

REVIEW ARTICLE

Nutrition and health of Victorian Aborigines (Kooris)

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Prior to European settlement of Australia, the health of Aboriginal people was probably better than that of the Europeans. In the past 200 years there has been a considerable improvement in the health of non-Aboriginal Australians, and a deterioration in the health of Aborigines. Some improvement in Aboriginal health has occurred in recent times. The Aboriginal people who live in Victoria are known as Kooris. An understanding of traditional Koori diets is important because people were generally healthy eating these diets. The traditional Koori diet was high in dietary fibre, unrefined carbohydrates, and protein, with adequate vitamins and minerals, and low in total fat and saturated fat, sucrose, salt, and without alcohol. Their lifestyle also dictated a high level of physical activity resulting in a reduced likelihood of overweight. The other notable aspect of the traditional diet was the variety of foods consumed. The present health problems of the Koori people stem primarily from their loss of ancestral lands, and social and cultural disruption. Kooris went from a hunter gatherer society to one almost entirely dependent upon mission handouts. There are many factors which may now contribute to the continued poor health and nutrition of Kooris. The relative importance of any of these factors is unknown. Morbidity and mortality data provide valuable information about the overall health of populations and their nutrition status. The Australian population is one of the healthiest in the world. There is however a remarkable difference between the health of Aboriginal and non-Aboriginal Australians. The leading cause of death for both male and female Aborigines is disease of the circulatory system, including ischaemic heart disease and stroke. Deaths due to circulatory system disease is 2.2 and 2.6 times higher than the age adjusted Australian rates for men and women respectively, and between 10 and 20 times higher for young and middle aged adult Aborigines. Rates of hospital admission are 2.5-3 times higher than the rest of the population, with the highest rates being for infants. Although mortality statistics do not show nutrition related disorders such as obesity, non-insulin dependent diabetes mellitus (NIDDM), and hypertension to be significant contributors to mortality, these statistics are not representative of the problem. Across Australia the prevalence of obesity, NIDDM, and hypertension are higher for Aborigines than the general population. Available data on morbidity and mortality for Aborigines in Victoria are limited, but the indication is that the overall situation is similar to the rest of Australia. If the situation for Victoria is similar to the rest of Australia, then this would suggest that the contemporary Koori diet is too high in fat and perhaps alcohol, and too low in fibre and variety. Further evidence is required to verify this suggestion.

There are several areas where information on Koori nutrition is limited or lacking. These include food intake, nutritional status, and dietary practices, such as cooking methods, salt and sugar use and meal patterns. It is generally agreed that information on Koori nutrition should be made available so that the problems can be identified, and strategies put in place to address the problem areas.

Introduction

Prior to European settlement of Australia, the health of Aboriginal people was probably better than that of the Europeans. In the two centuries since the arrival of the first fleet, there has been a marked improvement in the health of the non-Aboriginal population, and a deterioration in the health of Aborigines. Some improvement in the health of Aborigines has occurred in recent times¹.

This review brings together the present published knowledge on Koori nutrition and health in Victoria. Because details of Koori nutrition and health status are often lacking, information derived from other Aboriginal groups in Australia is also discussed. Methods and procedures for the collection of nutritional information

are also presented. The focus of this review is on adult nutrition. Nutrition in pregnancy, infancy and childhood is not discussed in detail. However most of the areas covered relate to nutrition throughout life.

Although it is generally agreed that the nutrition and health of Kooris as a group is poor, and that there is a high prevalence of nutrition-related disorders and diseases in the Koori population, there is a need for evidence from data collected to state this with certainty. The limited evidence that is currently available to support these contentions is present and discussed.

Traditional foods

Culture and food

The cultural factors relating to food, nutrition and health are many and often complex. This topic will be introduced briefly here, but has been covered in more detail by Anderson², Cutter³ and Harrison⁴.

To understand the past and present status of Aboriginal nutrition and health it is necessary to obtain a historical perspective on Aboriginal culture relating to food. Aborigines have been present in Australia for at least 40 000 years. Prior to European settlement of Australia, the Aboriginal economy was based on hunting and gathering, which was regulated by seasons, rainfall, and food species availability. In the traditional hunter-gatherer lifestyle, much of the day was spent in activities directly relating to food and therefore survival. Gathering, hunting, food preparation and consumption, and education relating to food and the environment were all activities vital to ensure survival. The nutrition of Aborigines was therefore linked to all other aspects of life.

Aboriginal life expectancy at birth, prior to European settlement of Australia has been estimated at about 40 years, with injury and disease being the most common causes of death⁵. However there is evidence that Aboriginal peoples achieved ages of about 65 years or more⁶. Although life expectancies at birth in European countries around 1800 were also about 40 years, morbidity was probably higher, and quality of life lower for the Europeans. Infant mortality was most likely higher for the Aborigines, but once a child reached two years of age the expectation of life was probably higher for Aborigines than Europeans⁷.

Aborigines suffered from relatively few endemic diseases. Two of the most prevalent seem to have been trachoma and yaws. They rarely suffered from the so-called lifestyle diseases such as heart disease, diabetes, hypertension with its sequelae, and obesity which in general have a high prevalence in Aboriginal communities today⁸.

