Are social connections associated with health and wellbeing in a context of social disadvantage and ethnic diversity?

A study of Pakistani and White British women and infants in the Born in Bradford cohort

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Abstract

Social disadvantage extends beyond a lack of income and basic necessities, to being deprived of the material and social resources required to lead a happy, healthy and fulfilling life. The focus of this study is on the role of social connections in relation to health, in a context of social disadvantage and ethnic diversity.

In this thesis I aim to study the associations between ethnic density, social capital and health for Pakistani and White British mothers and infants in the Born in Bradford study.

Data from the Born in Bradford cohort were linked with area-level data to create a multilevel dataset of 4,357 Pakistani and 3,869 White British mother-infant pairs.

While own ethnic density was not associated with birth weight or preterm birth, higher South Asian density was associated with lower odds of smoking for both Pakistani and White British women. Although levels of social capital seemed to be low and levels of social disadvantage were high, different indicators of social capital were associated with health outcomes for Pakistani and White British mothers and infants. There was some evidence to suggest that social capital provides health benefits especially to those in disadvantaged circumstances.

Social disadvantage for Pakistani women and infants in particular proved hard to capture with measures of individual socioeconomic status and area deprivation, and social gradients in health were attenuated for Pakistani women and infants in the Born in Bradford study and the Millennium Cohort Study.

The associations between social resources and health vary by ethnic group, social status, and health outcome, and there is no strong evidence that the promotion of social capital is a useful public health strategy. Greater social equality together with the social inclusion of minority groups are likely to provide the ideal context in which social capital can thrive, regardless of the social or ethnic composition of neighbourhoods.

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Authors’ declaration

I confirm that the research presented in this thesis is my own work. It has not been submitted for an award elsewhere. Where information has been derived from other sources, this has been appropriately acknowledged and full references have been provided.

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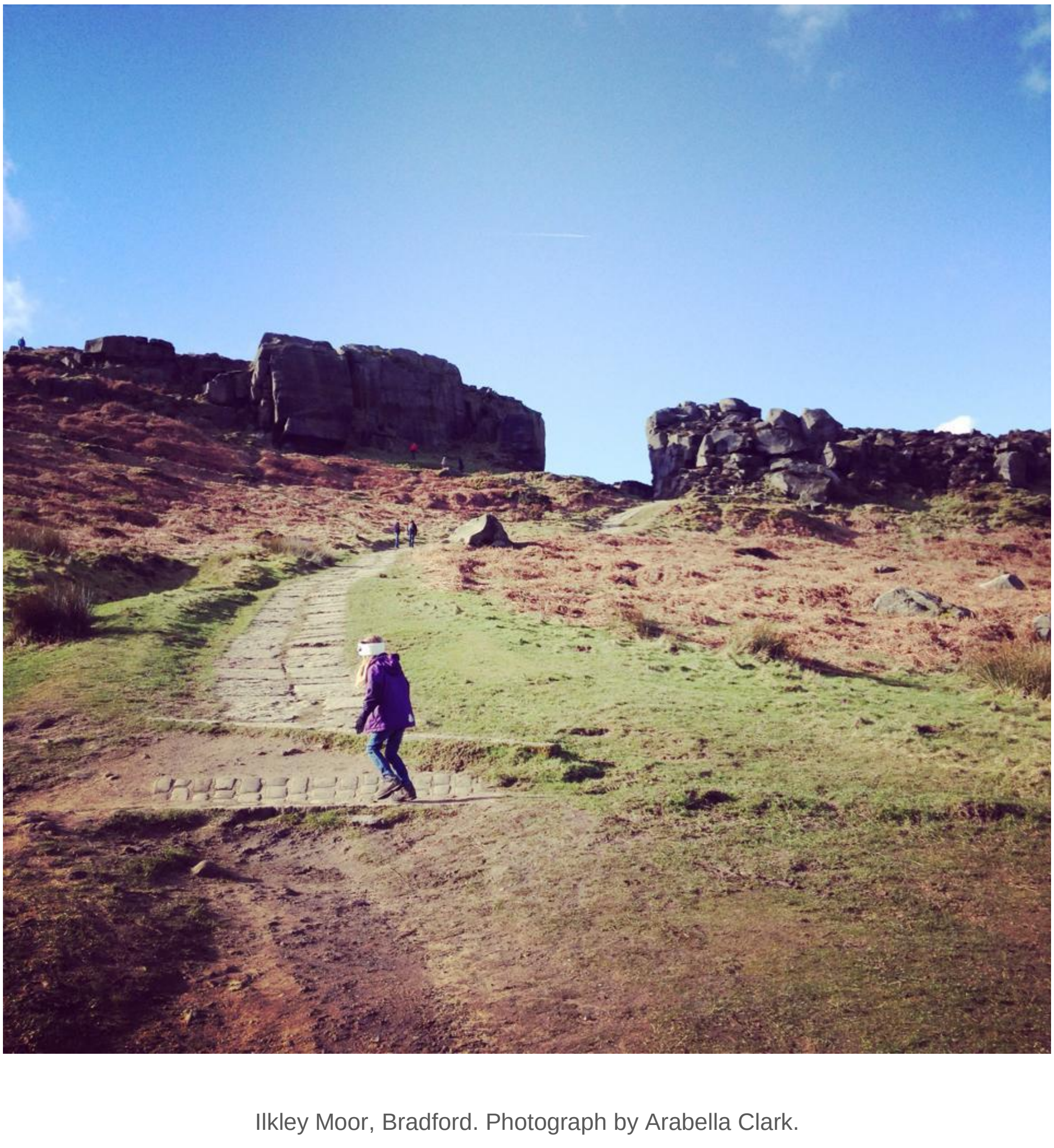
The published literature review is included in Appendix 1 of this thesis.

SECTION A   BACKGROUND

Chapter 1

Introduction



Ilkley Moor, Bradford. Photograph by Arabella Clark.

1.1 Thesis aim

In this thesis, I aim to study the associations between ethnic density, social capital and health for Pakistani and White British mothers and infants in the Born in Bradford study.

1.2 Thesis structure

This thesis consists of three sections; Section A Background, Section B Methodology, and Section C Analyses.

The background section gives an introduction to the research and research setting in Chapter 1, followed by an exploration of historical and sociological processes behind the life circumstances of ethnic minorities in contemporary Britain in Chapter 2, and finally a review of the literature on social and ethnic inequalities in health in relation to social capital in Chapter 3. Together, these three chapters provide the context and justification for the research, and identify the theory and scientific evidence upon which this thesis builds.

The methodology section describes the dataset used (Chapter 4), and discusses current practice and methodological challenges in ethnic density research (Chapter 5). Methods specific to particular studies or research questions are addressed separately in the relevant chapters (Chapter 3 for literature review, Chapters 6 to 8 for multilevel analyses, Chapter 9 for assessment of social gradients).

Section C of the thesis reports on the results of four separate studies. The first two chapters focus on ethnic density, in association with birth outcomes (Chapter 6) and smoking during pregnancy (Chapter 7). Chapter 8 examines the relationships between social capital and health, taking into account contextual factors such as social disadvantage and ethnic density. Chapter 9 builds on findings from this thesis, and goes back to the basics by assessing social gradients in health by ethnic group.

The discussion in Chapter 10 concludes the thesis by highlighting key findings and addressing implications for research and policy.

1.3 Bradford: An introduction to the research setting

A thesis based on the people of Bradford cannot be taken seriously without a thorough understanding of this research setting. Although the health effects of ethnic density and other contextual psychosocial factors could be studied anywhere, the results of the study can only inform future research if its context is understood and limits to generalisation are clear. This argument of external validity is true for every study, but its importance is undeniable when sociological processes in neighbourhoods and the city feature this prominently and are thought to interact with the demographics and social characteristics of residents to influence health.

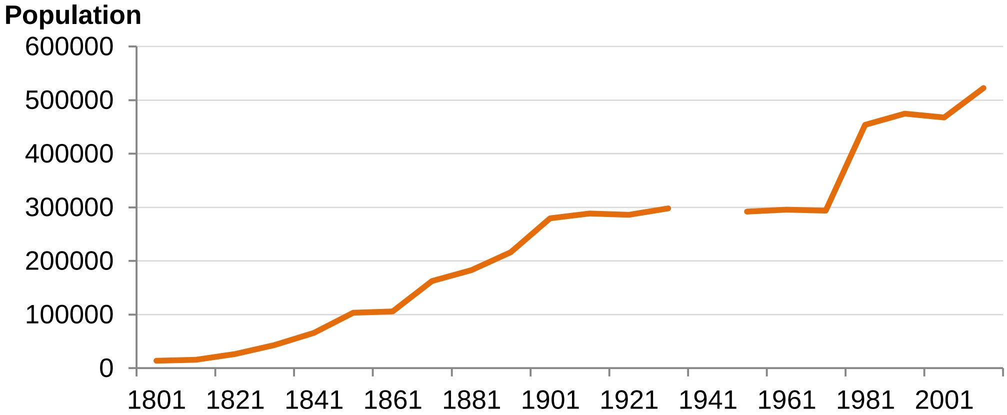
Figure 1.1 West Yorkshire

1.3.1 Population growth

Bradford is a city and metropolitan area in West Yorkshire (Figure 1.1), with a population of approximately half a million (ONS, 2010b). Population growth in the Metropolitan District is amongst the highest in England, with 80 live births per 1000 women of reproductive age in 2010, compared to 65.5 per 1000 for England as a whole (ONS, 2010a).

The growth of Bradford from a market town to an industrial city began around 1750, when the town counted nearly 5000 inhabitants (James, 1990, p.11). The Industrial Revolution caused rapid expansion of the population (Figure 1.2), and by 1851 the population was almost eight times as large as fifty years before; a growth rate resembling that of bigger industrial cities such as Manchester and Liverpool (James, 1990, p.32).

Figure 1.2 Population growth Bradford[a]



a) Based on UK census data; Bradford Municipal borough before 1891, county borough 1891-1971 (www.histpop.org), Bradford Metropolitan District after 1974 (www.ons.gov.uk). There was no census in 1941 due to World War II.

1.3.2 The Industrial Revolution

From 1800, the Industrial Revolution brought great progress to the city, mainly providing rich people with an opportunity to expand their wealth. The rapid growth also attracted businessmen from abroad, such as Jewish merchants from Germany. They had financial capital to invest in the development of factories and machines, and quickly saw their investments returned (James, 1990, pp. 31-32). For the working class, escaping poverty was virtually impossible. Worst off were the Irish families arriving after the Irish Potato Famine of 1845-1846, for whom pay was lower, neighbourhoods were more deprived, and circumstances of life and work were worse than for the general working class (Fieldhouse, 1981, p.141) (James, 1990, p.84). From 1850 onwards, many hand-workers lost their source of income as a result of industrialisation. The average wage for a weaver fell from 45 pence a week in 1833 to 23 pence a week in 1855 (James, 1990, p.37).

Since a working man alone could not support a family, many women and children were employed in the factories. It was not unusual for a child to work thirteen hours a day in the filth and loud noise of the factory (James, 1977, pp. 110-111). Some children were never washed and walked around in the same clothes for months. They were beaten when they did not work hard enough and accidents were frequent. Many young children had deformations in their legs, because they spent the day bent down under machines. Malnutrition was standard among working class children, along with a chronic lack of sleep. There was no time for family life or recreation whatsoever. Working conditions for children employed in the coal and iron mines were equally harsh. In general, employers were unaware and ignorant of the working conditions in their own factories and some even argued that working in a factory would be beneficial to poor children, illustrated by the following quote captured from a 'mill master' by Joseph Fieldhouse: "Frequently, children of a sickly, puny cast, are very much improved in health by entering woollen mills, the smell of the oil and indigo being very conducive to health…" (Fieldhouse, 1981, p.111).

In the first half of the nineteenth century, socioeconomic inequalities were most apparent in the gap between the working class and the upper class, the latter consisting mostly of manufacturers' families and merchants. In this period, average life expectancy was around twenty years and children under the age of five made up half of all deaths around 1840 (James, 1990, p.87). The main causes of death were typhoid, diarrhoea, pneumonia and tuberculosis. The death rate was worsened by the popularity of the miasmatic theory, which attributed the prevalence of infectious diseases to bad air, meanwhile ignoring the importance of personal and public hygiene (James, 1990, p.87).

1.3.3 Twentieth century

Around 1900, a middle class emerged that distinguished themselves from the working class in their ability to afford luxury products such as fashionable clothing, better and more nutritious food, furniture, and leisure activities. Many of them moved away from the city centre, into suburbs such as Heaton, Allerton and Bolton. Although circumstances improved for all social classes around this time, spatial inequalities in health increased. The overall mortality rate was between 20 and 30 per 1000 in the deprived city centre, compared to 12 per 1000 in Allerton and 13 per 1000 in Heaton (James, 1990, p.160). Many more children from white collar workers than from the working class went to secondary school. Although there were no tuition fees, education meant a loss of family income and brought with it extra expenses such as clothes and writing material. However, with 30% of all children attending secondary school in 1924, Bradford was a pioneer in education and continued to be so in the first half of the twentieth century (James, 1990, pp.156-158).

During the Interbellum small groups of immigrants settled in Bradford, mainly from Italy, Belgium, Russia, Poland, Germany, and Austria. The proportion of ethnic minorities remained fairly stable during the period of the two world wars at approximately 10%. After 1945 a new immigration wave brought people from Ukraine, Yugoslavia, Poland and Italy (James, 1990, p.176). The Second World War temporarily stimulated social equality, by measures such as food rationing for all and frozen rents. Tax policies redistributed wealth from the upper class to the lower and middle classes. Also, the spirit of the war united the country across social classes and the demand for uniforms led to an expansion of the national textile industry (James 1990, pp.172-173).

After World War II, the promise of work once again attracted immigrants. Like the Irish settlers a hundred years before, South Asian men came from rural communities with distinct cultures and religions. Another similarity between these immigrant groups is that both acted upon opportunities of employment that were at the time already fading. By 1971, Bradford had an estimated 30,000 South Asian immigrants (Fieldhouse, 1981, p.201). In 1977 the city counted seven mosques, two Sikh temples and one Hindu temple (Fieldhouse, 1981, p.200). In 1987, there were about 43,600 Pakistani residents in Bradford, followed by 15,800 Indian immigrants, slightly less than 5,000 people from the West Indies such as the Dominican Republic, Barbados and Jamaica, 4,000 Polish, 2,700 Bangladeshi and 1,800 people East Africans (James, 1990, p.220).

1.3.4 Twenty-first century

At the time of the census of 2011, 54% of the population in Bradford classified themselves as White British and the average of Pakistani residents in Bradford neighbourhoods was 35% (Middle Super Output Areas), with percentages ranging from 0% to 85% Pakistani residents (ONS, 2012a). Area deprivation, measured by the Index of Multiple Deprivation (IMD) in 2010 and covering aspects such as area-level income, employment, education, health and crime, ranked Bradford 26th of 326 local authorities, with number one being most deprived. The city received the fifth and sixth rankings for income and employment, respectively (ONS, 2011a).

Bradford scores far below average on most health indicators, even in comparison with other English cities marked by social and ethnic inequalities such as Birmingham, London and Manchester. Infant mortality was 7.9 per 1000 for the period January 2008 to December 2010, compared to a national average of 4.6 per 1000. Life expectancy is lower for both males and females (APHO, 2012b). Inequalities in child and maternal health are the focus of the Born in Bradford (BiB) family cohort study, in which longitudinal data is being collected for 13,776 pregnancies. The topics covered by the data include a wide variety of determinants of health, as well as diagnoses of illness and indicators of health and wellbeing. Recruitment of pregnant women started in March 2007 at the Bradford Royal Infirmary maternity unit and the study will follow-up mothers and children over the years. The cohort profile and a detailed protocol for the recruitment phase have been published (Wright, 2012) (Raynor, 2008) and the study will be discussed in more detail in Chapter 4 as part of the methodology of data collection and analysis. More information can also be found on the BiB website: http://www.borninbradford.nhs.uk/.

1.4 Conclusion

In this thesis, I will examine the associations between ethnic density, social capital and health for Pakistani and White British mothers and infants. The study will mainly depend on data from the BiB birth cohort study.

By providing a historical and social context to the research with an emphasis on health, ethnic diversity and socioeconomic inequalities, I hope to have demonstrated two points. Firstly, although the data used in this study were collected in Bradford in the period 2007 to 2010, the mechanisms that influence health and wellbeing of residents today are likely to be shaped by societal structures ever since the city started to develop around the year 1750. This urban legacy affects those families that have been living in Bradford for generations as well as newcomers. Immigration was a characteristic of Bradford long before the arrival of the first South Asian immigrants, and throughout the centuries economic growth has alternated with times of financial hardship. Bradford may have been known as the ‘wool capital of the world’ during the Industrial Revolution, but poverty for the majority of residents has always existed alongside great prosperity for a few wealthy Bradfordians in affluent areas of the city. Secondly, I have aimed to illustrate that the specific characteristics of Bradford should not be seen as a mere complication in the generalisation of results, because a researcher studying the effects of neighbourhood social capital and ethnic density on health inequalities could not have asked for a more interesting, nor a more relevant place, to study this subject. As Chapter 2 will discuss in more detail, the spatial distribution of ethnic and social groups in Bradford provides an excellent case for studying health and psychosocial factors at both the individual- and neighbourhood level.

Chapter 2

What makes an ethnic minority?

A background to ethnic and social diversity in Bradford

Assur Rehman's shop in Manningham, Bradford (Smith, 1987)

2.1 Introduction

Individuals belonging to the same ethnic group share certain characteristics, such as country of birth, race, language, and other cultural aspects. In order to study inequalities in socioeconomic status (SES) and health, research on health inequalities often distinguishes between ethnic groups. However, ethnicity and related concepts are social constructs, not indisputable facts. An overview of my choice of definitions is presented in Figure 2.1. These constructs make it possible to distinguish between people based on a definition that is generally accepted and agreed upon, as long as a few considerations are taken into account.

Firstly, concensus on who belongs to one ethnic group change over time under cultural influences. In the 1960's, all non-European immigrants were referred to as 'coloured', a label that is no longer used due to its association with racism and lack of specificity. In 2011 the standard classification of ethnic groups used in the UK census was: White British, White Irish, White Gypsy/Irish Traveller, White Other, Mixed White and Black Caribbean, Mixed White and Black African, Mixed White and Asian, Mixed Other, Indian, Pakistani, Bangladeshi, Chinese, Other Asian, African, Caribbean, Other Black, Arab and Any Other (ONS, 2012b). I will use this classification throughout the thesis when it concerns UK ethnic groups, and for other literature I adopt the definitions provided by authors.

Secondly, ethnicity is just one way to label people and only forms part of someone's identity. While researchers rarely consider ethnicity of importance for the ethnic majority, for ethnic minority groups there is a tendency to overplay the importance of ethnicity and lose sight of other aspects of identity that might be more relevant, such as age or gender (Atkin, 2009). For example, Pakistani and Indian people in the UK are today considered distinct ethnic groups, yet sixty years ago they belonged to the same country and their main cultural differences might be based on religion rather than ethnicity. Black people in primarily White societies are often merged into one group, although people from the West-Indies and Africa have very distinct cultures and were born thousands of miles apart.

Another call for caution is related to the concept of 'ethnic minority' in addition to 'ethnic group'. Castles and Miller (2009, p.35) define an ethnic minority as a group which identifies as a community, and has a subordinate position in society (Figure 2.1). Various researchers have argued for replacement of the term 'ethnic minority' with 'minority ethnic group', to emphasise the fact that everyone has an ethnicity and to point out that it is not necessarily ethnicity that makes a minority, but rather an unequal position in society. African slaves in the Southern states of the US for example used to be a numerical majority, and women may be considered a minority group. The term ‘social exclusion’ is used as an attribute or characteristic of ethnic minority groups, although not all individuals within ethnic groups will experience social exclusion (Ratcliffe, 2004, p.2). Furthermore, people may be excluded from a variety of social resources, including education, work, health care, social relationships and democratic rights. Throughout this thesis I will use the term ‘social disadvantage’ to describe characteristics of a subordinate position in society, among which I count financial hardship as well as low education, employment status and type of work, power and social status.

This chapter will reflect on the circumstances and processes that create and maintain ethnic minority groups. The discussed pathways principally focus on the sociological processes affecting immigrant groups, with an emphasis on South Asian immigrants in Bradford. In reality, the interaction between society and second- or third generation immigrants is much different from the processes affecting first generation immigrants, and not every explanation will have equal relevance in each place and point in time. Therefore I do not present a single theory, but a combination of interrelated explanations, which are to be interpreted differently depending on the specific context.

Figure 2.1 Definitions of ethnicity and related concepts

Ethnicity

‘The fact or state of belonging to a social group that has a common national or cultural tradition.’ (Oxford Dictionary, 2010).

Ethnic minority group

A group which has been assigned a subordinate position in society by dominant groups on the basis of socially constructed markers of phenotype, origins or culture, which has some degree of collective consciousness (or feeling of being a community) based on a belief in shared language, traditions, religion, history and experiences (Castles and Miller, 2009, p.35).

Acculturation

The process that migrants go through when they adopt cultural elements such as health behaviours and social activities from the new dominant culture and may simultaneously lose cultural elements from the original culture (Lara et al., 2005).

Social exclusion

‘The unique interplay of a number of factors, whose consequence is the denial of access, to an individual or group, to the opportunity to participate in the social and political life of the community, resulting not only in diminished material and non-material quality of life, but also in tempered life chances, choices and reduced citizenship’ (Kenyon et al., 2002).

2.2 From ethnic group to ethnic minority

2.2.1 Disadvantage upon arrival

The society of origin and its historic relationship with the host country influence the social position of immigrants. For example, the history of British colonisation meant that many immigrants arriving in the decades after the Second World War mostly came from countries that had until recently been under British rule. The lower social position of Indian and Caribbean people had long since been taken for granted and this process was not suddenly reversed upon their arrival in the English society. The position of immigrants may be further weakened if the decision to move was partly driven by social unrest in their home societies, as was the case for the first wave of Pakistani and Indian immigrants.

In 1947, the British Indian Empire dissolved into the independent countries of India and Pakistan, and the latter would later split up into Pakistan and Bangladesh (Indian Independence Act 1947). The partition of India, which was motivated by religious conflict, resulted in mass movements of involuntary migration of Indian Muslims to Pakistan and millions of Hindu and Sikh refugees moving from Pakistan to India. Estimates of the exact numbers of refugees vary, but a study by Hill and colleagues (2004) examined the situation in depth for the region of Punjab, which is the native region of many of the first South Asian immigrants in England. In the Indian districts of the Punjab, the Hindu population increased between 3% and 94% per district, while the smaller Sikh population saw a seven-fold growth in some districts, and the Muslim population decreased from around 30% in most districts to less than 1% in eight out of eleven districts. The Pakistani districts saw an even more staggering change, going from a population with a majority of Muslims and around 10 to 20% Hindus and Sikhs to a population of more than 99% Muslims in ten out of fifteen districts. Bharadwaj and colleagues (2008) concluded that 3.7 million persons were missing, after accounting for the difference between inflow and outflow in the former British Indian Empire between 1931 and 1951, and largely attributed this to mortality during the partition. It is from this context of religious segregation, violence and mass migration that the first young men from India and Pakistan arrived in England.

A third reason for disadvantage upon arrival is that immigrants themselves might in some aspects differ from people who stay behind. There are various reasons for migration, but ‘voluntary’ migration is initially often driven by employment opportunities and expectations of better living standards. A period of economic downfall has the highest impact on the working class, stimulating them to find their luck elsewhere. It has been suggested that in contradiction to the healthy migrant hypothesis, predominantly the poor and unemployed with less opportunities and resources leave, a process described as ‘negative selection’ (Small, 2012). One example is that of the Irish families that fled to Bradford and other Northern cities in 1845 and 1846, from their severely deprived rural communities which were hit by the Irish Potato Famine. Pakistani immigrants usually came from rural areas with high levels of unemployment and on average they were less educated than the English working class (Castles and Miller, 2009). Most of the Pakistani and Indian working class men did not speak English and although they might have enjoyed some education in their home countries, often they could only find work in the night shift of the factories; a job that was by law not available to women and unpopular among English men (Castles and Miller, 2009).

