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A review of ethnicity, health and nutrition-related diseases in relation to migration in the United Kingdom

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Abstract

Objectives: To identify lessons from and gaps in research on diet–disease links among former migrants in the United Kingdom (UK).
Results: Migrant status and self-identified ethnicity do not match so these terms mask differences in social, nutritional and health status within and between population groups. Some former migrants differ in causes of death from the general population, e.g.: fewer coronary heart disease deaths among Caribbean-born; fewer cancer deaths among Caribbean, South Asian- and East African-born adults. Irish- and Scottish-born have higher mortality from all causes. Experience of risk factors differ also, e.g.: higher prevalences of hypertension and diabetes in Caribbean- and South Asian-born adults than representative samples of the general population; obesity and raised waist-hip circumference ratios in South Asian, African-Caribbean and some Irish-born adults. Former migrants experience long-term disadvantage, associated with more self-defined illness and lower reported physical activity. Nutrient intake data from the few, recent, small-scale studies must be interpreted with caution due to methodological diversity. However, second generation offspring of former migrants appear to adopt British dietary patterns, increasing fat and reducing vegetable, fruit and pulse consumption compared with first generation migrants.
Conclusions: There is insufficient evidence on why some former migrants but not others experience lower specific mortality than the general population. Dietary intake variations provide important clues particularly when examined by age and migration status. Majority ethnic and younger migrant groups could raise and sustain high fruit and vegetable intakes but lower proportions of fat, by adopting many dietary practices from older migrants. Objective measures of physical activity and longitudinal studies of diets among different ethnic groups are needed to explain diversity in health outcomes and provide for evidence-based action.

Keywords
Ethnicity
Migrants
Nutrition-related diseases
Obesity
Diet
United Kingdom

Introduction

This review considers mainly former migrants ('first generation'), whose families and UK-born descendants form 7% of the total population, and focuses on the health and nutrition of adults. Internal migrants into England and Wales from Scotland and Ireland also constitute minority groups. Research in this area illustrates lessons and opportunities from which the whole of society as well as specific ethnic groups can benefit. Opportunities include rigorous comparison of diet–disease associations *within* relatively genetically homogenous ethnic groups who experience different environments (migration studies) and *between* genetically heterogeneous ethnic groups who experience the same environment, with important general implications. The review will therefore draw attention to gaps, uncertainties and unanswered questions in the field.

Issues of definition

Migrant status and ethnicity raise vexed and complex issues of definition. In the United Kingdom, information on how migration status affects health relies mainly on census records of place of birth and length of residence. It is unclear how long it takes for 'immigrants' to constitute a socially or culturally distinct or *ethnic* group of residents. Self-identified ethnicity was included in the UK census for the first time in 1991, yet ethnicity is recognised as a shifting construct. Individuals may change the ways that they view their cultural and hence ethnic identities and may have mixed ethnicities (e.g. the category 'Black

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Other' mainly chosen by British-born Blacks in the 1991 census). Nazroo[1] showed how self-identified ethnicity matched identity defined by country of family origin for the majority but not for everyone. 'Ethnicity' is also a social construct for the complexities of culture (history) and biology, whereas 'race' is a political term, without a biological basis[2–6]. Therefore the contested term 'ethnic minorities' may be used for some, mainly Black, minorities. As a result, there are 'forgotten' groups, for example, large but dispersed communities such as migrants of Chinese and Irish origin, as well as numerically small communities of refugees from Iraq and Somalia[5]. Such terms as 'Whites', 'Europeans', 'Caucasians' or 'general population' may include migrants from Ireland, the 'old' (white) Commonwealth (South Africa, Canada, Australia, New Zealand) or Europe (Poland, Italy, etc) or may refer only to UK nationals (English, Welsh, Scots). 'Caucasian' is imprecise as it includes many South Asian peoples. Such imprecision precludes the measurement of differences in dietary behaviours or health status within the majority ethnic group. Conversely, such terms as 'Black' and 'South Asian' conceal national, environmental, religious and hence dietary diversity: 'Blacks' may originate from the Caribbean or (mainly West) Africa; 'South Asians' may have come from India, Pakistan, Bangladesh, Sri Lanka or via East Africa (or the Caribbean). When used in British studies, such terms may lead findings from a relatively homogenous sub-group to be incautiously generalised to heterogeneous 'South Asians'. Similarly, 'African-Caribbean' refers to people of Caribbean origin and (west) African descent whose culture and diet have diverged enormously since slavery. Hence studies on Caribbean-origin people[7–10]are not directly comparable with studies which pooled African-Caribbeans with west-African migrant groups[11,12].

