

Table 5. Body mass index of the Junjuwa elderly (over 50 years): percentage distribution.

| BMI:* | Underweight under 20 % | Acceptable 20-25 % | Overweight 26-30 % | Obese over 30 % |
|------------------------|------------------------------|--------------------------|--------------------------|-----------------------|
| Total | | | | |
| elderly <i>n</i> =42 | 12 | 55 | 19 | 14 |
| Men <i>n</i> =19 | 21 | 58 | 16 | 5 |
| Women <i>n</i> =23 | 4 | 52 | 22 | 22 |
| 51-60 yrs <i>n</i> =13 | 0 | 62 | 15 | 23 |
| 61-70 yrs <i>n</i> =19 | 16 | 53 | 21 | 10 |
| 71-80 yrs <i>n</i> =10 | 20 | 40 | 30 | 10 |

Source: Wahlqvist et al (unpublished)

Table 6. Percentage distribution of Australian elderly by body weight classification and age.

| BMI:* | Underweight under 20 % | Acceptable 20-25 % | Overweight 26-30 % | Obese over 30 % |
|-----------|------------------------------|--------------------------|--------------------------|-----------------------|
| Men | | | | |
| 50-54 yrs | 1.2 | 37.6 | 44.6 | 15.4 |
| 55-59 yrs | 2.6 | 33.7 | 44.6 | 16.0 |
| 60-64 yrs | 2.0 | 34.4 | 49.0 | 10.9 |
| 65-69 yrs | 3.9 | 33.7 | 49.5 | 11.5 |
| Women | | | | |
| 50-54 yrs | 6.0 | 41.6 | 30.0 | 19.3 |
| 55-59 yrs | 5.4 | 41.2 | 28.8 | 23.0 |
| 60-64 yrs | 4.8 | 41.0 | 37.2 | 15.2 |
| 65-69 yrs | 5.8 | 35.6 | 36.3 | 20.6 |

* BMI Body mass index (weight[kg]/height[m]²)

Source: ref. 35.

23.7%³⁹, with an estimate for Australian Aborigines of between 10 and 20%³. This is compared to an estimated prevalence of 4.6% in the Australian general population⁴⁰. In the Australian general population the prevalence of diabetes is higher in men than in women⁴¹. However in the Aboriginal population the overall prevalence appears to be similarly high for men and women³⁹.

In the only study of the prevalence of NIDDM in Aborigines in Victoria, comparisons between an Aboriginal population and a non-Aboriginal population from the same area were performed. The crude prevalence of diabetes was 7.8% for the Aboriginal population and 3.4% for the non-Aboriginal population. Diabetes was more common in both Aboriginal men (8.8% vs 4.0%) and women (7.2% vs 2.8%). The age of onset for diabetes also differed between the groups and suggested an earlier onset of diabetes for Aborigines⁴². These results are consistent with those from other parts of Australia⁴³, and indicate that the prevalence of NIDDM is increased for both Aboriginal men and women in Victoria. The increased prevalence of diabetes is probably an important contributory factor to the high prevalence of circulatory system diseases. The high prevalence may relate to diet, stress and other environmental factors, but also may relate to genetic susceptibility.

It has been suggested that Aborigines have a genetic susceptibility to developing NIDDM when they undergo rapid lifestyle change. The increased susceptibility may be due to a long evolutionary adaptation to an environment where periods of low food availability were common. Exposure to this environment might have lead to subtle genetic changes resulting in an improved ability to store energy in the form of fat when food was relatively

abundant, and to use the stored fat for energy in the lean times. This characteristic which may have been advantageous in the traditional lifestyle could now predispose to obesity, or abdominal obesity in particular, and eventually to NIDDM^{44,45}.

Hypertension

Surveys prior to 1970 have reported relatively low blood pressures amongst Aborigines³⁹. However, recent studies have generally found that blood pressure levels are higher in Aborigines than non-Aborigines^{39,46} and a general association between 'westernization' and blood pressure, but there are some inconsistencies³⁹. If the recent studies are considered together, then it appears that hypertension is a significant problem in many Aboriginal communities. The prevalence is probably 1.5-2 times that of the non-Aboriginal population^{39,46}, which has been estimated at 16.7% for men and 12.7% for women³⁵. There has been one study which has measured blood pressure levels in a Victorian Aboriginal population. Diastolic, but not systolic blood pressure was higher for an Aboriginal population³⁶. Although anecdotal evidence suggests that hypertension is a problem in Kooris, this cannot be assumed without data.

