



University of Warwick institutional repository: <http://go.warwick.ac.uk/wrap>

This paper is made available online in accordance with publisher policies. Please scroll down to view the document itself. Please refer to the repository record for this item and our policy information available from the repository home page for further information.

To see the final version of this paper please visit the publisher's website. Access to the published version may require a subscription.

Author(s): Ala Szczepura

Article Title: Nutrition in an ethnically diverse society: what are some of the key challenges?

Year of publication: 2011

Link to published article:

<http://dx.doi.org/10.1017/S0029665111000085>

Publisher statement: © Cambridge University Press 2011

Nutrition in an ethnically diverse society - What are some of the key challenges?

Ala Szczepura^{1§}

¹Warwick Medical School, University of Warwick, Coventry, UK

[§]Corresponding author

Address:

Warwick Medical School, Social Studies Building
Main Campus
University of Warwick
Coventry CV4 7AL
UK

Email address: ala.szczepura@warwick.ac.uk

Telephone: +44 (0)24 7652 2958

Key Words.

Ethnic minorities; South Asians; diabetes and obesity; nutrition; evidence based practice.

Abstract

The role of nutrition is especially important in certain 'lifestyle' diseases which impact disproportionately on ethnic minority populations.

OBJECTIVE: The aim of this paper is to review the evidence on risk, health outcomes, and interventions for certain diseases which affect the UK's largest ethnic minority group (South Asians) in order to help professionals better address the needs of this diverse population.

EVIDENCE: Research evidence is presented on factors influencing access to services by ethnic minority populations and the changing UK policy background for public health and preventive care. The available research base on obesity, diabetes and CVD is discussed.

Conditions such as type 2 diabetes, which are more prevalent among the South Asian population, are associated with poorer health outcomes and appear to exhibit links to diet and nutrition that start in childhood or even before birth - all making preventive care important.

Obesity is a major risk factor and it appears that BMI thresholds may need to be lower for South Asians. Targeted interventions to improve diet and outcomes in the South Asian population also appear promising. Recent moves to promote access to evidence on ethnicity and health and to improve the cultural competence of organisations are discussed.

CONCLUSIONS: Health professionals will increasingly need to promote lifestyle changes in a manner which meets the needs of a diverse population in order to address future public health challenges. Nutritionists and other professionals will need to ensure that interventions are culturally appropriate and involve engagement with extended family members and communities.

Introduction

Health professionals are crucial in the fight against a number of conditions which impact disproportionately on ethnic minority populations. Approximately 12.5% of UK residents come from a non-white British ethnic background, and in some urban areas the proportion is nearer 50% (1). According to the 2001 Census, nearly half (45%) of the minority ethnic population in England lives in the Greater London area, where they form 29% of the population overall (2). South Asians currently represent nearly 40 per cent of the UK ethnic minority population, with individuals, or their families, mainly originating from India, Pakistan and Bangladesh.

With continued migration from South Asia, Europe and elsewhere, Britain has an increasingly multi-ethnic population. This can present a number of challenges to health care professionals when dealing with public health issues linked to diet and lifestyle. This paper focuses on specific conditions which are known to be more prevalent in people of South Asian origin, and are linked to diet and lifestyle. These include type 2 diabetes, CVD and coronary heart disease. It should be borne in mind, however, that there are other conditions, for example osteomalacia and rickets, which are also linked to diet and lifestyle in the South Asian population (3-5). The role of public health and preventive care are pivotal in all such lifestyle diseases.

UK policy background

In 2008, the *NHS Review* undertaken by Lord Darzi laid special emphasis on creating an NHS that would help people stay healthy (6). Primary Care Trusts (PCTs) were subsequently charged with commissioning comprehensive well-being and prevention services 'personalised to meet the specific needs of their local populations'. Six key goals were identified, the first of which was tackling obesity. A Coalition for Better Health was established to focus on combating obesity and providing incentives for primary care to help individuals and their families stay healthy. The following year, the *Guide for World Class Commissioners* stressed that 'promoting health and well-being is necessary but not sufficient', and cautioned that improvements in commissioning and service delivery must 'not widen the gap between different groups in society' (7). In February 2010, the Marmot

Review proposed an evidence-based strategy for the UK aimed at ‘tackling the persistent problem of inequalities in health and life expectancy’ (8). At the same time, national experts expressed concern that, while the Marmot Review included passing reference to the health disadvantage experienced by particular ethnic groups, it failed to ‘give any meaningful attention to this key dimension in modern British society’ (9). In July 2010, the UK Coalition Government published a White Paper (*Equity and excellence: Liberating the NHS*) which once again placed a strong emphasis on the need to reduce inequalities, stating that ‘the NHS is about fairness for everyone in our society.....We are committed to promoting equality’ (10). The Equality Act, which came into force in October 2010, gave public bodies a duty, when making decisions of a strategic nature, to have ‘due regard to the desirability of reducing inequalities of outcome which result from socio-economic disadvantage’ (11). In November 2010, the Home Secretary announced that the socio-economic duty, created as part of the Act, would now be omitted (12).

In contrast, there has been a legal requirement to address issues of racial equality for over 20 years in the UK. Furthermore, in the Race Relations (Amendment) Act 2000, all public bodies, including the NHS and local authorities, were given a statutory duty to make promoting race equality central to the way they work (13). Achieving this goal has apparently not been easy. The 2010 report from the Care Quality Commission (CQC) concluded that, although all Trusts should have met a minimum standard by 2004 in terms of promoting equality, nearly one in five were still failing to do so by 2009 (14). In primary care services also, a recent analysis of data from over one thousand English GP practices found that all aspects of care were rated substantially lower by respondents from ethnic minority groups than by white patients (15). The public health White Paper (*Healthy lives, healthy people: our strategy for public health in England*) proposes that at least 15% of current GP practice payments as part of the Quality Outcome Framework (QOF) should by 2013 be devoted to evidence-based public health and primary prevention indicators (16). It will become the responsibility of a new body (Public Health England) to decide on the level of investment in QOF public health primary prevention indicators, based on priorities for improving people’s health and reducing inequalities.

