

# Changing dietary habits of ethnic groups in Europe and implications for health

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*A systematic review of the literature suggests the dietary habits of some ethnic groups living in Europe are likely to become less healthy as individuals increase consumption of processed foods that are energy dense and contain high levels of fat, sugar, and salt. Such products often replace healthy dietary components of the native diet, such as fruits, vegetables, nuts, and grains. Mixed food habits are emerging mainly amongst younger people in the second and third generations, most likely due to acculturation and adoption of a Western lifestyle. Age and immigrant generation are the major factors accounting for changes in dietary habits, whilst income, level of education, dietary laws, religion, and food beliefs are also important factors. Obesity, cardiovascular disease, diabetes, and hypertension present major problems for the mainstream European population. However, the risk of chronic disease is reported to be higher in ethnic populations, particularly South Asians, African Caribbeans, and Mexicans.*

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## INTRODUCTION

The increased risk of degenerative diseases in immigrant populations in Europe might be explained by the following factors: increasing consumption of less healthy foods, genetic predisposition, lack of exercise, stress related to migration and settlement including changed and irregular meal patterns due to low-paid and long working hours. Additionally, acculturation and stronger integration within the new host country have been associated with a decline in the health of immigrants. These indications serve to emphasize 1) the need for further studies into the changing diets of immigrant populations due to acculturation, and 2) the need for critical comparisons with the diets of host populations, to determine the causes of diversity in health outcomes. The present review focuses on the major ethnic groups in Europe, their traditional dietary habits, post-migration changes in food habits, and the impact of such changes on health outcomes.

Several definitions have been invoked for an ethnic group or population. Carlson et al.<sup>1</sup> defined an ethnic

group or population as “a group of people smaller in number than the majority categories and who by their customs, language, race, values, and group interests differ from the majority population”. The UK Economic and Social Research Council<sup>2</sup> has used the term ethnic group to describe people of the same race or nationality with a “long-shared history and a distinct culture”. The largest ethnic groups living in selected European countries have been identified as South Asians in the UK,<sup>3</sup> Africans in France,<sup>4</sup> Turks in Germany,<sup>5</sup> Latin Americans in Spain,<sup>6</sup> and Surinamese in the Netherlands.<sup>7</sup> Population migration often necessitates changes in the types and quality of foods that migrants consume and the means by which it is prepared. Food items that change most readily are accessory foods such as snacks and sweets, while those that remain unchanged for the longest period of time are staple foods such as chapattis, rice, noodles, corn, and plantain.<sup>8</sup>

Dietary habits differ considerably within and among ethnic groups. A number of studies<sup>8-10</sup> have shown longitudinal changes in the traditional diet towards mixed food habits or a more “Westernized” diet. For example, the inclusion of snack foods such as French fries, potato

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**Table 1 Ethnic populations in select European countries.**

Country	Total population (thousands)	No. of immigrants (thousands)*	Largest group of immigrants
Denmark	5,411,405 <sup>85</sup>	463,235 (8.5%) <sup>85</sup>	Turks or Iraqis <sup>85</sup>
France	62,000,000 <sup>86</sup>	13,480,000 (21.7%) <sup>4</sup>	Maghreb <sup>4</sup>
Germany	82,314,906 <sup>5</sup>	7,255,949 (8.8%) <sup>5</sup>	Turks <sup>5</sup>
Italy	58,932,000 <sup>87</sup>	3,000,000 (5%) <sup>88</sup>	Romanians <sup>88</sup>
Netherlands	16,371,000 <sup>89</sup>	3,118,000 (19%) <sup>7</sup>	Surinamese or Turks <sup>7</sup>
Spain	44,770,000 <sup>90</sup>	3,700,000 (8.5%) <sup>6</sup>	Latin Americans <sup>6</sup>
UK	58,789,000 <sup>3</sup>	4,635,000 (7.9%) <sup>3</sup>	Asian or Asian British <sup>3</sup>

\* Figures in parentheses represent the percentage of the total national population.

chips, and cakes leads to ethnic populations having higher levels of fat, salt, and sugar in their diet. Such dietary changes are particularly evident in younger generations.<sup>11,12</sup> Studies have also shown that such changes result from a variety of factors, including food availability, income, convenience, religion, celebration of festivals, acculturation, age, country of origin, and food beliefs such as the healing properties of some foods.<sup>13</sup> As the nutritional quality of the diet declines, ethnic groups may become more susceptible to diet-related health problems similar to those affecting the mainstream population in Europe, such as obesity,<sup>14</sup> cardiovascular disease,<sup>15</sup> and diabetes.<sup>16</sup>

Over the last 30 years, a number of European countries, including France, Germany, and the UK, have seen huge increases in the popularity of ethnic food products intended for home consumption and a corresponding increase in the number of restaurants offering ethnic cuisine. This trend has resulted in changes in both the dietary habits and dietary quality of ethnic and mainstream populations alike. Therefore, as dietary habits continue to change due to the multicultural nature of European consumers and globalization of the food supply, a need exists to investigate the changing dietary habits of both the native and ethnic groups of European consumers.

