Intergenerational Continuities in Ethnic Inequalities in Health in the UK

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Declaration

I, Neil R Smith confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Abstract

Previous research strongly suggests that ethnic minorities are more likely to suffer a poorer health profile compared to the overall population. Trends have emerged to suggest that social factors such as socioeconomic status and health behaviours are not fixed across generations and have a role to play in these inequalities in health. This thesis investigated the differences in ethnic inequalities in health between the first and second generations, and determined the extent to which intergenerational changes in socioeconomic status and health behavioural factors might explain any variation that exists.

The study used ethnically-boosted data from the third sweep of the Millennium Cohort Study (*n*=14,860) and the combined 1999 and 2004 Health Survey for England (*n*=28,628). Cross-sectional analysis investigated generational differences in self rated general health, limiting illness, obesity, hypertension, depression, psychological distress and a range of biomarkers of cardiovascular disease, across the major ethnic minority groups in the UK (Indian, Pakistani, Bangladeshi, Black Caribbean, Black African, Irish, Chinese and Other). Children were additionally assessed for levels of cognitive development using the British Abilities Scales II. The generational change in socioeconomic circumstances (social class, highest educational qualification and household income) and the extent of acculturation (current smoking and drinking status, dietary behaviours and patterns of breastfeeding, immunisations and physical exercise) was examined.

Strong upward intergenerational socioeconomic mobility in ethnic minority groups did not lead to improving health profiles. The second generation required greater levels of social advantage than the first generation to achieve the same level of health. Acculturative shifts led to a worsening in health behaviours, although the degree of change was highly ethnic group specific. Findings showed that the social and economic contexts, and the cultural identities and behaviours of ethnic minorities, differ across generations, but ultimately their opposing influences on health result in stable overall patterns of health inequality across generations.

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Chapter 1: Introduction

1 Introduction

Ethnic inequalities in health have been well documented in the UK (Erens et al. 2001;Harding & Maxwell 1997;Marmot et al. 1984;Nazroo 1997b;Sproston & Mindell 2006) and internationally (Davey Smith et al. 1998;McLennan et al. 1997;Polednak 1989;Wu & Schimmele 2005). Studies have yielded consistent differences in disease and death rates between ethnic minorities and have described higher rates of disease (notably hypertension, diabetes and mental illness) and poorer general health in some groups relative to others.

The cause of these disparities remains uncertain. Since the Black Report (Black et al. 1982) there has been continued focus upon the influence of socioeconomic determinants in explaining how those at the lower end of the social hierarchy suffer a poorer health profile than those less disadvantaged. In investigating ethnic minorities, there is an additional requirement to understand how the lives of migrants are affected by living in the post-migratory environment which may or may not be markedly different from the lifestyle and social circumstances occupied in the country of origin.

There are currently three main viewpoints on the role of social determinants in the causation of such ethnic inequalities. Firstly, some suggest that socioeconomic factors play no part in the formation of health inequalities (Wild & McKeigue 1997), and that lower specific mortality rates found in groups of a lower social position in the general population can be principally explained by genetic factors. Secondly, even if economic and social variations in circumstances contribute, they must be placed within a wide framework encompassing biological, migration-based, cultural and racism-based explanations for the ethnic patterning of health, suggesting that socioeconomic variability alone cannot entirely explain health inequality (Smaje 1996). The final viewpoint suggests that ethnic health inequalities are predominantly explained by socioeconomic disparities between groups (Nazroo 1998;Sheldon & Parker 1992), and once socioeconomic differences are adjusted for in models ethnic health inequalities largely disappear. Given that socioeconomic position is closely linked to health outcome irrespective of any influence of genetic factors, a clearer understanding of socioeconomic inequalities will cast considerable light onto factors which may be responsible for the patterns of inequalities across ethnic minorities, and identify areas for the development of public health policy.

However, such investigations in the UK have been largely based upon data from migrants, either because they have been specifically focused on migrants, or because the older population, where morbidity and mortality become prevalent, is almost exclusively composed of migrants. Migrant mortality studies in the UK suggest that health profiles of these individuals have been shaped by a healthy migrant effect, whereby those who migrate are less disadvantaged and healthier than those individuals who remain in the country of origin. Importantly, a link has been established between increasing duration of residence and declining health in a range of UK ethnic minorities (Harding 2003a;Harding 2004;Williams 1993). This suggests that migrant health profiles are not fixed and are subject to change on exposure to the UK environment. Despite international studies identifying the health of migrants as approximating to that of the host population within one or two generations, there are few studies documenting generational differences in health in the UK, or the causal pathways mediating these differences, largely because of the young age profile of the second and third generations.

The great strength of exploring ethnic minorities by generation is that it can further our understanding of how health inequalities are structured. Attention is turned towards the context of the migration and the specific characteristics of the first generation, and how the experiences of these individuals who were born and encountered critical periods of development overseas, differ from the second generation who were born within the UK, or who migrated at a young age. By concentrating on these generational differences it is possible to identify those factors within each generation which might be changing alongside patterns of health inequalities. And once risk factors have been recognised, interventions can be put in place to curtail their detrimental effects. A key difficulty with this generational approach is that all migrants to the UK did not arrive at the same time, and hence the important social contexts surrounding the lived experiences of the first generation may be dissimilar across ethnic minority groups. Therefore the study of generational differences needs to counter, or at least appreciate, these ‘period effects’ which differentiate between ethnic minority groups, so that historical differences can be separated out from other drivers of health inequalities.

Two potential pathways mediating generational differences will be explored. First, it is likely that socioeconomic circumstances change across generation. Differentials in the extent of social mobility across ethnic minority groups lead to differences in exposures to risk factors to health in each generation. Second, there are likely to be intergenerational shifts in culturally specific behaviours and social norms. Such acculturative changes over time may also influence and possibly diminish the health advantages of the migrant generation. It seems likely, then, that exposures to both socioeconomic and behavioural risk factors to health are not fixed across generations, and that associated outcomes might be expected to vary accordingly.

Therefore this thesis intends to examine the extent to which ethnic inequalities in health differ across generations, how far they vary across ethnic minority groups, and identify the factors underlying such changes. To achieve these aims, secondary data analysis of two nationally representative datasets will be performed. The Health Survey for England (HSE) is an annual cross sectional survey and, by combining the 1999 and 2004 ethnically boosted years, provides a large sample of seven ethnic minority groups (Indian, Pakistani, Bangladeshi, Black Caribbean, Black African, Irish and Chinese). As well as health data, a variety of socio-demographic and behavioural information is available. Complementing these data is the Millennium Cohort Study (MCS); a longitudinal study including a sample of children born in the UK between 2000 and 2002, recruited at nine months of age. As well child health, details on parental health, socioeconomic circumstances and health behaviours are available across the same range of ethnic minority groups in the Health Survey for England. The MCS is also analysed cross sectionally, using the third sweep of data when the child is aged five. The design of the MCS addresses the issue of period effects outlined above, so that all ethnic minority groups are of comparable ages, and hence have experienced the UK social environment during the same time period.

Chapter two follows, and provides a detailed background to the issues around the assessment of intergenerational comparisons of health inequalities. The review identifies the importance of migratory histories and contexts surrounding the formation of ethnic minority groups in the UK, and how such distal processes can influence the contemporary social and economic location of ethnic minority groups and the associated patterns of health inequalities. Additionally, the background evaluates the evidence that social mobility and acculturative changes in health behaviours have a likely role to play in mediating health outcomes. Chapter three takes forward the messages from the literature review and presents specific research questions that drive the empirical work of the thesis, and provides an overarching theoretical model which describes the relationships between the salient pathways mediating generational health differences. Chapter four and five introduce the Health Survey for England and the Millennium Cohort study respectively, and describe those variables selected to operationalise social mobility and acculturation across generations. Chapter six presents the preliminary results of cross sectional analysis, outlining the ethnic inequalities in health, socioeconomic factors and health behaviours which exist in the sub-samples selected for analysis. Importantly, this analysis describes the sample composition in more detail, exploring the differences between ethnic minority groups in migratory histories and the consequent socio-demographic factors which are expected to have an important influence upon the generational differences in health. Chapters seven through to ten explore intergenerational differences in health and assess what might be the possible reasons behind these changes. Chapter seven describes the extent of the intergenerational differences in health across a range of subjective and objective health measures in adults, and in children, by comparing directly between generations. Additionally, each generation is compared to the White host population, to explore whether inequalities are widening or narrowing over generations. Chapter eight begins to explore possible mediating pathways for these differences, by investigating the differentials in socioeconomic mobility across generations of ethnic minorities, and uses statistical modelling to estimate how far these differences explain generational differences in health. Chapter nine examines whether acculturation is taking place among ethnic minorities, and estimates the influence of behavioural changes on the intergenerational patterning of health. Furthermore, the acculturative influence of the host population is illustrated by comparing the behaviours of each generation to the White group. Chapter ten brings together the combined influences of the socioeconomic and health behavioural pathways, to assess the relative contribution of each pathway in explaining the extent to which ethnic health inequalities vary across generations. The final chapter (Chapter eleven) summarises the main findings and discusses their relevance in relation to contemporary acculturative theory, and closes with an evaluation of the strengths and limitations of this thesis with proposals for future work.

The implications of this thesis are in advancing the limited understanding of how, and to what extent, ethnic minorities acculturate to UK society. The health disadvantages experienced by ethnic minorities in the UK are well documented, but the reasons for these inequalities are by no means fixed, and so neither should the inequalities. Intergenerational studies have a great deal to offer those seeking to understand the upstream causes of inequality with a view to minimising their growth or future formation. This approach is also of importance to those who are working downstream, who must service the differential health needs of certain groups, and who require an insight into potential patterns of health disadvantage in future generations.

Chapter 2: Background

2 Background

This thesis aims to build upon the well documented ethnic health inequalities literature described in the introductory chapter, to examine the extent to which these inequalities change over generations. Based on previous evidence, it is suggested that material or behavioural pathways might mediate these changes.

The potential influence of generational status upon health has been neglected until recently. This is because the second generation population has been small, and the young age of this group has meant that the prevalence of morbidity and mortality has been too low to provide the statistical power to differentiate between generations. Nonetheless, generational differences in health are expected for two major reasons. The first of these is rooted in the pre-migration background and history of those who choose to migrate. The first generation are a selected group of individuals who are likely to be unrepresentative of the population they leave behind. They are the starting point from which subsequent generations must shape their own lives, and the basis of the pre-migration selection might explain generational differences. For example, not all migrants will be from the same socioeconomic background; where one country may experience an exodus of rural labourers, another country may send predominantly skilled workers. Migration may also be influenced by agentic factors and individual freedoms to relocate. The decision to migrate is a personal one taken by a selected minority. Levels of personal motivation will differ between individuals as will levels of human capital and transferable resources they possess, which then may directly influence their post-migration experiences.

The second perspective is concerned with the way in which each generation interacts with the structural and behavioural environment after migration. It is argued that the second generation will become much closer to the health of their peers in the ‘host’ population than the first generation. This is due to them overcoming many of the material disadvantages experienced by the first generation which resulted from unfamiliarity with the UK environment and lower starting social positions than the general population. It may also be a consequence of increased exposure to the social norms, habits and behaviours directly affecting health, to which the second generation are exposed to from a younger age.

The following literature review begins by investigating the first of these factors, namely the context surrounding the migration. The aim is to appreciate how the first generation groups were formed and what the implications of this process might be for experiences within the UK. This will involve a historical overview describing which ethnic minority groups arrived in the UK, and during what period of history. Following this will be exploration of the health profile of migrants to the UK, and elsewhere, with a focus upon the influence of health selection. Attention will then turn to the role of socioeconomic factors on the patterning of health in the UK. However, as this investigation is centred on intergenerational trends in health, the review will focus upon the phenomenon of intergenerational socioeconomic mobility and whether socioeconomic changes across generations are associated with shifts in health profiles. There then follows an exploration of the current understanding of the process of acculturation. Acculturation will be discussed specifically in terms of health behaviours, and considers the extent to which behaviours may change over time and generation. This chapter will conclude with a critical discussion of the over-arching concept of ethnic identity and the difficulties associated with its measurement.

2.1 Post-War History of Migration to the UK

The 1948 British Nationality Act facilitated the arrival of the ethnic minority population in Britain from countries from the New and Old Commonwealth[1]. The legislation was an attempt to shore up the remains the 'skilled' Old Commonwealth, thereby granting UK citizenship rights to individuals from the New Commonwealth as well. The act was not intended as an immigration control yet it shaped policy and the patterns of the movement of people to the UK for the next 33 years (Hansen 2000). Early migration to the UK was primarily driven by economic forces arising from large structural changes occurring in the UK economy immediately post-war. The rebuilding of public infrastructure fuelled the construction and manufacturing industries, and the nationalisation of public services also contributed to a surge in demand for cheap labour. These labour market opportunities were coupled with government counter-urbanisation programmes and led to the internal migration of skilled workers from inner cities towards new towns which had room for growth. This provided appropriate conditions for the introduction of a large importation of labour to the UK (Peach 1998).

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[1] Countries of the New Commonwealth were typically the Caribbean Islands, India and the countries today known as Pakistan and Bangladesh. The Old Commonwealth was primarily comprised of Australia, New Zealand and Canada. Ireland withdrew from the Old Commonwealth in 1949 soon after the introduction of the British Nationality Act.

The migrants of the 1950s were predominantly from the Caribbean Islands, with migration from India also increasing towards the end of the decade. The early arrivals were eventually joined by their families and migration peaked in the late 1950s and early 1960s. However, this period was accompanied by changes in public attitudes towards migrants whose initial arrival was widely encouraged to support the expanding labour market. Migrants later became the target of open discrimination and general public resentment culminating in race riots, such as those in Notting Hill in 1958. Negative social and political attitudes to immigration expedited the passing of the Commonwealth Immigrants Act of 1962. This was aimed at curtailing arrivals from the New Commonwealth which now significantly outnumbered arrivals from the Old commonwealth; the impending introduction of restrictions resulted in a significant 'beat-the-ban' rush. Nevertheless, the legislation excluded Irish migrants altogether, permitted secondary 'chain-migration' of families and introduced generous quotas for the entry of new migrants that facilitated the next wave of migration which originated in Pakistan[2]. The forced expulsion of Asians from Kenya, who had citizenship rights to the UK, led to the emergency introduction of 1968 Commonwealth Immigrants Act, which was crudely constructed to specifically restrict the entry of persons who had no close ancestral links to the UK. This legislation, alongside the 1971 Immigrants Act, reduced the flow of primary migrants from the Indian sub-continent in particular, yet continued to allow passage for members of the Old Commonwealth.

In spite of these restrictions, Bangladeshi migration became most prominent in the late 1970s after the partition with Pakistan and arrivals continued into the 1980s. This was alongside an increase in the Chinese population, with an estimated 80% originating from the British Territory of Hong Kong (Wei 1994). Black African arrivals also increased from the 1980s onwards to today, many of whom arrived as students circumventing the many of the restrictions placed upon migration by the 1981 British Nationality Act. This Act finally deconstructed the terms of the 1948 Act and differentiated between immigration policy and UK citizenship. One of the largest ethnic minority groups in the UK today is Irish, who have a period of migration extending pre-War and who have been relatively unrestricted in their migratory movements to the UK.

[2] Reasons for exclusion of Irish citizens from immigration control are still contested. Further controls may have disrupted the political peace-process occurring in the 1970s. Ireland's proximity to the UK produced a mobile labour force which could rapidly respond to the demand of the UK labour market (Hansen 2000). It is also suggested that the Irish exemption was simple racial discrimination against 'citizens of colour' from the New Commonwealth (Paul 1997).

The migratory flows from Ireland have consequently remained at a relatively low, but consistent level, throughout the post-War period.

Contemporary movements are influenced to a greater extent by the flow of refugees, mainly from Africa, the Middle East or countries with on-going civil disruption such as Sri Lanka. This is not an entirely new phenomenon, as there was a notable influx of Kenyan and Ugandan Asians in the 1960s and 1970s, but those migrating for political means, rather than economic, represents a notable difference in migratory motivations. The scale of these migrations has elicited asylum specific legislature to control movements through the introduction of six major Acts between 1993 and 2006. Nevertheless, economic migrations to the UK are still commonplace. After the dissolution of colonial rule which was accompanied by a decline in the global influence of the Commonwealth, Britain joined the European Community. This has allowed a relatively free movement of European people across European borders, primarily for economic reasons. There is a sparse health literature on those individuals who travel shorter distances than the New Commonwealth migrants. This is due to the contemporary nature of their migrations, coupled by their young ages providing a paucity of morbidity and mortality data. Yet they are likely to represent a significant proportion of the UK ethnic minority population which will be more fully quantified at the 2011 Census.

Growth in the White British population has all but ceased since the 1991 census and the ethnic minority population accounts for nearly all the current population increase in the UK (Owen 2003). At the 2001 census the ethnic minority population of the UK was 4.6 million people, accounting for just over 7% of the total population and this proportion is likely to be significantly greater at the next census. As a direct consequence of its relatively recent social, political and economic history, the UK is currently well-placed to undertake studies of the early post-war migrants now that the initially large flow of arrivals have firmly established a second, and in some cases, third, generation within UK society.

2.2 Migratory Contexts

The combination of the point of origin, period of arrival, the motivations and the capabilities of each migrant group produces a complex interaction that shapes the social, economic, political, and ultimately the health profile of the migrant. The context of migration not only provides important background detail on the determinants of the health experiences of each ethnic minority group, but it also describes the factors which play a role in the construction of ethnic minority groupings post-migration. The discussion will now focus on the implications of migrant health selection, with a later consideration of how migration might influence the formation of ethnic group identities.

Pre-migration living conditions vary between groups in their country of origin resulting in differentials in early life course exposures to health risk factors. Variations in early life living conditions have the potential to lead to inequalities in later life illness, after migration. For instance, a study in Glasgow suggests that differences in physical development compared with the White population were a result of childhood deprivation in the Punjab (Williams 1993).The 1975 UN Human Development Index (HDI) (UNDP 2003) scored Bangladesh (0.36) as the least developed of the principle sending countries to the UK, followed by Pakistan (0.38), India (0.42), Caribbean (Jamaica: 0.69) China (0.53), Hong Kong/China (0.78), with the United Kingdom (0.85) being the most developed (a generic 'African group' is not included.) [3]. The inference here, that the country of birth describes post-migratory health inequalities, is perhaps too simplistic as the HDI scores used in this example are averages for the entire population, but it is possible that migrant groups are positively selected from within the whole population according to socioeconomic successes. This would positively select migrants with associated high levels of health and who are not representative of the majority in the country of origin. Conversely, other groups of migrants may be negatively selected. This selection dichotomy is exemplified by the socioeconomic distinctions between Ugandan Asians whose arrival was partly due to a disproportionate success within business and enterprise during Amin's rule in Uganda, arriving at the same time in the late 1960s as a relatively unskilled and mobile Irish manual labour force seeking work. Therefore country of birth explains little of the experiences of the migrant without a more elaborate understanding of the migrants' background. It would appear possible that the selection of individuals into each wave of migration produces groups with specific characteristics that are not necessarily representative of the population from which they were derived. They are a product of the social and political context of the period from which they were selected. And importantly, the impact of these differing profiles within the UK environment is likely to determine the patterning in health.

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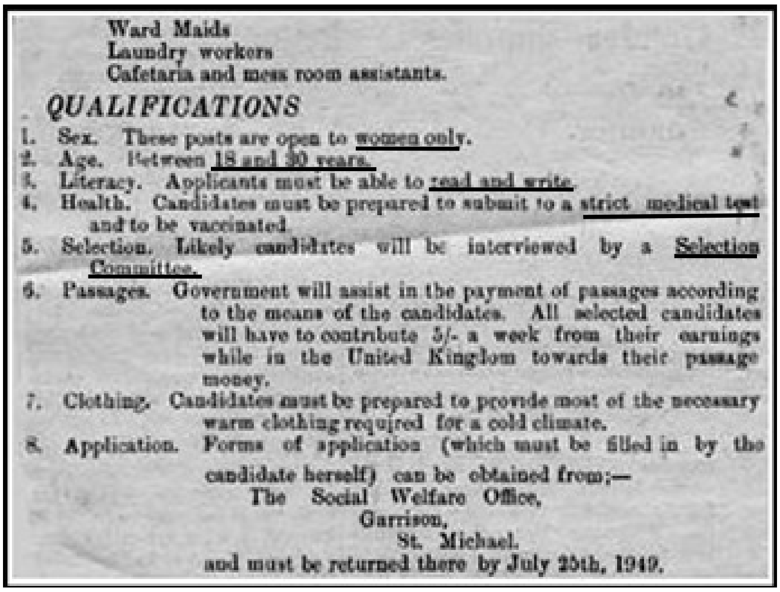
[3] The HDI was first produced in 1975 and provides a country's composite measure of three dimensions of human development: living a long and healthy life (measured by life expectancy), being educated (measured by adult literacy and enrolment at the primary, secondary and tertiary level) and having a decent standard of living (measured by purchasing power parity income).

By way of example, the following advert placed in the Barbados Beacon in 1949 demonstrates health selection in early Caribbean migrants. The advert for hospital staff selects women, who are young, (between 18 and 30 years) and literate (and therefore educated). They had to be capable of passing a selection panel of interviewers, and most importantly, be in good physical health as assessed by a strict medical test. The majority of applicants were also expected to fund their own travelling expenses and training fees, effectively excluding the financially disadvantaged from migration. This recruitment programme therefore included elements of health screening, self-selection of individuals with healthy lifestyles, and self-selection of the socioeconomically advantaged.

Figure 2.1: Advertisement showing health and socioeconomic selection of nurses from the Caribbean in 1949



Ward Maids
Laundry workers
Cafetaria and mess room assistants.

QUALIFICATIONS

1. Sex. These posts are open to women only.
2. Age. Between 18 and 30 years.
3. Literacy. Applicants must be able to read and write.
4. Health. Candidates must be prepared to submit to a strict medical test and to be vaccinated.
5. Selection. Likely candidates will be interviewed by a Selection Committee.
6. Passages. Government will assist in the payment of passages according to the means of the candidates. All selected candidates will have to contribute 5/- a week from their earnings while in the United Kingdom towards their passage money.
7. Clothing. Candidates must be prepared to provide most of the necessary warm clothing required for a cold climate.
8. Application. Forms of application (which must be filled in by the candidate herself) can be obtained from;—

The Social Welfare Office,
Garrison,
St. Michael.

and must be returned there by July 25th, 1949.

(Barbados Beacon 1949)

The health selection effect is significant because it determines the starting point from which health profiles either converge or diverge relative to the general population. The basis of selection can help our understanding of whether health inequalities are caused by structural circumstances and barriers faced by each group after migration. For example, if migrants are selected on the basis of good health but, experience poorer health after migration, it is likely that the new environment is hazardous to health. Alternatively, refugee arrivals may be expected to have poor health on arrival, with long term improvements from their low starting position.

2.3 Health Selection: The Healthy Migrant Effect

The healthy migrant effect can be defined in a number of different ways which are a direct consequence of the way it is measured. It can be defined as:

- The selection of individuals who are healthier than the population they have left behind.
- The selection of individuals who are healthier than the population they have joined.
- The selection of individuals who are healthier at the time of arrival compared to a later time period.

The precise definition of the healthy migrant effect is therefore entirely dependent upon with whom the migrant group is being compared. Nevertheless, each definition is consistent in placing the migrant at a relative health advantage over the comparison group at the time of arrival. The evidence for this effect and the value of these different comparative approaches in explaining health differences will be reviewed in the next section.

2.3.1 Migrant Health Compared to Origins

Turning attention to the first definition of the healthy migrant effect, a comparison of the migrant health profile to the profile in the source country was carried out using migrant mortality data from the 1971 census of England and Wales (Marmot et al 1984). Post-War migrants to England and Wales from the New Commonwealth had a lower mortality rate compared with individuals in the country of birth, thereby implying health selection. However, there was an inverse relationship in Irish migrants; those who migrated were the least healthy and more likely to suffer higher rates of mortality. This was explained by the alternative set of political and geographical differences encountered during migration compared with those migrants arriving from further away. The Irish did not face the health barrier and were selected from the more disadvantaged groups. This observation has been replicated in contemporary work from the United States where 'local' Mexican migrants with lower costs of migration demonstrated weaker health selection effects than those from further afield (Akresh & Frank 2008), with the extent of health selection strongly and associated with the socioeconomic background of the migrants. Other work suggests that migrants are healthier than those who remain behind when the country of origin has a high GDP per capita for a given set of skills and education; conversely health is poorer in migrants from countries with lower GDPs (Jasso et al. 2004). The implication is that health selection is possible, but the extent is determined by a range of wider factors such as the socioeconomic characteristics of the migrants and their point of origin, or the distance travelled.

A drawback of this approach is the lack of detail on the extent of the health gap between migrant and the host population. The comparison shows that migrants are healthier than their peers who stay behind, but does not reveal whether they are relatively healthy in the new environment and what their experiences may be post-migration. In which case a better approach to understanding the healthy migrant effect is to include a third population - the majority population - to ascertain whether health selection took place at origin, and whether these individuals are healthier than the host general population.

2.3.2 Migrant Health Compared to the General Population.

The second approach, comparing the health of arrivals to the majority population, overcomes the weakness of not measuring the relative health advantage post-migration. Nationally representative data from the UK have repeatedly shown persistent health disadvantages in ethnic minority groups relative to the White population across a range of subjective and objective health measures (Erens et al 2001;Nazroo 1997b;Sproston & Mindell 2006). Despite some notable exceptions in certain groups for specific illnesses, e.g. low prevalence of ischaemic heart disease in Black Caribbean individuals (Chaturvedi 2003), these findings suggest overall that the major ethnic minority groups observed by Marmot et al (1984) were unlikely to have significantly lower mortality than the UK population, despite having lower mortality than their peers at origin.

Nonetheless, support for the healthy migrant effect has been documented in a nationally representative survey of migrants in Australia (Donovan et al. 1992). Australian data has observed that South Asian migrants experience a significantly lower relative risk of circulatory disease morbidity and diabetes mortality than the host population (Gray et al. 2007). These findings are a notable contrast to UK South Asians that have significantly higher cardiovascular morbidity and mortality rates compared to the White population (Cappuccio et al. 1997;Chaturvedi 2003;McKeigue et al. 1991).

The same comparative techniques have repeatedly identified a healthy immigrant effect in a range of Canadian migrants. (Ali et al. 2004;Chen et al. 1996;Dunn & Dyck 2000;McDonald & Kennedy 2004;Newbold 2005). Interestingly these data have also identified significant disparities in health selection dependent upon migratory contexts, with economic and family chain-migrants reporting lower rates of poor general health than asylum seekers or refugees

(Newbold 2009). Comparisons from the United States between the large Hispanic population with non-Hispanics have consistently shown a lower mortality risk for Hispanics (Franzini et al. 2001;Hummer et al. 2000;Sorlie et al. 1993). These findings are particularly striking given the low socioeconomic position occupied by the Hispanic group generally predicts poorer health. This has led to the "Hispanic Paradox" phenomenon. There is a significant body of literature to suggest that this relationship is the result of healthy behaviours within the selected groups. (Abraido-Lanza et al. 1999;Markides & Coreil 1986;Perezstable et al. 1994;Singh & Siahpush 2002). Behaviours, as well as health screening policies, have also been cited as an explanation for the reduced risk of cardiovascular disease mortality in South Asian migrants in Australia (Gray et al 2007).

The main weakness of this approach for describing the effects of selection on health is that the health advantage of migrants is measured relative to the general population, and cannot determine whether health selection occurred at origin. A further caveat is that the impact of any health selection may be over-estimated by the sudden move between pre- and post-migratory environments, via what Razum and colleagues call "Time Traveller" effects (Razum & Twardella 2002). The theory states that migrants originating from countries within earlier stages in the epidemiological transition have weaker exposures to health risks common to the UK. These migrants then bring their mortality advantages with them and additionally benefit from improved healthcare, less infectious disease and generally better absolute living standards immediately following migration. This leads to a further increase their mortality advantage, and obscures the relative contribution of the effects of health selection. Whether these health advantages persist in the longer term is an interesting question and is addressed by the third approach to identifying the healthy migrant effect, which compares migrants on arrival to a later point in time.

2.3.3 Temporal Studies of Migrant Health.

Epidemiology has a long history of following the experiences of migrants over time to isolate environmental effects of health (Beaglehole et al. 1979;Marmot et al. 1975;Medalie et al. 1975). If disease rates change when individuals move from one place to another then it is indicative of the role of environmental factors.

Early studies identifying a negative influence of increasing duration of UK residence on health did not adjust for the effects of age (Fox et al. 1982). This is a significant weakness given that length of stay is closely associated with age and related effects on health. More recent work has accounted for this shortcoming. A cross sectional study of 159 UK South Asians described poorer health with increasing length of residence in the UK, controlling for age by limiting the sample to those between 30 and 40 years (Williams 1993). Respondents were more likely to: be overweight, report heart trouble and respiratory or psychosomatic conditions, have had accidents, need glasses and take time ill in bed, the longer they had been resident in the UK. Furthermore, a comparison of the UK South Asian sample with similar subjects in the country of origin showed that positive health selection of the more recent migrants, with shorter lengths of residence, was an unlikely explanation. It was therefore concluded that the UK environment does not promote health status as a consequence of more favourable environmental conditions and reduced exposures to infectious disease, as compared to the country of origin. This suggests that the "Time Traveller" phenomenon (Razum & Twardella 2002), suggesting an extension of the health advantage due to immediate improvements in living conditions after migration, did not apply to this sample. Findings also imply that the South Asian 'niche' occupied post-migration is hazardous to health, rather than it not promoting health, with changes in behaviours and economic circumstances cited by Williams (1993) as likely causal mechanisms. These remain untested hypotheses and suggest a key area for further investigation.

The negative influence of the UK environment on migrant health is supported by a 25 year follow-up study in the Office for National Statistics Longitudinal Study (extracted from the census of England and Wales) of 2,200 South Asian and 1,540 Black Caribbean first generation migrants. After standardising for age and temporal changes in socioeconomic factors, the prevalence of cardiovascular disease mortality increased with length of residence for Black Caribbean aged 45-54, although there was no effect for cancer mortality (Harding 2004) [4]. For South Asians aged between 25-54, all-cause, cancer and cardiovascular mortality was significantly and positively associated with increasing duration of residence (Harding 2003a). Sample attrition was particularly high for Black Caribbean (~20%) and a smaller proportion of Indian informants were lost to follow-up through emigration, death or unknown reasons. This introduces a potential source of systematic bias as loss to follow-up may not be randomised across health status, particularly so for departees who may be health selected to emigrate just as arrivals can be selected to immigrate. Nevertheless these longitudinal findings offer further

[4] Adjusting for socioeconomic factors is problematic as the relative importance of socioeconomic indicators is likely to vary by ethnic group (Davey Smith 2000). There is the added complication that the cultural emphasis on these indicators might alter with increasing length of residence or generation. These discussions will be returned to in more detail at a later point.

support to the notion that the UK environment is not protective of the health of the migrant generation, despite the limitations in explaining the mechanism through which duration of residence exerts its influence.

The decline in migrant health is not unique to the UK. A theory of accumulated disadvantage with age and duration of residence is supported by large scale studies from Australia (Donovan et al 1992), Canada (Chen et al 1996;Newbold & Danforth 2003), and the USA using a variety of morbidity and mortality outcomes (Singh & Miller 2004;Stephen et al. 1994). These studies demonstrated that ethnic groups which were previously healthier than the general population showed a steady convergence to the rates of selected health outcomes observed in the native-born population. These trends reflect changes in physical health rather than increases in the detection of existing problems or use of services through greater familiarity with health systems (McDonald & Kennedy 2004). These international findings are consistent with the post-migration erosion of healthy characteristics potentially via the “weathering hypothesis” (Geronimus 1996) where declining health is mediated through long term exposures to relative disadvantage.

This does not mean that increasing duration of residence is only associated with worsening health profiles however. Gray et al (2007) demonstrated statistically significant reductions in mortality with duration of residence in a diverse range of Australian migrants (New Zealand, Greek, Italian and South Asian). The retention of healthy lifestyles within these groups was suggested as a possible cause, as was the possibility that these findings were a consequence of a health selection cohort effect, but neither mechanism was investigated. The Australian findings indicate that the patterns of long term health vary not only by ethnic group but also by geographical context. So while each country’s migrations are different in detail, there are likely to be similar underlying and long term processes that contribute to health.

There are significantly fewer studies inferring health selection across generations. The Fourth National Survey (FNS) noted that ethnic minorities were less likely to report poor self-rated general health in the first generation relative to the second (Nazroo 2001a) but the effect was only statistically significant for Black Caribbean people.

This has a number of implications. Firstly, it suggests that health selection might operate within migrant groups as this effect would be expected to diminish for the UK born leading to poorer health. Secondly, as the UK born were in poorer health, ethnic health inequalities are unlikely to be the result of pre-migration environmental factors. Lastly, the health advantage of the migrants suggests that the physical process of migration and associated stresses are not responsible for ethnic health inequalities. These findings, along with those previously discussed describing poorer health with increasing length of residence, suggest that there is something about the second generation experience of UK life that is more detrimental to health than it was to the parental generation. Attention will now turn to identifying the mechanisms that might mediate the changes in the health profile over generations.

Summary

This section has reviewed evidence for the healthy migrant in a variety of global contexts but with a particular emphasis on the UK data. It has shown that the effect is rarely measured directly but is instead inferred from comparative analysis between the migrant health status on arrival and similar people at origin, the host population, or migrants measured at a later time period post-migration. These different comparisons have shown that post-war migrants to the UK, before 1971 at least, were healthier than their counterparts in the country of origin. Evidence has since suggested that they are not healthier than the UK general population. There are data indicating that these health profiles on arrival are not fixed and, importantly, have tendency to decline with length of residence. There is limited evidence examining whether this decline persists across generations, or whether it operates for all ethnic minority groups.

Attention will now turn to identifying the mechanisms that might mediate the changes in the health profile over time and generation. The evidence for the healthy migrant effect revealed three different potential pathways to the selection. The first pathway for selection is centred upon pre-migration health screening and migrant selection policies (Antecol et al. 2003;Laroche 2000). However, in the UK, migrant health screening and selection applies only to a small number of countries with a high prevalence of infectious disease (Paterson 2003), and the recent introduction of points-based policies for selective entry to the UK does not include subjects used in this study. The second pathway posits that those who migrate have healthy lifestyles and behaviours which they carry with them from the point of origin (Marmot et al 1984;Singh & Siahpush 2002). Therefore behaviours are likely to play a significant role in the formation of the post-migratory health profile and warrant further investigation. The final pathway is centred on socioeconomic self-selection. If migrants are selected according to socioeconomic factors then the association between socioeconomic profile and health on arrival, and in later generations, requires further analysis (Akresh & Frank 2008;Jasso et al 2004).

It is important to note that none of these models are mutually exclusive and often work in combination with each other. As the example of the Caribbean nurses in Figure 2.1 showed, migrants to the UK in the 1950s were screened and selected, both in terms of health as well as socioeconomic factors. The difficulty for empirical analysis, then, is detecting which pathways are operating, to what extent, and in which ethnic minority group. While the explanatory models described partially explain health profiles on arrival, they do not adequately account for the observed changes to health profiles experienced after prolonged exposure to the new environment. The identification of the risk factors which contribute to the “weathering”, or retention, of the migrant health profile over generations will be the focus of the remainder of this chapter and the subsequent analysis.

The next two sections of this review will therefore discuss the influences of both the socioeconomic and the behavioural pathways that have been implicated in the formation of the migrant health profile. As the focus of this thesis is long term change in health across generations, the specific influence of socioeconomic mobility on health will be reviewed. In addition, the relative strengths and weakness of the current literature will be discussed with a view to building upon this previous work using different data sources.

2.4 Socioeconomic Pathways to Health

Evidence from the UK general population (Craig & Mindell 2008;Marmot et al. 1978) and internationally (Davey Smith et al. 1997;Kaplan & Keil 1993) suggests that morbidity and mortality are socially patterned and follow a social gradient. Those at the lowest end of the socioeconomic order commonly suffer a poorer health profile than those individuals found in the higher professional classes. Changes to social position (social mobility) is directly relevant to health as it provides a mechanism by which risk factors, or advantageous factors, can accumulate at differential rates over the life course (Davey Smith et al 1997). It follows that the direction and extent of social mobility might be associated with a change in the health profile.

This section will concentrate on the role of socioeconomic circumstances in mediating changes to the health profile over generations. This will begin by examining the process of downward mobility experienced by migrants on arrival and explore why and to what extent this occurs in ethnic minority groups. The long term impact of living in the UK on social class position will then be explored. This section will conclude by evaluating whether changing socioeconomic position might mediate the shifting health profiles of migrants over time and between generations.

2.4.1 Patterns of Socioeconomic Mobility in the UK

2.4.1.1 Downward Mobility

There is evidence that male migrants moving to the UK in the 1950s and 1960s suffered serious disadvantages in the labour market which led to downward social mobility (Heath & Ridge 1983). Migrants filled undesirable roles on arrival performing unskilled manual labour offering low pay, poor working conditions, little job security and inferior social status (Castles & Kosack 1973). This level of employment was generally below the level occupied pre-migration. Such downward mobility has been explained by a lack of 'human capital', and experiences of discrimination and prejudice within society (Heath & Yu 2005).

Human capital comprises the work related skills of an individual. Education and the length of experience in the job market are commonly used by economists to quantify the level of capital possessed by an individual (Heath & Yu 2005;Mincer 1974). Both of these measures are particularly salient for a newly arrived migrant. Post-War migrants were arriving from countries with less developed education systems so many arrivals lacked any qualifications with overseas certificates possessing less value in the labour market than domestic ones. An additional barrier to labour market access was a lack of fluency in English, particularly for those from South Asian countries and especially for women (Modood 1997a). Therefore the human capital accumulated in the country of origin was not easily transferable limiting chances of economic success on arrival in the UK. The second major barrier to labour market integration at arrival was due to discrimination. Audit studies describe how similarly matched job candidates and potential housing tenants were discriminated against by ethnic group. This suggests that even when migrants had sufficient levels of human capital to enter the labour market, institutional forces constrained the opportunities for economic success (Daniel 1968).

These two barriers are not fixed however. Language proficiency would be expected to improve with increased exposure to the UK, and time spent in the labour market results in direct gains in 'human capital' and increases employability through work experience. As a consequence of widespread discrimination in the 1950s and 1960s, the Race Relations Acts (1965 and 1968) attempted to minimise discrimination reducing barriers to employment and training and providing rights against dismissals. The attempted reduction in the socioeconomic barriers experienced on arrival suggests upward movements in social class position may take place over time.

'Class reassertion' occurs when upward mobility is a direct consequence of the downward mobility experienced immediately following arrival. This scenario is important as upward mobility tends to be a direct consequence of the low social class origins caused by a lack of opportunity for the first generation, rather than it being a reflection of 'real' class success mediated through factors such as improving educational attainment. This chapter will now focus upon those studies which have attempted to measure post-migration social class movements, and will evaluate the evidence that upward mobility takes place over generations.

2.4.1.2 Intergenerational Socioeconomic Mobility

There is a considerable body of literature exploring the intergenerational changes in the socioeconomic position of individuals in the whole population (Blanden et al. 2001;Blanden et al. 2008;Goldthorpe et al. 1987;Heath & Payne 1999;Prandy 1998) with education identified as the major mediating factor for movement (Halsey et al. 1980). However, investigations into the extent of socioeconomic change and the mediators of such differences in ethnic minority groups are extremely limited by comparison.

Most investigative approaches have used cross-sectional data to measure the relationship between a respondent's social class and the retrospectively reported social class of their fathers (Heath & McMahon 2005;Heath & Smith 2003;Heath & Yu 2005). These studies pooled years from the General Household Survey to describe the influence of parental social class and educational background on the transition from manual to salaried occupations in each ethnic minority group. The findings of these studies suggest that patterns of social mobility are distinct across groups with the starting point within the social hierarchy being the most important determinant of the class position for the next generation.

The major limitation of these data is the way in which social class at origin was measured. It is likely that social class origins were representative of parental social position pre-migration, rather than class origins which are reflective of UK experiences (Platt 2007). The use of pre-migration origins assumes an unlikely international comparability between social classes and fails to account for the possibility of downward social mobility on arrival previously described in section 2.4.1.1. By measuring across the point of migration and ignoring international non-correspondence of social classes, the contribution of the processes operating within Britain remains unclear (Platt 2005).

A longitudinal approach overcomes many of these difficulties. The most recent and largest investigation of social mobility in a range of UK ethnic minorities followed 141,303 individuals from the Office for National Statistics Longitudinal Study (ONS LS) (Platt 2005). The longitudinal design elucidates the processes operating within the UK by tracking the experiences of the second generation whose parents were old enough to have reached their final class destination. This allows intergenerational mobility to be tracked directly. An additional strength over previous work is that study members are of approximately the same age and are followed over the same time period. This accounts for contextual period effects, such as labour market discrimination, which might otherwise confound differences observed between ethnic groups.

The study showed a general trend for all ethnic minority groups to show upward mobility with class origins being the key determinant of class destination across generations, and mobility being primarily facilitated by education (Platt 2005). However, there were relatively low mobility rates for second generation Pakistani and Bangladeshi people. They were the least likely to achieve upward mobility even when differences in education and markers of socioeconomic circumstances were controlled for. Heath and colleagues have attributed differences in intergenerational mobility to the effects of an 'ethnic penalty' arising from unmeasurable factors which are distinct to an ethnic minority group, which has commonly been attributed to discrimination within the labour market, and within society generally (Heath & McMahon 2005;Heath & Smith 2003;Heath & Yu 2005). For example, when second generation Pakistani groups have similar levels of 'human capital' to all other groups, they are significantly more likely to be unemployed. The implication is that ethnicity outweighs social origins in determining upward movement for the Pakistani group. Therefore education is not only differentiated across groups, but it is a less powerful mediator of upward mobility in groups with lower social class origins (Platt 2007). Consequently it seems that the socioeconomic gap is unlikely to be closed by equal educational opportunities – equality of opportunity would not result in equality of outcome in this instance. Furthermore, it is possible that the gap will widen as the socioeconomically advantaged benefit from education to a greater extent than those of lower starting positions. The implications of this for health are serious. If the social class gap between ethnic minority groups is expected to widen, so might the health gap.

2.4.2 Examining the Relationship between Social Mobility and Health

It seems likely that socioeconomic shifts take place across the first and second generations, with the extent of change differing by ethnic minority group. However, this mobility is only of significance to health if social class and health are causally linked for ethnic minorities as they are in the White population. If no social gradient in health exists in ethnic minorities then it is very unlikely that socioeconomic pathways are a determinant of health. It is theoretically possible that this might be the case due to health or socioeconomic selection processes operating in the country of origin. Alternatively, downward social mobility might lead to individuals of previously high social class, with high levels of health, becoming low social class on arrival, disrupting the social gradient in health which may have existed before migration. Indeed, early work on migrant mortality using the 1971 UK census failed to identify any social gradient in health (Marmot et al 1984). It would appear, from such data, that a widening of the socioeconomic gap is of no importance in the widening of the health gap between ethnic minorities and the White population.

However, the findings of Marmot et al (1984) are in significant contrast to those of the later Fourth National Survey (FNS) (Nazroo 1997b) and a more recent migrant mortality study using similar methods (Harding & Maxwell 1997), which identified clear social gradients in mortality across a similar range of ethnic minority groups. This is consistent with the notion that socioeconomic factors do indeed explain a significant proportion of the health inequalities experienced by ethnic minorities (Nazroo 2001a). Therefore, based on more recent evidence, investigating patterns of social mobility is likely to add to our understanding of the formation and persistence of health inequalities. The FNS most clearly described the salience of social class position on ethnic minority health, but it also raised questions surrounding how social class should be measured.

2.4.2.1 Measuring Social Class

Social class was defined by Marmot et al (1984) according to occupation provided on the death certificate. This single measure of social class was open to information bias where relatives tend to inflate the status of the deceased, or record the highest status achieved (Townsend & Davidson 1982). Therefore this indicator did not provide a true reflection of the socioeconomic experiences and exposure to risk factors post-migration and is the likely reason for the failure to detect a social gradient in health (Nazroo 1997b). The FNS instead used multiple markers to identify the social gradient in health. These included current occupation, housing tenure and standard of living to provide a more accurate and *contemporary* assessment of socioeconomic exposures relevant to health. It could be argued that the differences in the gradients are due to the measurement of morbidity in the FNS rather than mortality in the census. However, a replication of the Marmot et al (1984) analysis using data from the 1991 census identified strong social gradients in mortality for Caribbean, South Asian and Irish subjects contained in the original 1971 census (Harding & Maxwell 1997). This social gradient is consistent with the observations from the FNS. It indicates that the social class information on death certificates in 1971 was a weak reflection of contemporary social class and exposure to health risk. It is possible that the social class provided on death certificates following the 1991 census was less prone to information bias due to a greater length of time elapsing between date of migration and death. This created a more useful measure of the long term exposure to health risks in the UK.

A further weakness of a single socioeconomic measure is that standard social class groupings do not adequately account for the diverse range of experiences within each social class and ethnic minority group. The FNS described how the Registrar General Social Classification (RGSC) masks the concentration of ethnic minorities in lower income occupations compared to White groups. For example, Pakistani and Bangladeshi informants in the uppermost professional and intermediate classes had average weekly incomes comparable with Whites in the lower unskilled and partially skilled groups (Nazroo 2001a). This income disadvantage, which is likely to impact upon health experiences, was hidden by the use of only RGSC groupings. A means of capturing this disadvantage is to include several socioeconomic indicators in explanatory models. By constructing a more detailed standard of living index it was possible to explain more of the health disadvantages compared to basic measures of social class were used. (Nazroo 1997b).

Despite the emergence of a multivariable approach in quantifying these socioeconomic effects on health, most studies measuring social mobility's effects on health have concentrated on the single measure of occupation. This chapter will now focus upon those studies and will evaluate the contribution of intergenerational social mobility in mediating health.

2.4.2.2 The Influence of Social Mobility on Health Outcomes

Section 2.4.1 revealed that studies of social mobility in the UK's ethnic minorities are uncommon. Consequently there are only a few investigations which have gone one step further and linked the effects of social mobility to health. The Office for National Statistics Longitudinal

Study has been the most useful data source for this task and has described a positive relationship between upward mobility and health. Mortality risks were highest in first generation Black Caribbean and South Asian individuals who reported persistent social class disadvantage (manual RGSC) between the 1971 and 1981 census (Harding & Balarajan 2001a). Mortality rates were lowest in the persistently advantaged (non-Manual RGSC), or those moving up from manual to non-manual classifications. Similar findings are documented for morbidity, with higher rates of limiting illness associated with downward mobility and continued disadvantage (Harding 2003b). It is unlikely that poor health led to downward mobility as sick people were more likely to drop out of the labour market, and hence excluded from analysis, than be downwardly mobile (Bartley & Plewis 1997). Therefore these observations are consistent with the well-established link between socioeconomic and health advantage. They suggest that upward social mobility is a mechanism which improves health, whereas as downward mobility leads to a worsening in health.

The results of Harding's study (Harding 2003b) are noteworthy as they show that the effect of social mobility on health does not operate in the same way for all ethnic groups. Previous work using the general population observed how social mobility leads to a reduction in health inequality across the social classes (Bartley & Plewis 1997). Those who move from the most advantaged category report more limiting illness than the category they leave, but less limiting illness than the one they join. Those who are upwardly mobile report less limiting illness than the category they leave behind, but more limiting illness than the social class they join. These movements have the net effect of constraining the health gap between the socioeconomic classes, implying social mobility is an effective mechanism for reducing health inequality. However, exploring within ethnic groups the constraining effect did not apply to South Asian and Black Caribbean migrants as downward mobility was related to higher levels of limiting illness among these groups than all other people in the study (Harding 2003b). These findings suggest that downward social mobility in ethnic minorities confers a greater risk to health than in the general population. The implication is that health inequalities across ethnic minorities may persist if socioeconomic disadvantage disproportionately affects some groups more than others.

One potential explanation for these observations is that the use of occupational social class does not adequately capture the disadvantages experienced by these ethnic minority groups. Changes in occupational social class might relate more closely to overall living standards in some groups than others. An alternative explanation might be that the contrasting experiences of South Asian and Black Caribbean people are a direct consequence of migration. As previously discussed, social class origins of the first generation are likely to be determined pre-migration, with downward mobility occurring after arrival. It is possible that the relationship between mobility and health observed by Harding and Balarajan (2001) and Harding (2003b), while interesting from a historical sense, reflects a unique period following migration for these two groups. Furthermore, the cohort might also be biased by selection processes; Heath & Yu (2005) described the advantageous social class distributions of Black Caribbean women in the 1990s which was a consequence of selective employment practices in the 1950s. Therefore, in the absence of the relevant data to unpack a number of such cohort effects inherent within the first generation it is difficult to understand what socioeconomic mobility means for these migrants. Understanding the relationship between social mobility and health ideally requires the investigation of contemporary social origins indicative of exposure to the UK rather than overseas. By minimising the influence of migration effects the effects of social class on health may be more accurately documented.

There is only a limited amount of work which has adopted this approach however. Harding and Balarajan (2000) allowed ten years residence within the UK for the wearing off of potential selection effects before showing that second generation Black African people were more likely to report limiting illness than the first generation, despite being upwardly mobile. Similarly, mortality rates increased over three generations of Irish migrants, despite decreasing social disadvantage with each generation (Harding & Balarajan 2001b). The description of the second and third generation is significant as it avoids the direct effects of migration and associated difficulties in the measurement of social class.

The limitations of these findings, particularly the Irish studies, are considerable. The second generation measured by Harding and Balarajan's two studies are not related to the first generation. The second generation are the progeny of a migration to the UK approximately 30 years previously, comprised of migrants who are very different to the first generation who have migrated more recently. The comparison between the Irish third generation and the first generation is even more tenuous, with the third generation descended from migrants 60 years previously, separated by an intervening second generation.

Summary

There is a large evidence base documenting socioeconomic mobility of the general population of the UK post-war which appears to be primarily mediated through education. However, studies examining ethnic minority mobility are less common. Those which do exist describe the downward mobility of the first generation on migration, followed by a period of class re-assertion. However, intergenerational persistence of an 'ethnic penalty' across generations has been repeatedly described, where equal educational outcomes do not result in equal outcomes in the labour market for certain ethnic minority groups.

The effects of social mobility on the health of the general population are, again, more well-established than in minority groups and describe how upward mobility is associated with improving health, and downward mobility with declining health. The evidence from the relatively few studies on ethnic minorities is more mixed than the trends observed in the general population, and the strength of evidence less compelling due to some serious data limitations. The main finding is that upward social mobility does bring associated health advantages to the few ethnic minority groups examined, but downward mobility appears to affect migrant ethnic minority health to a greater extent than for the general population. This suggests that overall, for the few outcomes measured within the literature, ethnic minority socioeconomic mobility does little to constrain the size of the health gap between socioeconomic groups. What is less clear is whether social mobility is an effective mechanism for overcoming differences across all ethnic minority groups.

Assessing socioeconomic mobility intergenerationally may reduce the influence of contextual factors operating within the migrant generation, and appears to be a more effective approach in describing how changing social class explains health. A suitable method would be to use a first and second generation of broadly similar ages and who have lived in the UK at similar times. This would assess first generation disadvantage as explained through a lack of human capital, such as education, rather than as a consequence of structural prejudices that are considered a characteristic of a historical period. If both groups differ in only place of birth and early childhood, then generational differences in health can be attributed to either early life exposures, or the effects of the UK environment.

This section has examined how changing socioeconomic inequalities might mediate changes in the health profiles. The next section will focus upon the behavioural pathway, and explore how acculturation and modifications to the health related behaviours might cause differences in the health status of each generation.

2.5 Acculturative Change

The process of acculturation leads to a series of challenges and life changes which are likely to benefit or adversely affect the health of the migrant and native born generations. One of the earliest studies to identify the impact of acculturation on health outcome focussed on Japanese Americans (Marmot et al 1975). Japanese people who were most acculturated to Western lifestyles faced a three to five fold increase in coronary heart disease (CHD) prevalence compared to those in the most traditional group; a difference which could not be explained by the usual risk factors for CHD. This indicated that other processes or unknown risk factors were of importance. This classic work has recently been replicated in a large scale study in Sweden, 30 years later. A reduced CHD risk was observed in migrants in Sweden who had high rates of CHD in their country of birth, whereas those migrants who originated from low CHD risk countries subsequently faced a higher risk in Sweden (Gadd et al. 2006). The likelihood of migrant outcome approximated towards the likelihood of outcome in the host population regardless of the country of origin. This demonstrates that changes do occur in the health profile of the minority group relative to the majority over time, although the reasons for this are still unclear. Socioeconomic explanations for shifts in health status have been previously discussed. However, it is probable that culture has a role to play (Ahmad 1996), and the link between "way of life and way of death" is likely to be influenced by the host environment (Abraido-Lanza et al. 2005;Berry 2005;Hunt et al. 2004;Lee et al. 2000;Marmot et al 1975;Salant & Lauderdale 2003). As noted previously in the literature on healthy migrant selection, the health status of the migrant is not fixed upon arrival, and the relationship between the length of residence and generation with health status is not the same for all groups. One potential reason for this may be due to differential rates of acculturation to the UK environment between groups, and this process therefore represents a likely pathway in the shaping of ethnic health disparities within and between generations.

How these acculturative differences arise and what effect they might have on health outcome is an increasingly popular topic in the literature. A review by Hunt et al (2004) detected a near doubling in the number of articles indexed by Medline for 'acculturation' over the previous ten years. Yet despite this increased attention, acculturation remains a poorly defined and untheorised process in the current literature. Given that it is a concept attempting to describe complex interactions between ranges of global social contexts it is not surprising that the definitions of the process have remained necessarily vague. Nevertheless, the definitions all allude to the notion of a changing cultural element. This clearly marks out acculturation as a culturally specific event and therefore distinct from socioeconomic change.

The earliest definition described acculturation as "phenomena which result when groups of individuals having different cultures come into continuous first-hand contact, with subsequent changes in the original culture patterns of either or both groups" (Redfield et al. 1936). Such a definition views acculturation as one aspect of culture change that specifically results from intercultural contact, and that these changes are induced in both the dominant group (the host population) and the non-dominant group (the migrants). Later discussions identified the reciprocal relationship between migrant and host. Rather than viewing the process as a relatively straightforward merging of cultures, the differential resistance of cultures to change was considered, as was the possibility that new cultural forms could evolve which were not seen in either of the original groups (Social Science Research Council 1954). Despite these developments, the description of what was meant by culture, and the details of how it might change, remained unexplored. 'Acculturation' would therefore appear to be a rather nebulous term making its use as an epidemiological variable difficult, but this has not prevented the concept's rise as an explanatory variable within the health literature.

As an example, Gutmann (1999) stated in a review of studies on ethnicity, alcohol and acculturation that as definitions of acculturation have not been provided, readers were assumed to share a common knowledge as to what constituted 'acculturation' (Gutmann 1999). A systematic review of acculturation of the health of US Hispanics noted that 46 out of 69 selected articles presented no definition whatsoever of what was meant by acculturation. In those papers that did include acculturation as an explanatory variable very few included a specific definition of what was meant by culture in the context of what was being examined (Hunt et al 2004). And a comprehensive review of acculturative theory and measurement conducted by the American Psychological Association simply defined acculturation according to the 1954 definition of the Social Science Research Council. So, despite the complex discussion about how cultural change should be modelled or measured the core concept involved was never explored. This has not prevented acculturation being commonly used as an explanation for observations without making any attempt whatsoever to measure it. For example, in a study investigating the relationship between generational status and the prevalence of coronary heart disease (CHD) the authors note that: *"We lacked information about language spoken, food habits or other indicators of acculturation status"* (Sundquist and Li, 2006). Yet the authors specifically cite 'a lack of acculturation' as an explanatory factor for increased rates of CHD.

The implications of such use of the concept are worrying. As Hunt (2004) describes, the term may be *"nothing more than ethnic stereotypes wrapped in the cloak of scientific jargon woven out of sophisticated psychometric formulas".* The over-simplistic use of the term not only reinforces unhelpful ethnic stereotypes which have implications for ethnic minority experiences of discrimination in particular, but the concept also becomes used as something of an epidemiological black box (Abraido-Lanza et al. 2006). The literature shows that it is easy to assume that 'a lack of acculturation' is a cause of poor health (Jaber et al. 2003;Lindstrom & Sundquist 2005;Sundquist & Winkleby 2000;Wiking et al. 2004), but the actual mechanism of how acculturation leads to poorer health has remained elusive, and generally unexplored. Consequently inequalities in healthcare access or material circumstances become sidelined, and instead a focus is placed upon the role of ethnic cultures in the formation and propagation of health inequalities (Sheldon & Parker 1992). Clearly the use of acculturation as a variable in epidemiological research is a controversial issue; it is poorly defined, it does not appear to be accurately measured, and is often inappropriately invoked as a causal mechanism. Therefore the opportunities for using it to reliably test any aetiological hypothesis are severely curtailed unless these limitations are overcome.

2.5.1 Developing Theories of Acculturation

There are a number of alternative methods for measuring acculturation which move away from the linear scales historically used in empirical studies. Rather than quantify acculturation in terms of 'a lack of' to explain poor health, or 'high levels of,' to explain improved health outcomes, a multi-dimensional approach instead provides a more complete approach to determining how the acculturative process can shape the experiences of ethnic minority people. Contemporary acculturative theory is now driven by conceptual models which describe the interaction between two attitudinal dimensions facing individuals: the degree to which they wish to maintain their cultural identity; and the degree to which they wish to interact with the host culture, including other ethno-cultural groups present (Berry 2005). Differing combinations of these two factors gives rise to four distinct acculturative strategies: integration, assimilation, separation and marginalisation. Berry (1997) defines integration as resulting from the maintenance of one's own cultural heritage alongside daily interactions with the host, whereas assimilation leaves behind cultural heritage whilst seeking interaction with the new culture. In contrast to assimilation, separation forms when cultural origins are maintained but little interaction with the host takes place. Finally, marginalisation results when there is little possibility or interest in maintaining cultural heritage (often for reasons of enforced loss) alongside a lack of interaction with the host culture (for reasons of discrimination or exclusion). Such strategies are not always freely chosen and the dominant group, usually the host, can influence the strategy undertaken[5].

This framework adds to the understanding of the acculturative process for anthropologists and sociologists, but is it of any practical use in public health epidemiology? Empirical studies of North American migrants investigated the predictive value of these acculturative strategies in describing migrant health status. Those following the integration strategy were minimally affected by acculturative stress, whereas the marginalised tended to be highly stressed (Berry et al. 1987). Later work identified that integration strategies were more beneficial to mental health than other strategies (Berry et al 1987;Berry 1997). Irish migrants in London that followed an integrative approach had a more favourable health profile than those who pursued other means of acculturating, particularly marginalisation (Curran 2003). Although these findings were restricted to only the first generation, work on adolescent second generation Bangladeshi adolescents with integrated identities, measured through friendship choices, were less likely to experience depression compared to marginalised peers (Bhui et al. 2005b). However, having a traditional identity was associated with healthier dietary habits which in turn was associated with lower obesity rates for Black African and Black Caribbean adolescents (Bhui et al. 2005a). This suggests that acculturation strategies not only vary by ethnic group, but the effects of the strategy are likely to vary according the health outcome investigated.

It is worth noting that even the most recent studies by Berry do not offer a definition of acculturation any more sophisticated than crude definitions constructed 70 years previously. Acculturation is therefore something which can be described using models, but it cannot be so easily quantified. Berry's model indicates the *type* of acculturation, rather than determine the *extent* of acculturation which has taken place within each strategy. For instance, it is difficult to

[5] When assimilation is sought by the dominant group then society is termed the "melting pot". Forced separation results in "segregation" and marginalisation causes "exclusion". Finally, when diversity is an accepted feature of society and integration is possible, this is termed "multiculturalism" (Berry 1997)

say whether an individual who has assimilated is more or less acculturated than someone who has integrated. It can be argued that the extent of acculturation is therefore not the key exposure, as has been so often presumed in acculturation studies, but the manner in which it occurs may be of greater significance to health. This means that the acculturative strategy becomes the predictor variable, rather than a series of lifestyle or proxy indicators. A change in the emphasis of how acculturation is quantified and operationalised has many implications, not least that convergence towards the social norms of the host are not by default a good/bad outcome. If integrative acculturative strategies are indeed the healthiest responses to the new environment then this would not necessarily result in any changes relative to the host population, given that integration conceptually allows for the retention of personal attributes of the minority individual. Clearly acculturation is a complex phenomenon which cannot reliably be used as a singular linear response variable. And the closest that research has come to achieving a singular measure is through Berry's conceptualisation of the process as an 'acculturative variable' with four possible outcomes.

In addition, acculturation strategies are broadly defined and provide little understanding of the detailed mechanisms of how they translate into health outcomes. In an attempt to quantify acculturation using specific lifestyle indicators appropriate to an individual undergoing a period of cultural transition, an alternative acculturative framework to Berry's was tested in Spanish migrant populations (Navas et al. 2005;Navas et al. 2007). The methodology draws upon theories of segmented assimilation, where immigrant groups differentially adopt attitudes and behaviours of many other groups rather than just acculturating towards the host population (Portes & Zhou 1993;Zhou 1997). This segmented approach to measuring acculturation also avoids the application of a catch-all variable. Instead of one variable the framework identifies seven key domains of everyday life that can be applied to varying contexts. These lifestyle markers can be split roughly into two groups, centred upon structural or socioeconomic factors (politics, work, economic circumstances, family and social networks), and elements of cultural identity (religious beliefs, principles and values). The adopted behaviours in each of these domains differentially contribute to the accumulation of health risks. Furthermore, the wide range of lifestyle factors highlights the extent to which acculturation varies across groups. This approach avoids the measurement of a 'monolithic' acculturation concept and instead allows us to consider factors specific to health. One group of lifestyle factors directly relevant to health is health related behaviours. The evidence for changing health behaviours assumed to be a consequence of acculturative change will now be evaluated.

2.5.2 Generational Changes in Health Related Behaviour

Changes in the health behaviours of migrants is influenced primarily by the majority population, and commonly occurs within one to two generations (Dixon et al. 2000;Gordon-Larsen et al. 2003;Hawkins et al. 2008;Marmot et al 1975). Consequently there are grounds for investigating whether changes in health behaviours in the UK are likely to lead to an associated change in mortality and morbidity rates.

The most commonly investigated health behaviours in the UK are centred upon the classical risk factors for coronary heart disease (CHD) and obesity, such as smoking and alcohol intake, quality of diet and levels of physical exercise. These exposures are believed to lie along the biological pathway responsible for the high mortality rates in South Asians and low rates in Black Caribbean, when compared to the general population (Bhopal et al. 1999;Chaturvedi 2003). Although CHD mortality is a well-defined outcome and easily detectable using routine statistics, it is of limited use in UK generational studies where the second generation remains too young to contribute to mortality counts. Instead, attention turns to morbidity and markers predictive of later life illness. Through focussing on health behaviours it becomes possible to explain current inequalities in morbidity, or predict later life mortality, in all generations.

Dietary habits are implicated in the characteristic patterning of cardiovascular disease in UK ethnic minorities, although the basis for these conclusions may be questionable because of systematic measurement error. A review by Landman & Cruickshank (2001) describes how fat-energy intake in South Asian males was below (Sevak et al. 1994), similar to (Smith et al. 1993) and above (Silman et al. 1985) levels observed in the general population. The elevated levels are likely to be biased by a one day food diary only in subjects who spoke English. A review by Bush et al (1997) assessed mean percentage energy-fat in 14 studies which ranged widely from 36-60%, with unrepresentative samples comprising of pregnant women and diabetics coupled to vaguely described ethnic groupings (Bush et al. 1997;Landman & Cruickshank 2001). Dietary explanations for cardiovascular inequalities have also been based on assumed culinary ethnic stereotypes. For example, the use of ghee in South Asian cooking which is high in saturated fats has been overstated (Gupta et al. 1995), as it is not used by all groups termed as “South Asian” experiencing high rates of CHD (Nazroo 1997b).

However, there are studies which have investigated dietary change using cardiovascular biomarkers. A population of 205 Gujarati Indians in the UK had a poorer dietary profile compared to a similar population of 246 sampled from the villages of origin in Gujarat, India. (Heald et al. 2005). This led to an increased risk of glucose intolerance and cardiovascular illness, clearly demonstrating that changes in post-migration health behaviour may translate into an adverse physiological response. While this investigation draws relatively short term conclusions on the impact of migration in only the first generation, there is evidence elsewhere in Black Caribbean and Irish people of continued generational worsening of the diet into the second generation with an accompanied deterioration in associated lipid profiles suggesting greater risk of CHD in later life (Abbotts et al. 2004).

Further support of an approximation of behaviours towards the general population, and possible evidence of age specific changes in the rates of behaviour, were documented in one of the few directly intergenerational analyses, conducted in the Black Caribbean group (Sharma et al. 1999). The first generation tended to adhere to a more traditional Caribbean diet, higher in fruit and vegetables with a lower percent energy being derived from total and saturated fats. It was notable that the diet of the youngest members of both generations tended to move towards the dietary characteristics of the general population much faster than older members of the same ethnic group. This implies greater openness to the host cultural and dietary norms at a younger age, suggesting that age at migration might be an important mediator in acculturative change generally.

Patterns of behavioural convergence have also been described within studies of maternal behaviours (Hawkins et al 2008). A combination of all ethnic minority groups were less likely to smoke or consume alcohol during pregnancy, and more likely to initiate breastfeeding and continue for at least four months, compared with British and Irish mothers. These findings could be interpreted as a healthy migrant effect as mothers had a more favourable health practices than the general population. However, for every additional five years spent in the UK the risk of smoking during pregnancy in ethnic minority mothers increased by 31% (95% CI: 4% to 66%) and were 5% (95% CI: 0% to 10%) less likely to breastfeed for four months. This implies that health behaviours worsen with length of residence in the UK, with patterns of behaviour becoming more similar to those of the general population. However, observations do not examine trends within specific ethnic minority groups. Rates of breastfeeding initiation are reportedly higher among Black African, Black Caribbean, Indian, Pakistani and Bangladeshi mothers than the White population (Kelly et al. 2006), and current smoking rates are significantly higher in Black Caribbean women than all other ethnic minority groups (Erens et al

2001;Kelly et al. 2009;Sproston & Mindell 2006). This suggests that aggregate comparisons between all ethnic minority groups and the host population should be interpreted with caution, with group specific comparisons made where possible. Furthermore, it is unwise to frame an increased risk of poor behaviour in linear terms as, for example, it is highly unlikely that the 31% increased risk of smoking will persist beyond the first five years. This is especially so given secular trends within wider UK society that might encourage future smoking cessation. So while such findings do indicate significant changes in maternal behaviours by duration of residence, and by generational status, they do not examine inter-group variability.

In fact, the direction of generational behavioural change relative to the host population is not uniform for all groups. Data from the census of England and Wales showed increase in excess mortality with generation in second and third generation Irish which could not be explained by socioeconomic factors alone (Harding & Balarajan 1996;Harding & Balarajan 2001b). Although the study was limited by a lack of data on cultural or lifestyle indicators, it was suggested that higher smoking rates might have a role given that the higher mortality rates were driven by lung cancer and respiratory disease (Cruickshank 1996). More recent evidence from the Health Survey for England supports this hypothesis, showing second generation Caribbean and Irish people as having higher smoking rates than the general population. In this case, Irish and Caribbean people show uptake of poor healthy behaviours which extend beyond the rates observed in the host population (Abbotts et al 2004;Smith et al. 2008).

However, the link between generational increases in smoking and mortality remains an implied association. First, the increase in excess mortality over generations is associated with the cross sectional observation of higher smoking rates in a different sample of Irish respondents at a different point in time. Therefore, any causal explanation is simply inferred from two separate findings, rather than the smoking and mortality being measured within the same study. Second, the three generations of Irish are all being measured at the same point in time, and as such are not generationally linked. The three generations are constructed from three discrete sets of family histories and are not comparable with one another. It is possible that mortality might have increased with generation due to the different legacies of the grandparents and parents of the third and second generation respectively.

Further evidence of divergent patterns of health behaviours from those observed in the general population were described in a cohort of 6,699 eleven to thirteen year olds in London schools.

The risk of adolescents eating less than five portions of fruit or vegetables and skipping breakfast (in boys only) was greater in the second generation than the first. Maternal smoking in UK born mothers was also significantly greater in the second generation (Harding et al. 2008). Unfortunately, reported analyses did not report health outcomes by generation highlighting a common weakness of the literature where cross-generational exposures are rarely tested against cross-generational outcomes.

While generational shifts in behaviours have been shown both to converge and diverge from rates in the host population, there is also evidence that continuity may take place. In a study of Glasgow's UK-born adolescent South Asians there were lower smoking and drinking rates than the general population of a similar age that was interpreted as the likely cause for improved second generation health (Williams & Shams 1998). These findings should be considered carefully however. The cohort was comprised of 334 British Asians of whom 86% were UK born. Therefore the small sample size did not allow the detection of the previously documented diverse health experiences of individual South Asian ethnic minority groups. Furthermore, the cohort was selected from the Glasgow area only so generalisations to a national level should account for the patterns of historical migration to Glasgow, and the social context that was experienced by this specific cohort.

These studies tend towards the limited approach of measuring acculturative change on a linear scale, with post-migration changes in behaviour inferred as evidence of acculturation. Section 2.5.1 described how multidimensional acculturation strategies, such as integration or traditionalism, were identified using changes in health behaviour. Therefore the measurement of health behaviours over generation is useful for two reasons. First, it should be possible to determine whether changing health behaviours are indeed associated with shifting patterns of ill health and describe the extent to which the cultural pathway to health is significant in the formation of health inequalities. Second, changing health behaviours may provide additional detail on the types of acculturative strategies which occur in UK ethnic minorities that may have implications in the development of wider inequalities.

Summary

There is a broad evidence base associating the prevalence of health related behaviours with health outcomes in the general population, but comparatively few studies have focused on ethnic minority populations. There is a paucity of studies examining whether these trends are variable over length of residence or generation. Those that have provide a mixed picture of behavioural change.

Patterns of behavioural change with increasing duration of residence are correlated with the convergence in the risk of poor health towards the majority population discussed in section 2.3. This suggests a possible causal association between shifts in the patterning of health behaviours and the risk of mortality/morbidity.

The literature examining generational changes in health behaviours reflects more varied patterns of change. As well as converging patterns of behaviour towards the norms of the majority population, divergent or persistent health behaviours across generations have been documented. These differences may be driven by patterns of segmented assimilation taking place with variable uptake or retention of characteristics occurring in each group. So not only are ethnic inequalities in health behaviours apparent upon migration, but the rate at which they change over generation varies between groups. These patterns can be used to assess the degree to which health behaviours may contribute to shifting patterns of mortality and morbidity over generation.

The extent to which health behaviours differ by generation requires the measurement of multiple health behaviours which can capture a wide range of lifestyle choices. Potential reasons for the diversity of these choices which have given rise to the behavioural inequalities upon arrival are more complex, and will be discussed shortly.

Generational changes in health behaviours should account for secular trends which may influence the social norms of the sample. It may be that apparent behaviour changes within ethnic minorities are driven by cultural changes taking place amongst the social and cultural norms of the majority reference group. For example, over the past 25 years the rate of smoking cessation in the white UK majority population has steadily increased. The effect of only a small increase in rates of smoking uptake in the minority population will be exaggerated by the reduction of smoking in the reference group. This will reflect an inaccurate portrait of behavioural trends over generations in the minority group. The social norms of the majority should therefore not be considered as simply constant.

Lastly, the literature suggests that the term ‘acculturation’ in epidemiological research should be used cautiously. More explicit reference to the concept should be made, and supported by clearer detail on what is being measured. For example, acculturation is commonly measured by language proficiency, but this factor reflects many influences on migrant experiences beyond culture change. For example, it can moderate labour market participation, thereby intersecting with socioeconomic pathways to health. These wider influences ought to be considered carefully when using proxy variables for acculturation.

2.6 Generational Changes in Ethnic Identities

The previous sections outlined how health outcomes, socioeconomic circumstances and health behaviours vary across a range of ethnic groups. Yet the role of ethnicity has not yet been explored, so far serving as a convenient means to stratify these three elements according to a broad classification of ethnic group. An unrefined approach to defining ethnicity adds little to our understanding why differences between these groups might exist. This does not tell us about the various dimensions of an individual's ethnicity which may hold clues to explaining inequalities. This section will now discuss how ethnicity is defined and explain why the categories commonly employed in health research inadequately capture the multidimensional nature of ethnicity. This will be concluded by a discussion of how measuring ethnicity over generations might aid our understanding of health differences between ethnic groups.

2.6.1 Constructing Ethnicity

Ethnicity reflects self-identification with cultural traditions that provide personal meaning and boundaries between groups (Karlsen & Nazroo 2002). Factors commonly cited as most meaningful to an individual's ethnic assignation include country or birth, ancestry and decent and a general common place of origin (Fenton 1999;Modood 1997a). Ethnicity might be considered in relation to a personal identity, an identity that is not innate or fixed, but rather it is 'fluid' and worked on or self-constructed by groups and individuals, and liable to change taking on many different forms dependent upon the context (Ahmad 1996;Ahmad et al. 2002).

However, ethnicity is not entirely self-constructed. The internally defined identity is in addition to, and possibly in response to, the externally imposed social identities (Jenkins 1997). Ethnicity can be considered relational where the externally imposed characterisation affects the experiences of living with that identity; and what it means to an individual in having that particular identity will vary according to the external audience. Therefore identity, and the lifestyles and behaviours associated with it, is constructed within social constraints (Nazroo & Karlsen 2003). These constraints may be structural barriers present in wider society, such as social class inequalities and differential opportunities between groups, or discriminatory attitudes experienced by specific groups. This can reinforce a sense of group cohesion and political affiliation in an attempt to counter such disadvantage (Modood 1997a) and may be at the expense of behavioural components of identity (Karlsen & Nazroo 2002). Therefore ethnic identity is internally defined according an individual's personal values and priorities, and is in response to external social or structural factors.

It is important that health research recognises such complexity of ethnic identities and should attempt to include an assessment of the social, environmental and political contexts. It is the location of ethnicity within these contexts that is responsible for experiences leading to the patterning of health (Ahmad & Bradby 2007). Unfortunately the research tools available in survey data for defining ethnicity remain crude. The classification systems are 'widely agreed to be unsatisfactory in both theoretical and practical terms' (Bradby 2003) as they are limited in ability to assess the dynamic relationship between ethnic identity and the structural factors with which it interacts. However, these tools are all that is available for the examination of these important inequalities.

2.6.2 Ethnic Group Classification Systems

Ethnic categories are commonly derived through the use of either fixed categories, self definition, or researcher defined identity.

The fixed response categories, as used in large scale surveys and the last two censuses in the UK, permits an individual to select an 'identity' from a limited selection (ONS 2008). This system reaffirms the outdated ideology that human groups are mutually exclusive, where ethnic groups are fixed entities and can be simply distinguished from one another, thereby supporting a racialised view of humanity (Bradby 2003). Nazroo (1998) describes how this 'untheorised' and empirically driven approach essentialises ethnic groups and assumes they represent homogenous racial and cultural groupings, to apparently provide useful markers of genetic and behavioural risks (Nazroo 1998;Nazroo 2001a). Differences between groups are then assumed to be a result of cultural or ethnic effects, despite neither of these factors being measured. Therefore the unexplored and fixed notions of ethnicity implicit within these categories leads to the incorporation of racial essentialism within explanatory processes (Ahmad 1994;Smaje 1997). Importantly for a generational investigation of ethnic inequalities, fixed classifications provide little scope for mixed or multiple identities; a limitation that will only increase in significance. For instance, the introduction of mixed category at the 2001 census led to many Black Caribbean and Black African people changing their choices from the 1991 census (Platt et al. 2005). This suggests that the provision of fixed categories fails to adequately reflect the overall target population (Rankin & Bhopal 1999).

Self-assigned identities using free-text can overcome some limitations of fixed categories. While self identification allows individuals to express complex and hybrid identities more easily, the practical aspect of survey analysis requires the re-coding of responses into broader groups, and therefore reintroduces the notion of fixed categories.

Lastly, researcher defined identity can be determined through proxy variables for ethnicity, such as country of birth, languages spoken or religion. Consequently it is possible that self-defined and researcher defined identities may differ. However, this is a more refined means of measuring ethnicity, where multiple indicators of ethnic group can be called upon by the researcher. By considering how each indicator of ethnic group status (e.g. country of birth, family origin) is reflective of an underlying construct, such as lifestyles, religion, culture or socioeconomic circumstances, it is possible to build up a picture of those dimensions of ethnic identity which are the likely true mediators of ethnic differentials in health.

All of these classification systems are limited in their ability to capture accurately the dynamic, relational and contextual nature of ethnicity. The challenge, then, is to find a way of conceptualising ethnicity in a meaningful way which reflects people's life experiences and avoids reifying differences between groups, but is flexible enough to describe populations as their characteristics shift over time (Bradby 2003). Due to the limitations of survey data collection, this study will use self-defined ethnicity, which is based upon family origins chosen from a list of fixed categories. However, this project will significantly build upon these simple labels, and examine what they mean in terms of structural factors, such as socioeconomic circumstances, and will incorporate the contextual influences of migration effects. These ethnic categories will also be explored in terms of cultural identities by measuring health related behaviours. This allows us to address a number of important questions concerning the fluidity of ethnic identity and its influence on health. By detailing the shifting patterns of ethnic identity over generations it will be possible to identify those factors most significant for the formation of health differentials between groups.

2.7 Conclusions

This chapter began by examining at the historical contexts which shaped the sociodemographic and cultural profiles of the first generation migrants to the UK. These contextual factors appeared to have produced a healthy migrant effect in the majority of groups. Importantly, the health advantages experienced by the migrants appeared to wear off with increasing time spent in the UK. This implies a role for the UK environment in the re-shaping of the health profile constructed pre-migration, suggesting that the second generation, who have been generally neglected by analyses, are likely to have a significantly different health profile to the first.

One potential environmental influence driving these changes is socioeconomic factors, which have repeatedly been shown to explain health inequalities within, and between, ethnic groups. Given the close association between poor health and low socioeconomic position it is plausible that improvements in socioeconomic circumstances will lead to improvements in health. However, there were very few studies which examined changes in socioeconomic position between generations of ethnic groups, with even fewer examining the temporal relationship between socioeconomic position and health. This is clearly an area which requires more research attention.