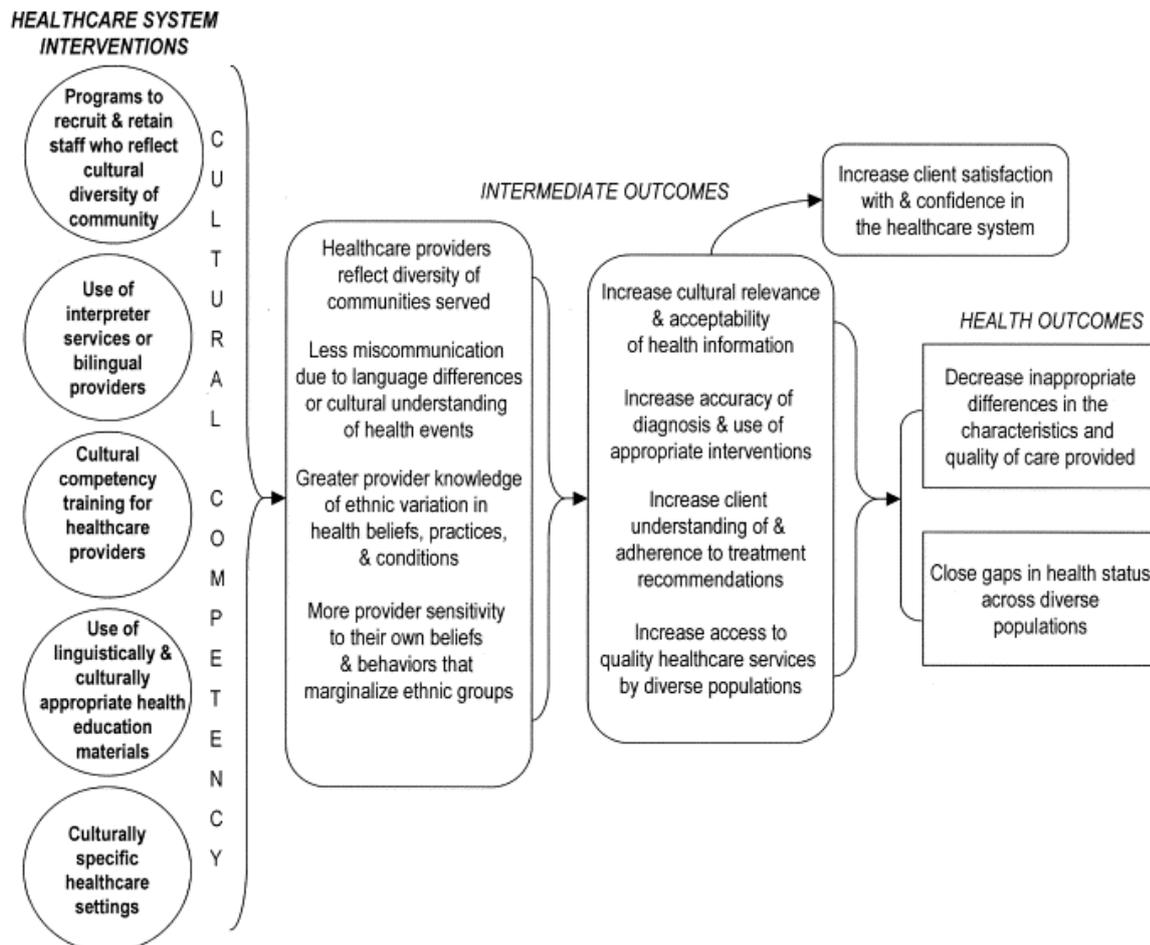
If the key goals proposed by Lord Darzi and the challenges identified by the CQC are to be addressed, health professionals will need to acquire the knowledge and skills required to meet the needs of a diverse population. Even if ethnic minority groups are provided with the same

services as other people this can still be discriminatory and result in inequalities if services are culturally or linguistically inappropriate. The key factors influencing access to health services, including preventive care, have been well rehearsed (17). In future, population health and wellbeing will require partnership working between NHS and Local Authority staff following the White Paper *Healthy Lives, Healthy People* (18). This has handed responsibility for public health to local authorities (together with a ring fenced budget) with the aim of tackling issues such as obesity, alcohol abuse and smoking. An initial equality impact assessment has been produced for the White Paper including analysis of any potential impact on racial equality.

Service provision

In countries that have experience of population diversity it is acknowledged that access to services may be poor for certain ethnic minority groups (17). Equity in access is defined as 'care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographical location or socio-economic status' (19). Reviews of the literature identify three key requisites for ethnic minorities: access via appropriate information; access to services that are relevant, timely and sensitive to cultural needs; and services which individuals can use with ease, and with confidence of being treated with respect (20). Various models have been put forward to make organisations more responsive and to improve cultural competence. As Figure 1 shows, this can require system-wide changes, especially for lifestyle interventions, because the provider and the patient each bring their individual learned patterns of language and culture to this experience (21). Organisations must also have the capacity to adapt to changes in the communities they serve (17). The slow implementation of ethnic monitoring data in the NHS means that, unlike the USA, it has not been possible to develop a UK overview of disparities in service use and outcomes for ethnic minority populations or to monitor these over time (22). Recent moves have focused on improving the use of UK ethnic monitoring data in areas such as cancer (17, 23, 24). The NHS has required all hospital trusts to record information on the ethnic origin of all patients since April 1996; more recently, this requirement has been extended to all new patients registering with a GP practice. Ethnic monitoring requires the identification of individuals as belonging to one or more groups, defined in terms of their culture and origin (25).

Figure 1: Analytic framework used to evaluate the effectiveness of healthcare system interventions to increase cultural competence



Source: (21)

Tackling obesity, the first goal set by the Darzi Review, will require a particular focus on the South Asian population since obesity is a major risk factor for type 2 diabetes (26). One of the characteristics which most strongly influences occurrence in the UK population is South Asian origin (27, 28). It has been estimated that 6.4% of the world’s adult population now suffers from diabetes, with a prediction that by 2030 the number of people with diabetes will have risen from 285 to 438 million (29). An early analysis of Health Survey for England data found that, although there had been improvements in the achievement of targets for blood glucose, blood pressure and cholesterol, and use of medications over the period 1998-2004,

these were not distributed uniformly across ethnic groups (30). Similarly, the latest evidence provided by the British Heart Foundation indicates that, for British people born in South Asia, coronary heart disease (CHD) accounts for about 25% of deaths compared with 15% in the White population; that revascularisation rates are higher in the White population than in those of South Asian origin; and that very few people from ethnic minority groups attend cardiac rehabilitation programmes (31). An earlier Health of Londoners Project, which analysed 1.3 million hospital admissions, also found significantly higher admissions for diabetes for South Asians and mortality rates over 4 times higher than average among Londoners born in Bangladesh and Pakistan (32). UK South Asian adults with type 2 diabetes are reported to access healthcare later than the majority population, with worse disease control, and to be at risk of more adverse outcomes (28, 33-38).

Because diabetes is recognised as an increasingly important public health concern (29), with established links to CVD (39), ischaemic heart disease (40-42) and hypertension (43), researchers have consistently called for improvements to preventive services for South Asians. These include better diabetes surveillance and earlier detection; improved education (for both communities and professions); and tailored prevention programmes including language-competent resources adapted for specific cultural groups, and the mobilisation of networks and community-based social enterprise schemes (44).

Improving diabetes outcomes for South Asians

In the UK, national surveys indicate that the odds of a person having diabetes are significantly higher for Indian, Pakistani and Bangladeshi populations than for the White majority population (45). Diabetes prevalence rates are reported to be 3-4 times higher in South Asian adults and the disease appears to occur a decade earlier than in the majority White population (46, 47). A 2008 review of data from the UK Prospective Diabetes Study (UKPDS) similarly concluded that there are sustained ethnic differences, including vascular risk factors, with 'Indian-Asians' presenting at a younger age than White Caucasians (48). A more recent UK risk algorithm, based on 2.54 million GP practice patients, also indicates a four to five-fold variation in 10 year risk of acquiring type 2 diabetes between different South Asian sub-groups, with Pakistani and Bangladeshi men having significantly higher hazard ratios than Indian men (49).

Diabetes appears to be associated with a higher prevalence of CVD in the South Asian population (45). CVD is the main cause of death in England and Wales, accounting for almost 170,000 deaths in 2009 (36). A higher prevalence of CHD and myocardial infarction rates are reported in South Asian populations (31, 50), apparently linked to a higher prevalence of diabetes (51). However, conventional cardiovascular risk factors such as smoking, blood pressure and total cholesterol cannot fully account for observed differences between ethnic groups (52). A recent study in Tayside, which has a small non-White population, also found a higher prevalence of retinopathy in South Asians, but no evidence of less frequent reviews, or poorer recording of BMI and glycaemic control (HbA1c levels) (46).

Type 2 diabetes, which used to be a condition affecting adults only, is now recognised as an increasingly important public health concern in children. A study of 7,300 people with diabetes in primary care found that obesity was more prevalent amongst younger people than older people from South Asian populations (53). The Child Heart and Health Study in England (CHASE) has recently reported that ethnic differences already exist in the precursors of type 2 diabetes among children aged 9-10; South Asian children were found to exhibit higher HbA1c, fasting insulin, triglyceride, and C-reactive protein, and lower HDL-cholesterol (54). Adiposity levels could not account for these differences. Other research has also reported higher insulin and leptin at birth for Indian babies, when adjusted for birth weight; this may indicate that prevention of insulin resistance syndrome needs to address regulation of foetal growth in addition to prevention of obesity in later childhood in this population (55). The CHASE study has also found that ethnic differences in blood pressure begin to emerge in adolescence (56).