### LITERATURE SEARCH

A total of 90 search words and subject headings were used to identify relevant studies in nine databases covering the science and technology, food and agriculture, medical and sociological research areas, i.e., Biological Abstracts, CAB Abstracts, Cochrane Library, Food Net base, Food Science and Technology Abstracts (FSTA), Health Management Consortium (HMC), Medline/PubMed, New Scientist, and Web of Science. Studies that addressed ethnic foods and ethnic groups in Europe, including coverage of dietary patterns (eating habits, food preparation and serving practices, food consumption), nutrient

intakes and requirements, deficiencies and diet-related chronic diseases, were included in the review. The studies fell primarily into the following two categories: 1) dietary patterns and 2) diet-related health problems. Data reported earlier than 1983 were excluded as were studies conducted outside Europe, with the exception of those used for the comparison of disease prevalence between the host country and the country of origin, and Latin America was considered of interest because it is the source of the major minority ethnic population in Spain.

This review reports on the dietary habits of selected ethnic groups in Europe as compared to those of their host populations and the implication of changes in dietary habits for the nutritional quality of their diets. The association between changes in dietary habits and nutrition-related diseases is also explored.

### IMPORTANCE OF ETHNIC GROUPS

Table 1 lists some of the largest ethnic groups in Europe. Germany has the largest proportion, at 9% of the total population, followed by Spain with 8.5%.<sup>5,6</sup> In Italy and the Netherlands the ethnic populations are smaller, accounting for 5% and 5.5% of the total population, respectively. In Italy, Romanians comprise the largest ethnic group, while in the Netherlands the Surinamese are the most prevalent, with Moroccans and Turks also present.<sup>7</sup>

Ethnic groups have generally migrated to large cities. For example, in France over one-third of the ethnic minority population from northern and sub-Saharan Africa has settled in Paris,<sup>17</sup> whilst in Amsterdam and other large Dutch cities, almost 60% of babies were born to parents born outside the Netherlands.<sup>18</sup> Migration into large towns and cities may suggest an increased exposure to Western-style fast foods; however, ethnic foods and raw ingredients are likely to also be readily available, since specialized ethnic stores usually open first in larger urban areas.

## DIETARY HABITS AND EATING PATTERNS

### African Caribbeans/West Indians

African Caribbeans originate from the numerous islands of the Caribbean, also known as the West Indies. West Indians in the UK are generally Creoles, people of European descent born in the West Indies or Latin America. The largest proportions of the African Caribbean population in the UK are of Jamaican origin, while others have migrated from Barbados, St Kitts, St Lucia, Montserrat and, to a lesser extent, Trinidad.<sup>19</sup>

The traditional diet of African Caribbeans and West Indians consists of starchy vegetables such as yam, potato, cassava, and plantain and cereals such as rice, corn, and wheat.<sup>20</sup> There is, however, wide variation in the dietary and food preparation practices of African Caribbeans depending on their origin. Vegetables are usually either boiled or added to highly flavored soups and eaten with meat or fish. Foods are seasoned heavily with herbs, spices, hot sauces, and condiments. Tropical fruits are often eaten throughout the day, and desserts are rarely served as part of a meal.<sup>19</sup> Traditional meat dishes include meat curries or roasted meat using lamb, beef, chicken, mutton, or goat. Roasted meats are seasoned, coated in flour, and fried. Fried dumplings are made with white flour and are deep-fried or boiled.<sup>19</sup> Foods such as *ackee* and salt fish are expensive and eaten only on special occasions. Commonly eaten snacks include patties, salt fish fritters, and fried dumplings.<sup>19</sup>

A number of studies in France and the UK have reported some departures from traditional African Caribbean diets following migration, especially within younger generations. One study in the UK recorded a decline in the nutritional quality of the diet associated with increased consumption of processed foods, such as cakes, biscuits, and sweetened breakfast cereals, which are high in fat and/or sugar.<sup>9</sup> In France, Benefice and Caius<sup>11</sup> conducted a survey of 14–15-year-old West Indians ( $n = 715$ ) using questionnaires to assess their dietary habits. They found that the dietary habits of the participants were similar in structure and composition to Western diets, although some foods reflected the Creole culture. In a study of 18-year-old North Africans ( $n = 13,147$ ) living in France, Wanner et al.<sup>21</sup> found that consumption of dairy products and meat was lower and consumption of starchy food and legumes higher, as compared with the majority of the French population. Beun et al.<sup>22</sup> suggested that unhealthy dietary habits were more common in low-income groups among people who also smoked and/or were overweight, and thus at greater risk of developing obesity and other diet-related diseases.

In contrast, a study from the UK reported little change from the traditional diet among African

Caribbeans. This study was based on a two-day food diary or 24-h recall method to determine commonly consumed foods, and recipe information was collected to calculate the nutritional composition of the foods commonly prepared and consumed. Foods such as rice, rice and peas, hard-dough bread, and West Indian soups were commonly rated in the list of top 10 foods by 29 Jamaican subjects living in Manchester and aged between 25 and 79 years.<sup>23</sup> The wide variety of traditional foods available to those living in the UK could explain why fewer changes were observed in the diets of Jamaicans living in the UK.