A second environmental pathway implicated in much of the ethnic inequalities literature is that of the role of culture and behaviour. As with socioeconomic position, behaviours are unlikely to remain fixed after arrival. Through daily interactions with the social norms of the majority population, and with other minority groups, it is probable that a degree of behavioural change occurs which might have direct effects on health. The existing evidence indicates that these changes are highly group-specific, with some groups more resistant to change than others. Nevertheless, with a few exceptions, the literature describes a general pattern of convergence towards the majority, fitting the classic acculturation models of minority groups 'assimilating' towards to the majority. It is expected that behaviours of the second generation will more closely resemble those of the majority than the first generation, as the UK born individuals are exposed to the UK environment throughout the critical periods of childhood. Again, there was very little in the literature to support this view as most studies concentrated on changes taking place within migrants, or individuals who are assumed to be migrants. This behavioural convergence is significant to health as many behavioural norms in the host society are less healthy than those in the countries of origin. Those studies which investigated the impact of generational differences in health behaviours on health were focused on migrants to the US. Given the large differences between the US and UK in the backgrounds of individuals and the contexts of migration, these findings may not be applicable to UK migrants and their offspring.

It is important to note that the effects on health of intergenerational changes in socioeconomic position, and in health behaviours, are unlikely to operate independently of one another. As described, increasing socioeconomic advantage is likely to yield improved health. However, should health behaviours worsen over generations, then the socioeconomically-driven health gains may well be cancelled out. There are no studies within the UK literature which have investigated this relationship. This project will attempt to fill this gap, and develop our understanding of the factors which contribute to the formation and propagation of ethnic inequalities.

Lastly, this project also aims at shifting the study of ethnic inequalities away from the traditional line of European research examining only the first generation. This chapter highlighted how the first generation are shaped by complex contextual forces which are often ignored by previous studies. Ethnic minority groups vary according to early life experiences in the country of birth, by motivations to migrate, and by the conditions experienced in the UK during the period of arrival. It is these experiences within the UK in the 1950s onwards which has provided the setting for much of the ethnic inequalities research to date. By shifting the focus towards the second generation it becomes possible to separate out these migration effects from ethnic group effects. As a consequence of being born in the UK, the second generation do not undergo these complex migration processes and selection issues. The life experiences of the second generation are therefore more reflective of the role of the UK, and the persistent barriers faced by ethnic minority groups. Therefore continuing disadvantage in the second generation represents a potentially greater problem than in the first as it is indicative on-going social inequality within UK society today. This project will reveal the strength of the link between the first and a second generation, in terms of structural and behavioural factors, and how the location of these factors within the UK environment ultimately determines differences in the health of the two generations.

Chapter 3: Aims & Objectives

3 An Intergenerational Approach to Understanding Ethnic Health Inequalities

The previous chapter explored the possibility that ethnic inequalities in health might vary between generations, and discussed whether changing socioeconomic circumstances and health related behaviours might mediate these differences. Now that the theoretical groundwork has been laid, this chapter will outline the research objectives formulated in direct response to the identified limitations and gaps within the current literature. These objectives are presented as part of a conceptual model for understanding of the relationships between acculturative behavioural change, socioeconomic circumstances, and health.

3.1 Aim

The overall aim of this project is to investigate the extent of intergenerational changes in ethnic inequalities in health, how far this varies between groups, and identify those factors underlying any differences. This aim will be met through the examination of six major research objectives using a combination of nationally representative cross-sectional and longitudinal data.

3.2 Research Objectives

1. *Examine the extent to which ethnic inequalities in health persist across generations, and how far this varies between groups.*

With exception to a sub-analysis within the Fourth National Survey (Nazroo 1997b), generational differences in nationally representative surveys have not been examined in any detail. Those studies which have are generally on a smaller-scale and regionally located in specific urban centres such as East London and Glasgow (Bhui et al 2005a;Harding et al 2008;Williams & Shams 1998). Additionally, these surveys are limited in their scope and focus only on a narrow range of indicators of physical, mental or subjective health measures.

It is expected that health inequalities across ethnic groups will differ by generational status, but the scale of the difference may vary according to group. The extent of these modifications may provide aetiological clues to the possible causes of in health inequalities, and suggest mechanisms to reduce inequality within the whole population, as well as for ethnic minorities.

Two distinct approaches will be used to fulfil this objective. The first describes the risk of poor health in the second generation compared to the first. This provides a direct measure of within-group differences in health over generation. The second approach will independently compare the first and second generations of each ethnic group to a White reference population. This will determine whether the health of ethnic minorities is becoming more, or less similar to the White population over generations.

2. *Establish the direction and extent of intergenerational socioeconomic mobility.*

The majority of research on socioeconomic mobility in the UK to date has been performed within the undifferentiated general population (Blanden et al 2001;Blanden & Gibbons 2006;Goldthorpe et al 1987;Halsey et al 1980;UK Cabinet Office 2009), with less known about patterns of intergenerational mobility within ethnic minorities (Platt 2005).

It is predicted that upward socioeconomic mobility will take place between generations of ethnic minority groups, although the magnitude of these shifts will vary according to ethnicity.

Socioeconomic mobility will be assessed by directly comparing the distribution of a range of socioeconomic markers across generations of each ethnic group. By additionally comparing each group to a White reference population, patterns of on-going relative disadvantage can also be identified.

3. *Explore how intergenerational socioeconomic mobility contributes to changes in health inequalities.*

The relationship between socioeconomic circumstances and health is well established within the general UK population (Acheson 1998). Existing research on the influence of social mobility on the health of ethnic minorities has been severely limited by a lack of associated data on health outcome. Consequently there are no nationally representative studies which have examined the relationship between social mobility and a broad range of health outcomes in ethnic minorities.

It is expected that improving socioeconomic circumstances of ethnic minorities will lead to more favourable health profiles. Furthermore a reduction in the socioeconomic differences between ethnic groups should be accompanied by a reduction in associated health inequalities.

The impact of intergenerational social mobility on health within ethnic groups will be examined by comparing the likelihood of poor health before and after standardising for socioeconomic circumstances. These analyses can confirm whether the effects of social mobility on health operate in the same way for ethnic minorities as they do for the general population, and identify those groups who experience additional barriers in overcoming health disadvantages.

4. *Establish the direction and magnitude of intergenerational acculturative change in health related behaviours.*

Differentials in health related behaviour across ethnic minority groups are well documented (Erens et al 2001;Sproston & Mindell 2006). There is evidence to suggest that these behaviours are liable to modification with increasing duration of residence, but there are fewer studies which extend this approach across generations. As well as quantify the extent to which behavioural change occurs between generations of each ethnic minority group, this objective will ascertain whether health behaviours approximate towards, or are resistant to the influences of the White majority population.

It is hypothesised that ethnic minority health behaviours are likely to differ between the first and second generations as a direct consequence of different levels of exposure to the post-migratory environment. Behaviours will approximate towards the health behaviours of the White population, but the extent of these shifts is likely to vary according to ethnicity.

The extent of health behavioural change will be described by comparing the prevalence of selected behaviours between generations. In addition, likelihood of having a given health behaviour in each generation compared to a White reference group will indicate the direction of behavioural change.

5. *Explore how intergenerational behaviour modification contributes to changes in patterns of health inequalities.*

The behavioural/cultural model has been closely linked to the formation of health inequalities since the Black Report (1980). The Health and Lifestyles Survey (1990) represents one of the largest and most detailed examinations of the relative influence of behavioural factors upon health outcomes, but this was performed in the general population only. The few studies in ethnic minorities that describe patterns of poor health over time generally speculate towards behavioural explanations for poor health rather than test for any causal role.

It is expected that that intergenerational differences in health behaviours will have a role in changing patterns of health inequalities. The relative changes in health profiles within ethnic minority groups will be determined by the behaviour being adopted. It is likely that the uptake of poorer health behaviours will have a detrimental effect on the health profile.

The influence of health behaviours will be estimated by directly comparing the health of each generation before and after accounting for differences in health behaviours. These analyses will determine whether changing health behaviours mediate generational differences in health.

6. *To what extent do socioeconomic and health behavioural pathways interact over generations to shape patterns of health inequalities.*

It is unlikely that the socioeconomic and cultural/health behavioural models of health inequality operate in isolation. Intergenerational upward mobility may be health promoting, whereas acculturative changes in health behaviour are hypothesised as having a detrimental effect; hence these pathways have opposing effects on health. This objective addresses this issue by examining the relative importance of socioeconomic mobility and changing health behaviours in explaining intergenerational trends in health outcome.

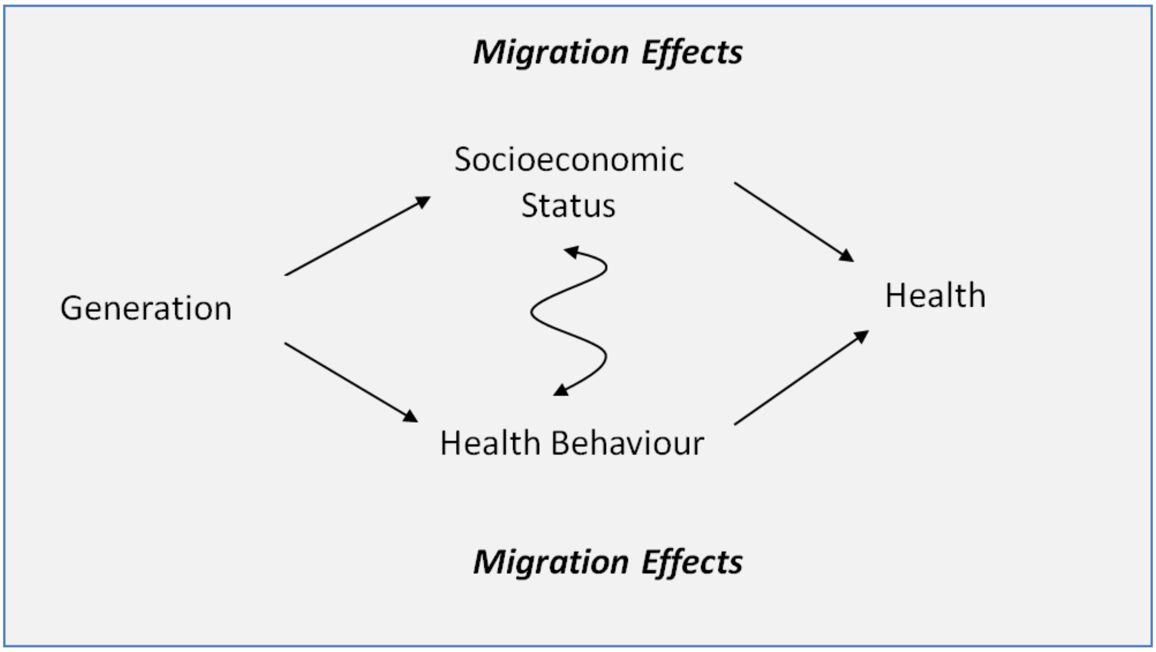
It is predicted that both pathways moderate health differences between generations, and have a net effect of maintaining health differentials across ethnic groups, so that health inequalities remain stable.

Generational differences in health will be estimated after simultaneously accounting for differences in social circumstances and behaviours. The residual generational differences suggest that alternative pathways mediate generational changes, and will serve as a stimulus for further research.

3.3 Explanatory Model

The inter-relationship between all hypothesised pathways is summarised by the model described in Figure 3.1. This describes how health outcome is moderate by socioeconomic factors as well as by health related behaviours, which co-vary in their influences on health according to generational status. This model also considers the interaction between socioeconomic status and health related behaviour and the possibility that the influence of behaviours on health may vary according to socioeconomic circumstances. Furthermore, migration effects, such as health selection, are also likely to moderate the potential causal pathways. Although such migration effects are most prominent for the first generation, it is possible that they may continue to determine health profiles across generations.

Figure 3.1: Theoretical Model for studying intergenerational differences in health



This conceptual model will be tested using both cross-sectional data from the Health Survey for England, and the Millennium Cohort Study. A brief introduction to these surveys and an assessment of their suitability in undertaking this task will be discussed in the following chapters.

Chapter 4: The Health Survey for England

4 The Health Survey for England

The Health Survey for England (HSE) is part of a series of surveys commissioned by the Department of Health to collect previously unavailable data from a representative sample of the general population on a wide range of aspects concerning public health and factors which contribute to public health.

The Health Survey for England was designed to:

1. Provide annual data for nationally representative samples to monitor trends in the nation's health;
2. Estimate the proportion of people in England who have specified health conditions;
3. Estimate the prevalence of certain risk factors associated with these conditions;
4. Examine differences between subgroups of the population (by age, sex, income or ethnicity) in their likelihood of having specified conditions or risk factors;
5. Assess the frequency with which particular combinations of risk factors are found, and in which groups these combinations most commonly occur;
6. Monitor progress towards selected health targets;
7. (Since 1995) measure the height of children at different ages, replacing the National Study of Health and Growth; and
8. (Since 1995) monitor the prevalence of overweight and obesity in children.

All surveys comprise of a detailed household questionnaire and a follow-up visit by a nurse who may take further measurements of health status as well as a blood sample for analysis. However, the standard household sampling technique does not yield ethnic minority individuals in sufficient numbers to enable analysis by specific group. For the 1999 and 2004 surveys the standard sampling and data collection methodology was modified in order to provide greater numbers of ethnic minority respondents aged 16 and over living in private households in England.

4.1 Sample Design

The HSE uses a multi-stage stratified probability sampling design using the small user postcode address file (PAF) as the sampling frame. This meant that the 1% of addresses not listed in the PAF is excluded from the probability of selection. The 1999 and 2004 sample was comprised of three components: The core sample of the general population, the ethnically boosted sample and the Chinese special boosted sample.

4.1.1 Core Sample

The core sample was designed for national level analysis and is representative of all adults aged over 16 living in private households. In 1999 and 2004 the core sample was halved in size to allow the survey of the ethnic boost. Census ward data was ordered by local authority and by the proportion which had a non-manual head of the household. 312 primary sampling units (PSU) were then randomly selected from this list. These were then randomly divided again into two equal halves with one half selected as the final PSU (half ward), from which 21 addresses were systematically selected to give a total sample of 6,552 addresses (=312x21). By selecting PSUs with a probability proportional to the number of addresses, and then selecting a fixed number of addresses within each, every address is given an equal chance of inclusion.

Where one address held more than one household then all households were selected, up to a maximum of three households. If more than three households resided at an address then three households were selected randomly. All adults (to a maximum of ten) in each selected household were interviewed.

4.1.2 Ethnic Boost

The ethnic boost sample was designed to increase the sample sizes of the major ethnic minority groups in England. In 2004 the target groups were: Indian, Pakistani, Bangladeshi, Black Caribbean, Black African, Irish and Chinese. In 1999 the Black African group was excluded due to the difficulties in selecting a representative sample. The ethnic minority over-sampling was achieved through the purposive selection of 13 strata which contained high proportions of the target ethnic minority residents according to the most recent census. 408 half ward PSUs were selected from these strata, with the number of addresses selected randomly from the PAF pre-determined according the strata being sampled. This yielded 26,528 and 37,535 addresses in 1999 and 2004 respectively.

All but one of the strata was screened to identify individuals who belonged to the target group in order to control ethnic minority sample sizes across the range of groups. As some higher prevalence ethnic minority groups were excluded from the random sample in the strata with the highest ethnic density, there was therefore an uneven probability of being selected in the ethnic boost in each PSU. In the stratum with the lowest ethnic density a cost effective system of focussed enumeration was applied, whereby the interviewer used the originally selected address (seed address) to identify whether the neighbouring households contained any ethnic minority residents. As this technique is useful only for 'visible' ethnic minority groups, it was not used for the seeded identification of Irish subjects.

As was the case for the core sample methodology, addresses containing up to three households were interviewed with random selection of only three households in the case of address multiple occupancy. Within the selected households all individuals aged over 16 and who were in any of the target groups were eligible for inclusion. As ethnic minority groups tend to live in larger households on average, only four adult individuals from each household were asked to participate. These were selected at random if more than four were present.

4.1.3 Chinese Boost

In 1999, the Chinese informants were followed up from 1998 Health Education Authority (HEA) report which screened addresses on the electoral roll by the most common 1,300 'Chinese-sounding' names (Sproston et al. 1999). This selected those areas of the country with the highest ethnic density of Chinese people at the 1991 census.

In 2004, the Chinese individuals were selected on the basis of the HEA methodology and included wards identified at the 2001 Census as having >15 Chinese sounding names (according to an Office for National Statistics list of common Chinese names), and which were not included in either the core or the ethnic boost sample. These wards were divided into two strata; those containing 15-25 people per ward, and those containing more than 26. Ten wards were sampled with probability proportional to the number of Chinese from the first stratum, and 65 were sampled from the second. 3,858 and 3,901 addresses were yielded in 1999 and 2004 respectively. All adults in each selected household were interviewed. Therefore, in 2004 the informants were selected using the ethnic boost, Chinese special boost and the core population sample, whereas in 1999 only the core population sample and the Chinese special boost were used.

Chinese people who do not possess a Chinese name, such as women married to non-Chinese, are excluded from the sample frame. This is of particular significance in an intergenerational study where the second generation females are more likely to marry non-Chinese men and adopt their surname than the first generation.

4.1.4 White Reference Sample – 1998 & 2003 Health Survey for England

There is limited information for Whites in the core sample in 1999 and 2004 as only the ethnic boost samples received a nurse visit and subsequent measurement of health status. This renders the White sample unsuitable for comparisons with the ethnic minority sample of the same year and is hence excluded from the analysis. A White reference population was instead derived from a combination of the 1998 and 2003 Health Surveys for England performed immediately prior to the ethnically boosted surveys who did receive a nurse visit.

4.1.5 Sample Weights

Sample weights account for the bias introduced by the study design whereby households and the individuals contained in them do not have an equal chance of inclusion within the survey. A second bias minimised by weighting is a consequence of differential rates of non-response to specific elements of the survey, namely the nurse visit or whether a blood sample was taken.

General population weights

The 1998 and 1999 Health Survey for England had no general population weight. The sample profile was deemed sufficiently similar to the whole population that weighting was unnecessary. However, the 2003 and 2004 surveys derived a household and an individual level selection weight to account for the uneven probability of household inclusion in the survey. This arises when more than three houses are present at selected address. A selection weight is equal to the number of households identified divided by the number selected, and adjusts for the under-representation of multi-occupied addresses in the sample. A second calibration weight is applied at the household level to account for differential non-response to interview. Weights were also calculated at an individual level for adults to correct for non-response within participating households.

Ethnic boost weights

The sampling methodology described in section 4.1 indicates that individuals in the ethnic minority boost did not have an equal probability of being selected for interview. There was also an uneven probability of an address being selected within a postcode sector, along with a varying probability of an individual in a household being selected for interview. Therefore a selection probability weight which was inversely proportional to the selection probabilities for the relevant postcode, address and the number of adults in a household, was derived to account for the selection bias which varied by ethnic group. These weights are required for 1999 and 2004 ethnic boosts only.

Non-response weights

A weight was calculated to adjust for differential non-response to the nurse visit. The weight was the reciprocal of the predicted probability of a nurse visit adjusted for age, sex, Government Office Region, social class of the head of the household, smoking status and ethnicity. These weights are applied wherever there was a nurse visit; namely in the core sample of the 2003 survey, and for the ethnic boost sample in the 2004 survey.

Overall three weights were derived for the 2003 and 2004 datasets: one for selection bias and non-response at the interview stage; one for non-response at nurse visit; and one for non-response in the production of a blood sample. If an informant did not pass the interview stage then they were unable to have a nurse visit or give blood. The nurse and blood weights account for the previous stages which must have been passed through so that only one weight is required at any one time in the analysis.

The percentages given in the descriptive tables throughout this study are weighted percentages which account for differences in selection probability and non-response. The adjusted base accounts for the over-sampling of the ethnic minorities and provides the best estimate of the true number of individuals in the population of England that are represented by the sample. Unweighted bases shown in the descriptive tables throughout this study therefore represent the actual number of observations used to derive the weighted percentages.

Further details on survey methodology are found in the Health Survey for England 1998, 1999, 2003 and 2004 Handbook (Erens & Primatesta 1999;Erens et al 2001;Sproston & Primatesta

2004;Sproston & Mindell 2006). The protocols are too large to list here, so links to their published forms are listed in Appendix B.

4.1.6 Combining the Health Survey for England Datasets

The Health Survey for England has remained highly consistent in its methodology over each year by continually employing the same multi-stage probability techniques. The core interview, nurse measurements and blood analyses have not undergone any large scale changes in their methodology within the survey years used here. The majority of the variables are the same in each year and are consistently coded. For these reasons, the merging of the 1998, 1999, 2003 and 2004 datasets can form a highly suitable dataset for detailed cross sectional secondary analysis, comprising of a large sample of a diverse range of ethnic minority respondents, and a White reference group.

The sample sizes and response rates for all adults aged over 16 in the Health Surveys for England that comprise the combined dataset are described in Table 4.1.

Table 4.1: Adult sample size and response of respective Health Surveys for England that comprise the combined dataset for analysis

Year	*Response Rate (%)†*	*Total (n)*	*% of combined dataset*
1998*	69.0	14,950	35.4
1999**	60.0	6,844	16.2
2003*	66.0	13,626	32.3
2004**	63.0	6,816	16.1
Total	*n/a*	*42,236*	*100*

Notes: † adult response rate to interview stage only.
* General population
** Ethnic minority population only
n/a: not applicable

4.2 Demographic Variables in the Health Survey for England

Age and Sex

Age at interview was defined as age at last birthday. Standardisation for both age and sex was required so that observed differences would reflect actual differences between ethnic groups rather than differences in age and gender distributions. During statistical modelling age is used as a continuous variable, but using a quadratic term in order to eliminate any non-linear effects between age and other exposures.

Generation

First generation ethnic minorities were defined as foreign born and migrating to the UK aged twelve or older. The second generation were classed as UK born, or foreign born and migrating to the UK when under twelve years of age. The age twelve cut-off is used because it correlates with subsequent exposure to a significant period of childhood and secondary schooling in the UK, which will be important influences for both social mobility and changes in behaviours. This is supported by the Fourth National Survey which noted that the differences in cultural and behavioural identity between those who migrated before age 12 were indistinguishable from the UK born (Modood 1997a). This cut-off provides as numerically balanced a sample as possible and has been used in previous large scale cross sectional studies differentiating between generations (Johns et al. 2002;Kasinitz et al. 2008;Kasinitz et al. 2002;Sproston & Nazroo 2002).

It is important to note that the 'first generation' is not biologically linked to the 'second generation' and the probability that the two groups approximate to one another will vary by ethnic group and migration history. Additionally, the second generation may also contain a small number of third generation respondents. These individuals cannot be identified due to a lack of detail on family histories. They are therefore classified as second generation throughout this study.

Ethnicity

Ethnic groupings were as defined by the 2001 Census. Ethnicity was established during the screening process where the interviewer read out a list of ethnic groups to an individual person in the household and asked after each one whether anyone in the household was of that origin. Individuals selected for interview were then asked to confirm their ethnicity as that previously offered during screening. A total of seven ethnic minority groups (Indian, Pakistani, Bangladeshi, Black Caribbean, Black African (2004 only), Irish and Chinese) were screened for.

4.3 Health Outcome Variables in the Health Survey for England

The Health Survey for England contains information on a range of subjective measures of wellbeing as well as objective anthropometric indices. Both types of outcome are likely to be predictive of later life health with significant and well-documented associations with later life mortality. This is of particular importance in a study of younger respondents where illness may not yet have manifested itself in physical symptoms. A particular strength of the HSE is the inclusion of blood biomarkers providing objective measures of the risk of cardiovascular outcomes in later life. Therefore a wide range of both self-reported and objective measures are used to determine the health profile of ethnic minority respondents in each generation.

Self Reported General Health

Informants were asked to rate their health according to a five-point scale: very good, good, fair, poor and very poor. The response was coded to a binary variable: fair/poor/very poor and good/very good. This dichotomy has been shown to capture the ordered nature of self rated health (Manor et al. 2000) and has been previously used in HSE analyses (Erens et al 2001;Sproston & Mindell 2006) and in the investigation of the Fourth National Survey of Ethnic Minorities in Britain (Nazroo 1997b).This measure is an important predictor of all-cause mortality (Idler & Benyamini 1997;Miilunpalo et al. 1997) validated in different ethnic groups, (Chandola & Jenkinson 2000b;McGee et al. 1999) so is a relationship that seems to be universal rather than ethnically specific (Lindstrom et al. 2001;Wiking et al 2004).

Limiting longstanding illness

Ethnic minorities have been shown to under-report long term illness by having a more restrictive notion than the White population of what is serious enough to class as a long standing illness (Nazroo 2001a;Pilgrim et al. 1993). Validation studies from the 1991 Census suggest that long term limiting illness is a more valid reflection of health status (Nazroo 2001a;Thomas & Purdon 1994). It provides an assessment of the morbidity for non-fatal illnesses which affect daily life, and hence is particularly useful in this study which is comprised of generally younger people who do not exhibit symptoms usually associated with diseases which contribute to mortality.

Obesity

Obesity is strongly associated with premature mortality in adulthood on account of its strong causal links to chronic diseases such as type 2 diabetes, hypertension, coronary heart disease and cancer (World Health Assembly 2004)

Adult body mass index (BMI) was calculated by dividing the body weight (kg) by the square of the height (m) and categorised as normal weight (<25), overweight (≥25) and obese (≥30) (World Health Organization & FAO 2003). It should be noted that these cut offs may not be clinically significant in all ethnic groups. Non-European ethnic groups develop a significant increase in glucose, lipid and blood pressure values at much lower BMIs than those predicted by established BMI cut points (Razak et al. 2007). Accepted ethnicity-specific BMI cut-off points have not yet been devised. Proposals by the World Health Organisation/International Obesity Task Force (International Diabetes Institute 2000) to set a cut-off of 23kg/m^2 for overweight in Asian populations is limited to specific populations and cannot be applied to all Asians (Bell et al. 2002). While non-specific BMIs can still be reliably compared between all ethnic groups, it is likely that the clinical significance of the differentials will be underestimated within the non-European ethnic minority groups.

Cardiovascular Disease Risk Factors

Age is the strongest predictor of cardiovascular disease but the young age of the sample does not provide sufficient cardiovascular outcomes for analysis. The focus is therefore placed on exposure to, and levels of, risk factors for cardiovascular disease that are known predictors of future cardiovascular health.

- Diagnosed Hypertension

High blood pressure is associated with increased risk of ischaemic heart disease and stroke, particularly in Black African and Black Caribbean populations (Hajat et al. 2004). Respondents were asked whether they had been diagnosed with high blood pressure by a doctor.

- Low Density Lipoprotein (LDL)

Low density lipoproteins are a fat protein complex which transports cholesterol from the liver to the blood. Excess levels lead to the deposition of fatty atheromatous plaques reducing arterial blood flow. Despite the strong association between the high concentration of LDL cholesterol and increased risk of cardiovascular events, no high risk threshold has been internationally recognised. This study uses the UK Department of Health recommendation that individuals with a LDL cholesterol concentration in excess of 3.0mmol/l are deemed at high risk of cardiovascular disease (Department of Health. 2000).

- High Density Lipoprotein (HDL)

HDL transports excess cholesterol from the blood to the liver for excretion conferring a cardio-protective role. The association between low levels of HDL cholesterol and increased risk of ischaemic heart disease are well established (Assmann et al. 1996). Individuals are considered at risk if the HDL cholesterol concentration falls below the threshold of 1.0mmol/l (Sacks 2002).

- Total Cholesterol

Raised blood cholesterol is associated with arterial atheroma leading to a narrowing of the arteries and increased risk of blockage restricting local blood flow. Respondents are at high risk of a cardiovascular event if the fasting blood cholesterol level is in excess of 5.0mmol/l , as per the recommendations of the 1998 Joint British Recommendations on prevention of coronary heart disease (British Cardiac Society 2005). Total cholesterol is comprised of the sum of low density and high density lipoproteins.

- C- Reactive Protein (CRP)

CRP is an acute phase reactant that increases production during periods of tissue damage. It is positively associated with myocardial infarction, peripheral arterial disease (Sitzer et al. 2002) and stroke (Kuo et al. 2005). CRP concentrations are typically around 1mg/l in the general population, but can reach up to 1000mg/l in individuals with infection, injury and inflammation. Therefore the distribution is not normal and the few individuals with values greater than 10mg/l were excluded from analysis on the assumption that readings were atypical due to a short-term tissue injury (Gimeno et al. 2008). Individuals with a CRP concentration >3.0mg/l were considered at high risk of a cardiovascular event (Myers et al. 2004).

4.4 Socioeconomic Variables in the Health Survey for England

Social Class (Registrar General's Socioeconomic Classification)

The Health Survey for England used the Registrar General's social class system to classify informants by social position. Informant occupations were classified according the hierarchical five class schema consisting of: Professional; Managerial and Technical; Skilled Manual and Non-Manual; Semi Routine; and Routine. Members of the armed forces (0.17%) and those with incomplete information (0.36%) were excluded from analysis.[6]

Equivalised Income

Equivalised household income adjusts the income value to account for the number of individuals in a household. The annual income score is then applied to all members of the household. This variable was divided into quintiles to account for the highly skewed income distribution, as the majority of informants were below the mean income. A separate category was derived for those with missing data to allow analyses to control for potential systematic bias introduced as a consequence of missing data being more likely in groups experiencing the least favourable economic profile.

Educational Attainment

Educational level was taken as the highest qualification attained by the respondent. This comprised of seven categories ranging from no qualification to National Vocational Qualification (NVQ) level five or degree, and is generally regarded as an accurate representation of the level of skills which are available to the labour market. NVQ 5 and NVQ 4 were grouped as the highest level of qualification, followed by higher education/NVQ 3 and NVQ 2/NVQ 1. The 3.9% of individuals with overseas qualifications were combined alongside those with no qualifications[7].

4.5 Health Related Behaviour Variables in the Health Survey for England

Diet

- Fruit and Vegetable Consumption

The UK Department of Health recommends at least five portions (400g) of fruit and vegetables per day in accordance with global dietary regulations (World Health Organization & FAO 2003). The data was dichotomised so that those informants eating fruit or vegetables less than once a week were classified as having a poor diet.

[6, 7] Unweighted percentages given

Missing values were completed with alternative data on the size of portions eaten per week; those eating less than 80g of fruit or vegetables per week (equivalent to one portion) were also classified as having a poor diet.

- Salt Intake

Salt intake was assessed through questions on culinary practices. Informants detailed whether salt was added at the table or not. Data was also provided on whether salt was ever added during the cooking as opposed to a salt substitute being used or never being added. Whereas urinary salt measurements may provide a more objective indication of actual salt intake, completion of self report questionnaires provides a clearer indication of the extent to which informants manually add salt. This is more appropriate to assessing culinary habits that are susceptible to change with time.

- Dietary Fat Intake

Saturated fat intake was estimated using the Dietary Instrument for Nutritional Education food frequency questionnaire (Roe et al. 1994) administered during the nurse visit. This tool measures 19 food groups that constitute 70% of the total fat and fibre intake of a typical UK diet. Fat scores were derived from the frequency of consumption of these foods and fat content of a standard portion. A low intake was defined as less than 83g/day of fat and a high intake comprised of more than 122g/day. Only data from 2003 and 2004 is available for use as earlier surveys used a different method of deriving the mean fat score.

- Diet Score

Unhealthy dietary behaviours (low fruit consumption, low vegetable consumption, adds table salt, adds salt in cooking and high fat score) were each assigned a value of one. An overall diet score was derived from the sum of all behaviours, with a score of three or more representing a poor diet.

Physical Activity

Low physical activity is associated with an increased risk of cardiovascular disease, obesity, type 2 diabetes and many forms of cancers. Current UK guidance recommends that adults should take part in moderate physical activity for at least 30 minutes each day on five or more days per week. A self reported questionnaire measured three types of activity: sports and exercise (lasting 15 minutes or more); home activity (lasting 30 minutes or more); and walking (lasting 30 minutes or more). A summary variable was constructed that categorised all subjects has having high, medium or low levels of activity. Those reporting three or fewer occasions of moderate or vigorous physical activity of at least 30 minutes in the last four weeks were classified as having low levels of physical activity. High levels of physical activity were defined as having experienced 20 or more occasions of moderate or vigorous activity in the previous four weeks.

Smoking

The impact of cigarette smoking on mortality and morbidity is well documented (Doll et al. 2004). There are marked differences in prevalence of cigarette smoking between ethnic groups, coupled to variable rates of smoking cessation over time (Sproston & Mindell 2006). This indicates that smoking behaviours are modifiable and therefore a particularly suitable marker of acculturative behavioural change. Smoking status was defined as current smoking versus non-smoking.

Smoking status was comprised of four self reported categories: Non-smoker, light smoker (<10/day), moderate smoker (10-20/day) and heavy smoker (>20/day). This captures current smoking status but does not show whether informants were ex-smokers. Smoking status was then dichotomised, for inclusion in logistic regression models, to current smokers versus current non-smokers.

Alcohol Intake

The global burden of disease attributable to alcohol use is 4% which is approximately equal to that of tobacco and hypertension (Room et al. 2005). Alcohol has been shown to be causally associated with up to 60 different medical conditions, the majority of which are detrimental to health (Rehm et al. 2003). The level of alcohol intake was categorised by the number of days per week that the informant drank (self reported). Heavy drinkers were classified as drinking 4-7 days/week, moderate drinkers were drinking 1-3 days/week and some informants reported complete abstention from alcohol consumption. Intake was recoded to a binary outcome variable (any daily drink vs. non-drinker) for later modelling purposes.

Chapter 5: The Millennium Cohort Study

5 The Millennium Cohort Study

The Millennium Cohort Study (MCS) is the fourth of Britain's national longitudinal birth cohort studies. As with the previous 1946, 1958 and 1970 birth cohorts, a large sample of newborn children selected from a specific time frame are being followed over their life course. The MCS aims to investigate how histories of wealth, education, family and employment might vary across all individuals and affect health outcomes according to how all these exposures interact with one another.

The MCS is well suited to cross generational analysis of ethnic minorities for a number of reasons. Unlike with previous birth cohorts, the MCS contains an oversampling of ethnic minority children creating a boosted sample size that provides greater analytical power. The MCS is also rich in socio-demographic, health, and health behavioural information on the child cohort member, and also on the parents. The inclusion of parents permits examination of the differences in child outcomes of the first and second generation migrants. This presents an opportunity for assessing the extent to which health inequalities persist across biologically-linked generations.

5.1 Sample Design

Cohort members were identified using the Department for Work and Pensions child benefit register, supplemented by local health visitors reporting new arrivals to an area who may have been missed by the benefit register. Although child benefit is considered a universal benefit, it is governed by a series of eligibility criteria based on residence. Therefore families whose residency status is uncertain (asylum seekers) or temporary (foreign armed forces) and who do not receive child benefit are excluded from sampling by default. 'Sensitive' cases, such as families with a child death, having a child taken into care, or families undergoing investigation into benefit fraud were excluded from benefit registers used to identify births. The use of benefit registers is more effective in reaching the marginal and low literacy families than birth records because the Department for Work and Pensions asks people to opt out rather than opt in. Opting in would be expected to produce a higher rate of non-response and disproportionately exclude the disadvantaged target group of the MCS. The MCS population was therefore defined as:

> *all children born between 1 September 2000 and 31 August 2001 (for England and Wales), and between 24 November 2000 and 11 January 2002 (for Scotland and Northern Ireland), alive and living in the UK at age nine months, and eligible to receive Child Benefit at that age; and, after nine months: for as long as they remain living in the UK at the time of sampling.*(Plewis 2004)

A fundamental aim of the MCS study design was to identify a representative sample of the total population, and gather a sufficient number of sub-groups of special interest; namely families living in disadvantaged geographical areas, and ethnic minority families. Therefore a complex survey design was employed to select the sample. The location of the births selected for inclusion in the MCS was derived using stratification (to target specific sub-groups of interest in the population) and clustering (to enable cost-effective fieldwork). This technique gave rise to varying probabilities of selection that must be accounted for during analysis.

Stratification

The population was first stratified by country to give: England, Scotland, Wales and Northern Ireland. The population for England was divided into three strata using socioeconomic and demographic information from electoral ward data. The ethnic minority stratum was derived from 169 of a total of 8,412 wards, which had an ethnic minority (any Black or any Asian) composition of 30% or greater at the 1991 Census. The disadvantaged strata included those in the poorest 25% according to the Child Poverty Index (CPI) for England and Wales, but excluded wards selected in the ethnic strata. The CPI stratifying factor was chosen as it is more closely related to the child focused objectives of the MCS than the alternative Index of Deprivation. It was also available for Scotland and Northern Ireland at the first sample whereas the Index of Deprivation was not. The third and final stratum for England was for advantaged wards, comprised of all wards not included in either of the above strata. Scotland, Wales and Northern Ireland were composed of two strata only. The disadvantaged stratum included wards that were in the poorest quartile of the CPI in 1998, whereas the advantaged were selected from all other quartiles.

Clustering

Clustering was used to provide greater detail on the local socioeconomic environments that the families lived in, as well as reduce the field cost of the survey. Wards with small populations were combined to create ‘superwards’ with at least 24 expected births per year. Wards were combined with their closest local authority or district neighbour, although wards from different strata were never combined. 'Superwards' were required only in some advantaged wards of England, but in advantaged and disadvantaged wards of all other countries.

This study design is an appropriate means of sampling the total population while effectively targeting the population sub-groups of interest to the MCS. Nevertheless, this methodology contains a number of shortcomings which ought to be considered. The stratification does not necessarily yield individuals of the intended target group. As all births in each selected ward were eligible for inclusion it should be noted that all births will not necessarily be within families targeted by the study design. For instance, 54% of disadvantaged families with a child under 16 lived within a disadvantaged ward, yet a relatively high proportion (37%) of the disadvantaged families were in an advantaged ward. The clustering process also has weaknesses. The precision of the estimates in cluster sampling is not as great as with simple random sampling of the same size, with precision decreasing with increasing cluster size. It was not possible to sub-sample the large wards of the MCS to remedy this due to unavailability of child benefit registers coupled to a lack of CPI data at the lower ward sub-level.

5.1.1 Sample weights

The stratified cluster design requires the use of weights to correct for units having unequal probabilities of selection. For example, children living in a disadvantaged ward have a greater chance of selection than those in an advantaged ward. And those sampled from a cluster will be more similar than others living elsewhere leading to highly correlated data. Unweighted analyses will therefore result in an underestimation of the standard errors and the subsequent significance tests will be invalid.

The sample weight was inversely proportional to the sample fraction of each stratum. This was scaled to sum the number of wards selected in the UK (398) so that the mean weight was one. The weight for non-response was then combined with the sample weight. All analyses were performed in STATA™ v9.2 Intercooled (StataCorp, TX, USA) using the 'svy' command to specify the inclusion of the probability weight, the stratum characteristics and the finite population correction factor derived from the number of wards selected in each country. Some analyses had only one primary sampling unit (PSU) present within a stratum meaning there was insufficient information with which to calculate the estimate of the stratum's variance. In such cases it is impossible to determine the variance of the estimated parameter from the stratified cluster design used by the MCS. Therefore these strata were manually identified and the singular PSUs were reassigned to an alternative stratum containing one or more PSUs.

Each sweep of the MCS requires its own set of survey weights as the probabilities of selection are not consistent at each phase due to the addition and loss of families from the cohort. All subsequent analyses therefore use the most appropriate weight dependent upon the data sweep being investigated.

5.1.2 Longitudinal Data Collection

The sampling design described in section 5.1 identified the initial cohort for interview at sweep one. Sweep two attempted to contact all 18,552 families from sweep one, plus 1,389 families who were living in the selected wards but whose addresses were missing from the earlier child benefit records. Sweep three comprised all those who had responded in either or both of the earlier two sweeps, but excluded families where the cohort member had died, emigrated or was discovered to be ineligible. Productive families were defined as those with any data from one of the five data collection instruments, namely: main interview, partner interview, proxy partner interview, child cognitive assessments and physical measurements. The total number of families at each sweep and the relevant response rates are described in Table 5.1.

Table 5.1: MCS Family sample sizes and responses at each sweep for the UK

Sweep	*Target Families (n)*	*Productive Families (n)*	*Response Rate (%)*
MCS1	27,201	18,552	68.0
MCS2a	18,552	14,898	80.0
MCS2b	1,389	692	50.0
MCS3	19,244	15,246	79.2

MCS2a: Overall response rate for families who were productive in MCS1 (All UK)
MCS2b: Overall response rate for the new families (All UK)

72% of families were productive in all sweeps, 8.5% took part in the first two but not the third, 7.5% in only the first and third, and 11.5% took part in the first sweep only. Longitudinal analyses should account for these attrition effects, due to differential rates of non-response, by using an appropriate weight.

The majority of analyses in this study are performed cross sectionally on data from the third sweep of the MCS. It will be pointed out in the relevant text where analysis is longitudinal and uses information from the previous sweeps.

5.2 Demographic Data in the MCS

5.2.1 Variables

Parental and Child Status

All respondents were asked their relationship to the child at interview. Only natural mothers and fathers were included in the analysis. Parents indicated whether the child was a single or a multiple birth. Ten sets of triplets and 194 twin pairs were excluded from the analysis.

Age

Parental age at interview was given in years whereas child age was documented in months.

Parental Ethnicity

Self defined ethnicity classifications for individuals present at sweep one and two were used for assigning missing ethnicity data at sweep three when the same respondent was present. Sweep three also contained previously missing ethnicity data for the 692 productive new families who were introduced into the study at sweep two. All individuals were coded into a fourteen ethnic group system comprised of:

1. White
2. White Irish
3. Indian
4. Pakistani
5. Bangladeshi
6. Asian/White Mix
7. Black Caribbean
8. Black African
9. Black Caribbean/White Mix
10. Black African/White Mix
11. Chinese
12. Other Mix
13. Other
14. Other White

Not all respondents provided ethnic group information which accurately corresponded to any of these groups. Therefore the data required extensive cleaning. Respondents who self defined their ethnicity as 'Other' were further classified where possible according to additional ethnicity details collected as part of the main questionnaire. Where an alternative ethnicity to any of the above fourteen categories was provided, or ethnicity was missing, reclassification obeyed the following guidelines:

- All 'Other' cases classed as Cypriot, Greek, Turkish, Italian, Romany, Polish, Baltic States, Russian States and former states of the Yugoslav republic were re-classed as 'White Other'.
- Middle Eastern, Arab, North African, Moroccan, Sri Lankan, Tamil, Vietnamese, Filipino, Japanese, Malaysian, Latin/South/Central American, those classified by religious affiliations and those from multi-ethnic islands (eg Mauritius and Seychelles) or of unspecified ethnic group mixtures were all classed as 'Other'.
- Indian/British Indian, Pakistani/British Pakistani, Bangladeshi/British Bangladeshi were re-classified into their appropriate South Asian groups.
- Kashmiri were classified as Pakistani.
- Missing parental ethnicity was inferred from the cohort member's ethnicity in isolated cases. If a 'Black Caribbean/White' cohort member had a White parent, the missing parent was logically assigned 'Black Caribbean' ethnicity.

The fourteen classification system was subsequently broken down to an eight classification structure comprised of the following groups:

1. White
2. Indian
3. Pakistani
4. Bangladeshi
5. Black Caribbean
6. Black African
7. Other White
8. Other

These groups were derived from the fourteen group system using the following guidelines:

- The 'Other White' group was combined with the 'White Irish' group to create a group of White immigrants to the UK.
- 'Black Caribbean/White Mixed' was grouped with the 'Black Caribbean' category. The same logic followed for Black African/White Mixed and was grouped with 'Black African'.
- The 'Asian/White Mixed' category as well as the 'Other Mixed' and 'Chinese' were all grouped together in the 'Other' category.

The mixed White/Black African or Black Caribbean individuals were assigned the respective non-White ethnicity in order to boost sample numbers of each respective group. It was also deemed appropriate as these individuals were, as a consequence of self-identifying with the Black Caribbean identity, unlikely to be wholly representative of the majority White population.

It was not possible to disaggregate the mixed White/Asian group into the respective South Asian ethnicities due to a lack of additional data on the specific country of origin. As a consequence of this these individuals were placed into the 'Other' category alongside the remainder of the sample. These individuals were of mixed or unspecified ethnicity or tended to self-identify with religious groupings rather than any of the more traditional ethnic groups. A significant minority of this category was composed of individuals from the Middle or Far East who do not fall into any of the common migratory groups to the UK.

Child Ethnicity

In cases where child ethnicity was missing or did not match either the natural mother or father a system of child reclassification of ethnicity was applied:

- The mother's ethnicity was used to classify child ethnicity if both parents were from a non-White ethnicity.
- If both parents were classed as non-White then the father was used to classify the child's ethnicity if the mother was classed as 'Other', 'Other Mixed', 'Chinese', 'Asian' or 'White Mixed'.
- If one parent was classed as White and one as non-white then the non-White ethnicity was used to classify the cohort member's ethnicity.
- If the child ethnicity differed from the parents, or was missing, and parental ethnicities were the same then child was assigned the parental ethnicity.
- If mother's ethnicity was missing it was inferred from the child's ethnicity provided in the questionnaire.

Child ethnicity was then collapsed to the eight category system according to the criteria outlined previously. The White group represents the majority reference population against which other ethnic minority groups can be compared.

Generation

The first generation was defined as those who were born overseas; the second generation meaning those born in the UK. The MCS contained details on the country of birth of the child's grandparents allowing the identification of the third generation. However, stratification by three generations can yield small cells sizes. For practical reasons, the majority of analyses combine the second and later generations. So, it is important to note that 'second generation' is referred to throughout this investigation for simplicity, and it should be remembered that this group contains a small number of third generation respondents. Furthermore, the numbers of third generation respondents is expected to vary according to the migration histories of each ethnic group. In a limited number of analyses three generations have been investigated. It will be made clear within the tables and text where this has taken place. This approach is uncommon within this investigation however.

Child generational status is ascribed from the mother. Maternal generational status is therefore dominant over the status of the father as it is reasonable to assume that the mother has the greatest influence over the wellbeing of the developing child. A further reason for using maternal status rather than paternal was to retain the 2,910 lone parent families who were headed by the mother.

To avoid confusion between child and parental generations, the child is described throughout all analyses and text in direct reference to the mother's generational status. For example, the offspring of second generation mothers are not the 'third generation', but is instead referred to as 'the child of the second generation'. Emphasis is therefore placed on the mother's generational status rather than the child's.

5.3 Health Outcomes in the MCS

5.3.1 Variables

Sweep three of the Millennium Cohort Study contains a suitable range of physical and mental health and anthropometric measurements for both the child and the natural parents.

Self Rated General Health and Limiting Illness

The clinical significance of these outcomes, as well as their categorisation for analysis was described in section 4.3. These outcomes were assessed in both parents who also reported child general health and limiting illness.

Obesity

The clinical significance of adult obesity was outlined in section 4.3. There is also a wealth of evidence linking child overweight/obesity directly to middle age mortality and morbidity (Dietz

1998a;Gunnell et al. 1998;World Health Organization 2000). Child obesity has not only long term implications for adult life, but it also diminishes immediate quality of life, with the literature suggesting a greater likelihood of raised blood pressure (Gutin et al. 1990), increased respiratory disorders such as asthma (Figueroa-Munoz et al. 2001;Gilliland et al. 2003) and early onset type 2 diabetes in overweight/obese children (Sinha et al. 2002). There may also be harmful psychosocial effects arising as a result of the culturally bound negative connotations surrounding body image and size (Dietz 1998b). Clearly the transmission of being overweight/obese from parent to child is of utmost public health importance at a time when obesity prevalence is forecast to rise (Department of Health 2006).

Height and weight measurements of children and their parents were recorded. Adult body mass index (BMI) was categorised as normal weight (<25), overweight (≥25) and obese (≥30) (World Health Organization & FAO 2003). Child BMI cut offs at age 5 were calculated using growth curves derived from International Obesity Task Force data which predicts overweight or obesity at age 18 (Cole et al. 2000). Therefore overweight thresholds were at >17.42 and >17.12, and obese at >19.30 and 19.17 for boys and girls respectively. Obese individuals were combined with the overweight in order to boost cell sizes. This collapsed overweight/obese categorisation assumes that there will be more individuals moving from normal to overweight over generations than there are moving from overweight to obese. This enables the tracking of the wider distribution of BMI across generations, rather than assessing the low numbers of obese individuals who may be of greater clinical importance. It is worth re-stating that while these cut-offs have a useful descriptive role in outlining the different BMI distributions across ethnic groups, the clinical significance of these cut-offs is unlikely to be uniform for all ethnicities.

Parental Mental Health

Incidence studies suggest that for some conditions in certain groups, notably schizophrenia in Black African-Caribbean, large ethnic inequalities exist relative to the White population (Bebbington et al. 1981;Bhugra et al. 1997;Fearon et al. 2006;Hutchinson et al. 1996;King et al. 1994;Wessely et al. 1991). When these observations are compared to prevalence surveys then the extent of inequality diminishes (Sproston & Nazroo 2002). It appears that differing data collection methodologies, namely incidence and prevalence studies, capture mental illness to varying degrees. Whether such incidence surveys are collecting data on true levels of poor mental health, or whether they are confounded by differential access to mental health services, is open to question. Therefore two variables have been selected to describe mental health in mothers and fathers. One measure is a self-reported distress score using a handheld questionnaire, whereas the other is doctor diagnosed depression which requires contact with health services.

- Depression

Both natural parents were asked whether a doctor had ever diagnosed them with depression. Depression was coded as a binary variable with depression representing a poor health outcome.

- Kessler Distress Score

Psychological distress was assessed in the natural parents on the six item Kessler Scale, using a computer assisted self completion form. Each parent was asked how often in the past 30 days they had felt:

- 'so depressed that nothing could cheer you up '
- 'hopeless '
- 'restless or fidgety '
- 'that everything you did was an effort'
- 'worthless'
- 'nervous'

Individuals scored four points for responding 'all of the time'; three points for 'most of the time'; two points for 'some of the time'; one point for 'a little of the time' and no points for 'none of the time'. Therefore 0-3 points represented 'No or low distress', 4-12 points was 'medium distress', and 13 or was a high level of psychological distress. To assess intergenerational differences the medium and high categories were combined to give a 'Raised' distress score.

The Kessler Distress Questionnaire has yet to be validated for use in ethnic minority populations. The subjective nature of the questions may be interpreted differently across ethnic groups as a consequence of cultural variations in the appraisal of mental health.

Child Cognitive Development

There is strong evidence in the literature to suggest that levels of childhood cognitive development are an important indicator in predicting future life chances (Feinstein 2003) and subsequent health (Batty et al. 2006;Hart et al. 2003;Singh-Manoux et al. 2005). Examination of intergenerational differences in cognitive performance at an early age is therefore indicative of the general well being and healthy development of children born to mothers with differing lengths of exposure to the UK environment.

The British Ability Scales (BAS) were used to assess cognitive development. This consists of a battery of individually administered tests of educational achievements and cognitive skills that are suitable for children and adolescents between the ages of 2 years and 6 months, to 17 years and 11 months. Three different tests were scored at sweep three: naming vocabulary, picture similarity and pattern construction. These three tests are designed and validated for capturing core verbal and pictorial reasoning skills as well assessing spatial abilities (Elliot et al. 1983). The raw scores were normed to a T score using the standardised norm tables derived from samples used in the development of the original assessments. There was a further standardisation sample for every three month age band. Therefore each child's final T score was based on the standardised score of their respective age band.

The BAS is noteworthy for the emphasis it places on the contextual factors surrounding the administration of the actual test which might affect an individual's performance; an element adequately catered for by the MCS data collection methods by the use of specially trained interviewers. Unfortunately, the BAS has retained a number of shortcomings of its predecessors in its efforts to reduce test bias for multi-lingual and multi-cultural populations. The key area of concern surrounds the representative sample of the UK population used to capture the cultural diversity of UK society in 1991 against which test scores were standardised (Hill 2005). Given that the ethnic minority population of the UK was 5.5% at the time of standardisation (OPCS 1996), this proportion was too small to influence the norms of the sample, and hence the standardised sample of the BAS is driven by the test scores of the White population. The dominant White culture will also exert the greatest influence upon the design of current (and future) test items perpetuating the cultural specificity and bias inherent in the psychometric scales. The BAS designers have more recently acknowledged the specific limitations of the verbal test scores across population subgroups. Whilst the scores on the verbal scales provide a useful estimation of the current competence levels of language skills, the authors confirm that "inferences must not be drawn from the verbal scales about children's cognitive or learning potential". (Elliott et al. 1997;Hill 2005). Therefore a degree of caution must be exercised when comparing ethnic minority groups to the White majority, as the validity of the tests in measuring the same cognitive factors across groups of different cultural backgrounds remains uncertain at this point.

Asthma

Mothers were questioned on whether the child had ever experienced asthma. This respiratory condition has consistently been shown to vary by ethnic group with South Asians having lower reported rates than the White population, (Nelson et al. 1997) specifically the Bangladeshi group (Panico et al. 2007) with similarly low rates observed for Black African people (Sproston & Mindell 2006). Conversely Black Caribbean experience higher rates than the White population (Sproston & Mindell 2006).

5.4 Socioeconomic Data in the MCS

5.4.1 Variables

National Statistics Socioeconomic Classification System (NS-SEC)

The NS-SEC is an occupationally based classification system measuring an individual's employment relations and occupational conditions on a seventeen point scale, although categories can be conceptually aggregated to create the more manageable seven and five class schemas. Any relationship between health outcome and NS-SEC is presumed to be a link between employment and working conditions specifically, rather than an association between the vaguely understood notions of 'class' which were previously used in the Registrar General's Classification System (RGSC). A further key difference to the RGSC system is that the NS-SEC is not designed as a hierarchical social structure, so the full system should not be used as an ordinal scale. For example, the recognition of a self-employed category makes it difficult to locate such individuals at any point in a hierarchal model as they are distinctive in their life chances and behaviours. Therefore each classification should be considered as an individual set of employment characteristics distinct from other groups. However, by collapsing the schema to a three level classification there is scope for defining a hierarchy (Rose & Pevalin 2001), although this comes at the cost of a loss of detail on the relationship between specific working conditions and the outcome.

Therefore the NS-SEC is operationalised in a number for ways for this study. Descriptive statistics use the five classification system to explore socioeconomic differences between ethnic groups. These groupings are:

1. Managerial and Professional Occupations.
2. Intermediate Occupations.
3. Small Employers and Own Account Workers.
4. Lower Supervisory and Technical Occupations.
5. Semi-routine and Routine Occupations.

An ordinal scale is preferable for the investigation of social mobility between generations and so this scheme was appropriately collapsed into a three class version, consisting of:

1. Managerial and Professional (1 above).
2. Intermediate Occupations (2 & 3 above).
3. Routine and Manual Occupations (4 & 5 above).

These collapses are those officially recommended by the Office for National Statistics who are responsible for the design and continued monitoring of this classification system (Rose & Pevalin 2001).

It is worth noting that the 'never worked and long term unemployed' have been excluded from these schemes. This is for two main reasons. First, there are strong ethnic group specific interactions between unemployment and gender which can be more effectively explored by assessing rates of unemployment/never working as part of separate analyses, rather than simply combining these individuals into the lower routine occupations. Second, being long term unemployed/never worked may have strong associations with health. It would therefore be unwise to include the unemployed, as a consequence of sickness, as part of a group classified as employed.

Deriving a family level NS-SEC is a useful means of pertaining an individual's NS-SEC class as the family unit may have greater relevance to an individual's life and circumstances than an individual's classification might. Therefore the family's highest NS-SEC achieved in either sweep one or two was used; no NS-SEC at sweep three was recorded. The use of the highest NS-SEC overcomes the particular problem facing the classification of parents to newborns who might otherwise appear downwardly mobile after the birth of the child, by relinquishing previous employment due to parenthood. The use of a previous NS-SEC classification also negates the problem of the long term sick being misclassified as unemployed as the occupation held before current sickness will instead be recorded and more accurately represents long term exposure to the environment.

Parental Economic Activity:

Parental working patterns are relevant to the health and development of the child via distinct economic and social pathways. First, parental employment trends determine the economic circumstances of the family. It can be assumed that two working parents are likely to bring greater material benefits to the family than unemployed parents might. The increasing number of lone parent families in the UK over the past 30 years, combined with their low labour market participation, is one of the key contributors to the increasing number of children growing up in poverty (Marsh et al. 2001).

Second, parental economic activity and employment determines the extent of social interaction which can take place between the parent and child. Those parents that work have less opportunity to interact with the child which is particularly relevant to types of child health related behaviours (Hawkins et al. 2009). Similarly the degree of child cognitive development is likely to be determined by the levels of stimulation which can be afforded by the parents.

Furthermore, the intergenerational patterns of family composition of ethnic minority groups can be used as indicator of adaption towards the social norms of the UK. There have been shifts in the patterning of the economic status of family members and family structures over recent decades in the general population, moving from the traditional nuclear family towards alternative structures, principally one where both parents tend to work. Therefore intergenerational trends in employment, among ethnic minority women in particular, can be taken as an additional indicator of changing social norms within groups. It is therefore important to assess the extent to which these changing social norms within the general population might affect each ethnic group and evaluate any impact these changes might have on parental health, as well as that of the child.

Parental economic status was described using the following categories: both parents being employed (full or part time); one parent employed and the other unemployed; both unemployed; one parent employed with missing data for partner; and one parent unemployed with missing data for partner. A particular emphasis is placed upon the economic status of lone parents with this family background being strongly associated with a higher level of poverty (Marsh et al 2001) suggesting a greater chance of poor health. Lone parenthood included mother-headed households only.

Family size & Overcrowding

Family size was estimated as the total number of individuals living permanently with the child cohort member at the time of the third sweep of data. Overcrowding provides an indication of the family living conditions and was defined as having more than one individual per room, excluding the bathroom and kitchen. Whilst family size contributes to the level of overcrowding and is used to estimate the demand for resources, in the context of this study it can also be used as an acculturative variable. Family size is liable to intergenerational variation through changes in the ethnic group specific fertility rates, as well through the changes to the whole family composition through wider family memberships such as grandparents. The ethnic patterning of both of these factors has been previously observed as being significantly different to the general population thereby providing scope for generational modification.

Family Income

Family income was derived from both main and partner responses at parent interview. It represents the total family income before accommodation costs. This was coded as a categorical variable into the following five income bands: less than £11,000, £11,000-22,000, £22,000–33,000, £33,000-55,000 and greater than £55,000. Those that refused or did not answer were included as a distinct category in the analysis as differences in refusal rates may vary by group and possibly be indicative of an underlying characteristic such as being financially disadvantaged.

Family Educational Achievement

Educational level was taken as the top qualification achieved in the family over any of the three sweeps. This was coded as seven categories, ranging from National Vocational Qualification (NVQ) level one to five, as well as overseas and none. These were grouped with NVQ 5/4 representing the top level, followed by NVQ 3, NVQ 2/1 and the lowest level was a combination of no qualifications and overseas qualifications. The highest qualification achieved is taken to represent the level of skills which are available to the labour market at the time of questioning. As was the case for NS-SEC classification, the top qualification within the family provides a more accurate description of the socioeconomic position of the family unit to which all respondents are exposed.

Benefit Receipts

All families were expected to receive child benefit due to recruitment by benefit registers. Consequently the distribution of families receiving more than one benefit provides supplementary information on the economic conditions of a family.

Free School Meals

Free school meals are available to all children whose parental income does not exceed £15,575, or who are in receipt of income based job seekers allowance and income support, or who are eligible through their immigration or asylum status. This variable captures the socioeconomic profile of the family provided by data on benefit receipts. However, it is also very strongly linked to dietary control of the child, with subsequent links to health, hence its continued inclusion within the analysis.

Housing Tenure

Parents identified whether their permanent housing tenure was either: Outright owner, mortgage owner, part rent/part mortgage, local authority resident, privately rent, parental or rent free living, and other. For later analysis and modelling this was collapsed into a binary category consisting of owner and tenant.

The interpretation of housing tenures in isolation requires a particular regard for the historical and contextual issues surrounding home ownership in the UK (Peach 1998), as not all ethnic minority groups have the same experiences and opportunities in home making. Housing tenure has been previously used in the creation of standard of living index which incorporates a wider variety of variables to more accurately describe the living environment (Harding 2003b;Harding & Balarajan 1996;Nazroo 1997b).

Housing Conditions (Damp)

Standards of living conditions were further assessed by measuring the prevalence of damp. The reporting of any problem with damp was taken as an outcome. Together with housing tenure, overcrowding and family size, this variable can contribute to the establishing a profile of living conditions which are likely to have direct effects upon the health of the parents and child.

5.5 Health Related Behaviour Data in the MCS

5.5.1 Variables

Health behaviours in the parents and the children of the Millennium Cohort were selected according a number of criteria. The first requirement was an evidence base associating a given behaviour with health outcomes investigated in this study. Second, these behaviours should be liable to change over time or generation, making them suitable as a marker of acculturative change due to differential exposure to the social norms of the majority population. And third, the behaviours chosen were socially patterned, thereby enabling the investigation of how changing socioeconomic status and behaviours might interact with one another over generations.

Smoking and Alcohol Drinking

The significance of smoking and alcohol intake, both in terms of health outcome, and as markers of acculturation, was described in section 4.3. Smoking status was defined as being a current smoker as opposed to not smoking at all. Drinking was defined as ever drinking alcohol versus abstention.

Breastfeeding

The physical, emotional and psychological influence of breastfeeding on maternal and child health is well documented (Gartner et al. 1997). The UK Department of Health breastfeeding guidelines advocate the exclusive feeding of infants on breast milk for the six months following birth (Department of Health 2004) in line with the World Health Organisation's global strategy on infant feeding practice (World Health Organization 2003). Mothers were asked the age at which the child was last fed breast milk. Given that previous studies of this sample showed that fewer than 1% of children were being exclusively fed on breast milk at six months (Kelly & Watt 2005), this target was unsuitable for identifying inter-group differences in behaviours due to the small cell sizes resulting. Therefore breastfeeding behaviours were taken as ever having been breastfed, irrespective of duration.

Immunisation

As well as providing an indication of parental attitudes towards child well-being, completed vaccinations directly confer health benefits for the child. As all children require and are eligible for vaccination, immunisation rates can also be used to measure extent to which different groups access health services irrespective of need. Adherence to vaccination programmes was measured by asking parents how many MMR vaccinations the child had received. Those who had received all three doses were categorised as completed and were compared to those who had not yet completed the programme by the third sweep at age five. This measure provides an indication of parental attitudes towards vaccination in general as it is closely associated with rates of primary vaccination uptake (Pearce et al. 2009).

Dietary Score

A diet score was derived from the following range of parentally administered child health behaviours. Each negative outcome was equal to a score of one and all behaviours were summed to give a total score reflecting the overall quality of the dietary health behaviours. A poor diet score in excess of three represented a poor dietary health outcome of the child.

- Skipping Breakfast

Parents were asked on how many days the child skips breakfast. This was coded to a binary variable for analysis where ’never misses breakfast’ was a normal outcome, and ‘misses breakfast at least once a week’ was a negative outcome reflecting poor dietary habits.

- Snacks between meals

The main snacks consumed between meals by the child were selected by the parent from the following: crisps and similar; breakfast cereals; cakes and sweet biscuits, any fruit; any vegetables; bread/toast or similar; crisp bread/crackers/rice; sweets; yoghurt; other dairy (cheese/egg).

A healthy snacking variable was derived from whether fruit or vegetables were consumed a main snack between meals, as opposed to all snacks. A measure of unhealthy snacking was determined by the consumption of crisps and sweets as a main snack versus all other alternatives.

- Fruit portions per day

Parents were asked how many portions of fruit given are given to the child daily. Those receiving three or more portions were considered healthy and any less represented a negative health outcome.

- Eating Patterns

Parents were asked how frequently the child eats at regular times. 'Never' or 'Sometimes' eating at irregular times was classified as a negative outcome as opposed to 'Usually' and 'Always'.

Parent and child exercising

Parental and child rates of physical exercise were measured by asking whether joint exercise was taken one or more times per week, as opposed to less frequently.

In most cases the health related behaviours of the child were controlled by the parent, with the child lacking agency regarding the behavioural traits adopted. This means that patterns of parental behaviours should be interpreted in two key ways. One view is that the trends in health behaviours describe the parental attitudes to health and well-being, and is indicative of whether the home environment is a healthy one. This is particularly true in the case of smoking and drinking, where health literacy is assumed to be high enough that the parent is aware that such behaviours are harmful to health. A second perspective views health behaviours as an exposure which has a direct impact on child and parental health through physiological pathways. An example of this would be in the case of breastfeeding, or immunisations, where benefits are directly transferred from mother to child. Therefore the results of the following analyses should bear in mind that child behaviours are not only indicative of exposures to child health, but also represent patterns of parental health behaviours.

Chapter 6: Introduction to the Data

6 Introduction to the Data

The previous two chapters outlined the variables in the HSE and MCS which will be used to describe and explain the intergenerational differences in health observed in this study. This chapter will describe the distribution of exposures and outcomes across ethnic minorities, to illustrate the patterning of ethnic inequalities. Later investigations will explore whether these inequalities differ by generational status.

6.1 Demographic Data

6.1.1 Demographic Profile of the Health Survey for England

The data in Table 6.1 details the age distributions of each ethnic group by five year age categories with groups eligible for inclusion in the analysis shown shaded in grey. As the different generations had only partially overlapping age structures with each other, age censoring was required. This was carried out to ensure that at least twenty individuals from each generation were contained in each five year age band. Those included in the analysis were: Black Caribbean aged 21-55, Indian aged 21-50, Pakistani aged 16-50, Bangladeshi aged 16-45, Chinese aged 16-45 and Irish aged 21-85 (the wider age distribution of the Irish group reflecting their longer migratory history). The White reference population covered ages 16-55. The Irish age distribution was further censored to ages 16-55 when modelled for a direct comparison with the White reference group. Despite age censoring the mean age of each generation varied within ethnic groups. For instance, the first generation Bangladeshi group was approximately ten years older than the second. There were also gender differences by ethnic group with all but the second generation Chinese group containing more females. The largest gender imbalance was in Black Caribbean where 35.0% of the first generation was male, equilibrating slightly to 40.1% in the second generation. Such uneven age and sex distributions in the data require further standardisation during modelling stages so that observed differences will reflect actual differences between generations and ethnic groups, rather than variations in the age and gender distributions.

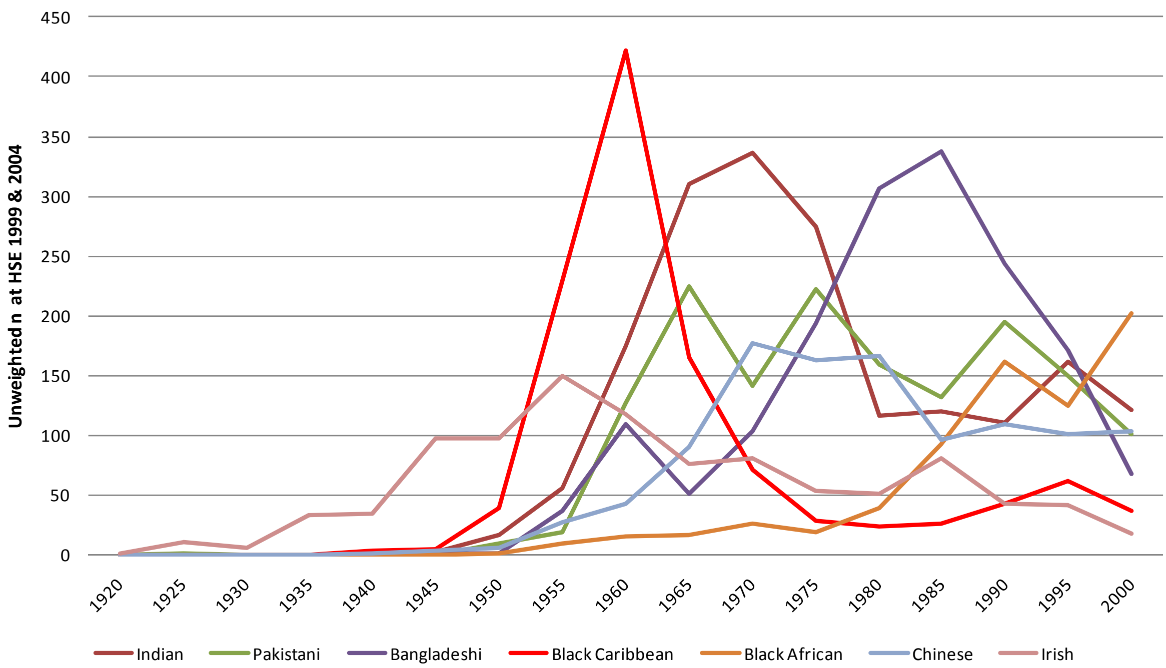
Table 6.1: Age distributions of individuals by ethnic group and generation. (Age groups selected for analysis with >20 informants shown as highlighted)

Age Group	*White*	*Indian*		*Pakistani*		*Bangladeshi*		*Black Caribbean*		*Black African*		*Irish*		*Chinese*	
	Reference	1^{st}	2^{nd}	1^{st}	2^{nd}	1^{st}	2^{nd}	1^{st}	2^{nd}	1^{st}	2^{nd}	1^{st}	2^{nd}	1^{st}	2^{nd}
16-20	1,752	17	227	26	304	25	312	14	232	31	70	6	86	25	143
21-25	1,716	53	163	87	202	114	204	21	130	49	31	21	95	70	88
26-30	2,181	109	132	144	215	190	132	22	165	107	22	50	150	60	58
31-35	2,661	134	168	160	129	164	67	38	266	110	29	43	207	70	53
36-40	2,760	155	135	148	89	154	29	47	316	106	32	65	234	115	36
41-45	2,491	195	86	156	44	137	21	62	157	76	13	47	206	147	24
46-50	2,366	212	38	130	24	105	5	61	81	56	14	55	165	161	16
51-55	2,480	188	8	86	7	58	3	82	24	37	5	63	158	98	8
56-60	2,263	120	3	76	4	74	2	138	11	21	4	84	93	62	7
61-65	1,950	123	1	79	1	80	4	159	6	18	0	83	66	50	4
66-70	1,786	94	3	50	1	66	4	153	4	15	1	93	45	47	2
71-75	1,601	53	3	27	0	28	0	96	3	5	2	79	47	22	1
76-80	1,303	26	2	9	3	5	0	46	2	3	0	61	23	12	1
81-85	796	12	0	2	0	1	0	16	3	1	1	32	21	5	0
86-90	343	6	1	0	0	0	0	6	0	0	0	10	7	0	0
91-95	119	0	0	1	0	0	0	1	0	0	0	3	0	0	0
96+	8	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Total	28,576	1,497	970	1,181	1,023	1,202	783	962	1,400	635	224	795	1,603	944	441
Selected Total	*18,407*	*858*	*722*	*851*	*1,007*	*784*	*765*	*333*	*1,139*	*403*	*184*	*776*	*1,510*	*487*	*402*
Mean Age	36.8	*38.7*	32.7	35.7	26.5	32.7	23.7	42.5	35.3	30.8	25.8	55.8	44.3	34.5	25.6
(SE)	*(0.08)*	*(0.27)*	*(0.28)*	*(0.29)*	*(0.26)*	*(0.25)*	*(0.24)*	*(0.51)*	*(0.22)*	*(0.31)*	*(0.59)*	*(0.59)*	*(0.36)*	*(0.36)*	*(0.40)*
Male (%)	47.6	43.1	46.2	45.9	46.0	46.7	44.9	35.0	40.1	41.1	45.7	43.9	42.9	41.1	53.9

Notes: Unweighted *n* for individuals shown in each age band. Shaded area denotes age groups selected for each generation containing more than twenty respondents. No generational status was defined for the White reference group. Mean age and respective standard error shown for generations included in the analysis. Weighted column percentages (%) given.

The period of migration is clearly visible when the year of arrival of each individual in the combined HSE is plotted by ethnic group. Figure 6.1 shows a clear peak in the number of Black Caribbean respondents reporting an arrival between 1955 and 1965. This is in contrast to the Bangladeshi respondents in the sample who were more likely to have arrived around 1980 to 1985. A similar peak is visible for Indian respondents around 1965 to 1970, accompanied by the arrival for Pakistani people. Chinese arrivals peaked in the in the 1970s, and Black African arrivals were most common in the 1990s to 2000. These arrival periods, for all groups, are in close agreement with the well documented patterns of post-War migration to Britain (Spencer 1997;Winder 2004). The patterns explain that it is the historical period of arrival which explains why the age distributions shown in Table 6.1 do not overlap uniformly for each ethnic minority group. Clearly the first generations of each group have not lived within the same contemporary context as and the implications of this will become clear during later discussion of the impact of environmental exposures upon health outcome.

Figure 6.1: Line graph showing the number of respondents in the 1999 & 2004 HSE who migrated to the UK, by year of migration and ethnicity (unweighted *n* given; year of migration grouped into five year bands).



6.1.2 Demographic profile of the MCS

The age and generational distributions of the parents and children of each ethnic group are shown in Table 6.2. Bangladeshi mothers were the most likely group to be first generation (92.0%) and also had the youngest mean age (31.3, standard error=0.34), although young age was not generally associated with being first generation. By contrast, 18.5% of the Black Caribbean group were first generation, with an accordingly higher proportion than other ethnic minority groups being third generation (27.6%). The Other White and Other groups had 17.0% and 13.7% respectively in the third generation and were the only other ethnic minority groups to have this extended generational distribution. The White group were overwhelmingly third generation or greater. Sample numbers in the third generation of Indian (*n*=7), Pakistani (*n*=9), Bangladeshi (*n*=2) and Black African (*n*=7) mothers are too small for meaningful analysis, with similar patterns in fathers. With a few exceptions, in the remainder of this study the second and third generation groupings are combined. Even so, sample sizes are often small, particularly in the Bangladeshi group and caution should be exercised when drawing conclusions from intergenerational analyses in this group in particular.

The line graph shows the number of individuals and the year of arrival to the UK in the selected sample at MCS3, by ethnic group. The peak of arrival for most groups appears to be around the mid-1990s. Given that the data comprises child bearing families in 2001-2003, the inferred mean age of arrival for the first generation is approximately 18-25 years of age. The White group, and to a lesser extent the Indian group, arrived during their early childhood in the 1970s. For all other groups the main period of arrival appears to be relatively consistent, and recent.

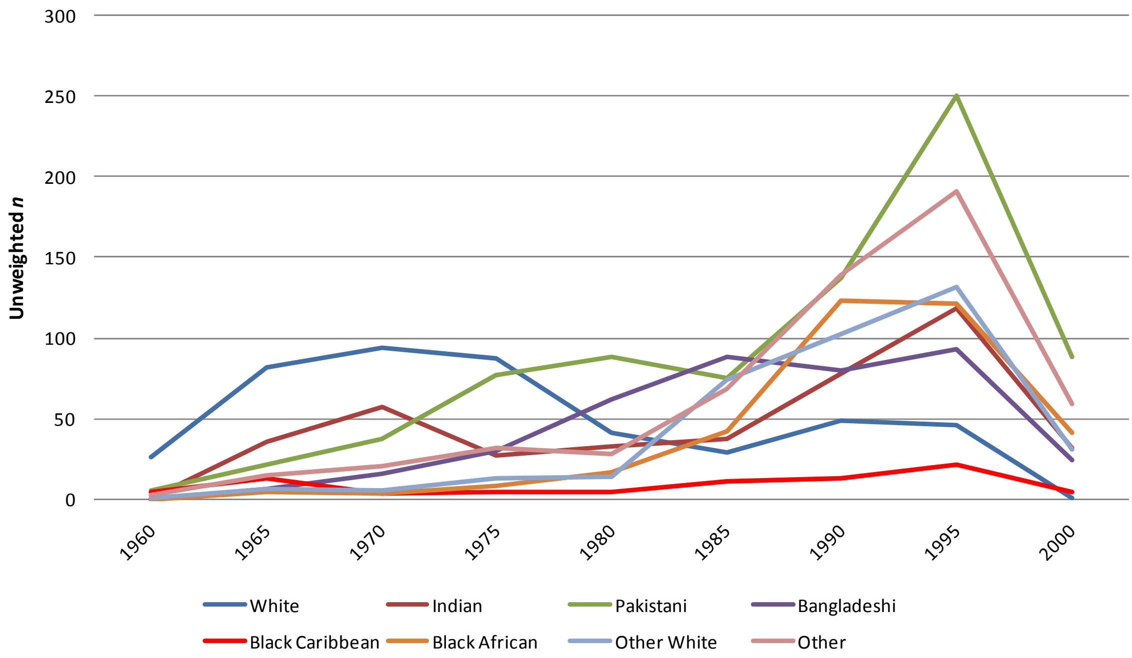
This graph does not reflect the historical patterns of post-war migration of individual ethnic groups as all individuals are of a generally similar age at 2001-2003 when the cohort started. For instance, it is known that that the Black Caribbean population increased in the UK in the 1950s, but these first generation parents are now of an age unsuitable for a birth cohort study beginning in 2001. This explains why the generational distribution for the Black Caribbean group is so wide in comparison to all other groups whose periods of migration occurred later in time.