Many former migrants of African-Caribbean, South Asian and Irish origin shared subsistence farming and disadvantaged origins. Others, including South Asians expelled from East Africa, have merchant, trading and professional backgrounds. Common experience may be as important as disparate geographical origins, since groups may share a higher risk of specific mortality but also have disparate and lower *other* causes of death[13]. Demographic variability outlined below illustrates the need for caution in interpreting research that offers valuable insights but may not be fully generalisable.

Patterns of immigration and settlement

Immigrants have been refugees or workers, with refugees from Ireland and Eastern Europe arriving before and during the 19th century. Around World War II, small numbers of Chinese seaman, primarily from rural Hong Kong, settled mainly in Liverpool and London, increasing in the 1960s. Labour shortages promoted post-war migration from the 'New Commonwealth'. Peak immigration from the Caribbean was in the 1950–60s, mainly Jamaica (60%) but also from Barbados, St. Kitts, St. Lucia and Montserrat, among other islands, all with some shared but other disparate traditions, including diet. Fewer came from bi-ethnic Trinidad and Guyana. Peak immigration from the Indian subcontinent occurred from the 1960s to 1970s: about one third Muslims from present-day Bangladesh; mainly Hindu but some Muslim Gujeratis from west India; and Sikhs from the north (Punjab). Pakistani migrants included rural Punjabis and Kashmiris, many of whom had migrated from India after partition (*Mujabirs*). Other migrants arrived from Ceylon (now Sri Lanka). In 1972, 28,000 East African 'Asian' refugees came from Uganda, followed by 'Asian' people from Kenya and Tanzania. Moreover 22 000 East Asians (e.g. Vietnamese) refugees arrived. Cypriots came mainly after partition in 1974. Legislation curbed the number of immigrants from 82 000 in 1975 to 55 000 in 1994, mainly to join families (70% wives, children, husbands; 59% Commonwealth citizens)[1,5,14]. In the 1991 census, 3 746 000 residents (6.8%) were born outside the UK, 45% in the New Commonwealth, 15.8% in Ireland, 13.2% in the European Community, and 6.1% from the remainder of Europe, USSR and Turkey. Minority ethnic groups (5.5% of the population) tend to be younger than the general population (Table 1). However, there were more 65+ year olds among migrants of Indian (5.2%) and

Table 1 Ethnicity and Population in Britain, 1991[5,14]

Ethnic group	Number (thousands)	Percent Total population	Percent British-born	Percent 0–15 years old	Percent 16–44 years old	Percent 45–64 years old
White	51 874	94.5	95	19	42	22
Black-Caribbean	500	0.9	54	22	48	25
Black-African	212	0.4	36	29	59	10
Black-Other	178	0.3	84	51	43	5
Indian	840	1.5	42	30	50	17
Pakistani	477	0.9	50	43	43	12
Bangladeshi	163	0.3	37	47	38	14
Chinese	157	0.3	28	23	23	14
Others	488	0.9	44	35	35	12

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Table 2 Mortality in England and Wales: Standardised Mortality ratios by country of birth for selected causes among 20–69 year old men and women, 1989–92[16,17]

	All Causes		Coronary Heart Disease		Stroke		Lung Cancer		Breast Cancer
Birth place	Men	Women	Men	Women	Men	Women	Men	Women	Women
England & Wales	100	100	100	100	100	100	100	100	100
South Asia	106	100	146	151	155	141	45	33	59
Caribbean	77	91	46	71	168	157	49	31	75
West Africa	113	126	56	62	271	181	62	51	125
East Africa	110	103	131	105	114	122	42	17	84
Scotland	132	136	120	130	125	125	149	169	114
Ireland	139	120	124	120	138	123	151	147	92

African-Caribbean (7.7%) than Pakistani (2.4%) or Bangladeshi origin (1.5%), reflecting the patterns of migration described above.

