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. Mortality and morbidity 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.

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 times. 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.
NUTRITION AND HEALTH OF VICTORIAN ABORIGINES (KOORIS)

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

<table>
<thead>
<tr>
<th>Common name</th>
<th>Systematic name</th>
<th>Protein</th>
<th>g/100g dry weight</th>
<th>Fat</th>
<th>Carbohydrate</th>
<th>Fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pale valeriana lycopifolia</td>
<td>Arthrophorum milliophorum</td>
<td>12.2</td>
<td>0.7</td>
<td>49.6</td>
<td>33.1</td>
<td></td>
</tr>
<tr>
<td>Chocolate Lily</td>
<td>Arthrophorum strictrum</td>
<td>11.3</td>
<td>0.6</td>
<td>75.5</td>
<td>7.5</td>
<td></td>
</tr>
<tr>
<td>Buibine Lily</td>
<td>Arthrophorum bulbine bulbosum</td>
<td>17.5</td>
<td>1.2</td>
<td>45.5</td>
<td>27.9</td>
<td></td>
</tr>
<tr>
<td>Murnong</td>
<td>*lowa (a)</td>
<td>5.5</td>
<td>2.9</td>
<td>49.0</td>
<td>40.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*lowb (b)</td>
<td>7.6</td>
<td>4.2</td>
<td>52.6</td>
<td>29.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>alpine</td>
<td>5.0</td>
<td>1.6</td>
<td>44.2</td>
<td>47.0</td>
<td></td>
</tr>
<tr>
<td>Orchid</td>
<td>Chiloglottis trapeziformis</td>
<td>10.0</td>
<td>1.1</td>
<td>56.7</td>
<td>26.7</td>
<td></td>
</tr>
<tr>
<td>Greenhood orchid</td>
<td>Persoonia nutans</td>
<td>14.4</td>
<td>1.2</td>
<td>77.0</td>
<td>2.9</td>
<td></td>
</tr>
<tr>
<td>Nuttall geranium</td>
<td>Gymnopodium spp</td>
<td>3.0</td>
<td>0.3</td>
<td>26.0</td>
<td>58.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Periderium exulcansatum</td>
<td>2.0</td>
<td>1.0</td>
<td>47.6</td>
<td>46.6</td>
<td></td>
</tr>
<tr>
<td>Cumbungi</td>
<td>*Typha spp</td>
<td>9.3</td>
<td>0.3</td>
<td>46.6</td>
<td>49.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Typha sp</td>
<td>5.9</td>
<td>1.0</td>
<td>41.1</td>
<td>49.8</td>
<td></td>
</tr>
</tbody>
</table>

* Native in breeding season. Sources: refs 2, 17, 19, 20.

Table 2(b). Composition of several plant foods traditionally used in Victoria: micronutrients.

<table>
<thead>
<tr>
<th>Common name</th>
<th>Systematic name</th>
<th>Na</th>
<th>K</th>
<th>Mg</th>
<th>Ca</th>
<th>Fe</th>
<th>Zn</th>
<th>Zn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pale valeriana lycopifolia</td>
<td>Arthrophorum milliophorum</td>
<td>158</td>
<td>798</td>
<td>187</td>
<td>79.1</td>
<td>0.6</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Chocolate Lily</td>
<td>Arthrophorum strictrum</td>
<td>25</td>
<td>662</td>
<td>217</td>
<td>143</td>
<td>0.6</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>Buibine Lily</td>
<td>Arthrophorum bulbine bulbosum</td>
<td>48.5</td>
<td>788</td>
<td>1667</td>
<td>109</td>
<td>49.1</td>
<td>4.2</td>
<td></td>
</tr>
<tr>
<td>Murnong</td>
<td>*lowa (a)</td>
<td>74</td>
<td>933</td>
<td>92</td>
<td>126</td>
<td>15.2</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*lowb (b)</td>
<td>111</td>
<td>642</td>
<td>107</td>
<td>74</td>
<td>27</td>
<td>3.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>alpine</td>
<td>133</td>
<td>1044</td>
<td>300</td>
<td>100</td>
<td>30</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Orchid</td>
<td>Chiloglottis trapeziformis</td>
<td>26</td>
<td>572</td>
<td>66</td>
<td>72</td>
<td>16</td>
<td>2.6</td>
<td></td>
</tr>
<tr>
<td>Greenhood orchid</td>
<td>Persoonia nutans</td>
<td>250</td>
<td>1146</td>
<td>225</td>
<td>193</td>
<td>53</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Nuttall geranium</td>
<td>Gymnopodium spp</td>
<td>20</td>
<td>608</td>
<td>57</td>
<td>51</td>
<td>71</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*Periderium exulcansatum</td>
<td>203</td>
<td>179</td>
<td>154</td>
<td>295</td>
<td>4.2</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>

