Ethnic inequalities in health: understanding the nexus between migration, deprivation change and social mobility

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Abstract

Ethnic inequalities in health, although widely observed, are not fully understood. Explanations for these inequalities are often overtaken by discussions of social inequalities in health or dismissed as the inevitable consequence of genetic and cultural differences determining health differences between ethnic groups. However, as society is becoming increasingly ethnically diverse, determining the nature of ethnic inequalities in health is ever more important, as is research evaluating whether and how health gradients are changing over time.

This thesis addresses these gaps in knowledge, examining the nature of ethnic inequalities in health and evaluating whether theories of selective sorting can help explain changing health gradients in the overall population or by ethnic group in England. Selective sorting is the process whereby differently healthy groups are sorted into different area types or social classes through migration, deprivation change and social mobility. Given the contrasting socioeconomic, spatial and health experiences of different ethnic groups in England it is likely that selective sorting may operate differently for different ethnic groups.

Using a variety of statistical methods, this thesis analyses data from the Health Surveys for England between 1998 and 2011, and the 1991, 2001 and 2011 Samples of Anonymised Records and ONS Longitudinal Study. This thesis notably finds that ethnic inequalities in health are better explained by socioeconomic and broad spatial difference than inherent features of different ethnic groups. However, an ethnic penalty may be operating which interacts with the already disadvantaged circumstances of certain ethnic groups further limiting their chances of good health. Transition between area types and social classes *can* contribute to widening health gradients for the overall population and by ethnic group. However, probability of transitioning varies between ethnic groups, with certain groups less likely to move away from areas becoming more deprived. This may further exacerbate existing health gradients.

For Herb

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Glossary of Terms

ASIRs Age-specific Illness Rates

BHPS British Household Panel Survey

BME Black and Minority Ethnic Groups

CIs Confidence Intervals

CoDE Centre on the Dynamics of Ethnicity

D Index of Dissimilarity

DCLG Department of Communities and Local Government

DWP Department for Work and Pensions

EQs Extremal Quotients

G Gini Coefficient

GOR Government Office Region

HSE Health Survey for England

LFS Labour Force Survey

LLTI Limiting long-term illness

LS Longitudinal Study

MEGs Minority Ethnic Groups

NHS National Health Service

NS-SeC National Statistics Socioeconomic Classification

ONS Office for National Statistics

ORs Odds Ratios

RGs Registrar General’s

RII Relative Index of Inequality

RRs Rate Ratios

SARs Samples of Anonymised Records

SC Social class

SEG Socioeconomic group

SII Slope Index of Inequality

SIRs Standardised Illness Ratios

SMRs Standardised Mortality Ratios

SMS Special Migration Statistics

UK United Kingdom

US United States

Chapter 1

Introduction

Ethnic inequalities in health are well documented yet poorly understood. Further, despite the well-established links between socioeconomic characteristics or place effects and health, less is known about why or how health gradients change over time, or indeed whether ethnic health gradients are changing over time. It is consistently demonstrated that health is socially and spatially graded. Belonging to higher social classes, earning more, higher levels of education and living in owner-occupied accommodation or less deprived areas are all associated with better health than less favourable social or spatial circumstances (Marmot, 1986; Davey Smith *et al*., 1997; Graham, 2000; Mackenbach *et al*., 2008; Wilkinson and Pickett, 2010; Gould and Jones, 1996; Stafford and Marmot, 2003). The pathways by which these varying socioeconomic and spatial circumstances influence health have been widely explored with conceptual frameworks explaining their influence helping us try and understand how these health inequalities occur. These range from theories of natural selection (see The Black Report, Department of Health and Social Security, 1980) to psycho-social (Wilkinson, 1997; Martikainen *et al*., 2002) or lifecourse (van de Mheen *et al*., 1998; Kuh and Ben-Shlomo, 1997) explanations.

Given the importance of socioeconomic determinants of health and their influence on health inequalities in society, the broader socio-political context of society is likely to be influential on changing health gradients. The rising economic prosperity enjoyed by England prior to the 2008 recession has been investigated in relation to health inequalities (Barr *et al*., 2012) with subsequent work exploring the impact of the recession (Institute of Health Equity, 2010; Stuckler *et al.*, 2011) or hypothesising as to the likely impact (Marmot and Bell, 2009). However, notwithstanding the likely relationships between rising or falling economic prosperity, explanations for why health gradients change over time are sparse.

The policy implications of this gap in knowledge are marked, particularly as there is convincing evidence to suggest that in some cases, these gaps in health are widening. For example, the gap in life expectancy between those at the top and bottom of the social hierarchy has widened (Blane *et al*., 1997; Blane and Drever, 1998; Drever and Whitehead, 1997; Hattersley, 1999; Johnson and Al-Hamad, 2011). Similarly, whether defined by the area in which a person lives (Levin and Leyland, 2005; Leyland, 2004; Shaw *et al*., 2005), or by area deprivation (Boyle *et al*., 2005; Norman *et al*., 2005; Raleigh and Kiri, 1997), those in more advantaged areas have seen greater improvements in their health than those in more disadvantaged areas. However, social and spatial gradients to health are not the only gradients which may have been changing over time as health gradients also manifest by ethnicity.

The population of England and Wales is increasingly ethnically diverse and this trend looks set to continue (Rees *et al*., 2011). In the 1991 Census, White groups comprised 94.1% of the population; by 2011 this had decreased to 86% (ONS, 2012). Distinguishing between White British and White Other, made possible by the expansion of ethnicity questions in the census, further reveals the extent of the population's increasing diversity. In 2011, 20% of the population of England and Wales identified with an ethnic group other than White British compared to 13% in 2001 (Jivraj and Simpson, 2015). The health experiences of these different ethnic groups are diverse, and cannot be reduced to differences between the White majority and the 'ethnic' minority. Despite the abundance of research on social and spatial inequalities in health, there has been a relative paucity of comparable research on ethnic inequalities in health. Yet in an ageing and increasingly ethnically diverse society within which chances of good health are not equitably distributed, relegating ethnic inequalities in health to the footnotes of wider health inequalities literature (to paraphrase West, 1991: 382), is not sustainable. Similar views are found in the growing body of work which does investigate ethnic inequalities in health. For example, Nazroo argues that ethnic inequalities in health reflect a "significant gap in current evidence and policy" (Nazroo, 2014: 90), apparent in the neglect of ethnic inequalities in health from the most recent substantive review of health inequalities in the UK (The Marmot Review, Institute of Health Equity, 2010). This thesis will contribute to closing these gaps in knowledge, advancing understanding as to the nature of ethnic inequalities in health and examining under-explored explanations for changing (ethnic) health gradients.

1.1 Changing health gradients

So what is driving changing health gradients? Further, can explanations of changing social and spatial health gradients help us understand (changing) ethnic health gradients? Amidst the wealth of health inequalities research, an under-explored aspect is that over time, changing health gradients may be due to processes of selective sorting between social classes and/or area types. It is this concept of selective sorting which is the main focus of this thesis.

Literature on selective sorting either focusses on selective migration and any associated changes in experience of deprivation (e.g. Boyle *et al*., 2002; Norman *et al*., 2005; Norman *et al*., 2011; Exeter *et al*., 2014) or social mobility and social selection (e.g. Dahl, 1996; Blane *et al*., 1993; 1999). Although debate on the influence of social mobility on health gradients has largely been rescinded since notable studies concluded that any sorting process between social classes constrains rather than widens health gradients (e.g. Bartley and Plewis, 1997; 2007), literature on selective migration and health has been steadily gaining momentum.

The concept of selective sorting thus encapsulates three distinct *mobility* processes: social mobility (relating to changes in social status through occupational change), residential mobility or migration (whether or not people change address), and deprivation mobility (if a person's residential area changes characteristics, whether or not they move). Whilst a number of studies have separately explored how selective sorting through social, residential or deprivation mobility may influence health gradients, no existing work has taken a more holistic approach to the study of these processes (although there are some notable exceptions partially considering these inter-dependencies such as Fielding's (1992a) work on migration and social mobility, or Platt's (2005a) discussion of social mobility, migration and ethnicity). The inter-dependency of these mobility processes can be exemplified by considering how a promotion, the resultant upward social mobility, and possible change of address to a differently deprived area may interact. Collectively, all three mobility processes may also be influenced by, or influence, health status. It might therefore be anticipated that an individual's health will benefit from this promotion and the move to a differently deprived area, but what of their health prior to the promotion or change of address? Are these upward steps through society and deprivation as likely for someone in poor health or with fewer health-enabling behaviours? More importantly, do opportunities for (un)favourable mobility vary between ethnic groups *and* by health status? Selective sorting operates when these opportunities for (un)favourable mobility *do* vary by attributes such as health or ethnicity, but the extent to which this sorting subsequently influences health gradients is widely disputed.

Drawing on developments in the selective migration literature which highlight problems with the analytical frameworks employed in social selection studies and indeed some of the existing selective migration work, this thesis will rejuvenate this area of research, taking a holistic approach to the investigation of these sorting processes and health gradients. Given the high degree of inter-dependence between social mobility and geographic mobility, a long-established if largely neglected association (Savage, 1988; Fielding, 1992a), and the possible analytical failings of extant literature in either field, it is possible that a fresh analysis may be revealing as to the nature and extent of widening health gradients.

However, updating and rejuvenating these typically distinct areas of academic enquiry is not the primary aim of this thesis. Rather, it is to further understanding as to the nature of *ethnic* inequalities in health. Only through a more detailed understanding of the nature of these inequalities can we hope to find the required evidence to close Nazroo's 'significant gap'. This evidence *will* follow from:

> "an understanding of the determinants of the differential distribution of health problems among racial or ethnic groups … *as a prerequisite to the development and direction of effective programs and services to address them".*

Williams *et al*., 1994: 27, emphasis added.

1.2 Thesis intent

This thesis will further existing work striving to prioritise ethnic inequalities in health within policy while also investigating whether theories of selective sorting between area types *and* social classes may have a role in perpetuating or widening (ethnic) health gradients. The originality of this research rests in the effort to unite discussions of social mobility and selective migration while developing analytical frameworks which are able to capture the diverse sorting of differently healthy ethnic groups within England. The work is therefore grounded in broader academic efforts to further research on health inequalities, mobility processes, ethnicity and health.

Conclusions reached will provide evidence as to the nature of ethnic differences in health and whether these have changed over time during a period of increasing ethnic diversity. This will be achieved by demonstrating these inequalities are unjust insofar as they are rooted in socioeconomic and spatial difference, and analysing trends in self-reported health over time. Further, this will reveal how differences in the opportunity to move away from deprivation or climb the social hierarchy may be perpetuating ethnic differences in health while also creating 'residualised' populations with ever-deteriorating health. Recognising how ethnic differences in health are perpetuated whilst striving to address the broader socioeconomic and spatial inequalities between ethnic groups which contribute to these health inequalities is a vital step in a society experiencing major demographic change.

It should be noted that the population of Wales is excluded from this analysis as despite increasing ethnic diversity across England *and* Wales, Wales is much less ethnically diverse than England. For example, in 1991, 93.8% of England's population identified as White compared to 98.5% in Wales (1991 Census data via CasWeb). By 2011, this had fallen steeply to 85.3% in England. However, Wales saw a much smaller decline with the White population only falling to 95.5% (2011 Census data via InFuse). Further, the context of 'ethnicity' in Wales and England is different given the complex and occasionally tense histories of, and relations between those who identify with 'White British' and/or 'Welsh'. As will later be discussed (see chapter 2), the socio-political context and historical legacy of a society's conception of ethnicity is important to definitions of ethnicity, and therefore to investigations concerned with ethnicity. In light of the contrasting ethnic contexts between England and Wales, it is possible that the meaning and salience of ethnicity will vary between the two countries and therefore have different implications for health and socioeconomic inequalities.

1.3 Aims and objectives

The overarching aims of this thesis, as noted above, are first to explore the nature of ethnic inequalities in health and second, to investigate whether selective sorting between area types and social classes contributes to changing health gradients in England within the overall population, and more importantly, whether this varies between ethnic groups. Research into inequalities in health, including some of the existing literature on selective sorting's contribution to (changing) health gradients, often uses cross-sectional data. Although this is not without exception (e.g. Norman *et al.*, 2005; Halleröd and Gustafsson, 2011), cross-sectional analysis does not account for the reality that people are not static in place, socioeconomic status or personal attributes. Any research into selective sorting which depends on people's ability to change area type or social class *must* use longitudinal data to establish the extent to which selective sorting is contributing to changing health gradients. A mixture of cross-sectional and longitudinal data will therefore be analysed to address the aims of this thesis. To achieve these aims, the following research objectives are identified.

This thesis will:

1. **Illustrate why further research into ethnicity, health and ethnic inequality should not be marginalised in wider health inequalities research and policy;**

This objective will run through the arguments presented throughout these pages. It will, however, be particularly apparent in the following chapter's discussion of the concepts and contexts of health and ethnicity.

2. **Review literatures relating to a) migration, deprivation mobility, social mobility and (changing) health gradients to demonstrate their inter-dependence, and b) variations by ethnic group;**

Detailed discussion of the literature informing this thesis will be split across the relevant analytical chapters. The following chapter, normally reserved as a literature review, is an exploration of the high level concepts involved in this thesis rather than a review of all pertinent literature. This will introduce chapter 4's analysis of the Health Surveys for England which will revisit some of the salient points regarding ethnic experiences in society and the relationship with ethnic inequalities in health. Chapter 5's analysis introduces 'migrants' into the analytical framework and will therefore begin with a discussion of migration and health, highlighting in particular the selective nature of migration and therefore, the characteristics which distinguish migrants from non-migrants. The contribution of selective sorting to health gradients will then be substantively explored in existing literature in chapter 7 which will also explore research into social mobility and ethnicity, deprivation, ethnicity and immobility, and their overall relationship with health in more detail. This will precede the longitudinal analysis within which transitions between area types and social classes by health status, ethnic group and migrant status can be investigated. All discussed literatures will be revisited as required in discussing the overall results of this thesis.

3. **Identify gaps in existing research on selective sorting and health inequalities;**

The chapter specific reviews will reinforce gaps in existing research on selective sorting and health inequalities identified in this introduction and discussed in more detail in chapter 2.

4. **Develop an analytical framework appropriate for the study of the inter-dependent mobility processes and health;**

The identified gaps in the literature will inform the development of an appropriate analytical framework for the study of the inter-dependent processes explored in this thesis.

5. **Analyse trends and patterns in population health by ethnic group in recent decades;**

All analytical chapters, whether using cross-sectional or longitudinal data, explore the patterning of population health by ethnic group at particular points in time.

6. **Explore the nature of ethnic inequality in England's society;**

Analysis of each dataset will explore the nature of socioeconomic, spatial and health inequality between ethnic groups and whether the magnitude of inequality has changed over time.

7. **Examine the nature of relationship between migration and health by ethnic group;**

Chapter 5 will explore how rates of migration vary according to socioeconomic attributes, health status, ethnicity and age. The relationship with health will be further explored in chapter 6 using regression modelling to identify the contribution of migration to differences in health between ethnic groups.

8. **Analyse whether transitions between area types or social classes influence the patterning of health by social class or deprivation for different ethnic groups.**

Chapter's 7 and 8 will use longitudinal data to track individuals over time, identifying different groups transitioning between social classes and deprivation quintiles to explore how this movement influences health gradients.

By using a mix of cross-sectional and longitudinal data, a clearer picture will be painted, first illustrating how health gradients and ethnic profiles have changed over time, and second revealing whether selective sorting a) varies between ethnic groups and b) contributes to changing (ethnic) health gradients. The chapters of this thesis will each contribute to a different part of this picture, progressively building towards a clear argument as to the importance of selective sorting in changing health gradients and our understanding of ethnic inequalities in health. The concepts and context of health and ethnicity are explored in the next chapter.

Chapter 2

Health and Ethnicity: Concepts and Context

2.1 Introduction

The core concepts for this research and the focus of this chapter’s discussion are health and ethnicity. The discussion acts as an exploration of the high level concepts investigated within these pages while introducing key ideas and theories in terms of their relationship to existing literature on health or ethnicity, rather than a detailed account of all literatures informing this thesis. Later chapters will return to some of the sources discussed here, exploring the arguments in more detail and drawing upon wider literatures as required. This chapter therefore grounds the thesis in the context of broader investigations into ethnicity and health, particularly amongst those prioritising socioeconomic explanations for (changing) ethnic health gradients. Although some of the literatures relating to the central concepts for this thesis, that of internal migration (or residential mobility), deprivation mobility and social mobility are introduced in this chapter, these will be substantively revisited in the relevant empirical chapters of this thesis.

This chapter is divided into two sections: the first addresses health while the second addresses ethnicity. Section one begins by defining health, discussing how it is recorded, collected and investigated in contemporary research. The discussion then turns to health inequalities, looking to key literatures on the drivers of these inequalities and discussion of the relevant conceptual debates. The final part of section one will introduce the concept of selective sorting, outlining how this concept may help explain changing health gradients.

The chapter then turns to ethnicity, a multi-dimensional concept often poorly defined in research. The relationship between ethnicity and health is complex: a lack of ethnic detail in routine datasets hampers efforts to disentangle these complexities. Nevertheless, a sizeable body of research documents ethnic differences in health, although the pathways by which these differences emerge remain unclear. The discussion of ethnicity will therefore begin by defining the concept while highlighting the inherent ambiguities of any definition of such a fluid and dynamic concept. Literature on ethnicity and health will then be examined before exploring arguments as to the drivers of ethnic inequalities in health. The section will conclude by outlining why the concept of selective sorting may be revealing when applied to changing ethnic health gradients. The final task of this chapter is to present the conceptual framework underpinning the analysis within this thesis.

2.2 Health

2.2.1 Conceptualising health

The World Health Organisation (WHO) defines health as "a state of *complete* physical, mental and social well-being and not merely the absence of disease or infirmity" (1948, emphasis added). To be in such a state would be no small feat: this definition in fact leaves many of us in less than good health most of the time (Smith, 2008). The need for complete well-being limits the practical use of the WHO's definition of health in population health research, neither defining 'well-being' nor being applicable to an ageing population with a growing prevalence of chronic disease (e.g. Jadad and O'Grady, 2008; Huber *et al*., 2011). The limitations of this definition and the need to adequately conceptualise health are the subject of many academic studies (e.g. Brülde, 2000; Boorse, 1977; Engel, 1960; Nordenfelt, 1995; Twaddle, 1974). However, comprehensively reviewing these debates would be a substantial undertaking and is outside the scope of this chapter. Nevertheless, it is important to recognise the conceptual ambiguity of 'health' and not assume that what constitutes good health or a state of "complete… well-being" is universal. This recognition is particularly important when conducting population health research within increasingly multi-ethnic societies influenced by a multitude of cultures and beliefs.

2.2.2 Self-assessed health and Limiting long-term illness

This thesis adopts two regularly used measures of health status, self-assessed general health and self-reported limiting long-term illness (LLTI), each with their own (dis)advantages. Population health research is dominated by measures such as these, independent of any clinical diagnosis or assessment of disease severity (Kind *et al*., 1998). These enable investigation of "the health outcomes of a group of individuals, including the distribution of such outcomes within the group" (Kindig and Stoddart, 2003: 381). Although both measures are extensively used, as demonstrated throughout this thesis, they are not without limitation. Estimates of population health and reporting on health inequalities according to these outcomes may be biased through the data collection or variations in interpretation of the questions over time, between cultures, and by individuals. Such variation is inherent in the ambiguity of the concept of health or illness (Hunt *et al*., 1991).

Health and associated well-being is as much a social construct as a medically quantifiable one. Whilst clinical diagnosis of symptoms can confirm the state of poor health through the presence of disease, these symptoms do not necessarily equate to poor health for an individual or unsatisfactory well-being. For example, Hannay (1978) surveyed 1,344 participants in Glasgow and found that 12% had signs of chronic bronchitis. However, as Hannay (1988) discussed, this was not necessarily considered as an illness as it is a normal occurrence for many. As socially constructed conceptions of health vary, so too may cultural conceptions of health. Individual expectations of health, happiness and life will therefore vary according to personal beliefs, the socio-political context an individual inhabits and by their cultural background (Hunt *et al*., 1991). Due to the distinct beliefs and experiences of different cultural or social groups, the validity of subjective measures of health may therefore be questioned as comparison assumes that each individual makes the same assessment of their personal internal state (Angel and Gronfein, 1988). For example, one study found that being overweight is "the most socially desirable body size" amongst Senegalese women (Holdsworth *et al*., 2004: 1561): the self-assessments of health from overweight Senegalese women will likely vary to those living in a society where being overweight is considered detrimental to health.

Thus, individual responses to a five scale measure of self-reported health (e.g. very good, good, fair, poor, very poor) may vary between societies and cultures irrespective of comparable clinical symptoms or diagnoses. Studies have demonstrated that the relationship between self-reported health and mortality varies not only between cultures, owing to variations in cultural and linguistic conventions of describing symptoms and health status which may influence self assessments of health (Zola, 1996), but also over time (Mitchell, 2005). The reliability of responses to self-reported measures of health also varies according to the nature of the survey, with respondents more likely to divulge health conditions in a written survey than verbally (Tourangeau and Smith, 1996; Grootendorst *et al*., 1997). Survey content may also bias responses. For example, Taylor *et al.* (2014) found that the Health Survey for England (HSE) over-estimated poor health or LLTI for most regions when compared to results from the census, although these larger estimates are not necessarily a false picture of population health. Indeed it may be assumed that respondents to a health survey, such as the HSE, will be predisposed to confirm poor health if present with the survey content encouraging more candour about health than elicited in the census.

Crossley and Kennedy (2002) found that both the nature of the survey and the framing or sequencing of the questions attenuates individuals' responses. Foster *et al*. (1990) found that lower estimates of LLTI were found where respondents are asked about specific illnesses before asking whether they are limited by their illness (others have similarly found that question order can influence assessments of health in health surveys, although the influence may be small, e.g. Bowling and Windsor, 2008). Differences in responses have also been found to vary by age, income, occupation and education (Sturgis *et al*., 2001; Crossley and Kennedy, 2002; Altman and Gulley, 2009).

Whilst caution is evidently required, both self-reported health and self-reported LLTI are useful measures of population health and valid measures for this thesis. Self-reported health is extensively used, becoming increasingly prominent in health-related research since the 1950s

(Jylhä *et al*., 1998; Jylhä, 2009). Typically following a Likert scale style, individuals are asked to rate their health against four or five points: this measure of health spans academic disciplines and national boundaries. Further, the WHO (1996) recommends its inclusion in all health surveys, giving respondents the option to identify their health as very good, good, fair, poor or very poor. Variations exist between countries and between *and within* surveys: for example, the 2001 UK Census asks respondents if their health has been good, fairly good or not good, but expanded this to very good, good, fair, bad or very bad in 2011 (ONS, 2001; 2011). Whilst multiple studies have investigated the nature of this self-reported measure of health (e.g. Idler, 1979; Idler and Benyamini, 1997; Idler *et al*., 2004; Benyamini *et al*., 1999), it remains unclear as to why this measure so consistently and strongly associates with mortality (Jylhä, 2009). However, this has been widely explored (e.g. Benyamini and Idler, 1999; DeSalvo *et al*., 2006) and the detailed findings need not be repeated here.

For the purposes of the analysis in this thesis, it is sufficient to recognise that despite possible differences in the interpretation, self-reported health provides an accurate and valid measure of population health. This has been widely demonstrated through the positive association between self-reported health and morbidity or mortality (Benjamins *et al*., 2004; Larsson *et al.*, 2002; Nybo *et al*., 2003; Tessler and Mechanic, 1978; Farmer and Ferrar, 1997; Burström and Fredlund, 2001), and its ability to predict health services use (Miilunaplo *et al*., 1997; Saxena *et al*., 2002). Reports of self-rated health have also demonstrated good test and re-rest ability (Lundberg and Manderbacka, 1996).

Nevertheless, identifying where variations in the evaluation of personal health may arise can help researchers interpret results of self-reported health, particularly from diverse multi-ethnic populations. Jylhä's (2009) framework outlining how individuals evaluate their health is illustrative of the key aspects where variation in the interpretation of the question may arise. Figure 2.1 adapts Jylhä's framework for evaluating health, important to discussions of ethnicity and interpretations of health. Variations in the interpretation of the question manifest through differences in the contextual frameworks of evaluation, i.e. the cultural, social and historical conceptions of health individuals are exposed to; the reference groups used to assess personal health; and the extent to which it is accepted to positively or negatively evaluate personal experiences.

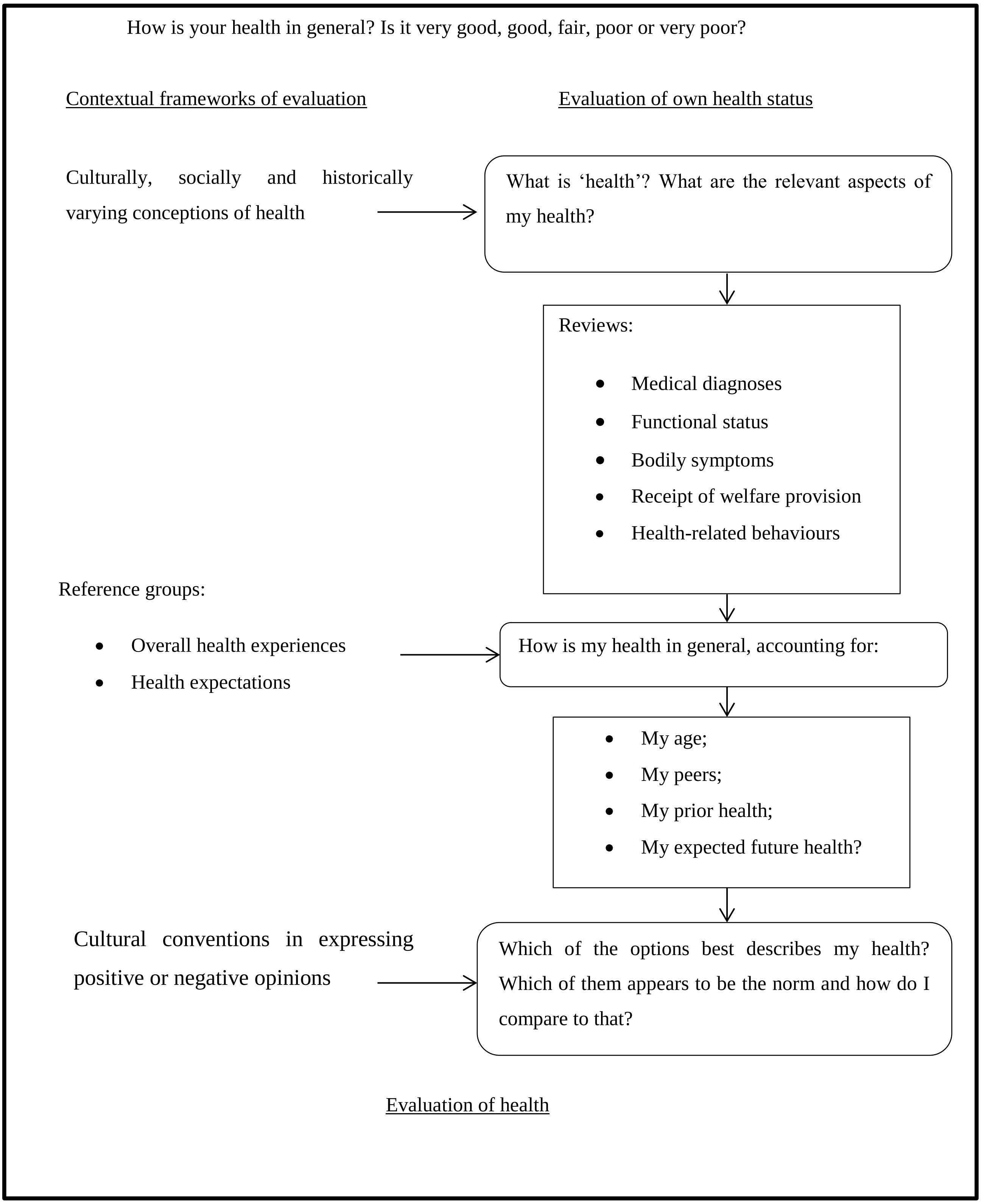


Figure 2.1 Evaluating individual health

Source: after Jylhä, 2009: 309.

Limiting long-term illness (LLTI) is also increasingly used in health-related research. First included in the 1991 Census, LLTI has strong significant associations with 35 of the items on the short form (SF) 36 health survey (Cohen *et al*., 1995), itself a valid indicator of population health in Britain (Brazier *et al*., 1993; Garratt *et al*., 1993; Lyons *et al*., 1994). LLTI's validity is further demonstrated by Dale (1993) who found strong correlations with data from hospital episodes (in- and out-patient visits) and GP consultations. Manor *et al*. (2001) also found strong associations between self-reported health and LLTI. Manor *et al.* (2001) further demonstrated that both LLTI and self-assessed health are strongly associated with serious health conditions such as epilepsy, cancer and diabetes, but also with lesser conditions such as eczema and hay fever. However, the associations for the lesser conditions are weaker.

LLTI is also widely used in existing research on selective sorting and health gradients (e.g. Harding, 2003; Boyle *et al*., 2004; Norman *et al*., 2005; Norman *et al*., 2011; Bartley and Plewis, 2007). Its use in this thesis therefore ensures results are comparable with previous literature. However, it should be considered that the wording of the question on LLTI may encourage respondents to only assess their physical health, excluding broader psychosocial aspects of mental and social well-being (Cohen *et al*., 1993). Further, results may be susceptible to changes in the wording of the question over time (discussed below).

2.2.3 Operationalising health

This thesis uses three different datasets to investigate ethnicity, health and selective sorting within which variables on self-reported health and LLTI can be found. However, there are some important variations which must be considered, particularly in light of the possible bias that can be introduced through survey content and the framing of the questions. This section serves only to highlight these differences, and will not substantively discuss either the datasets used or the implications of the differences (see chapter 3 and chapter 9).

Firstly, the Health Survey for England (HSE) is used to investigate the nature of ethnic inequalities in health in England, and explore whether these inequalities have changed between 1998 and 2011. This thesis then uses cross-sectional and longitudinal census microdata. As noted above, while the health survey has been found to overestimate levels of poor health in the population in contrast with census data (Taylor *et al*., 2014), these estimates are not necessarily false. However, the possible over-estimation of poor health may be attenuated as HSE data is obtained via face-to-face interviews: some respondents may be less candid in their responses (Crossley and Kennedy, 2002). Conversely, the census has a much broader content and this may prompt different responses from respondents who might otherwise confirm or deny poor health in a more targeted survey. Further, census forms are self-completed with may encourage more candid responses to health questions.

Secondly, there are some minor, albeit important, variations in the questions asked on either self-reported health or LLTI, both between the surveys and within the surveys by year. Although minor and therefore unlikely to substantively bias the results obtained, it is worth noting any variations which may influence results. In the census, the word ‘handicap’ was replaced with ‘disability’ between the 1991 and 2001 in the question on LLTI. Marshall and Norman (2013) review some of the issues arising from this change in question wording, pointing to the work of Bajekal *et al*. (2003) who suggested that lower levels of LLTI observed in 1991 compared with 2001 may be attributable to an unwillingness of respondents to label themselves as handicapped rather than disabled. However, as Marshall and Norman (2013) point out, the utility of LLTI has elsewhere been demonstrated through its strong associations with mortality (Bentham *et al*., 1995; Idler and Benyamini, 1997) and its ability to predict access to welfare benefits (Bambra and Norman, 2006; Norman and Bambra, 2007). Thus, for the purposes of this research and all others making use of these data, it is merely necessary to consider whether population health is under- or over-estimated in light of the variations, rather than entirely discount the results. Table 2.1 summarises the differences in question wording. Where appropriate, the implications of these differences will be considered within the discussion sections for these analyses.

Table 2.1 Health outcomes: Variations in availability and question wording

Health outcome	Health Survey for England		Census microdata	
Self-reported health	1998-2011	How is your health in general? Would you say it was very good, good, fair, bad or very bad?	1991	Not available
			2001	Over the last twelve months would you say your health has on the whole been: good, fairly good or not good?
			2011	How is your health in general? Very good, good, fair, bad or very bad?
LLTI	1998-2011	Do you have any long-standing illness, disability or infirmity? By long-standing I mean anything that has troubled you over a period of time, or that is likely to affect you over a period of time? (Yes or No)	1991	Do you have any long term illness, health problem or handicap which limits your daily activities or the work that you can do? Include problems which are due to old age. (Yes / No)
			2001	Do you have any long term illness, health problem or disability which limits your daily activities or the work that you can do? Include problems which are due to old age. (Yes / No).
			2011	Are your day-to-day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? (Yes, limited a lot; Yes, limited a little; No)

2.2.4 Health inequalities

Social and spatial inequalities in health have long been researched (e.g. Townsend *et al*., 1988; Shaw *et al*., 1999; Bajekal *et al*., 2013; Barr *et al*., 2012) with discussion of inequalities in health as much a part of academic rhetoric as public debate (e.g. Siddique, 2014). However, although the term ‘inequality’ is widely used, it is not always fully explained. The intent of this thesis, as outlined in the previous chapter, is to advance understanding as to the nature of ethnic inequalities in health, as well as examining the contribution of selective sorting to (changing) health gradients. Conceptual clarity is therefore important, particularly given the normative connotations that are associated with discussions of ‘inequality’ and the relationship with ‘inequity’.

Health inequality simply refers to measurable differences in the health of different population subgroups or places (Shaw *et al*., 2007). However, for some the concept is more value-laden. Rather than only referring to quantifiable differences, the use of the word ‘inequality’ suggests that the differences in health should be reduced through intervention. The implicit values associated with inequality are analogous to those made explicit in the concept of health inequity. According to Kawachi *et al*. health inequities are “those inequalities in health that are deemed to be unfair or stemming from some form of social justice” (2002: 56). Although Shaw *et al*. (2007) similarly refer to the social significance attached to inequities rather than inequalities, the authors describe inequities more in terms of the (un)fair distribution of resources or access to services in relation to need rather than in relation to health outcomes. Notwithstanding, the use of the term ‘inequity’ generally follows from a normative assessment of differences in health, determining that the differences are unjust or unfair (Kawachi *et al*., 2002: 57). Such assessments are subjective and cannot be empirically proven.

The ability to empirically demonstrate health inequalities therefore lends itself to research seeking to quantify differences in health between population subgroups specifically with the intent of contributing to efforts to flatten these gradients. Implicit in the aim to flatten these gradients is the normative assumption that they should be flattened, and, as it is assumed that health inequalities arise from differential access to social determinants of health and less deprived areas, are therefore caused by ‘modifiable differences’ (Shaw *et al*., 2007:11). Although this may arguably constitute an inequity, as an empirical piece of research this analysis is better served by discussions of *inequality* rather than *inequity.*

Health inequalities manifest in a number of ways. Whether measured by specific morbidities such as cardiovascular disease (Mackenbach *et al*., 2000; Diez-Roux *et al*., 2000; Kim *et al*., 2008) or diabetes (Bachmann *et al*., 2003; Espelt *et al*., 2008; Imkampe and Gulliford, 2011), mortality (Mackenbach *et al.*, 1997; Marmot, 2005; Boyle *et al*., 2005; Salti, 2010), self-reported health (van Doorslaer and Jones, 2003; Kunst *et al*., 1995; Chandola *et al*., 2007; Dunn, 2002; Mackenbach and Kunst, 1997; Marmot *et al*., 1991; Kunst *et al*., 2005) or LLTI (Shouls *et al*., 1996; Bartley and Plewis, 2002; Norman *et al*., 2005; Bentham *et al.*,1995; Gould and Jones, 1996; Boyle *et al*., 2002), inequalities in health are widely documented in contemporary society. There are a number of different conceptual approaches to explaining inequalities in health, including the selection effects primarily examined here, but also in terms of general social determinants of health (Marmot, 2005) or more specific explanations based in behaviour or cultural factors (e.g. Blaxter, 1990), psycho-social models (Marmot and

Wilkinson, 1999), or lifecourse approaches (Ku and Ben-Shlomo, 1997). These approaches are not necessarily mutually exclusive, with many of the models illustrative of the different pathways by which social determinants of health can influence health (e.g. see WHO, 2010). The importance of social determinants of health underpins much of the extant literature on inequalities in health: common to much of the literature is the idea that health inequalities manifest through socioeconomic and spatial inequalities.

Health is socially and spatially graded with inequalities observed by social class, income, educational attainment and area-based deprivation (Smith *et al*., 1997; Graham, 2000; Mackenbach *et al*., 2008; Wilkinson and Pickett, 2010; Stafford and Marmot, 2003). Belonging to higher social classes and earning more, being more highly educated and living in a more advantaged area are all associated with good health and health-enabling behaviours (Exeter *et al*., 2014). For those less favourably situated, their chances of good health and their uptake of health-enabling behaviours are much lower. To exemplify, Table 2.2 presents age and sex standardised mortality ratios (SMRs), rate ratios of the SMRs for the best and worst off areas, and the Relative Index of Inequality (RII) for ages 0-74 in Britain between 1990 and 2007 according to tenth of poverty (Thomas *et al*., 2010). The RII, a measure used within this thesis, quantifies the magnitude of the association between the socioeconomic attributes investigated (e.g. poverty) and the health outcome (e.g. mortality) (Shaw *et al*., 2007). It is a summary of relative differences in health across the population: the greater the value of the RII, the greater the inequality (see chapter 3 for discussion of the RII and associated measures). Poverty is measured according to the 2000 Breadline Britain Index which factors in lack of perceived necessities in life. Rate ratios of the worst off (poorest) to the best off areas have increased between 1990 and 2007 suggesting that the gap in life expectancy between the most advantaged and the most disadvantaged has widened. This is further evidenced by the increasing RII which accounts for the morality rates in all areas, rather than just the worst and best off.

More recently, the Slope Index of Inequality (a measure also used within this thesis) (SII), a summary of absolute rather than the relative differences in health summarised in the RII, has indicated that differences in healthy life expectancy between the most and least deprived areas of England and Wales are 19.1 years for men and 19.5 years for women (ONS, 2015). Although this represents a slight decrease from the previous figures released by the ONS for 2010-12, the persistence of this deprivation gradient to mortality alongside other possibly steepening gradients is a major public health concern. Indeed Johnson and Al-Hamad (2011) found that socioeconomic inequalities in mortality for women increased between 2001 and 2008. Ineffective policy may, in part, be due to an inadequate understanding of what drives changing health gradients.

Table 2.2 Age and sex standardised mortality ratios and relative index of inequality for ages 0-74 according to tenth of poverty, 1990-2007

Poverty tenth	1990-1	1992-3	1994-5	1996-7	1998-9	2000-1	2002-3	2005-4	2006-7
1 (poorest)	129	132	135	137	138	139	138	138	140
2	116	118	118	120	121	119	121	121	123
3	113	115	114	115	115	116	117	117	117
4	105	107	106	108	109	109	107	108	108
5	103	102	102	101	103	103	103	103	104
6	96	94	95	94	95	95	96	95	97
7	91	90	90	90	89	90	90	90	90
8	86	86	85	85	84	84	85	86	84
9	85	83	83	82	81	81	81	81	79
10	80	79	79	78	77	76	76	76	75
Rate ratio	1.61	1.67	1.71	1.76	1.79	1.83	1.82	1.82	1.88
RII	1.61	1.67	1.71	1.81	1.86	1.86	1.90	1.91	2.14

Note: Rate ratio (worst: best); RII = Relative Index of Inequality.
Source: Thomas *et al*., 2010: 2.

The entrenchment of health inequalities both in academic circles and the policy agenda followed the publication of the Black Report in 1980 (Department of Health and Social Security, 1980; Townsend *et al*., 1992). Since this report, successive government administrations have differently targeted health inequalities, focusing on a range of outcomes such as reducing differences in life expectancy or infant mortality (Department of Health, 2003). Subsequent policy recommendations to close widening socioeconomic health gaps have concentrated on social determinants of health; the lifecourse; different dimensions of inequality such as gender and ethnicity; and the role of the National Health Service (NHS) (Department of Health, 2009). The success of these policies is questionable, particularly as gaps in health persist (Department of Health, 2009). This is further exemplified by the SII summarised in Table 2.3: differences in life expectancy by area level poverty in England and Wales increased between 1992 and 2003 (Shaw *et al*., 2005).

Table 2.3 Slope Index of Inequality for Life Expectancy by area level poverty, Great Britain

	1992-1994	1995-1997	1998-2000	2001-2003
Total	3.71	3.69	3.80	3.87
Males	4.47	4.5	4.57	4.64
Females	3.00	2.94	3.08	3.12

Source: Shaw *et al*., 2005: 1019.

2.2.5 Changing health gradients

Despite an abundance of research investigating social and spatial inequalities in health, little is known about why these gradients may change over time. An under-explored but increasingly discussed explanation for changing health gradients relates to the concept of selective sorting. Selective sorting variously appears in the health inequalities literature under the guise of selective migration (e.g. Boyle, 2004) or social selection (e.g. Dahl, 1996). For both selective migration and social selection, the premise of selective sorting is that differently healthy individuals will be 'sorted' according to their health status and other sociodemographic attributes into different area types or social classes. Whilst this premise is generally agreed upon, the extent to which this sorting process can influence health gradients, and the manner of its influence, is contested.

For either selective migration or social selection to have a significant and widening influence on health gradients, it is argued that the health of those sorted into the more advantaged areas must be substantially better than the health of those who are drifting down towards more disadvantaged circumstances (e.g. Bartley and Plewis, 1997). However, as the health of the mobile groups is generally found to be somewhere between the health of those in the destination and those in the origin (Manor *et al*., 2003; Claussen *et al*., 2005), it is argued that this sorting process cannot widen health gradients. For example, researchers investigating social selection through social mobility either assert that the sorting process has too small an effect to be significant (Blane *et al*., 1993; 1999; van de Mheen *et al*., 1998; Chandola *et al*., 2003) or, that social selection through social mobility actually constrains health gradients (Bartley and Plewis, 1997; 2007).

There are similarly divergent conclusions within the selective migration literature although more recent evidence, particularly in the UK, illustrates that selective migration can widen health inequalities (Boyle *et al*., 2004; Norman *et al*., 2005; Norman *et al*., 2011). However, studies have found that the geographic scale is important, with no evidence of selection effects contributing to neighbourhood inequalities in health (van Lenthe *et al*., 2007) or variations in health at the regional level (Brimblecombe *et al*., 1999). Martikainen *et al*. (2008) concluded that selective migration's influence on geographic variations in health is too small to be significant.

Competing conclusions on selective sorting deserve further investigation, particularly given arguments by Boyle *et al*. (2009) questioning the analytical framework adopted in analyses of selective sorting and health gradients. Boyle and colleagues suggest that to understand the influence of selective sorting on health gradients, whether through social mobility or selective migration, comparisons should be drawn between the in/out mobile flows rather than between mobile and immobile groups. Further, no research explicitly accounts for the high degree of inter-dependency between migration and social mobility, a long-established if largely neglected association (Savage, 1988; Fielding, 1992a). However, as these two processes are inter-related, with changes to socioeconomic status or social class often accompanying a change of address, it is important to consider both with respect to changing health gradients. The literatures on selective migration and social mobility and their relationship with health will be revisited in later chapters analysing census microdata. These later discussions will highlight the inherently selective nature of migration, and the extent to which opportunities for upward or downward social mobility vary by sociodemographic attributes. It is the ‘selective’ aspect of these sorting processes which triangulates attention on ethnicity. More importantly, if the selective nature of migration or differences in opportunities for social mobility is contingent on sociodemographic attributes such as ethnicity, differences in the nature or operation of these sorting processes between ethnic groups may help explain (changing) *ethnic* health gradients.

2.3 Ethnicity

Ethnic inequalities in health are as persistent as the widely documented social and spatial inequalities in health, yet it has been argued that these inequalities reflect a “significant gap in current evidence and policy” (Nazroo, 2014: 90). The poorly defined concepts of ‘race’ and ‘ethnicity’ (McKenzie and Crowcoft, 1994) may explain much of this gap, with Loveman (1999) arguing that a lack of conceptual clarity has meant that conclusions about ethnic differences are not discussed in terms of the social mechanisms through which race or ethnicity can determine social, or in turn, health outcomes. By implication, ethnic or racial differences are then because of differences between the ethnic or racial groups, rather than wider structural or contextual factors in society. So what is meant by ethnicity and is it distinct from race?

2.3.1 Defining ‘ethnicity’, distinguishing ‘race’

Tracing the evolution of the concept of race is not a pretty journey (Gould, 1977; 1981): inherent to this socially constructed taxonomy (Williams *et al*., 1994) is the belief that some human groups are superior to others, divided by their physical features and apparently inherent biological differences. Advances in genetics have discredited this notion, demonstrating that grouping different populations as races does not accurately reflect any underlying genetic variation (Smaje, 1995), thus negating race’s utility for meaningful scientific research investigating health variations (Cooper, 1984; Rathwell and Phillips, 1986). Indeed a recent systematic review of genomic-wide research found little evidence that ethnic differences in health can be attributed to genetic differences between ethnic groups (Kaufman *et al*., 2015). Similarly, Rochford (2011) found little evidence to suggest that genetics are a major cause of health inequalities between Maori and non-Maori groups in New Zealand. In discrediting the scientific basis for the concept of race, its continued use serves only to justify the inferior treatment of certain population subgroups (Cooper and David, 1986). To reiterate Loveman (1999), where race persists in health-related or epidemiological research, this dismisses the health needs arising within the so-called racial groups as inevitable features of genetic difference, absolving any responsibility to address the social structures or policies which may perpetuate those health needs (Williams *et al*., 1994). Notwithstanding these fundamental problems, the concept of race has not been completely dismissed from the lexicon of health research, particularly that originating in the United States.

Research in European countries, including here in the UK and countries like Australia or New Zealand tends to focus on the concept of ethnicity. Although with no genetic basis, explanations of ethnic difference have still been sought in terms of genetic difference as Smaje (1995) points out (see Lock, 1994; Senior and Bhopal, 1994). Thus, even setting aside race, the lack of conceptual clarity on ethnicity also permits the dismissal of ethnic differences in health as an inevitable outcome of inherent differences in each ethnic group (Nazroo, 2014). To borrow Nazroo's summation of Sheldon and Parker's (1992) argument, viewing ethnicity as naturally divided groups in society "allows the *description* of ethnic variations in health to become their *explanation*" (Nazroo, 2001: 40). It is worth noting that explanations of differences in health based on inherent differences between ethnic groups are not entirely without merit. Whilst there is very little scientific basis for the socially, politically and historically constructed concepts of either race or ethnicity, there is some association between these socially assigned ethnicities or races and certain genetic features related to health (Smaje, 1995). However, these associations are not sufficient to explain broader ethnic differences in health, nor do they negate any political responsibility for social structures which perpetuate health inequalities.

Ethnicity is generally used to distinguish between populations who share a collective cultural heritage through shared ancestry and geography, influencing lifestyle choices, beliefs, language and religion (Fenton, 2005; Schermerhorn, 1978; Weber, 1978), whether real or 'imagined' (Anderson, 1991). In the UK, White British or White would therefore constitute as an ethnic group, particularly in a society where physical appearance is closely entangled with conceptions of ethnicity. However, everyday use of the word 'ethnic' tends to refer to something different, exotic or foreign. Minority ethnic groups (MEGs) are therefore viewed as different from the norm, visibly distinct in skin tone and culturally or socially distinct in lifestyles and beliefs. In fact, as 'ethnicity' replaced 'race' in health research, so too did 'ethnicity' replace 'culture', 'cultural' or 'tribal' in anthropological research (Cohen, 1978). Different socio-political contexts will emphasise different facets of 'ethnicity', varying according to their political and economic legacies. For example, ethnicity in Northern Ireland is framed around religion where identification with Catholicism or Protestantism is an important ethnic marker (Smaje, 1995). This is illustrated by the Northern Ireland census questions on ethnicity which specifically elicit information on respondent's religious background, irrespective of whether they are practicing any religious denomination. These sit alongside questions similar to those in the Census for England and Wales which equate ethnic identity with countries like Britain, India or Africa.

While the relationship between health, ethnicity and inequality is in no small part influenced by the varying socioeconomic composition of different ethnic groups, as will shortly be discussed, there are wider forces shaping the relationship between ethnicity and health. Variations in health within the general population are observed between places, by socioeconomic attribute, and according to health-related behaviours such as diet, exercise and smoking. Ethnic differences in experience of place, their socioeconomic composition, and health-related behaviours emerge through the interaction with: complex migration histories and settlement patterns; socialisation into different health behaviours; cultural influences; differences in lifestyle; establishment of social support networks; or experience of racism.

For example, the relationship between place and health for different ethnic groups will be influenced by the types of areas within which first generations of migrants settle in and move away from, with subsequent generations of migrants often following similar internal migration trajectories to new areas (see Catney and Simpson, 2010).The relationship between ethnicity and health will also vary within areas insofar as the establishment of social support networks and, relatedly, the creation of social capital varies according to neighbourhood characteristics (Cattell, 2001). As social support networks or social capital are beneficial to health (see Berkman and Glass, 2000) ethnic variations in the ability to establish these networks will influence the relationships between ethnicity and health. Differences in health-behaviours, such as low tobacco use amongst Indian groups (Bhopal *et al*., 1999), or low physical activity levels amongst South Asians (Williams *et al.*, 2011), also shape ethnic inequalities in health. Williams *et al*., (2011) found that low levels of physical activity in the South Asian population in the UK contribute to excess mortality from coronary heart disease. Cultural influences which vary between ethnic groups have also been found to influence health-related behaviours, and therefore will shape the relationship between ethnicity and health (e.g. Bradby and Williams, 2006). The influence of racism on ethnic inequalities' in health is explored elsewhere in this thesis (see chapters 4 and 5 in particular).

Defining ethnicity is a sensitive and difficult task, and despite the lack of conceptual clarity within studies utilising the concept, the subject of many a review and discussion for epidemiologists, sociologists and anthropologists alike (e.g. Cohen, 1978; Burgess, 1978; Senior and Bhopal, 1994; Eriksen, 1996; Poge, 2005; Callister *et al*., 2009). Although not exhaustive, the preceding discussion has illustrated some of the key problems in defining ethnicity relevant to health research: namely in the assumption that either 'ethnicity' or 'race' describes underlying genetic difference or perhaps more importantly, that it is possible to reach a universally applicable conception of either ethnicity or race. The fluidity of ethnicity makes it a difficult concept to grasp with many struggling to delineate the boundaries of distinct ethnic groups. However, it is still a useable concept which can reveal differences in the health needs and socioeconomic circumstances of a population, regardless of what facet of ethnicity is emphasised, be that geographic ancestry, religion or beliefs. In the words of Marmot,

> "The vagueness of the term 'ethnic' … does not invalidate this area of study. If two groups, however defined, have different rates of disease [or any health outcome], productive aetiological investigations may follow".

Marmot, 1989: 13.

However, where used 'ethnicity' must only act to identify population subgroups and not to explain differences between them. As will later be shown, differences in health between ethnic groups are not explained by shared cultural heritage which identifies ethnicity, but are rooted in socioeconomic differences between ethnic groups in society (Stronks and Kunst, 2009; Nazroo, 2001; Smaje, 1995; Nazroo, 1998). Looking to the root causes of inequality is key to the works of organisations like the *Joseph Rowntree Foundation* who have extensively investigated the relationships between ethnicity, health, poverty and general disadvantage (e.g. Catney and Sabater, 2015; Holtom *et al*., 2013; Barnard and Turner, 2011; Salway *et al*., 2011).

2.3.2 Operationalising ethnicity

The identification of ethnic groups within this thesis is determined by the availability of sufficiently detailed data to investigate differences in health. As already noted, three datasets will be used based on microdata from the England and Wales census, and annual data from the HSEs. The availability of ethnic data within these datasets is a valuable development for research on ethnicity and health, as previously 'ethnicity' was crudely derived from country of birth. Nevertheless, this development was viewed suspiciously by some owing to the subjectivity of the newly introduced 'ethnicity' questions rather than the objectivity of country of birth/nationality (Leech, 1989). However, in terms of health difference, it is not country of birth which matters, rather the experience of different population groups in society and their differential access to socioeconomic resources or opportunities which is better captured in 'ethnicity' than 'country of birth'.

One advantage of subjective ethnicity over objective country of birth/nationality is that individuals self-identify a specific ethnic group thereby categorising themselves, albeit within the boundaries of pre-determined groups. Thus, although their choice will reflect how they perceive their own ethnicity rather than being ascribed by an interviewer, their freedom to identify with ethnic group categories is curtailed by the options available to them. Where the options change, so may the choice of ethnic group. Ethnicity is not, therefore, stable over time: individuals may change their perception of their own ethnicity alongside "wider social processes" (Carter *et al*., 2009: 33), their beliefs on wider perceptions of ethnicity (Fenton, 1999), and the options available to them. For example, analysis of ethnic stability between the 2001 and 2011 censuses in England and Wales found that MEGs such as Bangladeshi, Pakistani, Indian, and Caribbean are all less stable than White British (Simpson *et al*., 2014). The authors also found that stability decreased between 1991-2001 and 2001-2011, falling from

98.0% to 96.0%. However, some of this change was due to the increasing ethnic diversity of the population. Simpson *et al.* (2014) suggest a number of reasons for this. For example, MEGs who are able to identify with multiple ethnicities may, when faced with increasing options, opt for ‘Other’ thus creating instability within individual ethnic groups. Similarly, increasing confidence in expressing one’s own sense of ethnic identity may prompt more MEGs to specify identities that are not otherwise offered in the categories. Notwithstanding increasing instability in ethnic groups, it should be noted that Simpson *et al.* (2014) show that the final ethnic groups used in this thesis’ analysis of census microdata, although exhibiting some instability between years, are considered relatively stable between 1991, 2001 and 2011 (although some groups are combined in this thesis to increase sample size, see chapter 3) (see also Simpson *et al*., 2015).

It is worth highlighting that owing to the likely differences within the relatively crude ethnic groups used in this research, it might be argued that ethnic groups should further be distinguished between by accounting for differences in religion. Given the likely interaction between ethnic identity, religion and wider experiences in society future work should more substantively address the question of religion in research investigating ethnic inequalities in health. This is exemplified by considering the increased socioeconomic disadvantage experienced by certain religious groups in the UK, particularly for Muslims (Peach, 2006). Variations in the socioeconomic experiences of different religious groups, should this interact with ethnicity, may be particularly pertinent to understanding inequalities in health. Indeed Karlsen and Nazroo (2009; 2010) have explicitly investigated the relationship between ethnicity, religion and health using, for example, data from the HSE in 1999 and 2004 (these survey years oversampled MEGs, see chapter 3). However, as it is not possible to *consistently* identify religion in the datasets used in this thesis, religion is not considered.

Irrespective of the changing stability of the ethnic groups analysed in this thesis, using subjective measures of ethnicity constrained by pre-determined categories is still worthwhile. If choice of ethnicity is influenced by factors such as wider social process or an individual’s perceptions of how others perceive them and how they view ethnicity in their society, then it is arguable that the choice of ethnicity reflects an individual’s experiences of society which may be relevant to health, particularly if we assume that ethnic differences in health are perpetuated by societal structures. However, the ethnic group an individual feels best reflects their own ethnic identity may not be reflective of their wider health needs, which in turn may have been influenced by society’s perception of their ethnicity. One method to ensure that any ethnic group considered to be particularly vulnerable in society or at risk of poor health is accounted for when respondents identify with multiple ethnic groups is to prioritise certain ethnic groups rather than count those respondents as ‘mixed and Other’. Ethnic groups are therefore prioritised to focus on the ethnicity which is most pertinent to their health and their experience of social determinants of health in society. A method such as this is employed in New Zealand whereby ethnicity is routinely prioritised according to national coding protocols designed to monitor the contrasting health experiences and needs of ethnic groups such as Maori, Pacific or New Zealand European groups. However, this method is not used in UK data. Thus, although not ideal, self-identified ethnicity is the most practicable for this thesis.

Where research operationalises ethnicity for groups other than the White British majority as a collective aggregation of crudely similar ethnicities, differences within these crude aggregates will be masked. For example, 'BME' or Black and Minority Ethnic groups are extensively used in the NHS, yet this ignores the diverse experiences of those groups. Chinese groups, for example, actually have some of the best health outcomes across a range of measures (e.g. Bécares, 2015) but this will be masked by BME. Similarly, BME masks marked variations between the Black and South Asian groups such as the higher prevalence of diabetes amongst South Asians than Black groups (McKeigue *et al*., 1991). However, aggregating MEGs is still common in research exploring ethnic differences (e.g. Norman and Fraser, 2013). Further, individuals identifying with multiple ethnicities, or with the growing number of undefined ethnic groups in routine data are routinely disregarded from health research owing to the heterogeneity of these groups.

Whilst the final ethnic groups used within this research are the most practicable possible within the constraints of the data, maintaining as much ethnic detail as possible, they do not entirely overcome these problems. For a more detailed review of some of the problems associated with existing attempts to operationalise ethnicity in statistics, readers should turn to Smaje (1995). Smaje summarises the arguments briefly outlined here, but notably concludes with the assertion that analysts need not entirely reject the use of routine ethnic statistics (1995: 26), rather that they should be used cautiously, as indeed they will be within these pages.

2.3.3 Ethnicity and health

Investigations of population health, as already discussed, are increasingly dominated by self-reported measures of health, and explorations of ethnicity and health are no exception. The availability of 'ethnicity' data in routine datasets, such as census microdata and the HSE, means that a growing body of research documents ethnic variations in self-reported health and LLTI. On the one hand, the breadth of this research may undermine Nazroo's assertion that ethnic inequalities in health reflect a significant gap in current evidence (2014). Yet on the other, if the conclusions of this research are not acted upon, with policy makers acknowledging that the relationship between ethnicity and health is exacerbated by socioeconomic inequalities in society, this gap may loom larger still. Before outlining some of the competing explanations for ethnic inequalities in health, this section will summarise some of the main findings of those investigating ethnicity and health, highlighting which ethnic groups are consistently found to be in poorer health.

Before discussing general assessments of health, which are more difficult to assign to any inherent biological predisposition for poor health, this review will consider some of the specific morbidities from which MEGs are particularly vulnerable to. Any review of ethnicity and health typically, although not exclusively, addresses a combination of cardiovascular disease (CVD), certain cancers, diabetes and mental illness (e.g. Smaje, 1995; NHS Ethnic Health Unit, 1995; Nazroo, 2003). Whilst this thesis will not explore health in terms of specific morbidities, it is worth briefly highlighting health outcomes which are more prevalent amongst different ethnic groups. As the South Asian groups, Indians, Pakistanis and Bangladeshis, are the only minority groups consistently defined in this thesis, this summary will focus (although not exclusively) on morbidities more prevalent in these groups.

Asians the world over are particularly susceptible to CVD (e.g. Exeter *et al*., 2014). Nazroo (2003) found a high risk of CVD amongst Indians whereas Caribbean groups have higher rates of stroke and hypertension. However, there is little evidence to show that known risk factors for CVD such as smoking explain higher rates of CVD amongst Asian populations (Fox and Shapiro, 1988), nor do similar diets as these are so varied between Asian groups (e.g. McKeigue *et al*., 1991; Clarke *et al*., 1991). However, it has been suggested that the higher prevalence of CVD may be related to higher rates of diabetes amongst South Asian groups (McKeigue *et al*., 1991; Greenhalgh, 1997; Mather *et al*., 1998; Bhopal *et al*., 2002). However, this raised susceptibility is not necessarily as consistent across South Asian groups as the literature suggests (e.g. Barnett *et al*., 2006). For example, Nazroo (2003) finds that whilst Pakistani and Bangladeshi groups are five times more likely to have diabetes than the White group, Indian groups are only three times more likely, similar to African Asian and Caribbean groups. Although these differences are important and may be rooted in underlying differences between ethnic groups, disregarding ethnic inequalities in health as inevitable based on the prevalence of a limited number of specific morbidities is not sound. Assessments of ethnicity and health need to account for the multi-dimensional concept of health (Nazroo, 2014) and therefore look to broader measures such as self-reported health, LLTI and where available, differences in mortality.

Pakistani, Bangladeshi and Black Caribbean groups have relatively high rates of poor health across a range of measures including general mortality and morbidity (Nazroo, 1998; Cooper, 2002; Harding, 2003; Nazroo, 2003; Bécares *et al.*, 2012). Babb *et al*. (2004) found that Indian women and Other Black men as well as Pakistani and Bangladeshi men and women in particular had high rates of poor health. However, Indians have relatively good overall health (Nazroo, 2003). This illustrates the need to distinguish between MEGs, particularly those who experience different levels of socioeconomic advantage. It may be argued that differences in reporting of health between ethnic groups can be attributed to different cultural interpretations of health, such as those discussed in the previous section. However, Chandola and Jenkins (2001) have found that self-assessed general health is a valid measure to investigate ethnic differences in health. Further, LLTI has successfully been used to investigate ethnic differences in health (e.g. Nazroo, 2003) and its use also ensures comparability with wider literature on selective sorting as will be seen throughout this thesis. Although brief, this summary has highlighted some of the known differences in health between ethnic groups as well as emphasising that MEGs, particularly Pakistani, Bangladeshis and Black Caribbean groups often have the poorest health. Whilst factors other than those addressed in this brief review may be pertinent to ethnic differences in health, particularly insofar as general social determinants of health may interact with ethnicity and therefore multiplicatively influence health, these will be explored where appropriate in the following chapters.

2.3.4 Explaining ethnic inequalities in health

Explanations for social and spatial inequalities in health are, although varied, rarely contested. The social determinants of health are widely documented as already discussed, and different distributions of these determinants of health within a population result in social gradients to health. It necessarily follows that any variation in the distribution of these social determinants between ethnic groups may therefore explain health differences between ethnic groups. The logic of this statement is hard to refute, and the argument is longstanding. For example, in 1845 Engels pointed to the disadvantaged socioeconomic circumstances of the Irish population in England as an explanation for their poor health (Engels, 1987). These early assumptions echo in contemporary international research whereby it is widely concluded that ethnic inequalities in health are perpetuated within unfair societies, divided along social and economic lines (Stronks and Kunst, 2009; Nazroo, 2001; Smaje, 1995; Nazroo, 1998). Moreover, it is increasingly argued that these ethnic gradients are worsened by discrimination or the marginalisation of MEGs (e.g. Williams, 1999; Williams and Mohammed, 2009; Nazroo, 2003).

In general terms, MEGs concentrate in more disadvantaged circumstances characterised by poor quality housing or temporary tenancies (private and social rentals); unemployment, under-employment or employment in low skilled occupations (Nazroo, 1997); lower levels of educational attainment or less return on their educational investment (Lynch and Kaplan, 2000; Krieger *et al*., 1993); and lower incomes (Hills *et al*., 2010; Nandi and Platt, 2010). Further, despite overall improvements there is still an employment gap between ethnic groups in England and Wales (DWP, 2014), with higher rates of unemployment amongst MEGs and strong evidence of persisting ethnic inequalities in labour market participation (Catney and Sabater, 2015). These disadvantaged circumstances are all associated with poorer health (Marmot *et al*., 1991; Bartley and Blane, 2008; Bambra and Eikemo, 2009; Gibson *et al*., 2011; van de Knesebeck *et al*., 2006). The concentration of MEGs in more disadvantaged circumstances (Modood *et al*., 1997; Nazroo, 1998; Barnard and Turner, 2011) will therefore contribute to poorer health outcomes for those groups.

Discussions of the concentration of MEGs in more disadvantaged circumstances are related to analyses of spatial inequalities in health between ethnic groups. Debates in this area centre on the importance of neighbourhood influences on health, and thereby raise questions as to the extent of the influence of context versus composition on health. Whilst composition refers to the characteristics of individuals who live in an area, context refers to characteristics of the area itself. The relative merits of 'contextual' or 'compositional' explanations for area variations in health have been examined (Macintyre *et al*., 1993; Duncan *et al*., 1998; Smith and Easterlow, 2005) with some questioning the utility of dichotomising this debate (Macintyre *et al*., 2002). Smith and Easterlow (2005: 174) have suggested that the prevailing paradigm governing research into inequalities in health is a "tale of risky places" whereby contextual accounts and narratives dominate: in their principally qualitative analysis of the movement and selective (dis)placement of the ill through the rented housing sector, argue for compositional accounts of (ill-)health. Others have argued for recognition that the aggregate of the individual-level characteristics plays no small part in determining the [social and demographic] characteristics of the place itself, therefore the distinction between context and composition is not and should not be viewed as dichotomous (Macintyre *et al*., 2002). For Smith and Easterlow's (2005) critique of the "strange geographies of health", this requires geographical narratives of health that not only consider context, but also composition and the way in which the health status of individuals influences their experience of place, and crucially, their possible mobility.

So how should area differences in health between ethnic groups be interpreted? As MEGs have been found to concentrate in more deprived areas (Jivraj and Khan, 2015), it logically follows that the known association between increasing deprivation and increasing poor health would result in higher rates of poor health amongst MEGs. However, research has explored the extent to which concentrations of ethnic groups in differently deprived areas may protect against harmful characteristics associated with increasing deprivation (Karlsen *et al*., 2002; Pickett and Wilkinson, 2008; Bécares *et al*., 2009). Whilst Karlsen *et al*. (2002) found no evidence that ethnic density in an area effects self-assessed health for MEGs, a comprehensive review of existing literature on ethnic density and health by Pickett and Wilkinson (2008) finds more in favour of the health protection arising from ethnic density. More recently, Bécares *et al*. (2009) concluded that as ethnic density increases, the association between racial harassment and health weakens. This illustrates one pathway by which a) health inequalities between ethnic groups may be perpetuated (through experiences of racism or racial harassment) and b) area differences in health between ethnic groups may be explained. However, whilst the authors do find that ethnic density indirectly benefits health through the weakening association between racism and health, there is no evidence of a direct association between ethnic density and self-assessed health, similar to the earlier findings of Karlsen *et al*. (2002).

Whether identified by area differences in health between ethnic groups or social differences, the poorer health of ethnic groups and therefore the observed ethnic inequalities in health are better explained by area or social differences than ethnicity. Specifically, research modelling the influence of socioeconomic factors on ethnic variations in health finds that socioeconomic factors attenuate the relationship between health and ethnicity, explaining more than ethnicity can alone (Williams, 1996; Cooper, 2002; Karlsen and Nazroo, 2010; Nazroo, 2014). This further demonstrates the importance of socioeconomic or sociodemographic attributes in explaining ethnic inequalities in health *rather* than ethnicity itself. Nevertheless, arguments persist claiming that socioeconomic difference accounts for little if any of the observed ethnic inequalities in health (Wild and McKeigue, 1997). Moreover, Nazroo (2014) suggested that the neglect of ethnic inequalities in health from the policy agenda could still be viewed as an assumption that ethnicity explains ethnic differences in health, rather than describing them: *"*ethnicity somehow reflects exceptional, perhaps exotic, factors that drive differences in health experience*"* (2014: 93).

Further evidence demonstrating the contribution of socioeconomic inequalities to ethnic health gradients is required, but this contribution does not necessarily explain *changing* ethnic health gradients. Given the contrasting socioeconomic and spatial experiences of different ethnic groups (Robinson, 1996; Modood *et al*., 1997), themselves important determinants of the propensity to migrate or for social mobility, theories of selective sorting between area types and social classes *and by ethnic group* may help explain changing ethnic health gradients. These selective sorting processes have not been holistically explored, as previously discussed, nor specifically investigated in terms of their relationship with health and ethnicity (although Harding's (2003) work on social mobility and health amongst South Asian and West Indian groups is a notable exception). However, there is evidence to suggest a dynamic relationship between the sorting processes, health and ethnicity. For example, Robinson (1990) investigated social mobility among MEGs and only found evidence of upward social mobility amongst Indian migrants. If chances of upward social mobility are limited to one minority group, the influence of social mobility on health gradients will vary by ethnic group. Similarly, propensity to migrate has been found to vary between ethnic groups (Stillwell and Hussain, 2010) with evidence suggesting that Asian groups having low propensities to migrate (Stillwell *et al*., 2008). If selective migration can influence health gradients, variations in propensity to migrate by ethnic group may be important. However, while propensity to migrate has been found to vary between ethnic groups, patterns of migration are similar with evidence of counter-urbanisation across all ethnic groups, apart from Chinese (Simpson and Finney, 2009). The implications of these similar patterns of migrations and variations in migration propensities, and the varying relationships between social mobility and ethnicity will be explored in later chapters.

2.4 Conceptual framework and research questions

The conceptual framework for this thesis relates to the complex and dynamic relationships between migration, social mobility, health and ethnicity. As will later be shown, investigations of selective migration and health gradients often focus on deprivation change alongside or in lieu of residential mobility, migration or change of address, however defined (e.g. Norman *et al.*, 2005). Thus, the selective migration component of this research includes deprivation change or, as it has been referred to in the literature, deprivation mobility (e.g. Exeter *et al.*, 2014), as well as migration or residential change. Figure 2.2 illustrates this conceptual framework. Geographic mobility includes migration and deprivation mobility. Health may be influenced by but also influence social and geographic mobility. This links contextual and compositional influences on health through the changing experience of place and social status, each widely recognised as important determinants of health. Furthermore, this fully accounts for the inter-dependence of social and geographic mobility, which has long been alluded to if not always made explicit. Ethnicity would then perhaps have an overarching or attenuating influence, encompassing the relationships between health and the mobility processes. Figure 2.2 encapsulates these relationships: health is centred between geographic (migration and deprivation mobility) and social mobility, influencing but also being influenced by these mobility processes. In turn, these mobility processes are linked to each other. These different processes and health are all attenuated by ethnicity, reflecting the varying experiences of geographic mobility, social mobility and health.

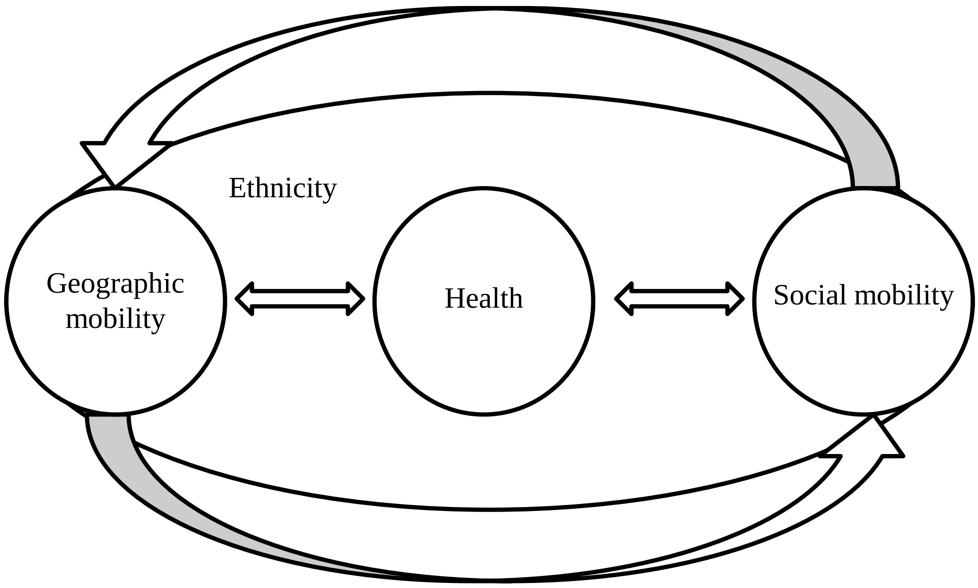


Figure 2.2 Conceptual framework: the inter-relationships between geographic mobility, social mobility, health and ethnicity of an individual

In light of this discussion, a number of research questions can now be asked. These questions summarise some of the themes explored in this review while also delineating the boundaries of this thesis' intended contribution to the research agenda on health, ethnicity, migration, social mobility and deprivation. The questions underpin the analyses presented in the empirical chapters of this thesis and will be used to structure the final discussion of the results obtained.

Over recent decades, are there changing rates of self-reported health and do these vary by ethnic group? It is expected that health is changing with the more disadvantaged groups not experiencing improvements in their health at the same rate as the more advantaged groups. Where different ethnic groups disproportionately experience disadvantage, they are likely to enjoy fewer or slower improvements in their health status.

Once sociodemographic attributes are accounted for, do any differences between groups remain? Sociodemographic attributes such as social class, household tenure and educational attainment are all known to be associated with health given the socially graded nature of health. The differential distribution of these sociodemographic attributes within different ethnic groups may therefore explain ethnic differences in health: this is increasingly demonstrated in the literature (e.g. Stronks and Kunst, 2009), but overlooked in the policy arena (Nazroo, 2014). Further demonstrating the importance of sociodemographic attributes in explaining ethnic differences in health is therefore of vital importance, and fundamental to the aims of this thesis.

Are there differences in health between migrants and non-migrants? Migration is an inherently selective process evident in the distinctive characteristics of migrants, distinguishable from non-migrants through their age, life-stage, tenure, socioeconomic status and importantly, health status (Bentham, 1988; Boyle *et al*., 1998; Champion *et al*., 1998; Boyle *et al*., 2002). Further, migrants differ from each other by age and notably, by health status with younger migrants tending to be healthier than non-migrants whereas the inverse is true for older migrants (Bentham, 1988; Findlay, 1988; Larson *et al*., 2004; Norman *et al*., 2005). However, less is known about differences in health between migrant statuses by ethnic group, or how this may interact with social mobility and changing health gradients.

Do health inequalities change over time between area types and social classes? There is convincing evidence to suggest that health inequalities between socioeconomic groups and by area types or location are widening (literature cited above). The changing socioeconomic context of England coupled with an ageing and increasingly ethnically diverse population necessitate further working investigating whether and how health inequalities change over time.

Do transitions between area types and social classes explain changing health gradients in England for the overall population or by ethnic group? The importance of this question in respect of both the aims of this thesis and the intended contribution to knowledge deserves consideration here, notwithstanding the repetition this will necessitate. It has been shown that there are competing conclusions in the literature as to the relative importance of either selective migration or social mobility in explaining (changing) health gradients. Conclusions vary notably, ranging from assertions that social mobility may actually constrain health gradients (e.g. Bartley and Plewis, 2007) to claims that selective migration may widen them (e.g. Boyle *et al*., 2009). Others have questioned the extent of the influence (Chandola *et al*., 2003) or considered the importance of scale (Brimblecombe *et al*., 1999). However, it has been shown that no work approaches the question of selective sorting holistically, simultaneously addressing migration and deprivation change, or migration and social mobility. Nor has any work approached these themes from an ethnic perspective.

These five questions guide the analysis within each of the following chapters investigating the HSE or census microdata, and introduce the key literatures informing arguments and developments within these fields. It is the task of this thesis to weave together these many arguments and tease out evidence from a variety of datasets in order to reveal the nature of ethnic inequalities in health, and establish what contribution selective sorting makes to changing health gradients.

2.5 Concluding remarks

This chapter has reviewed pertinent literature on health and ethnicity, introducing these and the key concept for this research: selective sorting. In summarising some of the inherent methodological problems of conducting health research from an ethnic perspective, this review has also established a level of conceptual clarity which, it has been argued, is lacking from many existing studies on ethnicity and health. However, this review is not exhaustive, particularly in terms of the dynamic relationships between selective migration (and deprivation), social mobility, health and ethnicity. More substantive discussions of these relationships will take place in the analytical chapters of this thesis.

Thus, following a discussion of the datasets and methods employed in chapter 3, chapter 4's analysis of the contribution of socioeconomic factors to changing ethnic health gradients in England will further discuss explanations of ethnic inequalities in health. Analysis in chapter 5 and 6 of propensity to migrate and the differences in the relationship between migration, ethnicity and in health will be preceded by a more detailed discussion of the relationship between migration and health, and the contribution of selective migration to changing health gradients. Finally, investigation of the dynamic relationships between deprivation change, migration, social mobility and health in chapters 7 and 8 will be accompanied by a detailed review of the existing literature on selective sorting, whether between area types or social class, highlighting problems with existing research and further illustrating why these processes may differently contribute to ethnic health gradients.

Introducing the concepts of health and ethnicity has effectively demonstrated why this research is important in terms of the lack of comparable research explaining changing *ethnic* health gradients, or indeed changing *overall* health gradients. Discussing the core concepts in this thesis and placing them in the context of existing work (and gaps) in this area demonstrates the importance of this research. A lack of research adequately explaining ethnic inequalities in health or explaining why either ethnic or overall health gradients can change represents a major gap in current understanding. Efforts to flatten ethnic health gradients must follow from an understanding of what drives them and why they are changing. The policy implications may only worsen if this is not addressed in a timely manner given the increasing ethnic diversity of England's population.

By holistically investigating the inter-relationships between these different concepts, as outlined in Figure 2.2, this thesis not only furthers research into selective migration and social mobility, but also contributes to discussions of general inequalities in health which currently cannot explain *changing* health gradients. Further, this work will shed new light on the complex relationship between ethnicity and health and the nature of ethnic inequalities in health, building on existing literature demonstrating that ethnic health inequalities are the product of an unfair society, manifesting through existing social and spatial inequalities (e.g. Cooper, 2002).

Chapter 3

Data and Methods

3.1 Introduction

Cross-sectional and longitudinal census microdata (respectively the Samples of Anonymised Records and the ONS Longitudinal Study) alongside annual cross-sectional survey data (the Health Survey for England) are used in this thesis to address the research aims and objectives. Annual survey data from the Health Survey for England (HSE) are first analysed to explore whether the patterning of health between ethnic groups has changed over time providing more temporal detail than possible in the decennial censuses. Results of the HSE analysis can also be compared and contrasted with findings from the census data.

Indirectly Standardised Illness Ratios (SIRs) and binary logistic regression modelling are the main methods featuring throughout this thesis. In addition, ratio ratios, the Gini coefficient (*G*) and Index of Dissimilarity (*D*), the Slope Index of Inequality (SII) and the Relative Index of Inequality (RII) are also applied to further quantify the extent of (changing) inequality between ethnic groups in England. Figure 3.1 summarises the overall research design, linking each of the empirical objectives to the methods and datasets used to address them. These are distinct to the conceptual objectives stated in chapter 1 (1, 2, 3 and 4) relating to reviewing the relevant literature and developing an appropriate analytical framework for the research.

Although arguably under-used in research on ethnic inequalities in health, each dataset provides valuable information on population and health in England. The under-use may be attributed to wider difficulties in quantitatively analysing ethnic differences in society, with a particular wariness of the small numbers which inevitably arise when disaggregating a population into minority ethnic groups (MEGs). Nevertheless, these datasets are not completely neglected with a number of notable studies using each to investigate ethnicity and health (e.g. Cooper, 2002; Mindell *et al*., 2014; Gould and Jones, 1996; Harding and Balarajan, 2001).

For ethnic inequalities in health to be substantively addressed in policy, existing data *must* be used to explore the nature of these inequalities notwithstanding small numbers, inconsistent categorisations of ethnic groups or the perceived applicability of the health or socioeconomic measures to different ethnic groups.