Identifying obesity risk thresholds

Research has consistently identified that South Asians develop metabolic and vascular complications associated with obesity at a lower BMI and waist circumference than the White majority population (57), and that these differences begin to emerge during childhood (58). Analysis of 2003-2004 data from the National Health and Nutrition Examination Survey and the Health Survey for England shows that in a population characterised as normal weight by BMI, the prevalence of type 2 diabetes will differ by ethnic group (59). In South Asians, risk appears to be related to the distribution of excess fat rather than to a simple BMI measure (60, 61). At a given BMI, South Asians have more intra-abdominal fat which may

be an important factor in their development of diabetes (62). Barker has suggested that such differences might represent a metabolic adaptation to impaired growth in foetal and early infancy - the 'thrifty phenotype' hypothesis (63). Thus, that nutritional deficiencies in utero result in lower birth weight which can lead to reduced insulin production later in life, resulting in diabetes if insulin production is unable to compensate for increased metabolic demand. An alternative hypothesis (the 'thrifty genotype') postulates that it is genetic differences which link low birth weight to adult diabetes (64, 65). Thus, low nutrient conditions in-utero are thought to result in selective survival of infants with insulin insensitivity, which is beneficial in a low calorie environment but results in increased susceptibility to diabetes in a high calorie environment. Low birth weight patterns are reported to continue for babies born to UK-born South Asian women similar to those for overseas-born (migrant) women (66). Further studies are examining whether lack of various nutrients in-utero can influence the development of circuits that regulate body weight and other cycles of metabolic programming and might correlate with susceptibility to diabetes (67, 68).

Identifying appropriate obesity risk thresholds for the South Asian population has extremely important public health implications in terms of preventing progression from metabolic syndrome (or 'pre-diabetes') to type 2 diabetes, culminating in CVD and CHD. If professionals and patients are unaware of potential differences they may under-estimate the risk associated with a particular BMI in ethnic individuals, resulting in increased risk of diabetes and associated CVD in the South Asian population (47). Use of the original WHO definition of obesity ($\text{BMI} > 30 \text{ kg/m}^2$) initially led to reports that the UK South Asian population was less obese than the White majority population and therefore at lower risk (36, 69). In 2004, the WHO introduced a differential threshold for South Asians; cut-offs were reduced to $\text{BMI} > 23 \text{ kg/m}^2$ for overweight and $\text{BMI} > 25 \text{ kg/m}^2$ for obese (70, 71). Application of these lower thresholds identifies higher obesity levels in the South Asian population and therefore greater risk (72). The South Asian Health Foundation (SAHF) has strongly recommended the use of these revised cut-offs for British South Asians, but this has not yet been formally adopted in the NHS (73). However, the Indian Health Ministry has recently announced a national adjustment to criteria for defining obesity in their country (74). Although obesity also places young people at increased risk, there is no agreed international definition for children (75). Waist circumference is recognised as an independent predictor of insulin resistance, raised lipid levels and increased blood pressure in childhood (70, 76).

Therefore, the International Diabetes Federation has recommended the use of a waist circumference >90th centile as a cut-off for all children; it has also advocated the use of ethnicity-specific centile charts (75).

Diet and lifestyle

Diet can make a substantial contribution to obesity and to the subsequent development of type 2 diabetes (77). In the UK, the National Institute for Health and Clinical Excellence (NICE) has recently highlighted prevention of progression from ‘pre-diabetes’ to type 2 diabetes as an important public health aim and initiated a consultation to develop guidance for high-risk groups (<http://guidance.nice.org.uk/PHG/Wave19/62>). A healthy diet low in fat (particularly saturated fat) and high in fibre and complex carbohydrates can help to prevent or delay diabetes development (78). Low levels of physical activity in certain ethnic groups also mean that strategies to reduce diabetes risk will need to achieve their main impact through dietary interventions in these populations (79, 80). Successful changes to dietary lifestyle require an understanding of cultural beliefs about a healthy diet and about the medicinal benefits of certain foodstuff.

The diet of ethnic minority groups varies widely (81). The question of whether certain aspects of the South Asian diet predispose individuals to glucose intolerance remains largely unanswered (47). High quality evidence from prospective trials to determine the role of specific nutrients in diabetes prevention and control is missing (78). However, there is evidence that dietary habits worsen following migration. For example, second generation offspring of former migrants are reported to adopt British dietary patterns, with increased fat and reduced vegetable, fruit and pulse consumption compared to first generation migrants (82). A review of European dietary habits of ethnic minority groups has similarly identified that mixed food habits are emerging in second and third generations, most likely due to acculturation and adoption of a Western lifestyle (83). In the UK, a culture of multiple meals, large portion sizes and snacking between meals, which can all contribute adversely to weight control, has been reported in some South Asian populations. For example, Bangladeshi and Pakistani families may eat two traditional meals in the course of the same evening, with children eating a meal both before and after attending religious classes (84). In contrast, in Gujarati Hindu and Punjabi Sikh households smaller portion sizes, fewer multiple evening meals and more control of children’s snacking has been reported. The childhood CHASE study has identified that South Asian children have a higher intake of total fat,

polyunsaturated fat and protein, and carbohydrates (particularly sugars), with lower vitamin C and D, than the majority population (85). These differences appear to be especially marked for Bangladeshi children. In early infancy, and even before, additional dietary triggers may be associated with increased risk of diabetes. These include excessive maternal weight gain during pregnancy and shorter-than-recommended duration of breast-feeding (86). South Asian populations show worryingly low rates of breast feeding, despite professional encouragement (58). Evidence is also emerging that early exposure to complex proteins in breast milk supplements could influence risk of type 1 diabetes in children with a genetic susceptibility, although there is no evidence of links to type 2 diabetes (87, 88).

Research on beliefs about diet indicates that British South Asians consider their family's diet is healthy because cultural dishes are 'prepared from scratch' (84). Research in a Bangladeshi population with diabetes has also highlighted the importance of beliefs about 'beneficial foodstuffs' which can adversely affect diabetes management (89). A study among Bangladeshi, Pakistani and Indian communities in Edinburgh similarly concluded that successful CHD prevention initiatives need to identify deep-rooted influences on health-behaviour (90). Religious observance can also affect nutrient intake and therefore diabetes control. For Muslim populations, such as those from Pakistan and Bangladesh, there are certain religious fasting requirements which individuals are expected to meet (84). For example, there is evidence that dietary changes during the month of Ramadan can affect clinical and metabolic parameters in type 2 diabetic patients (91). Although people with diabetes can be exempted from this religious obligation, research has shown that a high proportion do fast during Ramadan (92). The original nutritional advice for Ramadan (93) has recently been updated to provide professionals with improved guidelines for management of diabetes during this period (94).

Improving the evidence base on ethnicity and health

Fundamental to improving the health and wellbeing of ethnic minority populations is a need to improve the evidence base, and to increase knowledge and understanding among health professionals. The Acheson inquiry into inequalities in health commented on the lack of such an evidence base (95), and other authors have identified the low levels of recruitment of ethnic minority patients to clinical trials as a problem (96). At the same time, the

challenge faced by professionals in attempting to identify and assess the research evidence published on ethnicity and health is substantial. Poor indexing by journals makes identification of potentially relevant articles difficult, requiring complex search strategies and considerable expertise. Once identified, articles vary considerably in the categories used to define ethnic groups, with lack of consensus on the optimum categories often making comparison of studies impossible. Assessment of the quality of the research reported is also complicated by the wide range of methods used in studies, and the very few randomised controlled trials which limits the possibility of formal meta-analysis. All these factors present a considerable challenge for development of an evidence base on ethnicity and health. There are also issues beginning to emerge for assessing equity in systematic reviews (97).