In 1991, 75% of the minority ethnic populations lived in metropolitan and industrial areas in London, the West Midlands, West Yorkshire and Greater Manchester, compared with 25% of the majority (white) population. There may be >25% persons of minority ethnicity, in a few areas, e.g. in nine London boroughs, in Slough and Leicester. In most of Scotland, Wales, South West and Northern England there are no or very few persons of minority ethnicity. In Glasgow, three areas (Kelvingrove, Pollokshields, Crosshill) had >10% of minority ethnicity on the electoral roll, mainly of Pakistani origin. This heterogeneity must be born in mind in the interpretation of studies of diet and health in different cities in the UK. However, large-scale studies are available of mortality.

Mortality

Caribbean-born people had significantly *better* all cause mortality and 'South Asian-' and East African-born were no different from the national average (Table 2), in the latest available data, from 1988–1992[15–17]. However, most (former) migrant groups, including Scottish- and Irish-born residents in England and Wales, have higher mortality ratios from all causes (Table 3)[5,17–19]. The better overall mortality for Caribbeans, whose beneficial nutritional profile is outlined below, is due to much lower coronary heart disease (CHD) rates that have persisted for at least 20 years, with the important exception of small numbers of Indian-origin Trinidadian and Guyanese migrants[7]. Lower CHD rates have also been the pattern of the West African born. Adults of African and Caribbean origin have the highest mortalities from stroke (Table 2) and renal disease, in part related to 'competing causes' from the many fewer deaths from much commoner CHD, but also reflecting excess hypertension. Adults born in different parts of the Indian subcontinent differ in mortality: Bangladesh-born have higher total mortality than India- or Pakistan-born males. These differences persist after adjustment for social class (Table 3). People of South Asian, African and Caribbean origin have three fold higher, and disproportionately premature, mortality due to diabetes mellitus[5,20]. However Irish descendants appear to have lower standardised mortality due to diabetes[5,21] than in the UK generally, although smoking-related outcomes are excessive. By contrast, South Asians and Caribbeans have lower mortality than the general population from lung among other cancers (Table 2). Among South Asians and Caribbeans, smoking has been less common but may be changing in younger people. Chewing bedi is common in some South Asian men, particularly Bangladeshis.

Morbidity

More morbidity data are available for persons of South Asian origin than other ethnic groups[22]. There is consistent evidence that adults born in the Caribbean, Africa and South Asia have higher prevalences of diabetes mellitus than the general population in the UK e.g. Table 4[9,12,21,23–26] includes a major standardised international comparison of African-origin population samples whose dietary intakes are available[10,26–29]. The excess diabetes prevalence is closely associated with obesity, as indicated by high BMIs and high waist-hip ratios, and follows a geographic trend: lower in rural than urban Cameroon; leaner men, more overweight women in Jamaica and in UK African-Caribbeans[26].

Minority ethnic groups have poorer prognoses from diabetes. Cruickshank and Alleyne[30] reported more

Table 3 Mortality in England and Wales among 20–64 year old men, All causes, SMR adjusted for social class[19]

Birth place	SMR
All countries	100
Indian Sub continent	117*
India	114*
Pakistan	110
Bangladesh	159*
Caribbean	82*
West & South Africa	135*
East Africa	137*
Scotland	132*
Ireland	129*

* Significantly different from 100.