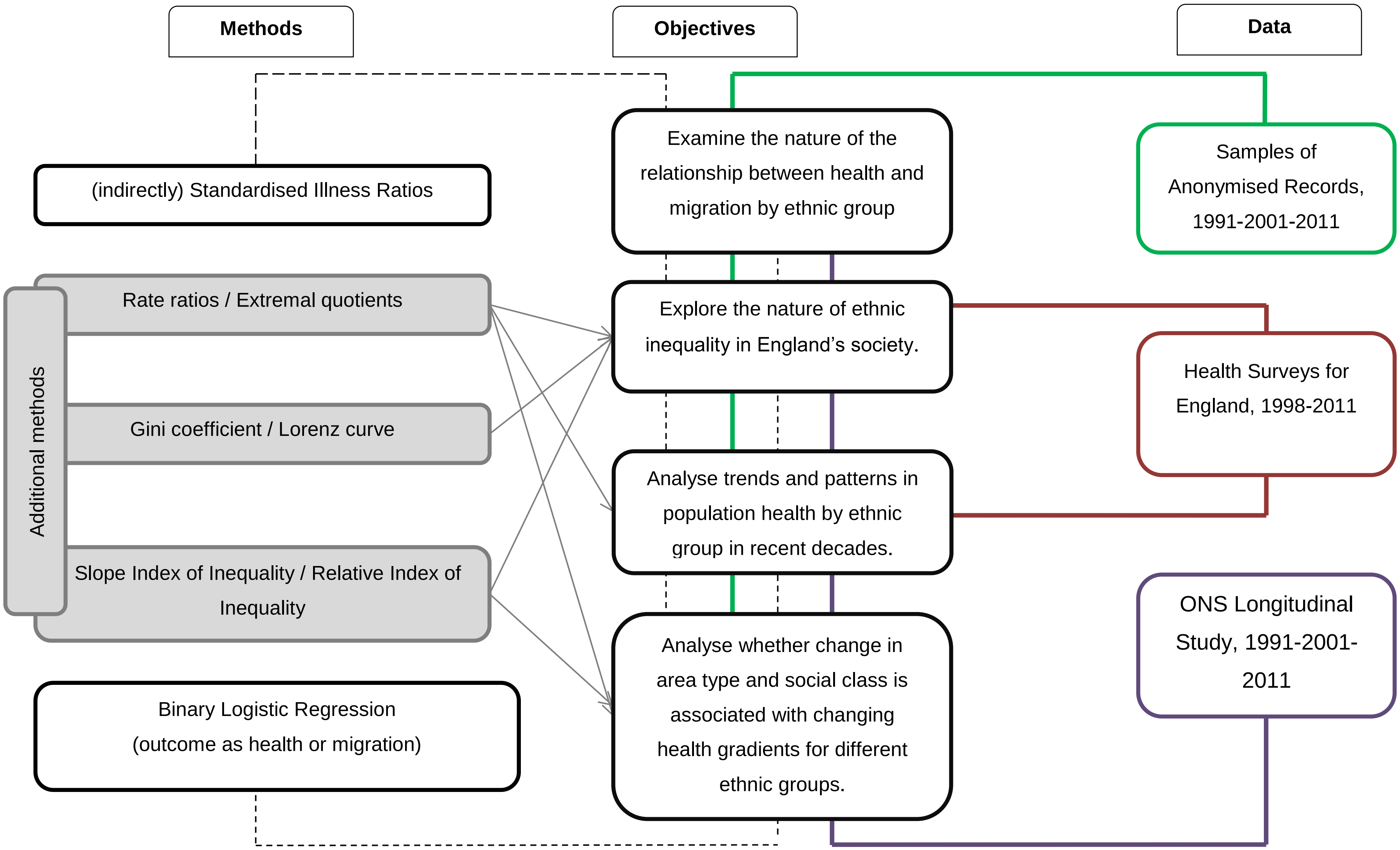


Figure 3.1 Overall Research Design: linking methods and data to research objectives

Note: coloured lines link each dataset to the relevant research objectives; dashed black lines link the core research methods to research objectives; grey arrows link additional research methods to relevant research objectives.

Recognising and, insofar as possible, accounting for these operational and methodological issues can help alleviate some concerns over the use of these data to quantitatively analyse ethnic experiences in society. The first half of this chapter will therefore discuss each of the datasets in terms of their suitability for the study of ethnic inequalities in health and the contribution of selective sorting to changing health gradients. The discussion will illustrate how the strengths of these data outweigh their limitations, particularly when each is used successively to address different elements of the overall picture suggested by the research aims. Substantive discussion of the implications of the limitations will be reserved for the concluding remarks in chapter 9 alongside ideas for future research and alternative datasets. As each analysis is intended to complement the others, operational decisions regarding the included variables often overlap. This will be identified where appropriate to save repetition.

The second half of this chapter provides a technical discussion and note on interpretation of the methods used (this will be reiterated where appropriate in each of the analytical chapters). Whilst alternative methods are available, those chosen are considered appropriate to address the research objectives and produce a cohesive piece of work when applied across the three datasets. As with the discussion of alternative datasets, discussion of the alternative methods will also be reserved for the concluding remarks in chapter 9. Before concluding, the final section will outline potential alternative methods to those employed. These will be revisited in the concluding chapter of this thesis.

3.2 Data

Table 3.1 summarises the variables (whether extracted in their original format or derived) used in each of the three datasets (and sample totals). This highlights inconsistencies in the variable definitions between datasets both in terms of coverage (smaller numbers in the HSE) and scope (e.g. variations in definition, coding or derivation of variables such as health, ethnicity and social class). Figure 3.1 summarises the overall research design, illustrating which research objectives are addressed in each dataset and identifying the methods applied. Each dataset should therefore be viewed as one piece of the puzzle, individually necessary but not individually sufficient to fulfil the research aims and objectives. Figure 3.2 illustrates how the datasets complement each other over the study period: data above the arrow are longitudinal whereas data below are cross-sectional.

Table 3.1 Variables included in the analysis from the Health Survey for England, Samples of Anonymised Records and Office for National Statistics Longitudinal Study

	Total	Variables	Variable categories
Health Survey for England			
1998-2000	31,402	Age	16-24 / 25-34 / 35-59 / 60-84
1999-2001	31,211	Gender	Male / Female
2000-2002	33,688	Ethnicity	White / Black / Indian / Pakistani and Bangladeshi / Mixed and Other
2001-2003	40,475	LLTI	LLTI / No LLTI
2002-2004	31,621	General health	Less than good health / Good health
2003-2005	31,379	Social class	I Professional / II Managerial and Technical / IIIN Skilled non-manual / IIIM Skilled manual / IV Partly skilled / V Unskilled / Unclassifiable
2004-2006	30,385	Household tenure	Owner-occupied / Privately rented / Socially rented
2005-2007	30,367	Educational attainment	Degree level + / Qualified below degree level / No qualifications
2006-2008	35,347	Economic activity	Employed / Long-term unemployed / Retired / Other economically inactive
2007-2009	26,245	Government Office Region (simplified)	North / Yorkshire / Midlands / East / London / South
2008-2010	27,944		
2009-2011	21,486		
Samples of Anonymised Records			
1991	672,605	Age	16-29 / 30-44 / 45-64 / 75-74
2001	1,074,864	Gender	Male / Female
2011	1,798,446	Ethnicity	White / Black Caribbean / Black African / Indian / Pakistani and Bangladeshi / Chinese / Mixed and Other
		UK birth	Born UK / Born elsewhere
		LLTI	LLTI / No LLTI
		Social class	I Professional / II Managerial and Technical / IIIN Skilled non-manual / IIIM Skilled manual / IV Partly skilled / V Unskilled / Unclassifiable
		Household tenure	Owner-occupied / Privately rented / Socially rented

			Educational attainment	Degree level (or above) / No degree or equivalent
			Government Office Region (simplified)	North / Yorkshire / Midlands / East / Inner London / Outer London / South
			Migrant status	Migrant / Non-migrant
			Migrant type	Short-distance migrant (0-14 km) / Mid-distance migrant (15-149 km) / Long-distance migrant (150+ km)
ONS Longitudinal Study (all variables for each survey year)				
1991 – 2001[†]	343,563		Age	
2001 – 2011[†]	321,697		Gender	Male / Female
			Ethnicity	White / Black / Indian / Pakistani and Bangladeshi / Mixed and Other
			LLTI	LLTI / No LLTI
			Social class	I Professional / II Managerial and Technical / IIIN Skilled non-manual / IIIM Skilled manual / IV Partly skilled / V Unskilled / Unclassifiable
			Deprivation quintile (Carstairs score)	Quintile 1 (least deprived) / quintile 2 / quintile 3 / quintile 4 / quintile 5 (most deprived)
			Migrant status	Migrant / Non-migrant
			Social mobility indicator*	Upward / Stable / Downward
			Deprivation mobility indicator*	Upward / Stable / Downward

Notes: [†] The sample is based on chapter 7's analysis excluding groups with prior poor health; * social mobility and deprivation mobility indicators are more fully developed within the analysis

Source: Health Survey for England; Samples of Anonymised Records; and Office for National Statistics Longitudinal Study

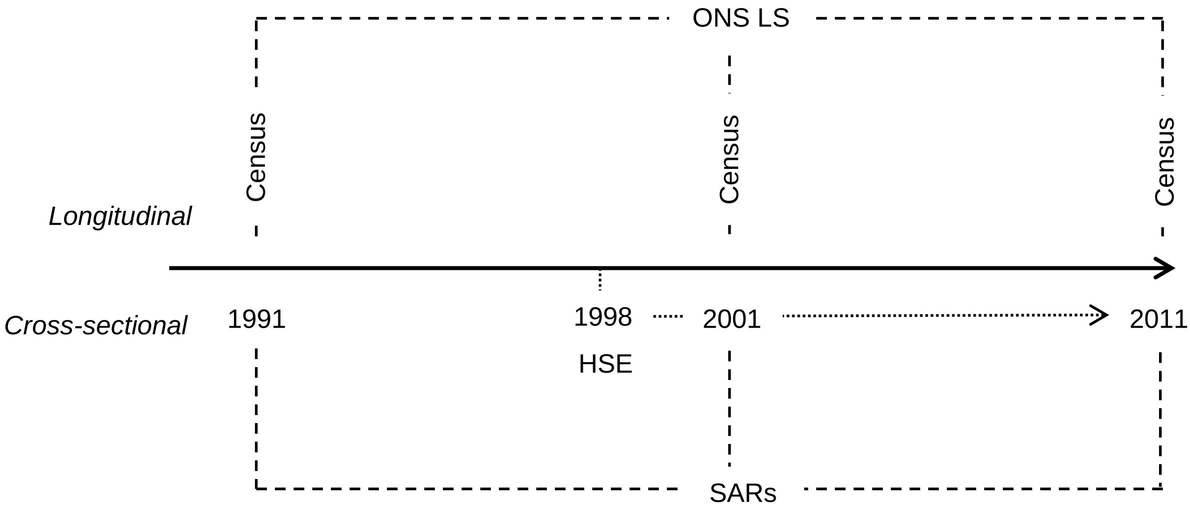


Figure 3.2 Data Jigsaw

Note: dashed lines denote census microdata; dotted lines denote annual cross-sectional data

3.2.1 Health Survey for England

Developed in response to the Acheson report (Department of Health, 1998) and subsequent efforts to centrally monitor the health of the population, the HSE is an annual household nationwide survey which began in 1991. To be eligible for sampling, participants were initially aged 16 years and over, typically residing in a private household address (although there are exceptions). Each year, a new representative sample of England's population are selected through random stratified sampling of postcode sectors. However, since 1995 the survey has also included children in households selected into the survey. In the analysis of the HSE and SARs, the sample population are restricted to those aged 16 and over (and aged under 86) due to the availability of socioeconomic data. As such, data on children and teens will not be further discussed. The longitudinal analysis, however, includes children aged under 16 as their movement between area types may be important in respect of the influence on (changing) health gradients. Moreover, this increases sample sizes when cross-tabulating by ethnic group. While efforts are made to ensure the HSE sample is as representative as possible, response rates have fallen in recent years (Mindell *et al*., 2012).

Using a combination of questionnaire-based answers (obtained through interviews), analysis of blood samples and certain physical measurements (obtained through nurse visits), the HSE is a rich source of data for the study of population health. The HSE contains subjective and objective information on physical and mental health, health-related behaviours and sociodemographic characteristics. Whilst core questions are repeated annually, the survey focusses on different population subgroups (such as the elderly) or specific morbidities (such as cardiovascular disease) each year. As this thesis is concerned with general health rather than specific morbidities, the annually varying content does not affect the extracted variables (see Table 3.1). However, where the focus is on specific population subgroups that are oversampled, this can distort the results and must be considered. In some cases, such as the 1999 and 2004 focus on MEGs, the oversampled population are provided in separate data files and are not problematic. However, in 2000 and 2005 where the survey focussed on the health of the elderly with participants aged 65 and over over-sampled, these groups are included in the main data file. Where boosted groups are not excluded, in a time-series those files could be excluded (as authors of an obesity study in Manchester chose, Higgins and Marshal, 2012); compensated for with survey weights where supplied; or accounted for within the interpretation of results. After some testing (discussed below), the latter option is used in this thesis.

Given that health deteriorates with age, it is likely that the 2000 and 2005 elderly boosted samples will skew rates of poor health. It is therefore important to establish the extent of the influence of the boosted sample on overall results (i.e. rates of poor health). Although no notable affect was found in the 2000 HSE, a clearly discernible and consistent spike was apparent in 2005 in rates of poor health. As the spike in poor health rates disappears when excluding people aged 65 and over, it can reasonably be attributed to the boosted sample rather than unique socioeconomic conditions of that year. Consequently, the files are maintained within the time-series dataset and necessary caution should be taken when interpreting the results. Indeed, illustrating the extent of the influence on population health rates of an older population is interesting in light of England’s ageing population.

As the impact of the oversampled population on health rates was minimal in 2000, and can be clearly identified in 2005, survey weights were not considered appropriate. Later introduced non-response survey weights were also not considered appropriate. Weights are introduced into survey data to either enhance the representativeness of a sample (design weights), account for atypical non-respondents which can bias an otherwise representative sample (non-response weights), or to produce results which mimic those which would be achieved if the sample size was the same size of the total population (grossing). It was established that including non-response weights did not influence the conclusions drawn in terms of the associations between the variables. The analysis conducted in chapter 4 was replicated for four regression models run with data from 2003 and 2011: this revealed that the direction and size of the effect for each model were comparable with and without survey weights. In either case, the conclusions drawn with respect to health gradients and the relationships between the variables were the same.

The time-frame studied is limited to between 1998 and 2011 due to operational constraints (noted below). However, this period is particularly apt for investigating the nature of ethnic inequalities in health. Rising and falling economic prosperity, important in respect of access to wider determinants of health, and increasing ethnic diversity characterise this time period. As chapter 2’s literature review suggested that ethnic inequalities in health are associated with socioeconomic inequalities, such rising and falling economic prosperity may be pertinent.

Creating the long-run time-series dataset required that variations in the nature of coding of the core variables between survey years were first harmonised. The following section will briefly discuss the harmonisation of key variables analysed, before identifying a couple of limitations with these data.

3.2.1.1 Variables

Independent variables are selected given their known association with health as demonstrated in the wider literature, some of which is reviewed in chapter 2. As such, no further justification for the variable selection will be included, although justification will be implicit in the discussion of the analysis and relevant wider literature. This section will discuss operational decisions made when harmonising ethnicity, social class, educational attainment and health, each key variables in analysis of the HSE and subsequent census microdata. For a detailed account of this data preparation see Darlington *et al*. (2014).

Ethnicity: Ethnicity data has been routinely collected in the HSE since 1996. However, the degree of ethnic detail varies between years, increasing in-line with increasing ethnic diversity. Although available from 1996, the time-frame begins in 1998 due to the availability of wider variables. It terminates at 2011 to correspond with the latest available census data. Sample sizes for detailed ethnic classifications are small and not always suitable for statistical analysis. As ethnic classifications vary between years, ethnic groups must be aggregated to capture the different ethnicities and create sufficient sample sizes without becoming too heterogeneous. This is particularly important as typical aggregations, such as Black and Minority Ethnic groups (BME), a commonly used ethnic classification in health research, masks variation between minority groups which may be important for social, economic, political or health-related analyses. Consequently, re-coding of the ethnicity variables was based on:

a) the need to retain sufficient ethnic detail to return theoretically meaningful results;
b) the statistical necessity of large enough category sample sizes; and finally,
c) the ability to create ethnic groupings which satisfy a) and b), but also are possible within the constraints of the varied categorisation of ethnicity over time in the HSE.

To create a harmonised ethnic variable which met the conditions described above, a number of compromises were necessary. Firstly, it was not possible to create a ‘White British’ or even ‘White English’ grouping and aggregate all other ‘White’ in ‘Other’. This was because:

a) Irish in Northern Ireland and Irish in the Republic of Ireland could not be consistently distinguished between even if other possible ‘ethnicity’ variables were used to cross-tabulate against: for example, this was a problem between 2000 and 2003;
b) some survey years included a response for those who are ‘Other European’ i.e. ‘White Other’, yet this was not consistent over time; and finally,

c) from 2008 onwards, respondents who were either ‘English’, ‘Scottish’, ‘Welsh’ or ‘Northern Irish’ could not be distinguished, only those who were ‘White British’, ‘White Irish’, or ‘Any other White background’.

Secondly, due to the small numbers involved some ethnicities were combined to increase the statistical potential of the analysis:

a) ‘Black African’ and ‘Black Caribbean’ were combined to create ‘Black’; and,
b) ‘Pakistani’ and ‘Bangladeshi’ were combined to create ‘Pakistani and Bangladeshi’.

Finally, a large heterogeneous group of ‘Mixed and Other Ethnic group’ was created to catch all of the remaining ethnicities. These remaining categorisations were too varied year on year to create anything more meaningful. Non-response categorisations, as with other variables, varied between years. Although non-responses were ultimately excluded from the final analysis along with the mixed category, these were initially collapsed to create two categories of either ‘Refused or don’t know’, or ‘Not applicable’. It should be noted that for the years 2004 to 2007, the derived ethnic variable is based on respondents’ self-identified cultural background. This was used in lieu of the explicit ‘ethnicity’ variables which were simplified to White, Mixed, Black or Black British, Asian or Asian British, and other. The ethnic classification used is the most appropriate given the constraints of the available data. However, it is noted that ‘White’ is perhaps too broad, capturing White European. Further, ‘Mixed and Other Ethnic group’ masks a substantial amount of variation between, for example, Chinese or British Pakistanis.

Social class: Prior to 2001, the principle measure of social status was the Registrar General’s (RGs) Social Class scheme. However, following calls for improvements to the theory and methods underpinning this classification, the National Statistics Socio-economic Classification (NS-SeC) was developed (Rose *et al.*, 2005). For example, while ‘Social Class’ (SC) is widely used it is criticised as an old-fashioned view of society relevant only to the 19th Century (Szreter, 1984; Donnelly, 1997). Further, it has been suggested that the occupation hierarchy of the SC should be disregarded insofar as this can only reflect the author’s “explicit or implicit judgements about the relative position of occupations” (Thomas, 1990: 28). Yet such a charge can be levied at any occupational typology: none can be completely neutral or objective as social research is inherently value-laden. ‘Socio-Economic Groups’ (SEG) were hailed by some as a significant improvement on SC as the 17 groups could be aggregated for use in social mobility research (Heath, 1995; Rose, 1997). In either case, as Rose and colleagues (2005) pointed out, each system was subjected to sustained critique due to their lack of theoretical clarity and the consequent desire for pragmatism over theoretical substance. The NS-SeC was developed and broadly adopted as it strove to, and largely succeeded in, tackling many of the problems inherent in the SC or SEG classifications. Crucially, the NS-SeC also demonstrates a social gradient in health (Chandola and Jenkinson, 2000) and has been successfully used in social mobility research, despite the fact that it is not technically hierarchical (Fry *et al.*, 2012). Whilst each has their relative merits, this thesis uses the RG's social class scheme. Social class is commonly used in health-related research and existing research on social mobility and health gradients (e.g. Bartley and Plewis, 1997) thereby ensuring the comparability of these results with wider relevant literatures. Further, as this research is primarily concerned with 'selective sorting' as an explanation for changing health gradients whereby differently healthy groups may differently experience upward or downward mobility, using an explicitly hierarchical measure of social status such as social class is more appropriate than the non-hierarchical NS-SeC.

To convert the NS-SeC back to the RGs social class, a look-up table was used (CeLSIUS at University College London). This was only required from 2010 onwards as up until 2009, the RGs social class was still provided alongside the newly established NS-SeC (included from 2001). All respondents who could not be classified within any one of the six social classes are defined as 'unclassifiable'; this also included the varying non-response categories. Table 3.4 summarises the social class and NS-SeC groups (NS-SeC categories are ordered according to their corresponding social class). Social class was assigned to each respondent and not solely based on the class of the head of household. Although women and elderly groups are not always assigned to a social class (Gillespie and Prior, 1995), and there is marked ethnic variation (as will be shown in chapter 4), this will be considered when interpreting the results.

Table 3.2 Converting National Statistics Socio-economic Classification to Social Class

Social class	National Statistics Socio-economic Classification
I – Professional	3.1 Higher Professional occupations – traditional employee 3.3 Higher Professional occupations – traditional self-employed
II Managerial & Technical	1 Employers in large organisations 2 Higher managerial occupations 3.2 Higher professional occupations – new employee 3.4 Higher professional occupations – new self-employed 4.1 Lower professional & higher technical – traditional employee 4.3 Lower professional & higher technical – traditional self-employed 5 Lower managerial occupations 7.3 Intermediate technical and auxiliary 8.1 Employers in small organisations – non-professional 8.2 Employers in small organisations – agriculture 9.2 Own account workers – agriculture
IIIN Skilled non-manual	4.2 Lower professional & higher technical – new employee 4.4 Lower professional & higher technical – new self-employed 6 Higher supervisory occupations 7.1 Intermediate clerical & administrative 7.2 Intermediate sales & services 12.1 Semi-routine sales 12.6 Semi-routine clerical
IIIM Skilled manual	7.4 Intermediate engineering 9.1 Own account workers – non-professional 10 Lower supervisory occupations 11.1 Lower technical craft 12.3 Semi-routine technical 13.3 Routine technical
IV Partly skilled	11.2 Lower technical process operative 12.2 Semi-routine service 12.4 Semi-routine operative 12.5 Semi-routine agricultural 12.7 Semi-routine childcare 13.1 Routine sales & service 13.2 Routine production 13.5 Routine agricultural
V Unskilled	13.4 Routine operative
Unclassifiable (includes armed forces, not fully described, students, all who have never worked and other unclassifiable)	14 Never worked & long-term unemployed 15 Full time students 16 Occupations not stated/inadequately described 17 Not classifiable for other reasons

Source: Mapping NS-SEC to Social Class, CeLSIUS

http://celsius.lshtm.ac.uk/modules/socio/se040302.html

Health: Health is operationalised with self-reported measures of health: self-assessed general health and self-reported limiting long-term illness (LLTI). Both measures are widely used in the health inequalities literature and self-assessed health in particular has been shown to be a valid measure for investigating ethnic differences in health (Chandola and Jenkins, 2000). Both health outcomes are collapsed into a binary format distinguishing between those with and without LLTI, or those whose self-assessment of their general health is good (very good and good) or less than good (fair, bad or very bad). This dichotomy is common in the literature and employed by statistical bodies such as the ONS (ONS, 2014). Whilst non-responses for all other variables are excluded in this analysis, those who do not confirm poor health are assumed to be in good health.

3.2.1.2 Limitations

Despite the representativeness of the HSE, the sample sizes are small which is potentially problematic when quantitatively analysing ethnic differences in society. Nevertheless, if patterns are repeated irrespective of small confidence intervals it is arguable that these trends should be noted. Small confidence intervals may well relate to small samples rather than necessarily the absence of important trends. This can be addressed by pooling data over three-year rolling periods to increase sample sizes, and by accounting for the possible influence of small numbers when interpreting results. Moreover, by also using different data to investigate the same patterns, results can be compared and contrasted which may further alleviate concerns over small numbers if patterns hold not only over time, but also between datasets.

The applicability of the selected variables to diverse ethnic groups may also raise problems, as it has been elsewhere suggested that cultural interpretations of health may differently influence results of self-assessed health between ethnic groups (e.g. Zola, 1996), or that social class may not capture the diverse experiences of different ethnic groups (Nazroo, 2003). However, these are the most practicable variables possible within the constraints of this, the HSE, and the subsequent Census microdata.

3.2.2 Census microdata

Census microdata are invaluable to social researchers, providing a rich array of sociodemographic information about the population at a given point in time. Nationally implemented, they are highly representative of the population although this does not completely negate non-response and under-enumeration of certain groups. This can be problematic as evidence suggests that under-enumerated groups vary notably from enumerated groups in terms of geography and sociodemographic characteristics with younger men and MEGs more likely to be under-enumerated (Dale *et al.*, 2000). Nevertheless, census microdata are highly versatile datasets and can be used to quantitatively investigate ethnic differences in society and health inequalities.

Investigations of health differences using census microdata became possible after the inclusion of a morbidity question in the 1991 Census whereby individuals were asked:

> "Does the person have any long-term illness, health problem or handicap which limits his/her activities of the work he/she does?"
>
> OPCS, 1991

The inclusion of this question alongside the release of a large sample of individual records, the Samples of Anonymised Records (SARs) (and indeed the availability of the Longitudinal Study (LS)) promoted the census to an *"*unrivalled geographically detailed source of information on perceived levels of morbidity in the population*"* (Gould and Jones, 1996: 857). It should however be remembered that variations in the nature of this question between 1991, 2001 and 2011 may influence results and must be considered when interpreting patterns of population health.

Census microdata also has a number of advantages over the HSE particularly through the large sample sizes of the SARs allowing for more detailed analysis of ethnic differences in society, the inclusion of migration variables, and the longitudinal nature of the ONS LS. Studies of selective sorting typically focus on cross-sectional data, with some notable exceptions (e.g. Norman *et al*., 2005; Norman *et al*., 2011; Exeter *et al*., 2011; Jokela, 2015). However, to effectively examine how changes in area type or social status are associated with changes in health longitudinal data must be used. Collectively considering conclusions drawn from both sources of census microdata is particularly valuable for any study concerned with migration as it has been noted that no other UK data source can provide better information on local migration than the census (Norman and Boyle, 2010: 147).

This thesis analyses SARs and LS data from 1991, 2001 and 2011, focusing on the strengths of either dataset to further understand the nature of (changing) ethnic inequalities in health. These separate analyses benefit from access to the full range of census topics in the SARs and LS, with the additional benefit of linked information on area types in the LS. As with the HSE, some operational decisions regarding choice and manipulation of variables are necessary, particularly in terms of ethnicity and health. This will be discussed in the following sections for each dataset, alongside a brief discussion of the core variables, particularly where they differ from those used in the HSE analysis, and a summary of some of the limitations of these data.

3.2.2.1 The Samples of Anonymised Records

Established in 1991, the SARs are a family of datasets covering the full range of census topics at 1991, 2001, 2011. Data are available either at the household- or individual-level. For these analyses, individual-level data are used. Following the release of the 1991 SARs, Gould and Jones (1996) noted a number of clear advantages of the SARs over existing census data. Namely, the flexibility in the choice of variables and categories that can be explored; the degree of statistical control in the modelling of social and geographic differences in LLTI; and, the potential for detailed examination of the health of small population subgroups (1996: 858). These advantages increase census by census with the increasing sample sizes released in successive SARs. Thus, the SARs comprise a 2% (1991), 3% (2001) and 5% (2011) sample of the census population of England and Wales. However, the sample for this analysis is restricted to England household residents aged between 16 and 74. The sample is restricted by age owing to incomplete socioeconomic data for the excluded ages.

3.2.2.1.1 Variables

The included variables are listed in Table 3.1, differing slightly from those used in the analysis of the HSE, both in number and nature. Economic activity is not included in the analysis of the SARs (or the LS), instead focussing on social class, educational attainment and housing tenure. Results of the analysis of the HSE time-series (chapter 4) and evidence from the wider literature demonstrate the importance of these variables in determining health (e.g. Marmot, 2005). This justifies their inclusion. Further, these are also important determinants of propensity to migrate, as will be discussed in chapter 7. In the HSE, self-assessed general health and LLTI are used to measure population health. However, analysis of the SARs and the ONS LS only uses LLTI as general health is not available in 1991. Given the larger sample sizes of the SARs, ethnicity is studied in more detail distinguishing between Black Caribbean and Black African. Finally, to account for geography, Government Office Region as of 2001 is used with the 1991 boundaries harmonised to those in 2001.

Health: Health is measured through the presence or absence of LLTI in analysis of the census microdata. However, the nature and coding of the LLTI question varies between census years, which may introduce bias into the results. In 1991, individuals are asked whether they have any long-term illness, health problems or handicaps which may limit their daily activities. However, by 2001 ‘handicap’ is replaced by ‘disability’. It is arguable that handicap may be associated with more malignant connotations than disability, thereby distorting the reporting of poor health. This substantive change is accompanied with lesser changes in the wording of this question in all three census years investigated (as seen in Table 2.1 in chapter 2). Changes to the wording of questions used to analyse trends overtime must be considered when interpreting results, particularly as this may influence overall rates of reported illness. Nevertheless, such changes do not negate the use of these data.

The responses options to the LLTI question also change between 2001 and 2011. In 1991 and 2001, respondents either confirm or deny the presence of LLTI. However, by 2011 respondents can indicate the extent to which their activities are limited by their illness, distinguishing between ‘limited a little’ and ‘limited a lot’. No guidance as to what constitutes ‘a little’ or ‘a lot’ are provided. It is therefore not possible to establish whether respondents who might not previously have reported any limiting long-term illness would now state they are limited ‘a little’. Thus, the LLTI variable is not strictly comparable. For the purposes of this analysis, both limited ‘a little’ and limited ‘a lot’ are counted as reporting LLTI in line with existing outputs from the ONS (e.g. 2014). Future work is needed to validate this operational decision. Nevertheless, as the 1991 and 2001 LLTI questions do not require respondents to be limited ‘a lot’, it is arguable that any form of LLTI will have been reported. At worst, 2011 data may slightly overestimate LLTI in the population.

Ethnicity: Larger sample sizes in the SARs (1991 n = 672,605; 2001 n = 1,074,864; 2011 n = 1,798,446) permit more detailed ethnic categories than derived in the HSE. As with the HSE, it is not possible to consistently differentiate between White British and White Other. Thus, seven ethnic groups of White, Black Caribbean, Black African, Indian, Pakistani and Bangladeshi, Chinese, and Mixed and Other are defined.

Geography: To account for spatial differences in health, regions are identified by aggregating Government Office Regions (GOR) with the 1991 geography harmonised to the 2001/2011 GOR geography. GORs are aggregated to provide sufficient sample sizes for meaningful analysis. However, Inner and Outer London are distinguished between, given the contrasting contextual and compositional attributes of these two sub-regions.

Class, tenure and education: As in the HSE, social class is used to measure socioeconomic position. In 2001 and 2011, NS-SeC is converted to social class according to the look up table (Table 3.2). The ‘unclassifiable’ category includes all groups not assigned to a class which varies between years. For example, in 2001 and 2011 this applies to the following categories: never worked, long-term unemployed and full time students. However, in 2001 there are also additional categories identifying groups ‘not known for other reasons’. This inflates the ‘unclassifiable’ group at 2001 and must be accounted for when interpreting the results. Household tenure distinguishes between owner-occupied, privately rented and socially rented. Although those resident in communal establishments are identifiable, they are excluded from this analysis in line with wider literature on selective sorting and health gradients (e.g. Norman *et al*., 2005). Finally, educational attainment is simplified to distinguish between those educated to degree level (or equivalent) and above, and those qualified below degree level. The latter category includes qualifications below degree level, foreign qualifications whose equivalence cannot be determined, and no qualifications. This simplification ensures sufficient sample sizes for meaningful analysis when cross-tabulating by ethnic group.

Migrant status and type: Migration, for the purposes of this thesis, relates to any move across any geographic scale within England, variously defined as internal migration or residential mobility in different research contexts (see chapter 5 for a more detailed discussion on defining and operationalising migrants). Migrants are identified in the census according to data on their usual address during the census, and one year prior to the census. In the SARs, this provides a one-year migration question identifying those who are still at the same address (non-migrants), those who have moved within the last year (migrants), and of those who have moved, how far they have moved (migrant type by distance), and whether they have moved from overseas (international migrant). Migrants are therefore defined as those who have moved *within England* in the year preceding the census across any geographic scale. All international migrants *including those from Wales, Scotland and Ireland* are excluded from the analysis. This necessarily only excludes *recent* international migrants. Although international migrants can also be identified by country of birth, this question does not indicate length of residence in the UK. Country of birth will therefore only be used as an independent variable to explore variations in the socioeconomic, spatial and ethnic patterning to population health.

Migrant types are defined by distance moved, distinguishing between short-, mid- or long-distance migrants according to natural breaks in the distance moved by all migrants at 1991, 2001 and 2011. These are identified in Figure 3.3, plotting the frequency of moves by distance for the three census years. The number of migrants falls dramatically after an initial high frequency of moves between 0-14 km, plateauing between 15 and 149 km before beginning to climb again from 150 km plus.

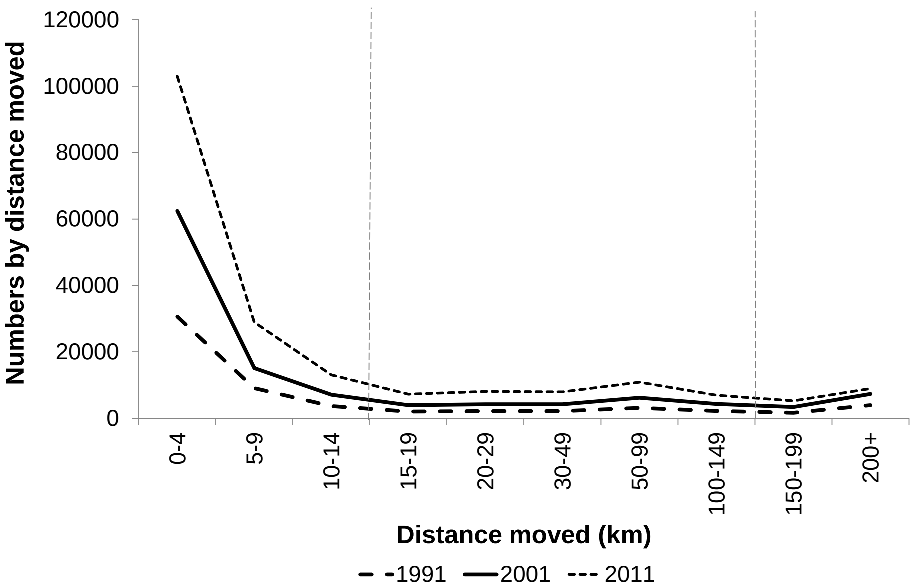


Figure 3.3 Numbers of migrants by distance moved, 1991, 2001 and 2011

Note: Vertical dashed lines identify natural breaks in the frequencies of distance moved.
Source: Samples of Anonymised Records

Comparable studies (e.g. Boyle *et al.,* 2002; Finney and Simpson, 2008) use similar (although not necessarily identical) distance boundaries thus validating this operational decision. Finney and Simpson (2008) discuss short distance moved as moves of less than 5km and long distance moves as moves over 200km or more. Boyle and colleagues distinguish between migrants moving less than 10km or more than 10km. These boundaries do not, however, capture the differences illustrated by Figure 3.3. Further, the identified distance boundaries arguably capture the extent to which a change of address will result in a significant change to the socioeconomic and area-circumstances an individual experiences. Whilst these distinctions are more commonly tied up in conceptual distinctions between ‘migration’ and ‘residential mobility’, the inclusion of migrant type may strengthen the conclusions reached if such distinctions are important with respect to the relationship between internal migration studied here and health.

3.2.2.2 Office for National Statistics Longitudinal Study

The ONS LS links census data and life event information for a 1% sample of the population of England and Wales. The original sample was selected from the 1971 Census, and incorporated data on individuals born on one of four selected dates of birth. The sample has been updated at each successive census by taking individuals with the same four dates of birth in each year and linking them to existing data (Hattersley and Creeser, 1995). Life event information has been added to the LS since census day in 1971, including birth and immigration (entry events) and death and emigration (exit events) of individuals with the four dates of birth. The LS now holds data on more than 1 million sample members and, at each census, data on more than 500,000 sample members. Census information is also included for all people enumerated in the same household as an LS member (referred to as LS non-members), but only information on LS members is linked over time. For each census, approximately 400,000 LS members are linked. Although this avoids non-response, a notable problem in other surveys including the HSE, it can be problematic if participants cannot be linked and may therefore bias the sample (Norman and Boyle, 2014).

By linking census data to life event information the LS, like the SARs, covers the full range of census topics with the added benefit of data on cancer registrations and mortality. External data can also be linked, such as measures of deprivation. The value of the LS for this research rests in the ability to examine changes in deprivation, socioeconomic status and health status for different ethnic groups in 10 year closed cohorts between 1991 and 2001, and 2001 and 2011. Further, through tracking individuals over time it is possible to expand the one-year migration question used in the SARs analysis to a 10-year migration question: LS member addresses are compared between censuses to identify whether they have moved in the intervening years (number of moves or returns to addresses, however, are not identifiable).

3.2.2.2.1 Variables

Many of the operational decisions for the LS variables are similar to those made for the SARs. Nevertheless, there are some important variations and additions that will be discussed. The additions are derived variables capturing changes in life circumstances between census years and therefore revealing trajectories of migration, deprivation change (or mobility) and social mobility. Substantive operational and theoretical discussion of these variables will be reserved for chapter 7. Social class and health are as defined in the SARs.

Ethnicity: The sample sizes available in the LS are large. However, the level of detail required for this analysis in terms of identifying, for example, socially mobile migrant groups in good health, creates small sample sizes when disaggregating by ethnic group. Analysis of the LS data will therefore focus on the total population, the total MEG population, White, Indian, or Pakistani and Bangladeshis. The combined 'Black' or 'Mixed and Other' groups are not substantively discussed due to the heterogeneity of these groups. South Asian ethnicities are discussed, notwithstanding the heterogeneity within these categorisations, as they are consistently defined throughout the thesis. Although not ideal, these are the most practicable choices possible and, when interpreted alongside results of the HSE and SARs analysis, will provide sufficient detail to draw meaningful conclusions.

Deprivation: Area types are classified according to area deprivation measured by the Carstairs Index (Morris and Carstairs, 1991). This is calculated according to four census variables documenting male unemployment, overcrowding (based on numbers of persons in a household per room), non-car ownership and low social class. Although there are some small changes in the nature of these variables between census years, the effect of these changes on the Carstairs Index are negligible and therefore not further discussed. Scores for the Carstairs Index are aggregated into quintiles: as relative scores they enable comparison between census wards in the same year. Thus, although a ward may have the same score at 1991 and 2001, this does not necessarily mean the ward is experiencing the same level of deprivation between census years. However, as the concern of this thesis is the deprivation experience of an individual in 1991, 2001 or 2011 relative to other wards in the same year, the lack of comparability over time is not a problem (other studies have similarly concluded that the Carstairs can be used to explore deprivation change over time in terms of selective sorting (e.g. Norman *et al*., 2005)).

Migrant status: As in the SARs, migrant status is restricted to those who have moved within England, excluding international migrants. However, whilst the SARs identifies one-year migration the LS identifies a 10-year migration variable with addresses compared for linked individuals at successive censuses. As a 10-year migrant variable, this excludes all international migrants who have not been resident in England for at least 10 years. Migrant type (by distance) is not used within the LS analysis. To account for the inter-relationships between migration, deprivation mobility and social mobility, migrants are defined as 'movers' if they changed address between censuses, or 'stayers' if they did not. This enables the analysis to distinguish between different combinations of movers or stayers with different experiences of deprivation change or social mobility.

Deprivation mobility and social mobility: Within each closed cohort (1991-2001 and 2001-2011), transitions between area types or social classes are identified and captured in single variables. These identify groups who either experienced upwards or downwards deprivation or social mobility, as well as those who remained in stable circumstances. These are fully described in chapter 7.

3.2.2.3 Limitations

Census microdata are widely hailed as invaluable sources of information for social researchers, particularly for health geographers (Gould and Jones, 1996) or those interested in migration (Norman and Boyle, 2010). Nevertheless, there are some important limitations to consider, not least in the inconsistencies of variables between census years (such as ethnicity or health). Firstly, the rich sociodemographic detail provided in the SARs comes at the expense of detailed geography (Norman and Boyle, 2010). Secondly, as individual-level samples of the population designed to allow for the analysis of multi-dimensional cross-tabulations, strict access and release conditions are imposed to ensure confidentiality which can constrain, as much as enable, research. Thirdly, despite the richness of the local migration information held in these data, particularly in terms of migrant characteristics, it is not possible to determine longevity at an address or if individuals have moved within the one-year (SARs migrants) or 10-year (LS migrants) periods. Finally, despite their coverage both the SARs and LS are only samples of the population. However, it has still been noted that these are larger in comparison with other national surveys such as the Labour Force Survey (Norman and Boyle, 2010) or the HSE used in this thesis. These limitations do not outweigh the sizeable benefits of these datasets, particularly in their suitability for addressing the aims of this thesis.

3.3 Methods

Patterns in population health are investigated using indirectly standardised illness ratios (SIRs). Rate ratios or extremal quotients based on these SIRs are used to further explore population health and the nature of ethnic inequality in England's society. The Gini coefficient, Slope Index of Inequality (SII) and Relative Index of Inequality (RII) are also used to quantify social, spatial and health inequalities between ethnic groups. Although originally developed as a measure of residential segregation (Duncan and Duncan, 1955), the Index of Dissimilarity is also used as this can be interpreted as a summary measure of inequality (Shaw *et al*., 2007). Measures of population health (SIRs), health inequality (e.g. the SII and RII) and binary logistic regression modelling are employed to examine whether change in area type or social class is associated with changing ethnic health gradients. This section will outline how these methods are applied and interpreted.

3.3.1 Standardised Illness Ratios

SIRs are used to compare population health between ethnic groups over time in the HSE, or to illustrate differences in health between ethnic groups at specific points in time with the census microdata. Crude rates of poor health are influenced by differences in the age-structure of a population alongside differences in the socioeconomic context. The older a population, the higher the crude rates of poor health given that health deteriorates with age. Standardising rates helps researchers account for this (Rowland, 2003). This thesis uses the indirect method of standardisation which is more robust with small numbers: observed counts of poor health in age group are compared with the expected counts, based on the application of a set of age-specific illness rates (ASIRs) to the population age structure. The source of the ASIRs determines the comparability of the SIRs. Thus, in the HSE analysis the standard population used to calculate the ASIRs are the entire sample from 1998 to 2011. As such, the SIRs are comparable over time. However, in the analysis of the census microdata, the standard population are the sample population at each census year (for the SARs) or contained with the closed cohort (for the LS). Thus, these SIRs are not necessarily comparable over time nor between data sources.

ASIRs are calculated by:

$$ASIRs = \frac{number\ of\ events\ (e.g. LLTI)\ in\ each\ age\ group}{total\ population\ in\ each\ age\ group}$$

The ASIRs are then used to calculate expected rates of poor health in a population and this is applied to the known age-structure of the population group in question:

$$Expected\ illness = \frac{ASIR\ \times population\ at\ each\ age}{1000}$$

SIRs are calculated as:

$$SIR = \frac{observed\ illness}{expected\ illness} \times 100$$

With 95% confidence intervals for the SIRs calculated as:

$$SIR\ \pm 1.96\ \times 100\ \times \frac{\sqrt{Observed}}{Expected}$$

SIRs provide a summary of the extent of illness (however defined) in a population subgroup, indicating whether there are higher or lower than expected levels of poor health in a population given their age structure. If the value is greater than 100, this is indicative of greater than expected levels of poor health in a population whereas a value of less than 100 indicates lower than expected levels of poor health. However, if the confidence intervals enclose 100 the rates observed are not significantly different to the standard population.

3.3.2 Rate ratios / Extremal quotients

Rate ratios (or extremal quotients) are summaries of the relative differences between SIRs. Implicit in the title, rate ratios are a ratio of two rates (Rowland, 2003). Rate ratios can be variously employed to summarise the relative magnitude of two rates (Rowland, 2003: 122) or more specifically, to summarise the extent of the gap between two groups and reveal how this gap may change over time. For example, in summarising the relative magnitude of two rates rate ratios can be used to assess the degree of inequality between MEGs relative to the White majority. Consider the SIRs for Whites, Black Caribbeans and Pakistani and Bangladeshis in 2001. Dividing the SIR for Pakistani and Bangladeshis with the SIR for Whites (rate ratio = 153.99/98.73 = 1.56) and comparing this to the similarly calculated ratio between Black Caribbeans and Whites (119.97/98.73 = 1.22) quantifies the extent of inequality between these different groups. The higher the value of the rate ratio, the greater the inequality (Schneider *et al*., 2005). This therefore reveals whether the magnitude of this inequality has changed in 2011 (or from 1991) by comparing the similarly calculated rate ratios for 2011 (or 1991) with those for 2001. Comparisons of rate ratios in different circumstances also helps establish whether transitions between area types or social classes widens, maintains or constrains health gradients. This is referred to as the ‘put people back’ approach and will be discussed in chapter 7.

3.3.3 Gini Coefficient and the Lorenz Curve

The Gini coefficient (G) is used to quantify how uneven the distribution of a population is across a given entity. Most commonly, this measure summarises the extent of income inequality but it can also summarise group differences in health for an entire population (Shaw *et al*., 2007) or, as used here, to summarise social or spatial inequality in a population. The value of G is constrained between 0 (perfect equality) and 1 (perfect inequality). Using the example of income, Shaw *et al*. (2007: 157) equate 0 to a situation whereby everyone has the same income, 1 suggests that one individual has all the income while everyone else has zero income. The Lorenz curve clearly illustrates G, plotted as a scatter diagram (Rowland, 2003: 484). A 45 degree diagonal line runs across the graph (from the bottom left to the top right) representing perfect equality with a curved line running alongside the diagonal illustrating the extent of inequality or the unevenness of the actual distribution.

After Jones (1967) and Shyrock and Siegel (1973), Rowland (2003: 488) summarises the calculation of G as:

$$G = \left(\sum_{i=1}^{n} X_i Y_{i+1}\right) - \left(\sum_{i=1}^{n} X_{i+1} Y_i\right)$$

where,

X_i and Y_i are the cumulative frequency distributions; and
n is the number of areas or categories.

Thus, *G* is a summary of the deviation of the Lorenz curve from zero inequality, or perfect equality. It thereby "measures the proportion of the total area under the diagonal that lies in the area between the diagonal and the Lorenz curve" (White, 1986: 204). The higher the value of *G*, the greater the deviation from zero inequality. For the purposes of this thesis, *G* will be calculated to measure the degree of social (social class) and spatial (region) inequality between ethnic groups. However, whilst *G* can summarise the magnitude of inequality between groups, it does not detail the direction of the inequality. In summarising the magnitude of inequality between groups, it only summarises the *total inequality* in a population thereby measuring "inter-individual inequality" only (Shaw *et al.,* 2007: 158). Nevertheless, *G* has been touted as the "workhorse of income inequality analysis" (White, 1986: 203), due to its simple method of calculation and clear ability to numerically and graphically summarise the extent of inequality in a population and can be used effectively in this thesis' analysis. Interpreted alongside assessments of the (changing) distribution of ethnic groups across socioeconomic variables or regions in England will help determine the direction of the inequality between ethnic groups.

3.3.4 The Index of Dissimilarity

The Index of Dissimilarity (*D*) similarly summarises the evenness in the distribution of a population, most typically in terms of residential segregation (Shaw *et al*., 2007). It is presented alongside *G* as it can be simply expressed as the percentage of one group which would need to redistribute to achieve an even distribution across the population (Rowland, 2003). Rowland (2003: 95) defines the calculation of *D* as:

$$D=0.5 \sum_{i=1}^{n} |\, x_i - y_i|$$

where,

the vertical rules denote absolute differences;
x represents percentages for the standard population (the reference group, e.g. White);
y represents percentages for the comparator population (e.g. Pakistani and Bangladeshis);
i is a data category, such as social class or region; and finally,
n is the number of groups or categories (e.g. five social classes).

Thus, as Rowland (2003) explains, *D* is equal to half the sum of the absolute differences between the percentages for the reference population (*x*) and the percentages for the comparator population (y) for all social classes (i). Calculated alongside G, Duncan (1957) describes the mathematical relationship between G and D as (cited in Rowland, 2003: 489):

$$D \leq G \leq 2D - D^2$$

Expressed as a percentage, the value of D is constrained between 0 and 100 whereby 0 denotes total evenness (total similarity) and 100 denotes total dissimilarity. In the context of inequality, 100 denotes complete inequality whereas 0 denotes complete equality.

3.3.4 The Slope Index of Inequality and Relative Index of Inequality

The Slope Index of Inequality (SII) summarises absolute inequalities in health for given groups such as social classes or area types whereas the Relative Index of Inequality (RII) summarises relative inequality. Amongst others (e.g. Preston *et al.*, 1981), Pamuk developed the measure, noting that the SII enables "trend[s] in inequality … [to be] assessed [more] legitimately by using a summary indicator that incorporates the [health] experiences of all classes [or socioeconomic groups more generally] and their relative shares of the population" (1988: 4). By extension, the RII enables the analysis of relative differences in health supplementing the summary of absolute differences by the SII. The SII is calculated by regressing the mean health of a group on the mean relative rank of that group (Shaw *et al.*, 2007: 182), with the regression equation expressed as:

$$\bar{y}_j = \beta_0 + \beta_1 \bar{R}_j$$

where

j = indexes the social class or area type;
$\bar{y}_j$ = average health status;
$\bar{R}_j$ = average relative ranking of social class or area type in the cumulative distribution of the population;
β_0 = estimated health status of hypothetical individual at bottom of the ranked groups (e.g. class V or deprivation quintile 5); and finally,
β_1 = difference in average health status between hypothetical individual at the bottom of the ranked groups and hypothetical individual at the top (e.g. class I or deprivation quintile 1).

In the case of social class, the classes are ranked from highest (I Professional) to lowest (V Unskilled). The population in each class are one part of the cumulative distribution of the entire population. Each group are given a single score based on the mid-point of their range in the cumulative distribution of the ranked population. For the purposes of this analysis, the mean health of each group is based on SIRs calculated by social class and area type. The SII can therefore be understood as a summary of the hypothetical absolute differences between the top and bottom of the ranked population, i.e. the top and bottom of the social class structure, according to results of the regression model. Where the SII is typically expressed as differences in rates, the RII which summarises relative differences is often expressed as rate ratios

(Mackenbach and Kunst, 1997). In the above regression equation the β_1 coefficient is the SII value.

The RII is similarly based on a regression model. However, to obtain the RII value the SII can be divided by the mean value of the outcome measured (the health outcome) (as proposed by Pamuk, 1988). It can also be obtained by calculating the ratio of the difference in the rate between those at the top of the ranked hierarchy and those at the bottom of the ranked hierarchy. Thus, it is the rate ratio of the theoretical extremes of the ranked hierarchy under investigation (e.g. social class or deprivation). This method, developed by Mackenbach and Kunst (1997), is therefore similar to other widely used measures of health inequality such as the calculation of rate ratios or extremal quotients used within this thesis. In the regression equation, this equates to the rate for those at the bottom of the ranked hierarchy (intercept + slope) divided by the rate for those at the top of the ranked hierarchy (intercept):

$$RII = \frac{(\beta_0 + \beta_1)}{\beta_0}$$

As the method suggested by Mackenbach and Kunst is similar to wider measures of health inequality, their approach is adopted to obtain the RII in this thesis. Unlike other measures of inequality such as the rate ratio or *G*, the RII and SII are invaluable to this research as these measures account for the total (study) population when estimating absolute and relative differences in health between population groups rather than only accounting for those at the top and bottom of the hierarchy. In accounting for differences in the proportion of the population within each category (deprivation quintile or social class), these measures also allow comparison of health inequalities between different population groups (Shaw *et al.*, 2007). This is the main strength of these measures. However, as groups are ranked hierarchically, these measures necessarily assume that everyone in the bottom group (the lowest social class or most deprived area-type is worse off than all groups above them (Mackenbach and Kunst, 1997; Schneider *et al.*, 2005; Shaw *et al.*, 2007). Whilst this *is* often the case, it is not universal.

3.3.5 Binary Logistic Regression

Health and, in the final analysis of this thesis, migration, are dichotomous outcomes which can be modelled using binary logistic regression. Dale *et al.* (2000: 165-167) concisely summarise the calculation of a binary logistic regression model. As such, the following borrows much from their work.

Logistic regression can be used to model the probability of migration or poor health as explained by different independent variables. In modelling the likelihood of these events, binary logistic regression estimates the probability of an event (either having LLTI or migrating), $P(y = 1)$ (Dale *et al.*, 2000). As a probability of a dichotomous event, the outcome must be constrained between 0 and 1 and so a linear regression model is not appropriate. A function of P (y = 1), known as the logit, must therefore be modelled by:

$$P(\,y = 1) = \exp(z)\,/[1 + \exp(z)]$$

where,

$z = b_0 + b_1\, x_1 + b_2 x_{x\,+\,\dots} + b_n\, x_{n;}$
b_0 = the constant;
b_1 = the regression coefficient of the first variable $x_{1.}$

This logit function is graphically represented as an elongated s-shape (see Figure 3.4) which summarises the effects of different explanatory variables on the probability of the outcome modelled (Dale *et al.*, 2000: 166). If the value of z is low, the effect of z on the probability of the outcome modelled is minimal. The probability increases steeply around intermediate z values where the function is approximately linear. It then plateaus very near 1 when z values increase.

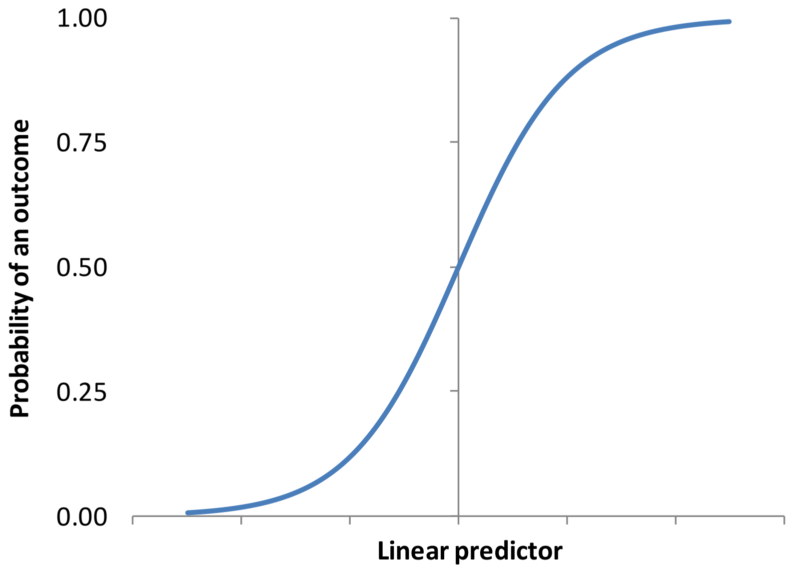


Figure 3.4 Logit function

Source: after Dale *et al.*, 2007: 166.

The equations giving $P(\,y = 1)$ and z listed above can be re-arranged to:

$$\mathrm{P}(\mathrm{y} = 1)/\mathrm{P}(\,\mathrm{y} = 0) \;=\; \exp(\mathrm{b}_0 + \mathrm{b}_1\mathrm{x}_1 + \cdots + \mathrm{b}_n\mathrm{x}_n)$$

In the above equation, $\mathrm{P}(\mathrm{y} = 1)/\mathrm{P}(\,\mathrm{y} = 1)$ (probability of the event occurring divided by the probability of the event of not occurring) gives the odds of y = 1. This is the odds of the event occurring, in other words, LLTI or migration. The logistic regression equation can therefore be interpreted whereby the coefficient b_1 gives the changes in the log odds of y = 1 for every unit change in x_1 while holding all other independent or explanatory variables constant. Although there are no simple measures of the goodness-of-fit to assess how well a model predicts an outcome, such as the R^2 value in linear regression, binary logistic regression is ideal for the purposes of this thesis. This is evident in its suitability in analysing census microdata (Dale *et al*., 2000), wide spread use in epidemiological research (see Kleinbaum, 1994), and applicability to investigations of selective sorting and health gradients (see Fox, 1990; Bartley and Plewis, 1997; 2007).

The models run within thesis will, where appropriate, be stratified according to pertinent population attributes (e.g. tenure or age). Stratifying the population sample and running separate logistic regression models accounts for interactions between certain independent variables and the outcome modelled. For example, it might be expected that the relationship between migration and health will vary by tenure give the dynamic relationship between tenure and migration themselves (see chapter 5). Home-ownership likely reduces the odds of migration whereas tenancies which are more likely to be temporary, such as private- or social-rentals, are more likely to be associated with higher rates of migration. Interactions can be defined within models. To explore these interactions in detail, the population can be stratified by tenure within the models, thereby better revealing the relationship between migration and health for different tenures.

3.4 Alternative Methods

Multi-level modelling (MLM) structural equation modelling (SEM) and microsimulation are three alternative methods which may have been adopted in this thesis. Before outlining why these are not adopted, the following section will introduce each method. MLM is a form of regression modelling appropriate for clustered or grouped data. For example, it might be anticipated that the patterns examined in this thesis, such as the relationship between social class and health or migration, may operate differently in different regions of England. To account for this, a two-level model may be run grouping the population into the different regions of England.

SEM, best understood as a combination of regression or path analysis and factor analysis (Hox and Bechger, 2006), often used to test causal relationships between variables. The hypothesised relationships are represented by, for example, regression coefficients which can be used to determine the importance of the relationships in influencing the outcome modelled. In the context of selective sorting and health, there are some (limited) examples of research using SEM (e.g. Mulatu and Schooler, 2002; Chandola *et al*., 2003). Chandola *et al*. (2003) use SEM to estimate the relative importance of social causation and health selection for health-related social mobility.

Finally, microsimulation is a method which synthesises large-scale population microdata. The simulated groups aim to be as representative as the real population as it is possible to estimate. Using these microdata, it is possible to explore changes in the life or circumstances of the simulated individuals and how these relate to, for example, policy changes (see Ballas *et al*. 2006: 65-66). Microsimulation might therefore be adopted to examine how simulated groups of the population move between classes and area types, and how this varies according to different health statuses or life circumstances (e.g. current location, social class) or demographic attributes (e.g. age or ethnicity).

While each method may be effectively employed to either disentangle the complex relationships between health, migration and ethnicity or investigate processes of selective sorting and the influence on health gradients, these methods are used within this thesis. The intent of this work is to update, rejuvenate and extend existing work on selective sorting. As such, while the methods employed have been adapted and extended, the analytical framework adopted in this thesis is guided by and grounded in existing work on selective sorting and changing health gradients, particularly work originating in the UK. In particular, this thesis is exploratory, examining *whether* selective sorting between area types or social classes *may* operate while accounting for the interrelationships between migration, social mobility and deprivation change, and then *whether* this *may* differently influence (changing) *ethnic* health gradients. Adapting existing widely and effectively employed methods is therefore considered to be the most appropriate methodology for this work. Future work may enhance the conclusions drawn in this thesis by applying these methods: this will be revisited in chapter 9.

3.5 Chapter summary

This chapter has introduced the datasets and statistical techniques employed within this thesis. Introduction of the datasets included a summary of the different variables and operational decisions taken in each analysis. Where appropriate, more substantive discussions will be presented in the following chapters. Technical discussion of the statistical techniques has illustrated their suitability, application and interpretation. Where the techniques are applied according to specific analytical frameworks, such as the ‘put people back’ approach in chapter 7, this will be discussed within the relevant chapter. As noted previously, whilst alternative datasets and methods may be considered, the chosen sources and techniques are appropriate to meet the needs of this thesis’ analysis. Alternatives will be discussed in the concluding chapter of this thesis, particularly in identifying future directions for research.

Chapter 4

Investigating ethnic inequalities in health: evidence from the Health Survey for England, 1998-2011

4.1 Introduction

This chapter uses annual cross-sectional data from the Health Surveys for England (HSE) to examine whether the patterning of health between ethnic groups changes over time. The analysis primarily addresses the first core aim of this thesis: to advance understanding on the nature of ethnic inequalities in health. Much of the relevant literature on ethnicity and health has already been explored in chapter 2. However, salient points will be revisited before introducing the objectives for this chapter. Although data, variables and methods for each of the analytical chapters in this thesis have been substantively discussed in chapter 3, the included variables and appropriate interpretation of the methods will be re-iterated in this and all subsequent analytical chapters. Similarly, discussion of results for all chapters will be framed around the chapter objectives (stated below). Overall discussion of the results, particularly in terms of the core aims posed in chapter 1 and research questions posed in chapter 2 will be reserved for the final chapter. Each chapter will conclude by introducing the following chapter's analysis, highlighting what part of the picture is painted by each separate analysis. However, this chapter's discussion will be extended as this sets the context for subsequent analysis of census microdata.

4.2 Revisiting health and ethnicity

The 'Marmot Review' (Institute of Health Equity, 2010) reports on health inequalities within the UK. Implicit in the report's title, 'Fair Society Healthy Lives', is that health inequalities are the product of an unfair society. Whilst issues of social justice and social and spatial inequalities in health have long been researched (Townsend *et al*., 1988; Shaw *et al*., 1999; Bajekal *et al*., 2013; Barr *et al*., 2012), there has been a relative paucity of comparable research on ethnic inequalities in health.

Nazroo (2014) identifies a gap in this field in both evidence and policy debates in the UK, including their absence from the Marmot Review. He suggests two explanations for this gap: either relating to inadequate conceptions about the drivers of ethnic inequalities in health based in genetics or cultural differences; or assumptions that existing discussions of social and spatial inequalities in health satisfactorily capture ethnic disparities. However, neither culture nor genetic differences adequately explain ethnic differences in health. There is little evidence that cultural factors have an important explanatory role (Nazroo, 1998), or more importantly that there is any underlying biological risk of poor health for minority ethnic groups (MEGs) (Nazroo, 2001; Bhopal *et al*., 2002).

Health follows social and spatial gradients with inequalities observed by social class, income, educational attainment and area-based deprivation (Smith *et al*., 1997; Graham, 2000; Mackenbach *et al*., 2008; Wilkinson and Pickett, 2010; Stafford and Marmot, 2003). Different ethnic groups are disproportionately distributed across the social classes or between area types, achieve different levels of qualifications or earn different incomes (e.g. Modood, 1997). Discussions of social and spatial inequalities in health must, therefore, consider the contrasting social, spatial *and health* experiences of different ethnic groups. However, single measures of socioeconomic status may inadequately describe the complexity of the social and spatial inequalities faced by MEGs (Chandola, 2001; Cooper, 2002). This is evidenced by salary differences between ethnic groups assigned to the same occupational class (Nazroo, 1997); or that MEG men are more likely to be unemployed or employed in part-time work than White men (ONS, 1996). Nearly twenty years later little has changed with recent data from the Labour Force Survey reporting higher rates of unemployment for all MEGs compared to Whites (DWP, 2014). It must be considered whether there is an additive penalty of not only being of a certain ethnicity but also experiencing social and spatial disadvantage to ensure that ethnic health gradients are substantively addressed within the policy agenda.

An additional explanation for the gap in policy and research relates to data: quantitative research on ethnic differences in health is hampered by a lack of detailed ethnic data with large enough sample sizes for meaningful investigation. However, a lack of robust data should not undermine efforts to use that which is available. Indeed this was the impetus for Ajwani *et al.* (2003) and Blakely *et al*.'s (2007) innovative work anonymously and probabilistically linking death registrations to census data in New Zealand to demonstrate the widening mortality gap between Maori, Pacific and non-Maori non-Pacific groups.

The strength of these three explanations waivers when reviewing international literature on ethnicity and health: research consistently demonstrates that ethnic inequalities in health are perpetuated within unfair societies, divided along social and economic lines, and worsened by discrimination or the marginalisation of MEGs (Abdalla *et al*., 2013; Bécares *et al*., 2013; Mitrou *et al*., 2014). Although the socio-political context may vary, a common theme is that MEGs are disproportionately concentrated in more disadvantaged circumstances characterised by poorer quality housing or temporary tenancies (private and social rentals); unemployment, under-employment, or employment in low skilled occupations (Nazroo, 1997; Li and Heath, 2008; Lindley *et al*., 2006; Berthoud, 2000; Cheung and Heath, 2007); lower levels of educational attainment or less return on their educational investment (Lynch and Kaplan, 2000; Krieger *et al*., 1993; Leslie and Drinkwater, 1999; Carmichael and Woods, 2000); and lower incomes (Hills *et al*., 2010; Nandi and Platt, 2010). These are all associated with poorer health (Marmot *et al*., 1991; Bartley and Blane, 2008; Bambra and Eikemo, 2009; Gibson *et al*., 2011, van de Knesebeck *et al*., 2006). Thus, where MEGs concentrate in more disadvantaged circumstances (Modood *et al*., 1997; Nazroo, 1998; Barnard and Turner, 2011), they will likely experience poorer health.

The marginalisation of MEGs in society is a form of racial discrimination, evident across the world from the United States (Williams and Mohammed, 2009) to New Zealand (Harris *et al*., 2006). In England, Gillborn (2008) asserts that the educational attainment gap between ethnic groups is a permanent feature of the education system due to the inherent structural racism (unconsciously) practiced in schools. It is this (unconscious) racism which may explain differences in earnings between ethnic groups (Nazroo, 1997) or different opportunities in the workforce and under-employment of MEGs given their educational attainment (Heath and Cheung, 2006). Even where improvements are seen, such as in the narrowing employment gap between White and MEGs between 1993 and 2013 (down to 11.9 percentage points from 15.2), gaps persist (DWP, 2014). Racism is not only divisive, compounding experiences of disadvantage amongst MEGs, it also jeopardises health (Williams, 1999; Karlsen and Nazroo, 2002; Harris *et al*., 2006). Whether direct or indirect, the stressors of racial harassment or discrimination are associated with adverse mental health (Krieger *et al*., 2005), poor self-assessed general health (Karlsen and Nazroo, 2004) and (poor) early child health and development (Kelly *et al*., 2012).

4.3 Research intent

The relationship between health and racism has been extensively explored in the literature cited here. This review has outlined evidence illustrating that ethnic inequalities in health are the product of an unfair society, deserving substantive consideration in reports such as the Marmot Review. The possibility of a multiplicative effect of being of a certain ethnicity and experiencing multiple socioeconomic disadvantages may explain a large amount of observed ethnic inequalities in health.

Building on the findings of existing literature, this chapter will quantify ethnic inequalities in health over a long-run time-series and examine whether these inequalities remain when sociodemographic circumstances are accounted for. To fulfil these aims, the objectives for this chapter are to:

a) access annual data from the HSE and harmonise variables over time;
b) calculate a time-series of health measures by ethnic group; and
c) model health outcomes while controlling for various sociodemographic attributes.

Although this analysis overlaps with previous work, it is justified given that research in this area is often challenged by sample sizes. Adding to the growing evidence base is key to improving understanding on the nature of ethnic inequalities in health. In addition to the core aims and objectives for this chapter, by examining the patterning of health by socioeconomic attribute and region in England, inferences can be drawn as to possible differences in the patterning of social mobility or internal migration between ethnic groups in England. Such differences are important given the second core aim of this thesis' focus on questions of selective sorting (via social mobility and migration) and changing health gradients.

4.3.1 Data and Methods

The HSE is an annual representative household survey of England's population covering a range of core topics each year alongside rotating special themes. Although the HSE is used to investigate ethnic differences in health (Cooper, 2002; Sproston and Mindell, 2006; Smith *et al*., 2009; Karlsen and Nazroo, 2010) and healthcare (Nazroo *et al*., 2009), no study has created a long-run data time-series to explore how ethnic differences in health have changed over time. Although the chosen study period was largely determined by the availability of sufficiently consistent variables, it is a period which is apt for analyses of ethnic difference and changing population health. As discussed in chapter 1, England became increasingly diverse with the UK's White population reducing from 91.4 to 86% between 1991 and 2011 (ONS, 2012). This period was also characterised by sustained economic growth from 1998 to 2007 (Barr *et al*., 2007), and then by recession; important factors affecting socioeconomic inequality. The time-series starts with a 10 year period of targeted political action on health inequalities from the then Labour government. Tracking wider changes in population health during and after such an intervention is important when looking to contribute to evidence-based policy.

Annual variation in the survey content requires that consistent variables are derived before creating a 1998-2011 time-series dataset. For a detailed account of this, see Darlington *et al*. (2014) (see also chapter 3). The HSE sample analysed is restricted to adults aged 16 and over with the small proportion living in communal establishments excluded. Table 4.1 summarises the variables used in this analysis alongside sample sizes from selected study years. All independent variables included are widely acknowledged as social determinants of health (social class, educational attainment, employment status, housing tenure and region of residence). These variables characterise the contrasting social and, to a small extent given the lack of geographic detail in the HSE, spatial experiences of ethnic groups in England. Derivation of the health, ethnicity and social class (with the top (I & II) and bottom (IV & V) two classes combined to increase sample sizes) variables is discussed in chapter 3 (as core variables in this thesis). In addition, age is collapsed into five categories to reflect breaks in the lifecourse; Government Office Region (GOR) is simplified to North, Yorkshire and the Humber, Midlands, London, East of England, and South; and educational attainment distinguishes between those qualified at degree level, those qualified below this threshold and those with no qualifications (including foreign and other qualifications). All non-responses for the health outcomes are taken to indicate no LLTI or good health on the assumption that respondents to a health survey will confirm poor health, if present. This should be interpreted cautiously as questionnaires focussing on health can produce higher (although not necessarily false) estimates of poor health in a population (Taylor *et al*., 2014). Since similar assumptions cannot be made about the independent variables, non-responses are excluded.

As noted in chapter 3, although the primary focus of this analysis are ethnic inequalities in health, the 1999 and 2004 ethnic boost data for the HSE are not used. Whilst the HSE is a highly representative sample of England's population, MEGs are over-sampled in the boost years to allow for more detailed analysis. The boosted data were not considered appropriate for this analysis for a number of reasons. Firstly, as the general household sampling method employed by the HSE provides a representative sample of the *whole* population (see Sproston and Mindell, 2006): although there may be smaller numbers sampled from MEGs, these data are still representative. Secondly, notable existing research has also successfully examined ethnic inequalities in health without using the boosted survey years (Cooper, 2002) yielding comparable results to those presented in this analysis (discussed below). Further, existing research which *does* analyse the boosted samples also yields comparable results to those found in this analysis (e.g. Mindell *et al*., 2014; Smith *et al*., 2009). Thirdly, such studies which do use the boosted samples in 1999 and 2004 tend to focus on the years around those points, aggregating all the data into a single sample. As this analysis is concerned with change over time, this was not considered appropriate, particularly owing to the change in sampling method if the boosted samples are included. Finally, results of this analysis are also comparable to those presented in the following chapter: the socioeconomic composition of each ethnic group found in these data are similar to those revealed by census data. This suggests that while certain MEGs may be less likely to respond, this has not significantly biased the results with only, for example, MEGs amongst higher social classes participating in the HSE. Future work may re-examine the patterns explore here, making use of the boosted sample. However, given the comparability of these results (as will be shown) with existing research using the HSE with and without the boosted samples, it is likely that this will simply enhance rather than substantively alter the conclusions drawn.

Data are pooled over rolling three-year periods to smooth annual fluctuations and increase sample sizes. Changing population health by ethnic group are first assessed using indirectly standardised illness ratios (SIRs): SIRs of more than 100 indicate poorer than expected health, whereas less than 100 indicates better than expected health. Rate ratios are then calculated to explore whether ethnic inequalities in health between minority and majority groups are changing. If the ratio has a value greater than 1, the minority group has poorer health than the White group and *vice versa*. If this value changes over time, the gap between the White majority and minority group is changing. Rate ratios are also calculated to explore inequalities within South Asian groups. To help explain the inequalities observed in these data, the contrasting socioeconomic and spatial experiences of different ethnic groups are examined by comparing the (changing) distribution of each ethnic group within the independent variables over time. Simple comparisons such as these are useful in capturing the extent of inequality within and between ethnic groups.

The relationships between each health outcome and the independent variables are then modelled using binary logistic regression. These models illustrate the extent to which the independent variables explain differences in health. Results for ethnic groups are modelled in relation to the White group. Reported results include odds ratios (OR), 95% confidence intervals (CIs) and predicted probabilities of LLTI or poor health. An OR of more than one indicates a greater likelihood of the outcome relative to the reference group and *vice versa*.

Table 4.1 Included variables and selected sample sizes (1998-2000, 2003-2005, 2009-2011) Health Surveys for England

	1998-2000 (31,402)	2003-2005 (31,429)	2009-2011 (21,486)
Male	14,277	13,891	9,531
Female	17,125	17,488	11,955
16 – 24	3,617	3,125	2,187
25 – 34	5,709	4,416	3,069
35 – 59	1,550	12,748	9,119
60- 84	8,008	10,295	6,563
85+	566	795	549
White	29,430	39,032	19,401
Black	523	777	506
Indian	503	612	448
Pakistani & Bangladeshi	412	521	427
Mixed & Other	534	679	704
No LLTI	23,264	22,553	16,029
LLTI	8,138	8,826	5,457
Good health	23,293	22,775	15,955
Less than good health (poor health)	8,109	8,604	5,531
I and II: Prof and Managerial & Tech	9,087	10,295	6,895
IIIN Skilled non-man	7,610	7,146	4,759
IIIM Skilled manual	5,895	5,511	4,021
IV and V: Partly- and un-skilled	7,321	6,883	4,167
Unclassifiable	1,489	1,544	1,644
Employed	17,294	16,008	11,420
Unemployed	1,551	1,289	1,054
Retired	6,604	8,990	5,643
Other econ inactive	5,953	5,092	3,369
Higher qualifications	7,547	8,457	6,988
Qualifications below	13,842	13,228	9,267
No qualifications	10,013	9,694	5,231
Owner-occupied	22,994	23,453	15,044
Privately rented	2,603	2,620	2,969
Socially rented	5,805	5,306	3,473
North	6,230	6,230	4,613
Yorkshire	3,437	3,197	2,160
Midlands	6,308	6,364	4,298
East of England	3,611	3,589	2,356
London	3,744	3,796	2,334
South	8,072	8,203	5,725

Source: Health Surveys for England

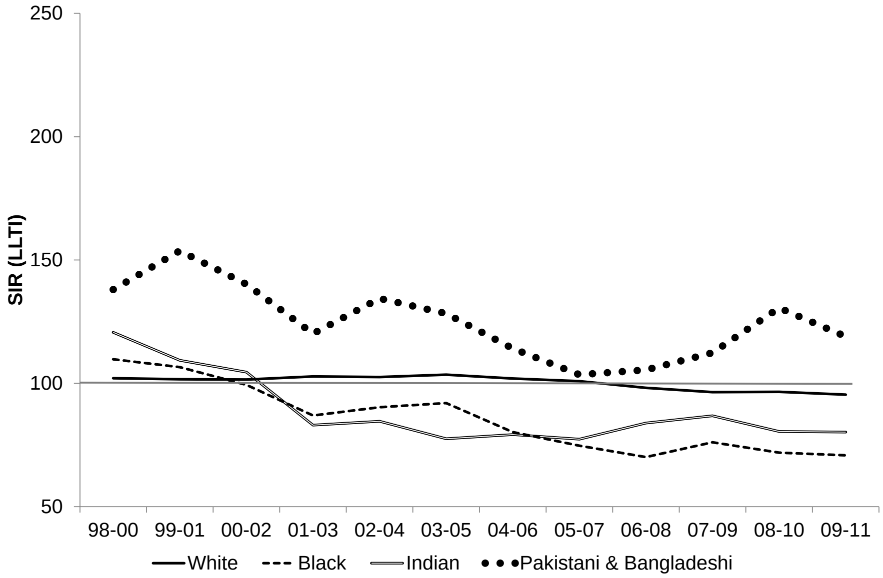
4.4 Results

4.4.1 Population health, inequalities and ethnic diversity

Figure 4.1 illustrates changing patterns of health by ethnic group according to the SIRs. For both health outcomes, Pakistani and Bangladeshis have relatively poor health: after an initial decline, the SIRs climb from 2005 for LLTI, and 2002 for poor health. Further, the SIRs invariably remain above 100 indicating consistently poorer than expected health for both health outcomes. Conversely, levels of poor health for Indians and Blacks are in decline, with the SIR for LLTI falling to less than 100 from 2000. However, for poor health the SIRs remain above 100 for Blacks and Indians, although these are not significantly different to Whites by 2008. In both health outcomes, the White group tends to have expected levels of LLTI and poor health over the study period. However, this is largely because Whites are the majority population. The SIRs indicate that a) MEGs consistently have higher than expected levels of poor health with significantly higher levels amongst Pakistani and Bangladeshis; b) Indians and Blacks have lower than expected levels of LLTI, below those of the White majority; c) improvements in the health of Pakistani and Bangladeshis are much less marked than for Indians and Blacks, with some evidence of deteriorating health in the later years; and finally d) gaps between all ethnic groups persist for the duration of the study period. The CIs (not presented on the graphs) tend to be large for the MEGs due to sample sizes. Notwithstanding small numbers, some significant differences are found.