Relationships between health statistics and nutrition

Available data on morbidity and mortality for Aborigines in Victoria is limited, but the indication is that the overall situation is similar to the rest of Australia. That is: all-cause mortality is 2-3 times that of the general population; the leading cause of death is circulatory system disease, including ischaemic heart disease and stroke; and the prevalence of obesity, NIDDM, and hypertension is higher than that of the general population.

These disorders and diseases are all nutrition-related. They have in common many of the same nutritional risk factors. Obesity, NIDDM and hypertension are also risk factors for circulatory system disease. In general a high intake of fat, a low intake of plant foods, a lower intake of fish, and a low food variety is associated with an increased risk for these disorders and diseases. The available data on contemporary Aboriginal nutrition, mortality from circulatory system disease, and prevalence of abdominal obesity, NIDDM and hypertension, would indicate that the contemporary Koori diet is too high in fat, and too low in fibre, fish and variety, leading to premature circulatory system disease. Further evidence is required to verify this suggestion.

Methods for the collection of nutritional data

The many methods available for collection of nutritional information include those for obtaining food intake and other dietary data, biochemical measurements which can provide an indication of nutrient intake, measurements of body composition which relate to nutritional status, and anthropological approaches to the assessment of nutrition and health. Before such methods can be used to study the nutrition of Victorian Aborigines a general understanding of the social, economic, cultural and demographic nature of the population is necessary. This may call for anthropological investigations.

Anthropological enquiry

One of the biggest obstacles to obtaining nutrition-related information in a specific group is knowing what information is required and therefore which areas to focus the information gathering tools upon. To ask questions about all parts of life relating to nutrition, and to perform all biochemical and body compositional measurements, would be extremely time-consuming and intrusive. Anthropological approaches can and have been used to study diets and factors influencing diet. Information obtained from these studies can be used to improve the design of more formal, systematic studies of food intake and nutritional status. These studies can also be useful for describing the social and cultural determinants of diet and health.

Principles of food selection, classification and dietary construction have been reviewed by Messer⁴⁷. Knowledge of these factors is useful to understand the determinants of food intake in a community or culture. Sensory characteristics of food such as taste, texture, visual characteristics and perception of psychological effect; cultural factors such as whether or not particular foods can be eaten, or by whom they can be eaten; dietary structure including how the diet is put together; and economic factors such as income and food cost are all important determinants of diet⁴⁷.

Anthropological studies generally focus on the social, psychological and ecological aspects relating to nutrition. This information, when viewed together with other food intake and nutritional information gathered on Kooris, would provide a more complete picture of Koori nutrition and health.

Systematic enquiry

Rapid assessment procedures (RAP). It has been established that the first step in an enquiry into food and nutrition is to obtain social, economic, cultural and demographic information to document qualitatively, rather than quantitatively, what the nutritional problems are, and what factors are contributory to these problems. This information is however often difficult to use in a quantitative or semi-quantitative way. The anthropological approaches for obtaining information relating to diet are also often time consuming.

Rapid assessment procedures (RAP) have been developed to obtain information relating to nutrition and health quickly, and in a way that the data can commonly be used in a quantitative or semi-quantitative fashion. They are a set of procedures which can be modified to particular needs and circumstances. The RAP method uses a combination of formal and informal data to obtain information about diet and factors relating to the diet of a community⁴⁸ and has been reviewed by Scrimshaw and Hurtado⁴⁹, who have produced a manual of RAP procedures.

Once particular problems have been identified, there can be discussion about use of the information. Decisions can be made as to directions for further work. One of the biggest advantages of RAP is that the information obtained does not remain the property of the researchers. Because the community is involved directly in the collection of the data, the information can also remain within the community.

Food intake data. There are several methods available for estimation of usual dietary intake. These methods include dietary records, 24-hour recall, and food frequency questionnaire.

