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Rheumatic Disease in an Australian Aboriginal Community in North Queensland, Australia. A WHO-ILAR COPCORD Survey

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ABSTRACT. ***Objective***. To estimate prevalences of rheumatic diseases in Aboriginal Australians.

Methods. The methodology of the Community Oriented Program for the Control of Rheumatic Diseases (COPCORD) was followed. Everyone aged 15 years or older in Yarrabah, North Queensland, was invited to complete a COPCORD Core Questionnaire. Aboriginal health workers carried out a house-to-house survey during January 2002. People reporting current musculoskeletal symptoms and 56 others (controls) were examined at the community health center.

Results. Eighty percent of the target population was covered during the survey. Eight hundred and forty-seven questionnaires were completed (47% men) and 135 people refused, a response of 86%. Rheumatic symptoms within the previous 7 days were reported by 33% and past symptoms by 22%. The most common sites of current pain were low back (12.5%), knee (11.2%), and shoulder (8.9%). Sixty-seven people (7.7%) said activities were limited by their symptoms. Two hundred and sixty-three people were examined, and the most common diagnoses were soft tissue pain (point prevalence 7.4%), osteoarthritis (5.5%), and low back pain (4.3%). The cumulative prevalence of gout was 7.0% in men and 0.9% in women over the age of 15 years. The relative risk of gout associated with drinking regularly was 2.5, and with body mass index > 25 was 3.3. No rheumatoid arthritis or systemic lupus erythematosus cases were identified, but there were 4 cases of psoriatic arthritis (point prevalence 0.5%).

Conclusion. This is the first unselected population study of rheumatic diseases in Australian Aboriginals. There was a high prevalence of gout among men, with modifiable factors of weight and alcohol identified. (J Rheumatol 2004;31:965–72)

Key Indexing Terms:
PREVALENCE RHEUMATIC DISEASES ABORIGINAL AUSTRALIAN COPCORD

The Community Oriented Program for the Control of Rheumatic Diseases (COPCORD) is a joint initiative by the World Health Organization (WHO) and the International League of Associations for Rheumatology (ILAR), and was established in 1981[1]. The aims of COPCORD are to help correct the information deficit about the epidemiology of rheumatic diseases, particularly in rural communities in developing countries, and to consider disease prevention and possible disease risk factors for the wide range of rheumatic complaints[1]. The COPCORD methodology was designed to be simple and cost effective, utilizing local health workers who perform a house-to-house survey, collecting data on rheumatic complaints and disability in a cohort aged 15 years and over. A rheumatologist examines symptomatic or disabled people. Prevalences can then be estimated for rheumatic diseases. An important part of a COPCORD survey is the subsequent development of an education program for health workers and the community, with the aim of preventing rheumatic diseases, and ensuring that those suffering obtain appropriate treatment. COPCORD surveys and programs have been carried out in many countries in the Asia-Pacific region[2-11] and Central America[12,13].

There have been no previous population surveys with regard to rheumatic diseases in Indigenous Australians. Hyperuricemia in Aboriginal Australians was described 30 years ago[14], but the first case of crystal confirmed gout was only reported recently[15]. A review in 1999 stated that gout, rheumatoid arthritis (RA), and HLA-B27 related arthropathies occurred rarely in Australian Aborigines, but that systemic lupus erythematosus (SLE), acute rheumatic

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fever, and osteoarthritis (OA) of the elbow and temporomandibular joints were relatively common[16]. The sources for the review included historical and archeological data, from a time when Aboriginal Australians had a hunter-gatherer lifestyle, very different from the situation today. A survey of chronic back pain of an Aboriginal group in Central Australia found that while such symptoms were common, people did not seek medical help for the pain[17].

The objective of this study was to estimate prevalences of rheumatic diseases in Aboriginal Australians. A secondary objective was to try and identify any modifiable risk factors for rheumatic disease in this population.

MATERIALS AND METHODS

Population. From the 1996 Australian census, 386,049 people identified themselves as Indigenous Australians, approximately 2.1% of the Australian population[18]. Of these, 81% stated they were Aboriginal only, with the remainder being Torres Strait Islander (TSI), or of both Aboriginal and TSI descent. Most of the health-related data collected by the Australian Bureau of Statistics refer to hospital admissions or deaths in hospital and are reported for all Indigenous people, with no differentiation made between the Aboriginal and TSI peoples. Australian Aborigines migrated in successive waves from Southeast Asia between 50,000 and 150,000 years ago. TSI have a separate identity and culture from Aborigines and have probably occupied the islands between Cape York in Northern Queensland and Papua New Guinea for more than 10,000 years.