Rate ratios relative to the White group illustrate whether these gaps are changing. In Figure 4.2, after an initial reduction, the gap between the White and the Pakistani and Bangladeshi groups increases over time for both health outcomes. Conversely, the gap between White and Black groups, and the White and Indian groups is narrowing over time. For LLTI, this indicates that Indians and Blacks fair better than the White majority. Differences in health between Indians and Pakistani and Bangladeshis are evidenced by widening gaps for both measures. For LLTI, the largest health gap is within these South Asian ethnicities. In the final years all groups (2009-11) begin to see some improvement, although the time-series would need to be extended to establish if this reflects a long-term trend. Recognising the divergent health experiences of these groups is important given a tendency to group these ethnicities together in public and academic research (e.g. Norman and Fraser, 2013).

a)



b)

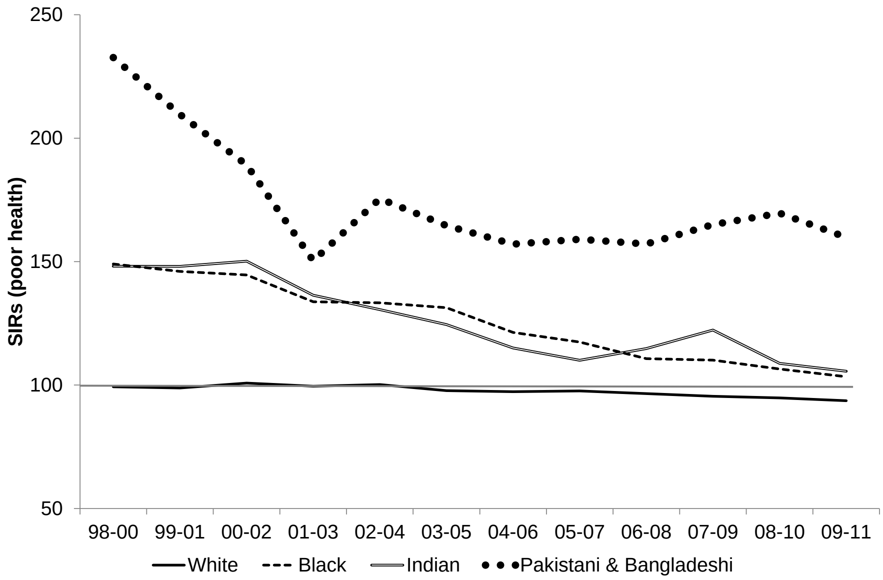


Figure 4.1 Changing population health: standardised illness ratios by ethnic group, 1998-2001 to 2009-2011, Health Survey for England

Source: Health Surveys for England

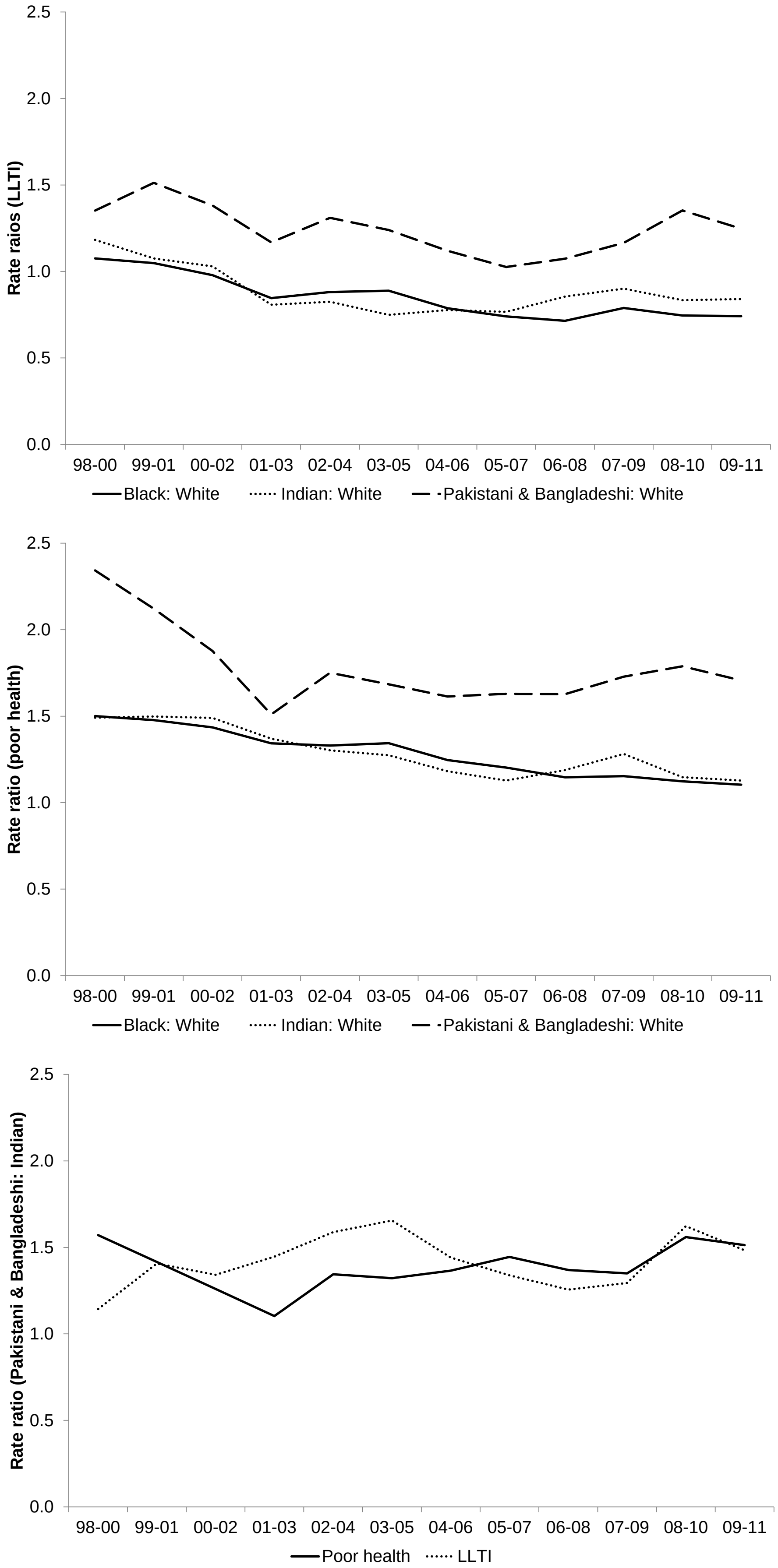


Figure 4.2 Rate Ratios for health differences between ethnic groups, 1998-2011

Source: Health Surveys for England

Table 4.2 reveals persisting and changing inequalities over time by comparing the distribution of each ethnic group within the independent variables. Indians consistently have high concentrations in more advantaged circumstances (higher social classes, in employment, educated to degree level or above, living in owner-occupation). This contrasts with Blacks and Pakistani and Bangladeshis who tend to be concentrated in more disadvantaged circumstances (lower social classes, unemployed or economically inactive, lower levels of educational attainment and living in socially rented accommodation). Whilst the White group are generally, although not exclusively, in better circumstances than either the Black or Pakistani and Bangladeshi groups, they are not more likely than Indians to experience advantage.

Notwithstanding the coarse (GOR) geography available in the HSE, there are observable differences in the spatial distribution of these ethnic groups. Whilst the MEGs overwhelmingly concentrate in London, with Black groups having the largest proportion there, they are not then equally spread across England. For example, Pakistani and Bangladeshis cluster in the North and Yorkshire, with a marked increase over time in the North. Conversely, a large proportion of Indians are resident in the Midlands.

Table 4.2 Ethnic groups within social class, economic status, educational attainment, housing tenure and Government Office Region (%), Health Survey for England, 1998-2000 to 2009-2011

	1998-2000				2004-2006				2009-2011			
	W	B	I	P and B	W	B	I	P and B	W	B	I	P and B
I and II:	30.3	20.2	33.2	21.0	34.9	32.4	46.0	35.9	34.5	36.4	42.7	23.9
IIIN	25.5	23.8	26.8	19.9	24.0	21.8	26.5	21.7	24.2	17.9	22.5	24.9
IIIM	19.8	20.6	15.9	23.2	18.4	16.1	11.1	22.8	20.6	13.6	14.4	23.9
IV and V	24.4	35.3	24.2	35.8	22.7	29.6	16.5	19.7	20.6	32.1	20.4	27.3
Employed	55.3	51.6	58.5	38.3	49.9	56.3	58.2	38.5	53.0	59.1	64.3	45.0
Unemployed	4.6	9.4	6.9	8.1	3.5	10.7	3.8	8.2	4.5	8.7	8.9	7.4
Retired	22.0	12.2	6.9	5.0	31.7	14.1	15.0	8.2	28.3	8.5	8.2	7.0
Other econ inactive	18.1	26.7	27.8	48.6	15.0	19.0	22.9	45.1	14.1	23.8	18.6	40.6
Higher qualifications	18.3	19.1	21.6	9.9	19.8	19.3	27.3	13.1	20.5	23.2	28.9	12.7
Qualifications below	32.0	26.3	24.5	19.2	27.7	18.0	14.8	12.8	27.1	14.8	14.7	11.9
No qualifications	49.7	54.6	53.9	70.9	52.4	62.7	57.9	74.1	52.4	62.0	56.4	75.4
Owner-occupied	73.4	35.6	82.6	56.7	74.7	39.4	79.6	67.6	69.6	36.8	78.0	64.3
Privately rented	7.8	10.7	10.2	10.0	7.9	17.0	13.3	8.9	13.5	24.0	16.7	16.5
Socially rented	18.9	53.7	7.1	33.3	17.3	43.6	7.1	23.2	16.9	39.2	5.3	19.2
North	20.9	4.3	7.1	12.5	20.9	7.1	4.8	18.3	22.1	7.8	7.6	25.9
Yorkshire	11.1	5.9	10.6	12.6	11.1	3.8	3.8	15.1	10.3	5.2	5.1	15.0
Midlands	20.1	13.3	33.8	18.4	20.8	17.6	24.3	18.5	20.1	15.9	33.3	15.8
East of England	11.8	5.9	6.1	11.7	11.4	6.2	4.6	7.7	11.5	6.5	6.3	7.2
London	9.3	64.1	32.8	37.5	8.0	57.1	50.2	31.3	7.9	51.7	32.3	28.1
South	26.8	6.4	9.6	7.3	27.8	8.2	12.2	9.1	28.1	12.9	15.4	8.1

Note: W = White, B = Black, I = Indian, P and B = Pakistani and Bangladeshi; I and II = Professional, Managerial and Technical classes; IIIN = Skilled non-manual; IIIM = Skilled manual; IV and V = Partly skilled and unskilled.
Source: Health Surveys of England

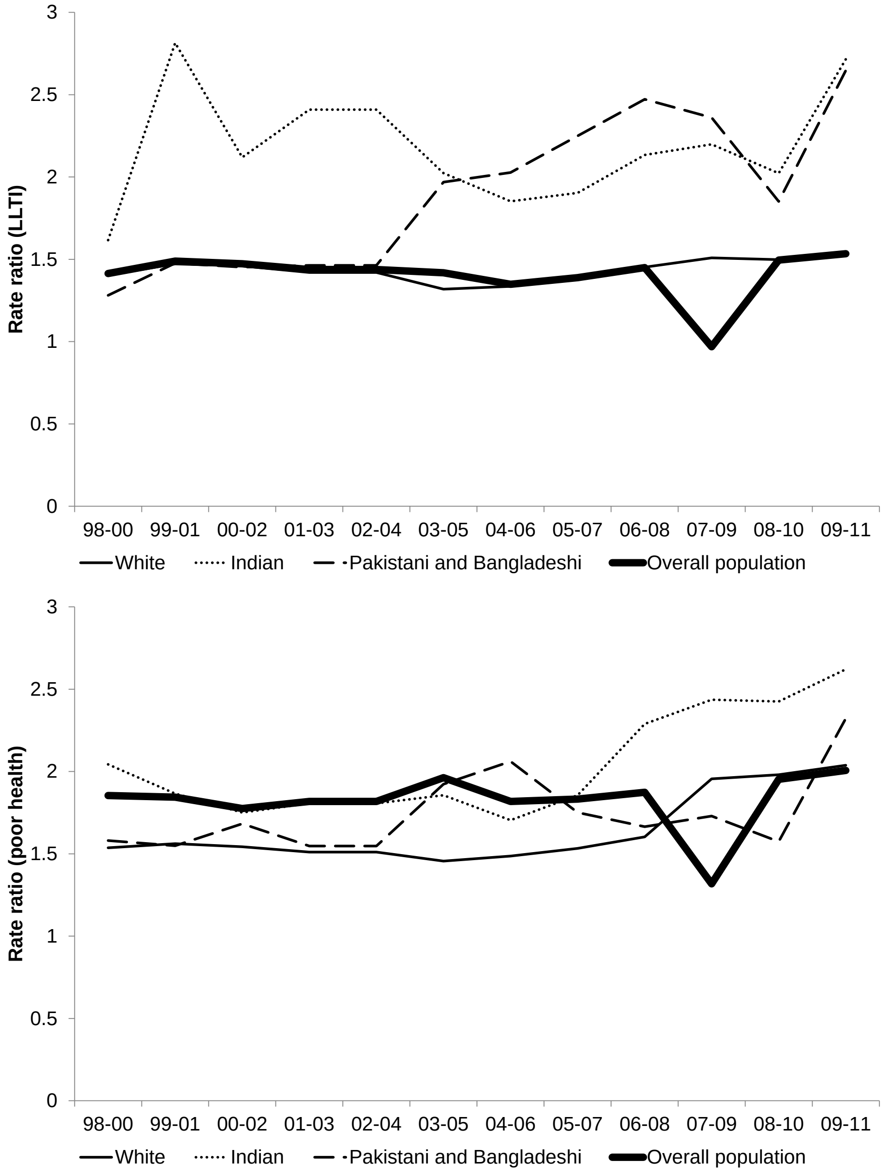


Figure 4.3 Rate ratios for health differences by social class within ethnic groups and the overall population, 1998-2011

Source: Health Surveys for England

Given the persisting socioeconomic disparities by ethnic group and the observed health inequalities in between ethnic groups, it is worth examining changing social inequalities in health within ethnic groups. Figure 4.3 plots the rate ratio within each ethnic group between the bottom (IV and V) and top (I & II) social classes over time. Although there are some marked fluctuations within ethnic groups, particularly by LLTI, the overall pattern is that relative inequalities in health by social class within ethnic groups and across the overall population appear to widen between 1998 and 2011.

4.4.2 Modelling poor health

Tables 4.3 and 4.4 present the binary logistic regression results as ORs for selected years. Model 1a estimates LLTI and 2a estimates poor health adjusting for each of the demographic variables. To determine the contribution of socioeconomic and spatial variables to differences in health, models 1b and 2b also adjust for the remaining independent variables (see Table 4.1). All differences in health are relative to Whites.

When only adjusting for demographic variables in models 1a and 2a, females have marginally higher odds of both outcomes than males, though differences are rarely significant. Odds of LLTI increase steeply with age relative to those aged 16-24, with a similar although shallower gradient evident for poor health. Relative to Whites, from 2000-2002 onwards Blacks and Indians have lower likelihoods of LLTI whereas Pakistani and Bangladeshis have higher odds (mainly significant). Conversely, odds of poor health are significantly raised for Blacks up to 2008-2010, mainly significantly raised for Indians, and consistently significantly raised for Pakistani and Bangladeshis.

Models 2b and 2b also adjust for the socioeconomic variables and GOR. For both health outcomes, social classes IIIN to V have raised odds relative to classes I and II. However, the ORs for social classes IV and V suggest that the magnitude of health penalty is lower than one might expect. For employment, education and tenure, the patterns of differences in both LLTI and poor health are generally consistent with expectations. Spatial differences in health, particularly between the North and South, are demonstrated by the generally significantly lower odds of LLTI and/or poor health for the East of England, London and the South relative to the North. For gender, the inclusion of these additional variables largely reversed the odds such that females are now less likely than males to report LLTI or poor health (mainly significant). The gradient of ORs by age is somewhat attenuated, but successive increases in likelihoods of either health outcome are found by age.

Model 1b shows Blacks have significantly higher odds for LLTI than Whites until 2007-2009. More recently, however, there are no differences. For poor health in model 2b, Blacks have significantly lowered odds relative to Whites for the latter half of the period, contrasting with no difference for the earlier years. Indians have significantly higher odds of LLTI throughout the study period, but generally no difference for poor health. The same pattern is evident for Pakistani and Bangladeshis.

Table 4.3 Binary Logistic Regression - Modelling limiting long-term illness using the Health Survey for England, 1998 – 2011

	Model 1a: Demographic variables			**Model 1b: Demographic, Socioeconomic variables and Government Office Region**		
	98-00 OR (L CI, U CI)	04-06 OR (L CI, U CI)	09-11 OR (L CI, U CI)	98-00 OR (L CI, U CI)	04-06 OR (L CI, U CI)	09-11 OR (L CI, U CI)
Male	REF	REF	REF	REF	REF	REF
Female	1.03 (0.97, 1.08)	*1.11 (1.05, 1.17)*	*1.15 (1.07, 1.23)*	*0.83 (0.78, 0.88)*	*0.85 (0.80, 0.91)*	*0.91 (0.85, 0.98)*
16 – 24	REF	REF	REF	REF	REF	REF
25 – 34	*1.36 (1.18, 1.57)*	*1.35 (1.14, 1.60)*	1.21 (0.96, 1.53)	*1.24 (1.09, 1.41)*	*1.46 (1.25, 1.70)*	*1.49 (1.23, 1.79)*
35 – 59	*2.76 (2.44, 3.13)*	*2.80 (2.41, 3.25)*	*2.89 (2.35, 3.55)*	*2.20 (1.96, 2.46)*	*2.87 (2.51, 3.28)*	*3.43 (2.91, 4.05)*
60- 84	*6.56 (5.78, 7.46)*	*6.70 (5.78, 7.77)*	*6.66 (5.42, 8.19)*	*2.51 (2.19, 2.89)*	*3.20 (2.74, 3.74)*	*4.09 (3.37, 4.96)*
85+	*12.72 (10.30, 15.71)*	*13.74 (11.23, 16.82)*	*14.00 (10.73, 18.25)*	*3.26 (2.62, 4.06)*	*3.82 (3.10, 4.70)*	*5.51 (4.24, 7.16)*
White	REF	REF	REF	REF	REF	REF
Black	1.09 (0.87, 1.37)	*0.79 (0.64, 0.98)*	*0.69 (0.63, 0.90)*	*1.40 (1.13, 1.72)*	*1.23 (1.01, 1.50)*	0.87 (0.69, 1.11)
Indian	*1.25 (1.00, 1.57)*	*0.76 (0.60, 0.97)*	0.82 (0.62, 1.08)	*1.87 (1.52, 2.30)*	*1.56 (1.26, 1.93)*	*1.35 (1.06, 1.73)*
Pakistani & Bangladeshi	*1.51 (1.13, 2.01)*	1.21 (0.93, 1.57)	*1.51 (1.14, 2.00)*	*2.26 (1.82, 2.82)*	*1.38 (1.12, 1.70)*	*1.48 (1.17, 1.88)*
I and II				REF	REF	REF
IIIN				1.04 (0.95, 1.13)	1.03 (0.94, 1.12)	1.04 (0.94, 1.16)
IIIM	-	-	-	*1.35 (1.23, 1.48)*	*1.34 (1.22, 1.46)*	*1.31 (1.18, 1.46)*
IV and V				*1.32 (1.21, 1.45)*	*1.30 (1.19, 1.42)*	*1.39 (1.25, 1.56)*
Employed				REF	REF	REF
Unemployed	-	-	-	*1.56 (1.35, 1.80)*	*1.75 (1.49, 2.07)*	*1.70 (1.43, 2.03)*
Retired				*2.48 (2.22, 2.75)*	*2.83 (2.55, 3.14)*	*2.54 (2.24, 2.88)*
Other inactive				*3.51 (3.25, 3.80)*	*3.83 (3.52, 4.17)*	*3.63 (3.27, 4.03)*
Higher qual				REF	REF	REF
Lower qual	-	-	-	*1.22 (1.12, 1.33)*	*1.26 (1.16, 1.37)*	*1.33 (1.21, 1.46)*
No qualifications				*1.87 (1.70, 2.05)*	*1.99 (1.82, 2.17)*	*1.91 (1.71, 2.13)*
Owner-occupied				REF	REF	REF
Privately rented	-	-	-	*1.29 (1.12, 1.44)*	*1.32 (1.18, 1.47)*	*1.43 (1.29, 1.60)*

Socially rented				*1.81 (1.70, 1.94)*	*2.03 (1.88, 2.18)*	*2.25 (2.05, 2.46)*
North				REF	REF	REF
Yorkshire				0.95 (0.86, 1.04)	0.95 (0.85, 1.05)	0.99 (0.87, 1.12)
Midlands				*0.86 (0.79, 0.94)*	*0.85 (0.78, 0.92)*	0.94 (0.85, 1.04)
East of England	-	-	-	*0.70 (0.63, 0.78)*	*0.77 (0.69, 0.85)*	*0.84 (0.75, 0.96)*
London				*0.78 (0.70, 0.86)*	*0.72 (0.65, 0.81)*	0.95 (0.84, 1.09)
South				*0.76 (0.70, 0.83)*	*0.73 (0.67, 0.79)*	*0.75 (0.68, 0.83)*

Table 4.4 Binary Logistic Regression - Modelling poor health using the Health Survey for England, 1998 to 2011

	Model 2a: Demographic variables			**Model 2b: Demographic, Socioeconomic variables and Government Office Region**		
	98-00 OR (L CI, U CI)	04-06 OR (L CI, U CI)	09-11 OR (L CI, U CI)	98-00 OR (L CI, U CI)	04-06 OR (L CI, U CI)	09-11 OR (L CI, U CI)
Male	REF	REF	REF	REF	REF	REF
Female	1.01 (0.96, 1.07)	1.02 (0.96, 1.07)	1.02 (0.95, 1.09)	*0.83 (0.78, 0.89)*	*0.94 (0.88, 0.99)*	1.03 (0.95, 1.11)
16 – 24	REF	REF	REF	REF	REF	REF
25 – 34	0.96 (0.84, 1.08)	0.99 (0.85 1.16)	0.85 (0.69, 1.04)	*1.68 (1.46, 1.93)*	*1.75 (1.49, 2.06)*	*1.59 (1.30, 1.95)*
35 – 59	*1.77 (1.59, 1.97)*	*1.91 (1.67, 2.18)*	*1.85 (1.55, 2.20)*	*3.42 (3.01, 3.88)*	*3.67 (3.18, 4.24)*	*3.97 (3.32, 4.75)*
60- 84	*4.09 (2.66, 4.57)*	*4.70 (4.12, 5.37)*	*4.11 (3.45, 4.89)*	*4.14 (3.57, 4.80)*	*4.16 (3.54, 4.90)*	*5.05 (4.12, 6.20)*
85+	*6.63 (5.43, 8.09)*	*7.27 (6.03, 8.78)*	*7.15 (5.62, 9.09)*	*6.66 (5.33, 8.33)*	*6.82 (5.51, 8.45)*	*8.40 (6.42, 11.00)*
White	REF	REF	REF	REF	REF	REF
Black	*1.74 (1.42, 2.13)*	*1.37 (1.13, 1.66)*	1.03 (0.81, 1.31)	0.92 (0.74, 1.16)	*0.76 (0.61, 0.95)*	*0.60 (0.46, 0.79)*
Indian	*1.69 (1.37, 2.09)*	1.22 (0.98, 1.52)	1.18 (0.93, 1.52)	*1.30 (1.04, 1.62)*	0.90 (0.71, 1.14)	0.96 (0.74, 1.26)
Pakistani & Bangladeshi	*2.71 (2.10, 3.50)*	*1.74 (1.37, 2.22)*	*2.06 (1.59, 2.67)*	1.11 (0.87, 1.42)	0.96 (0.77, 1.20)	1.12 (0.87, 1.45)
I and II				REF	REF	REF
IIIN				1.04 (0.95, 1.13)	0.94 (0.87, 1.03)	0.93 (0.84, 1.03)
IIIM	-	-	-	*1.25 (1.15, 1.37)*	1.06 (0.97, 1.16)	*1.12 (1.00, 1.24)*
IV and V				*1.14 (1.04, 1.24)*	0.99 (0.90, 1.08)	1.07 (0.96, 1.19)

Employed				REF	REF	REF
Unemployed	-	-	-	*1.64 (1.41, 1.91)*	*1.60 (1.34, 1.91)*	*1.49 (1.23, 1.81)*
Retired				*2.83 (2.54, 3.14)*	*3.11 (2.81, 3.45)*	*2.78 (2.45, 3.15)*
Other inactive				*4.41 (4.08, 4.76)*	*4.30 (3.96, 4.68)*	*4.51 (4.06, 5.01)*
Higher qual				REF	REF	REF
Lower qual	-	-	-	0.98 (0.91, 1.07)	*1.09 (1.01, 1.18)*	*1.12 (1.02, 1.23)*
No qualifications				*1.17 (1.07, 1.29)*	*1.32 (1.21, 1.44)*	*1.35 (1.21, 1.50)*
Owner-occupied				REF	REF	REF
Privately rented	-	-	-	*1.14 (1.03, 1.28)*	*1.14 (1.02, 1.28)*	*1.12 (1.00, 1.25)*
Socially rented				*1.48 (1.38, 1.59)*	*1.72 (1.59, 1.85)*	*1.95 (1.78, 2.14)*
North				REF	REF	REF
Yorkshire				*0.87 (0.79, 0.96)*	1.05 (0.95, 1.16)	0.89 (0.79, 1.02)
Midlands				*0.87 (0.80, 0.95)*	0.97 (0.89, 1.06)	1.01 (0.92, 1.12)
East of England				*0.71 (0.64, 0.79)*	*0.84 (0.76, 0.92)*	*0.86 (0.76, 0.98)*
London	-	-	-	*0.78 (0.71, 0.87)*	*0.65 (0.58, 0.72)*	*0.83 (0.72, 0.94)*
South				*0.76 (0.70, 0.82)*	*0.77 (0.71, 0.83)*	*0.79 (0.72, 0.87)*

Note: Statistically significant results are italicised.
Source: Health Surveys for England

ORs indicate the position of groups relative to the outcome for the reference group. Further insights can be gained by calculating predicted probabilities, illustrating the different chances of LLTI or poor health for each group given certain attributes. Calculating these probabilities reveals that a White individual in classes I and II living in the North has a higher probability of LLTI than if they lived in the South (3.9% versus 2.9% in 2009-2011). An Indian living in the South in the same social classes has the health chances of the White individual living in the North (3.9% probability of LLTI). The probability of LLTI climbs to 5.2% for an Indian of classes I and II living in the North. Whilst more favourable socioeconomic (higher social classes) or spatial (living in the South) circumstances are associated with lower probabilities of LLTI, the benefits of these circumstances are not equally distributed between ethnic groups. Although probabilities of LLTI do decline for all groups over time, the highest probabilities are consistently found for ethnic minorities, controlling for social and spatial variations. For brevity, modelled probabilities are not shown, particularly as these form a substantial component of chapter 6's analysis using census microdata.

4.5 Discussion

This chapter aimed to quantify ethnic inequalities in health over time and examine whether inequalities experienced by different ethnic groups remain after accounting for sociodemographic circumstances. In quantifying ethnic inequalities in health, the results suggest that inequalities appear to be widening between Whites and Pakistani and Bangladeshis and within South Asian ethnicities by general health and LLTI (see Figure 4.2). Conversely, health inequalities between Whites and Blacks or Whites and Indians have narrowed such that these minority groups increasingly fair better in terms of LLTI than Whites. Whilst the gap has similarly narrowed in terms of general health, Blacks and Indians are still in poorer health than Whites by this measure.

The divergent health experiences of each ethnic group are echoed in their contrasting socioeconomic experiences. While the gap widened between Pakistani and Bangladeshis and both the White majority and Indians, Pakistani and Bangladeshis remained concentrated in more disadvantaged circumstances as seen in Table 4.2. The relative disadvantage of certain MEGs, particularly Pakistani and Bangladeshis, is common in the literature as is the relative advantage of Indians (e.g. Bhopal *et al.,* 2002). The rising and falling economic prosperity which characterised England's economic climate during the period of study had no notable beneficial or detrimental effect on the socioeconomic circumstances of each ethnic group according to their socioeconomic distribution over time. All groups experienced some improvements in their socioeconomic circumstances, although this did not necessarily close the gap between ethnic groups. More may be gleaned by extending the study period to examine more closely the impact of the slowly recovering economy post 2009-2011 on different ethnic groups and their socioeconomic circumstances.

The contrasting results according to either health measure may reflect cultural interpretations in the meaning of limiting long term illness (Mitchell, 2005). Self-assessed general health is a valid measure to investigate ethnic differences in health (Chandola and Jenkins 2001). Perhaps the actual health of ethnic groups more closely matches the picture revealed by poor health than LLTI. Notwithstanding, subsequent analyses in this thesis will only use LLTI: although future work into the contribution of selective sorting to changing *ethnic* health gradients may be enhanced by including self-assessed general health, variable availability in the census microdata precludes its consistent use between 1991, 2001 and 2011. Further, focussing on LLTI ensures the comparability of this research with existing work on selective migration (e.g. Boyle *et al*., 2004; Norman *et al*., 2005; Norman *et al*., 2011), key literatures informing the analytical framework for this thesis.

Parallel to the changing ethnic health gradients, socioeconomic health gradients also steepened, both within ethnic groups and for the overall population (see Figure 4.3). This is evidenced by the widening rate ratios between the top and bottom two social classes across each ethnic group. Similar increases in social inequalities in health have been observed by Johnson and Al-Hamad (2011) who found that socioeconomic inequalities in mortality for women increased between 1991 and 2008.

In examining whether the inequalities experienced by different ethnic groups remain after accounting for sociodemographic circumstances, the results were clear. The addition of socioeconomic and spatial variables consistently modifies the ORs observed by age, ethnicity and gender. This suggests that some of the variation in health between males and females, age groups and ethnicities is explained by socioeconomic and spatial factors. However, there were notable differences between ethnic groups and by health outcome. Adjusting for socioeconomic and spatial variables reversed the odds of LLTI for Indians such that this group moved from significantly lowered to significantly raised odds of LLTI relative to Whites when accounting for social and spatial variables. Conversely, the opposite effect was found when modelling poor health. Given the more advantaged circumstances of Indians relative to not only the White majority but also Pakistani and Bangladeshis, lowered odds of LLTI when adjusting for the socioeconomic and spatial variables might have been anticipated. Bhopal *et al.* (2002) also found unexpected associations between factors such as class or household income and health for South Asians. Rather than leading the authors to refute the existence of a socioeconomic patterning to ethnic health gradients, they questioned whether socioeconomic indicators are sufficient to capture these patterns for ethnic groups. They called for better data to alleviate concerns about sample sizes and allow for discrete analysis of Indians, Pakistanis and Bangladeshis.

Results from these analyses are consistent with the wider literature: the influence of ethnicity on health decreases when adjusting for socioeconomic factors (e.g. Williams, 1996; Cooper, 2002; Karlsen and Nazroo, 2010; Nazroo, 2014; Mindell *et al*., 2014). Whilst some may argue that the differences which remain are attributable to genetic or cultural differences, there is evidence that wider experiences of racial harassment and discrimination experienced by MEGs account for these differences (e.g. Nazroo, 1998; Harris *et al*., 2006; Harris *et al.*, 2012) rather than genetics or culture.

The possible multiplicative or additive penalty of minority ethnic status is perhaps evident in the probabilities of LLTI. Probabilities vary between ethnic groups within the same social class and area suggesting that the influence of social class or area on health is not equally beneficial or harmful for different groups. Thus, the influence of socioeconomic position on health is in some part contingent on ethnicity. The idea of an ethnic penalty may also explain the raised odds of LLTI for Indians relative to White groups when adjusting for socioeconomic and spatial factors: are these groups penalised due to their ethnicity over and above the benefits of their more prosperous circumstances? This is consistent with differences in income between ethnic groups of the same class (Nazroo, 1997), the employment gap (DWP, 2014) and the under-return on educational investment (Heath and Cheung, 2006), as well as substantiating arguments about the suitability of single measures in capturing ethnic differences. Variations in the probabilities of LLTI between ethnic groups in comparable socioeconomic circumstances highlights the possible inadequacies of existing measures of socioeconomic position when applied to different ethnic groups (see Harding, 2003). These measures may not fully illustrate the interaction between ethnicity and socioeconomic position which may differently influence health between ethnic groups. Nevertheless, it is likely that this therefore under- rather than over-estimates the extent of the inequalities between ethnic groups in England.

This analysis substantively contributes to literatures on the nature of ethnic inequalities in health. It seems plausible to assert that as the influence of socioeconomic and spatial factors on health appears to vary between ethnic groups, whether or not this relates to issues of marginalisation or the operation of an ethnic penalty, it cannot be assumed that existing discussions of socioeconomic difference adequately capture the diverse experiences of ethnic groups.

As already stated, in examining the distribution of different ethnic groups by socioeconomic attributes and (crude) geography, it is possible to hypothesise as to the implications for patterns (or opportunities for) of social mobility and migration between ethnic groups. Over time, MEGs such as Pakistani and Bangladeshis experienced growth in the higher social classes (21.0% in classes I and II in 1998-2000 increasing to 23.9% in 2009-2011). Similarly, employment rates increased amongst Pakistani and Bangladeshis as did the percentage with higher qualifications. Although the percentage of Pakistani and Bangladeshis with *no* qualifications (as defined in this analysis) also increased, these changes are indicative of overall improvements in the socioeconomic experience of these groups. Similar improvements are apparent for Indians and Blacks, the latter whose proportion in the top social classes (I and II) notably increased from 20.2% in 1998-2000 to 36.4% in 2009-2011. Whilst these changes are perhaps suggestive of upward social mobility benefitting MEGs (at the population level), this does not serve to a) stop certain MEGs having high proportions in less advantaged circumstances and b) close health gaps within or between ethnic groups (as evidenced in Figures 4.2 and 4.3). Educational attainment is strongly associated with achieved social class: if MEGs are less likely to be qualified to degree level or above this will influence the extent of their opportunities for upward social mobility. Similarly, as will later be discussed, educational attainment, social class, housing tenure and indeed health status reflect defining characteristics of migrants (e.g. Bentham, 1988; Champion *et al*., 1998; Boyle *et al*., 2002; Boyle *et al*., 2004). Variations in the experiences of ethnic groups according to these attributes may therefore similarly influence patterns of and opportunities for migration by ethnic group. The spatial clustering of MEGs may also be a factor, particularly given that migration will also be influenced by place-specific factors such as the housing market, namely housing prices (Rabe and Taylor, 2009) or the labour market (Rees *et al*., 1996) and the varying availability of different types of employment. Further, as socioeconomic and spatial experiences not only vary between ethnic groups, but are important determinants of health, then it is possible that the relationship with social mobility or migration and health may vary between ethnic groups.

Whilst the cross-sectional data examined here cannot reveal whether migration or social mobility contribute to changing ethnic health gradients, the inferences drawn illustrate the importance of a) investigating the nature of ethnic inequalities in health and b), subsequently exploring what may contribute to *changing* (ethnic) inequalities in health. To address these aims more substantively, larger sample sizes are required. Further, it is necessary to establish whether hypothesised variation in the relationship between ethnicity and migration (owing to contrasting socioeconomic, spatial and health experiences) manifest. The Samples of Anonymised Records provide both the large sample sizes required and data on migration and are therefore examined in the following chapter’s analysis.

Chapter 5

Ethnicity, migration and health – trends, patterns and relationships: evidence (1) from the Samples of Anonymised Records, 1991, 2001 and 2011

5.1 Introduction

This thesis aims to explore the nature of ethnic inequalities in health while investigating whether selective sorting between area types and social classes contributes to changing health gradients in England for the overall population and by ethnic group. Analysis of the 1998 to 2011 Health Surveys for England (HSE) revealed that ethnic inequalities in health between some groups have widened over time, with Pakistani and Bangladeshis having some of the poorest health and also being relatively worse off than either Whites or Indians. The contrasting experiences of Indians compared to Pakistani and Bangladeshis undermines the utility of 'South Asian' in health-related or social research. Acceptance that differences within minority ethnic groups (MEGs) (non-White) are as many as differences between the minority and the majority, although long established (Jones, 1993) is not universally recognised.

Analysis of the HSEs demonstrated that health differences between ethnic groups are better explained by socioeconomic and broad spatial inequalities rather than inherent features of different ethnicities. However, the extent to which different socioeconomic or spatial circumstances are health enabling also varied by ethnic group, evident in the varying probabilities of poor health or limiting long-term illness (LLTI) for ethnic groups in comparable circumstances. Existing discussions of social and spatial inequalities in health may not therefore be sufficient to capture the complex and multiplicative influences on ethnic differences in health. Nevertheless, research should not disregard the evident importance of social and spatial inequalities. Rather, explanations of ethnic inequalities in health prioritising socioeconomic and spatial attributes should also consider whether any additional ethnic penalty also operates additively or multiplicatively influencing health.

Much can therefore be said on the nature of ethnic inequalities in health. However, analysis of HSE data is also suggestive of the possible importance of selective sorting in explaining both changing overall and changing ethnic health gradients. Understanding why triangulates attention on the 'selective' nature of the sorting processes investigated, and the extent to which 'selection' into different area types or social classes will depend on current sociodemographic and health circumstances. As ethnic groups vary not only in their experience of health but also in their distribution across England and socioeconomic structures, opportunities for 'selection' into more or less favourable area types and social classes may vary accordingly. This chapter will investigate how opportunities for selection may vary between ethnic groups, focusing in particular on the selective nature of migration. The chapter will first revisit some of the literatures introduced in chapter 2 regarding migration and health, focusing on sociodemographic and health characteristics of migrants, important to processes of selective sorting. Later chapters will explore in more detail the pathways by which selective sorting through migration (or indeed social mobility and area type change (deprivation mobility)) can influence health gradients.

Cross-sectional census microdata from the Samples of Anonymised Records (SARs) include information on migrant status alongside the full range of census questions. The large sample sizes allow for more detailed analysis of ethnic differences in society than possible in either the HSE or comparable datasets, notably in distinguishing between Black African and Black Caribbean experiences. This chapter further explores the nature of ethnic inequalities in health while also examining the inter-relationships between migration, ethnicity and health. Discussion of the data and methods are found in chapter 3, although interpretation of techniques will be reiterated here. The results will be discussed in terms of the chapter's objectives (section 5.5) with substantive discussion of their contribution to the overall aims of the thesis reserved for chapter 9. First, however, the concept of migration will be defined according to its use in this thesis before revisiting the relevant literatures on migration, health and ethnicity.

5.2 Defining migration: residential mobility, migrants, or movers?

Migration, for the purposes of this thesis, is restricted to subnational or internal migration in England. International migrants (including those moving between England and Wales, Scotland or Ireland) are excluded. After excluding international migrants, different types of mobile groups can be identified depending on the nature of the move. Distinctions are often made between international migration (already excluded from this thesis), internal migration and residential mobility (sometimes termed local migration) (Rowland, 2003).

Defining migrants and subsequently measuring migration is the focus of much of migration scholarship. Yet despite such efforts, definitional problems persist. Writing on the research challenges and prospects for migration research in 1992, Champion noted this given the changing dynamics of migration during that time. This was characterised by Morrison's 'chronic migrants' (1971), different types of residential mobility such as the seasonal 'migration' of elderly groups towards sunnier climates, and commuters changing address on a weekly basis for work. Nevertheless, Champion highlighted that for many, defining migration as a move across a statistical boundary to a new abode effective for at least a year is more than satisfactory (1992: 225).

Following this definition, residential mobility describes moves across a short distance within similar contexts, although the longevity of these moves is also expected to be more than temporary. Residential mobility is therefore distinct from migration insofar as it may not involve a sufficient change in the social and economic situation of an individual to constitute an actual migration event (Pol and Thomas, 2001). Castro and Rogers (1979) similarly distinguish between a *mover* and a *migrant* whereby the former remains within the same community or context whereas the latter leaves the original community of residence.

The changing dynamics of migration, a phenomenon which has continued since Champion's (1992) comments, increasingly necessitates more focussed study of specific aspects of migration. Examples include movement of households or family formation, movement of students between University terms, movement between temporary tenancies, and movement across different geographic scales. Variations in the sociodemographic characteristics of different groups of movers and their motivations for moving arguably require more nuanced terminologies than 'migration', particularly if not properly defined within research. The nature of the research should therefore govern the terminology used.

For the purposes of this research, migration is of interest simply because an individual has changed their address. This therefore accounts for residential mobility, likely reflecting short distance moves within the same or comparable communities and contexts, and the more traditionally defined migration events crossing statistical boundaries, over greater distances, and reflecting a more substantive change to the experiences of an individual. Each of these types of moves has a different relationship with health which may be relevant to the contribution of selective sorting to health gradients. Any change of address over any distance within England is therefore counted as a migration event. Whilst such definitional overlap is viewed suspiciously by some, particularly within the migration literature of the United States (de Beer *et al*. (2010) discuss the implications of differing definitions of migration, some of which have been alluded to here), it is common practice in research concerned with migration and health. Thus, the terms migrants/movers and non-migrants/stayers will be used synonymously throughout. Reasons for immobility may be as important in respect of changing health gradients and selection effects as reasons for mobility. These immobile groups, either termed non-migrants or stayers, therefore deserve more specific coverage in the literature. In recognition of the varying relationship between migration and health depending on distance, mobile groups will also be distinguished between by distance of move in this analysis.

5.3 Migration and health

To understand whether selective sorting between area types through migration (and social classes through social mobility) results in different concentrations of differently healthy groups across area types (or social classes) such that health gradients change, the complex relationships between migration and health must first be explored. The discussion will focus on migration and health in the context of health inequalities. However, it will begin with a broad overview of the history of migration and health research. This will demonstrate the place of this thesis within the broader discipline of migration research.

The importance of place and the varied social, economic and environmental conditions individuals are exposed to within these places are recognised as important determinants of health (Marmot and Wilkinson, 2009; Srinivasen *et al*., 2003). A wide range of studies therefore investigate geographical variations in health, comparing mortality and morbidity rates between different area types. Yet traditionally, such studies often failed to account for mobility in the population and that groups therefore experience a range of social, economic and environmental conditions throughout their lives. Ignoring the spatial and temporal dimensions of mobility within studies of disease or variations in mortality rates can only be done at "considerable risk" (Prothero, 1977: 266), with these problems mounting as population mobility increases (Bentham, 1988).

As early as the mid-nineteenth century, Farr (1864) noted that the health of migrants moving from urban to rural areas differed from that of those moving in the opposite direction. Similar findings were then documented by Welton (1872) with respect to urban to rural female movers. Despite the implications of these early observations for comparisons of area-specific mortality and illness rates, and the subsequent calls for researchers to take heed of mobility (Prothero, 1977; Bentham, 1988), it was some time before studies of spatial variations in health specifically and routinely investigated the importance of mobility.

Traditionally, the relationship between migration and health has been investigated in epidemiological studies seeking to map the spread and diffusion of disease (e.g. Mancuso and Sterling, 1974; Kliewer, 1992; Greenberg and Schneider, 1992; Strachan *et al*., 1995; Haworth *et al*., 1999; Maheswaran *et al*., 2002; Harding *et al*., 2008; 2009; Wagner *et al*., 2013). Epidemiologists can therefore examine the aetiology of specific diseases while also identifying problem areas or 'at risk' groups requiring specialised resources to tackle disease specific factors and manage population health.

However, interest in compositional differences in health status shifted the emphasis from migration featuring in health research, to health featuring in migration research, particularly where migratory flows may influence area-specific rates of mortality or morbidity. Such research sits alongside studies of spatial differences in health such as those between the North and the South (Shaw *et al*., 1999; Copeland *et al*., 2014), between more and less deprived areas (Rees *et al*., 2003; Boyle *et al*., 2004; Norman *et al*., 2005), between urban and rural communities (Gould and Jones, 1996; Haynes and Gale, 1999; Levin and Leyland, 2005; Riva *et al*., 2009; Riva *et al*., 2011), and between specific area types such as 'accessible rural areas' compared to 'industrial districts' (Norman and Bambra, 2007). Such research is analogous to studies which have documented social gradients in health in medical sociology and population health, whereby health status varies according to attributes such as educational attainment, socioeconomic status and occupation (Marmot, 1986; Davey Smith *et al*., 1997; Mackenbach *et al*., 2008; Wilkinson and Pickett, 2010).

Research on social and/or spatial health inequalities has included debate on the relative merits of 'compositional' and 'contextual' explanations for area variations in health outcomes (Macintyre *et al.,* 1993, Duncan *et al.,* 1998; Smith and Easterlow, 2005), as introduced in chapter 2. Arguments favouring a unified approach to the study of contextual *and* compositional influence on health, rather than dichotomising the concepts helps illustrate the importance of migration in discussions of (changing) health (gradients). The potential for research into migration and health to help explain changing health gradients and contribute to wider research on inequalities in health stems from the selective nature of migration. This focusses attention on behavioural approaches to the study of migration, centring on the question of "who goes where and why?", a question explicitly asked by Champion and Fielding (1992:1). Although health was conspicuously absent from their edited volume, much can be said in respect of "who goes where and why" when considering health through discussion of migrant characteristics.

5.3.1 Migrant characteristics

Migrants differ from non-migrants, most notably in age (Plane, 1993). This is apparent through the peaks and troughs in age-specific rates of migration: younger adults are the most mobile with rates of migration decreasing into the middle ages before climbing slightly in older ages. Motivation for migration varies between age-groups, most often driven by economic reasons. The younger age of migrants and the economic motivation behind their move are two of Ravenstein's "laws of migration" (1885; 1889) which still underpin much contemporary migration research. However, universal laws of migration can only guide research as the dynamics of migration change according to the socio-political context and vary significantly by attributes such as age.

Migrants also differ from non-migrants by sex, ethnicity (see section 5.3.1 below), housing tenure, socioeconomic position and educational attainment (Boyle *et al*., 1998; Champion and Ford, 1998; Norman *et al*., 2005; Brown *et al*., 2012). Migration is therefore selective according to these types of person-level attributes. Decision (not) to migrate and choice of destination vary according to these attributes, as motivation for migration is contingent on the differing social and economic 'push' and 'pull' factors which will also vary by age. These varying motivations are typically analysed within a lifecourse framework, recognising that propensity to migrate will vary notably but in a predictable manner across the lifecourse (Plane and Jurjevich, 2009).

Health is another distinguishing characteristic of migrants varying with age and differently determining choice (not) to migrate. However, as health not only varies by age, generally worsening over the lifecourse (particularly in later stages), but also varies along social and spatial gradients, then health may also be a consequence of migration. If living either in more or less deprived circumstances is harmful or beneficial to health, it is logical to assume that moving to a more or less deprived area may therefore affect health outcomes. Moreover, other physical and psychosocial area characteristics associated with origins and destinations may have important health consequences (Macintyre *et al*., 1993; Elliott *et al*., 1993).

Younger migrants tend to be healthier than their immobile counterparts whereas the inverse is true for older migrants (Bentham, 1988; Findley, 1988; Verheij *et al*., 1998; Boyle *et al*., 2002; Rogerson and Han, 2002; Larson *et al*., 2004; Norman *et al*., 2005). Young adults in good health are highly mobile, moving for employment or education opportunities which are themselves correlates of good health (Verheij *et al*., 1998). However, with increasing age reasons for mobility vary as does choice of destination depending on stage in the lifecourse. For example, younger healthy adults may first move to a more deprived, less desirable, more central urban area but then move outwards as status, income and aspirations climb to leafier suburbs characterised by lower deprivation (see Norman and Boyle, 2014). Poor health may also precipitate migration particularly in older ages as people move to be near formal or informal care. Whilst moves precipitated by poor health may be more likely in older ages and explain the climbing rates of migration in these age groups, poor health as a prompt for migration is not limited to the older age groups. Importantly and often overlooked, poor health also influences *ability* to migrate: reasons for immobility should not be neglected in studies of migration *and* health, particularly where migration is of interest in terms of its function in the process of selective sorting.

On the one hand, as outlined by Boyle *et al*. (2002), poor health may force an individual to move to alternative accommodation, whether in terms of space or location, or for economic reasons if poor health results in a loss of earnings. Yet on the other, poor health may prevent an individual from moving even if a move would be advantageous, such as moving to more health enabling areas (e.g. from more to less deprived). Of those who do migrate, whether or not to their (dis)advantage, poor health or illness is also related to distance moved, a relationship first identified by Fox *et al*. (1982). Boyle *et al*. (2002) investigated this relationship, finding that the percentage of migrants suffering from limiting long term illness (LLTI) was greater for migrants moving over short distances (< 10 km) than for those moving over long distances (10 km or more). Importantly, when modelling the probability of LLTI, Boyle and colleagues found that after adjusting for age, short-distance migrants are more likely to be ill than both long-distance migrants *and* non-migrants. Reasons for this heightened risk of poor health for short-distance migrants are possibly explained by housing tenure, with migrants in socially rented accommodations more likely to be ill than migrants in other tenancy types. Moves between socially rented housing are more likely to be across shorter distances within local authority district boundaries. However, small numbers prevented the authors further investigating this. As this thesis is concerned with sorting processes through social mobility *and* migration, studied together given their likely inter-dependence, it is worth noting that this relationship has also been found to vary by distance moved. Ewens (2005) found evidence of a link between social mobility and spatial mobility but only for long-distance moves: no association was found for moves across shorter distances. Chapter 6 will explore the relationships between distance moved, health and tenure, insofar as possible in more detail.

Health as a selective criterion for migration will therefore vary across the lifecourse and may also interact differently with different socioeconomic attributes. It is possible to identify an analytical framework within which the health status of migrants and non-migrants or movers and stayers can be compared and contrasted. This framework illustrates the links between person-level characteristics at different stages of the lifecourse, including health, and migration. It also reveals how health may not only be a determinant of migration, but also a consequence of migration. This framework is set out in Figure 5.1.

The distinctive migrant characteristics are evident in the push or pull factors, the social determinants of health which are entwined with the migrants exposure to different socioeconomic circumstances and the context of the area in which they live. These all manifest at both origin and destination, and will vary across the lifecourse by age (Norman and Boyle, 2014). Health selective migration is based on a combination of migrant characteristics and stage in lifecourse or age at migration. The movement of individuals with different health between origins and destinations influences spatial variations in health. This is compounded by the possible subsequent influence on the health of the migrants themselves: health may be influenced by the migration event itself, and the contextual and compositional circumstances of the destination area. Although not relevant to this thesis, this is important in terms of international migration and specifically relates to the adaptation, integration and acculturation of international migrants into the new areas, social structures and ways of life.

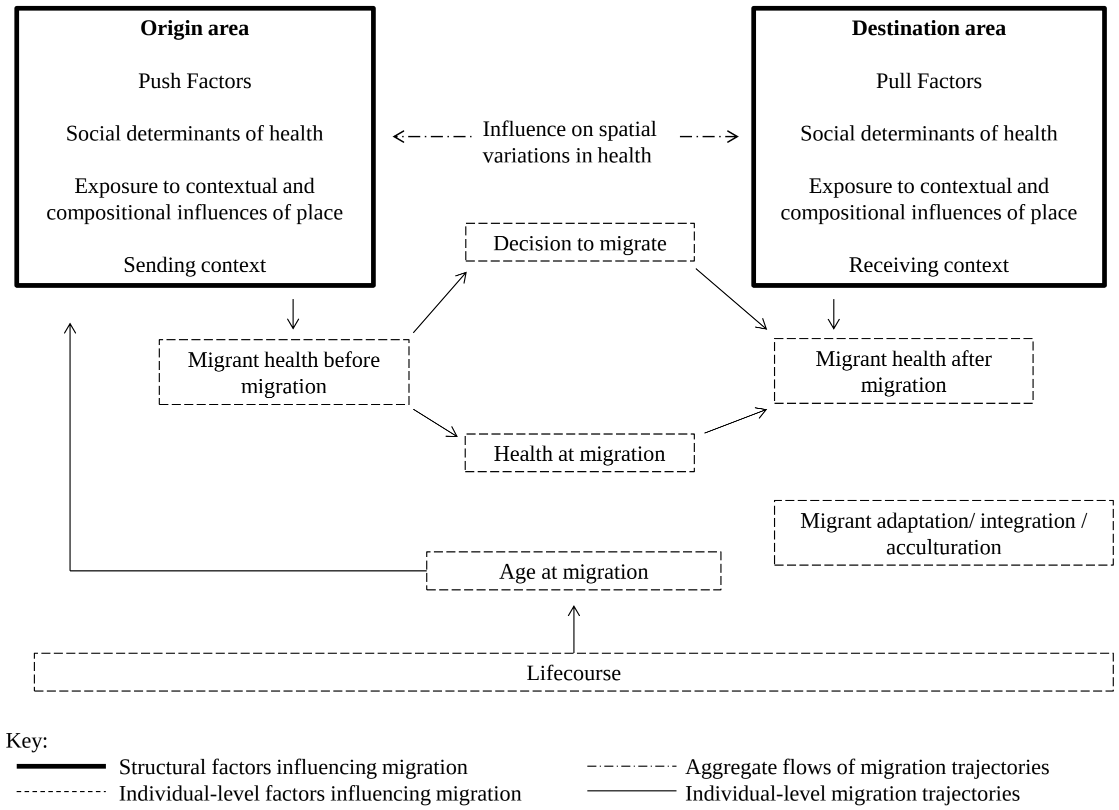


Figure 5.1 Migration and health: linking migrant characteristics, lifecourse and place

5.3.2 Health as a consequence of migration

The literature on international migration (for a comprehensive review, see Acevedo-Garcia *et al*., 2012), and the extent to which health may deteriorate or sometimes improve after migration, is concerned with the 'healthy migrant' effect. This relates to discussions of selective migration and health gradients insofar as it is indicative of the confounding influence of migration on spatial variations in health and substantiates claims as to the health-selective nature of migration. The health status of international migrants is typically better than the health of those they are leaving behind. Moreover, their health is usually better than expected given their socioeconomic and demographic characteristics (Fennelly, 2005; Newbold, 2005). The destinations for many of these migrants are often more deprived, characterised by lower socioeconomic circumstances. Areas with high net in-migration from international migrants *may* temporarily exhibit lower mortality and morbidity rates than expected given the contextual circumstances. However, as duration of residence lengthens, a process of acculturation occurs whereby migrant health begins to converge with the local population (McDonald and Kennedy, 2004; Weishaar, 2008). Such trajectories of assimilation may be analogous to the experiences of internal or subnational migrants moving across greater distances, and are therefore worth considering in the context of this research. Health as a consequence of migration, however, will not be specifically investigated within this thesis. Nevertheless, these are noted here as the implications of the health consequences of migration are important in respect of the possible influence of selective sorting between area types on changing health gradients.

5.4 Ethnic minorities and internal migration

Relatively little is known about ethnic patterns of internal migration, with much of the research on migration and ethnicity concerned with international rather than subnational moves. Yet as Robinson (1992: 189) persuasively argued, "certain population groups merit attention which is disproportionate to their numbers, whether for economic, social, psychological, moral or political reasons*"*. Although developments have been made, ethnicity and internal migration still reflect an under-explored dimension of migration studies. However, economic, social, moral and political reasons for investigating ethnicity and internal migration are particularly poignant in the context of selective sorting and health gradients.

If patterns of migration vary between ethnic groups, with opportunities, propensities or motivations to move within or between different area types varying accordingly, any sorting process through selective migration may lead to different concentrations of differently healthy ethnic groups within different areas. This is a matter of social, political and moral importance *if* patterns of favourable migration, i.e. moves between or within less deprived more healthy areas, vary by ethnicity. It is of economic importance if failing to account for any possible variation in selective sorting by ethnic group masks areas of need, precluding effective policy interventions. The following section will review what is known about ethnic patterns of internal migration before discussing how the selective nature of migration may influence such ethnic variations.

Patterns of internal migration in the UK vary by ethnicity (Owen and Green, 1992; Robinson, 1992; Champion, 1996; Owen, 1997; Stillwell and Duke-Williams, 2005; Bailey and Livingstone, 2005; Stillwell *et al*., 2008; Finney and Simpson, 2008; Simpson and Finney, 2009; Stillwell and Hussain, 2010). It is commonly found that whilst overall migration is higher for ethnic minority groups, rates of migration amongst Indian, Pakistani and Black Caribbean groups tends to be lower than rates for the White majority. Although it is often argued that the overall higher rates of migration for minority groups is attributed to their younger age structure, differences between specific ethnic groups necessitates more detailed investigation.

What is important is why and how these patterns vary, particularly if this variation influences the way in which selective sorting operates between ethnic groups. Finney and Simpson (2008) identify two ways in which migration scholarship may help explain the changing geography of ethnicity in Britain, important insofar as health inequalities can be influenced by compositional and contextual factors, and health differences are observed between areas and area types. The first questions whether characteristics of migrants varies between ethnic groups, related to and encapsulating rates or frequencies of migration, distance of move and the sociodemographic attributes of migrants. Through this focus, research into patterns of ethnic internal migration move away from debates characterised by 'segregation' approaches (see Finney, 2011), which are related to the second focus identified by Finney and Simpson. This approach centres on how migration influences the distribution of ethnic groups in different area types, related to issues of segregation, polarisation and the controversial phenomenon of 'White flight'. Both themes are pertinent to this research: the following section will review literature in this area in relation to these two themes.

5.4.1 Migrant characteristics and ethnicity

The selectivity of migration according to sociodemographic attributes and area types is as applicable to ethnic minority groups as the majority population. It might therefore be anticipated that migration will similarly vary across the lifecourse in line with certain life events or sociodemographic attributes by ethnic group. However, as Finney and Simpson (2008: 64) point out, "even if the same determinants of migration are recognised for each ethnic group, variation in group migration rates will be observed because of compositional effects". In other words, variations in the age-sex structure between ethnic groups or access to socioeconomic resources and opportunities may, in part, explain ethnic variations in patterns of migration despite the consistency of sociodemographic characteristics as determinants of migration between ethnic groups. The authors go on to note that further variation may arise if negative influences such as racial discrimination either precipitate moves away from areas, or prevent moves to certain areas.

Finney (2011) found that migration schedules vary for young adult ethnic minorities. Using 2001 census microdata, Finney modelled migration using multiple logistic regression: whilst all ethnic groups are most mobile when aged between 20 and 29, there are still marked differences between ethnic groups. For example, Bangladeshi, Pakistani and Black young adults have low levels of mobility when adjusting for wider sociodemographic attributes, reportedly half as likely to migrate as White Britons (Finney, 2011: 466). These differences are partly explained by different pathways out of the family home for ethnic minorities compared to White Britons: while South Asian groups are more likely to remain within the family home until married, White Britons are more likely to move away at younger ages, living independently from their late teens. Additional gendered differences are apparent in these pathways out of the family home, with married Indian and Pakistani women more likely to migrate than their male counterparts. Similar differences in male/female migration rates are found for White Britons. These findings substantiate Finney and Simpson's (2008) speculation that variations in household formation may explain lower rates of migration amongst younger South Asians who are more likely to remain in their parental home until married. Stillwell *et al*. (2008) also found that differences between ethnic groups in migration intensity were most apparent amongst those aged between 20 to 24 years.

Despite ethnic differences in the age-schedules of migration for young adults which may result from different cultural influences on lifecourse events, there are some general similarities in the patterning of migration by the previously identified migrant characteristics. Results from Simpson and Finney's (2008) study demonstrate this. For example, rates of migration are consistently highest amongst those in privately rented accommodation and lowest amongst those in owner-occupation. Similarly, higher levels of educational attainment are consistently associated with higher rates of migration, although low-qualified Africans are as likely to migrate as more qualified Africans. However, Raymer and Giulietti (2009) found education to be a more important factor in determining migration patterns for the White majority whilst employment status was more important for MEGs. This 'social gradient' to migration is reinforced by higher rates of migration amongst more professional occupations according to the National Statistics Socioeconomic Classification (NS-SeC). Catney and Simpson (2010) also find evidence of a social gradient to migration or residential mobility replicated across ethnic groups: of those who originate in settlement districts (areas traditionally attracting high proportions of international migrants due to infrastructure and job opportunities), those in higher social classes have a higher probability of moving than lower social classes. The health-migration relationship is also fairly consistent between ethnic groups: LLTI is associated with lower rates of migration. When modelling migration, Finney and Simpson (2008) conclude that the differences in migration patterns between ethnic groups are largely explained by their different sociodemographic compositions.

Finney (2011) also finds notable differences between ethnic groups in migration by student status: White British and Chinese students are more mobile than non-students although the inverse is true for Pakistani, Black Caribbean and Black African students. This may be attributed to differences in the location of different ethnic groups, particularly for Asian students who tend to live close to some of the larger Universities in the South East, Midlands or North of England (Finney and Simpson, 2008).

Migrant characteristics not only vary by stage in the lifecourse but also relate to distance moved. Ethnic differences in distance moved have been determined, with Champion (1996) finding that 55% of migrants from minority ethnic groups (MEGs) moved less than 5 km, compared with 47% of Whites. Champion also found that of all the ethnic groups, Black groups moved over the shortest distances. Finney and Simpson (2008) found similar patterns, 58% of moves by MEGs were less than 5 km compared to 53% of White moves. Notably, approximately 70% of Pakistani and Bangladeshi moves were over less than 5 km. The smallest mean distance migrated was 20 km for Black Caribbean movers, contrasting with 40 km for White Britons.

The mean distanced moved for Chinese movers, however, climbed to 47 km followed by 43 km for Indian movers. Whilst the sociodemographic composition of different ethnic groups has been found to explain much of the differences in probabilities of migration, they do not appear to explain differences in distance moved between ethnic groups (Finney and Simpson, 2008).

5.4.2 Spatial distribution of ethnic minority migrants

The extent to which MEGs are segregated, integrated or dispersed is a hot topic in both policy debates (Simpson and Finney, 2009) and public discourse. Although ethnic segregation in Britain does not equate to the ghettos of America, ethnic clustering within the country deserves consideration. Academic debates on these topics have fuelled heated media reactions, notably framed around the notion of ‘White flight’ as White populations allegedly ‘flee’ areas characterised by high proportions of minority groups. Factual or fictitious, the idea of ‘White flight’ is key to why migration studies must take heed of ethnicity. In terms of the relationship between health and migration, and any possible influence on health gradients, the spatial distribution of MEGs and the migration patterns of these groups are important in revealing what types of areas characterise the spatial experiences of different ethnicities. Further, as area type can influence choice to migrate or options of destination, the spatial distribution of ethnic groups is important: indeed the undeniable importance of different area types in respect of contextual and compositional influences on health need not be re-stated.

Migration may foster ethnic segregation as individuals are more likely to move to areas which have higher concentrations of their own ethnic group, perpetuated as Whites move away from areas attracting growing numbers of minority ethnicities. However, a more nuanced perspective of ethnic clustering relates to the cultural, socioeconomic and demographic processes that have historically shaped ethnic geography. Simpson and Finney (2009) suggest that ethnic clustering arises through specific pathways of migration out of urban centres following upwards socioeconomic mobility, then re-grouping in different locations (the authors cite notable studies in this area by Newman, 1985; Valins, 2003 and MacRaild, 1999). Yet these pathways from urban to rural are not specific to ethnic groups, counter-urbanisation characterises much of the migration events in contemporary developed societies (see Champion, 1989).

Simpson and Finney (2009) find that all ethnic groups are migrating away from areas with higher proportions of MEGs, apart from the Chinese. The authors note that these findings directly oppose controversial and conflictual debates framed by ‘White flight’. The spatial patterning to all internal migration is consistent with traditional “laws of migration” such as those proposed by Ravenstein (1885; 1889): namely, flows from urban to rural areas driven by a desire to improve personal circumstances. Simpson and Finney thereby conclude that “larger minority concentrations are not the result of racially differentiated internal migration patterns” (2009: 54).

Nevertheless, others are more tentative in their conclusions. For example, Stillwell and Husain (2010) found that internal migration patterns were generally characterised by counter-urbanisation for all ethnic groups, but that this pattern was much less apparent for MEGs. Further, although some MEGs were found to be moving away from Inner London to outer areas of the city and elsewhere, the patterning was only similar for Whites, Indians and Chinese, themselves similarly advantaged. Notwithstanding, Stillwell and Hussain's conclusions do also support arguments from Simpson and Finney (2009) which dispel arguments that migration patterns of ethnic minorities lead to self-segregation. Similarly, research by Catney and Simpson (2010) support these arguments insofar as migration patterns between ethnic groups are all socially graded. Patterns of migration away from traditional settlement areas are, the authors conclude, economically driven whereby those with sufficient resources move away; they are not racially driven. There are notable exceptions, for example the social gradient to residential mobility was less apparent for Chinese than for other ethnic groups. Further, migration in London was found to be more likely by White groups in intermediate and lower socioeconomic groups than professional and managerial groups.

5.4.3 Implications for selective sorting

As the influence of migrant characteristics appears to hold across ethnic groups, it seems reasonable to assume that selective sorting through migration will exert similar influences, if any, on ethnic health gradients as on overall health gradients. However, the extent of the influence will vary according to the composition of each ethnic group. Most importantly, the more advantaged the group the higher the likely rates of migration (Catney and Simpson, 2010). The influence of migration on health will therefore vary between ethnic groups according to their composition, further influencing health gradients if certain groups are less likely to move away from more disadvantaged circumstances (see chapter 8 for further discussion on implications of immobility or non-migration). Exploring whether selective sorting differently contributes to ethnic health gradients is therefore appropriate. This is further evidenced by the ethnic clustering in the UK and associated variations in probability of migrating.

5.5 Research intent

Given the inherently selective nature of migration, and possible variations in the health-migration relationship by ethnic group, it is important to evaluate how the composition of different ethnic groups in England varies according to distinguishing migrant characteristics. While addressing the composition of different ethnic groups with reference to migrant characteristics, this analysis will also investigate the extent of social, spatial and health inequalities. This chapter therefore builds and expands on the preceding analysis of Health Survey for England data. To contribute to the overall aims of this thesis, the objectives for this chapter are to establish whether:

a) the ethnic diversity of society changes by socioeconomic attribute and area between 1991, 2001 and 2011;
b) changing diversity is associated with changing social, spatial and health inequalities by ethnic group;
c) rates of migration vary according to socioeconomic attributes and ethnic group; and finally,
d) population health has changed between censuses by ethnic group, socioeconomic attributes, area and migrant status.

5.5.1 Data and Methods

The SARs sample for this analysis is restricted to England household residents aged between 16 and 74. International migrants, ages 0-15 and 75+, and residents in communal establishments such as care homes or prisons are therefore excluded. Excluding residents in communal establishments and international migrants is common practice in extant literature on selection effects, migration and health (e.g. Norman *et al*., 2005). The sample is restricted by age owing to incomplete socioeconomic data for the excluded ages. The included variables and their sample sizes are listed in Table 5.1. SARs members with missing health, ethnicity or socioeconomic data are also excluded. Derivation of the manipulated variables is discussed in chapter 3.

Table 5.1 Included variables, 1991, 2001 and 2011

Variables		1991	2001	2011
Label	Categories	count (prop (%))	count (prop (%))	count (prop (%))
Limiting long-term illness	LLTI	77,213 (11.5%)	183,271 (17.1%)	291,491 (16.2%)
	No LLTI	595,392 (88.5%)	891,593 (83.1%)	1,506,505 (83.8%)
Ethnicity	White	636,538 (94.6%)	985,237 (91.7%)	1,545,398 (85.9%)
	Black Caribbean	7,123 (1.1%)	13,027 (1.2%)	21,805 (1.2%)
	Black African	2,337 (0.3%)	9,536 (0.9%)	31,756 (1.8%)
	Indian	11,134 (1.7%)	22,823 (2.1%)	51,280 (2.9%)
	Pakistani & Bangladeshi	6,502 (1.0%)	18,925 (1.8%)	48,736 (2.7%)
	Chinese	1,997 (0.3%)	4,777 (0.4%)	13,383 (0.7%)
	Mixed & Other	6,974 (1.0%)	20,539 (1.9%)	86,061 (4.8%)
Age	16 – 29	191,864 (28.5%)	252,283 (23.5%)	435,304 (24.2%)
	30 – 44	195,554 (29.1%)	339,499 (31.6%)	496,355 (27.6%)
	45 – 64	202,479 (30.1%)	357,976 (33.3%)	645,955 (35.9%)
	65 – 74	82,708 (12.3%)	125,106 (11.6%)	220,832 (12.3%)
Gender	Male	329,302 (49.0%)	527,683 (49.1%)	891,439 (49.6%)
	Female	343,303 (51.0%)	547,181 (50.9%)	907,007 (50.4%)
UK birth	Born UK	614,863 (91.4%)	963,127 (89.6%)	1,586,539 (88.2%)
	Born elsewhere	57,742 (8.6%)	111,737 (10.4%)	211,907 (11.8%)
Social Class	I Professional	23,510 (3.5%)	42,144 (3.9%)	74,969 (4.2%)
	II Managerial & Technical	141,329 (21.0%)	264,709 (24.6%)	457,195 (25.4%)
	IIIN Skilled non-manual	129,032 (19.2%)	193,676 (18.0%)	394,987 (22.0%)
	IIIM Skilled manual	110,100 (16.4%)	175,935 (16.4%)	330,437 (18.4%)
	IV Partly skilled	89,307 (13.3%)	109,089 (10.1%)	196,026 (10.9%)
	V Unskilled	33,842 (5.0%)	42,513 (4.0%)	82,156 (4.6%)
	Unclassifiable	145,485 (21.6%)	246,798 (23.0%)	262,676 (14.6%)
Tenure	Owner-occupied	491,430 (73.1%)	788,765 (73.4%)	1,229,114 (68.3%)

	Privately rented	55,958 (8.3%)	117,230 (10.9%)	293,368 (16.3%)
	Socially rented	125,217 (18.6%)	168,869 (15.7%)	275,964 (15.3%)
Educational attainment	Degree level (or above)	50,547 (7.5%)	85,207 (7.9%)	509,156 (28.3%)
	No degree or equivalent	622,058 (92.5%)	989,657 (92.1%)	1,289,290 (71.7%)
Region	North	132,912 (19.8%)	202,779 (18.9%)	339,742 (18.9%)
	Yorkshire	69,736 (10.4%)	108,608 (10.1%)	183,709 (10.2%)
	Midlands	131,361 (19.5%)	206,658 (19.2%)	350,606 (19.5%)
	East	70,401 (10.5%)	117,813 (11.0%)	197,777 (11.0%)
	Inner London	33,577 (5.0%)	61,858 (5.8%)	98,314 (5.5%)
	Outer London	59,310 (8.8%)	97,133 (9.0%)	15,635 (8.7%)
	South	175,308 (26.1%)	280,015 (26.1%)	471,763 (26.2%)
Migrant status	Migrant	60,562 (9.0%)	118,150 (11.0%)	200,241 (11.1%)
	Non-migrant	612,043 (91.0%)	956,714 (89.0%)	1,598,205(88.9%)
Of migrants, migrant type	Short-distance (0-14 km)	43,357 (71.6%)	84,597 (71.6%)	144,990 (72.4%)
	Mid-distance (15-149 km)	11,638 (19.2%)	22,878 (19.4%)	41,503 (20.5%)
	Long-distance (150+ km)	5,567 (9.2%)	10,675 (9.0%)	14,198 (7.1%)

Source: Samples of Anonymised Records

Cross-tabulations are used to illustrate changing ethnic diversity in England's society and changing patterns of migration, along with population pyramids to assess the composition of different ethnic groups (important for factors such as likelihood of migrating and expected health). Differences in population health are explored with age-specific illness rates (ASIRs) and standardised illness ratios (SIRs). SIRs > 100 indicate higher than expected levels of poor health compared to the standard population (the 1991, 2001 or 2011 SARs sample), whereas SIRS < 100 indicate lower than expected levels of poor health, measured according to limiting long-term illness (LLTI). To explore inequality within and between ethnic groups, the Gini coefficient (*G*) and Index of Dissimilarity (*D*) are calculated. Lorenz Curves are then plotted to further illustrate *G*: the greater the value of either *G* or *D*, the greater the degree of social inequality or spatial segregation. Notwithstanding limitations associated with *G* or *D*, each clearly summarise inequality either in terms of how evenly a phenomenon is distributed across a population (*G*) or how segregated groups are in terms of their share of a phenomenon (*D*) (Shaw *et al*., 2007: 154-159). For a technical discussion of these methods, see chapter 3.

5.6 Results

5.6.1 Ethnic diversity in 1991, 2001 and 2011

According to data from the SARs, the percentage of the population born in the UK increased for all MEGs apart from Black Africans between 1991 and 2011. Given the restrictions applied to this sample (excluding *recent* international migrants), all non-UK born groups must have been resident in the UK for at least one year. Recognising that an ever-growing proportion of the minority ethnic population are born in the UK is important insofar as these groups are embedded in the UK population. Their experiences must be as much a focus of social and health policy as the general experiences of the White majority.

Population pyramids in Figure 5.2 show age-sex variations in the structure of each ethnic group. MEGs, particularly Black Africans and Pakistani and Bangladeshis are notably younger than the Whites (and therefore the overall population). On average, at least 72% of the sample of MEGs are aged between 16 and 44 at all censuses, apart from the Black Caribbeans. This is a marked contrast to the Whites with only 57% (1991), 54% (2001) and 49% (2011) of their population similarly aged. There are also gendered differences: the distribution of the sexes is notably skewed towards females for Black Caribbeans at 1991, 2001 and 2011. A similarly skewed distribution is evident for Chinese groups, although the magnitude is smaller. By 2001 and 2011, Black Africans are also skewed towards females rather than males. Conversely, whilst Pakistani and Bangladeshis are initially skewed towards females, this evens out in 2001. The mixed ethnic groups are much more evenly distributed.

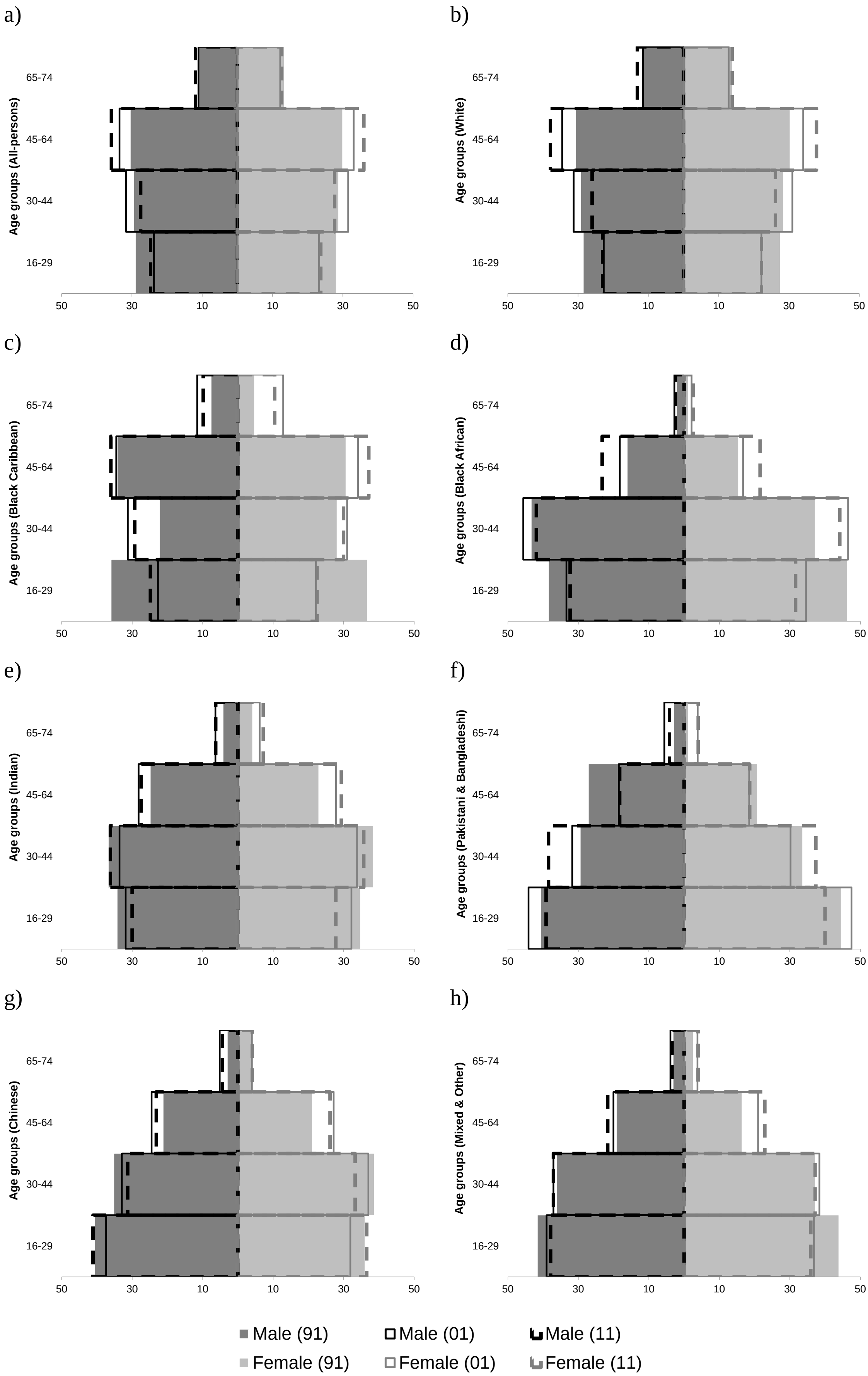


Figure 5.2 Population age-sex pyramids by ethnic group, 1991, 2001 and 2011

Source: Samples of Anonymised Records

Figure 5.3 plots the distribution of each ethnic group across the social class structure, excluding those not assigned to a class. All ethnic groups are sparsely distributed at the extremes of the social class structure, although some less so than others. A relatively high proportion of Black Africans, Indians, Chinese and Mixed and Others are consistently assigned to class I, contrasting with the notably smaller proportions of Whites, Black Caribbeans and Pakistani and Bangladeshis. Notwithstanding the relatively high proportion of Black Africans in class I, this group also consistently has the highest proportion in the class V. However, Black Africans experience declines in class I. Between 1991 and 2011, most ethnic groups experienced growth in classes I, II and IIIM while declining in the lower classes (IV and V). However, Mixed and Others proportion in class I declined between 1991 and 2011, as did the proportion in IIIN. These declines are mirrored by growth in class V. Such changes likely reflect the increasing diversity of this ethnic group and the contrasting experiences of established 'minority' groups compared to those of more recent settlers.

Whilst differences between the top and the bottom of the class structure are important, more attention should be paid to the middle groups as these account for a higher proportion of the population. Overall increases in the proportion of all ethnic groups in class II are observed between 1991 and 2011, although the proportions do decline slightly by 2011. Alongside these declines, growth is observed in class IIIN for White, Black Caribbean, Indian, and Pakistani and Bangladeshi groups. Notwithstanding these relative increases and declines, class II is consistently the predominant class for all ethnic groups at each census.

If advantage is equated with social class, Indians, Chinese, Black Africans, Mixed and Others and Whites are all generally *more* advantaged given their higher concentrations in higher social classes. However, the apparent advantage of the MEGs is undermined when including the population not assigned to a social class. Of the White group, an average of 14% of males are not assigned to a class at any census. Yet for females, this is as much as 28% in 1991 and 2001, although this figure does fall to 13% in 2011. Increasing opportunities for women to enter the workplace and a shift in attitudes may explain these increases. However, such dramatic increases in the proportion of females assigned to a class are not replicated across the MEGs.