In the ethnic African groups in Spain, there is evidence of dietary departures from the traditional African diet towards the Spanish diet. Spain has an ethnic population of Bubis, from the island of Bioco, off the coast of Cameroon in West Africa. In a cross-sectional study, a random sample of Bubis ( $n = 213$ ) aged between 18 and 84 years were interviewed using a food-frequency questionnaire.<sup>19</sup> Traditional starchy vegetables were reported to be consumed up to three times a month in this population. Dairy products, meat, fish, raw vegetables, and fruits were eaten on a daily basis, while eggs, potatoes, and pulses were eaten weekly.<sup>24</sup> Likewise, Montoya et al.<sup>25</sup> reported that first- and second-generation immigrants ( $n = 356$ ), aged 6–12 years living in Madrid, consumed more fruits, vegetables, legumes, and eggs but less fish and dairy products than the indigenous Spaniards, suggesting that the young immigrants had healthier diets.

### Turks

Traditionally, each Turkish meal includes one of the staples listed in Table 2. Breakfast and lunch normally contains bread, accompanied by cheeses or meat,<sup>26</sup> while dinner includes a staple (vegetable or meat casserole), yoghurt, salad, bread, and fruit.<sup>8</sup> According to Hulshof et al.,<sup>26</sup> dishes commonly consumed in Turkey include *pilav* (prepared from rice or bulghar wheat), minced meat, paste (*makarna* or *manti*), *sarma* (normally prepared from Chinese cabbage leaves), and *borek* (thin layers of wheat-flour dough inter-filled with meat or cheese).

Several studies have reported that the diets of Turks in Sweden and Denmark are changing to include less healthy components. In Sweden, Kocturk<sup>8</sup> reported that healthy foods such as vegetables, yoghurt, and fruit were being replaced by fruit syrups and ice cream, indicating a reduction in fiber and vitamin C and an increase in protein, saturated fat, and sucrose. In Denmark, Osler and Hansen<sup>27</sup> surveyed Danish and immigrant school children ( $n = 674$ ), aged 12–14 years. The questionnaire included categories on dietary intakes, and the results also showed that the immigrants were consuming greater amounts of sugar from cakes (30% on a daily basis, as

**Table 2 Foods commonly consumed in the traditional Turkish diet.**

Food group	Turkish tradition
Staple foods	Soft breads, bulgur wheat, pastries, pasta, rice
Meat/fish/eggs	Mutton, lamb, chicken, organ meat (liver/kidneys), some pork and seafood
Milk and dairy products	Milk from cows and sheep, yoghurt and fresh cheeses
Vegetables	Wide variety
Legumes	Wide variety
Fats	Margarine, butter, olive and other oils
Herbs and spices	Parsley, dill, pepper, mint, cinnamon
Sweets and desserts	Sweets, "halvas", "baklavas", puddings
Nuts and seeds	Wide variety
Fruits	European varieties (consumed liberally as desserts and snacks)
Drinks	Yoghurt, water, soft drinks, tea, coffee

Selected information adapted from Kocturk (1996).<sup>8</sup>

compared to 10% for the Danish youngsters); however, the immigrants were also consuming greater amounts of vegetables (90% on a daily basis, compared to 70% in the Danish group). Proposed reasons for these changes include a food supply to which they are unaccustomed, income restrictions, and lack of dietary knowledge.<sup>27</sup> In Sweden, however, Kocturk-Runefors<sup>28</sup> found contrasting results, reporting that the Turkish diet was low in animal foods, protein, refined sugar, alcohol, and fat, and higher in fruits, vegetables, and grains compared with the typical Swedish diet.

### South Asians

South Asians originate from the Indian subcontinent. In the UK, the main subgroups are from India, Bangladesh, and Pakistan, in some cases via East Africa. Within the Indian population, there are three subgroups Hindu, Punjabi, and Gujarati.

The traditional staples of the Indian diet are cereals (*chapatti*, *paratha*, *roti*, and/or rice) accompanied by a curry containing meat or vegetables.<sup>1</sup> Kassam-Khamis et al.<sup>29</sup> reported that consumption of staples varied within subgroups; thus, Bangladeshis consumed mainly rice and Pakistanis mainly *roti* or *chapatti*. *Parathas* were commonly consumed by Punjabis and Hindus but less often by Gujaratis.<sup>10</sup> According to Kassam-Khamis et al.<sup>29</sup> Pakistanis were the only group to frequently consume sweet dishes such as *kheer*, *sevia*, and *mithai*. Seasonal variations were evident, with warming foods such as *khadhi* (a yoghurt and chickpea soup) often eaten in the winter. Snacks (fried products or sweetmeats) were frequently consumed on special occasions.<sup>29</sup> This traditional reliance on a diet of curries and cereals (*chapatti*, *roti*, *paratha*, and/or rice) and large amounts of fruits and vegetables indicates a dietary intake that is fairly high in fiber and moderate-to-low in fats.<sup>30</sup>

These traditional dietary habits of South Asians have been reported to change, in some instances to a less-

healthy diet, after migration, especially in younger generations (Table 3). Typically, the new diets are higher in sugar and fat, which may support the contention that immigrant Indians are at increased risk of obesity and other degenerative diseases.<sup>12,31</sup>