* Native in breeding season. Sources: refs. 66.

Food and nutrition

An understanding of traditional Aboriginal diets is important because the Aboriginal people were generally healthy eating these diets. Although many of the bush foods are presently not eaten, it is difficult to obtain, information about the composition of these foods is beginning to provide a guide to an appropriate dietary intake today’s23. 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 were eaten. For each of the foods listed there were often several species available. The composition of a food species might be very different between specific species in different seasons or locations in Victoria. This, together with the variation in availability of food species throughout the year, makes an accurate estimate of the traditional diet of Victorian Aborigines difficult.

Roots as a staple food. There is some information 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.6,17 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 animal foods, roots were available all year round. Roots were also present throughout Victoria, although different species were more abundant in different areas.20.

Aboriginal knowledge of the ecology of root use by Aborigines in Southern Australia is provided by Gott.22 In this paper a more detailed discussion of the use of several roots as foods for Aborigines is described. Brand and others23 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, and calcium. The water content was usually high, averaging 84% in roots whose composition have been determined.

Because roots appear to have been used traditionally as the staple food in many Aboriginal communities in Victoria, it is interesting to consider the composition of the roots with some of the 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. Epidemiological 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

Weapons, and the protection of his family was the responsibility of the husband.20.
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 Anis G. Cottrell and Harrisons. 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. Aboriginals 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 related to food and therefore survival. Gathering, hunting, food production and preparation, and education relating to food and the environment were all activities vital to ensure survival. The nutrition of Aboriginals 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 death. However, there is evidence that Aboriginal peoples achieved ages of about 65 years or more. 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 Aboriginals, but once a child reached two years of age the expectation of life was probably higher for Aboriginals than Europeans.

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 diseases such as heart disease, diabetes, hypertension with its sequelae, and obesity which in general have a high prevalence in Aboriginal communities today.

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 tribes. The clan performed the economic, religious, socializing and cultural functions in society. 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, provide a major share of sharing related specifically to these foods.

The hunter-gatherer lifestyle of Victorian Aborigines, or Korris, 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-gatherers' society, food was 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 environment.

The making of weapons, and the protection of his family was the responsibility of the husband.