Highly skilled English-speaking immigrants also experienced difficulties in having their qualifications acknowledged (Castles and Miller, 2009, p. 102). Two of many documented examples are South Asian bus drivers with a university degree and Black Caribbean nurses who worked in lower positions than they were qualified for (Ratcliffe, 2004, p.89). Most of the South Asian and Black Caribbean men who came to England in the 50’s and 60’s were young, healthy and determined to work hard (Greenwood, 1985). A disadvantage upon arrival may explain an initial low position in the social hierarchy, but it fails to explain why many immigrant groups did not move upward from this position, nor does it provide insight into the ethnic minority position of their children and grandchildren.

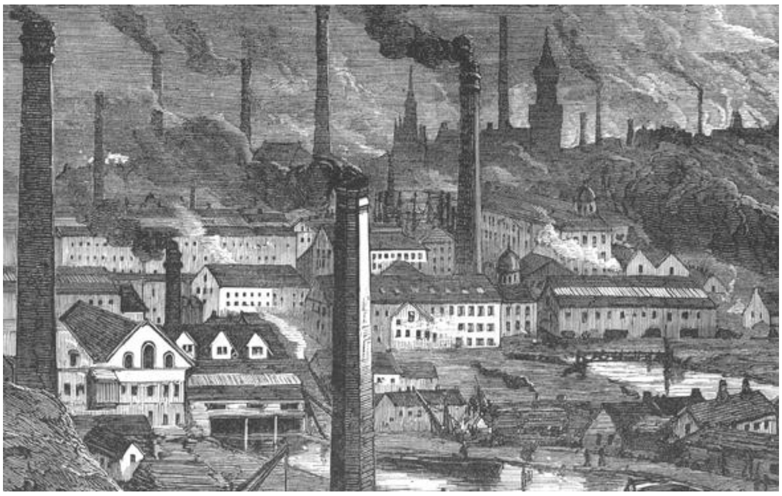
2.2.2 Acculturation: The interaction between newcomer and host

After arrival in a new country, immigrants have to build a new life under circumstances very different from their old environment. In the 1920’s and 1930’s researchers from the Chicago School of Sociology started to study the influence of place on the sociological processes affecting immigrants. Thomas and Znaniecki laid the foundations for later research with their study ‘The Polish Peasant’ (Thomas et al., 1996). They used the term ‘social disorganization’ to explain the social adjustment of rural Polish immigrants moving to urban areas in Western Europe and the United States. Their work was published at a time of increasing urbanisation and globalisation in Western societies, bringing rapid social changes (Lutters and Ackerman, 1996). They argued that social life in the city is extremely different from the rural communities where many immigrants come from, resulting in a process of adaptation and restructuring of relationships. With traditional social structures losing meaning and existing relationships falling apart, immigrant communities would suffer from internal conflict, eventually causing social problems such as crime. Sufficient stability within this chaos, for example by support from family members or the local church, would be key to successful adaptation. ‘The Polish Peasant’ is written from the perspective of the immigrant, and shows how immigrants respond to a new environment and a new social structure. Thomas and Znaniecki put much emphasis on the differences between the old and new culture, which they see as a major cause for social disorder. Less attention is devoted to the other side of the coin; how does the environment react to newcomers? As I attempt to show with the example of immigration in Bradford, the same city will, under different circumstances, react differently to immigrants. Some immigrants were readily accepted wile others were confronted with hostility and perceived as a threat to the English culture and society, which was not necessarily due to differences between the native and host culture.

Long before the arrival of workmen from the Commonwealth, there was an influx of immigrants into English cities. Large scale migration to English cities coincided with the development and expansion of these cities during the Industrial Revolution at the beginning of the nineteenth century. At times the demand for unskilled labour in the factories rose, and immigrants from continental Europe and other parts of the United Kingdom came from rural areas in search of employment and a better life. This is the first period in time that ethnic inequalities can be observed clearly, in terms of SES, spatial patterns within a city, power, capital and health. As discussed in Chapter 1, Bradford in the nineteenth century is the textbook example of a dynamic industrial city with marked socioeconomic inequalities, where immigrants settled in search of a better life.

The population of Bradford during the Industrial Revolution was of mixed religious background. John James (1977) made an inventory of religious groups and counted members of the Church of England, Unitarians, Presbyterians, Independents, Baptists, Wesleyan Methodists, Quakers and Roman Catholics, found in all social layers of society (James, 1977, pp. 187-197). German merchants formed a community in the area still known today as ‘Little Germany’, but were otherwise fully integrated in the social life of the city. The Irish made up approximately 10% of the population of Greater Bradford in 1851 (Fieldhouse, 1981, p. 141). They soon became the poorest of the poor, lower in status than the British working class. They lived in back-to-back houses or lodging houses in the cheapest neighbourhoods, close to the factories (Figure 2.2). This area was described by John James as follows: “The canal, like a filthy open sewer, runs along the border of the town, breathing pestilence and death. There are yet the crowded dwellings – the death-centres of town; the sewerage is still very imperfect, and the choking thick smoke of the factories pollutes the air.” (James, 1977, p. 9) It was not uncommon for eight people to live in one room, or for a family of parents and two or three children to sleep in one bed. The Irish were attracted by the promise of work, but they came at a time when unemployment had already kicked in. Not only was it impossible for them to escape poverty, but they found themselves discriminated against because of their religion and because the English working class feared a further loss of already scarce jobs (Fieldhouse, 1981, p.141).

Figure 2.2 Industrial Bradford in 1882 (Illustrated London News, 1882)

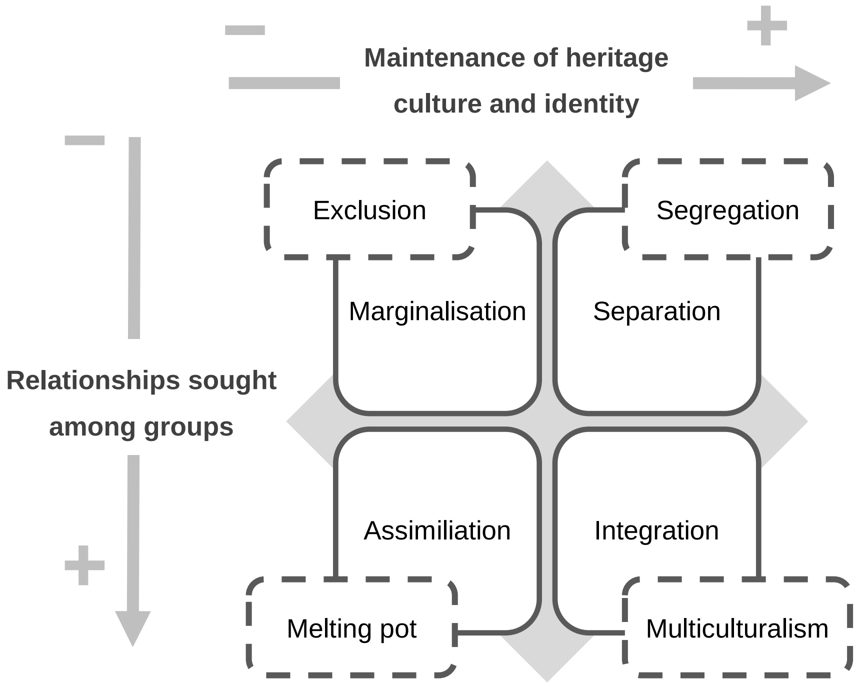


Whether or not ethnic or religious groups ended up at the bottom of society seems to depend partially on their cultural and economic capital upon arrival and partly on socioeconomic conditions at the time. The Jewish German immigrants invested money, which stimulated the growth of the industry and economy in Bradford, and despite their distinct culture and religion they were readily accepted into mainstream society. They represented an ethnic group and clustered in one area of the city, but were never considered a disadvantaged ethnic minority. The Irish on the other hand were closer to the English in terms of culture and language, but were discriminated against for their religion and low socioeconomic status (SES). Although they were willing to work and contributed to the city's growth by accepting employment under the worst conditions, they posed a threat to the English working class, who feared a further loss of jobs.

A framework for acculturation

Berry (2001) has developed a framework for acculturation that incorporates both coping strategies of the immigrants as well as attitudes of the host society. For individuals arriving in a new culture, four strategies are considered: integration, assimilation, marginalisation and separation (Figure 2.3). These individual processes influence and are influenced by the following attitudes of the host society: multiculturalism, a melting pot culture, exclusion and segregation. Individual and group-level processes stimulate each other, but are not necessarily complementary. Individuals within a subgroup may deviate from the group process of acculturation.

Figure 2.3 Strategies of acculturation, illustration reconstructed from Berry (2001)



Some groups are small in number and assimilate with mainstream society to the extent that they cannot be considered separate ethnic groups, such as Austrians in Germany or French in Switzerland. Assimilation requires contact between groups or individuals and acceptance from both sides; the dominant group accepts the newcomers and over time, immigrants come to identify themselves with the host society. Acceptance can be stimulated by learning the language and adopting social norms and rituals, but true assimilation only occurs when the new society becomes part of an individual's identity (Teske and Nelson, 1974).

Others form an ethnic community by separating themselves from the main culture, but do not experience widespread social exclusion despite holding on to their language and culture of origin to various degrees. Immigrant groups such as Italians in the US and Irish in the UK are examples of ethnic communities (Castles and Miller, 2009, pp.263-264). Marginalisation in turn leads to social and spatial exclusion; relationships between immigrant groups and the ethnic majority are lacking and immigrants lose their cultural identity in a struggle for acceptance into the host society. This process may partially be the result of choices made by the immigrants, but is to a large extent influenced by the attitude of the host society.

Integration is often considered an optimum, with the highest wellbeing for both the host society and immigrants. Relationships are established between groups, creating a multicultural society with acculturation between the host society and immigrant culture in both directions. In an ideal multicultural society, cultural exchanges are welcomed from both sides and cultural divergence is accepted within the boundaries of the law.

Besides a bidirectional process, integration is dynamic in nature. Berry's framework has been criticised for ignoring the everyday processes of acculturation that act on all groups of society, including the dominant group (Rudmin, 2003). As a consequence of globalisation, acculturation does not start but rather develops with the arrival of new immigrants, and all cultures are subject to constant changes. The Irish living in Bradford today can be considered an integrated ethnic group, as they are absorbed into society, occupying the same positions and living in the same neighbourhoods as the White British majority, while maintaining some aspects of the Irish culture and Catholic religion. Contrary to the times of the Industrial Revolution, their original cultural connections are not, under the present circumstances, a barrier for acceptance as equal members of society.

As a final note on acculturation theory I briefly contemplate the end stage of acculturation. Louis Wirth, another member of the Chicago School of Sociology, is considered one of the founding fathers of acculturation theory. In his main piece of work, 'The Ghetto', he considers assimilation the final stage of successful adaptation to a new culture (Wirth 1928) (Etzioni, 1959). In modern pluralistic societies however, acculturation does not seem to act as a linear process moving from initial internal conflict to complete assimilation, nor is assimilation necessarily the desired stage of acculturation. In England, second and third generation Pakistani immigrants illustrate this. They are a group that is distinct from the White British group, but also distinct from their parents, having grown up as British rather than Pakistani citizens, at a time of increasing hostility towards Muslims worldwide. Rather than assuming second and third generation immigrants to be in a next phase on the path to assimilation, it is more accurate to consider them as a cultural (sub) group of their own. Young British Pakistani women for example might wear a *hijab* to express their identity as a British Muslim, which is different from the solely religious motivation of their mothers and in part a response to the Western society (Afshar et al., 2005). They often challenge the traditional views of Islam and seek to shape their lives not as a compromise between the old and new culture, but as a modern way of life.

The strict division Berry (2001) makes between separation and integration is perhaps too simplistic to explain social networks in contemporary Britain. The Pakistani community has more accurately been described as a hybrid community, with, for example, integration in local politics and higher education and at the same time segregation in neighbourhoods and religious practices (Small, 2012). Furthermore, in the case of Bradford this community is not so much shaped by its current location as by family origin; the community originating from the Pakistani Mirpur area is characterised by strong bonds forming social networks that overcome a large geographical distance.

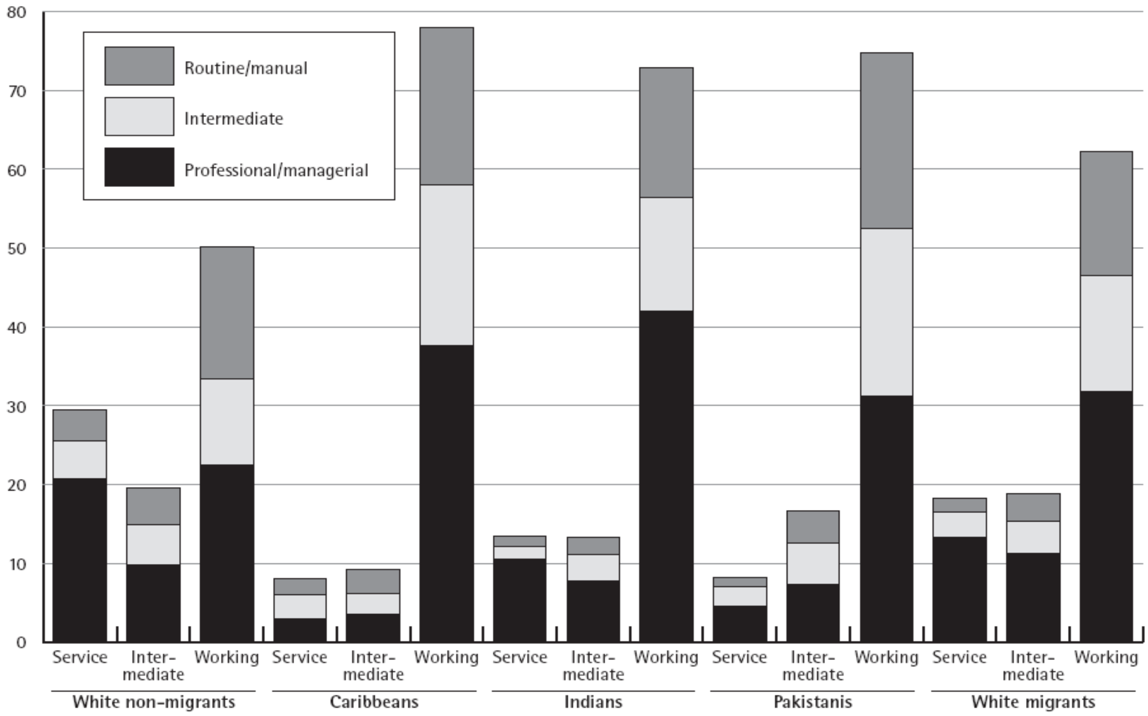
2.2.3 Social mobility

The previous section demonstrated the influence of time and place on the attitude of the host society towards immigrants. This section will consider the mechanisms and constraints immigrants experience when trying to find their place in society by focusing on social mobility. Distinct patterns of social mobility can be found between different ethnic groups and different generations of immigrants.

Upon arrival in the 1960's and 70's, Indian and Chinese immigrants had received more education than Pakistani immigrants. However, both were initially found in low wage, manual jobs. Combining longitudinal survey data with data from the 1971 and 1981 census, Platt (2005) found that 51% of non-immigrant White families belonged to the working class, compared to 73% of the Indian immigrants and 77% of Pakistani immigrants. The Labour Force Surveys from 1988, 1989 and 1990 show a somewhat different pattern, with 52% of White men in manual labour, 57% of Indian men and 71% of Pakistani men. White men within this group were most often employed in skilled manual jobs, while Pakistani and Bangladeshi men were more often semi-skilled. The participation of women in the workforce varied from very high participation rates among Black Caribbean women, to very low proportions of Pakistani and Bangladeshi women working outside the home (Jones, 1993, pp. 62-63). Most White, Black African and Black Caribbean women in formal employment were found in education, health care and public administration, while 33% of employed Chinese women were found in hotel work or catering. The most common types of employment among Indian and Pakistani women were in the textile industry and retail distribution (Jones, 1993, pp. 65-66).

Although the majority of immigrants started off in the working class, their children grew up in England, spoke the language and received English education. As early as the 1980's there was evidence from surveys and governmental reports that immigrants of Caribbean and South Asian origin stayed in education longer than White British people (Jones, 1993, pp. 31-33). With progress made in the education sector, access to university became available to all groups in society, which should have further stimulated social mobility (Ratcliffe, 2004, p.86). The research by Platt (2005), shows that the Indian group, similar to Chinese and European immigrants, compensated for a low social position with high social mobility (Figure 2.4). In 2001, 54.7% of the Indian children in the sample had experienced upward social mobility, and only 15.8% were born into working class families and never moved upward. In the Pakistani group, unemployment was much higher among young men and women and only 44.9% experienced upward social mobility from the social class of their parents. When religion was controlled for, the difference turned out to be even more disadvantageous for Muslims and Sikhs compared to the more socially successful Hindu group. Pakistani and Bangladeshi remained disadvantaged compared to other ethnic groups, even after taking education into account. When these groups do gain higher education, they seem to be restricted in their abilities to use the obtained qualifications to their advantage. Possible explanations for these differences given in the report are economic and cultural capital, family composition and discrimination based on religion, the latter for Muslim communities in particular (Platt, 2005). The next section will address the influence of discrimination on social exclusion, focussing on spatial segregation, which can be seen as both as a cause and effect of social exclusion.

Figure 2.4 Class destination in percentage of ethnic group, by class origin, copied from Platt (2005)



2.2.4 Spatial segregation

Clustering of ethnic groups in neighbourhoods or areas does not automatically lead to spatial segregation and social exclusion, as demonstrated by the Bradford example of German Jews. Also, spatial segregation is not a precondition for the creation of ethnic minority groups. In the Netherlands for example, ethnic minorities are concentrated in the four biggest cities, Amsterdam, Rotterdam, The Hague and Utrecht, but they rarely form the majority in a neighbourhood (Constant et al., 2009, Musterd, 2005). Wirth (1928) gives a number of reasons for the creation and maintenance of ethnically dense areas based on information on Jews living in European cities. Being first compelled to live in ghettos by the government, later the main factors for the maintenance of ghettos were: poverty; closeness to cultural facilities such as the synagogue; the presence of a tight-knit social network that would provide support; a barrier against hostility of the native religious majority; and adherence to cultural norms and traditions. Similar reasons have contributed to the formation of South Asian communities in England. The first South Asian immigrants rented houses that were in a bad condition, in deprived areas close to the factories in the inner cities, and often with many in one house in order to save money (Phillips, 1998). Since these men thought of their situation as a temporary one, they were willing to endure poor living conditions. When families started to move over from South Asia in the 1960's and 70's, they moved into areas which already housed substantial numbers of immigrants, providing emotional and financial support (Castles and Miller, 2009).

Discrimination

Ethnic clustering was further encouraged by discrimination, constituting both open discrimination and hidden prejudice by the general public, as well as discrimination by organisations and governmental policies. Griffith (1960, p.21) stated at the time: "there is unwillingness among white landladies and landlords to take in coloured tenants". William Daniel (1968, p.154) mentions the frequently seen advertisement for rented accommodations saying 'no coloureds', or 'Europeans only'. He presents results from the PEP racial discrimination inquiry that shows widespread discrimination in private letting. In an experiment, a man from the West Indies was told that accommodations were taken, while in 53% of the enquiries the same accommodations were still vacant for a White British man. An example of open discrimination is the viewpoint expressed by Horace Hird, former Lord Mayor of Bradford, in his historic account of the city. According to the author, "... neither Bradford nor Keighley nor any other place will have happy citizens if they become hopelessly choked with people whose way of life and habits are so much at variance with our own." (Hird, 1968).

Ann Dummett describes institutional discrimination by stating that "a racist society has institutions which effectively maintain inequality between members of different groups, in such a way that the open expression of racist doctrine is unnecessary" (Dummett, 1973, p. 131). Council housing, for example, is regulated by local authorities and provides affordable accommodation. However, the criteria applied in the selection of residents often indirectly excluded immigrants from the system. A minimum length of residence was used as a requirement to enter the waiting list, putting recent immigrants in a disadvantaged position (Daniel, 1968). Immigrants started to build up networks within their ethnic group, and these networks were used to lend and buy houses from each other, to get around discrimination in housing policies (Ratcliffe, 2004, pp. 66-67).

By 1990, the percentage of house ownership as opposed to letting was much higher among Pakistani and Indian families than among White British (Jones, 1993, pp. 135-137). Both Pakistani and Indian families usually lived in large Victorian terraced houses that provided enough space to host large families but were severely neglected, often without central heating and mostly found in deprived inner-city areas. Over time, Indian men moved upward to better jobs and were able to afford detached or semi-detached houses of better quality. Pakistani families, because of a combination of low SES, cultural preferences and institutional factors, kept occupying the same run-down houses.

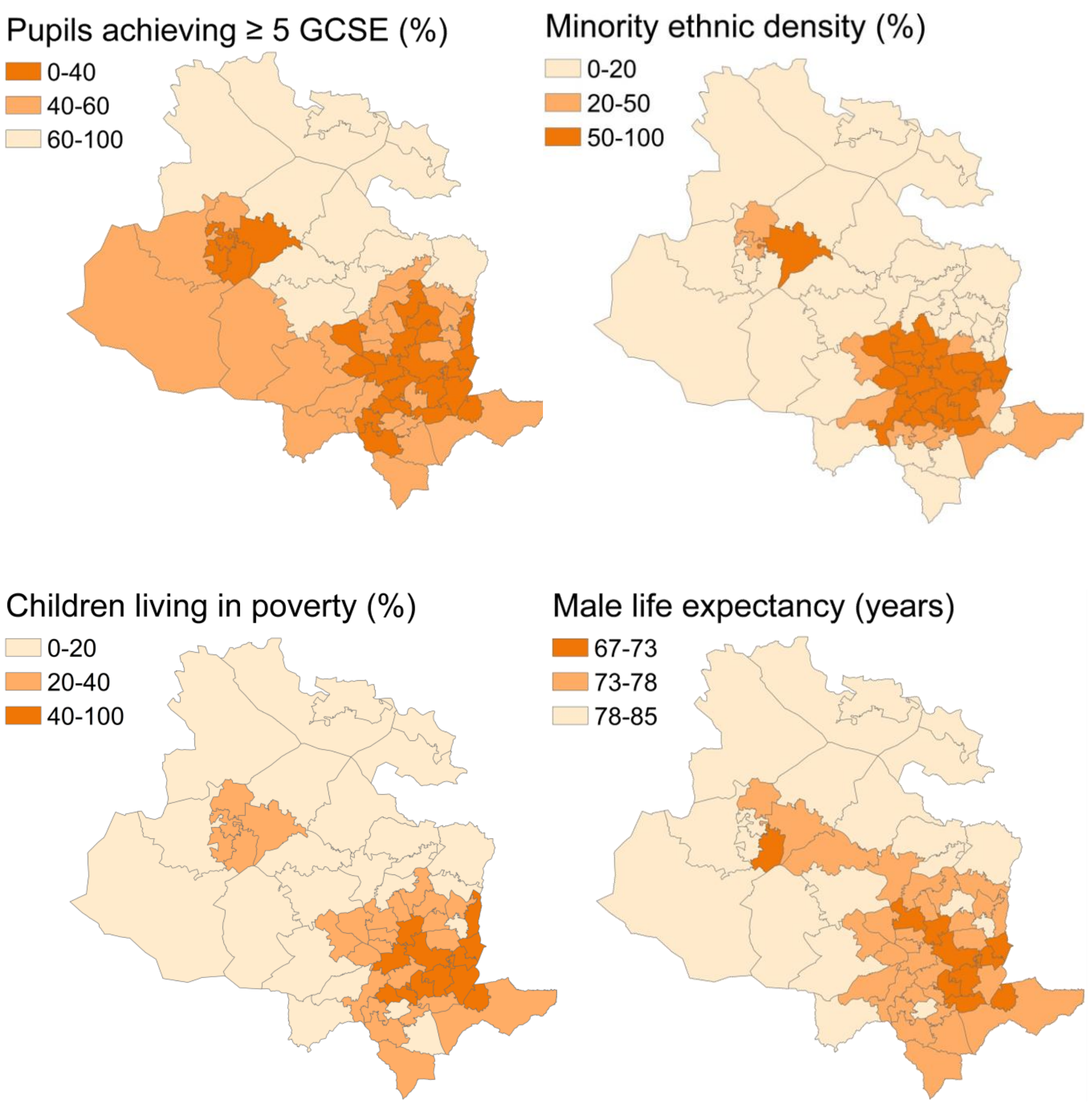
In 1991, 30% of UK Pakistanis were still found in terraced housing without central heating, compared to 7% of the White British population and 7% of the UK Indian population (Phillips, 1998). The Pakistani ethnic minority in particular became more segregated from the White British majority. They opened shops, creating employment opportunities that helped to decrease their vulnerability in times of economic crises, and built mosques and other cultural facilities in their neighbourhoods. In this way, ethnic communities emerged. Social exclusion increased over time as second and third generation immigrants were sent to different schools than the White majority ethnic group, and often these schools were of lesser quality (Ratcliffe, 2004, p.82). Experiences of discrimination encouraged self-consciousness of cultural differences and social position in the South Asian group, one of the characteristics of an ethnic minority according to Castles and Miller (2009, pp. 264-265). Finally, the fear of others that drives discrimination became a self-fulfilling prophecy: discrimination forces immigrants to rely on each other for support and protection; it stimulates spatial segregation and turns ethnic communities into a marginalised group in society that the majority fears for being different.