Traditional society was based around the family or clan. The clan may have consisted of related families, or the family of a particular individual. A number of clans would be grouped into tribes². The clan performed the economic, religious, socializing and cultural functions in society⁹. The sharing of resources was an integral part of these clans. The relationships between individuals within a clan was an important determinant of this sharing. Because animal foods, and particularly large game animals were prized, rules of sharing often related specifically to these foods.

The hunter-gatherer lifestyle of Victorian Aborigines, or Kooris, was probably similar to that of groups throughout Australia. However, the foods eaten were often quite different between groups. These differences were largely due to the environment. In the hunter-gatherer society men were required to catch larger fish and game, while women gathered most of the vegetable foods, as well as smaller animal foods such as shellfish, frogs and insects. Women also manufactured implements used for the collection of foods. The type of tools required varied according to the needs of the local group, which in turn reflected the environment². The making of

Table 1. Traditional Aboriginal foods in Victoria.

Animal foods	Plant foods
<i>Large game</i>	<i>Tubers/roots</i>
Kangaroo	Bracken
Emu	Tree fern
Wombat	Orchids
<i>Smaller game</i>	Greenhood orchid
Possums	Cinnamon bells
Ducks*	Murnong
Swans*	Liliaceous plants
Turkey*	Native geranium
Malley Fowls*	Marsh club rush
Eggs	Water ribbons
<i>Water foods</i>	Cumbungi
Fish (a wide variety of species of fish were available in Victoria)*	Blushing windweed
Turtles	<i>Fruits</i>
Crayfish, yabbies, shrimps	Wild or bush tomato
Mussels	Quandong
Frogs	Nardoo
Water rats	Berries
<i>Insects</i>	Cherry ballart
Moths	Lilly pilli
Witchetty grubs	Yams
Honey ants	Pigface fruits
<i>Insect products</i>	Nuts
Honey	<i>Seeds</i>
<i>Fungi</i>	Grass seeds
Blackfellows bread	Acacia seeds
	<i>Leaves</i>
	Pigface leaves
	Bulbine lily
	<i>Other vegetation</i>
	Wild onion
	Salt bush
	Lerp (exudate from gum leaves)
	Banksia nectar
	Flowers

* Not eaten in breeding season

Sources: refs 2, 17, 19, 20

weapons, and the protection of his family was the responsibility of the husband^{9,10}.

Food and nutrition

An understanding of traditional Aboriginal diets is important because the Aboriginal people were generally healthy eating these diets¹. Although many of the bush foods are presently either not available, or are difficult to obtain, information about the composition of these foods is beginning to provide a guide to an appropriate diet in today's setting¹¹⁻¹⁵. Foods presently available might have similar properties to those in a traditional diet. If this information is known then there is potential for the present diet to resemble more closely the traditional diet.

Within Victoria, the availability of food species dictated the diet of specific Aboriginal groups. Table 1 gives the common names of some of the foods eaten by Aborigines in Victoria. This is not an exhaustive list, however it can be seen that a wide variety of foods was eaten. For each of the foods listed there were often several species available. The composition of a food could be very different between species, and within species in different seasons or locations in Victoria. This, together with the variation in availability of food species throughout Victoria, makes an accurate estimate of the traditional diet of Victorian Aborigines difficult.

Roots as a staple food. There is some information

Table 2(a). Composition of several root plants traditionally used as food in Victoria: macronutrients.

Common name	Systematic name	Protein	g/100g dry weight		
			Fat	Carbohydrate	Fibre
Pale vanilla lily	<i>Arthropodium milleflorum</i>	12.2	0.7	49.6	33.1
Chocolate lily	<i>Arthropodium strictum</i>	11.3	0.6	77.5	7.5
Bulbine Lily	<i>Bulbine bulbosa</i>	17.5	1.2	45.5	27.9
Murnong					
– lowland (a)	<i>Microseris scapigera</i>	5.5	2.6	49.0	40.0
– lowland (b)	<i>Microseris scapigera</i>	7.6	4.2	52.6	29.2
– alpine	<i>Microseris scapigera</i>	5.0	1.6	44.2	47.0
Orchid	<i>Chiloglottis trapeziformis</i>	10.0	1.1	56.7	26.7
Greenhood orchid	<i>Pterostylis nutans</i>	14.4	1.3	77.0	5.3
Native geranium	<i>Geranium spp</i>	3.6	1.0	26.0	58.9
Bracken (Austral) fern	<i>Pteridium esculentum</i>	2.0	1.0	47.6	46.6
Cumbungi					
– (a)	<i>Typha spp</i>	9.3	0.3	46.9	40.5
– (b)	<i>Typha spp</i>	5.9	1.0	41.1	49.8

Table 2(b). Composition of several root plants traditionally used as food in Victoria: micronutrients.