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Table 4 Age adjusted prevalence rates of major risk factors for cardiovascular disease in adults of varying ethnic origins* in Wandsworth, South London, Manchester†, and Southall, West London, UK[12,26,34,40,44]

		White European		African descent		South Asian descent	
Risk factors		%	95% CI	%	95% CI	%	95% CI
Hypertension							
Wandsworth		18	13, 24	37	30, 44	28	23, 34
Manchester	Men	28	23, 34	38	31, 45	24	14, 34
	Women	18	13, 22	42	35, 48	32	20, 43
Southall		–		29	34, 44	–	
Diabetes							
Wandsworth		7	3.5, 11	18	12, 25	25	20, 32
Manchester	Men			24	18, 30	26	16, 37
	Women			21	16, 26	36	25, 48
Southall	Men	5		15		20	
	Women	2		–		16	
Obesity							
BMI >27 kg/m^2							
Wandsworth		31	25, 37	39	33, 46	24	19, 30
Manchester	Men	46	40, 52	50	43, 57	54	42, 66
	Women	44	39, 50	65	59, 72	63	51, 75
Southall	Men	25		–		27	
	Women	6		26		26	
Cholesterol							
>5.2 mmol/L							
Wandsworth		78	73, 83	58	51, 65	68	62, 74
Manchester	Men	82	63, 91	50	38, 62	–	
	Women	69	59, 79	70	60, 80	–	
Southall		–		–		–	
Smoking							
Wandsworth		40	33, 46	19	14, 25	25	20, 31
Manchester	Men	43	37, 49	36	30, 43	28	17, 39
	Women	43	37, 48	13	8, 17	–	
Southall		–		–		–	

* Ethnic origin defined in varying ways by place of own and parents' birth, with additional characteristics such as language, interviewer's judgement in the case of some 'South Asians'.
† Numbers of subjects (n) for White, African-Caribbean and South Asian (Pakistani) are: men, 260, 203, 67 respectively; women, 290, 232, 65 respectively.
– Indicates values not reported.

hypertension, cataracts and higher glycaemia, yet still less CHD in both random samples of Jamaican diabetic clinic attenders in Jamaica and UK Caribbeans compared with Europeans with diabetes in the same British clinic. That relative deficit from CHD was also confirmed for total mortality from diabetes[31]. However, Mather *et al.*[32] found poorer glycaemic control, increased retinopathy and a higher prevalence of microalbuminuria among South Asians compared with Europeans with diabetes attending the same clinic in west London. Age-adjusted prevalence of hypertension is higher in Caribbeans, Africans and South Asian men than in the general UK population[9,11,12,25,33,34] (see Table 4)[33,34]. Williams *et al.*[13] also found significantly higher blood pressure among 30–40 year-old South Asian men living in Glasgow, but not women. Hypertension is more common among South Asians with diabetes than in the general population[32]. There is a clear geographic gradient in such hypertension when representative samples aged 25–74 years, including socio-economically similar Europeans, are compared by standardised methods. UK African-Caribbeans have higher rates than local Europeans (men: 27% vs. 20%; women 30% vs.10%) and Jamaicans (men 12%, women 21%), with urban Cameroonians (17% men, 12% women) greater than rural (6% men, 7% women)[34–36].

These observations supported Greenhalgh's[21] conclusion from a systematic review that diabetes mellitus and its complications account for major avoidable morbidity and premature mortality, helping to explain why minority ethnic groups are over-represented among those in end stage renal failure awaiting transplants[37]. This in turn may arise from inequalities in access to, and inappropriate, management[5,12,17,38,39]. Under-detection may contribute in some samples[5] though not all[12], and in Manchester, the 'rule of halves' was better in African-Caribbean than in local European women[34]. Primary prevention of hypertension, as well as its good control, is an area with great dietary potential.

Obesity

Obesity has been endemic for a generation among women in Britain of South Asian and African-Caribbean origin[41,42]. Cross-sectional surveys in London[9,12,24,43,44], show that this is less so in men but mean BMIs of 25–26 kg/m^2 for the whole middle-aged male population are now recognised to be too high (Table 4). These groups have higher waist-hip circumference ratios than adults from the general population[9,12,25,44]. Social class, cohort age, age and sex interact among adults of Irish descent

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living in Scotland. For example, among 55 year old non-manual workers, Irish-Catholic origin was associated with a higher waist-hip ratio than for adults who were non-Catholics[45].