The target population for this survey was all residents of Yarrabah aged 15 years and over, 1309 people by the 2001 Australian census.

Approval for the survey was granted by Gurriny Yealamucka Health Committee, Yarrabah Community Council, and the Ethics Committee of Cairns Base Hospital. Informed, signed consent was obtained from each person aged 18 years or over, or from the parent or guardian of those aged 15 to 17 years, prior to questionnaire completion and medical examination.

Six Aboriginal people from Yarrabah were recruited to carry out the house-to-house survey, of whom 5 were trained health workers. Translation of the questionnaire was not required as all members of the community have English as their first language. The questionnaire consisted of 10 pages. Demographic data collected on every respondent consisted of: age; sex; marital status; Aboriginal, TSI, or "other" origin; and occupation.

Everyone was asked whether they had ever had rheumatic symptoms, namely, pain, tenderness, swelling, or stiffness in any bone, muscle, or joint. If the answer was negative, no further questions were asked and the respondent was categorized as "never having had rheumatic symptoms." If the answer was positive, further questions were asked to establish whether the symptoms had occurred within the previous 7 days (current symptoms) or more than 7 days ago (past symptoms), and where in the body they had been. People were also asked to indicate on a diagram of the human body where they had experienced symptoms, and to mark on a visual analog scale (VAS) the severity of any pain. Any precipitating event, such as sporting injury, fracture, or traffic accident was also enquired about, and any limitation of activities due to the symptoms. People who said they were currently limited in their activities completed a Health Assessment Questionnaire (HAQ), which is scored from 0 (no disability) to 3 (maximum disability)[19]. Treatment for the rheumatic symptoms was also recorded, including where the treatment was given, for example hospital or general practitioner. People were asked if a doctor had given a name (diagnosis) for the problem. Finally, people were asked how well they had been able to adapt to the problem.

The health workers worked in pairs, visiting each house in the community repeatedly, until each person eligible for the survey had either completed the questionnaire or refused to participate.

People reporting rheumatic symptoms within the previous 7 days were invited to Gurriny Yealamucka Health Centre (GYHC) for medical examination by NM or SS. We also invited everyone for examination who stated on the questionnaire that they had been given a diagnosis of gout or RA in the past, even if they had no current symptoms. People were asked to attend for examination within 3 days of completing the questionnaire.

To test the sensitivity of the questionnaire 56 people who reported no current symptoms were examined.

A proforma was completed during the examination. Height, weight, and blood pressure were measured. In addition to recording whether any rheumatic symptoms were currently present, a standard medical and surgical history was taken, including co-morbidities and a record of all current and previous drug treatments taken. Family history, and alcohol and smoking habits were recorded, and any food or other triggers identified by the person for the rheumatic symptoms. A general examination was performed in addition to the examination of the musculoskeletal system. Clinical diagnosis was reached where possible, as in previous COPCORD surveys[1].

In February 2002, followup treatment clinics were held at GYHC by NM and SS when 52 people who had been examined as part of the survey were invited to attend for corticosteroid injections or initiation of other treatment, including investigation and referral to specialists at Cairns Base Hospital. We worked closely with the locum general practitioner at Yarrabah throughout as several people attending for examination as part of the survey needed immediate medical treatment.

Data were analyzed in Excel (Microsoft) and SPSS (Version 10.1), using t test or chi-square testing as appropriate, with $p < 0.05$ considered significant.

RESULTS

Description of cohort. The total number surveyed (completed, refused, and unable) was 1046, a coverage of 80% of the target population based on the 2001 census data. Of the 847 who completed the questionnaire, the mean age was 35 (standard deviation, SD, 13, range 15 to 86) years, and 401 (47%) were male. Nearly half (48%) were single, with 19% married, 28% de facto (living as man and wife), 3% widowed, and 1% separated or divorced. Ninety-seven percent of respondents stated they were Aboriginal, 1.4% they were TSI, 0.5% they were Aboriginal and TSI, and 0.9% "Other." The results are presented including all those who were surveyed and examined.