Common name	Systematic name	mg/100g dry weight					
		Na Sodium	K Potassium	Ca Calcium	Mg Magnesium	Fe Iron	Zn Zinc
Pale vanilla lily	<i>Arthropodium milleflorum</i>	158	798	187	79.1	0.6	1.4
Chocolate lily	<i>Arthropodium strictum</i>	25	663	64	113	20.6	1.9
Bulbine lily	<i>Bulbine bulbosa</i>	48.5	788	1667	109	49.1	4.2
Murnong							
– lowland (a)	<i>Microseris scapigera</i>	74	933	97	126	15.2	1.1
– lowland (b)	<i>Microseris scapigera</i>						
– alpine	<i>Microseris scapigera</i>	111	642	107	74	27	3.7
Orchid	<i>Chiloglottis trapeziformis</i>	133	1044	300	100	30	3.3
Greenhood orchid	<i>Pterostylis nutans</i>	26	572	66	72	16	2.6
Native geranium	<i>Geranium spp</i>	250	1146	2255	193	59	3.6
Bracken (Austral) fern	<i>Pteridium esculentum</i>	20	608	57	51	7.4	1.0
Cumbungi							
– (a)	<i>Typha spp</i>						
– (b)	<i>Typha spp</i>	203	179	154	295	4.2	2.1

Source: ref. 66.

available about the relative contributions of particular foods or groups of foods to the diet of Victorian Aborigines. There is evidence that in Victoria tubers or roots were the staple, comparable to bread in many European countries, rather than seeds as in other parts of Australia^{16,17}. Europeans who gave accounts of contact with Aborigines described the use of roots as a staple. When animal foods were available the roots were consumed with the meat. However when animal foods ran low, plant foods, and roots in particular provided the most important alternative. Unlike seeds or fruits, roots were available all year round. Roots were also present throughout Victoria, although different species were more abundant in different areas¹⁶.

An account of the ecology of root use by Aborigines in southern Australia is provided by Gott¹⁶. In this paper a more detailed discussion of the use of several roots as food for Aborigines is described. Brand and others⁶⁶ have determined the composition of several root plants (Tables 2(a) & 2(b)). The roots eaten traditionally by Aborigines were usually very low in fat, and high in carbohydrate and dietary fibre. Although not high in protein many of the roots may be regarded as useful plant sources of protein. These foods are also naturally high in

sodium potassium, calcium and magnesium. The water content was usually high, averaging 84% in roots whose composition have been determined¹⁸.

Because roots appear to have been used traditionally as the staple food in many Aboriginal communities in Victoria, it is interesting to compare the composition of the roots with some of these other staple foods such as rice and wheat (Table 3). Protein and fat levels are generally similar between the roots and other staples. The major difference in the macronutrient composition is in the fibre content. Although many of the other staple foods, such as rice, wheat, oats, and potatoes are good sources of fibre, the amount of fibre in many of the roots is very high, sometimes as high as 50% of the dry weight. The roots are also relatively high in sodium, potassium and calcium.

A high intake of dietary fibre, which can be regarded as a surrogate measure for plant food intake, may have several consequences. Epidemiologic studies have found that diets higher in dietary fibre are relatively protective against cardiovascular disease and large bowel cancer. This relationship may be due to the protective effect of the fibre itself, or to the associated higher intake of many

Table 3. Composition of selected staple foods used traditionally in European and Asian cultures.

Staple	Protein	g/100g dry weight			Na Sodium	K Potassium	mg/100g dry weight		Fe Iron	Zn Zinc
		Fat	Carbohydrate	Fibre			Ca Calcium	Mg Magnesium		
Rice										
- white	7.4	0.6	90.3	2.6	24	32	13	42	1.0	2.9
- brown	8.9	2.7	87.1	4.4	5.5	180	13	134	1.4	2.5
Oats	11.9	9.5	69	7.6	3.3	326	50	144	4.1	2.1
Wheat flour										
- white	4.5	1.4	83	4.3	2.2	184	20	39	1.5	0.6
- wholemeal	13.7	2.4	59	12.6	5.7	357	34	116	3.4	1.4
Pasta (white)	12.1	0.9	75	5.4	6.0	61	21	27	1.2	0.6
Bread										
- white	13.9	4.1	77	4.4	729	178	81	44	1.9	1.0
- wholemeal	16.8	4.8	64.7	11.4	782	449	90	100	3.8	2.2
Potato	12.7	0.5	70	12.2	15.9	2383	21	101	3.2	2.1

Source: ref. 24.

vitamins and minerals. The physical properties of certain types of fibre might also reduce the risk of cardiovascular disease by lowering plasma cholesterol concentration. High fibre intakes can also improve the glycaemic response to a glucose load by slowing absorption. The major disadvantage of a high fibre diet is a reduction in the absorption of particular nutrients²¹. Fortunately many of the roots are relatively nutrient dense.

The high calcium content of many of the roots may have ensured an adequate intake of calcium in the traditional diet. The traditional diet did not contain dairy products, which are an important source of calcium in the present day diet of most Australians.