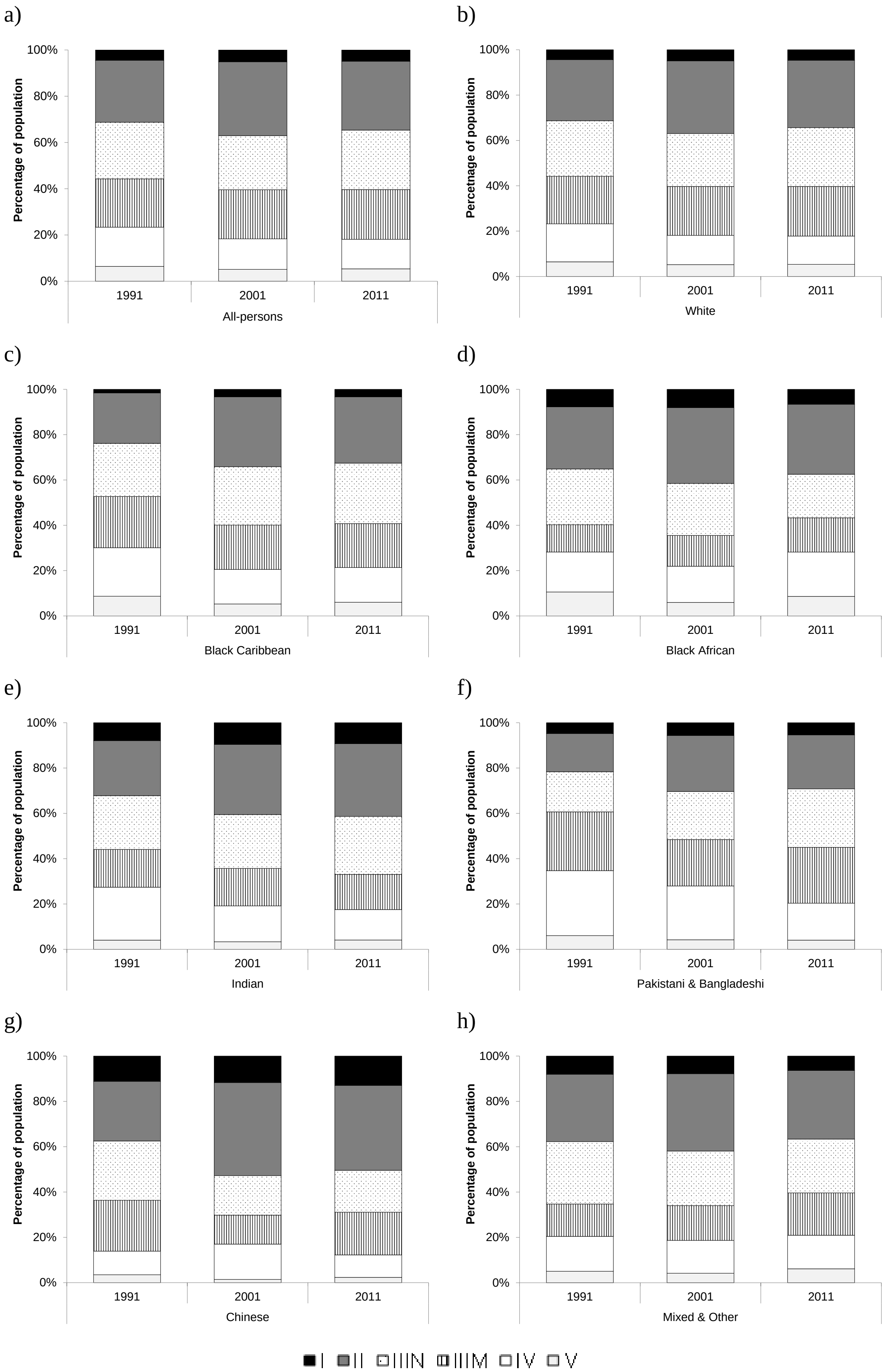


Figure 5.3 Social class by ethnic group, 1991, 2001 and 2011
Note: Sample excludes those who are not assigned to a class
Source: Samples of Anonymised Records

More than 35% of Black Africans are consistently not assigned to a class. In 1991 and 2011, 30% of Indians are similarly not assigned to a class although this declines to 20% by 2011. More than 30% of Chinese are also consistently not assigned to a class. There is significant gendered variation within ethnic groups: significantly higher proportions of females are unclassifiable by social class compared to males. However, the greatest variation is observed for Pakistani and Bangladeshis who have more than 50% not assigned to a class in 1991 and 2001. This falls to 41% in 2011. For females, 55% are not assigned to a class in 2011 although this does reflect a marked fall from 79% in 1991. These figures may be indicative of a high degree of worklessness within this ethnic group, potentially interacting with differences in cultural backgrounds influencing female pathways into employment. However, some of these variations may also reflect different opportunities between ethnic groups *and* genders to access the workplace. Nevertheless, these figures may be distorted if certain groups are not fully completing the census. Table 5.2 summarises these figures by ethnic group in 1991, 2001 and 2011.

Table 5.2 Percentage of population not assigned to a class by ethnic group, 1991, 2001 and 2011

		1991			**2001**			**2011**	
	M	F	All	M	F	All	M	F	All
White	13.3	28.3	20.9	16.6	28.2	21.8	11.1	12.8	12.0
Black Caribbean	22.5	25.8	24.2	26.1	28.2	27.2	21.6	20.2	20.8
Black African	36.3	40.5	38.4	34.5	42.2	38.6	33.3	39.3	36.5
Indian	20.9	39.3	30.1	23.7	36.5	30.2	17.3	23.5	20.3
Pakistani & Bangladeshi	33.2	78.5	54.4	34.4	66.6	50.5	27.0	56.4	41.2
Chinese	26.1	38.0	32.2	31.7	36.7	34.4	31.4	30.8	31.1
Mixed & Other	25.1	35.3	30.4	31.5	38.1	34.9	28.5	34.3	31.4
All-persons	13.9	29.0	21.6	17.6	28.1	23.0	13.2	15.9	14.6

Source: Samples of Anonymised Records

A pattern of decreasing home-ownership is evident for all ethnic groups between 1991, 2001 and 2011. This is illustrated in Figure 5.4. However, despite this decline more than 70% of Indians live in owner-occupied accommodation. Black Africans, who consistently have the lowest levels of home-ownership, decline in owner-occupation from 34% in 1991 to 28% in 2011. Much of this decline is attributable to an increase in the proportion living in privately rented housing, markedly so for the MEGs as a whole. Indians also have the lowest proportion of all ethnic groups in socially rented accommodation (less than 7.5%). This contrasts significantly with Black Africans: nearly 50% are resident in socially rented accommodation in 1991 and 2001, falling to 40% in 2011. Black Africans are the only group for which the majority are not concentrated in owner-occupation. Interestingly, whilst the 10 year period between 1991 and 2001 saw a significant increase in the proportion of Black Caribbeans and Pakistani and Bangladeshis in socially rented accommodation, *all* ethnic groups saw a decline in the proportion in social housing by 2011.

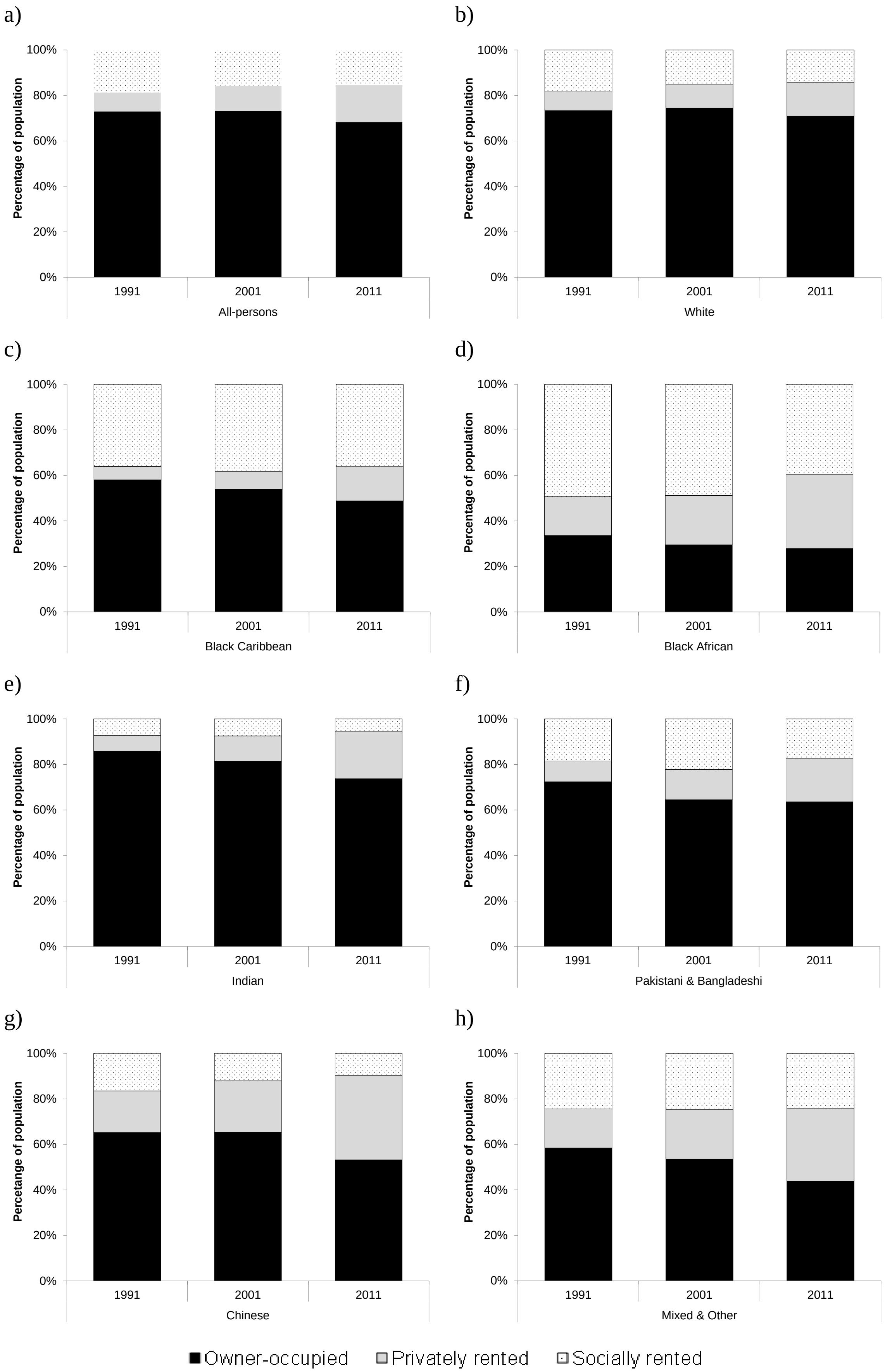


Figure 5.4 Household tenure by ethnic group, 1991, 2001 and 2011

Source: Samples of Anonymised Records

Similarly divergent experiences between ethnic groups are also evident by educational attainment (not illustrated). Despite the simplification of the educational attainment thresholds, necessary to create sufficient sample sizes, differences are apparent. According to these data, MEGs are generally better qualified than Whites, at least in terms of degree level qualifications. By 2011, only Pakistani and Bangladeshis (23.7%) are less educated than Whites (27.4%). Conversely, 40% or more of Black Africans, Indians and Chinese are educated to degree level or above. Notwithstanding these variations, there are increases in the proportion for all ethnic groups educated to degree level or above by 2011, particularly for the MEGs.

Figure 5.5 plots the distribution of each ethnic group across regions of England. Regions are based on aggregated Government Office Regions (GOR) for 2001, with 1991 regions harmonised to the 2001 boundaries (2011 boundaries are consistent with 2001 GOR). The contrasting experiences in the housing market described in Figure 5.4 are, to some extent, reinforced by varying distributions across England. These graphs are illustrative of wider discussions on ethnic clustering in relation to the geography of ethnicity (e.g. Finney and Simpson, 2008). Black Caribbeans and Black Africans consistently cluster in Inner and Outer London while the remaining ethnic groups are more evenly distributed. However, Indians also appear to cluster (to a lesser extent) in Outer London and the Midlands while relatively high proportions of Pakistani and Bangladeshis are consistently observed in the Midlands. Whites have higher concentrations in the South.

Although these data do demonstrate the contrasting socioeconomic and spatial experiences of different ethnic groups, the patterns are not necessarily as would be expected given the overall impression of disadvantage experienced by certain minority groups. For example, the high concentration of Black Africans in socially rented accommodation seems to conflict with the relatively high levels of educational attainment within this group. Similarly, the comparatively low levels of educational attainment amongst Whites do not coincide with their overall advantage indicated by higher concentrations in higher social classes. The implications of these conflicting findings are illustrative of an ethnic penalty disproportionately disadvantaging MEGs who do not receive the same ‘return’ on their investments.

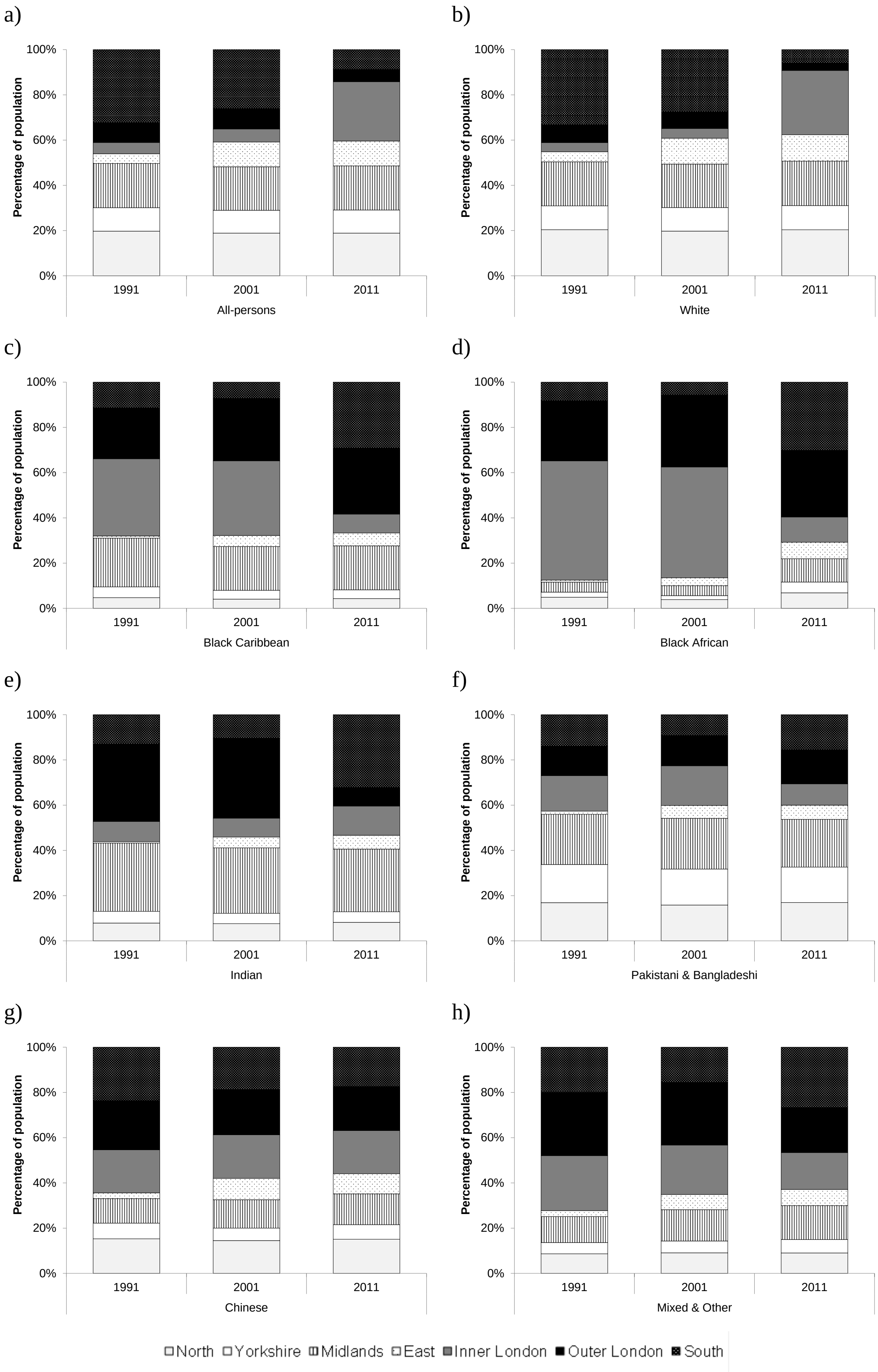


Figure 5.5 Region (simplified GOR) by ethnic group, 1991, 2001 and 2011

Source: Samples of Anonymised Records

5.6.2 Social and spatial and inequality by ethnic group

The Gini coefficient (*G*) and the Index of Dissimilarity (*D*) are calculated to summarise the extent of social and spatial inequality between ethnic groups within England. These measures provide a summary of the inequalities revealed by the previous cross-tabulations illustrating the composition of ethnic groups in England. Calculating both measures at each year also indicates whether the magnitude of this inequality has changed, although given the nature of these measures they cannot reveal whether the direction of the inequality has changed. This is illustrated by the previous cross-tabulations.

To reiterate, *G* depicts the magnitude of the inequality of the distribution, i.e. how different the distribution is from an equal distribution (no segregation or inequality) whereas *D*, expressed as a percentage, illustrates what percentage of a group would need to move to achieve an even distribution. Results are illustrated using the Lorenz curve, and Tables 5.3 and 5.4 separately summarise the results for social inequality (distribution of ethnic groups across social classes) and spatial inequality (distribution of ethnic groups within England's regions).

5.6.2.1 Social inequality

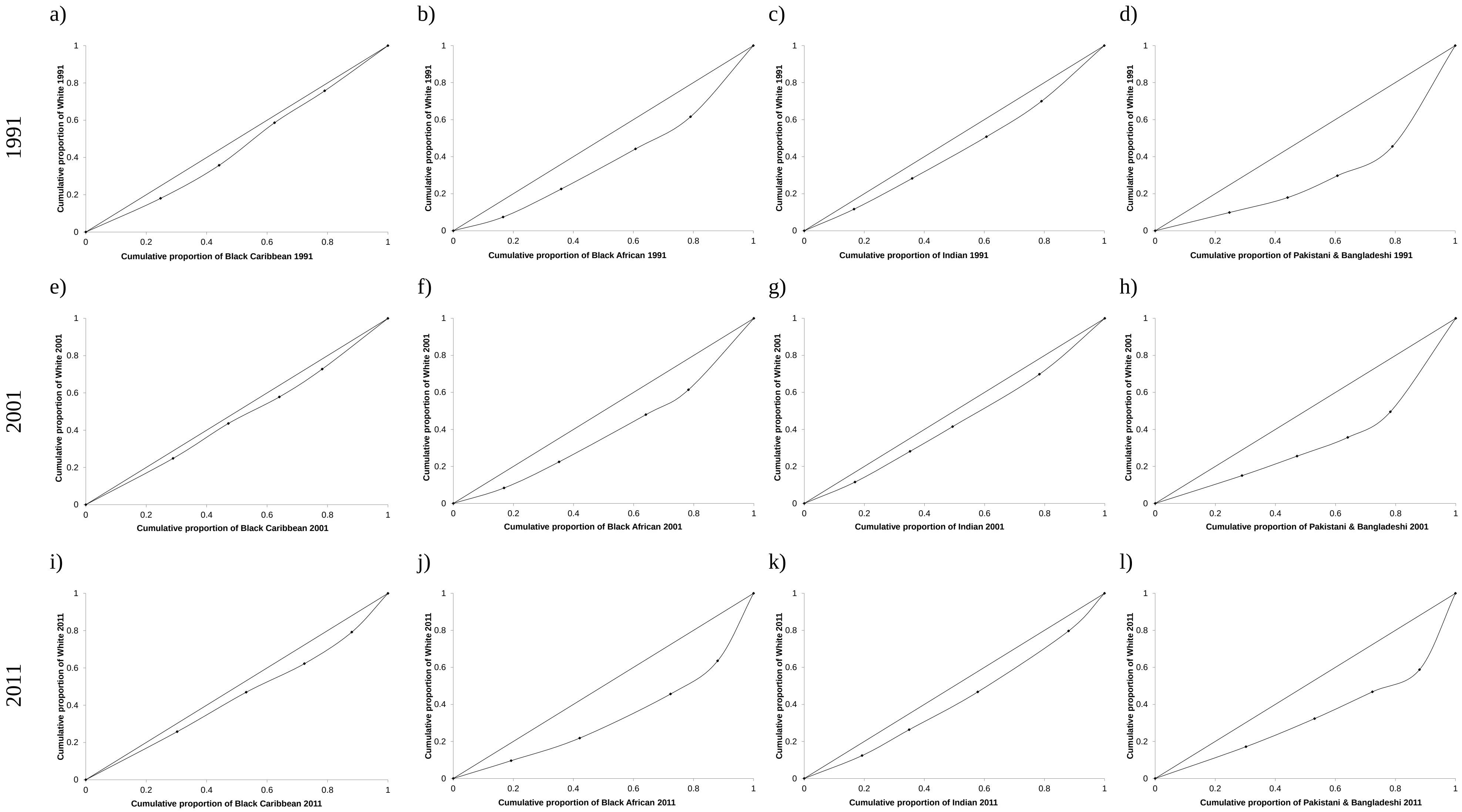
G and *D* are first calculated in terms of the ratio of Whites to each MEG. However, as differences are also found within MEGs, *G* and *D* are also calculated for the ratios within Black and South Asian groups. This includes the population not assigned to a class (unclassifiable). Table 5.3 summarises these results. According to *D*, whilst the social gap between MEGs and Whites initially narrowed between 1991 and 2001, this then widened for Black Caribbeans, Indians, and notably so for Black Africans by 2011. Further, despite a narrowing gap within Black and South Asian groups between 1991 and 2011, inequality is still marked for these MEGs. The greatest degree of inequality, as indicated by *D*, is consistently observed between Whites and Pakistani and Bangladeshis. For example, as much as 29% of Pakistani and Bangladeshis would need to redistribute across the social classes to achieve an even distribution when compared to Whites in 2011. This is reinforced by the consistently high *G* values, summarising the magnitude of inequality between Whites and Pakistani and Bangladeshis. *G* is also consistently high when summarising inequality within South Asian groups, and between Whites and Black Africans.

For illustrative purposes, this widening social gap between MEGs and Whites, and to some extent within Black and South Asian groups, is shown in Figure 5.6. The degree of inequality is evident in the size of the gap between the curve and the diagonal.

Table 5.3 Social inequalities between ethnic groups, Gini coefficient and Index of Dissimilarity, 1991, 2001, 2011

	1991		**2001**		**2011**	
	G	*D* (%)	G	*D* (%)	G	*D* (%)
White: Black Caribbean	0.11	8%	0.08	7%	0.13	10%
White: Black African	0.23	17%	0.22	17%	0.34	27%
White: Indian	0.13	10%	0.12	8%	0.15	11%
White: Pakistani and Bangladeshi	0.40	34%	0.33	29%	0.33	29%
Black African: Black Caribbean	0.22	18%	0.16	12%	0.22	17%
Indian: Pakistani and Bangladeshi	0.30	25%	0.25	21%	0.29	23%

Note: *G* Gini Index, *D* Index of Dissimilarity, distribution across the social class structure includes unclassified.
Source: Samples of Anonymised Records


1991
2001
2011
a)
b)
c)
d)
e)
f)
g)
h)
i)
j)
k)
l)
Cumulative proportion of White 1991
Cumulative proportion of Black Caribbean 1991
Cumulative proportion of Black African 1991
Cumulative proportion of Indian 1991
Cumulative proportion of Pakistani & Bangladeshi 1991
Cumulative proportion of White 2001
Cumulative proportion of Black Caribbean 2001
Cumulative proportion of Black African 2001
Cumulative proportion of Indian 2001
Cumulative proportion of Pakistani & Bangladeshi 2001
Cumulative proportion of White 2011
Cumulative proportion of Black Caribbean 2011
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Cumulative proportion of Indian 2011
Cumulative proportion of Pakistani & Bangladeshi 2011
0
0.2
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1

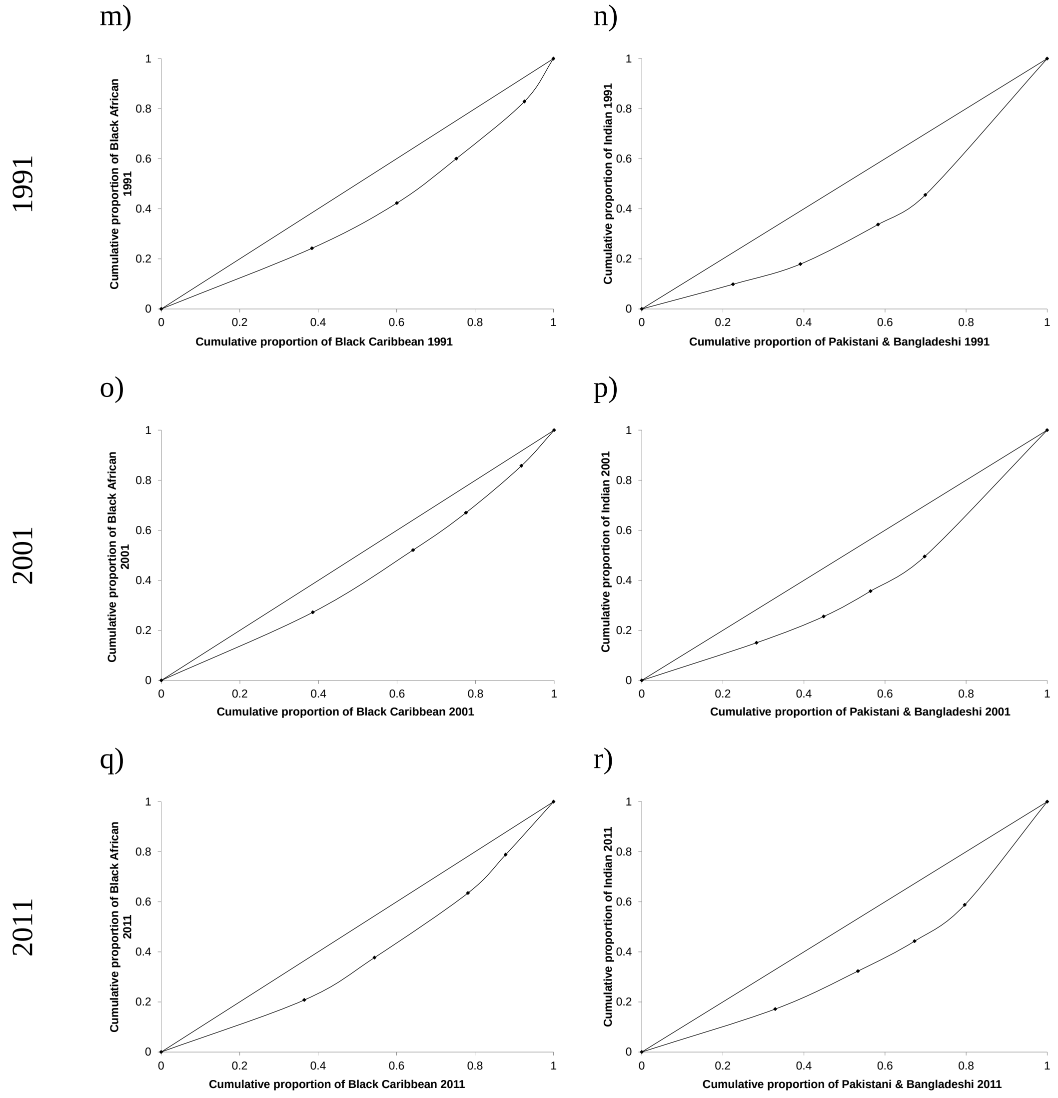


Figure 5.6 Lorenz Curve: Ethnic Composition of Social Class Structure (includes population not assigned to a class), 1991, 2001 and 2011

Source: Samples of Anonymised Records

5.6.2.2 Spatial inequalities

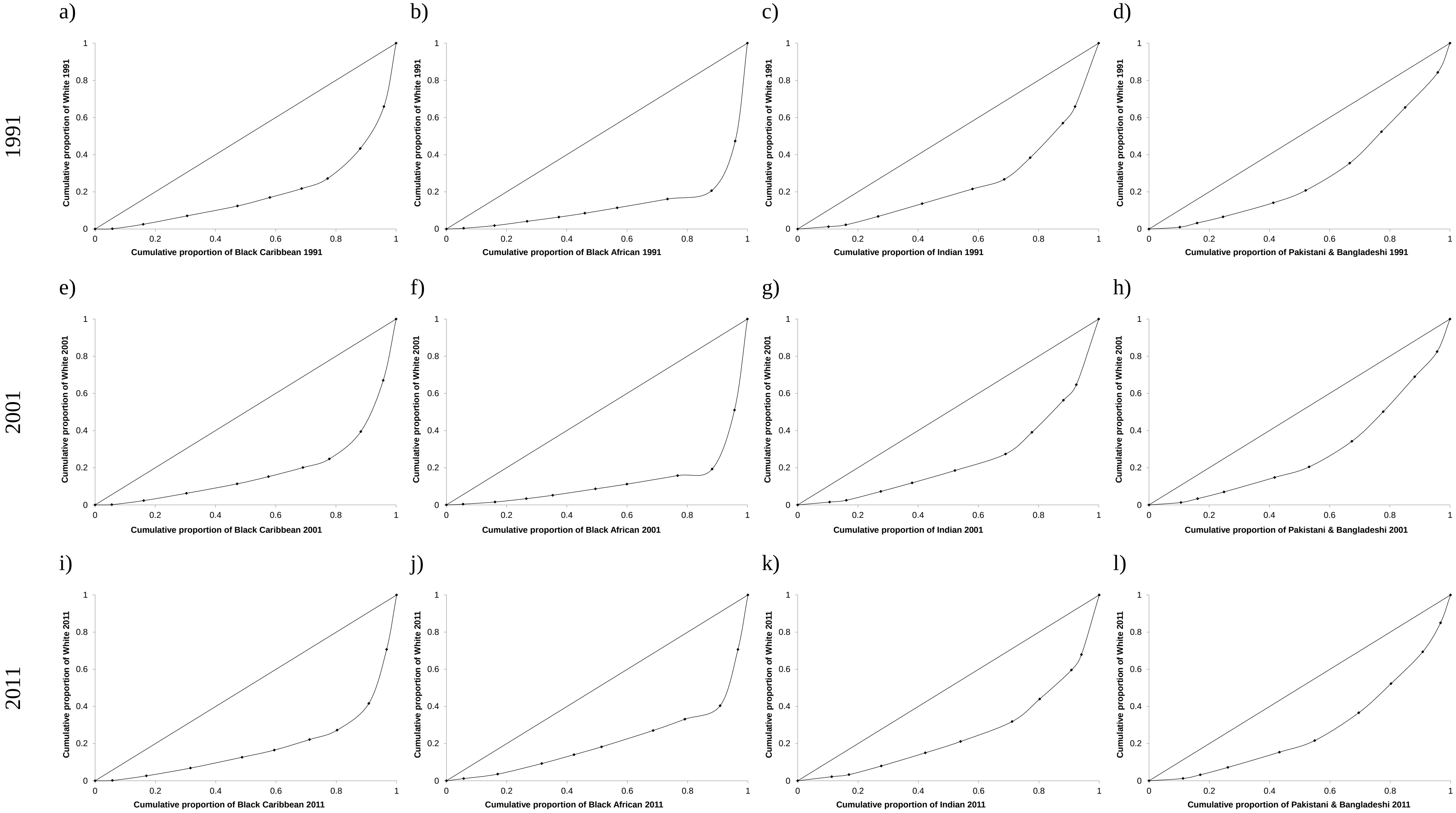
G and *D* are similarly calculated for MEGs relative to Whites and within Black and South Asian groups according to region of residence. According to these measures, the degree of spatial inequality between ethnic groups is much more marked then the degree of social inequality. Moreover, whilst the social gap between ethnic groups appears to be narrowing between 1991 and 2001, the spatial gap is widening over the same time period. Conversely, by 2011 the gap decreases between Whites and Black Africans, Whites and Indians, and within the Black and South Asian ethnic groups. However, *G* successively increases for Whites and Pakistani and Bangladeshis, although *D* is maintained between 2001 and 2011 after an increase between 1991 and 2001. The highest degree of spatial inequality is between White and Black groups: 53% of Black Caribbeans and 50% of Black Africans would need to move in 2011 to achieve an even distribution with Whites.

Figure 5.7 plots the Lorenz curve for each of the ratios summarised in Table 5.4. Although the degree of spatial inequality between White and Pakistani and Bangladeshi groups is marked, the distribution of Pakistani and Bangladeshis relative to Whites reflects the most even spatial distribution of all the MEGs. This is reflective of their spatial dispersal across regions of England, contrasting with the higher degrees of ethnic clustering of Black Africans and to some extent Black Caribbeans in London. However, were this measure based on deprivation it is likely that a much higher degree of segregation would be apparent for Pakistani and Bangladeshis.

Table 5.4 Spatial inequalities between ethnic groups, Gini coefficient and Index of Dissimilarity, 1991, 2001, 2011

	1991		**2001**		**2011**	
	G	*D* (%)	G	*D* (%)	G	*D* (%)
White: Black Caribbean	0.61	50%	0.63	53%	0.63	53%
White: Black African	0.73	67%	0.74	69%	0.57	50%
White: Indian	0.51	42%	0.51	42%	0.50	39%
White: Pakistani and Bangladeshi	0.41	31%	0.43	33%	0.44	33%
Black African: Black Caribbean	0.29	23%	0.26	20%	0.15	9%
Indian: Pakistani and Bangladeshi	0.40	30%	0.41	31%	0.37	28%

Note: *G* Gini Index, *D* Index of Dissimilarity
Source: Samples of Anonymised Records


1991
2001
2011
a)
Cumulative proportion of White 1991
Cumulative proportion of Black Caribbean 1991
b)
Cumulative proportion of White 1991
Cumulative proportion of Black African 1991
c)
Cumulative proportion of White 1991
Cumulative proportion of Indian 1991
d)
Cumulative proportion of White 1991
Cumulative proportion of Pakistani & Bangladeshi 1991
e)
Cumulative proportion of White 2001
Cumulative proportion of Black Caribbean 2001
f)
Cumulative proportion of White 2001
Cumulative proportion of Black African 2001
g)
Cumulative proportion of White 2001
Cumulative proportion of Indian 2001
h)
Cumulative proportion of White 2001
Cumulative proportion of Pakistani & Bangladeshi 2001
i)
Cumulative proportion of White 2011
Cumulative proportion of Black Caribbean 2011
j)
Cumulative proportion of White 2011
Cumulative proportion of Black African 2011
k)
Cumulative proportion of White 2011
Cumulative proportion of Indian 2011
l)
Cumulative proportion of White 2011
Cumulative proportion of Pakistani & Bangladeshi 2011
0
0.2
0.4
0.6
0.8
1

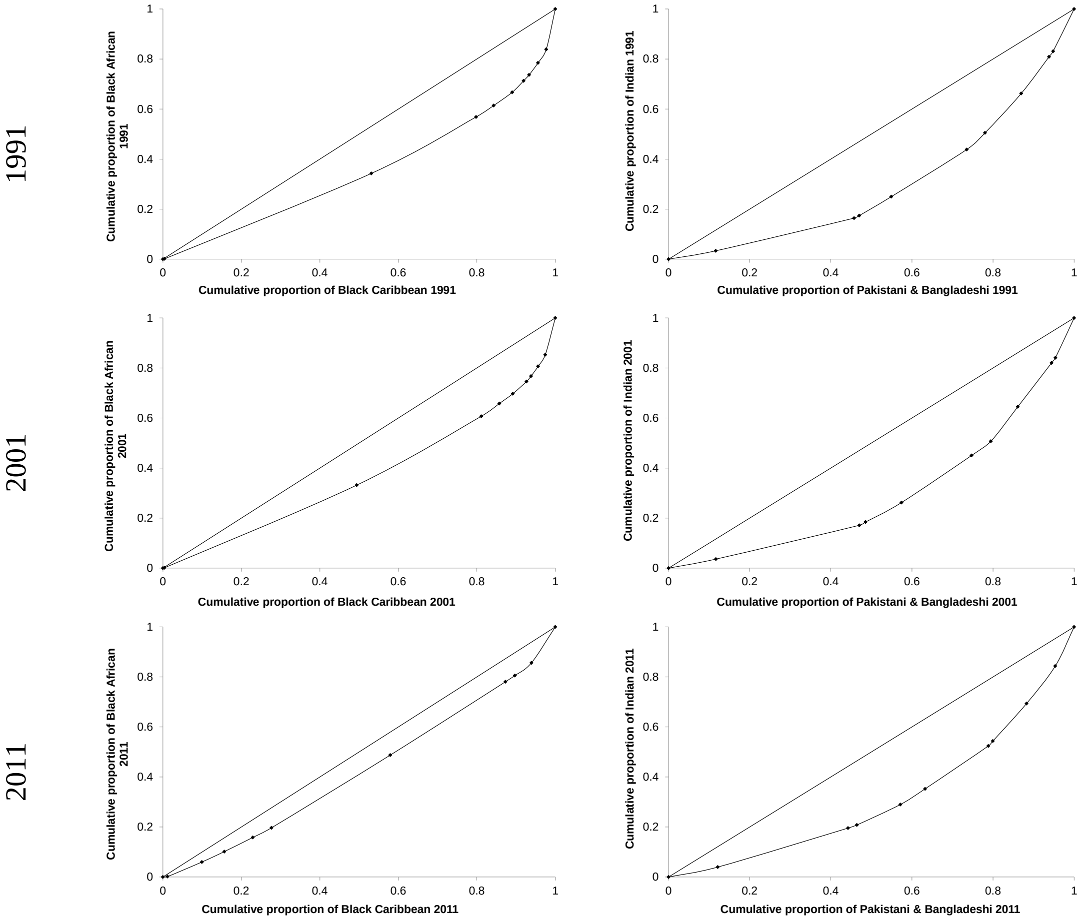


Figure 5.7 Lorenz Curve: Ethnic Distribution by Government Office Region, 1991, 2001 and 2011

Source: Samples of Anonymised Records

5.6.3 Variations in rates of migration by socioeconomic attribute and ethnic group

The varying composition of ethnic groups according to known distinguishing characteristics of migrants and determinants of health would suggest that opportunities for migration will vary between ethnic groups, as will levels of poor health. The following section will first explore the selective nature of migration according to known distinguishing characteristics of migrants in the overall population, before exploring variations by ethnic group and age. Differences by migrant type, here defined by distance of move, will also be explored.

Percentages of (internal) migrants and migrants by migrant type are plotted by social class (including unclassifiable), household tenure, educational attainment and region in Figure 5.8. Whilst the population does become *more* mobile between 1991 and 2011, much of this increase occurs between 1991 and 2001. Firstly, higher rates of migration are associated with higher social classes, privately rented tenancies and living in London. However, there are some variations between years. Between 1991 and 2011, the rates of migrants within the social class structure decreases. However, overall rates of migration increase and this is solely attributable to the marked increase in migrants not assigned to a social class.

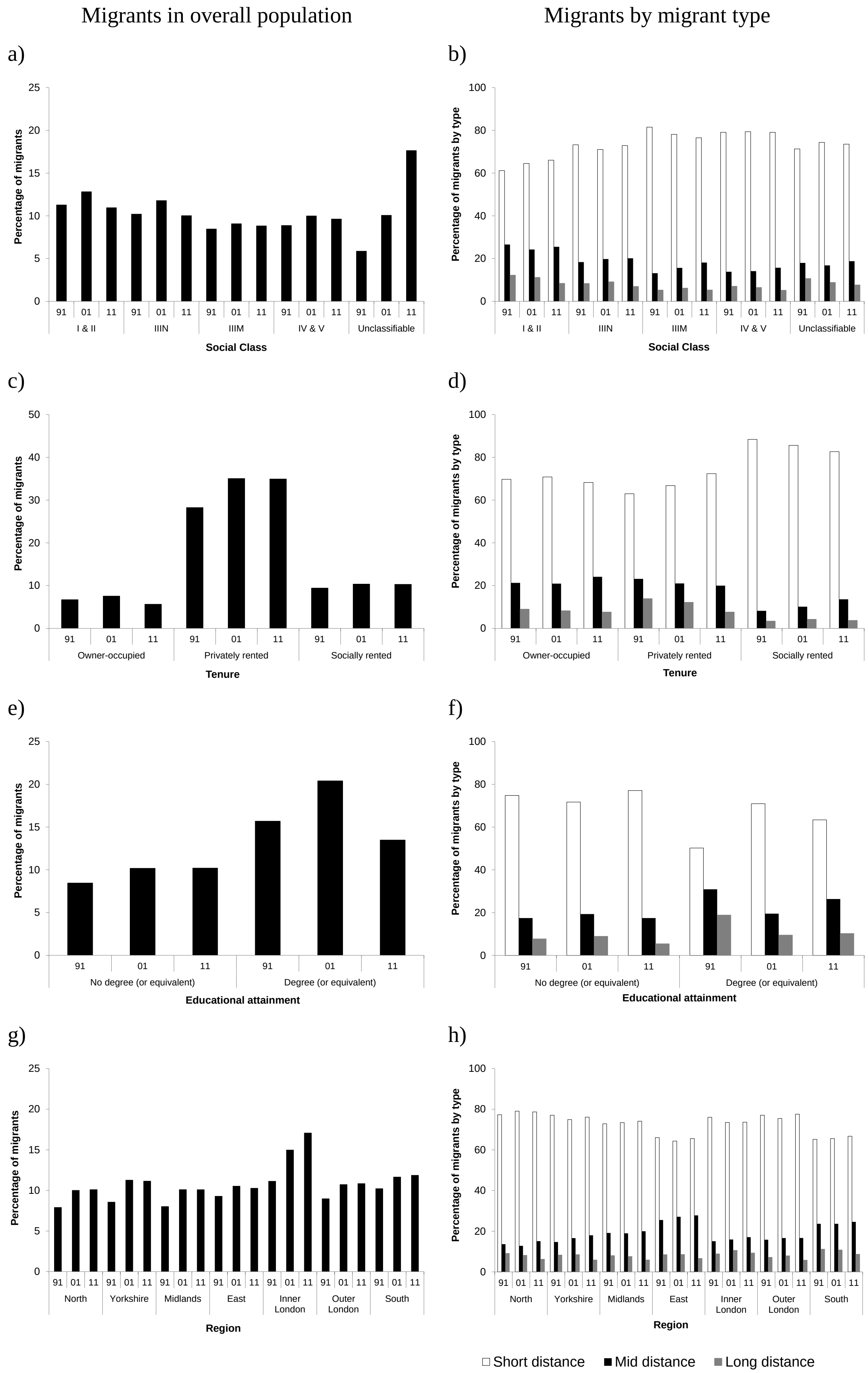


Figure 5.8 Migrants and migrant types by socioeconomic and spatial variables, 1991, 2001 and 2011
Source: Samples of Anonymised Records

Rates of migration increase notably by privately rented accommodation, expected given the increasing popularity of these temporary tenancies. Interestingly, whilst a marked increase in the rates of migration amongst those educated to degree level and above occurred between 1991 and 2001, by 2011 this falls to below rates observed in 1991. Increases observed between 1991 and 2001 for those not educated to degree level are maintained to 2011. By region, there are increases in the proportion of migrants for all areas apart from the East with notably higher rates consistently observed in Outer London. Nevertheless, differences in rates of migration between the remaining regions of England are not marked.

Whilst the nature of privately rented tenancies largely necessitates higher rates of migration amongst this group of the population, the raised rates of migration for higher social classes or higher levels of educational attainment are indicative of the enabling nature of increased socioeconomic advantage for migration. It is therefore likely that ethnic groups who are more advantaged will have higher propensities to migrate. However, increases in the proportion of 'unclassifiable' migrants deserves further consideration, particularly given high concentrations of MEGs assigned to 'unclassifiable'. It is possible that some of the increases in the proportion of unclassifiable migrants may be due to the ageing population, with rates of migration increasing slightly in older ages. However, this may also relate to changes in the migration patterns of MEGs with higher proportions of unclassifiable.

Socioeconomic attributes also appear to influence the type of migration event, defined by distance moved. Migrants are much more likely to move across a shorter distance (less than 15 km) for all population subgroups. This is also reported in migration studies (e.g. Boyle *et al*., 2002; Finney and Simpson, 2008), recognisable to demographers as one of Ravenstein's "laws of migration" (1885, 1889). The highest rates of migration observed by socioeconomic attribute and distance moved are for those in socially rented accommodation across less than 15 km. Moves across greater distances appear more likely amongst the more advantaged groups of the population. For example, notably higher proportions of those in owner-occupation, educated to degree level or above and in the higher social classes move across distances over 14 km than the remaining groups.

There is also a geography to distance moved. Higher proportions of migrants move over shorter distance in regions to the North of England and in London whereas slightly higher proportions of migrants move between 15-149 km in the East and South. Similarly, slightly higher proportions of migrants moving 150 km or more are found in the South and, to some extent, the East and Inner London. The crude geography reveals a crude spatial patterning to distance moved and the influence of advantage, at least insofar as more northerly areas are broadly less affluent than more southerly areas.

There are overall increases in rates of migration for all ethnic groups between 1991 and 2011. However, the greatest growth (and the groups with growth in each year) is amongst Black Caribbeans, Black Africans, Indians, Chinese and Mixed and Others. For example, by 2011 24% of Chinese and 18% Black Africans are migrants. In 1991 and 2001, Black Africans are the most mobile. Despite the relatively high growth in the proportion of migrants for Black Caribbeans, they are still the least mobile followed by Pakistani and Bangladeshis, and then Indians. According to migrant type, Black Caribbeans, Black Africans and to some extent, Pakistani and Bangladeshis have the lowest proportion of migrants moving over long distances and the highest moving over short distances, particularly for the Black Caribbeans. Higher proportions of migrants moving between 15 and 149 km are observed for Whites, Indians, Chinese and Mixed and Others with White, Indians and Chinese also having higher proportions moving over longer distances (150+ km). There is no significant change between years in the proportion of migrant types by ethnic group (see Figure 5.9).

Distance of move may be closely associated with reasons for move. For example, some may move between public housing across shorter distances whereas those whose move is motivated by a career progression may be more likely to move over a greater distance (e.g. Boyle *et al*., 2002; Fielding, 1992a). Indeed this reasoning is supported by evidence in Figure 5.8. Ethnic variation in distance moved is therefore important in the context of selective sorting and, as will later be demonstrated, changing ethnic health gradients.

To assess the age-selectivity of migration, Figure 5.10 plots age-specific rates of migration per 100,000 population by ethnic group. Declining rates of migration with increasing age are stable over time, a common finding in migration literature (e.g. Rogers and Castro, 1981; Raymer and Rogers, 2008). The age-selectivity of migration is also consistent across ethnic groups, although there are some differences in numbers as would be expected given the results presented thus far. Between 1991, 2001 and 2011, the numbers of migrants increases for all ethnic groups aged 16-29 and 45-64. However, for ages 65-74 after an initial increase between 1991 and 2001, numbers fall by 2011. This is consistent for all groups apart from Black Caribbeans and Chinese who see an increase by 2011 (although this did follow a dramatic decline in 2001 for Black Caribbeans). Increasing mobility of the population is not therefore restricted to one specific age group.

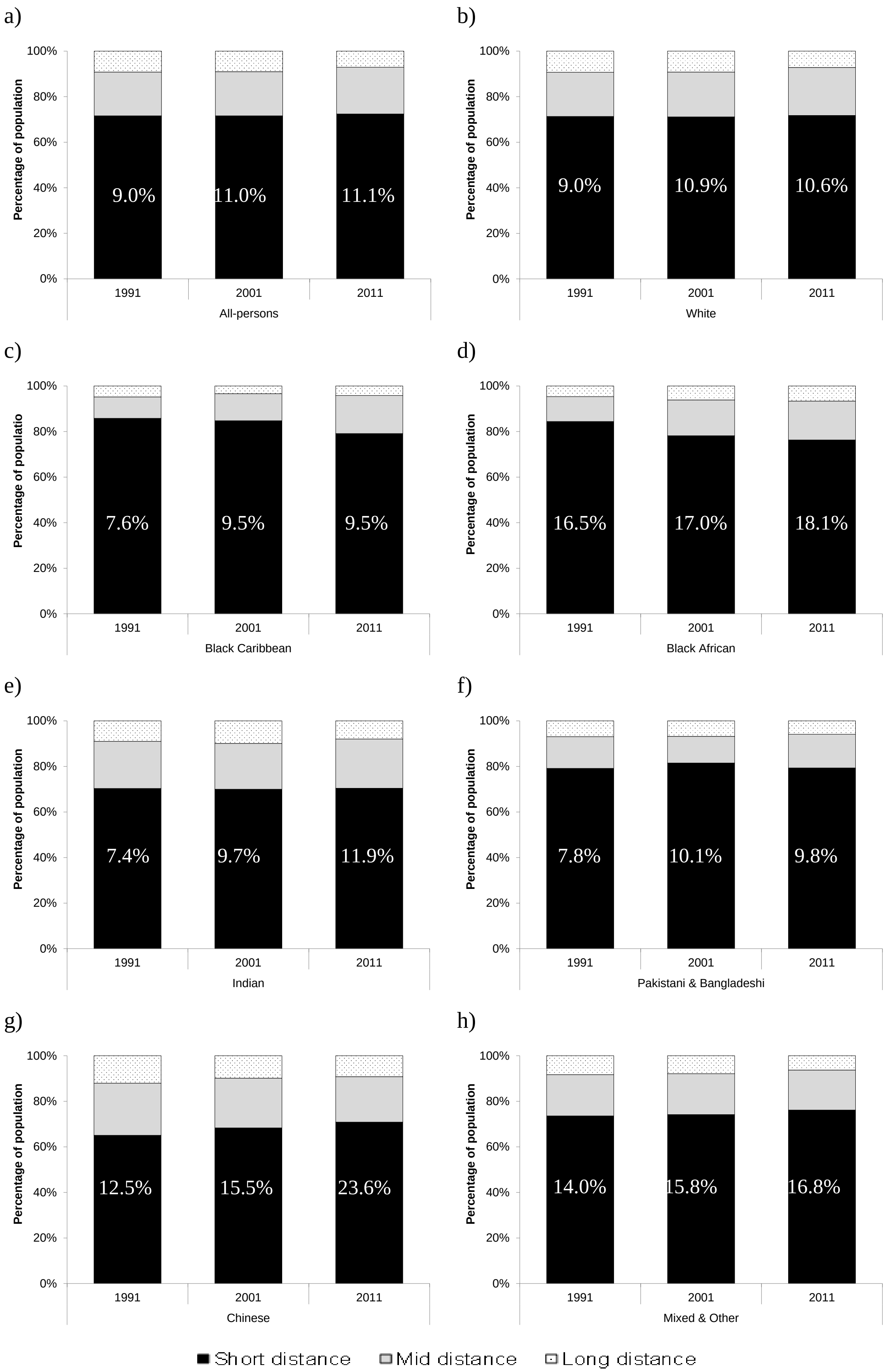


Figure 5.9 Migrant type (by distance) by ethnic group, 1991, 2001 and 2011 (% migrants by ethnic group added to each graph)

Source: Samples of Anonymised Records

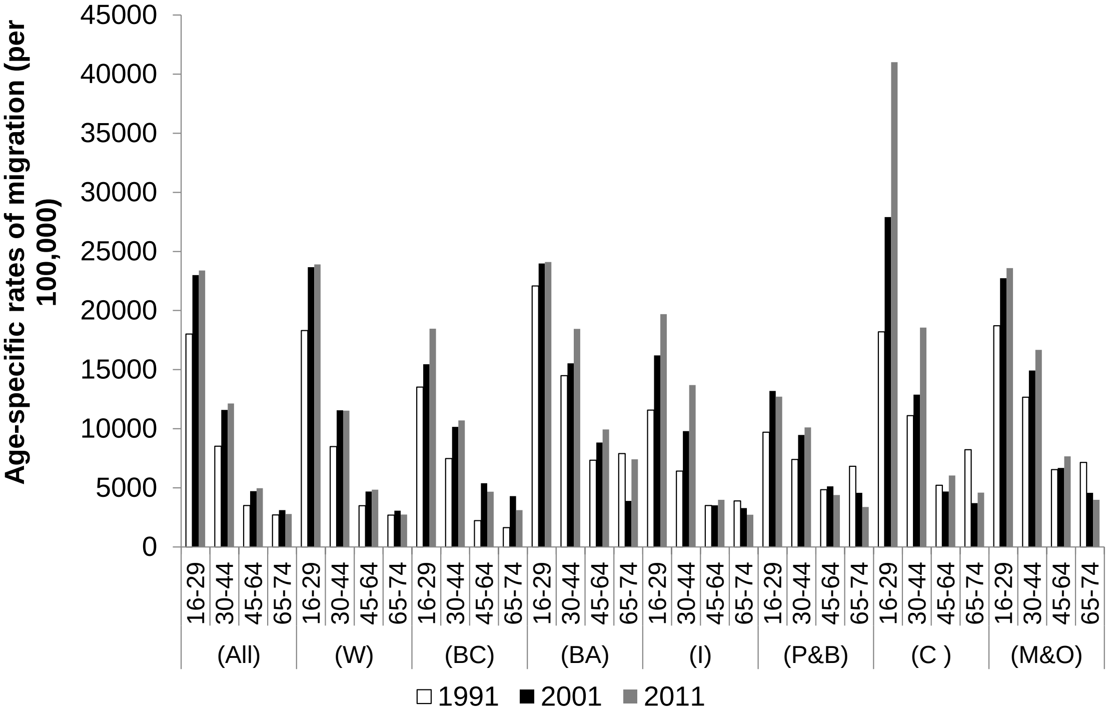


Figure 5.10 Age-specific rates of migration per 100,000 population by ethnic group, 1991, 2001 and 2011

Note: W = White, BC = Black Caribbean, BA = Black African, I = Indian, P&B = Pakistani and Bangladeshis, C = Chinese, M&O = Mixed and Other
Source: Samples of Anonymised Records

5.6.4 Changing population health by ethnic group, socioeconomic attributes, area and migrant status

Standardised illness ratios (SIRs) are calculated by social class, education, tenure, region of residence, migrant status for all-persons and then by ethnic group (Table 5.5). However, given the varying age-sex structure between MEGs, age-specific rates (ASIRs) are also calculated. Deteriorating health with increasing age is apparent for all ethnic groups in Figure 5.11. However, there are some interesting differences between the minority groups and the White majority. Black Caribbeans generally have higher age-specific rates of LLTI than Whites at 1991, 2001 and 2011 (apart from for those aged 45-64 in 2011). Similarly, Pakistani and Bangladeshis always have higher rates, apart from for those aged 16-29 in 2011. Conversely, Chinese and Mixed and Others generally have lower rates of LLTI (apart from for 65-74 for Chinese in 2001, and for 16-29 for Mixed and Other in 1991 and 2011). A slightly more varied picture emerges for Indian groups who only have higher rates of LLTI amongst those aged 30-74 (apart from aged 30-44 in 2011). Black Africans only have higher rates amongst those aged 65-74 (apart from for those aged 16-29 in 1991). This indicates an age-patterning to the ethnic inequality in health more nuanced than is perhaps suggested in wider literature. It is important to emphasise the divergent health experiences within typically aggregated ethnic groups: Black

Africans always have lower age-specific rates of LLTI than Black Caribbeans (apart from for those aged 65-74 in 1991), while Pakistani and Bangladeshis invariably have higher rates than the Indian groups. Contrary to the results of the HSE analysis which suggested improving population health, these data are suggestive of declining population health between 1991 and 2001 although there is evidence of a slight improvement by 2011. It is possible that some of this variation owes to a change in the question wording on the census (see chapter 2).

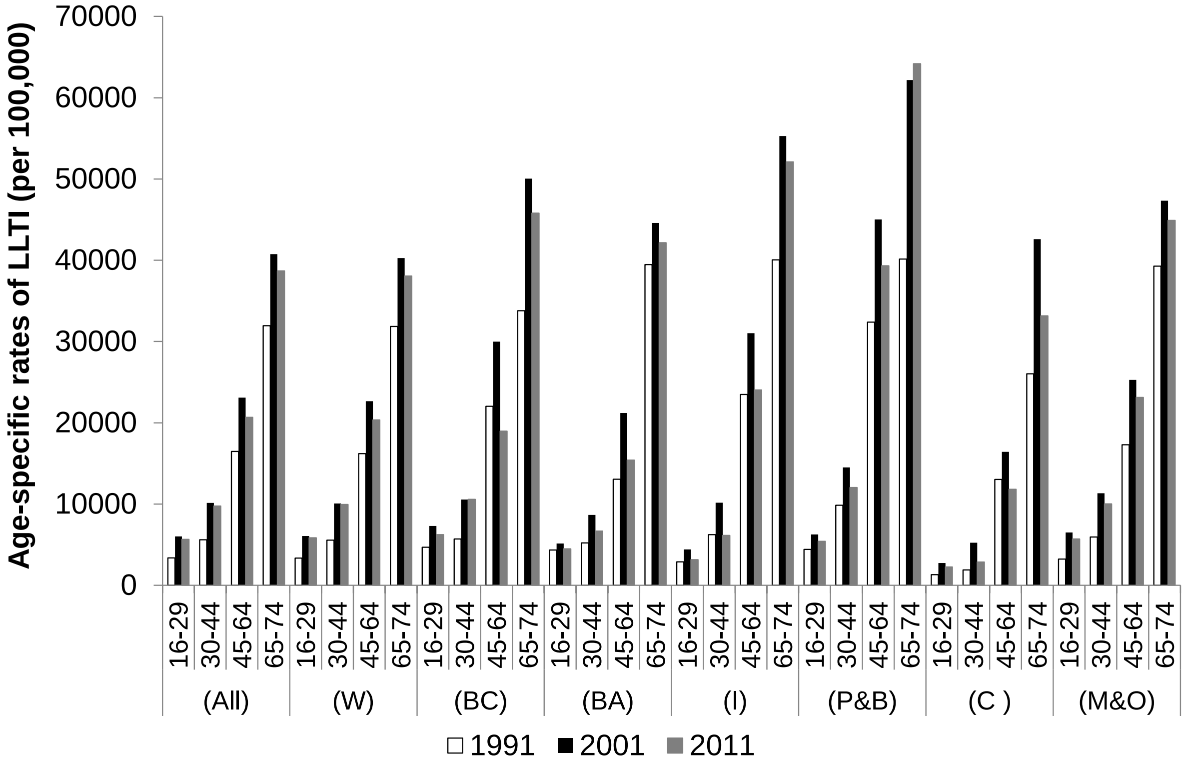


Figure 5.11 Age-specific rates of LLTI per 100,000 population by ethnic group, 1991, 2001 and 2011

Note: W = White, BC = Black Caribbean, BA = Black African, I = Indian, P&B = Pakistani and Bangladeshis, C = Chinese, M&O = Mixed and Other
Source: Samples of Anonymised Records

Table 5.5 Standardised Illness Ratios by ethnic group and simplified country of birth, 1991, 2001 and 2011

	1991			2001			2011		
	Male	Female	All	Male	Female	All	Male	Female	All
White	99.32	98.71*	99.01*	99.61	98.69*	99.15*	100.16	98.65*	99.36*
Black Caribbean	110.37	142.08*	125.68*	115.04*	125.36*	120.50*	100.99	103.94	103.06
Black African	79.91*	119.68	98.67	82.31*	98.13	90.31*	67.43*	82.98*	75.95*
Indian	109.80*	139.39*	123.86*	105.76*	132.11*	118.92*	87.36*	109.47*	98.83
Pakistani & Bangladeshi	174.21*	167.92*	173.19*	145.74*	166.14*	155.66*	127.62*	165.65*	146.33*
Chinese	57.38*	64.65*	60.96*	64.16*	69.60*	67.00*	49.31*	51.51*	50.67*
Mixed & Other	97.38	113.08	96.27	114.10*	109.37*	111.66*	107.53*	107.69*	107.63*
UK born	99.81	98.96	99.38	99.77	98.92*	99.35*	100.65*	99.16*	99.86
Not UK born	102.07	111.21*	106.61*	102.13*	109.13*	105.73*	94.52*	106.73*	101.12*

Notes: * SIRs are statistically significant (95% confidence level).
Source: Samples of Anonymised Records

The extent of these inequalities is further illustrated in Table 5.5 which presents SIRs by ethnic group. Whilst the SIRs are not comparable over time owing to the different standard populations used for each SARs year, should an SIR change from less than to greater than 100, this *is* indicative of a change in the patterning of health relative to the standard population. Firstly, the results reveal persisting gaps in health between ethnic groups, similar to those observed in chapter 4. For example, Pakistani and Bangladeshis always have significantly higher rates of LLTI than expected. Their SIRs are also consistently the highest observed each year. Black Caribbeans and Indians have similarly poor health, with significantly greater levels of illness then expected at 1991 and 2001. However, by 2011 the SIRs are not significant for Black Caribbeans. Further, for Indian males and the total Indian population, SIRs are indicative of better than expected health (significant for males) in 2011. By 2001, Mixed and Others also have significantly worse than expected rates of LLTI. This contrasts with the better health of Black Africans (significant for males, females and all-persons by 2011 with some variation in 1991 and 2001), and the markedly better health of Chinese who always have significantly lower rates of LLTI than expected. The patterning of health by gender within each ethnic group is generally the same, aside from the noted variation for Black Africans, Indians and Mixed and Others. There is also some gendered variation for Whites: whilst females and all-persons invariably have significantly lower levels of LLTI than expected, the SIRs are not significant for males. Table 5.5 also presents SIRs by country of birth. Despite lower rates of LLTI amongst non-UK born groups, adjusting for age and sex generally returns higher than expected rates of illness amongst non-UK born groups, whereas the opposite is generally true for UK born groups. However, these results are not uniformly statistically significant.

Table 5.6 presents SIRs for each socioeconomic and spatial variable for 1991, 2001 and 2011. SIRs by migrant status and migrant type are also calculated. These SIRs are for the total sample population (not by ethnic group). Social class has been simplified to increase sample size. As with the SIRs by ethnic group, these are split by gender. Analysing health status by social class, education, tenancy and region of residence reveals clear social and spatial gradients within the population. This is in line with widely accepted literatures on the socially and spatially graded nature of health (e.g. Marmot, 2005).

A marked class-health gradient is evident at 1991, 2001 and 2011 although the magnitude of the differences between classes varies. SIRs successively increase when moving down the social class structure with the poorest health (highest SIRs) consistently amongst the unclassified group. By 2011, the SIRs for males, females and all persons all indicate significantly greater than expected levels of LLTI for classes IIIM, IV and V, and unclassifiable. This contrasts with the previous years' whereby only unclassifiable consistently have significantly greater than expected levels of LLTI. All classes generally have better than expected levels of illness, significantly so in most cases. There are gendered differences in the patterning of health within each class, but these are generally small.

Those classified to degree level or above have significantly lower levels of LLTI than expected, contrasting with the significantly higher levels observed for those without a degree or equivalent. Differences between males and females are negligible with very little change between years. Significantly lower than expected levels of LLTI are consistently found for those in owner-occupied accommodation. However, SIRs of more than 100, indicating higher than expected levels of LLTI, are returned for those in privately rented and socially rented accommodation. Groups in socially rented accommodation consistently have the highest SIRs (statistically significant). SIRs for privately rented accommodation are only consistently significant in 2001 and 2011.

Thus, increasing SIRs indicating poorer health are observed with successively lower social classes, for those not educated to degree level or above, and for those in socially and to some extent privately rented accommodation. The patterns observed here are consistent with the patterns observed in the chapter 4. In terms of a spatial gradient to health, higher SIRs are associated with more northerly regions of England. However, SIRs for Inner London counter this trend of decreasing SIR when moving from North to South: SIRs for those in Inner London consistently indicate significantly higher levels of LLTI than expected, contrasting with the significantly lower levels in Outer London.

The SIRs by migrant status and migrant type are not altogether in line with expectations. For example, wider literature suggests that migrants are generally in better health than non-migrants. However, at 1991 and 2001, migrants all have significantly higher levels of LLTI than expected. Yet by 2011, migrants have significantly lower levels of LLTI than expected. SIRs for non-migrants invariably suggest that levels of LLTI for these groups are not significantly different from expected. Of those that do migrate, migrants moving over a shorter distance always have significantly higher levels of LLTI than expected. This contrasts with the significantly lower levels for mid- and long-distance migrants. The latter group have the lowest SIRs. Such variations illustrate the need to account for more complex relationships between migration and health than are tangible in the SIRs, such as the varying relationship between health and migration depending on household tenure or, as seen here, distance moved (see Boyle *et al*., 2002). Differences between males and females are not marked. Nevertheless, it is worth noting that lower SIRs are generally observed for women suggesting better health for women than men.

Table 5.6 Standardised Illness Ratios by social class, education, tenure, region, migrant status and type 1991, 2001 and 2011

	1991			2001			2011		
	Male	Female	All	Male	Female	All	Male	Female	All
I & II	55.38*	59.85*	57.81*	56.98*	59.89*	58.35*	63.34*	68.32*	65.41*
IIIN	83.42*	61.58*	66.43*	79.06*	66.62*	69.47*	90.72*	88.07*	90.06*
IIM	88.96*	85.86*	91.78*	82.84*	81.88*	83.49*	107.63*	102.42*	104.49*
IV & V	109.22*	92.20*	101.34	99.80*	93.60*	96.15*	138.09*	131.56*	134.82*
Unclassifiable	186.51*	138.36*	149.94*	202.45*	153.02*	170.12*	179.87*	159.62*	168.61*
No degree	105.36*	101.73*	103.36*	101.57*	101.51*	101.54*	115.96*	111.94*	113.88*
Degree (+)	44.23*	52.20*	47.49*	74.23*	72.67*	73.54*	58.92*	65.37*	62.07*
Owner-occupied	81.50*	80.20*	80.93*	82.08*	82.63*	82.38*	78.27*	79.85*	79.10*
Privately rented	97.97	102.35	100.27	112.94*	117.78*	115.31*	106.71*	112.21*	109.10*
Socially rented	171.58*	162.18*	165.99*	187.59*	170.80*	178.31*	211.04*	189.27*	199.40*
North	128.90*	121.07*	124.96*	124.70*	120.82*	122.73*	121.33*	117.01*	119.07*
Yorkshire	114.98*	113.18*	114.09*	109.28*	109.53*	109.39*	110.30*	107.59*	108.87*
Midlands	101.38	102.71*	102.09*	103.35*	103.93*	103.65*	104.36*	106.32*	105.37*
East	81.78*	84.63*	83.22*	83.90*	86.04*	84.98*	86.06*	88.35*	87.26*
Inner London	110.91*	22.32*	116.57*	110.64*	113.49*	112.08*	106.86*	110.59*	108.78*
Outer London	87.01*	89.89*	88.38*	88.44*	93.11*	90.88*	90.30*	93.98*	92.27*
South	81.05*	82.70*	81.86*	84.86*	84.18*	84.52*	85.56*	85.46*	85.51*
Migrant	103.71	107.90*	105.73*	97.82	102.59*	100.16	95.65*	97.98*	96.58*
Non-migrant	99.79	99.58	99.69	100.71	99.81	99.99	100.35	100.14	100.26
Short-distance	112.84*	116.96*	114.78*	108.90*	111.35*	110.08*	102.60*	103.32*	102.73*
Mid-distance	83.00*	87.50*	85.23*	87.41*	91.66*	89.49*	79.00*	85.16*	81.70*
Long-distance	79.68*	78.17*	79.07*	79.24*	96.80*	87.86*	77.48*	80.37*	78.75*

Notes: * SIRs are statistically significant (95% confidence level).
Source: Samples of Anonymised Records

The following section explores ethnic variations in the social and spatial patterning of health (Table 5.7). This reveals whether changing patterns of health are consistent between ethnic groups and whether the health gap between ethnic groups varies by socioeconomic attribute, migrant status and area. To increase sample size, SIRs are not split by gender nor are SIRs presented by migrant type owing to the very small counts of migrations within MEGs. Further, SIRs are not presented by region owing to the small numbers involved when cross-tabulating by region and the extent to which aggregating regions into, for example, the North and the South, ignores important patterns of ethnic clustering already documented. Declining sample sizes are unavoidable given the level of ethnic detail required for this analysis and often produce wide confidence intervals. However, if observed patterns are consistent between censuses it is likely that these patterns are indicative of wider trends which larger sample sizes may confirm.

Clearer gradients are evident from 2001 onwards where the increasing ethnic diversity of the population results in larger sample sizes which are more robust for statistical analysis. Crucially, the patterns observed by ethnic group are generally consistent with the patterns observed for the overall population: increasing disadvantage is associated with increasing SIRs. Poor health does not, therefore, appear to be a specific feature of minority ethnic status. Indeed Chinese and to some extent Black Africans have significantly better health than expected in certain socioeconomic circumstances.

There is marked variation between ethnic groups in the SIRs for those born in the UK and those born elsewhere. For Pakistani and Bangladeshis, Indians and for Black Caribbeans from 2001, being born outside of the UK is consistently associated with significantly higher than expected levels of LLTI. Whilst levels of LLTI are also significantly higher than expected for Pakistani and Bangladeshis born in the UK, Indians born in the UK always have significantly lower than expected levels of LLTI. Whites, Black Africans and Chinese generally have lower than expected levels of LLTI regardless of place of birth.

The socially graded nature of health is evident in the increasing SIRs when moving down through the class structure to unclassifiable, however, SIRs do not consistently successively increase. Nevertheless, poorer health is observed in the lower classes with better health in the higher classes for all ethnic groups at all census years. The highest SIRs within each year are generally observed for Pakistani and Bangladeshis, illustrative of their poorer health.

The social gradient to health is also apparent by educational attainment within each ethnic group: those with degree level qualifications or above have better health than those not qualified to that level. Further, SIRs for those without degree level qualifications are greater than 100 indicating poorer than expected health. This is true for all ethnic groups apart from Black Africans in 2001 and 2011, and Chinese groups in 1991, 2001 and 2011.

Table 5.7 SIRs by social class, education, tenure, region, migrant status and type by ethnic group, 1991, 2001 and 2011

1991	W	B C	B A	I	P & B	C	M & O
Born UK	99.21*	125.39*	186.56*	94.41	152.92*	87.55	135.33*
Born elsewhere	95.37*	124.05*	81.65*	127.41*	176.28*	59.24*	95.52
I & II	57.60*	79.54*	52.97*	56.80*	80.15	24.84*	67.44*
IIIN	66.33*	61.29*	89.89	73.59*	86.14	38.86*	68.72*
IIM	91.12*	90.63	85.50	112.13	174.35*	70.71	109.04
IV & V	100.36	115.26*	110.46	107.70	176.42*	62.54	129.91*
Unclassifiable	148.36*	209.89*	128.45	196.35	200.34*	90.36	148.21*
No degree	102.82*	125.31*	103.74	132.38*	180.30*	66.09*	110.97*
Degree (+)	47.26*	70.08	54.90*	44.75*	51.88*	22.55*	66.59*
Owner-occupied	79.68*	99.81	84.02	118.23*	162.80*	62.83*	83.56*
Privately rented	100.54	98.11	74.27	89.04	166.65*	26.93*	82.75
Socially rented	165.61*	172.43*	114.88	215.66*	217.47*	81.45*	181.13*
Migrant	105.12*	136.66	97.99	117.51	158.08*	60.72	104.04
Non-migrant	98.67*	123.75*	97.52	124.72*	175.06*	61.31*	105.80
2001	W	B C	B A	I	P & B	C	M & O
Born UK	99.21*	107.78	88.90	88.51*	117.02*	64.46*	123.84*
Born elsewhere	90.28*	125.22*	89.82*	124.32*	162.60*	66.83*	104.78
I & II	57.93*	69.36*	51.26*	67.25*	84.59*	44.52*	62.63*
IIIN	68.65*	74.52*	68.93*	88.76*	95.67	40.15*	81.25*
IIM	83.04*	93.14	64.06*	95.48	111.42	46.74*	93.68
IV & V	95.51*	118.98*	78.43	105.13	119.01*	70.69*	99.77
Unclassifiable	169.16*	188.35*	142.08*	186.58*	197.37*	104.87	175.48*
No degree	100.22	121.00*	90.33*	121.09*	158.37*	67.40*	112.51*
Degree (+)	72.45*	99.56	88.37	78.20*	83.58*	57.03*	93.91
Owner-occupied	81.54*	92.59*	65.37*	110.89*	140.58*	57.32*	83.76*
Privately rented	115.35*	141.28*	76.83*	111.50	161.20*	55.00*	111.12*
Socially rented	179.81*	160.00*	111.78*	206.58*	191.46	132.68*	178.62*
Migrant	100.09	137.49*	72.88*	90.99	125.58*	49.83*	100.48

Non-migrant	98.32*	118.60*	92.35*	120.21*	156.46*	68.51*	112.11*
2011	W	B C	B A	I	P & B	C	M & O
Born UK	99.68	99.99	85.46*	75.99*	120.56*	47.87*	121.69*
Born elsewhere	90.01*	106.14*	74.66*	105.02*	154.59*	51.06*	100.95
I & II	65.65*	82.17*	51.26*	53.57*	83.48*	33.23*	68.51*
IIIN	90.03*	89.26*	68.93*	86.93*	104.63	43.43*	98.67
IIM	104.54*	92.66*	64.06*	110.59*	127.79*	60.08*	105.66*
IV & V	136.10*	119.85*	78.43*	141.15*	168.24*	73.75*	120.42*
Unclassifiable	175.94*	149.15*	142.08*	143.73*	189.69*	68.35*	151.78*
No degree	100.22	112.81*	96.62	126.76*	167.11*	66.12*	128.29*
Degree (+)	72.45*	76.66*	49.01*	49.82*	68.27*	29.55*	64.25*
Owner-occupied	78.07*	75.99*	45.08*	95.08*	134.00*	45.15*	77.32*
Privately rented	114.69*	89.77*	59.20*	75.72*	129.80*	34.36*	94.29*
Socially rented	205.49*	152.00*	109.15*	204.06*	211.11*	122.67*	186.53*
Migrant	99.39*	105.88	66.99*	65.52*	110.17*	36.04*	96.35
Non-migrant	98.97*	102.86	77.53*	101.77	149.38*	53.34*	109.28*

Note: W = White, BC = Black Caribbean, BA = Black African, I = Indian, P&B = Pakistani and Bangladeshis, C = Chinese, M&O = Mixed and Other; * SIRs are statistically significant (95% confidence level).
Source: Samples of Anonymised Records

These groups have better health than expected regardless of educational attainment, although the SIRs are higher for those without higher level qualifications. Increased cases of statistical significance are found from 2001 onwards which is likely to reflect increasing sample sizes for the MEGs.

The highest SIRs for all ethnic groups are found for those living in socially rented accommodation. However, increasing poor health between owner-occupied, privately rented and socially rented accommodation is not consistent between ethnic groups. For example, in 1991 Black Africans, Black Caribbeans, Indians, Chinese groups and Mixed and Other all have higher SIRs for those in owner-occupation than the SIRs found for privately rented housing. However, by 2001 this pattern is only apparent for Chinese. Further, by 2011 Pakistani and Bangladeshis now have poorer health when in owner-occupation than when in privately rented accommodation, contrasting with the clear gradient observed in 1991 and 2001.

Finally, SIRs are presented by migrant status. In 1991, SIRs for White, Black Caribbean and Black African migrants are all indicative of higher than expected levels of illness, with poorer health for migrants than non-migrants. Conversely, while the South Asian ethnic groups all have higher than expected levels of illness for both migrants and non-migrants, the SIRs for non-migrants are higher than those for migrants. Similar patterns are evident in 2001, although Black Africans and Chinese both have significantly lower levels of illness than expected for migrants and non-migrants. In 2011, SIRs for the White, Black African and Chinese migrants and non-migrants indicate significantly lower than expected levels of LLTI. This contrasts with the SIRs for Black Caribbeans (not significant) and Pakistani and Bangladeshis (significant) where both migrants and non-migrants have an SIR of greater than 100. Only Indians and Mixed and Others have contrasting SIRs for the migrant versus non-migrant population: in both groups, migrants have better health than non-migrants but the SIRs are only significant for Indian migrants and Mixed and Other non-migrants.

The socially and spatially graded nature of health across all ethnic groups becomes increasingly evident as the population becomes increasingly ethnically diverse. However, certain groups do not appear to reap the same health benefits of more advantaged circumstances as others.

5.7 Discussion

This chapter addressed a number of research objectives. The first was to explore changing ethnic diversity in England between 1991, 2001 and 2011 before investigating whether this changing diversity ran parallel to changing social and spatial inequality between ethnic groups. As the composition of different ethnic groups and the extent to which they are relatively or absolutely (dis)advantaged influences not only chances of good health, but also likelihood to migrate, this is important in respect of selective sorting and changing ethnic health gradients.

Results suggest that whilst the population is increasingly ethnically diverse and most MEGs have experienced growth in more advantaged circumstances, there are still persisting social and spatial gaps. Black Caribbeans and Pakistani and Bangladeshis are consistently more likely to be more disadvantaged. These inequalities are clearly demonstrated by *G* and *D*, although the degree of spatial inequality is more marked than the social inequality between the White majority and MEGs, or within Black or South Asian groups. However, while social inequality appears to be widening in some cases, spatial inequality is decreasing as the population becomes more diverse. It therefore seems that although some ethnic groups are more unequal than others, there has been progress. Evidence of a widening gap between and within ethnic groups by socioeconomic attribute was also found in chapter 4's analysis of HSE data.

Secondly, this analysis explored the selective nature of migration. These data show that more advantaged migrants, here identified by higher social classes and higher levels of education, tend to move over greater distances and often also experience better health. Others have similarly found that migrants moving across greater distances are more likely to belong to higher classes or be more highly qualified (Boyle *et al*., 1998). Similarly, moves across shorter distances are particularly prevalent amongst more disadvantaged groups and most likely amongst those in socially rented accommodation. Migrants moving across shorter distances have also been found to exhibit higher rates of mortality than those who move across greater distances (Boyle *et al*., 2002; Britton *et al*., 1990; Fox and Goldblatt, 1982). Hughes and McCormick (2000) found that social housing is associated with increased rates of short-distance migration whilst prohibiting moves across greater distances. Marked variations in propensity for migration by ethnic group are observed at 1991, 2001 and 2011. South Asian groups are notably less mobile than Black Africans. Further, despite the younger age-structure of MEGs compared to the White majority, this does not result in increased rates of migration for these groups overall, which might be expected given that the majority of migrants are younger in age. This is perhaps indicative of fewer opportunities for migration amongst MEGs than the White majority, although it could also be attributable to cultural differences in motivations for migration, similar to variations in the age-schedule of migration in young adults of different ethnicities observed in the literature (Finney, 2011).

