

Original Article

Asian migration to Australia: food and health consequences

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Australia's food and health patterns are inextricably and increasingly linked with Asia. Indigenous Australians arrived in the continent via Asia and have linguistic connections with people who settled in south India; there was interaction and food trade between both South-East Asia and China and northern indigenous Australians over thousands of years. After European settlement in 1788, there have been several and increasing (apart from the period of the infamous White Australian Policy following the Colonial period and Independence, with Federation, in 1901) waves of Asian migration, notably during the gold rush (Chinese), the building of the overland Telegraph (Afghans), the Colombo Plan and Asian student education in Australia from the 1950s onwards (South-East Asians), and with refugees (Vietnamese and mainland Chinese), and business (late twentieth century) and progressive family reunion. Each wave has injected additional food cultural elements and caused a measure of health change for migrants and host citizens. Of principal advantage to Australia has been the progressive diversification of the food supply and associated health protection. This has increased food security and sustainability. The process of Australian eating patterns becoming Asianized is evident through market garden development (and the introduction of new foods), fresh food markets and groceries, restaurants and the development of household cooking skills (often taught by student boarders). Most of the diversification has been with grain (rice), legumes (soy), greens, root vegetables, and various 'exotic fruits'. Food acculturation with migration is generally bi-directional. Thus, for Asians in Australia, there has been a decrease in energy expenditure (and a lower plane of energy throughput), an increase in food energy density (through increased fat and sugary drink intakes), and a decrease in certain health protective foods (lentils, soy, greens) and beverages (tea). This sets the stage for 'eco-diseases'. In a population probably genetically programmed (but modifiably) *in utero* to abdominal obesity, diabetes (type II and gestational) and cardiovascular disease, these conditions may be rapidly acquired on migration, along with certain cancers (breast, colo-rectal and prostate). Thus, whilst Asian migration to Australia has provided health opportunities for host citizens, there have been threats to migrant citizens in regard to nutrition-related health.

Key words: acculturation, Asia, Australia, eco-disease, eco-nutrition, food variety, health, indigenous, migrant.

History of Asian migration to Australia

Although the ultimate human origins are in the African Rift Valley, Australia has been populated by people from Asian regions for longer than by people from anywhere else. This is the route that indigenous Australians took over thousands of years; some of their earlier relatives populated southern India. People from the Indonesian archipelago, Papua New Guinea and China also regularly visited northern Australia before Europeans found or, finally in 1788, settled.

It is the waves of Asian migration since European settlement, and before and after the Colonial period in Australia (ending on 1 January 1901 with the introduction of the notorious White Australia Policy), which most characterize the contribution of Asians and their food cultures to Australia's health and wealth (Table 1).

Contributions to Australian food culture

Asians in Australia have contributed to the development of the whole food chain (Fig. 1). At every critical point, Chinese Australians have been the dominant Asian influence, with major roles Australia-wide through the introduction of food crops (rice; various green vegetables; certain

stone, citrus and tropical fruits, even the Chinese gooseberry, later called Kiwi fruit; and a range of herbs and spices), food imports, market gardens, fresh-food markets, restaurants (there would scarcely be an Australian community without a Chinese restaurant) and Asian groceries.¹⁻³

The availability of some food processes and technologies has depended on Asians. Examples are noodle production, the manufacture of tofu and tempeh (both soy products), and the widespread use of plant shoots.

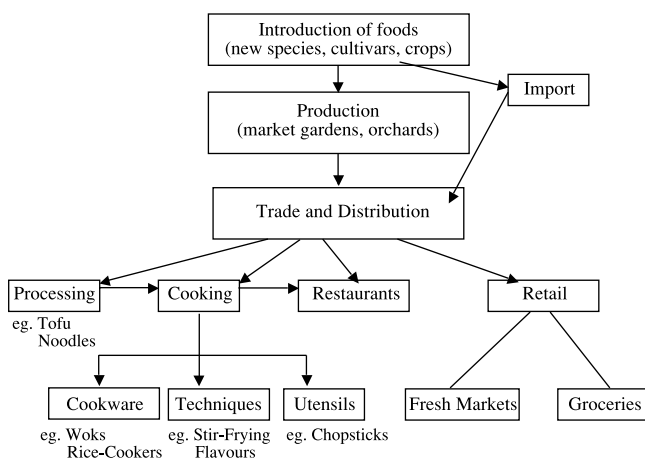
With the advent of international students in Australian universities, following the introduction of the Colombo plan in the 1950s, more and more Australian households were exposed to Asia, and especially Chinese, Malay, Indonesian