Another aspect of the composition of the roots which has been addressed is the structure of carbohydrates present. Many of the roots contained fructans ie storage carbohydrates composed of two or more monosaccharide fructose units¹⁸. In a study by Incoll¹⁸ it was found that several root species eaten as part of the traditional Koori diet had most of their water soluble carbohydrates (>75%) as fructans. The presence of these fructans in such high concentrations in staple foods is interesting because humans are said to lack the necessary enzyme to convert fructans to fructose²². Fructans cannot be absorbed from the gut, and bacterial fermentation is required to release the energy from fructans. The products of this fermentation are probably short chain fatty acids which can be used by humans for energy. Eating the traditional diet, Victorian Aborigines would require the appropriate gut bacteria to perform the fermentation. It is likely that the presence of these bacteria is a physiological adaptation to the diet rather than a genetic one¹⁷. Europeans who lived with Aborigines for varying periods of time reported no ill effects from eating some of these roots. Because of the high concentration of fructans in the roots, and because it is difficult to determine the percentage of the potential energy available from these compounds, it is hard to assess their energy value in humans.

Fruits, seeds and leaves. The relative contribution of other plants foods, to the total energy content of the traditional diet has not been determined because of the wide variety of plant foods available, seasonality, and varying distribution of these species throughout Victoria.

It is known, however, that a wide variety of plant foods was consumed, including fruits, seeds, leaves and plant exudates.

Fruits were often eaten while the people were out gathering or hunting other foods, and therefore were often not a significant part of the main meals. However, if particular fruits became abundant for only a short period of time, then large quantities would be collected, and the fruit dried and stored. Children were probably important in the collection of fruits²⁰. The composition of fruits eaten in the traditional diet in Victoria has not been systematically determined. Certain fruits however are quite high in particular nutrients. For example the cheeky yam (*Dioscorea bulbifera*) is high in vitamin C (233 mg/100 g)¹⁹. Fruits probably contributed significantly to the intake of particular nutrients such as vitamin C.

Acacia seeds were an important food source for Aborigines living in dryer areas of Australia²³. Particular species, such as *Acacia stenophylla* found along the Murray river, were eaten by Aborigines in Victoria²⁰. Though seeds from several other plants were eaten in Victoria they were probably not a major food source.

Other plant foods, such as leaves and plant exudates, were included in the diet of Kooris. They were probably important sources of several nutrients.

Animal foods. Almost all native animals present in Victoria were used for food by Kooris. In the traditional diet animal foods were an important source of protein and fat. The protein content of wild animals foods is generally similar to domesticated animals²⁴. The amino acid composition of the proteins in the meat of wild animals is of a similar high quality to domesticated animals. With respect to protein therefore, there is not a significant difference between meats eaten in the traditional diet and those available for consumption now. Animal foods consumed in the traditional Koori diet were a vital source of protein.

The other major component of animal foods is fat. The fat in animal foods varies both in concentration and type. In domesticated animals the fat content tends to be higher both through the muscle meat, as well as in the depot fat. The concentration of fat on the carcass of native 'wild' animals tends to be uniformly low²⁵. The

Table 4. Fatty acid composition and lipid content of a range of animal foods in traditional Victorian Aboriginal diets.

Animal food	Saturates	Monounsaturates	Polyunsaturates		Lipid content (%)
			n-6 series	n-3 series	
Mammals					
Eastern grey kangaroo	31.7	29.4	27.9	11.0	ND
Eastern walaroo	28.8	23.5	43.2	4.5	ND
Red kangaroo	35.1	19.1	25.8	6.7	ND
Black-tailed wallaby	25.2	14.8	53.9	6.1	ND
Long nosed potoroo	31.5	25.8	37.9	4.8	ND
Common wombat	36.8	12.9	43.1	7.2	ND
Koala	31.0	11.9	50.8	6.3	0.8
Brush-tail possum	35.8	15.3	35.3	13.6	1.1
Ringtail possum	30.6	34.7	30.2	4.5	ND
Platypus	29.6	18.7	26.9	24.8	1.8
Reptiles					
Red-bellied black snake	29.4	15.5	46.9	8.2	1.0
Crustaceans and molluscs					
Yabbie	22.8	25.6	25.0	26.6	0.7
Mussels	26.6	19.4	6.0	48.0	1.7

ND = Not Determined

Source: ref. 25.

composition of the lipids present is probably a more important consideration. There are two series of essential fatty acids (EFAs), the omega-6 series represented by the EFA linoleic acid, and the omega-3 (n-3) series represented by the EFA alpha-linolenic acid. Domesticated animals tend to be low in EFAs. Naughton et al.²⁵ have determined the fatty acid composition of the muscle meat from wild animals eaten traditionally by Aborigines (Table 4). The muscle meat is uniformly low in fat with a high proportion of polyunsaturated fatty acids (PUFAs). Most of the PUFAs were of the n-6 series, however several species, such as the southern grey kangaroo and the brushtail possum, are relatively rich in n-3 fatty acids.

The liver and fat from animals were also eaten and because of scarcity the fat from carcasses was consumed. The fat from the wild animals was also relatively high in the PUFAs of the n-6 and n-3 series²⁵. The liver is high in vitamin A, as well as several B group vitamins, and particular minerals²⁴.