Spatial segregation in Bradford today

Research on spatial segregation of ethnic minorities in Bradford suggests Pakistani Muslims in particular are still constrained in their choice of housing (Phillips, 2006). Apart from being bound by cultural traditions and preferences for not living in a predominantly White estate due to worries over safety and racism, institutional discrimination in housing was reported to be a relevant factor in the spatial segregation of ethnic groups in Bradford. Data from the 2011 census shows that spatial segregation along ethnic lines is a prominent feature of Bradford (Figure 2.5). Ethnic minorities tend to cluster in neighbourhoods such as Manningham, Bradford Moor, Toller and the city centre, where the majority of the residents are Pakistani. This is in sharp contrast with the northern wards Craven, Ilkley and Wharfedale, where only a few per cent of residents are not of White British ethnicity and virtually none are of South Asian ethnicity.

Neighbourhoods with a predominantly Pakistani population belong to the most deprived in Bradford and England. Figure 2.5 visualises the correlations between minority ethnic density, child poverty, educational achievement and life expectancy. In the most deprived inner-city areas, a high percentage of residents belong to an ethnic minority group and pupils' educational performance is lower. Male life expectancy ranges from an average of 67.5 years to 84.6 years and mapping these data reveals a pattern that closely resembles the distributions of child poverty and minority ethnic density. This association between ethnic density and social disadvantage will be discussed in depth in Chapter 5.

Figure 2.5 Minority ethnic density (ONS 2012a), child poverty (EMPHO, 2011), educational performance (ONS, 2011b) and male life expectancy (EMPHO and LHO, 2011) in Bradford



2.2.5 Role of the government

Although this thesis aims to explore sociological rather than political processes, the role of the government in the formation of ethnic minorities cannot be ignored. Besides the influence of institutional discrimination through social policies, immigration policies affect the process of acculturation illustrated in Figure 2.3 (Rudmin, 2003). Whether or not immigrants have equal legal rights, are considered true citizens and are part of society affects their social position. The formal structure of immigrant policies and governance varies among Western countries, but most of them have in the past opted for, and currently promote, either one of the four acculturation processes: assimilation, integration, separation or marginalisation.

The United States have at different times in the past stimulated assimilation as well as separation and marginalisation. This history dates back to the time of slaves imported from Africa who were clearly marginalised and excluded from taking part in society. Gradually, the formal approach shifted to the spatial and social separation of African Americans, although in reality they remained very much unequal in rights and even after the civil rights movement up to this day they are still considered a disadvantaged group. The concept of being ‘separate but equal’ has in many cases proven to be an unattainable utopia, since segregated ethnic groups are equal in theory, but in reality end up in the most deprived areas, with limited access to high quality education, good employment opportunities and appropriate health care (Ratcliffe, 2004). Wirth (1928, p.118) concluded the same after Jews in Europe were temporarily given formal equality: “Though the physical walls of the ghetto have been torn down, an invisible wall of isolation still maintains the distance between the Jew and his neighbors.”

The United States is traditionally a society of immigrants and in the past has welcomed most newcomers by offering them citizenship. Simultaneously, they actively promoted the creation of a melting pot. By 1970, the ideal of cultures melting together into one harmonious nation was considered a cover-up for forced assimilation, and multiculturalism became the new ideal for a successful diverse society. Both Sweden and Canada adopted immigration policies in the 1970’s that explicitly addressed the importance of freedom in cultural identity, promoting a multicultural society. A Canadian report from the Royal Commission on Bilingualism and Biculturalism stated in 1969: “Both integration and assimilation occur in Canada, and the individual must be free to choose whichever process suits him…” (Hugh, 1969).

On the opposite end of the spectrum are countries with a very restrictive approach, such as Germany in the late 1950’s. A system of ‘guest workers’ limited civil and political rights of labour immigrants, and was designed to discourage family reunion and settlement (Castles and Miller, 2009, pp. 187, 253). The first South Asian immigrants coming to England on employment vouchers were treated by the government as temporary work forces, although they did enjoy formal citizenship because they migrated from a former British colony. In 1972, the Immigration Act of 1971 was put into action as a political response to concerns over race and immigration (Berkeley et al., 2006). The new legal situation made immigration and family reunion from India and Pakistan more difficult as it removed most of the privileges previously granted to Commonwealth immigrants (Castles and Miller, 2009, p. 102). Social exclusion was promoted by keeping immigrants in the unsecure position of visitors, which impeded them from making long-term plans for themselves and their families. The rights of women, both those left behind and immigrants, were further marginalised (Ratcliffe, 2004, p.53). Only with a work permit were Commonwealth immigrants allowed to enter the UK and the policy was focused on treating immigrants as visitors (Castles and Miller, 2009, p. 102). These regulations discouraged interaction between immigrants and White British citizens, and stimulated not only social and spatial segregation but also social exclusion.

The 2002 Nationality, Immigration and Asylum Act introduced a citizenship test and other measures said to promote social cohesion and integration, while at the same time restricting immigration where possible. Since asylum regulations have become stricter in 2003 the percentage and absolute number of immigrants granted asylum have shrunk. In 2011 there were 19,865 applications for asylum, of which 67% were declined (Shon, 2010).

2.3 Consequences for society

In 2007 Robert Putnam, known for his work on social capital, published an article arguing that racial diversity in the United States leads people to mistrust each other, at least in the short term (Putnam, 2007). His approach has been criticised on methodological grounds as well as for ignoring the social inequalities and social exclusion of ethnic minorities that might cause mistrust in the first place (Arneil, 2006). It has since been argued that it is the residential segregation of ethnic groups, rather than ethnic diversity, which erodes trust (Uslaner, 2010). Mistrust between ethnic groups, and between the ethnic majority and ethnic minorities, could be seen as one of the consequences of social exclusion. Once the process of social exclusion has started, it cannot be reversed easily, meaning that future generations are automatically born ethnic minorities.

Social tensions between ethnic and religious groups rose worldwide at the end of the 20th century (Ratcliffe, 2004, p.161), and the consequences were largely seen from the year

2000 onward. From a global perspective, 2001 was the year of the attack on the World Trade Center in the United States, followed by military operations of the US in Iraq, governmental policies towards terrorism and intensified ‘Islamophobia’ in Western countries (Sheridan, 2006). For Bradford, 2001 was also the year of the Bradford Riots. Triggered by rumours that the National Front was planning to disturb a demonstration by the Anti-Nazi League, the social tension between ethnic minorities and white British youth led to attacks on the police, Asian-owned shops and cars. The total damage was estimated at 7.5 to 10 million pounds and 326 policemen were injured. Around 400 to 500 people were involved in the riots, many of whom were convicted after a man-hunt by the police (Denham, 2001).

After the riots took place, the Ouseley Report was published, reporting on ‘the segregation of Bradford along social, cultural, ethnic and religious lines’ (Ouseley, 2001). The author describes how fear ruled the community, with Bradfordians being afraid of violence and social tension and policemen fearing to be accused of racism. Asian citizens reported widespread discrimination, while White British citizens perceived favouritism towards Asian groups, for example because they were said to receive extra benefits. A study by Beider (2011) made the voice of the White working class in Bradford heard and portrayed them as a forgotten group. He argued that ethnic minorities are generally considered ‘passive victims of discrimination’ while the White working class, despite being disadvantaged in terms of SES, were held accountable for their own low social position as well as the subordinate position of ethnic minorities (Beider, 2011, p. 17). Many White working class citizens strongly distinguished themselves from what they called an ‘underclass’ of White Bradfordians characterised by family dysfunction, dependence on benefits and involvement in crime. Also, they felt the need to defend themselves from charges of racism, by pointing out their personal relationships with ethnic minorities or their own ethnic background. At the same time, they felt threatened by new immigrants, such as Polish people, arriving in their neighbourhoods (Beider, 2011).

The lack of trust between members of society hinders community cohesion and creates social exclusion both for ethnic minority groups and for the White working class. It may also be the driving force for the maintenance of high density ethnic areas, where ethnic minorities feel protected from stigmatisation and discrimination, and where they can hold on to their culture of origin. Qualitative studies have demonstrated that the younger generation of Pakistani men and women feel very much excluded from mainstream society, maybe even more so than their parents. Research conducted in Bradford and Birmingham from 1998 to 2002 for example shows that young Pakistani and African-Caribbean men and women feel treated as ‘second class citizens’ and miss a sense of belonging to British society (Harris et al., 2003). Many of the young people interviewed were only prepared to accept ‘being British’ as being in possession of a British passport and enjoying legal rights, rather than feeling like a British citizen. Some pointed out that their ethnically dense neighbourhood, such as Manningham in Bradford, was the only place where they felt at home.

2.4 Conclusion

The aim of this introductory chapter was to explore what makes an ethnic minority. The processes through which an ethnic group becomes an ethnic minority differ in time and place, and act on many levels. On a global level, historical bonds between the country of immigration and the host country influence the mindsets of both the immigrants and the host society, as illustrated with the example of former British colonies. On a national level, the political, social and economic context drives emigration, as was the case for the social unrest, violence and unemployment in the years after the Partition of India. At the same time, the context of the host country to an extent determines whether immigrants are welcomed, as was initially the case for South Asian and Caribbean immigrants, or seen as a burden, as were the Irish immigrants arriving during the economic downfall around 1850 and the second wave of South Asian immigrants arriving in yet another period of hardship in the 1970’s. Related to this, policies and institutions of the national government play a role in the acceptance or exclusion of immigrants. As opposed to the idea of a melting pot where all cultures merge into one, most Western societies today consider multiculturalism to be the true form of social acceptance.

Some ethnic groups seem more successful than others in their movement up the social ladder. Chinese and Indian immigrants in England have used education to their advantage, creating better employment opportunities and improved housing conditions for future generations. Other ethnic groups, despite enjoying the same access to education, did not see much improvement in SES. The reason for differences in social mobility can be found within the individual, within ethnic groups and cultures and in the community as a whole. Discrimination is a powerful factor in the stimulation of social exclusion and consequently in the creation of ethnic minorities, acting on an international level (global ‘Islamophobia’), nationally (institutional discrimination), and on a community level. It stimulates spatial segregation within urban communities, reduces social mobility on an individual level, and increases social inequalities between ethnic groups.

The next chapter will address the consequences of social disadvantage for inequalities in health. Implicitly, this chapter touched upon many aspects of social capital, for example the links between government and citizens, which is different for immigrants than for the native population through immigration laws, policies and institutional discrimination. Lack of social interaction between ethnic groups seems founded on mistrust and discrimination, and leads to spatial segregation and social exclusion. Finally, the close-knit communities of Pakistani in Bradford may be considered to represent bonding social capital, with a social network consisting of people with a similar ethnic background. Chapter 3 will explore the implications of social capital for both socioeconomic and ethnic inequalities in health, which will form the basis of the analyses in later chapters.

Chapter 3

Social capital and health inequalities

Manningham, Bradford. Own photography.

3.1 Introduction

3.1.1 Traditional approaches to the study of health inequalities

The scale of social inequalities in health in the UK became clear with the publication of the Black Report in 1980, chaired by Sir Douglas Black (Townsend et al., 1992). The report issued by the Department of Health and Social Security showed that differences in mortality between the social classes were evident, and that an increase in overall health did not result in improved health for all people, but rather a growing difference in health between rich and poor. Differences in health outcomes and mortality between the social classes have historically largely been attributed to material inequalities and behavioural-cultural differences (Bartley, 2003). For example, people with a higher income level have the means to make healthier and more expensive food choices and they live in more affluent areas where harmful influences such as air pollution and crime are less prevalent. It has long been known that the higher social classes are less likely to smoke and more likely to be physically active (Marmot et al., 1984). These mechanisms account for some, but not all, of the difference in health between groups with a different socioeconomic position.

There is convincing evidence that in societies where almost all people have access to basic goods and necessities, the relative position people occupy in society has an important influence on health and wellbeing. Income inequality, at the level of both countries and states, is negatively correlated with a variety of indicators reflecting the health and wellbeing, such as mental health, obesity, educational performance and life expectancy (Wilkinson and Pickett, 2009). Social gradients exist for many health outcomes, with every step down the social ladder being associated with worse health outcomes (Bartley, 2003).

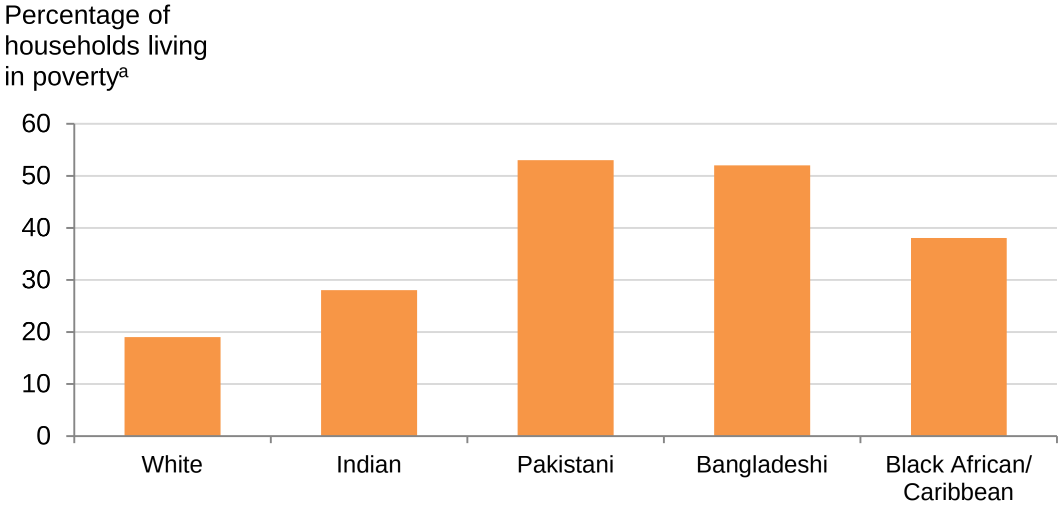
The social gradient in health is a powerful argument for the importance of psychosocial explanations of health inequalities, as it suggests that regardless of absolute material assets, inferiority in terms of power, wealth and status negatively influences health. In recent years, the focus of research on health inequalities in high-income countries has shifted from seeking material and cultural-behavioural explanations to a growing interest in psychosocial factors. In a society that prioritises social position and income, an inferior social position results in stress and negative feelings of shame and distrust which harm health and wellbeing (Wilkinson and Pickett, 2007). Also, feelings of inferiority stimulate stress-induced behaviour such as smoking and excess drinking (Lynch et al., 2000). On the other hand, social inequality will affect the social environment, which may directly enhance stress, or have indirect effects on health for example through decreased social mobility, less emotional support or lack of tangible help (Wilkinson and Pickett, 2006). Social capital has been linked to the second mechanism, as the concept is used to quantify and qualify the relationships and social networks people operate in, and it is thought to promote or harm health through multiple mechanisms (Halpern, 2005).

Ethnic inequalities in health

Although today ethnic inequalities in health are largely explained through cultural-behavioural and socioeconomic explanations, genetic differences were a popular topic for research up to the 90's, when it became obvious that other factors were more relevant and genetic differences within ethnic groups were generally more important than differences between ethnic groups (Bartley, 2003). The first comprehensive epidemiological study of the health of ethnic minorities in England was conducted by James Nazroo, based on data from the Health Survey for England (HSE) and carried out from 1993 to 1994 (Nazroo, 1997). Despite being merely descriptive in nature, the data are strongly suggestive of a correlation between ethnicity, social position and health. The more affluent White British, Chinese and Indian respondents enjoyed the best health across a range of health outcomes. Caribbean, Pakistani and Bangladeshi respondents were worst off for every outcome, with the latter two groups reporting the highest prevalence of cardiovascular disease, diabetes, poor mental health and low self-assessed health.

Ethnic inequalities in health were confirmed in later versions of the HSE. In the 1999 HSE, the general risk of illness was around three to four times higher for Pakistani and Bangladeshi people than for the general population, and the risk of diabetes was five times higher in these groups (NCSR, 1999). The 1999 HSE provided further evidence for the link between ethnic inequalities in health and SES, as 90% of Bangladeshi respondents were in the bottom tertile of household income, compared to 31% of White British respondents (Nazroo and Williams, 2006). In the Family Resources Survey of 2011/12, 53% of Pakistani and 52% of Bangladeshi respondents reported a household income below 60% of the median UK income, compared to only 19% of White respondents (Figure 3.1). Across ethnic groups, lower incomes were associated with worse health, such as poorer self-assessed health, limiting long-standing illness, diabetes, hypertension and a raised waist-hip ratio (Karlsen and Nazroo, 2009). These social gradients measured by SES probably explain the biggest part of the ethnic inequalities in health (Erens et al., 2001). However, the social disadvantage of ethnic minorities is not solely an issue of money, employment or education, because social position is also determined and maintained through processes like spatial segregation, social exclusion and discrimination (Chapter 2). Social capital is therefore a relevant factor in explaining social as well as ethnic inequalities in health.

Figure 3.1 Social disadvantage of ethnic minority groups (Alzubaidi et al., 2013)



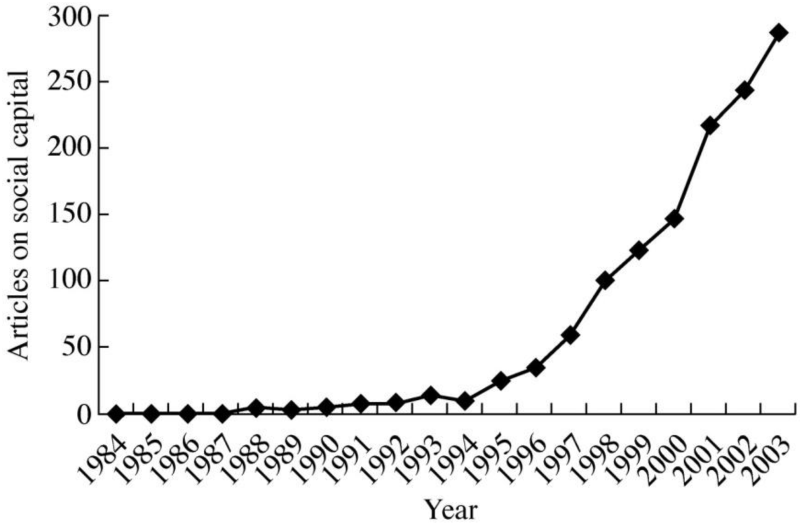
a) Income 60% or below median household income after taking into account housing costs.

3.1.2 Social capital

Social networks and the values and benefits derived from them have been studied for decades. A renewed interest in the subject followed the publication of Robert Putnam's 'Bowling Alone' (Putnam, 2000). Putnam describes a decline in social capital in the US since the 1950's. He paints the picture of a formerly united country, where the social fabric that holds society together is falling apart. Rather than visiting friends, Americans are watching television. Instead of participating in the community, local church or a political organisation, more and more hours in a day are dedicated to working, commuting and staying at home. Americans have less trust in others and bowling, once considered the typically American way of socialising, is increasingly done alone (Putnam, 2000).

Many have criticised Putnam's methodology and some have argued that traditional ways of socialising such as bridge clubs and bowling leagues do not necessarily provide more benefits than novel types of communication (McLean et al., 2002). Regardless, the number of articles published on social capital has increased rapidly since 1995 (Figure 3.2) and continues to rise. A literature search shows that in the past years literature reviews have been published in the field of health research on social capital in relation to mortality (Meijer et al., 2012), mental illness (De Silva et al., 2005) and access to health care (Derose and Varda, 2009). As of November 2012, the Pubmed database contained 1344 studies linked to the search term 'social capital' published in 2012 alone. Apart from systematic reviews, social capital is being studied in relation to subjects as diverse as vaccine uptake (Nagaoka et al., 2012), diabetes control (Farajzadegan et al., 2012), blood donation (Gonçalez et al., 2012) and drug use (Jonas et al., 2012).

Figure 3.2 Academic articles on social capital from 1984 to 2003, copied from Halpern (2005)



Defining social capital

Despite its potential to clarify the origin of health inequalities, the use of social capital has suffered from a lack of consensus regarding its definition and measurement (Adams and White, 2003) (Stephens, 2008). Definitions of social capital have been challenged and adjusted by scientists from various disciplines, with major contributions coming from sociology (Bourdieu, 1986) (Coleman, 1990), economy, and the political sciences (Fukuyama, 1997) (Putnam, 2000).

Table 3.1 shows an overview of the most commonly used definitions of social capital. Three important contemporary views on the concept often used in health research are those of Robert Putnam, Pierre Bourdieu and James Coleman. Putnam regards social capital above all as an attribute of the society, and its value lies in social networks and the norms of reciprocity and trustworthiness that arise from them (Putnam, 2000, pp.18-24) (Putnam, 1996). Bourdieu emphasises the way that social capital reproduces inequality by allowing some people to mobilise the capital of their family, sports club, school or other associations to their advantage. He defines social capital as: ‘the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalised relationships of mutual acquaintance or recognition’ (Bourdieu, 1986). Whereas Putnam has focused on trends in societal social capital over time, Bourdieu’s interest lies in the difference of gaining and using social capital between societal groups. As opposed to Putnam, who considers social capital to be a community resource available to all members of society, Bourdieu argues that use of social, economic and cultural capital is restricted by social class.

Table 3.1 Overview of social capital definitions

Author	Definition of social capital
(Bourdieu, 1986)	'the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition'
(Bourdieu and Wacquant, 1992)	'the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition'
(Putnam, 2000)	‘connections among individuals - social networks and the norms of reciprocity and trustworthiness that arise from them’
(Fukuyama, 1995)	'the ability of people to work together for common purposes in groups and organizations'
(Fukuyama, 1997)	'Social capital can be defined simply as the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them'.
(Burt, 1992)	'friends, colleagues, and more general contacts through whom you receive opportunities to use your financial and human capital'
(Coleman, 1990)	'Social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure'.
(Robison et al., 2002)	‘Social capital is a person’s or group’s sympathy toward another person or group that may produce a potential benefit, advantage, and preferential treatment for another person or group of persons beyond that expected in an exchange relationship.’
(OECD, 2001)	‘Networks, together with shared norms, values and understandings which facilitate cooperation within or among groups’.