Table 6.2: Distribution of maternal, paternal and child ethnic groups by respondent status in the third sweep of the Millennium Cohort Study

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*	*Total*
Natural Mother									
Weighted % (n)	86.9 *(12,241)*	1.9 *(391)*	2.7 *(671)*	0.9 *(290)*	1.3 *(247)*	1.5 *(323)*	2.6 *(329)*	2.2 *(396)*	100 *(14,888)*
Mean Age	34.3 *(0.12)*	34.1 *(0.33)*	32.1 *(0.27)*	31.3 *(0.34)*	34.7 *(0.53)*	36.2 *(0.52)*	36.3 *(0.31)*	35.6 *(0.33)*	n/a
1st Generation	2.2 *(252)*	54.3 *(199)*	62.6 *(369)*	92.0 *(210)*	18.5 *(41)*	71.0 *(200)*	72.6 *(215)*	74.7 *(261)*	9.8 *(1,747)*
2nd Generation	1.3 *(132)*	43.9 *(140)*	35.4 *(194)*	7.3 *(21)*	53.9 *(98)*	25.5 *(43)*	10.4 *(28)*	11.5 *(37)*	4.3 *(693)*
3rd Generation	96.5 *(10,718)*	1.8 *(7)*	2.1 *(9)*	0.8 *(2)*	27.6 *(60)*	3.5 *(7)*	17.0 *(52)*	13.7 *(39)*	85.8 *(10,894)*
Natural Father									
Weighted % (n)	86.2 *(9,115)*	2.3 *(355)*	3.0 *(583)*	1.1 *(261)*	1.0 *(122)*	1.3 *(203)*	2.6 *(250)*	2.5 *(340)*	100 *(11,229)*
Mean Age	37.8 *(0.11)*	37.9 *(0.39)*	35.2 *(0.41)*	36.9 *(0.46)*	39.7 *(0.87)*	40.3 *(0.51)*	39.0 *(0.38)*	39.7 *(0.47)*	n/a
1st Generation	2.1 *(151)*	51.4 *(162)*	71.9 *(291)*	87.6 *(128)*	20.4 *(25)*	68.7 *(107)*	61.6 *(107)*	77.5 *(218)*	9.6 *(1,189)*
2nd Generation	1.3 *(90)*	47.2 *(104)*	26.8 *(95)*	11.7 *(7)*	58.9 *(52)*	25.2 *(25)*	17.3 *(30)*	10.1 *(24)*	4.4 *(427)*
3rd Generation	96.6 *(7,168)*	1.5 *(4)*	1.4 *(3)*	0.7 *(2)*	20.7 *(19)*	6.0 *(6)*	21.1 *(41)*	12.4 *(25)*	86 *(7,268)*
Child									
Weighted % (n)	83.0 *(11,707)*	2.2 *(424)*	2.8 *(707)*	1.0 *(300)*	2.1 *(355)*	1.8 *(373)*	4.2 *(522)*	2.9 *(472)*	100 *(14,860)*
1st Generation	2.1 *(229)*	51.5 *(209)*	60.5 *(374)*	88.5 *(210)*	12.6 *(44)*	57.3 *(204)*	49.7 *(234)*	52.7 *(239)*	9.9 (*1,743)*
2nd Generation	1.2 *(115)*	38.4 *(140)*	34.5 *(198)*	7.0 *(21)*	34.9 *(102)*	21.9 *(48)*	8.6 *(36)*	7.9 *(31)*	4.4 *(691)*
3rd Generation	96.7 *(10,183)*	10.1 *(27)*	5.0 *(24)*	4.6 *(9)*	52.5 *(145)*	20.8 *(39)*	41.7 *(198)*	39.3 *(126)*	85.7 *(10,751)*

Notes: Weighted row percentages shown with unweighted base (*n*). 10 families with triplets and 194 with twins are excluded from the total of 15,246 productive families. Ethnicity was missing for 182 children, 144 fathers and 7 mothers. Child generational status was defined as that of the natural mother.
n/a – non-applicable

Figure 6.2: Line graph showing the number of mothers or fathers in MCS3 who migrated to the UK, by year of migration and ethnicity (unweighted *n* given; year of migration grouped into five year bands)



6.2 Health Outcomes

The previous section described how the age and sex distributions and the migratory histories of the sample each contributed to the formation of generations. However, at this introductory stage, the patterning of health, socioeconomic measures and health behaviours will be explored within a range of ethnic groups without stratifying by generation. The aim is to identify whether ethnic inequalities exist in this sample, so that later analysis might identify whether these patterns are the same in each generation.

Health outcomes in each ethnic group will be described using weighted percentages. This enables comparisons in the absolute burden of ill health between each ethnic group. Additionally, the relative risk of ill health in each ethnic minority group can be compared to a White reference group to highlight the extent of inequality. However, caution is required with relative risks as the emphasis on the difference between groups has the potential to overlook illnesses which are the most prevalent and which contribute most to the overall health burden. Therefore the supplementary data expressing relative risks are shown in Appendix I, and describe whether the differences in the absolute levels of poor health are statistically significant.

6.2.1 Descriptive Analysis of Health Outcomes in the Health Survey for England

The weighted percentages of selected health outcomes in the combined HSE sample are shown in Table 6.3. These data illustrate the considerable diversity in the health experiences of ethnic minorities in this sample. Almost half of Bangladeshi respondents reported fair/poor general health with Pakistani respondents having similarly high rates followed by Black Caribbean. The White group reported the least fair/poor general health. The patterning of limiting illness was similar to that of general health as Bangladeshi, Pakistani and Black Caribbean again experiencing the most, although the overall prevalence of limiting illness was not as great as for general health. The Chinese and Black African groups reported the least limiting illness which was in contrast to general health where the White group was the healthiest.

Trends in obesity rates were unrelated to the patterning of general health or limiting illness. Black African, and Black Caribbean people were approximately five times more likely to be obese than the least obese Chinese group. White, Indian, Pakistani and Other White groups had broadly comparable proportions that were obese, with the Bangladeshi group a showing comparatively lower risk of obesity. Finally, diagnosed hypertension was related to obesity, with approximately a third of Black African and Black Caribbean respondents, who were most likely to be obese, being diagnosed by their general practitioner with high blood pressure. The implied association between hypertension and obesity, which are known to be aetiologically associated, suggests that these data reliably captures the distribution of poor health.

Overall, the greatest health advantages were observed in Chinese people as they experienced the lowest rates of diagnosed hypertension, obesity and limiting illness, with a comparable level of fair/poor general health to all other groups. The poorest levels of subjective general health was experienced by the Bangladeshi and Pakistani groups, whereas it was the Black Caribbean and Black African that experienced the poorest levels of obesity and hypertension.

Table 6.3: Weighted distribution of selected health outcomes by ethnic group adjusted for age and sex (weighted column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Fair/Poor General Health	22.1	33.1	38.8	45.8	34.2	23.8	22.9	25.2
Unweighted base	*28,573*	*2,465*	*2,202*	*1,983*	*2,355*	*858*	*2,398*	*1,385*
Limiting Illness	22.6	23.1	30.1	30.8	26.0	16.6	23.1	11.9
Unweighted base	*28,569*	*2,466*	*2,204*	*1,983*	*2,360*	*858*	*2,397*	*1,385*
Obese	20.6	17.6	23.3	11.6	28.4	32.3	21.3	6.6
Unweighted base	*25,570*	*2,127*	*1,843*	*1,500*	*1,860*	*629*	*2,087*	*1,238*
Diagnosed Hypertension	21.3	24.2	21.9	20.2	31.3	33.4	21.5	20.2
Unweighted base	*19,806*	*1,404*	*1,050*	*716*	*1,117*	*277*	*1,366*	*711*

Mean total cholesterol, HDL, LDL cholesterol and C-reactive protein blood concentrations adjusted for age and sex are shown in Table 6.4. Mean total cholesterol was lower in all ethnic minority groups than in the White population. The majority of these differences were significant and are shown in Appendix I. The proportion with raised total cholesterol (>5mmol/l) was highest in the White group with lower concentrations observed in Pakistani, Bangladeshi, Black Caribbean and Black African subjects. HDL cholesterol concentrations tended to be lowest (<1.0mmol/l) in Bangladeshi and Pakistani, with Bangladeshi almost four times more likely than Black Caribbean to have low HDL cholesterol. Black African, Black Caribbean and Chinese groups were the least likely to have excessive LDL cholesterol levels (>3.0mmol/l), whereas Whites were the most likely. Lastly, mean CRP levels were considerably lower in Chinese than all other ethnic groups and were half as likely to have raised CRP levels compared to the next lowest group, Black African. The Pakistani group had the highest mean CRP concentration and were three times more likely than Chinese to be above the threshold for having a high CRP concentration.

Table 6.4: Mean values and proportions exceeding risk thresholds of physical health measures by ethnic group adjusted for age and sex (s.e=standard error; weighted column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Total Cholesterol								
Mean	5.53	5.36	5.30	5.35	5.14	5.24	5.44	5.27
(s.e)	*(0.01)*	*(0.03)*	*(0.04)*	*(0.05)*	*(0.03)*	*(0.08)*	*(0.03)*	*(0.04)*
>5mmol/l	68.3	57.2	49.4	51.5	50.1	48.5	66.4	53.6
Unweighted base	*17,060*	*1,212*	*838*	*543*	*962*	*220*	*1,267*	*527*
HDL Cholesterol								
Mean	1.47	1.36	1.27	1.20	1.51	1.43	1.49	1.49
(s.e)	*(0.00)*	*(0.01)*	*(0.01)*	*(0.02)*	*(0.01)*	*(0.03)*	*(0.01)*	*(0.02)*
<1.0mmol/l	12.3	16.1	25.3	31.3	8.5	9.3	11.4	10.7
Unweighted base	*17,037*	*1,205*	*833*	*538*	*957*	*220*	*1,262*	*524*
LDL Cholesterol								
Mean	3.46	3.33	3.17	3.31	3.17	3.12	3.34	3.08
(s.e)	*(0.04)*	*(0.04)*	*(0.05)*	*(0.07)*	*(0.05)*	*(0.09)*	*(0.04)*	*(0.05)*
>3.0mmol/l	70.1	57.1	51.4	61.2	53.7	45.2	61.8	44.5
Unweighted base	*733*	*576*	*289*	*139*	*454*	*127*	*698*	*299*
C-Reactive Protein								
Mean	2.13	2.11	2.63	2.46	1.99	2.07	2.07	1.31
(s.e)	*(0.02)*	*(0.06)*	*(0.09)*	*(0.11)*	*(0.07)*	*(0.18)*	*(0.07)*	*(0.07)*
>3.0mg/l	25.7	24.3	29.4	27.1	22.0	20.5	25.6	9.7
Unweighted base	*16,520*	*1,174*	*799*	*521*	*944*	*203*	*1,217*	*509*

6.2.2 Descriptive Analysis of Health Outcomes in the MCS

The following section describes the proportional distributions of a number of indicators of general health and well being over a range of ethnic groups, adjusted for age.

6.2.2.1 Mothers

Black Caribbean, Pakistani and Bangladeshi mothers reported the highest rates of fair/poor self rated general health, with Other White mothers reporting the least. This patterning was replicated for the prevalence of limiting illness. Black African mothers were the most likely of all ethnic groups to be overweight and obese. Pakistani, Bangladeshi and Black Caribbean mothers were all more likely than White to be obese

Considerably higher proportions of Black Caribbean (30.9%) and White (30.0%) mothers had been diagnosed with depression than all other groups. This was approximately three times greater than the smallest proportion of Black African mothers. Pakistani mothers were most likely to report the highest levels of psychological distress, but cell sizes were too small to draw firm conclusions. When a broader distribution of distress score was taken in order to boost cell sizes, so that a score of over four represented a positive outcome, then the high prevalence compared to all other groups persisted in Pakistani mothers. The prevalence of having a high distress score was lowest for the Other White and White groups; this trend also persisted when the high category was merged with the medium category to increase cell sizes.

While no single ethnic group of mothers was the most disadvantaged for all outcomes, it appeared that Black Caribbean women tended to have the worst overall physical and general health profile using these selected indicators, and, overall, the Other White group were the healthiest. These are, however, generalised conclusions.

Table 6.5: Weighted distribution of selected health outcomes for mothers, adjusted for age (weighted column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health	12.8	14.7	19.4	18.8	19.5	13.0	9.4	15.6
Unweighted base	*12,188*	*386*	*637*	*275*	*246*	*316*	*328*	*385*
Limiting Illness	9.9	12.3	17.0	21.0	15.5	8.1	5.6	14.6
Unweighted base	*12,186*	*386*	*635*	*275*	*246*	*315*	*328*	*385*
Obesity								
Overweight	25.4	27.9	30.2	33.6	31.4	36.3	18.4	22.6
Obese	15.1	10.4	19.2	15.8	21.4	26.0	10.9	14.7
Unweighted base	*10,304*	*327*	*486*	*194*	*193*	*221*	*285*	*334*
Diagnosed Depression	30.0	16.6	24.4	15.0	30.9	10.3	18.1	19.0
Unweighted base	*12,149*	*388*	*667*	*288*	*247*	*320*	*325*	*395*
Kessler Distress Score								
Medium (4-12)	27.0	30.9	41.3	35.5	34.3	29.4	30.6	35.9
High Distress (>13)	2.9	[5.5]	6.8	[4.2]	[3.9]	[5.7]	[1.5]	[4.9]
Unweighted base	*11,702*	*297*	*347*	*108*	*208*	*177*	*291*	*267*

Notes: [ ] =cases <20

6.2.2.2 Fathers

Inequalities in paternal health were broadly similar to the maternal patterns. Proportions reporting fair/poor self rated general health were highest in Pakistani and Bangladeshi groups, and was approximately double the proportion observed in Whites. The lowest prevalence was observed in the Other White group. This patterning was very similar for limiting illness, although the cell sizes for this particular outcome were rather small. For example, only nine Black Caribbean or any Other White fathers reported a limiting illness so care must be taken in the interpretation of these proportions.

The ethnic patterning of obesity and overweight differed markedly to general health and limiting illness. Indian fathers were the most likely to be obese of all groups with the Other White, Black African and Black Caribbean fathers the most likely of all groups to be overweight. By contrast the Bangladeshi group were the least likely to be either overweight or obese.

Other White and White fathers experienced the most diagnosed depression, closely followed by Pakistani. The Indian group had the largest proportion with the highest level of psychological distress. However, Pakistani, and to a lesser extent Bangladeshi and Other groups, were the most likely to report any degree of distress overall. Black African experienced the lowest distress scores, as well as having relatively low rates of diagnosed depression compared to other groups.

The greatest divergence between maternal and paternal health patterns tended not to be ethnic group specific however. In terms of absolute levels of observed outcomes, mothers reported higher levels of fair/poor general health and limiting illness, but were less likely than fathers to be overweight or obese. Interestingly there were large differences between distress scores and doctor diagnosed depression by gender. The distribution of raised distress scores was similar between parents of each ethnic group. However, mothers reported considerably higher rates of doctor diagnosed depression than fathers.

Table 6.6: Weighted distribution of selected health outcomes for fathers (weighted column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health	9.9	12.3	17.0	21.0	[15.5]	[8.1]	[5.6]	14.6
Unweighted base	*8,140*	*297*	*437*	*190*	*99*	*144*	*210*	*287*
Limiting Illness	11.5	10.5	15.2	13.1	[9.0]	[8.8]	[5.1]	9.9
Unweighted base	*8,135*	*297*	*437*	*189*	*99*	*143*	*210*	*287*
Obese/Overweight								
Overweight	47.6	40.8	42.2	35.8	49.1	44.6	50.3	43.6
Obese	18.1	21.2	14.4	[7.2]	[19.9]	20.8	20.6	13.5
Unweighted base	*7,865*	*289*	*404*	*169*	*90*	*131*	*202*	*267*
Depression								
Dr Diagnosed	13.3	6.4	10.3	[6.4]	[3.3]	[5.4]	13.5	11.0
Unweighted base	*8,749*	*332*	*521*	*222*	*115*	*171*	*232*	*315*
Kessler Distress Score								
Medium (4-12)	28.1	32.2	42.6	40.5	38.1	26.8	33.2	39.2
High Distress (>13)	1.9	[5.2]	[3.4]	[3.0]	[a]	[1.7]	[1.7]	[4.2]
Unweighted base	*7,841*	*248*	*254*	*79*	*91*	*105*	*192*	*229*

Notes: [ ] =cases <20
[a] no data

6.2.2.3 Child

The Pakistani group reported the highest levels of fair/poor general health, with all other groups reporting less fair/poor health than Whites, with exception to Other White. Limiting illness was most common in Black Caribbean (7.4%), Bangladeshi (7.1%) and Pakistani (6.8%) although the small cell sizes means these findings ought to be interpreted with care. Bangladeshi children experienced the highest obesity rates specifically. However, Black African and Black Caribbean children were considerably more likely than all other groups to be a combination of overweight or obese. Indian, Pakistani, Other White and Other ethnic minority groups had relatively lower rates of being overweight/obese than White. Almost one quarter (22.5%) of Black Caribbean children reported as ever having problems with asthma which was a notable departure from the relatively consistent rate of approximately 10-15% observed for all other groups.

There are broad similarities between parent and child health outcomes. The major exception to this finding was the high obesity rate observed for Bangladeshi children. This contrasts with the observation that Bangladeshi mothers have comparable rates to White, and fathers being the least likely of all groups to be obese. These observations may be due to the small cell sizes for obesity specifically, as using the combined overweight/obese variable produced a more consistent patterning of inequalities between parent and child in all other groups.

Table 6.7: Weighted distribution of selected health outcomes for children (column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health	3.5	4.9	9.0	6.4	6.6	3.1	2.9	4.3
Unweighted base	*11,666*	*424*	*689*	*296*	*354*	*369*	*522*	*471*
Limiting Illness	5.6	3.7	6.8	7.1	7.4	[5.8]	6.5	6.1
Unweighted base	*11,661*	*424*	*688*	*296*	*354*	*368*	*522*	*471*
Obese/Overweight								
Overweight	15.6	11.4	11.6	9.8	15.4	21.3	13.3	12.2
Obese	5.1	4.6	6.4	11.4	11.1	10.2	3.4	5.6
Unweighted base	*11,546*	*421*	*684*	*287*	*340*	*362*	*515*	*461*
Asthma	14.2	12.7	14.9	15.2	22.4	10.0	13.7	14.8
Unweighted base	*11,622*	*422*	*688*	*296*	*352*	*369*	*521*	*471*

Notes: [ ] =cases <20

Table 6.8 shows clear ethnic group differences in levels of child cognitive development by age 5. The Pakistani and Bangladeshi children score lower than all other ethnic groups on all three test scores. Lower scores compared to White are also observed for pattern construction and picture similarity tests in Black Caribbean and Black African. These lower test scores are in contrast to the Other and White Other groups who demonstrate comparable scores to White for all three tests, with exception to vocabulary score, which is slightly lower than White. The patterning of these test scores is associated with the previous observations in Table 6.7 that the children of Pakistani, Bangladeshi and Black Caribbean in particular are experiencing the greatest health disadvantage. Whereas the previously documented health outcomes suggest poorer health today, test scores such as these indicate that existing inequalities are likely to persist beyond childhood.

Table 6.8: Mean child cognitive development T scores by ethnic group (s.e = standard error)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Mean Picture Similarity Score	55.7	55.8	52.6	52.7	55.5	55.4	56.6	56.9
s.e	(0.19)	(0.59	(0.66)	(1.02)	(0.72)	(0.46)	(0.53)	(0.71)
Unweighted base	*11,532*	*418*	*680*	*288*	*341*	*359*	*511*	*458*
Mean Pattern Construction Score	51.2	51.0	46.5	46.4	47.7	47.1	51.7	51.7
s.e	(0.20)	(0.65)	(0.54)	(0.77)	(0.62)	(0.75)	(0.52)	(0.53)
Unweighted base	*11,493*	*418*	*681*	*286*	*339*	*359*	*509*	*454*
Mean Vocabulary Score	56.3	52.0	42.4	41.0	51.8	47.1	55.4	51.8
s.e	(0.19)	(0.82)	(0.85)	(0.72)	(0.70)	(0.85)	(0.55)	(0.89)
Unweighted base	*11,540*	*418*	*683*	*286*	*339*	*358*	*513*	*458*

6.3 Socioeconomic Factors

6.3.1 Descriptive Analysis of the Socioeconomic Profile of the Health Survey for England

The weighted distributions of selected socioeconomic indicators in the Health Survey for England are shown in Table 6.9. Chinese and Indian groups had the most advantaged distributions in terms of social class and highest qualification achieved. However, these factors are not associated with income levels which were most favourable in Irish and the White majority. The Bangladeshi group experience the greatest socioeconomic disadvantage for all indicators. Only 16.5% occupy the highest social class, whereas 53.4% of households possess overseas or no qualifications, and 46.9% are in the lowest income quintile. High levels of disadvantage were also observed in the Pakistani group.

Table 6.9: Distribution of socioeconomic factors by ethnicity (weighted column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Social Class								
i & ii	31.8	35.5	22.9	16.5	28.3	34.7	34.6	42.8
iii NM/M	43.8	37.0	47.2	47.7	43.9	35.8	40.6	39.3
iv & v	24.5	27.5	29.9	35.9	27.9	29.6	24.8	17.9
Unweighted base	*27,467*	*2,104*	*1,363*	*1,080*	*2,158*	*642*	*2,307*	*1,167*
Highest Qualification								
NVQ level 5/4	14.1	28.8	15.3	9.8	12.8	27.1	16.3	29.2
NVQ level 3	21.9	20.0	17.3	15.4	26.6	30.4	24.1	25.6
NVQ level 2/1	29.7	21.3	21.5	21.4	28.4	19.6	26.7	16.9
Overseas /None	34.3	29.9	45.9	53.4	32.2	22.9	32.9	28.4
Unweighted base	*28,545*	*2,451*	*2,190*	*1,971*	*2,338*	*846*	*2,392*	*1,380*
Equivalised Income								
5 – High	17.4	13.0	5.5	1.0	11.2	13.5	21.4	16.9
4	18.6	11.5	4.5	2.8	12.6	12.1	17.9	10.0
3	18.1	14.1	9.5	3.8	14.9	14.3	16.3	10.7
2	17.0	17.2	20.8	15.2	16.5	14.6	15.5	15.9
1 – Low	14.7	18.6	32.2	46.9	25.6	25.6	14.4	17.5
Missing/refused	14.1	25.7	27.6	30.2	19.1	20.0	14.6	29.1
Unweighted base	*28,576*	*2,467*	*2,204*	*1,985*	*2,362*	*859*	*2,398*	*1,385*

6.3.2 Descriptive Analysis of the Socioeconomic Profile of MCS

The distributions of selected family socioeconomic characteristics by ethnic group are shown in Table 6.10. The Pakistani and Bangladeshi families were the most disadvantaged, and were half as likely as White to be in the highest NS-SEC category, whereas Indian and Other White families were the most likely of all groups to occupy this advantaged category. The patterning of NS-SEC inequalities was similar for the highest educational qualification in the family; Other White had 29.6% qualified to NVQ level 5, contrasting sharply with Bangladeshi families with 7.9%. Other White and Indian families had the greatest proportion earning in excess of £55,000 per year and experienced the most favourable income distribution which was consistent with their relatively advantageous profiles of NS-SEC and the highest qualification attained. Just over one quarter of Bangladeshi families occupied the lowest income bracket earning less than £11,000 with the Pakistani families having a similarly disadvantaged income distribution. There was a clear association between families having missing income data and belonging to an ethnic group with a disadvantaged income distribution.

Patterns of family employment structures corresponded to patterns of family NS-SEC, highest qualification and family income. Over half of all Indian, White, Other White families (which also tended to be socioeconomically advantaged), had both parents in employment. This rate was approximately three times that of the more socially disadvantaged Pakistani and Bangladeshi groups. 44.1% of Black Caribbean families were headed by a lone parent mother, along with 38.0% in Black African families. This was in contrast to all other groups, and the particularly the low rate of 4.7% for Bangladeshi families. The high Black Caribbean lone parenthood rate corresponds with a low proportion of families with both parents in employment, whereas for Bangladeshi, the high likelihood of having a two parent family was instead associated with the increased likelihood of having one parent employed and one unemployed. There was also a strong implied association between the high rates of lone parenthood and having missing data on the partner. This suggests that for the Indian, Pakistani and Bangladeshi groups in particular, many respondents classed as unemployed with missing partner data were in two parent families. For Black Caribbean and Black African, many in this unemployed with missing partner group contributed to the high rates of lone parenthood.

Table 6.10: Distribution of family socioeconomic characteristics by child ethnicity (weighted column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC								
Managerial/Professional	55.0	56.6	23.8	25.4	47.4	44.5	74.1	53.9
Intermediate	13.1	13.1	9.6	7.3	17.2	12.4	7.6	8.2
Small/Self Employ	6.0	8.6	22.2	12.1	3.9	7.1	4.8	10.3
Low Supervise/Technical	8.1	5.2	10.1	9.2	6.9	8.0	4.5	5.7
Semi Routine/Routine	17.9	16.5	34.3	46.0	24.7	28.0	9.0	22.0
Unweighted base	*11,236*	*405*	*620*	*251*	*314*	*271*	*500*	*436*
Family's Highest Qualification								
NVQ level 5/4	49.2	64.2	28.4	20.8	43.4	51.3	69.1	59.3
NVQ level 3	16.1	11.3	12.8	12.9	15.7	9.3	9.5	12.7
NVQ level 2/1	29.1	14.0	28.9	30.8	30.4	14.0	13.8	13.6
None/ Overseas	5.6	10.4	29.9	35.5	10.5	25.3	7.5	14.4
Unweighted base	*11,700*	*424*	*705*	*300*	*355*	*372*	*522*	*471*
Family Income (£)								
55,000+	11.2	14.3	3.2	1.3	5.4	6.6	23.0	12.7
33,000-55,000	25.1	21.9	4.6	6.3	16.3	18.1	26.2	20.1
22,000-33,000	24.2	16.7	11.1	11.9	16.5	18.8	17.6	18.3
11,000-22,000	24.5	22.3	39.5	33.7	31.0	25.2	19.1	25.4
<11,000	7.3	7.6	20.7	25.7	15.2	15.8	4.3	11.8
Don't Know/Refuse	7.8	17.3	21.0	21.1	15.6	15.5	9.9	11.7
Unweighted base	*11,667*	*424*	*691*	*297*	*354*	*369*	*522*	*472*
Family Employment Status								
Both Employed	45.9	43.5	6.8	9.4	25.7	20.7	48.2	33.3
Unemployed/ Employed	22.6	31.0	47.8	45.2	13.0	14.5	24.4	30.4
Both Unemployed	4.3	3.1	11.8	13.4	3.4	11.0	3.8	7.2
One Parent Employed ǂ	12.7	9.9	6.1	7.4	23.2	14.8	11.9	10.8
One Parent Unemployed ǂǂ	14.5	12.5	27.5	24.8	34.8	39.0	11.7	18.3
Unweighted n	*11,697*	*423*	*703*	*299*	*354*	*372*	*521*	*471*
Lone Parenthood	16.3	7.8	13.0	4.7	44.1	38.0	10.8	18.4
Unweighted base	*11,610*	*423*	*700*	*298*	*348*	*370*	*520*	*468*

Notes: ǂ One parent is employed with missing data on partner; ǂǂ one parent is unemployed with missing data on partner; lone parenthood is for mothers only

Over three quarters of Black Caribbean families received more than one benefit, with slightly lower rates observed for Bangladeshi, Pakistani and Black African families (Table 6.11). Indian and Other White families had the smallest proportions claiming more than one benefit. Therefore Black Caribbean families were almost twice as likely as Indian families to receive more than one benefit. Patterns of receiving free school meals were broadly similar, except that Black African families were the most likely to receive free school meals, closely followed by Black Caribbean. Indian and Other White were the least likely to receive free school meals.

Table 6.11: Distribution of selected benefits by child ethnicity (weighted column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Benefit Receipts								
No Benefits	3.7	6.6	10.3	9.8	3.4	9.0	5.3	9.2
Child Benefit Only	35.5	51.2	26.2	23.8	20.3	27.9	46.9	41.4
>1 Benefit	60.8	42.2	63.5	66.4	76.3	63.1	47.9	49.4
Unweighted base	*11,488*	*413*	*673*	*293*	*348*	*356*	*515*	*462*
School Meals	25.6	15.8	35.0	38.8	43.2	48.0	15.8	29.7
Unweighted base	*5,274*	*183*	*406*	*194*	*234*	*290*	*227*	*242*

Family living conditions are described by ethnic group in Table 6.12. The patterning of housing tenure was inconsistent with the patterns of disadvantage observed across other socioeconomic markers. With the exception of Indian and Other White families, who were most likely to be owner-occupiers, all groups were more likely to rent accommodation than White, with rates highest in Black Caribbean and Black African families. The relatively high proportion of Pakistani home owners (69.9%) was noteworthy given their relative socioeconomic disadvantage described using other indicators. Bangladeshi families experienced the greatest proportion of overcrowding and any problems with damp, with relatively high rates of both observed for Pakistani and Black African groups. White and Other White groups lived in the least overcrowded housing, and White and Indian families were the least likely to experience damp.

Table 6.12: Distribution of selected socioeconomic indicators of family living conditions by child ethnicity (weighted column percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Owner-occupier	70.4	79.9	69.9	50.9	40.8	31.0	77.6	62.4
Unweighted base	*11,657*	*424*	*684*	*296*	*353*	*368*	*522*	*471*
Overcrowding	6.0	12.7	28.8	42.1	12.5	28.5	5.9	14.8
Unweighted base	*11,657*	*424*	*686*	*296*	*353*	*368*	*522*	*471*
Household Damp	11.7	8.2	16.4	25.6	13.4	18.7	14.6	15.8
Unweighted base	*11,655*	*424*	*686*	*296*	*353*	*368*	*522*	*470*

Notes: Housing tenure based on outright ownership (owner occupier) versus tenancy; damp is based on any reported damp versus no damp; overcrowding is >1 person per room.

6.4 Health Related Behaviours

6.4.1 Health Related Behaviours in the Health Survey for England

The distribution of health related behaviours in each ethnic group is shown in Table 6.13. Stratification by sex highlights markedly different trends across ethnic groups. Bangladeshi males were more likely to currently smoke than any other group. By contrast, the current smoking rates for Bangladeshi women were the lowest of all groups. Similar dichotomies were observed for Pakistani women who were five time less likely to smoke, Indian women were four times, and Black African and Chinese women were approximately half as likely to smoke as men. Smoking rates were highest, for both sexes, for White, Irish and Black Caribbean. Sex differences were not as large for current drinking. Again, the White, Irish and Black Caribbean experienced the highest rates for men and women, whereas Pakistani and Bangladeshi men and women tended to abstain from drinking.

The Bangladeshi and Pakistani groups were also similar to one another in terms of physical activity, and, along with Indian and Chinese, they were the most likely to have low levels of activity. Black African, Black Caribbean, Irish and White all had comparably low rates of low physical exercise.

The Chinese group ate most healthily on a weekly basis overall, having the lowest proportion of individuals eating both fruit and vegetables less than once per week, but for all other groups the patterns of consumption were mixed. The Bangladeshi group were the most likely to eat fruit less than once per week. Small differences were observed between all other groups, with exception to Chinese who were considerably less likely to consume fruit. Black African and Black Caribbean groups had the greatest proportion eating less than one portion per week of vegetables. The level of salt intake between groups varied to a much greater extent than fruit and vegetables consumption. Salt intake was highest in Indian, Pakistani and Bangladeshi individuals, who were almost twice as likely as White and Irish groups to add salt during cooking, and were the most likely ethnic minority groups to add salt after tasting. However, the White group experienced the highest dietary fat score and were roughly three times more likely to experience a high dietary derived fat score than Indian and Black African and Chinese group, and twice as likely than Black Caribbean people.

Therefore it was apparent that the patterning of health behaviours was highly variable *within* ethnic minority groups, particularly in the case of dietary factors. Variation in behaviours also existed *between* ethnic groups, exemplified by the large differentials in rates of any drinking. However, the between-group variations in behaviours tended to cluster certain ethnic groups together; the Irish and the White majority group had similar patterns of health behaviours to one another, as did Pakistani and Bangladeshi groups. As was outlined above, the behavioural profiles of these two clusters of ethnic groups were the most distinct from one another.

Table 6.13: Weighted distribution of selected health behaviours by ethnic group (column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Current Smoker - Male	27.5	21.1	27.3	41.6	28.9	20.3	34.5	19.4
Unweighted base	*12,748*	*1,166*	*1,026*	*915*	*938*	*378*	*1,030*	*640*
Current Smoker - Female	26.7	5.5	4.9	1.8	24.2	9.8	29.3	8.2
Unweighted base	*15,731*	*1,280*	*1,132*	*1,002*	*1,376*	*456*	*1,359*	*730*
Alcohol intake - Male	79.2	46.3	6.0	1.6	61.6	38.0	79.4	44.4
Unweighted base	*12,705*	*1,146*	*1,015*	*907*	*932*	*369*	*1,024*	*628*
Alcohol intake - Female	63.9	18.9	2.2	0.6	48.2	25.6	66.4	30.7
Unweighted base	*15,638*	*1,261*	*1,126*	*989*	*1,348*	*447*	*1,341*	*711*
Physical exercise freq								
Low	36.7	44.8	49.2	60.6	36.7	39.5	34.8	44.9
Medium	32.8	29.5	29.6	21.5	30.1	28.8	33.6	32.9
High	30.5	25.7	21.2	17.8	33.2	31.7	31.5	22.2
Unweighted base	*28,526*	*2,458*	*2,198*	*1,978*	*2,343*	*853*	*2,396*	*1,384*
Fruit consumption								
< 1 portion/week	19.7	19.0	16.6	24.9	17.8	19.0	19.5	12.6
Unweighted base	*28,574*	*2,115*	*1,730*	*1,462*	*1,937*	*857*	*2,100*	*1,169*
Vegetable consumption								
<1 portion/week	17.7	14.5	23.3	20.1	24.0	29.5	21.0	12.4
Unweighted base	*28,572*	*2,116*	*1,729*	*1,463*	*1,941*	*859*	*2,098*	*1,171*
Salt added during cooking								
Yes	51.7	91.1	90.0	91.7	73.3	79.8	50.5	83.7
no,	40.4	4.0	3.5	2.7	17.7	9.3	39.9	9.2
Use lo-salt	8.0	4.9	6.5	5.6	9.0	10.9	9.6	7.0
Unweighted base	*10,523*	*1,610*	*1,227*	*888*	*1,400*	*369*	*1,662*	*817*
Salt added at table								
Add salt without tasting	25.5	10.3	13.2	13.9	8.6	8.9	22.6	8.0
Taste then add salt	11.2	15.8	19.0	18.6	12.1	15.4	17.1	14.2
Taste then occasionally add salt	20.3	29.2	25.2	27.7	20.6	30.7	22.6	29.5
Rarely/Never add salt	42.9	44.7	42.6	39.8	58.7	45.0	37.7	48.3
Unweighted base	*25,496*	*1,606*	*1,221*	*884*	*1,401*	*369*	*1,672*	*817*
Derived fat score								
Low	61.6	84.1	74.9	71.5	77.5	84.5	67.2	79.3
Medium	25.9	11.7	17.2	19.3	15.9	11.9	23.7	17.1
High	12.5	4.1	7.9	9.2	6.6	3.7	9.1	3.6
Unweighted base	*22,946*	*1,286*	*914*	*521*	*1,056*	*331*	*1,443*	*594*
Derived Diet Score								
>3 (poor diet)	23.3	17.2	23.1	26.9	18.3	21.9	20.7	11.6
Unweighted base	*9,983*	*1,271*	*904*	*518*	*1,047*	*331*	*1,429*	*591*

6.4.2 Health Related Behaviours in the MCS

6.4.2.1 Mothers

Health behavioural data from the MCS observed the same patterning for smoking and drinking behaviours for mothers and fathers as observed in the HSE analysis. However, the MCS contains additional outcomes for mothers which are the focus of Table 6.14.

Black Caribbean and White groups were considerably more likely to smoke during pregnancy than all other groups. Whites had the greatest proportion of mothers who had never initiated breastfeeding with the lowest rates observed in Black African, Other and Bangladeshi groups. However, the White group had the lowest proportion of mothers who did not complete the child's MMR regimen, with comparable rates for Indian, Other and White Other. The lowest completion rate was seen in Black Caribbean, although this proportion still results in a relatively high level of completion (81.5%).

6.4.2.2 Child

The patterning of child health behaviours Table 6.14 demonstrates a much greater consistency in the overall quality of behaviours within each ethnic group, and reveals a striking dichotomy between the groups with the healthiest and least healthy behavioural profiles. Bangladeshi children had the greatest proportion of those who did not snack on fruit and vegetables between meals, who snacked on crisps and sweets, ate fewer than three portions of fruit per day, ate at irregular intervals and, along with Black African, under half exercised less than once per week. The Bangladeshi group contrasted sharply with the Other White group of children who consistently displayed the healthiest behaviours for all indicators assessed. Therefore, where adult behavioural profiles tended to be mixed, the child behavioural profiles are more consistent within each ethnic group.

Table 6.14: Distribution of maternal and child health behaviours by ethnic group (column percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Smoked in Pregnancy	35.8	6.8	4.8	[2.3]	47.7	[9.5]	27.1	20.2
Unweighted base	*11,878*	*364*	*635*	*269*	*230*	*285*	*319*	*362*
Never Breastfed	31.3	13.6	22.9	8.9	10.6	5.5	10.3	6.6
Unweighted base	*11,886*	*362*	*632*	*268*	*230*	*285*	*319*	*362*
Incomplete MMR	7.5	7.8	10.5	16.4	18.6	15.3	8.0	9.7
Unweighted base	*11,004*	*365*	*582*	*258*	*225*	*299*	*288*	*365*
Skips breakfast	6.9	7.6	13.3	11.0	10.6	13.6	3.7	8.7
Unweighted base	*11,661*	*424*	*687*	*295*	*354*	*369*	*522*	*469*
Fruit & vegetables as main snack	43.5	40.4	32.4	24.3	44.5	34.4	52.3	43.1
Unweighted base	*9,981*	*369*	*588*	*231*	*306*	*307*	*452*	*390*
Crisps & sweets as main snack	21.8	23.3	42.6	46.7	28.2	25.8	12.7	22.2
Unweighted base	*9,981*	*369*	*588*	*231*	*306*	*307*	*452*	*390*
>3 Portions fruit/day	55.9	42.5	29.9	22.0	45.4	40.6	63.6	48.5
Unweighted base	*11,661*	*424*	*684*	*296*	*353*	*367*	*521*	*470*
Irregular eating	5.7	6.6	12.4	19.2	11.9	18.2	2.8	8.7
Unweighted base	*11,668*	*424*	*688*	*296*	*354*	*370*	*522*	*471*
Exercises >once/wk	71.1	60.5	49.4	47.5	60.8	46.5	71.4	62.2
Unweighted base	*11,668*	*424*	*690*	*296*	*354*	*370*	*522*	*471*
Irregular eating	5.7	6.6	12.4	19.2	11.9	18.2	2.8	8.7
Unweighted base	*11,668*	*424*	*688*	*296*	*354*	*370*	*522*	*471*
Poor Diet Score	18.3	23.0	40.1	51.1	26.2	30.9	8.9	21.9
Unweighted base	*9,976*	*369*	*586*	*231*	*305*	*305*	*452*	*389*

Notes: [ ] =cases <20

6.5 Conclusions

This introduction to the data intended to describe the demographic profile of the sample selected for further analysis, to confirm that ethnic health inequalities are measurable, and to quantify the extent of socioeconomic and health behavioural differences between each ethnic group.

Demographic Profiles

There were clear differences in the demographic composition of the two datasets which may have a direct influence upon the patterning of health, and exposure to risk factors. The main differences concern the age structures of the two samples, as well as how representative each sample is to the whole population. First, the age distribution of the two generations of the HSE is wide and non-overlapping, with the second generation being significantly younger than the first. This means that the older first generation are likely to have been exposed to the UK environment at a different point in time to the younger second generation. This is in contrast to the MCS which is comprised of respondents of similar ages who are more likely to have lived in the same time periods as one another. These similar age structures suggest that period effects are likely to be largely eliminated within the MCS, but may still exist within the HSE.

Second, the HSE is a nationally representative sample of adults aged over 16 and is easily generalised to the whole population. However, the MCS is a representative sample of parents with young children born between 2000 and 2001. Therefore the sample is self-selecting adults of similar ages capable of child-bearing, and is not nationally representative of all adults. The implications of this demographic selection may be important as adults are selected on a range of social, economic and behavioural factors associated with having a family.

An important similarity between the samples is that adult informants are relatively young, particularly in the second generation, and unlikely to show significant age related effects on health. Investigating markers of future health, as well as current trends in morbidity, represents the most appropriate means of generating health profiles of each ethnic group with these data.

Health Profiles

These preliminary analyses have confirmed that health inequalities are observable in both of the selected samples, and where the same outcomes are observed, patterns of ill health are consistent across datasets. Rates of adult fair/poor self rated health and limiting illness are highest in Bangladeshi, Pakistani and Black Caribbean in both the HSE and the MCS, and lowest in the White group.

One difference between the datasets is not in the patterning of inequalities, but in the absolute levels of poor health. For instance, self rated general health and limiting illness is significantly higher in the HSE than the MCS. The reasons for this can only be speculated about, although it could be attributed to the self-selection of the MCS sample discussed previously, where adults are fit and healthy enough to start a family. Alternatively, the MCS sample may report better health as a direct consequence of being younger or because the young are more likely to self-report their health more favourably. However, these unknowns do not represent a major difficulty for further analyses as both dataset samples are not directly compared to one another; instead the focus will be on the relative differences between two generations of the same dataset.

Socioeconomic Profiles

The descriptive analyses also identified socioeconomic differences between ethnic groups, and that patterning of these inequalities was, as for health outcomes, comparable between each dataset. The most advantaged group were the White in both datasets, followed by Irish in the HSE, and Other White in the MCS (who were primarily composed of Irish). The Bangladeshi and Pakistani groups were the most disadvantaged. Socioeconomic inequalities documented here were also consistent with the wider literature. This suggests that the data is suitable for examining the extent to which ethnic minority health is determined by socioeconomic circumstances.

There are noteworthy differences between datasets in the measurement of the socioeconomic profiles of each ethnic group, although this did not affect the patterning of disadvantage. The HSE measured social class using the RGSC, whereas the MCS used the NS-SEC. The detail of these two classifications has been outlined previously, but the consistent patterning of the distribution of social class inequalities across the range of ethnic groups suggests that the hierarchical categorisations used for each system here are comparable to one another. The measurement of family income also varied, with the MCS using banded family incomes, whereas the HSE used quintiles of equivalised household income. Yet both methodologies produced comparable patterning of income inequalities. This suggests that different socioeconomic indicators employed here appear to capture the same patterns of disadvantage, and that valid comparisons between the datasets are possible.

The MCS also contained additional detail on family composition and circumstances, such as parental employment, benefit receipts and living conditions. These factors are particularly relevant to the health and development of the young child cohort member and provide additional information on the social circumstances of the child's early life environment.

Health Behavioural Profiles

Finally, there were clearly observable differences between the health behaviours of ethnic groups, which were, again, consistent across both datasets. The White majority tend to be either the healthiest or least healthy group; this is an interesting observation for two reasons. First, it suggests that the White group is a useful baseline group against which all other groups can be easily compared. While it is not a prerequisite that the baseline group need be the healthiest or unhealthiest in terms of behaviour, this observation can make the comparison of behaviours relative to White simpler to interpret. All other ethnic groups will have either healthier or less healthy behaviours than White for a given behaviour. Second, that the White group, in both datasets, commonly had the highest rates of either healthy or unhealthy behaviours neatly demonstrates that the behavioural profile of each ethnic group is complex and health behaviours are not uniformly healthy or otherwise within each group.

It should be noted that these generalisations about which group is 'healthiest' should be made with caution as it is apparent that groups tended not be all 'unhealthy' or 'healthy' across all behaviours; one unhealthy behaviour is not necessarily predictive of another. An example of this is the relationship between high smoking rates in Bangladeshi men and negligible levels of alcohol drinking, a pattern observed in both datasets.

The aim at this point is to confirm that ethnic inequalities in health outcomes are observable in a sample which has been prepared specifically for generational analyses, and it would appear that this is so. Therefore it is appropriate to continue with the use of these data to investigate whether these trends are persistent over generations.

Chapter 7:

Intergenerational Continuities in Health Outcomes

7 Intergenerational Continuities in Health Outcome

7.1 Aim

The previous chapter described the differences in health outcomes, socioeconomic factors and health behaviours across ethnic minority groups in the 1998, 1999, 2003 & 2004 Health Survey for England (HSE) and the third sweep of the Millennium Cohort Study (MCS). This chapter will explore these trends in more detail and investigate ethnic differences in health across generations. The later chapters will then investigate whether socioeconomic and health behavioural factors have a role to play in the intergenerational patterning of health described here.

Therefore the following chapter will address Objective 1:

- **Examine the extent to which ethnic inequalities in health persist across generations, and how far this varies between groups**

7.2 Methods

Two generations of ethnic groups will be used in cross sectional analysis. The construction of these generational cohorts and the selected health outcomes were described in Chapter 4 (for the HSE) and Chapter 5 (for the MCS). This analysis examines differences in health between these generations in two distinct ways.

1. Directly comparing the odds of ill health in the second generation with the first.
2. Comparing each generation of ethnic minority group to a White reference population.

The first stage of analysis uses survey weighted logistic regression to estimate the odds of poor health in the second generation compared to the first across a range of binary health outcomes. Two sample t-tests are used to test for significant differences between the mean cognitive development scores of children in each generation. For the HSE analysis, estimates are adjusted for age and sex. The MCS adjusts for age only and examines mothers, fathers and children independently. This step quantifies the difference across generations *within* each ethnic minority groups. Differences across generations of the White group are also explored.

The second stage of analysis compares the standardised risk of poor health in the first and second generations respectively, to a White reference group. The MCS contained a small minority of foreign born Whites who were subsequently excluded from the White reference group. This part of the analysis describes whether ethnic minority health is:

i. Converging towards the White majority reference population,
ii. Diverging from the majority,
iii. Persistent over generations.

These two approaches therefore complement one another; the first describes the magnitude of the difference within groups, whereas the latter approach suggests whether these differences are shifting the ethnic minority health profile towards or away from the White reference. Together, these two analyses will indicate whether health inequalities described in the previous chapter (section 6.2) are influenced by the effects of generation. Factors mediating these changes will be explored in later chapters.

It is important to remember that all UK born ethnic minority mothers within the MCS and HSE samples are termed “second generation”, although these groups are likely to contain a small number of third generation or greater.

7.3 Intergenerational Continuities in Health Inequalities: Second Generation Compared to First

7.3.1 The Health Survey for England

The data in Table 7.1 estimates the extent of generational difference across a range of health outcomes by comparing the chances of poor health in the second generation with the first, controlling for age and sex. There were no statistically significant differences in the prevalence of fair/poor general health or diagnosed hypertension across generations in any ethnic minority group. However, the higher risk of limiting illness in the second generation Black African group was statistically significant. Obesity prevalence provides stronger evidence of intergenerational changes in health taking place. The majority of ethnic minority groups were more likely to be obese in the second generation than the first and this was significant in Indian, Pakistani, Bangladeshi and Chinese. The Irish and Black African groups were less likely to be obese over generation, but this was not significant.

Table 7.2 estimates the extent of generational differences in biomarker concentrations that place an individual at an increased-risk of cardiovascular disease. With exception to the Pakistani group, there were no significant differences between generations in the likelihood of having raised total cholesterol, LDL cholesterol or C-reactive protein, or having low levels of HDL cholesterol. However, the Pakistani group had a significantly greater risk of having raised LDL cholesterol levels, but had a conversely lower risk of having hazardously low levels of HDL cholesterol. Although it was not significant, there was a consistent reduction in the risk of low HDL cholesterol in the second generation of all groups. Overall, these data provide weak evidence for intergenerational shifts in the concentrations of biomarkers of cardiovascular disease.

Table 7.1: Age and sex adjusted odds (95% CI) for poor health outcome in the second generation compared to the first

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Fair/Poor General Health	1.05 *(0.78-1.42)*	0.99 *(0.74-1.32)*	0.81 *(0.59-1.11)*	0.98 *(0.69-1.37)*	1.23 *(0.69-2.19)*	0.85 *(0.66-1.10)*	1.12 *(0.72-1.75)*
Limiting Illness	1.18 *(0.83-1.68)*	0.84 *(0.62-1.14)*	0.89 *(0.61-1.30)*	0.92 *(0.63-1.34)*	2.54 *(1.32-4.91)**	1.10 *(0.84-1.43)*	1.54 *(0.87-2.76)*
Obese	1.71 *(1.18-2.49)**	1.44 *(1.00-2.06)**	2.36 *(1.20-4.67)**	1.37 *(0.88-2.14)*	0.72 *(0.31-1.68)*	0.81 *(0.60-1.10)*	4.29 *(1.86-9.90)**
Diagnosed Hypertension	0.87 *(0.54-1.40)*	1.10 *(0.57-2.11)*	2.10 *(0.83-5.32)*	1.02 *(0.62-1.68)*	0.87 *(0.18-4.20)*	0.98 *(0.67-1.42)*	1.00 *(0.34-2.89)*

Notes: * = p<0.05

Table 7.2: Age and sex adjusted odds (95% CI) of having biomarker concentrations at risk of cardiovascular disease in the second generation compared to the first

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Total Cholesterol (>5 mmol/l)	1.24 *(0.88-1.75)*	0.80 *(0.54-1.19)*	1.25 *(0.71-2.21)*	1.15 *(0.71-1.86)*	1.12 *(0.46-2.71)*	1.40 *(0.99-2.00)*	0.86 *(0.47-1.57)*
HDL Cholesterol (<1 mmol/l)	0.74 *(0.46-1.20)*	0.54 *(0.34-0.86)**	0.98 *(0.55-1.75)*	0.62 *(0.30-1.31)*	0.95 *(0.31-2.95)*	0.65 *(0.41-1.06)*	0.73 *(0.28-1.85)*
LDL Cholesterol (>3 mmol/l)	0.86 *(0.53-1.38)*	1.98 *(1.03-3.80)**	0.79 *(0.23-2.79)*	1.34 *(0.67-2.69)*	0.78 *(0.23-2.59)*	1.24 *(0.82-1.88)*	0.71 *(0.29-1.71)*
C-Reactive Protein (>3mg/l)	1.34 *(0.91-1.97)*	1.15 *(0.73-1.84)*	0.80 *(0.38-1.70)*	1.15 *(0.68-1.93)*	1.46 *(0.51-4.14)*	0.88 *(0.61-1.26)*	1.75 *(0.70-4.37)*

Notes: * = p<0.05

7.3.2 The Millennium Cohort Study

7.3.2.1 Mother

Maternal health outcomes were stratified by generational status and are shown in Table 7.3. Second generation Black African mothers were significantly less likely to report fair/poor general health than first generation after adjusting for age. For all other groups there were no statistically significant differences between generations in the rates of fair/poor self rated health, having any long term illness, or in the likelihood of being overweight/obese in any ethnic group.

With exception to Indian mothers, all groups experienced more diagnosed depression in the second generation than in the first, although this was significant in Pakistani and Black Caribbean mothers only. There were no significant differences across generations in any group in having a raised distress score.

7.3.2.2 Father

Intergenerational trends in age adjusted paternal health are described in Table 7.4. Second generation White and Pakistani fathers were significantly more likely to report more diagnosed depression than their first generation counterparts. Second generation Bangladeshi fathers were significantly more likely to have a raised distress score than the first generation, but the small sample size of the second generation and the resulting wide confidence intervals means this observation should be viewed cautiously. There were no other significant differences between generations in the prevalence of fair/poor general health, limiting illness or being overweight/obese.

7.3.2.3 Child

Intergenerational trends in selected child health outcomes are shown in Table 7.5. Bangladeshi, Pakistani and Other White children with second generation mothers were at greater risk of fair/poor general health than children of first generation mothers but did not reach statistical significance. However, Black Caribbean children were significantly more likely to have experienced any problems with asthma if their mothers were second generation. For all other ethnic groups, there were no significant intergenerational differences in health.

Generational differentials in child cognitive development are shown in Table 7.6. The children of second generation Whites showed a significant decline in the picture similarity score compared to their counterparts with first generation mothers. All other ethnic minority groups showed no significant generational differences. Indian and Black African children with second generation mothers were significantly more likely to score higher than children with first generation mothers for the pattern construction test, whereas the mean score of the White children of the second generation appeared to be significantly lower relative to the first. Lastly, the mean vocabulary scores were significantly higher in children with second generation mothers compared to first generation, for all ethnic minority groups except Bangladeshi. White children with second generation mothers again showed a generational decline in mean score. Overall, Indian children generally showed the largest increases in cognitive development scores by generation, whereas Bangladeshi children showed no significant differences on any measures. The White children of first generation mothers were the highest scoring for all three measures but showed a consistent reduction in all mean test scores with generation.

Table 7.3: Age adjusted odds (95% CI) of second generation mothers having fair/poor general health; limiting illness; being overweight/obese; having doctor diagnosed depression; and having raised levels of distress compared to first generation mothers

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health	1.02 *(0.65-1.61)*	1.66 *(0.75-3.71)*	1.03 *(0.59-1.82)*	1.55 *(0.57-4.24)*	1.09 *(0.41-2.92)*	0.18 *(0.06-0.59)**	1.11 *(0.44-2.82)*	1.06 *(0.48-2.36)*
Limiting Illness	0.79 *(0.54-1.16)*	0.83 *(0.27-2.55)*	0.68 *(0.37-1.23)*	0.68 *(0.16-2.86)*	3.18 *(0.86-11.75)*	0.31 *(0.08-1.28)*	0.93 *(0.32-2.69)*	0.53 *(0.19-1.44)*
Obese/Overweight	1.41 *(0.95-2.08)*	1.13 *(0.59-2.14)*	0.90 *(0.54-1.51)*	1.03 *(0.33-3.18)*	0.98 *(0.38-2.55)*	0.83 *(0.30-2.30)*	1.39 *(0.74-2.62)*	0.92 *(0.44-1.94)*
Diagnosed Depression	1.05 *(0.76-1.46)*	0.88 *(0.37-2.10)*	2.33 *(1.30-4.20)**	1.57 *(0.63-3.91)*	3.07 *(1.20-7.85)**	1.25 *(0.44-3.60)*	1.23 *(0.57-2.69)*	1.55 *(0.71-3.41)*
Raised Distress Score	1.07 *(0.77-1.50)*	1.05 *(0.56-1.97)*	0.89 *(0.51-1.56)*	1.07 *(0.40-2.86)*	1.88 *(0.82-4.27)*	1.03 *(0.53-1.98)*	0.88 *(0.43-1.79)*	0.39 *(0.18-0.81)**

Notes: * = p<0.05

Table 7.4: Age adjusted odds (95% CI) of second generation fathers having fair/poor general health; limiting illness; being overweight/obese; having doctor diagnosed depression; and having raised levels of distress compared to first generation fathers

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health	1.83 *(0.80-4.21)*	1.00 (0.37-2.69)	1.11 (0.56-2.19)	[a]	[a]	1.27 (0.24-6.59)	2.72(0.64-11.49)	0.36 (0.12-1.07)
Limiting Illness	1.50 *(0.72-3.10)*	1.10 (0.39-3.08)	0.81 (0.42-1.58)	[a]	1.19 (0.21-6.79)	1.03 (0.21-5.10)	1.85 (0.36-9.40)	1.75 (0.57-5.33)
Obese/Overweight	1.07 *(0.72-1.61)*	1.12 (0.60-2.11)	2.13 (0.92-4.90)	[a]	0.90 (0.21-3.82)	1.94 (0.70-5.35)	1.29 (0.62-2.65)	0.87 (0.38-1.98)
Diagnosed Depression	1.88 *(1.02-3.46)**	1.12 (0.41-3.11)	1.00 (0.44-2.31)	[a]	0.30 (0.03-2.73)	0.12 (0.01-1.40)	0.97 (0.39-2.44)	0.89 (0.30-2.64)
Raised Distress Score	1.03 *(0.64-1.65)*	0.70 (0.31-1.56)	0.49 (0.24-1.00)	[a]	1.43 (0.29-6.98)	0.73 (0.25-2.10)	0.98 (0.50-1.93)	0.78 (0.31-1.99)

Notes: * = p<0.05; [a] = no data

Table 7.5: Odds (95% CI) of children with second generation mothers having fair/poor general health; limiting illness; being overweight/obese and having any asthma compared to children of first generation mothers, adjusted for maternal age

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health	0.85 *(0.38-1.94)*	0.74 *(0.24-2.27)*	1.90 *(0.82-4.41)*	1.87 *(0.63-5.57)*	0.62 *(0.14-2.75)*	0.22 *(0.03-1.33)*	2.40 *(0.65-8.87)*	0.55 *(0.20-1.51)*
Limiting Illness	1.09 *(0.48-2.52)*	1.05 *(0.19-5.75)*	0.54 *(0.24-1.21)*	0.79 *(0.06-11.16)*	1.12 *(0.19-6.62)*	4.18 *(0.35-50.12)*	0.54 *(0.20-1.47)*	0.92 (0.30-2.85)
Obese/Overweight	1.17 *(0.82-1.67)*	1.09 *(0.45-2.63)*	0.88 *(0.52-1.49)*	0.99 *(0.36-2.67)*	0.49 *(0.23-1.04)*	1.42 *(0.77-2.63)*	0.93 *(0.57-1.51)*	0.81 *(0.43-1.51)*
Asthma Problems	1.38 *(0.86-2.23)*	1.38 *(0.59-3.21)*	1.39 *(0.75-2.57)*	3.06 *(0.64-14.70)*	3.81 *(1.10-13.15)**	1.68 *(0.76-3.72)*	1.26 *(0.77-2.07)*	1.18 *(0.65-2.12)*

Notes: * = p<0.05: adjusted for child age and sex and maternal age.

Table 7.6: Mean cognitive development scores for children by child's ethnicity and maternal generation (SE=Standard Error of the mean)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Mean Picture Similarity Score								
1st Generation	57.6	55.0	52.7	53.0	54.2	53.8	57.1	57.3
(SE)	*(0.77)*	*(1.05)*	*(0.69)*	*(1.19)*	*(2.09)*	*(0.83)*	*(0.63)*	*(0.97)*
2nd Generation	55.8	56.4	52.7	52.2	55.8	56.1	56.2	56.4
(SE)	*(0.19)*	*(0.81)*	*(0.77)*	*(1.47)*	*(0.83)*	*(1.05)*	*(0.81)*	*(1.09)*
p	**0.01***	**0.44**	**0.51**	**0.62**	**0.71**	**0.24**	**0.22**	**0.49**
Mean Pattern Construction Score								
1st Generation	53.6	49.2	46.4	46.6	45.0	45.7	52.5	52.0
(SE)	*(0.80)*	*(0.83)*	*(0.60)*	*(0.85)*	*(1.89)*	*(1.09)*	*(0.79)*	*(0.64)*
2nd Generation	51.3	52.8	46.5	48.0	48.4	49.0	51.3	51.1
(SE)	*(0.21)*	*(0.84)*	*(0.79)*	*(1.11)*	*(0.80)*	*(1.27)*	*(0.62)*	*(0.87)*
p	**0.01***	**0.008***	**0.48**	**0.65**	**0.26**	**0.005***	**0.34**	**0.91**
Mean Vocabulary Score								
1st Generation	58.0	50.0	40.9	40.8	48.3	43.9	53.7	48.7
(SE)	*(0.78)*	*(0.97)*	*(0.95)*	*(0.76)*	*(2.22)*	*(1.10)*	*(0.86)*	*(1.24)*
2nd Generation	56.5	54.0	45.3	42.2	52.7	52.1	57.3	55.4
(SE)	*(0.19)*	*(1.05)*	*(1.27)*	*(1.39)*	*(0.73)*	*(1.16)*	*(0.70)*	*(1.13)*
p	**0.03***	**<0.001***	**<0.001***	**0.11**	**0.05***	**<0.001***	**<0.001***	**<0.001***

Notes: **p* = unpaired t-test for the difference between the means of each generation; adjusted for child sex and maternal age

7.4 Intergenerational Continuities in Health Inequalities Compared to a White Reference Group

The previous analysis identified those groups experiencing the greatest differences between generations. However, it could not tell us the direction of these changes relative to the White population. The following analysis will describe whether the health profiles of ethnic minority groups are converging towards or diverging from the health profile of the White majority by comparing the first and second generations independently to a White reference group.

7.4.1 The Health Survey for England

The age and sex adjusted risk of a poor health outcome in ethnic minority groups compared to Whites is estimated for each generation in Table 7.7. The Indian, Pakistani, Bangladeshi and Black Caribbean groups all reported a significantly higher prevalence of fair/poor self rated health than Whites in both generations; there were no significant differences between the White group and Black African, Irish and Chinese people. However, with exception to Black African and Chinese groups, the excess risk of fair/poor general health decreased over generation in all groups and this shift was significant for Pakistani and Bangladeshi groups.

The risk of having a limiting illness was significantly higher in the first generation Pakistani and Bangladeshi groups than in Whites. However, a statistically significant reduction in risk meant that rates of limiting illness in the second generation were comparable to Whites. Importantly, this risk reduction was statistically significant. By contrast, there was a significantly lower risk of limiting illness in first generation Indian, Black African and Chinese compared to the White groups. This advantage was also observed in second generation Indian and Chinese groups, whereas the risk for Black African people was comparable with Whites. Black Caribbean and Irish groups showed no significant differences to White people in either generation.

Regarding obesity, both generations of the Black Caribbean group were more likely than Whites to be obese, contrasting with both generations of Chinese people who were less likely. Pakistani and Black African groups were significantly more likely to be obese than the White group in the first generation, but not the second. The opposite effect was observed in Indian and Bangladeshi, who were significantly less likely to be obese in the first generation, but not the second. The high risk of obesity of Black Caribbean people mirrored the significantly greater risk of hypertension also across both generations. However, no other ethnic minority group demonstrated any significant differences in hypertension relative to Whites, in either generation.

A summary measure was derived to describe the overall direction of the change in health profile between generations. This compares the risks of poor health relative to the White group in each generation, and describes whether the risk is shifting towards the White group, or away from it. For example, the risk of limiting illness in the Pakistani first generation is 1.49 (95% 1.24-1.78), but this shifts towards 1.0 in the second generation, to 0.98 (95%CI 0.79-1.22). When this relationship was examined across all groups and for all outcomes, the risk of ill health approximated towards the White group in 24 out of 28 comparisons. However, these are rough estimates based on largely non-significant findings. Nevertheless, such a persistent trend may be reflective of the health profile of ethnic minorities becoming more similar to the White group over generation.

Table 7.8 describes the age and sex adjusted risks of having concentrations of blood biomarkers predictive of cardiovascular disease in each generation of ethnic minority group. All first generation ethnic groups were less likely than Whites to have total cholesterol concentrations above 5mmol/l, but this was only significant for Irish, Chinese and Black Caribbean. This lower risk persisted for the Black Caribbean second generation, whereas all other groups did not significantly differ from Whites.

The first generation of Indian, Pakistani and Bangladeshi people were all significantly more likely than the White group to experience harmfully low levels of HDL cholesterol. This was replicated for second generation Pakistani and Bangladeshi groups, but not for Indian. For all other ethnic minority groups, there were no significant differences in either generation compared to Whites. However, there was a consistent but non-significant reduction in the risk of having a low HDL cholesterol concentration across generations for all groups.

The risk of the first generation having harmful LDL cholesterol concentrations (above 3mmol/l) was statistically significantly lower in Pakistani, Black Caribbean, Chinese and Irish groups than in Whites. The second generation Chinese and Black Caribbean groups also experienced significantly lower risks. All other groups were not significantly different to Whites in the second generation.

Lastly, first generation Pakistani and Bangladeshi groups had significantly greater risks of having high levels of CRP (>3mg/l) relative to Whites, whereas the Chinese group experienced a significantly lower risk. These trends were consistent across generations of Chinese and Pakistani groups. However, Bangladeshi and all the other ethnic minority groups were not significantly different to Whites in the second generation.

Overall, the table shows that 20 out of 28 intergenerational comparisons described a shift in the risk of poor health towards the White group, although the majority of observations did not reach significance.

Table 7.7: Age and sex adjusted odds (95% CI) of poor health outcome compared to a White reference group, by generation

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Fair/Poor General Health							
1st Generation	1.44 *(1.20-1.72)**	2.16 *(1.83-2.55)**	2.95 *(2.50-3.49)**	1.57 *(1.19-2.06)**	0.89 *(0.64-1.24)*	1.19 *(0.97-1.45)*	0.95 *(0.74-1.22)*
2nd Generation	1.28 *(1.04-1.58)**	1.42 *(1.17-1.71)**	1.42 *(1.15-1.76)**	1.42 *(1.20-1.69)**	0.93 *(0.59-1.47)*	1.00 *(0.86-1.17)*	0.89 *(0.65-1.23)*
Limiting Illness							
1st Generation	0.75 *(0.60-0.94)**	1.49 *(1.24-1.78)**	1.56 *(1.29-1.90)**	1.14 *(0.84-1.54)*	0.44 *(0.29-0.68)**	0.93 *(0.75-1.16)*	0.39 *(0.27-0.56)**
2nd Generation	0.77 *(0.61-0.99)**	0.98 *(0.79-1.22)*	0.84 *(0.65-1.09)*	1.06 *(0.88-1.28)*	0.97 *(0.59-1.60)*	1.09 *(0.93-1.27)*	0.49 *(0.33-0.74)**
Obese							
1st Generation	0.73 *(0.58-0.92)**	1.21 *(1.00-1.47)**	0.63 *(0.44-0.89)**	1.49 *(1.09-2.03)**	1.75 *(1.29-2.38)**	0.78 *(0.61-1.00)*	0.15 *(0.09-0.26)**
2nd Generation	1.03 *(0.82-1.31)*	1.05 *(0.85-1.32)*	0.79 *(0.53-1.16)**	1.52 *(1.26-1.82)**	1.40 *(0.85-2.31)*	0.89 *(0.74-1.07)*	0.45 *(0.30-0.68)**
Diagnosed Hypertension							
1st Generation	1.21 *(0.94-1.56)*	0.87 *(0.60-1.25)*	0.88 *(0.55-1.40)*	1.70 *(1.21-2.41)**	1.45 *(0.78-2.68)*	1.08 *(0.81-1.45)*	0.76 *(0.47-1.24)*
2nd Generation	0.98 *(0.67-1.43)*	0.94 *(0.62-1.43)*	1.12 *(0.54-2.31)*	1.54 *(1.14-2.06)**	1.07 *(0.33-3.44)*	1.02 *(0.82-1.26)*	0.68 *(0.34-1.37)*

Notes:* = p<0.05 compared to White reference

Table 7.8: Age and sex adjusted odds (95% CI) for being in an at-risk group for biomarkers of cardiovascular disease compared to a White reference group, by generation

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Total Cholesterol (>5 mmol/l)							
1st Generation	0.80 *(0.65-1.00)*	0.84 *(0.64-1.10)*	0.93 *(0.68-1.25)*	0.54 *(0.37-0.80)**	0.74 *(0.44-1.23)*	0.53 *(0.39-0.73)**	0.67 *(0.47-0.96)**
2nd Generation	0.98 *(0.78-1.24)*	0.79 *(0.61-1.02)*	0.91 *(0.63-1.34)*	0.61 *(0.50-0.76)**	1.22 *(0.55-2.67)*	0.88 *(0.73-1.07)*	0.80 *(0.55-1.16)*
HDL Cholesterol (<1 mmol/l)							
1st Generation	1.71 *(1.29-2.27)**	3.48 *(2.65-4.58)**	4.20 *(3.01-5.86)**	0.96 *(0.52-1.75)*	1.24 *(0.56-2.72)*	1.13 *(0.77-1.66)*	0.94 *(0.56-1.57)*
2nd Generation	1.16 *(0.84-1.60)*	1.77 *(1.32-2.38)**	3.07 *(2.03-4.65)**	0.69 *(0.46-1.02)*	1.04 *(0.30-3.59)*	0.85 *(0.65-1.12)*	0.64 *(0.34-1.21)*
LDL Cholesterol (>3 mmol/l)							
1st Generation	0.80 *(0.55-1.16)*	0.61 *(0.39-0.96)**	1.27 *(0.66-2.48)*	0.56 *(0.32-0.98)**	0.66 *(0.33-1.34)*	0.55 *(0.35-0.86)**	0.40 *(0.24-0.66)**
2nd Generation	0.68 *(0.44-1.07)*	0.82 *(0.46-1.47)*	0.84 *(0.32-2.21)*	0.63 *(0.42-0.94)**	0.41 *(0.15-1.10)*	0.74 *(0.53-1.03)*	0.34 *(0.17-0.69)**
C-Reactive Protein (>3 mg/l)							
1st Generation	1.13 *(0.88-1.45)*	1.57 *(1.18-2.08)**	1.46 *(1.01-2.13)**	0.87 *(0.58-1.32)*	0.85 *(0.46-1.55)*	1.21 *(0.90-1.63)*	0.34 *(0.20-0.60)**
2nd Generation	1.24 *(0.94-1.63)*	1.39 *(1.03-1.88)**	1.31 *(0.81-2.14)*	0.94 *(0.72-1.23)*	1.26 *(0.48-3.31)*	1.13 *(0.92-1.39)*	0.45 *(0.23-0.85)**

Notes:* = p<0.05 compared to White reference

7.4.2 The Millennium Cohort Study

7.4.2.1 Mothers

The likelihood of reporting fair/poor general health compared to White in each generation is shown in Table 7.9. Only the first generation Pakistani and Bangladeshi mothers reported significantly more fair/poor self rated health than the White group. Black Caribbean mothers were the only second generation group to report significantly more fair/poor general health than Whites, contrasting to their comparable risk to White in the first generation.

There were no significant differences in the risk of having a limiting illness compared to White in either generation of ethnic minority mothers. However, with the exception of Black Caribbean, the second generation mothers appeared to have a lower risk compared to White of having a limiting illness.

First generation Pakistani, Bangladeshi and Black African mothers were significantly more likely than White to be overweight/obese. However, only second generation Black Caribbean mothers were more likely to be overweight/obese. This implies a reduction in obesity/overweight in Pakistani, Bangladeshi and Black African mothers over generation, but an increased risk compared to White for Black Caribbean mothers.

Overall, the risk of poor health over generations shifted towards the risk in the White group in 14 out of 21 comparisons.

Table 7.9: Age adjusted odds (95% CI) of maternal fair/poor general health; limiting illness and being overweight/obese compared to the White reference, by generation

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health							
1st Generation	0.93	1.57	1.62	1.90	1.19	0.60	1.23
95% CI	*(0.54-1.60)*	*(1.20-2.06)**	*(1.08-2.44)**	*(0.75-4.82)*	*(0.72-1.95)*	*(0.35-1.03)*	*(0.82-1.83)*
2nd Generation	1.54	1.52	1.52	1.84	0.22	0.69	1.29
95% CI	*(0.94-2.52)*	*(0.96-2.41)*	*(0.93-2.50)*	*(1.25-2.70)**	*(0.08-0.61)*	*(0.29-1.65)*	*(0.66-2.50)*
Limiting Illness							
1st Generation	0.87	1.02	1.02	0.51	0.79	0.93	0.96
95% CI	*(0.46-1.62)*	*(0.70-1.49)*	*(0.58-1.81)*	*(0.16-1.69)*	*(0.50-1.26)*	*(0.55-1.57)*	*(0.60-1.52)*
2nd Generation	0.66	0.68	0.59	1.37	0.25	0.87	0.47
95% CI	*(0.30-1.46)*	*(0.42-1.10)*	*(0.17-2.04)*	*(0.84-2.25)*	*(0.06-1.02)*	*(0.36-2.10)*	*(0.21-1.07)*
Overweight/Obesity							
1st Generation mother	0.86	1.48	1.53	2.22	2.51	0.51	0.89
95% CI	*(0.58-1.28)*	*(1.12-1.97)**	*(1.02-2.29)**	*(0.97-5.08)*	*(1.75-3.59)**	*(0.35-0.74)*	*(0.66-1.22)*
2nd Generation mother	0.90	1.28	1.20	1.63	2.14	0.72	0.79
95% CI	*(0.60-1.36)*	*(0.86-1.91)*	*(0.48-3.00)*	*(1.06-2.50)**	*(0.83-5.52)*	*(0.42-1.21)*	*(0.42-1.47)*

Notes: * = p<0.05

Generational differences compared to White in the mental health of mothers are described in Table 7.10. All first generation groups were significantly less likely to be diagnosed with depression than the White group. Only the Indian, Black African and Other White groups experienced this advantage in the second generation. For all other second generation groups there was no significant difference to Whites. The significant differences across generations of Pakistani mothers was noted in earlier analysis directly comparing second with first generation (Table 7.3), whereas this analysis informs of the direction of this change relative to Whites.

Pakistani mothers in both generations were more likely than the White group to experience a raised distress score. The first generation Other group were also at greater risk than Whites, but this was not significant for the second generation. There were no significant generational differences in any other groups. The results suggest that Pakistani mothers in particular experience higher rates of depression and distress than all other groups, and that this risk appears to increase with generation. The risk of poor mental health approximated to the rates in the White group in 11 out of 14 generational comparisons, implying intergenerational convergence in depression and psychological distress in mothers.

Table 7.10: Age adjusted odds (95% CI) of maternal mental health compared to the White reference, by maternal generation

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Diagnosed Depression							
1st Generation	0.51	0.55	0.40	0.41	0.22	0.45	0.47
95% CI	*(0.30-0.86)**	*(0.39-0.76)**	*(0.25-0.65)**	*(0.17-0.99)**	*(0.12-0.41)**	*(0.29-0.71)**	*(0.33-0.68)**
2nd Generation	0.42	1.24	0.67	1.14	0.28	0.56	0.71
95% CI	*(0.23-0.78*)*	*(0.81-1.90)*	*(0.33-1.37)*	*(0.71-1.83)*	*(0.11-0.74)**	*(0.32-0.99)**	*(0.37-1.37)*
Raised Distress Score							
1st Generation	1.38	2.47	1.30	0.75	1.21	1.05	1.97
95% CI	*(0.90-2.11)*	*(1.57-3.90)**	*(0.72-2.35)*	*(0.28-2.00)*	*(0.69-2.13)*	*(0.73-1.50)*	*(1.47-2.64)**
2nd Generation	1.43	2.17	1.36	1.50	1.27	0.92	0.81
95% CI	*(0.90-2.25)*	*(1.48-3.18)**	*(0.69-2.68)*	*(0.97-2.30)*	*(0.73-2.23)*	*(0.52-1.64)*	*(0.43-1.51)*

Notes: *p = <0.05

7.4.2.2 Fathers

First generation Pakistani and Bangladeshi fathers were at a significantly greater risk of fair/poor general health than Whites, and, as was the case for mothers, this risk was not significant for the second generation. However, the sample size of the Bangladeshi second generation was small, so the large but insignificant odds ratio should be interpreted with care. No other ethnic minority group differed significantly to Whites in either generation.

Only the first generation Pakistani fathers were significantly more likely than Whites to have a limiting illness. Again, this was not significant in the second generation. There were no other significant differences between ethnic minorities and Whites in either generation in the risk of having a limiting illness.

Patterns of being overweight/obesity contrasted sharply with to mothers. Pakistani and Bangladeshi fathers, and additionally the Other group, were significantly less likely than Whites to be overweight/obese, and these differences were non-significant in the second generation. No significant differences, compared to White, were observed in any other group in either generation. 14 out of 21 comparisons of general and physical health suggest a general shift in the health profile towards the White group.

Table 7.11: Age adjusted odds (95% CI) of paternal fair/poor general health; limiting illness and being overweight/obese compared to the White reference, by generation

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health							
1st Generation	1.46	1.91	2.22	0.18	0.63	0.37	1.69
95% CI	*(0.79-2.70)*	*(1.23-2.96)**	*(1.31-3.78)**	*(0.03-1.25)*	*(0.30-1.31)*	*(0.12-1.14)*	*(1.04-2.72)*
2nd Generation	1.10	1.92	5.01	1.79	0.71	1.16	0.59
95% CI	*(0.52-2.32)*	*(1.09-3.37)*	*(1.49-16.83)*	*(0.90-3.55)*	*(0.21-2.42)*	*(0.56-2.40)*	*(0.22-1.62)*
Limiting Illness							
1st Generation	1.13	1.45	0.76	0.99	0.59	0.25	0.66
95% CI	*(0.64-2.01)*	*(1.00-2.12)**	*(0.32-1.79)*	*(0.17-5.59)*	*(0.29-1.18)*	*(0.07-0.86)*	*(0.35-1.23)*
2nd Generation	0.94	1.22	2.53	0.83	0.57	0.56	1.11
95% CI	*(0.50-1.80)*	*(0.69-2.16)*	*(0.53-12.15)*	*(0.27-2.58)*	*(0.16-2.01)*	*(0.21-1.52)*	*(0.42-2.91)*
Overweight/Obesity							
1st Generation	0.75	0.54	0.31	2.07	0.73	1.22	0.68
95% CI	*(0.50-1.10)*	*(0.39-0.74)**	*(0.20-0.48)**	*(0.55-7.75)*	*(0.44-1.22)*	*(0.74-2.03)*	*(0.47-0.98)**
2nd Generation	1.12	1.09	1.43	1.09	1.49	1.52	0.60
95% CI	*(0.68-1.87)*	*(0.57-2.07)*	*(0.25-8.35)*	*(0.62-1.91)*	*(0.68-3.28)*	*(0.91-2.55)*	*(0.27-1.32)*

Notes: * = p<0.05

Generational differences in paternal mental health measures are described in Table 7.12. Diagnosed depression was lower in all ethnic minority groups in both generations, with exception to Other White. However, this was only significant for first generation Bangladeshi and for second generation Indian, Black Caribbean and Black African. There were no significant differences in the risk of having a raised distress score between ethnic minority groups and Whites. There were few differences in mental health indicators between generations and it was not possible to detect the general direction of generational change relative to the White group. Only 5 out of 12 comparisons between each generation of ethnic group showed convergence towards the risk of poor mental health in the White reference.

Table 7.12: Age adjusted odds (95% CI) of paternal depression compared to the White reference, by maternal generation

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Diagnosed Depression							
1st Generation	0.47	0.80	0.30	0.40	0.63	1.00	0.77
95% CI	*(0.22-1.00)*	*(0.49-1.29)*	*(0.11-0.83)**	*(0.05-3.11)*	*(0.25-1.60)*	*(0.56-1.79)*	*(0.46-1.29)*
2nd Generation	0.41	0.63	[a]	0.16	0.08	1.04	0.67
95% CI	*(0.17-0.99)**	*(0.34-1.16)*	[a]	*(0.04-0.58)**	*(0.01-0.61)**	*(0.45-2.42)*	*(0.26-1.76)*
Raised Distress Score							
1st Generation	1.53	3.14	0.85	1.04	1.08	1.36	1.82
95% CI	*(0.82-2.86)*	*(1.88-5.25)*	*(0.32-2.28)*	*(0.31-3.51)*	*(0.54-2.14)*	*(0.92-2.02)*	*(1.21-2.73)*
2nd Generation	0.97	1.31	4.62	1.47	0.79	1.33	1.42
95% CI	*(0.63-1.51)*	*(0.72-2.36)*	*(1.29-16.59)*	*(0.77-2.80)*	*(0.37-1.69)*	*(0.80-2.21)*	*(0.65-3.13)*

Notes: *p = <0.05; [a] = no data

7.4.2.3 Child

Table 7.13 describes the risk of having fair/poor general health, a limiting illness, being overweight/obese and reporting any problems with asthma in children of first and second generation ethnic minority mothers. Children of the second generation Black Caribbean, Pakistani and Bangladeshi mothers were more likely to be reported as being in fair/poor general health than Whites, whereas there was no significant difference for children with first generation mothers. This represents a worsening in reported general health in Pakistani, Bangladeshi and Black Caribbean children with generation.

The Pakistani children of first generation mothers were more likely to be reported as having a limiting illness than Whites. This risk was comparable to Whites for children with second generation mothers. There were no other significant differences in the risk of limiting illness between Whites and ethnic minority groups in either generation. Children of second generation mothers showed a non-significant but consistent reduction in the risk of limiting illness compared to the first generation's children. The one exception was for the Black African group which was comprised of notably small cell sizes.

Children of first generation Black Caribbean mothers experienced the greatest risk of being overweight/obese compared to White, but the significance of this risk diminished with generation. The opposite effect was observed in Black African children; obesity/overweight increased with maternal generation and the children of the second generation were significantly more likely than White to be overweight/obese.

Lastly, Black African children with first generation mothers were less likely than White people to experience asthma, although this risk approximated towards the White group with generation. Black Caribbean children with second generation mothers were at a significantly greater risk of asthma than White children. This implies an increase in the risk of childhood asthma in Black Caribbean children across generations and corresponds to the significant generational increase observed within ethnic minority groups (Table 7.5).