In order to support the development of such an evidence base, a web-based specialist library for ethnicity and health was established in 2007 as part of a new NHS knowledge service. The aim was to identify evidence to help improve the health of minority ethnic groups and migrant populations living in Britain. In April 2009, the National Institute for Health and Clinical Excellence (NICE) launched *NHS Evidence* (NHSE). This has a broader range of collections and enhanced electronic functionality. The objective is to provide high quality, evidence-based information across health and social care at a local and national level to inform decision-making. The Specialist Collection on Ethnicity and Health is provided by the UK Centre for Evidence in Ethnicity, Health and Diversity (CEEHD) (98).

Defining ethnicity

Defining 'ethnicity' is not a simple matter (99). The concept recognises that people identify themselves with a social grouping on cultural grounds including language, lifestyle, religion, food and origins. Furthermore, in a world of migration and mixing, it is essential to recognise that these cultures and societies are dynamic rather than fixed. There has been considerable debate and controversy about the categories used for defining 'ethnic minorities' (100-102).

Information on 'ethnicity' must be collected consistently in order to be of use. Data can be collected in a number of ways. One of the least threatening and most commonly used by front-level staff is to ask about *language*. This can be seen to relate directly to the needs of the client; unless a person's preferred language is recorded providers may have no idea of the need for interpreting and translation services. However, effective communication may

require awareness of other aspects of culture apart from language (103). *Religion* can also play an important part in communication, especially in the provision of care for people in distress. Most patient records do have a space for religion, although it is not always completed. It was only after debate and lobbying that the Office of National Statistics agreed to add a new question on religion to the Census in 2001. However, the most common indicator used in official records is *birthplace*. Information on birthplace is recorded on most identity documents, and is used to analyse data such as that collected on death certificates. Unfortunately, it provides a poor indicator of cultural or 'ethnic' origin since more than half of the 'minority' ethnic population is now born in Britain. *Nationality* is an equally problematic categorisation; it is essential not to confuse the idea of cultural identity with the question of the rights of the citizen to state-funded services. Although the terms used in the 2001 Census provide a suitable baseline (104), additional information on language and literacy, and migration history may be required for service planning and monitoring of uptake (17).

The crucial point made by many authors is that the categorisation used must be 'fit for purpose' i.e. it must be relevant to the delivery of the service being considered and to the recognition of client need. As stated by the Migration Policy Group in Brussels:

The trouble with using nationality, birthplace, ethnic origin or language spoken at home as indicators of ethnic categories is that this implicitly assumes that such criteria all refer to the same clear-cut entities It is more effective to use different criteria to pursue different policy objectives ... (105)

In order to encompass the wide-range of available literature, SCEH uses a broad ranging Thesaurus (106). This is able to accommodate papers and reports which use crude level meta-categories such as 'ethnic minority', 'black', 'migrant' as well as those which provide more detailed information on ethnicity (including language, religion and other key categories such as Roma or travellers, refugees and asylum seekers).

Much of the literature still uses crude meta-categories. These are likely to include sub-populations of diverse cultural, linguistic, religious and biological or genetic origin. For example, within a meta-category like 'South Asian', the three main groups (Pakistani, Bangladeshi and Indian) will exhibit considerable differences in terms of their health status as

well as their expectations and priorities. Also, even the population labelled as ‘Indian’ will include a number of different religio-linguistic groups (Sikh Punjabis, Muslim Gujeratis and Hindus of various linguistic origin), while others such as the ‘Pakistani’ population may be associated fairly closely with particular cultural characteristics such as language (Urdu) and religion (Muslim), although it is dangerous to assume that this will always be the case (107, 108). Few published articles go into this level of detail, but research which observes these distinctions is more likely to be generalisable, at least within the sub-category identified. Similarly, although there has been a steady growth in the collection of ethnic monitoring data in the NHS, there is relatively little report of its use in research publications. In fact, reference to minority groups in the abstracts or key-words of many papers proves on examination to either consist of a recommendation that ‘more research is needed on ethnic minorities’ or to explain that ‘non-English speakers’ have been excluded from a particular trial.

Evidence on lifestyle interventions

Even though there are a large number of articles on ‘ethnicity and health’, there is a shortage of high quality evidence. Where research is available, it often comes from other countries so that care is needed in generalising any findings to the UK. Ethnic minority populations will differ making comparisons difficult, and barriers to accessing healthcare in insurance-based systems such as the USA may accentuate any underlying ethnic differences. Within a particular ethnic group, there may also be disproportionate effects of age and gender, compared to the majority white population. For example, the older generation of South Asian immigrants has a poorer understanding of health and social care systems than the younger population (20). Over time, communities will become more familiar with services as they need to access them e.g. first maternity and later palliative care. Similarly, effective communication of lifestyle messages will depend on the language and literacy profile of the population targeted. In the South Asian community, the ability to speak English declines with increasing age, is lower for women than men, and is much poorer for those born outside the UK. However, there are also variations between sub-groups (103). Thus, South Asian women especially in Muslim cultural groups are the least likely to speak or read English: they may also not be literate in their ‘mother tongue’. Older people of Bangladeshi origin in particular have a limited ability either to understand spoken English or to read any language. Even in the early ‘middle-age’ group (30-49), there are significant numbers of Bangladeshi and Pakistani women who will be essentially illiterate in any language, and who also do not

speak English. Also, some languages, notably the Sylheti dialect of Bangladesh, do not have an agreed written form. At the same time, those who have acquired English as a second language often lose this 'learned' ability as they get older. With the migration of new groups (including asylum seekers and refugees) and the learning process undergone by settlers, the NHS faces a constantly changing picture of language needs.

The value of service-led lifestyle interventions targeted at people with increased risk of diseases such as diabetes is promising, but not conclusive. As a chronic condition, type 2 diabetes is associated with significant morbidity, leading to reduced quality of life over time as the disease and its complications affect the physical, mental and social well-being of patients (109-112). A systematic review of primary care interventions targeted at minority ethnic populations has concluded that case management in primary care (with specialist diabetes nurses, dieticians and community health workers) can improve HbA1c levels and cardiovascular risk factors, and that use of link workers from the minority ethnic community can lead to improved cardiovascular risk factor control (113). A subsequent large randomised controlled trial which evaluated the use of link workers to encourage dietary and lifestyle changes in South Asians with diabetes (*UKADS*) recorded significant improvements at two years in diastolic and mean arterial blood pressure but not in HbA1c (114, 115). Similarly, a primary care intervention (*Khush Dil*) for South Asians who attended health visitor-led screening clinics in Edinburgh found a positive impact (based on self-report) for CVD indicators, but the authors concluded that a controlled trial would be necessary to confirm effectiveness (116). A trial is currently underway (*ADDITION-Leicester*) in a multi-ethnic population with type 2 diabetes, half of whom will receive a multi-faceted cardiovascular risk intervention (117).

In contrast, evidence on the value of patient education *per se* in improving diabetes self management is more limited. A Cochrane review of the evidence on self-management education programmes by lay leaders for people with various chronic conditions could identify only limited impact in the general population (118). Another Cochrane review similarly found no significant differences in HbA1c levels between individual patient education and usual care for a general population with type 2 diabetes (119). However, there appears to be some evidence of effectiveness of educational programmes when targeted at ethnic minority populations, although a systematic review of these studies has highlighted the difficulty of designing and assessing such programmes (120). A Cochrane review has

identified that culturally appropriate health education for patients with type 2 diabetes can provide some improvement in glycaemic control in the short to medium term (121, 122). More recently, it has also been reported that a tailored (Ramadan-focused) education programme can be effective in empowering patients to change their lifestyle while minimising the risk of hypoglycaemic events during this period (123). Other researchers have also shown that provision of translated materials for patients can improve outcomes (124). However, community-based workers and primary health care practitioners can find it difficult to access quality-assured translated resources (44).