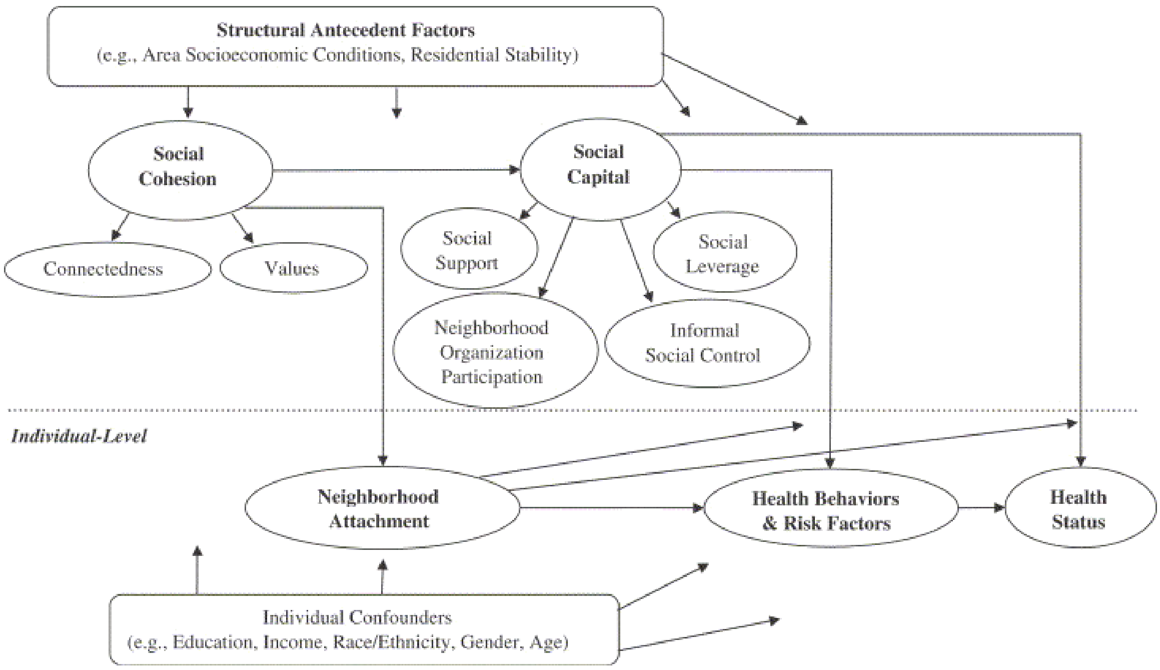
Coleman (1990) approached social capital as a way of integrating social theory with economic theory using ‘rational action theory’. He argued that social capital involves an expectation of reciprocity within networks characterised by high degrees of trust and shared values. According to Coleman social capital constitutes a public good, benefiting all those who are part of a structure and, as such, it is a potential asset for the underprivileged and not just an instrument of privilege.

Social capital: More than the sum of parts?

Fischer (2001) compared social capital to a ‘swamp in wet weather’, given its tendency to expand in all directions. He has argued that the vague and complicated term ‘social capital’ should be abandoned altogether, since much more transparent measures such as trust, political participation and social support are available and can be used independently. Newton (1997) in turn regards family as the vital source of social capital, and argues that the importance of civic participation might be overplayed. Others have suggested that informal networks might play a bigger role in generating trust than formal networks (Letki, 2008). Carpiano (2007) has developed a framework in which social support is a component of social capital as is participation, whereas the feeling of connectedness and social cohesion are excluded from the concept (Figure 3.3). Letki (2008) on the other hand stated that social capital is a dimension of social cohesion.

Lochner et al. (1999) make a case for the measurement of social capital from an ecological rather than an individual perspective, in line with Putnam's operation of the concept. They said there is now a general agreement to regard social capital as a feature of the social structure, distinguishing it from attributes of individuals such as social networks and support. Three years later however, the Office for National Statistics in the UK published a report stating that "… networks are central to the conceptualisation of social capital" (Harper and Kelly, 2003) and social support continues to be included as a measure of individual social capital in worldwide surveys. The 'general agreement' Lochner and his fellow authors (Lochner et al., 1999) were so optimistic about at the start of the twenty-first century has yet to be reached.

Figure 3.3 Social capital framework by Carpiano (2007)

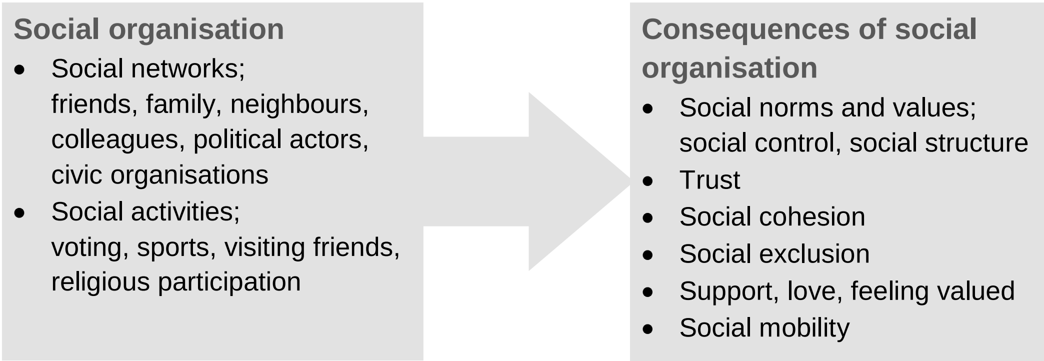


Despite the variety of definitions and interpretations of social capital, it is possible to find some common ground. Firstly, 'social' refers to people, connections between people and the social structures that make relationships possible. As shown in Table 3.1, Burt (1992) emphasises the importance of relationships, whether they are close friends, family or more loosely related contacts. The definition of Coleman (1990) captures all these contacts plus their organisation by calling it the ‘social structure’. This social organisation can be measured in terms of contacts (number of friends), existing structures (sports clubs or places of worship) or the activities within these networks (voting or visiting friends). Secondly, ‘capital’ refers to the notion that social contacts, relationships and networks provide value. This value is easily recognised when expressed in terms of money, but social capital is thought to provide value not only in a tangible way, but also in the shape of social and emotional support. The OECD (2001) refers to this as ‘norms, values and understandings’ while Bourdieu (1986) calls it ‘resources’.

Properties of capital

Coleman (1990) argued that social capital is defined by its function. It acts the same way other types of capital do, and shares similar characteristics. Robison et al. (2002) made an inventory of essential properties of capital. These are transformation capacity, durability, flexibility, substitutability, decay, reliability, ability to create one capital form from another, opportunities for (dis)investment, and alienability. Social capital can transform input into output, for example because putting in emotional support leads to feelings of being loved and valued. Secondly, social capital has durability, albeit to different extents. Some connections between people last a lifetime, while others are temporary (Robison et al., 2002). Another striking similarity with other types of capital is that social capital is subject to decay. Over time, when relationships are not being maintained or if they are abused, social capital can lose its value. Social capital also conforms well to the requirement of ‘reliability’. Strong bonds between family and friends are usually most reliable and the investment is therefore less risky than for relationships between friends, neighbours or colleagues. Another characteristic of social capital is the ability to create more capital (Robison et al., 2002). When considering the example of informal networks between professionals working in the same discipline, contacts across different companies will lead to being introduced to even more people. At the same time, social capital can be transformed into economic capital because professional networks increase employment opportunities and social mobility. The characteristic of alienability refers to the ability to transfer capital between people (Robison et al., 2002). Although a relationship is not transferred as easily as money or tangible goods, children enjoy the benefits of the family structure they are born in and immigrants are confronted with the social structure of their host society. Given that social capital shares the characteristics of ‘capital’, it can be considered in relation with other types of capital. This is particularly relevant for Bourdieu’s theory on the dependency between economic, cultural and social capital, as it explains that social capital is not accessible and usable by everyone in society in an equal manner (Harker et al., 1990).

Figure 3.4 Social capital components of social organisation and consequences of social organisation



In conclusion, ‘social capital’ is more than components of social participation, social organisation or measures of trust and reciprocity together. As illustrated in Figure 3.4, most social capital definitions attempt to combine the aspect of social organisation with consequences of social organisation, such as trust, reciprocity, love or exclusion. According to Castle (1998), social capital only has value in research if the concept is used in a precise and comparable manner. In this thesis I make a deliberate choice to consider all aspects of social organisation, as well as the consequences of social organisation, to be part of social capital. In the next few paragraphs I will elaborate on my view on social capital and the way I choose to use it throughout this thesis.

Dimensions of social capital

In order to measure and structure the broad concept of social capital, a distinction has been made between the dimensions of bonding, bridging and linking social capital. Bonding social capital refers to close relationships between family members or friends, often measured by indicators such as social support or the number of friends. Bonding social capital connects people with a similar social identity, which may relate to their social class, ethnic identity, religion, culture, age or otherwise (Kawachi et al., 2004). Bridging social capital refers to relationships between people that are more loosely connected, such as neighbours, members of a tennis club or colleagues. To take into account power differences in social relations, Szreter and Woolcock (2004) have introduced a linking component of social capital, which might be seen as a subtype of bridging social capital. Linking social capital is used to describe vertical relationships, such as the hierarchical relationship between employer and employee, or between citizen and government.

Some scholars describe the contacts gained through bonding capital as ‘strong ties’, and those gained through bridging capital as ‘weak ties’ (Granovetter, 1973). This approach has been criticised by others, as has the distinction between bridging and bonding (and linking) (Leonard and Onyx, 2004). Social networks are in reality more often than not a combination of types of social capital. A sports club for example will bond people with a similar interest who are living in the same area, but might bridge between different social classes. Bourdieu's view of social capital is said to be more related to the bridging/linking type than the bonding type. However, the social structure based on differences of social position and power at the core of Bourdieu's theory cannot be separated from bonding social capital. Criminal social structures such as the mafia, street gangs and the Ku Klux clan, but also small religious groups who are extremely closed-off from society, are often used to illustrate that social capital can have negative consequences (Putnam, 2000, p.340) (Putnam, 1993). These same examples show that bridging and bonding go hand in hand. Both the mafia and street gangs maintain their superiority by operating as a bonding family network, but are at the same time highly hierarchical. Within extreme religious groups strict social control serves to maintain the boundaries between those inside and outside the network, and for some, breaking the bond means complete exclusion from a community. Informal hierarchical relationships exist within families, groups of friends, neighbourhoods and many supposedly 'flat' professional organisations (Cederberg, 2012). Paradoxically, Putnam himself showed in an early study of Italian society that it is distrust that makes people turn inward to their family, explaining social support as a necessity to which people are forced by the negative influences of social exclusion in a socially unequal society (Putnam, 1993).

The different dimensions of social capital are thought to have different functions, which may overlap. It is often said that bonding social capital is important to 'get by', while bridging social capital is required for 'getting ahead' (de Souza Briggs, 1998). However, to make bonding synonymous with social support and friendship and bridging with getting ahead in life is too crude a distinction. Let us first consider the positive side of social capital. Close friends and family providing social support, or bonds, may not directly offer job opportunities to help one another move up the social ladder, but a supportive relationship might very well give someone the self-confidence to apply for a challenging job, just as a supportive husband might enable a mother to take up work outside the house (Blokland and Savage, 2008). In other words, bonds have the ability to bridge. In the same way, relationships with relatives higher up the social ladder may turn into long lasting friendships, and colleagues who occupy different positions in the hierarchy of the company may be friends, brothers, husband and wife or father and son. Are these bridges or bonds? On the other hand, family and friends do not always offer support and distant relationships may only sporadically offer advice or help to benefit social mobility. Research on the quality of ties for people living in poverty has shown the negative side of an extensive social network (Blokland and Savage, 2008). People reported that relationships were sometimes draining them of energy and money to the extent that they exacerbated poverty. Poor people intentionally tried to limit contact with other poor people for this reason. In the same study poor people living in deprived areas reported that contacts from higher social classes had not enabled them to climb up the social ladder. Knowing people higher up the social ladder may lead to some benefits, but is not automatically beneficial in terms of social mobility.

The conclusion must be that social capital is highly versatile; it has multiple purposes and works at different times for different people. A relationship between two actors may be beneficial to one and draining for the other, it may offer social support despite involving people with various social positions and it may offer advantages that do not necessarily qualify as bonding or bridging (Blokland and Savage, 2008). It is the interaction between social capital and other individual- and area-level factors which creates a variety of potential health effects.

Types of social capital

Except for the different dimensions of bonding, bridging and linking social capital, structural and cognitive measures have been distinguished (Harpham et al., 2002). Putnam (2000, p.300) makes use of the same measures, but operates the terminology 'formal and informal social capital'. Cognitive social capital is a subjective indicator, measuring for example feelings of trust, social support, togetherness and neighbourhood satisfaction. Structural social capital refers to objectively measurable activities and resources such as participation in neighbourhood activities, membership of a religious association or voting turnout in national elections. The total concept of social capital is thus captured by the two components of social organisation and consequences of social organisation, the cognitive and structural measures and the bonding, bridging and linking dimension of social capital. Not considered here is the level of social capital. Indicators such as social support often imply an individual level of measurement, while trust is often aggregated to a community or state level and structural data such as neighbourhood facilities can easily be gathered on a community level.

In general, structural measures are most suitable to measure aspects of social organisation while cognitive measures often refer to the consequences of social organisation. A structural measure of the bonding dimension of social organisation could for example be a count of the number of close friends, amount of time spent with family members or number of social activities with friends in one month. A cognitive measure of the bridging dimensions of consequences of social organisation is the feeling of trust between community members, and for the linking dimension, trusting politicians is a cognitive measure of social capital.

Questionnaires and surveys of social capital

Depending on the applied framework and definition, social capital is measured in different ways. Table 3.2 gives an overview of large surveys and questionnaires measuring social capital, some of which are developed to provide insight into the correlation between social capital and health. National and international surveys, such as the World Values Survey and HSE often include a measure of trust. The most widely used English version of this question is: ‘Generally speaking, would you say that most people can be trusted?’ It has been argued that question measures trustworthiness rather than trust, since it correlated only weakly with trust behaviour in experiments (Glaeser et al., 2000). However, another study concluded that the trust question in the World Values Survey (WVS) and General Social Survey does have construct validity. In an experimental game, a high correlation was found between experimental trust and WVS trust, but not between experimental trustworthiness and WVS trust (Johnson and Mislin, 2012).

Other validated questionnaires include the UK Harmonised Social Capital Question Set (Harper and Kelly, 2003), the set of social capital questions in the HSE and the Onyx Bullen Scale. The Harmonised Social Capital Question Set measures five domains: civic participation, social networks and support, social participation, reciprocity and trust and views about the area (Babb, 2005). The questions were tested in focus groups of different populations. The HSE questions were tested for content and construct validity and were shown to be associated with a range of health outcomes (Bajekal and Purdon, 2001). The Onyx Bullen Scale consists of 36 questions and measures the following aspects: value of life, tolerance of diversity, neighbourhood connections, family and friend connections, work connections, community participation, feelings of trust and safety and proactivity (Onyx and Bullen, 2000). The scale was initially developed for the Australian setting and has since been used and tested in different populations (O'Brien et al., 2004) (McAloney et al., 2011). The SOCAP IQ (Table 3.2) was developed for use in low-income and middle-income countries and translated versions were tested in Nigeria and Albania. In contrast to many other questionnaires, it includes components related to the distribution of social capital, such as social inclusion and empowerment.

Not included in the overview are less well-known social capital questionnaires developed for the purpose of measuring social capital in relation to specific aspects of health and illness. The Social Capital Scale constructed by Looman (2006), for example, originally aimed to measure social capital in relation to children with chronic health conditions.

Table 3.2 Overview of questionnaires and surveys measuring aspects of social capital

Questionnaire	Definition of social capital	Aspects of social capital measured
World Values Survey (WVS) **(Elgar et al., 2011)**	-	Civic participation Political participation Religious participation Social activities Trust (bridging, bonding, linking)
Health Survey for England (HSE) (HSCIC, 2007)	"…the resources available through membership of social networks or communities"	Perceived social support Contact with friends and family General trust Civic and political participation Views of the neighbourhood Access to local amenities
General Household Survey/ General Lifestyle Survey (Great Britain) (Hall and ONS, 2011)	OECD (2001): "networks, together with shared norms, values and understandings which facilitate cooperation within or among groups"	Views of the neighbourhood Trust (general, linking) Contact with friends and family Civic and political participation
General Social Survey (US) **(NORC, 2012)**	-	Political participation Civic participation Religious participation Tolerance of diversity Trust, fairness and helpfulness Family support Friends
British Social Attitudes Survey (Great Britain) **(NSCR, 2012)**	-	Political engagement Trust (linking) Civic participation Willingness to help
Australian General Social Survey (Australian Bureau of Statistics, 2010)	Based on OECD (2001): "networks, together with shared norms, values and understandings which facilitate cooperation within or among groups"	Social networks Social support Trust (bonding, bridging, linking)
European Values Survey **(EVS Foundation, 2012)**	-	Civic participation Political participation Religious participation Social activities General trust
Eurobarometer Special Issue 2005 **(European Commission, 2005)**	"Social capital refers to those stocks of social trust, norms and networks that people can draw upon to solve common problems".	General trust Social life Social support Civic participation Political participation

Questionnaire	Definition of social capital	Aspects of social capital measured
UK Harmonised Social Capital Question Set (Babb, 2005)	-	Reciprocity and trust Civic participation Social networks and support Social participation Views about the area
Onyx Bullen Scale (Onyx and Bullen, 2000)	-	Trust and safety Value of life Tolerance of diversity Neighbourhood connections Family and friend connections Work connections Community participation Proactivity
Social Capital Community Benchmark Survey (US) (Harpham et al., 2002)	Based on Putnam (2000): "features of social organisation such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit"	Social and inter-racial trust Diversity of friendships Political participation Civic participation Informal socialising Religious participation Equality of civic engagement Community variation in social capital
Canadian General Social Survey on Social Engagement 2003 (Statistics Canada, 2003)	Based on Putnam (2000): "features of social organisation such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit"	Social contacts Social support Civic participation Political participation Trust (bonding, bridging, linking)
Social Capital Assessment Tool (SOCAT) (World Bank, 2012)	"Social capital refers to the norms and networks that enable collective action".	Household Community participation Exclusion Collective action Solidarity Community trust and cooperation Conflict resolution
Social Capital Integrated Questionnaire (SOCAP IQ) (World Bank, 2012)	"Social capital refers to the norms and networks that enable collective action".	Groups and networks Trust and solidarity Collective action and cooperation Information and communication Social cohesion and inclusion Empowerment and political action
Adapted Social Capital Assessment Tool (SASCAT) (De Silva et al., 2006)	Based on Putnam (2004): "social networks and their associated norms of reciprocity"	Group membership Support from groups Support from individuals Citizenship activities

3.1.3 Social capital and health inequalities

Bourdieu's framework in the study of health inequalities

Pièrre Bourdieu was a French sociologist with a background in philosophy and anthropology, who developed what he referred to as 'thinking tools' to study the reproduction of social inequality in society. His influential works were published in the second half of the twentieth century, most notably Distinction (Bourdieu, 1984) and Outline of a Theory of Practice (Bourdieu and Nice, 1977). The main thinking tools, *field*, *capital*, *habitus* and *practice,* form a framework which shows how social inequality is not only reproduced and maintained through the distribution of capital, but determines social life to such an extent that both the structures of society as well as the agents interacting within society actively reinforce the established social positions. In a given social space, or *field*, people with a certain social position tend to act in a way that matches their position. The chances of gaining and using types of capital, which may be economic resources, skills and knowledge or social resources, depend on the social position people occupy. Influenced by Karl Marx, Bourdieu argues that people's actions and habits are constrained by a view of the world that is shaped by the dominant forces in society, and consequently people settle for expectations that are in line with their social position.

Bourdieu makes a distinction between three basic types of capital, namely economic capital, social capital and cultural capital, all of which can be converted into other types of capital. Economic capital refers to financial resources, of which money is the most obvious. It also includes negative resources such as debts, a mortgage or bank loans. Cultural capital consists of resources related to knowledge and skills, which come in different forms depending on the field in which the actor moves. In the field of education, an academic degree is considered cultural capital. In the field of art, both knowledge of the history of art as well as artistic taste are examples of cultural capital. Knowledge of the rules of the game, from football rules to dining etiquette and practices in business are part of cultural capital, although less visible and not expressed in formal document such as diplomas or degrees. Economic, social and cultural capital are dependent on each other and strongly related to the most desirable form of capital; symbolic capital. These are the resources available to an actor based on honour, prestige, class and status.

The use and exchange of capital is a subtle process that is sometimes disguised so as to obscure its true nature. Economic capital is often a motivator for action, although it can be dressed up differently. The highly commercial field of professional football for example is dependent on financial resources. Nevertheless, football players who earn millions a year will state that they are motivated by the prospects of gaining cultural capital; improving skills, the honour to play for a club or country, the pride of their supporters (Webb et al., 2002). In the same way, social networks may be considered a publically visible collection of social capital, but considering for example the importance of numbers of friends on Facebook and followers and ‘retweets’ on Twitter, it seems to act as a display of status at the same time.

This concept of different types of capital that Bourdieu proposes clarifies the relations between resources. Only some resources are a valuable possession irrespective of the environment they are used in. Karl Marx described these goods, such as food or clothes, as having use-value (Marx, 1992). Many forms of cultural and symbolic capital in turn only have exchange-value. Status and power only exist in a community that acknowledges this capital and although particular resources can be attributed to an individual, they lose their meaning outside the societal context. On a deserted island, exchange-value commodities such as prestige, awards or certificates are useless. In a similar way, immigrants who enjoyed a high social position and were held in high esteem by other people in the community may not be able to use these symbolic resources to their advantage in a new society which does not perceive the acquired capital to be valuable.

Since Marx developed his initial theory of capital, modern societies have become less dependent on heavy industry and more on the exchange of services and information. The dependency between types of capital has grown more complex as a result of societal change. In more equal societies, capital flows more freely between social classes and the chances of gaining capital for example by access to education or hard work and motivation are bigger. In a society that operates fairly, the big share of capital is not held within an advantaged group, but available to all and usable by all.

The thinking tools of Bourdieu offer four main advantages for the study of health inequalities as opposed to other theories and frameworks:

1. Focus on social position
2. Ability to incorporate different theories of health inequalities
3. Usefulness to study ethnic inequalities in health
4. Attention to the life course
5. Applicable to the study of spatial inequalities in health

As highlighted earlier in this chapter, Bourdieu’s theory describes social position as the key in the reproduction, the use and the harm or benefits received from social capital, making it suitable to study health inequalities. This comprehensive perspective on inequality incorporates material factors such as economic capital, it explains to a certain extent differences in health behaviours, and takes into account psychosocial influences on health. In an attempt to move beyond the dispute between materialist and psychosocial views on health inequalities, this framework integrates the main theories.

In addition, Bourdieu's theory is useful for the study of socially disadvantaged groups such as ethnic minorities. The definition of social capital as created by Putnam, and applied by many others, emphasises trust, social norms and participation. This seems to exclude ethnic minorities and other socially disadvantaged groups and individuals from stocks of social capital. Trust is associated with social inequality, social norms are the norms of the majority in a society, and participation is often measured by engagement in social activities that only appeal to the majority (Arneil, 2006). Bourdieu in turn acknowledges that participation of some might lead to social exclusion of others, and that social norms can also be a means of oppression.

Another advantage of Bourdieu's theory is that it facilitates a life course perspective on health inequalities, as it explains how social capital, and in fact all capital, is reproduced and exchanged within networks so that social position is more easily maintained than changed over generations. It is therefore plausible that the psychosocial effects of parents' social status are felt by their grandchildren.

Finally, in acknowledging the influence of the physical and social environment on the individual, Bourdieu's theory fits with research on spatial inequalities in health. Experts in social epidemiology have emphasised that it is not the social environment per se, but the interaction between individual and environment which creates geographical patterns in health (Berkman and Kawachi, 2000). Social capital in the neighbourhood influences health and health behaviour through social norms, social control and stress, leading to an accumulation of risks in socially disadvantaged neighbourhoods.