### Latin Americans/Mexicans

Cereals form the staple part of the Latin American diet, along with root crops and tubers.<sup>32</sup> The traditional Mexican diet consists of corn and beans, typically pinto, black, and other kidney bean varieties. Corn or wheat flours are made into *tortillas* and flat bread/wrap products such as tacos. Central and southern Mexico has foods based on *moles* or many sauces and the southern Mexican sauces contain additional ingredients such as meats, herbs, and spices.<sup>32</sup>

Changes in the dietary habits of Latin American immigrants to Europe, especially Spain, include increased consumption of more refined foods and decreased intake of complex carbohydrates, both of which are associated with consumption of more accessible processed foods. These changes are likely to impact the health of these immigrants since processed foods are generally higher in fat, salt, and sugar.<sup>25</sup>

Ecuadorian and Colombian ethnic groups living in Spain have been found to have altered their dietary habits to include less fruit, rice, and soups, all of which are traditionally eaten. These changes were more common amongst younger generations.<sup>33</sup>

### Moroccans

Moroccan cuisine is largely influenced by herbs and spices from Arabia while the cuisines of France and Spain have had a significant impact on the ingredients and cooking methods used. Traditional and commonly consumed Moroccan staples include lentils, couscous,

**Table 3 Changing dietary habits amongst South Asian immigrants in Norway and the United Kingdom.**

Population subgroup(s) and host country	Method of data collection	No. of subjects	Age	Dietary change	Reference
Indian, North African, and other ethnic origin (Norway)	Questionnaire on sociodemographic variables and food-frequency questionnaire	1719	Adolescents (15–16 years)	Higher consumption of chocolate and sweets (48.3% daily vs. 37.8% in mainstream population). A higher percentage of Indians consumed lower amounts of fruits and vegetables compared to the amounts in a Western diet (10.7% vs. 3.8%)	Kumar et al. (2004) <sup>12</sup>
Europeans, Punjabi Sikhs, Pakistani/Punjabi, Gujarati Moslems, Punjabi Hindus, and Gujarati Hindus (Coventry, UK)	Questionnaire on dietary and domestic habits, and prevalence of diabetes included	612 Total: 304 European; 118 Punjabi Sikh; 67 Pakistani/Punjabi; 28 Gujarati Moslems; 25 Punjabi Hindus; 47 Gujarati Hindus	>20 years	A larger percentage of Europeans than South Asians ate no fruit (21% vs. 4%), but Europeans ate more vegetables than South Asians [4.9 (95% CI, 4.6–5.2) vs. 4.1 (95% CI 3.7–4.2) days a week]. Pakistani Moslems and Gujarati Moslems were less likely to be vegetarians compared to Sikhs and Hindus (4% and 9% vs. 43% and 33%). Compared to Europeans, less South Asians ate burgers (44% vs. 17%), chips (79% vs. 74%), and cakes or biscuits (83% vs. 67%)	Simmons and Williams, (1997) <sup>10</sup>
Pakistani, Sikh, Hindu, and Bangladeshi Muslims (Birmingham, UK)	Dietary intakes determined by weighed food records and dietary recall methods (5 weekly intervals from 18 weeks of pregnancy)	37 Pakistani; 15 Sikh; 11 Hindu; 8 Bangladeshi	Pregnant women aged 23–24 years	Pakistani and Bangladeshi ate an English-style breakfast (bread or cereals). Hindus and Sikhs ate <i>chapattis</i> and <i>parathas</i> more often than English foods. Pakistanis, Sikhs, and Hindus consumed <i>chapatti</i> and <i>paratha</i> as their main staples for a main meal with meat and, occasionally, consumed eggs. Bangladeshi consumed the least varied diet, eating fruit only occasionally compared to the other subgroups (14% vs. 46–52%)	Wharton et al. (1984) <sup>48</sup>

chickpeas, and dried fruits. Honey is used in many dishes as a sweetener.<sup>34</sup> A meal typically begins with drinking either a sweet and warm herbal tea or with a soup called *harria*. Main meals are often comprised of a stew, which is usually prepared with a mixture of vegetables, poultry, lamb, or beef by cooking slowly in a vessel known as a *tagine*.<sup>34</sup>

In a study of Moroccan immigrants in Spain, Montoya et al.<sup>35</sup> found that the degree to which the dietary habits differed from those of the host population depended on the period of acculturation. Those less-acculturated, i.e. spending only a short period of time in Spain, consumed more eggs, fats, and carbonated beverages, representing a less-healthy diet than their traditional one. Those who had lived in Spain for longer periods consumed more milk, meat, fish, vegetables, legumes, and traditional foods such as soups, condiments, and sweets, and had thus adjusted to a healthier diet.