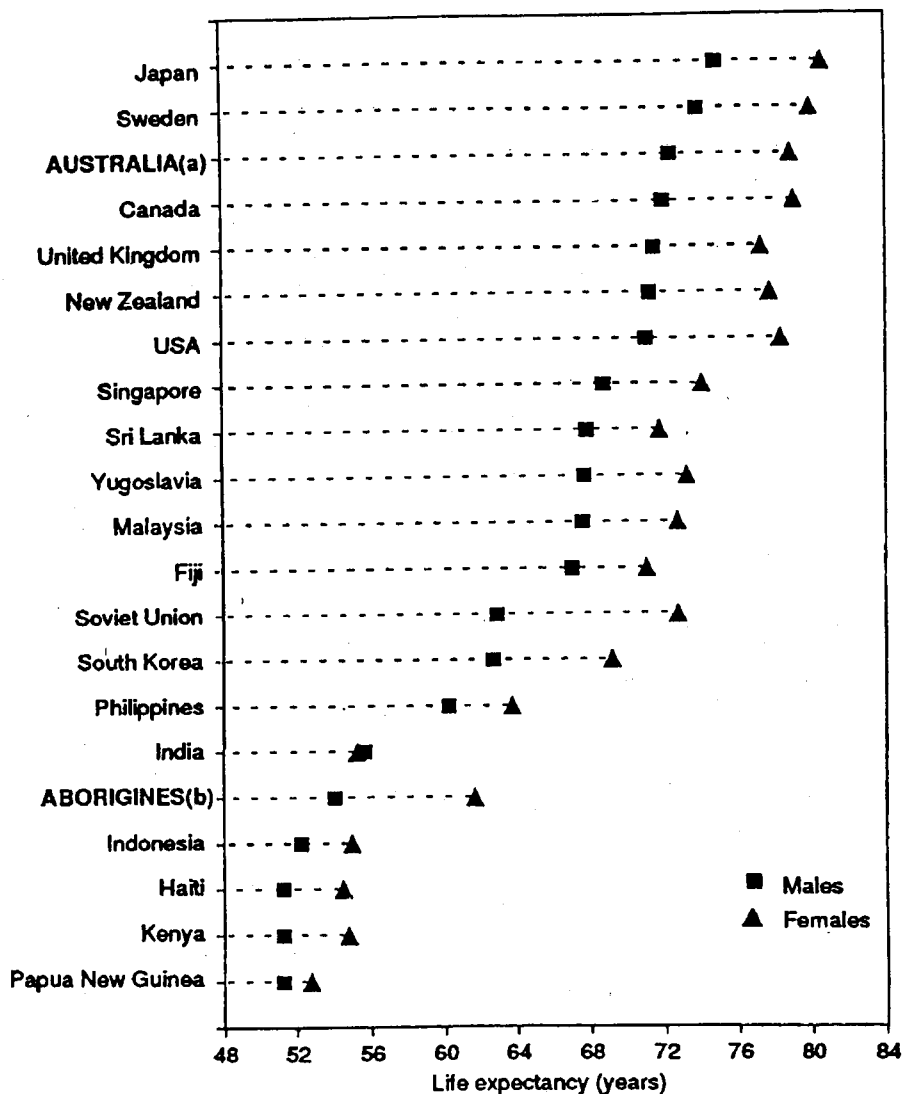
Another major source of n-3 fatty acids in the traditional diet was fish and other marine animals. These foods were an important source of protein and fat in groups residing by rivers or the sea. It can be seen from Table 4 that yabbies and mussels are very high in fatty acids from the n-3 series. Several other species of crustacea and molluscs were also eaten by Kooris. Some of the fish eaten in Victoria included lubrick, mullet, tailor, salmon, trevally, murray cod, perch, and catfish²⁰. Animal foods would therefore be important contributors to the intake of EFAs from both the n-6 and n-3 series, in addition to their obvious importance in relation to protein.

Cooking methods. The cooking methods used traditionally by Kooris were different to many used today in Australia. Food was generally roasted rather than boiled or fried. The ground oven was used by many groups within Victoria to cook animal foods and root vegetables. The major advantages of roasting foods in this way is that there is no added fat, and the loss of vitamins and minerals is reduced.

The traditional diet: an overview. The traditional Aboriginal diet consisted of a wide variety of foods from both plant and animal sources. The vegetable food included tubers, fruits, nuts, flowers, seeds and leaves. Mammals, birds, eggs, fish, shellfish and insects provided much of the protein in the diet^{2,3,17,19,20}. The diet was high in dietary fibre, unrefined carbohydrates, and protein, with adequate vitamins and minerals, and low in saturated fat, sucrose, salt, and without alcohol. The Aboriginal lifestyle also dictated a high level of physical activity, and individuals were therefore less likely to be overweight¹. Early reports describing contact between Europeans and Aborigines in Victoria provide evidence that the population was in good health¹⁰ which suggests that the diet was appropriate for health.