Theories of social capital and health inequalities

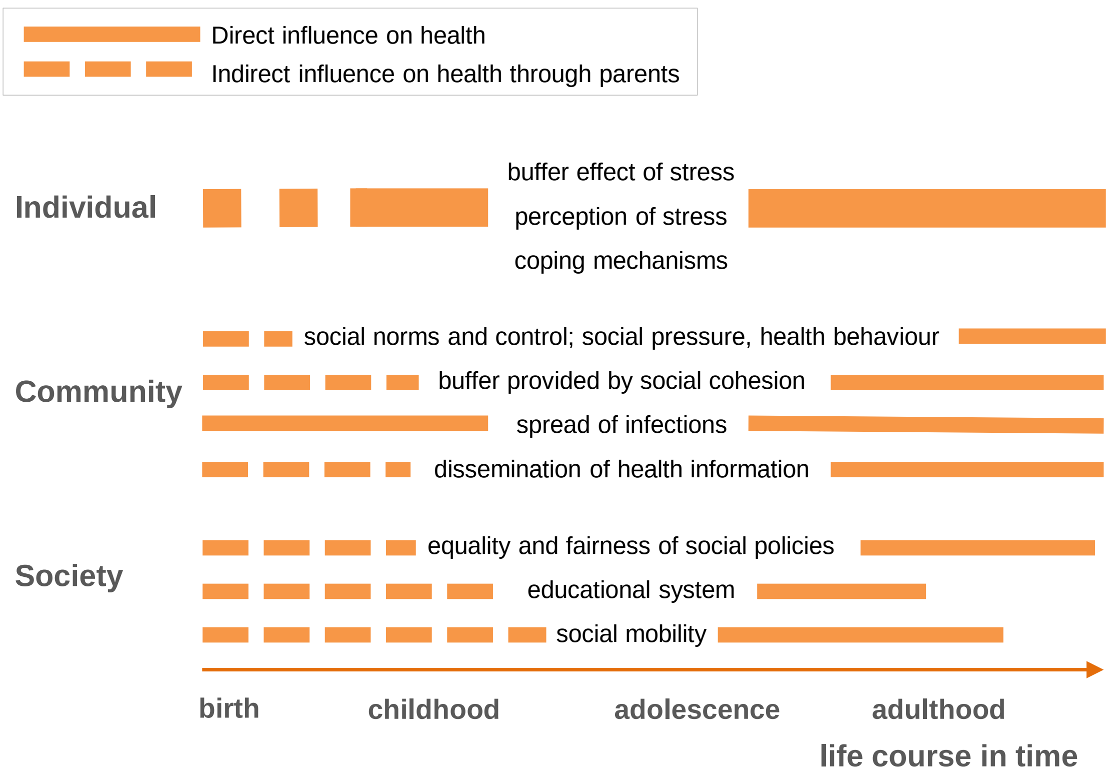
Social capital and mental health were linked as early as 1897, when the French sociologist Émile Durkheim published his study on the role of social control in the prevention of suicide (Durkheim, 1897). According to Durkheim, the tight-knit structure of Catholic communities in Europe led to lower rates of suicide, as opposed to higher rates among the more loosely connected Protestant communities. Although Durkheim's study has been criticised on methodological grounds, it set an example for the study of social influences on health. In the 1930's, Faris and Dunham (1939) studied the social environment in relation to mental disorders in Chicago and demonstrated that the incidence of schizophrenia was associated with social conflict, residential mobility and social disorganisation in the area of living.

Physical health has been linked to social capital too, most famously in the small community of Roseto, Pennsylvania (Egolf et al., 1992). This study, starting in the 1950s, showed that myocardial infarction among Roseto residents, almost all of whom were of Italian origin, was rare compared to rates in neighbouring towns. The researchers attributed this to the social dynamics and strong bonds between community members, after ruling out dietary factors and other confounders. Although Lynch and Davey Smith (2003) later argued that the claimed difference in myocardial infarction was not as evident as suggested, the follow-up showed that over the years, as new generations became less active in local social clubs and outgrew the traditional family lifestyle of their Italian ancestors, the rate of heart attacks began to rise until it was no different from other towns and cities in the same area. In 1999, Kawachi and colleagues (1999) published the first extensive study with a large US dataset that accounted for effects of individual confounders such as income and education. They showed correlations between trust, reciprocity, group membership and self-rated health.

Social capital influences inequalities in health on multiple levels (Figure 3.5). At an individual level, social capital can buffer the effects of stress, for example through emotional or financial support (Wilkinson and Marmot, 2003). In addition, unfortunate events may not be perceived as stressful when people feel supported. In this way, the negative health effects arising from poverty can be counteracted by positive influences of the social network. Thirdly, social connections may evoke a healthier coping mechanism in case of stress, for instance because people rely on friends or family for help and are less likely to drown their sorrows, start smoking or indulge in comfort eating as coping mechanisms.

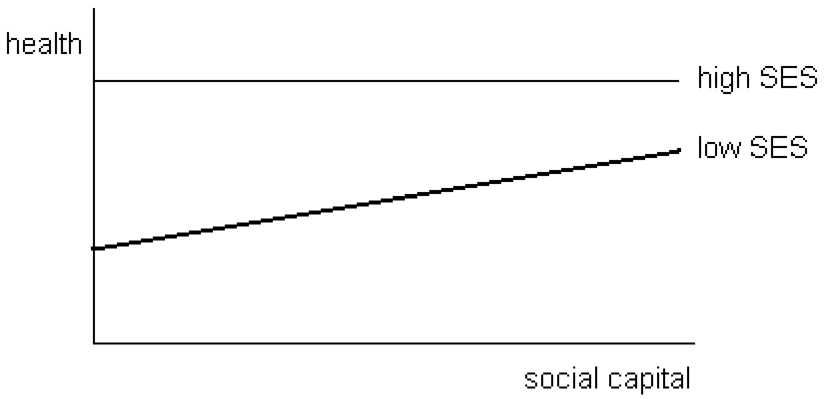
Social capital has a continuing influence on health during the life course. In early childhood, parents are the main provider of social capital and they will influence social contact between children for instance by sending children to a nursery, inviting other children to their homes and by contact with other family members and social networks. In a later stage children start to develop their own social networks. A German study showed that next to family, the school and neighbourhood are important providers of social capital in early adolescence, which was strongly associated with health outcomes (Bohn and Richter, 2011). Relationships developed during childhood form the basis for social networks later in life, when children change environments and become students and working young adults. Their contacts will have an impact on health behaviour, for better or worse. Society will influence how social capital is built up and distributed, for example through social policies, the educational system, urban design, social mobility and trends in the labour market (Halpern, 2005). The children of these adults will subsequently grow up under the influence of their parents’ social network.

Figure 3.5 Multilevel influence of social capital on health throughout the life course



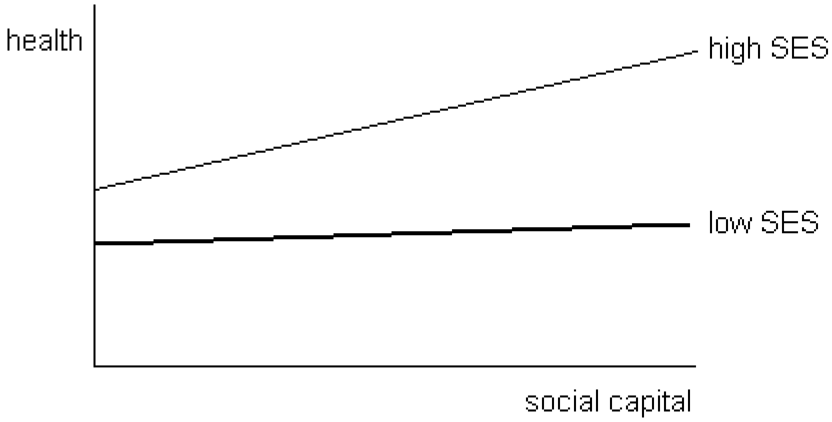
On a community level, four mechanisms have been identified that influence health through social capital (Figure 3.5). Social cohesiveness in a neighbourhood may buffer stress like social support does on an individual scale and in addition provide a spatial barrier. In some tight-knit communities, such as areas with a high percentage of ethnic minorities, the social network serves a spatial barrier against the negative impact of discrimination and stigmatisation on health (Shaw, Pickett, and Wilkinson 2010) (Pickett and Wilkinson, 2008). Other studies provide examples of solidarity among working class communities being manifest in health initiatives, for example around chronic illnesses associated with particular industries (Small et al., 2012). This *buffer hypothesis* is shown in Figure 3.6.

Figure 3.6 Buffer effect of social capital on health inequalities



Secondly, mechanisms of social control and pressure influence health behaviour, but may also cause social exclusion for those who do not adhere to the social norms of the majority (Arneil, 2006). This would mean that ethnic minorities and other socially disadvantaged groups may lose out on the health benefits of social capital, very much in line with Bourdieu’s theory of social position and capital. Due to the dependency of social, economic and cultural capital, people with a low social position will generally have less social capital and the amount of capital available to them cannot be used as effectively for the benefit of health. This *dependency hypothesis* is shown in Figure 3.7. Another area-level influence of social capital is that health information is more easily passed around in tight communities and finally, infections will spread more rapidly when people are in frequent contact with each other.

Figure 3.7 Dependency of social capital and socioeconomic status influencing health



Research focussing on the societal or state level has often included social capital measures such as trust and civic participation (Putnam, 2000) (Wilkinson and Pickett, 2009). There is a debate regarding the direction of this relationship between social capital and health inequalities (Abel, 2008). Some suggest that social inequality decreases both social capital and health, while others argue that more equal societies operate more fairly as a consequence of higher stocks of social capital, which happen to be there for cultural-historical reasons. In both situations, social capital is thought to create solidarity, which stimulates the adoption of fairer policies aimed at reducing both health and social inequalities (Halpern, 2005, Berkman and Kawachi, 2000). A study by Islam and colleagues (2006) showed that social capital has an effect on health regardless of social inequalities, but in less egalitarian societies community-level social capital might have a bigger impact on health. Social inequality is affected by national social policies and social capital in turn can influence social inequality and health inequalities because higher stocks of social cohesion and social participation may result in more effective lobbying for social policies and health improving policies.

Social capital has been studied by researchers from various disciplines and in the absence of a universally accepted definition or standard framework for measurement many have kneaded the concept to fit particular research interests, policy initiatives or political motives. With this introduction I have aimed to clarify and justify my way of using the social capital concept for the study of health inequalities. Two main hypotheses on the relationship between social capital and social position are the *buffer hypothesis*, which has been linked to ethnic density effects, and the *dependency hypothesis*, in line with the social capital theory of Bourdieu. In the remainder of this chapter I will first present the results from a systematic review on these relationships between social capital and socioeconomic inequalities in health, and continue with a discussion of the literature on neighbourhood social capital (NSC) and ethnic inequalities in health.

3.2 Systematic review of the relationships between social capital and socioeconomic inequalities in health

A modified version of the systematic review reported in this section was published in the International Journal for Equity in Health in July 2013. This paper is openly accessible online (Uphoff et al., 2013), and included in Appendix 1A of this thesis.

3.2.1 Methods

The methods and results of this systematic review are reported according to the PRISMA guideline to facilitate the transparency and reproducibility of findings (Moher et al., 2009). The search strategy and selection of studies was deliberately broad to allow for a wide variety of study designs and interpretations of social capital to be included. I reviewed studies published before July 2012 that could be located through online databases MEDLINE, EMBASE, CINAHL and Cochrane. The search identified studies that included terms related to social capital, health inequalities and/or SES in the article, title or abstract. Figure 3.8 shows the search strategy as used in MEDLINE and the complete search in all four databases is documented in detail in Appendix 2A.

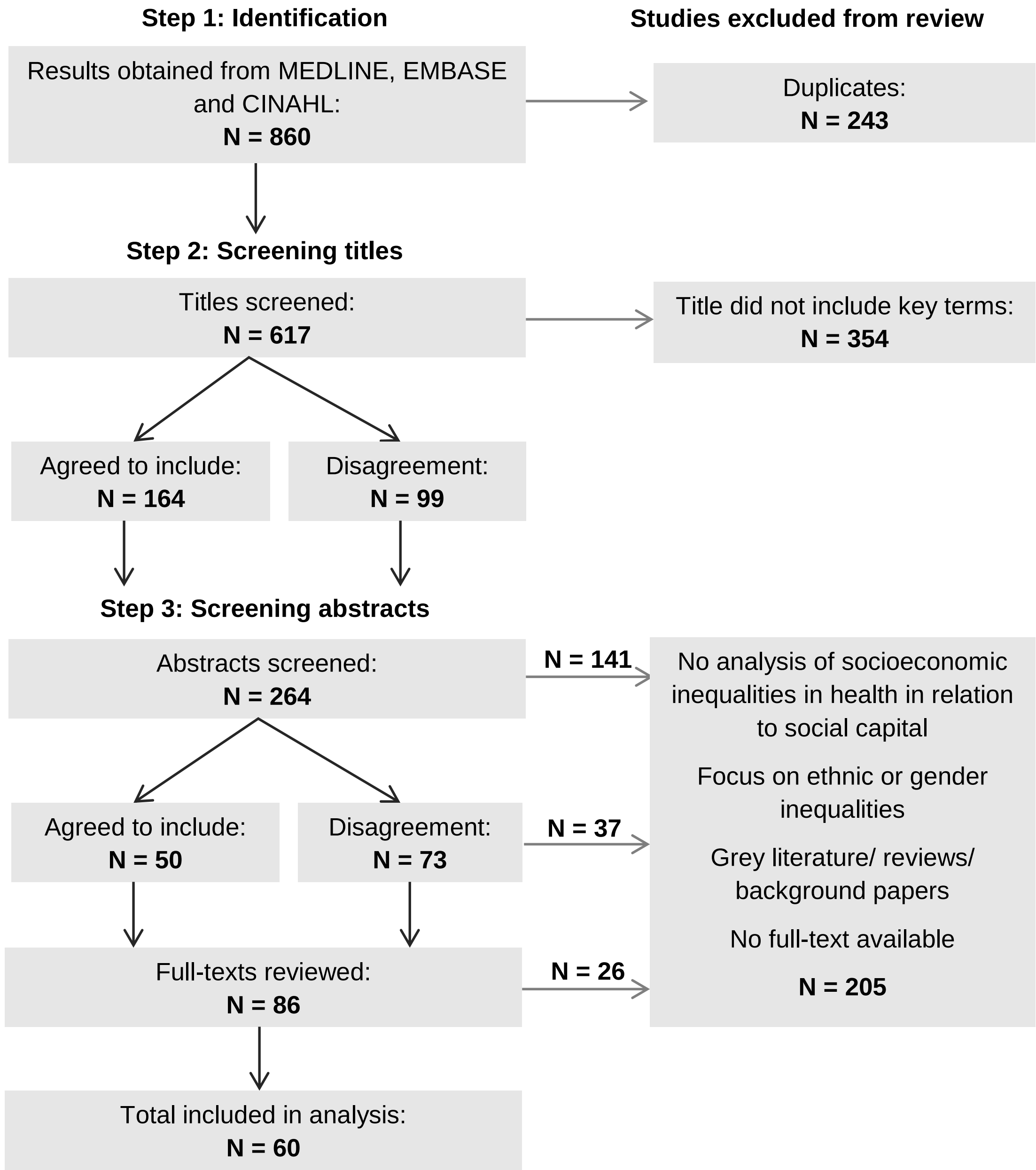
Figure 3.8 Literature search strategy MEDLINE

"health status disparities" OR "health inequality" OR "health inequity" OR "health inequalities" OR "health disparity" OR "health disparities" OR "Health Status Disparities"[Mesh]
AND
"socioeconomic status" OR "social class" OR poverty OR poor OR income OR disadvantaged OR deprivation OR deprived OR "socioeconomic factors" OR "socioeconomic position" OR deprivation OR deprived OR "Socioeconomic Factors"[Mesh]
AND
"social capital" OR "social support" OR "social participation" OR trust OR "emotional support" OR "social network" OR "social cohesion" OR "psychosocial support" OR "community capital" OR "neighbourhood cohesion" OR "neighborhood cohesion" OR "collective efficacy" OR "Social Support"[Mesh] OR "Community Networks"[Mesh] OR "Social Isolation"[Mesh] OR "Trust"[Mesh]

Studies were included regardless of study design, setting, social capital measure, type of health outcome and date of publication. No language restrictions were applied. Grey literature was excluded and background papers and reviews were separated from the main results.

The systematic literature search was performed on the 25th of July 2012 and step 1 resulted in the identification of 617 studies after removing duplicates (Figure 3.9). In step 2 titles were independently screened by the author (NU) and a colleague (BC) and in step 3 studies for which inclusion was agreed and studies on which no first agreement was reached were reviewed. Abstracts were assessed by two authors independently (NU and BC) and rejected if they did not analyse socioeconomic inequalities in health in relation to social capital or any of the related indicators listed in Figure 3.9. Abstracts of studies not agreed upon after this step were discussed until complete agreement between the two researchers was reached to either exclude or include the study for further analysis. A table with excluded studies after initial disagreement and reasons for exclusion can be found in Appendix 2B.

Figure 3.9 Pathway of identification, screening and selection of studies for inclusion in systematic review



The full-text review and data extraction were performed by one reviewer (NU) based on a summary table developed and piloted by the research team. The second reviewer (BC) checked a random 10% sample of the completed summary table. After the full-text review, studies were excluded if they failed to address social capital or any of the related indicators, if they did not use any health outcomes or if they did not include any measure on SES or health inequalities. No summary measures were reproduced given the incomparability of dependent and independent variables used in the studies.

Quality assessment

Given that most of the criteria for risk of bias provided by the PRISMA statement are related to trials with a more biomedical orientation, I assessed the quality of the study rather than the risk of bias. Firstly, the suitability of social capital and economic capital measures in relation to the aim or research question was assessed. This included an examination of potential logical fallacies and I verified whether a sound theoretical motivation for the choice of the social capital measure or related indicator was provided.

Transparent use of the social capital concept was emphasised; I expected studies to either use measures independently of the social capital concept, for example 'trust', or to use measures such as social support as indicators of social capital. Secondly I assessed the sample size and design of the study in relation to the type of analyses and reported conclusions. Studies were assigned one point if they failed on any of these quality criteria, two if there was room for improvement, and three if all quality criteria were met.

3.2.2 Results

A total of 60 studies were included in the analysis. A summary table of these studies and their main characteristics is presented in Appendix 2C. The collected data represent an array of geographical regions, with studies from the United States, Europe, Asia, Australia, Canada and the former Soviet Republic. Studies relying on data from the United States made up the biggest portion, but due to smaller sample sizes these participants represent only 24% of the total sample.

Self-reported measures of health were most frequently reported, and used as the only measure in 42% of studies. Other indicators of health and illness were measures of health behaviour, hypertension, obesity, mental health, mortality, access to healthcare, or a combination of multiple measures.

Correlation between social capital and socioeconomic inequalities in health

Nineteen studies tested for interaction effects between social capital and socioeconomic inequalities in relation to health. The remaining studies assessed the correlation between social capital, health and SES without taking into account interaction effects.

Out of sixty studies reviewed for analysis, only four did not confirm this three-way correlation. One of the studies did not analyse this hypothesis (Van Duyn et al., 2007), another study only used structural measures of social capital to test the relationship with self-rated health (Emerson and Hatton, 2007) and two studies did not find an effect of social capital on mortality (Turrell et al., 2006, Mohan et al., 2005). Turrell and colleagues (Turrell et al., 2006) attributed this finding mainly to a lack of spatial segregation within the study population of Tasmania, while Mohan and colleagues (Mohan et al., 2005) focused on area-level measures of social capital.

The studies that did confirm this hypothesis were mainly cross-sectional studies, often making use of data from large surveys. Sixteen studies analysed a sample consisting of more than 8,000 people, representing countries with low levels of socioeconomic inequality (e.g., Sweden and Norway), high-income countries with relatively high inequality (e.g., the United States and United Kingdom), and middle-income countries with high inequality (e.g., countries from the former Soviet Republic).

The studies revealing a relationship between social capital and socioeconomic inequalities in health often included multiple measures of social capital or related concepts, although the choice for these measures and components was not always clearly explained. Social capital measures related to friendship and trust were most often associated with health measures, with friendship often described as a measure of bonding social capital and trust as bridging social capital. Linking social capital was the least likely component to be measured explicitly, although various studies found significant relationships with health outcomes. In the study of Veenstra (2005) for example, political trust was negatively associated with poor or fair health (β -0.56, $p<0.001$), depression (β -0.01, p 0.019), and long-term limiting illness (β -0.41, p 0.001). Hyyppä and colleagues (Hyyppä and Maki, 2001) found general mistrust to be correlated with self-rated health (OR 0.70, 95% CI 0.50;0.97), but other social capital measures such as the number of auxiliary friends and religious participation produced stronger effects (OR 1.96, 95% CI 1.49;2.57 and OR 1.67, 95% CI 1.12-2.49, respectively). Although these findings confirm the co-existence of high social capital, high SES and good health, they do not explain differences in this relationship between groups in society and might therefore obscure interaction effects.

Buffer effect of social capital on health inequalities

The previous results identified a correlation between social capital and socioeconomic inequalities in health. Tables 3.3 and 3.4 show nineteen studies that sought to explain and nuance these findings by studying interaction effects. The buffer hypothesis suggests that people with a low SES can use social capital as a buffer against the negative impact of low economic and/or cultural capital on health. There were eighteen studies that looked at the effect of SES on the relationship between social capital and health, of which eleven confirmed the buffer hypothesis (Table 3.3).

Studies that focused on minority populations provided valuable insights, such as the research by Pearson and Geronimus (2011), who concluded that - especially for low-income American Jews - ties bonding according to religion were related to better self-rated health (OR 1.73, 95% CI 1.22; 2.66). In an underdeveloped area in Western China, Sun and colleagues (Sun et al., 2009) observed an association between self-rated health and social capital only for residents living in poverty. Poor residents living in areas with low neighbourhood cohesion were more likely to report poor self-rated health (OR 2.88, 95% CI 1.96; 4.24), whereas this association was not found for non-poor residents (OR 1.28, 95% CI 0.85; 1.91). Also, low reciprocity and social support was associated with worse self-rated health in the poor sample only (OR 2.99, 95% CI 2.04; 4.39).

Van der Wel (2007) studied the effect of trust and volunteering at a neighbourhood level among residents of Norwegian communities. Communities rich in social capital (measured by aggregating individual responses to social capital questions) were found to exhibit an impact of social capital that only benefited the self-rated health of the lowest income group, while no effect on health could be observed for residents with a higher income. Stafford and colleagues (2008a) found that the prevalence rate of common mental disorders was higher for deprived households with low scores on friendship ties (OR 2.53, 95% CI 1.34; 4.79), while there was no association with friendship ties for non-deprived households (OR 0.88, 95% CI 0.74; 1.06). In addition, people with low scores on friendship ties were more likely to have common mental disorders if they lived in deprived areas (OR 2.65, 95% CI 1.09; 6.41), but not in non-deprived areas (OR 0.89, 95% CI 0.73; 1.08). These interaction effects were not found for other measures of social capital, such as trust and attachment to the neighbourhood. A study from Germany developed a specific social capital index for eleven to fifteen year olds and reported the strongest effect of school and NSC on self-rated health for children with the lowest level of education (Bohn and Richter, 2011).

