

REVIEW ARTICLE

Nutrition and health of Victorian Aborigines (Kooris)

Jonathan M. Hodgson and Mark L. Wahlqvist

Monash University Department of Medicine, Monash Medical Centre, Clayton 3168 Victoria, Australia.

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	Quandongs
Frogs	Nardoo
Water rats	Berries
<i>Insects</i>	Cherry ballart
Moths	Lilly pilly
Witchetty grubs	Yams
Honey ants	Pigface fruits
<i>Insect products</i>	Nuts
Honey	<i>Seeds</i>
	Grass seeds
	Acacia seeds
	<i>Leaves</i>
<i>Fungi</i>	Pigface leaves
Blackfellows bread	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		Fibre
			Fat	Carbohydrate	
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 Victoria 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		Fibre	Na Sodium	K Potassium	mg/100g dry weight		Fe Iron	Zn Zinc
		Fat	Carbohydrate				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
Brushtail 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.

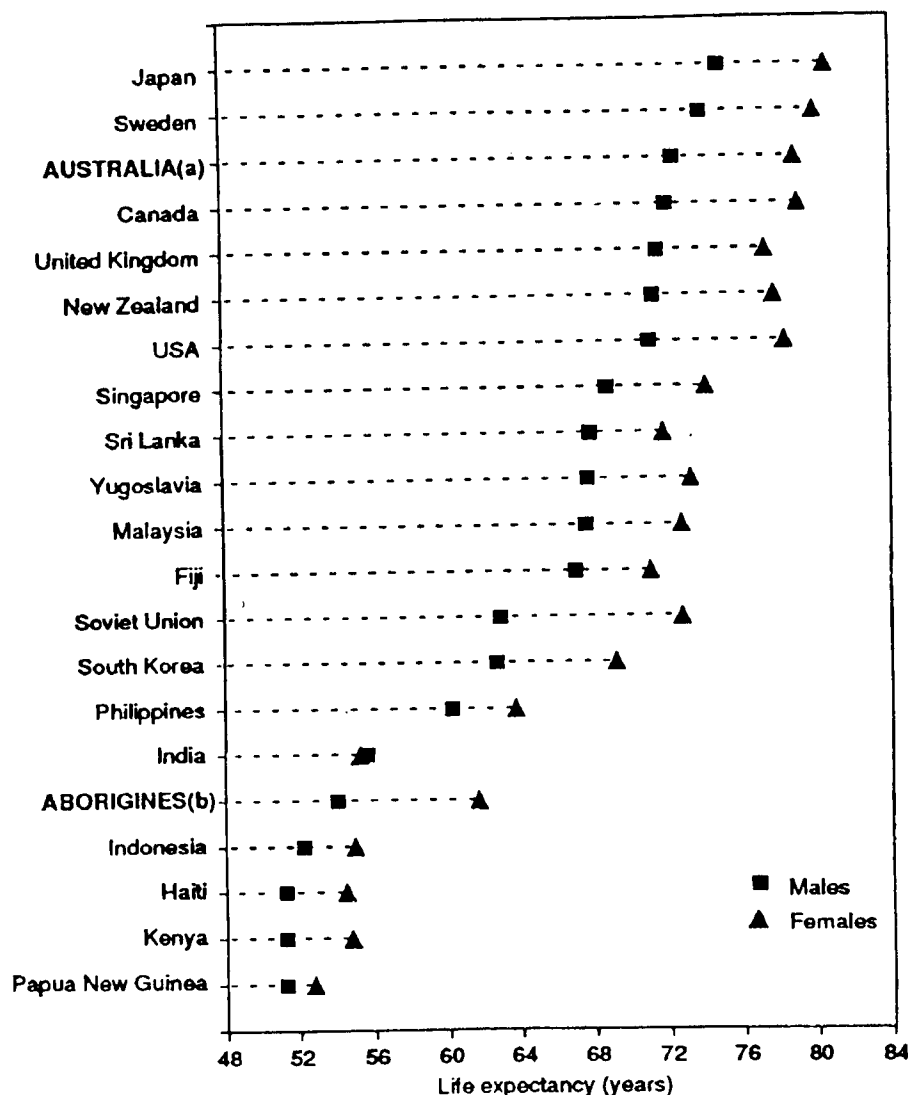
Another major source of n-3 fatty acids in the traditional diet was fish and other marine animals. These foods were an important source of protein and fat in groups residing by rivers or the sea. It can be seen from Table 4 that yabbies and mussels are very high in fatty acids from the n-3 series. Several other species of crustacea and molluscs were also eaten by Kooris. Some of the fish eaten in Victoria included lubrick, mullett, 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 hunger-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