### Surinamese

Originating from Surinam in northern South America, the Surinamese represent one of the largest ethnic groups (1.8% total population) in the Netherlands.<sup>7</sup> The dietary habits of the Surinamese have been found to differ considerably from those of the native Dutch population and were often found to be healthier.<sup>36</sup>

A nutrition survey, based on a written questionnaire, was conducted with 4450 children in the Netherlands, aged 0–18 years (88% Dutch, 3% Surinamese, 4% Turkish, and 5% others of non-Dutch origin). The results showed that 83% of the Surinamese consumed breakfast compared to 93% of the Dutch.<sup>37</sup> Assessment of macronutrient levels showed the daily intakes of the Surinamese to be closer to the recommended dietary amounts as compared with the Dutch.<sup>37</sup> The intake of fat, particularly saturated fat, was lower among the Surinamese, and carbohydrate intake was higher. However, vitamin and mineral intake levels, particularly those of calcium, iron, and one or more B vitamins, were lower than in the Dutch.<sup>37</sup>

Contrasting findings were reported by Van Erp-Baart et al.,<sup>36</sup> who assessed the dietary intake of Moroccan women ( $n = 39$ ) and Surinamese men ( $n = 45$ ) using focus-group discussions and 24-h recalls. They reported that fewer than half of the Surinamese consumed breakfast on a daily basis. At other meal times the foods consumed by the Surinamese men included larger amounts of fish (36 g/day), cereal and cereal products such as rice or pasta (274 g/day), and milk and dairy products (196 g/day). The dietary intakes of Moroccan women were reported to be lower for fish (<25 g/day), cereals and

cereal products (100 g/day), as well as for milk and dairy products (169 g/day).

### Chinese

The particular ingredients and cooking styles in traditional Chinese cooking differ by region. For example, rice is a common staple in southern China, while wheat products, such as noodles, are typical of northern regions. The styles of cooking also vary, Cantonese style in southern China, Beijing (northern China), lower Yangtze (eastern China), and Szechwan (western China).<sup>1</sup>

In France, certain dietary habits persist amongst Chinese immigrants while some habits change to a more Westernized diet. Roville-Sausse<sup>38</sup> interviewed Chinese ( $n = 70$ ) and French mothers ( $n = 50$ ) of 3–6-year-old children of the same educational and economic level. Children's food consumption was evaluated by 24-h recall and adjusted over a week. Chinese children born in France were much less likely to be breastfed (10% vs. 55% of French babies). After one year of age, traditional Chinese meals were consumed by the Chinese infants, but in comparison with their French counterparts, their diets contained less dairy foods (72% vs. 100%) and less fresh fruits (67% vs. 96%). While some of these dietary patterns are similar to those of the country of origin (i.e. relatively late introduction of new traditional meals and reduced consumption of dairy foods), new dietary habits were also observed (i.e., high intake of soft drinks and a reduced percentage of mothers breastfeeding). Eighty-four percent of the Chinese population studied was consuming soft drinks and 11% drank 600 ml or more of soda daily, suggesting an inadequate intake of important nutrients and a high intake of sugar. The lower rates of breastfeeding in this immigrant population are reflected in reports of studies conducted in China.<sup>39</sup> For example, in Hong Kong in 1997, 33.5% of mothers initiated breastfeeding.<sup>39</sup> However, the numbers seem to be increasing. According to the Baby Friendly Hospital Initiative Hong Kong Association (BFHIHKA), rates have increased from 19% in 1992 to 51% in 2000.<sup>40</sup> A large-scale survey of over 20,915 children in 105 counties of rural China reported that 98.22% were being breastfed. However, only 23.36% were being breastfed exclusively, and the duration was less than four months.<sup>41</sup>

### FACTORS AFFECTING DIETARY HABITS

The dietary habits of ethnic populations are influenced by many factors, including the availability of food, level of income, health, food beliefs, dietary laws and religion,

and cultural patterns and customs.<sup>1,13</sup> Additional factors include age (in particular, generation), region of origin, and occupation.<sup>1</sup>

### Availability of food

Some changes in dietary habits result directly from the lack of availability or prohibitive pricing of traditional foodstuffs in the host country. If traditional foods are imported, they are often more expensive.<sup>42</sup>

### Income

Generally speaking, total disposable income determines dietary habits, but the amount spent on food has been reported to be clearly important.<sup>43</sup> For some ethnic groups, maintaining cultural food habits is a key priority, and expensive imported foods will be purchased despite their cost relative to income.

The majority of ethnic groups living in Europe belong to lower socioeconomic communities and have similar backgrounds; they tend to find low-paid jobs in their host countries.<sup>29</sup> Low income can restrict food choice, so they often eat poorer quality foods, such as cheaper cuts of meat with more fat or, indeed, with little meat at all. They also tend to buy less fruits and vegetables and they consume more processed foods that are high in fat, salt, or sugar. This trend has been reported in both South Asian<sup>29</sup> and African Caribbean<sup>9</sup> groups living in the UK. For example, purchases of cooking oil, meat, and high-fat foods by South Asians was reported on a weekly basis in lower socioeconomic classes in London, suggesting diets that are higher in fat and pointing to an associated higher risk of coronary heart disease in this group.<sup>29</sup>

However, low income does not necessarily equate to a poor-quality diet in all ethnic groups. Sharma et al.<sup>43</sup> reported that African Caribbean adults in Britain, despite their low incomes, spent more on traditional foods like yams than on potatoes, thereby maintaining cultural food preferences. This has also been reported in South Asian families living in the UK.<sup>44</sup>

### Food beliefs

Several foods are believed to have medicinal properties among Indian subgroups. Particular foods, including selected condiments and fatty foods, such as any dish with extra chillies and *halwa*, a sweet pudding prepared from gram flour roasted in ghee and mixed with sugar, are believed to cure a sore throat overnight. There are other foods such as tamarind, tea, banana leaf, and karela that are believed to have health benefits or healing properties and are consumed frequently. Among African Caribbean groups, herbal teas and the vegetable *cho-cho* are fre-

quently consumed as they are believed to relieve hypertension and diabetes, while tea made from *ackee* leaves is widely believed to protect against colds.<sup>9</sup>

### Dietary laws and religion

Dietary laws have been reported to have a strong influence on food habits, especially in African Caribbean<sup>45,46</sup> and South Asian groups.<sup>1,47</sup> Depending on the nature of the dietary law, some foods are completely forbidden, while others may be eaten occasionally, or only in small quantities. In addition, there can be restrictions on how, when, and with what particular foods are eaten.