Table 3.3 Studies reporting an interaction between social capital and socioeconomic inequalities in health

Study (year)	Sample	Social capital measure	Health measure	Measure SES	Confirmed interaction hypothesis	Quality 1=poor 2=average 3=high
Abdou (2010)	297 US pregnant women	Cognitive Bonding	Symptoms of mental illness, wellbeing	Childhood SES, adult SES	Buffer	2
Altschuler (2004)	49 US residents	Cognitive Structural Bridging	Self-rated health	Average household income	Buffer	2
Baron-Epel (2008)	4350 adult Israeli Jews and Arabs	Cognitive Structural Bonding	Self-rated health	Income, occupation, education	Buffer + dependency	2
Beaudoin (2009)	5586 US residents	Cognitive Structural Bridging	Self-rated health	Household income	Dependency	2
Bohn (2011)	4323 German students	Cognitive Structural Bonding Bridging	Self-rated health	Education	Buffer	3
Cohen (2003)	8782 Chicago residents	Cognitive Bridging	Premature mortality	Concentrated neighbourhood disadvantage	Buffer	2
Gee (2006)	2241 US Filipinos	Cognitive Bonding	Unfair medical treatment	Education Employment	Buffer	3
Gorman (2007)	29816 US citizens ≥ 25 years old	Cognitive Structural Bonding Bridging	Self-rated health Hypertension	Education, relative income, insurance, employment, financial barriers	Buffer + dependency	3
Jesse (2006)	130 low-income pregnant US women	Cognitive Bonding	Smoking and substance abuse	Education, insurance	Buffer	2
Pearson (2011)	8566 Americans	Cognitive Structural Bridging Bonding	Self-rated health	Education, household income	Buffer	2
Stafford (2008)	9082 UK residents	Cognitive Structural Bridging Bonding	Common mental disorders	Household deprivation	Buffer	3
Subramanian (2002)	21456 US residents	Cognitive Bridging	Self-rated health	Educational attainment, income	Area-level	3
Sun (2009)	1605 urban Chinese residents ≥ 15 years	Cognitive Structural Bonding Bridging	Self-rated health	Education, poverty, household income	Buffer	3
Van der Wel (2007)	11807 Oslo residents (Norway)	Cognitive Structural Bridging	Self-rated health	Median income, income inequality, education	Buffer	2

Studies that did not find an interaction effect are presented in Table 3.4. They used a variety of social capital measures ranging from neighbourhood satisfaction to trust, civic participation and political participation. The authors of these studies discuss various explanations for their findings. In a study from Norway the absence of a buffer effect is attributed to the low level of income inequality in the society under study (Dahl and Malmberg-Heimonen, 2010). A study from Sweden did not show a significant effect when analysing contextual and individual social capital separately, and as potential explanations the authors mentioned the misclassification of neighbourhoods and the function of individual social capital as both a confounder and mediator, which means adjusting for confounding of social capital conceals the overall association (Engström et al., 2008).

Table 3.4 Studies contesting the interaction between social capital and socioeconomic inequalities in health

Study (year)	**Sample**	**Social capital measure**	**Health measure**	**Measure SES**	**Rejected hypothesis**	**Quality** **1=poor 2=average 3=high**
Abdou (2010)	297 pregnant US women	Cognitive Bonding	Symptoms of mental illness, wellbeing	Childhood SES, adult SES	Dependency	2
Abel (2011)	3068 Dutch and Hungarian adolescents	Cognitive Structural Bonding	Self-rated health	Self-assessed financial resources	Buffer + dependency	2
Bjornstrom (2011)	2176 Los Angeles residents	Cognitive Bridging	Self-rated health	Relative income	Buffer + dependency	3
Dahl (2010)	3190 Norwegian adults	Cognitive Structural Bonding Bridging Linking	Self-rated health Longstanding illness	Education, employment status, subjective poverty, household income	Buffer + dependency	2
Engström (2008)	31182 adults from Stockholm, Sweden	Cognitive Structural Bonding Bridging Linking	Self-rated health	Occupation, education, income, area income	Buffer + dependency	3
Gallo (2006)	304 San Diego residents	Cognitive Structural Bridging Linking	Self-rated health	Education	Buffer + dependency	2
Sun (2009)	1605 urban Chinese residents	Cognitive Structural Bonding Bridging	Self-rated health	Education, poverty, household income	Dependency	3
Van der Wel (2007)	11807 residents from Oslo (Norway)	Cognitive Structural Bridging	Self-rated health	Median income, income inequality, education	Dependency	2

Dependency effect of social capital and socioeconomic inequalities on health

In three out of nineteen papers reporting on interaction effects it is argued that there is a dependency between social capital and socioeconomic inequalities in health (Table 3.3). Baron-Epel and colleagues (Baron-Epel et al., 2008) found evidence for both hypotheses of interaction in the Israeli population. For the Arab ethnic minority, in line with the buffer hypothesis, social support was positively correlated with optimal self-health (OR 1.46, 95% CI 1.09; 1.94). For the more affluent Jewish group bridging and linking types of social capital were significantly associated with optimal self-rated health as well ($p<0.05$ for all measures). A large survey conducted in the United States found an interaction between education, the probability of hypertension and social integration measured as participation in six different activities (Gorman and Sivaganesan, 2007). Those who did not finish high school saw their probability of hypertension increase with more social integration, while social integration was protective of hypertension in all groups which had received more education. The same interaction effect was shown for the social capital indicator 'visited friends or family'. Beaudoin (2009) compared groups of White and Black Americans plus high and low income groups and concluded from a statistically significant interaction effect ($p<0.01$) that self-rated health of high income White Americans profited most from high social capital, while poor Black Americans profited least.

Eight studies, of which key findings are presented in Table 3.4, rejected the dependency hypothesis. Some of these reported they found a buffer effect instead (Abdou et al., 2010, Sun et al., 2009, Van Der Wel, 2007), while others confirmed a dependency effect only for certain populations (Abel et al., 2011) or rejected any type of interaction effect (Bjornstrom, 2011b, Dahl and Malmberg-Heimonen, 2010, Engström et al., 2008, Gallo et al., 2006). Bjornstrom (2011b), interestingly, did not find a relationship between self-rated health and relative position, although statistically significant associations were found between distrust and a higher relative position (β 3.56, $p<0.01$), and between mistrust and health (β 0.29, $p<0.01$).

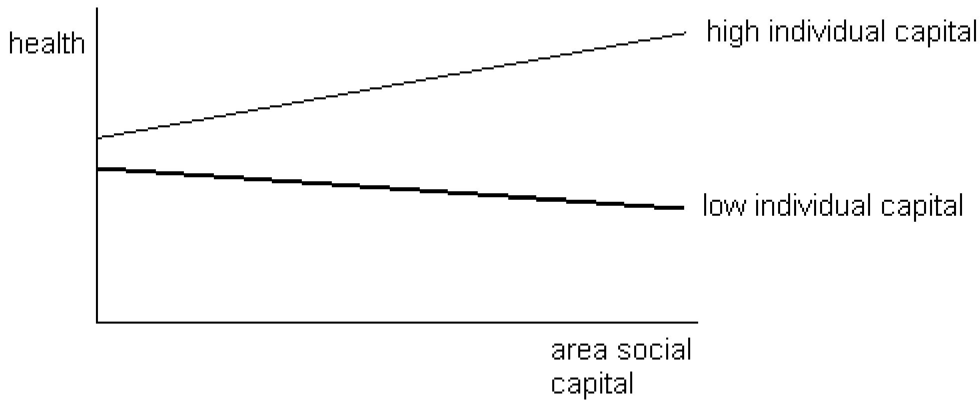
Studies that could not identify a buffer or dependency relationship mostly used data from European countries, which suggests that the relationship between social capital and socioeconomic inequalities in health varies between regions.

Effect of contextual social capital on health inequality

Studies that aggregated individually measured data to an area level generally did not produce significant results (Engström et al., 2008, Van Der Wel, 2007). Engström and colleagues (Engström et al., 2008) initially found an effect of area-level social capital on self-rated health, but this was no longer significant when adjusting for the effect of individual SES. Initial results most likely reflected the compositional effects of individual SES on health rather than the effect of contextual social capital.

One large US study did show an effect for contextual bridging social capital on a community level (Subramanian et al., 2002). Statistical significance disappeared after controlling for individual factors in a multilevel analysis, but further analysis of subgroups showed an interaction with individual trust. For people who reported a high level of trust, community level trust was protective of self-rated health, while for people with a low trust score, high community level trust negatively affected health (p<0.01). This mechanism is shown in Figure 3.10. The result reported by Subramanian (2002) is in line with the dependency hypothesis of individual social capital, since both suggest a lack of social capital or inability to use it for people with a lower socioeconomic position.

Figure 3.10 Effect of contextual social capital on health inequality



3.3 Evidence synthesis on the relationship between neighbourhood social capital (NSC) and ethnic inequalities in health

3.3.1 Introduction

So far I have considered the theories and frameworks of social capital, discussed their meaning for the study of health inequalities and found evidence to suggest that social capital influences social inequalities in health. Two main hypotheses have emerged from the systematic review of the literature:

1. Social capital provides a buffer against the negative health effects of social disadvantage.
2. Given the link between economic, cultural and social capital, people with a lower social position miss out on the health benefits that social capital can provide or experience negative health effects resulting from social exclusion.

Now that I have identified these hypotheses, I will narrow down the subject to consider the scientific evidence that is likely to be applicable to the study of social capital and health inequalities in Bradford. In this section I will discuss the literature on NSC and ethnic inequalities in health.

Although the systematic review presented in the previous section of this chapter was focused on socioeconomic inequalities in health, many of the included studies concerned ethnic minority populations (Baron-Epel et al., 2008, Beaudoin, 2009, Bjornstrom, 2011a, Daoud et al., 2009, Jesse et al., 2006, Pearson and Geronimus, 2011, Gee et al., 2006, Cene et al., 2011). This is unsurprising since ethnic minorities are generally found at the bottom of the social ladder, and part of ethnic inequalities in health therefore reflects the low social position of ethnic minorities. Much of the research identified in the literature review also focused on the neighbourhood, more specifically neighbourhoods in cities with racial or ethnic segregation, and spatial segregation of social classes. Examples are the study of Bjornstrom and colleagues on social capital among Latinos living in Los Angeles, research by Soskolne and Manor on Jewish Israeli from various urban areas and Sun and colleagues used data from Xining City and Yinchuan City in two underdeveloped regions in West China (Bjornstrom, 2011a, Soskolne and Manor, 2010, Sun et al., 2009).

Limited evidence is available on the relationship between NSC and ethnic inequalities in health, although social aspects of the neighbourhood have been studied extensively in relation to health, and for child health and development in particular (Leventhal and Brooks-Gunn, 2000). Some studies have stratified results for different ethnic or racial groups, and found effects of neighbourhood social factors for specific groups. Residential stability for example was positively associated with mental health problems for second generation Latino children in the US (Lara-Cinisomo et al., 2013). One study found that White children in the United States derived more benefits from the presence of affluent neighbours than Black children, with respect to their cognitive development (Brooks-Gunn et al., 1993). Most studies considered neighbourhood deprivation and poverty to be the major area-level social determinants of health and wellbeing and given the overrepresentation of ethnic minorities in these areas these were reported to be the primary social determinants for ethnic minorities in poor areas as well (McLeod and Shanahan, 1993, Brooks-Gunn et al., 1996).

Neighbourhood social capital

According to a popular Dutch expression, 'a good neighbour is better than a far-away friend'. However, it has been argued that the neighbourhood is no longer the most salient place for social capital as people become more and more mobile (Blokland and Savage, 2008). New modes of communication make it easier to maintain long-distance relationships, professional networking takes place in international settings and more people have the opportunity to travel further. Qualitative research among upper middle class professionals indeed showed that they did not consider their neighbours to be important social contacts. At the same time, physical location is known to determine access to capital (Blokland and Savage, 2008). For a number of reasons, NSC might be more important for people with a lower than for people with a higher social position:

- People with a lower social position have less opportunity to move elsewhere (Kearns and Parkes, 2003).
- People with a lower social position are less mobile; work and school are likely to be closer to home and transportation may be limited (Ellen and Turner, 1997).
- As a result of being less mobile and having less reason to go elsewhere, people with a lower social position spend more time in their neighbourhood, especially if they are unemployed, mothers, children, disabled or elderly (Mohnen et al., 2012), and are therefore limited to local resources (Stafford and Marmot, 2003).
- As a result of spending more time in the neighbourhood, people with a lower social position know their neighbours better and a bigger part of their friends and family live in the neighbourhood or in close proximity to their house (Li et al., 2005).

In a qualitative study among people from affluent and deprived areas in Scotland and northern England, those with a low SES were more likely to acknowledge the importance of neighbourhoods for health, while people with a higher SES were more likely to support an individualistic view of health inequalities, for example by emphasizing the importance of health behaviour (Podsakoff et al., 2012). Given that NSC is likely to be an important source of social capital for socially disadvantaged residents in the city, I expect to identify literature on the positive and negative effects of NSC on ethnic inequalities in health. Research has shown that aspects of NSC can influence health (Ziersch et al., 2005, Kim et al., 2006, Diez Roux and Mair, 2010). Neighbourhood social cohesion has been linked to mortality (Meijer et al., 2012) and psychosocial features of the community have been found to be associated with a range of health measures (Egan et al., 2008). Studies that have taken into account area deprivation show that deprivation, NSC and health are related. Deprivation is likely to shape people's perceptions of the neighbourhood, which is related to health (Poortinga et al., 2008, Bowling et al., 2006).

Individual factors have been found to be of influence as well. Sun et al. (2009) showed that in a sample of Chinese urban residents, lack of neighbourhood cohesion was associated with worse self-rated health only in the poor subsample. Aminzadeh et al. (2013) reported that adolescents with high levels of social deprivation had a tendency to score higher on wellbeing if they were more active in community organisations. Other individual factors that have been studied are the influence of neighbourhood ties (Baron-Epel et al., 2008) and length of residence (Mohnen et al., 2012, Keene et al., 2013). In line with the arguments on the importance of the neighbourhood for people with a lower social position mentioned above, some studies have shown that area deprivation affects the health of poor people more than it affects people with a higher income living in the same neighbourhoods (Yen and Kaplan, 1999) (Stafford and Marmot, 2003). This interaction between area deprivation and individual social position has mainly been attributed to people with a lower social position being dependent on the resources provided in deprived areas (Stafford and Marmot, 2003).

The literature I present will report on individual- and area-level influences on the relationship between NSC and health, specifically aimed at understanding ethnic inequalities in health.

3.3.2 Methods

This synthesis of the literature serves to guide the analysis of data from BiB on NSC and social and ethnic inequalities in health. The literature discussed in this section should not be considered the ultimate and most complete overview of literature on this topic. This is a non-systematic discussion of studies included in the systematic review, cross-references identified through the systematic review, literature recommended by colleagues and studies found through specific searches in the biomedical databases on NSC. All literature has been collected from February 2012 to August 2013 through medical journals, the

PubMed database and Google Scholar. After reading and summarising papers, I have grouped all information into key themes and hypotheses. This has resulted in the discussion of the literature as presented in the following section.

3.3.3 Results

Two studies have reported differential effects of NSC on the health of African American and White Americans. Caughy and colleagues (2003) reported that for African Americans living in affluent neighbourhoods, low NSC was associated with internalising problems such as anxiety and depression in children. In poor areas however, higher levels of NSC were associated with higher levels of internalising problems. Lochner and colleagues (2003) studied the effect of social capital in Chicago neighbourhoods and found that higher NSC was related to lower mortality rates. This effect was clearer for White than Black residents, and clearer for men than for women.

Other studies did take ethnicity into account as a confounder, but did not make use of stratified analyses or interaction terms. A number of qualitative studies have been published on the importance of social capital in the neighbourhood for ethnic minorities. Campbell and McLean (2003) for example reported that social capital for Pakistani people in the UK is more family- than community based. Social participation was relatively low, especially for first generation immigrant women who did not leave the house much (Campbell and McLean, 2003). African-Caribbean residents noted a lack of community spirit in their own ethnic group and they felt the Pakistani community had stronger community bonds and higher levels of solidarity (Campbell and McLean, 2002). Ethnic minorities in Sweden saw their ethnic communities as a response to social exclusion and discrimination but also as a cause of further exclusion from mainstream society. They mentioned negative influences of community capital such as social control (Cederberg, 2012).

Social capital and racial diversity

Spatial segregation along ethnic, racial and social lines has traditionally been studied from the viewpoint of the minority group, such as sociological studies on life in the American ghetto and the French *banlieues* (suburban council estates). More recently however, controversy has arisen regarding the negative consequences not only of segregation but of racial diversity for social capital in society as a whole. Putnam (2007) argues that racial diversity, at least in the short term, causes a decline in social capital and trust in neighbours as well as general trust. Studies aiming to test these relationships in other contexts have generally failed to reproduce these results (Gesthuizen et al., 2009, Hooghe et al., 2009), or have shown that racial diversity has a completely different effect on social capital for immigrants and the native population (Lancee and Dronkers, 2011). Also in relation to health, Kramer et al. (2010) reported that racial segregation is associated with a higher risk of very preterm delivery among Black Americans, but not among White American women.

It has been argued that Putnam's hypothesis might apply to the White majority in the United States only, and reflects 'Whiteness' or racial segregation rather than diversity (Uslaner, 2011). A neighbourhood with optimal diversity can consist of 50% Black Americans and 50% White Americans, or 30% Hispanics, 30% Black Americans and 30% White Americans, which ignores the crucial difference between racial or ethnic minorities versus the majority. Even in Putnam's own analysis, racial diversity has a negligible influence on trust compared to measures of poverty, crime, ethnicity, population density and income inequality. The standardised coefficients show that every year of education for an individual adds more to the level of trust than the difference between complete racial homogeneity and complete diversity (Putnam, 2007). This is unsurprising given that other studies have identified area deprivation and social disorder as the main factors eroding NSC and trust (Letki, 2008, Ross et al., 2001).

Earlier in this chapter Bourdieu's theory of capital served to discuss the relationships between social capital and social position. Trust can be seen as an indicator of social inequality in itself, which means that trust and racial or ethnic diversity are naturally correlated (Rothstein and Uslaner, 2005). This is not caused by living in neighbourhoods with people of different ethnicities, but by an unequal society that is excluding minority groups, which is more apparent in deprived ethnically diverse neighbourhoods. In order to consider the influence of social and ethnic inequalities in health, ethnic density is a far more useful measure than racial diversity. The theory and evidence related to ethnic density effects on health will be discussed in Chapter 5.

3.4 Discussion

3.4.1 Key findings

The findings of the systematic review, from a total of sixty studies, boil down to four main conclusions. Firstly, there is strong evidence to suggest that people with a lower SES generally have lower levels of social capital, and that lack of social capital is related to socioeconomic inequalities in health. This hypothesis is supported by studies with various designs, sample sizes and settings (Aldabe et al., 2011, Chavez et al., 2004, Klein et al., 2012, German and Latkin, 2012, Daoud et al., 2009, Henderson et al., 2011, Jusot et al., 2008, Power and Matthews, 1997, Dean and Sharkey, 2011, Soskolne and Manor, 2010, Aida et al., 2011, Mao et al., 2009). These studies report on different types of social, economic and cultural capital, although the choice of a certain measure is not always based on a thorough theoretical framework.

Buffer hypothesis

Secondly, there is an indication that social capital can buffer some of the negative effects of low SES on health (Abdou et al., 2010, Altschuler et al., 2004, Baron-Epel et al., 2008, Bohn and Richter, 2011, Cohen et al., 2003, Gee et al., 2006, Gorman and Sivaganesan, 2007, Jesse et al., 2006, Pearson and Geronimus, 2011, Stafford et al., 2008b, Sun et al., 2009, Van Der Wel, 2007). Studies confirming this hypothesis generally focused on social capital measured at the individual level and most significant buffer effects were observed among deprived communities and ethnic minorities. These findings are supported by literature on ethnic density, which suggests that ethnic minorities concentrated within neighbourhoods have better health outcomes than would be expected based on their, often low, socioeconomic position (Bécares et al., 2012).

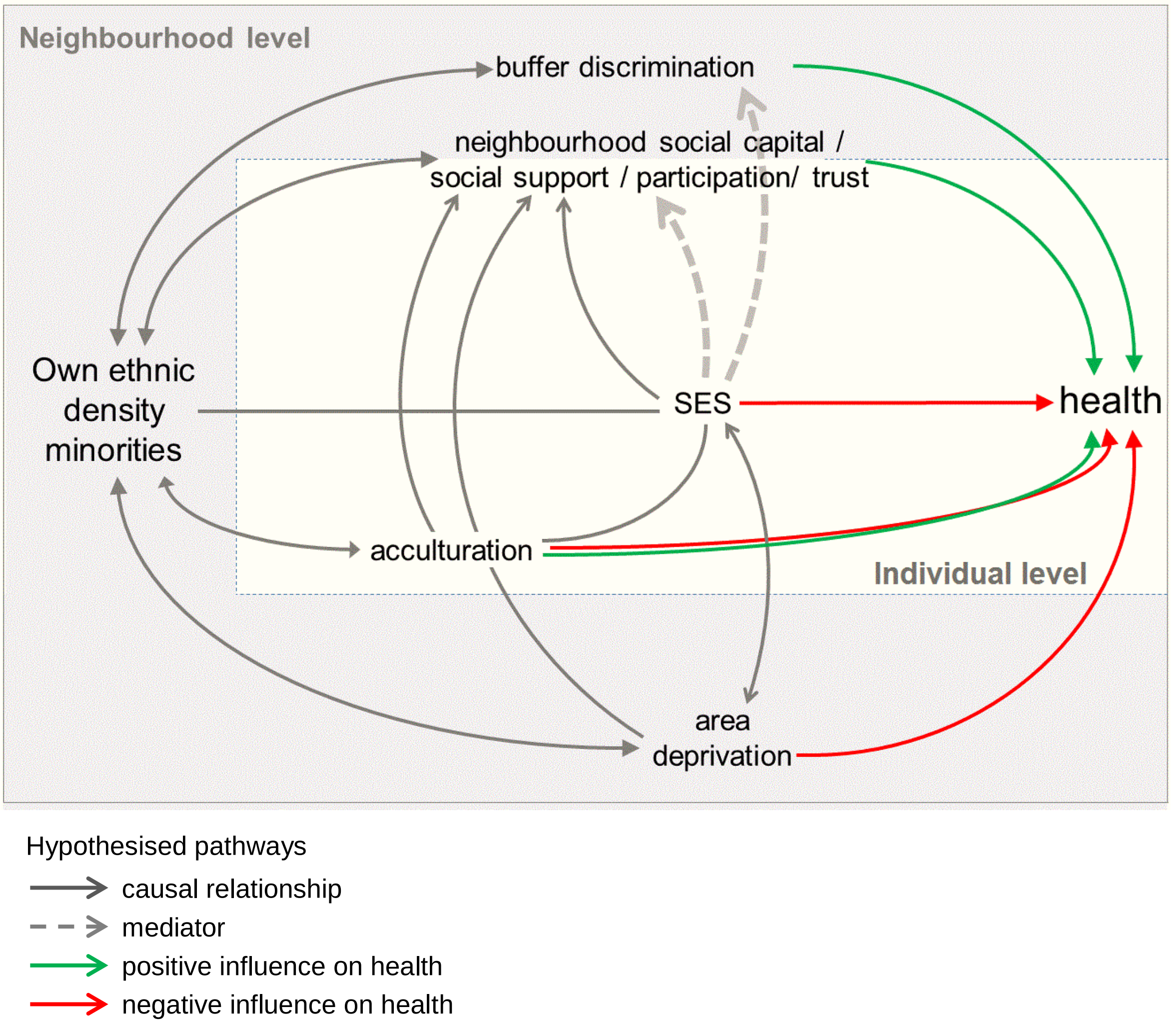
Dependency hypothesis

Thirdly I found that disadvantaged groups or people can be restricted in their opportunities to obtain and use social capital (Baron-Epel et al., 2008, Beaudoin, 2009, Gorman and Sivaganesan, 2007). This dependency hypothesis is consistent with the concept of social capital as described by Bourdieu. In much of his writing, social capital is pictured as an asset of the privileged and a means of maintaining their superiority (Bourdieu, 1984). As an extension of this hypothesis, there is some evidence to suggest that individual and contextual social capital interact in their effect on health (Subramanian et al., 2002). Some groups or individuals might not have access to the social network existing in a community due to social exclusion. It has been shown before that poor mothers are less healthy in affluent areas compared to more deprived areas, suggesting an important role for psychosocial factors in the risk of illness (OECD, 2001).