Although many of the foods eaten in the traditional diet are very similar in composition to foods presently available, there appear to be some differences. Root plants, eaten as the staple in most parts of Victoria, contained fructans which are present in relatively few foods available for consumption today. However, because adaptation to these foods is probably not genetic, their presence in the diet is unlikely to be essential for good health. They can most likely be replaced by other plant foods, such as rice, wheat, oats, and potatoes, similarly high in carbohydrate, dietary fibre and particular minerals. Another obvious difference is in the fatty acid composition of animal foods. With the exception of fish and other wild animals still eaten, animal foods available today tend to be higher in total and saturated fat. This difference can largely be overcome by choosing lean cuts of meats, removing visible fat and skin from chicken, eating fish and other seafood, and consuming wild animal foods when available. The other notable aspect of the traditional diet is the high food variety.

A diet consumed from the foods available today may approximate the traditional diet. This diet would include a wide variety of foods, be high in carbohydrate, dietary fibre, protein and essential fatty acids, and low in total and saturated fats and refined carbohydrates such as sucrose. Some attention to the way in which food is cooked would also be required.



(a) Includes Aborigines and Torres Strait Islanders
 (b) Includes Torres Strait Islanders

Fig. 1. Life expectancy at birth for Aborigines and selected countries, 1985. (Reproduced with permission, Australian Institute of Health²⁹, source: United Nations, Demographic Yearbook 1985, UN, New York)

A recent history: post European settlement

The present health problems of Kooris stem primarily from the loss of their ancestral lands resulting in socio-cultural disruption. Kooris went from a hunter-gatherer society to one almost entirely dependent on mission handouts. Aspects of traditional Koori life relating to nutrition and therefore health, such as hunting, gathering, food preparation, and education, either disappeared or were severely altered.

To comprehend the present status of Koori nutrition it is necessary to consider the impact that the settlement of Victoria had on Koori people. Effects of European settlement of Australia reached Victorian Aborigines well before actual face to face contact. Diseases such as smallpox, measles, and influenza devastated many populations well before any contact with Europeans had occurred². The settlement of Victorian land began gradually in the 1830s and initially the two societies lived

side by side. However gradually Kooris were driven from their land and forced to live in reserves and settlements. By the 1850s virtually all Kooris had been removed from their economic base, and by 1860 most of the 2000 surviving Kooris lived in reserves^{1,2}. Removal from traditional land to reserves was devastating for Kooris and many aspects of their life changed.

The nutrition of Kooris is linked to all other aspects of life, as is true for all societies. A low socio-economic status comprising a low income, low educational attainment and low occupational status, can be associated with poorer nutrition, and thus nutrition-related health problems^{26,27}. However low socio-economic status is not necessarily associated with poor nutrition²⁸. Some socio-economic or related factors might be more important contributors to poor nutrition than others. As a group Kooris have a relatively low socio-economic standing and may therefore be more likely to have many of the nutrition-related health problems. The specific

socio-economic factors which provide a stronger influence on nutrition are not known.

Nutrition and age

The relationships between nutrition and age, not only of the individual but also of the community and the culture, are important determinants of nutrition and health. Age in most populations is associated with knowledge, including knowledge of nutrition. Knowledge is accumulated with time and experience, and much is passed down from the previous generation. The transfer of information about nutrition from the elders in the population to the younger people is one of the most important methods of learning about nutrition. If the cycle of learning with experience and knowledge transfer is interrupted with a change in lifestyle and family disruption, such as that which has occurred in the last 150 to 200 years with the Koori population, then time may be required to increase the knowledge base.

Morbidity and mortality

Morbidity and mortality data can provide valuable information about the overall health of populations and their nutritional status. Many of the more important contributors to morbidity and mortality in both the non-Aboriginal and the Aboriginal populations in Australia are nutrition-related disorders and diseases. These include: cardiovascular disease, diabetes, dental caries, obesity and hypertension. Information about the mortality and morbidity rates from these diseases therefore provides an indication to nutrition status.

If, overall, the Australian population is one of the healthiest in the world, there is marked polarization of particular groups in the population. There is a remarkable difference in health between Aboriginal and non-Aboriginal Australians. In many parts of Australia the level of Aboriginal mortality is between two and four times that of the general population, and their life expectancy is 12 to 20 years less than that of other Australians. The expectation of life at birth for Australian Aborigines is comparable with levels reported for India, Indonesia, Haiti and Kenya²⁹ (Fig. 1).

The leading cause of death for both male and female Aborigines is disease of the circulatory system, including ischaemic heart disease and stroke. Deaths due to circulatory system disease is 2.2 and 2.6 times higher than the age adjusted Australian rates for men and women respectively, and between ten and 20 times higher for young and middle aged adult Aborigines²⁹. Death rates from all other causes are also significantly greater for Aborigines. In particular respiratory diseases, injury and poisoning are important causes of death in Aborigines. The observed rates of death, by cause, in Aborigines in relation to the mortality rates of the total Australian population are presented in Fig. 2.