A small minority of African Caribbeans belongs to a subgroup known as Rastafarians.<sup>45</sup> Each of the three types of Rastafarians, i.e., orthodox Rastas, functional Rastas, and lumpen Rastas, observe different dietary laws. Orthodox Rastas are the strictest while functional Rastas are the most relaxed. For all three Rasta types, foods of animal origin, particularly meat and fish, are classified as 'dead foods' and prohibited, whereas foods of vegetable origin are classified as acceptable or *I-tal*.<sup>46</sup>

Another religious group, the Seventh Day Adventists, do not consume fish without fins or scales, pork, pork products, alcohol, or stimulants such as tea or coffee.<sup>9</sup>

South Asians can be further classified as Hindu, Muslim, Jain, or Sikh.<sup>1</sup> Many Turks and Kurds are practicing Muslims.<sup>28</sup> Strict Hindus consume neither meat nor fish and the more orthodox Hindus also exclude eggs from their diet. Non-vegetarians will not consume beef, veal, sausages, or beef extract.<sup>47</sup> Pork is forbidden by Muslims and other meat must be *halal*<sup>1</sup>, which refers to the manner in which the animal was slaughtered. Wharton et al.<sup>48</sup> reported that pregnant Hindu women ate meat and fish in Birmingham, UK. While the reasons were not clear, the women were non-vegetarian Hindus, like many others. Most Jains in the UK, particularly the women, observe a strict vegetarian diet. Sikhs from the Punjab region have the least strict diets—some may eat beef and pork and alcohol is not forbidden; nevertheless, alcohol is generally consumed in moderation.<sup>1</sup>

### Generation and age

Dietary choices have been reported to be affected by generation and age. In the UK, the older generations of South Asians are less likely to change their dietary habits since they are more segregated from the mainstream population and thus continue eating traditional foods. In contrast, younger generations are more likely to change their eating habits by including English foods, as they are seen to be convenient, associated with the host country, and reflective of independence.<sup>49</sup> The food items consumed

**Table 4 Prevalence of overweight or obesity and diabetes in different ethnic populations.**

Ethnic group(s)	Control group	Disease	Prevalence versus control*	Reference
Indian	Indian (India)	Diabetes	40.9 million or 3.6%	Mohan et al. (2007) <sup>58</sup>
African	African (Africa)	Diabetes	7 million or 0.7%	Wild et al. (2004) <sup>91</sup>
Caucasian	Caucasian (UK)	Diabetes	2.35 million or 3.9%	Department of Health (2007) <sup>74</sup>
South Asian	Caucasian (UK)	Diabetes	20% vs. 5%	Cleland and Sattar (2006) <sup>56</sup>
African and South Asian	Caucasian (UK)	Diabetes	18% and 25% vs. 7%	Landman and Cruickshank (2001) <sup>92</sup>
Indian, Pakistani, and Bangladeshi	Caucasian (UK)	Diabetes	13%, 23%, and 23% vs. 4%	Bhopal et al. (1999) <sup>15</sup>
South Asians	Caucasian (UK)	Diabetes	19% vs. 4%	McKeigue et al. (1991) <sup>93</sup>
Albania, Chile, Eritrea, and Finland	Caucasian (Sweden)	Overweight or obese	31% vs. 18%	Magnusson et al. (2005) <sup>66</sup>
African and South Asian	Caucasian (UK)	Obesity (BMI > 27)	39% and 24% vs. 31%	Landman and Cruickshank (2001) <sup>92</sup>
Turkish	Netherlands (no control group)	Obesity (BMI > 30)	27% men and 28% women	Hulshof et al. (1995) <sup>26</sup>
South Asian and African Caribbean	Caucasian (UK)	Obesity	26.3%, 37% vs. 16.3%	Pomerleau et al. (1999) <sup>94</sup>
West African	Caucasian (Madrid, Spain)	Obesity	17.1% vs. 13.4%	Gill et al. (2005) <sup>24</sup>
Indian, Pakistani and Bangladeshi	Caucasian (UK)	Obesity (BMI > 30)	38%, 34% and 15% vs. 16%	Bhopal et al. (1999) <sup>15</sup>

\*Percentages indicate the rate of prevalence in specific groups or controls/Caucasian.

most frequently by younger South Asians are crisps (potato chips), sandwiches, pasties, baked potatoes, and pizzas.<sup>30</sup> All of these foods are particularly rich in fat and sugar and are associated with an unhealthy diet. In contrast, Chinese immigrants are reported to only marginally change their dietary habits even as time spent living in the UK increases.<sup>1</sup>