Dietary records or food diaries are detailed descriptions of types and amounts of foods and beverages consumed over a given period of time, usually 3 to 7 days. In some cases the food may be weighed⁵⁰. These methods are time consuming, expensive, and intrusive into the lives of the subjects, and can result in alterations to usual food intake. For Kooris this method may be used in small selected groups, however because of the problems outlined its usefulness may be limited⁵¹.

The 24-hour recall method is relatively rapid, requiring 10 to 20 minutes with trained interviewers. The success of this method depends upon memory, cooperation and communication ability of the subject, and on interviewer skill. Food models are often helpful. The major weakness of the 24-hour recall method is that food intake is variable from day to day, and any one 24-hour period does not represent the longer term intake. This method is therefore not useful if an assessment of long-term intake of individuals in a study is required. They can however be used to estimate the average intake of large groups of people⁵⁰.

The 24-hour recall and diet record methods are generally expensive, unrepresentative of usual intake, and inappropriate for assessment of past diet. Food frequency methods for the assessment of long term diet have therefore been developed. The principle of the food frequency approach is that long-term exposure to foods has a better relationship to health and disease than the intake assessed over a few days. Food frequency questionnaires have become the main method for measuring dietary intake in epidemiologic studies because they are easy to complete; often, being self administered, they provide a better estimate of long-term intake, and they are relatively easy to process. Food frequency questionnaires are also useful because they can be adapted to the group being studied and to aims of the study⁵². A food frequency questionnaire adapted for use with Kooris may be the best method to obtain food intake information on individuals in a Koori community.

Detailed information on dietary practices can also be obtained by questionnaire. This questionnaire can be self-administered or administered by an interviewer. Information on dietary practices is usually obtained at the same time as the food intake information is gathered.

Measurements of body composition. Anthropometric measurements such as weight, height, waist and hip circumferences, and skin folds are often used to assess nutritional status, and disease risk. Height and weight are the most commonly used measures of nutritional status on a world wide basis. The body mass index (BMI) is an assessment of relative weight used to classify people into groups according to weight for height. The BMI, calculated as the weight divided by the square of height, provides information about the long-term energy intake. The National Health and Medical Research Council (NH&MRC) has reviewed evidence relating BMI to morbidity and mortality and have suggested that the acceptable 'healthy' range is between 20 and 25⁵³. A BMI less than 18.5 has been associated with chronic energy

deficiency⁵⁴, and individuals with a BMI less than 20 can be classified as underweight. Individuals with a BMI between 26 and 30 are classified as overweight, and those with a BMI above 30 are classified as obese. Obesity is related to an increase risk of morbidity and mortality from several diseases²¹.

Other measurements for the estimation of body fatness include skin fold measurements, densitometry which is based on underwater weighing, and bioelectrical resistance and conductance methods.

The distribution of body fat can be assessed by measuring waist and hip circumferences, and subscapular skin folds. As with obesity, abdominal obesity is a risk factor for several diseases³⁷. However abdominal obesity is a risk factor independent of obesity based on the BMI⁵⁵⁻⁵⁸.

Body compositional measurements relating to body compartments other than fat can also provide information about nutritional status. Assessment of total body nitrogen or lean body mass, and measurement of bone density can contribute important nutritional information. These measurements are rarely used in larger epidemiologic studies due to time and cost considerations. It is unlikely that these methods would be employed unless a problem was identified and a specific question needed to be answered.

In studies of Koori groups, the measurement of weight, height, and waist and hip circumferences are, at least initially, the most useful body compositional measurements. They are easy to perform, non-invasive, and they provide a great deal of information about nutritional status.

Biochemical markers of nutrient intake. Several biochemical measurements can be used as indicators of nutrient intake. Plasma or serum is the biological sample used most commonly for these measurements. However the concentration of particular vitamins, minerals, or fatty acids in other samples, such as adipose tissue, blood cells, skin, urine, hair, nails, and breath, may also be used. The advantage with these tests is that they are objective, but these measurements also have the same problems of misclassification and bias, as food intake methods. The sensitivity of the nutrient to intake, non-dietary determinants of the nutrient concentration, the type and accuracy of the analytical procedure used, and which time frame the measurement relates to are important considerations. Attention to specimen collection, storage, and analysis is also vital to avoid misclassification and bias⁵⁹. However in particular circumstances the measurement of nutrient levels in blood or other tissues can provide a useful indication of nutrient intake.