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Table 1. Asian migration to Australia after European settlement and its food consequences

Period	Nature and constituents	Food change in Australia
1850s–1880s	Gold Rush in regional Australia and major cities; Chinese	Cultivation, catering
Late 19th and early 20th century	Market gardeners; Chinese	Diversification of food supply ¹
Late 19th century	Overland telegraph; Afghans	Information, food trade and ingredients
1950s–1970s	Asian student programmes	Promulgation of Asian cooking methods in Australian households
1970s onwards	Increasing travel between Australia and Asia	Cross-fertilization of food cultures

**Figure 1.** Asian contributions to Australian food culture.

and south Asian cooking techniques, and learned them from students boarding with them. Intermarriage between European and Asian Australians, travel to Asia and the growth of an Asian resident culture all acted synergistically to accelerate the pace of Asianization of Australian food patterns. Within 50 years, Australia's population more than doubled and few of the present day citizenry would not at least occasionally, if not regularly, eat Asian food.

Moreover, Asian (mainly Chinese) cooking facilities (e.g. the wok), techniques (e.g. stir-frying) and utensils (e.g. chopsticks) are fairly standard in Australian homes.⁴ As a matter of fact, Chinese is said to be the second most commonly spoken language in Australian households after English, which is a reliable way in which food culture can be expressed.

The most dramatic and rapid upsurge in Asian cuisine in Australia, and throughout the developed world, has been in Thai cuisine. It is as though Chinese and south Asian cuisine prepared the palate for a more taste-challenging food culture, itself the product of the intersection of Indian and Chinese (Indo-Chinese) cultures, benefited by local foods in Indo-China. This late 1980s and 1990s phenomenon has increased the diversity of the Australian diet with novel herbs and spices and fermented food, each with health-protective potential.^{5,6}

Food acculturation

Measurement and monitoring

It is possible to measure food acculturation by determining a reference point and pattern of a particular food culture.^{7–9}

This can be particularly useful where a population has migrated and established itself amongst a majority food culture, but it can also allow measurement of food-cultural drift at a particular location across time. Such studies have enabled consideration of the most vulnerable points in a food culture and how these might be managed with or without 'food cultural analogues' (Table 2); where there is no analogue, another 'alteration' in food habits (which may be favourable or unfavourable to health) can take place.

Aside from substitution, it is common that health-protective foods are simply dropped out or taken up with acculturation. However, a cuisine can have the appearance of a food culture and be very nutritionally different. For example:

- Noodles that are ready-made and more fatty
- Stir-fries with more fat
- Vegetable dishes with less tofu
- Less spices with some main ingredients
- More meat in a vegetable dish
- Less beans and lentils in a recipe
- Fish less often

These subtle differences can have profound health impacts;^{10,11} therefore, they are valuable to identify and understand within healthy eating programmes (e.g. <http://www.healthyeatingclub.com>).

Social dimension of acculturation

The Food Habits in Later Life studies of the International Union of Nutritional Sciences, of which the author has been the principle investigator, have demonstrated that deviation from a food culture due to social activities and networks may reduce survival over a 5–7 year observation period.¹² At the same time, certain food patterns (especially plant food and fish) and food (especially legumes) confer survival advantages in a cross-cultural manner.^{13,14} These studies provide valuable guidance for cultures in transition.

Food variety

The great advantage of Asian migration to Australia for the majority population has been the increased diversification of diet. More and more evidence points to food variety and physical activity as being two of the fundamental characteristics of healthy living.^{15–19} The health value of food variety derives partly from the breadth of biologically advantageous nutrients and other food components provided, from the interest created in food, and from the associated maintenance of biodiversity, which also confers greater health.

Table 2. Acculturation, food cultural analogues and alterations

Culture	Item	Food cultural analogue or alteration
Chinese	Green leafy vegetables	Increased fatty meat or cooking oil
	Sweet potato/yam	Potato
	Chinese tea	Coca-cola
	Rice (morning)	Breakfast cereal
	Rice (mid-day)	Bread
	Rice (evening)	Potato
	Tofu	Cheese, potato
Greek	Goat	Lamb
	Bread	Breakfast cereal
	Olive oil	Butter
	Wine	Beer
	Water	Beer
	Chick peas	Biscuits