Rates of hospital admissions are 2.5 to 3 times higher than the rest of the population, with the highest rates being for infants. Excluding pregnancy related admissions, injury and poisoning is the leading cause of hospitalization for Aborigines. Respiratory disease is the next most common reason²⁹. Again, the rates of admission from all other causes are higher for Abori-

gines. The hospital admission rates for Aborigines and non-Aborigines are presented in Fig. 3.

The data presented thus far have been obtained from New South Wales, Queensland, Western Australia, and South Australia. Morbidity and mortality statistics for Aborigines obtained in Victoria are scant. Information from Aboriginal hospital liaison officer reports for 1985 indicate that the average age of death for Koori people in Victoria is 50.3 years (48.4 years for men and 53.8 years for women)^{30,31}. However the average age of death is not directly comparable to life expectancy, and therefore can only be taken as an approximation of life expectancy², which is about 58 years for Aborigines across Australia (Fig. 1). Age-specific mortality rates from data collected in Victoria indicates that the mortality rates for young and middle aged adult Aborigines are considerably higher than both developed and developing countries in general³⁰. Data on the major causes of death have been presented by Jennings³¹. As to causes of death, deaths due to circulatory system diseases are at least as common as in the general population; deaths due to accidents are more common amongst Kooris, and death due to cancer is lower for Kooris, and particularly for the men³¹. Jennings³¹ has also analysed hospital morbidity data. Admissions for mental disorders are three times that of the general population, almost entirely due to alcohol related admissions. Respiratory admissions are also high, and the age distribution of Koori patients and the Victorian population also differs. Koori patients are on average younger, and in contrast with hospital admissions in the general community, there are fewer admissions for older Kooris³¹.

For Victoria, more data on Koori morbidity and mortality have been collected than have been analysed or published. The reliability of the data which have been collected is unknown. The identification of individuals of Aboriginal descent is often difficult, and the question is therefore often not asked of patients admitted to hospitals, or false presumptions are made on the basis of skin colour. Hospital workers can be reluctant to ask this question because of fears of a negative reaction from the patient. Death certificates can also be inappropriately filled in. Reliability of morbidity and mortality data rests upon the accurate estimate of the number of people of Aboriginal descent living in Victoria, as this figure is the denominator for rate measurements. The number is not known, and may be anywhere up to 22 000 people. An attempt should be made to obtain an accurate estimate of people of Aboriginal descent in Victoria and to improve data collection.

Nutrition-related disorders

There are several nutrition-related disorders which in general do not show up to a great extent in either morbidity or mortality statistics because they are risk factors for other diseases which result in death. Three of the most prevalent of these disorders in Aboriginal communities seem to be obesity, non-insulin dependent diabetes mellitus (NIDDM) and hypertension.

Obesity

Few studies of Aboriginal groups have been conducted

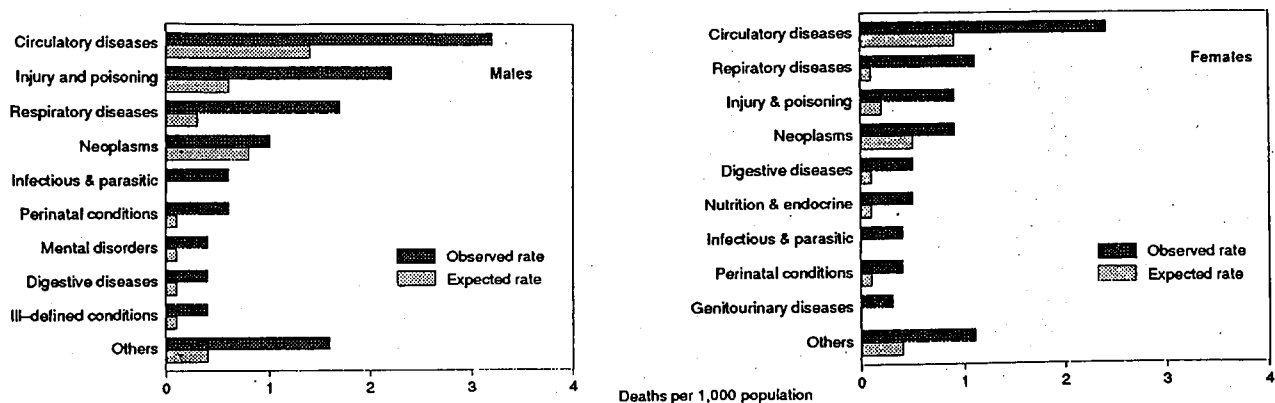


Fig. 2. Deaths of Aborigines by cause, observed and expected rates 1985. The observed rates represent the combined data for Aborigines of the Queensland reserve communities, Western Australia, South Australia, and the Northern Territory. The expected rates are the mortality rates for the total Australian population. (Reproduced with permission, Australian Institute of Health²⁹, source: Health Dept of WA, Northern Territory Dept of Health and Community Services)