Less physical activity

There is less reported physical activity among minority ethnic groups than in the majority population, which may contribute to higher levels of obesity[17,46] although in the Manchester inner city survey, people over 35 y of any ethnic group took very little physical activity at all[40]. The Health and Lifestyle survey found the highest participation in life enhancing activities among men of African-Caribbean- (59%) and the lowest among men of Bangladeshi-origin (45%), with men of Indian- (54%) and Pakistani-origin (49%) in between[46]. These rates were higher than women reported – though the patterns were the same: 51% Black Caribbean; Indian 38%, Pakistani 32%; Bangladeshi, 29%[46]. Pomerleau *et al.*[43] recently investigated physical activity through questioning about work, sports and leisure physical activity among women of South Asian, African-Caribbean and European descent in London (Southall and Brent). While all three groups had rather low levels of reported discretionary physical activity, European women had occupations where they sat rather than walked (49%). While the majority of South Asian (62%) and African-Caribbean women (69%) reported that they walked more often than sat, at work, type of work may matter more. Few measures of reported physical activity level were statistically significantly related to BMI; among European women, television watching and radio listening accounted for an average 0.5 (0.2–0.8 CI) % increase in BMI; whereas walking more than 2.5 km/d was associated with an average 3.8(−6.9, −0.8 CI)% lower BMI. Direct measures of physical fitness or physical activity level have not been reported among minority ethnic groups or migrants.

Importance of multi-site studies

Increasingly, the UK population includes second and third generation descendants of original migrants, born in the UK, and hence are not identified by place of birth as descendants of former immigrants. National vital statistics are not available yet by ethnicity. One approach to disentangling environment from genes as predominant 'causes' of the differential risk of degenerative disease are multi-site studies within (at least similar) ethnic groups. This allows comparison of (relatively) genetically homogenous samples of migrants with samples from sites of origin: for example among adults who share common ancestry in west Africa, whose forebears were transported as slaves to the Caribbean and via there to the USA. Compared with population samples resident in West Africa, adults in the Caribbean and USA or the UK of West African origin are more obese[47], and centrally obese, associated with a higher prevalence of diabetes and hypertension[26,36,48]. Up to 40% of the attributable risk of known diabetes in these studies was associated with BMIs $\geq 25\,kg/m^2$. Differences in the relationship between body fat and body mass index are reported among these relevant ethnic groups in an international meta-analysis[49].

Predisposition to degenerative diseases appears to be exacerbated by such environmental factors as: diet, physical inactivity, immune-inflammatory changes, stress of racism, poorer use and lower quality of care[5,17,21,50], much of which is poorly quantitated. The observation that older men of Catholic Irish descent were 3.8 cm and women 1.1 cm shorter on average than Protestant Irish descendants may reflect long term disadvantage rather than genetic short stature because the former migrants are shorter than contemporary Irish living in Ireland[22]. Similarly, Gujerati men were on average between 6 and 7 cm shorter than local Europeans and African-Caribbeans in a London study[9]. Yet children of some former migrants are taller than white children, suggesting that genetics has little role in population averages[51]. Thus the persistence of social and economic disadvantage may be the cause for persistent higher risk and experience of morbidity, as self defined disease contributes to objectively measured morbidity.

Diet, food and nutrition

The Diet and Nutrition Surveys and the National Food Surveys that form the cornerstone of national food and nutritional surveillance of the national and regional populations in the UK have not measured food and nutrient consumption or nutritional or health status in representative samples of minority ethnic groups or households. Cooper *et al.*[36,48] reported a positive correlation between site, apparent level of dietary energy 'abundance' and the prevalence of risk factors of adult-onset diseases among residents and migrants of African descent in international comparative studies. However, the paucity and imprecision of dietary data limits the confidence with which links can be made between specific dietary nutrient(s) and risk of these diseases. Thus, recent multi-site studies found the highest total energy intake and total percent fat-energy amongst rural Cameroonians with the lowest intakes in the Manchester[29]. This paradoxical finding may be attributable to differential under-reporting[52] or, more likely, to unmeasured physical activity.