### HEALTH IMPLICATIONS

Several studies have shown that the ethnic group that integrated most strongly with their host country rapidly adopted the disease patterns of the host.<sup>50</sup> Migrants have higher rates of mortality and morbidity due to nutrition-related diseases compared to the mainstream population<sup>51,52</sup> as well as to the population of their native country.<sup>53–55</sup>

Changing diets of ethnic groups have resulted in major health concerns such as diabetes,<sup>56</sup> obesity,<sup>14</sup> and cardiovascular disease.<sup>57</sup> There is a global prevalence of diabetes, with India having the largest number of diabetics (40.9 million).<sup>58</sup> In a host country, such as the UK, ethnic groups have been reported to be at increased risk compared to the mainstream population (Table 4). For instance, African Caribbeans are three times more likely<sup>59</sup> and South Asians five times more likely<sup>29</sup> to suffer from diabetes than the mainstream UK population.

It is still not fully understood why South Asians have such a high susceptibility to diabetes compared to Caucasians. In general, a more Westernized diet has higher levels of fat and sugar, which can lead to obesity, a known risk factor for diabetes.<sup>60</sup> However, several studies (Table 4) have shown South Asians to have a higher prevalence of obesity than their white counterparts, indicating that a number of additional factors must be at play, including lack of exercise and other dietary and genetically determined physiological responses, such as excessive insulin resistance.<sup>61,62</sup> An association between insulin resistance and obesity has also been observed amongst male Pakistani migrants.<sup>63</sup>

Obesity prevalence has reached epidemic levels in many countries (Table 5). Obesity has been measured according to BMI (body mass index), which is calculated as weight (kg) divided by height squared (m<sup>2</sup>). In Sweden, 39% of children born to Chilean immigrants have been reported to be overweight,<sup>64</sup> which compares to 7–7.5% in Chile,<sup>65</sup> and 31% of young immigrants aged 11–12 years old from Albania, Chile, Eritrea, and Finland were reported to be either overweight or obese. Dietary patterns were poor in this latter group, with 44% drinking sweetened beverages more than four days a week.<sup>66</sup> This suggests that consumption of too many calories from sugar and fructose may be the risk factors for overweight in these children.<sup>66</sup> Fructose intake from soft drinks has



**Table 5 Prevalence statistics for obesity in adult men and women (BMI > 30) in various countries.**

Country	Year	Prevalence (%)		Reference
		Male	Female	
<b>Europe</b>				
England	2005	23.1	24.3	International obesity task force (2007) <sup>95</sup>
The Netherlands	1998–2002	10.4	10.1	International obesity task force (2005) <sup>96</sup>
France	2003	11.4	11.3	International obesity task force (2005) <sup>96</sup>
Finland	2000	20.0	25.0	International obesity task force (2007) <sup>95</sup>
Sweden	2002	14.8	11.0	International obesity task force (2007) <sup>95</sup>
<b>Africa</b>				
Cameroon	2000	5.1	13.8	International obesity task force (2007) <sup>95</sup>
Jamaica	1999	7.6	23.9	International obesity task force (2007) <sup>95</sup>
West Indies Trinidad and Tobago	1999	10.7	21.1	International obesity task force (2007) <sup>95</sup>
India (Delhi)	1997	3.0	14.0	International obesity task force (2007) <sup>95</sup>
China	2002	2.4	3.4	International obesity task force (2007) <sup>95</sup>
Chile	2003	13.0	23.1	Hjern (1990) <sup>64</sup>

been found to be high and was associated with increased risk of obesity in the USA.<sup>67</sup>

The prevalence of obesity was also found to be higher in ethnic groups in the UK, the Netherlands, and France. For example, the Department of Health<sup>68</sup> investigated more than 6000 adults and 3415 children from African Caribbean, South Asian, Chinese, and Irish groups living in England. They found the highest levels of obesity in African Caribbean and Pakistani women, at >30% and >25%, respectively. The women were also around 60% more likely to be classed as obese compared to the mainstream female population.<sup>68</sup> Obesity levels overall were higher among immigrants in host countries compared to populations in their home countries (Table 5). For example, 13–23% of Africans were obese in Africa compared to more than 30% in the UK. In the Netherlands, immigrant populations from Turkey and Surinam had higher rates of overweight compared with the Dutch population. Cornelisse-Vermaat and van den Brink<sup>69</sup> and Benefice and Caius<sup>11</sup> used a questionnaire on food habits and carried out anthropometric measurements to evaluate 14–15-year-old West Indians ( $n = 715$ ) in France, and an excess of overweight and obesity was found.<sup>69</sup> It has been suggested that the elevated levels of obesity in ethnic groups compared to the mainstream population may be due to less physical activity.<sup>70</sup>

The prevalence of cardiovascular disease (CVD) is high amongst South Asians not only in host countries but also in countries of origin.<sup>71</sup> India has one of the highest mortality rates for CVD, with over 1.5 million deaths occurring in 2002 alone.<sup>72</sup> In one study, postprandial lipemia was measured in male subjects from South Asia ( $n = 8$ ), Latin America ( $n = 8$ ), and northern Europe ( $n = 9$ ). The results confirmed higher postprandial glucose and insulin concentrations in South Asians compared to the other groups. This can cause a degree of insulin resistance and play a role in the development of