Nutritional status of Aborigines in Victoria and Australia

Information about the food intake or markers of nutrient intake in Aboriginal populations in Victoria has not been collected. Very little nutritional data is available and it is therefore difficult to state with any degree of certainty what the nutritional status of the Koori population might be, despite the importance of nutrition as a determinant of health.

The dietary information that is available comes largely

from remote rather than urban or rural areas of Australia. This is despite the fact almost 25% of Aborigines live in major urban centres with populations of over 100 000 people. The geographic distribution of Aborigines varies between states. In Victoria the majority live in urban centres, whilst in the Northern Territory most live in rural and remote areas⁴. Because Aboriginal groups live in different locations in different social and economic circumstances, nutrition information collected in one group may not relate directly to another. However there are many similarities in circumstance between Aboriginal groups in remote Australia and Victorian Aborigines which may make examination of such literature useful.

Studies of food intake and nutrition status

The recent arrival of the formalized rapid assessment procedures (RAP) have opened the way for their use in Aboriginal populations. At least one study has been performed where RAP methods have been used to gather information. In a study by Wahlqvist et al.³⁴, information about food intake and health status of an elderly Aboriginal population in a remote community in Western Australia was gathered using RAP. The quantitative food frequency questionnaire was modified using RAP procedures, then used with key informants and groups of selected elderly Aborigines which allowed cross checking of the data. From this information a consensus statement was obtained about the usual dietary patterns of the group. Apparent total energy intake was high, with sugar, fatty beef and white flour contributing more than 50% of energy intake. Dairy products, fruits, vegetables and whole grain cereals were eaten irregularly and in small quantities³⁴.

Community studies are an important source of information about the contemporary diet of Aborigines. These are studies of remote communities where most of the food is obtained from a single community store. Food entering the community can be estimated from purchases or from store turnover⁴. There are several problems with these studies. Individual food intake is not assessed. The contribution of bush foods may not be taken into account, and food intake may be underestimated. The data collected from the stores says nothing about food distribution and although the estimated intake of particular nutrients may suggest nutrient adequacy, particular individuals may still be at risk. However these studies do provide information about dietary changes which occur when an Aboriginal population moves from a traditional diet to one predominantly purchased from stores. This may be analogous to Aborigines living in urban and rural areas who also have some choice about the foods bought in stores. Therefore, although these studies cannot be related directly to Aboriginal groups in urban and rural areas, they may provide some guide to their situation.

In a recent study by Lee⁶⁰ of a remote coastal community in the Northern Territory store turnover data was collected over a 12-week period. It was found that the variety of foods eaten was limited. Only 18 foods contributed more than 2% to the total energy, and of these, four foods (sugar, flour, bread and meat) provided over 55% of total energy. Sixty percent of the sugar intake was derived from white sugar, which is the equivalent of 38 teaspoons per person per day. Sixty-five

percent of the fat was derived from fatty meat and take-away foods such as potato chips. Although energy intake was excessive, the apparent intake of dietary fibre, some minerals (calcium and zinc) and some vitamins (retinol equivalents, riboflavin, vitamin E, vitamin B₆, folic acid) were inadequate⁶⁰. Data from several other community studies is now quite old, the studies being conducted in the 1960s and 70s⁴.

Available dietary information for Aboriginal groups in urban or rural Australia is scant. In a dietary survey by Kamien et al.⁶¹ of 17 Aborigines from two families from Walgett in New South Wales, six days of weighted food records were obtained. Meat and bread intake was high, and protein intakes were generally above the recommended dietary allowances. Measurement of vitamin levels in blood revealed several vitamin deficiencies. Blood levels of vitamins A, C, E, B₁, B₂, B₆, B₁₂, folic acid and beta-carotene were measured. Low blood levels of one or more of these vitamins were found in every individual in the study. The dietary data also indicate that the intake of calcium and iron were low in several individuals⁶¹. In another study from Walgett in New South Wales, the nutrient intakes of Aboriginal and white children were compared using 24-hour recall data. Total energy and protein intakes were not significantly different between the two groups, and neither group was at risk of protein deficiency. The intake of several vitamins including thiamin, riboflavin and ascorbic acid were significantly lower in the Aboriginal group suggesting that this group was at increased risk of vitamin deficiency⁶².