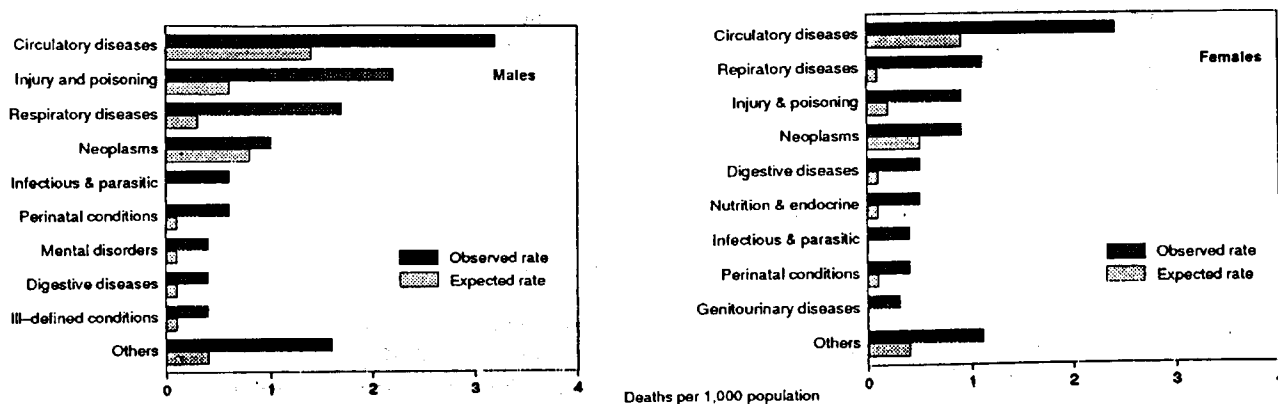


Fig. 2. Deaths of Aborigines by cause, observed and expected rates 1985. The observed rates represent the combined data for Aborigines of the Queensland reserve communities, Western Australia, South Australia, and the Northern Territory. The expected rates are the mortality rates for the total Australian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

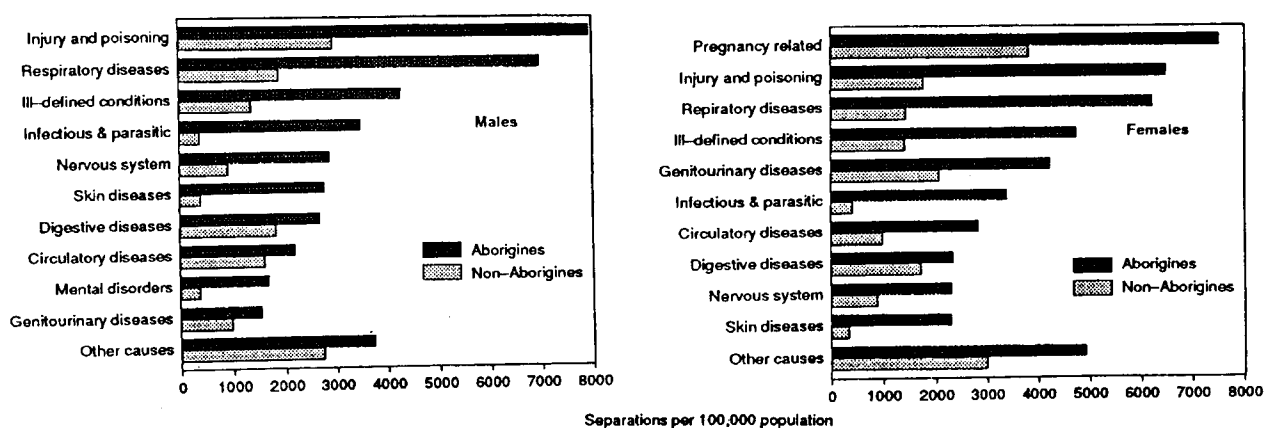


Fig. 3. Hospital separations for Aborigines and non-Aborigines, age standardized rates by principle diagnosis. Figures for both Aborigines and non-Aborigines represent the combined data for Western Australia, South Australia, and the Northern Territory. The Northern Territory data are for 1984. (Reproduced 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 underweight 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