Overall, 18 out of 28 comparisons between the children of first and second generation mothers showed a convergence in the risk towards the risk within the White reference, and this trend was most prominent for the increasing risk of asthma.

Table 7.13: Odds (95% CI) of child fair/poor general health; limiting illness; being overweight/obese compared to the White reference, by maternal generation

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/Poor General Health							
1st Generation mother	1.70	1.91	1.44	2.91	1.23	0.52	1.32
95% CI	*(0.78-3.66)*	*(0.96-3.82)*	*(0.83-2.51)*	*(0.67-12.70)*	*(0.37-4.01)*	*(0.17-1.54)*	*(0.76-2.28)*
2nd Generation mother	1.26	3.45	2.48	2.00	0.28	1.24	0.73
95% CI	*(0.63-2.52)*	*(2.26-5.26)**	*(1.08-5.72)**	*(1.11-3.58)**	*(0.07-1.15)*	*(0.59-2.59)*	*(0.31-1.72)*
Limiting Illness							
1st Generation mother	0.79	2.85	1.55	0.99	2.76	1.37	1.25
95% CI	*(0.29-2.20)*	*(1.89-4.31)**	*(0.48-5.01)*	*(0.19-5.32)*	*(0.64-11.96)*	*(0.69-2.72)*	*(0.59-2.66)*
2nd Generation mother	0.71	1.53	0.91	0.85	3.75	0.75	1.16
95% CI	*(0.21-2.32)*	*(0.82-2.88)*	*(0.15-5.47)*	*(0.48-1.52)*	*(0.54-26.08)*	*(0.35-1.59)*	*(0.48-2.78)*
Overweight/Obesity							
1st Generation mother	0.68	0.90	0.92	2.69	1.45	0.84	0.94
95% CI	*(0.42-1.10)*	*(0.64-1.27)*	*(0.61-1.40)*	*(1.29-5.64)**	*(0.94-2.23)*	*(0.58-1.21)*	*(0.66-1.35)*
2nd Generation mother	0.77	0.78	0.87	1.29	2.01	0.78	0.77
95% CI	*(0.42-1.39)*	*(0.56-1.10)*	*(0.36-2.11)*	*(0.96-1.73)*	*(1.30-3.09)**	*(0.56-1.09)*	*(0.48-1.24)*
Any Asthma							
1st Generation mother	0.66	0.86	0.82	0.43	0.52	0.91	0.90
95% CI	(0.41-1.07)	(0.59-1.25)	(0.49-1.39)	(0.13-1.39)	(0.36-0.75)*	(0.58-1.43)	(0.60-1.33)
2nd Generation mother	1.00	1.20	1.84	1.94	0.88	1.13	1.07
95% CI	(0.53-1.86)	(0.81-1.78)	(0.50-6.78)	(1.34-2.81)*	(0.42-1.85)	(0.78-1.64)	(0.67-1.72)

Notes: * = $p<0.05$; adjusted for child age and sex and maternal age

Child cognitive development test scores are shown in Table 7.14. The values show the mean difference in the score between each ethnic group and the White reference. A positive value suggests that the ethnic minority group scored higher than the White reference; a negative value means the ethnic minority score was lower. The Pakistani, Bangladeshi and Black African children of the first generation of mothers were significantly more likely to have lower picture similarity test scores than Whites. This effect persisted between generations of Pakistani children, but no significant differences were observed for any other groups. Pattern construction test scores revealed slightly more generational differences between Whites and ethnic minorities. In children with first generation mothers, all but the Other White and Other group had significantly lower test scores than Whites. These significant differences were also observed in the children of second generation Pakistani and Black Caribbean mothers, with no significant differences observed for the other groups. The vocabulary test showed the largest differences between the scores of Whites and ethnic minorities. Without exception, all ethnic minority groups of children with first generation mothers scored significantly lower than the White group. Despite the differences in the scores diminishing in all groups across generation, only children of second generation Other White and the Other mothers had comparable scores to Whites.

Overall, all ethnic minority groups showed an approximation towards the test scores of the White reference group across generations. 21 out of 21 comparisons showed a shift in the cognitive development scores towards the White group across generation. This represents a strong and, in most cases, significant convergence between the scores of the ethnic minority and the White population across generations. Despite the implied narrowing of the gap, these scores clearly describe how Pakistani and Bangladeshi children experience the greatest disadvantages in cognitive development on all three scales. By contrast, the Other White and Other groups were broadly comparable in their scores to Whites in each generation, with exception to the vocabulary score for children with first generation mothers.

Table 7.14: Difference in the mean child cognitive development score for each ethnic minority group compared to the White reference (95% CI)

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Picture Similarity Score							
1st Generation mother	-0.27	-3.65	-3.31	0.06	-1.64	1.69	-0.04
95% CI	*(-1.67, 1.12)*	*(-4.71, -2.58)***	*(-4.72, -1.88)***	*(-2.98, 3.11)*	*(-3.08, -0.21**	*(0.36, 3.02)**	*(-1.36, 1.28)*
2nd Generation mother	0.54	-3.10	-2.24	-0.60	-0.03	0.55	0.72
95% CI	*(-1.02, 2.10)*	*(-4.47, -1.74)***	*(-5.95, 1.46)*	*(-1.91, 0.70)*	*(-2.20, 2.14)*	*(-0.78, 1.89)*	*(-0.90, 2.34)*
Pattern Construction Score							
1st Generation mother	-2.01	-5.04	-3.97	-5.22	-5.39	1.12	-0.19
95% CI	*(-3.38, -0.65)***	*(-6.09, -3.99)***	*(-5.36, -2.58)***	*(-8.24, -2.21)***	*(-6.79, -3.99)***	*(-0.17, 2.42)*	*(-1.47, 1.10)*
2nd Generation mother	0.52	-4.43	-3.17	-3.20	-1.61	0.25	-0.08
95% CI	*(-1.01, 2.05)*	*(-5.77, -3.09)***	*(-6.86, 0.52)*	*(-4.48, -1.92)***	*(-3.74, 0.51)*	*(-1.05, 1.55)*	*(-1.67, 1.52)*
Vocabulary Score							
1st Generation mother	-7.56	-15.93	-15.91	-7.06	-14.22	-3.98	-10.42
95% CI	*(-8.97, -6.16)***	*(-17.00, -14.86)***	*(-17.33, -14.48)***	*(-10.13,-3.98)***	*(-15.66, 12.79)***	*(-5.31,-2.64)***	*(-11.74, -9.06)***
2nd Generation mother	-3.33	-12.55	-12.68	-3.93	-4.18	0.96	-1.35
95% CI	*(-4.89, -1.77)***	*(-13.92, -11.18)***	*(-16.39, -8.98)***	*(-5.23, -2.63)***	*(-6.35, -2.02)***	*(-0.36, 2.29)*	*(-2.97, 0.28)*

Notes: Unpaired t test used to derive mean difference in cognitive development test score between each ethnic minority and the White reference;
Mean test scores for White reference: Picture similarity = 57.46; Pattern Construction = 52.64; Vocabulary score = 57.25
* = p<0.05; ** = p<0.001;

7.5 Conclusions

This chapter estimated the extent of intergenerational differences in health within ethnic minority groups, and described whether the health profiles of each generation were becoming less or more similar to Whites. There were few significant health differences between generations of *adults* within each ethnic group, in both the HSE and MCS. This led to on-going health inequalities when compared to Whites. For example, there were no significant differences between rates of fair/poor general health of the second generation compared to the first across ethnic minority groups in the HSE (Table 7.1). This led to both generations of Indian, Pakistani, Bangladeshi and Black Caribbean groups experiencing on-going disadvantage relative to White (Table 7.7). This implies that health inequalities in the first generation are transmitted to the second.

Nevertheless, the small numbers of generational differences which are significant are broadly supported by the few cross-sectional studies which are published elsewhere. For instance, generational increases in the levels of HDL cholesterol observed in Pakistani respondents in the HSE replicates the findings of a smaller locally-defined cohort of Pakistani women, which also documented favourable generational differences to fasting blood glucose, and mean triglyceride levels (Pollard et al. 2008). The work of Pollard et al (2008) appears to be the only comparison of serum markers of cardiovascular disease across migrants and their descendants. Therefore this study adds considerably to the literature by replicating the findings within Pakistani people, as well as describing the intergenerational differences of the metabolic profiles of an additional six minority groups. Furthermore, HSE observations are consistent with those from the much larger ONS LS Study which also found an increased risk of limiting illness in second generation Black African (Harding & Balarajan 2000) and similarly persistent rates for Black Caribbean and the three South Asian groups.

The risk of poor *child* general and physical health within the MCS was also broadly persistent between generations with the only significant differences being an increased risk of asthma and a decreasing risk of being overweight/obese in Black Caribbean children. Although the confidence intervals for asthma risk were wide, the intergenerational risks are consistent with previous work using this data (Panico et al. 2007). Regarding child overweight/obesity, the decreasing risk across generations observed in the MCS is contrary to literature elsewhere which describes an increased risk for both overweight and obesity in Black Caribbean girls and

White Other boys (Harding et al 2008). Harding et al's work appears to be the only published study investigating generational differences in overweight or obesity. The opposing findings here may result from the MCS children being significantly younger, and overweight and obesity were not assessed independently of one another due to sample size limitations.

Despite the general lack of statistically significant intergenerational differences, there was an overall trend for the risk of poor health in ethnic minorities to converge towards the risk observed in the White reference populations. These patterns were noted in both the HSE and MCS. The one exception appeared to be in fathers' health, where only weak patterning was observed. It should be noted that the sample size for fathers was considerably smaller than for mothers and children affecting the ability to detect generational differences.

The strongest patterns of intergenerational convergence towards Whites were seen in the markers of cognitive development for children in the MCS. 20 out of 21 comparisons between the test scores of each generation of ethnic minority group observed a generational convergence in scores towards Whites. In many cases these shifts were statistically significant. As childhood patterns of cognitive development are predictive of later life health (Hertzman et al. 2001;Whalley & Deary 2001), so these results suggest that the second generation are likely to fare considerably better than their first generation counterparts. However, it is possible that increasing scores over generation are influenced by a cultural bias within the cognitive tests designed for and normed against the White population. For example, the largest intergenerational differences were observed for the vocabulary test scores in groups from non-English speaking countries. These findings provide good evidence of a cultural bias within the tests and are supportive of the BAS authors' own recommendations that learning potentials and life trajectories be assessed in non-Whites using only the 'culturally reduced' non-verbal and non-pictorial scales (Elliott et al 1997). Therefore it is uncertain whether these cognitive indicators are as predictive of later life development for the first generation as they are for the second generation, which is assumed to be more culturally familiar with the measurement instruments.

No specific ethnic groups were more susceptible to generational change than others. This excludes the possibility of focusing on a specific ethnic minority group more detail in the search for aetiological pathways of intergenerational transmission. In any case, such an empirical approach may well prove counter-productive as it may lead to a model of transmission that is not necessarily relevant to any other groups.

There was no clear evidence of positive health selection in either sample. Such a hypothesis would suggest that first generation ethnic minority groups experienced significantly lower rates of poor health than Whites, but such patterns were not clearly observable in either the HSE or the MCS. One possible case of health selection was in first generation mothers in the MCS, who all reported significantly lower risks of diagnosed depression than Whites, which then converged towards the risks associated with the White reference. However, it is possible that these patterns result from generational differences in idioms surrounding perceptions of mental illness. No such pattern was observed for levels of psychological distress which was measured differently using a composite scale.

It was expected that the markedly different life courses experienced by each generation would lead to different health profiles. For instance the first generation experienced critical periods of health and early life development overseas, in widely differing circumstances to those experienced by the second generation born in the UK. So, the overall lack of generational differences across ethnic minority groups is perhaps surprising. One possible explanation for the generational patterning is that health is biologically fixed within ethnic groups and environmental exposures distinct to each generation have a minimal impact in determining health. However, an alternative explanation, and an area which will be explored in more detail in the next two chapters, is that the generational health profiles described here are directly mediated by social factors. So while the health of the second generation appears to be the same as the first, it is possible that the experiences of each group in achieving this health profile may differ across generations. From previously published work it is plausible to assume that, firstly, the effects of socioeconomic mobility over generations are likely to have an influential effect upon health outcome, with differences in material wealth and status usually being associated with the prevalence of poor health. Secondly, the impact of environmental exposure to UK social norms and customs of the majority will have an effect on behavioural norms of the ethnic minority groups, which may then in turn directly affect health. Therefore, both the material and behavioural pathways are likely to have mediating effects in the intergenerational patterning of the inequalities in health observed here. How these pathways vary by generation, and what effect these differences have on the health profiles described, is a matter for investigation in future chapters.

Chapter 8:

Intergenerational Social Mobility and Health

8 Intergenerational Social Mobility and Health

8.1 Aim

The previous chapter explored within-group differences by generation, as well as comparing each generation to the White population. It did not, however, address any causal explanations for the observed patterning of health. This chapter will begin to identify the pathways which explain generational differences in health inequalities by focussing on the well established association between socioeconomic position and health outcome. This relationship implies that improving socioeconomic circumstances over generation is likely to lead an improvement in health status. The following analysis aims to confirm association between socioeconomic circumstances and health and:

- **Establish the direction and extent of intergenerational socioeconomic mobility (Objective 2)**
- **Explore how intergenerational socioeconomic mobility contributes to changes in health inequalities (Objective 3)**

8.2 Methods

Section 2.4.2.1 (page 41) discussed how single measures of socioeconomic circumstances did not adequately measure the social experiences of ethnic minorities. For this reason, multiple indicators of socioeconomic position will be employed throughout this analysis, to describe how social factors are related to, and possibly explain, the patterning of health.

Descriptive analysis

Chapter 6 described the distribution of health and socioeconomic inequalities across ethnic groups. This chapter cross-tabulates these two characteristics, to outline the extent to which poor health is socially patterned. All HSE distributions are age and sex standardised to account for the variation between the age and sex distributions of each ethnic group. For the MCS analysis, the mothers and fathers are adjusted for age. Child analyses are adjusted for age and sex.

Identifying patterns of socioeconomic mobility

The second stage of analysis compares the weighted distributions of selected socioeconomic indicators across generations of each ethnic group in the HSE and MCS. Longitudinal tracking of NS-SEC between sweeps one and two of the MCS explores whether the likelihood of upward mobility varies significantly by generation.

The effect of socioeconomic mobility on health outcome

The final stage of the analysis estimates the degree to which socioeconomic circumstances mediates the intergenerational patterning of health previously described in Chapter 7. All ethnic minority groups are initially combined and logistic regression estimates the odds of having poor health in the second generation compared to the first, adjusting for age, sex, ethnicity and socioeconomic factors. The extent to which the risk of poor health varies before and after adjustment for socioeconomic circumstances represents the relative importance of these factors in mediating generational differences between the health profiles. These models are then run independently for each ethnic group.

Lastly, linear regression modelled the intergenerational shifts in cognitive development score. The regression coefficient represents the magnitude of the change in the child's test score between each generation, adjusted stepwise for maternal age and child sex, and socioeconomic factors. Generational differences were estimated in all groups combined, followed by separate analysis in each ethnic group.

For all analyses, respective sample weights are applied using the STATA *svyset* command, to account for the uneven probabilities of being selected from the population, and to minimise the influence of non-response bias during data collection. Missing data in both surveys may introduce information bias if data is not missing at random. Using the longitudinal MCS it was possible to draw forward data from previous sweeps if it was unlikely to change (e.g. age or immigration status.) For variables such as social class and income an additional 'missing' category was derived to identify ethnic patterning in the data. Although this technique is limited, exploring missing data across ethnic groups and other socioeconomic variables can help identify whether data is missing at random, or is associated with an underlying characteristic.

8.3 Socioeconomic Circumstances and Health Outcome

Preliminary analyses will determine whether the prevalence of poor health is socially patterned. If so, then changing socioeconomic circumstances across generations could lead to health differences. The following descriptive tables use weighted row percentages showing the proportion of respondents who have poor health within each category of socioeconomic indicator.

8.3.1 The Health Survey for England

General Health

Socioeconomic circumstances were strongly associated with the prevalence of fair/poor self rated health. Individuals in the lowest social classes were generally twice as likely to report fair/poor general health as those in highest social class group. There was considerable variation in the proportions reporting fair/poor health according to socioeconomic measure; inequalities were widest when measured across highest qualifications attained and household equivalised income. This variation suggests that being in the highest household income quintile is less likely to lead to fair/poor health than being in the highest social class group. This highlights how different socioeconomic indicators do not capture experiences of poor health in the same ways.

Table 8.1: Socioeconomic distribution fair/poor general health by ethnic group (weighted row percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Social Class								
i & ii	17.1	21.0	22.0	25.8	25.8	14.2	15.5	17.6
iii NM/M	26.0	30.3	24.5	33.3	30.3	17.1	26.5	25.6
iv & v	33.4	41.6	38.4	45.4	47.2	22.4	35.9	30.6
Unweighted base	*27,464*	*2,104*	*1,363*	*1,080*	*2,158*	*642*	*2,307*	*1,167*
Highest Qualification								
NVQ level 5/4	11.6	19.8	17.6	19.6	20.5	11.2	10.9	16.0
NVQ level 3	16.3	18.9	13.0	15.1	22.7	14.8	18.6	12.5
NVQ level 2/1	20.4	28.1	27.2	25.1	26.9	17.2	19.8	21.9
Overseas /None	40.5	51.3	45.8	51.0	53.0	33.9	42.4	38.9
Unweighted base	*28,545*	*2,451*	*2,190*	*1,971*	*2,338*	*846*	*2,392*	*1,380*
Equivalised Income								
5 – High	12.1	20.4	[11.0]	[16.8]	13.7	[7.3]	9.3	9.9
4	15.5	19.8	[14.4]	[14.9]	19.7	[12.7]	15.2	17.0
3	23.4	28.9	28.6	30.8	33.1	15.6	23.7	18.9
2	34.5	38.2	29.8	36.2	43.2	20.3	39.4	32.6
1 – Low	41.1	42.9	39.1	40.5	40.7	28.1	49.6	35.8
Unweighted base	*24,560*	*1,880*	*1,603*	*1,407*	*1,909*	*678*	*2,048*	*990*

Notes: [ ] cases<20

Limiting Illness

The weighted proportions reporting a limiting illness was also strongly associated with socioeconomic circumstances (Table 8.2). The social gradient was prominent for all ethnic groups across social class, highest qualification attained, and across levels of household income quintiles. Again, the inequalities in limiting illness varied considerably according to the socioeconomic indicator, and were greatest across quintiles of household income and smallest for social class.

Table 8.2: Socioeconomic distribution of limiting long term illness by ethnic group (weighted row percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Social Class								
i & ii	21.5	13.6	16.4	18.5	20.9	11.1	20.7	8.4
iii NM/M	26.5	22.1	19.2	21.6	24.8	11.7	25.4	11.3
iv & v	30.2	29.3	30.8	31.9	33.8	13.0	32.7	15.5
Unweighted base	*27,461*	*2,103*	*1,363*	*1,079*	*2,157*	*642*	*2,306*	*1,167*
Highest Qualification								
NVQ level 5/4	16.5	13.7	12.7	11.8	18.2	9.8	18.8	6.6
NVQ level 3	19.6	12.0	10.0	10.8	20.0	10.1	21.0	8.0
NVQ level 2/1	20.8	18.1	19.3	15.3	19.1	10.2	19.9	11.5
Overseas /None	38.4	39.0	35.7	33.4	40.2	22.9	38.2	17.6
Unweighted base	*28,538*	*2,450*	*2,190*	*1,970*	*2,337*	*845*	*2,391*	*1,380*
Equivalised Income								
5 – High	16.1	11.4	14.6	[10.7]	10.6	[7.7]	15.7	6.0
4	17.2	13.5	13.8	[15.6]	20.1	10.7	18.8	11.1
3	24.4	20.1	20.3	[19.8]	21.1	12.8	26.1	7.1
2	33.5	22.5	23.0	19.6	32.1	13.9	36.6	18.0
1 – Low	39.6	33.7	29.4	27.3	35.2	18.2	39.4	19.1
Unweighted base	*28,569*	*2,466*	*2,204*	*1,983*	*2,360*	*858*	*2,397*	*1,385*

Notes: [ ] cases<20

Obesity

The association between socioeconomic factors and obesity was less consistent than that observed for limiting illness and general health. For Black African, Black Caribbean and Chinese groups in particular, those in the social class iii NM/M were the least likely to be obese, suggesting a weak gradient effect. Furthermore, the extent of inequality tended to be narrower across between each socioeconomic marker. No estimation of obesity prevalence was possible for Bangladeshi people in the uppermost income quintile due to a combination of the low overall prevalence of obesity in this group as well as the small number of Bangladeshi people with high incomes.

Table 8.3: Socioeconomic distribution of obesity by ethnicity (weighted row percentages)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Social Class								
i & ii	19.4	13.6	16.7	[3.0]	30.2	28.4	19.4	7.0
iii NM/M	21.7	16.9	16.7	7.3	23.3	21.9	21.1	6.2
iv & v	23.3	19.5	18.2	7.3	34.2	39.2	26.0	7.0
Unweighted base	*24,640*	*1,833*	*1,148*	*825*	*1,729*	*490*	*2,013*	*1,054*
Highest Qualification								
NVQ level 5/4	15.1	11.6	14.9	1.6	25.0	25.5	12.6	5.2
NVQ level 3	19.1	15.8	13.2	7.6	25.3	27.5	18.4	5.3
NVQ level 2/1	20.2	16.4	14.3	10.3	21.9	28.4	26.0	8.0
Overseas /None	26.3	23.1	28.2	12.2	37.0	34.9	26.3	6.9
Unweighted base	*25,550*	*2,126*	*1,840*	*1,499*	*1,858*	*628*	*2,087*	*1,237*
Equivalised Income								
5 – High	17.7	11.4	19.0	[a]	24.7	30.6	16.5	[7.2]
4	20.7	14.6	14.3	[a]	24.9	27.0	24.9	8.8
3	21.5	18.5	21.0	13.0	28.0	29.9	20.0	7.5
2	24.0	17.1	20.9	8.1	31.9	33.9	25.3	4.7
1 – Low	24.0	22.3	21.0	10.6	30.4	28.1	22.3	6.1
Unweighted base	*25,570*	*2,127*	*1,843*	*1,500*	*1,860*	*629*	*2,087*	*1,238*

Notes: [ ] cases<20; [a] = no data

8.3.2 The Millennium Cohort Study

As this section is concerned with the identification of any relationship between socioeconomic factors and health status, for brevity, only maternal and child distributions will be described. Later analyses investigating generational differences will additionally examine fathers.

8.3.2.1 Maternal Health

Self Rated General Health

Table 8.4 shows a gradient effect across NS-SEC with fair/poor health increasing incrementally with rising disadvantage in all ethnic groups except Bangladeshi and Indian. For family's highest qualifications and family income the gradient was weaker, although cell sizes were small which may affect the accuracy of the estimates. Nevertheless, the prevalence of fair/poor general health was generally higher at the most disadvantaged levels, and lower in the advantaged, providing evidence for social patterning in all ethnic groups.

Table 8.4: Distribution of maternal fair/poor general health in each ethnic group, by family socioeconomic factors (weighted row percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC*								
High	7.7	11.6	[16.4]	[18.7]	[16.0]	[9.3]	[6.1]	8.1
Medium	13.4	[18.8]	20.3	[12.6]	[17.3]	[10.5]	[17.0]	[10.9]
Low	21.5	18.3	24.8	19.6	[19.7]	[16.8]	[24.5]	23.7
Unweighted base	*11,618*	*367*	*557*	*231*	*216*	*220*	*315*	*352*
Family's Highest Qualification								
NVQ level 5/4	8.0	14.5	18.6	[15.6]	13.3	[8.0]	[8.1]	8.9
NVQ level 3	13.3	[8.4]	[18.8]	[19.0]	[16.1]	[7.2]	[6.3]	[13.2]
NVQ level 2/1	17.3	[17.0]	18.8	[13.3]	[22.4]	[13.7]	[13.5]	[13.9]
Overseas /None	28.0	[17.5]	25.4	27.2	[25.7]	[25.2]	[28.3]	[28.7]
Unweighted base	*12,186*	*386*	*636*	*275*	*246*	*315*	*328*	*384*
Family Income								
55,000+	5.2	[18.5]	[17.6]	[a]	[2.2]	[a]	[2.8]	[12.8]
33,000-55,000	6.8	[5.8]	[17.8]	[21.4]	[24.1]	[5.8]	[5.9]	[4.3]
22,000-33,000	11.8	[12.1]	[17.5]	[10.8]	[9.8]	[13.4]	[8.4]	[10.0]
11,000-22,000	19.5	[9.5]	22.5	[15.4]	[21.9]	[19.4]	[27.7]	[17.0]
<11,000	22.9	[27.7]	23.3	[27.3]	[25.5]	[17.2]	[12.2]	20.4
Don't know/refuse	13.9	[25.8]	17.4	[22.4]	[9.2]	[11.8]	[7.5]	[15.5]
Unweighted base	*12,187*	*386*	*637*	*275*	*246*	*316*	*328*	*385*

Notes: [ ] cases<20; [a] = no data; *High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

Limiting Illness

There was a clear social gradient for limiting illness by NS-SEC with White, Indian, Pakistani and Other White groups showing a stepwise increase in limiting illness with increasing disadvantage. Bangladeshi, Black African and Other groups had higher rates of limiting illness at low NS-SEC compared to high, but there was no patterning by NS-SEC for the Black Caribbean group. Maternal limiting illness was generally more prevalent in families where the highest qualification was below NVQ2/1 than in families with higher qualifications. Mothers from all families with less than 22,000 pounds per annum were generally more likely to experience limiting illness than mothers in higher income families. It is difficult to draw firm conclusions from these data as sample sizes for ethnic minorities tended to be small. For instance the sample size for Black Caribbean mothers was smallest, and showed the weakest evidence for social patterning of limiting illness.

Table 8.5: Distribution of maternal limiting illness in each ethnic group, by family socioeconomic factors (weighted row percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC*								
High	10.4	[10.2]	[6.4]	[9.8]	[15.7]	[8.0]	10.8	[11.6]
Medium	12.9	[12.1]	[10.2]	[5.4]	[14.4]	[13.6]	[13.8]	[10.4]
Low	18.7	[14.8]	15.5	[15.4]	[15.1]	[10.7]	[14.9]	[18.6]
Unweighted base	*11,616*	*367*	*555*	*231*	*216*	*219*	*315*	*352*
Family's Highest Qualification								
NVQ level 5/4	10.6	11.5	[5.5]	[10.1]	[13.7]	[6.8]	11.5	11.3
NVQ level 3	14.1	[5.8]	[7.0]	[18.2]	[8.1]	[15.8]	[10.0]	[11.3]
NVQ level 2/1	15.6	[16.3]	10.1	[9.1]	[21.8]	[11.8]	[14.2]	[22.4]
Overseas /None	21.7	[15.1]	21.2	[16.0]	[13.3]	[17.9]	[18.1]	[11.2]
Unweighted base	*12,184*	*386*	*634*	*275*	*246*	*314*	*328*	*384*
Family Income								
55,000+	8.1	[14.6]	[a]	[a]	[11.8]	[2.0]	[10.4]	[7.6]
33,000-55,000	8.3	[3.5]	[7.9]	[7.0]	[13.2]	[13.8]	[10.5]	[15.6]
22,000-33,000	14.3	[13.4]	[1.7]	[8.6]	[7.3]	[5.3]	[12.7]	[6.4]
11,000-22,000	18.0	[6.9]	14.9	[11.9]	[25.3]	[18.4]	[20.5]	[17.9]
<11,000	17.2	[24.3]	[12.8]	[20.6]	[14.7]	[10.4]	[5.5]	[14.8]
Don't know/refuse	14.5	[20.6]	[12.0]	[11.2]	[8.0]	[7.3]	[6.8]	[11.8]
Unweighted base	*12,185*	*386*	*635*	*275*	*246*	*315*	*328*	*385*

Notes: [ ] cases<20; [a] = no data; *High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

Overweight/Obesity

The socioeconomic distribution of being overweight/obese was more weakly associated with each socioeconomic indicator than general health and limiting illness (Table 8.6). For instance, all three South Asian groups were more likely to be overweight/obese in the medium NS-SEC category, at NVQ 3 levels of family's highest qualification, and around the middle family incomes (£22-33,000), with exception to Indian groups for income. It was notable that Black Caribbean mothers at high NS-SEC were more likely to be overweight/obese than those of low NS-SEC, although this inverted gradient was not observed in other socioeconomic indicators.

Table 8.6: Distribution of maternal overweight/obesity in each ethnic group, by family socioeconomic factors (weighted row percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC*								
High	37.2	35.1	42.8	[54.2]	55.7	59.7	29.4	27.7
Medium	43.0	40.3	50.6	[66.5]	48.4	58.8	40.7	48.4
Low	46.0	38.7	49.0	45.5	43.8	65.3	46.1	38.2
Unweighted base	*9,864*	*311*	*424*	*157*	*173*	*169*	*273*	*305*
Family's Highest Qualification								
NVQ level 5/4	36.3	35.4	41.2	51.4	45.2	59.6	28.9	30.6
NVQ level 3	44.5	[50.2]	50.3	[34.4]	[62.1]	[64.8]	[41.9]	41.2
NVQ level 2/1	44.8	[32.6]	41.0	54.9	53.4	[64.9]	[44.2]	[34.0]
Overseas /None	47.5	[38.0]	61.1	50.6	[33.5]	53.9	[36.9]	58.1
Unweighted base	*10,303*	*327*	*486*	*194*	*193*	*220*	*285*	*334*
Family Income								
55,000+	30.3	[29.6]	[43.3]	[25.0]	[49.5]	[60.1]	[23.8]	[22.6]
33,000-55,000	38.6	[43.6]	[35.3]	[35.6]	[54.9]	55.8	26.5	[22.8]
22,000-33,000	43.4	23.8	51.2	[60.6]	[50.6]	68.8	[43.4]	41.8
11,000-22,000	45.5	39.2	44.5	46.7	[56.3]	52.2	45.1	47.6
<11,000	40.5	[46.7]	49.7	58.4	32.3	67.8	[39.4]	42.6
Don't know/refuse	40.0	42.3	56.3	46.2	[44.0]	53.9	[28.1]	[34.1]
Unweighted base	*10,303*	*327*	*486*	*194*	*193*	*221*	*285*	*334*

Notes: [ ] cases<20; *High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

8.3.2.2 Child Health

General Health

Increasing socioeconomic disadvantage was strongly associated with an increase in fair/poor general health in White for all three indicators. An increase in fair/poor general health was also associated with decreasing NS-SEC in Indian, Pakistani and Black Caribbean, with much weaker relationships observed in the remaining ethnic minority groups. Furthermore, there was no clear relationship between fair/poor general health and family's highest qualification, or family income, for any ethnic minority group. Overall, the prevalence of fair/poor general health was markedly lower than in mothers. However, cell sizes for this outcome were particularly small with exception to the White group.

Table 8.7: Distribution of child fair/poor general health by family socioeconomic factors (weighted row percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC*								
High	2.1	[3.9]	[5.6]	[6.0]	[2.4]	[1.5]	[2.9]	[4.6]
Medium	3.3	[7.0]	[8.5]	[5.2]	[8.9]	[6.3]	[0.5]	[2.4]
Low	6.1	[6.4]	9.9	[7.5]	[11.6]	[2.3]	[3.3]	[4.2]
Unweighted base	*11,199*	*405*	*602*	*247*	*313*	*267*	*500*	*435*
Family's Highest Qualification								
NVQ level 5/4	2.1	[5.3]	[7.7]	[3.7]	[5.0]	[2.3]	[3.1]	[3.3]
NVQ level 3	3.4	[3.0]	[4.8]	[13.0]	[11.3]	[3.7]	[2.5]	[1.8]
NVQ level 2/1	5.4	[6.3]	[10.0]	[3.3]	[7.2]	[6.7]	[a]	[7.8]
Overseas /None	7.0	[2.8]	10.2	[8.4]	[5.2]	[2.6]	[7.4]	[7.2]
Unweighted base	*11,660*	*424*	*687*	*296*	*354*	*368*	*522*	*470*
Family Income								
55,000+	0.9	[a]	[14.8]	[a]	[2.2]	[a]	[2.9]	[0.9]
33,000-55,000	[2.2]	[6.3]	[3.9]	[4.1]	[5.0]	[2.2]	[2.4]	[4.0]
22,000-33,000	3.1	[4.0]	[4.8]	[6.6]	[7.9]	[2.1]	[2.1]	[4.7]
11,000-22,000	5.8	[5.3]	8.3	[9.7]	[3.4]	[2.1]	[2.9]	[3.4]
<11,000	6.3	[5.9]	[12.6]	[6.1]	[14.2]	[4.6]	[8.0]	[6.9]
Don't know/refuse	3.3	[7.2]	[9.2]	[2.5]	[7.5]	[6.9]	[3.2]	[7.4]
Unweighted base	*11,665*	*424*	*689*	*296*	*354*	*369*	*522*	*471*

Notes: [ ] cases<20; [a] = no data; *High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

Limiting Illness

The socioeconomic distribution of limiting illness in children is shown in Table 8.8. Socioeconomic advantage was associated with lower rates of limiting illness for all three socioeconomic indicators in Whites only. The Black Caribbean group showed an inverted gradient with socioeconomic advantage being associated with higher levels of limiting illness for all three indicators. However there was no consistent social patterning of limiting illness for any indicator and in any other ethnic minority group. The small number of cases of limiting illness in ethnic minority group makes the identification of social patterning difficult and conclusions unreliable.

Table 8.8: Distribution of child limiting illness by family socioeconomic factors (weighted row percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC*								
High	25.7	[16.6]	[30.2]	[58.4]	[30.6]	[62.7]	31.2	[32.1]
Medium	27.6	[31.1]	[60.5]	[35.6]	[25.3]	[72.5]	[11.5]	[34.1]
Low	31.5	[69.1]	43.0	[62.7]	[21.3]	[53.1]	[45.9]	[34.7]
Unweighted base	*11,189*	*405*	*601*	*247*	*313*	*266*	*500*	*435*
Family's Highest Qualification								
NVQ level 5/4	26.1	[15.1]	[41.2]	[29.4]	[31.8]	[63.7]	[30.6]	[28.9]
NVQ level 3	31.5	[83.2]	[71.3]	[82.6]	[32.2]	[66.7]	[10.4]	[53.7]
NVQ level 2/1	30.1	[40.1]	[36.2]	[66.7]	[14.4]	[29.8]	[39.7]	[39.0]
Overseas /None	33.0	[53.0]	43.7	[37.3]	[12.6]	[54.7]	[40.1]	[33.1]
Unweighted base	*11,650*	*424*	*686*	*296*	*354*	*367*	*522*	*470*
Family Income								
55,000+	21.6	[10.7]	[50.0]	a	a	a	[24.3	a
33,000-55,000	22.2	[29.8]	[33.6]	[15.9]	[33.3]	[58.6]	[36.2]	[42.7]
22,000-33,000	29.0	[53.2]	[52.6]	a	[42.4]	[85.5]	[33.1]	[28.8]
11,000-22,000	31.6	36.7	[44.1]	[61.0]	[14.6]	[43.0]	[24.8]	[35.0]
<11,000	33.3	[11.1]	[37.2]	[25.2]	[11.1]	[72.3]	[64.8]	[42.7]
Don’t know/refuse	38.9	[19.3]	[44.9]	[45.9]	[33.3]	[59.6]	[30.1]	[52.9]
Unweighted base	*11,655*	*424*	*688*	*296*	*354*	*368*	*522*	*471*

Notes: [ ] cases<20; a = no data; *High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

Overweight/Obesity

Childhood patterns of being overweight/obese are shown in Table 8.9. White children were more likely to be overweight/obese with increasing disadvantage. However, the difference in prevalence between the most and least disadvantaged individuals was only ~4% across NS-SEC categories and family's highest qualifications, and ~6% across the range of family incomes, indicating a weak social gradient. No ethnic minority group showed a consistent social patterning in being overweight/obese.

Table 8.9: Distribution of child overweight/obesity by family socioeconomic factors (weighted row percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC*								
High	19.5	14.6	15.5	[11.6]	[28.6]	[34.3]	16.5	[17.9]
Medium	20.9	[22.0]	19.3	[30.2]	23.2	26.0	[22.9]	15.8
Low	22.8	[16.5]	20.0	19.4	[27.5]	[32.2]	[12.7]	[17.0]
Unweighted base	*11,093*	*402*	*603*	*239*	*300*	*264*	*494*	*426*
Family's Highest Qualification								
NVQ level 5/4	19.5	17.2	[18.6]	[17.6]	25.8	33.4	15.1	15.8
NVQ level 3	20.3	[10.8]	21.4	[9.0]	[26.3]	[36.5]	[14.8]	[23.6]
NVQ level 2/1	22.5	[19.0]	[17.0]	[21.3]	26.5	[26.1]	[25.3]	[17.2]
Overseas /None	23.4	[9.8]	[17.3]	27.7	[29.5]	28.7	[17.4]	21.5
Unweighted base	*11,539*	*421*	*682*	*287*	*340*	*361*	*515*	*460*
Family Income								
55,000+	17.5	[10.8]	[8.1]	[40.0]	[27.9]	[17.0]	[10.4]	[17.1]
33,000-55,000	20.6	[19.9]	[46.6]	[13.6]	[20.8]	40.9	19.7	[19.5]
22,000-33,000	20.5	[14.3]	[13.0]	[2.2]	[30.1]	[37.7]	[16.1]	[15.2]
11,000-22,000	21.5	[16.6]	17.7	22.4	33.5	30.3	21.2	13.3
<11,000	23.6	[16.8]	[12.7]	[24.4]	[21.1]	[31.4]	[18.2]	[21.9]
Don't know/refuse	21.0	[15.6]	[22.8]	[27.3]	[19.4]	[15.5]	[15.0]	[25.6]
Unweighted base	*11,513*	*421*	*671*	*285*	*340*	*359*	*515*	*461*

Notes: [ ] cases<20; *High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

Asthma

Childhood patterns of asthma are shown in Table 8.10. Increasing socioeconomic disadvantage was associated with increasing prevalence of asthma in White children, for all three indicators. A similar but weaker trend was observed in all ethnic minority groups for NS-SEC with exception to Bangladeshi children who showed no evidence of a gradient, although the cell sizes were particularly small for this group. There was only a weak association between asthma and either highest family qualification or income.

Table 8.10: Distribution of child asthma by family socioeconomic factors (weighted row percentage)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC*								
High	10.9	12.7	[9.5]	[17.2]	18.6	[9.3]	12.2	14.2
Medium	15.2	[11.4]	13.8	[26.6]	[25.3]	[8.0]	[19.3]	[14.9]
Low	19.6	[13.9]	19.1	[10.7]	21.9	[15.1]	[16.5]	15.7
Unweighted base	*11,159*	*403*	*601*	*247*	*311*	*267*	*499*	*435*
Family's Highest Qualification								
NVQ level 5/4	11.4	10.6	10.1	[3.7]	19.0	[10.6]	11.5	13.1
NVQ level 3	14.3	[11.3]	4.5	[44.1]	[15.9]	[6.5]	[13.7]	[17.5]
NVQ level 2/1	17.3	[24.5]	[16.1]	[4.2]	28.6	[12.1]	[26.6]	[20.8]
Overseas /None	23.3	[11.2]	18.5	21.1	[28.5]	[8.6]	[10.9]	[13.9]
Unweighted base	*11,616*	*422*	*686*	*296*	*352*	*368*	*521*	*470*
Family Income								
55,000+	8.1	[16.7]	[10.8]	[a]	[6.4]	[6.0]	[6.9]	[14.8]
33,000-55,000	11.7	[13.7]	[11.5]	[26.5]	[16.8]	[9.8]	15.9	[16.9]
22,000-33,000	13.9	[13.7]	[18.8]	[29.1]	[15.0]	[10.2]	[12.2]	[9.8]
11,000-22,000	18.2	[13.0]	14.5	[12.8]	26.2	[12.1]	22.0	17.3
<11,000	21.1	[8.2]	15.8	[12.1]	[29.6]	[10.5]	[8.8]	[18.3]
Don't know/refuse	13.2	[8.6]	13.9	[12.5]	[26.9]	[7.7]	12.6]	[9.8]
Unweighted base	*11,621*	*422*	*688*	*296*	*352*	*369*	*521*	*471*

Notes: [ ] cases<20; [a] = no data; High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

Cognitive Development Test Scores

A test for trend was performed using the mean normalised cognitive development scores across categories of each socioeconomic indicator. A significant association suggests that increasing socioeconomic advantage is associated with an increasing test score. There was a significant and positive association between NS-SEC and all three test scores for the majority of ethnic groups, with the only exceptions being in Indian and Black African children for the picture similarity test, and Other White for the pattern construction test. Only the Indian and Bangladeshi picture similarity scores were not significantly associated with family's highest qualification. Family income appeared to be the most weakly related to cognitive development scores. Only White and Other White showed a significant association between family income and all three tests whereas Bangladeshi showed no significant association between family income and any test.

Table 8.11: Test for trend across socioeconomic indicators for mean cognitive development test scores (*p* value for trend given)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Family's Highest NS-SEC								
Picture Similarity Score	<0.01*	0.08	0.01*	0.02*	0.03*	0.16	<0.01*	0.36
Pattern Construction Score	<0.01*	0.05*	<0.01*	<0.01*	0.01*	0.04*	0.18	0.01*
Vocabulary Score	<0.01*	<0.01*	<0.01*	0.01*	<0.01*	<0.01*	<0.01*	<0.01*
Family's Highest Qualification								
Picture Similarity Score	<0.01*	0.25	0.02*	0.21	0.29	0.07	<0.01*	<0.01*
Pattern Construction Score	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*
Vocabulary Score	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*	<0.01*
Family Income								
Picture Similarity Score	<0.01*	0.39	0.12	0.82	0.66	0.24	<0.01*	0.68
Pattern Construction Score	<0.01*	0.20	<0.01*	0.07	0.02*	0.03*	0.04*	0.12
Vocabulary Score	<0.01*	<0.01*	<0.01*	0.18	0.08	<0.01*	<0.01*	<0.01*

Notes:* significant p-value given for chi-square test for trend

Summary

These descriptive data using adults in the HSE and the MCS provide good evidence of a socioeconomic patterning in self rated general health and limiting illness which has been documented elsewhere (Nazroo 1997b), with a weaker gradient observed for overweight and obesity (Saxena et al. 2004). As well as confirming within group variation of poor health by socioeconomic factors, these trends further highlight the existence of between group ethnic inequalities in health. The prevalence of general health, limiting illness and being overweight/obese in ethnic minority children did not appear to be socially patterned. Conversely, the White children showed clear social gradients for all health outcomes across all socioeconomic indicators. However, children of all ethnic groups showed strong evidence of social patterning in cognitive development test scores. With few exceptions, increasing socioeconomic advantage was associated with increasing cognitive development scores across all groups and for all socioeconomic indicators.

The next stage of analysis will investigate the extent of the socioeconomic differences over generation, before assessing whether these differences have any influence upon the risks of poor health.

8.4 Intergenerational Socioeconomic Mobility

The previous section outlined the socioeconomic patterning of health across ethnic groups. If the socioeconomic characteristics of each group vary over generation then changes to health might be expected. This section begins to explore this possibility and addresses Objective 2:

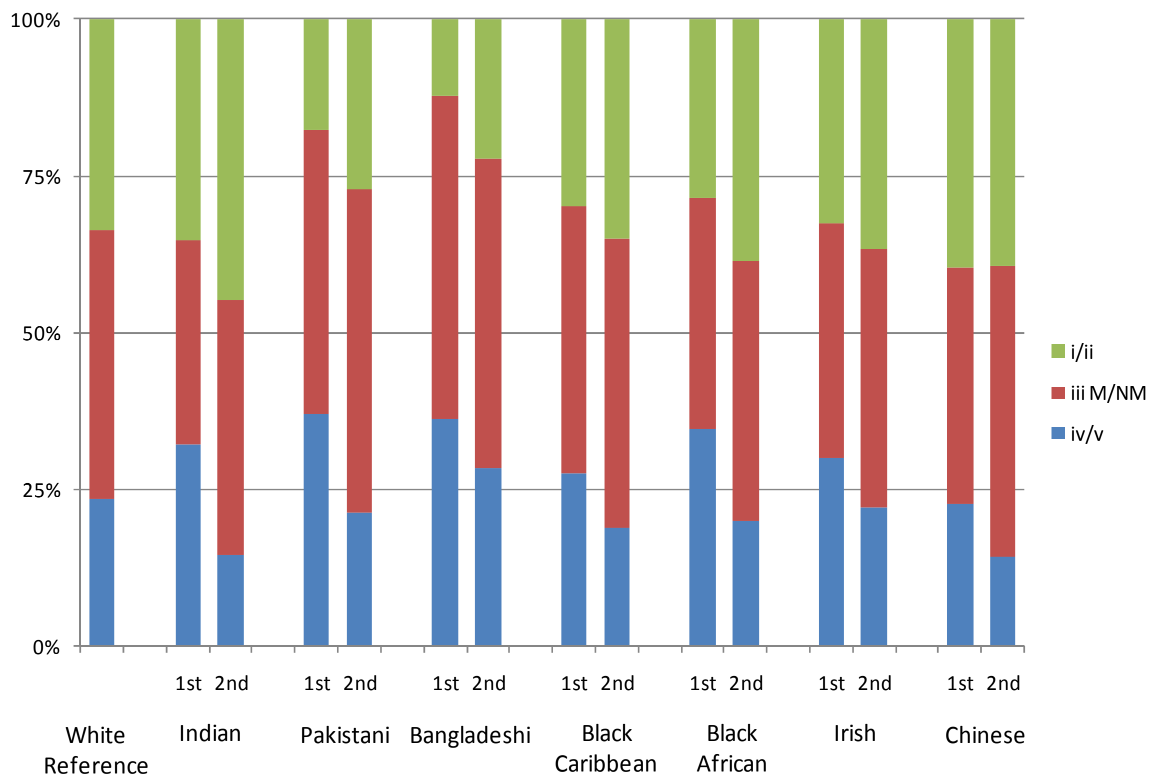
- **Establish the direction and extent of intergenerational socioeconomic mobility**

8.4.1 The Health Survey for England

Social Class (RGSC)

Rates of social class mobility (on the RGSC scale) are shown in Figure 8.1. All ethnic minority groups demonstrated upward mobility. Pakistani and Bangladeshi groups showed considerable upward mobility from their low first generation position, but remained most disadvantaged in both generations. By contrast, the Indian group showed a high level of upward mobility and was the most advantaged group in the second generation, consolidating the advantageous social class distribution of the first generation. Irish and Chinese were the least upwardly mobile but had a more advantageous social class profile than the White majority in the second generation.

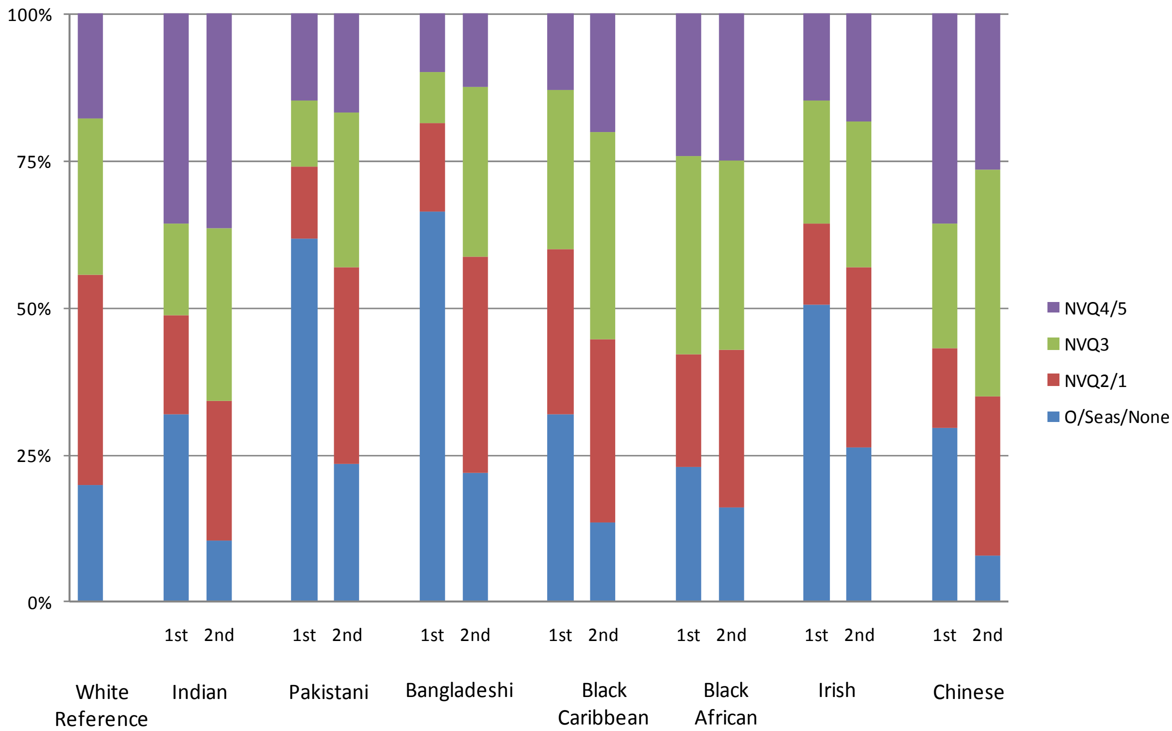
Figure 8.1: Weighted distribution of social class (RGSC) group by ethnicity and generation (weighted column percentages given)



Highest Educational Qualifications

The proportion of individuals attaining the highest level of educational qualification increased with generation in all ethnic minority groups. The largest shift in educational qualifications was observed in Bangladeshi and Pakistani groups with a large proportion (61.7% and 63.3% respectively) of the first generation with overseas or no qualifications attaining at least NVQ 3 in the second. However, the increase in the proportions reaching NVQ level 5/4 was not reflective of the shift observed lower down the educational scale. The Indian group contained the largest proportion attaining NVQ 5/4 in both generations and experienced the most favourable profile compared to all other ethnic groups. The Chinese were the only group to show an intergenerational decline in the proportion reaching NVQ level 5/4, although their overall profile of the second generation was relatively advantaged compared to the first. The Black African group showed the smallest generational differences in the distribution of highest qualifications achieved.

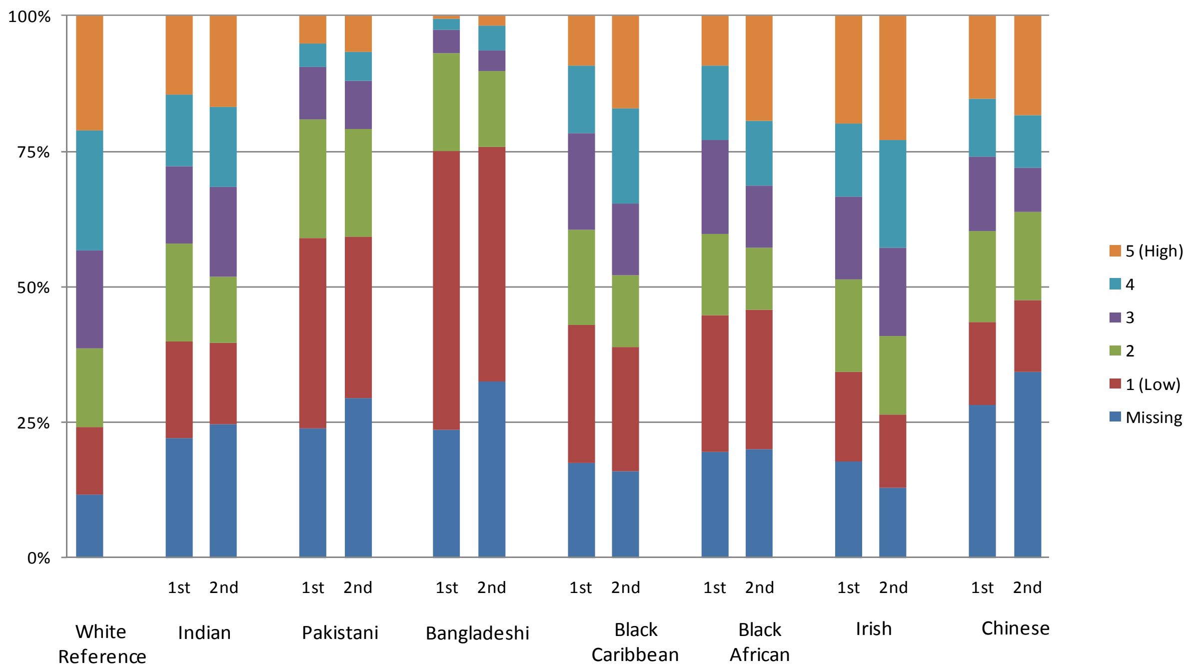
Figure 8.2: Weighted distribution of highest educational qualification attained by ethnicity and generation (weighted column percentages)



Household Income

The proportional distribution of household income by quintiles is shown in Figure 8.3. All ethnic minority groups showed an increase in equivalised household income over generation although large inequalities were persistent. The Bangladeshi group were the most disadvantaged in both generations. Over half (51.5%) of all individuals occupied the bottom quintile in the first generation, falling to 43.3% in the second. These findings are in stark contrast to the White group which was the most likely group to occupy the upper quintile, despite the fact that this group was not significantly well off in terms of social class and educational attainment. Conversely for Indian, having the most advantaged social class and educational attainment profiles in the second generation did not translate into having the largest proportion in the highest income quintile. Therefore there was an implied association between the highest educational qualification and RGSC, whereas income was not as closely related to either of these indicators. Importantly, this relationship was persistent between generations.

Figure 8.3: Proportional distribution of equivalised income quintiles by ethnicity and generation (weighted column percentages)



Summary

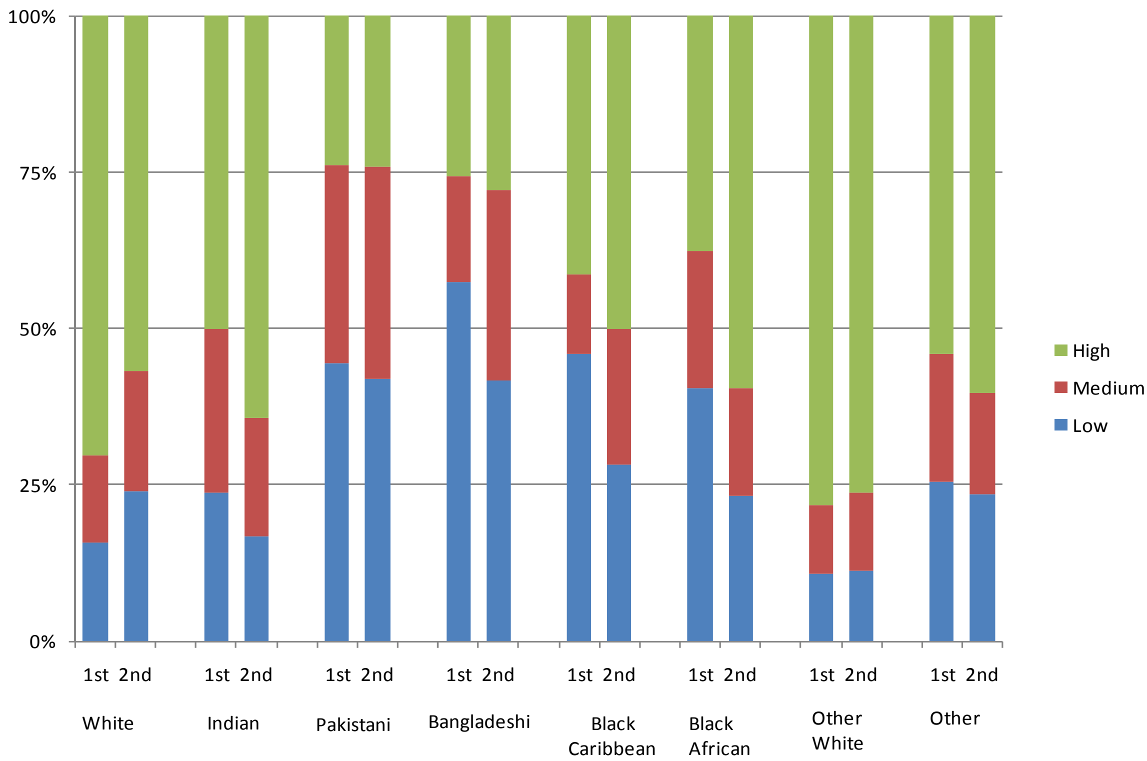
These comparisons imply that social mobility has taken place between generations of all ethnic minority groups in the HSE. The extent of mobility was greatest in those groups, such as Pakistani, that were the most socioeconomically disadvantaged in the first generation, which consequently provided a greater scope for improvement. Importantly, even after upward movement occurred within the most disadvantaged ethnic minority groups, relative socioeconomic disadvantage remained. Lastly, generational differences in social class and educational attainment were weakly related to shifts in income

8.4.2 The Millennium Cohort Study

Family's Highest NS-SEC

Child's ethnicity was used as the family's ethnic group designation. The distribution of the family's highest NS-SEC is shown in Figure 8.4. Apart from White and Other White, all groups showed upward mobility. The White and Other White groups were, respectively, 13% and 2% less likely to be in the highest NS-SEC in the second generation compared to the first. Black African families showed the greatest upward mobility with an approximate halving in the proportion in the lowest NS-SEC accompanied by a doubling in the proportion in the highest NS-SEC across generations. The lowest rates of upward mobility were observed in Pakistani, where the second generation were only ~3% less likely to be in the lowest NS-SEC group than the first.

Figure 8.4: Weighted distribution of family's highest NS-SEC, by child's ethnicity and generation (weighted column percentages)

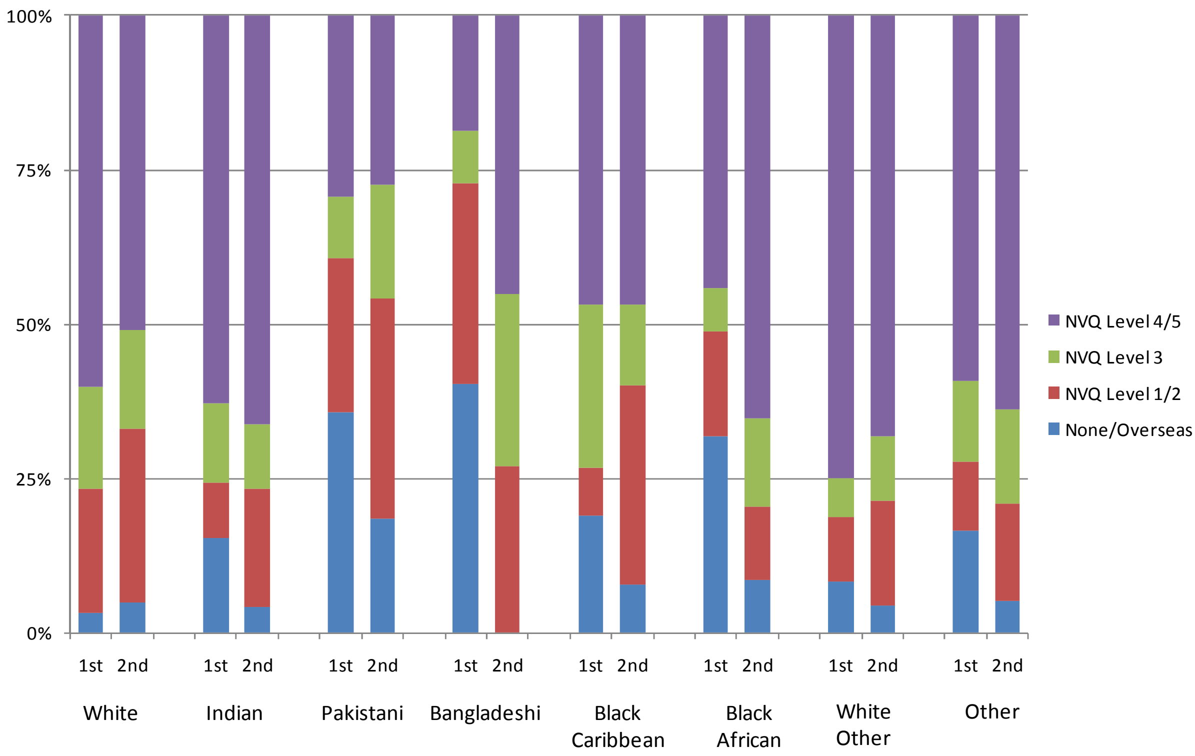


Notes: High-*Managerial/Professional*; Medium-*Intermediate, Small/Self Employed*; Low-*Low Supervisory, Semi Routine/Routine*

Family's Highest Educational Qualifications

The highest qualification in each family by child's ethnicity is shown in Figure 8.5. As was observed for NS-SEC, all second generation ethnic minority groups had more favourable profiles than the first, with exception to White and Other White. The second generation of these two groups had fewer families with NVQ 5/4, and the White group also had more people with overseas or no qualifications. Nevertheless, the Other White group had the most advantaged educational profile of all groups in both generations. Black African families experienced the largest increases in the proportion attaining the highest level of qualifications, whereas the Pakistani group were consistently disadvantaged in both generations, with the proportions of families attaining NVQ 4/5 being relatively static. Furthermore, the Pakistani group experienced the least favourable profile of all groups in the second generation. Lastly, the Bangladeshi group were the least advantaged in the first generation, primarily driven by the large proportion with overseas or no qualifications. However, there was a considerable intergenerational reduction in the proportion unqualified or overseas qualified, although caution is required as, due to sample size limitations, no Bangladeshi families had no or overseas qualifications.

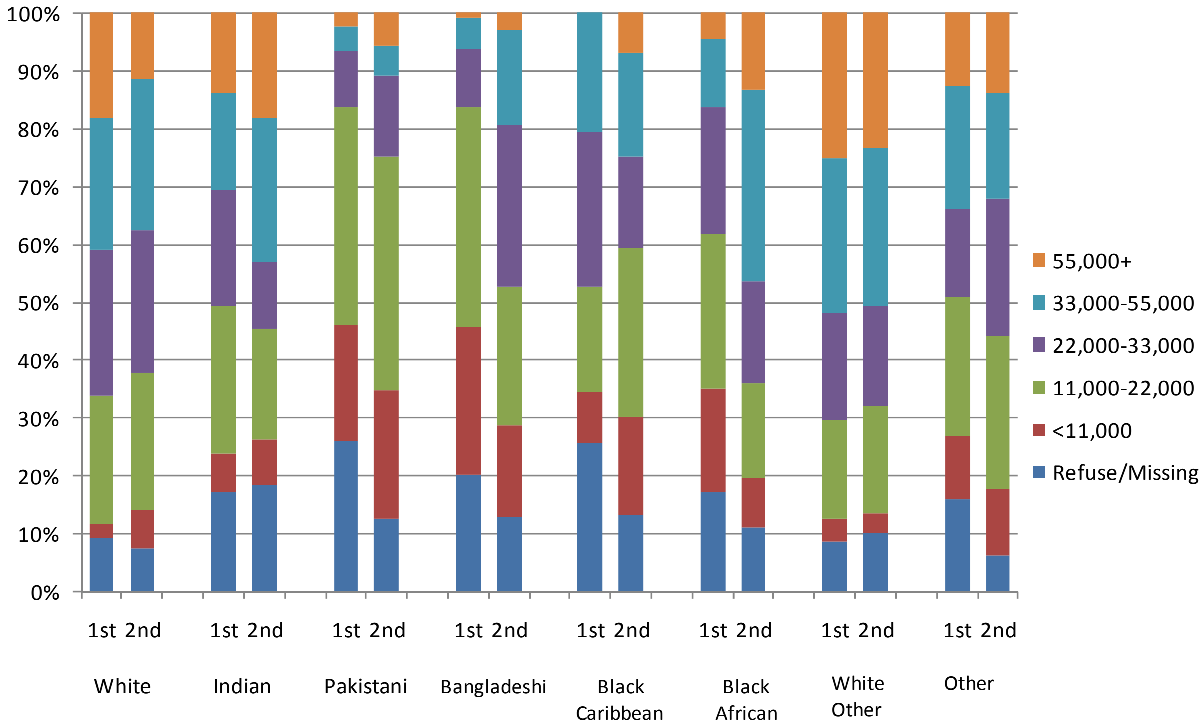
Figure 8.5: Generational distribution of highest educational qualification attained by child's ethnicity (weighted column percentages)



Family Income

With exception to the White and Other White groups, all second generation groups had more favourable family income distributions than the first generation. The intergenerational decline in the proportion occupying the highest family income band in White and Other White groups was consistent with the previously observed reduction in the proportion of families having the highest NVQ 5/4 qualification or being in the high NS-SEC category across generations. The Pakistani and Bangladeshi family income profile was persistently disadvantaged across generations compared to all other groups, with only a small generational increase in the proportion of families earning more than £55,000. However, both groups showed an intergenerational reduction in the high proportion living on less than £11,000. It should be noted that there were no observations at the highest income band in Black Caribbean, on account of the small cell sizes for this group. This may provide an unreliable depiction of the income distribution in this group shown in Figure 8.6.

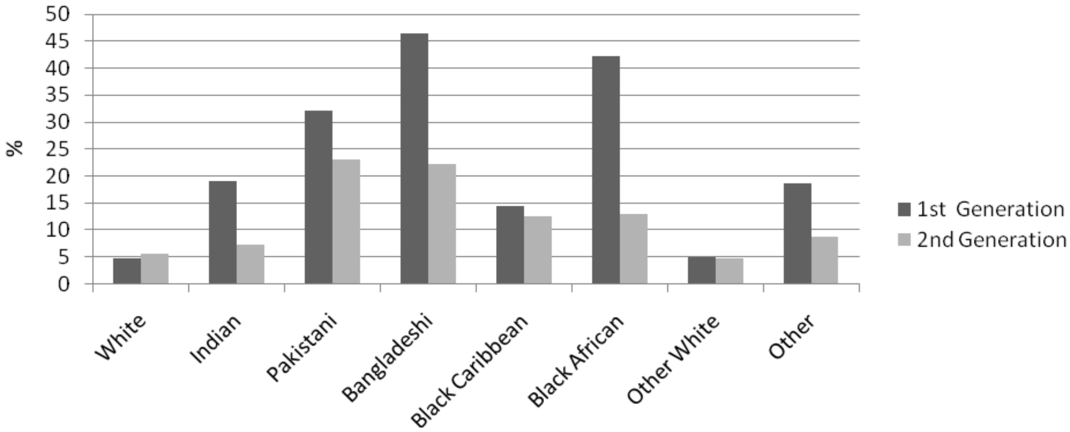
Figure 8.6: Generational distribution of family income by child's ethnicity (weighted column percentages)



Standard of Living

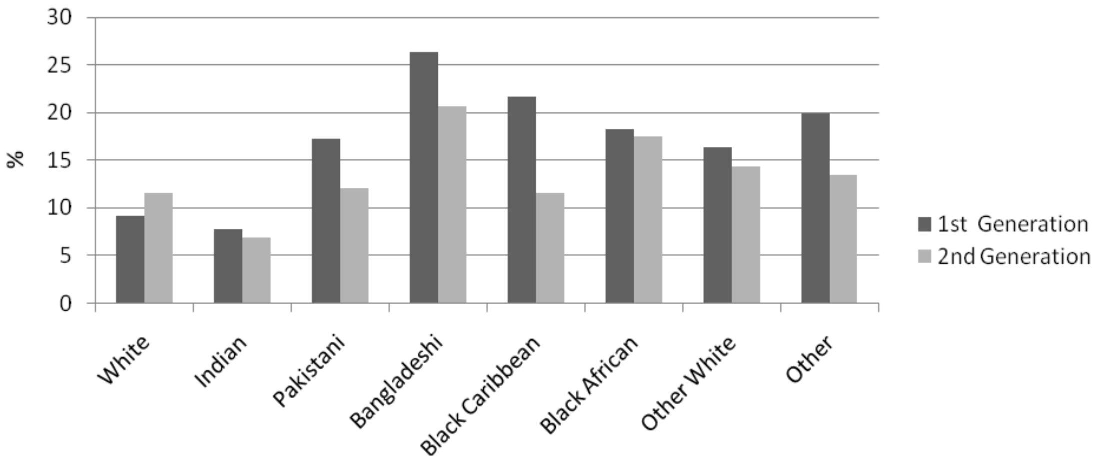
Generational differences in the weighted proportions of families with overcrowding, any damp problems and owner occupiers are shown below. With exception to White and Other White, all ethnic minority groups showed a considerable reduction in the proportion of families in overcrowded accommodation (>1 person per room). Despite this shift, all ethnic minority families were more likely than White and Other White to be overcrowded in the second generation.

Figure 8.7: Weighted proportion of families with overcrowding (>1person per room) by generation and child's ethnicity



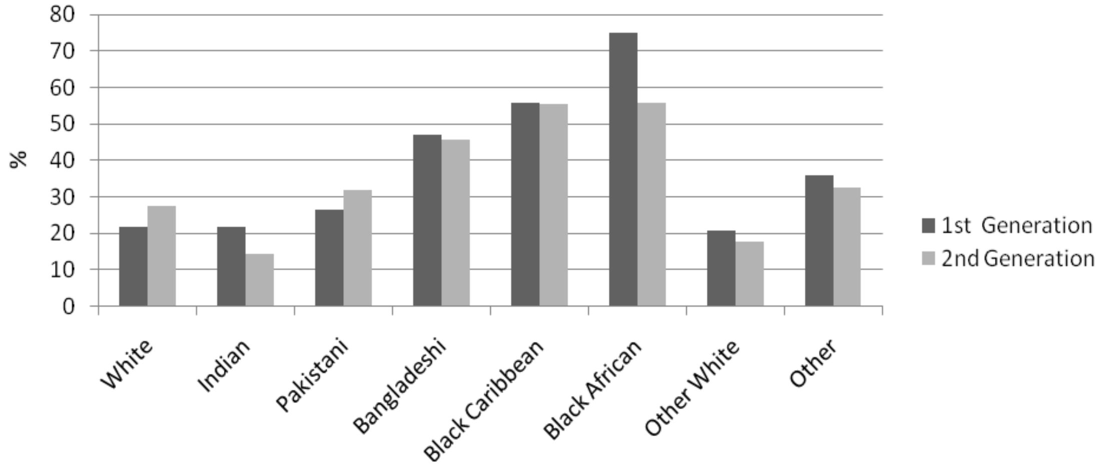
All groups reported fewer problems with damp in the second generation compared to the first, except for White, who showed an increase with generation. Indian families of both generations were the least likely to report any damp. However, all other ethnic minorities were more likely than the White group to experience damp in either generation.

Figure 8.8: Weighted proportion of families with any damp problems by generation and child's ethnicity



Generational changes in home ownership (as opposed to being a tenant) did not follow the patterns observed for overcrowding and damp. Home ownership rates decreased over generations for all groups except for White and Pakistani, although the extent of the change was small. These data suggest that changing patterns of damp and overcrowding are only weakly associated with patterns of housing tenure. Furthermore, home ownership does not correlate with other indicators of upward socioeconomic mobility suggesting that ethnic differences in housing tenure might be determined by other factors.

Figure 8.9: Weighted proportion of owner occupier (-vs- tenant) families by generation and chils's ethnicity

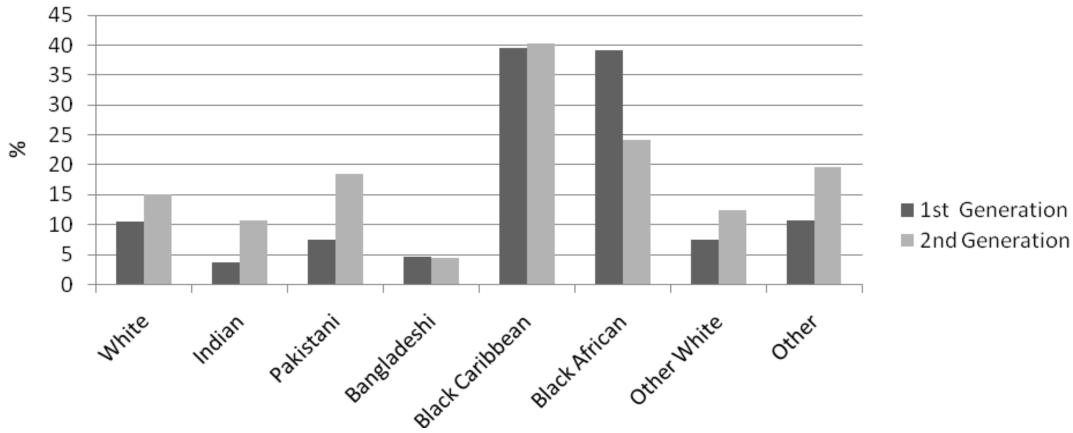


Overall, these indicators of standard of living suggest living conditions were generally improved in the second generation compared to the first, with exception to the White group.

Family Economic Structure

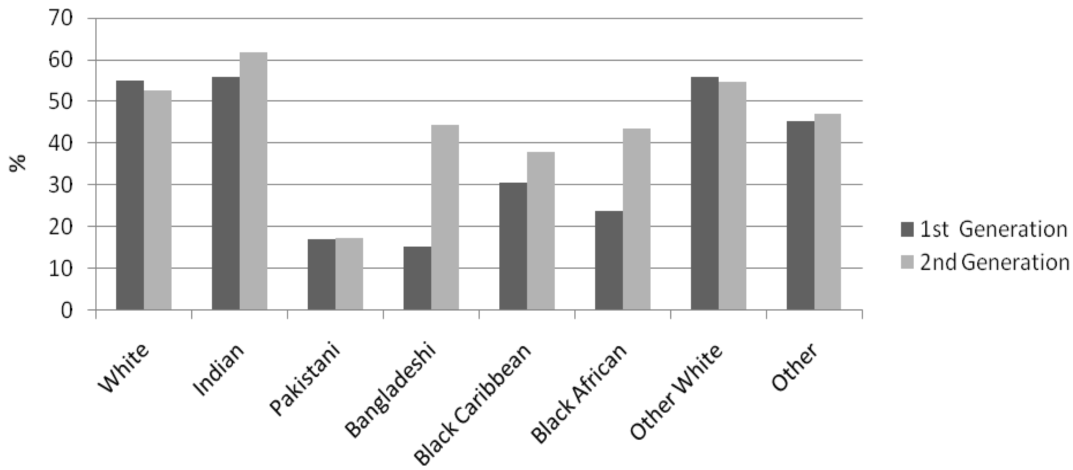
With exception to Black African and Bangladeshi, all ethnic groups showed an increase in the weighted proportion of lone parent families over generations. The reduction in the Black African group was in contrast to the higher proportions in the first generation. The prevalence of lone parenthood was consistently higher across generations of Black Caribbean, and consistently low across Bangladeshi families. It is notable that lone parenthood is the only socioeconomic marker to show broadly increasing social disadvantage over generation. It is therefore possible that any negative effects of this change are likely to be masked by other indicators capturing increasing social advantage.

Figure 8.10: Proportion of lone parent family by generation and child's ethnicity



The weighted proportion of families with two working parents increased over generation in all groups, with exception to White and Other White. The first generation Pakistani and Bangladeshi families had similarly low proportions with two working parents, but only the Bangladeshi families showed a generational increase with little change observed for Pakistani families.

Figure 8.11: Weighted proportion of families with both parents employed by generation and child's ethnicity



8.4.3 Longitudinal Analysis of Social Mobility in the MCS by Generation

So far, cross-sectional data has been used to describe patterns of mobility *between* generations. A longitudinal approach will now be adopted, briefly, to assess whether rates of social mobility differ *within* each generation. This approach will identify possible cohort effects operating within each group which might explain the patterns of mobility. For instance, is the first generation a more mobile cohort than the second? Table 8.12 describes the odds of the first generation moving up a social class over a three year period (sweeps one and two), compared to the second generation. The likelihood of upward movement is described independently for mothers, fathers and for the highest NS-SEC in the family. The likelihood of mobility is measured in a combined group of all ethnic minorities, excluding White.

There were no significant differences in the likelihood of upward social mobility within each generation, although the likelihood of fathers being less upwardly mobile in the second generation compared to the first is very close to being significant. However, these observations suggest that the extent of upward mobility experienced by all groups is approximately the same for each generation. The chance of a father being socially mobile is very similar to that of the family, reflecting the fathers' greater likelihood of having the highest NS-SEC classification in the family.

Table 8.12: Odds (95% CI) of upward social mobility (NS-SEC) between sweep one and two, in the second generation compared to the first, adjusted for age and child's ethnicity (excluding white)

	Odds Ratio
Mother	1.12 *(0.64-1.96)*
Father	0.63 *(0.40-1.01)*
Family Highest	0.63 *(0.39-1.04)*

Summary

The MCS provides good evidence that the direction of intergenerational socioeconomic mobility is ethnic group specific as, unlike in the HSE, not all ethnic groups were upwardly mobile. The Other White and the White groups were downwardly mobile across generations for all three socioeconomic indicators. Despite this, the Other White group was the most advantaged group in both generations. Indian, Pakistani, Bangladeshi, Black Caribbean, Black African and Other groups all showed upward socioeconomic mobility, although the extent of this varied considerably by group. The greatest upward movement was observed in the Black African group, and the smallest shifts in Pakistani and Bangladeshi groups. Unlike the findings of the HSE analysis, the indicators of social class, education and income were more closely related to one another, although it should be noted that the indicators used are not identical to those in the HSE.

So far it has been established that inequalities exist between groups, and that many of these inequalities are socially patterned. Evidence presented also suggests that socioeconomic circumstances within groups are not fixed across generations. Therefore, the next stage of the investigation will bring these findings together and attempt to measure the extent to which changing social circumstances over time might account for the generational differences across a range of objective and subjective markers of health.