<table>
<thead>
<tr>
<th>Table 1. Traditional Aboriginal foods in Victoria.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal foods</td>
</tr>
<tr>
<td>Large game</td>
</tr>
<tr>
<td>Kangaroo</td>
</tr>
<tr>
<td>Eel</td>
</tr>
<tr>
<td>Wurundu</td>
</tr>
<tr>
<td>Smaller game</td>
</tr>
<tr>
<td>Possums</td>
</tr>
<tr>
<td>Ducks</td>
</tr>
<tr>
<td>Turkey*</td>
</tr>
<tr>
<td>Mallard Ducks*</td>
</tr>
<tr>
<td>Ducks</td>
</tr>
<tr>
<td>Goose</td>
</tr>
<tr>
<td>Fish</td>
</tr>
<tr>
<td>Various species of fish available in Victoria*</td>
</tr>
<tr>
<td>Turtle</td>
</tr>
<tr>
<td>Crayfish, yabbies, shrimps</td>
</tr>
<tr>
<td>Mussels</td>
</tr>
<tr>
<td>Frogs</td>
</tr>
<tr>
<td>Water rats</td>
</tr>
<tr>
<td>Insects</td>
</tr>
<tr>
<td>Mothia</td>
</tr>
<tr>
<td>Witchetty grubs</td>
</tr>
<tr>
<td>Honey ants</td>
</tr>
<tr>
<td>Insect products</td>
</tr>
<tr>
<td>Honey</td>
</tr>
<tr>
<td>Fungi</td>
</tr>
<tr>
<td>Blackfellows bread</td>
</tr>
<tr>
<td>Seeds</td>
</tr>
<tr>
<td>Grass seeds</td>
</tr>
<tr>
<td>Acacia seeds</td>
</tr>
<tr>
<td>Other vegetation</td>
</tr>
<tr>
<td>Wild onion</td>
</tr>
<tr>
<td>Salt bush</td>
</tr>
<tr>
<td>Leat (extracted from gum leaves)</td>
</tr>
<tr>
<td>Bulldog lily</td>
</tr>
<tr>
<td>Other species</td>
</tr>
<tr>
<td>* Varieties in breeding season Source: refs. 9, 17, 19, 20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2(a). Composition of several root plants traditionally used as food in Victoria: macronutrients.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common name</td>
</tr>
<tr>
<td>Systematic name</td>
</tr>
<tr>
<td>Protein 100g dry weight</td>
</tr>
<tr>
<td>Fat                Calcium</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Pale vanilla lily</td>
</tr>
<tr>
<td>Chocolate lily</td>
</tr>
<tr>
<td>Bulbine lily</td>
</tr>
<tr>
<td>Murnong</td>
</tr>
<tr>
<td>- (low-b)</td>
</tr>
<tr>
<td>- (alpine)</td>
</tr>
<tr>
<td>- (Orchid)</td>
</tr>
<tr>
<td>- (Greenhood orchid)</td>
</tr>
<tr>
<td>- (Orchid)</td>
</tr>
<tr>
<td>Bracken (Australian)</td>
</tr>
<tr>
<td>Cumbungi</td>
</tr>
<tr>
<td>- (a)</td>
</tr>
</tbody>
</table>

* Varieties in breeding season Source: refs. 9, 17, 19, 20

<table>
<thead>
<tr>
<th>Table 2(b). Composition of several plant foods traditionally used as food in Victoria: micronutrients.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common name</td>
</tr>
<tr>
<td>Systematic name</td>
</tr>
<tr>
<td>Protein 100g dry weight</td>
</tr>
<tr>
<td>K Potassium</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Pale vanilla lily</td>
</tr>
<tr>
<td>Chocolate lily</td>
</tr>
<tr>
<td>Bulbine lily</td>
</tr>
<tr>
<td>Murnong</td>
</tr>
<tr>
<td>- (low-b)</td>
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<td>- (alpine)</td>
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<tr>
<td>- (Orchid)</td>
</tr>
<tr>
<td>- (Greenhood orchid)</td>
</tr>
<tr>
<td>Cumbungi</td>
</tr>
</tbody>
</table>

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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 glycemic response to a glucose load by slowing absorption. The major disadvantage of a high fibre diet is a reduction in the absorption of particular nutrients. 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 implications for the food carbohydrate of carbohydrates present. Many of the roots contained fructans in storage carbohydrates composed of two or more monosaccharide fructose units. In a study by Inoue it was found that several roots 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 large amounts of staple foods is interesting because humans are said to lack the necessary enzymes to convert fructans to fructose. Fructans cannot be absorbed from the gut, and bacterial fermentation results in the release of 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 Aboriginals would require the appropriate gut bacteria to perform the fermentation. It is likely that the presence of these fructans is a physiological adaptation to the diet rather than a genetic one. Europeans who lived with Aboriginals 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 not often 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 fruits. The composition of fruits eaten in the traditional diet in Victoria has not been systematically examined. Certain fruits however are quite high in particular nutrients. For example the cheeky yam (Dioscorea bulbifera) is high in vitamin C (233 mg/110 g) and protects against significant damage to the subjective preferences of certain nutrients such as vitamin C.

Ascasia seeds were an important food source for Aboriginals living in other areas of Australia. Particular species, such as Ascasia stenophylla found along the Murray river, were eaten by Aboriginals in Victoria. Although seeds from several other species with fruit 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 Koori. They were probably important sources of many nutrients.