Neighbourhood social capital and ethnic inequalities in health

After reporting on results from the systematic review, in the previous section I have discussed the literature on NSC and ethnic inequalities in health in particular, to identify additional evidence. Some of this evidence seems to support the dependency hypothesis, as applicable to ethnic minorities (Caughy et al., 2003, Lochner et al., 2003). Ethnic minorities viewed their neighbourhood as an important source of social capital and were critical about lack of community spirit, low levels of social participation and of ethnic minorities excluding themselves from mainstream society, as they saw this as a threat to social mobility and success (Cederberg, 2012, Campbell and McLean, 2002, Bécares and Nazroo, 2013). Many factors that influence health, NSC and the relationship between them have been identified in this chapter. This information will be used to develop the methodology for analysis, and the rationale behind these models is discussed in Chapter 4. Conflicting evidence was identified for racial diversity and social capital. As this thesis is specifically aimed at understanding social and ethnic inequalities in health, the ethnic density theory is considered more suitable than studies of racial diversity, and this will be discussed in Chapter 5. Figure 3.11 shows the hypothesised relationships between social capital, ethnic density and health in a causal diagram.

Figure 3.11 Causal diagram of the relationships between social capital, ethnic density and health



Causal graph theory is increasingly used to facilitate understanding of causal pathways, and it is being promoted as a useful addition to the 'epidemiological toolbox' (Ness et al., 2007, Shrier and Platt, 2008), for the study of neighbourhood-level health effects in particular (Fleischer and Roux, 2008, Dinno, 2007, Rothman et al., 2008). The arrows in the diagram represent hypothesised causal pathways, which are based on the literature identified in chapters 2 and 3. The diagram depicts a one-directional association between mediating variables and health. Although in reality poor health may lead to poverty, unemployment and social isolation, to simplify the framework I assume that these mechanisms are of minor importance with regard to ethnic density effects.

In this thesis I will study the associations between ethnic density and health, taking into account potentially harmful influences of individual SES and area-level deprivation (red arrows). One of the explanations for ‘ethnic density effects’ is that ethnic minorities are shielded from discrimination in areas with many of their own ethnic group, and another explanation is that social capital, in the broadest sense of the concept, might improve health in communities with a high percentage of the own ethnic group (Figure 3.11). Social capital might also be associated with health independently of ethnic composition, as shown by the direct arrows between social capital and health. Social disadvantage, as measured by SES and deprivation, might be a mediator of the relationships between social capital and health, as illustrated by the dashed arrows. This fits the dependency hypothesis. Alternatively, social capital might buffer some of the detrimental effects of social disadvantage on health, as shown by the green arrows (buffer hypothesis).

3.4.2 Strengths and limitations

As far as I am aware, Carlson and Chamberlain (2003) have performed the only overview of social capital in relation to health inequalities, which is incomplete and now out of date. Although the authors discussed the implications of their findings for health disparities, they did not include any inequality-related terms in the search strategy. Their review included studies published from 1997 to 2002 and they used a restricted version of social capital, mainly focussing on the measure of civic trust while excluding concepts such as social cohesion. With this approach the authors have captured only part of the body of work that has developed social capital conceptually and empirically. The systematic review in this thesis is the first complete overview of different types of social capital in relation to socioeconomic inequality and health outcomes. Nevertheless, limitations should be taken into account when interpreting the results from this systematic review.

Completeness of the review

It is possible that these results are biased because relevant studies have not been identified through the literature search. However, apart from excluding grey literature the search was deliberately broad to include all definitions and measures of social capital and different interpretations of ‘socioeconomic inequalities in health’. To further reduce the risk of selection bias, all studies were screened by two researchers independently and reasons for disagreement were discussed. Aiming at maximum transparency of the selection process, I have reported all reasons for exclusion after initial disagreement (Appendix 2B). The synthesis of evidence on the relationship between NSC and ethnic inequalities in health is almost certainly incomplete and most likely outdated, given that this topic is gaining popularity. As it was designed to complement the systematic review and aid the analyses in further chapters rather than to give a complete overview, I trust it served its purpose.

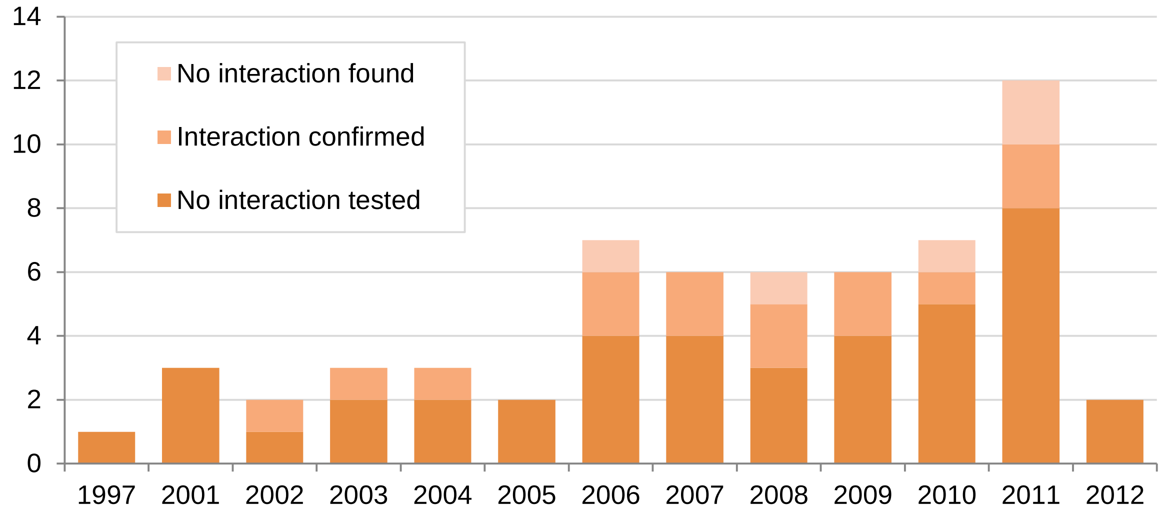
Quality of the evidence

Findings may be affected both by the quality of individual studies and by bias across studies. I rated the quality of individual studies in the systematic review with special emphasis on the suitability and validity of social and economic capital measures to clarify the relationship between social capital and socioeconomic inequalities in health. The quality of thirty-one out of sixty studies was rated suboptimal, mainly because they failed to address social capital based on a sound theoretical framework, resulting in a seemingly arbitrary choice of measurement (Appendix 2C). Fortunately, the other half of the studies did base their research on a theoretical discussion of the social capital concept. Cene and colleagues (2011) for instance performed a qualitative study based on the framework developed by Carpiano and others (2007) used standardised questionnaires for the measurement of social capital and related concepts. An example of the latter is the study by Johnson and colleagues, which makes use of a social capital index consisting of six items with confirmed internal consistency (Johnson et al., 2010).

Lack of evidence

A third limitation, relating to the interpretation of findings, is that none of the hypotheses are confirmed by all included studies. The dependency hypothesis is only supported by five studies out of nineteen in the systematic review, and a few additional studies focused on ethnic minorities. The majority of research does not address the interaction between social capital and socioeconomic inequalities in health. However, studies generally made use of large samples, often representing a diverse population in terms of age, gender and ethnicity. These findings indicate a growing interest in this area since 2006 (Figure 3.11). There is a shift from confirming and emphasising the contribution of psychosocial factors to health inequalities, to a more in-depth study of these psychosocial pathways, in an attempt to explain the social gradient in health. The current study contributes to this trend, and hopefully more studies will follow with the aim to test the identified hypotheses.

Figure 3.12 Trend for research on social capital and health inequalities



3.4.3 Research implications

Transparency of measurement

The variation of social capital measures and mixed results of studies identified through this systematic review of the literature show how difficult it is to use the social capital concept objectively and transparently in the study of health inequalities. Half of the studies did not elaborate on the theoretical framework underlying the measures or did not provide a rationale for the choice of measurement. Although this is the direct result of the absence of a uniform definition and the lack of consensus regarding measurement of the social capital concept, a seemingly arbitrary choice of measurement is not advisable. Combining measures of social capital, measures of social position or SES and health outcomes offers endless possibilities. Any researcher determined to confirm a certain hypothesis can conveniently choose the type of measures and type of analysis to match his or her research interests. Transparency can be improved by making deliberate choices for the measurement of social capital, which should be theoretically sound and evidence-based. Based on the findings of this systematic review, I conclude that two measurement choices in particular deserve careful consideration: the distinction between bonding and bridging social capital measures and the contextual versus compositional area-level perspective.

Bonding and bridging

One way to structure measures of social capital is as being of the bonding, bridging or linking type of social capital. In tables 3.3, 3.4 and the summary table in Appendix 2C I have categorised measures according to this distinction, to help identify the types of social capital for which the buffer and dependency hypotheses are valid. One would expect bonding types of social capital such as friendship and emotional support from family members to be associated with the buffer hypothesis, as social support is often hypothesised to buffer negative effects of stress and this support is likely to be found among close friends and family. Bridging types of social capital should be strongly linked to SES, as people of a low social position are less likely than those higher up the social ladder to form beneficial bridges with people of a high social position. However, from this literature review such a clear-cut picture does not emerge. My suggestion for future research on this topic, whether studying the buffer effect, dependency hypothesis or otherwise, is to take into account the interaction between social capital and individual factors. Social position may be more meaningful in the link between social relationships and health than the assumption of bonds between 'similar people' and bridges with a hierarchical relationship. Apart from social position, individual characteristics such as age, gender, ethnicity and length of residence in an area might influence the relationship between social capital and health as well.

Level of analysis

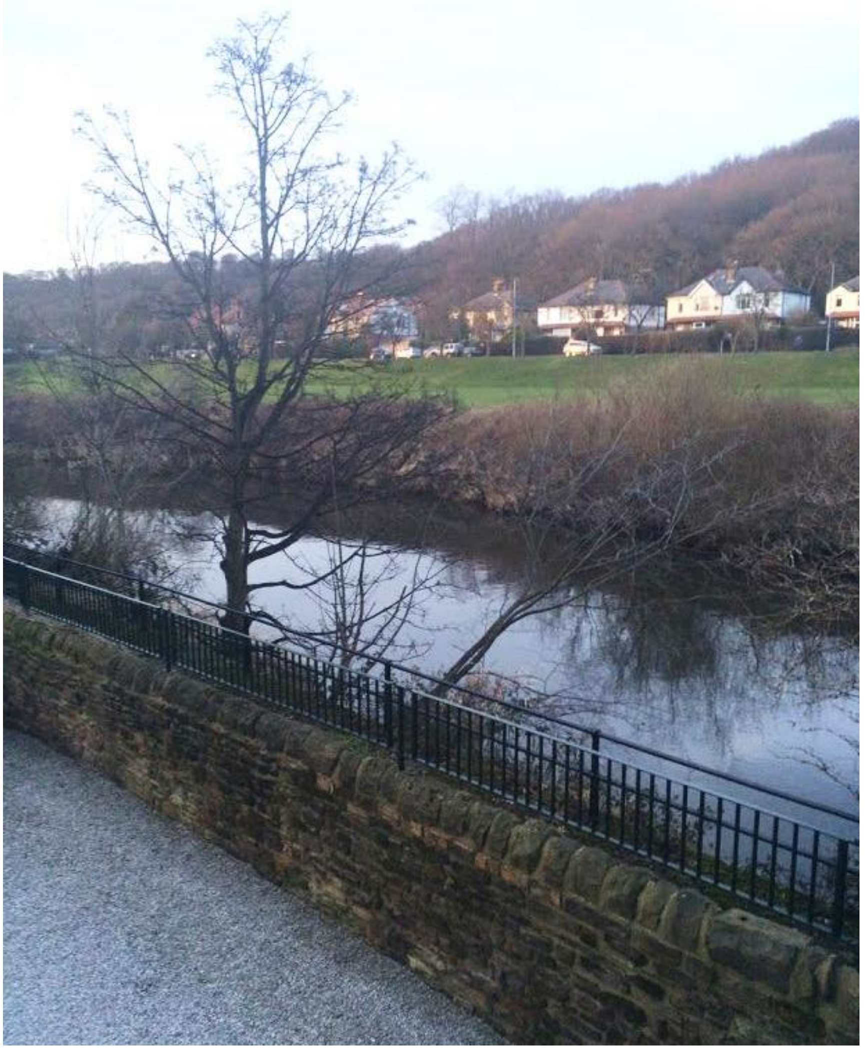
The level of analysis needs to be considered carefully when including social capital as a variable in health research. Applying an area-level focus to social capital and health is gaining popularity in health inequalities research and some advocate the distinction between compositional and contextual social capital (Subramanian et al., 2003). Compositional social capital refers to the social resources of individuals that make up an area. If measured in relation to health, the effect of social capital will reflect the sum of residents' individual social resources. Most of the studies in this systematic review of the literature approached area-level social capital in this way. Contextual social capital, as promoted by Kawachi and colleagues (Kawachi et al., 1999, Lochner et al., 1999, Kawachi et al., 2004), implies that the social space, rather than the individuals who live in it, is the reservoir of social capital (Lochner et al., 1999).

The contextual perspective poses measurement challenges, because individuals usually report on their own levels of social support, trust or participation, which creates a compositional and not a contextual measure of social capital, unless the interaction with individual social capital is taken into account. Also, other structural measures such as the number of organisations or activities in a neighbourhood provide very general indicators and fail to address individual differences between the people that take part in activities or organisations, for example with regard to their SES. This becomes problematic when contextual social capital has different effects on health and wellbeing for different individuals or groups in a community. Some studies identified in this chapter suggest that social capital usually interacts with social position in its effect on health and assume that social capital 'belongs' to the area more than to the individual, but this approach might obscure individual effects (Beaudoin, 2009) (Baron-Epel et al., 2008). The systematic review identified the study of Subramanian and colleagues as one of the few to use a multilevel analysis technique in combination with the study of interaction effects to distinguish the contextual effects of social capital from the compositional effects (Subramanian et al., 2002). The differentiation in the relationships between social connections and health for people with different individual- and area-level characteristics will be applied to the study of ethnic density in Chapter 7, and social capital in Chapter 8.

SECTION B METHODOLOGY

Chapter 4

Study design and data collection



River Aire in Shipley, Bradford. Photograph by Arabella Clark.

4.1 Introduction

Clinical trials are designed to remove contextual factors and exclude confounding influences. In doing so, researchers observe effects of the intervention as if looking through a magnifying glass; within the specific setting of a trial even small effects of interventions can be observed. Epidemiology does not seek to eliminate contextual factors that may influence causal relationships; it deliberately takes into account influences of the environment on health. Mainstream epidemiology has traditionally focused on biological mechanisms and the natural environment, which has led to the criticism of epidemiologists deploying a ‘Robinson Crusoe model’. Social epidemiology acknowledges that individuals are inseparable from their social environment, and that their health is influenced by social as well as natural factors (Oakes and Kaufman, 2006).

In the last twenty years, epidemiology is moving away from a focus on risk factors at the individual level towards what has been called a ‘Chinese boxes paradigm’ (Susser and Susser, 1996a, Susser and Susser, 1996b). Each box represents a level, and determinants at these levels and relationships between them are now increasingly studied with multilevel statistical techniques. Taking into account a variety of individual- and area-level biomedical and social factors generally requires large samples, to allow for many different variables being considered in one model simultaneously. The large sample size of the BiB study fulfils this requirement. The uniqueness of Bradford in terms of social inequalities, a long history of immigrant settlement, the varied ethnic composition of neighbourhoods, and the existence of significant health problems provides the variation in contextual factors needed to study ethnic density and social capital in relation to health. Could studies on ethnic density be designed with areas strongly varying in social composition, with neighbourhoods composed of virtually no ethnic minorities and neighbourhoods predominantly housing ethnic minority residents, it would be done the way it is found in Bradford. At the same time, making use of secondary data means these data were not collected specifically for the purpose of the present study, and the questionnaire was not designed to answer the research questions of this thesis. This demands a good understanding of the study sample and a careful assessment of the possibilities and limitations of the data.

Due to the complexity of the ethnic density hypothesis, methodological issues surrounding these analyses are discussed in Chapter 5. Chapters 6 to 9 form the key chapters on the analysis of the BiB data. Given the different health outcomes studied in each of these chapters, the rationale behind the use of these measures will be discussed in detail in the method sections of the individual chapters. The statistical models used vary likewise, since the different health outcomes and independent variables determine which method is most appropriate to use. Techniques for statistical analysis will therefore be discussed in Chapter 6 to 9 as well. This chapter focuses on the BiB study protocol, characteristics of the collected data, and the preparation of a multilevel dataset.

4.2 The Born in Bradford study

4.2.1 Born in Bradford study protocol

Born in Bradford (BiB) is a birth cohort that was established in 2007 in response to concerns about the high infant mortality rate in Bradford compared to other UK cities, and the high levels of childhood morbidity such as congenital anomalies and childhood disabilities (Wright et al., 2012, Small, 2012). The BiB study aims are as follows (Raynor, 2008):

- To describe and compare health and ill-health within a largely bi-ethnic population.
- To identify modifiable causal pathways promoting wellbeing, or contributing to ill-health.
- To develop a model for integrating research into routine data systems within the National Health Service in England and Wales, and potentially health care systems in other countries.
- To build and strengthen local research capacity.

Included in the study are pregnant women recruited at the Bradford Royal Infirmary, which is the only maternity unit in Bradford and assists in around 6000 deliveries a year (Raynor, 2008). Women were recruited from the maternity unit between March 2007 and December 2010, as they attended the clinic for an oral glucose tolerance test, which is offered to all pregnant women between 26 and 28 weeks gestation. All babies born to these mothers and all fathers were eligible to participate. Mothers were only excluded if they planned to move away from Bradford before the end of their pregnancy. The full BiB cohort includes 12,453 women, 13,776 pregnancies and 3,448 fathers (Wright et al., 2012). More than 80% of the women invited for the study took up the offer to participate. Ethical approval for the data collection was granted by Bradford Research Ethics Committee (Ref 07/H1302/112).

The data, as of 2013, comprised a baseline questionnaire covering a spectrum of demographic variables and social determinants of health included the General Health Questionnaire (GHQ-28), physical health measures of mother and child, results of the oral glucose tolerance test and lipid profiles of pregnant mothers, pregnancy serum, plasma and urine samples, cord blood samples, paternal saliva, and DNA samples of mother and child. In addition, follow up on subgroups of the cohort has provided extra data, for example on childhood obesity and allergies (Wright et al., 2012). In September 2011 the oldest children enrolled in primary school, opening up possibilities for child developmental and behavioural research. In 2013, published studies covered a wide range of topics including infant growth (Fairley et al., 2013), birth size (West et al., 2011), breastfeeding (Santorelli et al., 2013), maternal mental health (Prady et al., 2013b), tap water use (Smith et al., 2009), and congenital anomalies (Sheridan et al., 2013).

4.2.2 Born in Bradford data characteristics

Table 4.1 provides baseline characteristics for the mothers in the sample. The two biggest ethnic groups in the sample are Pakistani (45%) and White British (39%), followed by Indian (4%), other Asian (3%) and other White (3%). On average 65% of the mothers are married, although this is only 31% for the White British and 92% for the Pakistani mothers. Around 30% of the mothers have an educational level equivalent to five GCSE, and 22% have a lower level of education. Pakistani mothers are more likely to be found in the lowest or the highest education group than White British mothers. More Pakistani mothers than White British mothers reported receiving means tested benefits (47% versus 38%). The majority of participants reported managing well financially or doing alright (68%). As demonstrated with t-tests and Pearson chi-square tests in Table 4.1, all differences between Pakistani and White British mothers were statistically significant.

Table 4.1 Baseline characteristics Born in Bradford sample

Demographic variables	**BiB mothers**	**Pakistani mothers**	**White British mothers**
N	*11 396*	*5127*	*4488*
Ethnicity			
White British	39.4%		
Pakistani	44.9%		
Indian	3.8%		
Asian other	2.9%		
White other	2.6%		
Black	2.2%		
Mixed	1.9%		
Other	1.7%		
Mean age (years)	27.8	28.2	27.2
		t(9580)= -9.01, p<0.001	
Marital status			
First marriage	64.7%	91.8%	30.9%
Single	29.6%	1.2%	64.2%
Other	5.7%	7.0%	4.9%
		$\chi^2(2)= 4500, p<0.001$	
Parity			
0 (first child)	41.1%	32.4%	48.4%
1	58.9%	67.7%	51.6%
		$\chi^2(1)= 241.67, p<0.001$	
Educational level mother			
< 5 GCSE	21.5%	25.8%	20.0%
5 GCSE equivalent	30.6%	31.1%	34.1%
A level equivalent	14.4%	12.5%	17.0%
> A level	25.6%	25.9%	19.2%
		$\chi^2(3)= 116.41, p<0.001$	
Managing financially			
Living comfortably	26.5%	26.6%	26.4%
Doing alright	41.3%	41.5%	40.2%
Just getting by	23.9%	23.6%	26.2%
Quite/very difficult	7.6%	7.7%	6.8%
		$\chi^2(3)= 10.28, p=0.016$	
Receiving means tested benefits			
Yes	40.7%	46.9%	37.9%
No	59.0%	52.8%	61.8%
		$\chi^2(1)= 78.88, p<0.001$	

Socioeconomic status

Multiple indicators of social class or SES are available from the BiB questionnaire. As many mothers were not able to provide an estimate of household income, more subjective measures, such as 'how well is the family managing financially', proved useful. Studies have previously reported that subjective measures of SES might be a better indicator of health for adults than objective measures (Singh-Manoux et al., 2005). Also, the response rate to the income question has often been reported to be low and biased; people of lower social status in particular are reluctant to share this information in a survey (Kelaher et al., 2009). Comparisons of these measures of SES between ethnic groups should be made with caution. Previous research points out that Pakistani and Indian people living in the UK are more likely than White British people to own a house and a car, for example, and are less likely to report debts (Kelaher et al., 2009). For other measures the same study found no difference, for example the ability to afford household goods. In the BiB study, in both the Pakistani and White British groups, around 70% of the mothers said they were managing well financially. However, this measure correlated differently with other measures of SES in each group. In the Pakistani group, 35% of the fathers had an education qualification of A-level or higher. For the White British group, this was only 25%. Within these groups with high educational levels, 88% of the White British women compared to 79% of the Pakistani women report to be managing well financially.

Birth outcomes

Birth outcome variables *preterm birth* and *birth weight* were captured through data routinely collected by midwives as part of antenatal and postnatal care. BiB study identification numbers were entered into the electronic maternity record system Eclipse, to later be linked to data from the baseline questionnaire. No women objected to having these measurements taken, or to this information being used for the BiB study.