8.5 The Impact of Social Mobility on Health Outcome

The following section will address Objective 3:

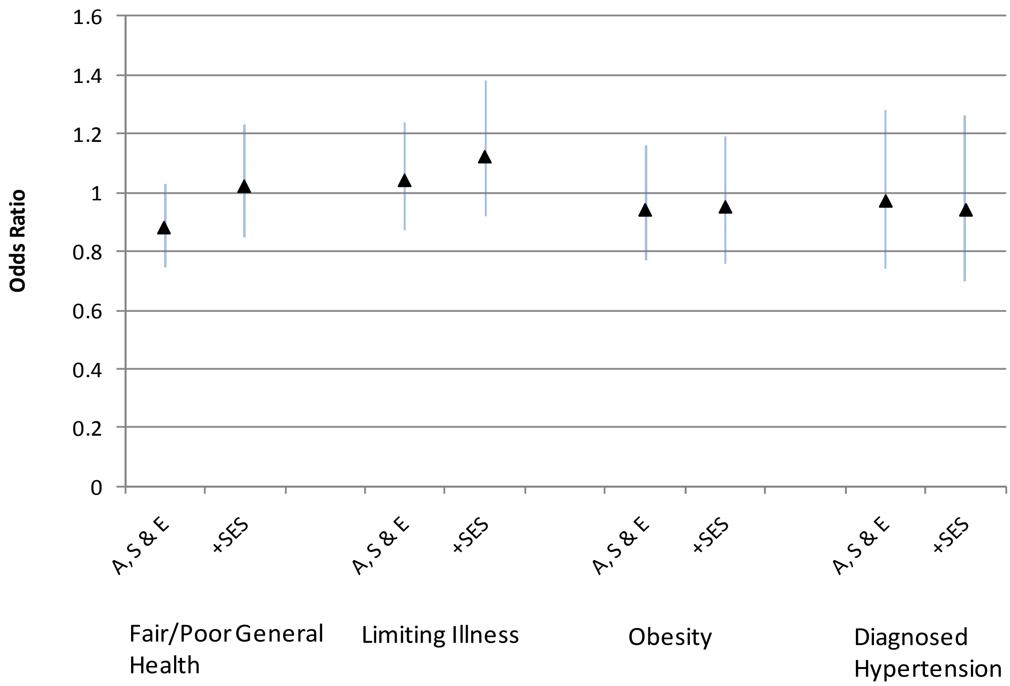
- **Explore how intergenerational socioeconomic mobility contributes to changes in health inequalities.**

8.5.1 Evidence from the Health Survey for England

The impact of socioeconomic mobility on health is estimated by comparing the age and sex adjusted risk of poor health in the second generation to the first, before and after controlling for socioeconomic circumstances. Previous descriptive analysis in section 8.4.1 confirms that it is upward mobility which is being controlled for in this model.

The results in Figure 8.12 are for a combined group of all ethnic minorities. No significant differences were observed between generations when standardising for age and sex although the risk of fair/poor general health and limiting illness in the second generation did increase slightly after adjustment for social class, equivalised income and highest qualification. This suggests that upward mobility across the generations mediates the lower risk of poor health in the second generation. There was a small reduction in the risk of diagnosed hypertension, but there was no change the risk of obesity over generations after controlling for socioeconomic circumstances.

Figure 8.12: Odds (95% CI) of being in poor health in the second generation compared to the first, adjusted stepwise for age (A), sex (S) and ethnicity (E) and socioeconomic factors (SES)



Notes: SES: social class, highest qualification, equivalised income

Table 8.13 describes this analysis in individual ethnic minority groups. Controlling for socioeconomic factors led to an increase in the reporting of fair/poor general health and limiting illness in the second generation in all ethnic minority groups, with exception to Irish. Second generation Pakistani subjects were significantly more likely than first to report fair/poor general health after accounting for socioeconomic factors. Limiting illness in the Black African group was significantly higher in the second generation than the first, both before and after accounting for socioeconomic factors. Controlling for socioeconomic factors led to an increase in the risk of limiting illness in all groups except Chinese and Bangladeshi.

The significantly greater risk of obesity in second generation Indian, Pakistani and Chinese groups persisted after controlling for socioeconomic factors, but obesity was no longer significant in Bangladeshi. Furthermore, the risk of obesity in the second generation relative to the first increased after accounting for socioeconomic circumstances in all ethnic minority groups except for Black African, Irish and Chinese groups. Lastly, the risk of hypertension also increased in second generations of Indian, Pakistani, Bangladeshi and Chinese relative to the first after controlling for socioeconomic circumstances, but decreased in Black African Irish and Black Caribbean groups.

These results suggest that controlling for improved socioeconomic circumstances in the second generation relative to the first leads to a general increase in the risk of poor health over generations in Indian, Pakistani and to lesser extent Bangladeshi and Black Caribbean groups. However, this effect was weaker for Chinese, Irish and Black African groups. It is possible that generational effects on health may operate differently within individual ethnic minority groups.

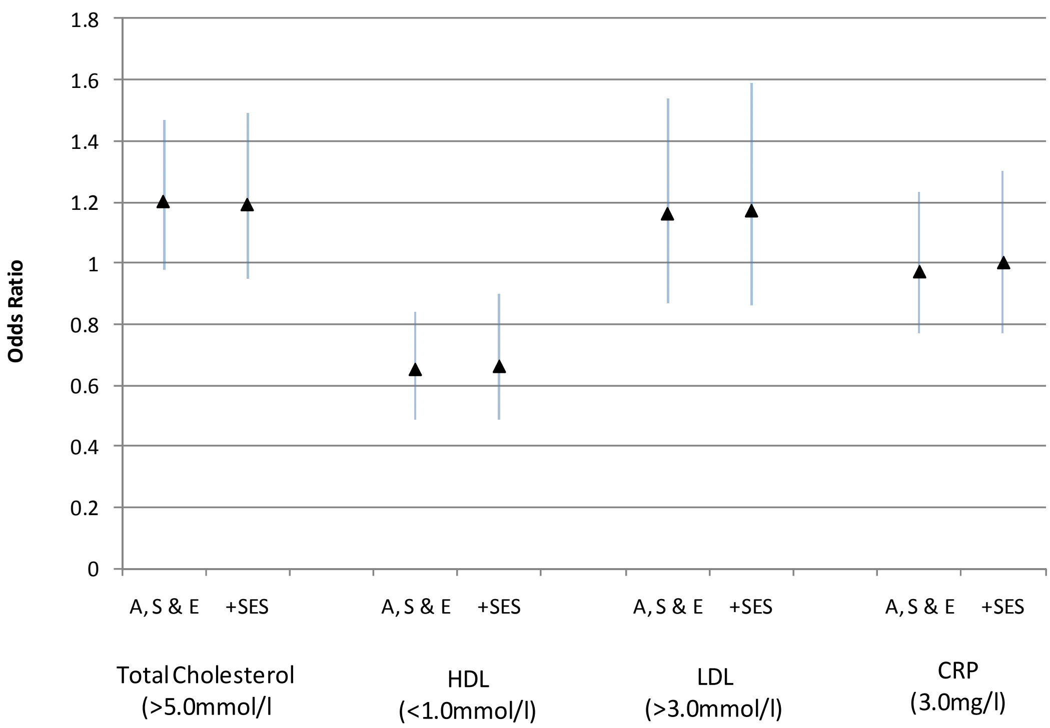
Table 8.13: Odds (95% CI) of having fair/poor general health, a limiting illness, being obese or having diagnosed hypertension in the second generation compared to the first, adjusted step-wise for age & sex, and socioeconomic factors by ethnic group

Odds Ratio for Poor Health: 2nd v 1st Generation	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
General Health							
Age & Sex Adjusted	1.05 *(0.78 - 1.42)*	0.99 *(0.74 - 1.32)*	0.81 *(0.59 - 1.11)*	0.98 *(0.69 - 1.37)*	1.23 *(0.69 - 2.19)*	0.85 *(0.66 - 1.10)*	1.12 *(0.72 - 1.75)*
+SES Adjusted	1.34 *(0.94 - 1.90)*	1.60 *(1.07 - 2.39)**	1.03 *(0.67 - 1.58)*	1.26 *(0.87 - 1.81)*	1.99 *(0.89 - 4.43)*	0.86 *(0.65 - 1.14)*	1.61 *(0.96 - 2.72)*
Limiting Illness							
Age & Sex Adjusted	1.18 *(0.83 - 1.68)*	0.84 *(0.62 - 1.14)*	0.89 *(0.61 - 1.30)*	0.92 *(0.63 - 1.34)*	2.54 *(1.32 - 4.91)**	1.10 *(0.84 - 1.43)*	1.54 *(0.87 - 2.76)*
+SES Adjusted	1.39 *(0.88 - 2.18)*	0.99 *(0.64 - 1.54)*	0.79 *(0.47 - 1.31)*	1.08 *(0.71 - 1.63)*	5.11 *(2.22 - 11.75)**	1.11 *(0.84 - 1.47)*	1.28 *(0.64 - 2.58)*
Obese							
Age & Sex Adjusted	1.71 *(1.18 - 2.49)**	1.44 *(1.00 - 2.06)**	2.36 *(1.20 - 4.67)**	1.37 *(0.88 - 2.14)*	0.72 *(0.31 - 1.68)*	0.81 *(0.60 - 1.10)*	4.29 *(1.86 - 9.90)**
+SES Adjusted	2.02 *(1.30 - 3.13)**	1.83 *(1.06 - 3.17)**	2.94 *(0.89 - 9.75)*	1.49 *(0.94 - 2.35)*	0.61 *(0.19 - 2.01)*	0.76 *(0.55 - 1.04)*	4.23 *(1.56 - 11.44)**
Diagnosed Hypertension							
Age & Sex Adjusted	0.87 *(0.54 - 1.40)*	1.10 *(0.57 - 2.11)*	2.10 *(0.83 - 5.32)*	1.02 *(0.62 - 1.68)*	0.87 *(0.18 - 4.20)*	0.98 *(0.67 - 1.42)*	1.00 *(0.34 - 2.89)*
+SES Adjusted	1.00 *(0.58 - 1.71)*	1.29 *(0.60 - 2.78)*	2.21 *(0.67 - 7.34)*	0.98 *(0.57 - 1.67)*	0.76 *(0.19 - 3.14)*	0.93 *(0.63 - 1.36)*	1.13 *(0.41 - 3.07)*

Notes: *p<0.05; SES: social class, highest qualification, equivalised income

The risk of having hazardous concentrations of blood biomarkers for cardiovascular disease (>5mmol/l total cholesterol; <1mmol/l HDL cholesterol; >3mmol/l LDL cholesterol; >3mg/l CRP) in the second generation compared to the first is shown in Figure 8.13. This estimate was derived using a combination of all ethnic minority groups. Controlling for socioeconomic differences between generations made very little difference to the risk of hazardous biomarkers concentrations in the second generation compared to the first. This meant that the second generation were significantly less likely to have hazardously low levels of HDL cholesterol irrespective socioeconomic circumstances with no significant difference between generations for other biomarkers.

Figure 8.13: Odds (95% CI) of having hazardous concentrations of biomarkers of cardiovascular disease in the second generation compared to the first, adjusted step-wise for age (A), sex (S) and ethnicity (E) and socioeconomic factors (SES)



Notes: SES: social class, highest qualification, equivalised income

The odds of having hazardous levels of biomarker concentrations for cardiovascular disease in individual ethnic minority groups are shown in Table 8.14. Controlling for socioeconomic factors led to highly variable changes in risk which were outcome and ethnic group specific. The Pakistani second generation had a significantly lower risk of hazardous HDL cholesterol levels than the first after adjusting for age and sex only. However, this risk was no longer significant after accounting for socioeconomic differences. Similarly, the significantly greater risk of LDL cholesterol in the second generation compared to the first was also insignificant after controlling for socioeconomic factors. The Black Caribbean group showed an increased risk for hazardously high total cholesterol, LDL cholesterol and CRP after controlling for socioeconomic factors, with no change observed for HDL cholesterol. Only the Irish group experienced a reduction in the chances of being at risk of in the second generation after adjustment for social circumstances, although none of the changes were significant. For all other groups, there was no consistent effect of controlling for socioeconomic factors on the risk of having harmful concentrations of biomarkers. Overall, it appears that blood concentrations of biomarkers predictive of later life cardiovascular events are broadly persistent across generations, and that socioeconomic factors alone do not have a significant explanatory role in the maintenance of these patterns.

Summary

The risk of fair/poor self rated health, limiting illness and diagnosed hypertension was persistent across generations of individual ethnic minority groups after adjusting for age and sex, with obesity risk increasing with generation in Chinese, Indian, Pakistani and Bangladeshi groups only. On adjusting for socioeconomic factors the majority of second generation groups had greater risks of fair/poor general health, limiting illness, obesity and diagnosed hypertension. This effect was most prominent in the three South Asian groups in particular, and weaker in Black African, Irish and Chinese groups.

Results for blood biomarkers of cardiovascular disease are less revealing however. Not only are there no intergenerational differences in biomarker concentrations predictive of cardiovascular disease, but these risk factors are not mediated via socioeconomic pathways, suggesting that other mechanisms, such as health behaviours, might explain the patterns of health documented here.

Table 8.14: Odds (95% CI) of being in an at-risk group for biomarkers of cardiovascular disease in the second generation compared to the first, adjusted step-wise for age & sex, and socioeconomic factors by ethnic group

Odds Ratio for Poor Health: 2nd v 1st Generation	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Total Cholesterol (>5mmol/l)							
Age & Sex Adjusted	1.24 *(0.88-1.75)*	0.80 *(0.54-1.19)*	1.25 *(0.71-2.21)*	1.15 *(0.71-1.86)*	1.12 *(0.46-2.71)*	1.40 *(0.99-2.00)*	0.86 *(0.47-1.57)*
+SES Adjusted	1.16 *(0.79-1.71)*	0.67 *(0.40-1.11)*	1.17 *(0.55-2.50)*	1.21 *(0.73-2.00)*	1.40 *(0.51-3.86)*	1.36 *(0.94-1.96)*	0.88 *(0.44-1.76)*
HDL (<1.0mmol/l)							
Age & Sex Adjusted	0.74 *(0.46-1.20)*	0.54 *(0.34-0.86)**	0.98 *(0.55-1.75)*	0.62 *(0.30-1.31)*	0.95 *(0.31-2.95)*	0.65 *(0.41-1.06)*	0.73 *(0.28-1.85)*
+SES Adjusted	0.81 *(0.48-1.38)*	0.72 *(0.43-1.22)*	1.01 *(0.46-2.24)*	0.62 *(0.27-1.40)*	0.14 *(0.01-1.29)*	0.60 *(0.36-1.00)*	0.80 *(0.26-2.40)*
LDL (>3.0mmol/l)							
Age & Sex Adjusted	0.86 *(0.53-1.38)*	1.98 *(1.03-3.80)**	0.79 *(0.23-2.79)*	1.34 *(0.67-2.69)*	0.78 *(0.23-2.59)*	1.24 *(0.82-1.88)*	0.71 *(0.29-1.71)*
+SES Adjusted	0.79 *(0.47-1.35)*	1.45 *(0.63-3.33)*	1.45 *(0.63-3.33)*	1.61 *(0.77-3.35)*	1.31 *(0.26-6.63)*	1.19 *(0.78-1.84)*	0.66 *(0.19-2.30)*
CRP (>3.0mgl/l)							
Age & Sex Adjusted	1.34 *(0.91-1.97)*	1.15 *(0.73-1.84)*	0.80 *(0.38-1.70)*	1.15 *(0.68-1.93)*	1.46 *(0.51-4.14)*	0.88 *(0.61-1.26)*	1.75 *(0.70-4.37)*
+SES Adjusted	1.49 *(0.98-2.27)*	1.17 *(0.73-1.89)*	0.81 *(0.36-1.83)*	1.25 *(0.73-2.14)*	2.87 *(0.74-11.16)*	0.83 *(0.57-1.20)*	2.36 *(0.79-7.07)*

Notes: *p<0.05; SES: social class, highest qualification, equivalised income

8.5.2 Evidence from the Millennium Cohort Study

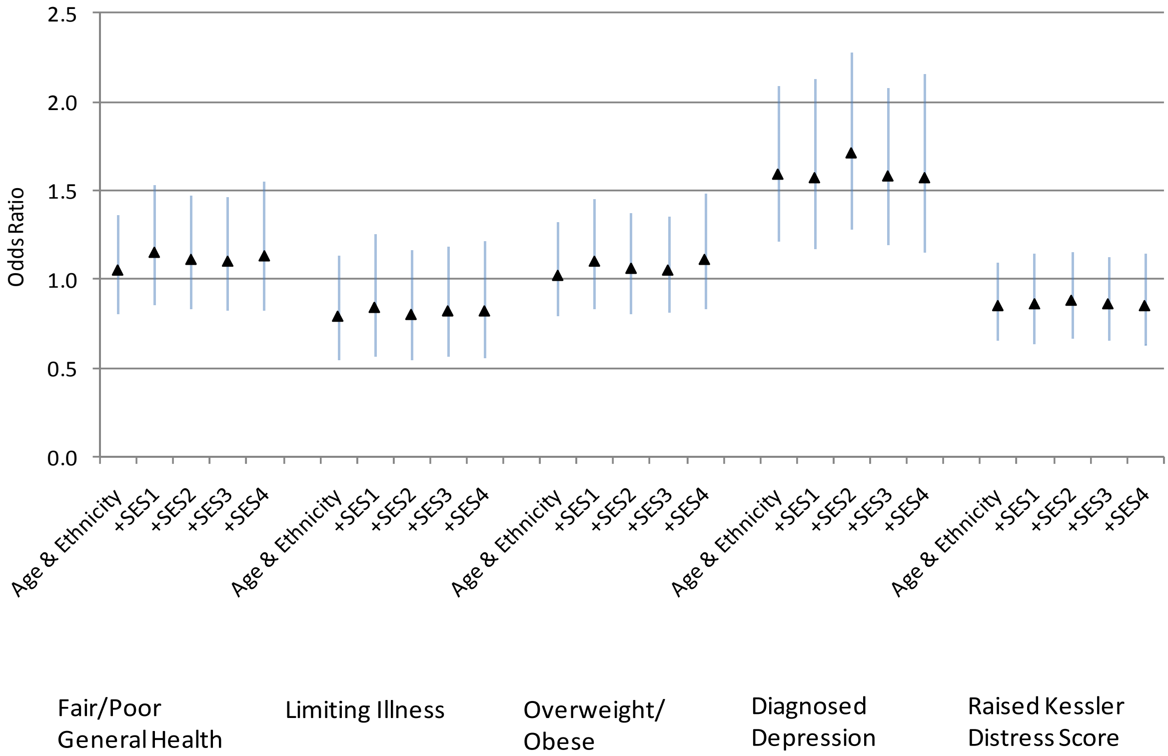
8.5.2.1 Maternal Health

Figure 8.14 describes the extent to which socioeconomic conditions explain the maternal health differentials between the first and second generation of a combination of ethnic minority groups. The White majority group is excluded from this analysis. These data also describe the influence of a wide range of socioeconomic factors beyond the social class, education and income indicators used previously. Each model is constructed by standardising for maternal age and ethnicity, followed by the addition of specific sets of socioeconomic factors.

There was an increased risk of fair/poor general health, limiting illness and being overweight/obese in the second generation compared to the first after adjusting for socioeconomic factors. However, the risk of doctor diagnosed depression was not moderated by socioeconomic factors. These data are consistent with the previous findings documented from the HSE. The self rated assessment of mental health (Kessler Distress Score) followed the same patterns as self rated general health, leading to an increasing risk in the second generation after controlling for social factors.

However, for the majority of health outcomes, indicators of living conditions (SES2) and family economic structures (SES3) did not explain as much of the excess risk in the second generation as did the combined measures of class, education and income. It is possible that the proportion of two parents working is likely to be closely related to, and explained by, models with family income data. Wald tests confirm that these family economic parameters contribute little to the model when they are included together. Consequently, only NS-SEC, family's highest qualification and family income are used in later analyses in the MCS as this represents the most parsimonious model.

Figure 8.14: Odds (95% CI) of poor maternal health in the second generation compared to the first, adjusted for age, ethnicity and socioeconomic factors (SES)



SES1: family highest NS-SEC, family income, family highest qualification; SES2: damp, overcrowding, housing tenure; SES3: lone parent & parental economic activity; SES4: All SES variables

Table 8.15 describes the influence of socioeconomic factors on maternal health. Controlling for socioeconomic factors reduced the risk of poor health in the second generation compared to the first for all outcomes in the White group. This trend was replicated for fair/poor general health, limiting illness, overweight/obesity and for diagnosed depression in Other White and Black Caribbean. As the White and Other White were downwardly mobile, these findings suggest that the excess risk of poor health in the second generation of White and Other White was mediated by poorer socioeconomic circumstances. However, the Black Caribbean group was upwardly mobile suggesting that, for this group, improving socioeconomic circumstances did not lead to better health. Nevertheless, there was a general trend in Indian and Pakistani groups for the risk of poor health to increase across all outcomes after controlling for upward socioeconomic mobility. The effect was weaker across outcomes for Bangladeshi and Black African. Overall, and with the notable exception to the Black Caribbean group, the upwardly mobile groups showed an increased risk of poor health in the second generation after socioeconomic adjustment, suggesting that poor health in the second generation is attenuated by better socioeconomic conditions. Therefore, these observations imply that the risk of poor health was mediated by intergenerational differences in socioeconomic advantage.

Table 8.15: Odds (95% CI) of poor maternal health in the second generation compared to the first by ethnicity, adjusted for age and socioeconomic circumstances (SES)

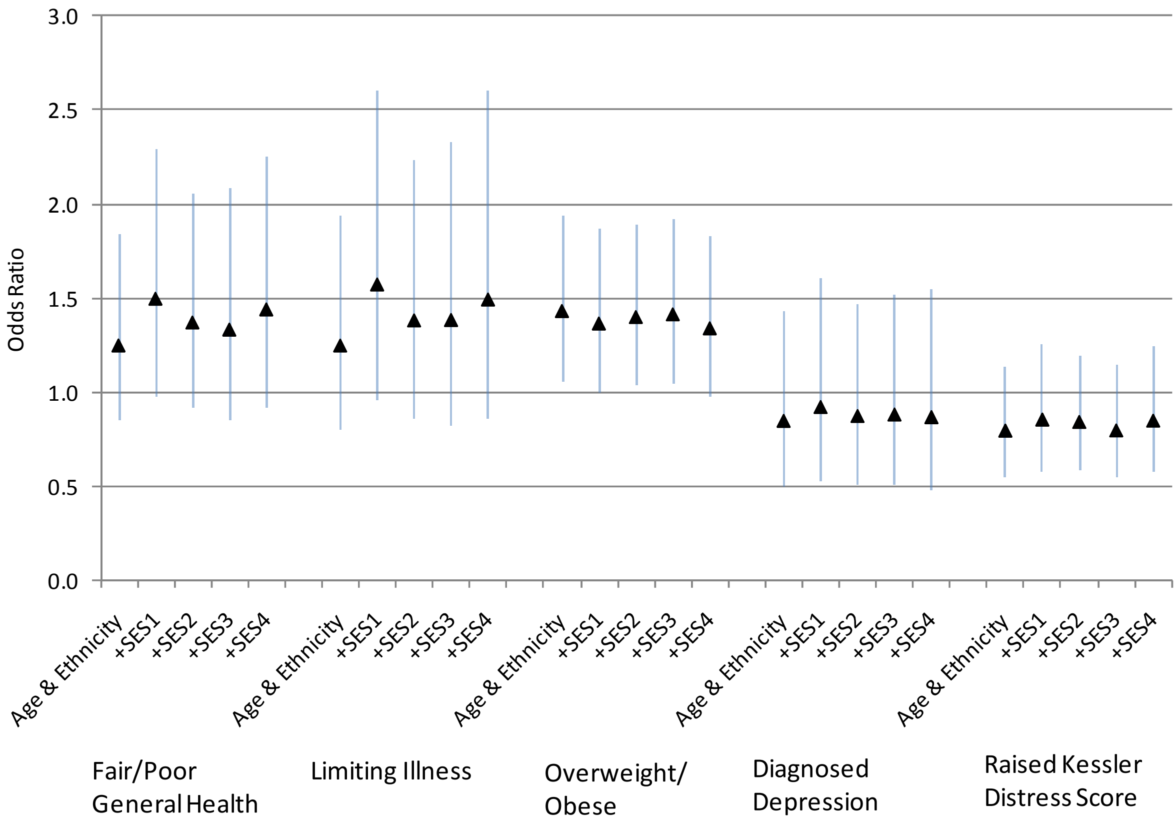
	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age Adjusted	1.02 *(0.65-1.61)*	1.66 *(0.75-3.71)*	1.03 *(0.59-1.82)*	1.55 *(0.57-4.24)*	1.09 *(0.41-2.92)*	0.18 *(0.06-0.59)**	1.11 *(0.44-2.82)*	1.06 *(0.48-2.36)*
+SES	0.95 *(0.59-1.51)*	1.80 *(0.83-3.94)*	1.09 *(0.58-2.07)*	2.21 *(0.58-8.44)*	0.78 *(0.27-2.21)*	0.25 *(0.05-1.21)*	0.92 *(0.36-2.36)*	1.18 *(0.48-2.93)*
Limiting Illness								
Age Adjusted	0.79 *(0.54-1.16)*	0.83 *(0.27-2.55)*	0.68 *(0.37-1.23)*	0.68 *(0.16-2.86)*	3.18 *(0.86-11.75)*	0.31 *(0.08-1.28)*	0.93 *(0.32-2.69)*	0.53 *(0.19-1.44)*
+SES	0.76 *(0.51-1.13)*	0.86 *(0.28-2.66)*	0.83 *(0.39-1.74)*	0.77 *(0.11-5.22)*	1.78 *(0.47-6.66)*	1.13 *(0.14-8.95)*	0.82 *(0.29-2.28)*	0.51 *(0.16-1.59)*
Overweight/Obesity								
Age Adjusted	1.41 *(0.95-2.08)*	1.13 *(0.59-2.14)*	0.90 *(0.54-1.51)*	1.03 *(0.33-3.18)*	0.98 *(0.38-2.55)*	0.83 *(0.30-2.30)*	1.39 *(0.74-2.62)*	0.92 (0.44-1.94)
+SES	1.37 *(0.94-2.01)*	1.11 *(0.55-2.25)*	1.12 *(0.65-1.95)*	0.82 *(0.18-3.67)*	0.75 *(0.26-2.13)*	0.81 *(0.30-2.21)*	1.25 *(0.63-2.47)*	1.07 *(0.43-2.67)*
Diagnosed Depression								
Age Adjusted	1.05 *(0.76-1.46)*	0.88 *(0.37-2.10)*	2.33 *(1.30-4.20)**	1.57 *(0.63-3.91)*	3.07 (1.20-7.85)*	1.25 (0.44-3.60)	1.23 (0.57-2.69)	1.55 (0.71-3.41)
+SES	0.96 *(0.69-1.34)*	1.28 *(0.46-3.54)*	2.20 *(1.21-4.01)**	1.95 *(0.41-9.36)*	2.98 *(0.88-10.08)*	1.09 *(0.28-4.22)*	1.10 *(0.53-2.27)*	1.87 *(0.77-4.54)*
Raised Distress Score								
Age Adjusted	1.07 *(0.77-1.50)*	1.05 *(0.56-1.97)*	0.89 *(0.51-1.56)*	1.07 *(0.40-2.86)*	1.88 *(0.82-4.27)*	1.03 *(0.53-1.98)*	0.88 *(0.43-1.79)*	0.39 *(0.18-0.81)**
+SES	1.03 *(0.73-1.44)*	1.10 *(0.56-2.19)*	1.02 *(0.57-1.81)*	0.62 *(0.17-2.29)*	2.37 *(0.95-5.92)*	1.72 *(0.55-5.36)*	0.85 *(0.38-1.89)*	0.35 *(0.14-0.84)**

Notes: *p<0.05; SES: highest family NS-SEC, family income, highest family qualification

8.5.2.2 Paternal Health

Generational differences in a combination of ethnic minority groups are shown in Figure 8.15. Controlling for socioeconomic factors increased the risk of fair/poor general health, limiting illness, diagnosed depression and of having a raised distress score in the second generation compared to the first. The risk of being overweight/obese in the second generation compared to the first was reduced after accounting for NS-SEC, highest family qualification and family income (SES1). As previously observed in mothers, accounting for standards of living conditions (SES2: damp, overcrowding, housing tenure) and family economic structures (SES3: lone parenthood, parental economic activity) made little difference to the overall risk of poor health. Therefore socioeconomic influences on health will be explored using only NS-SEC, highest family qualification and family income.

Figure 8.15: Odds (95% CI) of poor paternal health in the second generation compared to the first, adjusted for age, ethnicity and socioeconomic factors (SES)



SES1: family highest NS-SEC, family income, family highest qualification; SES2: damp, overcrowding, housing tenure; SES3: lone parent & parental economic activity; SES4: All SES variables

Table 8.16 describes socioeconomic effects on the health of individual ethnic groups. The paternal sample was smaller than the maternal and issues of power are again of concern with modelling impossible for Bangladeshi fathers. The risk of poor health was reduced in the White group after controlling for socioeconomic factors, with exception to being overweight/obese. Standardising for socioeconomic factors had highly inconsistent effects on intergenerational risk in all other groups. Although there were observable socioeconomic effects on the risk of poor health, the direction of change varied widely across ethnic groups for the same outcome. Additionally, the direction of the change in the risk within ethnic groups was also inconsistent. This suggests that there was no uniform influence of socioeconomic factors on health outcome for fathers.

Table 8.16: Odds (95% CI) of poor paternal health in the second generation compared to first, adjusted for age and socioeconomic circumstances (SES)

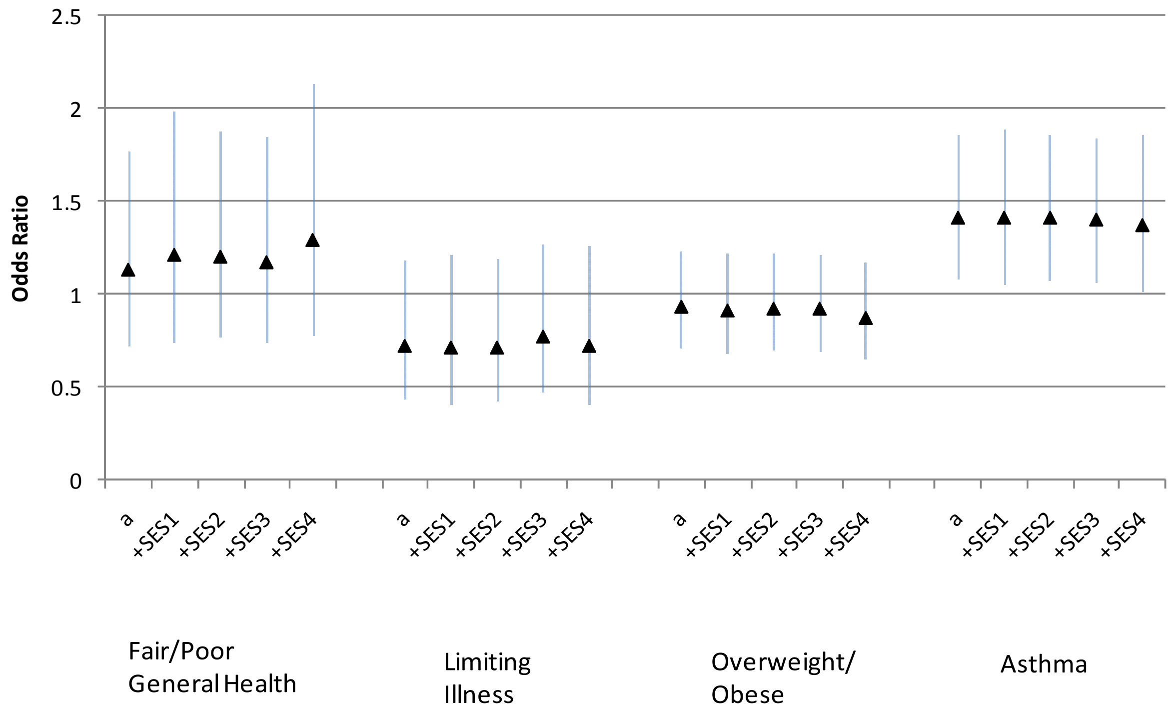
	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age	1.83 *(0.80-4.21)*	1.00 *(0.37-2.69)*	1.11 *(0.56-2.19)*	-	-	1.27 *(0.24-6.59)*	2.72 *(0.64-11.49)*	0.36 *(0.12-1.07)*
Age + SES	1.51 *(0.64-3.59)*	0.96 *(0.32-2.93)*	1.13 *(0.52-2.43)*	-	-	1.55 *(0.11-22.71)*	2.90 *(0.62-13.60)*	0.62 *(0.21-1.79)*
Limiting Illness								
Age	1.50 *(0.72-3.10)*	1.10 *(0.39-3.08)*	0.81 *(0.42-1.58)*	-	1.19 *(0.21-6.79)*	1.03 *(0.21-5.10)*	1.85 *(0.36-9.40)*	1.75 *(0.57-5.33)*
Age + SES	1.35 *(0.63-2.93)*	1.24 *(0.37-4.19)*	1.04 *(0.47-2.30)*	-	1.80 *(0.33-9.88)*	1.73 *(0.13-22.25)*	1.91 *(0.28-12.90)*	2.20 *(0.61-7.90)*
Overweight/Obesity								
Age	1.07 *(0.72-1.61)*	1.12 *(0.60-2.11)*	2.13 *(0.92-4.90)*	-	0.90 *(0.21-3.82)*	1.94 *(0.70-5.35)*	1.29 *(0.62-2.65)*	0.87 *(0.38-1.98)*
Age + SES	1.36 *(1.01-1.82)**	1.13 *(0.46-2.80)*	1.28 *(0.74-2.22)*	-	1.06 *(0.16-6.75)*	1.21 *(0.34-4.23)*	2.66 *(1.09-6.48)**	0.70 *(0.34-1.42)*
Diagnosed Depression								
Age	1.88 *(1.02-3.46)*	1.12 *(0.41-3.11)*	1.00 *(0.44-2.31)*	-	0.30 *(0.03-2.73)*	0.12 (0.01-1.40)	0.97 *(0.39-2.44)*	0.89 *(0.30-2.64)*
Age + SES	1.19 *(0.82-1.73)*	0.61 *(0.19-1.96)*	2.50 *(0.97-6.41)*	-	1.00 *(0.68-1.46)*	-	1.84 *(0.51-6.59)*	1.68 *(0.68-4.16)*
Raised Distress Score								
Age	1.03 *(0.64-1.65)*	0.70 *(0.31-1.56)*	0.49 *(0.24-1.00)*	-	1.43 *(0.29-6.98)*	0.73 *(0.25-2.10)*	0.98 *(0.50-1.93)*	0.78 *(0.31-1.99)*
Age + SES	0.91 *(0.70-1.17)*	2.63 *(1.12-6.14)**	1.12 *(0.58-2.18)*	-	0.78 *(0.15-4.19)*	0.78 *(0.12-5.27)*	1.03 *(0.41-2.61)*	0.49 *(0.20-1.19)*

Notes: *p<0.05; SES: highest family NS-SEC, family income, highest family qualification

8.5.2.3 Child Health

The risk of poor health in children of second generation mothers compared to first generation mothers is described in Figure 8.16. Models were constructed by first standardising for child age and sex and ethnicity, followed by additional adjustment for different sets of socioeconomic factors. Controlling for NS-SEC, family's highest qualification and family income increased the risk of fair/poor general health, but had very little influence on any other health outcome. As for parents, adjusting for the standard of living (SES2) and family economic structures (SES3) did not add significantly to models estimating the extent to which social factors mediate intergenerational changes in health outcome. Wald tests suggest that these additional factors (SES2 and SES3) do not add significantly to the model when included with all other indicators.

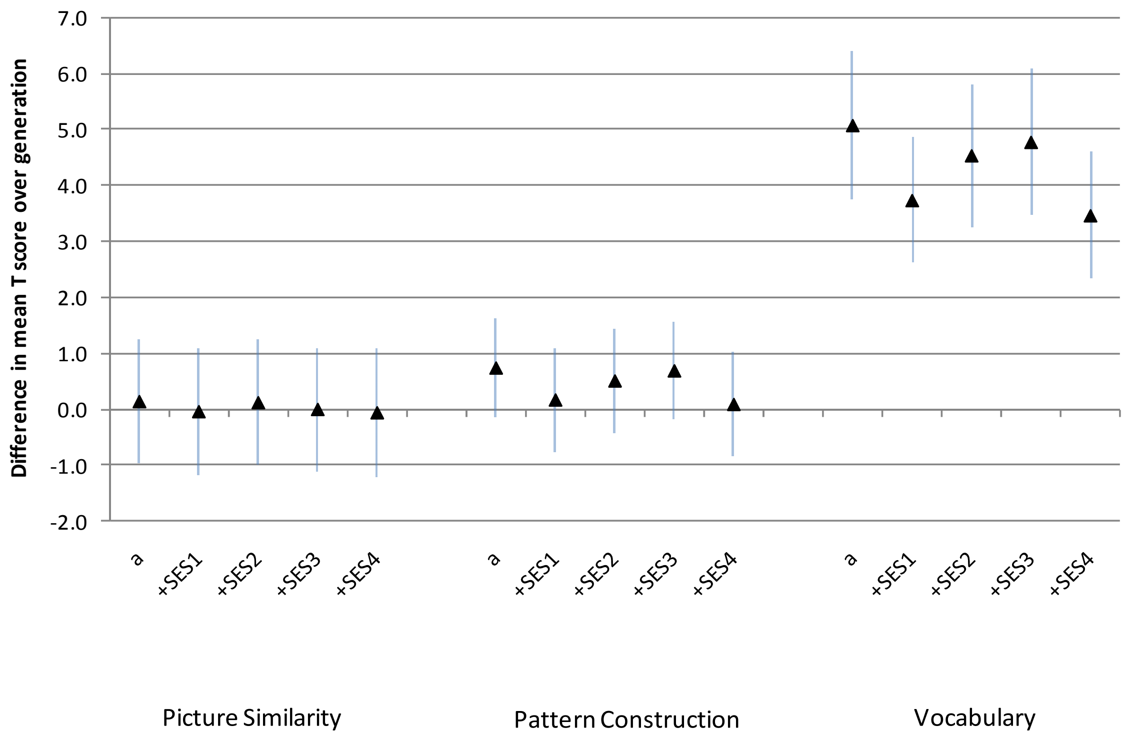
Figure 8.16: Odds of poor child health in the second generation compared to first, adjusted for demographic factors[a] and socioeconomic factors (SES)



[a] adjusted for child's age, sex and ethnicity & mother's age; SES1: family highest NS-SEC, family income, family highest qualification; SES2: damp, overcrowding, housing tenure; SES3: lone parent & parental economic activity; SES4: All SES variables

Figure 8.17 describes the effect of controlling for socioeconomic factors on the mean cognitive development test scores in a combination of all ethnic minority groups. The regression coefficient shows the change in the mean test score in the second generation compared to the first. NS-SEC, family's highest qualification and family income had no influence upon picture similarity scores. However, the mean score for the pattern construction test, and to a greater extent, the vocabulary test, was attenuated by these socioeconomic factors. Adjusting independently for standards of living (SES2) and family economic structures (SES3) had a negligible influence on the mean score, for all tests. This implies that increasing NS-SEC, family's highest qualification and family's income over generations may explain some of the increase in pattern construction and vocabulary scores.

Figure 8.17: Linear regression coefficient for change in child cognitive development scores over generation, adjusted for demographic factors[a] and socioeconomic factors (SES)



[a] adjusted for child's sex and ethnicity & mother's age; SES1: family highest NS-SEC, family income, family highest qualification; SES2: damp, overcrowding, housing tenure; SES3: lone parent & parental economic activity; SES4: all SES variables

The data in Table 8.17 explores these findings within individual ethnic groups. With exception to Bangladeshi children, adjusting for family socioeconomic factors did not produce any significant changes in the odds of having poor health in children of second generation mothers compared to first. Bangladeshi children with second generation mothers were significantly more likely to have problems with asthma than children of first generation mothers, but this group has a small base which is reflected in the wide confidence intervals. Overall, this suggests that child health is not only persistent across generations, but changing family socioeconomic circumstances appear to have little role in mediating these patterns. This is supported by the earlier observations in section 8.3.2.2 (page 162) suggesting a weak socioeconomic patterning of health in ethnic minority children, which was apparent for self rated general health alone, across categories of NS-SEC only.

Table 8.18 shows linear regression coefficients for cognitive development scores. The coefficient represents the difference in the mean score between the children of second generation mothers compared to first. A positive coefficient shows that the second generation had a higher mean score than the first, whereas a negative coefficient describes the reduction in the score over generation. The downwardly mobile White and Other White groups showed an increase in the mean score over generations, for all three cognitive tests, after accounting for socioeconomic factors. Conversely, there was a uniform decrease in all test scores for all other ethnic minority groups, who were upwardly mobile over generations. The single exception was for Indian picture similarity test, which showed no discernible shift in score after accounting for socioeconomic factors. These results strongly suggest that intergenerational shifts in socioeconomic circumstances mediate the generational differences in child cognitive development.

Table 8.17: Odds (95% CI)) of poor child health in the second generation compared to the first, adjusted for maternal age and family socioeconomic circumstances (SES) by ethnicity

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age Adjusted	0.85 *(0.38-1.94)*	0.74 *(0.24-2.27)*	1.90 *(0.82-4.41)*	1.87 *(0.63-5.57)*	0.62 *(0.14-2.75)*	0.22 *(0.03-1.33)*	2.40 *(0.65-8.87)*	0.55 *(0.20-1.51)*
Age + SES	0.73 *(0.33-1.65)*	0.67 *(0.17-2.67)*	2.31 *(0.93-5.76)*	1.44 *(0.08-25.12)*	1.01 *(0.29-3.54)*	0.21 *(0.03-1.27)*	2.51 *(0.58-10.80)*	0.51 *(0.18-1.47)*
Limiting Illness								
Age Adjusted	1.09 *(0.48-2.52)*	1.05 *(0.19-5.75)*	0.54 *(0.24-1.21)*	0.79 *(0.06-11.16)*	1.12 *(0.19-6.62)*	4.18 *(0.35-50.12)*	0.54 *(0.20-1.47)*	0.92 (0.30-2.85)
Age + SES	1.03 *(0.44-2.37)*	0.78 *(0.06-9.54)*	0.51 *(0.20-1.31)*	-	0.88 *(0.08-9.61)*	-	0.58 *(0.18-1.93)*	0.87 *(0.25-3.07)*
Overweight/Obesity								
Age Adjusted	1.17 *(0.82-1.67)*	1.09 *(0.45-2.63)*	0.88 *(0.52-1.49)*	0.99 *(0.36-2.67)*	0.49 *(0.23-1.04)*	1.42 *(0.77-2.63)*	0.93 *(0.57-1.51)*	0.81 *(0.43-1.51)*
Age + SES	1.12 *(0.79-1.59)*	1.08 *(0.44-2.66)*	0.84 *(0.44-1.62)*	5.13 *(0.91-28.96)*	0.39 *(0.16-0.95)*	1.40 *(0.65-2.99)*	0.87 *(0.52-1.45)*	0.93 *(0.48-1.82)*
Asthma								
Age Adjusted	1.38 *(0.86-2.23)*	1.38 *(0.59-3.21)*	1.39 *(0.75-2.57)*	3.06 *(0.64-14.70)*	3.81 *(1.10-13.15)**	1.68 *(0.76-3.72)*	1.26 *(0.77-2.07)*	1.18 *(0.65-2.12)*
Age + SES	1.30 *(0.80-2.11)*	1.14 *(0.45-2.88)*	1.47 *(0.75-2.89)*	6.62 *(1.40-31.32)**	3.83 *(0.96-15.23)*	2.46 *(0.85-7.12)*	1.12 *(0.66-1.91)*	1.24 *(0.63-2.42)*

Notes: *p<0.05; SES: highest family NS-SEC, family income, highest family qualification; all analyses adjusted for child age and sex

Table 8.18: Regression coefficients (95% CI) for child cognitive development T scores in the second generation compared to the first, adjusted for maternal age and family socioeconomic circumstances (SES) by ethnicity

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Picture Similarity								
Age Adjusted	-1.62 *(-3.07,0.17)*	1.49 *(-1.35,4.34)*	0.14 *(-1.50,1.79)*	-1.11 *(-5.40,3.19)*	0.91 *(-2.92,4.74)*	2.56 *(-0.51,5.62)*	-0.96 *(-3.09,1.17)*	-0.94 *(-3.87,1.99)*
Age + SES	-1.30 *(-2.74,0.13)*	1.50 *(-1.63,4.64)*	-0.16 *(-1.88,1.56)*	-1.90 *(-7.94,4.14)*	0.79 *(-3.10,4.68)*	2.21 *(-1.08,5.50)*	-0.49 *(-2.59,1.60)*	-2.04 *(-4.94,0.87)*
Pattern Construction								
Age Adjusted	-2.10 *(-3.64,0.57)*	3.88 *(1.61,6.15)**	0.13 *(-1.64,1.90)*	1.55 *(-1.71,4.81)*	4.21 *(-0.05,8.47)*	3.35 *(0.15,6.56)**	-1.22 *(-3.12,0.69)*	-0.86 *(-2.95,1.23)*
Age + SES	-1.68 *(-3.18,0.19)*	3.62 *(1.53,5.71)**	-0.57 *(-2.30,1.17)*	0.40 *(-2.46,3.26)*	2.69 *(-0.99,6.37)*	0.67 *(-2.69,4.03)*	-0.94 *(-2.92,1.04)*	-1.92 *(-4.00,0.15)*
Vocabulary								
Age Adjusted	-1.09 *(-2.51,0.33)*	4.62 *(1.73,7.50)**	4.66 *(2.34,6.98)**	1.99 *(-1.23,5.20)*	4.54 *(-0.13,9.22)*	8.24 *(4.80,11.67)**	3.47 *(1.31,5.62)**	6.77 *(3.45,10.08)**
Age + SES	-0.55 *(-1.91,0.82)*	3.24 *(0.77,5.71)**	3.01 *(1.10,4.92)**	1.08 *(-3.20,5.36)*	3.24 *(-0.56,7.04)*	3.55 *(-0.15,7.25)*	3.67 *(1.63,5.71)**	4.96 *(2.05,7.88)**

Notes: *p<0.05; SES: highest family NS-SEC, family income, highest family qualification; all analyses adjusted for child sex

Summary

Intergenerational differences in selected health outcomes in the MCS appear to be partly explained by socioeconomic factors. There was a degree of comparability with earlier HSE analyses whereby the risks of fair/poor general health, limiting illness and being overweight/obese increased in all ethnic groups combined, after adjusting for improved socioeconomic circumstances in the second generation. However, upon stratifying by ethnic minority group the sample would appear to lack power with confidence intervals becoming statistically wider. It is difficult to conclude confidently that there are significant differences in health by generation in these ethnic minority groups.

Intergenerational changes in child health followed similar patterns. There were no significant differences in health by generation before or after accounting for social factors, just as was observed in the parents. However the relationship between social factors and child cognitive development was very striking. Clearly the higher test scores in the second generation are at least partly explained by the better socioeconomic conditions.

8.6 Conclusions

This chapter began by describing the social patterning of a range of subjective and objectives measures of physical health and well-being.

- There was social gradient in the levels of fair/poor general health, limiting illness and, to a lesser extent, obesity in ethnic minority adults in the HSE and the MCS. Those people from more disadvantaged backgrounds have poorer health than those experiencing greater advantage. These observations are supported by previous work on the HSE (Cooper 2002;Higgins & Dale 2009;Nazroo 1998) and the MCS (Hansen et al. 2008).

- Ethnic minority children in the MCS showed considerably weaker relationships between socioeconomic factors and fair/poor general health, limiting illness and being overweight/obese. It is possible that the small proportion of children experiencing poor health at such a young age does not provide sufficient statistical power to detect socioeconomic differences. However, the findings from the MCS are supported by similar results elsewhere documenting a lack of social patterning across the same outcomes within children in the HSE (Saxena et al. 2002;Saxena et al 2004)

- Higher picture similarity, pattern construction and vocabulary cognitive development test scores were associated with increasing socioeconomic advantage for all groups. These developmental markers are predictive of later life chances and suggest that the socioeconomically advantaged at age five are likely to experience better later life health than those who experience poorer socioeconomic conditions (Batty et al. 2006;Hart et al. 2003;Singh-Manoux et al. 2005).

- Although the associations between socioeconomic position and health in ethnic minorities is already documented in the HSE and MCS, these findings confirm that data used here, which has been specifically prepared for generational analyses and hence excludes a significant proportion of samples used previously, continues to demonstrate these trends and is suitable for further analysis across generations.

Objective 2 *establishes the direction and extent of intergenerational socioeconomic mobility.*

- There was strong evidence of upward intergenerational socioeconomic mobility within all ethnic minority groups across all three socioeconomic indicators in the HSE. The MCS findings were broadly consistent with the HSE with two notable exceptions; the Other White and White groups showed downward mobility across generations and experienced poorer socioeconomic circumstances over increasing generation.

- The extent of mobility was not uniform for all groups. Pakistani and Bangladeshi groups experienced on-going disadvantage over generations relative to all other groups. In contrast, the Indian group were comparable with, and in some instances more advantaged than, the White group in the second generation. These findings are consistent with previous studies (Heath & Smith 2003;Platt 2005). A particular strength of these comparisons is the included description of the differential starting positions of each group. This highlights whether upward mobility is due to a greater scope for change arising from a low starting position, as is likely for Pakistani and Bangladeshi, or whether upward socioeconomic shifts build on more advantaged origins, as is the case for the Indian group. These observations imply that upward mobility in ethnic minorities is not simply an inevitable consequence of being born and schooled within the UK, but is an ethnic group-specific process and is strongly influenced by socioeconomic origins.

- The inconsistent relationships between each socioeconomic marker across ethnic minority groups were observed in each generation. There was a strong implied association between social class measures and the highest qualification achieved, but the association with levels of income was much weaker. Methodologically speaking, this suggests that the continued use of multiple indicators is required to describe the levels of socioeconomic disadvantage experienced within each group. In terms of understanding ethnic social inequalities, it suggests that increasing educational levels or higher levels of employment are not being translated into higher incomes in the same way for all ethnic minority groups.

- Rates of socioeconomic mobility within a combination of all ethnic minority groups were the same for each generation, suggesting that upward mobility is not exclusive to the first generation and is expected to continue within the second generation, and possibly into the third. This precludes the possibility of a first generation cohort effect, where the first generation is more upwardly mobile than the second as a consequence of being demoted to the lower social classes immediately after migrating.

The third objective was to assess *the extent to which intergenerational socioeconomic changes might explain health inequalities.* Objective 2 suggests that controlling for generational differences in socioeconomic circumstances accounts for improved socioeconomic circumstances on the health of the second generation compared to the first, for the majority of ethnic minority groups. However, for the White and Other White groups in the MCS, worsening socioeconomic circumstances in the second generation compared to the first is controlled for.

- In the HSE, controlling for upward mobility across generations of individual ethnic minority groups increased the risk of fair/poor general health and limiting illness in the second generation compared to the first for all but the Irish group. This trend was statistically significant for limiting illness in Black African people and is supported by findings elsewhere using longitudinal data (Harding & Balarajan 2000). Similar increases in risk were observed for obesity (with exception to Irish and Black African) and for hypertension (with exception to Irish, Black African and Black Caribbean). This suggests that upward mobility and consequently higher socioeconomic position reduces the risk of poor health in the second generation for the majority of groups. However, having hazardous levels of cardiovascular disease biomarkers did not appear to be explained by socioeconomic differences across generations, when all ethnic minority groups were combined, or when assessed individually.

- The MCS provided additional support to the findings from the HSE. Ethnic minority groups had an increased risk of fair/poor general health, limiting illness and being overweight/obese in all second generation groups which were upwardly mobile, with exception to the Black Caribbean group. Conversely, the risk of poor health decreased in the second generation compared to the first once the poorer socioeconomic circumstances of the downwardly mobile White and Other White groups were accounted for. These results provide further support to the notion that socioeconomic differences between generations mediate changes to the physical health of adults.

- Children in the MCS showed little evidence of intergenerational health differences being mediated by family socioeconomic characteristics. The only consistent trend was observed for Whites, who were less likely to report poor health (for all outcomes) in the second generation compared to first, after accounting for downward mobility, although this was not significant. Considering that child physical health was so weakly associated with socioeconomic circumstances it is not surprising that intergenerational difference in the family's social environment had little effect on health.

- There was strong evidence for a mediating role of socioeconomic factors in the increasing mean cognitive development scores over generation, within a combination of all, and within individual ethnic minority groups. Controlling for intergenerational improvements in socioeconomic circumstances led to a consistent and considerable reduction in the difference in the mean score between generations. Further support to the mediating role of socioeconomic factors arose when adjusting for downward mobility in White and Other White groups resulted in clear increases in mean scores over generation.

- Accounting for lone parenthood and family economic structures, and standards of living (damp, overcrowding, tenure) did not influence the risk of poor health in the second generation compared to the first to any greater extent than family's highest NS-SEC, family's highest educational qualification and family income did. The proportion of two parents working is likely to be closely related to, and explained by, models including family income data. However, lone parenthood increased in all but the Black African group between generations and was the only socioeconomic marker to broadly show increasing social disadvantage. Any negative effect is likely to be masked by other variables describing increasing social advantage.

This chapter has therefore described the how social circumstances vary across generations of ethnic and suggests that that these differences contribute at least partly to the formation of health differentials. However, it is unlikely that socioeconomic factors mediate generational changes in health on their own, as, in many cases, even after controlling for socioeconomic factors, significant health differences persisted. Therefore attention turns to alternative pathways which are likely to be influenced by the experiences of the social environment. As discussed in the opening chapters, there is a possibility that migrant health behaviours developed overseas, and within differing cultural contexts, might change over generation as a consequence of interacting with the UK environment, and so these changes will be the focus the next chapter.

Chapter 9:

Intergenerational Acculturation and Health

9 Intergenerational Acculturation

9.1 Aim

The previous chapters have identified clear differences in the extent to which the health profiles of a range of ethnic groups differ between generations. The question of why these patterns of health disadvantage differ between generations has so far centred on the role of the material pathway to health and the importance of socioeconomic factors. It has been shown that each ethnic group is socially mobile, albeit in varying directions, demonstrating that the social position, standard of living conditions, employment opportunities, and the general position in society occupied by each ethnic minority group is not fixed, and changes are very likely to be a direct function of time spent in the UK. These structural changes are often conflated with terms such as 'assimilation', or 'integration', as the characteristics of the migrant generation are modified according to experiences in the UK.

However, such terms are more accurately located within the domain of acculturative theory where attention is not so much on structural changes in socioeconomic profiles, but is instead focussed on behaviours and attitudes and how these personal traits might change over time. The behavioural pathway to health is a classic paradigm in social epidemiology, and is an especially pertinent one for the study of generations of migrants. This is because cultural and behavioural differences between the migrants and the majority population are likely to exist, having been shaped by differing early life experiences overseas. The modification of these cultural characteristics is expected to vary by group. One likely reason for this might be that the rate of change is influenced the initial magnitude of difference between the social norms of the White majority and the minority; the greater the 'cultural distance' between the first generation and the White majority then the greater scope there is for cultural and behavioural change. A direct comparison between behaviours in the majority and minority is required to investigate these trends. And while it is also supposed that behavioural differences are a consequence of cultural aspects of each ethnic group, it should not be assumed that the White reference population occupies the "normal" set of behaviours. The White majority is merely a reference against which the direction of acculturative change is plotted and does not therefore represent the 'healthy' (or 'unhealthy') set of behaviours. If this caveat is adhered to then such comparative analysis may yield useful data on whether behaviours are rejected or adopted according to whether they are healthy or otherwise.

Therefore this chapter is aimed at gaining a more detailed understanding of how health related behaviours differ with generation, and assesses whether these trends have an influence on a range of selected health outcomes. The subsequent analysis is specifically focussed on the following objectives:

1. **To establish the direction and extent of the intergenerational differences in health related behaviours relative to the general population (Objective 4)**
2. **Explore how intergenerational behaviour modification contributes to differences in patterns of health inequalities (Objective 5)**

9.2 Methods

All health behaviours investigated in the course of this analysis were described in detail in chapter 4 (for the HSE) and chapter 5 (for the MCS).

Direct intergenerational comparisons

In the HSE, logistic regression estimated the odds of having a given health behaviour in the second generation compared to the first. This was adjusted for ethnicity so that the observed differences would reflect actual differences between generations rather than differences in the number of people in each ethnic minority group. Sex differences between generations were identified by stratifying by sex and controlling for age. When males and females were combined the models were subsequently adjusted for sex. The odds of having a given health behaviour in the second generation relative to the first were then estimated independently for each ethnic minority group.

This was repeated for the MCS with some minor modifications to the methodology. Maternal and paternal data existed for three generations allowing the risk of a given health behaviour in two discrete UK born generations to be independently compared to the foreign born generation. Therefore the odds of having a given behaviour in the "UK born second generation" and the "UK born third generation" were compared to the foreign born first generation. Sex standardisation was not required as each model was separately constructed for either mothers or fathers, but the respective ages and ethnicity were controlled for. However, to provide cell sizes large enough for robust comparisons, the examination of intergenerational differences in behaviours within individual ethnic minority groups required the combination of the two UK born generations (as per the methodology employed elsewhere throughout this study).

Intergenerational change relative to a White reference

The second stage of the analysis used logistic regression to model the likelihood of each generation having a given health behaviour compared to the White reference group. Each generation in the HSE was controlled for age, sex and ethnicity, whereas MCS parents were stratified by sex and controlled for age and ethnicity. The risk of poor child behaviours compared to the White reference was controlled for child's age, sex and ethnicity, and for maternal age. These comparisons were performed on a combination of all ethnic minority groups, followed by each group individually.

Measuring the influence of health behaviours on health outcome

The final stage of the analysis estimated the degree to which the intergenerational differences in health related behaviours mediated the generational differences health outcomes described previously in Chapter 7. Analysis used logistic regression to calculate the odds of having a selected health outcome in the second generation compared to the first, adjusting stepwise for age, sex and ethnicity, and health behavioural factors. Rather than enter health behaviours in the model as confounders, the analysis views these components as explanatory variables, so that extent to which the likelihood of health outcome varies before and after adjustment for behaviours represents the relative importance of these factors in mediating generational differences in health. These models were then run independently for each ethnic group. This analysis was repeated using MCS data stratifying by parental status.

Lastly, linear regression modelled the intergenerational shifts in cognitive development scores in children in the MCS. Therefore the regression coefficient represents the change in the score between each generation, adjusted step-wise for child's sex and maternal age, and health related behaviours. Test scores were previously age adjusted when normed against the British Abilities Scales reference population and require no further age standardisation. This linear regression model was run for all groups combined, and then separately for ethnic group.

As with all other analyses in this study, the *svy* command was used in STATA v10.1 to employ the appropriate weights to account for non-response bias and to provide a closer estimation of the measure of effect in the general population.

9.3 Acculturative Changes in Health Behaviours in the Health Survey for England

Previous descriptive analysis (section 6.4) showed considerable differences between the ethnic minority groups in the proportions reporting poor health behaviours. However, the analysis did not reveal whether these trends differ between generations. The following analysis estimates the magnitude of intergenerational differences for all groups combined, and then provides additional detail by investigating generational shifts independently for each ethnic group.

9.3.1 The Extent of Intergenerational Change in Health Related Behaviour in the Health Survey for England

There was a striking gender contrast in the likelihood of current smoking with second generation women being statistically significantly more likely to be current smokers than the first generation, as opposed to men who were less likely. Such statistically significant dichotomies by sex were not apparent for other behaviours. Second generation men and women were more likely than the first generation to drink any alcohol, have low fruit or vegetable consumption (<once a week) and have a poor overall diet score, but this was statistically significant only for drinking any alcohol. Second generation men and women were less likely to have low levels of physical activity than the first generation, but this was statistically significant for men only, whereas the lower second generation risk of adding salt during cooking was statistically significant for women only. There were no significant generational differences observed in salt being added at the table or for dietary fat scores for either sex.

Table 9.1: Odds (95%) of having poor health behaviour in the second generation compared to the first, adjusted for age and ethnic group

	Male	*Female*
Current smoker	0.79 *(0.63-0.99)**	1.35 *(1.04-1.76)**
Any alcohol intake	1.57 *(1.22-2.00)**	1.36 *(1.09-1.69)**
Low fruit consumption	1.27 *(0.98-1.65)*	1.27 *(0.97-1.66)*
Low vegetable consumption	1.11 *(0.84-1.47)*	1.09 *(0.84-1.43)*
Low physical activity	0.75 *(0.60-0.93)**	0.88 *(0.74-1.05)*
Any salt during cooking	0.79 *(0.60-1.05)*	0.75 *(0.59-0.95)**
Any salt added at table	0.94 *(0.67-1.32)*	0.86 *(0.64-1.15)*
High derived fat score	0.95 *(0.57-1.56)*	1.23 *(0.70-2.16)*
Poor Diet Score	1.03 *(0.73-1.44)*	1.21 *(0.82-1.78)*

Notes: * p<0.05

More detailed stratification by ethnic minority group and generation (Table 9.2) showed a large intergenerational increase in the risk of any alcohol drinking which was statistically significant in all groups except for Irish. However, drinking rates were so low in the Bangladeshi first generation that an estimate was not possible. Additionally, all second generation ethnic minorities were more likely to smoke than their first generation counterparts and was significant for Indian, Pakistani, Bangladeshi and Black Caribbean women, although case numbers were small for Pakistani and Bangladeshi women requiring caution in interpretation. Frequency of fruit and vegetable consumption tended to decline with generation in Black African people and for all three South Asian groups (significantly so for Indian). Indian people had a statistically significant greater risk of having a higher derived fat score in the second generation, and there was an increase in the risk of having a poor diet score over generation in all groups except Irish and Chinese, although these observations did not reach statistical significance.

However, some health behaviours were healthier in the second generation. All ethnic minorities were less likely to have low levels of physical activity with increasing generation, which was significant in Indian, Pakistani, Bangladeshi and Chinese groups. With exception to the Bangladeshi group, the majority of ethnic minority groups were less likely to add salt during cooking, which was significant for the Chinese group. Second generation Pakistani and Chinese groups were significantly less likely to add salt at the table, although, there was a greater risk for the Black Caribbean group.

Table 9.2: Age and sex adjusted odds (95%) poor health related behaviour in the second generation compared to the first

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Current Smoker							
Men	1.07	0.91	0.84	1.29	0.98	0.73	0.64
	(0.69-4.66)	*(0.62-1.34)*	*(0.55-1.30)*	*(0.75-2.25)*	*(0.40-2.36)*	*(0.49-1.07)*	*(0.35-1.17)*
Women	2.52	4.06	6.52	2.91	1.82	1.05	1.07
	*(1.14-5.54)**	*(1.71-9.65)**	*(1.10-38.46)**	*(1.79-4.75)**	*(0.73-4.50)*	*(0.75-1.48)*	*(0.52-2.23)*
Any alcohol intake	2.23	2.33	-	1.43	1.46	1.23	1.55
	*(1.69-2.93)**	*(1.16-4.66)*	-	*(1.03-1.97)**	*(0.88-2.43)*	*(0.95-1.59)*	*(1.11-2.16)**
Low physical activity	0.65 *(0.50-0.83)**	0.69 *(0.55-0.88)**	0.75 *(0.57-0.99)**	0.95 *(0.67-1.34)*	0.73 *(0.46-1.14)*	0.90 *(0.70-1.15)*	0.50 *(0.36-0.70)*
Low fruit consumption	1.64 *(1.22-2.20)**	1.09 *(0.80-1.49)*	1.13 *(0.82-1.55)*	1.58 *(1.05-2.36)**	1.38 *(0.88-2.16)*	1.07 *(0.84-1.37)*	0.76 *(0.48-1.19)*
Low vegetable consumption	1.48 *(1.06-2.07)**	1.27 *(0.96-1.67)*	1.45 *(1.02-2.04)**	0.80 *(0.57-1.11)*	1.24 *(0.84-1.84)*	0.88 *(0.68-1.13)*	1.36 *(0.85-2.17)*
Any salt during cooking	0.83 *(0.51-1.37)*	0.76 *(0.45-1.30)*	1.14 *(0.53-2.44)*	0.86 *(0.55-1.34)*	0.75 *(0.31-1.78)*	0.93 *(0.70-1.24)*	0.53 *(0.29-0.97)**
Any salt added at table	0.82 *(0.61-1.11)*	0.70 *(0.51-0.97)**	1.34 *(0.88-2.05)*	1.80 *(1.18-2.74)**	0.99 *(0.53-1.84)*	0.64 *(0.47-0.87)*	0.50 *(0.32-0.77)**
High derived fat score	3.90 *(1.49-10.20)**	1.48 *(0.90-2.44)*	0.80 *(0.31-2.05)*	2.13 *(0.72-6.26)*	0.12 *(0.02-0.94)*	0.82 *(0.49-1.36)*	3.76 *(1.24-11.40)**
Poor Diet Score	1.57 (0.97-2.55)	1.09 (0.70-1.69)	1.10 (0.60-2.04)	1.75 (0.95-3.25)	1.13 (0.57-2.26)	0.89 (0.61-1.30)	0.77 (0.33-1.76)

Notes: * p<0.05

9.3.2 The Direction of Acculturative Changes Relative to the White Population in the Health Survey for England

The previous section described the extent to which health behaviours were modified over generations of each ethnic minority group. However, generational differences *within* each ethnic minority group do not explore the potential influence of the behaviours of the majority on these changes. The following investigation examines whether ethnic minority behaviours become more, or less similar than a White reference group that represents the majority population.

Figure 9.1 shows that, after adjusting for age, the second generation Bangladeshi men were significantly less likely to currently smoke than the first generation. This is a striking change given the large excess risk of smoking relative to the White group in the first generation. There was a mixed intergenerational pattern of smoking behaviours in other groups. The risk of current smoking in Indian, Black Caribbean and Irish groups approximated towards the risk of smoking in the White reference group, whereas Pakistani, Black African and Chinese people shifted away from the smoking rates in White people, and were less likely to smoke in the second generation than in the first. There were marked differences in the smoking profiles of women (Figure 9.2). Every ethnic minority group approximated towards the smoking rates in the White reference over generation. This was a statistically significant shift for Black Caribbean and Indian women. Despite these shifts, only the second generation Irish and Black Caribbean groups were more likely to smoke than the White reference.

Both generations of ethnic minorities were significantly less likely to ever drink than the White group, with exception to the second generation Irish who drink more (Figure 9.3). Patterns of convergence towards rates in the White group (previously observed for current smoking) was replicated in Black Caribbean, Black African and Indian groups, implying a correlation between smoking and drinking uptake over generations for these people. The proportion reporting any drinking in either generation of Pakistani and Bangladeshi people was small, but was more likely in the second generation. These data show that while current smoking and any drinking rates were associated with one another in the White group, ethnic minority uptake of these behaviours was group specific and the implied association between these behaviours was not the same for all groups.

There was a reduction across all groups in the risk of low physical exercise over generation, with an approximation towards the rates observed in the White reference. However, only the Black Caribbean and Irish had comparable rates of physical activity to Whites in the second generation indicating that although inequality had narrowed, most ethnic minorities still had lower levels of exercise (Figure 9.4). Similar intergenerational patterns of convergence were observed for the risk of a poor diet score. All first generation ethnic minority groups, with exception to Irish and Bangladeshi, had a lower risk of having a poor diet score relative to the White majority group, and was significant for Indian, Black Caribbean and Chinese groups. However, the second generation of all groups, except Irish, showed a generational increase in the risk of a poor diet score relative to the White majority, indicative of a worsening of the diet over generations. This increased risk was large enough in second generation Pakistani, Bangladeshi and Black African groups to represent a generational divergence from the risk of poor diet scores observed in the White population.

Figure 9.1: Age adjusted odds of being a current smoker compared to the White reference by generation: Men

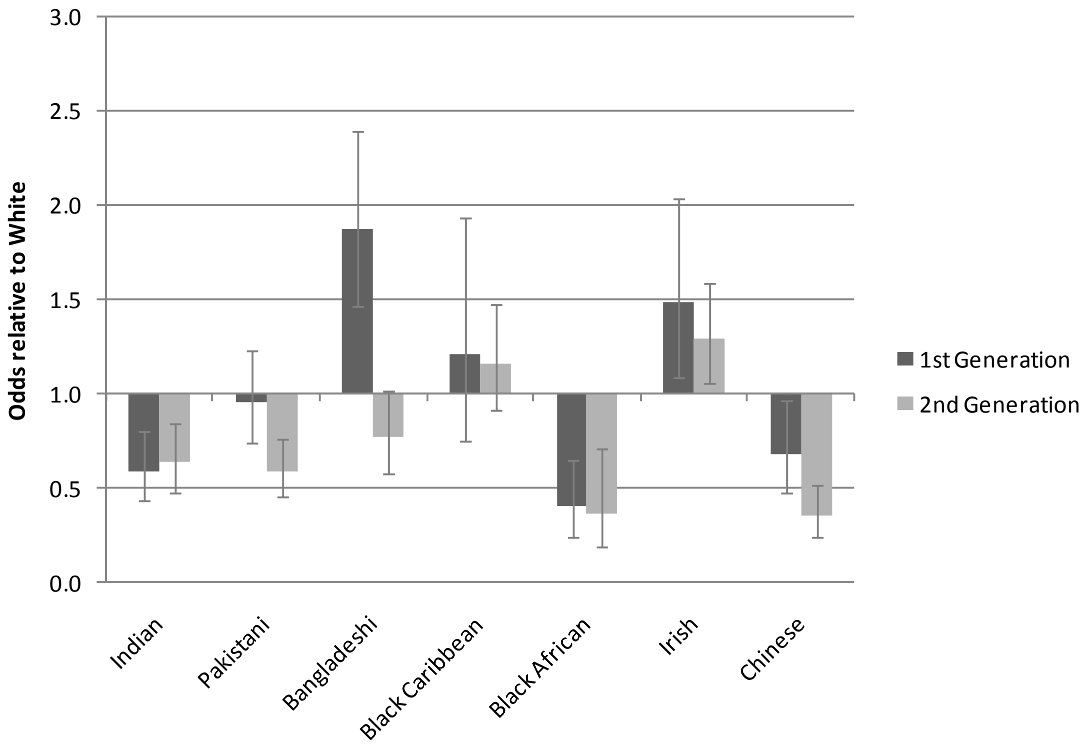


Figure 9.2: Age adjusted odds of being a current smoker compared to the White reference by generation: Women

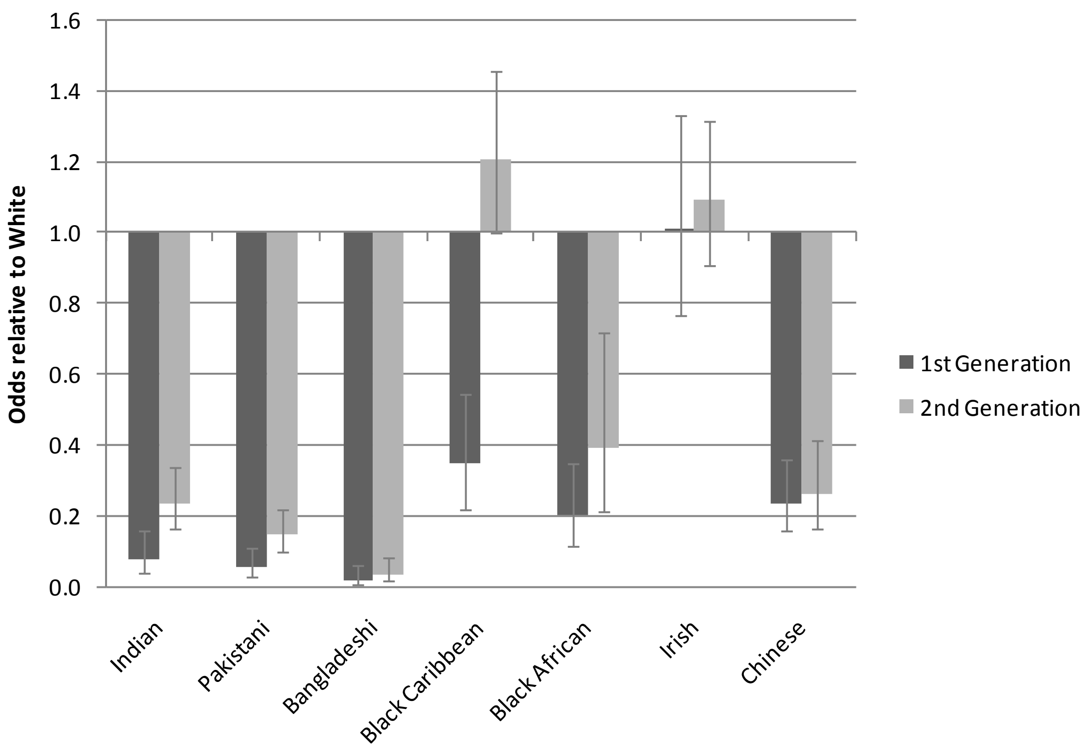


Figure 9.3: Age & sex adjusted odds of any drinking compared to the White reference by generation

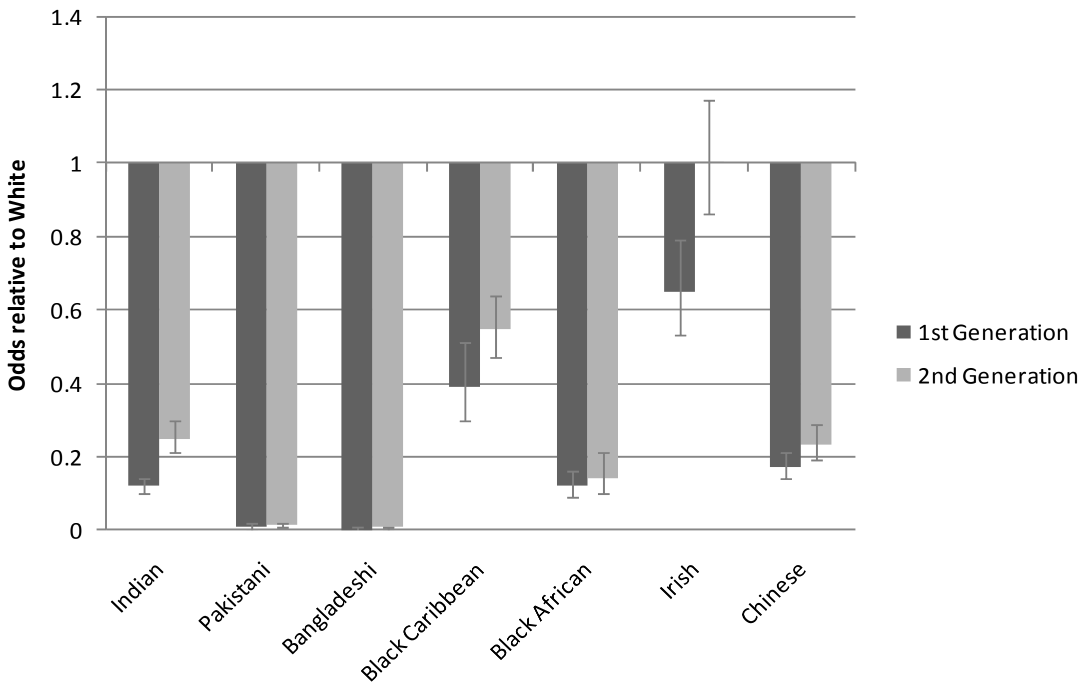


Figure 9.4: Age & sex adjusted odds of having low levels of physical activity compared to the White reference by generation

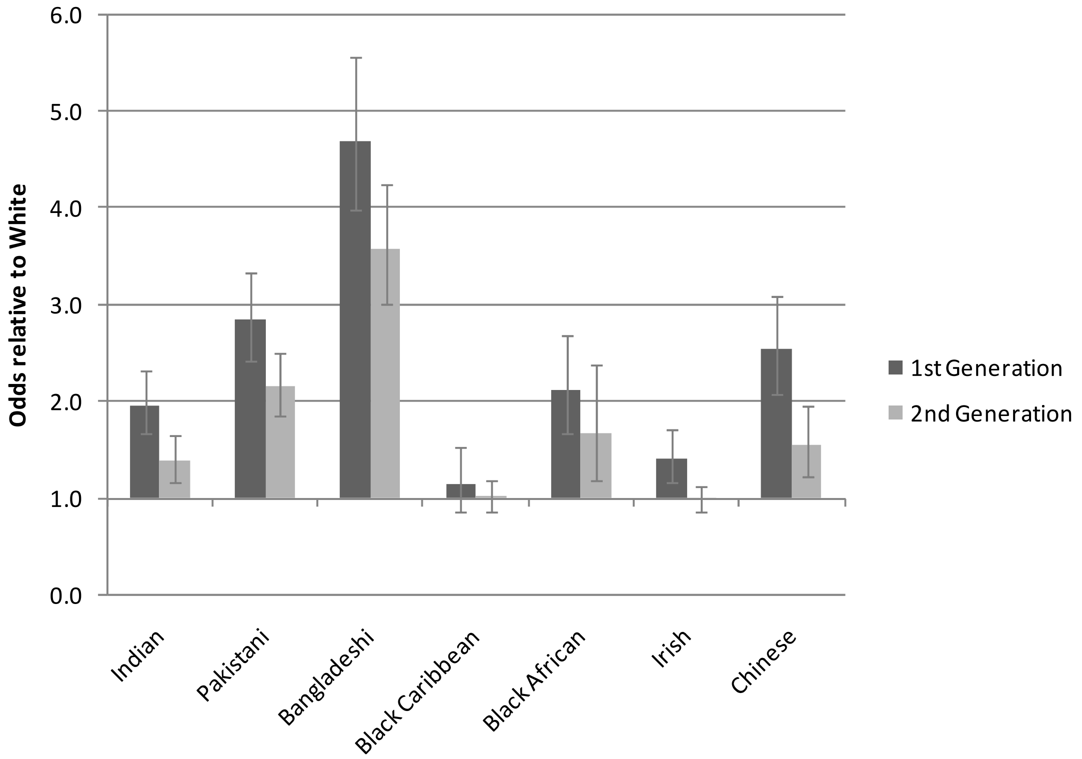
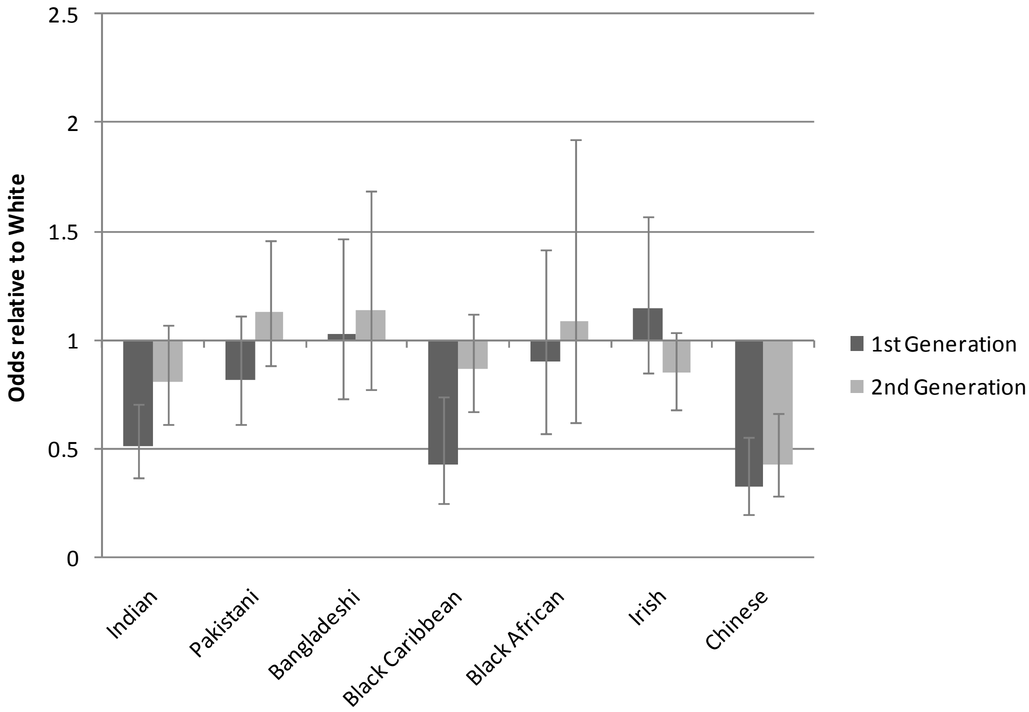


Figure 9.5: Age & sex adjusted odds of having a poor diet score compared to the White reference by generation



Summary

Significant differences in health behaviours exist between generations and behavioural uptake is not universally towards healthy, or unhealthy behaviours. For example, current smoking and drinking rates, especially for women, tended to increase over generation, representing a relative worsening in health behaviour. However, there was also a beneficial increase in the frequency of physical exercise in ethnic minorities over generation as well. There was good evidence to suggest that a majority of these intergenerational changes led to an approximation towards the behaviours observed in a White reference population.