Effective dietary interventions to tackle obesity, and therefore improve diabetes and CVD outcomes, require intervention across the entire life course (125, 126). In terms of dietary intervention specifically targeted at ethnic minorities, a 2008 literature review could identify only two such studies in the UK (79). Both focused on the South Asian community and targeted women using either trained community members acting as facilitators and leaders of cookery clubs (127), or dieticians and fitness instructors to run healthy eating and exercise groups (128). The results suggest that targeted interventions can be effective, especially if these build on existing community links and involve engagement with extended family members and community leaders as recommended by the Department of Health (84). A new wave of community-based social enterprise schemes, such as Apnee Sehat ('Our Health'), are now being established by Britain's South Asian community to meet the needs of local people through tailored lifestyle programmes, including supervised cooking sessions, shopping tours and educational DVDs for patients and professionals (129). More recently, charities such as the British Heart Foundation have started to deliver training courses to improve the knowledge of health trainers in voluntary and community organisations, with some success (130). For children, lifestyle modifications can be achieved by motivating and empowering parents in the context of the community in which they live. A Cochrane review of obesity intervention programmes concludes that, in general, participatory 'family based lifestyle interventions with a behavioural programme' are most likely to succeed in children (131). In the USA, the 'Let's Move' campaign against childhood obesity launched in 2010 also aims to empower parents and improve access to high-quality foods in all communities (86). Diabetes UK has recently identified the need for more research in the area of tailored interventions for South Asians (132). The Charity has also produced advice and resources for diabetes professionals, including a Toolkit to enable community and religious leaders to host Diabetes Awareness sessions for people from the South Asian Communities (133).

Conclusions

Addressing the needs of ethnic communities and linguistic groups, each with their own cultural traits and health profiles, presents a number of challenges to health care systems. This can require system-wide changes especially for lifestyle interventions (see Figure 1). Because the provider and the patient each bring their individual learned patterns of language and culture to this experience, communication is paramount. Behaviour change will require attention to context, including the needs of the person seeking to transmit information, as well as the characteristics (language, literacy, culture) of the intended recipient. Messages must be specifically tailored to their audience, taking religious and other beliefs and practices into account. Information from official sources may have less impact if not supported by personal experience and information from community networks. This can ensure a higher level of relevance for the issues being communicated.

Culturally competent healthcare systems - those that provide culturally and linguistically appropriate services - have the potential to reduce racial and ethnic health disparities. When people do not understand what their healthcare providers are telling them, and when providers either do not speak the patient's language or are insensitive to cultural differences, the quality of care and improvements in lifestyle can be compromised. This can lead to lower patient satisfaction with care, fewer improvements in health status, and inappropriate racial or ethnic differences in use of the services offered.

Over recent years there has been a large expansion in literature which could potentially support provision of culturally appropriate care. Extensive evidence has emerged from countries and regions experiencing increased population diversity, including the United States of America, Australia, Canada and the UK. At the same time, there has been little attempt to assess this evidence and provide information for practitioners. In the UK, this has been addressed by the National Institute for Health and Clinical Excellence (NICE) with the establishment of an on-line specialist collection on 'ethnicity and health' (www.library.nhs.uk/ethnicity).

Acknowledgements

Ala Szczepura declares she has no conflicts of interest. AS wrote the manuscript. Thanks are due to NHS Evidence, the National Institute for Health and Clinical Excellence (NICE) which supports the activity of the *NHS Evidence Specialist Collection for Ethnicity & Health*.

References

1. ONS. The Office of National Statistics. 2010; Available from: <http://www.ons.gov.uk/about>.
2. Office for National Statistics. Key Statistics for Postcode Sectors in England and Wales. Census 2001. 2004 [cited 2010 23 August]; Available from: http://www.statistics.gov.uk/downloads/census2001/ks_postcode_sectors.pdf.
3. Sievenpiper JL, McIntyre EA, Verrill M, Quinton R, Pearce SH. Unrecognised severe vitamin D deficiency. *BMJ*. 2008 Jun 14;336(7657):1371-4.
4. Lowe NM, Mitra SR, Foster PC, Bhojani I, McCann JF. Vitamin D status and markers of bone turnover in Caucasian and South Asian postmenopausal women living in the UK. *Br J Nutr*. 2010 Jun;103(12):1706-10.
5. Holick MF. Deficiency of sunlight and vitamin D. *BMJ*. 2008 Jun 14;336(7657):1318-9.
6. Darzi A. High quality care for all: NHS Next Stage Review 2008.
7. Shircore R. Guide for World Class Commissioners. Promoting Health and Well-Being: Reducing Inequalities 2009.
8. Marmot M. Fair Society, Healthy Lives: A Strategic Review of Health Inequalities in England Post-2010 2010; Available from: <http://www.marmotreview.org/>.
9. Salway SM, Nazroo J, Mir G, Craig G, Johnson M, Gerrish K. Fair Society, Healthy Lives: a missed opportunity to address ethnic inequalities in health. *BMJ* 340:doi:101136/bmj.c684 2010.
10. Department of Health. Equity and excellence: Liberating the NHS. Department of Health; 2010 [cited 2010 3 November]; Available from: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_117353.
11. Government U. Equality Act 2010. 2010 [cited 2010 18 October]; Available from: http://www.equalities.gov.uk/equality_act_2010.aspx.
12. May T. Equality strategy speech. 2010 [cited 2010 18 November]; Available from: <http://www.homeoffice.gov.uk/media-centre/speeches/equality-vision>.
13. Government U. The Race Relations (Amendment) Act. 2000. 2000 [cited 2010 6 September]; Available from: http://www.opsi.gov.uk/acts/acts2000/ukpga_20000034_en_1.
14. Care Quality Commission. The state of health care and adult social care in England. Key themes and quality of services in 2009. 2010.
15. Mead N, Roland M. Understanding why some ethnic minority patients evaluate medical care more negatively than white patients: a cross sectional analysis of a routine patient survey in English general practices. *BMJ*. 2009;339:b3450.
16. Department of Health. Healthy lives, healthy people: our strategy for public health in England. Department of Health; 2010 [cited 2011 10 January]; Available from: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_121941.
17. Szczepura A. Access to health care for ethnic minority populations. *Postgrad Med J*. 2005 Mar;81(953):141-7.
18. Department of Health. Choosing Health White Paper. Department of Health; 2010 [cited 2010 30 November]; Available from:

http://www.dh.gov.uk/en/AboutUs/MinistersAndDepartmentLeaders/ChiefMedicalOfficer/DH_4102990.