Eight hundred and forty-seven people completed the questionnaire and 135 people refused, a response rate of 86%. There was no significant difference in the mean ages of those completing and refusing to complete the questionnaire (35 and 34 yrs, by t test), and no significant difference in the proportions of men and women (47% and 49% were male, by chi-square test).

Sixty-four people (45 men) were unable to complete the questionnaire. The reasons included dementia or memory loss, mental illness, or being absent from the community during the survey (for example, in prison). There was no significant difference in the mean ages of those completing and unable to complete the questionnaire (35 and 37 yrs), but significantly more men than women were unable to complete the questionnaire ($p < 0.001$), due to more men being in prison.

Rheumatic symptoms. Rheumatic symptoms were defined in the questionnaire as "any pain, tenderness, swelling, or stiff-

ness in any bone, joint or muscle." In the 847 who completed the questionnaire, 281 (33%) reported rheumatic symptoms within the previous 7 days (current symptoms). The mean age was 38 (SD 14) years and 45% were male. A further 185 (22%) respondents [mean age 33 (SD 12) years, 55% male] reported past rheumatic symptoms, more than 7 days ago. The remaining 381 (45%) stated they had never experienced rheumatic symptoms [mean age 33 (SD 13) years, 45% male]. Women were more likely than men to report current symptoms, while men were more likely to report past symptoms ($p = 0.036$, 4-way comparison by chi-square test). The mean age of those with current symptoms (38 yrs) was higher than those who reported either never having had rheumatic symptoms (33 yrs, $p = 0.001$), or past symptoms (33 yrs, $p < 0.001$). The most common sites for rheumatic symptoms within the last 7 days were: back pain (12.5%), knee pain (11.2%), and shoulder pain (8.9%). Age- and sex-specific rates of these complaints are shown in Table 1. The symptoms reported for each area shown for current and past symptoms are shown in Table 2. The mean VAS of pain associated with current symptoms was 53 (SD 26).

Occupation and disability. The majority of people surveyed were in work (n = 579, 68%). Only 73 (9%) were unemployed and 24 (2.8%) were unable to work through ill health. There were 35 (4%) people in full-time education, 104 (12%) had housework or child-care as their main occupation, and 32 (4%) were retired. One hundred and twenty-five people (112 men) worked as laborers (cementing and fencing), and 58% of these people reported musculoskeletal symptoms either currently or in the past, compared with 54% of the remaining 722 people surveyed, who were not laborers.

Sixty-five people (7.7%) said they were limited now in the kind or amount of activities they could do because of current rheumatic symptoms. However, the median HAQ score was only 0.875, with a range of 0.125 to 2.0. Several respondents were unable to do activities such as competitive sports or heavy work and such limitations of activity were not captured by the HAQ, which was designed to measure disability in RA.

Table 2. Symptoms by area reported by 847 completers of questionnaire. Current symptoms were within the previous 7 days, past symptoms more than 7 days ago. More than one area was reported in many cases, particularly for past symptoms.

	Curent Symptoms n (%, 95% CI)	Past Symptoms n (%, 95% CI)
Back	106 (13, 10 to 15)	103 (12, 10 to 14)
Knee	95 (11, 9 to 13)	121 (14, 12 to 17)
Shoulder	75 (9, 7 to 11)	80 (9, 7 to 11)
Ankle	63 (7, 6 to 9)	82 (10, 8 to 12)
Wrist	51 (6, 4 to 8)	64 (8, 6 to 9)
Hand	40 (5, 3 to 6)	38 (4, 3 to 6)
Elbow	32 (4, 2 to 5)	34 (4, 3 to 5)
Neck	29 (3, 2 to 5)	45 (5, 4 to 7)
Great toe	17 (2, 1 to 3)	43 (5, 4 to 7)
Hip	15 (2, 1 to 3)	37 (4, 3 to 6)

Precipitant of symptoms — trauma. Reported precipitants of rheumatic symptoms are shown in Table 3. Those reporting sporting injuries were more likely to be young and male, while those who reported a fall as the cause of their symptoms were more likely to be older and female. Motor vehicle accidents and fractures were as likely to be reported by either sex, and showed no association with age (Table 3).

Treatment. Of the 466 people who reported rheumatic symptoms, either within the last 7 days or in the past, 179 (38%) had not sought or received any treatment. Self-treatment, with simple analgesics or tablets from friends or family was used by 30 (6%), while 178 (38%) had visited the general practitioner.