Thirdly, this chapter explored population health between 1991, 2001 and 2011. Contrary to results of the HSE analysis, these data are indicative of worsening population health. In an ageing population, it is logical to assume that overall population health would deteriorate, yet this worsening of population health was evident for all ages (see Figure 5.11). However, some of this apparent deterioration may be attributable to changes in the question wording on the census between 1991 and 2001, and the changing response categories in 2011. Notwithstanding deteriorating health, it is important to note that the social and spatial patterning to health is consistent between ethnic groups, although the degree of difference between classes, tenures or educational attainments varies. For example, the social class gradient to health does not consistently result in successively increasing SIRs between ethnic groups. Nevertheless, despite the similarities and the implications of these similarities for explanations of ethnic differences in health, gaps in health do persist. Whilst the health of Indians improves by 2011, Pakistani and Bangladeshis consistently experience the poorest health. Black Caribbeans also have poor health across census years. Emphasising the difference in health status, and indeed wider socioeconomic attributes examined, between Black Africans and Black Caribbeans is important given common groupings of 'Black' in health-related and other sociological research.

5.6 Concluding remarks

The results of this chapter suggest that although distinguishing characteristics of (non-)migrants are observable within all ethnic groups, the varying distribution of these characteristics may not only influence likelihood of migrating but also the nature of the move itself. If certain ethnic groups are consistently concentrated in more disadvantaged circumstances, as largely observed for Pakistani and Bangladeshis or Black Caribbeans, opportunities for (and directions of) migration will vary. Further, given the complex relationship between migration and health, evidenced by the results of this analysis and the earlier review of relevant literature, contrasting socioeconomic and spatial experiences of different ethnic groups will have different implications for any process of selective sorting. To illustrate, consider the detrimental and limiting relationship between poor health, disadvantage and likelihood of migrating. As poor health and disadvantage both limit opportunities for migration, any process of selective sorting for such groups will vary to that of more advantaged, healthier groups.

In the next chapter, further exploring how migration or the nature of migration differently influence health between ethnic groups when accounting for wider sociodemographic attributes will therefore serve two purposes: furthering the core aims of this thesis and expanding on this chapter's findings with respect to the selective nature of migration, and the complex relationship between migration, health and ethnicity.

Chapter 6

Ethnicity, migration and health – modelling relationships: evidence (2) from the Samples of Anonymised Records, 1991, 2001 and 2011

6.1 Disentangling the complex health-migration relationship

The contrasting socioeconomic and spatial experiences of different ethnic groups in England are largely mirrored by contrasting health experiences. Those in more disadvantaged circumstances have poorer health than those in more advantaged circumstances with Pakistani and Bangladeshis experiencing the poorest health. Experience of (dis)advantage also appears to be associated with propensity to migrate with higher rates of migration and moves across greater distances amongst those in more advantaged circumstances. However, when taken as a whole, migrants in 1991 and 2001 have greater than expected levels of illness, higher than that observed for non-migrants. By 2011, this pattern has reversed. Nevertheless, as the majority of moves are made over shorter distances and migrants moving over shorter distances are known to be in poorer health (e.g. Boyle *et al*., 2002), this may explain the relatively poorer health of migrants in certain years. Despite this inference, it should be noted that for all ethnic groups apart from Black Caribbeans and Black Africans, the proportion of migrants moving over short distances increased between 1991 and 2011, most notably for Chinese. These findings from chapter 5 illustrate the complex relationship between socioeconomic situation, migrant status and health. As propensity to migrate has been found to vary by health status, ethnicity and wider sociodemographic attributes, it is likely that the relationship between migrant status and health may also vary by ethnic group according to their composition and general access to opportunities. For example, minority ethnic migration patterns may be influenced by racial harassment, discrimination or general hostility in the housing market, limiting in-migration to new areas. This has been termed 'bad' segregation in the literature (Peach, 1996). If areas perceived as more hostile to ethnic minority groups are more advantaged, minority groups in poor health may have fewer opportunities to migrate to health-enabling areas. Further, even if in good health, time accumulated in more deprived areas may then be detrimental to health.

To explore the complex relationship between migration, health and ethnicity, the odds of poor health can be modelled, as explained by socioeconomic attributes, migrant status (or type) and ethnicity, using binary logistic regression. The probability of poor health for different ethnic groups given certain attributes can then be calculated and compared. Poor health will be measured by the presence or absence of limiting long-term illness (LLTI). Choice of independent variables is governed by the wider literature on social and spatial determinants of health (e.g. Kunst *et al*., 2005; Chandola *et al*., 2007; Mackenbach, 2012) and further substantiated by analysis of data from the Health Survey for England (HSE) in chapter 4. Social class, tenure, education and Government Office Region (GOR) are important determinants of health *and* help explain ethnic differences in health. To further the results of the modelling in chapter 4, migrant status and type are also included, Thus, the intent of this chapter is to disentangle the complexities of the health-migration relationship, focussing in particular on the age-, tenure- and distance moved-selectivity of migration. Each are important in terms of the influence on health status by ethnic group.

Extant literature on the relationship between migration and health and its contingency with age, tenure and distance moved, amongst other attributes, have already been explored in the previous chapter and need not be repeated. It is suffice to restate that migrants are distinct from non-migrants in age, sex, ethnicity, socioeconomic attributes, geography and health. These distinguishing characteristics vary according to stage in the lifecourse and substantively influence motivations for migration. This can be for employment purposes, with young healthy adults moving across greater distances. Or, it can be due to housing market pressures, with adults of all ages moving across shorter distances according to the dictates of their tenure. Such groups may be in poorer health, moving between socially rented accommodations. Or, moves can be governed by poorer health with increasing years as elderly groups move to be near formal or informal care.

As the relationship between migrant status and health varies according to wider socioeconomic circumstances, particularly tenure, with socioeconomic status and location also influencing distance moved, the modelling of health in this chapter must account for these different interactions. Further, as the health-migration relationship is also selective on age, with the literature demonstrating that younger migrants are more likely to be in better health than their stable counterparts, whereas older migrants are more likely to be in poorer health (Findley, 1988; Bentham, 1988; Larson *et al*., 2004), this will also be accounted for in this chapter's models.

6.2 Research intent

This chapter will further understanding on the nature of ethnic inequalities in health by exploring how different sociodemographic attributes, area and migrant status contribute to ethnic differences in health. Further, it will illustrate how a process of selective sorting may operate differently between ethnic groups due to ethnic variations in the nature of the health-migration relationship. The objectives for this chapter are to:

a) Determine if that ethnic inequalities in health are better explained by sociodemographic attributes than ethnicity alone;
b) Identify how probability of poor health varies between ethnic groups by migrant status and migrant type (defined by distance moved); and,
c) Explore if the age- or tenure-selectivity of migration differently influences probability of poor health by ethnic group.

6.2.1 Methods

Binary logistic regression is used to model the odds of LLTI at 1991, 2001 and 2011. Predicted probabilities of LLTI are also calculated for different groups of the population to assess how population health changes over time (see chapter 3 for a fuller discussion of these methods). As noted previously, the variables selected for the modelling in this chapter are guided by the wider literature on migration and health, health inequalities and ethnicity. The variables therefore reflect attributes which characterise migrants (age, sex, ethnicity and socioeconomic attributes such as class, education and tenure), while also being recognised determinants of health. However, there are a number of small changes employed to suit the statistical needs of the analysis. Notably, Government Office Region (GOR) is simplified to distinguish between the North, South and Inner London. Although it has elsewhere been noted that this will mask known patterns of ethnic clustering between regions, the increased sample sizes are required. Nevertheless, distinguishing between Inner London and the South is valuable given the complex context of Inner London, its divergence from the general affluence of Outer London and the South, and its concentration of minority ethnic groups (MEGs). All other variables are as employed in chapter 5. For a full variable list, see Table 5.1 (accounting for the change to GOR).

Four sets of models will be run for each year (1991, 2001 and 2011). First, health will be modelled adjusting only for age, sex and ethnicity. These odds will be compared to odds from the subsequent models adjusting for socioeconomic attributes, GOR and migrant status. ORs > 0 indicate higher odds of LLTI than the Whites (always the reference group), whereas ORs < 0 indicate lower odds of LLTI than the Whites. The extent to which the odds of poor health by ethnic group are attenuated between models will demonstrate the important contribution of these variables to ethnic differences in health. The second set of models will also adjust for an interaction between migrant status or type and housing tenure. A review of the literature confirms that this interaction is important with respect to the health-migration relationship (e.g. Boyle *et al*., 2002). However, to effectively explore these interactions, a series of tenure-specific models will be run, adjusting for all socio-demographic variables (excluding tenure), GOR and migrant status or type. To explore the interactions by age, a series of age-specific models will also be run. Small numbers preclude the use of ethnic-specific models. Table 6.1 summarises these models listing the population subgroup modelled and variables adjusted for. The total sample is restricted to England household residents aged between 16 and 74 years. Thus, *recent* international migrants, residents in communal establishments, and children or the elderly are excluded. The former are excluded in line with wider literature on selective migration (e.g. Norman *et al*., 2005) while the latter are excluded due to incomplete socioeconomic data. To assess the contribution of given characteristics to ethnic differences in health, the probability of poor health for each ethnic group by migrant status and social class (in recognition of the wider intent of this thesis to also explore social mobility) will also be calculated for each set of models as appropriate. These are comparable whereas the odds ratios (ORs) are only comparable insofar as the magnitude or direction of the difference in the odds of poor health *relative to the reference group* can be evaluated between models. The actual size of the difference is not comparable.

Table 6.1 Binary Logistic Regression model summary

Model	Population subgroup	Variables
1	1991, 2001 and 2011 sample population	Age Sex Ethnicity Country of birth (Demographic variables)
2a	1991, 2001 and 2011 sample population	Demographic variables Social class Educational attainment Tenure Simplified GOR (Socioeconomic variables & GOR) Migrant status Tenure*Migrant status
2b	1991, 2001 and 2011 sample population	Demographic variables Socioeconomic variables & GOR Migrant type (distance moved) Tenure*Migrant type
3a	1991, 2001 and 2011 sample population by tenure: e.g. 1991, owner-occupation 1991, privately rented accommodation 1991, socially rented accommodation 2001… etc.,	Demographic variables Socioeconomic variables & GOR (minus tenure) Migrant status
3b	1991, 2001 and 2011 sample population by tenure (see 3a)	Demographic variables Socioeconomic variables & GOR (minus tenure) Migrant type
4a	1991, 2001 and 2011 sample population by age: e.g. 1991, aged 16-29 1991, aged 30-44 1991, aged 45-64 1991, aged 65-74 2001… etc.,	Demographic variables (minus age) Socioeconomic variables & GOR Migrant status Tenure*Migrant status

4b	1991, 2001 and 2011 sample population by age (see 4a)	Demographic variables (minus age) Socioeconomic variables & GOR Migrant type Tenure*Migrant type

6.3 Results

Odds of poor health, defined here as LLTI, are modelled using binary logistic regression. It should be noted that in all cases, ORs presented for the sociodemographic variables are derived from models adjusting for migrant status rather than migrant type. When adjusting for migrant type, the size of the ORs does not vary by more than .01 decimal places in the coefficients. Where variation occurs, the interpretation is the same. As such, these are not presented. The presentation of the results will be framed around the chapter objectives.

6.3.1 Explaining ethnic inequalities in health

Figure 6.1 compares ORs by ethnic group in 1991, 2001 and 2011 for model 1 and model 2a, statistically significant ORs are starred. As outlined in Table 6.1, model 1 adjusts for age, ethnicity, sex, and country of birth whereas model 2a also adjusts for socioeconomic variables, GOR, migrant status and the interaction between tenure and migrant status. For all ethnic groups, the addition of sociodemographic variables attenuates the odds of poor health. Further, for Black Caribbeans in 2011, Black Africans in 1991, and Mixed and Other in 1991, 2001 and 2011, this addition reverses the direction of the ORs. For Black Africans in 1991, the ORs also become statistically significant. Conversely, in 1991 and 2001 the ORs for Mixed and Other lose their statistical significance. This attenuation of the ORs when adjusting for wider variables is similar to the patterns observed within chapter 4's analysis. Further, it is a key finding with respect to wider policy and evidence debates on the nature of ethnic inequalities in health. Crucially, it demonstrates that ethnic inequalities in health are *better explained* by wider sociodemographic attributes than ethnicity alone.

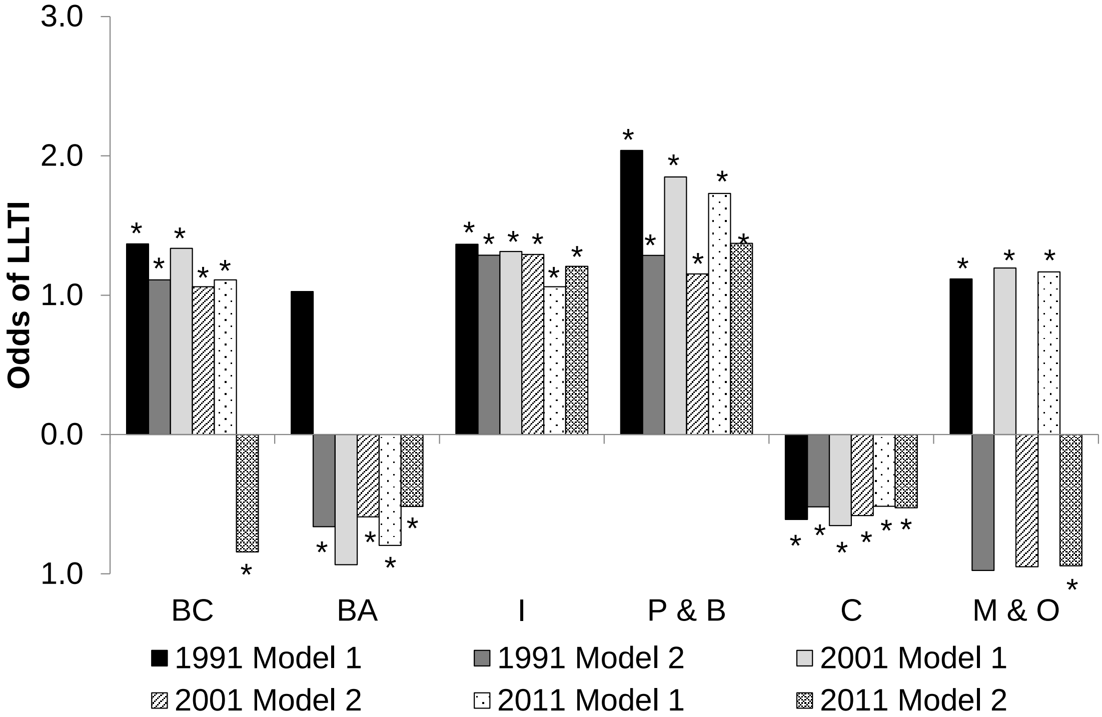


Figure 6.1 Comparing odds of LLTI by ethnic group between logistic regression models, 1991, 2001 and 2011

Note: BC – Black Caribbean, BA – Black African, I – Indian, P & B – Pakistani and Bangladeshi, C – Chinese, M & O – Mixed and Other; statistically significant ORs are starred; Model 1 adjusts for age, sex, ethnicity and (simplified) country of birth; Model 2 additionally adjusts for social class, education, tenure, region of residence, migrant status and tenure*migrant status.
Source: Samples of Anonymised Records

6.3.2 Tenure-selectivity of health-migration relationship by ethnic group

6.3.2.1 Adjusting for the tenure-migration interaction

Table 6.2 summarises the ORs and confidence intervals (CIs) at 1991, 2001 and 2011 for models 2a and 2b (odds only presented for the migrant type and migrant type interaction in model 2b) outlined in Table 6.1. Statistically significant ORs are starred. In 1991 and 2001, females have significantly lower odds of LLTI than males. Conversely, by 2011 females have significantly higher odds of LLTI. In 1991, 2001 and 2011, odds of LLTI successively increase with age. All ORs are significant. Although not strictly comparable between years, it is worth noting how the magnitude of the ORs changes relative to the reference group year on year. For example, in 1991 ages 65 to 74 are 10 times more likely to have LLTI than those aged 16-29 whereas in 2011, ages 65 to 74 are 17 times more likely.

The patterning of health by ethnic group is generally consistent between censuses, although there are some notable differences. In 1991 and 2001, Black Caribbeans, Indians and Pakistani and Bangladeshis all have significantly higher odds of LLTI than Whites. However, by 2011

Black Caribbeans have significantly lower odds of LLTI than Whites. Black Africans, Chinese and Mixed and Other all have significantly lower odds of LLTI than Whites (although not significant for Mixed and Other in 1991). While Chinese consistently have the best health, indicated by the lowest odds of LLTI, the poorest health indicated by the highest ORs is not consistent between years. In 1991, odds of LLTI are the same for Indians and Pakistani and Bangladeshis (29% more likely than Whites to report LLTI), although the confidence intervals for Pakistani and Bangladeshis are slightly wider than for Indians. However, in 2001 whilst the odds of LLTI for Pakistani and Bangladeshis are 15% higher than for Whites, they are 29% higher for Indians. Conversely, in 2011 Pakistanis and Bangladeshis are 33% more likely to have LLTI than Whites, while Indians are only 17% more likely. The odds of LLTI for all ethnic groups, apart from Mixed and Other in 1991, are statistically significant. Whilst certain MEGs are significantly more likely to have LLTI than Whites, a slightly different picture emerges when comparing odds of LLTI for those born outside of the UK to those born within the UK. In 2001 and 2011, those born elsewhere (outside of the UK) have significantly lower odds of LLTI than those born in the UK.

Alongside the ethnic patterning to health, odds of LLTI clearly demonstrate the socially and spatially graded nature of health in the population. These data suggest that increasing disadvantage, whether defined by lower social classes, living in privately or socially rented accommodation, not being educated to degree level or living in the North of England and to some extent, Inner London, are all associated with increased odds of LLTI (all statistically significant). There are some changes, albeit marginal, to the magnitude of the ORs between 1991, 2001 and 2011. In 1991, 2001 and 2011 odds of LLTI relative to social classes I and II successively increase when moving down through the social class structure. The highest odds of LLTI are consistently found for those not assigned to a class (unclassifiable). This patterning to health does not vary between years although the magnitude of the differences between each class relative to the reference group (classes I and II) does vary. For example, in 1991 those not assigned to a class are more than 3 times more likely to have LLTI than those in classes I and II, rising to more than 4 times more likely in 2001. However, by 2011 this group is only just over 2 times more likely to have LLTI than those in classes I and II. Changes in the ORs relative to the reference group for all other classes in each census year are much less marked. It is worth restating that being 2 times more likely to have LLTI in 1991 may not be the same as being 2 times more likely to have LLTI in 2011. However, it is of interest if the difference in the odds of LLTI increases from 2, to 4, 5 or 8.

ORs for those in privately rented or socially rented accommodation suggest that these tenancies always have a significantly higher risk of LLTI than groups in owner-occupation. The highest risk, indicated by the highest ORs, is consistently observed for those in socially rented accommodation. A similar social gradient is apparent by educational attainment: those educated to degree level or above always have significantly lower odds of LLTI than those educated to below this threshold.

Region of residence has been simplified to distinguish between the North, South and Inner London. Odds of LLTI are significantly lower in the South and Inner London relative to the North, with the lowest odds consistently observed for those in the South. For example, in 1991 whilst those in Inner London are 16% less likely to have LLTI than those in the North, residents of the South are 24% less likely. Similarly, in 2001 Inner London residents are 19% less likely to have LLTI than residents of the North who are 21% less likely. Moving down through England from the North, to Inner London and then to the South, odds of LLTI decrease: this is illustrative of the North South divide.

When adjusting for an interaction between migrant status and household tenure, odds of LLTI for migrants are significantly lower than for non-migrants. In 1991, migrants are 7% less likely to have LLTI than non-migrants, 6% less likely in 2001, and 11% less likely in 2011. This contrasts with the odds returned when not adjusting for the interaction between migrant status and household tenure. Migrants can be further distinguished by their distance moved. When adjusting for an interaction between migrant type and household tenure, short-distance migrants always have significantly lower odds of LLTI than non-migrants.

Table 6.2 Binary Logistic Regression: modelling LLTI, 1991, 2001 and 2011

	1991 OR (L CI, U CI)	2001 OR (L CI, U CI)	2011 OR (L CI, U CI)
Male	REF	REF	REF
Female	0.65 (0.64, 0.66)*	0.75 (0.74, 0.76)*	1.03 (1.02, 1.04)*
16-29	REF	REF	REF
30-44	2.14 (2.07, 2.21)*	2.57 (2.52, 2.62)*	2.60 (2.55, 2.64)*
45-64	6.61 (6.42, 6.80)*	6.77 (6.64, 6.91)*	6.88 (6.77, 7.00)*
65-74	10.15 (9.84, 10.46)*	9.95 (9.74, 10.17)*	17.12 (16.82, 17.43)*
White	REF	REF	REF
Black Caribbean	1.11 (1.02, 1.20)*	1.06 (1.01, 1.12)*	0.81 (0.78, 0.84)*
Black African	0.66 (0.56, 0.79)*	0.59 (0.55, 0.64)*	0.49 (0.47, 0.52)*
Indian	1.29 (1.20, 1.38)*	1.29 (1.24, 1.35)*	1.17 (1.14, 1.21)*
Pakistani & Bangladeshi	1.29 (1.18, 1.40)*	1.15 (1.10, 1.20)*	1.33 (1.29, 1.37)*
Chinese	0.52 (0.42, 0.64)*	0.58 (0.52, 0.65)*	0.49 (0.54, 0.53)*
Mixed & Other	0.98 (0.89, 1.07)	0.95 (0.91, 0.99)*	0.92 (0.89, 0.94)*
Born UK	REF	REF	REF
Born elsewhere	1.00 (0.96, 1.03)	0.96 (0.94, 0.98)*	0.94 (0.92, 0.96)*
I & II	REF	REF	REF
IIIN	1.22 (1.18, 1.26)*	1.31 (1.29, 1.34)*	1.19 (1.17, 1.21)*
IIIM	1.24 (1.20, 1.28)*	1.32 (1.29, 1.34)*	1.33 (1.32, 1.35)*
IV & V	1.50 (1.46, 1.55)*	1.58 (1.55, 1.61)*	1.62 (1.60, 1.64)*
Unclassifiable	3.36 (3.27, 3.46)*	4.47 (4.40, 4.55)*	2.36 (2.32, 2.40)*
Owner-occupied	REF	REF	REF
Privately rented	1.22 (1.18, 1.26)*	1.51 (1.48, 1.55)*	1.64 (1.62, 1.67)*
Socially rented	2.01 (1.97, 2.05)*	2.24 (2.20, 2.27)*	3.10 (3.06, 3.13)*
No degree	REF	REF	REF
Degree (+)	0.64 (0.61, 0.67)*	0.76 (0.74, 0.78)*	0.71 (0.70, 0.71)*
North	REF	REF	REF
Inner London	0.84 (0.81, 0.88)*	0.78 (0.76, 0.80)*	0.81 (0.79, 0.83)*
South	0.76 (0.74, 0.77)*	0.78 (0.77, 0.79)*	0.79 (0.78, 0.79)*
Non-migrant	REF	REF	REF
Migrant	0.93 (0.89, 0.99)*	0.94 (0.91, 0.97)*	0.89 (0.87, 0.92)*
Household tenure* Migrant status	Significant	Significant	Significant

Non-migrant	REF	REF	REF
Short-distance	0.90 (0.84, 0.96)*	0.91 (0.87, 0.96)*	0.88 (0.85, 0.91)*
Mid-distance	1.00 (0.90, 1.12)	0.94 (0.89, 0.98)*	0.91, 0.86, 0.97)*
Long-distance	1.00 (0.85, 1.18)	1.13 (1.02, 1.24)*	0.96, (0.87, 1.06)
Household tenure * Migrant type	Significant	Significant	Significant

Note: * Odds ratios (ORs) are statistically significant (95% confidence interval); L CI = Lower confidence interval, U CI = Upper confidence interval
Source: Samples of Anonymised Records

6.3.2.1 Exploring interactions: tenure-specific models

To examine the influence of the interaction between tenure and migration on health in more detail, predicted probabilities of LLTI by ethnic group for different migrant groups in each of the tenure types can be calculated. These are based on the tenure-specific models (models 3a and 3b in Table 6.1). To better account for social and spatial variations in the health experiences and migration patterns of different ethnic groups, these probabilities are also broken down by social class and simplified GOR. ORs are not presented for these models as these are not strictly comparable between ethnic groups. The following results are limited to White, Black Caribbean, Black African, Indian and Pakistani and Bangladeshi. For brevity, Chinese and Mixed and Other are not further discussed owing to small sample sizes for the Chinese and the heterogeneity of Mixed and Other.

Table 6.3 presents predicted probabilities of LLTI for migrants and non-migrants by ethnic group, social class and area, controlling for age, sex and educational attainment. The overall social and spatial patterning to health is consistent between ethnic groups. For each ethnic group, probability of LLTI decreases when moving from the North, to Inner London, to the South, and when moving down through the social class structure. Migrants in owner-occupied or privately rented accommodation always have a lower probability of LLTI than non-migrants, although this is reversed for migrants in socially rented accommodation. Further, the gap in probability of LLTI between migrant and non-migrant groups in comparable circumstances is notably wider for those in socially rented accommodation than for those in the remaining tenancies.

Between 1991, 2001 and 2011 the probability of LLTI increased for most population subgroups, suggesting overall declines in population health. There is a marked spike in probability of LLTI amongst the unclassifiable groups in 2001, although this is attributed to differences in the 'unclassifiable' group between 1991, 2001 and 2011 owing to variations in coding in the original data. This picture of deteriorating health, also evident in the cross-tabulations and SIRs in chapter 5, contrasts with evidence in chapter 4. It has already been speculated that these differences may be attributable to differences in the question wording between the HSE and the census, and within the census between years. The following sections will now explore the results in more detail, discussing each set of probabilities by region of residence.

North: For all ethnic groups in the North, migrants in owner-occupied or privately rented accommodation have lower probabilities of LLTI than non-migrants. Conversely, migrants in social housing have higher probabilities of LLTI than non-migrants. Probability of LLTI increases with decreasing social class: migrants not assigned to a class in socially rented accommodation have the highest probabilities of LLTI.

Table 6.3 Modelled probability of LLTI by ethnic group, migrant status, social class in tenure-specific models, 1991, 2001 and 2011

Probability of LLTI			1991						2001						2011					
			Owner		Private		Social		Owner		Private		Social		Owner		Private		Social	
			NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M	NM	M
White	North	I & II	2.3	2.2	2.4	2.4	5.2	6.8	2.9	2.8	4.0	3.3	8.5	10.6	2.9	2.6	4.1	3.1	10.0	10.7
		IIIN	2.8	2.6	3.4	3.3	5.9	7.6	3.8	3.6	5.6	4.7	9.0	11.2	3.4	3.0	5.2	4.0	10.0	10.7
		IIIM	2.9	2.8	3.8	3.8	5.0	6.5	3.9	3.7	6.0	5.1	8.0	9.9	3.9	3.5	5.5	4.3	10.2	10.9
		IV & V	3.6	3.4	4.1	4.0	5.9	7.7	4.7	4.5	7.2	6.1	9.0	11.2	4.9	4.4	7.1	5.5	11.2	12.0
		U	7.0	6.6	7.7	7.6	14.5	18.4	11.7	11.2	16.5	14.1	24.8	29.6	7.0	6.3	9.3	7.2	16.4	17.4
	Inner London	I & II	2.1	2.0	1.9	1.9	4.4	5.8	2.3	2.2	2.7	2.2	7.6	9.5	2.4	2.1	3.2	2.4	9.0	9.6
		IIIN	2.5	2.3	2.7	2.6	5.0	6.5	3.0	2.8	3.8	3.2	8.1	10.0	2.8	2.5	4.1	3.1	9.0	9.6
		IIIM	2.6	2.5	3.0	3.0	4.2	5.5	3.0	2.9	4.1	3.4	7.1	8.9	3.2	2.9	4.3	3.3	9.2	9.8
		IV & V	3.3	3.1	3.3	3.2	5.0	6.6	3.7	3.5	4.9	4.1	8.1	10.1	4.0	3.6	5.6	4.3	10.1	10.8
		U	6.3	6.0	6.2	6.1	12.6	16.0	9.3	8.9	11.6	9.9	22.7	27.1	5.8	5.2	7.3	5.7	14.8	15.8
	South	I & II	1.7	1.6	1.8	1.7	4.2	4.2	2.2	2.1	3.1	2.6	7.2	9.0	2.2	2.0	3.3	2.5	8.3	8.9
		IIIN	2.1	1.9	2.5	2.4	4.7	4.7	2.9	2.8	4.4	3.7	7.7	9.6	2.7	2.4	4.2	3.2	8.3	8.9
		IIIM	2.2	2.1	2.8	2.8	4.0	4.0	3.0	2.8	4.8	4.0	6.8	8.5	3.1	2.7	4.4	3.4	8.4	9.0
		IV & V	2.7	2.6	3.0	3.0	4.7	4.7	3.7	3.5	5.7	4.8	7.7	9.6	3.8	3.4	5.7	4.4	9.3	9.9
		U	5.3	5.0	5.7	5.6	11.8	11.8	9.2	8.8	13.4	11.4	21.7	26.1	5.5	4.9	7.5	5.8	13.7	14.6
Black Caribbean	North	I & II	2.8	2.6	2.5	2.4	5.0	6.5	3.5	3.3	5.7	4.8	6.8	8.5	2.8	2.5	3.4	2.6	6.6	7.0
		IIIN	3.3	3.1	3.5	3.4	5.6	7.3	4.5	4.3	7.9	6.7	7.3	9.0	3.3	2.9	4.3	3.3	6.6	7.0
		IIIM	3.5	3.3	3.9	3.9	4.8	6.2	4.7	4.4	8.5	7.2	6.4	8.0	3.8	3.4	4.6	3.5	6.7	7.1
		IV & V	4.3	4.1	4.2	4.1	5.6	7.4	5.7	5.4	10.2	8.6	7.3	9.1	4.7	4.2	5.9	4.6	7.4	7.9
		U	8.3	7.8	7.9	7.8	14.0	17.8	13.8	13.2	22.3	19.3	20.7	24.9	6.7	6.0	7.7	6.0	11.0	11.7

	Inner London	I & II	2.5	2.4	2.0	1.9	4.3	5.6	2.7	2.6	3.8	3.2	6.1	7.6	2.3	2.0	2.6	2.0	5.9	6.3
		IIIN	2.9	2.8	2.8	2.7	4.8	6.3	3.6	3.4	5.4	4.5	6.5	8.1	2.7	2.4	3.4	2.6	5.9	6.3
		IIIM	3.2	3.0	3.1	3.1	4.1	5.3	3.7	3.5	5.8	4.9	5.7	7.2	3.1	2.8	3.6	2.7	6.0	6.4
		IV & V	3.9	3.7	3.3	3.3	4.8	6.3	4.5	4.2	7.0	5.9	6.5	8.1	3.9	3.5	4.6	3.6	6.6	7.1
		U	7.5	7.1	6.3	6.2	12.1	15.5	11.1	10.6	16.0	13.7	18.8	22.7	5.6	5.0	6.1	4.7	9.9	10.6
	South	I & II	2.1	2.0	1.8	1.8	4.0	5.2	2.7	2.6	4.5	3.8	5.8	7.3	2.2	1.9	2.7	2.1	5.4	5.8
		IIIN	2.5	2.3	2.6	2.5	4.5	5.9	3.5	3.3	6.3	5.3	6.2	7.7	2.6	2.3	3.5	2.7	5.4	5.8
		IIIM	2.6	2.5	2.9	2.8	3.8	5.0	3.6	3.4	6.8	5.7	5.4	6.8	3.0	2.6	3.7	2.8	5.5	5.9
		IV & V	3.3	3.1	3.1	3.0	4.5	5.9	4.4	4.2	8.1	6.9	6.2	7.7	3.7	3.3	4.7	3.7	6.1	6.5
		U	6.3	6.0	5.9	5.8	11.4	14.6	10.9	10.4	18.3	15.7	18.0	21.8	5.3	4.7	6.2	4.8	9.1	9.7
Black African	North	I & II	2.5	2.3	1.9	1.8	2.6	3.4	2.4	2.3	2.8	2.3	4.0	5.0	2.0	1.7	2.4	1.8	4.2	4.5
		IIIN	2.9	2.8	2.6	2.5	2.9	3.9	3.2	3.0	3.9	3.3	4.2	5.3	2.3	2.1	3.1	2.4	4.2	4.5
		IIIM	3.1	3.0	2.9	2.9	2.5	3.3	3.3	3.1	4.3	3.6	3.7	4.7	2.7	2.4	3.3	2.5	4.3	4.6
		IV & V	3.9	3.7	3.2	3.1	2.9	3.9	4.0	3.8	5.1	4.3	4.2	5.3	3.4	3.0	4.2	3.3	4.8	5.1
		U	7.4	7.0	6.0	5.9	7.6	9.9	10.0	9.6	12.1	10.3	12.8	15.7	4.8	4.3	5.6	4.3	7.2	7.7
	Inner London	I & II	2.2	2.1	1.5	1.4	2.2	2.9	1.9	1.8	1.9	1.6	3.5	4.4	1.6	1.4	1.8	1.4	3.8	4.0
		IIIN	2.6	2.5	2.1	2.0	2.5	3.3	2.5	2.4	2.7	2.2	3.7	4.7	1.9	1.7	2.4	1.8	3.8	4.1
		IIIM	2.8	2.7	2.3	2.3	2.1	2.8	2.6	2.4	2.9	2.4	3.3	4.1	2.2	2.0	2.5	1.9	3.8	4.1
		IV & V	3.5	3.3	2.5	2.5	2.5	3.3	3.1	3.0	3.5	2.9	3.8	4.7	2.8	2.5	3.3	2.5	4.3	4.6
		U	6.7	6.3	4.8	4.7	6.5	8.5	7.9	7.6	8.4	7.1	11.5	14.2	4.0	3.6	4.3	3.3	6.5	6.9
	South	I & II	1.9	1.7	1.4	1.3	2.1	2.7	1.9	1.8	2.2	1.8	3.3	4.2	1.5	1.4	1.9	1.5	3.5	3.7
		IIIN	2.2	2.1	1.9	1.9	2.3	3.1	2.4	2.3	3.1	2.6	3.6	4.5	1.8	1.6	2.4	1.9	3.5	3.7
		IIIM	2.4	2.2	2.2	2.1	2.0	2.6	2.5	2.4	3.4	2.8	3.1	3.9	2.1	1.9	2.6	2.0	3.5	3.8
		IV & V	2.9	2.7	2.3	2.3	2.3	3.1	3.1	2.9	4.1	3.4	3.6	4.5	2.6	2.3	3.4	2.6	3.9	4.2
		U	5.6	5.3	4.4	4.4	6.1	8.0	7.8	7.5	9.7	8.2	10.9	13.5	3.8	3.4	4.5	3.4	5.9	6.3

Indian	North	I & II	3.1	2.9	2.3	2.3	5.8	7.6	3.8	3.7	4.4	3.7	9.0	11.2	3.6	3.2	3.4	2.6	9.8	10.5
		IIIN	3.7	3.5	3.2	3.2	6.5	8.5	5.0	4.7	6.1	5.2	9.6	11.8	4.3	3.8	4.4	3.4	9.8	10.5
		IIIM	3.9	3.7	3.7	3.6	5.5	7.2	5.1	4.9	6.6	5.6	8.5	10.5	4.9	4.4	4.7	3.6	10.0	10.7
		IV & V	4.8	4.6	3.9	3.8	6.5	8.5	6.2	5.9	7.9	6.7	9.6	11.9	6.1	5.5	6.0	4.7	11.0	11.7
		U	9.2	8.7	7.4	7.2	16.0	20.2	15.0	14.4	17.9	15.4	26.0	30.9	8.7	7.8	7.9	6.1	16.1	17.1
	Inner London	I & II	2.8	2.6	1.8	1.7	4.9	6.5	3.0	2.9	2.9	2.5	8.1	10.1	3.0	2.7	2.7	2.0	8.8	9.4
		IIIN	3.3	3.1	2.6	2.4	5.6	7.3	3.9	3.7	4.1	3.5	8.6	10.6	3.5	3.1	3.4	2.6	8.8	9.4
		IIIM	3.5	3.3	2.9	2.7	4.7	6.2	4.0	3.8	4.5	3.8	7.6	9.4	4.1	3.6	3.6	2.8	9.0	9.6
		IV & V	4.4	4.1	3.1	2.9	5.6	7.3	4.9	4.7	5.4	4.6	8.6	10.7	5.1	4.5	4.7	3.6	9.9	10.6
		U	8.3	7.9	5.9	5.5	13.9	17.6	12.1	11.5	12.6	10.8	23.8	28.4	7.2	6.5	6.2	4.8	14.6	15.5
	South	I & II	2.3	2.2	1.7	1.7	4.6	6.1	3.0	2.8	3.4	2.9	7.7	9.6	2.8	2.5	2.7	2.1	8.1	8.7
		IIIN	2.8	2.6	2.4	2.3	5.2	6.8	3.8	3.7	4.8	4.1	8.1	10.1	3.4	3.0	3.5	2.7	8.1	8.7
		IIIM	3.0	2.8	2.7	2.6	4.4	5.8	3.9	3.8	5.2	4.4	7.2	9.0	3.9	3.4	3.7	2.9	8.3	8.8
		IV & V	3.7	3.5	2.9	2.8	5.2	6.8	4.8	4.6	6.3	5.3	8.2	10.2	4.8	4.3	4.8	3.7	9.1	9.7
		U	7.0	6.6	5.5	5.4	13.1	16.7	11.9	11.4	14.5	12.4	22.8	27.3	6.9	6.2	6.3	4.9	13.5	14.3
Pakistani & Bangladeshi	North	I & II	3.4	3.4	3.6	3.5	4.6	6.0	3.8	3.6	5.0	4.2	6.5	8.1	4.4	3.9	5.0	3.9	8.8	9.4
		IIIN	4.0	4.0	4.9	4.8	5.1	6.7	5.0	4.7	7.0	5.9	6.9	8.6	5.2	4.7	6.4	5.0	8.8	9.4
		IIIM	4.3	4.3	5.6	5.5	4.4	5.7	5.1	4.8	7.5	6.3	6.1	7.6	6.0	5.4	6.8	5.3	9.0	9.6
		IV & V	5.3	5.3	6.0	5.9	5.2	6.7	6.2	5.9	9.0	7.6	6.9	8.6	7.4	6.7	8.7	6.8	9.9	10.6
		U	10.0	10.0	11.0	10.8	12.9	16.5	15.0	14.3	20.0	17.3	19.8	23.8	10.5	9.4	11.3	8.8	14.6	15.5
	Inner London	I & II	3.1	2.9	2.8	2.8	3.9	5.1	3.0	2.8	3.4	2.8	5.8	7.3	3.6	3.2	3.9	3.0	7.9	8.5
		IIIN	3.6	3.4	3.9	3.9	4.4	5.7	3.9	3.7	4.7	4.0	6.1	7.7	4.3	3.8	5.0	3.8	7.9	8.5
		IIIM	3.9	3.7	4.4	4.4	3.7	4.9	4.0	3.8	5.1	4.3	5.4	6.8	5.0	4.4	5.3	4.1	8.1	8.6
		IV & V	4.8	4.5	4.8	4.7	4.4	5.8	4.9	4.6	6.2	5.2	6.2	7.7	6.2	5.5	6.8	5.3	8.9	9.5
		U	9.1	8.6	8.9	8.7	11.1	14.3	12.0	11.5	14.2	12.2	17.9	21.7	8.7	7.8	8.9	6.9	13.2	14.0

	South	I & II	2.6	2.4	2.6	2.6	3.6	4.8	2.9	2.8	3.9	3.3	5.5	6.9	3.5	3.1	4.0	3.1	7.3	7.8
		IIIN	3.0	2.9	3.7	3.6	4.1	5.4	3.8	3.6	5.5	4.6	5.8	7.3	4.1	3.7	5.1	4.0	7.3	7.8
		IIIM	3.2	3.1	4.1	4.1	3.5	4.6	3.9	3.7	6.0	5.0	5.1	6.5	4.7	4.2	5.4	4.2	7.4	7.9
		IV & V	4.0	3.8	4.4	4.3	4.1	5.4	4.8	4.6	7.2	6.0	5.9	7.3	5.9	5.2	7.0	5.4	8.2	8.8
		U	7.7	7.3	8.3	8.2	10.5	13.5	11.8	11.3	16.3	14.0	17.1	20.8	8.3	7.5	9.1	7.1	12.1	12.9

Note: NM = non-migrant, M = migrant

Source: Samples of Anonymised Records

Of those in owner-occupied accommodation, the lowest probability of LLTI is for Whites in 1991 and Black Africans in 2001. In 2011, Black Africans and Black Caribbeans have lower probabilities of LLTI than Whites in owner-occupation across all social classes. Pakistani and Bangladeshis consistently have the highest probability of LLTI across all social classes in owner-occupied and privately rented accommodation. However, Indians have the highest probability of LLTI in socially rented accommodation. Between 1991 and 2001, the probability of LLTI increased for all ethnic groups with the greatest relative change amongst Black Caribbean migrants and non-migrants in privately rented accommodation not assigned to a social class (relative change of 2.8 and 2.5, respectively). Only Black African non-migrants in owner-occupied accommodation in classes I and II experienced a decrease in the probability of LLTI (relative change of 0.96). Conversely, between 2001 and 2011, most groups experienced a decrease in the probability of LLTI. Where increases did occur, these are primarily amongst Pakistani and Bangladeshis.

Inner London: The social class patterning to health and the health advantage of migrants in owner-occupied or privately rented accommodation or non-migrants in socially rented accommodation in Inner London is similar to that observed in the North. However, probability of LLTI for individuals in Inner London is slightly lower than for individuals in comparable circumstances in the North. As in the North, the lowest probability of LLTI is for Whites in owner-occupation in 1991 and similarly situated Black Africans in 2001. By 2011, Black Africans and Black Caribbeans in owner-occupied accommodation have lower probabilities of LLTI than Whites in comparable circumstances. Pakistani and Bangladeshis in owner-occupied and privately rented accommodation have the highest probabilities of LLTI, whereas Indians have the highest in socially rented accommodation. On average, there is less change in probability of LLTI between 1991 and 2001, and between 2001 and 2011 in Inner London than in the North.

South: The patterns observed in the North and Inner London are replicated within each ethnic group living in the South: migrants in owner-occupied and privately rented accommodation have lower probabilities of LLTI than non-migrants, whilst the opposite is true for migrants and non-migrants in socially rented accommodation. Further, probability of LLTI increases with decreasing social class (from I and II down to unclassifiable). Whilst Whites generally have the lowest probabilities of LLTI in 1991, by 2001 they are overtaken by Black Africans who subsequently consistently have the lowest probabilities of LLTI across all classes and tenancy types. However, in 1991 Black Africans also have the lowest probability of LLTI of those in social housing, followed by Indians: Whites have similar probabilities of LLTI to Black Caribbeans in this tenancy type and are only surpassed by Pakistani and Bangladeshis.

Evidently, the relationship between social class, migrant status and health is significantly attenuated by housing tenures for each ethnic group: adjusting for these complex interactions by running tenure-specific models further evidences arguments that ethnic inequalities in health are explained by wider socioeconomic and spatial factors *rather* than ethnicity. Further, while migrants in social housing are evidently more likely to be in poorer health than non-migrants in this tenancy type, contrasting with experiences of migrants in owner-occupied and privately rented accommodation, this relationship varies between ethnic groups. MEGs in social housing almost invariably have *better* health than Whites in social housing, as suggested by the probabilities presented in Table 6.3. Only Black Caribbean and Pakistani and Bangladeshi migrants in the South (1991) and Indians (1991, 2001) have higher probabilities of LLTI than Whites in comparable circumstances in social housing.

6.3.3 Age-selectivity of health-migration relationship by ethnic group

The results presented in this chapter thus far illustrate that ethnic inequalities in health are substantially explained by contrasting socioeconomic and broad spatial experiences between ethnic groups. Further, the relationship between migrant status and health does not appear to vary markedly by ethnic group: migrants are consistently healthier than non-migrants in owner-occupied and privately rented accommodation, while migrants in socially rented accommodation are consistently in poorer health than non-migrants. However, the extent to which these different socioeconomic circumstances are conducive to (ill) health does vary. The health-migration relationship is also known to vary by age, which will be explored in this section. Given the contrasting age-structures of the different ethnic groups observed in chapter 5 (see Figure 5.2), this may have important implications for health inequalities in an ageing population. Due to small sample sizes, age-specific models cannot be further disaggregated by tenancy type (as above) or by ethnic group. The probabilities are all derived from models adjusting for gender, ethnicity, simplified county of birth, social class, educational attainment, housing tenure, region of residence, migrant status, and an interaction between migrant status and housing tenure.

Research into the health-migration relationship demonstrates that younger migrants tend to be in better health than their stable counterparts, whereas older migrants are more likely to be in poorer health (e.g. Findley, 1988; Bentham, 1988; Larson *et al*., 2004). Although the predicted probabilities presented here do illustrate this, there are some variations between censuses and by ethnic group. However, before discussing these in more detail there are some generic patterns worth drawing out. Probability of LLTI increases with decreasing social class, as found in the tenure-specific models. Probability of LLTI is also greatest for those living in the North for all age groups, and lowest for those living in the South for all age groups apart from 16-29 years. This younger age-bracket experiences the best health in Inner London, perhaps reflective of the relationship between social mobility and migration whereby young, healthy adults migrate to urban centres of industry and commerce. Between 1991 and 2011, there are overall increases in the probability of LLTI with a notable spike in the probabilities of LLTI for all groups in 2001. However, whilst the probabilities of LLTI in the tenure-specific models increase successively for much of the population between 1991, 2001 and 2011, this is not true in the age-specific models. The following section will now discuss overall probability of LLTI by social class, migrant status and region of residence for each age-specific model before examining if these relationships are consistent by ethnic groups.

When holding ethnicity constant, there are notable variations in the probability of LLTI by social class, migrant status and region of residence. In 1991, only migrants aged 65-74 have a higher probability of LLTI than non-migrants. For example, non-migrants aged 16-29 in social class I and II have a 2.20% probability of LLTI in the North, 1.92% in Inner London and 1.97% the South. Conversely, migrants in the same socioeconomic and geographic circumstances have a 2.06%, 1.80% and 1.84% probability of LLTI, respectively. A similar pattern is observed for ages 30-44 and 45-64. However, migrants aged 65-74 in classes I and II have a 27.32% probability of LLTI if living in the North, falling to 24.57% in Inner London and 22.71% in the South. Yet for non-migrants of the same age, this falls to 26.47% in the North, 23.77% in Inner London, and 21.96% in the South. Although the differences are small, they are consistent for all classes and regions. As noted above, only ages 16-29 experience lower probabilities of LLTI in Inner London than in the South.

In contrast to the results from 1991, in 2001 migrants aged 45-64 *and* 65-74 years all have higher probabilities of LLTI than their stable counterparts. However, the size of the gap between migrants and non-migrants is generally smaller for those aged 45-64 compared to the gap for ages 65-74. For example, migrants aged 45-64 are generally only slightly more likely than non-migrants to have LLTI, with differences in the probability of LLTI at less than 0.5%. Conversely, the probability of LLTI for migrants aged 65-74 is more than 1.5% higher than non-migrants. However, by 2011 *all* migrants consistently have lower probabilities of LLTI than non-migrants regardless of age (in the 16-74 years SARs samples). Figure 6.2 illustrates the probabilities discussed here. As the spike in the probability of poor health for unclassified groups in 2001 distorts the overall picture presented here, and is attributed to differences in the coding of unclassifiable rather than a substantial deterioration in health for these groups, these probabilities are not plotted. However, the overall trend is suggestive of deteriorating population health between 1991 and 2011. For the unclassifiable groups, overall probability of LLTI for unclassified groups increases over the 20 year period, albeit despite a marked reduction in 2011 following the 2001 spike.

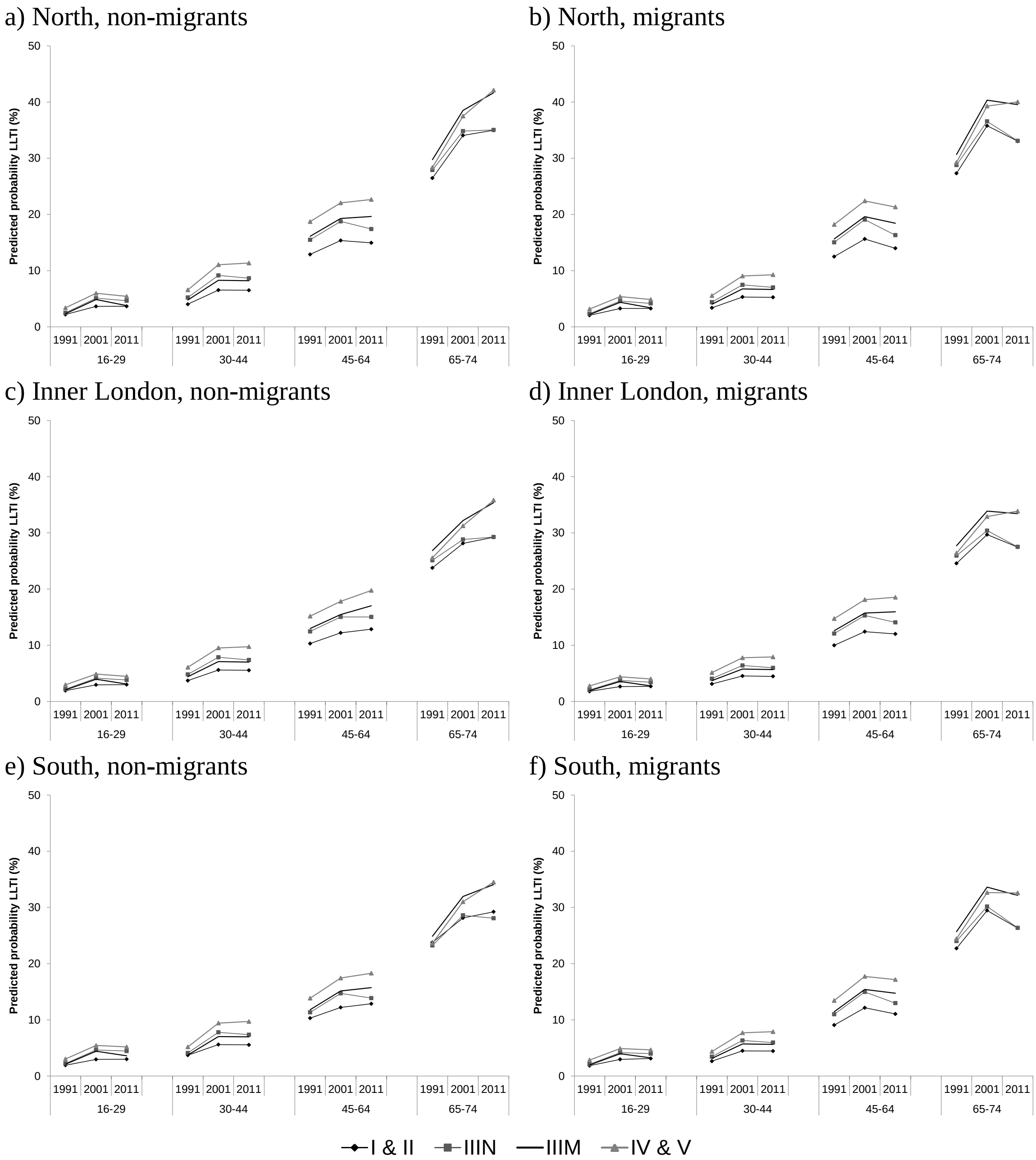


Figure 6.2 Predicted probability of LLTI by migrant status, region of residence, social class and age, 1991, 2001 and 2011

Source: Samples of Anonymised Records

Given the ageing of the population and wider improvements in healthy life-expectancy (for example, Salomon *et al*. (2013) find that global healthy life expectancy has increased between 1990 and 2010), it is possible that the nature of the age-selectivity of the health-migration relationship has changed by 2011. Whilst the sample for these analysis has been restricted to those aged between 16 and 74 years due to incomplete socioeconomic data for older age groups, to explore if the age-selective health-migration relationship has changed in line with the ageing of the population, an additional sample is extracted from the 2011 SARs data for adults aged 75 years and over. Table 6.4 summarises the probabilities of LLTI for this age group by migrant status, social class and region of residence. The incomplete social class data distorts the probability of LLTI for all groups not assigned to a class (dropping to around 20%): these are therefore not presented.

Table 6.4 Probability of LLTI (%) for 2011 SARs population aged 75 and over by migrant status, region of residence and social class

		Non-migrant	Migrant
North	I & II	58.77	63.39
	IIIN	57.17	61.84
	IIIM	64.48	68.80
	IV & V	63.69	68.05
Inner London	I & II	53.66	58.44
	IIIN	52.01	56.83
	IIIM	59.59	64.17
	IV & V	58.75	63.37
South	I & II	54.39	59.16
	IIIN	52.75	57.56
	IIIM	60.30	64.85
	IV & V	59.47	64.06

Source: Samples of Anonymised Records

As observed for ages 65-74 in 1991, and 45-64 and 65-74 in 2001, migrants have a higher probability of LLTI than non-migrants when aged 75 and over. This patterning is consistent between areas and by social classes. Thus, whilst the age-selectivity of migration does vary slightly in 2011, the social and spatial gradients to health persist for migrants and non-migrants.

6.3.3.1 Variations by ethnic group

The following set of results explores the age-selectivity of health-migration by ethnic group, comparing probabilities of LLTI for different ethnic groups by age, social class and migrant status. Results should be cautiously interpreted as some of the probabilities will be based on small sample sizes, particularly when cross-tabulating ethnic groups by social class. To alleviate the problem of small sample sizes, probabilities are not further broken down by region of residence. The crude aggregations used thus far (North, Inner London, and South) will inevitably mask variations between ethnic groups given the propensity for ethnic clustering evident in chapter 5. Thus, these probabilities adjust for region of residence rather than explicitly examine differences between the North, South and Inner London (Table 6.5). The overall picture painted is one of deteriorating health with a consistent spike in the probability of LLTI in 2001, most apparent amongst the population not assigned to a class. Despite some small improvements in the probability of LLTI between 2001 and 2011 for most groups, this does not reduce overall probability of LLTI to levels below those observed in 1991. Where differences emerge, these will be identified below.

Table 6.5 Probability of LLTI (%) for different age-groups by ethnicity, migrant status and social class in 1991, 2001 and 2011

			16-29			30-44			45-64			65-74		
			91	01	11	91	01	11	91	01	11	91	01	11
White	Non-migrant	I & II	2.20	3.65	3.65	4.03	6.54	6.51	12.89	15.37	14.95	26.47	34.07	34.99
		IIIN	2.50	5.11	4.65	5.22	9.16	8.65	15.49	18.77	17.41	27.91	34.83	35.04
		IIIM	2.34	4.87	3.77	4.77	8.28	8.20	16.11	19.29	19.65	29.76	38.53	41.64
		IV & V	3.39	5.98	5.43	6.58	11.05	11.36	18.73	22.06	22.67	28.38	37.50	42.12
		U	5.89	8.29	6.93	16.60	32.49	18.13	39.29	55.43	29.19	41.74	51.38	47.70
	Migrant	I & II	2.06	3.27	3.27	3.39	5.31	5.26	12.50	15.63	13.98	27.32	35.79	33.05
		IIIN	2.34	4.59	4.17	4.40	7.48	7.02	15.05	19.08	16.32	28.80	36.57	33.10
		IIIM	2.19	4.38	3.38	4.02	6.75	6.65	15.65	19.61	18.45	30.67	40.33	39.56
		IV & V	3.17	5.38	4.87	5.56	9.06	9.27	18.21	22.41	21.33	29.27	39.29	40.03
		U	5.52	7.48	6.23	14.26	27.83	15.00	38.47	55.93	27.60	42.80	53.27	45.55
Black Caribbean	Non-migrant	I & II	2.45	3.47	3.24	3.50	5.52	5.36	15.02	18.93	10.27	26.91	39.86	40.05
		IIIN	2.78	4.87	4.13	4.55	7.77	7.15	17.97	22.91	12.07	28.37	40.67	40.10
		IIIM	2.61	4.64	3.35	4.15	7.01	6.78	18.67	23.51	13.73	30.23	44.56	46.97
		IV & V	3.77	5.70	4.83	5.74	9.40	9.44	21.60	26.69	16.02	28.83	43.49	47.46
		U	6.53	7.91	6.17	14.69	28.67	15.26	43.62	61.53	21.16	42.28	57.55	53.10
	Migrant	I & II	2.29	3.12	2.90	2.94	4.48	4.32	14.59	19.24	9.57	27.77	41.69	38.00
		IIIN	2.60	4.37	3.70	3.83	6.32	5.78	17.47	23.27	11.27	29.26	42.51	38.05
		IIIM	2.44	4.17	3.00	3.49	5.70	5.47	18.15	23.88	12.83	31.15	46.44	44.82
		IV & V	3.53	5.13	4.33	4.84	7.68	7.67	21.02	27.08	15.00	29.74	45.36	45.31
		U	6.13	7.14	5.55	12.57	24.36	12.55	42.77	62.01	19.89	43.35	59.38	50.94
Black African	Non-migrant	I & II	2.06	2.58	2.57	2.24	3.77	3.51	8.11	10.97	6.95	28.18	34.78	34.78
		IIIN	2.34	3.63	3.28	2.92	5.35	4.71	9.86	13.56	8.23	29.68	35.55	34.83
		IIIM	2.19	3.46	2.66	2.66	4.81	4.46	10.28	13.96	9.42	31.59	39.27	41.41
		IV & V	3.17	4.26	3.84	3.71	6.51	6.27	12.09	16.12	11.08	30.16	38.24	41.89
		U	5.52	5.95	4.93	9.81	21.23	10.36	27.85	45.77	14.91	43.85	52.16	47.46
	Migrant	I & II	1.93	2.32	2.30	1.88	3.05	2.81	7.85	11.17	6.47	29.07	36.51	32.84
		IIIN	2.19	3.26	2.94	2.45	4.33	3.79	9.55	13.80	7.66	30.60	37.30	32.89
		IIIM	2.05	3.11	2.38	2.23	3.89	3.58	9.96	14.20	8.77	32.54	41.09	39.33
		IV & V	2.97	3.83	3.44	3.11	5.28	5.06	11.72	16.39	10.34	31.09	40.04	39.80
		U	5.18	5.36	4.42	8.33	17.76	8.43	27.16	46.28	13.95	44.92	54.05	45.32

Indian	Non-migrant	I & II	1.97	2.94	2.59	5.46	8.63	5.99	17.56	21.74	18.98	34.30	48.25	51.28
		IIIN	2.24	4.13	3.30	7.05	11.97	7.98	20.89	26.12	21.93	35.96	49.10	51.34
		IIIM	2.10	3.94	2.67	6.45	10.85	7.56	21.67	26.77	24.58	38.06	53.07	58.26
		IV & V	3.04	4.85	3.86	8.84	14.35	10.50	24.93	30.21	28.09	36.49	51.98	58.73
		U	5.30	6.75	4.96	21.50	39.36	16.85	48.25	65.55	35.46	50.95	65.60	64.08
	Migrant	I & II	1.85	2.64	2.31	4.60	7.03	4.83	17.07	22.08	17.81	35.29	50.14	49.13
		IIIN	2.10	3.71	2.96	5.96	9.83	6.46	20.32	26.51	20.63	36.97	50.99	49.18
		IIIM	1.97	3.54	2.39	5.45	8.89	6.12	21.09	27.17	23.16	39.09	54.95	56.14
		IV & V	2.85	4.36	3.46	7.49	11.84	8.55	24.29	30.64	26.54	37.51	53.87	56.63
		U	4.97	6.08	4.45	18.62	34.21	13.90	47.39	66.00	33.69	52.04	67.28	62.07
Pakistani & Bangladeshi	Non-migrant	I & II	2.33	3.51	3.48	5.09	6.61	7.71	17.11	21.15	24.59	29.33	49.89	58.04
		IIIN	2.64	4.92	4.43	6.58	9.25	10.20	20.37	25.45	28.11	30.87	50.73	58.09
		IIIM	2.48	4.70	3.60	6.02	8.37	9.69	21.14	26.09	31.20	32.82	54.70	64.71
		IV & V	3.58	5.77	5.18	8.27	11.16	13.33	24.34	29.48	35.22	31.36	53.61	65.16
		U	6.21	8.00	6.62	20.29	32.73	20.99	47.45	64.75	43.33	45.24	67.06	70.09
	Migrant	I & II	2.18	3.15	3.12	4.29	5.37	6.24	16.62	21.49	23.17	30.24	51.78	55.92
		IIIN	2.47	4.43	3.98	5.56	7.55	8.30	19.81	25.83	26.57	31.81	52.62	55.98
		IIIM	2.32	4.22	3.22	5.08	6.82	7.87	20.56	26.49	29.56	33.79	56.56	62.71
		IV & V	3.35	5.19	4.65	7.00	9.15	10.92	23.70	29.91	33.47	32.31	55.49	63.17
		U	5.83	7.22	5.95	17.54	28.05	17.47	46.59	65.21	41.43	46.32	68.71	68.25

Source: Samples of Anonymised Records

The health of migrants relative to non-migrants at different ages for all ethnic groups is consistent with the patterns observed for all-persons by region of residence. In 1991, migrants aged 16-29, 30-44 and 45-64 years always have lower probabilities of LLTI than non-migrants. Migrants aged 65-74, however, have higher probabilities of LLTI in 1991 than non-migrants. By 2001, migrants aged 45-64 also have higher probabilities of LLTI than non-migrants, although the gap between migrants and non-migrants at this age is also smaller than that for migrants and non-migrants aged 65-74. Finally, it is only migrants aged 75 years and over who have higher probabilities of LLTI than non-migrants across all ethnic groups in 2011: migrants aged 65-74 are in better health than their stable counterparts.

The social patterning to health for migrants and non-migrants is also consistent between ethnic groups: higher probabilities of LLTI are associated with lower social classes. However, the influence of social class and indeed migrant status on health varies between ethnic groups by age such that overall ethnic inequalities vary notably between age-groups.

For all MEGs (Black Caribbean, Black African, Indian and Pakistani and Bangladeshi) aged 16-29 in 2001 and 2011, the probability of LLTI is *lower* than for Whites in comparable social classes and of the same migrant statuses. The only exception is for Black Caribbeans and Pakistani and Bangladeshis in 1991 who experience poorer health than Whites. Of those aged 16-29, Indians consistently experience the best health evident in the lowest probability of LLTI across all classes and migrant statuses. All ethnic groups aged 16-29 see overall increases in the probability of LLTI by social class apart from amongst the population not assigned to a class. For Pakistani and Bangladeshis, the probability of LLTI increases between 1991 and 2011 for the unclassifiable group, contrasting with a decline for the other ethnic groups. These patterns are consistent for migrants and non-migrants.

For all social classes and migrant statuses aged 30-44 years, Black Caribbeans and Black Africans are in better health than Whites in comparable circumstances. Conversely, Pakistani and Bangladeshis are *always* in poorer health than Whites in comparable circumstances, consistently experiencing the poorest health. Contrasting notably with the low probabilities of LLTI amongst Indians aged 16-29, in 1991 and 2001 Indians aged 30-44 now have higher probabilities of LLTI than Whites *and* Pakistani and Bangladeshis. However, by 2011 the health of this group has improved, better than that of Whites and Pakistani and Bangladeshis. Between 1991 and 2011, the probability of LLTI for those not assigned to a class decreased for Black Caribbean migrants, Black African non-migrants, Indian non-migrants and migrants, and Pakistani and Bangladeshi non-migrants.

Inequalities in health between ethnic groups open up with increasing age. Black Caribbeans, Indians and Pakistani and Bangladeshis have higher probabilities of LLTI than Whites. Only Black Africans aged between 45-64 consistently experience lower probabilities of LLTI than

Whites. By 2011, Black Caribbeans also have lower probabilities of LLTI than Whites. The South Asian groups experience notably poorer health in older ages and always have higher probabilities of LLTI than Whites in comparable circumstances (aged 45-64 and 65-74). Increasing ethnic inequality in health with increasing age may have significant implications for health policy in future years, particularly as the currently relatively youthful minority ethnic population ages.

For ages 45-64, White migrants and non-migrants not assigned to a class experienced overall improvements in their health, evident in the decreasing probability of LLTI for these groups between 1991 and 2011. Similarly, Indians and Pakistani and Bangladeshis not assigned to a class also saw a decline in the probability of LLTI for migrants and non-migrants. This contrasts with the overall decline for *all* classes and migrant statuses seen for Black Caribbean and Black Africans between 1991 and 2011. However, improvements in the health of certain MEGs at different ages does not compensate for persisting gaps. Further, whilst some of the spike in probabilities of LLTI in 2001 is attributable to differences in the coding of unclassifiable, as noted previously, wider increases by ethnic group may have resulted from changes in the question wording in the census. Different ethnic groups may interpret the (new) question differently, distorting apparently changing patterns of population health (see Table 2.1 in chapter 2).

6.4 Discussion

Disentangling the complex relationship between health and migration is not easy, particularly given variations in the age- and tenure-selectivity of migration by ethnicity, socioeconomic attributes and, to some extent, area. However, examining probabilities of LLTI for age-specific and tenure-specific models helps further understanding on the nature of ethnic inequalities in health, particularly in terms of differences by age, and variations in the relationship between migration and health. Firstly, by comparing results of model 1 with models 2a and 2b, it is evident that sociodemographic attributes, migrant status and migrant type substantially explain ethnic differences in health. The odds of poor health by ethnic group are notably attenuated by the addition of wider sociodemographic variables and those relating to migrant status or type. Most importantly, when adjusting for sociodemographic variables the direction of the odds of poor health for Black Caribbeans, Black Africans and Mixed and Other relative to Whites reverses such that these minority groups are significantly less likely to be in poor health than Whites.

Migrants in privately rented and owner-occupied accommodation are more likely to be in good health than non-migrants, contrasting with the poorer health of migrants in socially-rented accommodation compared to non-migrants. Despite a comparable patterning in the relationship between tenure, migration and health by ethnic group, there are some variations worth noting which are important to discussions of ethnic inequalities in health. MEGs in socially rented accommodation generally have *better* health than Whites in comparable circumstances. It can be speculated that there are two reasons for this. On the one hand, the health of the Whites in socially rented accommodation may be markedly different to the health of Whites in owner-occupied or privately rented accommodation. The reference groups are therefore different between tenancy types. Yet on the other, it is possible that the apparently better health of MEGs in social housing reflects contrasting experiences of the housing market between ethnic groups, and variations in the reasons for entry into social housing. Whilst eligibility for social housing can vary between areas by local authority (Shelter, 2015), might there also be variations in the way need is prioritised between ethnicities? In other words, are ethnic minority groups in poor health less able to access social housing when in need than White groups in poor health? It is possible that some form of ethnic penalty, such as that known to operate in the labour market, also operates in the housing market. This has been alluded to in the literature as ‘bad’ segregation (Peach, 1996) but deserves further consideration in future work. Although as noted above, it is possible that this may be compounded by compositional differences in the White groups in the different tenancies.

The relationship between migrant status or migrant type and health is also found here to vary by age, although not necessarily by ethnic group. While the health-selective nature of migration ‘selects’ healthy *young* migrants, *older* migrants are more likely to be in poorer health. The point at which ‘young’ becomes ‘old’, however, has changed over time: given that the statutory retirement age is changing this may continue to change. The social and spatial patterning to health is consistent between ethnicities, as is the relationship between migration and health in terms of health-selectivity. Only the extent of the influence changes, with certain MEGs less able to reap the health-benefits of more advantaged circumstances than others. However, it is worth noting that there are marked differences in the patterning of poor health between ethnic groups by age. As ethnic inequalities in health widen with increasing age, an ageing and increasing ethnically diverse population may be faced with persisting and widening gaps in health that must be addressed in policy.

Analysis of the SARs in this and the preceding chapter have demonstrated that health varies by age, gender, ethnicity, socioeconomic and migrant status. This is apparent in the SIRs calculated in chapter 5, and the varying probabilities of LLTI presented in this chapter. More importantly, as results have shown that probability of poor health varies between migrants and non-migrants by age and ethnicity, it is possible that through migration (or immobility), differently healthy groups will be ‘sorted’ into different areas and socioeconomic circumstances. It is therefore likely that selective sorting may influence persisting or widening health gradients, with variations in the operation of the sorting process by ethnic group. This is further evidenced by the contrasting composition of different ethnic groups in England, documented in chapter 5.

Where opportunities for migration vary by socioeconomic status, area or health, any variation in the composition of ethnic groups by these variables will accordingly differentiate the patterning of migration. As opportunities for migration may vary between ethnic groups according to their composition, so may opportunities for social mobility (see the discussion on the implications of contrasting socioeconomic experiences between ethnic groups for patterns of social mobility in chapter 4). The following chapters will investigate whether selective sorting operates in England and whether it varies between ethnic groups to assess if selective sorting differently contributes to (changing) health gradients within the overall population and by ethnic group.

Chapter 7

Selective sorting and changing ethnic health gradients: evidence (1) from the Office for National Statistics Longitudinal Study, 1991, 2001, 2011

7.1 Introduction

Selective sorting is the process by which differently healthy groups of people are 'sorted' into different area types or social classes, primarily through migration or social mobility. However, area types also change through area regeneration or decline: area type change or deprivation mobility for non-migrants or stayers is therefore important. It has been hypothesised that the sorting of differently healthy groups into different area types or social classes can influence (changing) health gradients. However, conclusions vary as to the nature of the influence on health gradients or indeed the magnitude of the effect. Amidst the conflicting conclusions in the literature a clear gap in knowledge exists.

As migration and social mobility are inter-dependent processes in turn related to deprivation mobility, adopting a mutually exclusive approach to the investigation of these sorting processes on changing health gradients is not sufficient. Conclusions from existing literature on selective sorting may also be questioned depending on the analytical framework employed: where assessments of the contribution of selective sorting to overall health gradients are drawn from comparisons of health between mobile and immobile groups, further work is required. Further, no work has specifically investigated how these processes may also vary by ethnic group and therefore explain changing *ethnic* health gradients (a notable exception in respect of social mobility is the work of Harding, 2003). Yet the conclusions of this thesis thus far demonstrate the importance of specifically investigating ethnic inequalities in health, and possible variations in the magnitude of the influence of migration or indeed social mobility on health between ethnic groups. Identifying possible mechanisms contributing to widening health gradients are important for policy debates seeking to flatten existing gradients which may be widening over time (e.g. Johnson and Al-Hamad, 2011; Norman *et al*., 2005).

It has been shown that ethnic inequalities in health are rooted in socioeconomic and broad spatial difference. However, the benefit of more advantaged circumstances on health varies between ethnic groups and by age. Some groups are better able to reap the health benefits of more advantaged circumstances, while an ethnic penalty appears to penalise others, interacting with their disadvantaged position to additively or multiplicatively harm health. The extent to which different ethnic groups can maximise the health benefits of their (dis)advantaged circumstances may influence opportunities for or trajectories of both social mobility and selective migration, depending on the strength of the association of these sorting processes with health status.

Opportunities for migration may also vary given the contrasting composition of different ethnic groups in England, varying according to recognised characteristics of migrants which influence either propensity (not) to migrate or the nature of a migration event itself. This ranges from socioeconomic attributes such as social class or educational attainment to health status. Nevertheless, it should be noted that the relationship between health and migration is similar between ethnic groups. The contrasting composition of different ethnic groups may also influence opportunities for social mobility. If groups are concentrated in the lower social classes, although upward mobility is the only option it is likely that opportunities for such mobility may be low. Variations in the health experiences, socioeconomic attributes, probability of migrating and geography of ethnic groups in England may therefore differently influence the nature of selective sorting between ethnic groups.

This chapter uses longitudinal data which link the same individuals over time to explore how transitions between area types and social classes influence health gradients in England for different ethnic groups, examining whether selective sorting can a) influence (changing) health gradients and b) if this varies by ethnic group. Existing literature on whether social mobility or selective migration contributes to health gradients will first be evaluated, as will the (limited) literature similarly examining area type change's contribution to (changing) health gradients (area type change will also be referred to as deprivation mobility). Through this evaluation, it will be argued that by holistically approaching the investigation of selective sorting, accounting for possible variations by ethnic group, and also developing the analytical frameworks used, theories of selective sorting may be particularly useful in explaining changing overall *and* ethnic health gradients. First, however, it is necessary to define the concept of social mobility in the context of health inequalities research. This will focus on the complex relationship between social status, social mobility and health. Such discussions are analogous to those previously presented regarding the health-migration relationship and the importance of place as a determinant of health (see chapter 5 and the discussion of literature on health inequalities in chapter 2).

7.2 Social mobility

Social mobility is the movement of individuals through a social system, whether favourable or unfavourable. Social systems are most commonly defined by a structured typology of occupation: thus, social mobility is analogous to occupational mobility in this analysis. Social mobility either refers to inter-generational mobility and the changing social position of individuals across familial generations or intra-generational mobility referring to changes to an individual's social position during their lifetime (West, 1991). Intra-generational mobility therefore pertains to changes during adulthood, rather than the initial possible change between class of origin (parental class) and achieved social class in adulthood. Although this analysis focuses on intra-generational social mobility, it is possible that more insights into changing ethnic health gradients may be gained by also accounting for inter-generational social mobility, particularly given the changing experiences of first-, second- and third-generation migrants (e.g. Heath and Smith, 2003).

Reducing an individual's experience of social reality to a single measure of social status such as social class is not without problems. Macintyre (1986) suggested that as individuals occupy many social positions at any one time (income, tenure, occupation, etc.), focusing on one may ignore complex interactions between each position and underestimate the implications for health status. Similar concerns are expressed in respect of ethnic experiences of social position, as highlighted in chapter 4: uni-dimensional measures of social status such as social class may not be sufficient to capture the diverse and complex experiences of minority ethnic groups (MEGs) (Harding, 2003). However, where used it is likely that uni-dimensional measures will under- rather than over-estimate the extent of inequality between ethnic groups insofar as they are insufficient to capture the full experiences of each ethnic group. Notwithstanding these limitations, social status or position will hereafter be defined according to social class.

Before examining the relationship between social mobility and health, it is worth highlighting some recent trends in social mobility in England. Political and media usage of 'social mobility' seems often to focus exclusively on upward mobility yet individuals can also experience downward mobility. Nevertheless, documenting trends in social mobility was, to the UK's 2011-2015 coalition government, of central importance given their focus on social mobility as a key policy objective (Cabinet Office, 2011). However, disparate conclusions as to the direction of trends in social mobility are extensive. Such background provides an invaluable context within which to investigate the influence on (changing) health gradients.

7.2.1 Trends and patterns

Between 1981 and 2001, the overall percentage of males remaining in the same social class (according to the National Statistics Socioeconomic Classification, NS-SeC) fell whilst the percentage changing social class increased with a high percentage found to move into the top NS-SeC class (see Table 3.3 in chapter 3) (Fry *et al*., 2012). The overall findings of this study suggested that while the proportion of the population in managerial and professional classes increased, declines were found in intermediate and more routine classes, although there are gendered differences. Notably, Fry *et al*. (2012) found that women had lower probabilities of favourable social mobility than men, relating these findings to literatures discussing difficulties in re-entry into the labour market after child-birth (e.g. Manning and Petrongolo, 2008). Nevertheless, Fry *et al*. (2012) argue that advances in equality of opportunity have been seen over time. Similarly positive findings have been suggested by Lambert *et al*. (2007) and Li and Divine (2011).

Changes in the labour market in England, heralded by increasing opportunities in non-manual occupations, precipitate much of the observed increases in social mobility when operationalised through occupational typologies of class. “More room at the top” as noted by Platt (2005a: 8), opens up more opportunities for upward social mobility for those in more manual occupations (see Erikson and Goldthorpe, 1993). Indeed Heller *et al*. (2002: 2) noted substantial changes in the distribution of the population by social class between 1970 and 1993, with the proportion of males in class II increasing from 19.9% to 30.3%. Nevertheless, although the expansion of the non-manual occupations did create opportunities for upward social mobility, it also reinforces the advantaged circumstances of the middle-classes who are more able to retain their position (Erikson and Goldthorpe, 1993; Goldthorpe *et al*., 1987), as Platt (2005a, 2005b) highlights.

However, differently operationalising social class leads to less favourable conclusions. For example, Nicoletti and Ermisch (2007) examine social mobility in terms of earning differences between family generations (inter-generational social mobility), finding that social mobility is in decline. Similarly, Blanden *et al*. (2005) conclude that inter-generational social mobility declined for birth cohorts from 1958 and 1970. Conversely, others have concluded that if not in decline or even improving, social mobility is static (Blanden *et al*., 2007; Goldthorpe and Jackson, 2007; Goldthorpe and Mills 2008).

Differences in the operationalisation of social mobility are evidently important. These differences can also influence assessments of the contribution of social mobility to (changing) health gradients, as will be shown in the following section’s discussion of indirect or direct selection effects and social mobility. Perhaps, then, what is of more interest is whether opportunities for social mobility are equitably distributed between specific subgroups of the population. Fry *et al*. (2012) consider this in terms of gendered differences, but what of differences between (un)healthy groups, or of differences between ethnic groups? These questions are central to this thesis’ investigation of ethnic inequalities in health and the contribution to selective sorting to changing health gradients. Before exploring ethnic differences in social mobility and possible differences in the relationship with (changing) health gradients, the following section will review some of the key literatures examining social mobility in the context of health inequalities.

7.2.2 Social mobility and health inequalities

Publication of the Black Report (Department of Health and Social Security, 1980) garnered substantial attention in health inequalities. At the heart of this interest is explaining what Kröger *et al*. (2015: 1) asserts as "one of the most reliable findings in public health research": the social gradient to health. Two theories, often framed as diametric opposites, dominate attempts to explain this gradient: social causation and social selection. The former holds that health is socially determined by structural factors in society, giving rise to the social gradient in health: better socioeconomic circumstances are associated with better health. The latter maintains that the social gradient to health manifests through the entry of healthy groups into higher social classes whereas those in poorer health drift down into lower social classes (see Dahl, 1996). Thus, health determines social position with the occupational class structure filtering or *sorting* differently health groups into different classes or occupations based on their "physical strength, vigour or ability" (Townsend *et al*., 1992: 105).

If political, social or even moral importance is attached to the existence of social inequalities in health, theories of social selection whereby health determines social position are perhaps less palatable than theories of social causation. If health *does* determine social position, the poorer health of lower social classes compared to the better health of the higher classes can be explained away as inevitable features of this Darwinian process of natural selection. Indeed Macintyre (1997: 727) notes that this version of "selection thus "explains away" observed inequalities in health by occupational class as being nothing meriting social concern or collective intervention". However, if discussions of social causation and social selection are framed around reciprocity rather than dichotomy, social selection may maintain and widen existing health gradients established by social causation. These gradients cannot, therefore, be explained away as inevitable features of society and thus deserve academic and political attention. The need to conceptualise research according to the reciprocal relationship between social causation and social selection has not gone unmet. For example, Halleröd and Gustafsson (2011) find evidence for a causal impact of socioeconomic status on health alongside evidence for the influence of health status on selection into different socioeconomic circumstances. Similarly, Mulatu and Schooler (2002) conclude that while socioeconomic status influences health status (social causation), health status simultaneously influences socioeconomic status (social selection). According to West (1991: 382), this reciprocal relationship between social causation and social selection arises due to the "interrelated features of social life and health selection". Efforts should therefore be made to quantify the extent of the effect of health selection, particularly as this may vary depending on existing social policy and the political climate (West, 1991), or crucially for this research, by ethnicity. Indeed a recent systematic review of the literature on selection and social causation concluded that both are important in generating health inequalities (Kröger *et al*., 2015). It might therefore be anticipated that health gradients manifest through social causation and are subsequently perpetuated through social selection. The reciprocity of the relationship echoes arguments from Smith and Easterlow (2005) regarding the suitability of dichotomous approaches to contextual versus compositional influences in health.