When the intrinsic variety of Asian food cultures (Chinese and Indian in particular) are considered, they are seen to be broad (Fig. 2). This food variety has now been injected into mainstream Australian food culture. One negative aspect of food variety is that, by encouraging interest in food, greater amounts may be eaten and energy-dense food can increase the risk of obesity. However, this may not be negative, provided the items are not energy-dense.^{20,21}

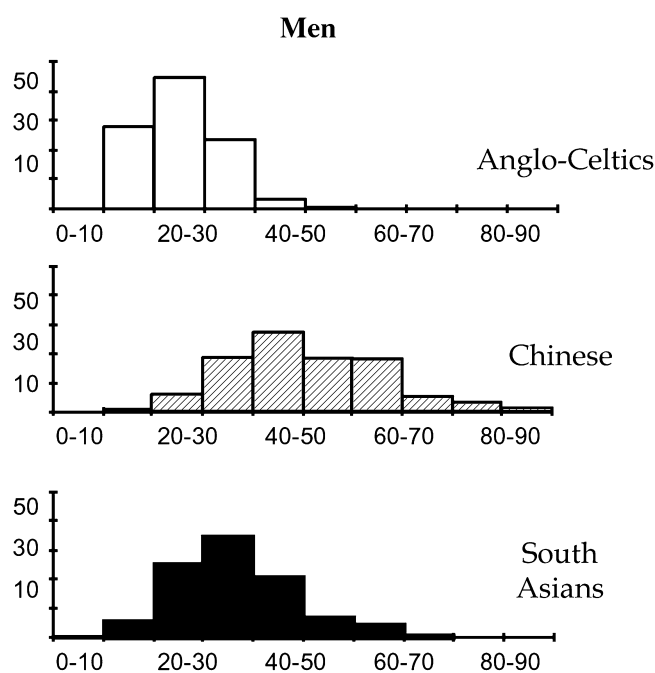
Eco-disease

What has been referred to as chronic non-communicable disease might be better referred to as 'eco-disease', since it may develop or resolve quite quickly (as with macrovascular disease and osteoporosis), and it may have transmissible features (as in atherosclerosis, certain cancers or obesity).

One of the most interesting forms of homeostasis requires both endogenous hormones and exogenous hormone-like factors, such as phytoestrogens.^{22,23} Asian food culture in transition provides one of the best examples of how oestrogen deficiency (menopause) may be differentially expressed in regard to food culture.²²⁻²⁵

Moreover, the phenomenon of the 'double burden of disease',²⁶ where the so-called 'diseases of affluence' (chronic disease such as obesity, diabetes, cardiovascular disease, osteoporosis and certain cancers) may coexist with 'diseases of undernutrition' (protein-energy malnutrition, micronutrient deficiency, food-borne illness) in the one community, household or individual, is now increasingly common with both socioeconomic disadvantage and advantage. This phenomenon requires the application of a new paradigm, arguably one that more effectively relates the human condition to the environment; hence 'eco-disease'.

Asians in Australia have been in nutritional transition, probably beginning *in utero* where the mother was exposed to nutritional inadequacy and the fetus was programmed for a similar nutrition environment. However, after birth and into adulthood a nutritional, especially energy, surfeit, along with varying nutritional quality (nutrient density), and associated especially with low energy throughput due to physical

**Figure 2.** Food variety and ethnicity in Australia.¹⁹

inactivity has caused adverse health effects in Asian immigrants to Australia.

Obesity

Asians tend to express obesity first as abdominal obesity, with an otherwise acceptable body mass index (BMI) range, which can be as low as approximately 22.5 kg/m².²⁷⁻²⁹ This may be associated with fetal programming in accordance with the Barker hypothesis;³⁰⁻³⁴ therefore, it is a transitional and not an inevitable problem. Data on Chinese migrants indicate a general inverse relationship between stature and BMI/abdominal obesity.³⁵⁻³⁷ Therefore, the metabolic and health consequences of obesity are seen, in Asian migrants, as lesser degrees of total body fatness, or energy imbalance (Table 3 and Fig. 3).

Table 3. Anthropometric measurements amongst adult Melbourne Chinese³⁶

	Men (n = 271)	Women (n = 269)
Body mass index (BMI; kg/m ²)	22.7	21.8
% overweight (BMI >25–30)	17.7	14.1
Waist circumference (cm)	84.3	81.4
Waist-hip ratio	0.91	0.88

Diabetes

The most important adverse health effect of abdominal obesity is type II diabetes, the prevalence of which is increasing at a disproportionately high rate amongst Asian Australians, compared with their non-Asian counterparts (Fig. 4).³⁸

Type II diabetes is an important risk factor for macrovascular (atherosclerotic) disease (MVD) in particular, affecting the cerebrovasculature, coronary vasculature, renal and peripheral vasculatures. It will become increasingly more important than other MVD risk factors.