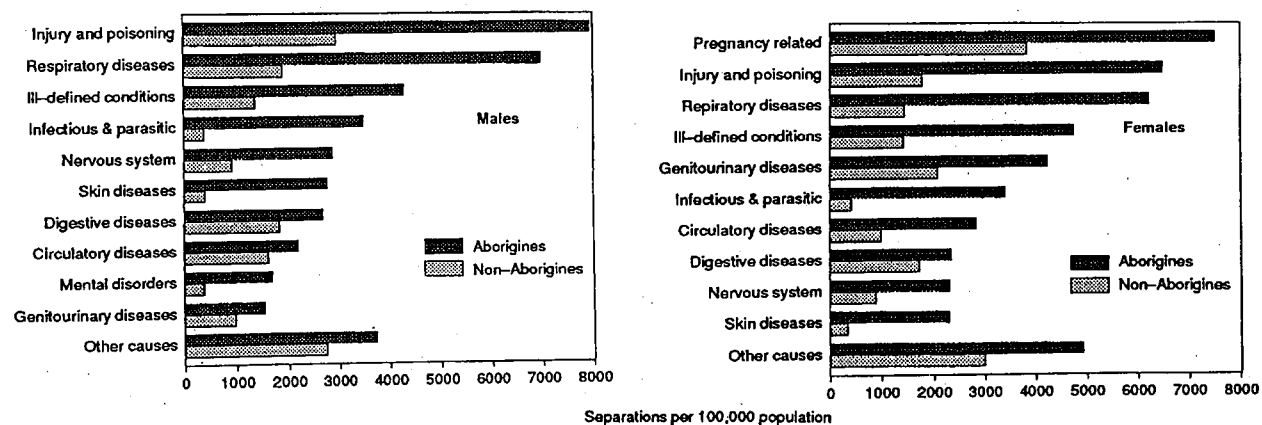


Fig. 3. Hospital separations for Aborigines and non-Aborigines, age standardized rates by principle diagnosis. Figures for both Aborigines and non-Aborigines represent the combined data for Western Australia, South Australia, and the Northern Territory. The Northern Territory data are for 1984. (Reproduced with permission, Australian Institute of Health²⁹, source: Health Dept of WA, SA Health Commission and Northern Territory Dept. of Health and Community Services)

using anthropometric measurements such as BMI. It appears that Aboriginal adults, and women in particular, tend to gain weight rapidly in early adulthood³², despite a high prevalence of underweight in young women 15 to 24 years old³³. In a study by Wahlqvist et al.³⁴, of elderly Aborigines (>50 years) from Junjuwa, Fitzroy Crossing, it was found that 19% were overweight and 14% were obese. The prevalence of overweight and obesity was higher in women than men, and the prevalence of underweight was 21% for men, but only 4% for women (Table 5). For comparison, data from the National Heart Foundation 1989 Risk Factor Prevalence Study³⁵ is shown in Table 6. The prevalence of obesity was lower in the elderly Aborigines than in the general population for men, and similar for women. In a study of an Aboriginal population in Victoria, it was found that the BMI was significantly higher for Aboriginal women than a comparable non-Aboriginal group of women. However the BMIs for the men were similar³⁶. These results suggest that the levels of obesity may not be a great deal higher in the Aboriginal men in Victoria, but may be increased in women, although data are limited in this area.

Perhaps as important as the BMI is the measurement of body fat distribution. Central or abdominal distribution of fat has been associated with an increased risk of

stroke, coronary heart disease, hypertension, and non-insulin dependent diabetes³⁷. There is some evidence that the prevalence of abdominal fat distribution is greater in Aborigines than non-Aborigines^{34,38}. In the study of elderly Aborigines at Fitzroy Crossing, the prevalence of a waist hip ratio greater than 1, which suggests significant abdominal obesity, was 74% for elderly women and 58% for the men³⁴, results consistent with those from O'Dea³⁸ who found that prevalence of abdominal obesity was high for both men and women. In the study by Guest³⁶, abdominal obesity was significantly higher for Aboriginal women and even Aboriginal women with a low BMI were found to have increased levels of abdominal obesity, while Aboriginal men were similar to non-Aboriginal men in relation to the prevalence of abdominal obesity³⁶. In the Australian general population the prevalence of abdominal obesity is higher for men than women³⁵. These results provide one possible explanation why Aboriginal women, in contrast to non-Aboriginal women, have a similar risk to men for diseases associated with obesity, such as diabetes⁴.

Diabetes mellitus

In several Aboriginal communities across Australia, prevalence rates of NIDDM have varied from 4.5% to

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	n=42	12	55	19
Men	n=19	21	58	16
Women	n=23	4	52	22
51-60 yrs	n=13	0	62	15
61-70 yrs	n=19	16	53	21
71-80 yrs	n=10	20	40	30

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 led 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.

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Nutrition and health of Victorian Aborigines (Kooris)

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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KOORIS膳食是重要的，因為KOORIS人進食這種膳食普遍地獲得健康。傳統的KOORIS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KOORIS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餘地區的情況相似。如果維多利亞州的情況與澳洲其餘地區相似，那麼可以設想目前KOORIS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KOORIS人群的營養狀況還需要努力才能得到較好的數據。吸食烟草也是一個主要問題，同時也是公共衛生的主要研究課題。

KOORIS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KOORIS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KOORIS營養的社會經濟知識和有關因素也是重要的。