Animal foods. Almost all native animals present in Victoria were used for food by Koori. In the traditional diet animal foods were an important source of protein and fat. The protein content of wild animals is generally similar to domestic animals. 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 to many used today in Australia. Food was generally roasted rather than boiled or fried. The ground oven was used by many groups in the preparation of 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 other marine animals provided much of the protein in the diet. Early reports describing contact between Europeans and Aborigines in Victoria provide evidence that the population was in good health 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 currently available, there appear to be some differences. Root plants, eaten as the staple in most parts of Victoria, are regarded as relatively few foods available for consumption today. However, because adaptation to these foods is probably not immediate, their presence in chicken and eggs 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 particularly 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 meat, removing excessive skin and fat 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.
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 glycemic response to a glucose load by slowing absorption. The major disadvantage of a high fibre diet is a reduction in the absorption of particular nutrients. 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 not been adequately addressed is the proportion of carbohydrates present. Many of the roots contained fructans in storage carbohydrates composed of two or more monosaccharide fructose units. In a study by Inglis 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 proportions is interesting because humans are said to lack the necessary enzyme to convert fructans to fructose. 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 phylogenetic adaptation to the diet rather than a genetic one. 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 these 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 fruits. The composition of fruits eaten in the traditional diet in Victoria has not been systematically recorded. Certain fruits however are quite high in particular nutrients. For example the cheeky yam ( Dioscorea bulbifera) is high in vitamin C (233 mg/100g) and probably contributed significantly to the intake of particular nutrients such as vitamin C. Acacia seeds were an important food source for Aborigines living in other areas of Australia. Particular species, such as Acacia stenophylla found along the Murray river, were eaten by Aborigines in Victoria. Although several seeds from other areas 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 Koori. They were probably important sources of several nutrients.

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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, roots, nuts, flowers, seeds and leaves. Mammals, birds, eggs, fish, shellfish, and crustaceans provided much of the protein in the diet. 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 likely to be overweight. Early reports describing contact between Europeans and Aborigines in Victoria provide evidence that the population was in good health which suggests that the diet was appropriate for health.

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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 Aboriginals well before actual face to face contact. Diseases such as smallpox and influenza devastated many populations well before any contact with Europeans had occurred. The settlement of Victorian land began gradually in the 1850s 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 1860s virtually all Kooris had been removed from their economic base, and by 1860 most of the 2000 surviving Kooris lived in reserves. 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. The observation that more than half the Kooris are below the poverty line represents almost 1 in 2. Poverty is a strong indicator of health status.

The leading cause of death is Coronary Heart Disease. Deaths due to circulatory system disease is 2 times higher than for all other causes of death. Death rates due to all other causes are also significantly greater for Kooris. In particular respiratory diseases, injury and poisoning are important causes of death in Aboriginals. The leading causes of death, by cause, are Coronary Heart Disease and for all other causes of death. The leading causes of death for Coronary Heart Disease are Coronary Artery Disease, Heart Failure and Other Cardiac Conditions.

To provide an estimate of mortality for Aboriginals living in Victoria, as this is the denominator for the calculation of death rates. The number of Kooris is unknown, and may be anywhere up to 22,000 people. An attempt should be made to obtain an accurate estimate of the number of people of Aboriginal descent living 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 other 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...
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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 morbidity and mortality 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 Kenya (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 Aborigines. 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 excess 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 for Aboriginal and non-Aboriginal Australians are compared in Table 1. Some socio-economic or related factors might be more important than contributing 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 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)18. Age of death is not directly comparable to life expectancy, and therefore can only be taken as an approximation of life expectancy19, which is about 50 years for Koori people in 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 general20. Data on the major causes of death have been presented by Jennings19. As to causes of deaths, 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 men21.

Jennings 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 Kooris21.

For Victoria, more data on Koori morbidity and mortality have recently been collected and published. The reliability of the data which have been collected is unknown. The identification of individuals of Aboriginal descent is often questionable, 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.