There are some likely food-habit candidates for the expression of diabetes in Asian Australians, such as the following:

- Decreased intake of low glycaemic meals that contain legumes (which ameliorate the glycaemic impact of other meal components like rice)
 - Decreased intake of green leafy vegetables (containing magnesium)
 - Increased intake of saturated and *trans*-fatty acids³⁹
 - Decreased intake of fish
- and of the risk of diabetes complications, additional to the above:
- Decreased food variety
 - Decreased intake of legumes
 - Decreased intake of tea

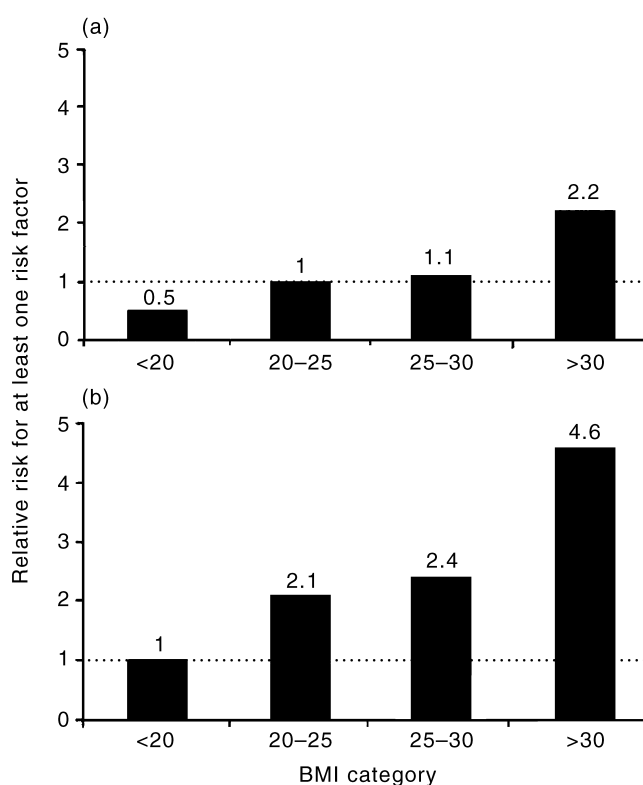
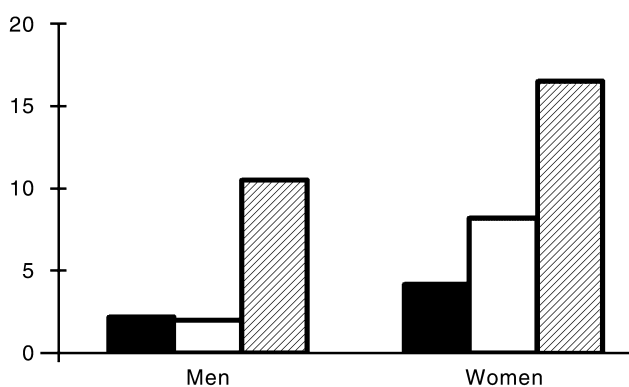
Of similar importance is the growing problem of gestational diabetes amongst Asian Australians (Fig. 5). Gestational diabetes is not only a precursor of established diabetes in women, but also of diabetes in offspring, with all of its sequelae.^{40,41} This intergenerational health problem is one of the most pressing for Asian families in Australia, and in other economically and culturally transitional environments.

Cardiovascular disease

The nutritional risk for cardiovascular disease (CVD) amongst Asian Australians is complex and multifactorial, involving several pathways:

- Physical inactivity;
- Decreased intake of protective foods, especially plants (including legumes and greens), fish and tea;
- Increased intake of fatty meats, high fat convenience noodles, and more fatty cooking techniques.