However, these data are entirely cross sectional and use a sample with wide age ranges who will have been exposed to the UK environment during different time periods where the social norms of the majority, which are vital in influencing the extent of acculturative behaviour, are expected to vary. Despite age censoring, age structures of each generation still differ slightly and it is possible that the older first generation are exposed to a slightly different set of social norms of the majority than the second generation are. The MCS will effectively counteract this effect, by investigating health behaviour differences in two generational cohorts of narrow age ranges who have been exposed to the UK environment over more similar time periods. Should MCS findings significantly differ to those of the HSE then it is possible that period effects are inherent in the HSE sample.

9.4 Acculturative Changes in Health Behaviours in the Millennium Cohort Study

The MCS identifies those mothers and fathers who are UK born second or third generation. For this analysis only, these generational categories will be used when all ethnic minority groups are combined. The following investigation excludes all White people from the analysis.

9.4.1 Extent of Intergenerational Change in Health Behaviour in the Millennium Cohort Study

9.4.1.1 Mothers

After controlling for age, a combined sample of all ethnic minority groups shows that the second and third generations are significantly more likely than the first to currently smoke during and outside of pregnancy and to ever drink alcohol (Table 9.3). These risks incrementally increased over three generations for current smoking, any drinking and having incomplete MMR regimens. However, there were no statistically significant differences between generations in rates of MMR incompletion and never having breastfed.

Table 9.3: Odds (95% CI) of having poor health behaviour in the second and third generation compared to first, adjusted for maternal age and ethnic group

	1st *Generation (Foreign Born)*	2nd *Generation (UK Born)*	3rd *Generation (UK Born)*
Current smoker	1.00	1.55 *(1.01-2.38)**	2.26 *(1.33-3.83)**
Smoked in Pregnancy	1.00	2.39 *(1.54-3.69)**	2.18 *(1.35-3.52)**
Any Drink	1.00	2.91 *(1.92-4.41)**	3.86 *(2.14-6.95)**
Never Breastfed	1.00	0.97 *(0.68-1.40)*	1.45 *(0.80-2.60)*
Incomplete MMR	1.00	1.19 *(0.79-1.78)*	1.50 *(0.84-2.68)*

Notes: * $p<0.05$

Stratifying by three generations across individual ethnic minority groups did not provide third generation cell sizes large enough for further analysis. Therefore maternal generation was again defined as both second generation and greater, or first generation. Table 9.5 (see page 213) shows that current smoking was significantly more common in second generation Black Caribbean, Black African and Other group mothers than the first. Indian and Pakistani mothers also showed an increase in current smoking status over generation but this was not significant. The chances of smoking in pregnancy were also significantly greater in these groups, as well for Bangladeshi mothers. A large generational increase in drinking was apparent in all groups except Pakistani and Bangladeshi mothers. These findings are highly consistent with results from the HSE. There were no statistically significant differences across generations in MMR incompletion and only second generation Pakistani mothers were less likely to have never breastfed than their first generation counterparts.

9.4.1.2 Fathers

A combined sample of all ethnic groups (excluding White) demonstrated an incremental increase with generation in the likelihood of drinking any alcohol compared to the first (Table 9.4). The risk of current smoking compared to the first generation was more mixed, with a decline in the second followed by an increase in the third; none of these findings reached statistical significance.

Table 9.4: Odds (95% CI) of having poor health behaviour in the second and third generation compared to first, adjusted for paternal age and ethnic group

	1st Generation (Foreign Born)	*2nd Generation (UK Born)*	*3rd Generation (UK Born)*
Current smoker	1.00	0.85 *(0.61-1.18)*	1.19 *(0.85-1.65)*
Any drink	1.00	1.42 *(0.91-2.21)*	1.46 *(0.67-3.19)*

A less consistent relationship existed between generation and current smoking with second generation fathers being less likely to smoke than the first, although the third generation were more likely to smoke than the first. However, these trends ought to be interpreted cautiously as they are not statistically significant. That they broadly follow a similar trend of increasing risk with generation also observed in mothers, which were statistically significant, suggests that these findings should not be completely dismissed and that the lack of significance may well be due to a lack of power.

The results shown overleaf in Table 9.6 describe how paternal health behaviours of each ethnic group tend to be more similar across generations than in mothers, and there were no statistically significant differences in the rates of any drinking or current smoking in any group. One exception was observed for rates of any drinking in Black Caribbean people and even then the confidence intervals were very wide possibly due to the low base.

Table 9.5: Odds (95% CI) of second generation mothers having a poorer health behaviour compared to the first, adjusted for age

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Current Smoker	0.87 *(0.62-1.21)*	2.15 *(0.45-10.34)*	2.50*(0.76-8.22)*	0.79 *(0.08-7.87)*	3.35 *(1.10-10.19)**	4.10 *(1.28-13.12)**	0.73 *(0.28-1.91)*	2.54 *(1.17-5.51)**
Smoked in Pregnancy	1.06 *(0.76-1.49)*	8.04 *(1.67-38.67)**	4.78 *(1.83-12.46)**	6.54 *(1.77-24.13)**	2.70 *(1.01-7.21)**	6.21 *(1.68-23.00)**	0.82 *(0.41-1.62)*	4.33 *(2.01-9.31)**
Ever Drinks	1.74 *(1.20-2.53)**	5.02 *(2.54-9.92)**	1.72 *(0.24-12.46)*	[a]	3.57 *(1.20-10.59)**	1.73 *(0.80-3.72)*	2.44 *(0.89-6.71)*	2.87 *(1.39-5.94)**
Never Breastfed	1.40 (0.98-2.00)	1.02 (0.40-2.64)	0.47 (0.26-0.84)*	0.56 (0.05-6.82)	3.48 (0.87-13.90)	0.96 (0.83-1.11)	4.35 (1.84-10.26)*	2.71 (0.86-8.53)
MMR Incomplete	2.08 *(0.88-4.93)*	0.90 *(0.32-2.52)*	1.08 *(0.55-2.13)*	0.38 *(0.03-4.28)*	0.96 *(0.34-2.74)*	2.03 *(0.58-7.13)*	2.75 *(0.97-7.79)*	0.81 *(0.27-2.41)*

Notes: [a] =no data;* p<0.05

Table 9.6: Odds (95% CI) of second generation fathers being having a poorer health behaviour compared to the first, adjusted for age

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Current Smoker	1.21 *(0.83-1.77)*	0.49 *(0.22-1.09)*	1.13 *(0.62-2.03)*	0.27 *(0.04-1.62)*	0.48 *(0.14-1.70)*	1.12 *(0.21-6.06)*	0.76 *(0.34-1.72)*	0.87 *(0.41-1.82)*
Ever Drinks	1.19 *(0.50-2.86)*	1.70 *(0.72-4.01)*	2.27 *(0.86-5.99)*	[a]	5.80 *(1.06-31.90)**	1.76 *(0.80-3.86)*	0.55 *(0.18-1.70)*	0.91 *(0.36-2.28)*

Notes: [a] =no data; * p<0.05

9.4.1.3 Child Health Behaviours

The health behaviours of children of second and third generation mothers were compared to children with first generation mothers (Table 9.7). The most striking trend is in the overall improvement in dietary behaviours over increasing generation of mothers. Children of third generation mothers were significantly more likely than first generation mothers to give fruit as the main snack and give more than three portions of fruit per day, as well as be less likely to give sweets and crisps as a main snack. This resulted in a significant reduction in the likelihood of having a poor combined diet score in the third generation compared to the first generation.

Generational improvements in diet were not matched by improved healthy feeding routines however. There was no generational influence on rates of skipping breakfast, and the children of second generation mothers were more likely to eat irregularly than children of first generation mothers. This behaviour was significantly greater in children of third generation mothers than the first generation. However, there were no significant changes in any selected health behaviours between children of first generation mothers and those of second generation.

Table 9.7: Odds (95%) of having poor child health behaviour in the second and third generation compared to the first adjusted for child's age, sex and ethnicity and maternal age

	1st Generation (Foreign Born Mother)	*2nd Generation (UK Born Mother*	*3rd Generation (UK Born Mother)*
Skips Breakfast	1.00	0.96 *(0.65-1.43)*	0.71 *(0.44-1.15)*
Fruit & Vegetables main snack	1.00	0.91 *(0.65-1.28)*	1.37 *(1.04-1.80*)*
Crisps & Sweets main snack	1.00	1.03 *(0.74-1.43)*	0.70 *(0.51-0.95)*
>3 portions of Fruit/day	1.00	1.07 *(0.80-1.45)*	1.78 *(1.35-2.34*)*
Poor Diet Score	1.00	1.12 *(0.79-1.59)*	0.49 *(0.33-0.72)*
Eats Irregularly	1.00	1.06 *(0.71-1.58)*	2.28 *(1.33-3.89*)*
Exercises >Once/wk	1.00	1.14 *(0.84-1.55)*	1.31 *(1.00-1.71)**

Notes: *p<0.05

Generational differences in individual ethnic groups were estimated by combining the two UK born generations into a second generation (and greater) category, as used elsewhere throughout this study. No significant differences between the children of first and second generation mothers were observed for the chances of a child skipping breakfast, exercising more than once per week, eating more than three portions of fruit per day, and having a poor overall diet score. For all other behaviours there was no consistent patterning to the few significant findings arising, and given the number of comparisons being made it is possible that some have arisen by chance. Of the non significant findings, the White and Other White children of second generation mothers had poorer health behaviours than the first, for all health behaviours. No other groups showed such a consistent intergenerational worsening in health behaviour.

These data are useful in describing the magnitude of the behavioural differences between children of each generation. What these data do not show is the degree to which these behaviours might be influenced by the social norms of the majority population. The next stage of the analysis will therefore investigate the extent to which the health behaviours of each ethnic group approximate towards the behaviours of the White majority.

Table 9.8: Odds of children of second generation mothers having a selected health behaviour compared to the first (Maternal age adjusted, 95% CI given)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Skips breakfast	1.58 *(0.73-3.41)*	0.33 *(0.11-1.03)*	0.69 *(0.40-1.17)*	0.71 *(0.14-3.54)*	2.90 *(0.68-12.36)*	1.05 *(0.43-2.52)*	1.87 *(0.65-5.33)*	0.78 *(0.33-1.82)*
Fruit & vegetable main snack	0.86 *(0.61-1.20)*	1.10 *(0.63-1.90)*	1.22 *(0.84-1.76)*	0.56 *(0.18-1.74)*	1.17 *(0.48-2.89)*	2.44 *(1.22-4.88)*	0.86 *(0.54-1.38)*	1.30 *(0.75-2.27)*
Crisps & sweets main snack	1.38 *(0.87-2.21)*	0.87 *(0.43-1.74)*	0.86 *(0.55-1.35)*	0.65 *(0.20-2.19)*	1.23 *(0.33-4.59)*	0.43 *(0.18-1.00)*	1.84 *(1.01-3.37)**	0.58 *(0.31-1.10)*
>3 portions/day of fruit	0.78 *(0.56-1.08)*	1.60 *(0.94-2.73)*	1.57 *(1.11-2.22)**	2.05 *(0.71-5.93)*	1.06 *(0.43-2.62)*	1.55 *(0.84-2.86)*	0.91 *(0.57-1.46)*	2.28 *(1.39-3.73)**
Poor Diet Score	1.24 *(0.75-2.05)*	0.92 *(0.39-2.18)*	0.85 *(0.54-1.34)*	0.28 *(0.08-1.01)*	1.02 *(0.34-3.08)*	0.47 *(0.22-1.03)*	1.81 *(0.79-4.17)*	0.59 *(0.32-1.12)*
Eats at irregular times	0.70 *(0.34-1.43)*	1.45 (*0.48-4.38)*	0.82 *(0.44-1.50)*	3.46 *(0.60-19.78)*	3.20 *(1.35-7.58*)*	1.72 *(0.69-4.27)*	1.64 *(0.41-6.54)*	1.43 *(0.67-3.08)*
Exercises with Child>Once/wk	0.99 *(0.70-1.40)*	1.59 *(0.86-2.93)*	1.44 *(0.91-2.27)*	2.75 *(0.93-8.07)*	1.98 *(0.84-4.67)*	0.84 *(0.46-1.52)*	0.96 *(0.60-1.52)*	1.10 *(0.67-1.81)*

Notes: *p<0.05; all analyses adjusted for child age and sex

9.4.2 Direction of Acculturative Change Relative to the White Population in the Millennium Cohort Study

The following section outlines the relationship between ethnic minority health behaviours relative to the White majority over generations.

9.4.2.1 Maternal Behaviours

Black African and Black Caribbean mothers demonstrated a significant increase in current smoking with second generation mothers just as likely to smoke as the White reference. Additionally, second generation Black Caribbean mothers were statistically significantly more likely to smoke in pregnancy than White mothers. Furthermore, the intergenerational difference in the risk of any drinking compared to the White reference was statistically significant for Black Caribbean mothers. This indicates that, of all the ethnic minority groups in the study, Black Caribbean mothers were the most likely to adopt the drinking and smoking behaviours which were most prevalent in the White reference group. Conversely, Pakistani and Bangladeshi mothers appeared to have the greatest level of behavioural retention over generations relative to the White group, as the proportions ever drinking and currently smoking remained very low. Therefore the statistically significant increase for any drinking in second generation Pakistani mothers was a likely consequence of the small numbers of women who reported drinking in each generation and should be interpreted cautiously.

There was a statistically significant lower risk of never breastfeeding in all first generation ethnic minorities compared to White mothers. This lower risk was also observed in all second generation mothers, except for Other White. However, caution is needed concerning the small sample of Black African mothers reporting never breastfeeding. Black Caribbean and Black African mothers of both generations were significantly less likely than the White group to complete the MMR programme, whereas all other groups had completion rates comparable to Whites, and which did not vary significantly by generation. An exception to these trends concerned Bangladeshi mothers who showed a significant convergence towards the rates of MMR incompletion in the White group over generation.

Figure 9.6: Age adjusted odds of mother being a current smoker compared to the White reference group, by ethnic group and generation

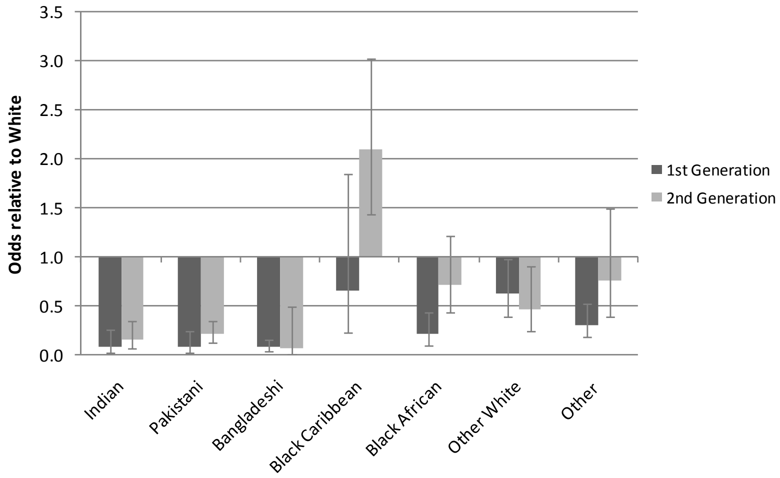


Figure 9.7: Age adjusted odds of mother smoking during pregnancy compared to the White reference group, by ethnic group and generation

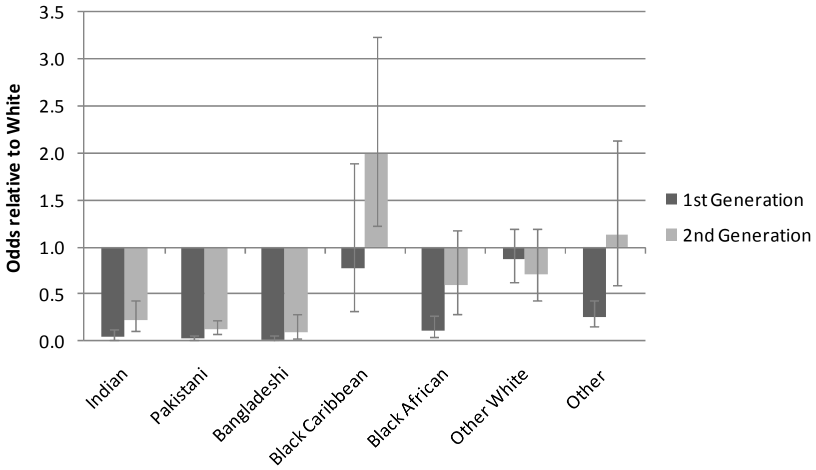


Figure 9.8: Age adjusted odds of mother ever drinking alcohol compared to the White reference group, by ethnic group and generation

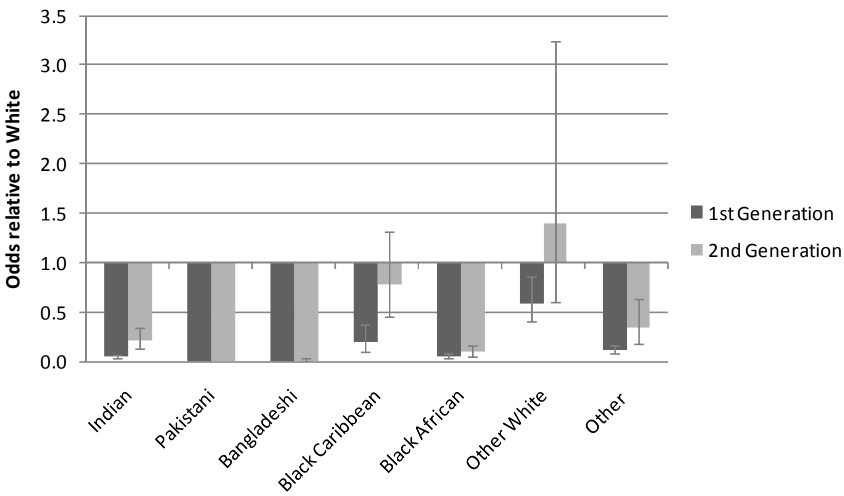


Figure 9.9: Age adjusted odds of mother never breastfeeding compared to the White reference group, by ethnic group and generation

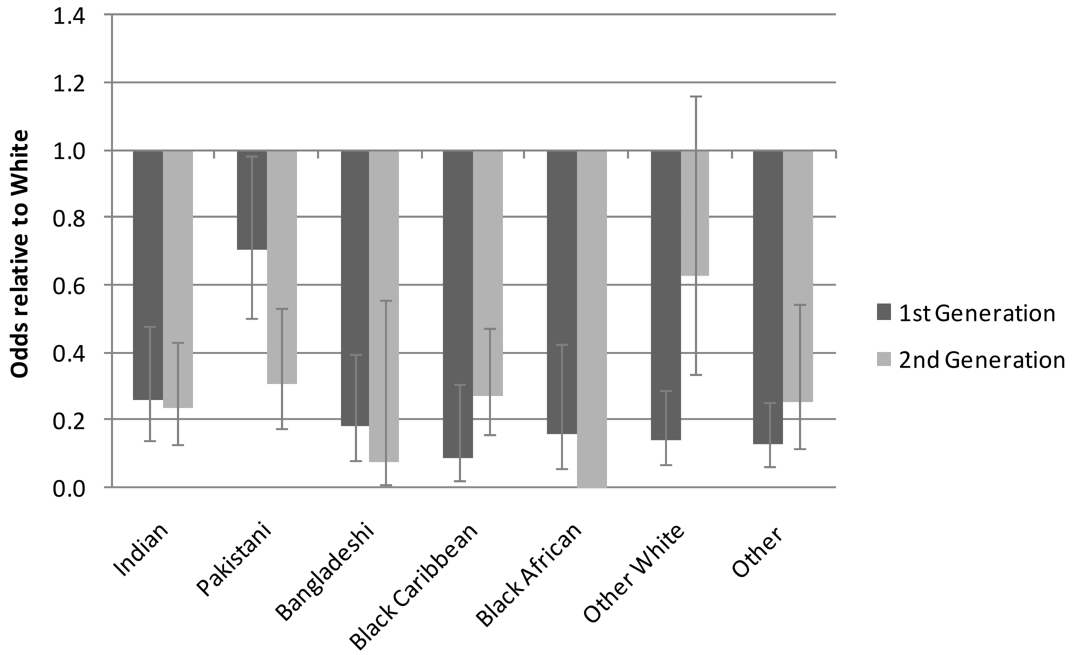
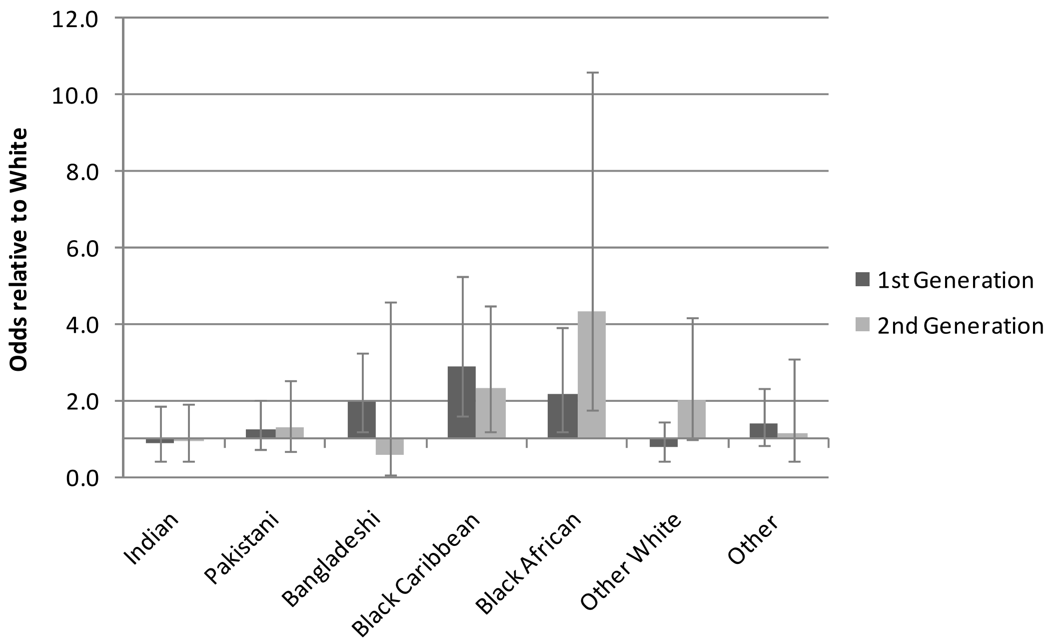


Figure 9.10: Age adjusted odds of mother not completing MMR immunisation of the child compared to the White reference group, by ethnic group and generation



9.4.2.2 Paternal Behaviours

The first generation Bangladeshi and Black Caribbean fathers were statistically significantly more likely than the White group to currently smoke, but this was not significant in the second generation. There were no other significant differences by generation. All first generation ethnic minority groups were significantly less likely than Whites to drink any alcohol. This trend was replicated in all second generation ethnic minority groups with exception to Black Caribbean, Other White and the Other group which were not significantly different to White fathers.

Figure 9.11: Age adjusted odds (95% CI) of current smoking for fathers compared to White reference group, by generation and ethnic group

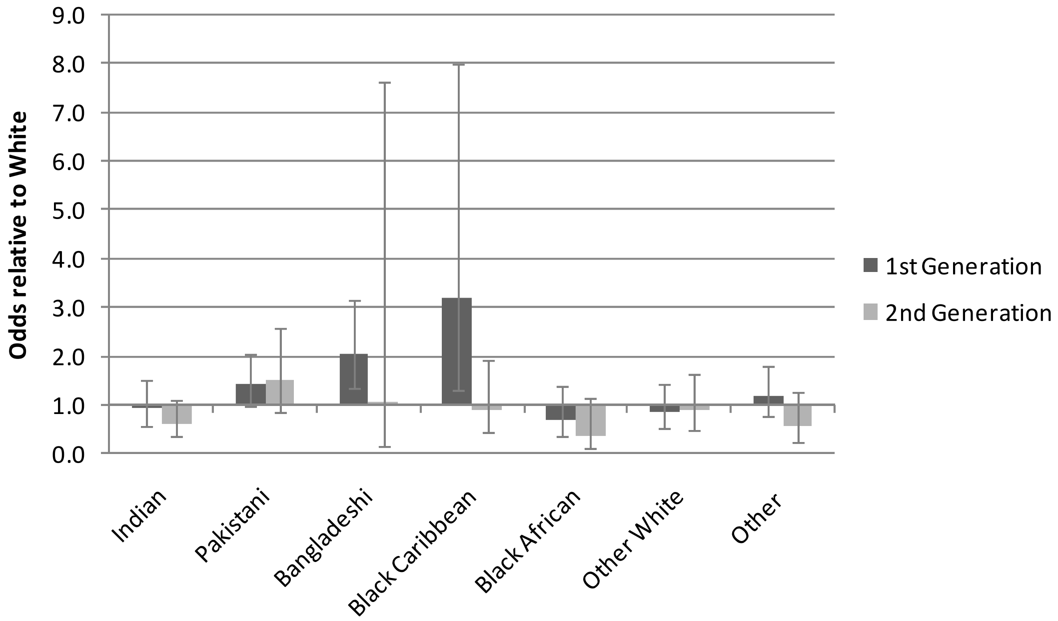
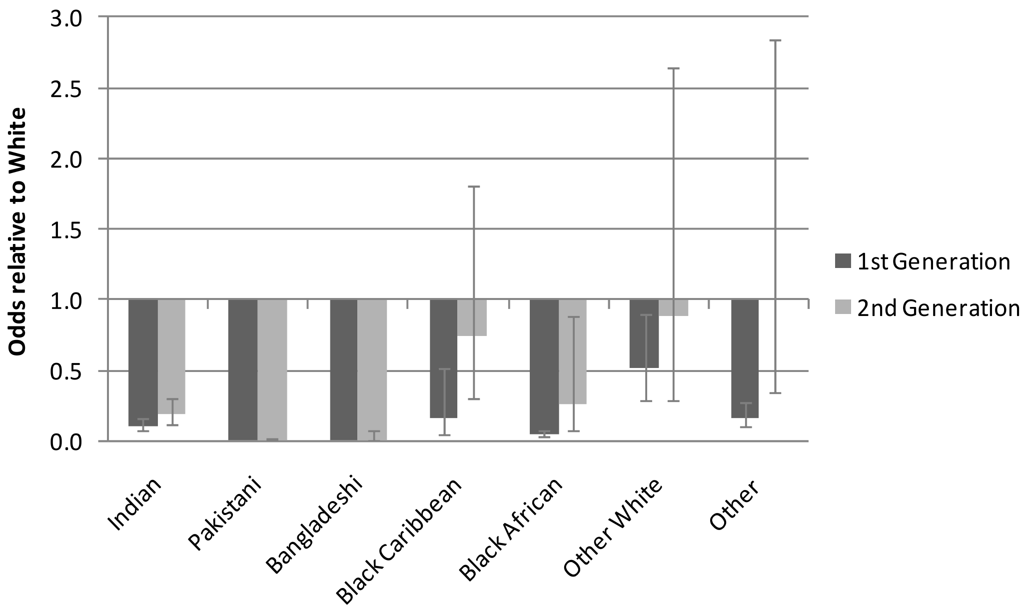


Figure 9.12: Age adjusted odds (95% CI) of any drinking for fathers compared to White reference group, by generation and ethnic group



9.4.2.3 Child Health Behaviours

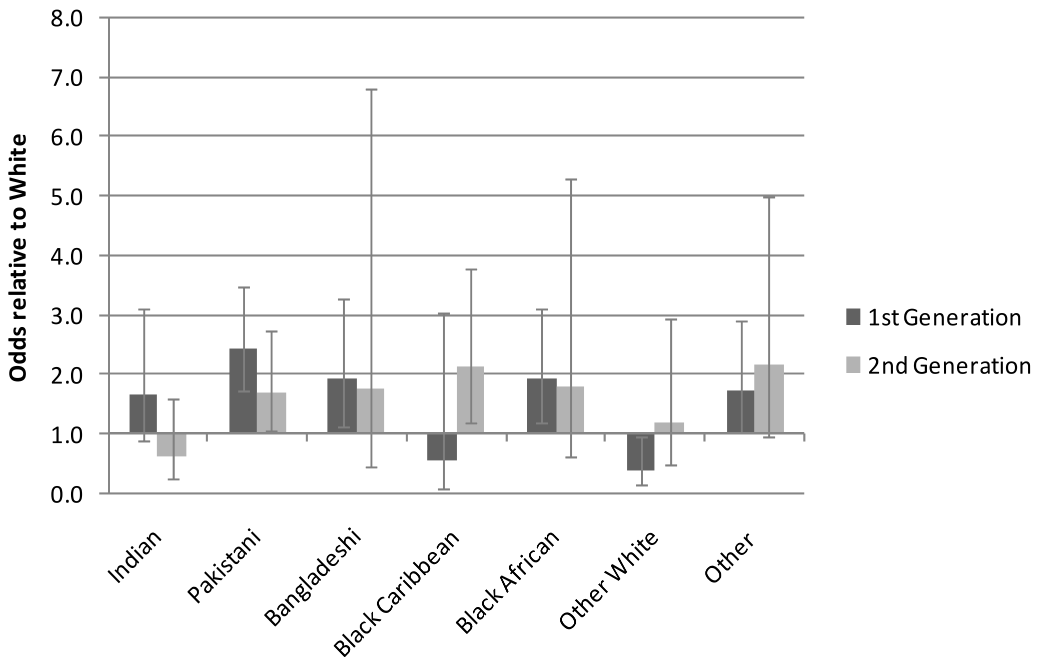
Stratification by generation showed a general trend in the majority of groups to approximate towards the risk of health behaviours observed in the White majority (Figure 9.13 to Figure 9.18). With exception to the Other group, the risk of skipping breakfast shifted closer to the White group in all ethnic minority groups over generation. Pakistani, Bangladeshi, and Black African children with first generation mothers were significantly less likely to skip breakfast, but this statistically significant effect diminished with generation. The risk of eating at irregular times also approximated towards that of the White children in all ethnic minority groups with exception to Other White and Indian children. Bangladeshi, Black Caribbean, Black African and Other children with first generation mothers were less likely than White children to eat at irregular times, but there was no difference in those with second generation mothers.

Regarding dietary behaviours, the lower likelihood of eating fruit as a main snack than the White group was statistically significant in both generations of Pakistani and Bangladeshi. However, children with first generation Black African mothers were statistically significantly less likely to eat fruit as a main snack, and Other White children were more likely, but neither group showed significant differences in children of second generation mothers. The risk of eating crisps as a main snack shifted towards the risk of consumption in the White children for all groups except Black Caribbean. This was also observed in all ethnic minority groups for the likelihood of eating more than three portions of fruit per day. Overall, the derived diet score summing these eating patterns suggests that for all except the Indian group, the risk of having poor dietary health behaviours becomes more similar to the White children over generation. However, these intergenerational differences were not statistically significant.

Lastly, the rates of exercising with the child more than once per week also shifted towards the rates of exercise in the White group in all ethnic minority groups, except for Black African and Other groups. Despite the increase in physical exercise with generation, the risk of Black Caribbean and Pakistani group exercising less than once per week was statistically significant.

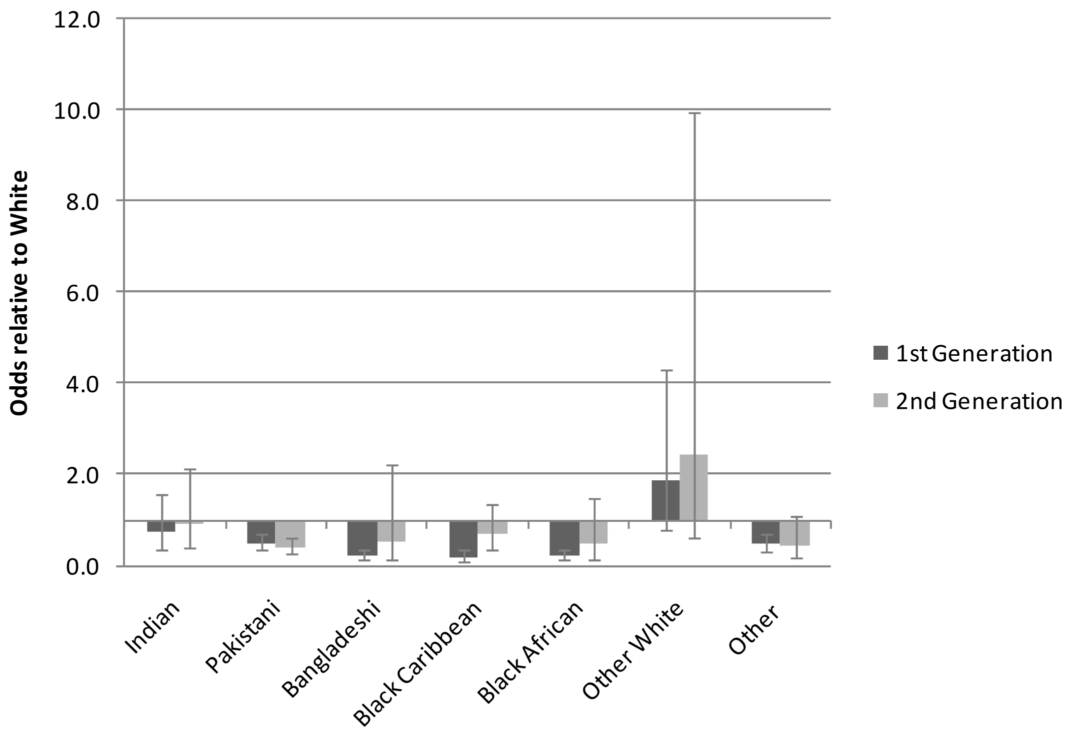
Overall, these findings provide good evidence that the health behaviours of children of second generation mothers were more similar to the White children than the behaviours of children with first generation mothers. This is consistent with the idea that the social norms of the White group influence the behavioural norms of the ethnic minority mothers. Furthermore, these maternal differences have a direct influence on the health and development of the children.

Figure 9.13: Odds (95% CI) of child skipping breakfast compared to White reference group, by maternal generation



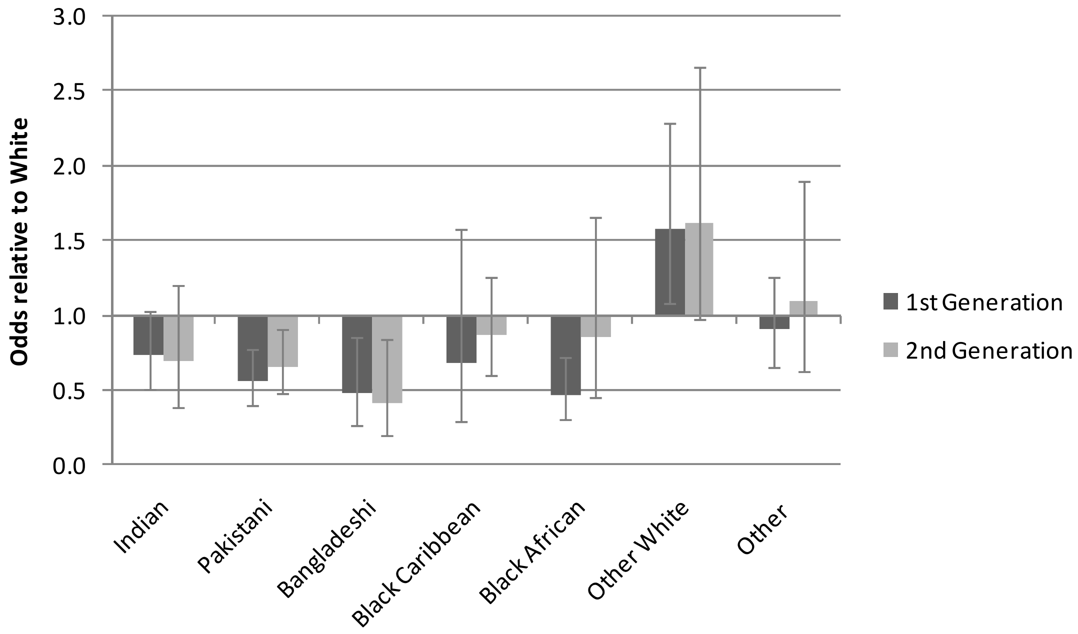
Notes: adjusted for child age and sex and maternal age

Figure 9.14: Odds (95% CI) of child eating at irregular times compared to White reference group, by maternal generation



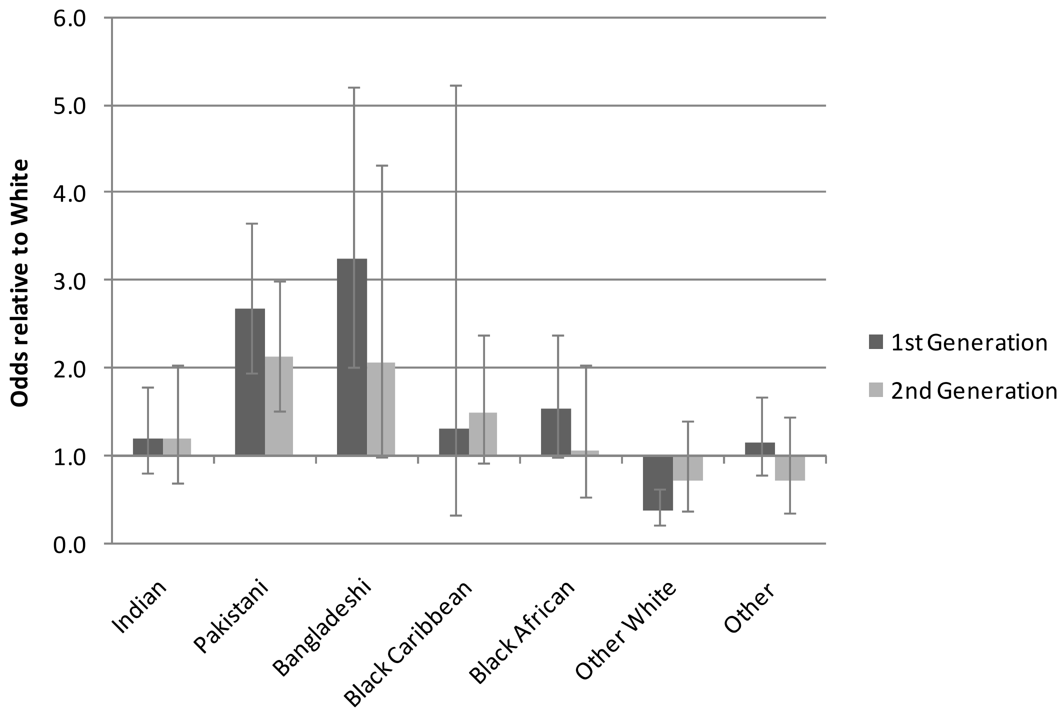
Notes: adjusted for child age and sex and maternal age

Figure 9.15: Odds (95% CI) of child eating fruit as a main snack compared to White reference group, adjusted by child age and sex and maternal age, by maternal generation



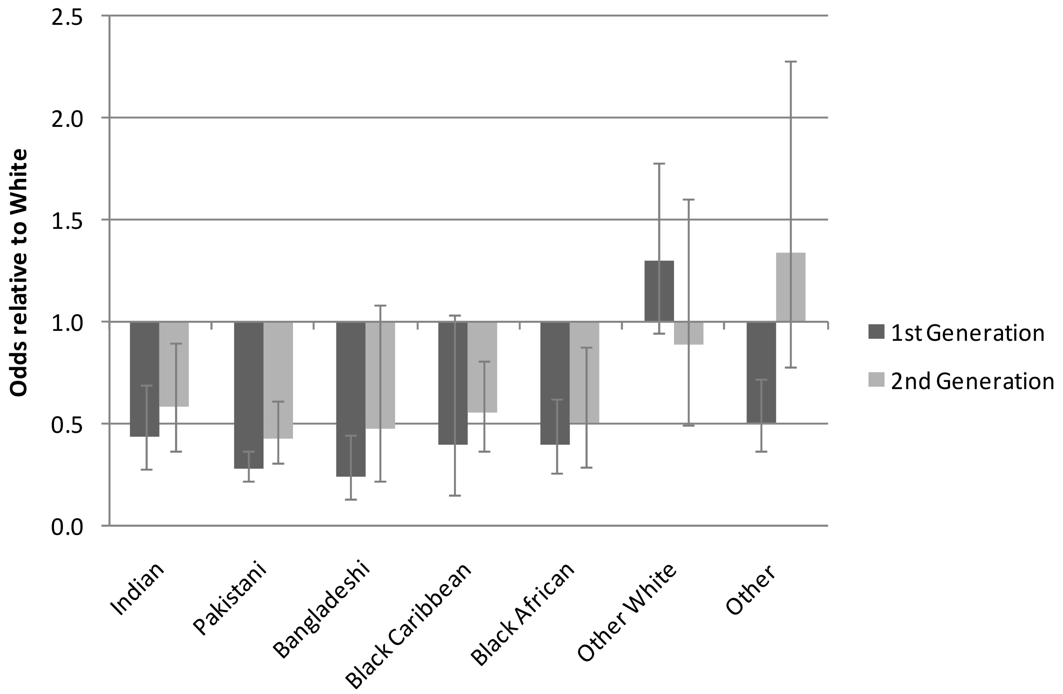
Notes: adjusted for child age and sex and maternal age

Figure 9.16: Odds (95% CI) of child eating crisps and sweets as a main snack compared to White reference group, by maternal generation



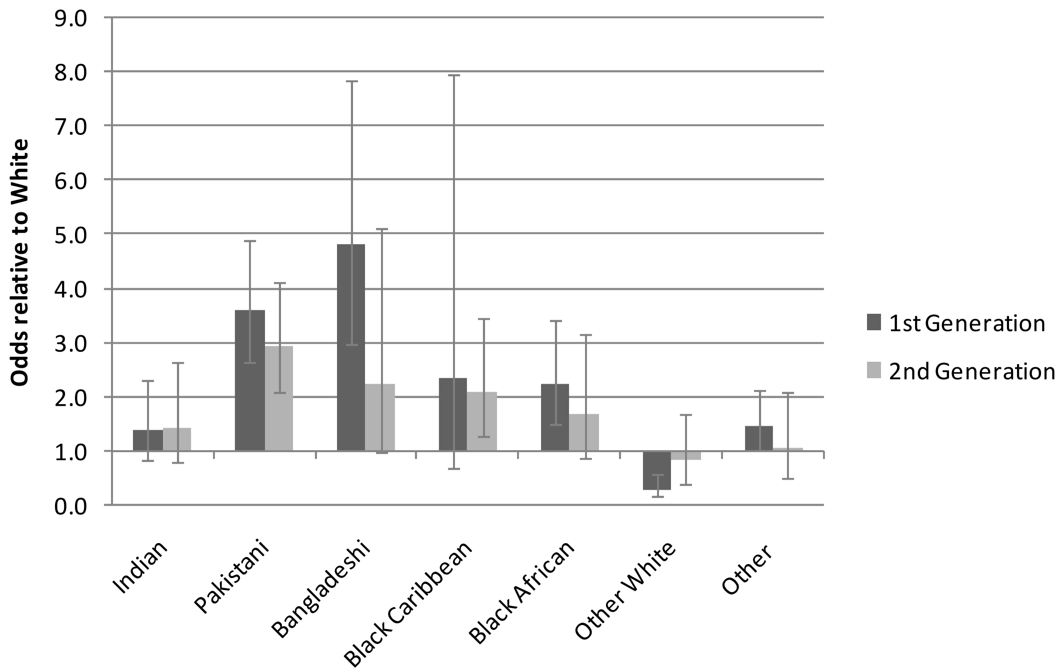
Notes: adjusted for child age and sex and maternal age

Figure 9.17: Odds (95% CI) of child eating >3 portions fruit per day compared to White reference group, by maternal generation



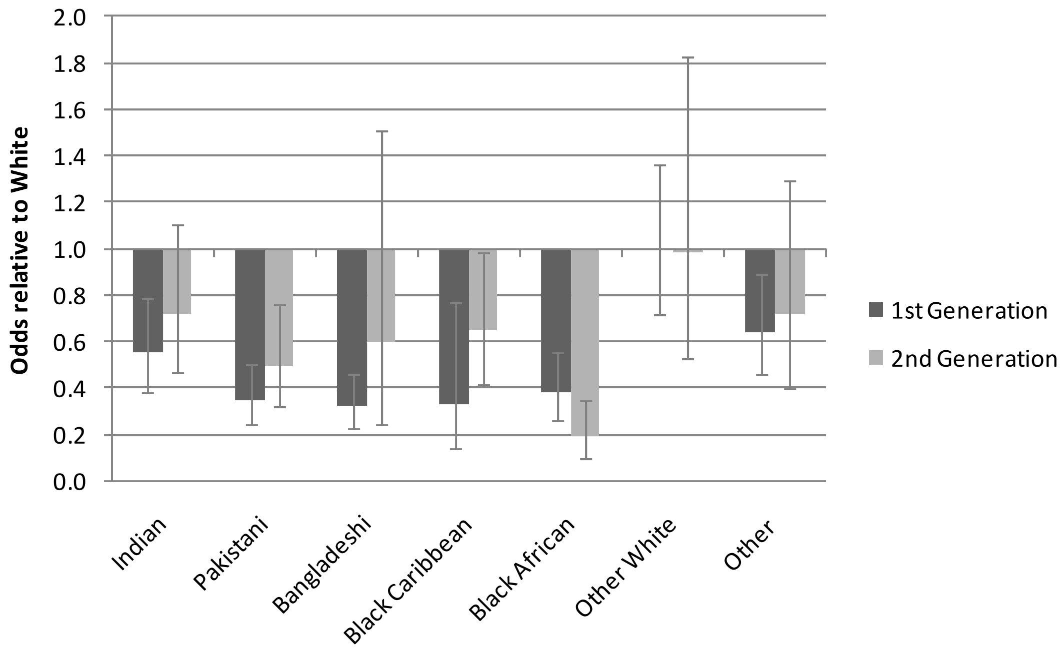
Notes: adjusted for child age and sex and maternal age

Figure 9.18: Odds (95% CI) of child having a poor diet score compared to White reference group, by maternal generation



Notes: adjusted for child age and sex and maternal age

Figure 9.19: Odds (95% CI) of child exercising with parent >once per week compared to White reference group, by maternal generation



Notes: adjusted for child age and sex and maternal age

Summary

Current smoking and any drinking, which was most prevalent within the White majority population, was more likely in the second generation parents than the first. The retention of high rates of breastfeeding in minority groups suggests that this positive behaviour is strongly associated with ethnic minority status. Given that immunisation rates were similarly unchanged by generation, it could be suggested that the immediate post-natal behaviours are generally less open to acculturative change.

Paternal behaviours tended to be more similar over generation than maternal ones, with a notable exception to Bangladeshi smoking rates. One general explanation for this consistency might be that first generation fathers had higher rates of drinking and smoking than mothers and so the health behavioural gap with White fathers was not as large as it was with mothers. This meant that the smaller behavioural differential between first and second generation was harder to detect, especially given the low base population for the paternal analyses.

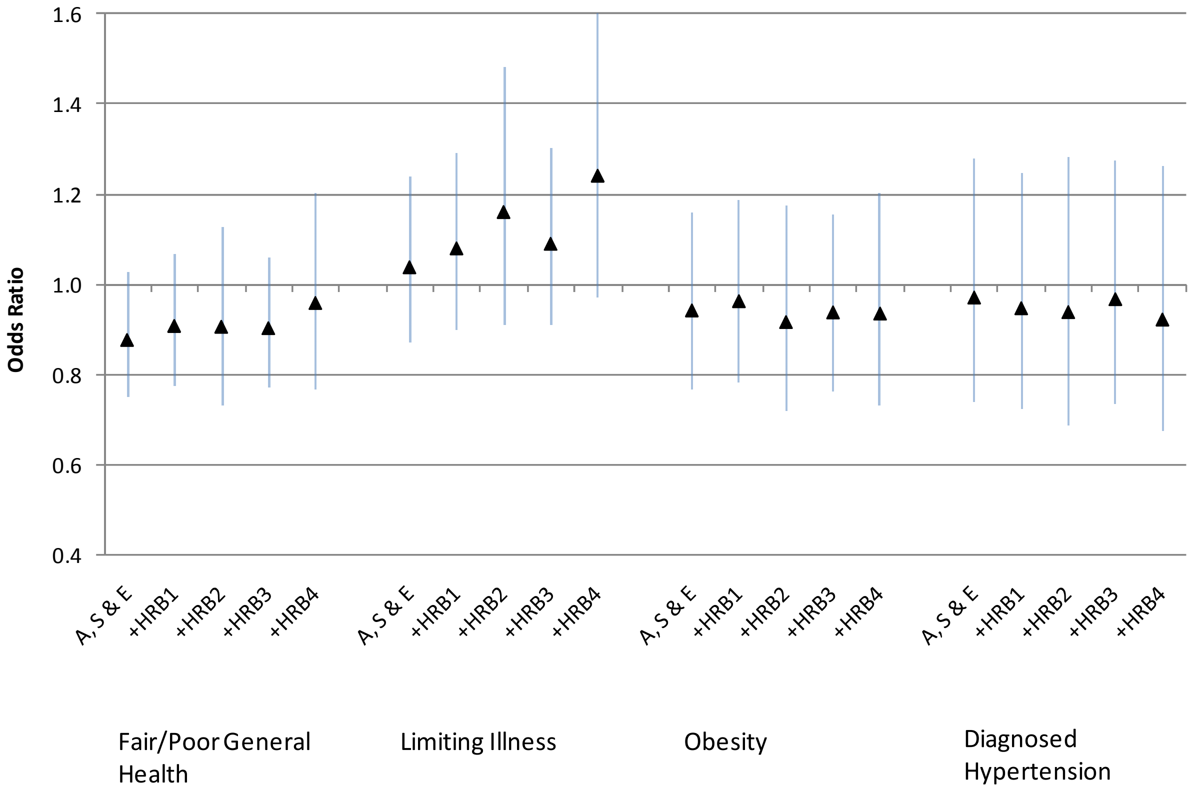
There was mixed evidence for the potential influence White behavioural norms on child health behaviours. The differences in the White Other group were generally smaller and less likely to be significant than those modifications observed in the other minority groups, both relative to the White population, and between generations of the same ethnic group. These smaller differences are likely to be due to the cultural and behavioural similarities that already exist in the first generation mothers of this group and the White majority.

9.5 The Impact of Changing Health Behaviours on Health Outcome in the Health Survey for England

The previous section established that health behaviours differ over generations with the second generation being more similar to the social and behavioural norms of the majority population. The following analysis investigates whether these behavioural differences might moderate the differences in the patterns of health across generations. This investigation will begin by describing the impact of health behaviour differences in a combination of all ethnic minority groups, and will then explore differences in each individual group.

The risk of poor health in the second generation of all the ethnic minority groups compared to the first generation is shown in Figure 9.20. Controlling independently for current smoking and drinking, quality of diet and levels of physical activity produced non-significant differences in the risk of having poorer health in the second generation. Health behaviours appeared to mediate the risk of limiting illness to a greater extent that than the other outcomes but even so this was not statistically significant. Closer examination of the impact of each health behaviour on health suggested that a combination of smoking and drinking attenuated the risk of poor health to the greatest degree. A further Wald test identified that the risk of any drinking explained most of the intergenerational difference in each outcome, although this effect was small.

Figure 9.20: Odds of poor health in the second generation compared to the first in all ethnic minority groups adjusted for age (A), sex (S), ethnicity (E) and health related behaviours (HRB)

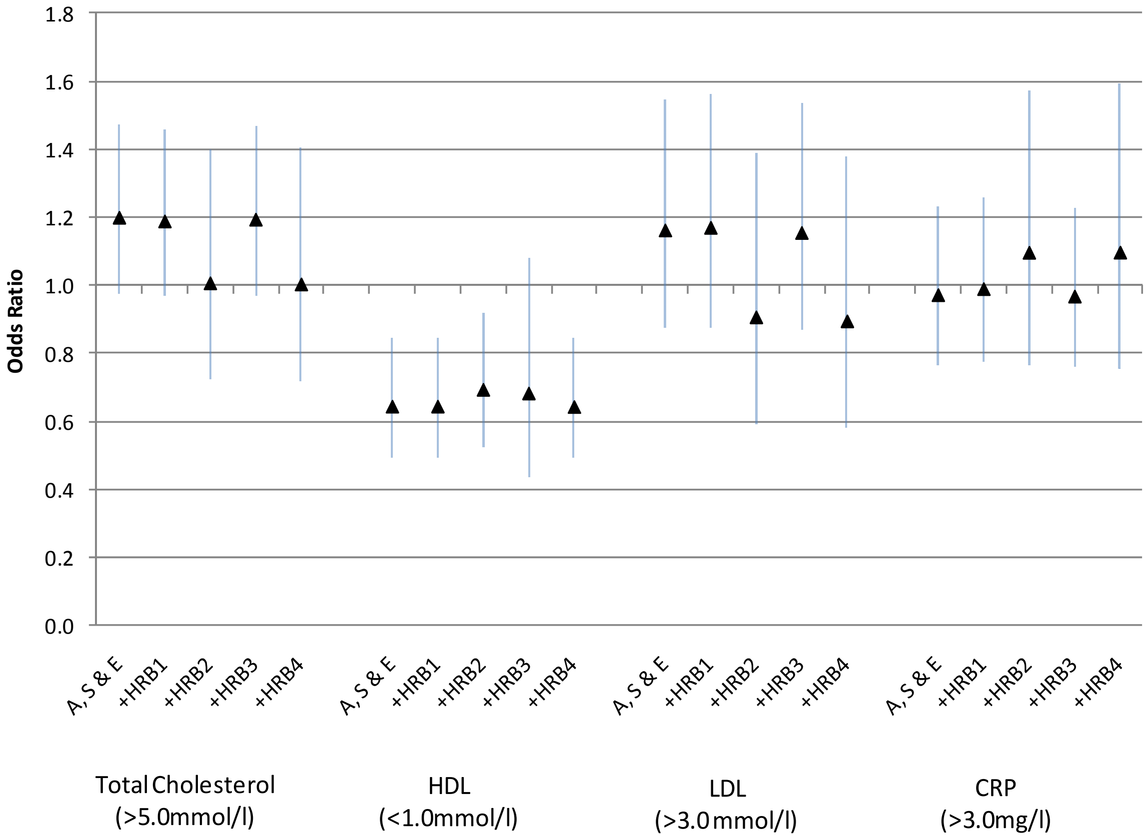


Notes: HRB1: current smoking and drinking; HRB2: diet score; HRB3: physical activity; HRB4: all health behaviours

Odds of having hazardous levels of biomarkers of cardiovascular disease in the second generation compared to the first are shown in Figure 9.21. Results show a reduction in the excess risk of having harmful levels of total cholesterol and LDL cholesterol in the second generation after controlling for health behaviours, but this did not reach significance either before or after adjusting for health behaviours. Closer inspection across each health behaviour reveals that much of the excess risk for both biomarkers was explained by the increasingly poor diet score over generation.

Results for CRP and HDL cholesterol levels were slightly different however. The second generation experienced a lesser risk of having unhealthy levels of these biomarkers, significantly so for HDL cholesterol, but this health advantage was diminished after controlling for behaviours. The increase in the risk of low levels of HDL cholesterol and CRP appeared, again, to be most closely related to the intergenerational worsening of the diet.

Figure 9.21: Odds (95% CI) of being at high risk of cardiovascular biomarker concentration in the second generation compared to the first for all ethnic minority groups combined, adjusted for age (A), sex (S), ethnicity (E) and health related behaviours (HRB)



Notes: HRB1: current smoking and drinking; HRB2: diet score; HRB3: physical activity; HRB4: all health behaviours

It should be remembered that these blood biomarkers are only risk factors for cardiovascular disease and are therefore not entirely predictive of future morbidity rates. Nevertheless, these data provide evidence that intergenerational trends in biomarkers of cardiovascular disease risk are likely to be mediated, to a small extent, by changing patterns of health behaviour.

However, these preliminary conclusions are based on the aggregate trends of all ethnic minority groups. It has been previously observed that patterns of health behaviours, and that the rate at which these change, are ethnic group specific. It would therefore seem likely that if health behaviours do indeed play a role in the changing patterns of health inequalities then those groups who undergo the largest acculturative changes will also be those with the most significant changes to their health profile. Table 9.9 therefore shows the mediating effect of health behaviours on the risk of poor health in the second generation compared to the first in each ethnic minority group.

Obesity rates were the most likely outcome to be influenced by behaviours. Statistically significant higher risks of second generation obesity in Indian, Pakistani, Bangladeshi and Chinese groups were generally reduced after controlling for behaviours and became non-significant for Pakistani and Bangladeshi people. The statistically significant high risk of limiting illness in second generation Black Caribbean people compared to first was not significant after additionally controlling for health behaviours. Apart from this exception, health behaviours did not appear to moderate the risk of self rated general health, rates of limiting illness or diagnosed hypertension in the second generation of each ethnic group. The only groups with a consistent reduction in the risk of poor health in the second generation after adjustment for behaviours were Bangladeshi and Chinese, although these changes were not significant. Furthermore there were no outcomes that were uniformly affected by behaviours. These results therefore provide weak evidence for a potential causal link between health behaviours and intergenerational differences in physical health.

Table 9.9: Odds (95% CI) of having fair/poor general health, limiting illness, being obese or having diagnosed hypertension in second generation compared to the first, adjusted step-wise for age and sex, and health behavioural factors (HRB)

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
General Health							
Age & Sex Adjusted	1.05 *(0.78-1.42)*	0.99 *(0.74-1.32)*	0.81 *(0.59-1.11)*	0.98 *(0.69-1.37)*	1.23 *(0.69-2.19)*	0.85 *(0.66-1.10)*	1.12 *(0.72-1.75)*
+HRB Adjusted	0.91 *(0.61-1.37)*	1.04 *(0.66-1.63)*	0.72 *(0.39-1.33)*	1.00 *(0.57-1.77)*	1.13 *(0.44-2.92)*	1.03 *(0.72-1.48)*	0.86 *(0.43-1.73)*
Limiting Illness							
Age & Sex Adjusted	1.18 *(0.83-1.68)*	0.84 *(0.62-1.14)*	0.89 *(0.61-1.30)*	0.92 *(0.63-1.34)*	2.54 *(1.32-4.91)*	1.10 *(0.84-1.43)*	1.54 *(0.87-2.76)*
+HRB Adjusted	1.23 *(0.72-2.10)*	0.80 *(0.50-1.30)*	0.85 *(0.40-1.77)*	1.00 *(0.55-1.81)*	1.41 *(0.48-4.16)*	1.44 *(0.99-2.08)*	1.10 *(0.46-2.59)*
Obese							
Age & Sex Adjusted	1.71 *(1.18-2.49)**	1.44 *(1.00-2.06)**	2.36 *(1.20-4.67)**	1.37 *(0.88-2.14)*	0.72 *(0.31-1.68)*	0.81 *(0.60-1.10)*	4.29 *(1.86-9.90)*
+HRB Adjusted	1.90 *(1.19-3.04)**	1.42 *(0.87-2.33)*	1.70 *(0.58-4.95)*	1.40 *(0.78-2.53)*	0.82 *(0.34-1.98)*	0.78 *(0.54-1.13)*	5.76 *(1.77-18.74)*
Diagnosed Hypertension							
Age & Sex Adjusted	0.87 *(0.54-1.40)*	1.10 *(0.57-2.11)*	2.10 *(0.83-5.32)*	1.02 *(0.62-1.68)*	0.87 *(0.18-4.20)*	0.98 *(0.67-1.42)*	1.00 *(0.34-2.89)*
+HRB Adjusted	0.75 *(0.41-1.38)*	1.17 *(0.59-2.32)*	1.64 *(0.55-4.88)*	1.14 *(0.61-2.13)*	1.04 *(0.18-6.06)*	0.92 *(0.61-1.41)*	0.74 *(0.25-2.18)*

Notes: *p<0.05; HRB: smoking and drinking, diet score and physical activity levels

The mediating effects of health behaviours on the intergenerational risk of harmful biomarker concentrations are shown in Table 9.10. The second generation chances of having raised total cholesterol levels reduced in all ethnic minorities, with exception to Black African, after controlling for health related behaviours. The opposite trend was seen in levels of CRP as the second generation were more likely than the first to experience hazardous levels after adjusting for all health behaviours. These group specific trends are consistent with the results from the aggregated ethnic group analysis and suggest that changing health behaviours partially explain the intergenerational differences in total cholesterol and CRP blood concentrations.

The influence of behaviours on the risk of harmful levels of HDL and LDL cholesterol in each ethnic minority group was not as uniform as for other biomarkers. Pakistani, Black African and Chinese people all demonstrated a reduction in the risk of low HDL cholesterol in the second generation compared to the first after controlling for behaviours, whereas all remaining groups showed a risk increase. For LDL cholesterol, Pakistani and Bangladeshi groups demonstrated an increased risk of raised levels after adjusting for behaviours, whereas all other groups showed a reduction in risk. Changes in risk in all groups for HDL and LDL cholesterol were not significant however.

Summary

These data do not offer statistically strong evidence for the behavioural pathway as a determinant of health measured on a range of subjective and objective marker of general and physical health. The use of biomarkers appear the most promising outcomes in terms of suggesting that behaviours lead to a reduction in the risk differentials between generations for some biomarkers, but many of these trends do not reach significance.

Table 9.10: Odds (95% CI) of having high risk concentrations of biomarkers of cardiovascular disease in the second generation compared to the first, adjusted step-wise for age & sex, and health behavioural factors (HRB)

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Total Cholesterol (>5mmol/l)							
Age & Sex Adjusted	1.24 *(0.88-1.75)*	0.80 *(0.54-1.19)*	1.25 *(0.71-2.21)*	1.15 *(0.71-1.86)*	1.12 *(0.46-2.71)*	1.40 *(0.99-2.00)*	0.86 *(0.47-1.57)*
+HRB Adjusted	0.76 *(0.41-1.41)*	0.63 *(0.31-1.29)*	1.21 *(0.41-3.56)*	0.66 *(0.24-1.86)*	2.31 *(0.86-6.21)*	1.31 *(0.66-2.61)*	0.50 *(0.20-1.26)*
HDL (<1.0mmol/l)							
Age & Sex Adjusted	0.74 *(0.46-1.20)*	0.54 *(0.34-0.86)**	0.98 *(0.55-1.75)*	0.62 *(0.30-1.30)*	0.95 *(0.31-2.95)*	0.65 *(0.41-1.06)*	0.73 *(0.28-1.85)*
+HRB Adjusted	0.76 *(0.31-1.84)*	0.36 *(0.13-0.98)**	1.11 *(0.39-3.11)*	0.70 *(0.08-6.15)*	0.71 *(0.18-2.79)*	0.95*(0.27-3.37)*	0.19 *(0.02-2.40)*
LDL (>3.0mmol/l)							
Age & Sex Adjusted	0.86 *(0.53-1.38)*	1.98 *(1.03-3.80)**	0.79 *(0.23-2.79)*	1.34 *(0.67-2.69)*	0.78 *(0.23-2.59)*	1.24 *(0.82-1.88)*	0.71 *(0.29-1.71)*
+HRB Adjusted	0.46 *(0.21-1.01)*	3.81 *(1.19-12.17)**	1.66 *(0.15-18.82)*	0.76 *(0.19-3.10)*	0.55 *(0.10-3.13)*	0.92 *(0.45-1.88)*	0.35 *(0.08-1.45)*
CRP (>3.0mg/l)							
Age & Sex Adjusted	1.34 *(0.91-1.97)*	1.15 *(0.73-1.84)*	0.80 *(0.38-1.70)*	1.15 *(0.68-1.93)*	1.46 *(0.51-4.14)*	0.88 *(0.61-1.26)*	1.75 *(0.70-4.37)*
+HRB Adjusted	1.44 *(0.75-2.76)*	1.51 *(0.67-3.38)*	1.13 *(0.35-3.68)*	2.23 *(0.75-6.68)*	0.72 *(0.19-2.81)*	1.00 *(0.53-1.89)*	2.82 *(0.72-11.12)*

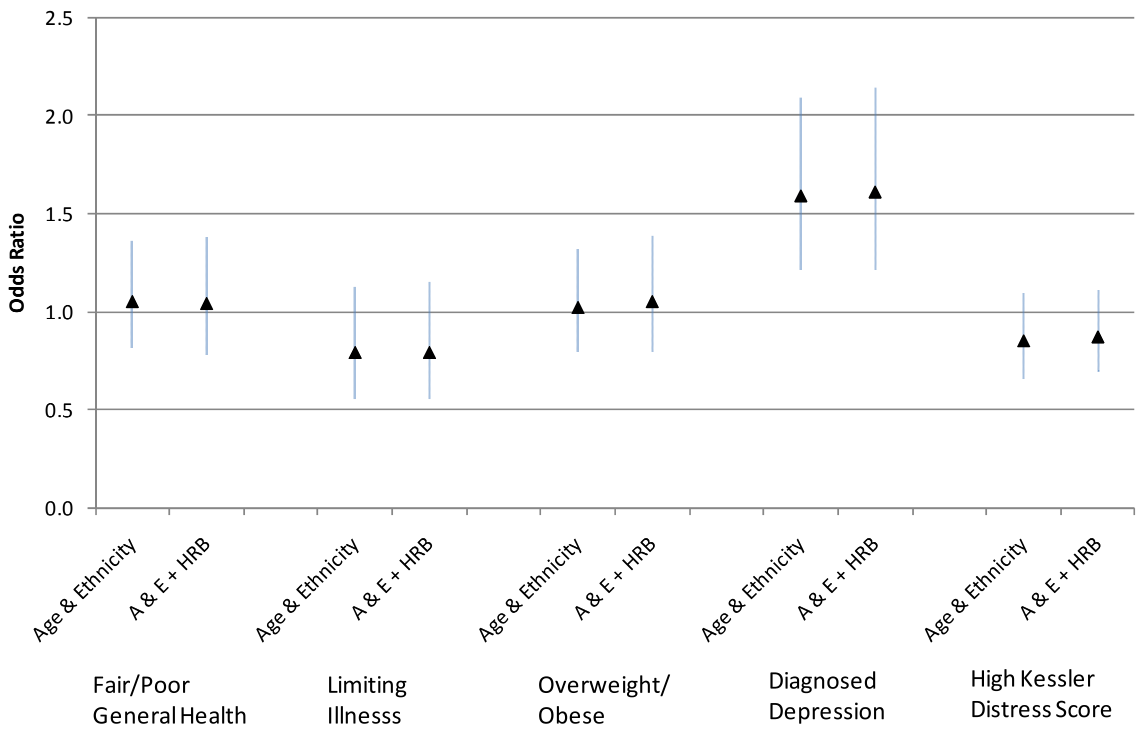
Notes: HRB: smoking and drinking, diet score and physical activity levels

9.6 The Impact of Changing Health Behaviours on Health Outcome in the MCS

9.6.1 Mothers

Figure 9.22 shows that adjusting for health related behaviours in a combination of ethnic minority groups does not result in any significant changes in the risk of poor health outcome in the second generation compared to the first. Therefore health behaviours do not appear to contribute significantly to the intergenerational patterning of these health outcomes.

Figure 9.22: Odds (95% CI) of poor maternal health in the second generation compared to the first generation, adjusted for age (A), ethnicity (E) and health behaviours (HRB)



HRB: current smoking, any drinking

However, patterns in the changing risk of poor health emerge when analyses are performed within individual groups, although, no observations are statistically significant. Controlling for any drinking and current smoking in the White and Other White groups led to an increase in the risk of all poor health outcomes in the second generation compared to the first. Similarly, the risk of fair/poor general health, limiting illness and being overweight/obese also increased in the Bangladeshi and the Other groups. Conversely, for the same health outcomes, there was a reduced risk in the second generation after adjustment in Indian and Black Caribbean groups.

Risks of diagnosed depression and raised distress score increased in the Black Caribbean and all three South Asian groups after adjustment, but decreased in the Black African group. However, the statistically significant higher risk of diagnosed depression in Black Caribbean people was observed after adjusting for health behaviours, suggesting that increases in current smoking and any drinking between generations in this group did not moderate rates of diagnosed depression. Overall though, these data do not provide conclusive evidence of health related behaviours influencing risks of poor maternal health as the differences are insignificant and in many cases too small to draw firm conclusions.

Table 9.11: Maternal odds (95% CI) of having a poor health outcome in the second generation compared to the first generation, adjusted for age and health related behaviours (HRB)

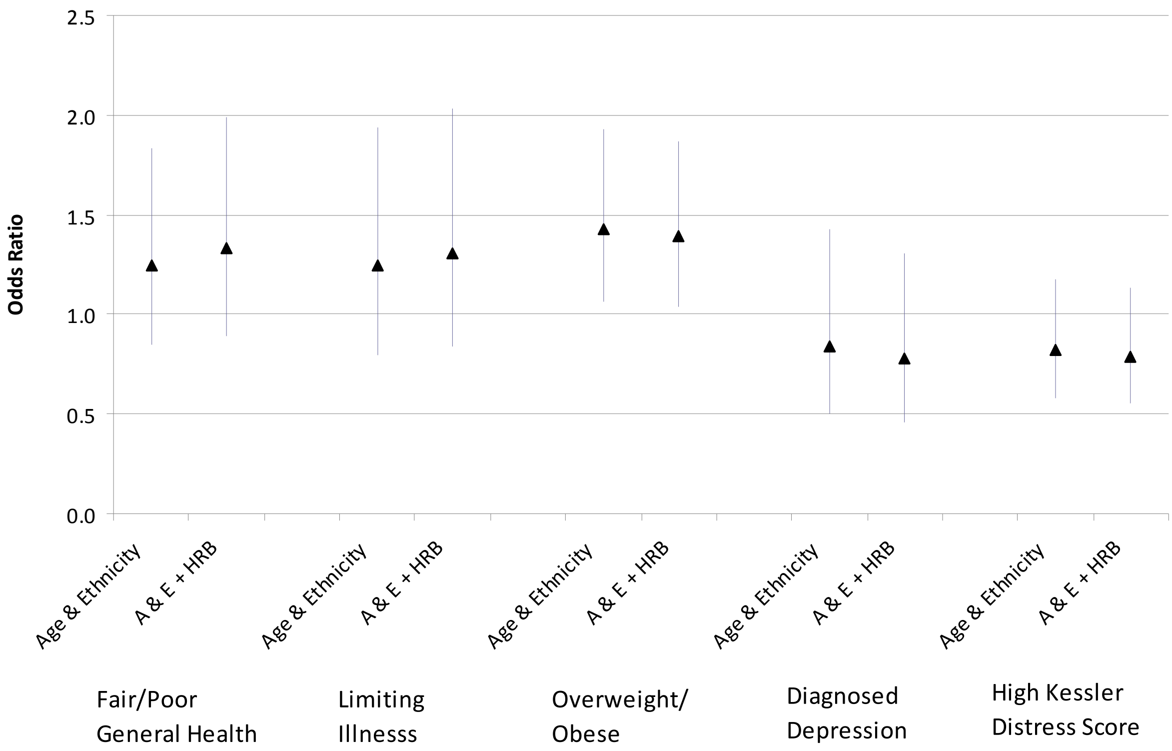
	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age Adjusted	1.02 *(0.65-1.61)*	1.66 *(0.75-3.71)*	1.03 *(0.59-1.82)*	1.55 *(0.57-4.24)*	1.09 *(0.41-2.92)*	0.18 *(0.06-0.59)**	1.11 *(0.44-2.82)*	1.06*(0.48-2.36)*
+HRB Adjusted	1.12 *(0.71-1.77)*	1.37 *(0.63-3.01)*	1.02 *(0.58-1.81)*	1.69 *(0.62-4.59)*	0.99 *(0.36-2.70)*	0.12 *(0.03-0.49)**	1.31 *(0.49-3.55)*	1.23 *(0.56-2.70)*
Limiting Illness								
Age Adjusted	0.79 *(0.54-1.16)*	0.83 *(0.27-2.55)*	0.68 *(0.37-1.23)*	0.68 *(0.16-2.86)*	3.18 *(0.86-11.75)*	0.31 *(0.08-1.28)*	0.93 *(0.32-2.69)*	0.53 *(0.19-1.44)*
+HRB Adjusted	0.85 *(0.57-1.25)*	0.63 *(0.21-1.94)*	0.67 *(0.37-1.21)*	0.73 *(0.18-2.98)*	3.07 *(0.87-10.83)*	0.35 *(0.08-1.46)*	0.95 *(0.32-2.88)*	0.56 *(0.19-1.61)*
Overweight/Obesity								
Age Adjusted	1.41 *(0.95-2.08)*	1.13 *(0.59-2.14)*	0.90 *(0.54-1.51)*	1.03 *(0.33-3.18)*	0.98 *(0.38-2.55)*	0.83 *(0.30-2.30)*	1.39 *(0.74-2.62)*	0.92 *(0.44-1.94)*
+HRB Adjusted	1.43 *(0.91-2.24)*	0.87 *(0.43-1.79)*	0.79 *(0.40-1.56)*	1.16 *(0.27-4.94)*	0.66 *(0.17-2.55)*	0.82 *(0.30-2.21)*	1.80 *(0.89-3.62)*	1.13 *(0.49-2.62)*
Diagnosed Depression								
Age Adjusted	1.05 *(0.76-1.46)*	0.88 *(0.37-2.10)*	2.33 *(1.30-4.20)**	1.57 *(0.63-3.91)*	3.07 *(1.20-7.85)**	1.25 *(0.44-3.60)*	1.23 *(0.57-2.69)*	1.55 *(0.71-3.41)*
+HRB Adjusted	1.09 *(0.77-1.54)*	1.14*(0.43- 3.00)*	2.44 *(1.36-4.40)**	1.65 *(0.67-4.03)*	2.99 *(1.13-7.91)**	0.96 *(0.28-3.30)*	1.28 *(0.57-2.88)*	1.34 *(0.59-3.03)*
High Distress Score								
Age Adjusted	1.07 *(0.77-1.50)*	1.05 *(0.56-1.97)*	0.89 *(0.51-1.56)*	1.07 *(0.40-2.86)*	1.88 *(0.82-4.27)*	1.03 *(0.53-1.98)*	0.88 *(0.43-1.79)*	0.39 *(0.18-0.81)*
+HRB Adjusted	1.11 *(0.79-1.57)*	1.14 *(0.60-2.18)*	0.93 *(0.56-1.55)*	1.08 *(0.39-3.04)*	2.04 *(0.87-4.82)*	0.90 *(0.46-1.74)*	0.96 *(0.47-1.95)*	0.39 *(0.19-0.80)*

Notes: *p<0.05; HRB: current smoking, any drinking

9.6.2 Fathers

Adjusting for differences in health behaviours had no major influence on the risk of having poor health for any of the five outcomes. This meant that the significantly greater risk of fathers being overweight/obese in the second generation, compared to the first, persisted after accounting for the overall increased risk of drinking and smoking. However, the risk of fair/poor general health, limiting illness, diagnosed depression and having a raised distress score was not significantly different between generations and these consistent patterns were not moderated by patterns of health behaviours.

Figure 9.23: Odds (95% CI) of poor paternal health in the second generation compared to the first generation, adjusted for age (A), ethnicity (E) and health behaviours (HRB)



Notes: HRB: current smoking, any drinking

Table 9.12 performs this analysis in individual groups. These findings are limited by the small sample sizes of fathers with models failing to estimate any risks of poor health in Bangladeshi fathers, and confidence intervals were particularly wide in Black Caribbean and Black African groups. It is subsequently difficult to draw meaningful conclusions from these data. Those findings with a reasonable measure of precision tended to show that controlling for health behaviours has very little influence on the risk of all health outcomes, replicating the observations when all ethnic minority groups were combined.