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Obesity

Few studies of Aboriginal groups have been conducted

Fig. 1. Life expectancy at birth for Aborigines and selected countries, 1985. (Reproduced with permission, Australian Institute of Health20, source: United Nations, Demographic Yearbook 1985, UN, New York)
using anthropometric measurements such as BMI. It appears that BMI varies between men and women in particular, to gain weight rapidly in early adulthood[13], despite a high prevalence of overweight in young women 15 to 24 years old[13]. In a study by Walshe et al.[14], of elderly Aboriginals (>50 years) from Junee, 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 of Canada[15] is shown in Table 6. The prevalence of obesity was lower in the elderly Aboriginals 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 for the general population[16]. 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 diabetes. There is some evidence that the prevalence of abdominal fat distribution is greater in Aboriginals than non-Aboriginals[17-19]. In the study of elderly Aboriginals 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 men[19], consistent with some of the studies in this area[20-22]. However, in the Aboriginal population the overall prevalence appears to be similarly high for men and women[20]. In the only study of the prevalence of NIDDM in Aboriginals in Victoria, comparisons between an Aboriginal and 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 Aboriginal women[18]. These results are consistent with those from other parts of Australia[23], and indicate that the prevalence of NIDDM is increased for both Aboriginal men and women in Victoria. The increased prevalence of diabetes may be an important factor to the high prevalence of cardiovascular 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 Aboriginals have a genetic susceptibility to developing NIDDM when they undergo a 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 in the past. 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 may have been advantageous in the traditional lifestyle which now predispose to obesity, or abdominal obesity in particular, and eventually to NIDDM[24].

Hypertension
Surveys prior to 1970 have reported relatively low blood pressures amongst Aboriginals[25]. However, recent studies have found that blood pressure levels are higher in Aboriginals than non-Aboriginals[26,27], and a general association between 'westernisation' and blood pressure, but there are some inconsistencies[28]. If the recent studies are considered together, then it appears that hypertension is a significant problem in many Aboriginal communities. The prevalence is probably 5.5-2 times that of the non-Aboriginal population[29-31], which has been estimated at 16.7% for men and 12.7% for women[32]. 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 population[33]. Although anecdotonal evidence suggests that hypertension is a problem in Koories, this cannot be assumed without data.

Relationships between health statistics and nutrition
Available data on morbidity and mortality for Aboriginals 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[34]. The 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 diseases. In general a high intake of fat, a low intake of plant foods, a low 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 Koorei 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 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 Aboriginals, a basic understanding of the social, economic, cultural and demographic nature of the population is necessary. This may call for anthropological investigations.
using anthropometric measurements such as BMI. It appears that women have a higher risk of stroke, coronary heart disease, hypertension, and non-insulin-dependent diabetes. There is some evidence that the prevalence of abdominal fat distribution is greater in Aboriginal women. In the study of elderly Aboriginal women 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 men, results consistent with those from O'Dea who found that prevalence of abdominal obesity was high for both men and women. In the study by Guest, 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 obesity. In the Australian general population the prevalence of obesity is higher for men than women. 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 diabetes.

**Diabetes mellitus**

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

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Anthropological enquiry
One of the biggest obstacles to obtaining nutrition-related data from an Aboriginal 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 include not only dietary intake but also other environmental factors, would be prohibitively expensive in terms of time and resources. Anthropological approaches can be used to gather useful information, and have been used to study diets and factors influencing diet. Information obtained from such 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 in determining the social and cultural determinants of diet and health.

Principles of food selection, classification and dietary construction have been reviewed by Messer. 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 diet.

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

Systematic enquiry

Rapid assessment procedures (RAP). It has been established that the first step in the inquiry 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 contributing to these problems. This information is however often difficult to use in a quantitative or semi-quantitative way. The anthropological approach of gathering information relating to diet are 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 easily obtained informal data to obtain information about diet and factors influencing it. RAP can be used to obtain a picture of the total community diet. The method has been used successfully in Australia.

Food intake data. There are several methods available for estimation of usual dietary intake. These methods include 24-hour recall, dietary history, 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. In some cases the food may be weighed. These methods are time consuming, expensive, and intrusive into the lives of the subjects, and can only be used for usual food intake. For Kooring this method may be used in small selected groups, however because of the problems outlined its usefulness may be limited.

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 the ability of the subjects to complete the skill. Food models are often helpful. The major weakness is the recall of food intake that 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 people.