Table 1. Age-and sex-specific rates of current symptoms and the most commonly reported sites with current symptoms.

	Population by 2001 Census	Number Surveyed (% of Census)	Current Symptoms at Any Site, n (% Surveyed, 95% CI*)	Low Back, n (% Surveyed, 95% CI)	Knee, n (% Surveyed, 95% CI)	Shoulder, n (% Surveyed, 95% CI)
Men						
Total	657	401 (61)	127 (32, 27 to 36)	41 (10, 7 to 13)	47 (12, 9 to 15)	28 (7, 4 to 9)
Age 15–24	201	98 (49)	24 (24, 16 to 33)	5 (5, 1 to 9)	8 (8, 3 to 14)	6 (6, 1 to 11)
Age 25–44	315	220 (70)	74 (34, 27 to 40)	25 (11, 7 to 16)	29 (13, 9 to 18)	17 (8, 4 to 11)
Age 45–64	115	71 (62)	23 (32, 22 to 43)	10 (14, 6 to 22)	9 (13, 5 to 20)	5 (7, 1 to 13)
Age 65 and over	26	12 (46)	6 (50, 22 to 78)	1 (8, –7 to 24)	1 (8, –7 to 24)	0 (0, 0 to 0)
Women						
Total	652	446 (68)	154 (35, 30 to 39)	65 (15, 11 to 18)	48 (11, 8 to 14)	47 (11, 8 to 13)
Age 15–24	195	114 (58)	26 (23, 15 to 31)	11 (10, 4 to 15)	9 (8, 3 to 13)	4 (4, 0 to 7)
Age 25–44	327	244 (75)	83 (34, 28 to 40)	37 (15, 11 to 20)	20 (8, 5 to 12)	24 (10, 6 to 14)
Age 45–64	100	71 (71)	36 (51, 39 to 62)	14 (20, 10 to 29)	16 (23, 13 to 32)	15 (21, 12 to 31)
Age 65 and over	30	17 (57)	9 (53, 29 to 77)	3 (18, 0 to 36)	3 (18, 0 to 36)	4 (24, 3 to 44)

* 95% CI: 95% confidence interval. 135 people refused to take part and 65 were unable.

Table 3. Precipitants of current symptoms reported in the questionnaire. Some people recorded more than one precipitant of symptoms (in different parts of the body, and at different times). "Other" included 9 work-related incidents, 4 assaults, 2 accidental knife cuts, and 1 each of: meningitis, stingray sting, vein graft site for CABG, bicycle accident, shot by pellet gun (self-harm), and jumped over fence. 1 other cause was not stated.

	n (% with current symptoms, n = 281)	Mean Age (SD)	T test of Mean Age	Men n (%)	Women n (%)	Chi-square of Sex
No precipitant (spontaneous)	149 (53)	39.6 (13.6)	—	54 (36.2)	95 (63.8)	—
Sporting injury	47 (17)	29.1 (8.6)	$p < 0.002$	38 (80.9)	9 (19.1)	$p < 0.001$
Fracture, broken bone	23 (19)	35.0 (12.5)	NS	11 (47.8)	12 (52.2)	NS
Traffic accident	12 (4)	37.3 (12.2)	NS	8 (66.7)	4 (33.3)	NS
Fall	19 (7)	45.3 (18.9)	$p < 0.001$	5 (26.3)	14 (73.3)	$p = 0.063$
Strain or sprain	32 (11)	36.3 (12.3)	NS	12 (37.5)	20 (62.5)	NS
Other	22 (8)	38.1 (15.3)	NS	14 (63.6)	8 (36.4)	NS

NS: not statistically significant.

Rheumatic diagnoses. There was a mean delay of 2.4 days between completion of the questionnaire and medical examination for the 263 people who were examined, 171 of whom had current symptoms. Those with current symptoms had a shorter mean delay (1.7 days, range 0–14 days) than those without current symptoms (5.0 days, range 0–3 days). Overall, 80.5% of people were examined within 3 days of completing the questionnaire. The delays in examining some people with current symptoms will have resulted in an underestimate of the prevalence of short-lived conditions such as low back pain or soft tissue conditions.