Although some of the literature on social selection and health is framed around a reciprocal relationship between social selection and social causation and their influence on health gradients, this approach is not universal. Further, the nature of the social selection investigated also varies between studies.

Social selection relates to social mobility, operationalised in this thesis as changes in social class. However, this can be extended to mobility into and out of employment. For social mobility to have a significant effect on changing health gradients, it has traditionally been argued that the health or health potential of those 'sorted' into lower social classes must be as bad or worse than the health of those in the destination classes. Similarly, for those experiencing upward social mobility, their health must be as good or better than the health of those in the upper classes. However, most studies find the health of the mobile groups to be somewhere between that of the destination and origin classes (e.g. Manor *et al*., 2003; Claussen *et al*., 2005). This leads many to conclude that although health selection *does* operate through social mobility, the magnitude of the influence on health gradients is too small to be of significance (Blane *et al*., 1993; 1999; Power *et al*., 1996; van de Mheen *et al*., 1999; Chandola *et al*., 2003).

For example, Novak *et al*. (2012) studied health selection and intra-generational social mobility in Sweden and found no evidence that health status was associated with mobility for men or women. However, although Billingsley (2012) found that the negative relationship between favourable social mobility and mortality is actually due to social causation rather than health selection, downwards or unfavourable social mobility was found to be associated with social selection. Still others have argued that as the health of the socially mobile groups is neither better (for upwardly mobile groups) nor worse (for downwardly mobile groups) than the health of their destination class, that social mobility actually constrains health gradients (Bartley and Plewis, 1997; 2007; Blane *et al*., 1999). Indeed social mobility has been advanced as a policy tool to flatten health gradients, thus reducing health inequalities in society (Bartley and Plewis, 2007). Heller *et al*. (2002), who notably recognise the importance of accounting for social mobility when analysing class differentials in health, find that redistribution across the social classes can contribute to a reduction in mortality between males by social class in England and

Wales. Indeed the authors attribute a 16% reduction in mortality between 1970-2 and 1991-2 to upward social mobility and the resulting increase in the proportion assigned to class II (2002: 4).

Research on transitions into and out of employment often finds more evidence of health selection and the consequent influence of social mobility on health gradients than studies focussed only on transitions between classes or occupations. For example, although Elstad and Krokstad (2003) did not find any evidence of health-related mobility between occupations, they did conclude that mobility into and out of employment was health selective. Similarly, van de Mheen *et al*. found that the health of those moving in and out of employment was significantly worse than those who remained employed (1999: 517), concluding that “inequalities among the working population can be considerably biased by mobility out of and into employment”. This indicates a strong influence of this form of health-related mobility on health gradients. However, some have found that the extent to which health can function as a selection mechanism into and out of employment is attenuated by prior social status (Bartley and Owen, 1996).

The extent to which the influence of health selection is attenuated by prior social status shifts attention from direct selection effects discussed so far, whereby groups are sorted into different social classes or circumstances because of their health, on to indirect selection effects. Indirect pathways for health selection might include poor child health or adverse socioeconomic circumstances in childhood limiting educational success and subsequent occupational achievements. Perhaps, as the WHO argues, the selectivity of social mobility depends more on the determinants of health, e.g. education, than health itself (WHO, 2010). For example, Deary *et al*. (2005) find that as well as height, education and childhood IQ are good predictors of upward social mobility while height and childhood IQ also predicted downward social mobility. Lundberg (1991) investigated whether childhood living conditions, and accordingly, childhood health status, has an effect on inter- and intra-generational social mobility. Lundberg demonstrated that poor health exerted no direct effect on either form of social mobility therefore arguing that health-related social mobility could not explain social inequalities in health. However, Lundberg did conclude that adverse childhood living conditions increased the chances of being in a lower social class as an adult, thus illustrating the possible of indirect selection effects. Novak *et al*. (2012) similarly found that unfavourable environments at school consistently predicted social mobility for both genders.

Although research such as that by Lundberg appears to provide yet more evidence suggesting that direct health-related social mobility does not explain changing health gradients, it does serve to highlight the importance of age. Social mobility is, to a large degree, a product of education which for many will determine occupational choices. Consequently, early adulthood is when most will experience social mobility. If an individual has suffered poor health which has impacted upon their educational experience, this may limit their subsequent opportunities including their choice of occupation. This reinforces arguments proffered by the WHO, emphasising the importance of indirect rather than direct selection. In the context of a society recovering from a recession, it is worth considering that the impact of the 2008 economic downturn may be a reduction in upward social mobility for teens (Rock, 2013). This is attributed to teens following in the footsteps of their parents with regards to further education, particularly when also considering the rise in tuition fees, thus potentially restricting chances of future inter-generational social mobility. Potential declines in social mobility are worth noting as this may impact upon the results of this analysis. However, it is likely that this phenomenon will not yet have been captured in the data used. Although evidently of interest, expanding the focus to indirect effects such as childhood health or socioeconomic circumstances is outside the scope of this analysis, particularly insofar as this relates to inter- rather than intra-generational social mobility. More importantly, the analytical framework adopted in this chapter (outlined below), simultaneously considering the influence of selective sorting on changes between area types and social classes, necessitates a focus on direct intra-generational social mobility rather than indirect inter- or intra-generational social mobility.

Despite the tendency for research to conclude that either social mobility has a limited contribution to changing health gradients or actually constrains health gradients, further research is warranted. This is most strongly evidenced by the interesting paradox raised by Boyle *et al*. (2009): despite the supposed constraining influence of social mobility on health gradients, health gradients appear to be widening during a time when many would argue that rates of social mobility are high. Paraphrasing the findings from Claussen *et al*. (2005), Boyle *et al*. note that this may arise because “the net effect of social mobility on the social gradient at follow-up depends on the relative influence of incomers and out-goers to that class” (2009: 1836). The authors subsequently question the validity of interpretations of mechanisms seeking to explain widening or narrowing inequalities found in transition matrices used to study mobility (Boyle *et al*., 2009: 1841). By questioning the validity of interpretations of mobility matrices and arguments from Bartley and Plewis (2007) who recommend social mobility as a policy for reducing health inequalities, the authors clearly emphasise the need for further research in this area.

7.2.3 Social mobility and ethnicity

Ethnically differentiated studies of social mobility are not comparable to wider studies not accounting for ethnicity (Platt, 2005b: 446). However, they do shed light on the experiences of ethnic groups within society which are pertinent to the aims of this thesis. On the one hand, cross-sectional data can be used to compare the social distribution of ethnic groups at different points in time (as in chapter 4's analysis) (Heath and McMahon, 1997; Modood, 1997; Robinson, 1990). However, as Platt (2005b) notes, such studies may mask important differences given the contrasting proportions of MEGs assigned to a social class (as noted in chapter 4). On the other hand, a number of studies specifically investigate inter-generational social mobility of MEGs, seeking to establish whether the opportunities available to second- and third-generation migrants differ from their parents (e.g. Heath and McMahon, 1999; Heath and Ridge, 1983; Heath and Smith, 2003; Heath and McMahon, 2005). In these types of studies, social mobility is either studied in absolute terms, i.e. the absolute number of a group who move into a different class, or in relative terms, i.e. what are the odds of one member of a group moving into a different class (Heath and Smith, 2003). Heath and Smith (2003) used the General Household Survey to compare absolute and relative social mobility between first- and second-generation migrants. The authors found that all first-generation migrants experienced upward absolute social mobility apart from Pakistanis, although the majority remained stable in the same social class. However, differences between MEGs emerged amongst second-generation migrants: Irish and Indians were found to experience net levels of upward social mobility, contrasting with the net levels of downward social mobility for Caribbeans and Pakistanis. In terms of relative social mobility, ethnicity was not found to be more important than class of origin. In other words, being of a MEG did not produce significantly different odds of social mobility to the reference group of White British males. Notwithstanding, there are differences in the ability of MEGs to move away from disadvantage, particularly amongst second-generation Caribbeans and first-generation Pakistanis. Similarly, Platt (2005b) found that the relative advantage of higher social classes at origin for a higher social class at destination (upward social mobility) was lower for Indians and Caribbeans than for White non-migrants. Platt further finds that higher social classes are not as protective against unemployment for MEGs as for the White majority. Whilst mobility out of employment, as already discussed, is not always considered within research into social mobility, it can be revealing in terms of the relationship with health. McDonough and Amick III (2001) accounted for race (a US based study) when investigating differential vulnerability to the labour market effects on poor health. The authors found that being Black and in poor health reduced the risk of labour market exit amongst males, contrasting with wider studies finding the inverse (e.g. Bound *et al.*, 1996). However, being less sensitive to poor health and remaining in employment may not necessarily be construed in a positive light: this reduced risk may be explained by varying access to resources precluding the option of giving up employment when faced with deteriorating health.

Research into patterns of relative social mobility between ethnic groups explicitly examine whether opportunities for social mobility are comparable between population subgroups. Where differences arise, it is necessary to question whether an ethnic penalty is in operation, penalising MEGs over and above the White majority in otherwise comparable circumstances. It is hard to deny that this penalty operates given the wealth of research documenting differences in factors such as employment rates or income (see chapter 4). Differences in employment rates or income between ethnic groups reflect different opportunities for social mobility, as do differences in the percentage of MEGs achieving senior management positions or opportunities for career progression. A recent review of MEGs in the NHS found that MEGs had fewer opportunities for career progression and were treated less favourably in disciplinary proceedings (Kline, 2015). Similarly, an earlier study found that White nurses worked, on average, 11.8 years before reaching senior ward sister level, compared to an average of 15.1 years for minority ethnic nurses (Pike and Ball, 2007). Heath and Smith (2003: 202) also found that first-generation Indians and Pakistanis were not able to access salaried employment despite being at least as qualified as salaried White British men. There are, however, marked differences between MEGs in the operation of this ethnic penalty. While Caribbean migrants find that increased education brings increased occupational success, as generally observed in the White majority, this does not protect them from high unemployment rates (Platt, 2007). Platt also argues that the geographic dispersal of Caribbeans and their relatively high levels of social integration (see Peach, 2005) means they are less able to draw on ethnic capital afforded to more clustered groups (such as Bangladeshis) yet still excluded from “majority-dominated elite networks and resources” (2007: 507). Conversely, for Pakistanis and Bangladeshis, Platt found that an ethnic penalty persisted regardless of educational attainment, limiting chances of achieving a higher social class.

A common theme across the literatures exploring ethnic patterns of social mobility, or to some extent the opportunities for social mobility, is the importance of migrant histories. MEGs are created through processes of international migration, and the experiences of first generation migrants may differ from that of the second-generation. These issues are beyond the scope of this review given this thesis’ exclusion of recent international migrants. Nevertheless, future work examining the contribution of selective sorting through social mobility to ethnic health gradients may benefit from a more nuanced approach to the analysis of differences between first- and second-generation migrants. Data constraints do not permit an investigation in this thesis.

The literature cited in this section clearly shows that patterns of social mobility vary between ethnic groups, and may continue to vary given unequal opportunities between ethnic groups. Although not an exhaustive review, these findings are reflective of the (limited) wider literature. More limited still is literature specifically examining the relationship between ethnicity, social mobility and health. Although accounted for in some studies, such as McDonough and Amick III (2001) cited above, few are explicitly concerned with the possible influence of differences in social mobility on the patterning of health by ethnic group. Harding (2003) is a notable exception, examining the relationship between social mobility and LLTI amongst West Indian and South Asian migrants resident in England and Wales. Harding assesses social mobility using a multi-dimensional measure to define (dis)advantage, finding that those who are persistently disadvantaged and those who are socially mobile (regardless of direction) are more likely to report LLTI (according to percentage with LLTI at end of study period) than those who remain the least disadvantaged for all ethnic groups. Importantly, West Indian and South Asians report higher levels of LLTI when downwardly mobile than all other sample members. More recently, Smith *et al*. (2009) used the ethnic boost samples from the 1999 and 2004 HSEs to examine whether changes in socioeconomic status and health behaviour between first- and second-generation migrants explained ethnic inequalities in health. Importantly, not only were health inequalities between ethnic groups unaffected by changes in health behaviours, the benefits of upward social mobility between generations did not serve to close the health gaps. Further, after accounting for upward social mobility of second-generation migrants, the authors found that their health was poorer than that of the first-generation (Smith *et al*., 2009: 256).

Differences in opportunities for social mobility between ethnic groups will likely interact with health, and have important implications for (changing) health gradients. The following sections will outline the evidence for and against selective migration’s contribution to health gradients while also addressing deprivation mobility.

7.3 Selective migration

Migration, as discussed in chapter 5, is inherently selective based on person-level attributes including health status and varying according to stage in the lifecourse. The ‘push’ of an origin area or the ‘pull’ of a destination will vary according to person-level characteristics which in turn, vary according to stage in the lifecourse (see Figure 5.1 in chapter 5). Similar to the social selection hypothesis whereby those in better health are selected into higher social groups while those in poorer health are selected into lower social groups (e.g. Townsend *et al*., 1992), selective migration assumes that those in poor health are either less able to move away from or more likely to drift down into more deprived areas whereas those in good health are better able to move to or remain in more desirable locations (e.g. Boyle *et al*., 2009). However, empirically demonstrating this is problematic as it is difficult to disentangle cause and effect within the constraints of available data: does selective migration (or indeed social selection) lead to concentrations of healthy people in more advantageous areas (and social statuses) and unhealthy people in less advantageous areas (or social statuses), or do poor area and socioeconomic conditions lead to concentrations of unhealthy people in these areas and statuses, and *vice versa* for healthy people.

Whilst health may influence migration propensity and the direction of migration, so too may the migration event or the resulting changing area circumstances influence health. Thus, through the potentially stressful act of migrating and the resulting influence of place effects on health it is clear that a reciprocal relationship between health and migration is in operation. Through this reciprocal relationship, the extent of the effect of health selective migration may vary by area or according to individual circumstances. The extent of the effect of selective migration may also vary by demographic attributes such as gender or ethnicity. Whilst one American study did not find any relationship between mobility and health status for women, a relationship was evident for men suggesting selective migration did influence male mobility (Halliday and Kimmitt, 2008). Similar ideas have been alluded to by others for whom migration involves a dynamic population group and theories should not be assumed to be universally applicable (Connolly and O'Reilly, 2007; Connolly *et al*., 2007; Stockdale and Catney, 2012).

7.3.1 Selective migration, deprivation mobility and health inequalities

In discussions of social selection, it is argued that for social mobility to contribute to widening gradients, the health of those moving into higher social classes must be better than the health of those they are joining whereas the health of those moving down must be worse than that of those they are joining (Boyle *et al*., 2009). However, research has demonstrated both in the selective migration and social selection literature, that the health of mobile groups is usually somewhere between that of the origin and destination groups (Elstad, 2001). In the social mobility literature, this has led to some concluding that selection effects constrain rather than widen health gradients (Bartley and Plewis, 1997; 2007) (see above). However, as Boyle *et al.* (2009) point out, such analytical frameworks fail to account for the differential movement of upwardly and downwardly mobile persons. It is here where the influence on health gradients is likely to play out and this does not require health to be substantially worse or better than those in the destination social class or indeed the area type.

In the late 1990s, research into the influence of selective migration on changing health gradients was rare (Verheij *et al*., 1998) owing to a lack of appropriate longitudinal data which is essential to effectively analyse the extent of the role of selective migration. Studies using only cross-sectional data with limited retrospective information on health and other individual-level attributes found that selection effects were not important (Blazer *et al*., 1985; Lewis *et al*., 1992; Diderichsen *et al*., 1992). However, more recent research increasingly finds to the contrary.

In 1998, Verheij *et al*. concluded that absolute numbers of migrants need to be high for selective migration to contribute to urban-rural variations in health. However, the authors went on to suggest that this does not necessarily preclude the contribution of selective migration to variations in health according to deprivation. Notwithstanding, the numbers of migrants involved are evidently important as Martikainen *et al*. (2008) also later concluded. Their analysis demonstrated that migration only had a small effect on area socioeconomic mortality differences due to the small migratory flows. The geographic scale of migration has also been found to be important in terms of the extent of the influence of selective migration on spatial variations in health (Brown and Leyland, 2009) (and the relationship with health as shown previously). Brimblecombe *et al*. (1999) found that although selective migration did not account for variations in health at the regional level, major variations in health observed at district level could be attributed to selective migration. However, the authors subsequently concluded that area differences in mortality owed more to the cumulative lifetime advantage of certain migrant groups than selective migration effects (Brimblecombe *et al.*, 2000).

Similarly negative conclusions regarding the role of selective migration in either widening or maintaining spatial variations in health have been reached by others at varying geographic scales and in different socio-political contexts (e.g. Connolly and O'Reilly, 2007; Popham *et al.*, 2011). Nevertheless, others have demonstrated the role of selective sorting in changing health gradients. For example, Norman *et al*. (2005) find that selective migration is responsible for increasing health inequalities observed between less and more deprived areas as opposed to changing contextual circumstances. Indeed subsequent research has demonstrated that as groups move away from more deprived areas, this movement exaggerates overall health inequalities between areas (Norman *et al*., 2011). Incidentally, much of the literature discussed thus far, and much of the literature existing in this area, is concerned with physical health, conceptualised either in terms of cause-specific mortality or morbidity rates, or in terms of either general self-assessments of health or the presence of limiting long-term illness (LLTI). However, there is perhaps stronger evidence of selective migration with respect to mental health (DeVerteuil *et al*., 2007). Indeed there is evidence to suggest that downward migration, albeit international, is related to social mobility and associated with a heightened risk of poor mental health for certain groups (Das-Munshi *et al*., 2012). Nevertheless, as this thesis conceptualises health according to LLTI, the (limited) literature relating to selective sorting and mental health will not be further explored.

Whilst choice of outcome is important in terms of the role of selective migration in contributing to widening health gradients, it does not affect the overall significance of selective migration for spatial analyses of population health. Other studies have looked at direct and indirect selection. According to Verheij *et al.* (1998), indirect selection is the selection of migrants based on health-related behaviours or risk factors whereas direct selection is based on actual health. Studies looking at both have concluded that neither form of selection would significantly contribute to neighbourhood inequalities in health. This contrasts with Pearce and Dorling (2006) who found evidence to suggest that indirect selection of smoking and non-smoking migrants could significantly exacerbate recorded geographic inequalities in health in New Zealand. Findings such as these have important implications for the provision of healthcare services and health promotion strategies. However, there is also a dilemma for anyone seeking to monitor population health and the prevalence or widening of inequalities in health: is the health of the population worsening or are widening health inequalities only a by-product of selective migration. Whilst the latter is still inequitable and requires careful consideration and service planning, it is not quite the public concern which would arise from overall worsening health. Indeed it has been demonstrated that selective migration may appear to widen health inequalities without requiring an overall worsening of population health (O'Reilly and Stevenson, 2003).

Conclusions are evidently varied and necessitate further work examining the nature of selective migration in respect of (changing) health gradients. To address the conflict in both the selective migration and social mobility literatures, this thesis hypothesises that holistically investigating these sorting processes may be more conclusive given the inter-dependence of social mobility and migration. Moreover, recognising the simultaneous importance of deprivation mobility may strengthen conclusions.

Poor health is known to be associated with increasing deprivation (e.g. Boyle *et al*., 2004). If healthy individuals are more likely to move to less deprived areas with the inverse being true for unhealthy individuals, then the associated deprivation mobility which corresponds with the migration event may have a further additive or multiplicative influence on health after migration. If unhealthy individuals who move to more deprived areas through a process of selective migration then experience even worse health, this reflects a significant public health concern. Changing experience of deprivation is as important as the migration event itself. However, if healthy individuals are sorted into less deprived areas, what of the unhealthy groups who are not sorted away and remain in more deprived circumstances?

Moorin *et al*. (2004) found that unhealthy individuals were less able to migrate away from rural remote areas to the typically urban areas with adequate medical services. Concentrating on residualised populations created through selective migration could, as suggested by Brown and Leyland (2009), help reduce widening inequalities in mortality for area-specific causes or premature mortality (Exeter *et al*., 2011) (these literatures are revisited in chapter 8). A focus on immobility is particularly important in discussions of ethnic variations in the nature or operation of selective sorting, particularly if differences in likelihood of migrating (see chapter 5's discussion (section 5.3) and analysis in chapter 8) mean that certain ethnic groups may be more or less likely to remain in differently deprived areas. The widely observed poorer health of certain MEGs coupled with fewer opportunities or propensities to migrate is therefore pertinent to discussions of selective sorting and ethnic health gradients, perhaps framed around immobility rather than migration.

Before concluding this section, it is worth revisiting the work of Smith and Easterlow (2005) (see chapter 2). Literature exploring context and composition typically dichotomises the argument giving rise to the label of context *versus* composition. However, as implied by Macintyre *et al*. (2002) and explored by Smith and Easterlow (2005), research should seek to unite composition and contextual narratives recognising the entwined importance of each. Smith and Easterlow (2005) recognise that whilst contextual factors can differentially shape the health of individuals, compositional factors *including health history* can influence migration trajectories. They conclude that this can either lead to favourable selection into healthy or health enabling places, or to unfavourable selection into risky or health disabling places. Having migrated, either through favourable or unfavourable selection, contextual influences will then continue to influence individual health. The continued reciprocal relationship between health, place, socioeconomic circumstances and transitions between must be considered in research of this kind. The reciprocity of this relationship, similar to that between social selection and social causation, is particularly important given the previous discussion of deprivation (im)mobility and residualised populations who are either immobile in the most deprived areas, or churning within the most deprived areas.

7.4 Selective sorting between area types and social classes: migration, social mobility and deprivation change

Young healthy mobile adults, as already highlighted, may move in search of employment or education opportunities. If migrants, of any age, are mobile for employment or education, this focuses attention on the idea that perhaps residential mobility and social mobility are related. Notable work in this area by Fielding (1992) observed that the South East of England seemed to disproportionately attract potentially upwardly mobile young adults who were then more likely to be promoted than those elsewhere in the country. These adults were also found to be more likely to attain a higher financial and social position than those residing elsewhere. Whilst this link has been established for some time, the logical step to link these interdependent mobilities to health has not yet been taken. Indeed, in an increasingly mobile world, the inter-dependence of these mobility processes, whether they be based on social structures, changing locations, or changing deprivation, gain in importance. Literature reviewing differences in patterns of migration by ethnic group or social mobility have been explored in this chapter (section 7.2.2) and chapter 5 (section 5.3). Notwithstanding the evidence provided in these discussions, given variations in the age-patterning of migration and indeed social mobility, as well as their changing relationship with health, it is reasonable to hypothesise that variations will be observed by ethnic group owing to their different compositions (as shown in chapter 5 and, to some extent, chapter 4). In particular, such variations may influence or attenuate *the extent* of the influence of social mobility, migration or deprivation change on changing ethnic health gradients.

Importantly, recognising the inter-dependence of migration, social mobility and deprivation mobility in terms of the relationship with (changing) health gradients introduces the idea of residualised populations created when people move away from certain areas perceived as less desirable: those that remain are the ‘social residue’, the population without the opportunity (or perhaps motivation or ability) to move away. Whilst immobile groups have featured in some of the research cited in this chapter, it has often only been as a reference group for analytical comparison. Yet reasons for immobility (or ‘entrapment’ as coined by Smith and Easterlow, 2005) are likely to be revealing in studies of population health.

For example, as distinctive ethnic groups have very different residential patterns (Robinson, 1996) and experiences of social class, or social and residential mobility (Blackman, 2006; Smith and Easterlow 2005) they may have different experiences of selective migration evident in differing propensities for migration. This may contribute to observed ethnic differences in health or indeed the further marginalisation or ‘residualisation’ of certain ethnic groups in less advantaged circumstances. Thus, health may be influenced by but also influence social and geographic (im-) mobility. This therefore links contextual and compositional influences on health through the changing experience of place and social status, each widely recognised as important determinants of health.

Whilst some have sought to elucidate the importance of accounting for the interaction between migration, health and social class (Malmusi *et al*., 2010), there has been little attempt to consider how propensity for social and residential mobility is influenced by health, or how these inter-dependent mobility processes simultaneously influence health by ethnic group. Herein lies the intent of this chapter’s analysis. To effectively explore these complex inter-relationships, it is essential to address analytical concerns first raised by Boyle *et al*. (2009) and further explored by Norman and Boyle (2014). Much of the work on selective migration and spatial variations in health produced in the Netherlands tends to find little or no evidence of a strong influence of selective migration (Verheij *et al*., 1998; van Lenthe *et al*., 2007 Martikainen *et al*., 2008; Jongeneel-Grimen *et al*., 2011; Jongeneel-Grimen *et al*., 2013, though see Kibele and Janssen, 2013). This may be because these studies focus on direct comparisons of the health differences between migrants and non-migrants, rather than the differences in health between the migrant flows (i.e. whether people with different health statuses are moving in or out of an area). Although Verheij *et al*. (1998) do investigate the differences between flows and between migrants and non-migrants, others (Jongeneel-Grimen *et al*., 2011; Jongeneel-Grimen *et al*., 2013) do not. If selective sorting influences health gradients, analyses should focus on health differences between mobile groups rather than comparisons between mobile and immobile groups (as pointed out by Boyle *et al.*, 2009 regarding social mobility). Jongeneel-Grimen *et al.* (2013) concluded that health-selection would not enlarge health differences between deprived and non-deprived areas, contrasting with a previously cited study in the UK which found convincing evidence that selective migration did indeed explain widening health inequalities between deprived and non-deprived areas (Norman *et al.*, 2005). The analytical framework and the spatial scale adopted evidently affects the results which emerge. The final section of this discussion will delineate the pathways by which it is argued that selective sorting can influence health gradients guided by an analytical framework which compares the health of mobile groups transitioning between social classes and area types.

7.4.1 Selective sorting and health gradients

The health of groups transitioning between area types or social classes may not be significantly different from the health of either their destination or origin, but this does not preclude any substantive influence on health gradients. As differently health groups transition between areas or social classes, this sorting process may maintain, widen or constrain existing health gradients. Social determinants of health or contextual (place) influences will simultaneously maintain or exacerbate existing health gradients. Thus, those in the best health remain in (or transition between) the most advantaged circumstances whereas those in the poorest health remain in (or transition between) the least advantaged circumstances. The health (dis)advantage of more or less (dis)advantaged circumstances is therefore maintained through transitions between these different circumstances and the subsequent (or prior) health (dis)benefits of those circumstances. This is illustrated in Figure 7.1.

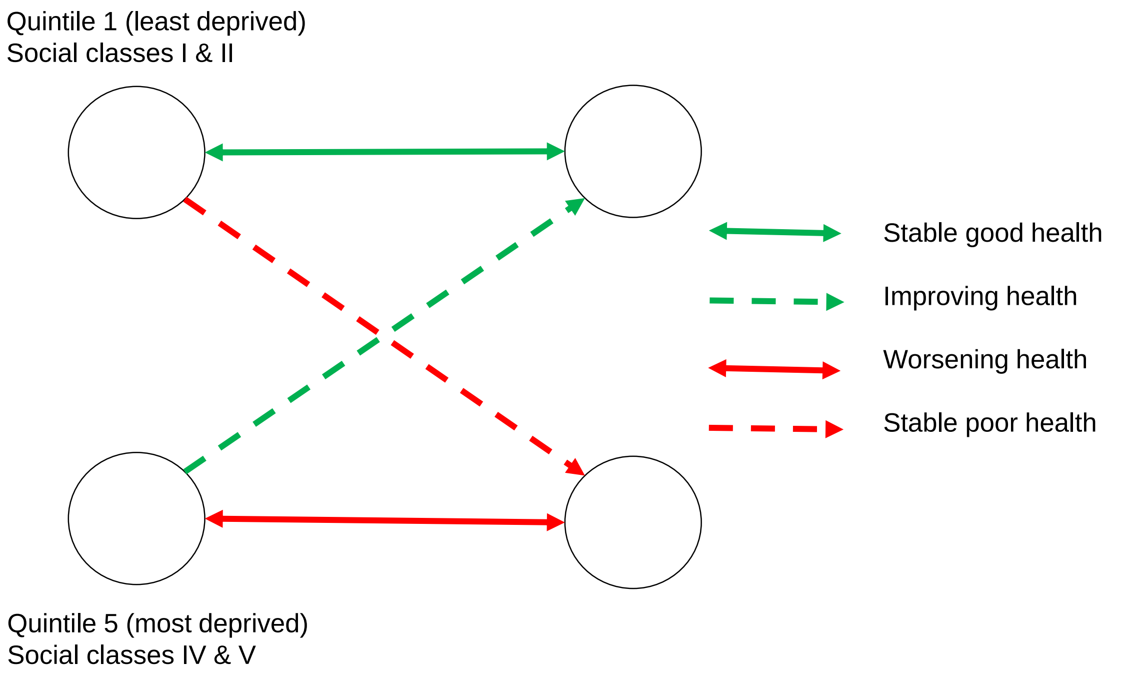


Figure 7.1 Transitions between (dis)advantaged circumstances and health change

It is expected that the best health is afforded to those consistently in the most advantaged circumstances whereas the poorest is for those in the least advantaged. This is denoted by the straight lines between the most and least advantaged circumstances with green indicating good health and red indicating poor health. Worsening health (red dashed lines) is observed for those moving towards more disadvantaged circumstances whereas improving health (green dashed lines) is observed for those moving towards more advantaged circumstances. The dashed lines also denote upward (green) or downward (red) mobility.

Comparing the health of the mobile and immobile groups, as shown in Figure 7.1, will not reveal how transitions of the mobile groups influences overall health gradients. This is key to the critique of extant research into social selection and social mobility made by Boyle *et al.* (2009) and discussed above. As Norman and Boyle (2014) subsequently argue, to identify how transitions between social classes and area types influence changing health gradients, comparisons of health must be made between the transitioning groups as shown in Figure 7.2, rather than the comparisons made in Figure 7.1 above.

In Figure 7.2, the continuous green lines denote groups in the most advantaged circumstances with the best health whereas the continuous red lines denote groups in the least advantaged circumstances with the poorest health. Upward mobility and improving health is denoted by dashed green lines whereas downwards mobility and worsening health is denoted by dashed red lines. In Figure 7.2 it is possible to compare the health of the transitioning groups moving between the most and least advantaged circumstances.

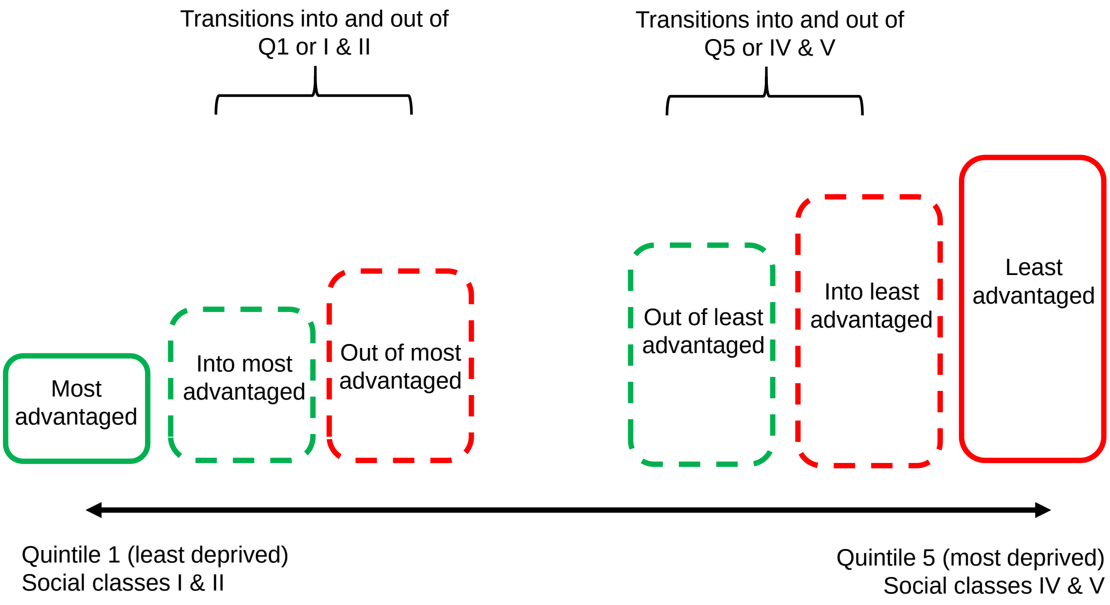


Figure 7.2 How transitions into and out of (dis)advantaged circumstances widen health gradients

For selective sorting to widen health gradients the health of those *entering* the most advantaged circumstances must be *better* than the health of those leaving. Similarly, the health of those *entering* the least advantaged circumstances must be *poorer* than the health of those leaving. This patterning to health is shown in Figure 7.2. For selective sorting to maintain existing health gradients, the health of the downwardly mobile must be better than the health of the upwardly mobile for either those transitioning around the most advantaged circumstances, or for those transitioning around the least advantaged. If the health of the downwardly mobile is consistently better than the health of the upwardly mobile, it is possible that selective sorting narrows rather than widens or maintains existing health gradients.

7.5 Research intent

This chapter will update existing literature on selective migration and social mobility using the latest available census data; rejuvenate the field by holistically investigating the influence of selective sorting by migration, deprivation mobility *and* social mobility collectively on health gradients; and further work in this area by also examining variations by ethnic group. Thus, the research objectives are as follows:

a) Identify if transitions between area types or social classes widen, maintain or narrow health gradients;
b) Establish whether this varies by ethnic group; and finally,
c) Evaluate how migration, deprivation mobility or social mobility contribute to changing overall or ethnic health gradients

7.5.1 Data and Methods

The ONS LS is a 1% sample of the population of England and Wales, linking the decennial census to life event information (such as births or deaths) and cancer registrations (Hattersley and Creeser, 1995) (see chapter 3). The sample for this analysis are a closed sample of LS members' resident in England and present at either the 1991 and 2001 censuses, or the 2001 and 2011 censuses. All sample members with incomplete ethnicity or deprivation data are excluded. International migrants, residents in communal establishments and those in poor health at 1991 (for the 1991-2001 sample) or 2001 (for the 2001-2011 sample) are also excluded: these exclusions ensure comparability with previous LS literature on selective sorting (e.g. Harding, 2003; Boyle *et al*., 2004; Norman *et al*., 2005). As closed samples, it can be assumed that the samples are relatively healthy since all persons present at the start of the decade survive the 10 years.

The variables included in this analysis relate to migrant status, area type, social class, transitions between area types and social classes, health status, and core demographic attributes (age, sex and ethnicity). Where appropriate, these are comparable to those used in the previous analyses in this thesis. However, there are some necessary differences owing to sample sizes. Table 7.1 lists the included variables and their sample sizes. Notably, ethnicity distinguishes between Whites, Blacks, Indians, Pakistani and Bangladeshis, and Other (including Chinese and Mixed). Small sample sizes necessitate the aggregation of Black African and Black Caribbean groups. Although five ethnic groups are identified in Table 7.1, the analysis will focus on the experiences of the South Asian groups in comparison to either the total population, of which Whites are the majority, or the total minority ethnic population. This is appropriate as these

South Asian groups are the only ethnicities (other than Whites) consistently defined in this thesis and are arguably more meaningful than ‘Black’ or ‘Mixed’. Ethnicity is taken as the ethnicity recorded at the end of the study period (i.e. 2001 for 1991-2001 and 2011 for 2001-2011). Although there are some changes between years, with MEGs less stable than the Whites (as discussed in chapter 2, see Simpson *et al.*, 2014), the extent of change is relatively minor. Future work may explore whether changes between ethnic groups may be related to changing socioeconomic status, the socio-political context or even health status.

Migrants, or movers as they are termed in this analysis, are identified according to the LS 10-year migration variable. This enables the identification of movers and stayers during each decade. This contrasts with the identification of migrants in the preceding analysis of cross-sectional census microdata whereby migrants (movers) are identified according to a one-year rather than 10-year migration variable.

Area type is defined by deprivation, measured according to the Carstairs Index (Morris and Carstairs, 1991). Carstairs is a composite measure based on four variables, calculated for each census year. As the Index is calculated at each year, although the score for an area in 1991 may be the same as the score in 2001, this does not necessarily mean there has been no change during that census period. Rather, that there has been no change in that area relative to the level of deprivation in other areas across England. Carstairs is calculated by standardising and then summing the following variables for each ward: the percentage of unemployed male residents aged over 16; the percentage of persons in households with one or more persons per room; the percentage of residents in households with no car; and finally the percentage of residents in households with an economically active head of household in social class IV or V (partly skilled or unskilled) (Boyle *et al.*, 2004: 2462). The scores used are grouped into quintiles with equal numbers of the population for each census year.

The identification of movers and stayers is crucial to this chapter’s holistic analysis of selective sorting whereby transitions between area types and social classes are of interest. Transition categories are therefore identified for *movers* and *stayers* who may transition between deprivation quintiles due to migration or deprivation mobility, but who may also transition between social classes. The transition categories identified are directly comparable to those used in much of the influential literature on selective migration (e.g. Norman *et al.*, 2005; Exeter *et al.*, 2011), and accordingly adapted to assess social class transitions. Importantly, these transition categories will enable comparisons of the health status between mobile groups moving into or out of the extremes of the deprivation spectrum or social class structure.

Table 7.1 Variables included in the analysis

Variables		Description	1991-2001, count (prop (%)) *N* = **343,563**		2001-2011, count (prop (%)) *N* = **321,697**	
Label	Categories		1991	2001	2001	2011
Limiting long-term illness	LLTI	Presence of LLTI at each census		52,618 (15.3%)		42,875 (13.3%)
	No LLTI		343,563 (100%)	290,945 (84.7%)	321,697 (100%)	278,822 (86.7%)
Ethnicity*	White	Derived ethnic group	321,285 (93.5%)		291,418 (90.6%)	
	Black		3,743 (1.1%)		5,014 (1.6%)	
	Indian		7,343 (2.1%)		7,775 (2.4%)	
	P & B		5,155 (1.5%)		7,444 (2.3%)	
	Other		6,037 (1.8%)		10,046 (3.1%)	
Age	-	10 year age groups	-	-	-	-
Social Class	I & II	Registrar General's schema of social class derived from the NS-SeC	68,735 (20.0%)	89,585 (26.1%)	81,516 (25.3%)	94,993 (29.5%)
	IIIN		56,311 (16.4%)	64,199 (18.7%)	55,823 (17.4%)	71,151 (22.1%)
	IIIM		47,708 (13.9%)	54,835 (16.0%)	44,339 (13.8%)	54,232 (16.9%)
	IV & V		49,607 (14.4%)	50,509 (14.7%)	40,288 (12.5%)	21,188 (8.8%)
	Unclassifiable		121,202 (35.3%)	84,435 (24.6%)	99,731 (31.0%)	73,133 (22.7%)
Social mobility	Stable I & II	Social class transitions (excludes unclassifiable)†	48,258 (23.4%)		56,025 (27.6%)	
	IIIN-IIIM to I & II		21,677 (10.5%)		19,749 (9.7%)	
	I & II to IIIN-IIIM		13,797 (6.7%)		20,514 (10.1%)	
	Stable IIIN-IIIN		64,332 (31.2%)		67,271 (33.1%)	
	IV & V to I-IIIM		21,633 (10.5%)		18,338 (9.0%)	
	I-IIIM to IV & V		13,851 (6.7%)		8,400 (4.1%)	
	Stable IV & V		22,763 (11.0%)		12,684 (6.2%)	
Deprivation	Q1 – Least deprived	Deprivation quintiles based on Carstairs Index score at each census	73,536 (21.4%)	76,009 (22.1%)	71,620 (22.3%)	74,418 (23.1%)
	Q2		72,098 (21.0%)	74,675 (21.7%)	68,906 (21.4%)	71,949 (22.4%)
	Q3		69,090 (20.1%)	70,606 (20.6%)	64,587 (20.1%)	65,882 (20.5%)
	Q4		66,104 (19.2%)	64,067 (18.6%)	59,033 (18.4%)	58,869 (18.3%)
	Q5 – Most deprived		62,735 (18.3%)	58,206 (16.9%)	57,551 (17.9%)	50,579 (15.72%)
Deprivation mobility	Stable Q1	Deprivation transitions	43,581 (12.7%)		47,913 (14.9%)	
	Q2-Q4 to Q1		29,882 (8.7%)		24,259 (7.5%)	
	Q1 to Q2-Q4		28,373 (8.3%)		22,352 (6.9%)	

	Stable Q2-Q4		159,976 (46.6%)		154,281 (48.0%)	
	Q5 to Q1-Q4		23,545 (6.9%)		22,313 (6.9%)	
	Q1-Q4 to Q5		19,016 (5.5%)		15,341 (4.8%)	
	Stable Q5		39,190 (11.4%)		35,238 (11.0%)	
Migrant status	Mover	Moved between 1991-2001 or 2001-2011	145,787 (42.4%)	169,878 (49.4%)	132,501 (41.2%)	144,772 (45.0%)
	Stayer		197,776 (57.6%)	173,685 (50.6%)	189,196 (58.8%)	176,925 (55.0%)

Note: *Ethnic categories are self-identified which are subject to change over time, in the analysis all ethnic groups are taken from the end of the census period (i.e. in 2001 for 1991-2001, and 2011 for 2001-2011), P & B = Pakistani and Bangladeshi. † Unclassifiable excluded from social class transitions. In 1991-2001, *n* = 137,252 (39.9%); in 2001-2011, *n* = 118,716 (36.9%).

Source: ONS LS

For deprivation mobility, seven transitions are identified whereby individuals either (1) remain in the least deprived quintile (Q1); (2) move into Q1 from quintiles 2 – 4 (Q2-Q4); (3) move out of Q1 into Q2-Q4; (4) remain in Q2-Q4; (5) move out of the most deprived quintile (Q5) into quintiles 1 – 4 (Q1-Q4); (6) move into Q5 from Q1-Q4; or (7) remain in Q5. Figure 7.3 illustrates these seven transition categories. Social mobility is similarly defined, whereby individuals either (1) remain in the classes I & II; (2) move into I & II from IIIN-IIIM; (3) move out of I & II into IIIN-IIIM; (4) remain in IIIN-IIIM; (5) move out of IV & V into I-IIIM; (6) move into IV & V from I-IIIM; or (7) remain in IV & V. Figure 7.4 illustrates these seven transition categories. Classes I and II, and IV and V are each combined to increase sample sizes. The (unclassifiable) population not assigned to a class are excluded from this analysis.

Standardised illness ratios (SIRs) are calculated for different groups of movers and stayers transitioning between deprivation quintiles and social classes to compare the health of groups transitioning between area types and social classes. These will be calculated for the total population and by ethnic group to explore ethnic variations in the two closed samples: 1991-2001 and 2001-2011. Although comparable literature analyses mobility flows over a 20 rather than 10 year census period (e.g. Boyle *et al*., 2002; Norman *et al*., 2005), a closed sample of LS members from 1991 to 2011 produces insufficient sample sizes of MEGs.

To explore the overall contribution of transitions between area types or social classes to health gradients, a ‘put people back’ approach is adopted (e.g. Brimblecombe *et al*., 1999, 2000; Connolly *et al*., 2007; Norman and Boyle, 2014). SIRs are calculated based on health status at the end of the study period according to class or deprivation at destination and origin. By calculating extremal quotients (EQ) between the top and bottom of the class structure or deprivation spectrum according to origin and destination, it is possible to establish whether transitions between area types or social classes influenced the social- and deprivation-health gradients.

If the ratio is greater when transitions are allowed, selective sorting may widen health gradients. Conversely, if the ratio is greater when no transitions are allowed, selective sorting may constrain health gradients. To explore the extent of the influence of these transitions on health gradients, SIRs are then calculated for each of the transitioning groups (illustrated in Figures 7.3 and 7.4) for movers (migrants) and stayers (non-migrants). This helps establish whether migration attenuates the health-deprivation or health-social class relationship, and is illustrative of the inter-dependency between migration, deprivation mobility and social mobility. To explore variations by ethnicity, SIRs are also calculated by transition category for each ethnic group. An SIR > 100 suggests higher than expected levels of illness whereas an SIR < 100 suggests lower than expected levels of illness. Expected rates are calculated using a standard population of all LS members present in each closed cohort.

<table>
<tr><td colspan="2" rowspan="2">Deprivation mobility</td><td colspan="5">Deprivation quintiles at B</td></tr>
<tr><td>Q1: Least deprived</td><td>Q2</td><td>Q3</td><td>Q4</td><td>Q5: Most deprived</td></tr>
<tr><td rowspan="5">Deprivation quintiles at A</td><td>Q1: Least deprived</td><td>1</td><td colspan="3">3</td><td rowspan="4">6</td></tr>
<tr><td>Q2</td><td rowspan="3">2</td><td colspan="3" rowspan="3">4</td></tr>
<tr><td>Q3</td></tr>
<tr><td>Q4</td></tr>
<tr><td>Q5: Most deprived</td><td colspan="4">5</td><td>7</td></tr>
</table>

Persistently least deprived	Improving deprivation	Stable deprivation	Worsening deprivation	Persistently most deprived

Figure 7.3 Deprivation transition categories

Note: dark lines represent the seven deprivation transition categories; 1 = Stable Q1; 2 = Q2-Q4 to Q1; 3 = Q1 to Q2-Q4; 4 = Stable Q2-Q4; 5 = Q5 to Q1-Q4; 6 = Q1-Q4 to Q5; 7 = Stable Q5
Source: adapted from Exeter *et al*., 2011: 392.

<table>
<tr><th colspan="2" rowspan="2">Social mobility</th><th colspan="4">Social class at B</th></tr>
<tr><th>I & II</th><th>IIIN</th><th>IIIM</th><th>IV & V</th></tr>
<tr><td rowspan="4">Social class at A</td><td>I & II</td><td>1</td><td colspan="2">3</td><td rowspan="3">6</td></tr>
<tr><td>IIIN</td><td rowspan="2">2</td><td colspan="2" rowspan="2">4</td></tr>
<tr><td>IIIM</td></tr>
<tr><td>IV & V</td><td colspan="3">5</td><td>7</td></tr>
</table>

Persistently higher social class	Improving social class	Stable social class	Declining social class	Persistently lower social class

Figure 7.4 Social class transitions

Note: dark lines represent the seven deprivation transition categories; 1 = Stable I & II; 2 = IIIN-IIIM to I & II; 3 = I & II to IIIN-IIIM; 4 = Stable IIIN-IIIM; 5 = IV & V to I-IIIM; 6 = I-IIIM to IV & V; 7 = Stable IV & V

Source: adapted from Exeter *et al*., 2011: 392.

7.6 Results

7.6.1 Transitions between area types and social classes by ethnic group

Table 7.2 summarises counts of movers and stayers by transition category for all-persons, Indians and Pakistani and Bangladeshis between 1991-2001 and 2001-2011. Although counts of movers and stayers for MEGs are very small, this does not necessarily negate the importance of any patterns revealed (emphasised previously in this thesis).

The counts in Table 7.2 are indicative of the disproportionate disadvantage experienced by MEGs compared to the overall population: higher counts are found for all-persons (dominated by the White majority) in categories describing stability or change around the least deprived areas or the top of the social class structure. Conversely, for MEGs such as the Indians or Pakistani and Bangladeshis reported here, the highest counts are found in categories describing stability or change around more disadvantaged circumstances. Notably, more than 50% of Pakistani and Bangladeshi movers and stayers in 1991-2001, and stayers in 2001-2011 consistently remain in the most deprived areas. Indeed more than 65% of Pakistani and Bangladeshi stayers remain in Q5 in both census periods. Overall differences between the two census periods are generally small, although it is worth noting the small increases in the proportion of South Asians remaining in or moving into the least deprived areas. Such favourable improvements are worth highlighting, notwithstanding the persisting ethnic social, spatial and health inequalities observed in this thesis and the wider literature.

The experiences of South Asians according to social class transitions are more aligned with the experiences of the overall population. Whilst Pakistani and Bangladeshis still have notably higher counts and proportions in the lower social classes, the counts for all groups are generally skewed towards transitions around the top two classes. For example, although the stable groups in classes I and II account for about a third of the Indian and total population, far fewer of Pakistani and Bangladeshis are stable in the top two classes. Although social inequalities between ethnic groups are evident according to these transition categories, the magnitude of inequality is not as stark as that for deprivation transitions/stability. Interestingly, movers appear less likely to remain in the bottom classes than stayers, and also slightly less likely to transition between classes I-IIIM to IV & V, indicative of the inter-dependency between social mobility and migration. This is consistent between ethnic groups.

Table 7.2 Counts of movers and stayers by transition category and ethnic group, 1991-2001 and 2001-2011

	1991 – 2001						2001 – 2011					
	Movers			Stayers			Movers			Stayers		
	A	I	P & B	A	I	P & B	A	I	P & B	A	I	P & B
Q1 to Q1	17,291	92	19	26,290	191	60	14,440	106	38	33,473	358	68
Q2-Q4 to Q1	20,934	188	33	8,948	51	19	17,251	258	82	7,008	88	14
Q1 to Q2-Q4	17,252	119	33	11,121	152	35	14,784	104	48	7,568	46	25
Q2-Q4 to Q2-Q4	69,890	814	373	90,086	1,536	579	60,102	849	564	94,179	1,790	948
Q5 to Q1-Q4	18,044	672	342	5,501	142	103	16,645	811	751	5,668	247	218
Q1-Q4 to Q5	12,157	315	233	6,859	486	154	10,279	219	221	5,062	278	173
Q5 to Q5	14,310	754	1,193	24,880	1,831	1,979	11,271	583	1,449	23,967	2,038	2,845
I & II to I & II	25,169	390	117	23,089	456	115	24,716	552	230	31,309	698	218
IIIN-IIIM to I & II	13,368	244	66	8,309	228	84	10,264	79	126	9,485	247	103
I & II to IIIN-IIIM	7,186	96	37	6,611	122	43	9,443	200	117	11,071	283	159
IIIN-IIIM to IIIN-IIIM	30,223	421	140	34,109	614	226	26,065	381	298	41,206	820	406
IV & V to I-IIIM	11,788	169	143	9,845	282	146	8,184	151	223	10,154	255	260
I-IIIM to IV & V	7,042	90	42	6,809	167	57	3,465	68	48	4,935	161	74
IV & V to IV & V	9,214	203	107	13,549	586	180	3,861	121	79	8,823	427	143

Note: A = All-persons, I = Indian, P & B = Pakistani & Bangladeshi
Source: ONS Longitudinal Study

Figure 7.5 illustrates the ‘put people back approach’ first by deprivation and second by social class. The light bars are based on deprivation and class of origin, i.e. sample members are put back to their position of origin whereas the dark bars are based on deprivation and class of destination. Thus, the dark bars ‘allow’ transitions to occur, or people to be ‘sorted’ into different destinations whereas the light bars assume no transitions occur. No distinction is made between movers and stayers. For clarity, the line marking 100 (expected level of LLTI) is emphasised in bold. It should be noted that the SIRs are not comparable between the 1991-2001 and 2001-2011 census periods owing to the different standard populations used.

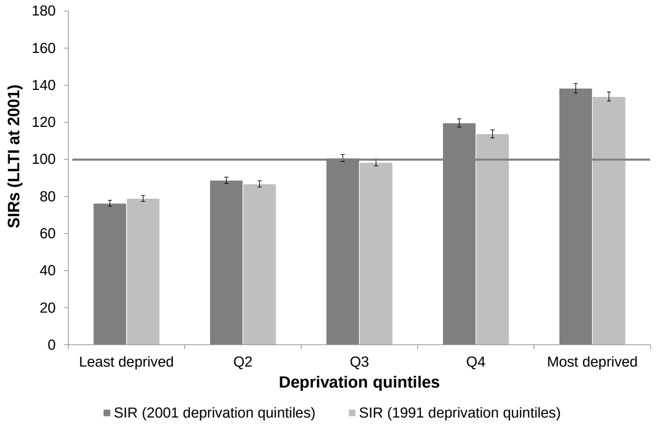
All four plots are illustrative of the graded nature of health, whether spatially by deprivation or socially by social class: SIRs for more deprived areas and lower social classes are significantly higher than SIRs for less deprived areas or higher social classes. Increasing deprivation or declining social class each return successively higher SIRs and therefore increasingly higher levels of LLTI. Differences between deprivation quintiles and social classes are generally significant. Calculating the EQs by deprivation and social class suggests that transitions between area types or social classes may widen health inequalities, evidenced by the higher EQ when transitions occur. These are presented in Table 7.3.

Table 7.3 Extremal Quotients of SIRs by deprivation quintile and social class, 191-2001 and 2001-2011

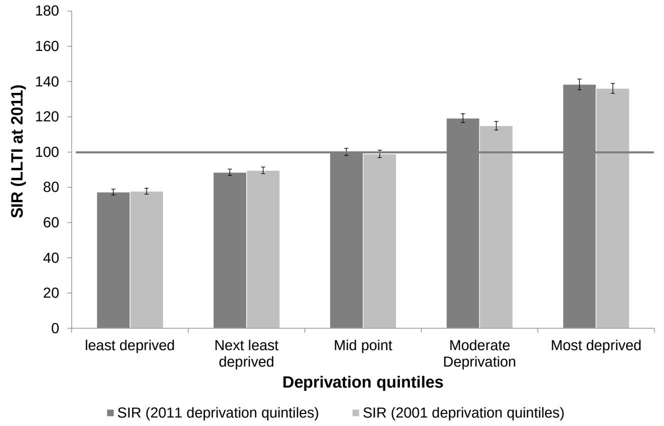
	1991-2001		2001-2011	
	Transitions	No transitions	Transitions	No transitions
Q5: Q1	1.81	1.70	1.79	1.75
IV & V: I & II	1.52	1.50	1.78	1.55

Source: ONS LS

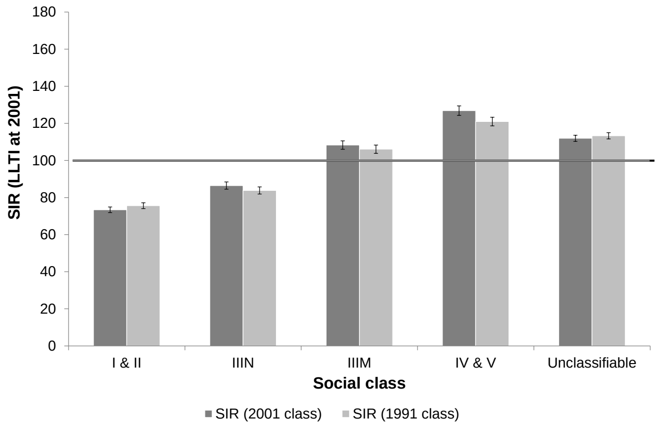
a) 2001 SIRs by deprivation quintile at 2001 and 1991



b) 2011 SIRs by deprivation quintile at 2011 and 2001



c) 2001 SIRs by social class at 2001 and 1991



d) 2011 SIRs by social class at 2011 and 2001

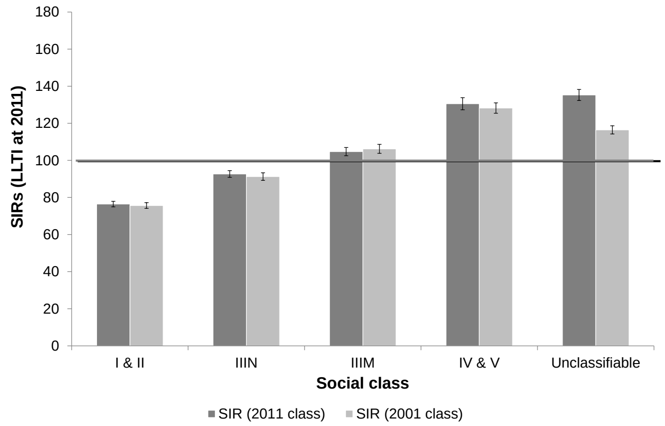


Figure 7.5 SIRs by deprivation quintile and social class, 1991-2001 and 2001-2011

Source: ONS Longitudinal Study

7.6.2 Selective sorting and changing health gradients

7.6.2.1 Selective sorting between area types

Figure 7.6 plots the SIRs by deprivation transition category for movers and stayers between 1991 and 2001, and 2001 and 2011 for the overall population and for MEGs (discussed below). Movers are those who have *changed their address* between 1991 and 2001, or 2001 and 2011 whereas stayers are those who have not changed their address during either census period. Thus, transitions between area types for movers arise because this group has changed address and is now in new area type (although movers can also move within the same area types, e.g. Q1 in 1991 and then Q1 in 2001). Transitions between area types for stayers arise because the area in which they live has changed, rather than because they have changed address.

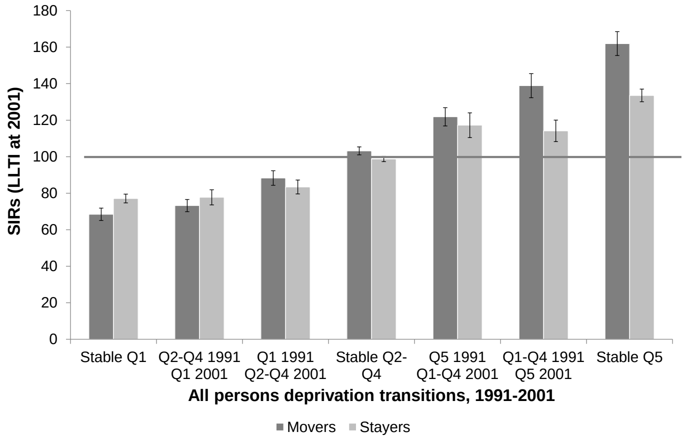
The X axis for each graph should be read as follows (using the 1991-2001 census period as an example). For movers, 'Stable Q1' are those groups who have changed address but still live in the least deprived areas whereas 'Stable Q1' for stayers denotes those groups who do not change address and whose area type is consistently classified as Q1. 'Q2-Q4 1991 Q1 2001' either refers to movers who have changed address and also moved from an area in Q2, Q3 or Q4 into Q1, or to stayers whose area has become less deprived. 'Q1 1991 Q2-Q4 2001' conversely refers to movers whose change of address was associated with increasing deprivation or stayers whose area becomes more deprived. As with 'Stable Q1', 'Stable Q2-Q4' and 'Stable 5' refers to either movers whose change of address did not affect the type of area in which they live, consistently living in Q2-Q4 or Q5, or to stayers whose area remains similarly deprived over time. Finally, 'Q5 1991 Q1-Q4 2001' denotes movers whose change of address is associated with decreasing deprivation and moving away from the most deprived areas, while 'Q1-Q4 1991 Q5 2001' denotes movers whose change of address is associated with moves to the most deprived areas (Q5). For stayers in these groups, the change in deprivation occurs in the area in which they live and does not arise because these groups have moved.

As observed in Figure 7.5, poor health is positively associated with increasing deprivation. Those remaining in the least deprived areas have the best health whereas those remaining in the most deprived have the poorest health. Differences in health between the most and least deprived areas are significant for stayers and movers. Whilst the health-deprivation gradient is consistent for movers and stayers, it is more pronounced for movers. In 1991-2001, the EQ for movers is 2.36 contrasting with 1.73 for stayers. Similarly, in 2001-2011, the EQ is 2.44 for movers and 1.75 for stayers. This suggests relative differences in health are greater for movers than for stayers. Differences in the health of the transitioning groups between movers and stayers also suggest that nature of selective sorting varies for movers and stayers.

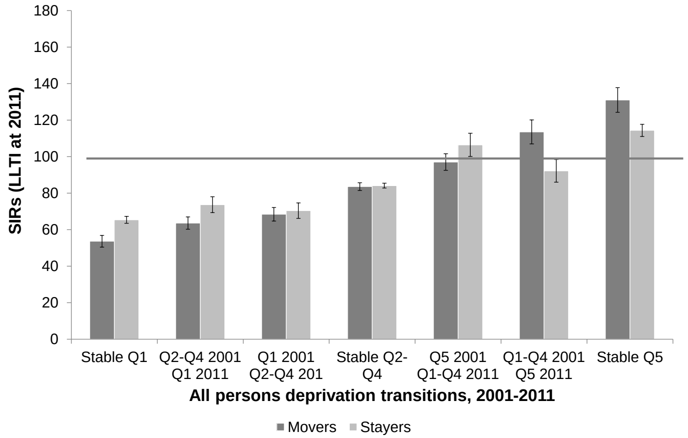
Transitions into successively more deprived circumstances for movers generally return higher (although not always significantly so) SIRs with each downward transition. Movers transitioning into Q1 (from Q2-Q4) have better health than movers transitioning out of Q1 (into Q2-Q4) (differences are significant in 1991-2001). Similarly, movers transitioning into Q5 (from Q1-Q4) have poorer health than movers transitioning out of Q5 (into Q1-Q4) (significant in both study periods). This suggests that movers in better health are more likely to be sorted into less deprived areas whereas movers in poorer health are more likely to be sorted into more deprived areas. Conversely, stayers who become more deprived through deprivation mobility consistently have better health than stayers whose area becomes less deprived in 2001-2011, with stayers whose area changes to Q5 in 1991-2001 being in better health than stayers whose area changes from Q5. It is important to note that, apart from knowing that people were healthy at the start of the decade, it is not possible to tell when they became unhealthy if they did.

Movers at the top of the deprivation scale churning within or transitioning around Q1, generally have better health than stayers experiencing comparable deprivation change although these differences are not always significant. However, movers towards the bottom of the deprivation scale, churning within or transitioning around Q5, have notably poorer health than their stable counterparts experiencing comparable deprivation change. This is further evidence that the health-deprivation relationship appears to be exaggerated for movers compared to stayers.

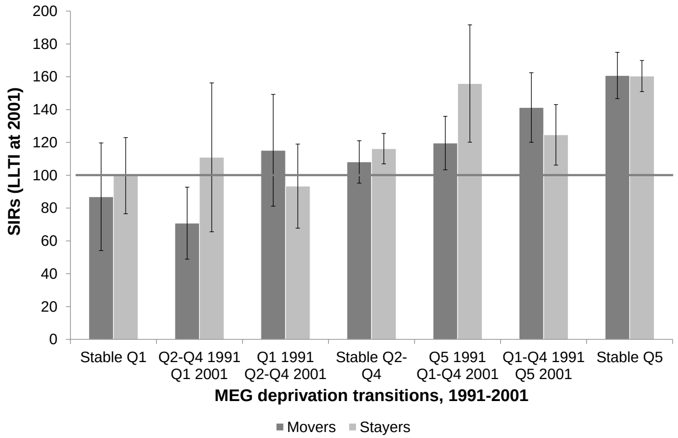
a) SIRs for movers and stayers by deprivation transition, 91-01



b) SIRs for movers and stayers by deprivation transition, 01-11



c) SIRs for MEG movers and stayers by deprivation transition, 91-01



d) SIRs for MEG movers and stayers by deprivation transition, 01-11

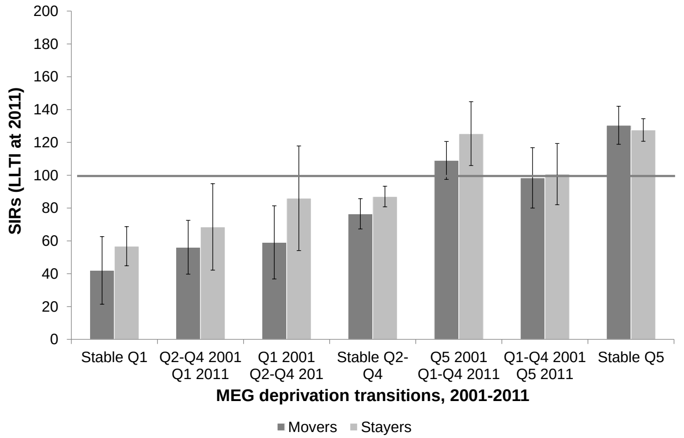


Figure 7.6 SIRs for overall population and Minority Ethnic Group (MEG) movers and stayers by deprivation transition, 1991-2001 and 2001-2011

Source: ONS Longitudinal Study

As poor health increases for moves when moving towards more deprivation, the SIRs suggest that transitions between area types through migration in 1991-2001 and 2001-2011 may contribute to widening health gradients. However, as the health of stayers who become more deprived is better than the health of stayers becoming less deprived, the influence on health gradients varies. In 1991-2001 only the health of stayers transitioning into Q5 (from Q1-Q4) is better than the health of those transitioning out of Q5. Conversely, in 2001-2011 this is also true for stayers who transition out of Q1 (into Q2-Q4). At best, deprivation mobility for stayers in 1991-2001 appears to maintain existing health gradients. However, in 2001-2011 as the health of stayers becoming more deprived is always better than the health of stayers becoming less deprived, it is possible that this may narrow health inequalities. Given a longer period (20 rather than 10 years), the accrual of the (dis)benefits of an area may exert a stronger influence on the health of those who reside there with deprivation mobility widening health gradients as found by Norman *et al*. (2005). Over a 10-year period, the protective influence of a less deprived area may maintain existing health in the short-term should an area become more deprived.

The collective influence of movers and stayers on (changing) health gradients can be evaluated by examining the SIRs for movers and stayers combined, thereby accounting for the inter-relationships between migration *and* deprivation mobility. Table 7.4 summarises the SIRs for movers and stayers combined, demonstrating that selective sorting between area types whether through migration or deprivation mobility appears to contribute to widening health gradients. The SIRs increase with transitions into increasing deprivation (statistically significant SIRs are starred). The best and worst health are consistently observed for those remaining in the least and most deprived areas.

Table 7.4 SIRs by deprivation transition for movers and stayers (collectively) in 1991-2001 and 2001-2011

Deprivation transition	1991-2001 SIR (95% confidence interval)	2001-2011 SIR (95% confidence interval)
Stable / churn within Q1	74.4 (72.5, 76.4)*	62.8 (61.2, 64.5)*
Q2-Q4 into Q1	75.1 (72.5, 77.7)*	67.8 (65.1, 70.4)*
Q1 into Q2-Q4	85.9 (83.1, 88.6)*	69.3 (66.5, 72.1)*
Stable / churn within Q2-Q4	100.2 (90.9, 101.4)	84.0 (82.9, 85.1)*
Q5 into Q1-Q4	120.3 (116.3, 124.3)*	100.5 (96.8, 104.1)
Q1-Q4 into Q5	126.3 (121.9, 130.7)*	103.4 (98.9, 108.0)
Stable / churn within Q5	140.8 (137.7, 143.9)*	118.0 (115.0, 121.0)*

Note: * denotes statistical significance
Source: ONS Longitudinal Study

7.6.2.1.1 Selective sorting between area types by ethnicity

Discussion of ethnic variations will be limited to comparisons between the overall population and the total MEG population, Indians or Pakistani and Bangladeshis. Figure 7.6 also present SIRs by deprivation transition category for movers and stayers between 1991 and 2001, and

2001 and 2011 for MEGs. Although increasing deprivation is associated with increasingly poor health, the health-deprivation gradient by transition category is more erratic for MEGs than for the overall population, particularly in 1991-2001. In 1991-2001, MEG movers have better health when transitioning into Q1 than those remaining in Q1 whilst the inverse is true for stayers. Nevertheless, the health of MEG movers transitioning into Q1 (from Q2-Q4) is better than the health of movers transitioning out of Q1 (into Q2-Q4) with a similar patterning of better health for movers transitioning away from Q5. Conversely in 2001-2011 although the health of MEG movers transitioning around Q1 is similarly patterned, albeit with a smaller difference between the mobile groups, MEG movers transitioning into Q5 (from Q1-Q4) have better health than the reverse flow (Q5 into Q1-Q4). In 2001-2011, the patterning to health for stayers is the same as that for movers, although stayers are generally in poorer health than movers. Differences between the mobile groups are rarely significant or significantly different from the standard population. However, by 2001-2011 MEG movers and stayers consistently in the most or least deprived areas have the poorest and best health (statistically significant), as observed in the overall population. Conversely, whilst levels of poor health for MEG movers and stayers in the most deprived areas are similar to the overall population, MEG movers and stayers in 2001-2011 churning in or transitioning around Q1 have markedly better health than the overall population. This suggests that by 2001-2011, MEGs living in the least deprived areas are not only significantly different from MEGs living in the most deprived areas, but also significantly different from those drawn from the total population living in the least deprived areas.

Similar to the patterns observed in the overall population, the magnitude of inequality in health is greater for MEG movers than for MEG stayers, evidenced by differences in the EQ. Moreover, the magnitude of inequality within MEGs is greater than the magnitude of inequality within the overall population. Discussions of general inequalities should not therefore assume that all MEGs disproportionately suffer disadvantage: some MEGs are not only more advantaged than other MEGs, but also more advantaged than the most advantaged groups in the overall population. EQ’s for all ethnic groups reported in these results are summarised in Table 7.5.

Table 7.5 Extremal quotients for stable deprivation transition categories, 1991-2001 and 2001-2011

Q5: Q1	1991-2001		2001-2011	
	Movers	Stayers	Movers	Stayers
All-persons	2.37	1.73	2.45	1.78
MEGs	1.85	1.61	3.10	2.25
Indians	1.46	1.67	3.95	2.14
Pakistani & Bangladeshi	3.40	1.13	2.81	1.23

Source: ONS Longitudinal Study

The influence of transitions between area types on health gradients is more variable for MEGs than for the overall population. In 1991-2001, MEG movers entering Q1 (from Q2-Q4) are in better health than those leaving Q1 (into Q2-Q4); similarly, movers entering Q5 (from Q1-Q4) are in poorer than health those leaving Q5. Thus, for MEG movers transitions between area types may contribute to widening health gradients in 1991-2001. Conversely, the better health of MEG stayers whose area becomes more deprived compared to those whose area becomes less deprived suggests that for stayers, health gradients are maintained and may even be constrained. In 2001-2011, although MEG movers entering Q1 (from Q2-Q4) have better health than those leaving Q1 (into Q2-Q4), the health of movers leaving Q5 (into Q1-Q4) is *poorer* than the health of those entering Q5 (from Q1-Q4). Transitions between area types for MEG movers in 2001-2011 may therefore maintain rather than widen existing health gradients. The patterning of health for MEG stayers in 2001-2011 is similar to that for movers, although stayers are consistently in poorer health than movers (apart from stayers in the most deprived areas who have marginally better health than movers).

The contrasting influence of selective sorting between area types for movers and stayers emphasises the importance of collectively examining migration and deprivation mobility for MEGs (see Table 7.6 below). For transitioning groups in 1991-2001, increasing deprivation is associated with increasingly poor health (higher SIRs). Thus, selective sorting between area types appears to contribute to widening health gradients, driven by the health of migrants rather than groups experiencing deprivation mobility (as shown above). Conversely, overall health gradients for the total MEG population are at most maintained through transitions between area types in 2001-2011.

Table 7.6 SIRs by deprivation transition for MEG movers and stayers (collectively) in 1991-2001 and 2001-2011

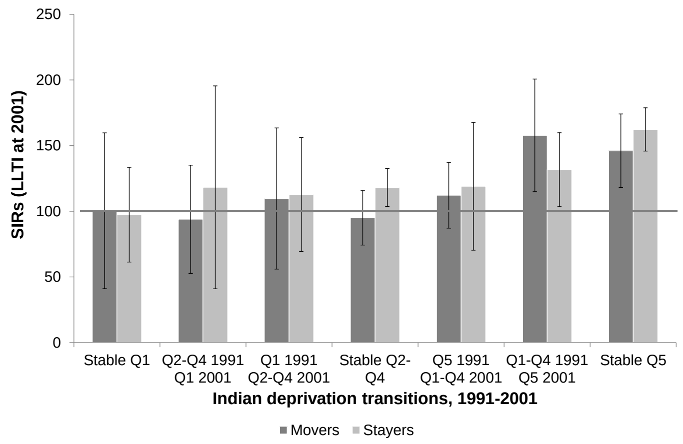
Deprivation transition	1991-2001 SIR (95% confidence interval)	2001-2011 SIR (95% confidence interval)
Stable / churn within Q1	95.9 (76.9, 114.8)	53.8 (43.4, 54.2)*
Q2-Q4 into Q1	81.6 (61.4, 101.7)	60.1 (46.1, 74.1)*
Q1 into Q2-Q4	102.3 (81.8, 122.9)	70.3 (51.7, 88.8)*
Stable / churn within Q2-Q4	113.6 (106.0, 121.1)*	84.0 (78.8, 89.2)*
Q5 into Q1-Q4	127.3 (112.4, 142.30*	113.7 (103.8, 123.7)*
Q1-Q4 into Q5	132.3 (112.4, 146.2)*	99.6 (86.5, 112.7)
Stable / churn within Q5	160.5 (152.7, 168.4)*	128.3 (122.4, 134.3)*

Note: * denotes statistical significance
Source: ONS Longitudinal study

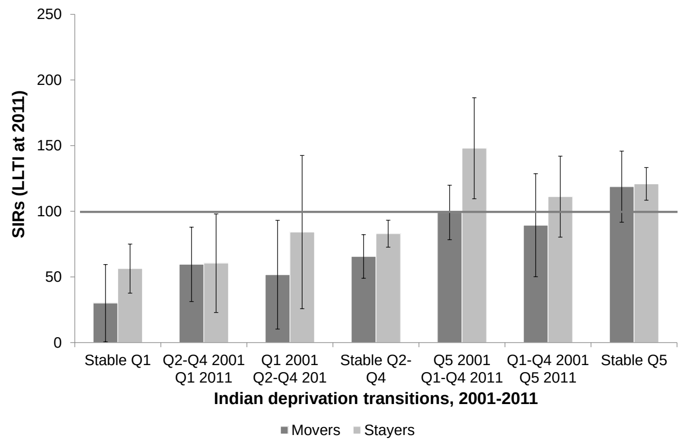
Figure 7.7 presents SIRs by deprivation transition category for Indian and Pakistani and Bangladeshi movers and stayers in 1991-2001 and 2001-2011. For both South Asian groups, the patterns observed in 1991-2001 are more erratic than those in 2001-2011. Notwithstanding the erratic patterning in 1991-2001, there is a strong health-deprivation gradient apparent for both groups, similar to the patterns observed for MEGs and the overall population. Whilst the steepness or magnitude of the relationship varies, increasing deprivation is generally associated with increasingly poor health. However, neither Indians or Pakistani and Bangladeshis necessarily experience the best or worst health when consistently in the least or most deprived areas. For example, Indian movers transitioning into Q1 (from Q2-Q4) experience the best health in 1991-2001 (similar to MEG movers in 1991-2001) with the poorest heath for movers transitioning into Q5 (from Q1-Q4). Conversely, for Pakistani and Bangladeshi movers the best and worst health *is* experienced by those churning within the least and most deprived areas. However, the confidence intervals are very wide for those in Q1, narrowing with increasing deprivation. This reflects the larger proportions of Pakistani and Bangladeshis in more deprived areas. For Indian stayers in 1991-2001, the health-deprivation gradient is similar to that observed for the overall population with increasing deprivation associated with increasingly poor health. However, the gradient for Pakistani and Bangladeshi stayers in 1991-2001 is much more erratic, with the best health for those stayers whose area changes from Q1 (into Q2-Q4) and the worse health for stayers whose area changes from Q5 (into Q1-Q4). For both South Asian groups, the deprivation gradient is more pronounced by 2001-2011.

Notably, Pakistani and Bangladeshi movers *and* stayers remaining in or transitioning around the most deprived areas consistently have significantly higher than expected levels of illness. In contrast, the health of Indian movers churning within Q1 is notably better than any other groups in comparable circumstances: this group of mobile advantaged Indians are significantly different from less advantaged Indians and the overall population. Indeed the relative inequalities in health within Indian movers are the highest observed in 2001-2011 (3.95) with a similarly high degree of inequality for Indian stayers (2.14). Despite the more erratic patterns observed for Pakistani and Bangladeshis, movers changing area types exaggerates the health-deprivation relationship, leading to greater relative inequalities between the most and least deprived areas for movers compared to stayers. For example, in 2001-2011, the EQ for Pakistani and Bangladeshi movers is 2.81 compared with 1.23 for stayers. These are summarised in Table 7.5.

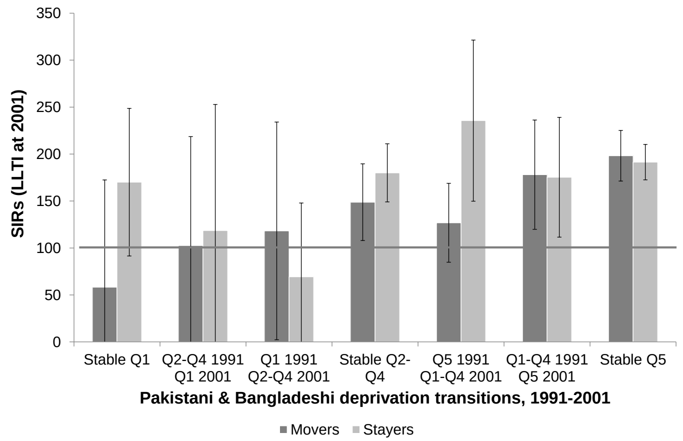
a) SIRs for I movers and stayers by deprivation transition, 91-10



b) SIRs for I movers and stayers by deprivation transition, 01-11



c) SIRs for P&B movers and stayers by deprivation transition, 91-01



d) SIRs for P&B movers and stayers by deprivation transition, 01-11

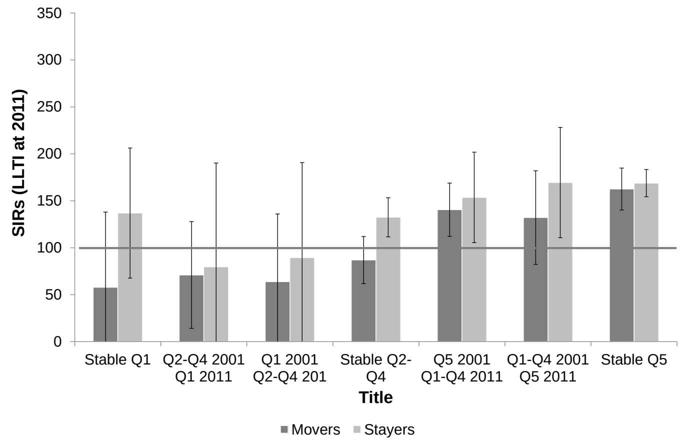


Figure 7.7 SIRs for Indian (I) and Pakistani and Bangladeshi (P&B) movers and stayers by deprivation transition, 1991-2001 and 2001-2011

Source: ONS Longitudinal Study

So how does selective sorting influence health gradients for Indians or Pakistani and Bangladeshis? Whilst Indian movers may widen health gradients in 1991-2001, movers becoming more deprived in 2001-2011 have better health than movers becoming less deprived. This may contribute to narrowing health gradients. Pakistani and Bangladeshi movers in 2001-2011 similarly may narrow health gradients while maintaining existing gradients in 1991-2001. For Indian stayers in 1991-2001, as the health of those entering Q5 is poorer than the health of those leaving Q5, with marginal differences for stayers transitioning around Q1, it is likely that deprivation mobility maintains rather than widens health gradients. Similarly, in 2001-2011 deprivation mobility likely maintains rather than widens health gradients for Indian stayers, although differences between Indian stayers transitioning around Q1 are greater than observed in 1991-2001. For Pakistani and Bangladeshi stayers, gradients could be narrowed in 1991-2001 given the better health of groups whose area becomes more deprived compared to those whose becomes less deprived, yet widened in 2001-2011. However, it is important to note that where the distribution of poor health across transitioning groups suggests that transitions can widen or narrow health gradients, the smaller migrant flows in question, particularly for Pakistani and Bangladeshis, may limit the magnitude of the effect.