Data from smaller studies within the UK must be interpreted with caution as they give conflicting information about dietary fat consumption. In a recent review, Bush *et al.*[22] found mean percentage energy from fat ranged from 36–60% in 14 studies conducted among diverse subjects of varyingly defined South Asian origin,

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Table 5 Comparison of Dietary Fat among free-living South Asian healthy non-pregnant women and men from research using a variety of dietary methods, 1985–1995

Type of Sample	Sample Size	Dietary method	Fat Energy % (SEM)*	Reference
Households Mainly Gujerati-(77%), Urdu/Punjabi-speaking (15%) households in Brent & Harrow W London; systematic sample from electoral register; compared with National Food Survey. Response Rate: 51%	184	Household Food Consumption Survey	38.8 (0.6) [1981 NFS = 42.2]	McKeigue *et al.* (1985)[24]
Individual men				
English speaking volunteers from quota of 35–69 year old men of Bangladesh origin from general practice register in E London, compared with National Food Survey	12/116	1d precise weighed intakes with questioning & observation	56.7 (1.93) [1983 NFS = 43.9]	Silman *et al.* (1985)[55]
20–65 year old male factory workers Bradford, unspecified S Asian, 78 (62%) Muslim, 44(35%) Hindu compared with 160 white controls in the same factories. Response rate: Not stated	126	3d diet diary with food frequency questionnaire	40 [39, NS]	Smith *et al.* (1993)[54]
40–64 year old men of Punjabi origin from general practice registers, for 'Southall study', W London; mainly Sikh. Response rate: 59%; compared with whites (81/161). Includes all insulin responders	92/125	7 day weighed intake records	36.5 (0.62) [39.2 (0.7) P = 0.007)]	Sevak *et al.* (1994)[53]
45–54 year old men, quota sample, 81% registered with general practice in defined area,	20/75	5 day weighed inventory & questionnaire	38	Miller *et al.* (1988)[7]
Individual women				
First generation South Asian women, Glasgow, compared with general population (35) and Scots of Italian origin (30 1st generation, 38 2nd generation. Ages, response rate not stated.	35	7 day weighed intake records	42.4 (1.1) [Gen. Pop.39.1 (0.90) Scots Italians 1st gen:. 35.7 (1.05) 2nd gen:. 38.3 (0.84)]	Anderson *et al.* (1995)[60]
Second generation South Asian women, Glasgow, compared with general population (35) and Scots of Italian origin (30 1st generation, 38 2nd generation). Ages, response rate not stated.	37	7 day weighed intake records	39.8 (0.98) [Gen. Pop 39.1 (0.90) 1st gen. 35.7 (1.05) 2nd gen. 38.3 (0.84)]†	Anderson *et al.* (1995)[60]
42–70 year old women previously studied‡ who had stayed with same general practitioner; 48% competed protocol; 8 Sikhs, 2 Muslims.	10	7 day weighed intake records	35.8 (1.65) [1982–3: 40.1 (0.82) $P < 0.05$]	Anderson & Lean (1995)[59]
Vegetarian women of Gujerati origin, randomly sampled as part of a population sample.	15	Dietary history validated with weighed intake records	40	Thompson & Cruickshank (1990)[56]

* All SEMs shown were calculated from published SDs and N's except McKeigue et al. (1995)
† Significance of differences among all groups = $P < 0.05$, showing significant convergence with the general population over time.
‡ Subjects previously used as controls in an investigation of osteomalacia.

and using different methods of assessment. The samples included pregnant women and people with diabetes. At a household level, dietary fat-energy supply appeared to be lower than in the later national food survey[24] (Table 5). This may be highly misleading given consumption of fried snacks (samosas, bhajis etc.).Among males of South Asian origin, fat-energy has been found to below[53], similar to[54] and higher than the general population's[55] (Table 5). Silman *et al.*'s[55] results may have been biased by assessing 1 day only, in a small sub-sample of informants who spoke English. Fewer women of South Asian origin have been studied or reported in detail, but with similarly varying results[22,56–60].