The rheumatic diagnoses reached are shown in Table 4. No rheumatic diagnosis was reached in 81 people (classified as "normal" in Table 4). This included 47 people with current rheumatic symptoms by questionnaire, 16 people with rheumatic symptoms in the past, and 18 people who had never had symptoms. Nineteen of these people had an abnormal general medical examination, and a non-rheumatic diagnosis was reached that accounted for their symptoms. Referral to the general practitioner or specialist was made in 6 cases.

Table 4. Diagnoses and point prevalences in the 263 people examined.

Diagnosis	n (%)	Point prevalence, %, 95% CI
Normal*	81 (31)	9.6, 7.6 to 11.5
Soft tissue pain	63 (24)	7.4, 5.7 to 9.2
Osteoarthritis	47 (18)	5.5, 4.0 to 7.1
Low back pain	36 (14)	4.3, 2.9 to 5.6
Gout**	32 (12)	3.8, 2.5 to 5.1
Arthralgia	13 (5)	1.5, 0.7 to 2.4
Sporting injury	5 (2)	0.6, 0.1 to 1.1
Psoriatic arthritis	4 (1.5)	0.5, 0.0 to 0.9
Rheumatic fever***	2 (1)	0.2, –0.1 to 0.6
Reactive arthritis	1 (0.5)	0.1, –0.1 to 0.3
Septic arthritis***	1 (0.5)	0.1, –0.1 to 0.3

* Normal: no rheumatic diagnosis. ** In 7 cases of gout, tophi were present. The prevalence for gout is cumulative, and included people with past episodes of gout, and/or tophi. *** The 2 cases of rheumatic fever had persistent arthralgias that were attributed to previous episodes of rheumatic fever. No acute cases of rheumatic fever were diagnosed during the survey. Similarly, the case of septic arthritis was not acute, but had persistent symptoms despite adequate treatment.

In those in whom a rheumatic diagnosis was reached, soft tissue problems predominated (n = 63) and were nearly always localized. Only 2 cases had generalized pain, and only one person, who declined treatment, fulfilled the American College of Rheumatology criteria for fibromyalgia[20]. The most common sites of localized soft tissue pain were shoulder (n = 25), neck (n = 7), and hip (greater trochanteric pain, n = 5).

The diagnosis of OA was made clinically in 47 people without the use of radiographs, and some people diagnosed with soft tissue pain or back pain (see below) may in fact have had OA. From the history (especially of trauma and sports injuries), cases were categorized as primary OA in 26 (88% female) and secondary OA in 21 (82% male). Women were thus more likely to have primary, and men secondary OA ($p < 0.001$, 4–way comparison by chi-square test), and the mean age for primary was significantly higher than for secondary OA (51 vs 39 yrs, $p = 0.002$, t test). Seventy-seven percent of all people diagnosed with primary OA were overweight (body mass index, BMI > 25). The most common site of both primary and secondary OA was the knee (15 and 11 cases, respectively). Lumbar spine OA was not diagnosed as no radiographs were taken as part of the survey, but some of the cases with back pain (see below) probably had OA. In the 36 people with back pain, 2 had sciatica when seen. Only 1 (different) person had undergone surgery (2 lumbar discectomies), and still had back pain.

In the questionnaire, 52 people (39 men, 13 women) stated they had gout. Men were more likely to report gout than women ($p < 0.001$), and the mean age of those reporting gout was significantly higher than those who did not report having gout (44 vs 34 yrs, $p < 0.001$). We examined 44 (85%) of these people and agreed with the diagnosis

of gout in 29 (66%). A further 3 men with symptoms in the past were diagnosed with gout.

Gout was therefore diagnosed in 32 people, 28 men (88%). In 10 cases, the diagnosis was confirmed (by the demonstration of urate crystals in joint aspirate in 3 cases; by the presence of tophi in 5 cases; or by both in 2 cases). In a further 17 cases, there was a good history for gout, including rapid development of an inflamed joint in response to a recognized trigger and a prompt response to nonsteroidal antiinflammatory drugs (NSAID), or podagra. In the remaining 5 cases, gout was a possible diagnosis. Sixteen (50%) of the people we diagnosed with gout reported seafood as a trigger for an attack of gout, 10 reported alcohol, and 10 reported tomatoes. Other food triggers for gout reported by only up to 3 people each were: greasy foods, cucumber, red meat, chili, garlic, oranges, and cheese.