The 24-hour recall and diet record methods are generally expensive, unrepresentative of usual intake, and inappropriate for assessing diet. Food frequency methods for the assessment of long term diet have therefore been developed. The principle of the food frequency approach is that the knowledge about the foods which a person has a better relationship to health and disease than the intake assessed over a few days. Food frequency questionnaires have become the method of choice for measuring dietary intake in epidemiological studies because they are easy to complete; often, being self-administered, they provide a better estimate of long term intake of foods, minerals, and fatty acids in other samples, such as adipose tissue, blood cells, skin, urine, hair, nails, and breath, may also be useful in assessing the intake of individuals. The objective, but these measurements also have the same problems of misclassification and bias, as food intake measurement. Attention to specimen collection, storage, and analysis is also vital to avoid misclassification and bias. However in particular circumstances 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. Aboriginal peoples living in Victoria has been discussed above. Little nutritional data is available and it a therefore difficult to state with any degree of certainty what the nutritional status of the Kooring population might be. This may also be 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 centres of over 100000 people. The geographic distribution of Aborigines varies between states. In Victoria the majority live in urban centres, whilst in the Northern Territory a high proportion of Aboriginal groups live in different locations in different social and economic circumstances, nutrition information is collected in different regions and by different authorities.

In any case 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 nutritional status

The relationship of the food frequency questionnaire to the RAP procedures has been evaluated by comparing the dietary method with the RAP techniques. The relationship of the food frequency questionnaire to the RAP procedures has been evaluated by comparing the dietary method with the RAP techniques. The relationship of the food frequency questionnaire to the RAP procedures has been evaluated by comparing the dietary method with the RAP techniques. The relationship of the food frequency questionnaire to the RAP procedures has been evaluated by comparing the dietary method with the RAP techniques. The relationship of the food frequency questionnaire to the RAP procedures has been evaluated by comparing the dietary method with the RAP techniques. The relationship of the food frequency questionnaire to the RAP procedures has been evaluated by comparing the dietary method with the RAP techniques.
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Once particular problems have been identified, there can be discussion about use of the information. Decision can also be made at this stage for further work. One of the biggest advantages of RAP is that the information obtained does not remain the property of the re-searchers and the information collected 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 can be classified into two types: 24-hour recall, and food frequency questionnaire.

Dietary records or food diaries are described as following descriptions of types and amounts of foods and beverages consumed over a given period of time. In some cases the food may be weighed. These methods are time consuming, expensive, and intrusive into the lifestyle of the subjects, and can only be used to estimate usual food intake. For Koories this method may be used in small selected groups, however because of the problems outlined its usefulness may be limited.

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 the possession of the subject by the dietary recall 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 people.

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

Detailed information on dietary practices can also be gained by questionnaire, self-administered or administered by an interviewee. 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 BMI is an assessment of relative weight used to classify people into groups according to weight for height. The BMI, which is calculated as the weight divided by the square of height, provides information relating to body weight and energy intake. The National Health and Medical Research Council (NHMRC) has reviewed evidence relating BMI to health and has determined that BMI is a reasonable and acceptable 'healthy' range is between 20 and 25. A BMI less than 18.5 has been associated with chronic energy deficiency, and individuals with a BMI less than 20 can be classified as underweight. Individuals with a BMI between 20 and 25 are classified as normal weight, and a BMI with a BMI above 30 are classified as obese. Obesity is related to an increased risk of morbidity and mortality from several diseases.

One method used 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 sub-scapular skin folds. As with obesity, abdominal obesity is a risk factor for the development of non-communicable diseases. However abdominal obesity is a risk factor independent of obesity based on the BMI.

Leanness measurements relating to body compartments other than fat can also provide information about nutritional status. Assessment of total body nitrogen using the Stummel-Bray method and measurements of bone density can contribute important nutritional information. These measurements are rarely used in larger epidemiological 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 Koorie 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 can provide a great deal of information about nutritional status.

Biochemical markers of nutrient intake. Several biochemical chemical 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, liver, intestine, hair, nails, and breath, may also be useful. For example, blood concentration of vitamin D, the objective, but these measurements also have the same problems of misclassification and bias, as food intake measurements. Attention to specimen collection, storage, and analysis is also vital to avoid misclassification and bias. However in particular circumstances 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. Aborigines living in Victoria has been linked with a BMI of 20.5. The National Health and Medical Research Council (NHMRC) has reviewed evidence relating BMI to health and has determined that BMI is a reasonable and acceptable 'healthy' range is between 20 and 25. A BMI less than 18.5 has been associated with chronic energy deficiency, and individuals with a BMI less than 20 can be classified as underweight. Individuals with a BMI between 20 and 25 are classified as normal weight, and a BMI with a BMI above 30 are classified as obese. Obesity is related to an increased risk of morbidity and mortality from several diseases.