Depending on the part of the subcontinent from which people originated, their methods of cooking, income among other social factors, people of South Asian origin may eat meals and dishes that clearly vary in the amount and quality of fat[54]. The study by Kassam-Khamis *et al.*[61] highlights the perils of estimating dietary fat intake using food tables with standard recipes. Since 1985 British food tables include recipes for dishes commonly eaten by former migrants[62,63], but were not available throughout the period when the studies in Table 5 were done. However the range of minority ethnic foods in the tables is small and cannot encompass the varied South Asian, Caribbean and African culinary traditions. Some researchers[24,55,59] supplemented British with regional tables and other sources of nutrient composition data, mainly for raw foods. It is unclear whether the 9 studies in Table 5 made similar allowances for water lost, fat used during cooking or plate waste. Jamaican recipes for popular dishes collected independently in England and in Jamaica however gave remarkably similar energy and protein contents*. In the absence of calibration or validation, it is difficult to assess the size of errors in nutrient conversion in the studies under review. Food tables have been found to overestimate fat content by 7.5% compared to analysis of duplicate portions[64] and more than the 5–10% reported for most nutrients by Paul & Southgate[65] in 1988.

McKeigue & Sevak[66] point out that the South Asian diet should not be assumed to be unhealthy. Nevertheless, frying vegetables may limit or damage potentially 'protective' nutrients, including anti-oxidants. Consuming fried foods and snacks occurs in the context of little physical activity. In qualitative research, informants of South Asian origin in Scotland reported preferences for vegetables, fruit and pulses[67,68], that they perceived themselves, and sometimes have been reported, to eat in larger quantities than the general population[13,54]. This may explain why lower saturated fat with higher P:S ratios and higher NSP (non-starch polysaccharide) intakes have been found among some adults of South Asian descent[24,53,54], although not in most Gujerati groups[7,56,57], and not always lower total fat[55,69]. Therefore an apparently healthy South Asian dietary pattern may be associated with vegetarianism rather than region of origin or religion. Types of dietary fatty acids may be critical. Vegetarian Gujeratis, who eat no fish, have virtually undetectable amounts of the w-3 eicosapentanoic and decosahexanoic acids in their dietary intakes, validated by vanishingly low levels in blood lipids, and red cell membranes[7,56,58]. High intakes of linoleic acid may also compromise insulin action.

Anderson and Lean[59] found that after a decade, the dietary fat intake of women of South Asian descent had become more similar to the diet of the general population. Glaswegians of Italian descent are less overweight and have lower fat intakes[60], more comparable with their traditions than Glaswegians of South Asian descent[70].

As part of a multi-site study, a representative sample of adults of African-Caribbean origin was studied in Manchester, using a food frequency questionnaire[27]. As a group, African-Caribbeans had lower dietary fat-energy than the general population (Table 6) but there was a clear age trend, so that intakes of second generation migrants, whether Caribbean or UK born, had higher fat energy (34–35%) than the older first generation (31%), but still lower than the national average (38%, with no age gradient)[10] (Table 6). The evidence indicates that former migrants' diets are generally closer to the 'healthy' pattern that the general population are advised to take, in terms of P:S ratio, fibre, fruit and vegetable consumption. However, it is unclear whether any of the dietary methods used to date appropriately assess the amount of cooking oil or fats, including ghee added to breads (chapatti, paratha, nan, etc.) and snacks (samosas, etc.). Re-use of cooking fats, frequent in poorer families and reported to be widespread in the Bangladeshi community, saturates and may create trans-isomers of, as well as oxidising, fatty acids.

Social nutrition – eating at home

The cuisines and eating habits of minority and majority ethnic groups overlap increasingly and may indicate the potential for nutrition health education to promote increased and/or sustained consumption of complex carbohydrate-rich, low fat foods, vegetables and fruit among both the ethnic majority and minority population groups. Study of social aspects of diet should also shed light on the factors that support or act as barriers to healthy patterns of food choice, purchase, cooking and conservation.

Migrants adopt the composition of small, informal and less significant meals to resemble those of the 'host' or general population[71]. Thus breakfast tends to be based on cereals, irrespective of ethnicity[68,72,73]. 'Proper meals'* now include foods adopted from Italian (pasta) or Asian

*Sharma personal communication; Landman, unpublished.

*Culturally significant for identity eaten in the home.