Of the 32 people diagnosed with gout, 7 were receiving no treatment and 17 used NSAID (almost exclusively indomethacin), either continuously or as required. Only 2 were taking allopurinol, although 9 others had been prescribed it in the past. All had stopped taking the drug due to perceived lack of efficacy, and in several cases allopurinol had been started during an acute attack of gout. One person was taking aspirin, and another frusemide (furosemide). No subject was recorded as taking a thiazide diuretic, although 11 received unspecified anti-hypertensive medication, which may have included thiazides. Five people had co-existing diabetes, and 3 were taking lipid-lowering medication.

In Table 5, the percentages of the 32 people diagnosed with gout in whom various factors associated with gout are present in comparison with the 231 people examined and not diagnosed with gout. From these data, the risk of having gout in this cohort was increased 3.3 fold by being overweight (BMI > 25), and 2.5 fold by regularly drinking alcohol.

We further explored the relationships between risk factors in Table 5 and the expression of gout by logistic regression analysis. In the model, older age ($p < 0.001$), male sex ($p < 0.001$), and a family history of gout ($p < 0.019$) were predictive of gout. Surprisingly, current regular alcohol intake and BMI were not predictive. However, male sex and alcohol intake were closely related, as were age and BMI, and a larger sample size may be necessary for the modifiable factors of alcohol and BMI to reach significance.

We found no cases of RA, SLE, or other connective tissue disease. However, 4 cases of psoriatic arthritis, all in people with a psoriatic rash, were diagnosed, giving a point prevalence of 0.5%.

The sensitivity of the questionnaire was 86% (14% of those reporting never having had rheumatic symptoms had an abnormal musculoskeletal history and/or examination), and the specificity was 76% (a diagnosis of a rheumatic disorder was made in 76% of those examined with current rheumatic symptoms).

Comorbidities. The median BMI (kg/m^2) of those examined was 26, with a range of 15 to 51. Fifty-eight percent were overweight (BMI > 25) and 72 (27%) were obese (BMI > 30). Of the 263 people examined, 62 (24%) were hypertensive, 33 (12.5%) had diabetes, and 6 (2%) had raised cholesterol. All these conditions had been previously diagnosed, and treatment prescribed elsewhere. A history of rheumatic fever was present in 29 (11%), and 10 (4%) had rheumatic heart disease and were taking prophylactic penicillin.

DISCUSSION

This is the first unselected population survey of Aboriginal Australians with regard to rheumatic diseases. The COPCORD methodology was followed, the core questionnaire was administered by local health workers, and prevalences for rheumatic diseases were subsequently estimated. The overall coverage of 80% of the population (as estimated from the 2001 census data) was lower than we had hoped. Reasons for this include the fact that the survey was carried out during the holiday period and some people may have been staying with relatives outside the community. It can be seen from Table 1 that for each age group the percentage of women surveyed was higher than men, compared to the population estimate from the census, and men may be more likely to travel away from the community during holidays. The census was carried out in August 2001 and the survey in January 2002. It is unlikely that the population of Yarrabah changed significantly during this time. The

Table 5. Factors associated with gout.

	Diagnosed with Gout, % (n = 32)	Examined and Not Diagnosed with Gout, % (n = 231)	Probability of Gout Associated with Each Risk Factor (chi-square test)
Male	88	42	p < 0.001
Age > 40 yrs	63	39	p = 0.013
BMI > 25	78	55	p = 0.008
Regular alcohol intake	59	37	p = 0.014
Family history of gout	31	18	p = 0.070 (NS)

BMI: body mass index (kg/m^2), NS: not statistically significant.

percentage of the estimated population from the census surveyed by age group and sex is also shown in Table 1, and it can be seen that the lowest response was in the youngest and oldest male groups, 49% and 46% respectively. Each of these groups included people unable to participate in the survey, for example due to being in prison, or having dementia.

The life expectancy for Indigenous Australians is reduced by about 20 years for men and women compared to the Australian population as a whole[18]. There are high rates of diabetes, renal disease, hypertension, obesity, and alcohol and tobacco use in Australian Aboriginal people, and also often poor access to, or utilization of, health care[18]. Rheumatic fever and subsequent rheumatic heart disease is still prevalent[21] and has been linked to overcrowded living conditions in many communities[22].