A recent study of an Aboriginal population in Victoria by Guest³⁶ has included questions about food habits. Although food intake was not assessed in this population, some useful information about food habits was obtained. The results indicate that the consumption of take-away foods, sugar, salt and added fats was high in the Aboriginal population studied.

Data from dietary studies, studies where nutrient levels in blood have been measured, and studies where anthropometric measurements have been taken in Aboriginal groups outside Victoria, may provide some indication of the Koori diet and nutritional status. However the composition of the Koori diet in Victoria is largely unknown. An effort needs to be made to obtain a better indication of the nutritional status of Kooris.

Alcohol and tobacco use

Some information on alcohol use and abuse in Aboriginal groups has been collected; much is from anthropological studies and the data are therefore descriptive. Several of these studies have linked the use of alcohol with a way of life considered normal by a community. Recently there has been increased emphasis on the collection of data on alcohol use and associated morbidity and mortality⁶³. However very little of this information is available. In the study by Guest³⁶, the prevalence of alcohol consumption was similar for Aborigines and non-Aborigines. However the non-Aborigines drank with increased frequency, and more Aborigines drank only on weekends or pay week. The extent of any problem in the populations could not be estimated because the amount of alcohol consumed was not determined³⁶.

The prevalence of tobacco use in Aborigines has been determined in only a few selected populations. In a study from the Northern Territory, over 50% of Aborigines smoked and 25% chewed tobacco⁶³. Guest et al.⁶⁴ have compared the prevalence of smoking in an Aboriginal and a non-Aboriginal population from Victoria. It was found that the smoking prevalence was quite high for Aborigines (64.4%) when compared to non-Aborigines (22.8%). The results also suggested possible links between smoking and obesity, abdominal obesity, and the intake of sugar, salt and fat. It would appear that smoking is a major problem, and may be an obvious target for public health action³⁶.

Conclusions

There are several areas where information on Koori nutrition is lacking. Food intake, and dietary practice, such as cooking methods, salt and sugar use, and meal patterns are largely unknown. Measurements relating to nutrition, such as BMI, waist circumference, and skin folds, and measurements of biochemical markers of nutrient intake, have not been performed in Koori groups.

It is generally agreed that information about Koori nutrition should be available so that the problems can be identified, and strategies put in place to address the problem areas. Some information on food habits has been collected and the only other information available at the present time is observational, which has not been documented. Some of the reasons why this information has not been collected have been presented. These difficulties still apply to the collection of this data today. There should therefore be some consideration of the best, most culturally sensitive ways to obtain this data.

The first step is probably to document qualitatively and semi-quantitatively, using anthropological methods including rapid assessment procedures (RAP), what the nutritional problems are in Koori communities, and which factors are important contributors to these problems. Some decision about the relative importance of particular areas of nutritional assessment can then be made. The methods employed will be related specifically to the purpose of any future study.

The collection of information on the prevalence of nutrition-related disorders can be difficult. These disorders are often not included as contributors to morbidity and mortality in hospital data. The best way to obtain an assessment of the prevalence of these disorders in the Koori population is to include measurements of obesity, blood pressure, and diabetes in studies conducted in Koori populations.

Without having identified specifically where the nutritional problems lie for Kooris, the available data obtained from Aboriginal groups in other parts of Australia and to a lesser degree Victoria, suggest that the diet is too high in fat, sugar and salt, and in certain cases alcohol, and too low in plant foods and variety resulting in an increased risk of mortality from circulatory system diseases and an increased prevalence of obesity, NIDDM and hypertension. Cigarette smoking would also appear to be a major problem. Given that the nutritional problems for Kooris are similar to other

Aboriginal groups across Australia, the dietary guidelines recommended for the general population would apply also to the Aboriginal population in Victoria. That is, total and fat intake should be reduced; sugar and salt use should be minimized; alcohol consumption reduced where appropriate; and the variety of foods eaten increased, with the increase in variety coming mainly from plant foods.

'Guide-lines on Ethical Matters in Aboriginal and Torres Strait Islander Health Research' have been drawn up by the National Health and Medical Research Council NH&MRC⁶⁵. These guide-lines provide information about the general ethical issues relating to the area of research on Aboriginal and Torres Strait Islander health. These guide-lines should be followed for all future research activities.