Table 9.12: Paternal odds (95% CI) of having a poor health outcome in the second generation compared to the first generation, adjusted for age and health related behaviours (HRB)

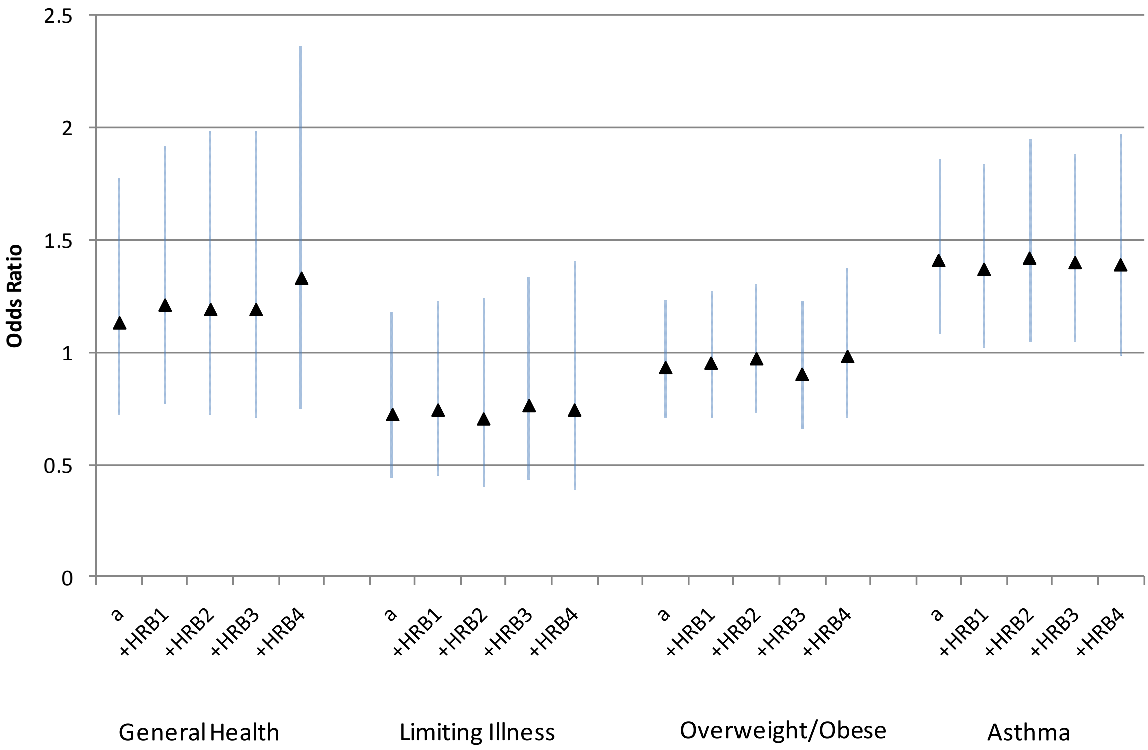
Odds Ratio for Poor Health: 2nd v 1st Generation	*White*	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age Adjusted	1.83 *(0.80-4.21)*	1.00 *(0.37-2.69)*	1.11 *(0.56-2.19)*	[a]	[a]	1.27 *(0.24-6.59)*	2.72 *(0.64-11.49)*	0.36 *(0.12-1.07)*
+HRB Adjusted	1.71 *(0.75-3.92)*	1.04 *(0.40-2.71)*	1.15 *(0.66-2.23)*	[a]	[a]	1.48 *(0.27-8.18)*	2.59 *(0.61-11.02)*	0.33 *(0.11-0.98)**
Limiting Illness								
Age Adjusted	1.50 *(0.72-3.10)*	1.10 *(0.39-3.08)*	0.81 *(0.42-1.58)*	[a]	1.19 *(0.21-6.79)*	1.03 *(0.21-5.10)*	1.85 *(0.36-9.40)*	1.75 *(0.57-5.33)*
+HRB Adjusted	1.47 *(0.71-3.03)*	1.10 *(0.40-3.04)*	0.85 *(0.46-1.60)*	[a]	1.42 *(0.14-14.38)*	1.66 *(0.34-8.10)*	1.86 *(0.34-10.16)*	1.73 *(0.58-5.16)*
Overweight/Obesity								
Age Adjusted	1.07 *(0.72-1.61)*	1.12 *(0.60-2.11)*	2.13 *(0.92-4.90)*	[a]	0.90 *(0.21-3.82)*	1.94 *(0.70-5.35)*	1.29 *(0.62-2.65)*	0.87 *(0.38-1.98)*
+HRB Adjusted	1.10 *(0.73-1.65)*	1.23 *(0.64-2.36)*	2.05 *(0.91-4.60)*	[a]	1.25 *(0.23-6.79)*	1.39 *(0.38-5.14)*	1.25 *(0.59-2.65)*	0.84 *(0.36-1.96)*
Diagnosed Depression								
Age Adjusted	1.88 *(1.02-3.46)**	1.12 *(0.41-3.11)*	1.00 *(0.44-2.31)*	[a]	0.30 *(0.03-2.73)*	0.12 (0.01-1.40)	0.97 *(0.39-2.44)*	0.89 *(0.30-2.64)*
+HRB Adjusted	1.76 *(0.92-3.35)*	1.13 *(0.41-3.17)*	0.60 *(0.26-1.41)*	[a]	0.17 *(0.03-1.12)*	0.14 *(0.01-1.48)*	0.86 *(0.35-2.09)*	1.02 *(0.34-3.04)*
Raised Distress Score								
Age Adjusted	1.03 *(0.64-1.65)*	0.70 *(0.31-1.56)*	0.49 *(0.24-1.00)*	[a]	1.43 *(0.29-6.98)*	0.73 *(0.25-2.10)*	0.98 *(0.50-1.93)*	0.78 *(0.31-1.99)*
+HRB Adjusted	1.01 *(0.63-1.61)*	0.71 *(0.30-1.67)*	0.52 *(0.25-1.08)*	[a]	0.84 *(0.14-4.86)*	0.84 *(0.28-2.53)*	0.94 *(0.47-1.89)*	0.85 *(0.33-2.14)*

Notes: [a] =no data; *p<0.05; HRB: current smoking, any drinking

9.6.3 Child

Figure 9.24 shows that adjusting for maternal current smoking, any drinking, never breastfeeding, incomplete MMR status and poor dietary score had no statistically significant influence on the intergenerational differences of selected child health outcomes. However, there was a tendency for the risk of fair/poor general health to increase in the children of second generation mothers after controlling for these behaviours. This effect was not observed for levels of limiting illness, obesity or asthma.

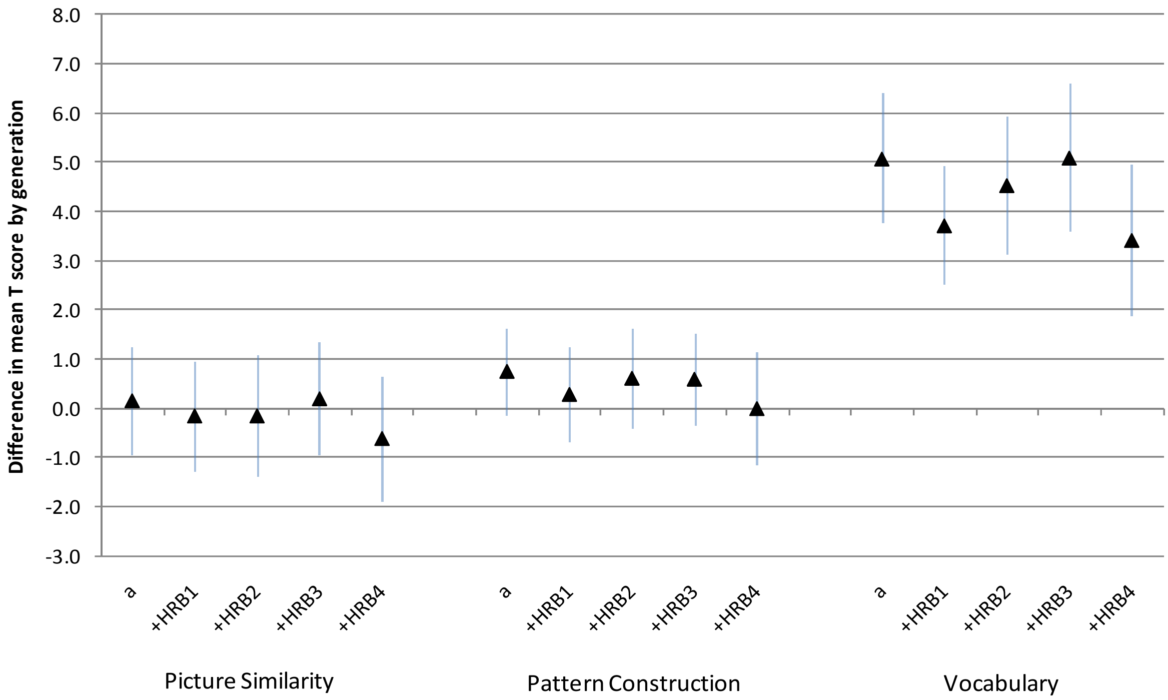
Figure 9.24: Odds (95% CI) of poor health in children of second generation mothers compared to the first generation, adjusted for demographic factors[a] and health behaviours (HRB)



a adjusted for child's age, sex and ethnicity & mother's age; HRB1: current smoking, any drinking; HRB2: exercise>once a week, child's dietary habit score; HRB3: never breastfed, incomplete immunisations (MMR); HRB4: all health behaviours

Regarding the relationship between changing health behaviours and generational differences in markers of cognitive development, controlling for all behaviours led to a weak reduction in the test score of the children of UK born mothers. This trend, whilst not statistically significant, was observed for picture similarity, pattern construction and vocabulary test scores.

Figure 9.25: Difference in mean child cognitive development test scores over maternal generation, adjusted for demographic factors[a] and health behaviours (HRB)



[a] adjusted for child's, sex and ethnicity & mother's age; HRB1: current smoking, any drinking; HRB2: exercise>once a week, child's dietary habit score; HRB3: never breastfed, incomplete immunisations (MMR); HRB4: all health behaviours

Table 9.13 shows that controlling for intergenerational changes in health behaviours did not result in any significant changes in the risk of poor health in individual groups, and the wide confidence intervals for most outcomes are indicative of the small cell sizes. There was an increase in risk of the children of all first generation mothers having a limiting illness after accounting for behaviours, with exception to the Other group, who reported a decrease. For all other outcomes there was no consistent modification of the chances of poor health after accounting for behaviours.

However, it appears that behaviours have a much greater influence upon intergenerational changes in child cognitive development. The coefficients shown in Table 9.14 represent the points change in the mean cognitive test score with increasing generation. Controlling for health behaviours generally reduced the size of the regression coefficient for the change in mean score between generations in the majority of groups, in each cognitive test. For example, the Black African children of second generation mothers scored 3.35 (0.15-6.56) points higher than their counterparts with first generation mothers on the pattern construction test. But, after accounting for changing patterns of health behaviours over generation, this improvement was reduced to 1.72 (-1.85-5.29) points. There were a small number of exceptions to this trend however. Controlling for health behaviours did not have a positive influence on the White group's vocabulary score, the Bangladeshi group's picture similarity and vocabulary score, and the Other White group's pattern construction score; for all other groups, and for all test scores, controlling for health behaviours attenuated the intergenerational improvements in the mean test score. Despite the general consistency of this trend, there were no statistically significant differences between the test scores before and after controlling for health behaviours.

Summary

There was inconsistent evidence that the intergenerational patterning of maternal health was mediated via changing health behaviours. A similar finding was in evidence for health outcome in children. However, there appeared to be a mediating link between behaviours and increasing scores for measures of cognitive development in children as once the intergenerational differences in behaviours were accounted for, the intergenerational increases in test scores were reduced in magnitude. It is not obvious, theoretically at least, where health behaviours such as diet, maternal drinking or smoking might lie of the causal pathway to cognitive development. Behaviours such as having been breastfed are likely to be more closely associated with indicators of cognitive development, whereas it is likely that smoking, drinking and diet are acting as markers parental acculturation which may influence child test performance.

Table 9.13: Odds of a child of a second generation mother having a poor health outcome compared to a child of the first generation, adjusted for maternal age (Age) and health related behaviours (HRB)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age Adjusted	0.85 (0.38-1.94)	0.74 *(0.24-2.27)*	1.90 *(0.82-4.41)*	1.87 *(0.63-5.57)*	0.62 *(0.14-2.75)*	0.22 *(0.03-1.33)*	2.40 *(0.65-8.87)*	0.55 *(0.20-1.51)*
+HRB Adjusted	1.77 (0.62-5.04)	0.48 *(0.09-2.58)*	2.47 *(0.98-6.23)*	[a]	0.44 *(0.04-4.35)*	0.21 *(0.02-2.49)*	2.80 *(0.72-10.85)*	0.37 *(0.08-1.66)*
Limiting Illness								
Age Adjusted	1.09 *(0.48-2.52)*	1.05*(0.19-5.75)*	0.54 *(0.24-1.21)*	0.79 *(0.06-11.16)*	1.12 *(0.19-6.62)*	[a]	0.54 *(0.20-1.47)*	0.92 *(0.30-2.85)*
+HRB Adjusted	1.18 *(0.42-3.29)*	1.81 *(0.23-14.44)*	0.99 *(0.35-2.82)*	[a]	1.32 *(0.12-14.51)*	[a]	0.69 *(0.21-2.28)*	0.07 *(0.01-0.74)**
Overweight/Obesity								
Age Adjusted	1.17 *(0.82-1.67)*	1.09 *(0.45-2.63)*	0.88 *(0.52-1.49)*	0.99 *(0.36-2.67)*	0.49 *(0.23-1.04)*	1.42 *(0.77-2.63)*	0.93 *(0.57-1.51)*	0.81 *(0.43-1.51)*
+HRB Adjusted	1.22 *(0.78-1.90)*	0.96 *(0.34-2.65)*	0.66 *(0.34-1.30)*	2.44 *(0.49-12.09)*	0.32 *(0.12-0.84)**	2.42 *(0.95-6.18)*	0.83 *(0.45-1.51)*	1.56 *(0.72-3.38)*
Asthma								
Age Adjusted	1.38 *(0.86-2.23)*	1.38 *(0.59-3.21)*	1.39 *(0.75-2.57)*	3.06 *(0.64-14.70)*	3.81 *(1.10-13.15)**	1.68 *(0.76-3.72)*	1.26 *(0.77-2.07)*	1.18 *(0.65-2.12)*
+HRB Adjusted	1.07 *(0.64-1.77)*	1.36 *(0.40-4.60)*	1.43 *(0.68-2.99)*	0.71 *(0.09-5.84)*	3.68 *(0.67-20.31)*	2.05 *(0.81-5.18)*	1.17 *(0.63-2.17)*	1.35 *(0.58-3.12)*

Notes: [a] =no data *p<0.05; HRB: current smoking, any drinking, incomplete immunisation, ever breastfed, exercise>once a week, child's dietary habit score; all analyses adjusted for child age and sex

Table 9.14: Regression coefficients for difference in child cognitive development T scores in the children of second generation mothers compared to first generation adjusted for maternal age (Age) and parental health behaviours (HRB)

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Picture Similarity								
Age Adjusted	-1.62 *(-3.07-0.17)*	1.49 *(-1.35-4.34)*	0.14 *(-1.50-1.79)*	-1.11 *(-5.40-3.19)*	0.91*(-2.92-4.74)*	2.56 *(-0.51-5.62)*	-0.96 *(-3.09-1.17)*	-0.94 *(-3.87-1.99)*
+HRB Adjusted	-2.21*(-4.00--0.43)**	1.44 *(-1.61-4.49)*	-0.88*(-3.16-1.39)*	-0.87*(-7.29-5.55)*	-1.61 *(-7.96--4.74)**	2.46 *(-0.80-5.72)*	-1.81 *(-4.25-0.63)*	-1.93 *(-5.24-1.39)*
Pattern Construction								
Age Adjusted	-2.10 *(-3.64-0.57)*	3.88 *(1.61-6.15)**	0.13*(-1.64-1.90)*	1.55 *(-1.71-4.81)*	4.21*(-0.05-8.47)*	3.35 *(0.15-6.56)**	-1.22 *(-3.12-0.69)*	-0.86 *(-2.95-1.23)*
+HRB Adjusted	-2.19 *(-3.93- -0.45)**	3.51 *(0.14-6.87)**	-0.72 *(-3.20-1.75)*	0.71 *(-3.83-5.26)*	3.23 *(-3.86-10.31)*	1.72 *(-1.85-5.29)*	-0.82 *(-3.16-1.51)*	-2.83 *(-5.58- -0.08)*
Vocabulary Score								
Age Adjusted	-1.09 *(-2.51-0.33)*	4.62 *(1.73-7.50)**	4.66 *(2.34-6.98)**	1.99 *(-1.23-5.20)*	4.54 *(-0.13-9.22)*	8.24 *(4.80-11.67)**	3.47 *(1.31-5.62)**	6.77 *(3.45-10.08)**
+HRB Adjusted	-0.52 *(-1.98-0.95)*	1.23 *(-2.37-4.84)*	2.81 *(-0.47-6.08)*	5.16 *(0.08-10.24)**	4.11 *(-2.60-10.82)*	5.88 *(1.68-10.08)**	3.05 *(0.41-5.70)**	3.71 *(0.20-7.22)**

Notes: *p<0.05; HRB: current smoking, any drinking, incomplete immunisation, ever breastfed, exercise>once a week, child's dietary habit score; all analyses adjusted for child sex

9.7 Conclusions

This chapter began by examining the extent of intergenerational differences in health behaviours, and then assessed the direction of acculturative changes compared to the White majority population. The key findings are summarised below.

- There is strong evidence suggesting that health behaviours differ by generation, and that some of these behavioural differences widen over multiple generations. For instance, there was a statistically significant incremental increase across three generations in the risk of current smoking, smoking in pregnancy and any drinking in a combination of all ethnic minority mothers in the MCS, which is consistent with an alternative analysis of this data (Hawkins et al 2008). There was also a rise in the risk of never breastfeeding and failing to complete the MMR regimen with increasing generations, although these differences were not significant. Fathers also showed an incremental increase in drinking over generations, but this was not significant. Although the second and third generations are both born in the UK, the step-wise increases over multiple generations implies an additional level of exposure to the UK environment for the third generation, possibly due to the greater acculturation of the parents. Therefore, these patterns of intergenerational difference suggest that increasing exposure to the UK environment leads to greater acculturation.

- Examination of generational differences across individual groups suggests that the extent of the shift in behaviours is ethnic group specific. Findings from the HSE and the MCS support previous work (National Institute for Ethnic Studies in Health and Social Policy 2000) in showing a significant generational difference in current smoking in Black Caribbean women, with modest differences for all other groups. Conversely, levels of any drinking of alcohol in Pakistani and Bangladeshi men and women were highly similar across generations, but more likely to rise across generations for other groups. Furthermore, for other behaviours such as physical exercise, all ethnic minority groups demonstrated considerable generational differences. The reasons for these specific differences are not clear, although the drinking rates in Pakistani and Bangladeshi people are likely to be strongly moderated by religion. Therefore patterns of intergenerational difference in health behaviours should be considered as complex with the extent of the difference being specific to both the ethnic minority group, and to the behaviour.

- Where generational differences do occur, they tend to approximate towards the risk of poor health behaviour observed within the White reference group. This is clearly exemplified in the HSE as all ethnic minority groups approximate towards levels of physical activity and rates of any drinking in the White group, with few exceptions across ethnic minority groups for current smoking or having a poor diet score. This is broadly supportive of an assimilative acculturation strategy where the ethnic minority behaviours shift towards those common to those in the host population.

- The general approximation towards the White group means that acculturation leads to the uptake of healthy behaviours, as well as unhealthy behaviours. For instance, all ethnic minority women in the HSE, and all except Other White women in the MCS, demonstrate higher levels of current smoking over increasing generations suggesting harmful effects for long term health. However decreasing levels of low physical exercise across generations in the HSE, and increasing frequency of exercise with the child in the MCS is beneficial to health. This suggests that that the UK environment may have positive effects on behaviours, as well as negative.

This chapter also investigated whether changes in health behaviours have a mediating effect on the patterning of health outcomes across generations

- These data do not offer statistically strong evidence for the behavioural pathway as a determinant of health as measured on a range of subjective and objective markers of general and physical health. There are large differences between the patterns of changing risk after controlling for health behaviours when all ethnic groups are combined, and when each individual group is analysed individually. There are few consistent effects on health risk when controlling for intergenerational differences in health behaviours in individual ethnic groups. This was reflective of the considerable heterogeneity in patterns of behaviours across ethnic groups and how these affect the health experiences of each group in individual ways.

- However, differences in behaviour leads to a reduction in the risk of having hazardous levels of biomarkers of cardiovascular disease between generations, but, again, the majority of these observations are not significant. Therefore it remains difficult to conclude firmly whether changing health behaviours do indeed lead to changing patterns of cardiovascular risk in this study.

- The increase in the child cognitive development test scores was attenuated after adjusting for maternal health behaviours. These results were observed when all ethnic groups were combined and when stratified by ethnic group. This suggests that ever drinking and currently smoking is associated with higher test scores in the second generation. It is unlikely that these behaviours lie on the causal pathway to cognitive development however. Instead, these behaviours may be acting as proxies for parental familiarity and integration with the UK environment, so that those parents who are more acculturated to the behavioural norms of the White majority are more likely to have children who perform well in tests which may be culturally biased towards the White population.

This chapter has explored how health behaviours differ between generations, and whether these changes influence health outcome. As was noted in the earlier chapter, the behavioural/cultural pathway is unlikely to be acting alone in determining patterns of health inequalities. Instead, it is likely to complement the socioeconomic influences, so that the effects on health of generational differences in socioeconomic circumstances might be nullified, or amplified, by the simultaneous action acculturative changes. The next chapter will investigate these possibilities.

Chapter 10:

The Influence of Socioeconomic and Health Behavioural Factors on Health

10 Intergenerational Modification of Health Outcomes by Socioeconomic and Health Related Behavioural Factors

10.1 Aim

Chapter 8 explored how socioeconomic differences influenced the intergenerational patterning of ethnic health inequalities, and Chapter 9 investigated the potential role of health behaviours. This chapter brings together these two mediating pathways to describe their combined effects in determining differences in health experiences over generations and addresses Objective 6:

- **To what extent do socioeconomic and health behavioural pathways interact over generations to shape patterns of health inequalities.**

10.2 Methods

Survey weighted logistic regression models estimated the risk of poor health in the second generation compared to the first. The relative change in the risk of poor health, after step-wise adjustment for a series of socioeconomic *and* health behavioural variables, represents the extent to which these pathways contribute to the generational differences in health. Additionally for children, linear regression was used to estimate the difference in cognitive development test scores between generations after adjusting for socioeconomic and behaviour differences. These analyses are performed in all ethnic minority groups combined (i.e. White groups are excluded from the analysis), and across individual ethnic minority groups.

Therefore the following tables show the odds of poor health adjusted for demographic and for socioeconomic factors, which were estimated in Chapter 8. Tables also display the odds of poor health adjusted for demographic and health behavioural factors derived in Chapter 9. In addition the tables show the novel findings of this chapter, namely the odds of poor health adjusted for demographic, socioeconomic and health behavioural factors.

10.3 The Combined Effects of Socioeconomic Circumstances and Health Behaviours on Health

10.3.1 The Health Survey for England

The risk of fair/poor general health and limiting illness in the second generation increased after adjustment for socioeconomic factors and health behaviours combined. Models testing for the independent effects of these two pathways suggest that this increase in risk was driven by socioeconomic differences for fair/poor general health, and additionally by health behaviours for limiting illness. Socioeconomic factors and health behaviours had little effect on the risk of being obese or being diagnosed with hypertension when controlled for either simultaneously or independently.

The limiting illness findings imply that controlling for socioeconomic circumstances and health behaviours had a cumulative effect of the risk of poor health. For instance, the change in the risk of poor health after simultaneously controlling for socioeconomic factors and behaviours is approximately equal to the sum of the change in the risk when each pathway is controlled for independently.

Table 10.1: Odds (95% CI) of poor health in the second generation compared to the first for all ethnic minority groups combined, adjusted for age, sex and ethnicity, socioeconomic factors (SES) and health behaviours (HRB)

	Model 1	**Model 1 & SES**	**Model 1 & HRB**	**Model 1 & SES & HRB**
General Health	0.88 *(0.75-1.03)*	1.02 *(0.85-1.23)*	0.96 *(0.77-1.20)*	1.02 *(0.79-1.31)*
Limiting Illness	1.04 *(0.87-1.24)*	1.12 *(0.92-1.38)*	1.24 *(0.97-1.60)*	1.33 *(1.00-1.76)**
Obesity	0.94 *(0.77-1.16)*	0.95 *(0.76-1.19)*	0.94 *(0.73-1.20)*	0.93 *(0.70-1.23)*
Diagnosed Hypertension	0.97 *(0.74-1.28)*	0.94 *(0.70-1.26)*	0.92 *(0.68-1.26)*	0.92 *(0.66-1.28)*

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (age, sex and ethnicity); *SES*: social class, highest qualification, equivalised income; *HRB*: current smoking and drinking, diet score and physical activity levels

There was a statistically significant lower risk of having hazardously low levels of HDL cholesterol in the second generation compared to the first, which persisted after controlling independently for socioeconomics and health behaviours. However, this risk was no longer significant after controlling for these factors simultaneously. Additionally, there were no statistically significant generational differences in the risk of having high levels of total cholesterol, LDL cholesterol or CRP after controlling for socioeconomics and health behaviours at the same time.

Table 10.2: Odds (95% CI) of hazardous levels of biomarkers of cardiovascular disease in the second generation compared to the first for all ethnic minority groups combined, adjusted for age, sex and ethnicity, socioeconomic factors (SES) and health behaviours (HRB)

	Model 1	Model 1 & SES	Model 1 & HRB	Model 1 & SES & HRB
Total Cholesterol (>5mmol/l)	1.20 *(0.98-1.47)*	1.19 *(0.95-1.49)*	1.00 *(0.72-1.41)*	0.96 *(0.65-1.43)*
HDL Cholesterol (<1.0mmol/l)	0.65 *(0.49-0.84)**	0.66 *(0.49-0.90)**	0.64 *(0.49-0.84)**	0.87 *(0.49-1.53)*
LDL Cholesterol (>3.0mmol/l)	1.16 *(0.87-1.54)*	1.17 *(0.86-1.59)*	0.90 *(0.58-1.38)*	0.82 *(0.51-1.31)*
CRP Cholesterol (>3.0mg/l)	0.97 *(0.77-1.23)*	1.00 *(0.77-1.30)*	1.10 *(0.76-1.59)*	1.14 *(0.76-1.71)*

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (age, sex and ethnicity); *SES*: social class, highest qualification, equivalised income; *HRB*: current smoking and drinking, diet score and physical activity levels

Table 10.3 describes these results by ethnic minority group. There was an increased risk of fair/poor general health and limiting illness in the second generation after controlling together for socioeconomic circumstances and health behaviours (the only exceptions being for limiting illness in Pakistani and Chinese groups), although this effect was not statistically significant. These changes were driven by socioeconomic differences as adjusting for health behaviours had little effect on the risk of poor health. The second generation Indian, Pakistani, Bangladeshi and Chinese groups were significantly more likely to be obese than the first generation after controlling for age and sex. This risk remained significant for Indian and Chinese after controlling for socioeconomics and health behaviours combined, whereas all other groups demonstrated no significant intergenerational differences after full adjustment. Lastly, there were no significant generational differences in diagnosed hypertension, before or after adjusting for the combined effects of socioeconomic and behavioural factors.

As was noted in the combined ethnic group analysis, the effects of adjusting for socioeconomic factors and health behaviours were cumulative and in many instances in opposing directions. For example, the risk of fair/poor health increased for the second generation Indian group compared to the first, after adjusting for socioeconomic factors. However, the risk decreased after adjusting for health behaviours. Therefore, controlling for all factors simultaneously led to the independent effects of these pathways cancelling one another out.

Table 10.4 presents the same analysis using biomarkers of cardiovascular disease. As was suggested by the combined sample of ethnic minority groups (Table 10.2), there were few significant intergenerational differences in the risk of having hazardous concentrations of biomarkers. Only the second generation Pakistani group were significantly more likely to report high levels of LDL cholesterol, which remained significant after controlling for behaviours, but not for socioeconomic factors. It was not possible to assess the combined effect due to sample size limitations. No other ethnic minority group showed any statistically significant differences across generations, either before or after controlling for socioeconomic and health behavioural factors. These analyses were particularly affected by the small number of respondents who were at risk for each biomarker. In many cases these estimates are omitted from the table or contain large confidence intervals that should be interpreted cautiously.

As for the indicators of physical health, the cumulative effects of socioeconomic and health behavioural factors were clearly in evidence with each pathway contributing in different ways to the risk of poor health. Where adjusting for socioeconomic factors increased the risk, and health behaviours decreased the risk, the fully adjusted odds lay in between the two independently derived estimates.

Table 10.3: Odds (95% CI) of poor health in the second generation compared to the first, adjusted for age and sex, socioeconomic factors (SES) and health behaviours (HRB) by ethnic minority group

Odds Ratio for Poor Health: 2nd v 1st Generation	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
General Health							
Age & Sex	1.05 *(0.78-1.42)*	0.99 *(0.74-1.32)*	0.81 *(0.59-1.11)*	0.98 *(0.69-1.37)*	1.23 *(0.69-2.19)*	0.85 *(0.66-1.10)*	1.12 *(0.72-1.75)*
Age, Sex & SES	1.34 *(0.94-1.90)*	1.60 *(1.07-2.39)**	1.03 *(0.67-1.58)*	1.26 *(0.87-1.81)*	1.99 *(0.89-4.43)*	0.86 *(0.65-1.14)*	1.61 *(0.96-2.72)*
Age, Sex & HRB	0.91 *(0.61-1.37)*	1.04 *(0.66-1.63)*	0.72 *(0.39-1.33)*	1.00 *(0.57-1.77)*	1.13 *(0.44-2.92)*	1.03 *(0.72-1.48)*	0.86 *(0.43-1.73)*
Age, Sex & SES & HRB	1.19 *(0.74-1.91)*	1.37 *(0.73-2.57)*	0.52 *(0.23-1.19)*	1.22 *(0.69-2.16)*	1.95 *(0.57-6.65)*	0.93 *(0.63-1.38)*	1.38 *(0.65-2.96)*
Limiting Illness							
Age & Sex	1.18 *(0.83-1.68)*	0.84 *(0.62-1.14)*	0.89 *(0.61-1.30)*	0.92 *(0.63-1.34)*	2.54 *(1.32-4.91)**	1.10 *(0.84-1.43)*	1.54 *(0.87-2.76)*
Age, Sex & SES	1.39 *(0.88-2.18)*	0.99 *(0.64-1.54)*	0.79 *(0.47-1.31)*	1.08 *(0.71-1.63)*	5.11 *(2.22-11.75)**	1.11 *(0.84-1.47)*	1.28 *(0.64-2.58)*
Age, Sex & HRB	1.23 *(0.72-2.10)*	0.80 *(0.50-1.30)*	0.85 *(0.40-1.77)*	1.00 *(0.55-1.81)*	1.41 *(0.48-4.16)*	1.44 *(0.99-2.08)*	1.10 *(0.46-2.59)*
Age, Sex & SES & HRB	1.44 *(0.75-2.75)*	0.81 *(0.42-1.56)*	0.97 *(0.38-2.52)*	1.19 *(0.63-2.26)*	2.77 *(0.65-11.68)*	1.46 *(0.99-2.15)*	0.90 *(0.32-2.48)*
Obesity							
Age & Sex	1.71 *(1.18-2.49)**	1.44 *(1.00-2.06)**	2.36 *(1.20-4.67)**	1.37 *(0.88-2.14)*	0.72 *(0.31-1.68)*	0.81 *(0.60-1.10)*	4.29 *(1.86-9.90)**
Age, Sex & SES	2.02 *(1.30-3.13)**	1.83 *(1.06-3.17)**	2.94 *(0.89-9.75)*	1.49 *(0.94-2.35)*	0.61 *(0.19-2.01)*	0.76 *(0.55-1.04)*	4.23 *(1.56-11.44)**
Age, Sex & HRB	1.90 *(1.19-3.04)**	1.42 *(0.87-2.33)*	1.70 *(0.58-4.95)*	1.40 *(0.78-2.53)*	0.82 *(0.34-1.98)*	0.78 *(0.54-1.13)*	5.76 *(1.77-18.74)**
Age, Sex & SES & HRB	2.16 *(1.24-3.74)**	1.68 *(0.81-3.48)*	2.06 *(0.37-11.3)*	1.41 *(0.78-2.54)*	0.83 *(0.25-2.70)*	0.71 *(0.49-1.04)*	6.90 *(1.62-29.37)**
Diagnosed Hypertension							
Age & Sex	0.87 *(0.54-1.40)*	1.10 *(0.57-2.11)*	2.10 *(0.83-5.32)*	1.02 *(0.62-1.68)*	0.87 *(0.18-4.20)*	0.98 *(0.67-1.42)*	1.00 *(0.34-2.89)*
Age, Sex & SES	1.00 *(0.58-1.71)*	1.29 *(0.60-2.78)*	2.21 *(0.67-7.34)*	0.98 *(0.57-1.67)*	0.76 *(0.19-3.14)*	0.93 *(0.63-1.36)*	1.13 *(0.41-3.07)*
Age, Sex & HRB	0.75 *(0.41-1.38)*	1.17 *(0.59-2.32)*	1.64 *(0.55-4.88)*	1.14 *(0.61-2.13)*	1.04 *(0.18-6.06)*	0.92 *(0.61-1.41)*	0.74 *(0.25-2.18)*
Age, Sex & SES & HRB	0.94 *(0.48-1.82)*	1.24 *(0.47-3.27)*	1.52 *(0.43-5.34)*	1.02 *(0.53-1.99)*	[a]	0.87 *(0.57-1.33)*	0.73 *(0.17-3.15)*

Notes: *p<0.05; [a] =no data; *SES*: social class, highest qualification, equivalised income; *HRB*: current smoking and drinking, diet Score and physical activity levels

Table 10.4:Odds (95% CI of hazardous levels of biomarkers of cardiovascular disease in the second generation compared to the first, adjusted for age and sex, socioeconomic factors (SES) and health behaviours (HRB) by ethnic minority group

Odds Ratio for Poor Health: 2nd v 1st Generation	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Total Cholesterol (>5mmol/l)							
Age & Sex	1.24 *(0.88-1.75)*	0.80 *(0.54-1.19)*	1.25 *(0.71-2.21)*	1.15 *(0.71-1.86)*	1.12 *(0.46-2.71)*	1.40 *(0.99-2.00)*	0.86 *(0.47-1.57)*
Age, Sex & SES	1.16 *(0.79-1.71)*	0.67 *(0.40-1.11)*	1.17 *(0.55-2.50)*	1.21 *(0.73-2.00)*	1.40 *(0.51-3.86)*	1.36 *(0.94-1.96)*	0.88 *(0.44-1.76)*
Age, Sex & HRB	0.76 *(0.41-1.41)*	0.63 *(0.31-1.29)*	1.21 *(0.41-3.56)*	0.66 *(0.24-1.86)*	2.31 *(0.86-6.21)*	1.31 *(0.66-2.61)*	0.50 *(0.20-1.26)*
Age, Sex & SES & HRB	0.61 *(0.29-1.31)*	0.40 *(0.14-1.17)*	[a]	0.90 *(0.27-2.99)*	2.15 *(0.45-10.22)*	1.24 *(0.58-2.67)*	0.86 *(0.26-2.85)*
HDL (<1.0mmol/l)							
Age & Sex	0.74 *(0.46-1.20)*	0.54 *(0.34-0.86)**	0.98 *(0.55-1.75)*	0.62 *(0.30-1.30)*	0.95 *(0.31-2.95)*	0.65 *(0.41-1.06)*	0.73 *(0.28-1.85)*
Age, Sex & SES	0.81 *(0.48-1.38)*	0.72 *(0.43-1.22)*	1.01 *(0.46-2.24)*	0.62 *(0.27-1.40)*	0.14 *(0.01-1.29)*	0.60 *(0.36-1.00)*	0.80 *(0.26-2.40)*
Age, Sex & HRB	0.76 *(0.31-1.84)*	0.36 *(0.13-0.98)*	1.11 *(0.39-3.11)*	0.70 *(0.08-6.15)*	0.71 *(0.18-2.79)*	0.95*(0.27-3.37)*	0.19 *(0.02-2.40)*
Age, Sex & SES & HRB	1.00 *(0.33-2.98)*	0.48 *(0.14-1.71)*	1.22 *(0.11-13.76)*	0.24 *(0.02-3.78)*	0.43 *(0.01-32.68)*	1.05 *(0.28-3.96)*	[a]
LDL (>3.0mmol/l)							
Age & Sex	0.86 *(0.53-1.38)*	1.98 *(1.03-3.80)**	0.79 *(0.23-2.79)*	1.34 *(0.67-2.69)*	0.78 *(0.23-2.59)*	1.24 *(0.82-1.88)*	0.71 *(0.29-1.71)*
Age, Sex & SES	0.79 *(0.47-1.35)*	1.45 *(0.63-3.33)*	1.45 *(0.63-3.33)*	1.61 *(0.77-3.35)*	1.31 *(0.26-6.63)*	1.19 *(0.78-1.84)*	0.66 *(0.19-2.30)*
Age, Sex & HRB	0.46 *(0.21-1.01)*	3.81 *(1.19-12.17)**	1.66 *(0.15-18.82)*	0.76 *(0.19-3.10)*	0.55 *(0.10-3.13)*	0.92 *(0.45-1.88)*	0.35 *(0.08-1.45)*
Age, Sex & SES & HRB	0.25 *(0.09-0.71)**	[a]	[a]	1.20 *(0.11-13.63)*	0.53 *(0.02-15.36)*	0.74 *(0.35-1.55)*	0.25 *(0.01-8.41)*
CRP (>3.0mg/l)							
Age & Sex	1.34 *(0.91-1.97)*	1.15 *(0.73-1.84)*	0.80 *(0.38-1.70)*	1.15 *(0.68-1.93)*	1.46 *(0.51-4.14)*	0.88 *(0.61-1.26)*	1.75 *(0.70-4.37)*
Age, Sex & SES	1.49 *(0.98-2.27)*	1.17 *(0.73-1.89)*	0.81 *(0.36-1.83)*	1.25 *(0.73-2.14)*	2.87 *(0.74-11.16)*	0.83 *(0.57-1.20)*	2.36 *(0.79-7.07)*
Age, Sex & HRB	1.44 *(0.75-2.76)*	1.51 *(0.67-3.38)*	1.13 *(0.35-3.68)*	2.23 *(0.75-6.68)*	0.72 *(0.19-2.81)*	1.00 *(0.53-1.89)*	2.82 *(0.72-11.12)*
Age, Sex & SES & HRB	1.85 *(0.83-4.12)*	1.45 *(0.52-4.06)*	[a]	2.23 *(0.67-7.39)*	[a]	1.02 *(0.53-1.95)*	2.83 *(0.55-14.58)*

Notes: *p<0.05; [a] *= no data; SES*: social class, highest qualification, equivalised income; *HRB*: current smoking and drinking, diet Score and physical activity levels

10.3.2 Millennium Cohort Study

10.3.2.1 Mothers

The risk of fair/poor general health, having a limiting illness and being overweight/obese in a combination of all ethnic minorities increased in the second generation relative to the first after simultaneously controlling for socioeconomics and health behaviours. The increased risk was mediated by controlling for socioeconomic circumstances, whereas controlling for health behaviours had a much weaker influence. However, there were no statistically significant generational differences in the risk of fair/poor general health, limiting illness or being overweight/obese before or after controlling for socioeconomic and behavioural factors.

The second generation were at a statistically significant greater risk of diagnosed depression than the first, after controlling simultaneously for generational differences in socioeconomic and health behavioural factors. This strongly suggests that other mechanisms not accounted for explain the intergenerational increase in the risk of diagnosed depression. There were no statistically significant differences observed for having a raised distress score in the second generation compared to the first and was unaffected by controlling for socioeconomic or behavioural factors.

Table 10.5: Odds (95% CI) of poor health in the second generation mothers compared to the first in a combination of all ethnic minority groups, adjusted for age and ethnicity, socioeconomic factors (SES) and health behaviours (HRB)

	Model 1	Model 1 & SES	Model 1 & HRB	Model 1 & SES & HRB
General Health	1.05 *(0.81-1.36)*	1.15 (0.86-1.53)	1.04 *(0.78-1.38)*	1.10 *(0.82-1.49)*
Limiting Illness	0.79 *(0.55-1.13)*	0.84 *(0.57-1.25)*	0.79 *(0.55-1.15)*	0.83 *(0.56-1.23)*
Overweight/Obesity	1.02 *(0.80-1.32)*	1.10 *(0.84-1.45)*	1.05 *(0.80-1.39)*	1.12 *(0.85-1.49)*
Diagnosed Depression	1.59 *(1.21-2.09)**	1.57 *(1.17-2.13)**	1.61 *(1.21-2.14)**	1.60 *(1.17-2.18)**
Raised Distress Score	0.85 *(0.66-1.09)*	0.86 *(0.64-1.14)*	0.87 *(0.63-1.14)*	0.86 *(0.69-1.11)*

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (age and ethnicity); *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking

Table 10.6 explores these trends by ethnic group. The second generation Black African group was statistically significantly less likely to report fair/poor general health than the first after controlling for both socioeconomics and health behaviours. However, caution is required as there were a small number of cases reporting fair/poor health. There were no other statistically significant differences in the risk of fair/poor health, limiting illness or overweight/obesity for all other groups before or after being fully adjusted.

The increased second generation risk of doctor diagnosed depression was statistically significant in Pakistani mothers and remained so after controlling for socioeconomic and health behavioural factors independently, and together. The significantly higher risk of depression in second generation Black Caribbean mothers was no longer significant after simultaneously adjusting for socioeconomic factors and health behaviours. The second generation Other group was less likely than the first to have a raised distress score after full adjustment. However, there were no other statistically significant differences either before or after adjusting for socioeconomic and health behavioural factors.

Closer inspection of the changing risks of poor health after independent and simultaneous adjustment of confounders shows that intergenerational differences in socioeconomic circumstances and health behaviours tend to have an additive effect on risk when they are controlled for at the same time. Importantly, the effects of these pathways on the risk of poor health were often in opposing directions, having a neutralising effect, meaning that the fully adjusted risks were not significantly different from the age adjusted risks. These patterns are consistent with those across ethnic minority groups in the HSE analysis, as well as those at the combined ethnic group levels of the HSE and the MCS.

Table 10.6: Odds (95% CI) of poor health in the second generation mothers compared to the first, adjusted for age, socioeconomic factors (SES) and health behaviours (HRB) by ethnic group

Odds Ratio for Poor Health: 2nd v 1st Generation	*White*	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age	1.02 *(0.65-1.61)*	1.66 *(0.75-3.71)*	1.03 *(0.59-1.82)*	1.55 *(0.57-4.24)*	1.09 *(0.41-2.92)*	0.18 *(0.06-0.59)**	1.11 *(0.44-2.82)*	1.06 *(0.48-2.36)*
Age & SES	0.95 *(0.59-1.51)*	1.80 *(0.83-3.94)*	1.09 *(0.58-2.07)*	2.21 *(0.58-8.44)*	0.78 *(0.27-2.21)*	0.25 *(0.05-1.21)*	0.92 *(0.36-2.36)*	1.18 *(0.48-2.93)*
Age & HRB	1.12 *(0.71-1.77)*	1.37 *(0.63-3.01)*	1.02 *(0.58-1.81)*	1.69 *(0.62-4.59)*	0.99 *(0.36-2.70)*	0.12 *(0.03-0.49)**	1.31 *(0.49-3.55)*	1.23 *(0.56-2.70)*
Age & SES & HRB	1.05 *(0.65-1.68)*	1.38 *(0.66-2.86)*	1.07 *(0.56-2.04)*	2.48 *(0.69-8.96)*	0.73 *(0.24-2.18)*	0.19 *(0.04-0.87)**	1.05 *(0.41-2.68)*	1.25 *(0.52-3.02)*
Limiting Illness								
Age	0.79 *(0.54-1.16)*	0.83 *(0.27-2.55)*	0.68 *(0.37-1.23)*	0.68 *(0.16-2.86)*	3.18 *(0.86-11.75)*	0.31 *(0.08-1.28)*	0.93 *(0.32-2.69)*	0.53 *(0.19-1.44)*
Age & SES	0.76 *(0.51-1.13)*	0.86 *(0.28-2.66)*	0.83 *(0.39-1.74)*	0.77 *(0.11-5.22)*	1.78 *(0.47-6.66)*	1.13 *(0.14-8.95)*	0.82 *(0.29-2.28)*	0.51 *(0.16-1.59)*
Age & HRB	0.85 *(0.57-1.25)*	0.63 *(0.21-1.94)*	0.67 *(0.37-1.21)*	0.73 *(0.18-2.98)*	3.07 *(0.87-10.83)*	0.35 *(0.08-1.46)*	0.95 *(0.32-2.88)*	0.56 *(0.19-1.61)*
Age & SES & HRB	0.82 *(0.55-1.24)*	0.54 *(0.17-1.74)*	0.81 *(0.38-1.71)*	0.84 *(0.11-6.26)*	1.79 *(0.49-6.49)*	1.20 *(0.13-10.93)*	0.79 *(0.27-2.32)*	0.51 *(0.16-1.63)*
Overweight/Obesity								
Age	1.41 *(0.95-2.08)*	1.13 *(0.59-2.14)*	0.90 *(0.54-1.51)*	1.03 *(0.33-3.18)*	0.98 *(0.38-2.55)*	0.83 *(0.30-2.30)*	1.39 *(0.74-2.62)*	0.92 *(0.44-1.94)*
Age & SES	1.37 *(0.94-2.01)*	1.11 *(0.55-2.25)*	1.12 *(0.65-1.95)*	0.82 *(0.18-3.67)*	0.75 *(0.26-2.13)*	0.81 *(0.30-2.21)*	1.25 *(0.63-2.47)*	1.07 *(0.43-2.67)*
Age & HRB	1.43 *(0.91-2.24)*	0.87 *(0.43-1.79)*	0.79 *(0.40-1.56)*	1.16 *(0.27-4.94)*	0.66 *(0.17-2.55)*	0.82 *(0.30-2.21)*	1.80 *(0.89-3.62)*	1.13 *(0.49-2.62)*
Age & SES & HRB	1.38 *(0.89-2.13)*	0.79 *(0.37-1.69)*	0.95 *(0.49-1.85)*	0.74 *(0.08-6.61)*	0.52 *(0.15-1.86)*	0.92 *(0.29-2.94)*	1.76 *(0.83-3.70)*	1.16 *(0.42-3.22)*
Diagnosed Depression								
Age	1.05 *(0.76-1.46)*	0.88 *(0.37-2.10)*	2.33 *(1.30-4.20)**	1.57 *(0.63-3.91)*	3.07 *(1.20-7.85)**	1.25 *(0.44-3.60)*	1.23 *(0.57-2.69)*	1.55 *(0.71-3.41)*
Age & SES	0.96 *(0.69-1.34)*	1.28 *(0.46-3.54)*	2.20 *(1.21-4.01)**	1.95 *(0.41-9.36)*	2.98 *(0.88-10.08)*	1.09 *(0.28-4.22)*	1.10 *(0.53-2.27)*	1.87 *(0.77-4.54)*
Age & HRB	1.09 *(0.77-1.54)*	1.14 *(0.43-3.00)*	2.44 *(1.36-4.40)**	1.65 *(0.67-4.03)*	2.99 *(1.13-7.91)**	0.96 *(0.28-3.30)*	1.28 *(0.57-2.88)*	1.34 *(0.59-3.03)*
Age & SES & HRB	1.01 *(0.71-1.43)*	1.70 *(0.57-5.03)*	2.43 *(1.36-4.33)**	2.03 *(0.39-10.58)*	3.03 *(0.85-10.76)*	0.45 *(0.08-2.56)*	1.12 *(0.53-2.37)*	1.54 *(0.62-3.86)*
Raised Distress Score								
Age	1.07 *(0.77-1.50)*	1.05 *(0.56-1.97)*	0.89 *(0.51-1.56)*	1.07 *(0.40-2.86)*	1.88 *(0.82-4.27)*	1.03 *(0.53-1.98)*	0.88 *(0.43-1.79)*	0.39 *(0.18-0.81)**
Age & SES	1.03 *(0.73-1.44)*	1.10 *(0.56-2.19)*	1.02 *(0.57-1.81)*	0.62 *(0.17-2.29)*	2.37 *(0.95-5.92)*	1.72 *(0.55-5.36)*	0.85 *(0.38-1.89)*	0.35 *(0.14-0.84)**
Age & HRB	1.11 *(0.79-1.57)*	1.14 *(0.60-2.18)*	0.93 *(0.56-1.55)*	1.08 *(0.39-3.04)*	2.04 *(0.87-4.82)*	0.90 *(0.46-1.74)*	0.96 *(0.47-1.95)*	0.39 *(0.19-0.80)*
Age & SES & HRB	1.06 *(0.75-1.51)*	1.05 *(0.51-2.15)*	1.04 *(0.60-1.79)*	0.62 *(0.17-2.28)*	2.52 *(0.95-6.68)*	1.49 *(0.50-4.45)*	0.89 *(0.40-2.01)*	0.32 *(0.14-0.76)**

Notes: *p<0.05; *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking

10.3.2.2 Fathers

Fathers of all ethnic minority groups combined were statistically significantly more likely to be overweight/obese in the second generation than the first, after adjusting independently for socioeconomic circumstances and health behaviours, but this difference was not significant after adjusting for these factors at the same time. However, neither socioeconomic nor health behavioural factors mediated the greater risk in the second generation as confidence intervals and the odds estimate remained highly consistent in all models.

The risk of fair/poor health and limiting illness increased after fully adjusting, and this increase was primarily driven by adjusting for socioeconomic differences between generations. A similar but weaker effect was observed for the risk of having a raised distress score. However, the reduced second generation risk of doctor diagnosed depression was mediated by health behaviours, albeit weakly.

Table 10.7: Odds (95% CI) of poor health in the second generation fathers compared to the first in a combination of all ethnic minority groups, adjusted for age and ethnicity, socioeconomic factors (SES) and health behaviours (HRB)

	Model 1	Model 1 & SES	Model 1 & HRB	Model 1 & SES & HRB
General Health	1.25 *(0.85-1.83)*	1.50 *(0.98-2.29)*	1.33 *(0.89-1.99)*	1.52 *(0.99-2.34)*
Limiting Illness	1.25 *(0.80-1.94)*	1.58 *(0.95-2.60)*	1.31 *(0.84-2.03)*	1.58 *(0.96-2.60)*
Overweight/Obesity	1.43 *(1.06-1.93)**	1.37 *(1.00-1.87)**	1.39 *(1.04-1.87)**	1.36 *(0.99-1.85)*
Diagnosed Depression	0.84 *(0.50-1.43)*	0.92 *(0.53-1.60)*	0.78 *(0.46-1.31)*	0.79 *(0.45-1.36)*
Raised Distress Score	0.79 *(0.55-1.13)*	0.85 *(0.58-1.25)*	0.82 *(0.58-1.18)*	0.87 *(0.59-1.29)*

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (age and ethnicity); *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking

These findings were investigated in individual ethnic groups. However, where it was possible to derive an estimate of the intergenerational risk of a poor health outcome, confidence intervals were very wide with few consistent patterns emerging across any groups. Therefore these findings add little to this stage of the investigation.

Table 10.8: Odds (95% CI) of poor health in the second generation fathers compared to the first, adjusted for age, socioeconomic factors (SES) and health behaviours (HRB) by ethnic group

Odds Ratio for Poor Health: 2^{nd} v 1^{st} Generation	*White*	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Age	1.83 *(0.80-4.21)*	1.00 *(0.37-2.69)*	1.11 *(0.56-2.19)*	[a]	[a]	1.27 *(0.24-6.59)*	2.72 *(0.64-11.49)*	0.36 *(0.12-1.07)*
Age & SES	1.51 *(0.64-3.59)*	0.96 *(0.32-2.93)*	1.13 *(0.52-2.43)*	[a]	[a]	1.55 *(0.11-22.71)*	2.90 *(0.62-13.60)*	0.62 *(0.21-1.79)*
Age & HRB	1.71 *(0.75-3.92)*	1.04 *(0.40-2.71)*	1.15 *(0.66-2.23)*	[a]	[a]	1.48 *(0.27-8.18)*	2.59 *(0.61-11.02)*	0.33 *(0.11-0.98)**
Age & SES & HRB	1.44 *(0.82-2.55)*	0.65 *(0.22-1.89)*	1.09 *(0.51-2.31)*	[a]	[a]	[a]	0.80 *(0.10-6.50)*	0.45 *(0.11-1.82)*
Limiting Illness								
Age	1.50 *(0.72-3.10)*	1.10 *(0.39-3.08)*	0.81 *(0.42-1.58)*	[a]	1.19 *(0.21-6.79)*	1.03 *(0.21-5.10)*	1.85 *(0.36-9.40)*	1.75 *(0.57-5.33)*
Age & SES	1.35 *(0.63-2.93)*	1.24 *(0.37-4.19)*	1.04 *(0.47-2.30)*	[a]	1.80 *(0.33-9.88)*	1.73 *(0.13-22.25)*	1.91 *(0.28-12.90)*	2.20 *(0.61-7.90)*
Age & HRB	1.47 *(0.71-3.03)*	1.10 *(0.40-3.04)*	0.85 *(0.46-1.60)*	[a]	1.42 *(0.14-14.38)*	1.66 *(0.34-8.10)*	1.86 *(0.34-10.16)*	1.73 *(0.58-5.16)*
Age & SES & HRB	1.35 *(0.63-2.90)*	1.16 *(0.35-3.87)*	1.10 *(0.52-2.34)*	[a]	0.39 *(0.01-10.76)*	[a]	2.33 *(0.38-14.33)*	2.12 *(0.60-7.55)*
Overweight/Obesity								
Age	1.07 *(0.72-1.61)*	1.12 *(0.60-2.11)*	2.13 *(0.92-4.90)*	[a]	0.90 *(0.21-3.82)*	1.94 *(0.70-5.35)*	1.29 *(0.62-2.65)*	0.87 *(0.38-1.98)*
Age & SES	1.36 *(1.01-1.82)**	1.13 *(0.46-2.80)*	1.28 *(0.74-2.22)*	[a]	1.06 *(0.16-6.75)*	1.21 *(0.34-4.23)*	2.66 *(1.09-6.48)**	0.70 *(0.34-1.42)*
Age & HRB	1.10 *(0.73-1.65)*	1.23 *(0.64-2.36)*	2.05 *(0.91-4.60)*	[a]	1.25 *(0.23-6.79)*	1.39 *(0.38-5.14)*	1.25 *(0.59-2.65)*	0.84 *(0.36-1.96)*
Age & SES & HRB	1.07 *(0.70-1.63)*	1.50 *(0.75-3.00)*	2.03 *(0.84-4.94)*	[a]	0.54 *(0.07-4.37)*	3.10 *(0.53-18.05)*	1.00 *(0.39-2.55)*	0.81 *(0.32-2.02)*
Diagnosed Depression								
Age	1.88 *(1.02-3.46)*	1.12 *(0.41-3.11)*	1.00 *(0.44-2.31)*	[a]	0.30 *(0.03-2.73)*	0.12 (0.01-1.40)	0.97 *(0.39-2.44)*	0.89 *(0.30-2.64)*
Age & SES	1.19 *(0.82-1.73)*	0.61 *(0.19-1.96)*	2.50 *(0.97-6.41)*	[a]	1.00 *(0.68-1.46)*	[a]	1.84 *(0.51-6.59)*	1.68 *(0.68-4.16)*
Age & HRB	1.76 *(0.92-3.35)*	1.13 *(0.41-3.17)*	0.60 *(0.26-1.41)*	[a]	0.17 *(0.03-1.12)*	[a]	0.86 *(0.35-2.09)*	1.02 *(0.34-3.04)*
Age & SES & HRB	1.58 *(0.80-3.09)*	1.31 *(0.35-4.92)*	0.65 *(0.22-1.87)*	[a]	[a]	[a]	0.86 *(0.29-2.53)*	0.77 *(0.21-2.88)*
Raised Distress Score								
Age	1.03 *(0.64-1.65)*	0.70 *(0.31-1.56)*	0.49 *(0.24-1.00)*	[a]	1.43 *(0.29-6.98)*	0.73 *(0.25-2.10)*	0.98 *(0.50-1.93)*	0.78 *(0.31-1.99)*
Age & SES	0.91 *(0.70-1.17)*	2.63 *(1.12-6.14)**	1.12 *(0.58-2.18)*	[a]	0.78 *(0.15-4.19)*	0.78 *(0.12-5.27)*	1.03 *(0.41-2.61)*	0.49 *(0.20-1.19)*
Age & HRB	1.01 *(0.63-1.61)*	0.71 *(0.30-1.67)*	0.52 *(0.25-1.08)*	[a]	0.84 *(0.14-4.86)*	0.84 *(0.28-2.53)*	0.94 *(0.47-1.89)*	0.85 *(0.33-2.14)*
Age & SES & HRB	0.94 *(0.57-1.54)*	0.61 *(0.21-1.76)*	0.79 *(0.33-1.88)*	[a]	0.96 *(0.10-9.24)*	2.84 *(0.54-14.96)*	0.94 *(0.42-2.09)*	0.66 *(0.24-1.80)*

Notes: *p<0.05; [a] =no data; *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking

10.3.2.3 Child

Although the children of second generation mothers were at greater risk of asthma after controlling for demographic and socioeconomic factors, this was no longer significant after simultaneously controlling for health behaviours. There were no significant differences in the risks of fair/poor general health, limiting illness or being overweight/obese in the children of the second generation relative to the first after adjusting for socioeconomics and health behaviours together. With exception to the risk of fair/poor general health, which increased after full adjustment, generational differences across a combination of all ethnic minority children were largely uninfluenced by the effects of socioeconomic circumstances and health behaviours.

Table 10.9: Odds (95% CI) of poor health in the children of second generation mothers compared to first, in all ethnic minority groups combined, adjusted for demographic factors, socioeconomic factors, (SES) and health behaviours (HRB)

	Model 1	Model 1 & SES	Model 1 & HRB	Model 1 & SES & HRB
General Health	1.13 *(0.72-1.77)*	1.21 *(0.74-1.98)*	1.33 *(0.75-2.36)*	1.32 *(0.70-2.51)*
Limiting Illness	0.72 *(0.44-1.18)*	0.71 *(0.41-1.21)*	0.74 *(0.39-1.40)*	0.80 *(0.39-1.66)*
Overweight/Obesity	0.93 *(0.71-1.23)*	0.91 *(0.68-1.22)*	0.98 *(0.71-1.37)*	0.98 *(0.70-1.36)*
Asthma	1.41 *(1.08-1.86)**	1.41 *(1.05-1.89)**	1.39 *(0.98-1.97)*	1.37 *(0.96-1.97)*

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (maternal age and child's ethnicity, age and sex); *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking, incomplete immunisation, never breastfed, exercise>once a week, child's dietary habit score

The generational differences in the mean cognitive development test scores for the combined group of all ethnic minority children is shown in Table 10.10. A negative coefficient indicates that the mean test score in the second generation is lower than the first, and a positive coefficient suggests a higher second generation score. The children of the second generation were likely to score lower on picture similarity and pattern construction tests than the children of the first generation, after socioeconomic and health behaviour factors were both accounted for, although these differences were not statistically significant. Adjusting independently for socioeconomics and health behaviours attenuated the generational differences in the vocabulary score, with simultaneous adjustment halving the advantage of the children with second generation mothers over their first generation counterparts. The largest differences were for the vocabulary test which is likely to be influenced by the second generation parents being more likely to speak English in the home. These findings provide evidence that child cognitive development varies by generation, and that these differences in development are associated with socioeconomic pathways as well as through health behaviours controlled by the mother.

Table 10.10: Regression coefficient (95% CI) for the change in the mean cognitive development score between the children of second generation mothers and first in all ethnic minority groups combined, adjusted for demographic factors, socioeconomic factors (SES) and health behaviours (HRB)

	Model 1	Model 1 & SES	Model 1 & HRB	Model 1 & SES & HRB
Picture Similarity Score	0.14 *(-0.96, 1.23)*	-0.04 *(-1.18, 1.10)*	-0.63 *(-1.91, 0.64)*	-0.66 *(-1.96, 0.64)*
Pattern Construction Score	0.74 *(-0.14, 1.62)*	0.17 *(-0.75, 1.09)*	-0.02 *(-1.17, 1.13)*	-0.36 *(-1.53, 0.80)*
Vocabulary Score	5.07 *(3.76, 6.39)**	3.73 *(2.62, 4.85)**	3.41 *(1.87, 4.95)**	2.65 *(1.31, 3.98)**

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (maternal age and child's ethnicity and sex); *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking, incomplete immunisation, never breastfed, exercise>once a week, child's dietary habit score

Table 10.11 describes these trends by ethnicity. The small cell sizes for child health outcomes are reflected in the wide confidence intervals, particularly in the fully adjusted models. There was an increased risk of asthma in Black Caribbean children with second generation mothers, after controlling for demographic factors (child age, sex, ethnicity and maternal age). Although the risk generally remained higher than all other ethnic groups, it was no longer significant after controlling independently, and simultaneously, for socioeconomics and health behaviours. Black Caribbean children of second generation mothers were also less likely to be overweight/obese than children of first generation mothers. As was observed for mothers, both pathways contributed their independent effects within the fully adjusted model.

Generational differences in the mean cognitive development test scores, adjusted for socioeconomics and health behaviours, are shown in Table 10.12. Fully adjusting for socioeconomic and health behavioural factors led to a worsening in the mean picture similarity test scores of children in the second generation compared to the first. This implies that intergenerational differences in socioeconomic and health behavioural factors mediate the higher scores of the children with second generation mothers. However, the opposite effect was observed in Black African and Indian children with second generation mothers, where scores improved after fully adjusting for socioeconomics and health behaviours. The mean pattern construction test scores in children with second generation mothers worsened after fully adjusting, with exception to the White and Other White groups, for whom scores improved. Finally, there was also a reduction in the vocabulary test scores after fully adjusting for generational differences in socioeconomic circumstances and health behaviours. The only exceptions were for the White and Bangladeshi children where the vocabulary test scores increased after accounting for socioeconomic and behavioural factors.

These analyses showed that White children with second generation mothers had statistically significant lower test scores for the picture similarity test, and, with the Other group, for the pattern construction test. Conversely, the vocabulary test scores were statistically significantly higher in the children of second generation mothers for the Other and Other White group after full adjustment. That the Other group has statistically significantly higher scores on the vocabulary test after full adjustment, and statistically significant lower scores on pattern construction tests suggests that these scales are measuring discrete aspects of cognitive development. Finally, Indian children of second generation mothers had statistically significantly higher scores after fully adjusting for all socioeconomic and behavioural factors.

It was notable that the Black Caribbean group showed no significant generational shifts in mean scores given the larger proportion who were born to third generation mothers. To account for this, a further analysis (Table 10.13) compared between the scores of children with third and first generation mothers (ie. excluding all second generation). There was a statistically significant increase in the third generation vocabulary test score after adjusting for demographic factors and additionally by socioeconomic factors, but this was no longer significant when health behaviours were accounted for independently or simultaneously with socioeconomic factors. There were no significant differences in pattern construction and picture similarity test scores, and generational differences were comparable to when the third generation was combined with the second.

Table 10.11: Odds (95% CI) of poor health in the children of second generation mothers compared to first, adjusted stepwise for demographic factors, socioeconomic factors (SES) and health behaviours (HRB) by ethnic group

Odds Ratio for Poor Health: 2^{nd} v 1^{st} Generation	*White*	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
General Health								
Model 1	0.85 (0.38-1.94)	0.74 (0.24-2.27)	1.90 (0.82-4.41)	1.87 (0.63-5.57)	0.62 (0.14-2.75)	0.22 (0.03-1.33)	2.40 (0.65-8.87)	0.55 (0.20-1.51)
Model 1 & SES	0.73 (0.33-1.65)	0.67 (0.17-2.67)	2.31 (0.93-5.76)	1.44 (0.08-25.12)	1.01 (0.29-3.54)	0.21 (0.03-1.27)	2.51 (0.58-10.8)	0.51 (0.18-1.47)
Model 1 & HRB	1.77 (0.62-5.04)	0.48 (0.09-2.58)	2.47 (0.98-6.23)	[a]	0.44 (0.04-4.35)	0.21 (0.02-2.49)	2.80 (0.72-10.85)	0.37 (0.08-1.66)
Model 1 & SES & HRB	1.56 (0.55-4.47)	0.40 (0.05-3.11)	2.51 (0.84-7.46)	[a]	1.39 (0.18-10.51)	[a]	2.73 (0.64-11.69)	0.35 (0.07-1.71)
Limiting Illness								
Model 1	1.09 (0.48-2.52)	1.05 (0.19-5.75)	0.54 (0.24-1.21)	0.79 (0.06-11.16)	1.12 (0.19-6.62)	4.18 (0.35-50.12)	0.54 (0.20-1.47)	0.92 (0.30-2.85)
Model 1 & SES	1.03 (0.44-2.37)	0.78 (0.06-9.54)	0.51 (0.20-1.31)	[a]	0.88 (0.08-9.61)	[a]	0.58 (0.18-1.93)	0.87 (0.25-3.07)
Model 1 & HRB	1.18 (0.42-3.29)	1.81 (0.23-14.44)	0.99 (0.35-2.82)	[a]	1.32 (0.12-14.51)	[a]	0.69 (0.21-2.28)	0.07 (0.01-0.74)
Model 1 & SES & HRB	1.12 (0.41-3.07)	[a]	0.68 (0.08-5.83)	[a]	[a]	[a]	0.96 (0.23-3.94)	[a]
Overweight/Obesity								
Model 1	1.17 (0.82-1.67)	1.09 (0.45-2.63)	0.88 (0.52-1.49)	0.99 (0.36-2.67)	0.49 (0.23-1.04)	1.42 (0.77-2.63)	0.93 (0.57-1.51)	0.81 (0.43-1.51)
Model 1 & SES	1.12 (0.79-1.59)	1.08 (0.44-2.66)	0.84 (0.44-1.62)	5.13 (0.91-28.96)	0.39 (0.16-0.95)*	1.40 (0.65-2.99)	0.87 (0.52-1.45)	0.93 (0.48-1.82)
Model 1 & HRB	1.22 (0.78-1.90)	0.96 (0.34-2.65)	0.66 (0.34-1.30)	2.44 (0.49-12.09)	0.32 (0.12-0.84)*	2.42 (0.95-6.18)	0.83 (0.45-1.51)	1.56 (0.72-3.38)
Model 1 & SES & HRB	1.18 (0.76-1.84)	0.85 (0.32-2.27)	0.75 (0.34-1.69)	[a]	0.23 (0.07-0.74)*	2.48 (0.69-8.96)	0.81 (0.43-1.51)	1.79 (0.80-4.04)
Asthma								
Model 1	1.38 (0.86-2.23)	1.38 (0.59-3.21)	1.39 (0.75-2.57)	3.06 (0.64-14.70)	3.81 (1.10-13.15)*	1.68 (0.76-3.72)	1.26 (0.77-2.07)	1.18 (0.65-2.12)
Model 1 & SES	1.30 (0.80-2.11)	1.14 (0.45-2.88)	1.47 (0.75-2.89)	6.62 (1.40-31.32)	3.83 (0.96-15.23)	2.46 (0.85-7.12)	1.12 (0.66-1.91)	1.24 (0.63-2.42)
Model 1 & HRB	1.07 (0.64-1.77)	1.36 (0.40-4.60)	1.43 (0.68-2.99)	0.71 (0.09-5.84)	3.68 (0.67-20.31)	2.05 (0.81-5.18)	1.17 (0.63-2.17)	1.35 (0.58-3.12)
Model 1 & SES & HRB	0.98 (0.59-1.63)	1.19 (0.36-3.94)	1.39 (0.61-3.20)	[a]	3.03 (0.50-18.37)	3.32 (0.92-12.03)	1.07 (0.57-1.98)	1.24 (0.55-2.77)

Notes: *p<0.05; [a] = no data; *Model 1*: adjusted for demographic factors (maternal age and child's ethnicity, age and sex); *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking, incomplete immunisation, never breastfed, exercise>once a week, child's dietary habit score

Table 10.12: Regression coefficient (95% CI) for the change in the mean cognitive development score between the children of second generation mothers and the first, adjusted for demographic factors, socioeconomic factors (SES) and health behaviours (HRB) by ethnic group

	White	*Indian*	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Picture Similarity								
Model 1	-1.62 *(-3.07,-0.17)**	1.49 *(-1.35,4.34)*	0.14 *(-1.50,1.79)*	-1.11 *(-5.40,3.19)*	0.91 *(-2.92,4.74)*	2.56 *(-0.51,5.62)*	-0.96 *(-3.09,1.17)*	-0.94 *(-3.87,1.99)*
Model 1 & SES	-1.30 *(-2.74,0.13)*	1.50 *(-1.63,4.64)*	-0.16 *(-1.88,1.56)*	-1.90 *(-7.94,4.14)*	0.79 *(-3.10,4.68)*	2.21 *(-1.08,5.50)*	-0.49 *(-2.59,1.60)*	-2.04 *(-4.94,0.87)*
Model 1 & HRB	-2.21*(-4.00,-0.43)**	1.44 *(-1.61,4.49)*	-0.88*(-3.16,1.39)*	-0.87*(-7.29,5.55)*	-1.61 *(-7.96,4.74)*	2.46 *(-0.80,5.72)*	-1.81 *(-4.25,0.63)*	-1.93 *(-5.24,1.39)*
Model 1 & SES & HRB	-1.86 *(-3.64,-0.08)**	2.20 *(-0.79,5.19)*	-0.83 *(-3.01,1.34)*	-1.84 *(-8.59,4.91)*	-1.89 *(-6.50,2.73)*	2.98 *(-0.48,6.44)*	-1.59 *(-3.95,0.76)*	-3.03 *(-6.54,0.48)*
Pattern Construction								
Model 1	-2.10 *(-3.64,-0.57)**	3.88 *(1.61,6.15)**	0.13 *(-1.64,1.90)*	1.55 *(-1.71,4.81)*	4.21 *(-0.05,8.47)*	3.35 *(0.15,6.56)**	-1.22 *(-3.12,0.69)*	-0.86 *(-2.95,1.23)*
Model 1 & SES	-1.68 *(-3.18,-0.19)**	3.62 *(1.53,5.71)**	-0.57 *(-2.30,1.17)*	0.40 *(-2.46,3.26)*	2.69 *(-0.99,6.37)*	0.67 *(-2.69,4.03)*	-0.94 *(-2.92,1.04)*	-1.92 *(-4.00,0.15)*
Model 1 & HRB	-2.19 *(-3.93,-0.45)**	3.51 *(0.14,6.87)**	-0.72 *(-3.20,1.75)*	0.71 *(-3.83,5.26)*	3.23 *(-3.86,10.31)*	1.72 *(-1.85,5.29)*	-0.82 *(-3.16,1.51)*	-2.83*(-5.58,-0.08)**
Model 1 & SES & HRB	-1.77 *(-3.51,-0.04)**	3.27 *(0.31,6.22)**	-0.92 *(-3.32,1.49)*	0.79 *(-4.71,6.29)*	0.40 *(-4.33,5.13)*	0.03 *(-4.09,4.14)*	-0.79 *(-3.14,1.56)*	-3.53 *(-6.50,-0.57)**
Vocabulary Score								
Model 1	-1.09 *(-2.51,0.33)*	4.62 *(1.73,7.50)**	4.66 *(2.34,6.98)**	1.99 *(-1.23,5.20)*	4.54 *(-0.13,9.22)*	8.24 *(4.80,11.67)**	3.47 *(1.31,5.62)**	6.77 *(3.45,10.08)**
Model 1 & SES	-0.55 *(-1.91,0.82)*	3.24 *(0.77,5.71)**	3.01 *(1.10,4.92)**	1.08 *(-3.20,5.36)*	3.24 *(-0.56,7.04)*	3.55 *(-0.15,7.25)*	3.67 *(1.63,5.71)**	4.96 *(2.05,7.88)**
Model 1 & HRB	-0.52 *(-1.98,0.95)*	1.23 *(-2.37,4.84)*	2.81 *(-0.47,6.08)*	5.16 *(0.08,10.24)**	4.11 *(-2.60,10.82)*	5.88 *(1.68,10.08)**	3.05 *(0.41,5.70)**	3.71 *(0.20,7.22)**
Model 1 & SES & HRB	-0.08 *(-1.58,1.42)*	1.67 *(-1.19,4.52)*	1.71 *(-0.77,4.19)*	3.46 *(-2.08,9.73)*	2.15 *(-3.71,8.00)*	3.52 *(-0.71,7.75)*	3.00 *(0.72,5.29)**	3.26 *(0.10,6.42)**

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (maternal age and child's ethnicity and sex); *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking, incomplete immunisation, never breastfed, exercise>once a week, child's dietary habit score

Table 10.13: Regression coefficient (95% CI) for the change in the mean cognitive development score between Black Caribbean children of third generation mothers and the first, adjusted for demographic factors, socioeconomic factors (SES) and health behaviours (HRB)

	Picture Similarity	**Pattern Construction**	**Vocabulary Score**
Model 1	-0.85 *(-5.47, 3.77)*	4.52 *(-0.32, 9.35)*	5.56 *(0.54, 10.57)**
Model 1 & SES	-0.11 *(-0-.75, 3.53)*	3.15 *(-0.57, 6.87)*	4.47 *(0.18, 8.75)**
Model 1 & HRB	-3.31 *(-10.00, 3.39)*	2.26 *(-6.45, 10.98)*	4.33 *(-3.32, 11.96)*
Model 1 & SES & HRB	-2.73 *(-6.63, 1.17)*	-0.76 *(-6.38, 4.85)*	2.31 *(-3.60, 8.23)*

Notes: *p<0.05; *Model 1*: adjusted for demographic factors (maternal age and child's ethnicity and sex); *SES*: highest family NS-SEC, family income, highest family qualification; *HRB:* current smoking, any drinking, incomplete immunisation, never breastfed, exercise>once a week, child's dietary habit score

10.4 Conclusions

Chapters 8 and 9 described how differences in health across generations were mediated by socioeconomic factors or health related behaviours respectively. This chapter examined these pathways simultaneously, and showed the total extent to which these factors might explain the intergenerational differences in child and adult health, and child cognitive development. The key findings of this analysis are outlined below:

- For the majority of ethnic minority groups, the influences of socioeconomic circumstances and health behaviours on health were in competing directions. These trends were particularly prominent for indicators of physical health in mothers in the MCS and in adults in the HSE. The majority of ethnic minority groups experienced an increase in the risk of fair/poor general health, and limiting illness after controlling for socioeconomic factors, whereas controlling for health behaviours had a weaker effect and commonly reduced the risk of poor health. Simultaneous adjustment suggests that the beneficial socioeconomic effects on health are largely cancelled out by the worsening in adult health behaviours in each group. This might explain why the fully adjusted risks of poor health in the second generation are in the vast majority of cases not significantly different to the risks adjusted for only demographic factors. So, while there were no significant intergenerational differences in the risk of poor health after adjusting for social and behavioural factors, it appears unlikely that these pathways had no role in determining health experiences. Therefore these findings reiterate the need to appreciate ethnicity's multidimensional nature and measure accurately the diverse range of experiences of those identifying with a given ethnic group which might ultimately shape health experiences.

- Generational differences in child physical health were not consistently influenced by socioeconomic or health behavioural factors, and there were no significant differences between generations after controlling for these pathways simultaneously. A possible explanation is that the unweighted base experiencing poor health was too small to derive accurate estimates, increasing the possibility of type II errors during modelling. This is compounded by the proportions of children with poor health being considerably lower than in adults, providing less scope for significant general difference, and requiring greater statistical power to detect any differences. An alternative explanation might be that each generation of five year olds has not differentially accumulated health risks over their short life courses to enable differentiation between generations. Data elsewhere from the HSE shows that ethnic differences in fair/poor general health become much greater after adolescence, and increase with age (Nazroo 2004). It is possible that as inequalities *between* ethnic minority groups widen over the life course, generational differences *within* groups may become easier to observe, as a consequence of longer exposures to potentially different environments. This effect may also apply to limiting illness and obesity which are also positively associated with age in the general population (Bajekal et al. 2006).

- Generational differences in test scores were attenuated after accounting for socioeconomic and health behavioural factors and strongly imply a mediating role for these pathways in child cognitive development. These findings are in contrast to adults in the HSE and mothers in the HSE for whom the effect on health is often in opposing directions. These results suggest that it is the better socioeconomic circumstances *and* health behaviours experienced by children with second generation ethnic minority mothers that partially explain the higher picture similarity, pattern construction and vocabulary test scores. As these test scores are useful predictors of on-going child health and development (Batty et al 2006;Hart et al 2003;Singh-Manoux et al 2005), it is suggested that in the future children with second generation mothers are likely to experience less health disadvantage than those with first generation mothers.

- However, a degree of caution is required in interpreting each of these scores. Generational differences in the mean vocabulary test scores are, on average, considerably larger for ethnic minorities than for the picture similarity and pattern construction scores. A possible explanation is that English is more commonly spoken in home of children with second generation mothers. As such, the vocabulary test is not an accurate marker of cognitive development per se, but highlights a degree of cultural specificity to these tests which are designed and normed against the general population, which is overwhelmingly White. Nevertheless, the picture similarity and pattern construction tests are less likely to be confounded by cultural factors and provide good evidence that the children of second generation mothers do have higher levels of cognitive development at age five.

This is the final analysis chapter of the thesis. It has brought together the findings of the two previous chapters, and additionally accounted for socioeconomic and health behavioural differences simultaneously. In doing so it has controlled for two mechanisms previously documented as determinants health, so that the few statistically significant differences which remain between generations are a consequence of factors unaccounted for in this analysis. The next chapter will summarise and evaluate the key findings from this thesis and discuss the strength of the evidence for these pathways in explaining generational differences in health, as well suggest potential pathways which may account for unexplained differences outlined here.

Chapter 11: Discussion

11 Discussion

This thesis examines whether ethnic health inequalities persist across generations and explores whether changes in social circumstances or culturally-informed health behaviours might explain patterns of ill health across generations. In doing so, this study adds significantly to the literature examining acculturation which has, until recently, been dominated by an assumption that migrant health defaults towards the characteristics of the host group, with further assimilation into a dominant host culture and structures continuing across generations, and over time. This study suggests that such a unidirectional approach is inappropriate in understanding the health profiles of multiple generations of ethnic minorities, and argues that a multidimensional approach be taken, specifically measuring both the social and behavioural components of daily life which contribute to health experiences. Importantly, this study reveals how a refined examination of acculturation identifies the formation of mixed cultures interacting with changing structural factors to shape the health of ethnic minorities in ways specific to each group.

This chapter will now provide an overview of the key results from this thesis, and consider the theoretical implications of these findings to the wider study of ethnic health inequalities. Limitations of the study are presented and the thesis closes with a discussion of areas with future research potential and identifies policy recommendations.

11.1 Do Ethnic Inequalities in Health Persist Across Generations?

There is evidence that ethnic inequalities compared to the White reference tend to narrow across generations, but, many of the observed differences do not reach statistical significance. In the HSE for instance, the risks of fair/poor general health are lower in the second generation than in the first for Pakistani, Bangladeshi, Indian and Black Caribbean groups. Nevertheless, both generations have statistically significant higher rates of fair/poor general health than the White reference group. So while inequalities are observed within each generation, the extent of this appears to be diminishing, but only slightly. The reduction in inequality is supported by findings from the MCS, as the significantly greater risk of fair/poor general health in first generation Pakistani and Bangladeshi mothers is no longer significant in the second.

This specific example demonstrates that the risk of fair/poor health in ethnic minorities is converging across generations towards the risks in the White reference. In fact, these patterns are observed across a range of outcomes in both datasets. In the HSE, 24 out of 28 comparisons between generations across the range of ethnic minority groups and health outcomes, show the risks of poor health in the second generation shifting towards the risks observed in the White reference group. In mothers and children in the MCS, 14 out of 21, and 18 out 28 comparisons respectively, show shifts towards the risk of poor physical health in the White reference group. Most significantly, the mean cognitive development scores of all groups of ethnic minority children approximate to those in the White group, in all three cognitive development tests. However, it is important to note these intergenerational trends do not necessarily describe decreasing disadvantage. Rates of doctor diagnosed depression were significantly lower than the White reference group in the first generation of all ethnic minority mothers in the MCS, but this advantage is observed only the second generation Indian group. Therefore generational differences in health compared to White people can lead to the formation of inequalities and disadvantage, just as differences may lead to decreasing disadvantage and the narrowing of the health gap.