Yarrabah is an Australian Aboriginal community approximately 50 km by road southeast of Cairns, North Queensland. In 1892 Yarrabah was proclaimed an Aboriginal Reserve by the Church of England Mission, and between 1898 and the 1960s many children and adults of mixed Aboriginal and mainly European descent were taken from all over Cape York and forcibly settled at Yarrabah[23]. In addition, the Aboriginal people who were living on Cape Grafton, the site of Yarrabah, were obliged to live in the mission, and in 1904 a group of Aboriginal people who had already been removed once to Fraser Island off south Queensland were brought to Yarrabah[23]. In common with many other Aboriginal communities in Australia therefore, the ancestry of the population of Yarrabah is heterogeneous having been created by the policies of Australian governments during the twentieth century.

Despite its proximity to Cairns, Yarrabah is semi-isolated in several ways and has been described as "semi-remote"[21]. Geographically, there is a mountain range covered in dense rainforest between the coastal plain and the main road to Cairns. This barrier is one reason why the land was chosen as the site of the mission originally (to prevent escapes, and to protect the Aboriginal inhabitants from the settlers in Cairns), and the resulting cultural and political isolation continues in many respects today. Although many people from Yarrabah visit Cairns regularly for shopping and entertainment, it is relatively rare for non-Aboriginal people to visit Yarrabah.

The most interesting finding was the prevalence of gout, especially in light of the literature which states gout is rare in Indigenous Australians[16]. In our study, 3.8% of the population aged 15 years or more were diagnosed with gout, 7.0% of men and 0.9% of women. This prevalence is compared with selected other population surveys in Table 6, and can be seen to be higher than in the United Kingdom (in the 1970s[24]) or rural Indonesia[4], but lower than in the New Zealand Maori population[25]. This last study found the European population in New Zealand has an increased prevalence of gout approaching that found in Aboriginal Australians in this survey[26] (Table 6). Important lifestyle-associated risk factors for gout were identified in the survey, namely being overweight and regular alcohol intake. BMI > 25 and regular alcohol intake were associated with an increased risk of having gout of 3.3 and 2.5, respectively. These factors were not significant in a logistic regression analysis, however, probably due to confounding effects of age and male sex (see Results).

When hyperuricemia was first described in Indigenous Australians in 1969, communities were largely alcohol-free and obesity was rare[14]. As may be the case in New Zealand Maori peoples, the genetic tendency for hyperuricemia, which was beneficial during a hunter-gatherer lifestyle when food was scarce, appears to have resulted in the expression of gout on the adoption of a westernized lifestyle. A limitation of this study was that serum uric acid levels were not measured. The COPCORD studies in Indonesia found prevalences of gout much higher than previously suspected[4].

The Aboriginal population has a much younger age-structure than the non-indigenous population, and the mean age of the people over 15 years old surveyed was 35 years. The life expectancy is 57 years and 62 years for indigenous men and women, respectively, compared with 75 years and 81 years for all Australian men and women, respectively[18].

The rates of reported current pain were higher than in other COPCORD surveys such as those in rural Thailand, and rural and urban Philippine populations (Table 7). It is not clear why this is so.

The limitation of activity (disability) reported by 7.7% people aged 15 years or older in Yarrabah was also higher than in other COPCORD surveys. For example, in rural Thailand 3% of people were defined as disabled[9]. However, in the Thailand survey, people were asked about difficulty in performing specific tasks, rather than a general question such as we used initially. If there was a positive response to the question "Are you limited now in the kind or amount of activities you can do because of pain, tenderness, swelling, or stiffness in your bones, joints, or muscles?" the interviewer in our survey proceeded to the HAQ. The subsequent HAQ scores obtained were generally low (median 0.875), which was unsurprising as the HAQ was developed to measure disability in RA, and not difficulty with sporting or work activities.

The most common rheumatic diagnosis was localized soft tissue pain, with the shoulder, neck, or hip the most common sites. In common with other population surveys, reported rates of pain increased with age (Table 1).

OA, both primary and secondary, had an overall point prevalence of 5.5%. Primary OA was more common in older, overweight women, while secondary OA was more common in younger men and often attributed to sports injuries and other trauma. We found no cases of elbow or

Table 6. Prevalence of gout in population surveys.

	n Surveyed	Men (%, 95% CI)	Women (%, 95% CI)	Overall (%, 95% CI)
United Kingdom[24]	258 091	0.6*	0.1*	0.3, 0.3 to 0.3
New Zealand European[25]	315	5.8, 1.9 to 9.7	0.6, –0.5 to 1.7	2.9, 1.0 to 4.8
New Zealand Maori[25]	342	13.9, 8.0 to 19.8	1.9, 0.1 to 3.7	6.4, 3.8 to 9.0
Rural Indonesia (Java)[4]	4458	1.7, 1.2 to 2.2	0.1, 0.0 to 0.1	0.8, 0.5 to 1.1
Australian Aboriginal (Yarrabah, present study)	847	7.0, 4.5 to 9.5	0.9, 0.0 to 1.8	3.8, 2.5 to 5.1

CI: confidence interval. * 95% CI not available as number of men and women surveyed not provided[24].