CVD.<sup>71</sup> The prevalence of CVD has been reported to be high in Bangladeshis within the individual South Asian subgroups<sup>73</sup> and African Caribbeans<sup>74</sup> within the general UK population. In addition, ethnic groups from Poland, Turkey, the Middle East, and Asia living in Sweden had higher incidences of CVD than the Swedish. Age-standardized incidence rates for CVD risk per 1000 persons among the Polish, Turkish, Iranian, and Asian men and women aged 35–64 years of age have been reported to be 12.4, 14.2, 11.7, and 11.4 compared with 9.75 for Caucasian, Swedish controls.<sup>75</sup>

A diet rich in saturated fats is a well-known risk factor for coronary heart disease through its effect on blood cholesterol. South Asian diets have been found to contain high levels of fat.<sup>31</sup> Other factors likely to contribute to the high incidence of coronary heart disease amongst South Asians include migration, disadvantaged socioeconomic status, proatherogenic diet, lack of exercise, high levels of homocysteine and LP(a) lipoprotein, endothelial dysfunction, and enhanced plaque and systemic inflammation.<sup>73</sup>

## CONCLUSION

There is strong evidence that traditional dietary habits differ considerably amongst ethnic populations in European countries. Following migration, the majority of ethnic groups alter their eating habits, combining parts of their traditional diet with some of the less healthy elements of the Western diet. This has been particularly evident among African Caribbeans, South Asians, Turks, Greeks, Mexicans, and Chinese. A pattern common to all groups that emerged from this review was that the staple diet, including such foods as rice, starchy vegetables, ethnic breads, noodles, and curries, remained by and large in the diet while more Western, processed foods were consumed by younger generations. Such foods include

breakfast cereals, soft drinks, crisps, sweets, and snacks that are higher in fat or sugar (or in some cases both) and lower in dietary fiber than the legumes and grains of the traditional diet. It is likely that consumption of meat in some ethnic groups may have increased because meat is so abundant in western and southern Europe compared to in home countries.

Age and generation were two major factors determining the extent to which diets changed; other factors were the proportion of income spent on food, availability of food, dietary laws, religion, and food beliefs. Religion is a strong determinant of dietary patterns, and it generally restricts consumption of certain foods amongst the Rastafarians, Hindus, Muslims, Jains, and Sikhs.

Increasing consumption of less-healthy foods, genetic predisposition, lack of exercise, and stress associated with migration and settlement may explain, at least in part, the increased risk of degenerative diseases such as diabetes, obesity, cardiovascular disease, and hypertension that are found particularly within South Asian and African Caribbean groups. Among women in the UK, the prevalence of obesity has been reported to be >30% in African Caribbeans and >25% in Pakistanis, while it is >20% in the general female population.<sup>61</sup> Also in the UK, South Asians are more likely to have diabetes than the general population, and the risk of diabetes in this group is reported to be over four or five times higher than amongst Caucasians.<sup>45,29</sup>

According to the World Health Organisation,<sup>76</sup> nutritional deficiencies are receding as the leading contributors to death and disability in developing countries. Protective effects of whole-grain food intake on deaths due to inflammation, oxidative stress, and infections have been reported consistently.<sup>77</sup> Consumption of whole-grain foods has also been associated with reduced risk of coronary heart disease, type 2 diabetes,<sup>78</sup> and other diseases<sup>79,80</sup> whereas refined grains did not offer protection and might instead increase the risk of chronic diseases.<sup>81</sup> Therefore, dietary components such as grains and legumes that are typical of traditional ethnic diets may be associated with reduced risk of chronic diseases in the home country. The reported post-migration dietary changes towards consumption of less-healthy food components, such as fat, sugar, and salt, and energy-dense diets combined with reduced physical activity are likely to be the main causes of increased risk of chronic diseases, and all are significant features of modern Westernized diets and lifestyle.

Additionally, acculturation and stronger integration have been reported to result in declining health of immigrants.<sup>82,83</sup> However, specific dietary and environmental factors that lead to a decrease or an increase in risk of diseases, and hence mortality, upon migration need to be identified more accurately.

The reported dietary differences and resulting changes in nutrient intakes, together with the high rates of diet-related conditions within ethnic groups, are a considerable challenge to improving the overall quality of life of these groups by reducing the risk of diet-related diseases. This review also identified several limitations that inhibit understanding of the risk factors for declining health in minority groups. These include, the reliability of intake data due to lack of food composition data on ethnic foods consumed by these groups, and the intake data obtained from dietary assessment methods that are not critically assessed for their suitability in these groups. There are important differences in food preparation, serving practices, and eating habits, such as eating from the communal pot.<sup>84</sup> Therefore, it is suggested that nutrient intakes of ethnic minority groups must be interpreted with caution. In addition to there being fewer studies on ethnic groups, compared with those on majority groups, they are small in scale, and minority groups are often not represented in longitudinal or/and large cohort studies.

While the data presented here are both fragmented and incomplete and do not allow firm conclusions to be drawn, they suggest that changes in the diets of immigrant populations are taking place and that in younger generations, in particular, these result in diets that are less healthy overall. These indications serve to emphasize the need for further studies of the changes in diets of immigrant populations due to acculturation, and for critical comparisons to be made with the diets of host populations to determine the factors effecting diverse health outcomes.

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