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percent of the fat was derived from fatty meat and take-
away foods such as potato chips. Although energy intake
was high, the intake of dietary fibre, some
minerals (calcium and zinc) and some vitamins (retinol
equivalents, riboflavin, vitamin E, vitamin B₆, folic acid)
were inadequate90. Data from several other community
studies in New South Wales are now available and the
studies being conducted in the 1960s and 70s.
Available dietary information for Aboriginal groups in
urban areas in Victoria is limited to a survey by
Kamien et al.68 of 17 Aboriginals from two families from
Walgett in New South Wales, six days of weighted food
records were obtained. Meat and bread intake was high,
and the total fat and intake generally above the recom-
dended dietary allowances. Measurement of vitamin
levels in blood revealed several vitamin deficiencies.
Blood samples were collected on the last day, 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 action92.

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
outings are largely unrecorded. With regard to nutrition,
such as BML, waist circumference, and skin
folds, and measurements of biochemical markers of
nutrient intake, have not been performed in Koori populations.

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
subject to scientific scrutiny. Some work on health
promotion has not been collected and presented. These
difficulties still apply to the collection of this data
today. There should be an effort by the best, most
culturally sensitive ways to obtain this data.

The first step is to conduct quantitative and
semi-quantitative studies using anthropometrical
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 method of enquiry should 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
problems 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
and other factors is to include measurements of obesity,
blood pressure, and diabetes in studies conducted
in Koori populations.

Without having identified specifically where the nutri-
tional problems of Koori populations may lie, the available data obtained from Aboriginal groups in other parts of
Australia and to a lesser degree Victoria, suggest
that the major problem is too high in fat, sugar and salt, and in
some cases alcohol, and too low in plant foods and variety
resulting in an increased risk of mortality from circu-
latory system diseases and an increased prevalence of
diabetes. Koori diets are very similar to Australian diets, so
would also appear to be a major problem. Given that
the nutritional problems for Kooris is similar to other
Aboriginal groups across Australia, the dietary guide-
lines recommended for the general population would
apply well to the Aboriginal population in the Northern Territory. That is, total and fat intake should be reduced; sugar and salt
use should be minimized; alcohol consumption reduced
and the variety of foods consumed increased, with the increase in variety coming mainly from
plant foods.

"Guide-lines on Ethical Matters in Aboriginal and Torres
Strait Islnder health: smokeing which have been
published by the National Health and Medical Research Council
NHMRC93. These guide-lines provide information about
and 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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percent of the fat was derived from fatty meat and take- away foods such as potato chips. Although energy intake usually exceeded the intake of dietary fibre, some minerals (calcium and zinc) and some vitamins (retinol equivalents, riboflavin, vitamin E, vitamin B6, folic acid) were inadequate26. Data from several other community studies conducted in the 1960s and 1970s also indicated that the intakes were significantly higher for Aboriginals (64.4%) when compared to non-Aboriginals (22.8%). The results also suggested possible links between smoking and nutrition. Alcohol intake was high, as indicated by 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 action29.

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 sizes are largely unknown. Knowledge of factors 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 communities.

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 collected on a large scale. Thus, the information on nutrition has not been collected for any of the data today. These should be the focus of the best, most culturally sensitive ways to obtain this data.

The first step is to document qualitatively and semi-quantitatively using anthropometric 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 further 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 Koori population is to include measurements of obesity, blood pressure, and diabetes in studies conducted in Koori communities.

Without having identified specifically where the nutritional problems are in Koori communities, the available data obtained from Aboriginal groups in other parts of Australia and to a lesser degree Victoria, suggest that many Aboriginals (in Victoria) consume large quantities of alcohol, and low is plant foods and variety resulting in an increased risk of mortality from circulatory system diseases and an increased prevalence of disease from nutritional deficiencies.

Acknowledgement

The authors are grateful to have been able to draw upon the rich food and health culture heritage of the Aboriginal community in Victoria, and beyond, in the preparation of this paper.

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