Table 7. Prevalent rheumatic pain in people aged 15 years or more reported in population surveys.

	n Surveyed	Men Reporting Pain (%, 95% CI)	Women Reporting Pain (%, 95% CI)	Men and Women Reporting Pain (%, 95% CI)
Rural Thailand[9]	2455	12, 10 to 14	23, 21 to 25	18, 16 to 20
Rural Philippine[2]	1675	15, 13 to 17	19, 16 to 22	17, 15 to 19
Urban Philippine[8]	3006	11, 9 to 13	21, 19 to 23	16, 15 to 17
Rural (Java) Indonesia[4]	4458	25, 23 to 27	23, 21 to 25	24, 23 to 25
Australian Aboriginal (Yarrabah, present study)	847	32, 27 to 37	35, 31 to 39	33, 30 to 36

temporomandibular joint OA, unlike findings in paleopathological studies[16], where up to 20% of male skeletons showed evidence of elbow OA. It has been suggested that this was due to the hunter-gatherer lifestyle with repeated spear throwing, and use of the jaw to crack open foods.

A survey of 3001 Australians aged 15 years or over in South Australia found 8.6% reported a doctor had given them a diagnosis of OA, and 4% had been given a diagnosis of RA[26]. No joint examinations were performed in the study, and self-reported arthritis was associated with being female, aged over 65 years, and reduced quality of life (measured by Medical Outcome Study Short Form-36). The population surveyed was said to be representative of the Australian population generally and will thus have been mainly Caucasian[26].

We found no cases of SLE, other connective tissue diseases, or RA. It has been shown that the shared rheumatoid epitope occurs infrequently in Aboriginal Australians[27], and in a series of 7 cases of RA in Indigenous Australians recently reported, 4 carried the epitope[28]. However, of these 4 cases, one was from Papua, New Guinea and 2 others were Torres Strait Islanders. The prevalence of SLE in Aboriginal Australians has been estimated as 1 in 1900 in a study in the Northern Territory region of Australia[29], and it is therefore not surprising that no cases were identified in this survey.

The finding of 4 cases of psoriatic arthritis was unexpected. This is the first report of psoriatic arthritis in Aboriginal Australians to our knowledge. Following the survey, an education program was run at Yarrabah. A training day was held for health workers, and leaflets about the relevant rheumatic conditions were designed for distribution from GYHSAC. Also, the football (rugby league) players were told the results of the survey and advised about sports injuries. Feedback to the community has also been via a poster of the main findings at GYHSAC, the GYHSAC newsletter, and the touch-screen kiosk in the council offices.

The survey found significant numbers of people affected by all types of trauma, including sports injuries and falls. GYHSAC hope to employ 2 health workers in the future with the aim of reducing the impact of trauma on community members. These health workers will also liaise with medical staff about rheumatic conditions and continue the education about preventing gout and other conditions.

Many indigenous people in Australia today have health problems including diabetes, chronic renal failure, rheumatic heart disease, and asthma. Lifestyle factors such as alcohol use, smoking, and obesity contribute to illness and subsequent reduction in life expectancy[18]. In addition, infections such as rheumatic fever, and chronic respiratory, skin and gastrointestinal infections that may be linked to poor infant and child development and later cardiovascular disease, can be attributed to poor housing and washing facilities in many communities[30]. The enthusiastic response to this community-led survey demonstrated that Aboriginal Australian people are concerned about their health, and keen to find out about conditions such as gout, OA, and sports injuries, which impact greatly on their lives. Aboriginal health workers and communities are already concerned

about adverse lifestyle factors such as obesity and excess alcohol use, and are addressing them through programs designed to reduce gouty attacks. These could have important additional health benefits on, for example, hypertension and diabetes. To be successful, such programs would have to be locally designed and implemented and acknowledge cultural factors.

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