Table 7.7 summarises the SIRs for collective movers and stayers for the South Asian groups, important given the smaller proportions of migrants amongst these groups. In 1991-2001, transitions between area types appear to contribute to widening health gradients for Indians whilst maintaining existing Pakistani and Bangladeshi health gradients. Conversely, Indian health gradients may be maintained by transitions in 2001-2011 while Pakistani and Bangladeshi gradients may widen.

Table 7.7 SIRs by deprivation transition for Indians and Pakistani and Bangladeshis, movers and stayers (collectively) in 1991-2001 and 2001-2011

	Indians		Pakistani and Bangladeshis	
Deprivation transition	1991-2001 SIR (95% CI)	2001-2011 SIR (95% CI)	1991-2001 SIR (95% CI)	2001-2011 SIR (95% CI)
Stable / churn within Q1	98.2 (67.39, 129.05)	51.7 (35.5, 68.0)*	154.5 (85.0, 224.0)	118.0 (61.9, 174.0)
Q2-Q4 into Q1	100.3 (63.8, 136.9)	59.9 (37.3, 82.5)*	110.0 (22.0, 198.0)	73.0 (22.4, 123.7)
Q1 into Q2-Q4	111.6 (77.8, 145.3)	66.3 (31.6, 101.1)	90.8 (23.5, 158.1)	74.5 (14.9, 134.1)
Stable / churn within Q2-Q4	111.6 (99.8, 123.5)	78.9 (70.2, 87.8)*	170.0 (145.2, 194.7)*	118.4 (102.0, 134.7)*
Q5 into Q1-Q4	113.7 (91.4, 136.0)	113.9 (95.4, 132.4)	160.4 (121.1, 199.7)*	144.1 (119.6, 168.6)*
Q1-Q4 into Q5	140.6 (117.0, 164.1)*	104.0 (79.6, 128.3)	176.9 (133.9, 219.9)*	150.1 (111.8, 188.4)*
Stable / churn within Q5	158.5 (144.2, 172.7)*	120.5 (109.2, 131.8)*	193.7 (178.3, 209.2)*	167.0 (154.9, 179.2)*

Note: * SIRs denote statistical significance (95% confidence interval (CI))
Source: ONS Longitudinal Study

7.6.2.2 Selective sorting between social classes

Figure 7.8 plots SIRs for movers and stayers by social class transition category in 1991-2001 and 2001-2011 for the overall population (and MEGs discussed below). The socially graded nature of health is clearly illustrated: SIRs increase with decreasing social class (or transitions into successively lower social classes). Further, the lowest SIRs are found for those who remain at the top of the class structure (classes I and II) while the highest are found for those who remain at the bottom (classes IV and V). The gradient is more pronounced for movers than for stayers, although differences between the extremes of the class structure are consistently significant for movers and stayers. This illustrates the inter-relationship between social mobility and migration, while further demonstrating that migration can exaggerate health gradients.

Health differences between movers and stayers by social class transition are similar to those observed by deprivation transition. Movers towards the top of the class structure are in better health than their stable counterparts, evident in the lower SIRs. Conversely, movers around the bottom of the class structure have poorer health. Moreover, the magnitude of inequality between the top and bottom of the class structure is greater for movers than stayers. EQs for the differences in health between the top and bottom of the class structure for movers and stayers are summarised in Table 7.8. For ease of comparison, this table also includes the EQs for the MEGs discussed below.

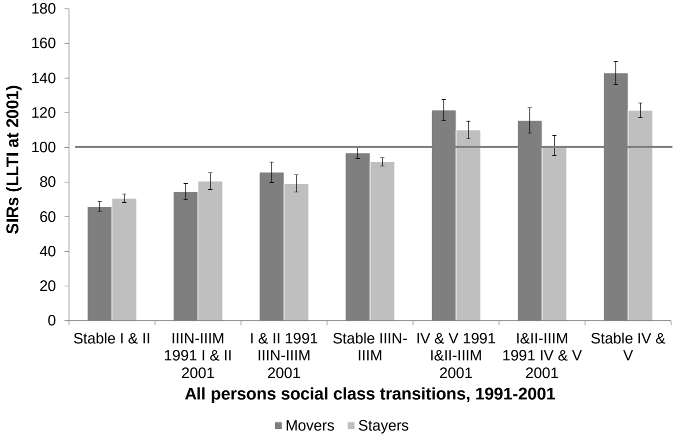
Table 7.8 Extremal quotients for stable social class transition categories, 1991-2001 and 2001-2011

I & II: IV & V	1991-2001		2001-2011	
	Movers	Stayers	Movers	Stayers
All-persons	2.17	1.72	2.47	1.80
MEGs	2.14	2.10	3.63	2.41
Indian	2.28	2.36	6.42	2.67
Pakistani & Bangladeshi	1.93	1.92	2.03	2.01

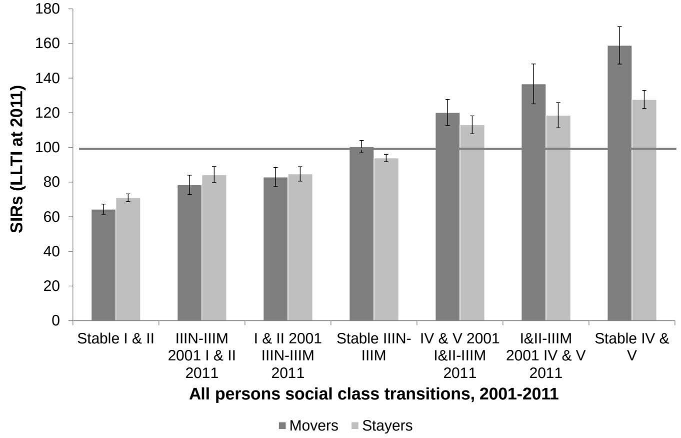
Source: ONS Longitudinal Study

The health-advantage of higher social classes and lower levels of deprivation appears to be more marked for movers than stayers. Similarly, movers appear to experience a heightened health-disadvantage when in lower classes or increased deprivation. In 1991-2001, social mobility for movers and stayers does not appear to widen health gradients. For movers, transitions between social classes at most appear to maintain existing health gradients. However, for socially mobile stayers, it is possible that health gradients may be constrained: the health of those entering classes I and II is poorer, albeit only marginally so, than the health of those leaving. Similarly, the health of those entering classes IV and V is better than the health of those leaving. However, in 2001-2011, successive increases in the SIRs with each transition into lower social classes for both movers and stayers is suggestive of a widening influence on health gradients.

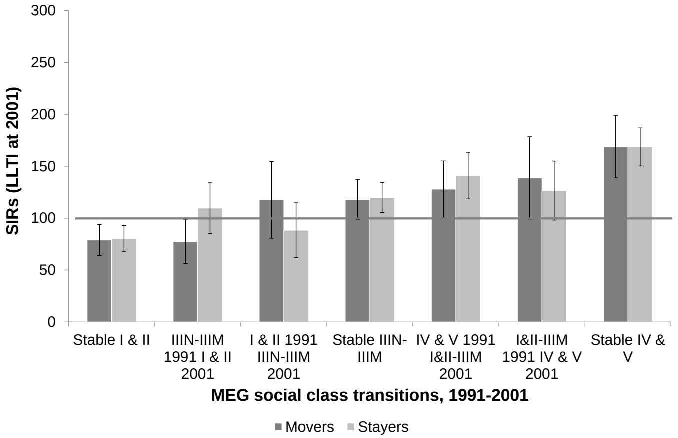
a) SIRs for movers and stayers by social class transition, 91-10



b) SIRs for movers and stayers by social class transition, 01-11



c) SIRs for MEG movers and stayers by social class transition, 91-01



d) SIRs for MEG movers and stayers by social class transition, 01-11

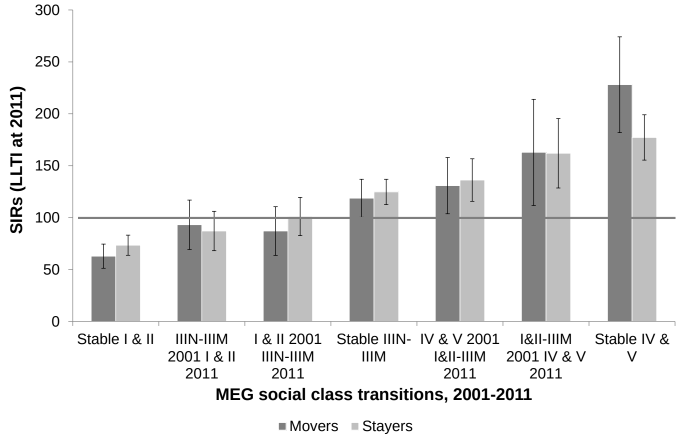


Figure 7.8 SIRs for overall population and Minority Ethnic Group (MEG) movers and stayers by social class transition, 1991-2001 and 2001-2011

Source: ONS Longitudinal Study

Although differences between mobile groups are often only marginal, these differences need only be apparent and not necessarily substantially different (and therefore significant) to exert an influence on health gradients, as noted by Boyle *et al*. (2009). The SIRs for collective movers and stayers experiencing social mobility also suggest that social mobility maintains health gradients in 1991-2001 but contribute to widening gradients in 2001-2011. These are summarised in Table 7.9 alongside the SIRs for MEGs, Indians and Pakistani and Bangladeshis. Statistically significant results are starred. As one of the principle concerns in this analysis is the influence of social mobility on health gradients, the overall contribution of social mobility for movers and stayers for each ethnic group will first be assessed. The extent to which migration attenuates these patterns will then be explored.

7.6.2.2.1 Selective sorting between social classes by ethnicity

Firstly, although the social gradient to health is consistent across ethnic groups, the magnitude of the influence varies. This is similar to the patterns observed by deprivation and substantiates arguments that ethnic inequalities in health are rooted in socioeconomic and spatial inequalities rather than by virtue of minority ethnic status. However, the distributions of SIRs indicating higher than expected levels of illness do vary. MEGs in 1991-2001 and 2001-2011 all have significantly higher than expected levels of illness in classes IIIN-IIIM and when transitioning around or remaining in classes IV and V. Only MEGs who remain in the top two classes (I and II) have significantly lower than expected levels of illness. Conversely, a bleaker picture is painted for Pakistani and Bangladeshis who, regardless of transition category, all have higher than expected levels of illness. The SIRs are significant for those who remain in classes IIIN-IIIM, and all transitions or stable periods in lower classes. In 1991-2001, Indians also exhibit very poor health with higher than expected levels of illness across all transitions apart from those who remain in classes I and II. This advantaged group of Indians have significantly lower than expected levels of illness. In 2001-2011, although Indians transitioning around classes I and II also have lower than expected levels of illness, the SIRs are not significant. As would be expected given the smaller sample sizes involved for minority groups towards the top of the class structure, the confidence intervals are wider at the top and less likely to be significant.

Table 7.9 SIRs for combined movers and stayers by social class transition category, 1991-2001 and 2001-2011

	1991-2001 SIR				2001-2011 SIR			
	All	MEG	I	P & B	All	MEG	I	P & B
Stable I & II	68.61*	79.75*	74.53*	111.90	68.77*	69.50*	61.37*	105.60
Changed to I & II (IIIN-IIIM)	77.54*	94.04	115.46	118.42	81.98*	89.58	87.19	130.94
Changed from I & II (IIIN-IIIM)	82.03*	100.16	102.79	120.25	84.06*	96.25	95.50	101.02
Stable IIIN-IIIM	93.57*	119.16*	115.72	167.75*	95.73*	122.97*	120.67*	180.06*
Changed from IV & V (I-IIIM)	115.09*	135.92*	146.98*	206.67*	115.44*	134.31*	129.73	163.81*
Changed to IV & V (I-IIIM)	107.25*	130.93*	111.76	200.40*	124.30*	162.26*	183.50*	180.23*
Stable IV & V	128.39*	168.62*	174.69*	216.58*	134.58*	188.62*	202.60*	211.14*

Note: * denotes statistically significant results; All = all-persons; MEG = minority ethnic groups; I = Indians; P & B = Pakistanis and Bangladeshis
Source: ONS Longitudinal Study

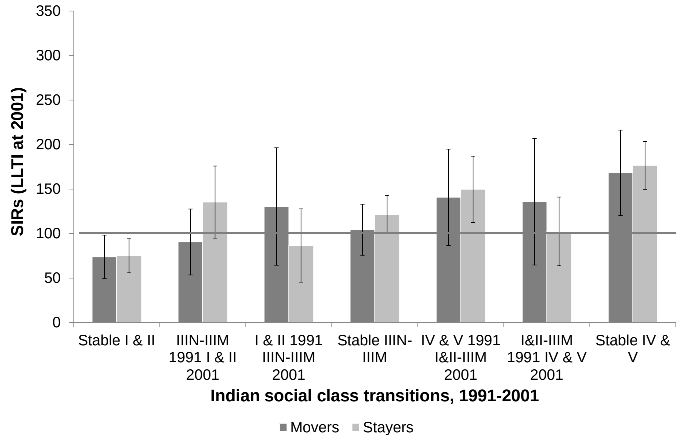
The influence of social mobility on health gradients varies between ethnic groups, as also observed with respect of deprivation mobility and migration. The social mobility of MEGs appears to maintain existing health gradients in 1991-2001, and widen health gradients in 2001-2011. For Indians, it is possible that social mobility constrains health gradients in 1991-2001. However, in 2001-2011 social mobility for Indians appears to widen health gradients. Conversely, social mobility for Pakistani and Bangladeshis in 1991-2001 and 2001-2011 appears to maintain existing health gradients for these ethnic groups. To explore whether these patterns are attenuated by the migration of different ethnic groups, the following section will separately explore the influence of social mobility on health gradients for movers and stayers in 1991-2001 and 2001-2011.

SIRs for the transitioning MEGs are presented alongside the SIRs for social class transitions in the overall population presented in Figure 7.8. In 1991-2001, movers experiencing social mobility appear to contribute to widening health gradients whereas socially mobile stayers may narrow these health gradients. The gradients may narrow as the health of those moving into lower social classes is better health than those entering higher social classes. However, in 2001-2011 MEG socially mobile movers appear to maintain rather than widen health gradients. This contrasts with the apparent widening influence of socially mobile stayers. Thus, these data suggest that the social mobility of MEG movers at 1991-2001, and MEG stayers in 2001-2011 both contribute to widening health gradients. Conversely, for stayers at 1991-2001 and movers at 2001-2011, transitions between social classes appears to maintain existing health gradients. Whilst there are differences in the apparent influence of social mobility on health gradients between movers and stayers, the health-advantage of belonging to higher social classes is still evident. Further, as observed by deprivation, the degree of inequality between those at the top and bottom of the class structure is greater for movers than for stayers (see Table 7.8). Further, movers at the top of the class structure have better health than stayers, contrasting with poorer health for those at the bottom compared to stayers.

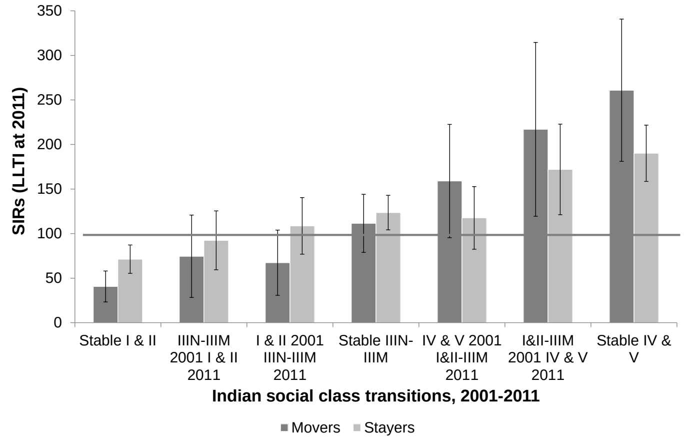
Figure 7.9 plots SIRs by social class transition for Indian and Pakistani and Bangladeshi movers and stayers in 1991-2001 and 2001-2011. The most striking feature of these graphs is the difference in health between movers at the top and bottom of the class structure for Indians: with EQs of 6.42 in 2001-2011 this is the highest degree of inequality observed for any group. The extent of social inequality in health within Indian groups is similar to the levels observed by deprivation (see Table 7.5), although the social inequality is markedly higher. Further, the SIR for Indian movers in 2001-2011 who remain in the top classes is the lowest observed for any group, similar to the lowest SIR observed for Indian movers who churn within the least deprived areas in the same study period. According to the health status of the transitioning groups in 1991-2001, socially mobile Indian movers likely maintain existing health gradients amongst movers, while socially mobile Indian stayers have the potential to narrow health inequalities. Conversely, while socially mobile Indian movers may also maintain existing health gradients in 2001-2011, stayers who are socially mobile may contirubte to widening health gradients.. The gradient is much more pronounced in 2001-2011 than in 1991-2001, with a greater degree of inequality amongst movers than stayers.

The health (dis)advantage of different social classes is similarly evident for Pakistani and Bangladeshis whereby declining social status, indicated by lower social classes, are associated with increasing SIRs. Yet the poorer health of this ethnic group compared to the Indians, MEGs and overall population, is demonstrated by the higher SIRs. In 1991-2001 and 2001-2011, it seems likely that the social mobility of movers and stayers for Pakistani and Bangladeshis maintains existing differences in health rather than contributes to widening health gradients. Differences in health between movers and stayers in comparable transitions are also notably smaller for this ethnic group. Movers towards the top of the social class structure (and deprivation spectrum) are generally in better health than stayers in the same circumstances, whereas movers towards the bottom are more often in poorer health than stayers in the overall population and amongst Indians (and MEGs to some extent). However, no such pattern is observed for Pakistani and Bangladeshis by social class, although the SIRs for transitions by deprivation are more suggestive of this patterning to health between movers and stayers across the deprivation spectrum (see Figure 7.7).

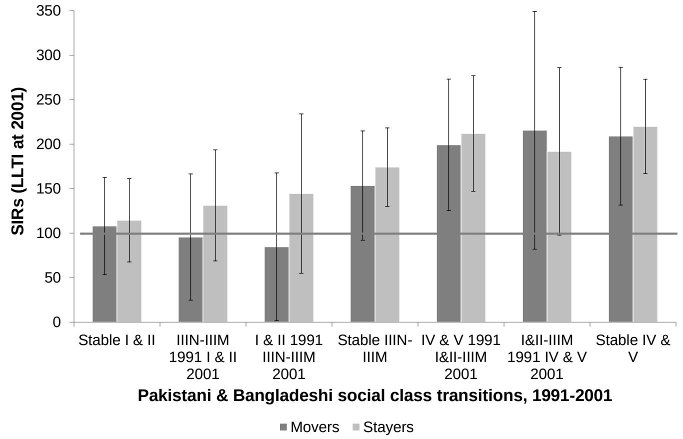
a) SIRs for I movers and stayers by social class transition, 91-10



b) SIRs for I movers and stayers by social class, 01-11



c) SIRs for P&B movers and stayers by social class transition, 91-01



d) SIRs for P&B movers and stayers by social class transition, 01-11

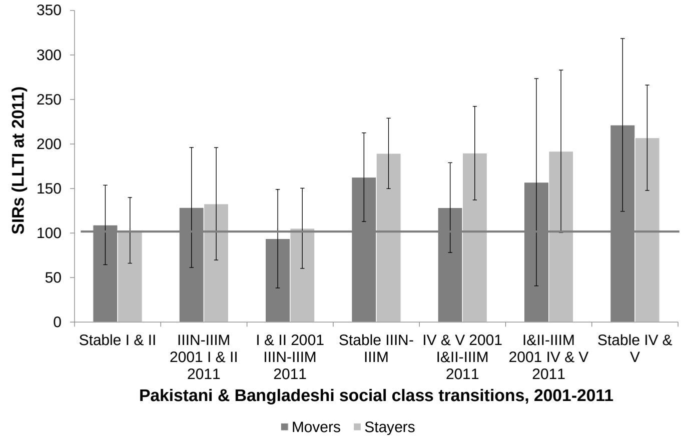


Figure 7.9 SIRs for Indian (I) and Pakistani and Bangladeshi (P&B) movers and stayers by social class transition, 1991-2001 and 2001-2011

Source: ONS Longitudinal Study

7.7 Discussion

The principal finding of this chapter's analysis is that selective sorting between area types and social classes a) can contribute to widening health gradients and b) varies between ethnic groups. However, there are two issues which must be considered before discussing the implications of these results, alongside the evidence drawn from the HSE and SARs, in the final chapter of this thesis.

Firstly, selective sorting's influence on health gradients has only been explored in terms of the transitions into or out of the extremes of the deprivation spectrum or social class structure. Whilst inequalities between the most and least deprived areas, or the top and bottom social classes, are a matter of social and political concern, they do not account for the majority of the population. A related issue is the exclusion of 'unclassifiable' groups from the analysis of social mobility, a category which accounts for a sizeable proportion of MEGs. The conclusions of this research, and wider literature on selective sorting's contribution to changing health gradients would be strengthened by accounting for transitions across the entire population and also including groups not assigned to a class.

Secondly, it has been found that propensity to migrate may vary between ethnic groups, not least owing to their contrasting composition in respect of migrant characteristics. However, such variation may also arise from their varying geography and indeed a varying inclination to migrate at different ages. Considering how such variation may influence overall and ethnic-specific changing health gradients is therefore warranted, particularly given the noted neglect of 'immobility' in related research. The final analytical chapter of this thesis will address each of these issues in turn, seeking to strengthen the final discussion of these results while also highlighting future avenues for research.

Chapter 8

The neglected middle, immobility and ethnicity- variations in the nature of selective sorting: evidence (2) from the Office for National Statistics Longitudinal Study, 1991, 2001 and 2011

8.1 Introduction

Evidence from the ONS Longitudinal Study (LS) has demonstrated that selective sorting between area types and social classes *can* contribute to widening health gradients, at most maintaining existing social and spatial inequalities in health. Further, the contribution of selective sorting to health gradients is exaggerated for movers compared to stayers. This is illustrative of the complex relationship between migration and health explored in chapter 5's analysis of the Samples of Anonymised Records (SARs). To strengthen the findings discussed thus far, this chapter extends the analysis to a) account for relative (and absolute) inequalities in health across the entire population and b) examine different probabilities of *immobility* between ethnic groups and the relationship with health, social class, deprivation and changing social or spatial circumstances. While addressing aspects uncovered in this thesis, this final chapter also addresses wider gaps in the literature on general inequalities in health and discussions of selective sorting's contribution to (changing) health gradients.

Research into health inequalities largely focusses on differences between the top and bottom of the population at the expense of the vast majority of the population. The magnitude of inequality between the best and worst off in society are of political, social and moral importance to the overall population (for example, see Wilkinson and Pickett, 2010). However, this should not come at the expense of researching inequalities for the middle groups or perhaps more importantly, the *entire* population. As the majority of the population are distributed within the middle social classes (II, IIIN and IIIM) or deprivation quintiles (2, 3 and 4), it is important to examine the influence of selective sorting between middle classes and deprivation quintiles. Indeed Heller *et al*. (2002) argue for research and policy interventions considering the whole population when tackling health inequalities, rather than only those aimed at improving the health of the most disadvantaged.

In the literature on selective sorting, immobile groups get little specific coverage. Although this is not without exception (e.g. Boyle *et al*., 2004; Cox *et al.*, 2007; Brown *et al.*, 2012), if differently healthy groups are sorted into different area types or social classes because of their health, what of the groups whose health may serve to maintain their current circumstances? The sorting process is as applicable to these immobile groups as to mobile groups transitioning between area types and social classes. Distinguishing between movers and stayers in the previous chapter's analysis does begin to acknowledge the importance of immobility: however, more work is required, particularly as certain ethnic groups are less likely to migrate (Owen and Green, 1992; Robinson, 1992; Champion, 1996; Stillwell and Duke-Williams, 2005; Finney and Simpson, 2008; Finney, 2011) and may have fewer opportunities for social mobility (CoDE and Cumberland Lodge Policy Workshop, 2013).

Before outlining the analytical framework for this chapter, the following section will explore some of the (limited) literature on immobility in the context of selective sorting which will establish the importance of this analysis. Where appropriate, more detailed discussions of these issues elsewhere in the literature will be signposted.

8.2 Exploring immobility

The selectivity of migration is unequivocal. Migrants are distinguished by their youth, unemployment or employment within professional occupations, single status and privately rented tenancies (Finney and Simpson, 2008). Thus, migrants vary by age, stage in the lifecourse, socioeconomic status and health. But what of those who do not migrate? If migrants are selected according to these characteristics, so too are non-migrants selected according to their antithetical characteristics. Although often overlooked, questions of immobility have begun to emerge in discussions of selective sorting. For example, Cox *et al*. (2007) found that the relationship between deprivation and diabetes has strengthened over time owing to selective *immobilit*y rather than selective migration. Deprivation immobility, where areas are persistently deprived over time, has also been found to be important in respect of health in Scotland: premature mortality significantly increased in areas which are persistently amongst the most deprived (Exeter *et al.*, 2011; Norman *et al*., 2011). Immobility or even the idea of 'residualisation' associated with immobility and deprivation are both suggestive of negative reasons for non-migration. However, non-migration may be viewed more positively, captured in research considering the extent to which people are more (or less) rooted as an explanation for declining rates of migration (e.g. Cooke, 2011).

Given the results of this thesis thus far, it is likely that there is a socioeconomic gradient to the rootedness of differently healthy individuals: while the better off may be ‘rooted’ in less deprived areas regardless of their health, the more disadvantaged are more likely to drift down, sorted away from less deprived areas. It might be anticipated that the socioeconomic gradient to ‘rootedness’, or the likelihood of residualisation, will vary between ethnic groups and by health status given the contrasting socioeconomic and spatial experiences of different ethnic groups documented in chapter 4 and 5.

8.2.1 Revisiting the literature: (im)mobility and health

The association between health and deprivation is well established (Carstairs and Morris, 1989; Carstairs, 1981; Dibben *et al*., 2006; Norman *et al*., 2005). While comparable deprivation between areas does not necessarily equate to comparable health (e.g. consider the notably poorer health of Glasgow compared to similarly deprived parts of Manchester or Liverpool (Walsh *et al.*, 2010)), increasing deprivation generally heralds increasingly poor health. For those ‘sorted’ into more deprived areas, the possible (further) deterioration of their health warrants continued academic attention and consideration in policy development. Of equal importance, however, is the health of those immobile groups who, for various reasons, are not able (or willing) to move away from deprivation. The importance of selective immobility has been established by Boyle *et al*. (2004) who found that immobile residents were positively or negatively influenced by the increasing or decreasing deprivation of the area they lived in over time.

For those in poor health, immobility goes hand-in-hand with residualisation. If those in good health are better able to move away from areas with undesirable characteristics such as increased deprivation or importantly for discussions of health, inadequate health services the remaining immobile groups are the residue of the less enabled groups (see Williams, 1999). Moorin *et al*. (2004) found that unhealthy individuals were less able to migrate away from rural remote areas to the typically urban areas with adequate medical services. In Scotland, Brown and Leyland (2009) argue that concentrating on residualised populations created through selective migration could help reduce widening inequalities in mortality for area-specific causes or premature mortality (Exeter *et al*., 2011). While relocating apparently residualised populations might stretch any local authority or governing body to its limits, targeted area regeneration policies may lead to overall improvements in population health and a reduction in health inequalities. Notwithstanding the harmful effects of deprivation and residualisation, it is possible that residualised populations may be protected by the presence of established social networks and social capital (Jackson *et al*., 2009) or feelings of social integration (Keene *et al*., 2013). However, this does not negate the importance of exploring whether processes of immobility may contribute to the creation of residualised populations and exacerbate existing health gradients, particularly if certain ethnic groups may be more susceptible than others. The distinctive residential patterns of different ethnic groups (Robison, 1996) and their experiences of social class, or social mobility and internal migration (Blackman, 2006) already explored in this thesis emphasises the importance of exploring how immobile different ethnic groups are in the context of selective sorting and health gradients.

Theorising these relationships re-invokes discussions of contextual *and* compositional influences of health through the changing experience of place and social status, each widely recognised as important determinants of health. Given the apparent inter-relationships between (changes in) social class, deprivation and heath, exploring how health, class or deprivation at different time points influences probability of migrating for different ethnic groups may help explain the immobility of different ethnic groups, and illustrate the implications for (changing) health gradients.

8.3 Research Intent

This chapter addresses aspects of this thesis which deserve further consideration. This will strengthen conclusions drawn and highlight areas for future research. Thus, to further the core aims of this thesis this chapter will examine:

a) how selective sorting between area types and social classes influences overall health gradients (rather than focussing on differences between the top and bottom of either the class structure or deprivation scale); and,
b) whether (changes) in health status, social class and area type differently explain ethnic probabilities of immobility.

Although much of the research on health inequalities and indeed selective sorting focusses on differences in health between the best and worst off, this is not without exception. For example, Boyle *et al*. (2009) calculate the Relative Index of Inequality (RII) alongside rate ratios when applying the ‘put people back’ approach used in chapter 7’s analysis. Similar to rate ratios, increases in the value of the RII when comparing the distribution of the health of the population by destination class or area type with the distribution of the population returned to their origin class or area type suggests that these transitions may influence widening health gradients. However, the RII accounts for differences across the whole population rather than only the best and worst off as in the extremal quotients or rate ratios. Notwithstanding the use of the RII by Boyle *et al*. (2009), this measure was not the focus of the analysis and deserves more substantive consideration. Aside from the brief application in this paper, no work has substantively used the RII or its sister measure, the Slope Index of Inequality (SII) in investigations of selective sorting and (changing) health inequalities, although these measures have been used in studies speculating as to the impact of selective sorting through migration on apparent geographic polarisations in life expectancy (Pearce and Dorling, 2006). Both are used in wider literature exploring trends in health inequalities such as socioeconomic disparities in coronary heart disease (Bajekal *et al*., 2013), or more general trends in socioeconomic inequalities in morbidity and mortality in Britain and across Western Europe (Davey Smith *et al*., 2002; Mackenbach *et al*., 1997).

8.3.1 Data and methods

Table 7.1 in chapter 7 lists the variables and sample sizes relevant to the first section of this analysis. As introduced above, the SII and RII will be used to examine the contribution of selective sorting between area types and social classes to changes in health gradients for the total population and by ethnic group in England (see chapter 3). However, rather than summarising how transitions influence differences between the best and worst off, the SII and RII account for changes across the entire population (or ethnic group). Standardised illness ratios (SIRs) will be calculated according to health at the end of the census-period by destination deprivation quintile or social class and origin deprivation quintile or social class. Where the SII or RII increases when mobility is allowed (i.e. health by destination), this suggests that transitions between area types or social classes contributes to widening health gradients, accounting for changes in health for all classes and area types. Conversely, should the value decrease it is assumed transitions may contribute to narrowing health gradients. For sorting to have no discernible effect on health gradients, changes in the value of the SII or RII would be negligible. Both the RII and SII are presented as changes in the absolute levels of inequality in the population do not necessarily correspond with changes in the relative levels of inequality. For example, although the health of the entire population could worsen such that each social class experiences double the levels of limiting long-term illness (LLTI), the doubling of the SII would not alter the size of the RII: absolute differences will have widened whereas relative differences will have remained the same. As a substantial proportion of the minority ethnic groups (MEGs) are excluded from the previous social mobility analyses given the exclusive focus on those who are assigned to a class, the unclassifiable groups are included in the calculation of the SII and RII. The SII and RII will also be used to summarise the degree of health inequality for stable groups in the population who consistently remain in the same social class or deprivation quintile. Recognising the magnitude of health inequality for stable or *immobile* groups is important given that differently healthy (ethnic) groups of different circumstances have different opportunities or propensities for mobility.

The second section of this analysis extends the LS sample used thus far to include those who begin each decade in poor health (Table 8.2).

Table 8.1 Extended sample size for analysis: including those in poor health at the start of the census periods

Variables		Description	1991-2001, count (prop (%))		2001-2011, count (prop (%))	
Label	Categories		1991	2001	2001	2011
Limiting long-term illness	LLTI	Presence of LLTI at each census	30,168 (8.1%)	75,452 (20.2%)	50,746 (13.6%)	78,707 (21.3%)
	No LLTI		343,563 (91.9%)	298,279 (79.8%)	321,697 (86.4%)	293,736 (78.9%)
Ethnicity*	White	Derived ethnic group	349,643 (93.6%)		337,314 (90.6%)	
	Black		4.076 (1.1%)		5,776 (1.6%)	
	Indian		7,937 (2.1%)		9,168 (2.5%)	
	P & B		5,655 (1.5%)		8,818 (2.4%)	
	Other		6,383 (1.7%)		11,367 (3.1%)	
Age	-	10 year age groups	-	-	-	-
Social Class	I & II	Registrar General's schema of social class derived from the NS-SeC	72,450 (19.4%)	93,779 (25.1%)	91.483 (24.6%)	105,990 (28.5%)
	IIIN		59,336 (15.9%)	67,853 (18.2%)	64,234 (17.3%)	81,786 (22.0%)
	IIIM		51,793 (13.9%)	59,386 (15.9%)	53,827 (14.4%)	65,015 (17.5%)
	IV & V		54,666 (14.6%)	55,628 (14.9%)	50,642 (13.6%)	36,588 (9.8%)
	Unclassifiable		135,486 (36.3%)	373,731 (26.0%)	112,257 (30.1%)	83,064 (22.3%)
Social mobility (1)	Stable I & II	Social class transitions (excludes unclassifiable)†	50,395 (23.0%)		62,268 (26.3%)	
	IIIN-IIIM to I & II		22,531 (10.3%)		22,042 (9.3%)	
	I & II to IIIN-IIIM		14,482 (6.6%)		23,263 99.8%)	
	Stable IIIN-IIIN		68,413 (31.3%)		79,691 (33.7%)	
	IV & V to I-IIIM		23,153 (10.6%)		21,644 (9.2%)	
	I-IIIM to IV & V		14,678 (6.7%)		10,480 (4.4%)	
	Stable IV & V		25,125 (11.5%)		17,172 (7.3%)	
Social mobility (2)	Stable I & II	Social class transitions includes unclassifiable	50,395 (13.5%)		62,268 (16.7%)	
	IIIN-IV & V to I & II		29,387 (7.7%)		27,640 (7.4%)	
	I & II to IIIN-IV & V		17,444 (4.7%)		25,690 (6.9%)	
	Stable IIIN—IV & V		121,551 (32.5%)		120,962 (32.5%)	

	Unclassifiable to I-V		57,869 (15.5%)		52,819 (14.2%)	
	I - V to Unclassifiable		19,468 (5.2%)		23,626 (6.3%)	
	Stable Unclassifiable		77,617 (20.8%)		59,438 (16.0%)	
Deprivation	Q1 – Least deprived	Deprivation quintiles based on Carstairs Index score at each census	78,111 (20.9%)	80,332 (21.5%)	79,679 (21.4%)	82,760 (22.2%)
	Q2		77,386 (20.7%)	80,179(21.5%)	78,229 (21.0%)	81,943 (22.0%)
	Q3		74,977 (20.1%)	76,789 (20.6%)	74,755 (20.1%)	76,218 (20.5%)
	Q4		72,738 (19.5%)	70,800 (18.9%)	69,960 (18.8%)	69,946 (18.8%)
	Q5 – Most deprived		70,519 (18.9%)	65,631 (17.6%)	69,820 (18.8%)	61,576 (16.5%)
Deprivation mobility	Stable Q1	Deprivation transitions	46,242 (12.4%)		53,410 (14.3%)	
	Q2-Q4 to Q1		31,418 (8.4%)		26,850 (7.2%)	
	Q1 to Q2-Q4		30,213 (8.1%)		24,813 (6.7%)	
	Stable Q2-Q4		174,468 (46.7%)		179,706 (48.3%)	
	Q5 to Q1-Q4		25,759 (6.9%)		26,088 (7.0%)	
	Q1-Q4 to Q5		20,871 (5.6%)		17,844 (4.8%)	
	Stable Q5		44,760 (22.9%)		43,732 (11.7%)	
Migrant status	Mover	Moved between 1991 and 2001, or 2001 and 2011	180,653 (48.3%)	193,078 (51.7%)	150,881 (40.5%)	160,776 (43.2%)
	Stayer		193,078 (51.7%)	180,653 (48.3%)	221,562 (59.5%)	211,667 (56.8%)

Note: *Ethnic categories are self-identified which are subject to change over time, in the analysis all ethnic groups are taken from the end of the census period (i.e. in 2001 for 1991-2001, and 2011 for 2001-2011), P & B = Pakistani and Bangladeshi. † Unclassifiable excluded from social class transitions. In 1991-2001, *n* = 154,954 (41.5%); in 2001-2011, *n* = 135,883 (36.5%).

Source: ONS Longitudinal Study

The extended sample is used to explore immobility or rootedness. Binary logistic regression models are run to inform calculations of the probability of immobility for different subsets of the population. In modelling the odds of migration, and using these results to calculate probabilities of immobility (probabilities of migrating are calculated and then subtracted from 100 to give probability of immobility), this will reveal how (changing) health, socioeconomic and deprivation circumstances differently explain probability of migration between ethnic groups. These results will be discussed in relation to the previous analysis in this chapter which sheds light on the magnitude of health inequalities for immobile groups. The models are summarised in Table 8.2. All models listed are run for both census periods. Extending the samples to include rather than exclude those who begin the decade in poor health will help reveal whether immobility is more or less likely for different subsets of the population already in poor health.

Table 8.2 Model descriptions: population subgroups sampled and independent variables

Model	Population subgroup	Independent variables
1a	Ill at start (e.g. poor health, 1991) Baseline social class[†]	$\left.\begin{array}{l}\text{Age}\\\text{Sex}\\\text{Ethnicity}\end{array}\right\}$ Demographic variables Origin deprivation quintile
1b	Not ill at start (e.g. good health, 1991) Baseline social class[†]	Demographic variables Origin deprivation quintile
1c	Ill at end (e.g. poor health, 2001) Baseline social class[†]	Demographic variables Origin deprivation quintile
1d	Not ill at end (e.g. good health, 2001) Baseline social class[†]	Demographic variables Origin deprivation quintile
2a	Ill at start (e.g. poor health, 1991) Baseline deprivation[*]	Demographic variables Social mobility (upward, stable/churn, downward)
2b	Not ill at start (e.g. good health, 1991) Baseline deprivation[*]	Demographic variables Social mobility (upward, stable/churn, downward)
2c	Ill at end (e.g. poor health, 2001) Baseline deprivation[*]	Demographic variables Social mobility (upward, stable/churn, downward)
2d	Not ill at end (e.g. good health, 2001) Deprivation mobility[1]	Demographic variables Social mobility (upward, stable/churn, downward)
3a	Ill at start (e.g. poor health, 1991) Deprivation mobility[1]	Demographic variables Origin social class
3b	Not ill at start (e.g. good health, 1991) Deprivation mobility[1]	Demographic variables Origin social class
3c	Ill at end (e.g. poor health, 2001) Deprivation mobility[1]	Demographic variables Origin social class
3d	Not ill at end (e.g. good health, 2001) Deprivation mobility[1]	Demographic variables Origin social class
4a	Ill at start (e.g. poor health, 1991) Deprivation mobility[1]	Demographic variables Social mobility (upward, stable/churn, downward)
4b	Not ill at start (e.g. good health, 1991) Deprivation mobility[1]	Demographic variables Social mobility (upward, stable/churn, downward)
4c	Ill at end (e.g. poor health, 2001) Deprivation mobility[1]	Demographic variables Social mobility (upward, stable/churn, downward)

4d	Not ill at end (e.g. good health, 2001) Deprivation mobility[1]	Demographic variables Social mobility (upward, stable/churn, downward)

Note: † 5 separate models run for each of the social classes (I & II, IIIN, IIIM, IV & V, Unclassifiable); * 5 separate models run for each of the deprivation quintiles (Q1, Q2, Q3, Q4, Q5); [1] 3 separate models run for deprivation mobility (upward, stable/churn, downward).

8.4 Results

8.4.1 Changing overall health gradients: accounting for more than the extremes

The SII and RII are calculated according to three separate scenarios for either the health-deprivation gradient or health-social class gradient. This summarises health inequalities by destination and origin social class or area type, alongside an additional summary for the population who do not change social class or area type during the 10 year period. The steepness of the slope indicates the steepness of the gradient (the SII) whilst the RII indicates the magnitude of relative inequalities in health by deprivation (or social class) (see Schneider *et al*., 2005 for a technical discussion or Public Health Ontario, 2013 for a practical application).

Figure 8.1 plots the regression line for the SIRs by origin deprivation, destination deprivation, and stable deprivation quintiles between 1991-2001 and 2001-2011. It should be noted that when calculating the SIRs by origin and destination deprivation (or class), the entire closed sample are included (i.e. England household residents not in poor health at the start of the study period) whereas the SIRs for stable groups *only* includes sample members whose area type did not change between 1991 and 2001, or 2001 and 2011. The SII is the slope of the regression line. In both 1991-2001 and 2001-2011, absolute differences in health according to the SII increase when transitions between area types are allowed (SIRs by destination deprivation). Where transitions occur (whether through area type change or migration) these will be referred to as deprivation mobility in this chapter, given that it can result in a different deprivation quintile. The SII increases from 69.27 to 78.91 in 1991-2001 and 72.76 to 78.36 in 2001-2011. In 1991-2001, the steepening of the slope is attributable to the worsening health of those in all quintiles apart from the least deprived (Q1) who saw marginal improvements. This suggests that transitions between area types for the overall population, and not just changes around Q1 and Q5, can contribute to widening health gradients. However, the greatest degree of inequality is observed for those groups who consistently remain in the same area type. This is illustrative of the health (dis)advantage of differently deprived areas: the poorest health is for those remaining in the most deprived areas whereas the best health is for those remaining in the least deprived areas. A similar pattern is evident in 2001-2011, although increases in the steepness of the slope after transitions occur are shallower than observed in 1991-2001.

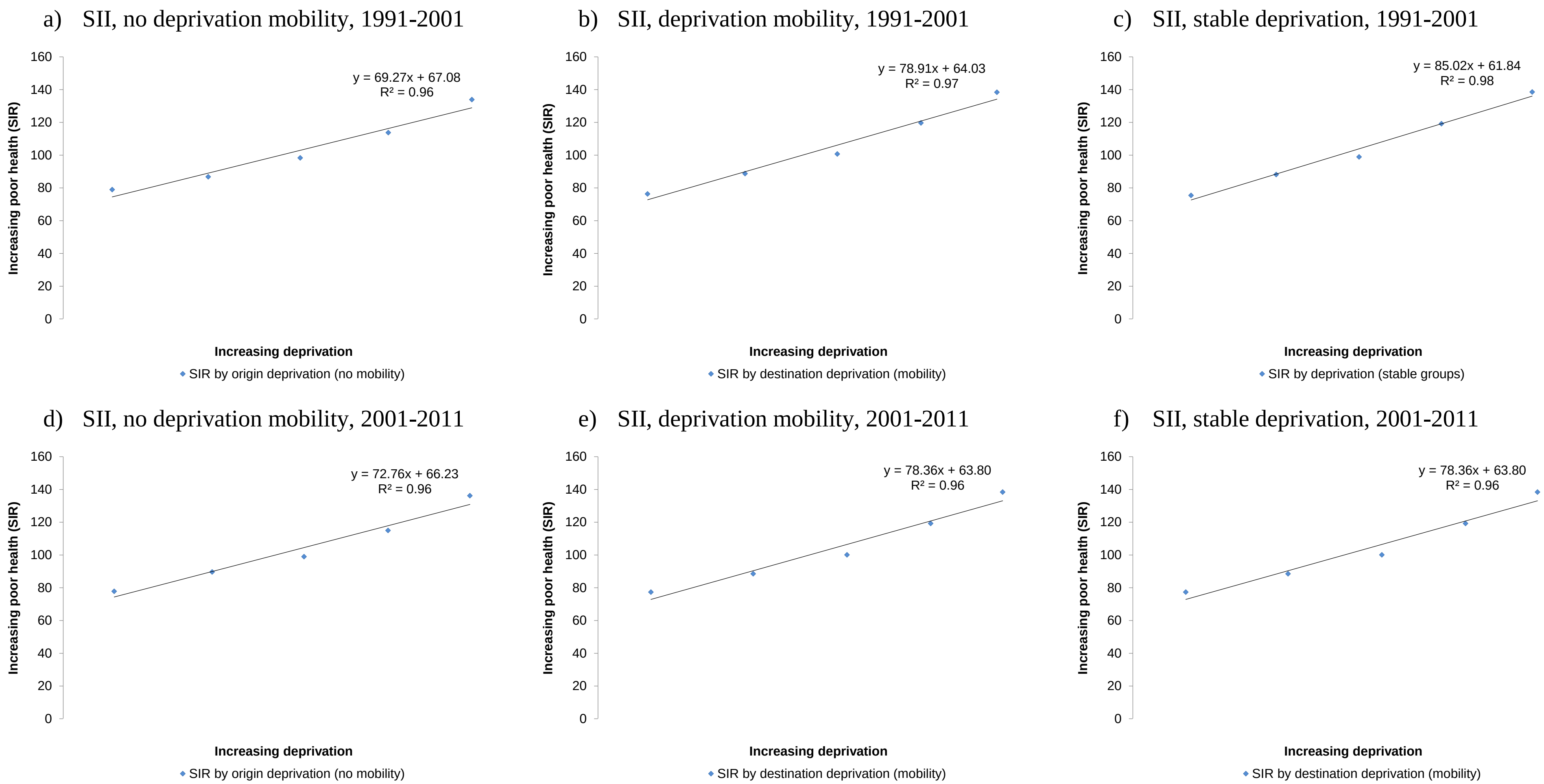


Figure 8.1 Comparing the Slope Index of Inequality (SII) for 1991-2001 and 2001-2011 by: health at origin deprivation (no deprivation mobility); health at destination deprivation (deprivation mobility); health for stable deprivation groups (stable deprivation)

Source: ONS Longitudinal Study

The degree of health inequality between stable groups is markedly higher in 2001-2011 (SII = 91.90) than in 1991-2001 (SII = 85.02). While the SII summarises hypothetical absolute differences in health between the best and worst off in the population, the RII summarises hypothetical relative differences. Table 8.3 summarises the RII in 1991-2001 and 2001-2011 for the three scenarios plotted above. Similar to the results obtained via the SII, when deprivation mobility is allowed relative differences in health increase. This is evident in the increasing size of the RII, climbing from 2.03 to 2.23 in 1991-2001 and 2.10 to 2.23 in 2001-2011. The highest degree of relative inequality is also observed for stable groups who remain in the same area types. To reiterate, those who are consistently in the most deprived areas have the poorest health whereas those consistently in the least deprived areas have the best health

Table 8.3 Relative Index of Inequality by deprivation, 1991-2001 and 2001-2011

Relative Index of Inequality	**1991-2001**	**2001-2011**
No deprivation mobility (origin deprivation)	2.03	2.10
Deprivation mobility (destination deprivation)	2.23	2.23
Stable deprivation quintiles	2.37	2.56

Source: ONS Longitudinal Study

Figure 8.2 plots the regression line for the SIRs by origin social class, destination social class and stable social class between 1991-2001 and 2001-2011. This includes the population not assigned to a class, or the unclassifiable group. It might be assumed that including the unclassifiable group will exaggerate the relationship between social class, social mobility and health. Such assumptions arise from the fact that the unclassifiable group may, amongst other reasons, be out of employment and therefore not assigned to a class due to long-standing or recent poor health. However, rather than exaggerating the influence of social mobility, the gradients are generally flattened by including this group. The only case whereby *excluding* these unclassifiable groups *flattens* the gradient is between 2001 and 2011 when allowing social mobility: the SII decreases from 91.42 when including unclassifiable groups to 70.85 when excluding them. In all other cases, including the unclassifiable group flattens the gradient. It is possible that this anomalous result can be attributable to differences in the recording of social class between 2001 and 2011 for older age groups.

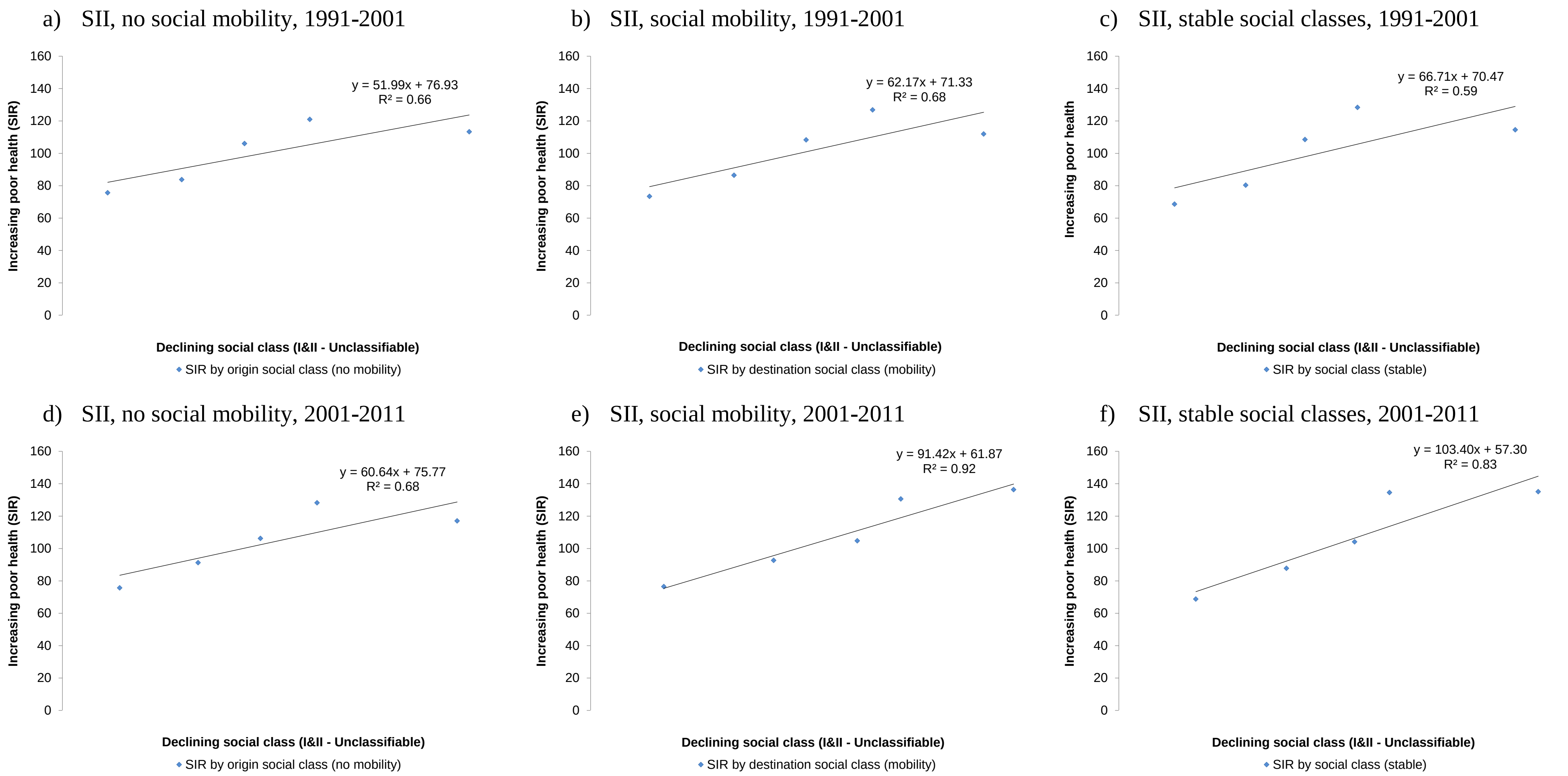


Figure 8.2 Comparing the Slope Index of Inequality (SII) for 1991-2001 and 2001-2011 by: health at origin social class; health at destination social class; health for stable social classes

Source: ONS Longitudinal Study

When social mobility is allowed, the steepness of the slope increases (51.99 to 62.17 in 1991-2001, and 60.64 to 91.42 in 2001-2011). It therefore seems that transitions between all social classes can contribute to widening health inequalities, although the contribution is much more marked in 2001-2011 than 1991-2001. This contrasts with the greater increases according to health inequalities by deprivation in 1991-2001 as compared to the increases in 2001-2011. In 1991-2001, the steepening gradient is largely attributable to the poorer health of classes IIIM, IV & V and the Unclassifiable when social mobility is allowed. Conversely, by 2001-2011, the steepening gradient is attributable to the poorer health of *all* classes apart from IIIM.

Whilst the inclusion of the unclassifiable group generally flattens the social class-health gradient, it is worth reiterating that the contribution of selective sorting between social classes to health gradients changes in 2001-2011 when *excluding* the unclassifiable group. Calculating the SII while including the unclassifiable group suggests that transitions between social classes, and therefore selective sorting, can contribute to increases in the absolute differences in health in the population. Conversely, although this is also found in 1991-2001 when excluding the unclassifiable group, this is not the case by 2001-2011. Social mobility between assigned classes in 2001-2011 resulted in a decrease in value of the SII suggesting that this movement flattened existing health gradients. There are two possible reasons for this contrasting picture. Firstly, it may relate to differences in the coding of Unclassifiable between 2001 and 2011, as already noted. Secondly, it may relate to changes in the socio-political context between 2001 and 2011 following a period of economic crisis and dramatic changes in the labour market.

Regardless of whether or not the unclassifiable group is included, those who remain in the same social class exhibit the greatest degree of health inequality, evident in the higher SII values. This is further evidenced in the high RII values for the stable groups, summarised in Table 8.4 alongside the RII values for the remaining two scenarios. For clarity, the RIIs are presented when excluding and including the unclassifiable group.

Table 8.4 Relative Index of Inequality by social class, 1991-2001 and 2001-2011

Relative Index of Inequality	1991-2001		2001-2011	
	Includes Unclassifiable	Excludes Unclassifiable	Includes Unclassifiable	Excludes Unclassifiable
No social mobility	1.68	2.11	1.80	2.40
Social mobility	1.87	2.27	2.48	2.22
Stable social class	1.95	3.19	2.80	3.65

Source: ONS Longitudinal Study

The magnitude of relative differences in health between social classes is generally greater than that observed by deprivation, particularly when excluding the unclassifiable group. As with the patterns observed according to the SII, sorting between social classes generally contributes to an increase in the relative differences in health apart from in 2001-2011 when excluding the unclassifiable group.

The results of these calculations suggest that migration, area type change and social mobility not only influence health inequalities between the top and the bottom of either the deprivation scale or class structure, but also within the middle of these two hierarchies. To further explore these patterns, the SII and RII are now calculated for selected MEGs. As with the previous analysis in chapter 7, the Black group are excluded due to the diverse experiences of Black Caribbeans as compared to Black Africans, revealed in chapter 5 and 6's analyses. These results are summarised in Table 8.5. As such a high proportion of the MEGs are not assigned to a class, these are included in the calculations.

Firstly, deprivation mobility in 1991-2001 and 2001-2011 appear to contribute to widening health inequalities, whether absolute (SII) or relative (RII) for the MEGs as a whole, and amongst Indians or Pakistani and Bangladeshis. In the overall population, the contribution of selective sorting to *steepening* health gradients was largely attributable to deteriorations in health for many of the deprivation quintiles or social classes. However, changes in the nature of health inequalities for particular MEGs after transitions occur seem to benefit some groups more than others. Thus, increasing inequalities may be better explained by greater improvements for some MEGs while others deteriorate, rather than overall deteriorations as apparent for the overall population. This is illustrative of the complex inequalities *within* MEGs.

For example, the steepening health-deprivation gradient for the total MEG population is largely attributable to the poorer health of those in Q3, Q4 and Q5 in 1991-2001 or those in Q2, Q3 and Q4 in 2001-2011. Yet for Indians, improving health seems to exert a greater influence than deteriorating health with the health of those in Q1, Q2 and Q3 notably improving in 1991-2011 after mobility has occurred. Similarly, in 2001-2011 improvements are found in Q1, Q2 and Q5 (although to a lesser extent than in 1991-2001). For Pakistani and Bangladeshis, allowing transitions between area types also appears to result in greater improvements at the top of the deprivation spectrum with smaller deteriorations towards the bottom. This suggests that when accounting for changes across the whole population, there may be marked differences in the experiences of selective sorting both within *and* between MEGs. It is possible that the crude ethnic groups used within this analysis are masking significant variations in the socioeconomic and spatial experiences within ethnic groups in England. Notwithstanding, changes in the steepening class-health gradient are more in line with those observed across the overall population, albeit with notably greater deteriorations in the health of unclassifiable MEGs following social mobility than found for the overall population.

Secondly, in contrast to the patterns observed in the overall population for stable groups, stability in social classes or area types is not associated with the highest degree of health inequality within and between MEGs. For example, in 1991-2001 when compared to the other scenarios by deprivation (mobility or no mobility), only Indians have the highest degree of *absolute* inequality in health (SII) when remaining the same area type. Yet the *relative* inequality for Indians who remain in the same deprivation quintile was comparable to that observed when no deprivation mobility occurs (RII = 1.50), and lower than the RII with deprivation mobility (RII = 1.82). This is the only instance whereby the direction of the difference in absolute or relative inequalities varies between the three scenarios. By 2001-2011, only the MEGs as a whole experience the greatest (relative and absolute) inequality when remaining in the same deprivation quintiles. The social class-health gradients are consistently the steepest, exhibiting the highest degree of absolute or relative inequalities in health amongst MEGs when social mobility is allowed. These results indicate that selective sorting between area types and social classes is as important for differences in health within and between MEGs as it is for differences in health within the overall population. However, there are differences in the implications of immobility between ethnic groups.

Table 8.5 Comparing the Slope Index of Inequality (SII) and Relative Index of Inequality (RII) between ethnic groups by deprivation or social class (im)mobility and stability, 1991-2001 and 2001-2011

	1991-2001						**2001-201**					
	SII			RII			SII			RII		
	MEG	I	P&B	MEG	I	P&B	MEG	I	P&B	MEG	I	P&B
No deprivation mobility	60.82	50.47	45.52	1.63	1.50	1.30	85.35	92.14	82.16	2.11	2.37	1.63
Deprivation mobility	72.72	71.69	61.22	1.81	1.82	1.43	89.35	101.73	92.11	2.15	2.54	1.73
Stable deprivation	70.20	134.35	30.45	1.72	1.50	1.18	91.74	99.44	65.60	2.17	2.52	1.44
No social mobility	70.64	63.40	58.36	1.71	1.63	1.39	70.29	65.38	64.53	1.69	1.68	1.41
Social mobility	100.99	90.77	90.79	2.15	2.03	1.66	131.87	154.51	138.68	2.74	3.84	2.17
Stable social class	89.37	82.61	65.02	1.90	1.90	1.41	109.01	133.52	93.64	2.15	2.81	1.63

Note: MEG = Minority ethnic groups; I = Indian; P&B = Pakistani and Bangladeshi
Source: ONS Longitudinal Study

8.4.2 Why do some move and others stay?

Using binary logistic regression with migration as the outcome, this section examines how life circumstances (social class, experience of deprivation, health status) and changes in these circumstances in 1991-2001 or 2001-2011 differently influence probability of immobility by ethnic group. To account for known variations in probability of (im)mobility by age and gender, these are adjusted for in the models. As health status and experience of deprivation or social class varies over time and differently relate to probability of (im)mobility, the binary logistic regression models are run for different subsets of the population accounting for these differences. This allows for the interactions between (changing) health, deprivation and social class in terms of the influence of (im)mobility. Probabilities of immobility are presented for different ethnic groups according to different (changing) circumstances according to the models summarised in Table 8.2.

Models 1a-d model the likelihood of migrating for differently healthy groups of the population in different social classes at baseline, each adjusting for age, sex, ethnicity and origin deprivation. Only White, Indian and Pakistani and Bangladeshi ethnic groups are considered owing to the diverse experiences of Black Africans and Black Caribbeans whose aggregation is not considered appropriate for this analysis. The predicted probabilities for these differently healthy groups in different social classes are calculated for each ethnic group according to their origin deprivation, adjusting for age and sex to identify how the probability of migrating, and therefore immobility, varies. A selection of these probabilities are summarised in Figure 8.3, plotting the probability of immobility for Q1, Q3 and Q5 by ethnic group, health status and baseline class (U, IIIM or I&II).

Firstly, between 1991-2001 and 2001-2011 there are some slight overall increases in the probability of immobility for all groups, suggestive of falling rates of migration. Further, Whites generally have lower probabilities of immobility than Indians, who themselves have lower probabilities of immobility than Pakistani and Bangladeshis. More noticeable, however, are changes in the gap between probabilities of immobility within ethnic groups by health status. For Indians in Unclassifiable at baseline, and Pakistani and Bangladeshis in classes I & II, there is a discernible gap in the probability of immobility according to initial health status: in 1991-2001 those beginning in poor health have a much higher probability of immobility than those beginning in good health. For example, Unclassifiable Indians initially in poor health have a 49.1% probability of immobility in Q1 compared to 32.7% if initially in good health. However, by 2001-2011 while this gap had narrowed such that the differences are negligible, probability of immobility when initially in poor health falls to 45.5% while probability of immobility when initially in good health rose 41.0%. The changes in Q2-Q4 are similar.

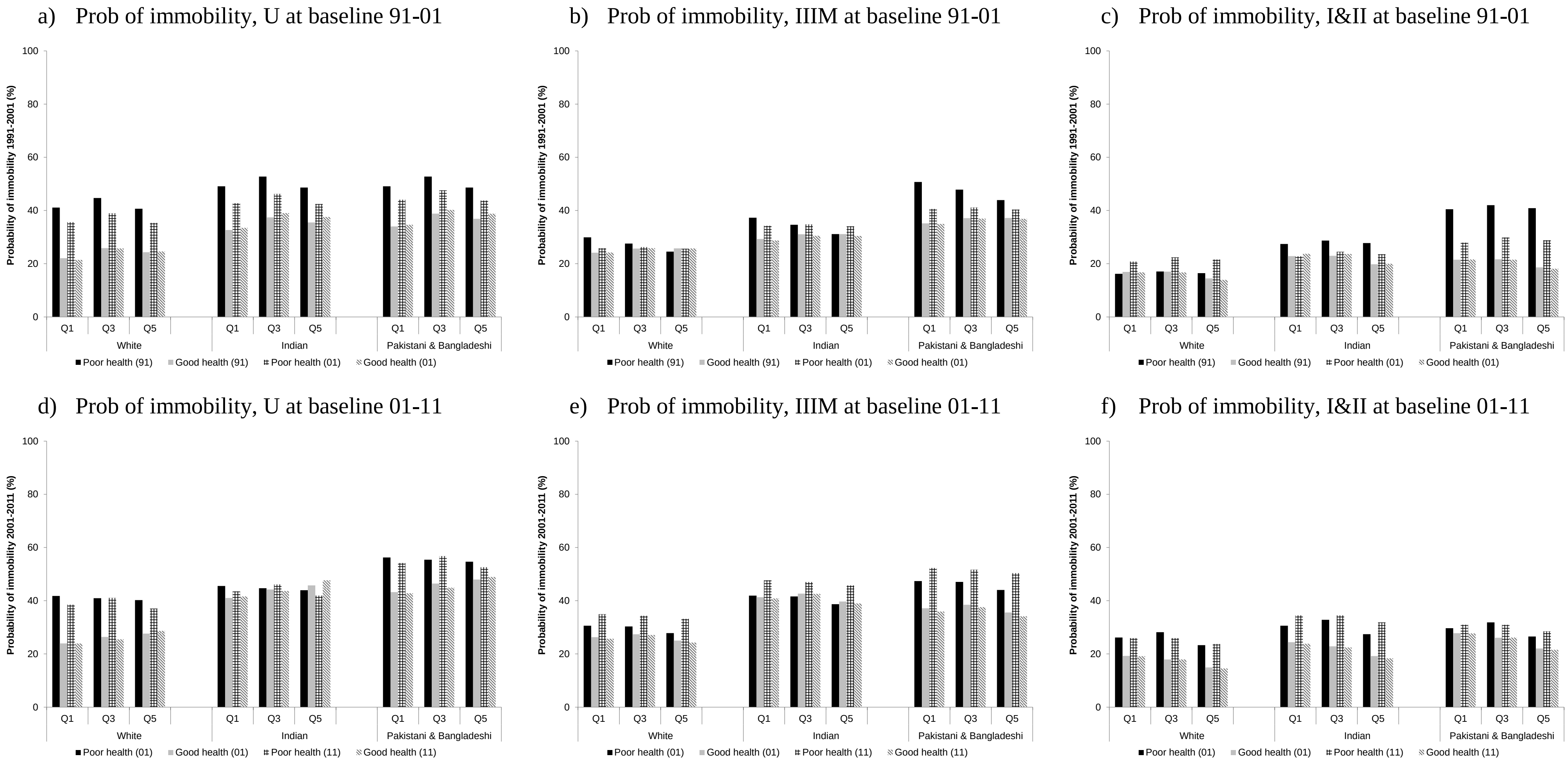


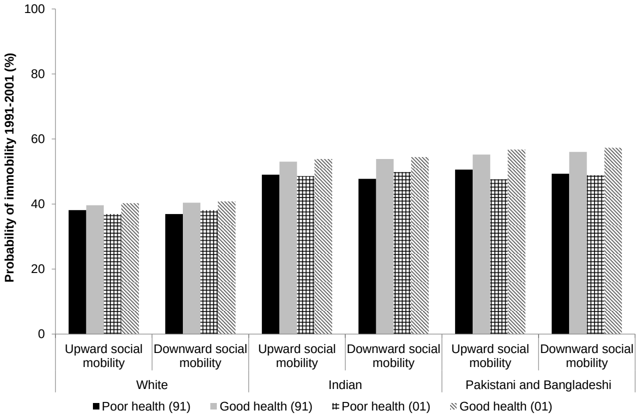
Figure 8.3 Probability of immobility for differently healthy groups and social classes (including unclassifiable) at baseline by ethnic group and origin deprivation quintile 1991-2001 and 2001-2011
Source: ONS Longitudinal Study

Conversely, for Whites in classes I & II a gap opened up by 2001-2011 in terms of probability of immobility for those initially in poor health compared to those initially in good health. Generally speaking, particularly for the unclassifiable groups, the association between initial health status and probability of immobility appears to be greater for Pakistani and Bangladeshis than for Whites in particular or, to some extent, Indians. However, poor health is generally associated with higher probabilities of immobility across ethnic groups, social classes and origin deprivation. Differences within ethnic groups by origin deprivation are, however, marginal. These results suggest that social class has a stronger influence on likelihood of migrating or *not* migrating than deprivation: while a clear social gradient to immobility is apparent, with probability of immobility generally increasing with declining social classes, there are much smaller differences within ethnic groups by origin deprivation.

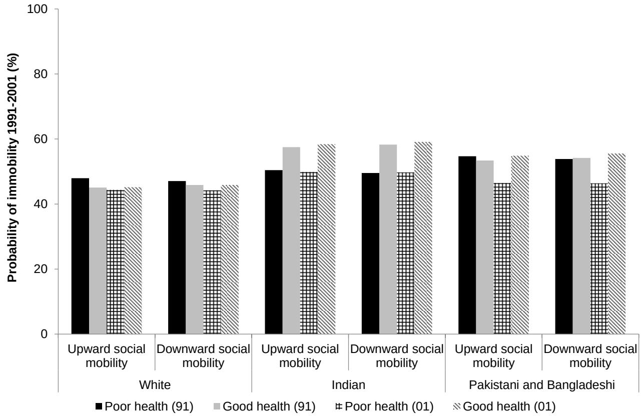
Despite the similar associations apparent between immobility, health, social class and deprivation for each ethnic group, if probabilities of immobility are notably higher for certain ethnic groups in poor health in more disadvantaged circumstances, this may be important in respect of the creation of residualised populations perhaps experiencing declining health. For example, Unclassifiable Pakistani and Bangladeshis initially in poor health have a 54.7% probability of immobility in the most deprived areas compared to 40.2% for Whites in comparable circumstances. Nevertheless, these higher rates of immobility may also benefit Pakistani and Bangladeshis. For example, of those in classes I & II, Pakistani and Bangladeshis are also more likely to be immobile than Whites, particularly when in poor health. This is consistent across deprivation quintiles. If immobility in more deprived areas is viewed negatively, so must immobility in less deprived areas be viewed positively.

Models 2a-d, summarised in Figure 8.4, investigate how likelihood of migrating varies within area types and by health status according to experience of social mobility. These models therefore explicitly examine the hypothesised inter-relationship between migration and social mobility, seeking to establish how this is attenuated by experience of deprivation or health status for different ethnic groups. Similar to the previous results, there are (slight) overall decreases in probabilities of migrating between 1991-2001 and 2001-2011, evident in the subtle increasing probability of immobility across all groups. However, whilst probabilities of immobility decreased with increasing social class, the inverse is true for decreasing deprivation. For example, the average probability of immobility for upwardly socially mobile Indians in Q5 (accounting for all health statuses) is 38.7% in 1991-2001 and 43.6% in 2001-2011, but for similarly socially mobile Indians in Q1, average probability of immobility is 46.6% in 1991-2001 and 48.5% in 2001-2011. Regardless of health status and ethnic group, higher probabilities of immobility are generally observed in less deprived areas suggesting that tendencies to move decrease when in less deprived areas. This seems intuitively sound: those in less deprived areas may be less inclined to move when comfortably situated.

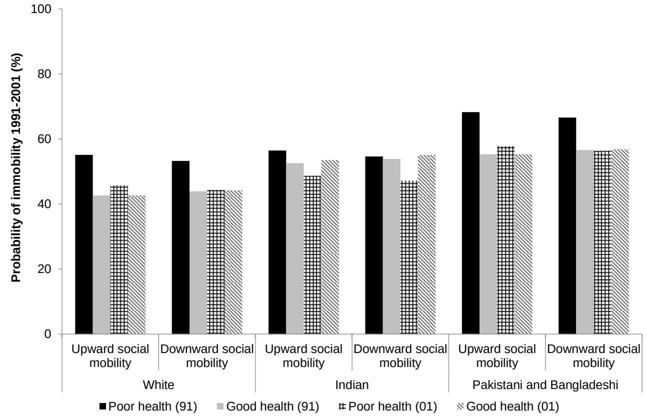
a) Probability of immobility, Q5 at baseline 91-01



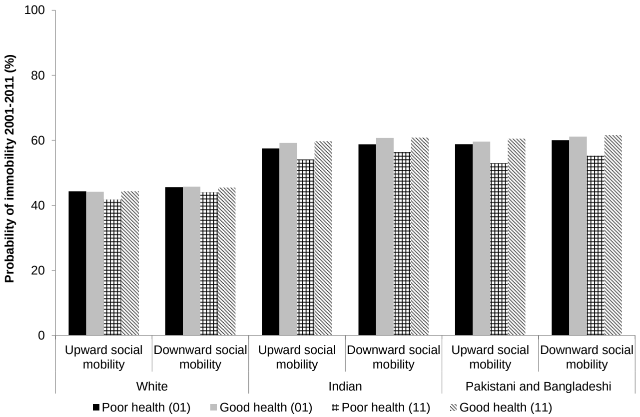
b) Probability of immobility, Q3 at baseline 91-01



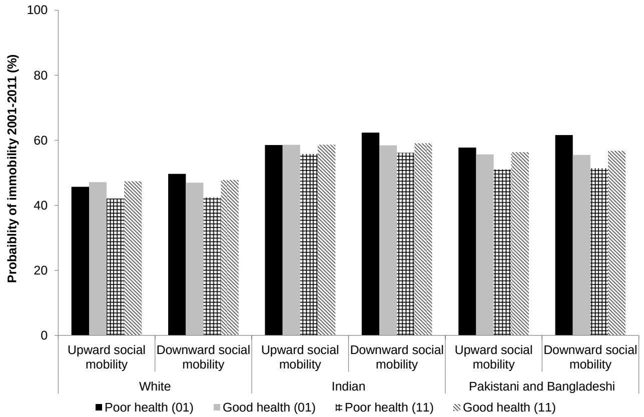
c) Probability of immobility, Q1 at baseline 91-01



d) Probability of immobility, Q5 at baseline 01-11



e) Probability of immobility, Q3 at baseline 01-11



f) Probability of immobility, Q1 at baseline 01-11

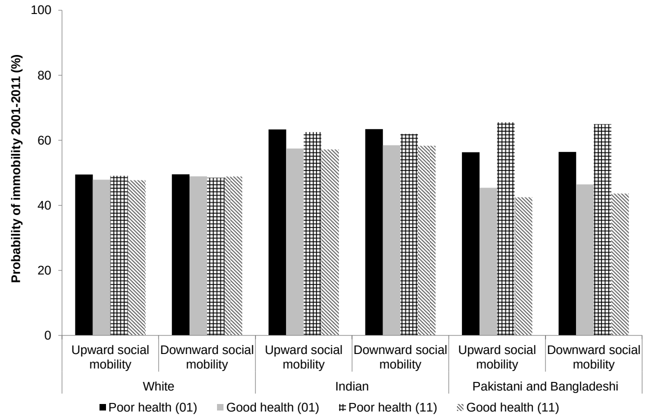


Figure 8.4 Probability of immobility for differently healthy groups and deprivation quintile at baseline by ethnic group and social mobility status, 1991-2001 and 2001-2011

Source: ONS Longitudinal Study

Differences in the probability of immobility by health status within ethnic groups are smaller when in the most deprived area at baseline, with both Indians and Pakistani and Bangladeshis being less likely to move than Whites who have notably lower rates of immobility. For example, in 1991-2001 Pakistanis in Q5 beginning in poor health have a 49.3% probability of immobility when experiencing downward social mobility, but this climbs to 56.0% if initially in good health. Similarly, although differences are smaller by 2001-2011 (60.1% compared to 61.1%), these are still greater than those observed for Whites. Although lower probabilities of immobility for groups in poor health within Q5 compared to those in good health may be a good thing it is worth emphasising that direction of move is not known (for those who do migrate). These groups may move but while changing address, merely churn within the same area type. The outcome for these models is not migration *and* change of area type, simply migration as a *change of address* (see chapter 3). Similarly, although it may be assumed that immobile groups remain in the same area type, some *will* change area type through the deprivation mobility of the area rather than through migration. Whilst such change accounts for a very small proportion of deprivation mobility in the population, as noted in chapter 7, it is worth emphasising. Comparing differences between the most and least deprived areas suggest that groups experiencing downward social mobility are *marginally* less likely to be immobile in Q5 than those experiencing upward social mobility, whereas the inverse is true in Q1 with *marginally* higher rates of immobility amongst the downwardly socially mobile. Although consistent between ethnic groups, these differences are very small. However, it is interesting to speculate as to the reasons for these differences. Are groups in more deprived areas less able to maintain their current residence when experiencing downward social mobility, thus having to move to an alternative address but potentially similarly deprived area? Conversely, do those currently residing in less deprived areas have more resources available to them and are therefore more able to withstand the consequences of downward social mobility? A more nuanced breakdown of area types and indeed the direction of moves for these different groups would help explain these patterns.

Across all ethnic groups, but notably so for the minority groups plotted, the lowest probabilities of immobility in Q5 or Q3 are for those ending in poor health. Although this is also true, to some extent, for those in Q1 in 1991-2001, by 2001-2011 probability of immobility for Pakistani and Bangladeshis ending in poor health is markedly higher than for the remaining health statuses. The degree of variation in the probability of immobility for the MEGs is much more marked than observed for Whites, particularly for those in Q1.

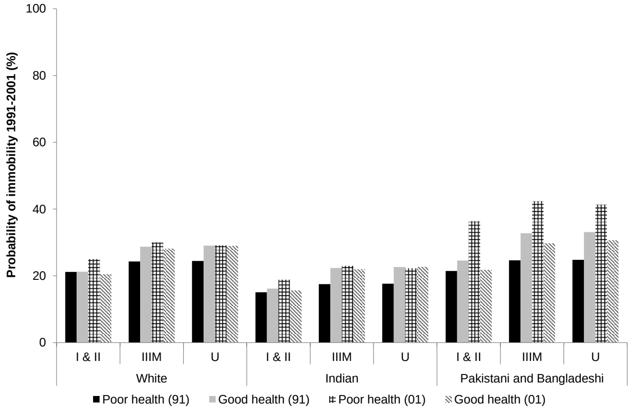
Models 3a-d examine how the outcome (migration) varies by social class for differently healthy groups experiencing different types of deprivation mobility (Figure 8.5). Although, as noted above, a greater proportion of deprivation mobility will result from migration than area regeneration or decline, it is worth examining how probability of immobility varies between ethnic groups and health statuses according to their experiences of deprivation mobility. If certain groups, and particularly groups in poorer health, are more likely to experience downward deprivation mobility in a given time frame and also more likely to remain immobile during that time (i.e. not migrated between 1991 and 2001), this may have important implications for health and social policy interventions.

According to these models, MEGs in poor health (and good health) have notably higher probabilities of immobility when experiencing downward deprivation mobility than Whites also in poor health (or good health). Whilst overall patterns between ethnic groups are similar, whereby higher probabilities of immobility (on average, regardless of health status) are associated with downward deprivation mobility, MEGs are notably less likely to move when experiencing downward deprivation mobility, and therefore may be *more* likely to become residualised in increasingly disadvantaged areas. This contrasts with the much more comparable probabilities of immobility between ethnic groups by comparable health statuses when also experiencing upward deprivation mobility. Indeed differences in probability of immobility seem to be more driven by health status within ethnic groups experiencing similar deprivation mobility than by baseline social class.