Acknowledgement. The authors are privileged to have been able to draw upon the rich food and health cultural heritage and contemporary knowledge of the Aboriginal community in Victoria, and beyond, in the preparation of this paper.

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Nutrition and health of Victorian Aborigines (Kooris)

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Asia Pacific Journal of Clinical Nutrition 1993, 2, 43-57.

摘要

維多利亞州土著 (KOORIS) 的營養與健康

歐洲人殖民來澳洲以前，其健康狀況也許較土著為差。但過去200年來，非土著澳洲人的健康得到大大改善，而土著居民的健康却相反地趨向惡化。僅近年來土著居民的健康才出現一些改善。

住在維多利亞州的土著居民稱為KOORIS。傳統的KOORI膳食是重要的，因為KOORI人進食這種膳食普遍地獲得健康。傳統的KOORI膳食是高膳食纖維，高未精制的碳水化合物，高蛋白，並有足夠的維生素和礦物質，同時總脂肪和飽和脂肪含量低，蔗糖低，鹽低，沒有酒精。他們的生活方式是體力活動多，結果減少了可能發生的肥胖，其他方面值得注意的是傳統性的膳食中的食物種類較多。

由於KOORI人失去了祖傳的土地和破壞了他們的社會和文化，因而帶來了目前的健康問題。KOORIS從狩獵自給社會進入了一個幾乎完全靠政府供給食物的社會。目前有許多因素也許會使KOORIS健康和營養不良，這些因素的相對重要性仍未知曉。

發病率和死亡率數據提供了人群健康和營養狀況有價值的資料。雖然土著和非土著澳洲人之間的健康存在明顯的差異，但澳洲居民畢竟是世界上最健康的居民之一。引起土著死亡的主因是循環系統疾病，包括缺血性心臟病和中風。土著男女由循環系統疾病致死的為非土著澳洲人的2.2-2.6倍。青年和中年土著因循環系統疾病致死的為非土著澳洲人的10-20倍。土著入住醫院為其他人群的2.5倍-3倍，而以嬰兒的住院率最高。雖然死亡統計沒有顯示與營養性疾病如肥胖，非胰島素依賴性糖尿病(NIDDM)和高血壓有明顯的關係，但這些統計並不能代表問題的真相。從澳洲整體來說，土著的肥胖症，NIDDM和高血壓均高於一般人群。維多利亞州土著的發病率和死亡率的數據不多，但已指出了與澳洲其他地區的情況相似。如果維多利亞州的情況與澳洲其他地區相似，那麼可以設想目前KOORI膳食是脂肪太多，或者酒精也太多，而膳食纖維和食物種類太少。要說明這一設想，進一步的證據是需要的。

在維多利亞州已收集的發病率和死亡率的數據較多，但分析和發表的數據較少，而且收集數據的可靠性仍未知曉。收集了數據需要分析和發表，討論數據的確實性將會使數據的收集得到改進。有關維多利亞州土著人數應準確估計，因為這個數字對統計的比率是非常重要的。

評估土著人群的膳食和營養的研究不多。這些膳食資料大部分來自澳洲的偏僻地區，而來自城市和鄉村的較少。從澳洲偏僻地區的研究發現，總能量進食偏高，蔗糖、肥牛肉和白面粉供給大量熱能。乳製品、水果、蔬菜和全谷類進食不規則並數量偏少，而維生素和礦物質進食則不足。從城市和鄉村人群得到的營養數據是不多的：從已進行的研究發現有幾種維生素和礦物質缺乏，大部分維多利亞州土著的膳食組成和營養狀況仍未知曉。有一些事實證明他們進食快餐食物，進食蔗糖、鹽和脂肪偏高，有關KOORI人群的營養狀況還需要努力才能得到較好的數據。吸食煙草也是一個主要問題，同時也是公共衛生的主要研究課題。

KOORI營養資料中有幾方面是不足和缺乏的，這些包括食物進食，營養狀況和膳食實況，如烹調方法，鹽和糖的應用與膳食模式。從KOORI營養資料中找出共同的問題並制定解決這些問題的策略是重要的。同時也許會影響KOORI營養的社會經濟知識和有關因素也是重要的。