19. Institute of Medicine Committee on Monitoring Access to Personal Health Care Services. Access to Health Care in America. (Ed). M, editor: Washington DC: National Academy Press; 1993.
20. Atkinson M, Clark M, Clay D, Johnson M, Szczepura A. Systematic review of ethnicity and health service access for London.2001.
21. Anderson LM, Scrimshaw SC, Fullilove MT, Fielding JE, Normand J. Culturally competent healthcare systems. A systematic review. *Am J Prev Med.* 2003 Apr;24(3 Suppl):68-79.
22. Committee on National Statistics. Eliminating Health Disparities.: The National Academies Press, Washington DC, USA.; 2004.
23. Iqbal G, Gumber A, Szczepura A, Johnson M, Wilson S, Dunn J. Improving ethnic data collection for statistics of cancer incidence, management, mortality and survival in the UK.2008.
24. Lloyd P. Ethnic cancer data for improved commissioning of health services. NHS Evidence; 2009 [cited 2010 19 November]; Available from: <http://www.library.nhs.uk/ETHNICITY/ViewResource.aspx?resID=326764&tabID=290>.
25. Gerrish K. Researching ethnic diversity in the British NHS: methodological and practical concerns. *J Adv Nurs.* 2000 Apr;31(4):918-25.
26. Mokdad AH, Ford ES, Bowman BA, Nelson DE, Engelgau MM, Vinicor F, et al. Diabetes trends in the U.S.: 1990-1998. *Diabetes Care.* 2000 Sep;23(9):1278-83.
27. Stevens A, Raftery J. Health Care Needs Assessment Oxford Radcliffe Publishing Ltd, Oxford. ; 1994.
28. Barnett AH, Dixon AN, Bellary S, Hanif MW, O'Hare J P, Raymond NT, et al. Type 2 diabetes and cardiovascular risk in the UK south Asian community. *Diabetologia.* 2006 Oct;49(10):2234-46.
29. International Diabetes Federation B. Diabetes Atlas (2009). 2009 [cited 2010 18 October].
30. Millett C, Saxena S, Ng A, Mainous A, 3rd, Majeed A. Socio-economic status, ethnicity and diabetes management: an analysis of time trends using the health survey for England. *J Public Health (Oxf).* 2007 Dec;29(4):413-9.
31. British Heart Foundation. Ethnic differences in cardiovascular disease 2010. British Heart Foundation; 2010 [cited 2010 5 November]; Available from: <http://www.heartstats.org/datapage.asp?id=8854>.
32. Bardsley M, Barker M, Bhan A, Farrow S, Gill M, Jacobson B, et al. The Health of Londoners: A Public Health Report for London. 1998.
33. McKeigue PM, Ferrie JE, Pierpoint T, Marmot MG. Association of early-onset coronary heart disease in South Asian men with glucose intolerance and hyperinsulinemia. *Circulation.* 1993 Jan;87(1):152-61.
34. Cappuccio F, Cook D, Atkinson R, Wicks P. The Wandsworth Heart and Stroke Study. A population-based survey of cardiovascular risk factor in different ethnic group. Methods and baseline findings. . *Nutr Metab Cardiovasc Dis* 1998;8:371-85.
35. Knight TM, Smith Z, Whittles A, Sahota P, Lockton JA, Hogg G, et al. Insulin resistance, diabetes, and risk markers for ischaemic heart disease in Asian men and non-Asian in Bradford. *Br Heart J.* 1992 May;67(5):343-50.
36. Department of Health. Health Survey for England 2004: Health of Ethnic Minorities - Full Report. Department of Health; 2006 [cited 2010 8 September]; Available from: <http://www.ic.nhs.uk/statistics-and-data-collections/health-and-lifestyles-related-surveys/health-survey-for-england/health-survey-for-england-2004:-health-of-ethnic-minorities--full-report>.
37. King H, Rewers M. Global estimates for prevalence of diabetes mellitus and impaired glucose tolerance in adults. WHO Ad Hoc Diabetes Reporting Group. *Diabetes Care.* 1993 Jan;16(1):157-77.
38. Heisler M, Smith DM, Hayward RA, Krein SL, Kerr EA. Racial disparities in diabetes care processes, outcomes, and treatment intensity. *Med Care.* 2003 Nov;41(11):1221-32.
39. Kannel WB, McGee DL. Diabetes and cardiovascular disease. The Framingham study. *JAMA.* 1979 May 11;241(19):2035-8.

40. Wingard D, Barrett-Connor E. Heart disease and diabetes. Diabetes in America Bethesda, MD: National Institute of Health; 1995.
41. Stevens RJ, Kothari V, Adler AI, Stratton IM. The UKPDS risk engine: a model for the risk of coronary heart disease in Type II diabetes (UKPDS 56). *Clin Sci (Lond)*. 2001 Dec;101(6):671-9.
42. McKeigue PM, Marmot MG. Mortality from coronary heart disease in Asian communities in London. *BMJ*. 1988 Oct 8;297(6653):903.
43. Dodson PM. Hypertension and diabetes. *Curr Med Res Opin*. 2002;18 Suppl 1:s48-57.
44. Kumar S. Diabetes and Ethnicity. NHS Evidence; 2007 [cited 2010 19 November]; Available from:
<http://www.library.nhs.uk/ethnicity/viewResource.aspx?resID=269934&code=9affbc666f4c4f792370742ac30e8750>.
45. Zaninotto P, Mindell J, Hirani V. Prevalence of cardiovascular risk factors among ethnic groups: results from the Health Surveys for England. *Atherosclerosis*. 2007 Nov;195(1):e48-57.
46. Fischbacher CM, Bhopal R, Steiner M, Morris AD, Chalmers J. Is there equity of service delivery and intermediate outcomes in South Asians with type 2 diabetes? Analysis of DARTS database and summary of UK publications. *J Public Health (Oxf)*. 2009 Jun;31(2):239-49.
47. Hanif W. Type 2 diabetes and obesity in the south Asian population. NHS Evidence; 2008 [cited 2010 19 September]; Available from:
<http://www.library.nhs.uk/ethnicity/viewResource.aspx?resid=296344&code=a650e11a04575c7b1e6a1bb48671f39d>.
48. Davis TM. Ethnic diversity in type 2 diabetes. *Diabet Med*. 2008 Aug;25 Suppl 2:52-6.
49. Hippisley-Cox J, Coupland C, Robson J, Sheikh A, Brindle P. Predicting risk of type 2 diabetes in England and Wales: prospective derivation and validation of QDScore. *BMJ*. 2009;338:b880.
50. Patel KCR. The Epidemic of Coronary Disease in South Asians. NHS Evidence; 2008 [cited 2010 19 September]; Available from:
<http://www.library.nhs.uk/ethnicity/viewResource.aspx?resid=296301&code=ccf9fd4b740d7bb19c631325a1427a9d>.
51. Patel JV, Lim HS, Gunarathne A, Tracey I, Durrington PN, Hughes EA, et al. Ethnic differences in myocardial infarction in patients with hypertension: effects of diabetes mellitus. *QJM*. 2008 Mar;101(3):231-6.
52. Forouhi NG, Sattar N. CVD risk factors and ethnicity - a homogeneous relationship? *Atheroscler Suppl*. 2006 Apr;7(1):11-9.
53. Millett C, Khunti K, Gray J, Saxena S, Netuveli G, Majeed A. Obesity and intermediate clinical outcomes in diabetes: evidence of a differential relationship across ethnic groups. *Diabet Med*. 2008 Jun;25(6):685-91.
54. Whincup PH, Nightingale CM, Owen CG, Rudnicka AR, Gibb I, McKay CM, et al. Early emergence of ethnic differences in type 2 diabetes precursors in the UK: the Child Heart and Health Study in England (CHASE Study). *PLoS Med*. 2010;7(4):e1000263.
55. Yajnik CS, Lubree HG, Rege SS, Naik SS, Deshpande JA, Deshpande SS, et al. Adiposity and hyperinsulinemia in Indians are present at birth. *J Clin Endocrinol Metab*. 2002 Dec;87(12):5575-80.
56. Harding S, Whitrow M, Lenguerrand E, Maynard M, Teyhan A, Cruickshank JK, et al. Emergence of ethnic differences in blood pressure in adolescence: the determinants of adolescent social well-being and health study. *Hypertension*. 2010 Apr;55(4):1063-9.
57. Razak F, Anand SS, Shannon H, Vuksan V, Davis B, Jacobs R, et al. Defining obesity cut points in a multiethnic population. *Circulation*. 2007 Apr 24;115(16):2111-8.
58. Lakhanpaul M, Bird D. Obesity and South Asian Children. NHS Evidence; 2009 [cited 2010 19 November]; Available from:
<http://www.library.nhs.uk/ETHNICITY/ViewResource.aspx?resID=327155&tabID=290>.
59. Diaz VA, Mainous AG, 3rd, Baker R, Carnemolla M, Majeed A. How does ethnicity affect the association between obesity and diabetes? *Diabet Med*. 2007 Nov;24(11):1199-204.