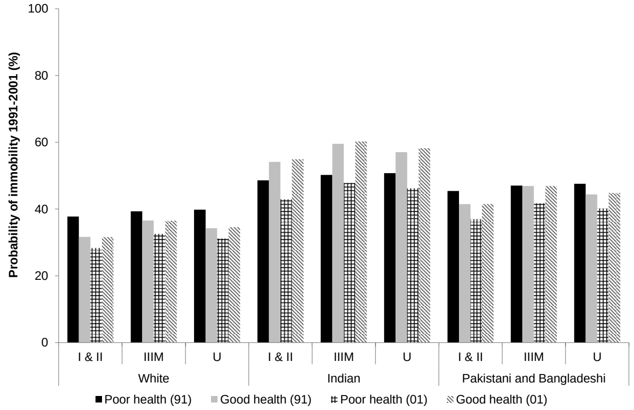
There are some interesting changes between 1991-2001 and 2001-2011 which are largely consistent between ethnic groups. For those experiencing upward deprivation mobility and also beginning in poor health in 1991-2001, probabilities of immobility are (marginally) lower than for those in good health. Conversely, probabilities of immobility are generally higher if ending in poor health than ending in good health. Yet in 2001-2011, being in poor health is always associated with higher probabilities of immobility for those experiencing upward deprivation mobility. A similar but inverted pattern is evident for downward deprivation mobility: beginning in poor health in 1991-2001 is associated with higher probabilities of immobility than beginning in good health, whereas ending in poor health is associated with lower probabilities of immobility than ending in good health. However, in 2001-2011 poor health is consistently associated with lower probabilities of immobility.

Within ethnic groups by social class, although the probability of immobility increases with declining social class (as seen with the probabilities from I&II to IIIM), probability of immobility for the unclassifiable groups is similar to that for those in classes I and II. This is fairly consistent between ethnic groups.

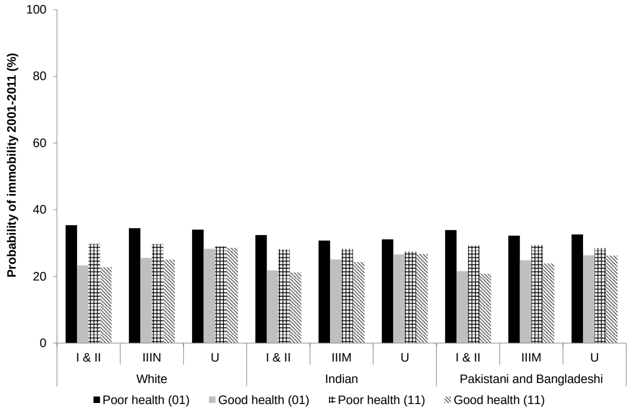
a) Probability of immobility, upward deprivation mobility 91-01



b) Probability of immobility, downward deprivation mobility 91-01



c) Probability of immobility, upward deprivation mobility 01-11



d) Probability of immobility, downward deprivation mobility 01-11

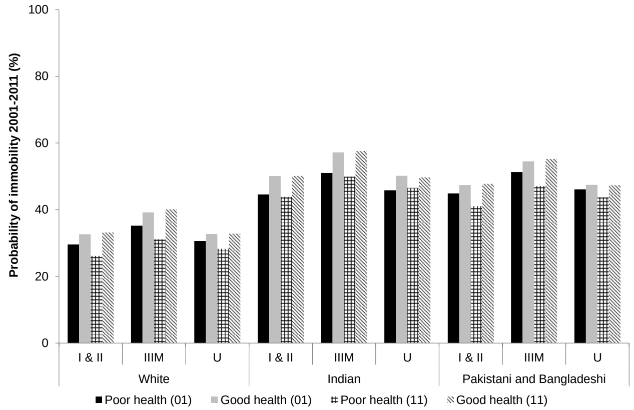


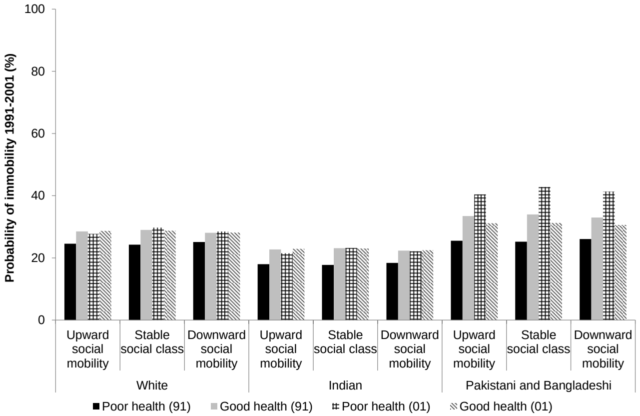
Figure 8.5 Probability of immobility for differently healthy groups experiencing upward or downward deprivation mobility by ethnic group and baseline social class, 1991-2001 and 2001-2011
Source: ONS Longitudinal Study

Finally, models 4a-d examine the interaction between upward or downward deprivation mobility and health status by experience of social mobility. Figure 8.6 summarises these results, plotting the probability immobility for differently healthy groups experiencing different forms of deprivation or social mobility by ethnic group. Other than the previously noted overall (small) increase in the probability of immobility across the population, there is a particularly noticeable change between 1991-2001 and 2001-2011 for Pakistani and Bangladeshis experiencing upward deprivation mobility. In 1991-2001, probability of immobility is markedly higher for Pakistani and Bangladeshis experiencing upward deprivation mobility who end in poor health (ill in 2001). Probability of immobility for Pakistani and Bangladeshis in 1991-2001 is also notably higher than for Whites or Indians. Yet by 2001-2011, probability of immobility converges between ethnic groups for those experiencing upward deprivation mobility with similar levels between ethnic groups and within ethnic groups by health status. Only those in prior poor health have a discernibly higher probability of immobility amongst those ethnic groups experiencing upward deprivation mobility.

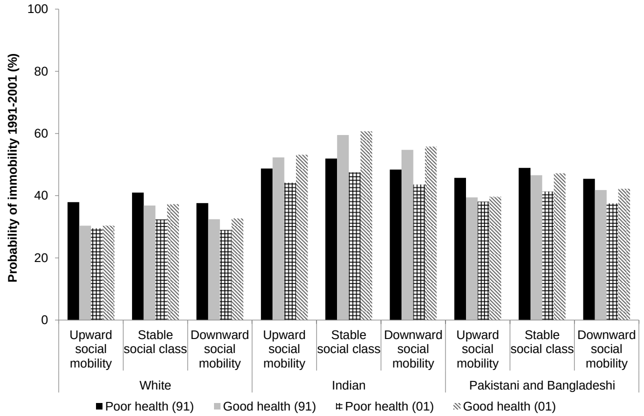
Conversely, the patterning to the probability of immobility for those experiencing downward deprivation mobility is similar between 1991-2001 and 2001-2011, with much more variation between ethnic groups and by health status. Indians and Pakistani and Bangladeshis have higher probabilities of immobility, particularly amongst those who remain in the same social class, than Whites. For example, the probability of immobility for Pakistani and Bangladeshis experiencing downward deprivation mobility and downward social mobility is 45.4% in 2001-2011 when beginning in poor health, compared to 30.7% for Whites. This contrasts with more comparable levels between ethnic groups for those experiencing upward deprivation mobility, irrespective of their experience of social mobility (although there are differences within ethnic groups by health status). Within the MEGs shown here, the lowest probabilities of immobility are for those experiencing upward social mobility with marginally higher probabilities for those experiencing downward social mobility of comparable health.

The results of this analysis suggest that deprivation, social class and transitions between deprivation quintiles or social classes are differently important in influencing probability of immobility between ethnic groups by health status. Indians and Pakistani and Bangladeshis generally have higher probabilities of immobility. Although this is consistent across deprivation quintiles and social classes, there are differences between ethnic groups by deprivation quintile or social class. Thus, where Indians or Pakistani and Bangladeshis concentrate in more deprived areas, the probability of immobility is higher than for Whites in comparable circumstances regardless of health or social class.

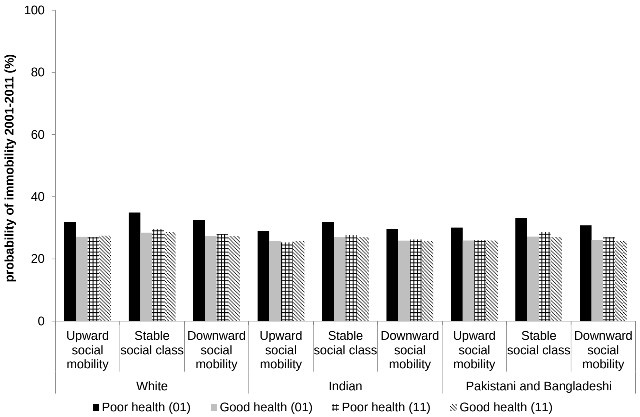
a) Probability of immobility, upward deprivation mobility 91-01



b) Probability of immobility, downward deprivation mobility 91-01



c) Probability of immobility, upward deprivation mobility 01-11



d) Probability of immobility, downward deprivation mobility, 01-11

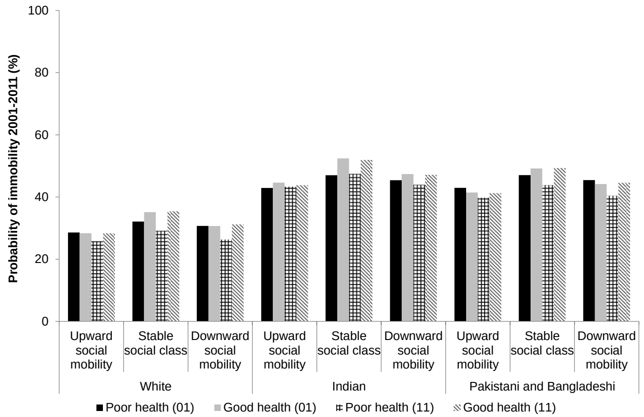


Figure 8.6 Probability of immobility for differently healthy groups experiencing upward or downward deprivation mobility by ethnic group and social mobility status, 1991-2001 and 2001-2011
Source: ONS Longitudinal Study

8.5 Discussion

This chapter begun by identifying two under-explored elements within this thesis relating to the measures used to assess changing health gradients and implications of differences in propensity (or opportunity) for mobility between ethnic groups. By addressing these elements in the final empirical analysis for this thesis, the final chapter's discussion will be substantively enhanced. However, it is first useful to discuss the implication of this chapter's two analyses in relation to each other, thereby illustrating this chapter's contribution to the core aims of this thesis.

Using the SII and RII, rather than simply drawing assumptions as to changing health gradients by assessing differences in the health of those at the extremes of the deprivation spectrum or social class structure, better illustrates how selective sorting across all deprivation quintiles or social classes can contribute to absolute and relative differences in population health. Moreover, these measures are comparable as they account for the size of the population within each deprivation quintile or social class. Importantly, using the SII and RII has further demonstrated that selective sorting between area types or social classes *can* contribute to widening health gradients for the overall population and crucially for ethnic health gradients.

However, while mobility appeared to contribute to widening ethnic health gradients, the greatest degree of inequality for the overall population was observed for those groups who remained in the same social classes or area types between 1991 and 2001, or 2001 and 2011. Persistently living in the most deprived areas is therefore associated with the poorest health, with the inverse for those persistently in the least deprived areas. The same is true for persisting social class position. Conversely, this magnitude of inequality was not observed for stable MEGs. Notwithstanding these differences in the magnitude of inequality, the importance of considering how differences in opportunities for mobility may influence health gradients was still explored. In particular, such differences may reasonably be attributed to differences in the age-structure of the MEGs: as mobility peaks in younger ages, both for migration and social mobility, the younger age structure of these groups may mean that more inequality is observed for these mobile groups than stable groups who are perhaps older. These issues were then explored in terms of the probability of immobility for different subgroups of the population, particularly in terms of residualisation which may exacerbate existing health gradients and (further) widen health inequalities.

Residualisation appears more likely for minority groups than the Whites. While all groups are generally more likely to move if ill and in more deprived circumstances, the directions of these moves are not consistently known: should the move result in a move away from more deprived areas, this would be advantageous for health. However, should the move simply reflect churning within more deprived circumstances, this may have further additive or multiplicative harmful consequences for health. Indeed the greater variation in the influence of health on probability of immobility within MEGs than for Whites may be reflective of a greater enabling or prohibitive influence of health on opportunities for migrating. A notable finding is that Indians and Pakistani and Bangladeshis are more likely to be immobile while also experiencing downward deprivation mobility, suggesting that these groups are less able or willing to move away when living in declining areas. Propensity to migrate is evidently influenced by factors such as baseline social class or deprivation, but the extent of this influences varies by class and subsequent transitions between areas (through deprivation mobility) or social classes and is markedly (in some cases) and *differently* attenuated by health status between ethnic groups. This cannot fail to attenuate the nature of the influence of selective sorting on (changing) health gradients between ethnic groups and may explain some of the diverse patterns found for MEGs according to transitions between area types examined in chapter 7.

The final chapter for this thesis will further explore the issues raised here, assessing how each of the analyses presented within these pages contributes to efforts to understand the nature of ethnic inequalities in health, and assessments of the contribution of selective sorting to changing (ethnic) health gradients.

Chapter 9

Discussion and final conclusions

9.1 Introduction

Ethnic inequalities in health are relatively overlooked in contemporary research, particularly in comparison to the wealth of literature investigating social and spatial inequalities in health. Although social and spatial inequalities in health *are* well documented, less is known about why these gradients may change over time. In the context of an increasingly ethnically diverse society within which health gradients may be steepening over time (e.g. Johnson and Al-Hamad, 2011), these gaps in knowledge cannot be neglected. The research presented in this thesis has contributed to closing these knowledge gaps by a) advancing understanding on the nature of ethnic inequalities in health and b) evaluating whether selective sorting between area types and social classes can contribute to (changing) health gradients in England for the overall population and by ethnic group.

This thesis has advanced understanding on the nature of ethnic inequalities in health, using existing data in novel ways to add to the evidence base required to substantively address ethnic inequalities in health within society. Further, by exploring explanations for why gradients change over time, this thesis has added a new dimension to existing understanding of ethnic inequalities in health. In fulfilling the second aim of this thesis, this work reflects an original contribution to knowledge insofar as it extends, updates and rejuvenates existing scholarship in a number of multi-disciplinary areas spanning the fields of geography, demography, sociology and social epidemiology. Thus, this research contributes to discussions on migration and health gradients; social mobility and health gradients; and, deprivation change and health gradients. More importantly, this research explicitly explores the inter-relationships between these three mobility processes (or indeed the inter-relationships between social immobility, deprivation immobility and non-migration) and health and ethnicity.

To fulfil the aims of this thesis, a number of broad research objectives were identified in chapter 1. Chapter 1 also highlighted where each of the objectives would be addressed in the thesis. This chapter will discuss the results of this thesis in the context of these conceptual and empirical objectives. The discussion will then explicitly consider this thesis' contribution to knowledge in terms of the research questions posed in chapter 2. This will clearly illustrate what this thesis has achieved and how discussions of the themes explored have been advanced. In highlighting what has been achieved, it is also necessary to state what is still to be done.

However, before discussing the recommendations for future research and the implications for policy development, the limitations of this thesis will be explored. Appraising the conclusions drawn in light of the limitations of the measures used and data constraints highlights future areas for research. This section will also consider alternative datasets and methods which may be used to further explore the themes examined in this thesis and thereby enhance the conclusions drawn.

9.2 Summary of research findings

9.2.1 Conceptual objectives

Objective 1: illustrate why further research into ethnicity, health and ethnic inequality should not be marginalised in wider health inequalities research and the policy agenda. The importance of conducting research into ethnicity, health and inequality has been clearly stated in the introduction for this final chapter. Increasing ethnic diversity amidst persisting and potentially widening health gradients necessitates continued research into the nature of these inequalities and detailed research on whether, how and why they may change. In particular, this research is called for where ethnic health gradients are overlooked in policy and research or inappropriately subsumed into wider discussions of general social and spatial inequalities. Ethnic inequalities in health are not determined by ethnicity, nor are they adequately described by explanations of social or spatial inequalities in health. These arguments have been made by others and noted within this thesis (see chapter 2 in particular). Re-stating and subsequently substantiating such claims, as indeed the results of this thesis have (in particular, chapter 4's analysis of the Health Surveys for England), fulfils this objective.

Objective 2: review literatures relating to a) migration, deprivation mobility, social mobility and (changing) health gradients to demonstrate their inter-dependence, and b) variations by ethnic group. This thesis has drawn on a vast array of literatures spanning the disciplines of geography, demography, sociology and epidemiology. To ground this multidisciplinary thesis, chapter 2 explored the high level concepts guiding this analysis: health and ethnicity. This chapter documented existing evidence on health inequalities and ethnic inequalities in health while introducing the concepts of selective sorting and key literatures linking migration, deprivation mobility and social mobility to (changing) health gradients. The inter-dependence of these mobility processes are illustrated in Figure 2.2, links that are re-iterated throughout the analytical components of this thesis, and reviewed in more detail in chapter 5 and chapter 7. Chapter 5 revisited literatures on health and migration, first defining the concept of migration for the purposes of this thesis and then examining the relationship between health and migration. Chapter 7 expanded chapter 5's discussion of migration and health, reviewing existing literature exploring the contribution of migration to (changing) health gradients and also the limited literatures on deprivation change and health gradients. This accompanied a review of some of the relevant literature on patterns of social mobility in the population, social mobility and health, and variations by ethnicity. Through these reviews, the inter-dependence of the mobility processes are made clear, as are the possible (and documented) variations in migration, deprivation change and social mobility by ethnic group.

Objective 3: identify gaps in existing research on selective sorting and health inequalities. Chapter 1 clearly identified broad gaps in research and policy, evident in the lack of research into ethnic inequalities in health and lack of understanding as to why health gradients (may) change over time. These gaps underpin the core aims of this thesis: through a review of the relevant literatures informing this work, the boundaries of these were established. Chapter 2's review of some of the existing literature on health and ethnicity highlighted that despite a notable body of work demonstrating that ethnic inequalities in health are rooted in socioeconomic and broad spatial difference, more is required to ensure that these health gradients are substantively addressed in policy. The final sections of chapter 2 also introduced the concept of selective sorting as a possible explanation for changing health gradients within the overall population and by ethnic group: chapter 7 revisited the introduced studies to identify clear gaps in knowledge. Firstly, the dynamic relationship between social mobility and migration largely overlooked in the mobility literature (with some notable exceptions e.g. Fielding, 1992a; Williams, 2009) and almost entirely absent from discussions of either social mobility's or migration's contribution to changing health gradients. Although Boyle *et al*. (2009) do *separately* examine social mobility and migration, with Norman *et al*. (2005) *simultaneously* exploring migration and deprivation change, no work to date has explicitly examined the inter-relationships between all three processes and their influence on changing health gradients for the total population. Secondly, very little work has considered any of the processes and their influence on health gradients from an ethnic perspective (Harding (2003) is an exception). Thirdly, the contribution of selective sorting to changing health gradients is almost exclusively concerned with mobile groups. However, documented differences in the patterns of internal migration between ethnic groups or opportunities for social mobility means some groups are more likely to be *immobile* than others. If certain groups are more likely to be immobile in different area types or social classes, this may have different implications for changing health gradients.

Objective 4: develop an analytical framework appropriate for the study of these inter-dependent processes. Identifying gaps in the literature aided the development of an appropriate analytical framework for the study of the inter-dependent (im)mobility processes and their contribution to changing health gradients. This framework, adopted in chapter 7, helps fulfil the second aim of this thesis. By combining established approaches to the study of selective migration and health gradients (the 'put people back approach') with revised methods according to the critiques made by Boyle *et al*. (2009), this research has successfully examined how transitions between area types and social classes *for movers and stayers*, contribute to changes in health gradients for the overall population and by ethnic group. Distinguishing between movers and stayers accounts for the inter-dependency of the mobility processes and the ability to experience deprivation change without changing address. In these scenarios, by first identifying how health would be distributed in the population *should no transitions occur* and comparing this to the distribution of health *once transitions have occurred*, it is possible to establish whether transitions do in fact contribute to changes in health gradients. Further, by then comparing the health of transitioning groups, it is possible to determine the nature of the influence of transitions into or out of the most or least deprived areas on deprivation-health gradients, and transitions into or out of the top and bottom classes on social class-health gradients. Examining the health of transitioning groups for specific ethnic groups is an important contribution to this area of research, highlighting similarities and differences which should now be heeded in policy development.

The analytical framework was extended in chapter 8 to a) assess the contribution of transitions between area types and social classes on health gradients across the whole deprivation spectrum and class structure, rather than simply between the extremes; and b) explore how probability of immobility (non-migration) is differently influenced by transitions between or experience of social class or deprivation and importantly, different health statuses by ethnic group. For a), although measures of inequality which account for the whole population rather than the extremes (e.g. the most and least deprived areas), such as the Relative Index of Inequality (RII), have *briefly* featured in one study of selective sorting and health gradients (Boyle *et al*., 2009), these measures are not substantively considered nor do they feature in comparable literature. Calculating the RII and associated Slope Index of Inequality (SII) according to the ‘put people back’ approach for the overall population and specific ethnic groups therefore enhances the conclusions drawn in this thesis. Finally for b), although much can be said of the influence of transitions between area types and social classes on health gradients, to avoid the possible bias introduced by prior selection effects, those beginning in poor health are excluded from the sample. This is in line with notable studies which have informed this research (e.g. Boyle *et al*., 2004; Norman *et al*., 2005; Boyle *et al*., 2009; Norman *et al*., 2011). However, exploring how those already in poor health distribute across deprivation quintiles or social classes and interpreting this alongside the results of the previous analyses may shed more light on overall processes of selective sorting. The work here can be readily built upon.

9.2.2 Empirical objectives

Objective 5: analyse trends and patterns in population health by ethnic group in recent decades. Trends and patterns in population health by ethnic group have been explored in each of the analytical chapters of this thesis. Overall trends, however, are best explained in chapter

4’s analysis of data from the HSEs and chapter 5’s analysis of cross-sectional census microdata for the 1991, 2001 and 2011 SARs. The patterns revealed in the logistic regression modelling in chapter 6 and the analysis of transitioning groups in chapter 7 will be discussed in relation to ethnic inequality in society and the contribution of selective sorting to (changing) health gradients. Although there is some general agreement between datasets, most notably in the poorer health of Pakistani and Bangladeshis relative to other ethnic groups, it is interesting to note that the overall trends observed in the HSE vary to those observed in the census microdata. Analysis of the HSEs suggests the health of MEGs is improving over time in England (see Figure 4.1), evident in the overall reductions in the standardised illness ratios (SIRs) for LLTI and self-assessed less than good health (poor health). According to these data, the health of Blacks and Indians improves such that observed levels of LLTI are lower than expected (an SIR of < 100), and better than the White majority. For poor health, the SIRs for Indians and Blacks decline to similar levels observed for the White majority. Pakistani and Bangladeshis almost consistently have the poorest health (differences are mainly significant) and despite overall improvements, levels of LLTI begin to increase from 2005-2007 while levels of poor health begin to increase steeply from 2002-2004. The changing health of Pakistani and Bangladeshis relative to the White majority and the more advantaged Indians is worsening over time for both health outcomes: increasing rate ratios are illustrative of increasing health inequalities between these groups (see Figure 4.2). Conversely, the improving health of Blacks and Indians narrows the inequalities between these minority groups and the White majority, ultimately reversing the direction of the inequality with the White majority in poorer health.

Age-specific illness rates (ASIRs) (based on LLTI) calculated by ethnic group for the 1991, 2001 and 2011 SARs are illustrative of deteriorating health with increasing age, consistent between ethnic groups. However, there are some marked differences. In particular, as shown on Figure 5.11 (chapter 5), the difference in the ASIRs within ethnic groups is much more marked for Black Caribbeans, Indians and Pakistani and Bangladeshis. Further, ASIRs for these minority groups are generally lower amongst the 16-29 age group compared to Whites, only increasing beyond Whites in older ages. Variations in the health inequalities between ethnic groups by age are often overlooked. Yet these results, and results from the binary logistic regression modelling in chapter 6, clearly show that younger MEGs are often in better health than their White contemporaries. This therefore suggests that the health of MEGs deteriorates at a steeper rate than Whites, and may be reflective of their general disadvantaged state relative to the White majority accumulating over time, as well as experiences of marginalisation or discrimination. Over time, ASIRs for all ethnic groups and across all ages increase markedly between 1991 and 2001, declining slightly in 2011. The dramatic increase between 1991 and 2001 may reflect changes in the question wording on the census whereby ‘handicap’ was replaced with ‘disability’ (see Table 2.1 in chapter 2).

SIRs calculated with the SARs are not strictly comparable, unlike the SIRs calculated with the HSEs, as the standard population used varies between years. However, changes in the direction of the SIR (> or < 100) between years is interesting. Pakistani and Bangladeshis consistently have significantly poorer health, indicated by SIRs of > 100 in 1991, 2001 and 2011. However, while Black Caribbeans and Indians are in similarly poor health at 1991 and 2001, by 2011 the SIRs are suggestive of lower than expected levels of illness (LLTI) for Indians, and no significant difference for Black Caribbeans relative to the standard population. Chinese and Black Africans consistently have lower than expected levels of LLTI (SIR significantly < 100). There are, however, gendered differences within ethnic groups whereby female MEGs are often in poorer health than their male contemporaries, contrasting with the generally better health of White females compared to White males.

Chapter's 4, 7 and 8 do not distinguish between Black African and Black Caribbean, and no chapter distinguishes within Indian groups. However, there are clear differences which must be considered. 'Black' disguises the relatively *good* health of Black Africans compared to the notably poorer health of Black Caribbeans whereas 'Indian' masks a wealth of difference within Indians. This is most apparent when comparing SIRs and extremal quotients calculated by social class or deprivation quintile transition in chapter 7. For example, the extremal quotient for socially mobile Indian movers (IV&V: I&II) based on the SIRs by social class is 6.42 in 2001-2011, compared to 2.03 for Pakistani and Bangladeshis in comparable circumstances: the greater the extremal quotient, the greater the relative inequalities in health. Ideally, Pakistani and Bangladeshis would also be separated. Recognising that even the most practicable and theoretically meaningful ethnic groupings possible (within the constraints of the data) may be insufficient to capture the breadth of ethnic inequality in society is important given the aims of this thesis and the hope that these results can help ensure such inequalities are substantively addressed in policy. It is possible that, should sample sizes permit, a more detailed ethnic classification would better reveal the extent or nature of ethnic inequalities in health.

Objective 6: explore the nature of ethnic inequality in England's society. Ethnic inequality in England's society reflects more than differences in health. Further, as the differences in health are related to wider social and spatial inequalities, chapter 5 examined the magnitude of social and spatial inequality within and between ethnic groups in 1991, 2001 and 2011. Using the Gini coefficient (G) and the Index of Dissimilarity (D), ethnic inequality in each of the SARs can be examined (see Tables 5.3 and 5.4). These measures summarise the inequalities revealed in the cross-tabulations of tenure, educational attainment, social class and region of residence by ethnic group and SARs year in chapter 5. Pakistani and Bangladeshis (Figures 5.3 to 5.5), are consistently more disadvantaged in terms of lower social classes and lower levels of educational attainment than the White majority or MEGs. Pakistani and Bangladeshis also have the highest proportions not assigned to a class (54.4% in 1991, 50.5% in 2001 and 41.2% in

2011). This picture of socioeconomic disadvantage is reinforced by *G* and *D*: relative to Whites, *G* is at 0.40 in 1991 falling to 0.33 in 2001 and 2011. Despite this reduction, this is still the highest degree of inequality between any of the MEGs relative to the Whites. According to *D*, as much as 29% (2001 and 2011) of Pakistani and Bangladeshis would need to redistribute in the social class structure to achieve a distribution comparable to Whites (this includes the unclassifiable group). This contrasts with 10% of Black Caribbeans and 11% of Indians, although Black Africans experience similar levels of social inequality relative to Whites with 27% required to redistribute in 2011. This is a marked increase from 2001, rising from 17%. Inequalities are also apparent within MEGs, although these measures do not reveal the direction of the inequality. It is therefore important to interpret these measures alongside the afore mentioned cross-tabulations. For example, although 17% of Black Caribbeans would need to redistribute in the social class structure to achieve a distribution comparable with Black Africans, Black Caribbeans have a lower proportion in the lower social classes than Black Africans: of Black Africans assigned to a class, 19.6% are in class IV and 8.6% in class V, contrasting with 15.4% and 6.0% of Black Caribbeans, respectively. *G* and *D*'s summary of inequality within South Asians is more easily interpreted: 23% of Pakistani and Bangladeshis (who are, overall, less advantaged) would need to redistribute in the class structure to achieve an even distribution relative to the more advantaged Indians in 2011. The contrasting experiences *within* commonly aggregated ethnic groups further demonstrates the need for more detailed approaches to analysing ethnic inequality in society.

The extent of spatial inequality within and between ethnic groups is much more marked than the social inequality observed, according to these measures. Alongside increasing ethnic diversity between 1991 and 2001, a (marginal) reduction in the magnitude of social inequality between ethnic groups occurred while spatial inequality increased. Conversely, between 2001 and 2011 the degree of spatial inequality decreased. Further, whilst the highest degree of social inequality was observed for Pakistani and Bangladeshis, Black Caribbean and Black Africans appear to be the most segregated according to these measures: in 2011, 53% of Black Caribbeans and 50% of Black Africans would need to redistribute to achieve an even distributed across regions relative to Whites. However, while this reflects a small increase for Black Caribbeans over time, indicating increasing spatial inequality, for Black Africans this reflects a marked reduction, falling from 67% in 1991. The degree of spatial inequality reflects the marked clustering of Black Africans and Black Caribbeans in areas of London contrasting with the wider dispersal of South Asian groups across regions of England. The geographic detail is, however, limited: the geography of ethnicity in England is far more nuanced than revealed in these data. Further, as speculated in chapter 5 (and to some extent substantiated given the patterns revealed in chapter 7) it is likely that should the measure of spatial inequality be based on deprivation rather than region, Pakistani and Bangladeshis would exhibit greater inequality.

The social and spatial inequalities between ethnic groups revealed by these summary measures and the cross-tabulations in chapter 5 (and briefly discussed in chapter 4) are indicative of the extent of (dis)advantage experienced by different ethnic groups. Given the importance of social and spatial determinants of health, these differences are important to the ethnic patterning of health revealed by the SIRs. Interpreting the SIRs discussed in the previous section alongside results of the binary logistic regression modelling are particularly revealing as to the nature of ethnic inequality in England. Importantly, this further substantiates claims that ethnic inequalities in health are rooted in socioeconomic and broad spatial difference (e.g. Stronks and Kunst, 2009), interacting with ethnicity and (possibly) exaggerated by experiences of discrimination or marginalisation. Indeed a number of studies have documented a positive association between poor self-rated health and discrimination in a range of socio-political contexts (Williams *et al*., 1997; Williams *et al*., 1999; Ren *et al*., 1999; Brown *et al*., 2000; Finch *et al*., 2001; Karlsen and Nazroo, 2002; 2004; Krieger *et al*., 2005; Harris *et al*., 2006; Bécares *et al.*, 2012*;* Priest *et al*., 2013). Although the data used here cannot explicitly investigate experiences of racism, the positive association between racial discrimination and poor health for minority ethnic groups (MEGs) may explain the heightened risk of poor health for MEGs in otherwise comparable circumstances to the White majority.

Chapter 4's analysis of data from the HSEs revealed widening inequalities in health between Whites or Indian and Pakistani and Bangladeshis, and narrowing inequalities between Indians or Blacks and Whites (as noted previously according to the rate ratios). Running parallel to the widening and in some cases narrowing health gradients *between* ethnic groups was a picture of increasing social inequalities in health *within* ethnic groups. Social gradients to health widen between 1998 and 2011 for Whites, Indians and Pakistani and Bangladeshis according to the increasing rate ratios of SIRs for poor health or LLTI by social class. Widening social inequalities in health are also observed for the overall population according to both health measures (see Figure 4.3 in chapter 4). For LLTI and poor health, the greatest degree of social inequality within ethnic groups by 2009-2011, evidenced by the highest rate ratios, is observed for Indians. This is further evidence of the marked differences within Indian ethnic groups.

Logistic regression modelling in chapters 4 and 6 both demonstrate that ethnic inequalities in health are better explained by socioeconomic, broad spatial and (in chapter 6) migrant status than ethnicity alone. Adjusting for attributes other than ethnicity, age and gender consistently modifies the odds of LLTI (or poor health in chapter 4). This suggests that some of the ethnic differences in health (as well as age- and gendered- variations) are explained by socioeconomic and spatial factors: a finding replicated in a number of comparable studies (e.g. Cooper, 2002; Mindell *et al*., 2014). However, while social and spatial inequality help explain health inequalities within ethnic groups, they are not sufficient to capture the breadth of the experiences of different ethnic groups. Such an inference could only be drawn if comparable socioeconomic circumstances resulted in comparable odds or probabilities of poor health between ethnic groups: this has not been found. Certain MEGs, particularly Pakistani and Bangladeshis, are not able to reap the same benefits of more advantaged circumstances as either the White majority, or in some cases, Indians (and often Chinese groups not extensively explored in this thesis).

Probabilities of poor health between ethnic groups are briefly discussed in chapter 4 and more extensively explored in chapter 6. Analysis of changing probabilities of LLTI by ethnic group between 1998 and 2011 in the HSE (not shown) found that despite overall reductions in the probability of LLTI, MEGs still had the highest probability of LLTI when compared to Whites in comparable circumstances. However, expanding the analysis to account for migration (with the SARs) and then exploring the age-selectivity and tenure-selectivity of migration and the relationship with health revealed a more nuanced picture of ethnic inequalities in health otherwise masked in the data. While important to advancing knowledge on the nature of ethnic inequalities in society, these results also illuminate the complex relationship between migration and health.

Objective 7: examine the nature of relationships between migration and health by ethnic group. Patterns of migration, an inherently selective event, are known to vary across the lifecourse with age (Plane, 1993; Raymer and Rogers, 2008) according to different sociodemographic attributes such as housing tenure (e.g. Boyle *et al*., 1998) and crucially, health (e.g. Bentham, 1988; Larson *et al*., 2004; Norman *et al*., 2005). However, the relationship between migration and health depends on stage in the lifecourse *and* wider socioeconomic attributes. There are then further differences according to migrant type, here defined by distance moved. To summarise the varied findings in the wider literature extensively discussed in these pages, younger migrants are more likely to be in better health than their stable counterparts. However, when distinguishing between migrant type and tenure, migrants moving over *short* distances and in *social rented accommodation* are more likely to be in *poorer* health than non-migrants (see in particular, Boyle *et al*., 2002). Older migrants, however, are more likely to be in poor health than their stable counterparts.

Analysis of the SARs and the ONS LS demonstrate these patterns. Cross-tabulating sociodemographic variables with the two migrant variables identified in the SARs illustrated the selectivity of migration. Higher social classes and higher levels of educational attainment are each associated with higher (although not always significantly higher) rates of migration (see Figure 5.8 in chapter 5). The social gradient to migration, however, is not as pronounced as might be expected: rates of migration are lowest amongst those in class IIIM (8.5%, 9.1% and 8.8% in each year), increasing for classes IV & V in each year and notably increasing further for the population not assigned to a class in 2001 (10.1%) and 2011 (17.6%). Propensity to migrate is also associated with tenure, with higher rates of migration amongst the population in rented tenancies, usually temporary by nature. Contrasting with the low levels of migration for groups living in owner-occupied accommodation (on average < 7% in 1991, 2001 and 2011), rates of migration are significantly higher in privately rented accommodation: 28.3% in 1991, 35.1% in 2001 and 34.9% in 2011. Rates of migration are lower amongst the population in socially rented housing, falling to an average of 10%.

It is likely that variations in propensity to migrate by social class, educational attainment and tenure attenuate the relationship between migration and health: as higher social classes and higher levels of educational attainment are associated with better health, these migrants are more likely to be healthy. Simple descriptions of the health of migrants as compared to non-migrants are not sufficient to capture these complexities. For example, calculating SIRs by migrant status in chapter 5 suggests that there are only consistently significant differences in the health of male and female migrants in 2011 (lower levels of LLTI than expected, SIR < 100), with females in 1991 and 2001 having significantly higher levels of LLTI than expected (107.90 and 102.59, respectively). The health of non-migrants, who account for between 91.0% (1991) and 88.9% (2011) of the population, is not significantly different from the overall population (as would be expected). These SIRs are summarised in Table 5.6 of chapter 5, with Table 5.7 subsequently summarising SIRs by ethnic group. However, SIRs by migrant status and ethnic group, although telling as to the overall health of different population subgroups, do not help in defining the nature of the relationship between health and migration.

Results of the logistic regression models in chapter 6 are particularly revealing as to the nature of these complex relationships, illustrating how the relationship between migration and health (or the influence of migration on health) is contingent on age or tenure, and attenuated by sociodemographic attributes such as social class. Odds of LLTI were significantly lower for migrants relative to non-migrants in 1991, 2001 and 2011 when adjusting for the interaction between housing tenure and migrant status. However, differences emerged by migrant type: for example, long-distance migrants in 2001 had significantly raised odds of LLTI relative to non-migrants. To examine the influence of the interaction between migrant status or type and tenure, probabilities of LLTI were calculated for different ethnic groups by social class and migrant status according to each of the tenure-specific models. Predicted probabilities allow for comparison between ethnic groups by migrant status according to given attributes. These are important to explanations of the relationship between migration and health. Further, these tenure-specific models are also illuminating as to the nature of ethnic inequalities in health: the results will be discussed accordingly.

Across each set of models, higher probabilities of LLTI are found in lower social classes regardless of migrant status and ethnic group. However, the social gradient to health is flatter within the population living in social housing with only those not assigned to a class having markedly poorer health. This clearly demonstrates the importance of housing tenure in contributing to or determining health inequalities within the population. Further, the interaction between housing tenure and migration in terms of the magnitude of the influence on (poor) health varies between ethnic groups in unexpected ways. Within these distinct models run for each of the SARs (1991, 2001 and 2011), the highest probability of LLTI is no longer invariably afforded to Pakistani and Bangladeshis, nor do Whites consistently experience the lowest probability of LLTI. Although the poorer health of Pakistani and Bangladeshis is evident in the generally higher probabilities of LLTI regardless of social class, migrant status, region or occupancy type, in 1991 the highest probability of LLTI is for migrant Indians in socially rented accommodation, not assigned to a class and living in the North (20.2%). In 2001, Pakistani and Bangladeshis in these circumstances have the highest probability of LLTI in that year (30.9%). However, by 2011 it is White migrants not assigned to a class, living in the North and in socially rented accommodation who have the highest probability of LLTI (17.4%). By distinguishing between tenures, a clearer understanding of the relationship between migrant status and health emerges: migrants in social housing are in poorer health than non-migrants and this is consistent between ethnic groups especially when not assigned to a class. Migrants in privately rented and owner-occupied housing, however, are in better health than non-migrants.

What is of particular interest in these tenure-specific models is the extent to which accounting for interactions between migrant status (or type) and housing tenure differently influences probability of LLTI between ethnic groups. For example, despite the generally observed poorer health of Black Caribbeans and Pakistani and Bangladeshis, these groups have lower probabilities of LLTI when in social housing than Whites. On the one hand, this may suggest that Whites in social housing are significantly different from Whites in owner-occupied or privately rented accommodation. In particular, this may reflect the heterogeneity of the White ethnic group. For example, by 2011 Whites accounted for 86% of the total population of England and Wales but only 80.5% of this group identify as White British (ONS, 2012). In England, 79.8% of the population are classed as White British with a further 1.0% Irish, 0.1% White Gypsy or Irish Traveller and 4.6% as White Other (ONS, 2012). White Gypsy or Irish Traveller groups are particularly disadvantaged in society (see Cemlyn *et al*., 2009 for a comprehensive review of the inequalities experienced by Gypsy and Traveller communities) with significantly poorer health (Parry *et al*., 2007). Sub-setting the SARs sample by tenure may result in a higher concentration of less advantaged and in some cases minority White groups dominating the White ethnic group in these models which results in the poorer health observed. On the other hand, differences in the probability of poor health between ethnic groups in social housing may reflect differences in the ability to access social housing when in need. According to data from the Department of Communities and Local Government (DCLG), between June

2012 and December 2013 the proportion of new social lets to minority groups in England dropped by nearly a quarter yet the proportion allocated to Whites rose nearly 10% (Douglas, 2014). Trends such as this alongside apparent differences in the probability of LLTI between ethnic groups in social housing suggest that further research in this area is required. Are MEGs facing barriers to accessing appropriate social housing compared to White groups? Are minority White ethnic groups disproportionately concentrated in social housing and, by virtue of their 'White' status, neglected from wider discussions of minority disadvantage?

Health inequalities between ethnic groups are evidently entangled with their contrasting socioeconomic experiences and residential circumstances, both in terms of tenure and deprivation (as shown in chapter 7 and discussed below) and cannot be reduced to either ethnicity (as noted above) or subsumed by wider discussions of social and spatial inequalities in health. Importantly, these inequalities are also influenced by the complex relationship between migration and health which varies according to housing tenure. However, migration is also age-selective. Examining the age-selectivity of migration in terms of the influence on health illustrated that a) ethnic inequalities in health open up in older ages with MEGs often in better health than Whites when aged 16-29; b) migrants are in better health than non-migrants in younger ages, and in poorer health than non-migrants when older; and finally, c) over time, migrants are in better health than non-migrants for longer periods of time over the lifecourse. As ethnic inequalities in health evidently increase with age, the ageing of the relatively youthful minority ethnic population in England (see Figure 5.2 in chapter 5) may have important implications for policy development.

This thesis' analysis of the contribution of selective sorting to changing health gradients sheds some light on the apparent acceleration of deteriorating health for MEGs relative to Whites: persisting disadvantage is an important factor. Notwithstanding the changing patterning of ethnic inequalities in health with age, the relationship between age, health and migration is generally consistent. Younger migrants *are* more likely to be in better health than non-migrants with the inverse true in older ages. However, increases in life expectancy and healthy life expectancy in the last few decades appear to have influenced the health-migration relationship in older ages. For example, between 1990 and 2010 life expectancy increased by 4.2 years in the UK (Murray *et al.*, 2013). As life expectancy has been found to have a positive linear relationship with healthy life expectancy, whereby increases in life expectancy will correspond with increases in healthy life expectancy (Steel, 2015), moves in later life associated with poorer health may therefore be delayed. This delay would result in migrants being in better health than non-migrants at older ages, as observed from 1991 to 2011. Marshall and Norman (2013) found a 'kink' in ASIRs (by LLTI) at retirement whereby increasing rates of LLTI with age slowed or declined around retirement age. One explanation for this kink suggested by the authors is health-selective migration. As the relationship between health and migration at retirement age evidently remains unclear, future research in this area is required. Nevertheless, whilst there are differences in life expectancy between ethnic groups (Rees *et al*., 2009), the changing nature of the health-migration relationship with age is consistent between ethnic groups.

Objective 8: analyse whether transitions between area types or social classes influence the patterning of health by social class or deprivation for different ethnic groups. This thesis has examined the health of groups of movers (migrants) and stayers (non-migrants) transitioning between area types and social classes for different ethnic groups between 1991 and 2001, and 2001 and 2011. The extent of the influence on health gradients by social class and deprivation has been assessed in a number of ways, using the ‘put people back’ approach and evaluating the health of different groups of movers and stayers transitioning between area types and social classes. The ‘put people back’ essentially compares the distribution of health by destination deprivation quintile or social class with the distribution of health if mobile groups are put back into their deprivation quintile or social class of origin. Rate ratios between the most and least deprived areas (Q5:Q1) or bottom and top two social classes (IV&V: I&II) are then calculated at origin and destination: if the rate ratio is higher by destination, transitions between area types or social classes are widening health gradients, yet if the rate ratio is higher by origin, these transitions may be constraining health gradients. For the total population, rate ratios by social class and deprivation are consistently *higher* at destination (although the difference is marginal by social class in 1991-2001) (See Table 7.3 in chapter 7). This suggests that transitions between area types and social classes widen health gradients by social class and deprivation for the overall population. Following this ‘put people back’ approach, the SII and RII were also calculated at origin and destination deprivation or social class to account for differences across the whole population in chapter 8. In contrast to the patterns observed by transition category (discussed below), absolute inequalities denoted by the SII and relative inequalities denoted by the RII consistently increase for all ethnic groups in both census periods after transitions occur. While differences in health between the best and worst off are important to discussions of health inequality, particularly for ethnic groups who concentrate in the most disadvantaged circumstances, as differences also appear to play out in transitions between the middle deprivation quintiles or social classes, future work should explore these transitions more substantively.

To explore the nature of the influence of selective sorting both within the overall population and by ethnic group, the health of groups transitioning between area types or social classes are compared for movers (migrants) and stayers (non-migrants). Distinguishing between movers and stayers helps determine if the sorting process is exaggerated for movers compared to stayers, whether in terms of experience of deprivation mobility or social mobility, and also accounts for the inter-relationship between deprivation mobility and migration, or social mobility and migration. Previous work by Boyle *et al*. (2009) (amongst others) has illustrated the importance of comparisons between the mobile transitioning groups rather than between mobile and immobile groups in identifying the extent and magnitude of the influence of selective sorting on health gradients. Transitions between area types between 1991 and 2001 or 2001 and 2011 for movers appears to contribute to widening health gradients as the health of groups moving out of Q1 is poorer than the health of groups moving into Q1, while the health of those moving out of Q5 is better than the health of those moving in. However, for stayers over a 10 year period changes in area types appear to maintain the deprivation-health gradient in 1991-2001, yet constrain the gradient in 2001-2011. The deprivation-health gradient is therefore exacerbated through migration, with no evidence that area type change can contribute to widening health gradients as found by Norman *et al*. (2005) who used a 20 year rather than 10-year period. It is possible that over a 20 year period area type change through deprivation mobility may similarly widen health gradients. Length of residency is evidently important in terms of accruing health (dis)benefits associated with differently deprived areas. To determine the *overall* influence of selective sorting on deprivation-health gradients, SIRs by transition categories are compared for movers and stayers combined: successively increasing SIRs with transitions into more deprived areas in 1991-2001 and 2001-2011 suggest that selective sorting does contribute to widening deprivation-health gradients (see Table 7.4 in chapter 7). Although a similar pattern is observed in 1991-2001 for MEGs, with the overall influence of selective sorting between area types contributing to widening health gradients, in 2001-2011 this process appears to maintain rather than widen existing health gradients. Conversely, although the deprivation-health gradient for Indians appears to widen in 1991-2001 and maintain in 2001-2011, the opposite is true for Pakistani and Bangladeshis. Nevertheless, relative inequalities in health between area types are consistently exaggerated by migration for all ethnic groups, whether or not these transitions subsequently widen health gradients. This is evident in the extremal quotients calculated for movers and stayers who churn or remain within the most and least deprived areas (see Table 7.5).

The influence of transitions between social classes on social-health gradients is similarly exacerbated by migration for most ethnic groups (see Table 7.8) although differences within Pakistani and Bangladeshis are marginal compared to those observed by deprivation. Further, the social gradient within Indians is steeper for stayers than for movers in 1991-2001. The influence of transitions between social classes for movers and stayers is more consistent between ethnic groups than observed for transitions between area types. In 1991-2001, transitions between social classes maintained health gradients in the overall population, total MEGs and for Pakistani and Bangladeshis, constraining health gradients for Indians. However, in 2001-2011 social-health gradients appear to be widened for the overall population, the MEG population and Indians while maintained for Pakistani and Bangladeshis. The influence of selective sorting between social classes therefore changes between 1991-2001 and 2001-2011 but is fairly consistent by ethnic group. Conversely, the influence of selective sorting between area types consistently contributes to widening health gradients in the overall population (driven by the transitions of migrants) but varies across the MEGs. The only consistent pattern between the sorting processes and by ethnic group is that the distribution of health by transition category for the MEGs is more closely aligned to that observed for the total population in 2001-2011 than 1991-2001, regardless of the subsequent influence on health gradients. So what might explain these differences in terms of the apparent influence on health gradients between ethnic groups, or account for the similarities in the patterning of health if not the actual influence on health gradients?

On the one hand, it might be argued that increasing similarities in the patterning of health between ethnic groups as compared to the overall population reflect increasing sample sizes less susceptible to fluctuations in the data. The smaller sample sizes for MEGs in 1991-2001 may produce the more erratic patterns observed in chapter 7 (e.g. see Figure 7.7). On the other hand, this may reflect increasing integration or acculturalisation of MEGs, particularly those examined in the longitudinal analysis of this thesis, into the overall population. The South Asian presence in the UK began to grow in the post-war period as migrant workers from the Indian continent flocked to the UK to fill the labour shortage (Ballard, 1994). The UK remains a popular destination for South Asian migrants with successive generations remaining in areas once characterised by labour shortages such as London and the midlands (reflected in Figure 5.5). The South Asian community are therefore increasingly entrenched in society with the mechanisms shaping the ‘native’ populations socioeconomic experiences and their health similarly increasingly shaping that of the settled second-, third- and fourth-generation migrants. Thus, although there are social inequalities within and between ethnic groups, the relationship between socioeconomic status and health is comparable between ethnic groups: higher social classes are associated with lower rates of poor health. Further, as shown in Figure 4.3 (chapter 4) the social patterning to health *within* ethnic groups is changing in similar ways over time. It is therefore likely, as indeed analysis of transitions between social classes by ethnic group has shown, that experiences of selective sorting between social classes and the contribution to (changing) social-health gradients will therefore be increasingly comparable between ethnic groups over time.

However, while the relationship between deprivation and health is also consistent between ethnic groups, there is a greater degree of spatial segregation by ethnic group than there is social segregation (see Figures 5.6 and 5.7). There are also some differences, albeit slight, in patterns of migration between ethnic groups. It is possible that the spatial experiences of MEGs interacts with differences in their likelihood to migrate which modifies the influence of selective sorting between area types on health gradients when compared to the overall population. To understand how this interaction may manifest it is useful to revisit discussions of contextual and compositional effects of place on health. Place as a determinant of health is central to explanations of changing health gradients through deprivation mobility or migration, as social determinants of health are central to explanations based in social mobility. Thus, in exploring changing deprivation-health gradients, it is assumed that contextual and or compositional attributes of place will be shaping these gradients. However, should the influence of contextual characteristics of place on health be contingent on compositional characteristics of place, it is possible that the influence of selective sorting between area types may vary for MEGs who are more segregated than the White majority. This has been explored in a variety of ways, framed around discussions of ethnic density and the influence on health (e.g. Halpern and Nazroo, 2000; Pickett and Wilkinson, 2008; Bécares *et al*., 2009; Stafford *et al*., 2009). Identifying the geography of the migration events for different ethnic groups over a twenty rather than a ten year time period may help disentangle these complexities.

Chapter 8 begun to try and unravel some of these complexities, considering how selective sorting's contribution to changing health gradients is as much about the mobile transitioning groups as the immobile groups. Differences in the contribution of selective sorting between area types to changing ethnic health gradients, arguably arising from differences in the spatial distribution of ethnic groups and patterns of migration, focus attention on the contribution of *immobile* groups to changing health gradients, rather than simply *mobile* groups. While mobile groups are *selected* and subsequently *sorted* into different area types (or social classes), immobile groups are arguably *selected* to remain. Logistic regression models in chapter 8 informed the calculation of probability of *immobility* for different ethnic groups according to their health status, experience of and transitions between area types and social classes. Crucially, it was demonstrated that probability of immobility was higher for MEGs than for Whites when in comparable circumstances, problematic if certain MEGs are more likely to be in more deprived areas and lower social classes. The most important finding in respect of changing health gradients was that MEGs are more likely to be immobile when also experiencing downward deprivation mobility than Whites. Thus, MEGs are more likely to remain in declining areas. As increasing deprivation is associated with poor health, and longevity in increasingly deprived areas has been found to be associated with declining health (Norman *et al*., 2005) this may ultimately exacerbate ethnic health gradients. Further, MEGs have higher probabilities of immobility when in the most deprived areas than White groups, suggesting that these groups are less able (or willing) to move away from more deprived areas than Whites. This is likely to further exacerbate health-deprivation gradients and serves to undermine the apparent maintaining influence of transitioning mobile MEGs found in chapter 7. Accounting for immobility is evidently important in discussions of the contribution of selective sorting to changing *ethnic* health gradients.

Probability of immobility, according to the logistic regression models in chapter 8, was lower for those in higher social classes for all ethnic groups. The similarities in the social gradient to immobility between ethnic group found here echoes the findings of Catney and Simpson (2010) who modelled probability of migrating for ethnic groups by NS-SeC (rather than social class). However, Catney and Simpson found that this social gradient varied depending on the nature of the move modelled, particularly in terms of moves between settlement (areas where immigrants are likely to settle and therefore characterised by more ethnic diversity) or non-settlement districts. It is possible that the inter-play between the two selective sorting processes, i.e. migration and social mobility, is not as strong for MEGs as apparent for the White majority due to differences in the distance moved. As evident in this thesis (chapter 5) and wider literature (e.g. Finney and Simpson, 2008), MEGs as a whole are more likely to move over shorter distances than the White majority. Thus, as the link between social and spatial mobility has been said to only operate for long-distance moves (Ewens, 2005), such a link may not operate for MEGs who typically move across short distances.

9.3 Contribution to knowledge

9.3.1 Over recent decades, are there changing rates of self-reported health and do these vary by ethnic group?

According to SIRs calculated in the HSE, there are overall improvements in population health for all ethnic groups, evident in the overall decline in the value of the SIRs for LLTI or less than good health (see Figure 4.1). In contrast to the overall improvements found in population health by ethnic group within the HSEs, analysis of the SARs suggested to the contrary. Age-specific illness rates (ASIRs) by ethnic group suggest that despite some improvement between 2001 and 2011, overall rates of LLTI between 1991 and 2011 increased by some margin. The contrasting pictures of population health between the HSE and the SARs deserve some consideration, particularly as this is likely more a reflection of the nature of the data itself and the time-period in question than actual differences.

Firstly, while the HSE data suggests overall improvements in population health, rates of LLTI are higher in the population according to the HSE than observed in census microdata. Surveys focusing on health have previously been found to produce larger estimates of poor health in population (see Taylor *et al*., 2014) which may therefore bias the results. Secondly, when focusing on the period between 2001 and 2011 in both the HSE and SARs datasets, overall changes in rates of LLTI are comparable: there is a slight reduction across all ethnic groups. The dramatic increase in rates of LLTI between 1991 and 2001 found in the SARs may reflect changes in the question wording, something which may be compounded by differences in the interpretation of the question between ethnic groups, rather than actual dramatic changes in population health.

Should the HSE study sample used be extended back to 1991 (lack of ethnicity data notwithstanding), it is possible that the overall patterns observed would correspond more closely. Importantly, what is consistent between datasets is that while *all* ethnic groups experience some improvement between 2001 and 2011, these improvements do not serve to close the health gaps. Moreover, evidence from the HSE suggests that the more disadvantaged subgroups *within* ethnic groups and the overall population are experiencing improvements at a slower rate than the more advantaged. Figure 4.3 illustrates this through the increasing health inequalities within ethnic group and the overall population by social class. Groups which are disproportionately concentrated in more disadvantaged circumstances, such as Pakistani and Bangladeshis or Black Caribbeans, are therefore not only more likely to experience within-group inequalities, but less likely to experience overall improvements in their health at the same rate as more advantaged ethnic groups in the population. These conclusions are in line with the anticipated patterning to health noted in chapter 2.

9.3.2 Once sociodemographic attributes are accounted for, do any differences between groups remain?

It has consistently been demonstrated that sociodemographic attributes such as social class, household tenure, educational attainment and the addition of migrant status in the SARs analysis attenuate the odds of LLTI or poor health for different ethnic groups. This suggests that some of the ethnic differences in health are explained by differences in socioeconomic status and, to some extent, migrant status. Although the importance of socioeconomic attributes in influencing ethnic differences in health has been explored elsewhere in the literature (Williams, 1996; Cooper, 2002; Karlsen and Nazroo, 2010; Nazroo, 2014; Mindell *et al*., 2014), building a robust evidence base explaining the nature of ethnic inequalities in health is essential if these inequalities are to be addressed in an increasingly ethnically diverse society. In particular, as ethnic inequalities in health increase with age, the ageing of a relatively youthful minority population must be considered in social and public health policy.

However, socioeconomic status, place and migrant status do not explain all differences in health between ethnic groups. Differences in the modelled probabilities of poor health for different ethnic groups given comparable socioeconomic attributes, place and migrant status clearly demonstrate this. A growing body of work looks to experiences of racial harassment and discrimination as a possible explanation for the apparent multiplicative or additive influence of (dis)advantage on minority ethnic health. International research has found a strong association between poor health and experiences of racism (e.g. Williams *et al*., 2003; Harris *et al*., 2012), with discriminatory practices possibly limiting access to different socioeconomic resources or opportunities (such as comparable earnings in equivalent occupations) for certain ethnic groups. In the absence of robust data documenting experiences of racism or discrimination, evidence of ethnic penalties operating in the housing market, labour market or education system are often examined. Research in the UK into ethnic penalties has found that certain MEGs are underemployed relative to Whites with comparable levels of educational attainment resulting in higher levels of unemployment amongst Indian, Pakistani, Bangladeshis and Caribbean men in particular (Rafferty, 2012; Catney and Sabater, 2015), earn less than the White majority (Longhi and Platt, 2008; see also Leicht, 2008) and are under-represented in certain types of education such as postgraduate research degrees (Wakeling, 2009). Similarly, results from this thesis found that certain MEGs, particularly Pakistani and Bangladeshis, are more likely to not be assigned to a class (and therefore out of work) or in lower social classes, be economically inactive and have lower levels of educational attainment. MEGs also have higher proportions in more deprived areas and higher proportions remaining in the most deprived areas. Some form of ethnic penalty is evidently in operation which, given the negative association of these attributes with good health, is likely to differently influence overall rates of poor health between ethnic groups.

9.3.3 Are there differences in health between migrants and non-migrants?

The health of migrants varies according to age and housing tenure. Younger migrants are more likely to be in good health than non-migrants whereas older migrants are more likely to be in poorer health than non-migrants. However, increases in life expectancy appear to have delayed moves associated with poor health in older ages. The age-patterning to the health of migrants, however, only manifests when accounting for the interaction between housing tenure and migration. Migrants in owner-occupied and privately rented accommodation are in better health than non-migrants whereas migrants in socially rented accommodation are in poorer health than non-migrants. These differences demonstrate the importance of framing research into migration and health around lifecourse approaches to the study of migration (e.g. Kulu and Milewski, 2007; Dennett, 2010; Wingens *et al*., 2011). Such studies take an age-based approach to analysing patterns of migration according to age-cohorts and thereby use age as a proxy for lifecourse events (Tyrell and Kraftl, 2015: 19 referring to Dennett, 2010 and Stillwell, 2008). Given that health inequalities vary by age, as found by Norman and Boyle (2014) amongst others, and demonstrated in the modelled probabilities of LLTI by ethnic group and age in this thesis, an integrated approach to the study of migration and health drawing on lifecourse theories and discussions of social determinants of health, is arguably best placed to reveal the complexities of these relationships. This thesis' analysis of the inter-relationships between migration, health and ethnicity has advanced understanding on ethnic patterns of internal migration, a notably under-explored area of research (Robinson, 1992). The analytical framework guiding this analysis, which relates to lifecourse approaches to the study of migration and health inequalities, and theories on social determinants of health, is apt for the study of ethnic patterns of migration. Finney (2011) found that ethnic patterns of lifecourse migration vary, in part owing to differences in the age-structures of MEGs but also related to differences in the cultural norms and traditions encompassed by different ethnic groups. Further, ethnic inequalities in health vary by age with younger MEGs in better health than the White majority, falling behind with increasing age. Lifecourse perspectives are therefore important and differences between ethnic groups in experience of migration or health at similar stages in the lifecourse must be further explored in the research agenda, particularly as the minority population ages. An ageing population also reinforces the importance of further investigating the relationship between health, migration and retirement (Marshal and Norman, 2013), particularly as the statutory retirement age is increasing.

Given this thesis' contribution to knowledge of ethnic patterns of migration, it is worth further identifying how this research has contributed to recent recommendations for future research in this area by Finney *et al*. (2015). Firstly, the authors argue that discussions of ethnic dispersal or assimilation would be better framed around themes of ethnic inequalities and social justice, as indeed are this thesis' discussions of health. They notably ask "what are the consequences of [ethnic] inequalities in mobility?" (2015: 43), consequences which are considered in the residualisation or rootedness of different ethnic groups explored in chapter 8 in relation to changing health gradients. Secondly, the authors argue for more exploration of how ethnic identity intersects with wider social markers including class, gender and religion when influencing differences in migration patterns. The focus of this thesis on the inter-relationship between social mobility and migration, and accordingly, the socioeconomic and spatial experiences of different ethnic groups, encapsulates certain aspects of intersectionality which may simultaneously influence ethnic patterns of migration and ethnic inequalities in health. This builds on work explicitly examining the association between social class, ethnicity and migration (Catney and Simpson, 2010).

9.3.4 Do health inequalities change over time between area types and social classes?

Health inequalities appear to change over time between area types, with migration (and to a lesser extent deprivation mobility) contributing to widening health gradients between 1991 and 2001, and 2001 and 2011. However, selective sorting between area types does not appear to influence changing ethnic health gradients in the same manner that it influences changing health gradients for the overall population. This may be attributable to the concentration of MEGs in more deprived areas, greater degrees of spatial segregation for MEGs relative to the White majority and differences in the propensity to migrate. It should be noted that ethnic segregation is defined in terms of concentrations in GORs of England: a more detailed geography may reveal very different patterns of ethnic segregation.

Health inequalities between social classes are widening in the overall population and by ethnic group between 1998 and 2011, according to increases in the relative difference in health between the bottom and top two social classes (Figure 4.3). Analysis of longitudinal census microdata further demonstrates that social inequalities in health may have changed over time through transitions between social classes: social mobility appears to widen health gradients, changing the distribution of health across social classes which would have arisen should no social mobility occur. This is evident in the increases in relative inequalities in health between the top and bottom classes, as revealed by the extremal quotients calculated using SIRs by social class, and the increasing SII and RII accounting for changes in each social class. However, while social inequalities in health appear to have widened for Pakistani and Bangladeshis according to data from the HSE, this is not attributable to social mobility between 2001 and 2011: transitions between social classes appears to maintain existing health gradients for these ethnic groups rather than widen them.

9.3.5 Do transitions between area types and social classes explain changing health gradients in England for the overall population or by ethnic group?

Results of the analysis in chapter 7 and the first part of chapter 8 clearly establish how transitions between social classes and area types contribute to changing health gradients. Importantly, these analyses extend existing work in this area by using the latest available census data; exploring the nexus between migration, deprivation mobility and social mobility; and also examining these processes from an ethnic perspective. It has been shown that the overall contribution of selective sorting between area types and social classes widens overall health gradients by social class and deprivation for the overall population, the total minority ethnic population, and health gradients for Indians and for Pakistani and Bangladeshis. However, when focussing on relative differences between the best and worst off, there are variations between ethnic groups. Nevertheless, migration has been found to exaggerate the relationship between deprivation and health or social class and health (apart from for Indians by social class in 1991 and 2001). When distinguishing between movers and stayers and when limiting the analysis to differences between the best and worst off, selective sorting *at most* maintains existing health gradients and *at worst* widens existing health gradients consistently between 2001 and 2011, and for the overall population between 1991 and 2001. People in less favourable circumstances are more likely to be immobile and not achieve transitions to better area or social circumstances and health. This immobility is also influential on the maintenance of health inequalities.

9.4 Limitations

9.4.1 Data

This thesis has used the most appropriate data available to investigate the nature of ethnic inequalities in health and explore the contribution of selective sorting to (changing) health gradients. The data used is considered appropriate as: a) the HSEs are an under-used resource to explore ethnic inequalities in health; b) sample sizes in the SARs and ONS LS facilitate meaningful analysis of changing life circumstances and ethnic experiences in society; and c) analysis of transitions between area types (and to some extent social classes) are comparable with key literatures informing the analytical framework guiding this analysis (e.g. Boyle *et al*., 2004; Norman *et al*., 2005; Boyle *et al*., 2009). However, there are alternatives.

A number of repeated cross-sectional surveys similar to the HSE exist. Examples include the Labour Force Survey (LFS) or the British Household Panel Survey (BHPS) (recently, Understanding Society). However, neither focuses on health which may be beneficial given the first core aim of this thesis. Further, as the HSE has been used in a number of studies to examine ethnic inequalities in health, it is important to advance these studies by developing a long-run time-series of the HSEs to further investigate ethnic inequalities in health. This therefore reflects a valuable contribution to the literature while also demonstrating the utility of datasets which are hitherto under-used for the study of ethnicity and health (notwithstanding the notable exceptions cited in this thesis).

Finney (2011) also notes that neither the BHPS nor the LFS are appropriate for the study of migration for different ethnic groups, owing to small sample sizes for ethnic groups in the BHPS or limited migration information in the LFS. Finney goes on to highlight the value of census microdata such as the SARs for this type of research, owing to the large sample sizes. However, given the focus on migration it may be argued that the Special Migration Statistics (SMS) and broader specially commissioned tables on flow data may be revealing. However, this thesis's emphasis on ethnicity negates such use. As Stillwell *et al*. (2008) concluded, although the SMS are valuable sources of data on migration flows, particularly in terms of spatial coverage, they are limited insofar as they only provide uni-dimensional counts rather than cross-tabulations required to analyse ethnic differences in migration patterns by socioeconomic attributes or health. The ethnic detail of the SARs is therefore more appropriate for the purposes of this research, at the expense of the spatial coverage of the SMS and commissioned tables. Further, whilst both the SARs and LS are only samples of the population of England and Wales, they are sizeable and this is a substantial advantage over alternative national surveys such as the LFS or General Household Survey (Boyle and Norman, 2010: 148).

Finally, the ONS LS is particularly valuable for the analysis of transitions or changes in individual circumstances over time. However, datasets such as BHPS/Understanding Society also offer the potential to analyse transitions over time. Nevertheless, the size of the LS, a noted advantage of this dataset, and the ability to track transitions from 1991 mean it is more appropriate for this analysis than Understanding Society. Further, as this thesis has sought to update and extend existing work on selective sorting, using comparable data was a key factor in determining which datasets to use. Future work could examine whether these patterns hold across wider datasets such as Understanding Society if the sample size has increased enough to be able to explore ethnic groups.

9.4.2 Variables and measures

Should future work extend these analyses and apply the analytical framework employed to different datasets, limitations with the measures and methods used must be considered. Working within the constraints of predetermined (by data collectors) and contested constructs of ethnic groups is not without problems. To analyse ethnic differences in society, ethnic groups must be suitable for statistical analysis while also theoretically meaningful. Thus, whilst the sample sizes in the HSE and ONS LS are reasonable, when cross-tabulating by ethnicity (and other attributes) they reduce markedly. However, the value of research or existing data should not be contingent on statistical significance which generally requires large sample sizes. Any patterns revealed may be indicative of broader trends which should be considered in the absence of more robust data, particularly where results replicate findings of other studies, or between datasets as found in this thesis. The distinct analyses in this thesis maintained as much ethnic detail as possible, particularly in the analysis of the SARs. Recognition of the diverse experiences of Black groups (evidenced in the SARs) meant that this group was not considered in the longitudinal analysis. While not ideal, these groups are the most detailed possible for the purposes of this analysis. In particular, as these analyses corroborate each other and wider studies reviewed in the literature, limited statistical significance should not undermine the conclusions drawn.

Sample sizes of ethnic groups are not the only limitation when analysing ethnic experiences in society. Such studies assume that traditional markers of individual experiences of society, such as social class, are sufficient to capture the diverse experiences of MEGs. However, as substantial proportions of the minority ethnic population are not assigned to a social class (with similar although lesser limitations found when applying NS-SeC), it is likely that a multi-dimensional measure of socioeconomic status would better capture inequalities within and between ethnic groups, as well as their diverse patterns of social mobility. Indeed, if a higher overall percentage of each MEG could be assigned to a social class it might be more illuminating as to the extent of ethnic gradients in health. To illustrate, 31.3% of the White group could not be assigned to a social class yet this increased to as much as 65.6% for Pakistani and Bangladeshis in the HSE sample. The inability to assign social class may also mask gendered differences in not only social class, but also economic activity and educational attainment between ethnic groups which may be revealing as to ethnic differences in health (see Nazroo, 1998). Nevertheless, it is likely that uni-dimensional measures unable to capture the diversity of experience between ethnic groups under- rather than over-estimate ethnic inequality in society. Thus, the conclusions of this thesis would likely be enhanced rather than substantively changed if social status was operationalised differently. Further, using social class helped ensure comparability with wider research on changing health gradients and social mobility, rather than the limited research on ethnicity, social mobility and health. However, Harding (2003) developed a measure of socioeconomic status in her study of social mobility, health and ethnicity which could be adapted for these purposes.

Health was primarily operationalised through the presence or absence of LLTI, alongside self-assessed general health in the HSE analysis. However, assessments of general health were not introduced in the census until 2001. Nevertheless, given the contrasting patterning of health between ethnic groups according to these two health outcomes found in the HSE, further work should expand the analyses of census microdata to account for general health rather than LLTI alone. Differences in the interpretation of LLTI between ethnic groups may distort the picture of poor health in the population. Using LLTI, however, ensured consistency in the analysis of census microdata and with wider studies which substantively inform the analytical framework adopted. Nevertheless, it is recognised that neither measure of self-reported health are particularly appropriate for uncovering differences in health amongst ages where mortality is uncommon (Power *et al*., 1996).

9.4.3 Alternative methods

The analytical framework adopted in this thesis has, as already noted, been guided by existing work on selective sorting and changing health gradients originating in the UK. Whilst this thesis has expanded this framework to explicitly account for the inter-relationships between migration, deprivation mobility, social mobility, health and ethnicity, and also substantively considered alternative methods to summarise the influence on changing health gradients (using the SII and RII in addition to rate ratios), it is arguable that more sophisticated methods may be more revealing as to the causal relationship between selective sorting and changing health gradients. Three alternative methods were introduced in chapter 3 (section 3.4) which may also shed light on the complex inter-relationships between migration, social mobility, deprivation change, health and ethnicity: multi-level modelling (MLM), Structural equation modelling (SEM), and microsimulation. While these methods were, as previously discussed, not considered appropriate for this thesis, the conclusions of this research may be enhanced by extending the work and applying these more sophisticated methods.

In particular, SEM has been effectively used to assess the relative importance of health selection or social causation in terms of health-related social mobility (Chandola *et al*., 2003). The authors note that the use of cross-lagged panel models in their structural equation modelling address a number of methodological issues with longitudinal research, in particular arguing that the “measurement error of complex (latent) concepts such as health and social position is reduced through the use of factor models” (Chandola *et al*., 2003: 2069). In the context of this research, multi-group SEMs may be run to assess the relative importance of factors such as socioeconomic status or health-selection in influencing health-related social mobility for *different ethnic group*. Such models follow from the conclusions of this thesis which find that selective sorting *can* contribute to changing health gradients. Multi-group SEMs would reveal whether the size of the influence varies between ethnic groups and subsequently be more revealing as to the causal relationships between selective sorting and changing (ethnic) health gradients. MLM may also enhance the conclusions drawn, particularly in terms of the interaction between baseline deprivation, social mobility and migration and the subsequent influence on (changing) health gradients. For example, a two-level model which groups populations by baseline deprivation might reveal how upward or downward migration (changing deprivation) or social mobility might differently influence probability of LLTI (or alternative health outcomes). Further, MLMs may also group the population by region to assess whether differences in the relationship between health and transitions between area types or social classes are observed across England. Future work may therefore benefit from applying alternative methods such as these to account for factors such as place effects (defined here as baseline deprivation effects) on the influence of different types of mobility on health gradients, or to identify the relative importance of selective sorting through social mobility, deprivation mobility and migration on changing (ethnic) health gradients.

9.5 Recommendations for future work

Discussion of the results of this thesis thus far has already identified a number of suggestions for future research, particularly in expanding the analysis to include assessments of general health in the census microdata; applying the analytical framework to alternative datasets such as Understanding Society; and using more sophisticated modelling techniques such as structural equation modelling. However, wider avenues for research can be identified which will significantly advance the conclusions drawn in this thesis. In particular, these suggestions relate to the limited existing qualitative research in this area and the way in which health is conceptualised. Much of the existing work on selective sorting is quantitative whereby health is conceptualised as the presence of limiting long-term illness, self-assessed general health or in terms of mortality. Yet it was noted that evidence for health selective migration was perhaps stronger for mental health (DeVerteuil *et al.*, 2007). Thus, future work could adopt a mixed methods approach to help disentangle the relationship between health and migration for a wider range of health outcomes, including mental health. Another research theme that deserves more future attention is health migration related to informal family care (Rogers *et al.*, 1992). Whilst this is increasingly important in societies with ageing populations, Ellis and Muckins' (1996) study of migration of people with AIDS in the USA reminds us that other demographic groups with particular degenerative conditions can also need to move back and seek family support (and sometimes paradoxically from elderly parents).

At this juncture, it is worth noting that a new body of studies has begun emerging that is exploring very short-term health mobilities where individual travel to other countries for cosmetic surgery, dentistry and/or other therapeutic healing (Bell *et al.*, 2011; Holliday *et al.*, 2013; Smith and Puczko, 2013). Whilst perhaps not directly linked to more mainstream studies of migration and health status, this burgeoning field may uncover useful linkages with a focus on the consequence of the processes of globalisation and mobility, culture (see also Fielding, 1992b and Halfacree and Merriman, 2015) and the importance of longitudinal biographical approaches in understanding processes and motivations (Boyle and Norman, 2009; Bailey, 2005). Expanding the research in these areas while accounting for the inter-relationships between migration and a multi-dimensional measure of social mobility may help further explain the nature of changing health gradients in the overall population and by ethnic group. Further, social mobility has also been operationalised in this thesis according to intra-generational social mobility, focussing on the transitions of an individual rather than the change between familial generations. However, in the context of ethnicity and successive generations of migrant groups it is important to explore how opportunities for social mobility within ethnic groups are changing over time. This is an indicator of the openness of a society and important to discussions of health gradients: these are particularly important given the context of increasing ethnic diversity, an ageing population within which health inequalities *may* increase with age, and the current socio-political climate.

These conclusions are limited to England, a country with its own socio-political context which may have different implications for patterns of mobility (whether spatial or social) than other countries with different socio-political contexts. Indeed forthcoming research examining the relationship between migration, deprivation change and risk of cardiovascular disease between ethnic groups in New Zealand finds remarkably different relationships between (poor) health and likelihood to migrate. This is illustrative of the extent to which variations between ethnic groups and socio-political contexts may be important in discussions of selective sorting and health gradients (Darlington *et al*., forthcoming). This research from New Zealand also raises the profile of the need to determine the impact of migration on health: Darlington *et al*. (2015) found that (multiple) movers are more likely to experience cardiovascular disease than stayers, the stress of moving could be a trigger.

Whilst the results of this analysis do find evidence to suggest that selective sorting between area types and social classes can contribute to changing and even widening health gradients for the overall population and overall minority ethnic population, a more nuanced picture of the contribution of selective sorting to health gradients may be gained through an international comparison. Indeed van Lenthe *et al*. (2007) call for such an international comparison in relation to neighbourhood inequalities in health.

9.6 Concluding remarks

This thesis has contributed to knowledge on the nature of ethnic inequalities in health, advancing discussions in this area by further demonstrating the importance of social and spatial differences in determining ethnic inequalities in health. Further, by illustrating that the (dis)benefits of social or spatial determinants of health are not equal across ethnic groups, this research has emphasised the need to continue investigating whether MEGs health and experience of (dis)advantage interacts with the (un)conscious practice of racial discrimination in society. A particular strength of this analysis is the creation of long-run time-series dataset to analyse changing ethnic health in a period characterised by rising and falling economic prosperity, targeted intervention in health inequalities, and increasing ethnic diversity. Given the recognition of the importance of socioeconomic determinants of health and their influence on health inequalities in society, the broader socio-political context of society is likely to be influential on changing health gradients. The conclusions of this research add to the growing evidence base needed to ensure these issues are substantively addressed in policy. In particular, the contrasting patterning of poor health within and between ethnic groups demonstrates the importance of a more nuanced approach to funding allocations between areas and intervention programs which currently group MEGs together. As there are substantial differences within ethnic groups (such as Indians) and between typical groups (such as Black or South Asian), it is possible that current finding allocations disproportionately benefit certain areas or programmes by virtue of a MEG *presence* rather than a MEG *need*. In the language of health inequalities and health inequities, such a difference in funding allocation would constitute a health inequity if it impacted negatively on health and is therefore of political, moral and social import.

This thesis has also explored whether selective sorting influences changing health gradients for the overall population and by ethnic group in England. Existing literatures on migration, deprivation mobility and social mobility have been updated with the inclusion of data from the 2011 Census. Secondly, the inter-dependence between these mobility processes has been accounted for by investigating changing health gradients for groups who migrate and are socially mobile, and for groups who experience area type change either through migration or deprivation mobility. Thirdly, the influences of these mobility processes on changing health gradients between ethnic groups have also been explored. This research has raised important questions as to the *immobility* of different ethnic groups, and the possible creation of residualised populations in different area types which may also contribute to changing or exacerbate existing health gradients.

The policy implications of residualised populations are significant: if certain minority groups are less likely to move away from areas which may also be more likely to become deprived, these areas require targeted area-based initiatives to improve health and well-being of the residents. For example, area regeneration programs which are tailored to meet the needs of ethnically diverse local populations may be more appropriate than universal approaches aimed at attracting more affluent groups into the area. This might include providing specific services or resources to meet the specific needs of the local population. However, area-based initiatives should run along-side person-centred policies. As certain ethnic groups already facing multiple disadvantages and appear to be more likely to remain in more move between more disadvantaged, deprived areas, policies should be designed that target these specific groups. Tailored policy responses aiming to identify these disadvantaged differently mobile groups, accounting for the complex and varied needs of different ethnic groups, may help ensure that health does not further deteriorate. If we can establish why these groups move within or are unable to move away from disadvantage, policies can be specifically designed to address the root causes of their disadvantage and help them move to different areas if desired.

The key conceptual findings of this thesis are that moving within or between disadvantaged circumstances, whether defined by area type or social class, exacerbates poor health and contributes to widening health gradients. Further, the influence of social mobility on health gradients is exaggerated for movers as compared to stayers. Crucially, ethnicity is evidently important in understanding how migration, deprivation change and social mobility contribute to health inequalities within the population. This thesis therefore contributes to understanding as to how ethnic health gradients manifest and why they change. At the very least this reflects an important contribution to discussions on the development of evidence based policy designed to close ethnic health gaps as, to repeat the words of Williams *et al*. (1994: 27) cited in chapter 1:

> “an understanding of the determinants of the differential distribution of health problems among racial or ethnic groups … [is] a prerequisite to the development and direction of effective programs and services to address them”.

Chapter 10

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