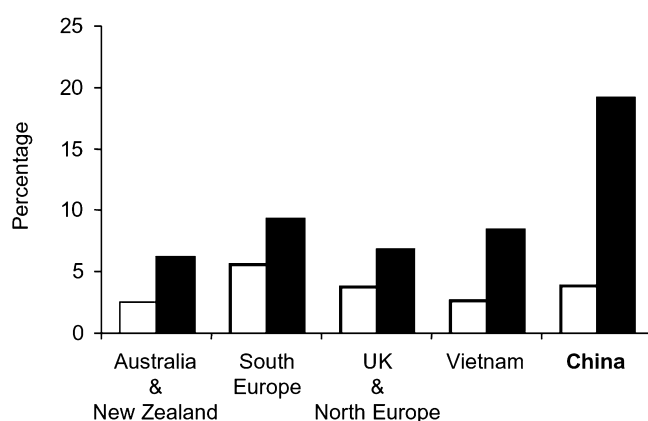
The recent Okinawan Round-Table on Nutrition and Cardiovascular Disease in the Asia Pacific Regions produced a set of recommendations which contextualize this view:⁴²

**Figure 3.** Odds ratio for having at least CVD risk factor if different BMI reference categories are used amongst Singaporean Chinese.³⁷**Figure 4.** Age-standardised diabetes* prevalence amongst Asian and Anglo-Celtic Australians.¹⁹

- 1 The prevention of CVD in the Asia-Pacific region should be based on food based dietary guidelines, which take account of sustainability, culture, social settings and broad health needs.
- 2 Emphasize a varied, nutritious food intake as the foremost dietary guideline.
- 3 Greater efforts should be made to identify culturally relevant cardioprotective foods and beverages.
- 4 A lifelong approach to CVD prevention, from conception to old age, is required.
- 5 Attention should be given to the role of food, and quality of life, in ageing populations.
- 6 Encourage food intake decisions which are inclusive of physical fitness, mental health and social activity.

Table 4. Measurements of fasting blood lipids, and glucose and blood pressure amongst Chinese and Anglo-Celtics in Melbourne⁴³

	Chinese		Anglo-Celtic	
	Men	Women	Men	Women
Cholesterol (mmol/L)	5.5	5.3	5.8	6.0
Triglycerides (mmol/L)	1.6	1.2	1.4	1.2
High density lipoprotein cholesterol (mmol/L)	1.33	1.52	1.28	1.64
Fasting glucose (mmol/L)	4.4	4.5	5.0	4.9
Blood pressure (mmHg)				
Systolic	117	114	136	134
Diastolic	73	67	81	78

**Figure 5.** Increasing gestational diabetes incidence rates by country of birth.⁴⁰

7 Develop advocacy to health food policy and programmes in relation to CVD in the Asia-Pacific region through intersectoral partnerships and good governance.

Cardiovascular risk factors amongst Chinese in Melbourne are of interest and are almost certainly deteriorating (Table 4).³⁶

Osteoporosis

Although osteoporosis and fracture are emerging as significant health problems amongst Asians,^{44–48} it is clear that this cannot be accounted for simply by low calcium intakes amongst Asians, who generally do not consume high-calcium milk or dairy products. Foods other than dairy products (leafy and cruciferous vegetables, legumes and fish) actually have higher calcium levels than is generally assumed.⁴⁹

High sodium intakes amongst some Asian populations may compromise calcium balance, by increasing calcium excretion.⁵⁰

Most important for bone health amongst Asians is the protective effect of soy and its isoflavones.⁵¹ The beta-receptor for oestrogen is located at relatively high densities in bone and is preferentially occupied by phyto-oestrogen, which presumably explains the impressive effects of soy on bone.^{52–54}

Table 5. Age-standardized cancer incidence rates in Victoria, Australia⁵⁶

	Breast (women)	Prostate (men)
Asian born	Low (56 per 100 000)	Low (25 per 100 000)
Australian born	High (67 per 100 000)	High (45 per 100 000)

Cancer

There are striking differences between hormone-sensitive cancers in Asian Australians and their European counterparts (Table 5).^{55,56} This supports the view that protective lifestyles, probably including food habits such as eating soy, may be potent safeguards against these cancers. In the Australian community, there are already differences in breast cancer risk, according to phytoestrogen status, with studies in Perth^{24,25,57,58} and Melbourne⁵¹ supporting this assessment.

Future prospects

While the health patterns of Australians in general are improving, judged by perinatal and infant mortality rates, life expectancies and disability adjusted life expectancies,⁵⁹ this is not uniform across the population; notably indigenous Australians are the most disadvantaged. Greek Australians, and probably Asian Australians, are undergoing a paradoxical increase in morbidity of the chronic or eco-disease type, while at the same time living longer than people in their countries of birth.⁶⁰ However, there may be an increase in morbidity and disability amongst successive generations of Asian Australians, unless urgent attention is given to the problem of transitional nutrition.⁶¹ Meanwhile, the majority of the Australian population is benefiting, from a health point of view, from the Asianizing of the Australian food culture.

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