60. Despres JP, Lemieux I, Prud'homme D. Treatment of obesity: need to focus on high risk abdominally obese patients. *BMJ*. 2001 Mar 24;322(7288):716-20.
61. McKeigue PM, Shah B, Marmot MG. Relation of central obesity and insulin resistance with high diabetes prevalence and cardiovascular risk in South Asians. *Lancet*. 1991 Feb 16;337(8738):382-6.
62. Taylor R. Pathogenesis of type 2 diabetes: tracing the reverse route from cure to cause. *Diabetologia*. 2008 Oct;51(10):1781-9.
63. Barker DJ, Hales CN, Fall CH, Osmond C, Phipps K, Clark PM. Type 2 (non-insulin-dependent) diabetes mellitus, hypertension and hyperlipidaemia (syndrome X): relation to reduced fetal growth. *Diabetologia*. 1993 Jan;36(1):62-7.
64. McCance DR, Pettitt DJ, Hanson RL, Jacobsson LT, Knowler WC, Bennett PH. Birth weight and non-insulin dependent diabetes: thrifty genotype, thrifty phenotype, or surviving small baby genotype? *BMJ*. 1994 Apr 9;308(6934):942-5.
65. Singhal A, Wells J, Cole TJ, Fewtrell M, Lucas A. Programming of lean body mass: a link between birth weight, obesity, and cardiovascular disease? *Am J Clin Nutr*. 2003 Mar;77(3):726-30.
66. Harding S, Rosato M, Cruickshank J. Lack of change in birthweights of infants by generational status among Indian, Pakistani, Bangladeshi, Black Caribbean, and Black African mothers in a British cohort study. *International Journal of Epidemiology*. 2004;33:1-7.
67. Sullivan EL, Grove KL. Metabolic imprinting in obesity. *Forum Nutr*. 2010;63:186-94.
68. Saravanan P, Yajnik C. Role of maternal vitamin B12 on the metabolic health of the offspring: a contributor to the diabetes epidemic? *British Journal of Diabetes & Vascular Disease*. 2010;10(3):109-14.
69. Williams R, Bhopal R, Hunt K. Coronary risk in a British Punjabi population: comparative profile of non-biochemical factors. *International Journal of Epidemiology*. 1994;23(1):28-37.
70. Lee S, Bacha F, Arslanian SA. Waist circumference, blood pressure, and lipid components of the metabolic syndrome. *J Pediatr*. 2006 Dec;149(6):809-16.
71. WHO. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet*. 2004 Jan 10;363(9403):157-63.
72. WHO. Redefining obesity and its treatment. 2000 [cited 2010 16 September]; Available from: http://www.who.int/nutrition/publications/obesity/09577082_1_1/en/index.html.
73. South Asian Health Foundation (SAHF). Position Statement on Diagnosis and Treatment of Obesity in British South Asians. 2010 [cited 2010 8 September]; Available from: <http://www.sahf.org.uk/news.aspx?id=16>
74. Misra A, Chowbey P, Makkar BM, Vikram NK, Wasir JS, Chadha D, et al. Consensus statement for diagnosis of obesity, abdominal obesity and the metabolic syndrome for Asian Indians and recommendations for physical activity, medical and surgical management. *J Assoc Physicians India*. 2009 Feb;57:163-70.
75. Zimmet P, Alberti KG, Kaufman F, Tajima N, Silink M, Arslanian S, et al. The metabolic syndrome in children and adolescents - an IDF consensus report. *Pediatr Diabetes*. 2007 Oct;8(5):299-306.
76. Bacha F, Saad R, Gungor N, Arslanian SA. Are obesity-related metabolic risk factors modulated by the degree of insulin resistance in adolescents? *Diabetes Care*. 2006 Jul;29(7):1599-604.
77. Lovegrove JA. CVD risk in South Asians: the importance of defining adiposity and influence of dietary polyunsaturated fat. *Proc Nutr Soc*. 2007 May;66(2):286-98.
78. Wyness L. Understanding the role of diet in type 2 diabetes prevention. *Br J Community Nurs*. 2009 Sep;14(9):374-9.
79. Netto G, Bhopal R, Khatoon J, Lederle N, Jackson A. Health promotion and prevention interventions in Pakistani, Chinese and Indian communities related to CVD and Cancer. A review of the published evidence in the UK, other parts of Europe and the United States. 2008.

80. Fischbacher CM, Hunt S, Alexander L. How physically active are South Asians in the United Kingdom? A literature review. *J Public Health (Oxf)*. 2004 Sep;26(3):250-8.
81. McKeigue PM, Marmot MG, Adelstein AM, Hunt SP, Shipley MJ, Butler SM, et al. Diet and risk factors for coronary heart disease in Asians in northwest London. *Lancet*. 1985 Nov 16;2(8464):1086-90.
82. Landman J, Cruickshank JK. A review of ethnicity, health and nutrition-related diseases in relation to migration in the United Kingdom. *Public Health Nutr*. 2001 Apr;4(2B):647-57.
83. Gilbert PA, Khokhar S. Changing dietary habits of ethnic groups in Europe and implications for health. *Nutr Rev*. 2008 Apr;66(4):203-15.
84. Department of Health. Healthy Weight, Healthy Lives: Consumer Insight Summary. 2008.
85. Donin AS, Nightingale CM, Owen CG, Rudnicka AR, McNamara MC, Prynne CJ, et al. Nutritional composition of the diets of South Asian, black African-Caribbean and white European children in the United Kingdom: the Child Heart and Health Study in England (CHASE). *Br J Nutr*. 2010 Jul;104(2):276-85.
86. Wojcicki JM, Heyman MB. Let's Move--childhood obesity prevention from pregnancy and infancy onward. *N Engl J Med*. 2010 Apr 22;362(16):1457-9.
87. Knip M, Virtanen SM, Seppa K, Ilonen J, Savilahti E, Vaarala O, et al. Dietary Intervention in Infancy and Later Signs of Beta-Cell Autoimmunity. *N Engl J Med*. 2010 Nov 11;363(20):1900-8.
88. Harlan DM, Lee MM. Infant formula, autoimmune triggers, and type 1 diabetes. *N Engl J Med*. 2010 Nov 11;363(20):1961-3.
89. Choudhury SM, Brophy S, Williams R. Understanding and beliefs of diabetes in the UK Bangladeshi population. *Diabet Med*. 2009 Jun;26(6):636-40.
90. Netto G, McCloughan L, Bhatnagar A. Effective heart disease prevention: lessons from a qualitative study of user perspectives in Bangladeshi, Indian and Pakistani communities. *Public Health*. 2007 Mar;121(3):177-86.
91. Sari R, Balci MK, Akbas SH, Avci B. The effects of diet, sulfonylurea, and Repaglinide therapy on clinical and metabolic parameters in type 2 diabetic patients during Ramadan. *Endocr Res*. 2004 May;30(2):169-77.
92. Hui E, Bravis V, Hassanein M, Hanif W, Malik R, Chowdhury TA, et al. Management of people with diabetes wanting to fast during Ramadan. *BMJ*. 2010;340:c3053.
93. Connor H, Annan F, Bunn E, Frost G, McGough N, Sarwar T, et al. The implementation of nutritional advice for people with diabetes. *Diabet Med*. 2003 Oct;20(10):786-807.
94. Karamat MA, Syed A, Hanif W. Review of diabetes management and guidelines during Ramadan. *J R Soc Med*. 2010 Apr;103(4):139-47.
95. Acheson D. Inequalities in health. Report on inequalities in health did give priority for steps to be tackled. *BMJ*. 1998 Dec 12;317(7173):1659.
96. Hussain-Gambles M, Atkin K, Leese B. Why ethnic minority groups are under-represented in clinical trials: a review of the literature. *Health Soc Care Community*. 2004 Sep;12(5):382-8.
97. Tugwell P, Petticrew M, Kristjansson E, Welch V, Ueffing E, Waters E, et al. Assessing equity in systematic reviews: realising the recommendations of the Commission on Social Determinants of Health. *BMJ*. 2010;341:c4739.
98. NHS Evidence. NHS Evidence: Specialist Collections. 2010 [cited 2010 29 November]; Available from: <http://www.evidence.nhs.uk/aboutus/Pages/AboutSpecialistCollections.aspx>.
99. Specialist Collection for Ethnicity and Health. What Are Ethnic Groups? : NHS Evidence; 2010 [cited 2010 19 November]; Available from: <http://www.library.nhs.uk/ethnicity/page.aspx?pagename=EH>.
100. Bhopal RS, Phillimore P, Kohli HS. Inappropriate use of the term 'Asian': an obstacle to ethnicity and health research. *J Public Health Med*. 1991 Nov;13(4):244-6.
101. Aspinall PJ. Department of Health's requirement for mandatory collection of data on ethnic group of inpatients. *BMJ*. 1995 Oct 14;311(7011):1006-9.