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Table 6 Mean daily nutrient intake and 95% confidence intervals of Caribbean-born group compared with national British data by age band (men and women combined)[10]

	n		Energy KJ		% Total energy from fat	
Age band-years	AfC	NDNS	AfC	NDNS	AfC	NDNS
25–34						
1. Caribbean born	10	–	8427 6243–10611		35 (31–38)	–
2. British born	43	507	10343 9163–11527	8598 8322–8874	35 (34–36)	38.6 –
35–49*	35	731	8171 7209–9129	9017 8598–9079	30 (29–32)	38.1 –
50–64	124	556	8427 7824–9029	8347 8121–8573	32 (31–32)	38.6
65+	36	–	8021 7058–8987	–	30 (29–32)	–
Total	251	2197	8686 8263–9104	8640 8514–8770	32 (31–32)	38.4 –

* For African-Caribbean (AfC) group, excludes 3 people born in Britain.
NDNS = National Diet and Nutrition Survey[82].
– = Not Available.

cuisines (rice) alongside rising use of convenience and ready-to-eat foods and sauces[74]. Pizza, Chinese stir-fry and spaghetti bolognese are apparently considered to be less than 'proper', and are part of domestic interpretations in a 'creolised' British cuisine[74,75]. As a result, there is no specifically 'British' cuisine, 'curry' being considered as British as roast beef[71]. The retail 'ethnic' (Chinese, Italian and Mexican) food market is growing rapidly[76]. 'Indian' food exceeds stereotypically British fish and chips as the most commonly purchased fast food. Among both majority and minority ethnic groups, being elderly, making a home and/or looking after a family are factors in a strong or renewed commitment to traditional food[71,72]. Women from minority ethnic groups seem to value 'freshness' as opposed to prepared or pre-cooked foods[67,77]. Williams *et al.*[70] found that compared with Italian-Scots, South Asian-Scots have stronger, more traditional, restrictive gender roles that reinforce cooking and hospitality as a private activity. They also suggest that folk traditions of hunger may support obesity. This may explain why few minority ethnic groups report concern about their weight[1,46].

Conclusions

There is insufficient evidence to explain why some recent and longstanding migrants have higher risks or experience of specific causes of mortality, while others do not and even have better total mortality rates than the general population. Nutritional intake variations provide important clues particularly when examined by age and migration status[10,59,60]. Despite the limited and sometimes conflicting evidence, diet unequivocally contributes to obesity, diabetes, high blood pressure and related deaths from coronary heart disease. This is due in some measure to both contemporary and historical social circumstances and to culture that affects feeding, eating and physical activity patterns. There is considerable evidence that social inequalities and social exclusion contribute not only to lower physical activity but also to poorer health outcomes in general, all creating a cycle of disadvantage transmitted to the next generation. This is in keeping with Barker's theory, that malnutrition in utero or in early childhood may predispose to adult disease, especially in the face of improvements in standards of living[78]. There is evidence to support this theory in populations relevant to former migrants. Thus maternal nutrition status in pregnancy in Jamaica 'predicted' blood pressure in childhood ([79,80] for example). In India, fetal growth (size at birth) predicted prevalence of CHD[81]. The evidence points to the benefit of good environment, including diet, for health in former migrants as well as the majority population. Raising 'cultural competency' among health workers[17] would improve the quality of care that minority ethnic groups and former migrants experience, and would improve primary and secondary nutrition health promotion for all. Majority ethnic populations have much to gain from many of the dietary practices of minority groups as has already been shown: by the incorporation of some foods and dishes e.g. complex carbohydrate-rich rice, pasta; curries especially those made with dahl and vegetables; raised and sustained high fruit and vegetable intakes but lower proportions of fat, as in the diets of older migrants of African-Caribbean and Italian origin, particularly. However, the database for devising food-based dietary guidelines or guidance on healthy living has obvious gaps, for example about the diets, nutritional and health status among neglected smaller migrant groups (e.g. from China, Iraq, Somalia). There is also a need for objective measures of physical activity and longitudinal studies of nutritional intakes in different ethnic groups in order to clarify the mechanisms underlying the diversity in health outcomes. Further applied research will have to address how to produce

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better, more 'culturally competent' health workers, nutritionists and dietitians who can deliver high quality, *evidence-based* food, nutrition and health services for all the population.

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