There are few statistically significant findings when the extent of health difference is compared directly between the first and second generations. Of these, obesity is significantly increasing over generations for all three South Asian and Chinese groups in the HSE, as is limiting illness for the Black African group, but neither of these observations are replicated within adults or children in the MCS. In the MCS, rates of diagnosed depression significantly increase with generation in Pakistani and Black Caribbean mothers with a generational increase in risk in having a raised distress score also noted in Pakistani mothers. Second generation White fathers are more likely to be diagnosed with depression than the first generation, and second generation Black Caribbean children have a greater risk of being diagnosed with asthma. So it appears, then, that the majority of generational differences within ethnic groups are not significant, but where they are, they indicate a worsening in health across generation. Furthermore, the significant generational differences described above tend to be specific to particular outcomes and within only certain groups. Therefore no particular ethnic minority group is more likely to experience significant generational differences in their health profile to a greater extent than any other group.

Overall these findings describe few statistically significant differences between generations of adults and children. This implies that the well documented ethnic health inequalities (Erens et al 2001;Nazroo 1997b;Sproston & Mindell 2006) are weakly influenced by generational status. While there was evidence that the extent of inequalities between the White group and ethnic minorities was reducing with increasing generation, the majority of the significant differences were due to a loss of the health advantage of the first generation over the second.

11.2 The Extent of Social Mobility

These data provided strong evidence of shifting patterns of socioeconomic circumstances across generations for all groups. The majority of ethnic minority groups demonstrated upward mobility, with the second generation occupying higher social classes, having larger household incomes and attaining higher levels of education than the first generation. However, the Other White and White groups included in the MCS also show distinct patterns of downward mobility as the second generation are socioeconomically worse off than their first generation counterparts. This downward shift is an interesting finding as it suggests that greater socioeconomic success within the UK is not a function of being born or having experienced childhood in the UK. These socioeconomic differences suggest that social starting positions determined by parental backgrounds, while important determinants of final social position, are not necessarily fixed. Movement in either direction within a social class system has the capacity to reduce health inequalities (Bartley & Plewis 1997) implying that the health differences across ethnic groups will likely narrow given sufficient time.

However, a note of caution is required here as these are cross sectional comparisons and respondents are not strictly speaking generational as they are not biologically linked. Instead socioeconomic differences between generations living in the same time periods can only imply that mobility is taking place. For instance, the second generation in this cross sectional study are the offspring of an (unmeasured) first generation who arrived in the UK at an earlier time. It is possible that the second generation are downwardly mobile relative to this unmeasured parental generation, but appear to be upwardly mobile when compared to the recently arrived first generation. However, this scenario seems unlikely as recent longitudinal tracking between parents and adult offspring identified similar patterns of upward mobility to those described here (Platt 2005). The comparability between Platt's (2005) work and this analysis appears particularly strong as both have specifically identified the weakest upward mobility in the

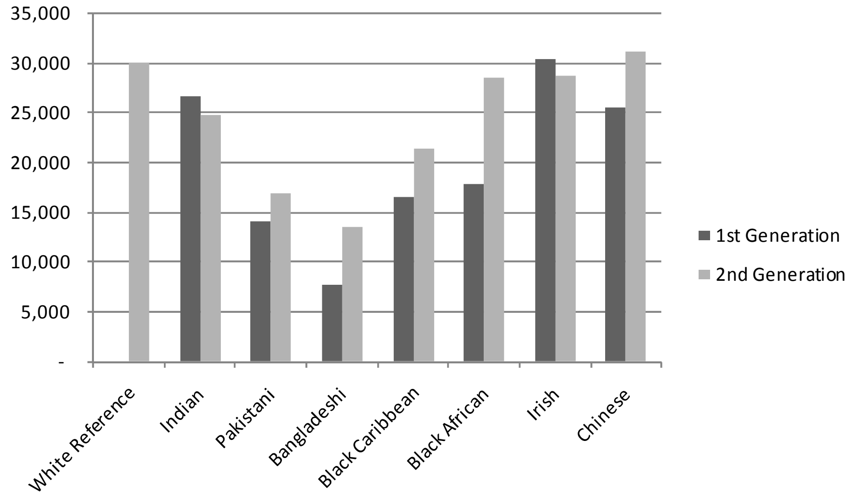
Pakistani group. Furthermore, patterns of social mobility described here are also consistent with observations from other cross sectional studies of ethnic minorities (Harding & Balarajan 2001b;Heath & Payne 1999;Heath & Smith 2003). Therefore these findings are indicative of an intergenerational decline in socioeconomic disadvantage in most ethnic minority groups although the Other White and White groups experienced downward mobility from their previously favourable socioeconomic positions.

The investigation of social mobility highlights important theoretical questions concerning the accuracy to which indicators describe the social context of each generation. The socioeconomic circumstances of each socioeconomic and ethnic minority group are so distinct from one another that it is very difficult to realistically adjust for all these features simultaneously (Kaufman et al. 1998;Nazroo 1998). This may be amplified by ethnic minority groups prioritising indicators of socioeconomic circumstances differently (Davey Smith 2000). For instance, not all groups value car ownership in similar ways, despite this being a well used socioeconomic indicator in previous studies of ethnic minority groups (Harding 2003a;Harding 2004). Residual confounding might occur as a result of being unable to fully control for such a wide range of distinct experiences. The danger is that this residual effect can be easily and incorrectly attributed to some unknown factor, distinct to an ethnic minority group, and which has not been measured, such as hypothesised genetic or cultural influences.

The greater danger is that the meaning of each indicator may vary by generation as well as ethnicity, so that generational differences in cultural distinctiveness are measured, rather differences in socioeconomic circumstances. For example section 8.4.2 suggests that use of state benefits and free school meals as markers of socioeconomic disadvantage is limited as ethnic differences are not necessarily driven by need. The MCS shows that benefit receipts are greatest in Black Caribbean families despite Pakistani and Bangladeshi families experiencing the lowest incomes, with a high proportion of the White group also claiming more than one benefit, even though they were not particularly disadvantaged according to the other described socioeconomic measures. Therefore the use of certain socioeconomic indicators should be considered carefully due to the heterogeneity of experiences which exist across groups and because these indicators are not universally applicable to all ethnic groups. Most importantly for this study, the importance of these indicators in describing socioeconomic circumstances to each group varies across generations as well.

A closer inspection of how these socioeconomic indicators vary by generation in chapter 8 revealed that ethnic minority groups are on the whole becoming more similar to the majority population. The implication is that the scale of the differences is actually decreasing with generation and in terms of measuring socioeconomic exposures, the relationships between variables are becoming much closer. To demonstrate, the FNS described how ethnic minority groups on average had smaller incomes than their White counterparts in the same social class (Nazroo 1997b). The evidence from the HSE presented in Figure 11.1 shows that the mean (geometric) equivalised income for each group in RGSC class i/ii generally increases between generations. With exception to Indian and Irish groups, this suggests that the income gap between minorities and Whites is closing in the majority of groups and that income becomes more closely related to social class over generation. Nevertheless, all but the Chinese group remain disadvantaged compared to the White group.

Figure 11.1: Geometric mean equivalised income (£) of each ethnic group within RGSC class i/ii by generation.



Over time it could be expected that socioeconomic measures will become consistent across ethnic groups in the UK. However, as Figure 11.1 shows, the number of generations that this will take is likely to vary considerably by ethnic group. Therefore the possibility of residual confounding on adjusting for socioeconomic circumstances remains, unless a number of socioeconomic markers are used which accurately capture the complex relationship between socioeconomic position and ethnicity.

11.3 The Influence of Socioeconomic Mobility on Health

There is a large evidence base associating higher social position with better health (Wilkinson & Marmot 2003). Furthermore, there is strong evidence to suggest that socioeconomic inequalities account for many of the health inequalities observed across ethnic groups (Cooper 2002;Nazroo 1997b;Williams & Collins 1995). This analysis aimed to describe the extent to which generational differences in socioeconomic factors explains the patterning of health across generations.

Controlling for intergenerational improvements in material circumstances generally leads to an increase in the risk of poor physical health for the second generation in the HSE. These results suggest that the better socioeconomic conditions of the second generation leads to a reduction in the risk of poor health, and therefore contributes to the similar risks of poor health observed in each generation. Findings from the MCS are less robust. When all ethnic minority groups are combined, the increase in the risk of poor health in the second generation is again apparent, but is not detectable within individual groups. This might be due to the smaller size of the MCS sample experiencing a lack of statistical power compared with the HSE. A key exception is for the largest White group who, for all maternal outcomes, demonstrate a reduction in the risk of poor health over generations after accounting for increasing socioeconomic disadvantage. That the downwardly mobile White group demonstrate a change in the risk in the opposite direction to the upwardly mobile groups provides further support to the suggestion that changing socioeconomic circumstances mediate health risks over generations. These findings are supported by the few studies investigating the role of socioeconomic factors in the formations of generational differences in limiting illness (Harding & Balarajan 2000).

However, there are important extra considerations to the relationship between social position and health when dealing with migrants. The findings show that the risks of poor health are similar across generations, despite better circumstances for the second generation, implying that the second generation require a greater level of socioeconomic advantage to achieve the same level of health as their first generation counterparts. Attention therefore turns to who is the first generation and why is their health similar to the second generation despite poorer social conditions? One explanation may be that there was positive selection in this group, so that those who migrated were healthier than their social characteristics might ordinarily suggest (Marmot et al 1984). If selection has taken place then it is to be expected that such an effect should diminish with time. Therefore, finding that second generation requires better social conditions to have the same health as their first generation counterparts is consistent with the notion that migrant selection on the basis of health, or factors associated with health, has occurred.

Another possible explanation involves the first generation being downwardly mobile on arrival having occupied higher socioeconomic positions in home countries compared to after migration (Byron & Thorburn 1998;Heath & Ridge 1983;Modood 1997b). This results in the advantageous health profile persisting after migration, whereas the socioeconomic profile is subject to immediate change creating an apparent mismatch between low social position and relatively good health. Chapter 8 (section 8.4.3) explores this possibility and compares the chances of moving upwards between the low, medium and high NS-SEC categories over two successive sweeps of the MCS. However, there is only a small likelihood of upward mobility, over time, and within each generation. Therefore the first generation are no more upwardly mobile than the second generation and it seems unlikely that they are reasserting their class position as a consequence of rapid downward mobility experienced on arrival. This finding is encouraging for overcoming health differences driven by socioeconomic inequalities. If upward mobility is due to reassertion then it is plausible that the next generations could find upward mobility more difficult than their predecessors. This could then lead to a widening of the socioeconomic inequality gap, with an accompanying increase in the health gap between ethnic minorities and the general population. However, this does not seem to be operating so it is possible that upward social mobility will continue over future generations and contribute to a reduction in health differentials between groups.

Additional measurement issues arise from the analysis which not only influence the interpretation of these findings, but also have important implications for future work. The two datasets use different social class schemas to describe intergenerational mobility. There is a large body of literature exploring how the RGSC schema, used in the HSE, interacts with ethnicity and a range of other socioeconomic indicators to explain health differences. However, the NS-SEC (used in the MCS) has been shown previously to be a useful tool in explaining health inequalities in the general population (Chandola & Jenkinson 2000a), but less is known about its interaction with ethnicity. Therefore it is noteworthy that mobility rates vary according to class schema and ethnic group. The Pakistani group in particular appear socially stable using NS-SEC, but demonstrate strong upward mobility using RGSC. Later studies should consider re-coding between the RGSC and the NS-SEC classifications to verify this potentially important finding. So, even though employment prestige is increasing according to RGSC, the NS-SEC results suggest that employment relations and conditions of employment have not changed greatly in each generation of the Pakistani group. This may have important implications for future models investigating work related stress and other psychosocial pathways to health in this group. Furthermore, income and the level of educational attainment appear to increase similarly for all groups over generation, including Pakistani people, despite these social schemas operating differently across ethnicities. The discrepancies between the class schemas again highlight the complexity of accurately measuring the socioeconomic contexts across different ethnic groups and reinforce the need to measure multiple indicators of socioeconomic position.

11.4 Intergenerational Changes in Health Behaviours

A specific objective of this thesis is to examine the extent to which health related behaviours change across generations of ethnic minority groups. The analyses from chapter 9 suggest that patterns of behavioural uptake or retention are more complex than assimilation models suggest. Not only does the extent of generational shifts in behaviours vary across ethnic groups, but so does the direction of change relative to the White group; the behaviour of some groups becomes more similar to White people while others shift away or experience little difference. For example, the Black Caribbean group are the most likely overall to converge towards rates observed in the White reference group for drinking, smoking, having low levels of physical activity and having a poor diet score. By contrast, Pakistani and Bangladeshi group behaviours vary less by generation, particularly in relation to drinking. The complexity of acculturative patterns of behaviours is also influenced by gender. Black Caribbean women are more likely than all other groups to take up smoking over generations, whereas smoking rates tend to decline over generation for men. So, although there is an overall trend for health behaviours to shift over generation towards those in the White population, examination within individual ethnic groups reveals a much more complex picture. This highlights the considerable behavioural heterogeneity within each generation and suggests that a universal pattern of acculturation is unlikely to exist for all groups. Health behaviours certainly change in some groups more than others, but it seems likely that the reasons for these differences vary.

There is also convincing evidence that behavioural changes are positive as well as negative with all ethnic minority groups showing an increase in the levels of physical activity over generation. This is of particular significance for South Asian groups that have well documented higher rates of cardiovascular disease (Bhopal et al 1999;Chaturvedi 2003;Nazroo 2001b) and would benefit greatly from increased regular exercise, as might Black Caribbean and Black African groups who have a higher prevalence of hypertension (Agyemang & Bhopal 2003;Cappuccio et al 1997). However, acculturative changes in behaviour tended to increase exposures to health risks. Fruit or vegetable consumption declines over generation, significantly so for Indian, Bangladeshi and Black Caribbean groups, a finding that is consistent with a recent systematic review of dietary changes in UK ethnic groups (Gilbert & Khokhar 2008). Also, the likelihood of ever drinking increases across generations, and when all ethnic minority groups are combined, there is a statistically significant increase in risk with each increasing generation. This means that future investigations of ethnic differences in health in multigenerational samples should pay particular attention to the role of generational status; speculative pathways explaining health trends should not be based upon contrasting behaviours of the first generation which has, until recently, been the predominant data source. To illustrate, the higher total energy intake in second generation born South Asians (Brock et al. 2009) and Black Caribbean (Douglas 1987;Sharma et al 1999) might not lead to a greater risk of obesity as suggested, because these groups are increasingly likely over generation to be physically active on a regular basis. Unless attention is paid to generational differences in predictive exposures then important explanations for health disparities may be missed.

11.5 The Influence of Health Related Behaviours on Health Outcome

No universal shift in the risk of poor health was observed within individual ethnic groups after adjustment for a range of health behaviours. This is likely due to the considerable diversity in the patterns of health behaviours and subsequent risks to health across ethnic groups. However, even when the direction of behavioural change is taken into account for individual groups, the effect on the risk of poor health remains highly inconsistent. For instance, controlling for the generational increases in current smoking and drinking in the Black African group reduces the risk of fair/poor general health. However in the Other White/Irish groups, these unhealthy behaviours are associated with a decrease in fair/poor general health over generation, although these findings are not statistically significant. A possible reason for this effect is that the young age of the population means that the longer term effects of smoking and drinking behaviours have not yet influenced health to a sufficiently measureable degree.

This is not to say that health behaviours are of no overall importance. Controlling for socioeconomic factors at the same time as health behaviours reveals an interactive effect, where the two pathways work alongside each other, commonly in opposite directions. Controlling for generational improvements in socioeconomic circumstances increases the risk of fair/poor general health in the second generation of Indian mothers compared with the first, from 1.05 (95% CI: 0.78-1.42) to 1.34 (95% CI: 0.94-1.90). Controlling for an increase in unhealthy behaviours across generations decreases the risk to 0.91 (95% CI: 0.61-1.37). But controlling for both results in an intermediate risk of 1.19 (95% CI: 0.74-1.91). Such patterns were predominant within the vast majority of analyses across ethnic groups for adult markers of physical and mental health as well as for blood biomarkers of cardiovascular disease. This suggests that both health behaviours and socioeconomic factors contribute to the similar patterning of health across generations, but these may, for certain outcomes and in specific groups, be in competing directions. Therefore these results identify how ethnicity as structure and as identity (Nazroo 1997b;Smaje 1996) are different across generations; there are clear differences in socioeconomic circumstances which are accompanied by the evolution of mixed patterns of behaviours, with the end result that the health experiences of each generation is generally the same.

11.6 Generational Continuities in Child Health

Inequalities in child health are of great public health importance as childhood experiences are a key determinant of a wide range of adult health outcomes (Kuh et al. 2002;Langenberg et al. 2003;Lynch et al. 1997;Poulton et al. 2002;Power et al. 1998;Power et al. 2002). The differential accumulation of socioeconomic, behavioural and psychosocial risks have been suggested as mediating the link between child and adult health (Kuh et al. 2003). However, studies have not been carried out using ethnic minority populations which, as has been shown, are likely to experience significantly different socioeconomic circumstances and health behaviours than the general population. This study was aimed at identifying whether the generational differences in socioeconomic position and health behaviours of parents contribute to the patterning of health inequalities at age five in the Millennium Cohort.

There are no significant differences in fair/poor general health, limiting illness or obesity between the children of first and second generation mothers. The likelihood of having asthma is significantly higher in children with second generation Black Caribbean mothers only. Despite clear intergenerational differences in household socioeconomic advantage, and health behaviours, neither of these influences appears to have an effect on the patterning of child health at age five. These findings are replicated when all groups are combined. However, socioeconomic and behavioural differences in childhood are likely to have a considerable longer term impact on adult health (Lynch et al 1997). It is possible that the differential accumulation of risk over the life course has not yet reached a point at which it is expressed through ill health; it is likely that these differences in exposure may not be manifested in health outcomes until adolescence or early adulthood. Given the observed differences in the social environments of each generation of children it appears that the Millennium Cohort will be a valuable tool for future research understanding how socioeconomic and behavioural factors mediates generational differences in health within ethnic minorities.

Markers of cognitive development are useful indicators of later life chances and health (Feinstein 2003;Luo & Waite 2005;Martin et al. 2004;Singh-Manoux et al 2005). On this basis there is an optimistic outlook for ethnic minorities in this cohort as the majority of groups showed intergenerational improvements in the British Abilities Scales (BAS) cognitive test scores. Importantly, all three test scores of each ethnic minority group shift towards the highest scoring White group with increasing generation, implying that inequalities in later life might also narrow, and that this change is in part due to improving socioeconomic circumstances. It was notable that health behaviours also mediated generational differences in cognitive development to a greater extent than for markers of physical health. It may be that these markers are proxies for wider levels of acculturation of the parent which are unmeasured, but could affect the child's performance as well as development.

There are no other published studies exploring ethnic differences in BAS scores. However, the socioeconomic explanations offered here are supported by studies of child behaviour using the Strengths and Difficulties Questionnaire: an emotional and behavioural screening questionnaire for 3 to 16 year olds. The relative advantage of the Indian group was explained to some extent through the existence of parental education and close family units (Goodman et al. 2009;Maynard & Harding 2007). This is consistent with data from the general population where socioeconomic factors accounted for poorer child mental health, especially in those with lone mothers (McMunn et al. 2001). It remains possible that other additional pathways mediate generational differences, as social and friendship networks have been shown to explain adolescent behaviour differences in a range of ethnic groups (Klineberg et al. 2006).

However, the BAS results should be interpreted cautiously due to the possible cultural bias inherent in the tests (Elliott et al 1997). The large increases in the vocabulary test scores suggest that language and cultural familiarity may have mediated the generational improvements, rather than the scores being indicative of greater cognitive development. It is possible that the picture similarity tests were also culturally biased with those children with second generation mothers having higher scores perhaps due to greater everyday exposure to the objects presented to them in the test. It is likely that the pattern construction tests were more reliable indicators of differences in cognitive development as these tests were not as influenced by cultural experiences. With exception to White and Other White groups, all other ethnic groups showed generational increases in these scores, attenuated most strongly by adjusting for improving socioeconomic circumstances. This particular cognitive development test result is therefore predictive of more favourable later life health for the second generation, which is partly mediated via childhood socioeconomic circumstances.

11.7 Theoretical Implications of the Study for Acculturative Research

Over the last ten years there has been a great increase in the number of articles investigating the effects of acculturation, with many of these specifically focussing on health (Hunt et al 2004). The majority of research has been led by US researchers examining Black and particularly Hispanic populations (for a recent review see Thomason & Hoffman-Goetz, 2009), with a more limited number from European countries, typically from the Netherlands (Bos et al. 2007;Stevens et al. 2004;Troe et al. 2006), Germany (Razum & Zeeb 2004;Zick et al. 2001) and Sweden (Leao et al. 2009;Sundquist & Li 2006;Wiking et al 2004). By comparison, the UK literature is sparse, often using smaller and geographically localised datasets (Bhui et al 2005b;Harding et al 2008;Williams 1993) with some of the most revealing studies tending to be qualitative rather than quantitative (Papadopoulos et al. 2003).

The greater volume of US studies has recently led to a critical scholarly discourse over attempts to measure the relationship between acculturation and health. Commentators have recently expressed dissatisfaction with using proxy variables such as generation or length of residence as assumptive means of determining the extent of acculturation, and propose new multidimensional approaches. Salant et al (2004) in a review of the Asian diaspora recommend:

> *"that researchers proposing to study acculturation and health articulate a conceptual model of acculturation... paying attention to the historical experiences of different ethnic groups. They should be aware that... socioeconomic status may modify acculturation's effect on health"* (Salant & Lauderdale 2003).

Referring to socioeconomic factors is a direct attempt to shift away from a linear measurement of acculturation, where acculturation is viewed as zero-sum and culturally based phenomenon where individuals acculturate in one dimension. Hunt et al (2004) go further, despite recognising the possibilities of multidimensional measurement, and call for the abandonment of acculturation as a variable in epidemiological research on account of it allowing 'culture' to becoming a catch-all explanation where all other explanations fail:

> *In the absence of a clear definition and an appropriate historical and socio-economic context, the concept of acculturation has come to function as an ideologically convenient black box, wherein problems of unequal access to health posed by more material barriers, such as insurance, transportation, education, and language, are pushed from the foreground, and ethnic culture is made culpable for health inequalities* (Hunt et al 2004).

The difficulty, then, appears to be in operationalising acculturation and measuring it accurately and in a way that is relevant to health experiences. Abraido-Lanza et al (2006) combines the various points of view, and identifies that environmental context, both pre- and post-migration, is a vital determinant of the acculturative experience. A theoretical and multidimensional approach is proposed:

> *A consideration of the intersection of large-scale social forces and culture is critical to stimulating the exploration of much-neglected sociological concepts, namely, class and power dynamics in the public health literature on acculturation. However, perhaps it is time to identify and differentiate the cultural resources and structural factors that better explain how acculturation affects health* (Abraido-Lanza et al 2006).

This discourse is strikingly familiar to that in the UK in the mid-1990s surrounding the measurement and use of ethnicity as an epidemiological variable. Indeed, it is possible to substitute the word 'ethnicity' for 'acculturation' in all the above quotes and the recommendations are almost identical to those emanating from UK literature around that time (Ahmad 1996;Bhopal 1997;Nazroo 1997b;Senior & Bhopal 1994;Smaje 1996).

A theorised understanding of ethnicity emerged from the UK debate. Smaje (1996) theorised ethnicity along the same lines as Abraido-Lanza et al (2006): as part of an identity within which cultural traits are conferred; and as a structure where the place within society determines the lived experience. The work of the Fourth National Survey examined this framework, with Nazroo (1997) clearly showing socioeconomic factors were an important determinant of ethnic minority health, with the fluid nature of identity leading to changes in health related behaviours such as smoking. However, dealing with historical contexts has been more problematic and cannot be ignored. Ahmad (1996) describes how culture is shaped by the current and previous experiences of ethnic groups and it is the diverse range of experiences which then determine health. Difficulties in analysis arise when migrants arrive during discrete waves so that ethnicity and the environment interact with one another specifically according to the period of migration, complicating comparisons between groups. For example, the Black Caribbean group in the UK experience a greater level of relative socioeconomic disadvantage (and subsequent poor health) than Black Caribbean people experience in the US, despite having the same geographical origins (Nazroo et al. 2007). The differences are purported to have arisen through the later migration of Black Caribbean people to the US, into a more favourable social and race relations context than that experienced by earlier migrants to the UK. But, by comparing two generations of broadly similar ages, each ethnic group experiences the UK social context at the same time; and it is how groups interact with the same environment, and the environment with them, which determines their life experiences and health.

Therefore, this thesis has taken theoretical principles established within the UK literature some time ago, and applied them to the emerging field of acculturative research. Doing so directly acts upon the recommendations from current acculturative theorists that the measurement of acculturation incorporates cultural components, but should be mindful of the influence of historical contexts in shaping health profiles. The evidence described here suggests that acculturation measured in this way produces a wide range of new and mixed cultures and identities, which are not necessarily stronger or weaker than their original forms – they are merely different. Furthermore, these cultures and identities are located in a significantly different, and generally more favourable, socioeconomic context which leads to health experiences which are not significantly different to those who are less acculturated. So, the experiences of belonging to a given ethnic minority group varies considerably across generations, although ultimately health experiences do not. The implication of this is that ethnic health inequalities are broadly similar across generations.

Throughout this study the socioeconomic and behavioural pathways to health have been considered separately, so that socioeconomic factors are not conceptualised as part of the acculturative process. However, mention should be made that the two mechanisms are indeed closely related to one another, to the point that socioeconomic changes might be causally related to, or part of, acculturation. Health behaviours such as smoking are socially patterned in the White population (Jarvis & Wardle 2006) and across ethnic minorities (Nazroo 1997b), being more prevalent in lower classes than higher. It is therefore possible that upward social mobility is accompanied by a lower likelihood of smoking, meaning that acculturative changes are being driven by socioeconomic shifts. An alternative perspective, where socioeconomic factors can be considered a part of acculturation, concerns the Bourdieu approach to class. This suggests that health behaviours and lifestyles are markers of social distinction (Bourdieu 1984), so that certain behaviours afford a strong cultural meaning linked to prestige. For instance, vegetarianism is a symbol of belonging to the highest caste in Hindu culture, so that those aspiring to the higher castes are likely to adopt these health behaviours (Shatenstein & Ghadirian 1998). Furthermore, known health risks associated with behaviours may be ignored in deference to the adoption of markers of higher socioeconomic position. The implication is that socioeconomic shifts are causally linked to the extent of acculturation, so that behavioural changes may take place irrespective of the social norms of the host population towards which groups would be otherwise be expected to acculturate.

However, the socioeconomic and behavioural contexts explored here are only two pathways contributing to health. Abraido-Lanza et al (2006) suggest additional roles for class and power dynamics. It should be noted that such socio-political factors are unexplored and can only be speculated on, but the construction of new or reaffirmed ethnic identities could influence a range of pathways to health, including those investigated here, in a number of ways. The politicisation of Black Caribbean people in Britain in the 1970s and 1980s led to the formation of distinct Black Caribbean identity different to that in earlier and later time periods (Modood et al. 1994;Modood 1997a). Similar phenomenon occur today with the consolidation of Muslim identities (Modood 2003). Such changing identities may then directly influence the health related behaviours described here, change risk of discrimination (Ameli et al. 2004;Jayaweera & Choudhury 2008) and consequential levels of stress and poor health (Benzeval et al. 1992;Karlsen & Nazroo 2002;Krieger et al. 1993), and possibly limit access to resources including the labour market (Brah 1994) with resulting effects on health. Therefore these unexplored pathways also highlight the dynamic contexts in which ethnic minorities spend their lives. Clearly such contexts are difficult to operationalise in quantitative studies and this points to a need for data which is far more detailed than what is currently available.

As a final note, it is worth returning to the most recent work by US researchers leading the way in acculturation studies, to see if conceptualisations borrowed from the UK have been applied. A large and recent systematic review of public health studies of Hispanic populations in the United States made no mention whatsoever of structural and contextual forces operating within each ethnic group which might influence patterns of acculturation (Thomson & Hoffman-Goetz 2009), although it generated considerable debate within the research community (Alegria 2009;Carter-Pokras & Bethune 2009). For all the introspection and critical analysis of the measurement of acculturation in the past 10 years, some continue to regard acculturation as a straightforward one-dimensional process that can be assessed using psychometric scales with no regard for the wider environmental contexts in which the changes are played out. As has been shown in this study, ignoring social contexts and the possibilities that diverse patterns of behaviours and lifestyles form through the mixing of traditional and adopted cultures, excludes a key determinant of how acculturative changes might influence ethnic differences in health.

11.8 Limitations of Study

Both datasets are analysed cross-sectionally meaning causality can only be inferred as the extent to which the exposure preceded the outcome is unknown. For example, it would be useful to know whether the high frequency of physical activity is a long term behaviour or a more recent change in lifestyle when assessing individuals who are at risk of cardiovascular disease. Furthermore, patterns of social mobility and health behavioural change across generations can only be inferred from the differences between two generations measured at the same point in time.

Cross sectional data are also limited in managing cohort effects within each generation and ethnic minority group, resulting from exposure to different historical contexts as a consequence of differences in the period of migration. Despite attempts to standardise for age and social circumstances, recent migratory history means that, for example, it is likely that some of the Bangladeshi second-generation sample within the HSE had not yet reached their final social position owing to their relatively young age.

As a consequence of changing attitudes associated with acculturation, health perception may also differ across generations. Previous studies have shown strong validity of the subjective self rated general health across a variety of ethnic groups (Chandola & Jenkinson 2000b;McGee et al 1999), but there are no published data available to validate the intergenerational persistence of this trend. It has also been proposed that South Asian groups may perceive symptoms of mental illness differently to UK Whites (Fenton & Sadiq-Sangster 1996;O'Connor et al. 2002). The Fourth National Survey (FNS) suggested that the concept of 'depression' in particular did not translate and therefore the questionnaire was culturally limited (Nazroo 1997b). It is possible that the second generation are generally more aware of mental illness and the tools used in British psychiatry for its measurement, with fluency in English predisposing them to reporting depression to a greater extent than the first. Indeed the FNS noted that age at migration was more closely related to mental illness than fluency in English indicating a role for the wider processes of acculturation and familiarity with British concepts of reporting illness (Nazroo 1997a). This is supported by the findings from Chapter 7, where depression is significantly lower than Whites in the first generation of all ethnic minorities, but this advantage diminishes with generation.

The findings of the MCS in particular may be of limited generalisability to the whole population. Parents included in the MCS have selected characteristics associated with being a new parent, such as being relatively young and healthy enough to start or add to a family, and may have their health, socioeconomic and behavioural profiles shaped by their parental status. However, in terms of health outcome, it appears as though the family context of the MCS sample does not greatly influence ethnic patterning of health as there are clear similarities between the MCS and the HSE in this.

In many cases the findings within this study are not significant and this may be due to small sample sizes available, especially within the MCS. Due to the sample sizes it is not practical to model every outcome with the same individuals. Therefore each model contains a different number of respondents. In the final step of model construction, accounting for both socioeconomic and health behavioural effects, the small numbers of respondents with data available for all variables explains the wide confidence intervals. Nevertheless, it is reassuring that for the majority of health outcomes, the ethnic patterning is reproduced in both datasets suggesting that trends were genuine, even if not statistically significant.

Lastly, a small number of respondents who are mixed White/ethnic minority are assigned ethnic minority status. Children with one White and one ethnic minority parent are also assigned to the relevant ethnic minority group. This is an effective means of disaggregating the 'mixed ethnicity' grouping which is primarily made up of people with Black Caribbean ancestry. In defence of this position, it is notable that the health, socioeconomic and health behavioural profiles of the Black Caribbean group are highly correlated with the mixed category, and the profiles of the Black Caribbean group are similar whether the mixed group are included or not. Similarly, the White Other group demonstrates the same profile irrespective of the inclusion of the White Irish group. Additionally it is worth stating that those with mixed backgrounds are likely to be viewed by others as ethnic minority, and this in itself will influence their experiences in the social environment.

11.9 Future Study

Further research is needed to determine whether poor health behaviours are more disadvantageous to health at higher socioeconomic positions than lower ones, as previously identified in the general population (Blaxter 1990). It is suggested that socioeconomic factors carry more weight in determining health than do health behaviours. Therefore, when individuals experience fewer socioeconomic risks to health, 'room' is created for poor health behaviours to exert a greater influence on health in the absence of other risk factors. This mechanism is of particular relevance to the ethnic minorities in this thesis who have demonstrated upward mobility and a propensity towards worsening health behaviours. The findings presented here assume no specific interaction between health behaviour and socioeconomic circumstances. However, this mechanism may explain the overall lack of generational differences in health inequalities observed here and why the second generation require higher levels of socioeconomic advantage in order to attain the same level of health as the first generation.

This study proposes a multidimensional approach to measuring acculturation by using socioeconomic and behavioural domains of daily life that impact on health. Alternative and more complex acculturation models suggest that social support and family networks lie in between these two domains (Navas et al 2005). It is possible that the type and the quality of network will vary with generation as a consequence of differing familiarities with the UK environment, and these relationships could well influence health.

A connected aspect worthy of future study is how these networks operate on a community level. There is evidence to suggest that ethnic minorities living in higher co-ethnic density are less likely to currently drink alcohol (Becares et al. 2009a) and have slightly better mental health possible due to lesser experiences of racism (Becares et al. 2009b). Ethnic minorities who have invested within their areas not only perceive their surroundings as better than the high deprivation score would predict (Karlsen et al. 2002), but these perceptions translate into health promoting or protective mechanisms (Bajekal et al. 2004;Nazroo & Williams 2006). However, the second generation may have a view of what makes a successful neighbourhood more closely related to the general population and may not perceive their ethnically dense environment as positively as the first generation, possibly diminishing health benefits associated with ethnic density. Therefore it is possible that ethnic density effects which influence health might vary according to generation. The investigation of these effects is beyond the scope of this study, but they may drive some of the observations described, particularly for health behaviours. Since this investigation was started, geographical data on the location of MCS families within the UK has been released and would enable future studies to account for area effects in greater detail.

Multigenerational analyses were limited, with third generations or greater being combined into a UK born generation to boost sample sizes in most analyses. Future studies should disaggregate these generations to determine whether acculturative changes are linear with generation, and identify the point at which changes relative to the majority population cease. Incorporating a wider range of variables exploring ethnic identities in more detail would identify those elements which are most persistent over multiple generations and determine the extent to which these factors might explain the persistence of health profiles.

The final question is how best to answer such research questions. The continued study and development of longitudinal data is a vital resource in understanding how health is determined over the entire life course. The Millennium Cohort has provided a useful source of data to begin this task, and the inclusion of social and economic factors is a considerable strength. However, the generational differences were weak among children in particular. Nevertheless, it is certainly possible that they might appear at a later time point, such as at adolescence, at a time which the child has accumulated a distinct set of exposures over their early life course which can sufficiently differentiate between each generation. The considerable socioeconomic and health behavioural differences across generations of families described in this thesis certainly implies that the early life environment of the child varies, and that these circumstances also differ by ethnic minority group. This intimates that generational health differences can be expected in the future.

There are a number of smaller scale longitudinal studies which are currently underway, or just starting, and which are located regionally. For example, the MRC DASH[8] study (Harding et al. 2007) and the RELACHS[9] longitudinal study in East London (Stansfeld & Institute of Community Health 2003), both explore the health, behaviours and family circumstances of children in local schools. The Born in Bradford cohort study (Bradford Institute for Health Research 2009) is especially interesting, sampling 10,000 babies among whom a significant proportion will be from the large and local South Asian population. The advantages of these non-national studies may be to more easily combine qualitative with quantitative research methods to better understand issues of changing ethnic identity in particular, which is a key component of acculturation. Exploring aspects of changing identity using structured questionnaires for quantitative analysis is not easy, whereas skilled interviewers may be able to better understand what elements of identity are changing over time, and whether these differences might be influencing health. It is likely that mixed methods approaches in future will be the most appropriate, if not the most practical or cost effective means to gather data that can be easily tailored to the ever-changing contemporary contexts of society.

[8] Determinants of Adolescent Social well-being and Health

[9] Research with East London Adolescents; Community Health Survey

11.10 Conclusions

This study provides evidence from the UK of the intergenerational patterning of ethnic health inequalities. The results are consistent with the main hypotheses of the study and are generally supported by the few studies previously performed in this novel research area. After accounting for the limitations described above, the following major conclusions are drawn:

- Ethnic inequalities in health are broadly persistent across generations. Those significant differences which did occur result in worse health in the second generation compared to the first.
- Strong upward intergenerational socioeconomic mobility in ethnic minority groups does not translate into better health. Instead, the second generation require greater levels of socioeconomic advantage in order to maintain the same level of health as their predecessors.
- The extent of intergenerational changes in health related behaviours is specific to ethnic group and to behaviour. However, acculturative changes produce a general worsening of behaviours across ethnic minority groups, with exception to rates of physical activity which improve. These changes in health behaviours over generation do not significantly influence patterns of health.
- Findings show that the social and economic contexts, and the cultural identities and behaviours of ethnic minorities, differ across generations, but ultimately their opposing influences on health result in stable overall patterns of health inequality across generations

11.11 Recommendations

The continuity of ethnic health inequalities compared to the White population is a worrying concern, especially as UK born ethnic minorities are unaffected by pre-migration health risks such as experiencing critical periods of childhood health risk overseas. Consequently second generation experiences are indicative of the way that ethnicity interacts with UK society, and vice versa, without the confounding effects of migration. A number of recommendations may address these on-going inequalities.

Despite considerable evidence of upward socioeconomic mobility, ethnic minorities are more likely to be disadvantaged than Whites, with the exception of the Indian, Chinese and Other White groups. The removal of barriers to socioeconomic mobility of ethnic minorities, such as workplace discrimination, will be an effective means of reducing, or least moderating, health inequalities. Continued action should be taken to ensure that ethnic minority people are fairly represented at appropriate locations within the labour market commensurate with skills and qualifications so that the current relative socioeconomic disadvantage experienced by the majority of ethnic minority groups is overcome.

Additionally, action should be taken to ensure that educational opportunities which are currently well exploited by ethnic minorities are more effectively translated into positive outcomes in the labour market. Encouragement should be given to poorer families to attend higher and further education, through financial support, or through careers services targeting groups with no family history of higher education.

As health behaviours of ethnic minorities appear to converge on those of the majority in many cases it is tempting to conclude that future health promotion messages will be effective across all ethnic groups. However, there is evidence that smoking cessation is greater in the White group than all others (Farren & Naidoo 1996;Sproston & Mindell 2006) suggesting that anti-smoking messages are not reaching all groups. Therefore health promotion should be aware of specific differences between ethnic groups and appreciate that some groups are less likely to hear or respond to particular messages.

Lastly, ethnic health inequalities are apparent in children by age five suggesting that pre-school interventions are required to help reduce the health gaps across ethnic groups. Action should be taken to ensure that there is equal access across all ethnic groups to early year's initiatives such as Sure Start centres.

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Appendix A

Appendix A Health Inequalities Compared to a White Reference Group

A.1 The Health Survey for England

The age and sex adjusted odds of poor health compared to the White reference group are shown in Table A1. There was a greater risk of fair/poor general health in all ethnic minority groups than Whites, except for Black African and Irish people. Rates of limiting illness were significantly greater than in Whites in Pakistani, Bangladeshi and Black Caribbean groups, whereas rates were significantly lower in Chinese and Black African people. Obesity rates were highly variable across the range of ethnic minority groups. Indian, Bangladeshi and Chinese groups were all at significantly lesser risk of being obese than Whites, whereas Pakistani, Black Caribbean and Black African groups experienced a significantly greater risk, with no difference observed for Irish people. Rates of diagnosed hypertension demonstrated the fewest inequalities between ethnic minorities and Whites. There was a significantly greater risk of being diagnosed hypertensive in Indian, Black Caribbean and Black African groups, whereas all other groups had rates comparable to the White population. Looking at the overall health profile of these groups it is apparent that the Black Caribbean group have significantly poorer health for all outcomes. The Irish group demonstrated no significant differences to the White population.

The risk of having hazardous concentrations of blood biomarkers of cardiovascular disease compared to White is shown in Table A2. All ethnic minorities were less likely than Whites to have raised levels of total cholesterol and this was significantly so in Indian, Pakistani, Black Caribbean and Chinese. A similar pattern was observed for LDL cholesterol as all minorities were again less likely than Whites to experience elevated levels and was significant for Pakistani, Black Caribbean, Black African, Irish and Chinese groups. Levels of CRP and HDL cholesterol across ethnic minorities were more mixed however. For both biomarkers, Indian, Pakistani and Bangladeshi reported a significantly greater risk of having harmful levels, with exception to CRP levels in the Indian group which were non-significant. Conversely, all other groups demonstrated a tendency to have a lower risk of having harmful concentrations of biomarkers, but this reached significance in only Black Caribbean for HDL cholesterol.

Table A1: Age and sex adjusted odds (95%) of poor health outcome in each ethnic group compared to the White reference population

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Fair/Poor General Health	1.74 *(1.57-1.93)**	2.24 *(2.01-2.50)**	2.99 *(2.68-3.33)**	1.84 *(1.65-2.05)**	1.11 *(0.91-1.35)*	1.05 *(0.93-1.18)*	1.19 *(1.04-1.36)**
Limiting Illness	1.03 *(0.92-1.15)*	1.48 *(1.31-1.66)**	1.52 *(1.35-1.72)**	1.21 *(1.07-1.36)**	0.68 *(0.54-0.86*)*	1.03 *(0.91-1.16)*	0.46 *(0.39-0.56)**
Obese	0.82 *(0.72-0.94)*	1.18 *(1.03-1.34)**	0.51 *(0.42-0.61)**	1.53 *(1.35-1.74)**	1.85 *(1.51-2.26)**	1.05 *(0.91-1.20)*	0.27 *(0.22-0.35)**
Diagnosed Hypertension	1.18 *(1.01-1.37)**	1.03 *(0.85-1.26)*	0.93 *(0.70-1.24)*	1.68 *(1.42-1.98)**	1.85 *(1.34-2.55)**	1.01 *(0.86-1.19)*	0.93 *(0.75-1.15)*

Notes: *p<0.05

Table A2: Age and sex adjusted odds ratios (95% CI) of having biomarkers at of cardiovascular disease in each ethnic group compared to the White reference population

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Total Cholesterol (>5 mmol/l)	0.79 *(0.69-0.91)**	0.72 *(0.60-0.85)**	0.83 *(0.67-1.03)*	0.54 *(0.46-0.64)**	0.71 *(0.49-1.01)*	0.89 *(0.76-1.03)*	0.72 *(0.59-0.88)**
HDL Cholesterol (<1 mmol/l)	1.41 *(1.17-1.69)**	2.54 *(2.10-3.08)**	3.64 *(2.88-4.60)**	0.70 *(0.53-0.91)**	0.79 *(0.42-1.46)*	0.97 *(0.78-1.20)*	0.89 *(0.66-1.21)*
LDL Cholesterol (>3 mmol/l)	0.78 *(0.59-1.02)*	0.62 *(0.44-0.88)**	1.00 *(0.63-1.61)*	0.63 *(0.47-0.84)**	0.60 *(0.38-0.97)**	0.75 *(0.57-0.98)**	0.49 *(0.36-0.67)**
C-Reactive Protein (>3mg/l)	1.10 *(0.95-1.28)*	1.62 *(1.36-1.95)**	1.43 *(1.11-1.84)**	0.91 *(0.76-1.09)*	0.99 *(0.65-1.50)*	1.00 *(0.85-1.18)*	0.37 *(0.27-0.51)**

Notes: *p<0.05

A.2 The Millennium Cohort Study

A2.1 Mothers

Table A3 shows that Pakistani, Bangladeshi and Black Caribbean mothers were significantly more likely to report fair/poor general health, and, along with Black African, be overweight/obese. There were no significant differences between any ethnic minority group and the White reference group in the risk of limiting illness.

Table A3: Maternal age adjusted odds (95% CI) of mother having fair/poor general health, a limiting illness and being overweight/obese compared to the White reference population, by maternal ethnicity

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Fair/poor general health	1.17 *(0.84-1.63)*	1.64 *(1.26-2.13)**	1.57 *(1.10-2.24)**	1.65 *(1.15-2.35)**	1.02 *(0.71-1.47)*	0.70 *(0.46-1.07)*	1.26 *(0.93-1.71)*
Limiting Illness	0.77 *(0.49-1.21)*	0.88 *(0.67-1.16)*	0.97 *(0.60-1.57)*	1.14 *(0.73-1.78)*	0.67 *(0.43-1.03)*	0.91 *(0.60-1.37)*	0.81 *(0.55-1.19)*
Overweight/Obesity	0.91 *(0.71-1.18)*	1.44 *(1.15-1.79)**	1.44 *(1.00-2.06)**	1.64 *(1.11-2.43)**	2.42 *(1.58-3.69)**	0.61 *(0.46-0.81)**	0.88 *(0.69-1.12)*

Notes: *p<0.05

Ethnic minorities were significantly less likely to have been diagnosed with depression, with exception to the Black Caribbean group for whom there was no difference to the White group (Table A4). This contrasts somewhat with the risk of having a raised distress score, which was significantly higher than in Whites for mothers in the Other and the Pakistani group, with no significant differences to White observed for all other groups.

Table A4: Maternal age adjusted odds (95% CI) of diagnosed depression and having a raised distress score compared to the White reference population, by maternal ethnicity

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Diagnosed Depression	0.47 *(0.32-0.68)**	0.75 *(0.59-0.95)**	0.41 *(0.28-0.61)**	1.04 *(0.72-1.51)*	0.27 *(0.18-0.40)**	0.51 *(0.37-0.72)**	0.55 *(0.41-0.73)**
Raised Distress Score	1.34 *(0.99-1.83)*	2.14 *(1.57-2.92)**	1.46 *(0.95-2.26)*	1.46 *(0.99-2.16)*	1.32 *(0.88-1.97)*	1.16 *(0.89-1.52)*	1.66 *(1.28-2.15)**

Notes: *p<0.05

A2.2 Fathers

Pakistani, Bangladeshi and Chinese fathers reported significantly more fair/poor general health than the White group, whereas the Irish group experienced significantly better general health than Whites (Table A5). These trends were mirrored in Pakistani and Irish groups for limiting illness. However, Pakistani, Bangladeshi as well as Chinese fathers were significantly less likely than White fathers to be overweight or obese.

Table A5: Paternal age adjusted odds (95% CI) of father and child having fair/poor general health, a limiting illness and being overweight/obese compared to the White reference population, by paternal ethnicity

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Fair/poor general health	1.27	1.86	2.41	1.67	0.80	0.54	1.55
	(0.82-1.96)	*(1.39-2.47)**	*(1.63-3.54)**	*(0.88-3.16)*	*(0.52-1.23)*	*(0.31-0.96)**	*(1.05-2.26)**
Limiting Illness	0.90	1.38	1.16	0.76	0.74	0.41	0.84
	(0.60-1.37)	*(1.05-1.80)**	*(0.66-2.03)*	*(0.31-1.84)*	*(0.40-1.36)*	*(0.20-0.84)**	*(0.53-1.34)*
Overweight/Obesity	0.86	0.68	0.40	1.17	0.99	1.28	0.70
	(0.64-1.15)	*(0.55-0.86)**	*(0.27-0.58)**	*(0.71-1.92)*	*(0.67-1.45)*	*(0.92-1.78)*	*(0.51-0.96)**

Notes: *p<0.05

Inequalities in diagnosed depression in fathers were similar to mothers (Table A6). The majority of ethnic minority groups experienced lower risks of depression than the White group and this was significant in Indian, Bangladeshi, Black Caribbean and Black African fathers, with no differences observed for Pakistani, Other and Other White groups. As was the case for mothers, Pakistani fathers experienced significantly higher risks of having a raised distress score, as did Bangladeshi and the Other group

Table A6: Paternal age adjusted odds (95% CI) of diagnosed depression and having a raised distress score compared to the White reference population, by paternal ethnicity

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Irish*	*Chinese*
Diagnosed depression	0.44	0.75	0.44	0.23	0.37	1.02	0.81
	*(0.25-0.80)**	*(0.54-1.05)*	*(0.24-0.82)**	*(0.08-0.60)**	*(0.16-0.85)**	*(0.66-1.58)*	*(0.55-1.18)*
Raised Distress Score	1.33	2.05	1.77	1.45	0.92	1.31	1.78
	(0.95-1.87)	*(1.46-2.89)**	*(1.02-3.10)**	*(0.87-2.41)*	*(0.59-1.45)*	*(0.97-1.77)*	*(1.29-2.45)**

Notes: *p<0.05

A2.3 Child

Despite the young age, there were clear ethnic inequalities in child health (Table A7). As was observed in the mothers, Pakistani, Bangladeshi and Black Caribbean children were significantly more likely than Whites to have fair/poor general health. Pakistani and Bangladeshi children, along with those from the Black African group, also had significantly greater risks of limiting illness than Whites. Black Caribbean and Black African groups were significantly more likely to be overweight/obese, but the Other White group were less likely to be so. Lastly, Black Caribbean children were significantly more likely than the White group to have ever had any problems with asthma, whereas Black African children were observed as having a significantly lesser risk. Overall, Black Caribbean reported the poorest health relative to their White peers and there were no significant differences in health between the children in the Indian and the Other group.

Table A7: Age adjusted odds (95% CI) of child asthma compared to the White reference population, by child's ethnicity

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Fair/poor general health	1.41	2.69	1.88	1.94	0.87	0.82	1.22
	(0.86-2.32)	*(1.83-3.96)**	*(1.29-2.73)**	*(1.20-3.15)**	*(0.37-2.05)*	*(0.45-1.49)*	*(0.78-1.92)*
Limiting Illness	0.86	1.89	2.56	0.85	3.30	1.14	1.25
	(0.41-1.79)	*(1.28-2.79)**	*(1.12-5.88)**	*(0.51-1.42)*	*(1.27-8.53)**	*(0.70-1.86)*	*(0.72-2.16)*
Overweight/Obesity	0.73	0.85	1.04	1.38	1.76	0.77	0.83
	(0.53-1.01)	*(0.68-1.06)*	*(0.70-1.52)*	*(1.04-1.85)**	*(1.33-2.33)**	*(0.60-0.98)**	*(0.62-1.11)*
Any Asthma	0.87	1.05	1.08	1.74	0.67	0.96	1.04
	(0.61-1.25)	*(0.84-1.31)*	*(0.72-1.62)*	*(1.27-2.40)**	*(0.46-0.99)**	*(0.70-1.32)*	*(0.79-1.39)*

Notes: *p<0.05

The difference in the mean cognitive development test scores between White and ethnic minority children are shown in Table A8. A negative score denotes a lower score compared to the White group. All three test scores were significantly lower in Pakistani, Bangladeshi, Black Caribbean and Black African children compared to Whites, and the differences were particularly marked for Pakistani and Bangladeshi children. The Other White and Other group had higher cognitive development scores than Whites for the pattern construction and picture similarity tests, but not so for the vocabulary test. It is worth noting that the Indian children did not score significantly differently to the White group for the picture similarity and pattern construction test, but were significantly lower scoring for the vocabulary score. These findings contrast sharply to the consistently lower scores in Bangladeshi and Pakistani groups.

Table A8: Mean difference in child's cognitive development score compared to the White reference population, by child's ethnicity

	Indian	*Pakistani*	*Bangladeshi*	*Black Caribbean*	*Black African*	*Other White*	*Other*
Picture Similarity	0.30 *(-0.69,1.30)*	-3.55** *(-4.34,-2.76)*	-3.35** *(-4.55,-2.16)*	-0.45 *(-1.56,0.65)*	-0.74 *(-1.82,0.33,)*	1.14* *(0.24,2.05)*	0.42 *(-0.54,1.37)*
Pattern Construction	-0.72 *(-1.69,0.26)*	-4.62** *(-5.39,-3.84)*	-3.92** *(-5.09,-2.75)*	-3.61** *(-4.70,-2.53)*	-4.18** *(-5.23,-3.13)*	0.68 *(-0.21,1.57)*	0.16 *(-0.77,1.10)*
Vocabulary	-5.63** *(-6.63,-4.63)*	-14.49** *(-15.28-,13.69)*	-14.99** *(-16.20,-13.79)*	-4.43** *(-5.54-,3.33)*	-10.95** *(-12.03,-9.87)*	-1.36* *(-2.27,-0.44)*	-6.56** *(-7.53,-5.59)*

Notes: *p<0.01; ***p*<0.001; all test scores are normed for child's age and adjusted for sex

Appendix B

Appendix B Survey Questionnaires

The 1998, 1999, 2003 and 2004 Health Survey for England and the third sweep of the Millennium Cohort Study used a series of self-complete and interviewer assisted questionnaires. These were used to gather data on the health, socioeconomic and health behavioural outcomes used in this thesis. The questionnaires are available at the following locations.

- ## Health Survey for England: Methodology and Documentation

1998

http://www.archive.official-documents.co.uk/document/doh/survey98/hse-00.htm

1999

http://www.archive.official-documents.co.uk/document/doh/survey99/hse99-00.htm

2003

http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4098912.pdf

2004

http://www.ic.nhs.uk/webfiles/publications/healthsurvey2004ethnicfull/HealthSurveyforEnglandVol2_210406_PDF.pdf

- ## The Millennium Cohort Study – The Third Sweep

Computer Assisted Personal Interviewing Questionnaire

http://www.cls.ioe.ac.uk/core/documents/download.asp?id=1155&log_stat=1

Cognitive Ability and Physical Assessment Questionnaires and Test Procedures

http://www.cls.ioe.ac.uk/core/documents/download.asp?id=541&log_stat=1

Appendix C

Intergenerational continuities of ethnic inequalities in general health in England

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ABSTRACT

Background: Previous research strongly suggests that ethnic minority groups are more likely to suffer a poorer health profile compared with the overall population, although it is not clear whether these inequalities persist over generations. This study aimed to establish the degree to which ethnic inequalities in health are transmitted from the first to the second generation, and to determine the extent to which intergenerational changes in socioeconomic status and health behaviours might explain any variation that exists.

Methods: Data from the 1999 and 2004 Health Surveys for England assessed the prevalence of fair/poor general health across first (n = 4492) and second (n = 5729) generations of six ethnic minority populations. A white population was selected as reference (n = 18 407). The risk of fair/poor general health was estimated by applying logistic regression models and stepwise inclusion of demographic, socioeconomic and behavioural variables. Generational movement relative to the white baseline was assessed for all ethnic groups adjusted for age and sex.

Results: No significant differences in levels of reported fair/poor general health were observed between generations. After adjusting for improved socioeconomic position, the second generation became more likely to report worse health, whereas adjusting for differences in health behaviours had no effect. The Bangladeshi population showed significant intergenerational improvement in general health relative to the white reference, showing a reduction in the odds ratio (95% CI) from 2.75 (2.14 to 3.56) for the first generation to 1.58 (1.17 to 2.13) in the second generation.

Conclusion: Ethnic minorities in England report consistent rates of fair/poor general health across generations, despite the health benefits resulting from upward social mobility. These health inequalities are unaffected by changes in health behaviours. Understanding these intergenerational pathways will have important public health policy implications as the migrant population not only ages, but also reproduces.

Ethnic inequalities in health have been well documented in the UK.[1–5] Since the Black Report,[6] there has been continued focus upon the influence of socioeconomic factors in explaining how those at the lower end of the social hierarchy suffer a poorer health profile than those less disadvantaged. Emphasis has also been placed upon understanding the importance of biological, cultural or behaviour risk factors to health, which may also be differentially distributed between and within ethnic minority groups.[7]

However, such investigations in the UK have been largely based upon data from migrants, either because they have been specifically focused on migrants or because the older population, where morbidity and mortality become prevalent, is almost exclusively composed of migrants. Immigrant mortality studies in the UK[3] and elsewhere[8 9] suggest that the health profiles of these individuals have been shaped by a healthy migrant effect, whereby those who migrate are atypically healthier and less likely to be disadvantaged than those individuals who remained in the country of origin. Importantly, a link has been established between increasing duration of residence and declining health in a range of UK ethnic minorities.[10–12] This suggests that the positive health characteristics of the first generation are not retained indefinitely and that some loss of the healthy profile is inevitable over time. Despite international studies identifying migrant population health as approximating to that of the host population within one or two generations,[13 14] there are few studies documenting intergenerational changes in health status in the UK, or the causal pathways by which change is mediated, largely because of the young age profile of the second and third generations.

There is substantial evidence of differential rates of intergenerational upward social mobility in the main UK ethnic minority groups.[15 16] These differences in socioeconomic success reflect the different capabilities and circumstances of each group, leading to differences in the reduction in the exposure to risk factors to health over generations. There is also evidence for intergenerational modification of culturally specific behaviour and social norms.[17] Acculturative changes in health behaviours over time might also influence, and possibly diminish, the health advantage of the migrant generation. Common examples of this acculturative phenomenon are the uptake of less healthy behaviours such as increased smoking rates, declining standards of diet[18–20] and a worsening in maternal behaviours.[21] It would seem likely, then, that exposure to both socioeconomic and behavioural risk factors to health are fixed neither across generations nor over time, and that associated health outcomes might be expected to vary accordingly.

Previous cross-sectional analyses have shown consistently higher rates of reported fair/poor self-rated general health across a range of UK ethnic minorities when compared with the white majority population.[1 4 5] This study takes advantage of the large sample sizes in the ethnically boosted years of the Health Survey for England (1999 and 2004) to investigate the extent of intergenerational change in ethnic inequalities in self-rated general health and health behaviours, how far this varies between groups, and to identify those factors underlying any observed changes.

METHODS

Health survey for England

The Health Survey for England (HSE) used a multistage stratified probability sample design to select a nationally representative sample of the general population. The 1999 and 2004 surveys oversampled ethnic minority households and, when these surveys are combined, the sample is large enough to allow for the study of generation effects. Comparative data for a white English population are drawn from the 1998 and 2003 HSE surveys.

Ethnicity and generation

Ethnicity was recorded according to informant self-reports of their family origins. The groups included in the analysis were black Caribbean, Indian, Pakistani, Bangladeshi, Chinese, Irish and white English. First-generation ethnic minorities were defined as foreign born and migrating to the UK aged 12 years or older. The second generation were classed as UK born, or foreign born and migrating to the UK when under 12 years of age. The cut-off age of 12 years is used because it correlates with subsequent exposure to a significant period of childhood and secondary schooling in the UK, which will be important influences for both social mobility and changes in behaviours. This cut-off provides as numerically balanced a sample as possible and has been used in previous large-scale cross-sectional studies differentiating between generations.[22–25] Similar results are obtained when country of birth is used as the cut-off.

As the different generations had only partially overlapping age structures with each other, age censoring was required. This was carried out to ensure that at least 20 individuals from each generation were contained in 5-year age bands. Consequently, we only included in the analysis: black Caribbean aged 21–55 years, Indian aged 21–50 years, Pakistani aged 16–50 years, Bangladeshi aged 16–45 years, Chinese aged 16–45 years and Irish aged 21–85 years (this wider age distribution reflecting their longer migratory history). The white English reference population covered ages 16–55 years. The Irish age distribution was further censored to ages 16–55 years when modelled for a direct comparison with the white reference group.

Health outcome

Informants were asked to rate their health according to a five-point scale: very good, good, fair, poor and very poor. This was coded to a binary variable: fair/poor/very poor and good/very good. This dichotomy has been shown to capture the ordered nature of self-rated health[26] and has been used previously in HSE analyses[1 5] and in the investigation of the Fourth National Survey of Ethnic Minorities in Britain.[4] This measure is an important predictor of all-cause mortality,[27 28] validated in different ethnic groups,[29 30] so is a relationship that seems to be universal rather than ethnically specific.[31 32]

Explanatory variables

Socioeconomic factors

A single socioeconomic indicator inadequately reflects the social position occupied by individuals of each ethnic minority group.[4 33] For example, there is much variation in the income levels among occupations that make up each occupational class. Consequently, three indicators were used to more accurately assess the social circumstances of each group. The Registrar General's social class system classified informant occupations by social position. Household income, equivalised to account for the number of individuals in a household, was coded into quintiles to account for the highly skewed income distribution. Educational level was taken as the top qualification achieved by the informant. This comprised seven categories ranging from no qualification to NVQ5 or degree, and is generally regarded as an accurate representation of the level of skills available to the labour market. The small numbers of people with foreign qualifications were treated as having no qualification.

Health-related behaviours

Measures covered smoking, alcohol consumption and diet. For modelling purposes, behaviours were coded to binary variables. Smokers were classified as those who were current smokers as opposed to current non-smokers. Patterns of alcoholic intake were identified as any regular drinking vs abstention from alcohol. Diet was assessed in terms of fruit and vegetable consumption, contrasting those consuming less than one portion of fruit or vegetables in a week with others.

Analysis

Stepwise construction of binary logistic regression models began with the calculation of an unadjusted odds ratio (OR) for the poor/fair health in the second generation relative to the first generation. These odds were subsequently adjusted to account for differences in the age and sex distributions between generations. The effects of socioeconomic status and health behaviours were then examined separately, and simultaneously, to estimate the extent to which each factor explained intergenerational variation in fair/poor general health.

The final models examined whether the odds of fair/poor health for ethnic minority groups were converging to, or diverging from, the rates of fair/poor health in the white reference population. All analyses were performed using STATA™ version 9.2 (StataCorp, College Station, TX, USA), which allowed us to account for sample weights (used to account for different known probabilities of selection into the sample) and the stratification and clustering of the sample.

RESULTS

Table 1 shows the demographic and socioeconomic characteristics of each generation across the range of ethnic groups. All ethnic minority groups tended to show upward intergenerational social mobility as measured through educational attainment, social class and equivalised income, although the extent of this mobility varied between groups. The Indian group demonstrated the greatest mobility, with around 45% of the second generation in the upper professional classes compared with 35% in the first generation, and similar differences were observed in levels of educational attainment and income. These intergenerational changes contrasted sharply with the Bangladeshi group, where half of the first generation sample occupied the lowest income quintile, decreasing to 43% into the second generation. The Bangladeshi group showed marked improvements in educational attainment, however, with 64% of the first generation having no qualification declining sharply to 21% in the second generation. As a consequence of a low starting position and weak upward socioeconomic mobility, the second generation of both the Bangladeshi and the Pakistani groups remained markedly socioeconomically disadvantaged relative to the white population.

Table 1 Demographic and socioeconomic characteristics by ethnic group and generation (weighted % given; SE = standard error)

	Black Caribbean		Indian		Pakistani		Bangladeshi		Chinese		Irish		
Generation	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**White**
Mean age (SE)	42.5 (0.51)	35.3 (0.22)	38.7 (0.27)	32.7 (0.28)	35.7 (0.29)	26.5 (0.26)	32.7 (0.25)	23.7 (0.24)	34.5 (0.36)	25.6 (0.40)	55.8 (0.59)	44.3 (0.36)	36.8 (0.08)
Sex (wt%)													
Female	65.0	59.9	56.9	53.8	54.1	54.0	53.2	55.1	58.9	46.1	56.1	57.1	52.4
Total unweighted n	333	1139	858	722	851	1007	784	765	487	402	776	1510	18 407
Social class (wt%)													
i and ii	29.8	35.1	35.2	44.9	17.6	27.2	12.1	22.3	39.8	39.3	32.7	36.7	33.6
iii Non-manual/ manual	42.6	46.0	32.7	40.6	45.2	51.5	51.7	49.5	37.6	46.3	37.4	41.2	43.1
iv and v	27.4	18.9	32.1	14.5	37.1	21.3	36.1	28.2	22.6	14.4	29.9	22.1	23.4
Total unweighted n	311	1076	783	656	482	670	418	426	408	319	754	1467	17 728
Education (wt%)													
NVQ4/NVQ5/degree	13.0	20.2	35.6	36.4	14.8	16.9	9.9	12.4	35.5	26.4	14.8	18.2	17.7
Higher educ. <degree	18.8	18.4	7.2	11.6	3.8	9.1	2.5	6.0	8.5	8.7	12.0	13.3	11.8
NVQ3/GCE A level	8.5	16.7	8.0	17.8	7.4	17.1	6.1	22.8	12.9	30.0	8.7	11.6	14.9
NVQ2/GCE O level	23.8	27.5	15.4	19.4	11.1	25.0	12.8	31.4	10.4	25.2	10.7	25.2	30.0
NVQ1/CSE other grade Equiv.	4.2	3.5	1.7	4.4	1.3	8.5	2.4	5.5	3.1	1.9	3.2	0.5	5.7
Foreign/other	4.0	0.8	3.4	0.7	3.9	0.7	2.2	0.3	2.5	0.5	4.3	0.2	2.6
No qualification	27.9	12.8	28.4	9.7	57.8	22.8	64.2	21.6	27.1	7.2	46.3	30.6	17.3
Total unweighted n	332	1124	856	711	851	996	784	752	486	398	776	1504	18 380
Equivalised income (quintiles)													
1 (low)	25.5	22.8	17.7	15.0	35.2	29.8	51.5	43.3	15.1	13.3	16.6	13.5	12.7
2	17.6	13.3	18.2	12.2	22.0	19.8	18.1	13.8	16.8	16.2	17.1	14.7	14.4
3	17.9	13.2	14.2	16.4	9.7	9.1	4.3	3.9	13.8	8.3	15.3	16.3	18.2
4	12.4	17.7	13.2	14.9	4.3	5.3	2.0	4.5	10.7	9.7	13.6	20.0	22.3
5 (high)	9.2	17.0	14.6	16.8	5.1	6.6	0.5	1.9	15.3	18.3	19.8	23.0	21.4
Total unweighted n	275	956	685	567	646	709	605	523	354	266	648	1307	18 407

Table 2 shows that there was a general trend for the health behaviours of second- compared with first-generation ethnic minority people to approximate towards those observed in the majority population. A statistically significant increase in the rate of smoking across generations was observed for the black Caribbean group. In the Indian and Pakistani groups, smoking rates were also higher in the second generation, although changes were not statistically significant. These changes represented a convergence towards the smoking rates observed in the majority white population. Most groups showed a slight intergenerational worsening of the diet, reaching statistical significance for the Indian group for low vegetable and fruit consumption. Patterns of daily alcohol intake varied widely by ethnic group, with the vast majority of those in the Pakistani and Bangladeshi groups abstaining. Nevertheless, with the exception of the Irish, all ethnic minority groups showed a statistically significant increased likelihood of drinking in the second generation, with movement towards the prevalence of drinking in the white majority population.

The odds ratios for fair or poor general health adjusted for age and sex, and then a range of socioeconomic and health behaviour variables are shown in table 3. There appeared to be little difference between the generations after accounting for age and sex differences. Adjustment for socioeconomic factors resulted in a slight increase in the odds of reporting fair or poor health in the second generation for all but the Bangladeshi and Irish groups. This increase was statistically significant for both Pakistani and Chinese groups. In contrast, adjustment for health-related behaviours had little effect on the models. So, in the model that adjusted for both health-related behaviour and socioeconomic position, the odds of fair/poor health in the second compared with the first generation approximated to that where only socioeconomic position was adjusted for. Results suggest that, once improved socioeconomic circumstances in the second generation were accounted for, fair/poor health was more likely in the second generation, with the exception of the Bangladeshi and Irish groups. It would appear that the overall tendency to show comparable health in the second generation was a consequence of upward intergenerational social mobility.

Table 4 shows age- and sex-adjusted ORs for having fair/poor health compared with white English people, separately for first- and second-generation people in each ethnic minority group. With the exception of the Bangladeshi group, there were no differences between generations. The Bangladeshi group showed a statistically significant convergence from first to second generation towards the rates of fair/poor general health in the white English population. This finding is consistent with earlier models (table 3), which also observed an improvement in levels of general health between the Bangladeshi generations. It was notable that the Bangladeshi first generation reported considerably poorer general health than all other groups, providing scope for the marked improvement seen in the second generation. There was a consistently elevated rate of fair/poor health within the black Caribbean, Pakistani, Indian, as well as the Bangladeshi group, whereas the rates for both Chinese and Irish groups were more similar to the rates observed in the white population.

DISCUSSION

This study examined the extent to which intergenerational modifications in socioeconomic circumstances and health behaviours are associated with generational shifts in general health. The well-established association between higher social

Table 2 Weighted distributions of health-related behaviours by ethnicity and generation including age- and sex-adjusted odds ratios of likelihood of a poor health-related behaviour in the second generation relative to the first

	Black Caribbean		Indian		Pakistani		Bangladeshi		Chinese		Irish		
Generation	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**1st**	**2nd**	**White**
Smoking													
Non-smoker	79.8	63.8	88.9	83.0	84.1	84.4	76.9	84.3	83.4	84.7	71.0	67.7	67.9
Light smoker, under 10/day	7.3	20.8	7.1	8.8	6.2	7.4	11.2	8.6	9.0	9.2	9.2	8.9	8.6
Moderate smoker, 10 to under 20/day	9.5	12.1	2.9	5.5	7.0	5.6	9.1	4.8	5.9	5.4	11.7	12.0	13.2
Heavy smoker, 20+/day	3.4	3.4	1.1	2.7	2.7	2.6	2.9	2.3	1.6	0.7	8.1	11.3	10.4
Age-/sex-adjusted odds of smoking in 2nd generation vs 1st generation	*1.96*** (*1.39* to *2.77*)		*1.37* (*0.95* to *1.99*)		*1.20* (*0.85* to *1.69*)		*0.88* (*0.58* to *1.35*)		*0.76* (*0.48* to *1.21*)		*0.88* (*0.68* to *1.13*)		
Total unweighted n	333	1,125	858	714	850	963	781	701	487	387	776	1504	18 315
Diet													
Fruit consumption <1 portion/week	13.3	20.4	15.8	22.9	15.0	19.1	22.0	25.4	14.7	15.5	16.0	20.7	22.8
Age-/sex-adjusted odds of low vegetable consumption in 2nd generation vs 1st generation	*1.41* (*0.86* to *2.30*)		*1.47*** (*1.03* to *2.08*)		*1.12* (*0.80* to *1.57*)		*1.22* (*0.87* to *1.72*)		*0.76* (*0.46* to *1.23*)		*1.22* (*0.88* to *1.70*)		
Total unweighted n	291	944	750	606	688	762	591	556	425	329	677	1326	18 406
Vegetable consumption <1 portion/week	24.6	23.8	11.7	18.5	22.3	27.4	16.1	23.3	11.1	18.8	20.4	19.8	18.6
Age-/sex-adjusted odds of low vegetable intake in 2nd generation vs 1st generation	*0.84* (*0.58* to *1.23*)		*1.56** (*1.06* to *2.26*)		*1.12* (*0.81* to *1.55*)		*1.33* (*0.91* to *1.95*)		*1.31* (*0.79* to *2.18*)		*0.96* (*0.69* to *1.34*)		
Total unweighted n	291	946	752	606	685	764	591	558	425	331	675	1326	18 405
Alcoholic intake frequency (drinking frequency/week)													
None	47.4	38.2	72.7	55.7	96.8	94.8	99.6	97.6	65.6	56.0	34.7	25.4	24.6
1–3 days/week	37.4	49.0	21.5	32.2	2.2	4.2	0.3	1.4	28.4	34.7	40.1	46.3	48.5
4–7 days/week	15.2	12.8	5.8	12.1	1.0	1.0	0.1	1.0	6.1	9.3	25.2	28.3	26.9
Age/sex adjusted odds ratio for any drinking in 2nd generation vs 1st generation	*1.43** (*1.03* to *1.97*)		*2.23*** (*1.69* to *2.93*)		*2.33** (*1.16* to *4.66*)		*14.28*** (*3.83* to *53.20*)		*1.55** (*1.11* to *2.16*)		*1.23* (*0.95* to *1.59*)		
Total unweighted n	329	1,122	845	709	845	956	775	687	474	387	766	1491	18 255

**p<0.001; *p<0.05.

position and better health suggested that the intergenerational social mobility observed here, and elsewhere,[16 34 35] would consequently lead to improved second-generation general health. This was not the case, however. In fact, once the upward mobility of the second generation was accounted for, their health appeared to be worse than that of the first generation.

A possible underlying explanation concerns the process of health selection. The healthy migrant effect posits that the first generation have a better health profile than their social position might otherwise suggest. Furthermore, migrants are liable to face a period of immediate downward mobility post migration, undertaking social roles that were not befitting of their social status before migration.[15] Such downward mobility exacerbates the mismatch between relatively high health status and low social position post migration. This phenomenon may account for the finding that the second generation appears to require greater levels of socioeconomic advantage to achieve the same level of self-reported health as the first generation.

While socioeconomic disadvantage is likely to contribute to patterns of health inequality, other risk factors are clearly involved. These risks are situated within the differing life courses of each generation. The second generation is exposed to different sets of exposures in early life compared with the first generation, having spent critical periods of childhood and development within the UK environment. For example, postnatal growth has been shown to affect later life disease risk.[36] As the second generation ages, it is likely that differential

Table 3 Logistic regression models for odds of fair/poor general health in the second generation, adjusted for age, sex, socioeconomic factors (SES) and health-related behaviours (HRB)

	Unadjusted	Age and sex	Age, sex and SES	Age, sex and HRB	Age, sex, SES and HRB
Black Caribbean	0.80 (0.56 to 1.15)	1.15 (0.77 to 1.70)	1.34 (0.90 to 2.00)	1.06 (0.70 to 1.59)	1.26 (0.83 to 1.91)
Indian	0.82 (0.60 to 1.10)	1.08 (0.77 to 1.51)	1.27 (0.87 to 1.86)	1.01 (0.71 to 1.44)	1.20 (0.81 to 1.77)
Pakistani	0.84 (0.59 to 1.21)	1.24 (0.82 to 1.89)	1.61 (1.02 to 2.53)*	1.21 (0.79 to 1.84)	1.57 (0.99 to 2.49)
Bangladeshi	0.49 (0.33 to 0.73)	0.85 (0.53 to 1.35)	0.89 (0.54 to 1.45)	0.90 (0.55 to 1.45)	0.92 (0.56 to 1.52)
Chinese	0.78 (0.48 to 1.28)	1.13 (0.67 to 1.91)	1.88 (1.04 to 3.43)*	1.21 (0.72 to 2.04)	1.98 (1.08 to 3.61)*
Irish	0.56 (0.43 to 0.73)	0.84 (0.63 to 1.11)	0.83 (0.61 to 1.13)	0.85 (0.63 to 1.14)	0.83 (0.61 to 1.14)

*Significant p<0.05.

Table 4 Age- and sex-adjusted odds ratios for fair/poor general health in the first and second generation compared with a white reference population

	1st generation	2nd generation
Black Caribbean	1.41 (1.03 to 1.93)	1.44 (1.19 to 1.74)
Indian	1.44 (1.17 to 1.77)	1.34 (1.06 to 1.69)
Pakistani	1.45 (1.12 to 1.89)	1.46 (1.13 to 1.89)
Bangladeshi	2.75 (2.14 to 3.56)	1.58 (1.17 to 2.13)
Chinese	0.93 (0.69 to 1.26)	0.83 (0.56 to 1.23)
Irish	0.74 (0.51 to 1.07)	0.95 (0.78 to 1.15)

exposure to psychosocial risks in the workplace will also be encountered, as the second-generation populations establish themselves within areas of the labour market unoccupied by the first generation.[34] These risks may be experienced alongside new levels and forms of discrimination, with the second generation exposed to less extreme forms of discrimination and racism, but liable to a greater sense of the injustice caused by the gap between expectations of economic or legal equality and the realities of exclusion.[37] Barriers to healthcare, treatment and effective illness management may also differ by generation, which may subsequently affect how an individual reports their health. Causal analysis of such pathways is beyond the scope of this cross-sectional analysis, so continued development of panel survey data will be vital to the further exploration of differences in the experiences of each generation.

Whichever speculated pathway may be in operation, the data presented here does not support a role for acculturative changes in health behaviours in mediating intergenerational trends in fair/poor general health. Differences in health behaviours (eg, alcohol intake) provide evidence that health risks can be determined by general characteristics common to specific ethnic groups such as religion. Despite changes in these health behaviours across generations, suggesting a (variable) degree of acculturation taking place, these did not translate into a significant change in general health. It is possible that the self-reported general health outcome was insensitive to the effects of changing behaviours in the relatively young sample used. For instance, the second-generation black Caribbean group are likely to be too young to report an adverse effect on their general health as a consequence of a significant smoking uptake. Future analyses that make use of biomarkers that are specifically linked to key health behaviours, and are predictive of later life illness, may cast more light on the influence of the post-migratory cultural environment on health outcomes in the relatively young second generations.

There is, however, the possibility that the observed rates of social mobility are a consequence of the way data describe the first generation. Owing to possible downward mobility post migration for the first generation, it is unclear to what degree upward social mobility might be mediated by post-migration class reassertion and whether these trends in mobility will persist across future generations. It is plausible, then, that the next generations will find upward mobility more difficult than their predecessors, perhaps leading to a widening of the socioeconomic inequality gap, with an accompanying increase in the health gap between ethnic minorities and the general population.

The cross-sectional design of the Health Survey for England has important implications for intergenerational investigations. As with any cross-sectional study, any link between improving socioeconomic circumstances and general health is associational and not necessarily causal. Furthermore, the data are poorly equipped to manage differential cohort effects within each generation and ethnic group, resulting from exposure to different historical contexts as a consequence of differences in the period of migration. For example, despite attempts to standardise for age and social circumstances, recent migratory history meant that it is likely that some of the Bangladeshi second-generation sample in particular had not yet reached their final social position owing to their relatively young age. More specific cohort effects also require greater attention in future investigations as it is likely that changes in socioeconomic position take place alongside changes in identity which are driven by contemporary contexts. As a consequence of these changing attitudes, health perception may also differ across and within generations. Although previous studies have shown a strong association between self-rated health and mortality across a variety of ethnic groups, there are no published data available to validate the intergenerational persistence of this trend. It is also possible that generational variations in the length of residence mediated group differences in general health. Unfortunately, it was not possible to examine the impact of the length of residence reliably due to the co-linearity which existed between generational status, the length of residence and age. Lastly, this study was unable to examine sex differences in self-rated health, owing to the small sample size.

What is already known on this subject

- Ethnic minorities in England and Wales are more likely to report fair/poor health than the general white population.

What this study adds

- For black Caribbean, Indian, Pakistani and Bangladeshi groups, fair/poor general health is persistently more common in both generations than in their white English counterparts.
- Accounting for upward intergenerational social mobility suggests that the second generation has poorer general health than the first generation.
- Acculturative changes in health-related behaviours do not contribute to intergenerational trends in self-reported general health.

Summary

Improving socioeconomic circumstances mediated the extent to which fair/poor general health was reported. However, upward intergenerational mobility did not subsequently lead to improved levels of general health but, instead, only maintained the same level of health inequality across generations.

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