102. McKenzie KJ, Crowcroft NS. Race, ethnicity, culture, and science. *BMJ*. 1994 Jul 30;309(6950):286-7.
103. Szczepura A, Johnson M, Gumber A, Jones K, Clay D, Shaw A. An Overview of the Research Evidence on Ethnicity and Communication in Healthcare.: University of Warwick, Coventry, UK2005.
104. UK Census. 2001 [cited 2010 28 August]; Available from: <http://www.statistics.gov.uk/census2001/census2001.asp>.
105. Vermeulen H. Immigration Policy for a Multi-cultural Society1997.
106. Presley F, Shaw A. Race and health: an information sources guide: SHARE, King's Fund Centre, London.1995.
107. Modood T, Berthoud R, Lakey J, Nazroo J, Smith P, Virdee S, et al. Ethnic Minorities in Britain: Diversity and Disadvantage Policy Studies Institute, London1997.
108. Johnson M, Owen D, Blackburn C, Rehman H, Nazroo J. Black and Minority Ethnic Groups in England: The second health & lifestyles survey. : Health Education Authority, London. 2000.
109. Gujral JS, McNally PG, O'Malley BP, Burden AC. Ethnic differences in the incidence of lower extremity amputation secondary to diabetes mellitus. *Diabet Med*. 1993 Apr;10(3):271-4.
110. Hornquist JO, Wikby A, Stenstrom U, Andersson PO, Akerlind I. Type II diabetes and quality of life: a review of the literature. *Pharmacoeconomics*. 1995;8 Suppl 1:12-6.
111. Reddy SS. Health outcomes in type 2 diabetes. *Int J Clin Pract Suppl*. 2000 Oct(113):46-53.
112. Harris MI. Health care and health status and outcomes for patients with type 2 diabetes. *Diabetes Care*. 2000 Jun;23(6):754-8.
113. Saxena S, Misra T, Car J, Netuveli G, Smith R, Majeed A. Systematic review of primary healthcare interventions to improve diabetes outcomes in minority ethnic groups. *J Ambul Care Manage*. 2007 Jul-Sep;30(3):218-30.
114. O'Hare JP, Raymond NT, Mughal S, Dodd L, Hanif W, Ahmad Y, et al. Evaluation of delivery of enhanced diabetes care to patients of South Asian ethnicity: the United Kingdom Asian Diabetes Study (UKADS). *Diabet Med*. 2004 Dec;21(12):1357-65.
115. Bellary S, O'Hare JP, Raymond NT, Gumber A, Mughal S, Szczepura A, et al. Enhanced diabetes care to patients of south Asian ethnic origin (the United Kingdom Asian Diabetes Study): a cluster randomised controlled trial. *Lancet*. 2008 May 24;371(9626):1769-76.
116. Mathews G, Alexander J, Rahemtulla T, Bhopal R. Impact of a cardiovascular risk control project for South Asians (Khush Dil) on motivation, behaviour, obesity, blood pressure and lipids. *J Public Health (Oxf)*. 2007 Dec;29(4):388-97.
117. Webb DR, Khunti K, Srinivasan B, Gray LJ, Taub N, Campbell S, et al. Rationale and design of the ADDITION-Leicester study, a systematic screening programme and randomised controlled trial of multi-factorial cardiovascular risk intervention in people with type 2 diabetes mellitus detected by screening. *Trials*. 2010;11:16.
118. Foster G, Taylor SJ, Eldridge SE, Ramsay J, Griffiths CJ. Self-management education programmes by lay leaders for people with chronic conditions. *Cochrane Database Syst Rev*. 2007(4):CD005108.
119. Duke SA, Colagiuri S, Colagiuri R. Individual patient education for people with type 2 diabetes mellitus. *Cochrane Database Syst Rev*. 2009(1):CD005268.
120. Khunti K, Camosso-Stefinovic J, Carey M, Davies MJ, Stone MA. Educational interventions for migrant South Asians with Type 2 diabetes: a systematic review. *Diabet Med*. 2008 Aug;25(8):985-92.
121. Hawthorne K, Robles Y, Cannings-John R, Edwards AG. Culturally appropriate health education for type 2 diabetes mellitus in ethnic minority groups. *Cochrane Database Syst Rev*. 2008(3):CD006424.
122. Hawthorne K, Robles Y, Cannings-John R, Edwards AG. Culturally appropriate health education for Type 2 diabetes in ethnic minority groups: a systematic and narrative review of randomized controlled trials. *Diabet Med*. 2010 Jun;27(6):613-23.

123. Bravis V, Hui E, Salih S, Mehar S, Hassanein M, Devendra D. Ramadan Education and Awareness in Diabetes (READ) programme for Muslims with Type 2 diabetes who fast during Ramadan. *Diabet Med.* 2010 Mar;27(3):327-31.
124. Hawthorne K. Effect of culturally appropriate health education on glycaemic control and knowledge of diabetes in British Pakistani women with type 2 diabetes mellitus. *Health Educ Res.* 2001 Jun;16(3):373-81.
125. Stender S, Burghen G, Mallare J. The role of health care providers in the prevention of overweight and type 2 diabetes in children and adolescents. *Diabetes Spectrum.* 2005;18:240-8.
126. Netto G BR, Lederle N, Khatoon J, Jackson A. How can health promotion interventions be adapted for minority ethnic communities? Five principles for guiding the development of behavioural interventions *Health Promot Int.* 2010.
127. Snowdon W. Asian cookery clubs: a community health promotion intervention. . *International Journal of Health Promotion and Education* 1999;37(4):135-6.
128. Williams J, Sultan M. Evaluation of an Asian women's healthy eating and exercise group. *Journal of Human Nutrition & Dietetics* 1999;12(1):91-8.
129. Apnee Sehat. Who we are - and why are we different. 2010 [cited 2010 13 November]; Available from: <http://www.apneesehat.net/whoweare/index.html>.
130. Tozer R, Aubery L, Gill P, Jones C, Patel M, Zaid Q, et al. Developing cultural competence across communities: a coronary heart disease training programme for health advocates and trainers. *Diversity in Health and Care* 2010;7.
131. Oude Luttikhuis H BL, Jansen H, Shrewsbury VA, O'Malley C. Interventions for treating obesity in children. *Cochrane Database of Systematic Reviews.* 2009;2009(1):CD001872.
132. Khunti K, Kumar S, Brodie J, (Eds). *Diabetes UK and South Asian Health Foundation recommendations on diabetes research priorities for British South Asians.*2009.
133. Toolkit to Support the Running of Diabetes Awareness Events for the South Asian Communities. 2006 [cited 2010 20 September]; Available from: http://www.diabetes.org.uk/Professionals/Shared_Practice/Care_Topics/Black_and_Minority_Ethnic_Communities/Toolkit_to_Support_the_Running_of_Diabetes_Awareness_Events_for_the_South_Asian_Communities/.