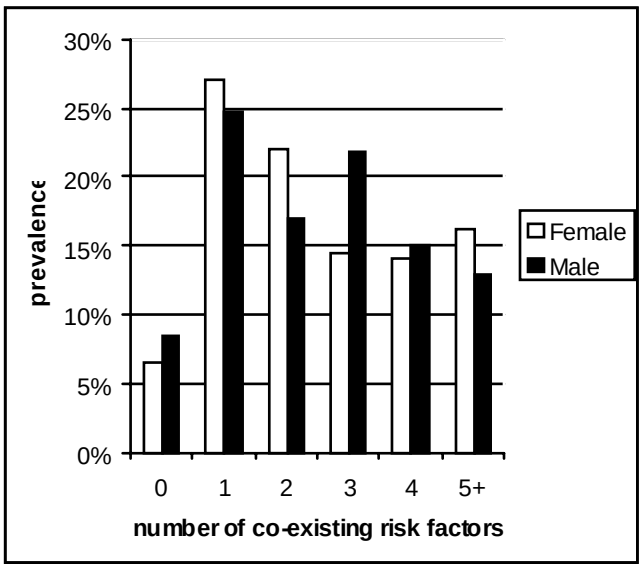
The high prevalence of obesity and diabetes among women in the Torres Strait has, in addition to the impact on their own health, a potential intergenerational impact on the health of their children.[16] Much attention in recent years has focused on the inter-relationship of under-nutrition in early life and chronic disease in adult life.[17] However, less frequently discussed is the inter-relationship of over-nutrition in early life and chronic disease in adult life. The children of mothers who were diabetic during pregnancy or who subsequently developed diabetes have a marked amplification of risk of early onset obesity and diabetes.[18,19] This intergenerational effect probably contributes to the increasingly high prevalence and early onset of diabetes in populations where obesity and diabetes are already prevalent. Indeed, Type 2 diabetes has been diagnosed in primary school-aged children in the Torres Strait in recent years.[20]

As in other populations, the prevalence of co-morbidities such as hypertension, dyslipidaemia and renal disease was higher among people who had diabetes, but the high prevalence of these other risk factors among those Torres Strait Islanders who were not diabetic is particularly striking. The high prevalence of hypertension among young men is notable and may be related to the high prevalence of drinking among this group.

Hypercholesterolaemia was less common than reported in the AusDiab study, consistent with data from other Indigenous Australian populations.[21] In contrast, low levels of HDL cholesterol and high levels of triglycerides were very common. The high prevalence of smoking and the low levels of physical activity contribute to the poor health demonstrated here. Poor nutrition, attributable in part to limited access to healthy food,[22] compounds the negative effects of smoking and low levels of physical activity.

Figure 1: Prevalence of co-existing risk factors* within an individual for women and men.

*Risk factors included are abdominal obesity, hypertension, hypercholesterolaemia, dyslipidaemia, diabetes, micro- or macro-albuminuria and smoking.



A limitation of the present study is that both the communities that participated in these surveys and the individuals who participated in each community were self-selected. Therefore, the question remains as to how representative the results are of the population of Torres Strait and the Northern Peninsula Area. Anecdotal information attributed low participation to internal community politics, religious beliefs and, in one location, concerns about the Human Genome project rather than to health characteristics of attenders and non-attenders. The results shown here are congruent with routinely collected health data for the Torres Strait and NPA Health Services District that show high levels of hospital separation for diabetes, particularly for women, and excess mortality for diabetes for both men and women compared with Queensland.[23] Furthermore, the present survey sample was indistinguishable from the district population with respect to age and gender distribution. Subsequent to these surveys, a simplified annual adult health check has been developed which is being incorporated into routine health services in the Torres Strait and Northern Peninsula Areas Health Service District. This check, supported by a computer-based management system, will provide representative routine health information in the future.

The epidemic of obesity and diabetes among people of the Torres Strait is a relatively recent phenomenon. The rise in prevalence of obesity, diabetes and associated conditions has often been attributed to genetic susceptibility exposed when people assume a Western lifestyle.[24] More recent research points to the potent intergenerational effect of abnormal glucose tolerance in mothers[18,19] as contributing to the familial pattern of inheritance, while

the influence of social determinants[25] on health are increasingly recognised as contributing to inequalities in health that become self-perpetuating across the generations.[26] Such research highlights the need for interventions to address the non-genetic factors contributing to the poor health profile of Torres Strait Islander people as described here. Food supply issues, especially access to good-quality fresh fruit and vegetables, and lifestyle behaviours must be addressed. Access to education and employment opportunities are also needed.

The Torres Strait Diabetes Summit in 1996 led to the development of *Meriba Zageth for Diabetes – Our Work for Diabetes*, an integrated strategy to address the prevention, early detection and management of diabetes. A review of *Meriba Zageth* four years later identified that while progress had been made in the clinical areas of early detection and management of diabetes, little progress had been achieved in prevention components of the strategy.[27] Substantial investment in expertise and resourcing of preventative strategies is required if the problem of chronic disease among Torres Strait Islander people is to be reduced.

It is ironic that the gap between the health status of Torres Strait Islander people and other Australians may be diminishing, not because of improved health in the Torres Strait but because of the burgeoning epidemic of obesity and diabetes among Australians in general.[12] Recent reports have highlighted that intensive interventions to improve nutrition and physical activity among people at high risk of diabetes can reduce or delay progression to diabetes.[28-30] The application of such research among Torres Strait Islander people would provide experience and expertise which, as well as contributing to equity for Indigenous people, will be of value in addressing a health issue of increasing concern to all Australians.

Acknowledgements

This study was made possible by a grant from the National Health and Medical Research Council (grant # 944727). Our thanks go to Philip Mills OAM, manager of the Torres Strait and Northern Peninsula Area Health Service District, Queensland Health and Mrs Grace Fischer, of the Torres Strait and Northern Peninsula Area Health Council, for their ongoing support and assistance. Our thanks also to Connie Karschimkus for assistance with laboratory assays, to Sophia Dunn and Hanz Spier for data management and to Fiona Tulip and Brad McCulloch for assistance with statistical analysis. We also thank the many people who worked on the adult health screenings reported here and the participants and communities who made this work possible by their participation. *Prapa eso po yupla.*

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