4.3 Creating a multilevel dataset

4.3.1 Criteria for data inclusion and exclusion

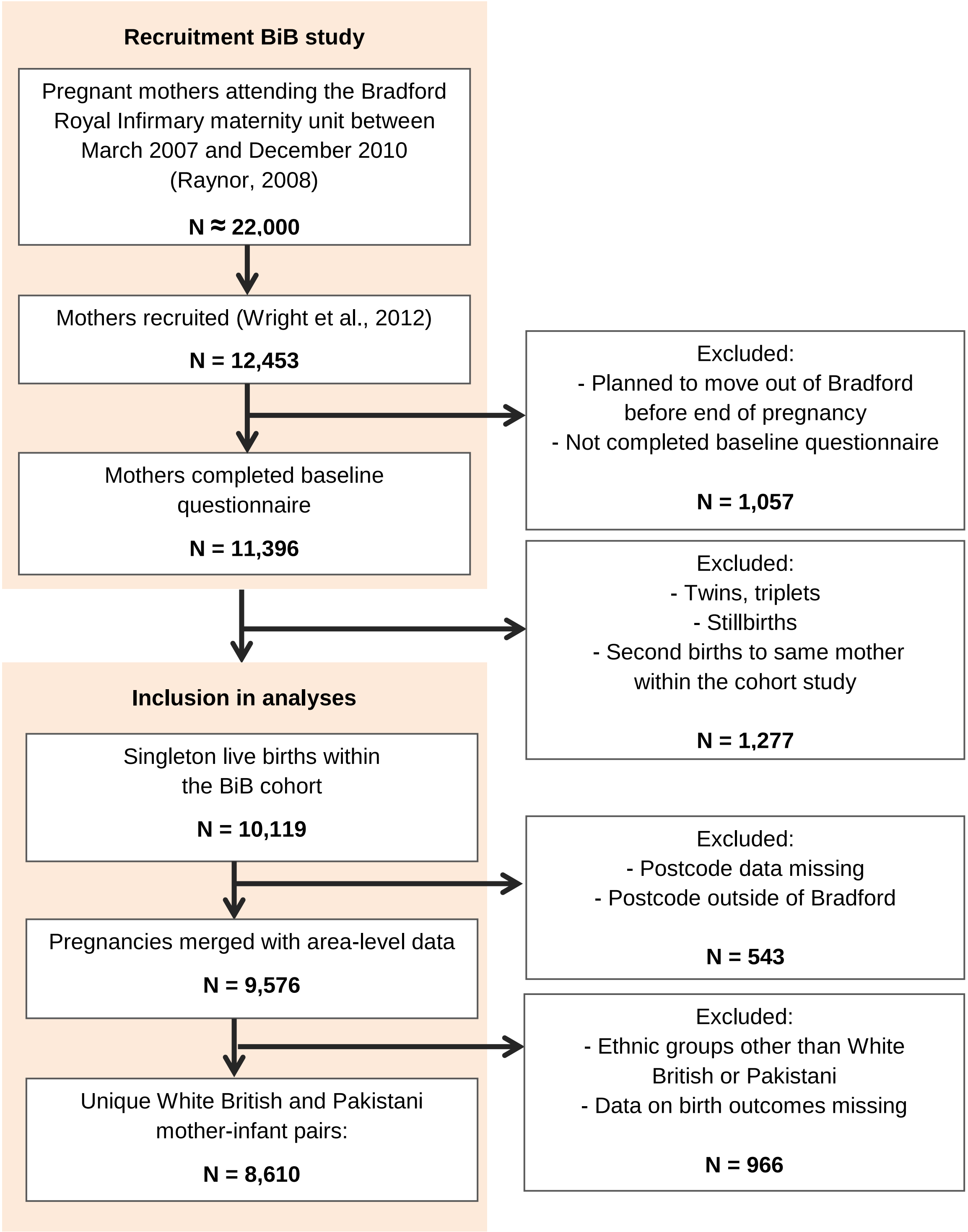
Of the 11,396 completed baseline questionnaires, some were completed by the same mother because they gave birth twice within the BiB cohort. I excluded these 1,011 subsequent pregnancies, to include 10,385 unique mother-infant pairs (Figure 4.1). Next, stillbirths (N=57), twins (N=130), and triplets (N=2) were excluded from the analyses because birth weight and preterm birth are used as dependent variables in many of the statistical models in this thesis, which are not comparable in case of stillbirth or multiparous birth.

For all households in the study, postcodes were linked to Lower Layer Super Output Areas (LSOAs) in order to merge individual-level data with area-level data. LSOA boundaries were created by the Office for National Statistics (ONS) to facilitate the reporting of small area statistics in the UK, and these LSOAs can be grouped into Middle Layer Super Output Areas (MSOAs) (Constant et al., 2009). LSOAs count 1,500 residents on average and MSOAs have an average population size of 7,200 residents. Bradford Metropolitan District consists of 61 MSOAs and 310 LSOAs.

Area-level data were obtained from multiple sources. The ONS publishes the Census 2011, containing information on the ethnic composition of areas, from which measures of ethnic density were derived (ONS, 2012b). In addition, the IMD 2010 provides information on deprivation by LSOA (ONS, 2011a). For the analyses in Chapter 8, the Child Well-Being Index (CWI) was added to the dataset (Bradshaw et al., 2009). This small area index provides information on seven features of child wellbeing: material wellbeing, health, education, crime, housing, environment, and children in need (see Chapter 8).

A total of 543 mother-infant pairs were excluded in this step because they lived outside of Bradford (N=525), or because their postcode could not be matched with a LSOA (N=18). Finally, the analyses in this study are performed for the Pakistani and White British families only, reducing the sample size to 8,610 mother-infant pairs.

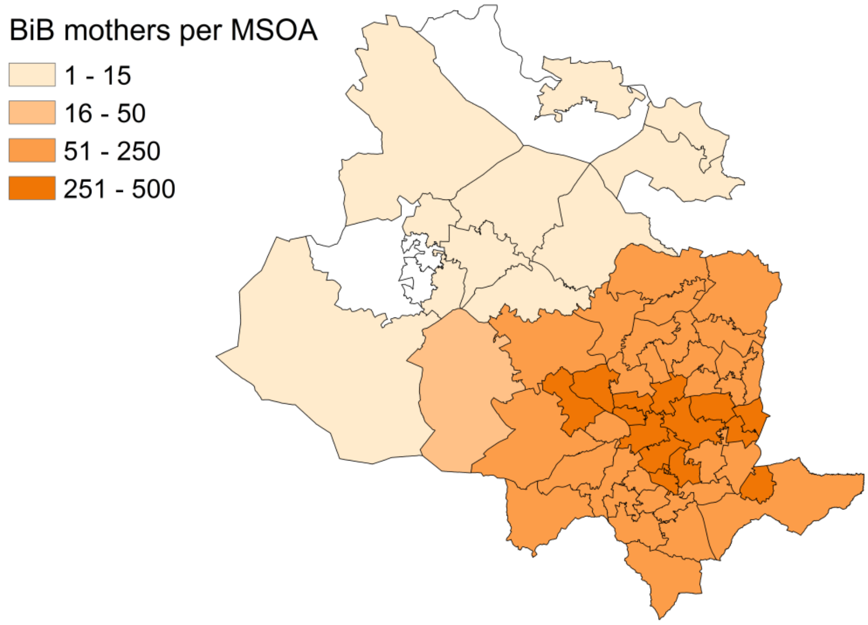
Figure 4.1 Recruitment of the study population and sample selection



4.3.2 Geographic distribution of individuals

Figure 4.2 illustrates the distribution of BiB mothers over MSOAs in Bradford. Most mothers live in or around the city centre. The inner-city areas are more deprived than areas in the periphery. Four areas north of Bradford were not represented by the BiB sample (white on map). Almost none of the participants live in rural areas in the North, which include the suburbs of Keighley, Bingley and Ilkley, where population density is low in comparison to the city.

Figure 4.2 Spatial distribution of Born in Bradford mothers in Bradford



4.4 External validity

In order to assess the external validity of the study sample, it is worth knowing how it compares to the total population of Bradford and to England as a whole. However, since the sample consists of pregnant women and infants only, this is not comparable to population data as such. Small yet significant differences have been reported between non-recruited births taking place at the Bradford Royal Infirmary and births within the cohort. Mothers in the cohort are more likely to be of South Asian ethnicity, babies born within the cohort have a slightly higher birth weight, they are less likely to be stillbirths, had a higher gestational age at birth and were less likely to be born preterm (Wright et al., 2012).

Table 4.2 shows characteristics of the areas in which BiB White British and Pakistani households live compared to households in Bradford and England. Women in the study had on average lived nearly five years at their current address. The areas they live in are more deprived than Bradford neighbourhoods in general, and these mothers therefore come from far more deprived areas than the general population of England. Also, among the BiB sample, percentages of Pakistani and foreign-born residents are substantially higher than for the whole of Bradford.

Table 4.2 Area characteristics Born in Bradford, Bradford and England

Area characteristics	BiB subsample [c]	Bradford	England
N	*8,226*	*522,452*	*53,012,456*
Mean area deprivation[a]	42.1	32.2	21.7
Percentage White British residents[b]	46.3%	63.9%	79.8%
Percentage Pakistani residents[b]	34.0%	20.4%	2.1%
Percentage born in England	68.0%	81.4%	83.5%

a) IMD 2010. Higher score means higher level of deprivation relative to other areas (LSOA level).
b) Census 2011
c) Weighted figures based on individual data

4.5 Conclusion

The BiB study gives access to information on personal characteristics, living circumstances, social capital and health and wellbeing for a large sample of mothers and infants living in Bradford. Combined with area-level data on the social and ethnic composition of neighbourhoods, I use this dataset to study the associations between social connections and health for Pakistani and White British mothers and infants. Taking into account the study setting of Bradford and the hypotheses on relationships between social capital, economic capital and health identified in the literature, I specifically focus on the context of social disadvantage and its importance for social connections and health.

The sample, although well-suited for the main topics of this thesis, is not representative of Western societies in general, nor of the UK or England. Levels of area deprivation are relatively high in Bradford, and the ethnic composition is substantially different and more diverse. This means that results cannot automatically be generalised to a national or international level. Secondly, the BiB sample and subsample included in this particular study only cover a small part of the Bradford population. Around the time of data collection, it was estimated that 107,330 women between 16 and 44 years of age were living in Bradford (ONS, 2008). With only 8,226 women included in the final sample for this study, only around 8% of all women in Bradford of reproductive age are represented. These women mostly live in more deprived and more ethnically diverse inner-city neighbourhoods of Bradford, where birth rates are higher.

Bearing in mind the limitations of the collected data, in the next chapter I will focus on the measurement of the associations between ethnic density and health. Together with the literature discussed in Chapters 2 and 3, this section will serve as a preparation and justification for the main analyses with the BiB data in Chapters 6 to 9.

Chapter 5

Measuring ethnic density effects on health

Whetley Hill, Bradford. Own photography.

5.1 Introduction

5.1.1 First evidence of an ethnic density effect

Research on health effects of ethnic density has developed independently of the social capital literature, but could be seen as an example of the buffer hypothesis of neighbourhood social capital (NSC) on health inequalities. This may explain the 'Latino paradox' or 'Hispanic paradox', which refers to the observation of low mortality among Hispanics living in the US, despite their social disadvantage (Markides and Coreil, 1986, Abraído-Lanza et al., 1999). Even when taking into account the healthy migrant effect and people moving back to their country of origin when old or struck by ill health, part of the paradox remains unexplained. It seems that the social network of the Hispanic group counteracts stressors and negative influences on health, leading to lower mortality rates. A recent study has shown that these effects spill over to other ethnic groups, as White and Black mothers in areas with more Hispanic residents have lower odds of smoking and a reduced risk of infant mortality (Shaw and Pickett, 2013).

Although the Hispanic paradox in the last two decades has spurred research into the health benefits of social networks and social capital for ethnic minorities, evidence of ethnic density effects on health was reported much earlier. In 1939, Faris and Dunham, colleagues at the University of Chicago, analysed ecological data on hospital treatment for schizophrenia and mental disorder and concluded that rates of illness varied widely between areas in Chicago. The highest rate of mental illness was nearly 16 times higher than the lowest rate (Faris and Dunham, 1939, p. 187 Table 46).[1] As shown in Figure 5.1 and 5.2, patients clustered in deprived areas of the city. Despite the ecological design of the study, the researchers attributed findings to area-level effects on health rather than individual-level effects. Although they explained this observation to be due to social isolation, which is more likely to be an effect of schizophrenia than a main cause (Cockerham, 2007), they also observed that in areas with high Black density the incidence of schizophrenia did not fit the general pattern (Faris and Dunham, 1939).

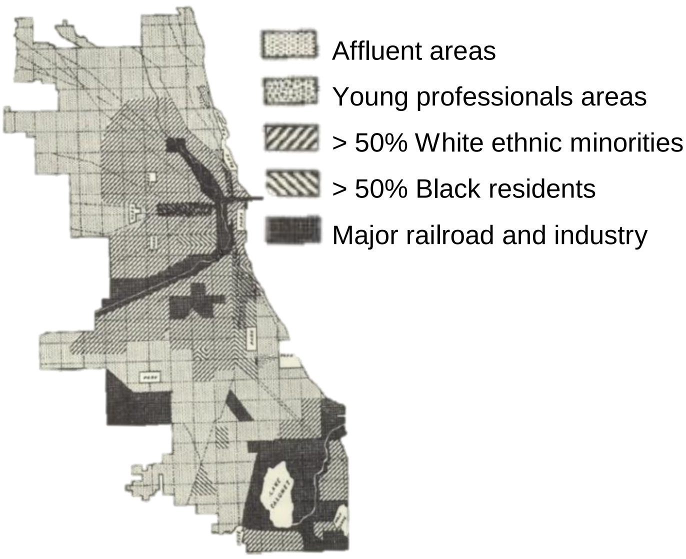
The rate of hospital admissions for schizophrenia was 41.4 per 100.000 on average for Black Americans and 32.7 per 100.000 for White Americans. In areas where around 50% of the residents were Black, the rates were 39.4 for Black residents and 131.0 for White residents. In affluent areas with predominantly White residents, the rates were 35.7 for

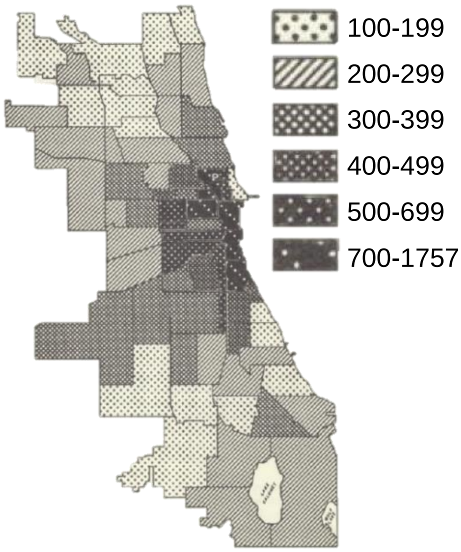
[1] The manner in which this research is described reflects the time in which it was conducted. For the sake of cultural sensitivity and consistency with this thesis the terminology has been adapted. The following replacements have been made: 'Black' or 'Black American' instead of 'Negro', 'area with high Black density' instead of 'Negro area', 'deprived area' instead of 'slum area', 'bipolar disorder' instead of 'manic-depressive psychosis' and 'mental disorder' instead of 'insanity'.

Black residents and 20.5 for White residents (Faris and Dunham, 1939, p. 54 Table 10). A similar pattern was identified for bipolar disorder, although numbers were generally lower. Alcohol-induced psychosis was close to the average for Black residents living in areas with high ethnic density, but four times higher than the average for White Americans living in these same areas (Faris and Dunham, 1939, p. 115 Table 33).

Figure 5.1 (left) Types of cultural and economic areas Chicago. Adapted from Faris and Dunham (1939, p. 6 Map 1).

Figure 5.2 (right) Rates of mental illness Chicago 1930-1931 per 100.000 adult population. Adapted from Faris and Dunham (1939, p. 24 Map 2).





Both for ethnic minorities, who may experience social exclusion, and for the ethnic majority, living in communities with more residents of the same ethnic group was associated with lower prevalence rates of mental disorders. When the book was reprinted in 1960, the authors acknowledged that the ecological nature of their study limits the conclusions that can be drawn from it. It is not possible to conclude whether ethnic density stimulates health through an area-level or contextual effect, or whether this is a compositional effect due to the make-up of the population in these areas. A second limitation is that the analysis considers only two factors at once, which means that, for example, the ethnic density of areas is compared with their rates of illness, without accounting for differences in area deprivation or SES of the individuals. As minority ethnic density often correlates positively with area deprivation and negatively with the social position of residents, it would intuitively be unlikely that ethnic minorities will be healthier in areas with a high percentage of ethnic density.

More plausible is the following hypothesis:

Ethnic minorities living in areas with high levels of ethnic density are healthier than would be expected based on the level of area deprivation and their individual socioeconomic position.

5.1.2 Explaining ethnic density effects

Berkman and Kawachi in their book on social epidemiology list five explanations for area-level differences in health, apart from differences caused by individual characteristics of residents: shared physical features of the environment, the availability of healthy spaces, provided services, sociocultural features of the neighbourhood, and the reputation and perceptions of the area (Berkman and Kawachi, 2000). The hypotheses proposed in relation to protective health effects of ethnic density are linked to these explanations.

Social support

Firstly, social support received through networks of extended family and relations living in the neighbourhood can provide health benefits that buffer negative effects of area deprivation and low economic capital (Halpern, 1993). Social support could influence health directly through decreased levels of stress, and indirectly, as a result of lower levels of stress, through healthier behaviour. This explanation is applicable to groups other than ethnic minorities, and corresponds with findings from the literature review presented in Chapter 3.

Results from a Welsh household study suggest that social cohesion can buffer negative effects of area deprivation on mental health (Fone et al., 2007). Two recent studies however have found no evidence for the social support explanation in relation to mental health (Bécares and Nazroo, 2013, Jurcik et al., 2013). The social support mechanism might reflect a compositional rather than a contextual health benefit, as residents who do not receive social support will not benefit or benefit only when the effects of support within families spill over outside the social network. On the other hand, if levels of social support are strong between residents with similar cultural beliefs and values, this may reinforce social norms in a community, which could affects residents' health behaviours outside the social network. Data from the US has indicated that Hispanic density greatly reduces the odds of smoking during pregnancy for White and Black mothers. Smaller but statistically significant associations were found for infant mortality among Black and White babies (Shaw and Pickett, 2010).

Protection from the outside world

Secondly, ethnic minorities may be protected from the harmful effects of discrimination in areas where most of the residents belong to the same ethnic group (Astell-Burt et al., 2012, Bécares and Das-Munshi, 2013, Bécares et al., 2013, Hjern et al., 2013). A study among immigrant students living in Montreal showed that high ethnic density is associated with lower perceived discrimination, which was in turn associated with lower odds of depression (Jurcik et al., 2013). Also, in areas where ethnic density was high, feeling closer to the culture of the country of origin (heritage acculturation) seemed protective against depression. This suggests that areas with high ethnic densities have beneficial effects on health because they create a feeling of safety, where ethnic minorities are accepted, their cultures are respected, and they are shielded from discrimination. Faris and Dunham hinted at this explanation, and called it 'social inclusion' (Faris and Dunham, 1939). This contextual explanation is likely to provide health benefits for everyone in the neighbourhood, although some residents may be more susceptible to this buffer effect than others. As this mechanism acts through the absence of the ethnic majority rather than the presence of the ethnic group, it may be that minority ethnic density across all ethnic groups is in this case as important as ethnic density of a particular group.

Amenities and services

A third explanation, which has been explored less than the others, is that areas with a high percentage of ethnic minorities provide more social facilities, health services and options for social participation to which ethnic minorities are attracted, increasing levels of social capital in the neighbourhood and hereby indirectly promoting health (Bécares, 2009). Even for residents who do not participate in any community-based activities NSC could improve health, although it is likely to be most beneficial to actively involved residents.

The next section will provide a critical examination of the literature on ethnic density and health, giving an overview of the evidence for the ethnic density hypothesis and identifying methodological challenges in the study of ethnic density effects.

5.2 Critical examination of the literature

5.2.1 Overview of the literature

Research on health effects of ethnic density is gaining popularity, with more studies published in 2013 than any year before. Since the first observation by Faris and Dunham, ethnic density effects have been examined in various populations and countries. I will restrict the discussion to quantitative studies of distinct ethnic groups, employing a multilevel design and adjusting for the appropriate individual- and area-level confounders. As a result, various ethnic density studies in the field of psychiatry in particular were excluded, as they treated people of multiple ethnic origins as one group and/or did not include any measures of individual SES as covariates in the statistical analyses (Kirkbride et al., 2007, Kirkbride et al., 2008, Veling et al., 2008).

Two systematic reviews on physical and mental health effects published by Shaw et al. (2012) and Bécares et al. (2012) offer an overview of quantitative studies on ethnic density effects published up to January 2011. These two reviews are used as the basis for this discussion of the literature, and complemented by studies published from January 2011 up to January 2014. The discussion is structured according to the setting of the research (UK, US and other countries) and the type of health outcome studied. The literature on birth outcomes is discussed in more detail, as these are the health outcomes used in the analyses in Chapter 6. Table 5.1 presents an overview of evidence for the ethnic density hypothesis according to setting, ethnic group and health outcome. Findings are classified as a positive or negative association if ethnic density effects were reported for any ethnic group or subgroup within an ethnic group.

Table 5.1 Overview of multilevel studies on ethnic density and health by ethnic group

Ethnic group	**Health outcome**	**Associations between ethnic density and health**		
		Positive association	*No association*	*Negative association*
African American[a]	Birth outcomes		Pickett (2002) Buka (2003) Masi (2007) Bell (2007) Mason (2009) Messer (2010)	Walton (2009) Philips (2009) Reichman (2009) Mason (2010) Nkansah-Amankra (2010) Shaw (2010) Mason (2011)
	Behavioural outcomes	Bell (2007) Xue (2007) Shaw (2010)	Robert &Reither (2004) Cozier (2007) Chang (2009) Datta (2006)	Chang (2006) Do (2007) Park (2008)
	Self-rated health / physical illness	Robert & Ruel (2006)	Mellor & Milyo (2004) Robert & Ruel (2006) White & Borrell (2006)	
	Mortality	Franzini& Spears (2003) Blanchard (2004)	Rodriguez (2007)	

Ethnic group	Health outcome	Associations between ethnic density and health		
		Positive association	*No association*	*Negative association*
Hispanic American	Birth outcomes	Jenny (2001) Walton (2009) Shaw (2010) Shaw (2013)	Shaw (2013)	Jenny (2001) Masi (2007)
	Behavioural outcomes	Shaw (2010)	Do (2007) Park (2008)	Kulis (2007)
	Self-rated health and physical illness			Patel (2003) Roy (2013)
	Mortality	Franzini & Spears (2003) Eschbach (2004)		
	Mental health	Gerst (2011)		
UK Pakistani, Bangladeshi and Indian groups	Birth outcomes	Pickett (2009)		
	Behavioural outcomes	Bécares (2011)		
	Self-rated health, general health and physical illness	Stafford (2009) Pickett (2009) Bécares (PhD) (2009)	Karlsen (2002) Bécares (PhD) (2009)	
	Mental health	Neeleman (2001) Propper (2005) Pickett (2009) Bécares & Das-Munshi (2013)	Neeleman&Wessely (1999) Bécares (2009) Astell-Burt (2012)	Bécares (2009)
UK Black Caribbean and Black African groups	Behavioural outcomes	Bécares (2011)		
	Self-rated health and physical illness	Stafford (2009) Bécares (2009)	Karlsen (2002) Pickett (2009)	
	Mental health	Propper (2005) Schofield (2011)	Neeleman & Wessely (1999) Bécares (2009) Astell-Burt (2012) Bécares & Das-Munshi (2013)	Neeleman (2001)
Asian Americans	Birth outcomes		Mason (2011)	Walton (2009)
	Behavioural outcomes	Kandula (2005)	Park (2008)	
Ethnic minorities Australia	Wellbeing	Astell-Burt (2013)		
	Mental health	Feng (2013)		
Māori New Zealand	Self-rated health	Bécares (2013)		
	Mental health	Bécares (2013)		
Ecuadorians Spain	Mental health		Jarrín (2013)	
Ethnic minorities Sweden	Wellbeing	Hjern (2013)		

a) Often described in the literature as ‘Black’ or ‘Black American’.

5.2.2 Birth outcomes

Evidence from the UK

One UK study on birth outcomes and ethnic density has been published so far (Pickett et al., 2009). No associations were found between ethnic density and birth weight, but preterm delivery was less likely for Pakistani mothers living in MSOAs with 5 to 30% own ethnic density as compared to mothers living in MSOAs with 0 to 5% ethnic density (p=0.043). Also, there was an indication of a protective effect for mothers living in areas with more than 50% ethnic density (p=0.077). This study was limited by the low percentage of ethnic density for most ethnic groups, and small sample sizes. Ethnic density was measured as a categorical variable only. The highest category of ethnic density was ‘over 50%’, which represents a very heterogeneous mix of neighbourhoods. The hypothesis that high ethnic density protects against discrimination and buffers the stress associated with having an ethnic minority status is more likely to be true for areas where ethnic density for minority groups is much higher than White British ethnic density. Although making use of the large Millennium Cohort Study (MCS) which comprised 369 Bangladeshi mothers, 462 Indian mothers and 868 Pakistani mothers, the statistical power of the study was relatively low because these mothers were mostly from areas where ethnic density was low, and variation measured between individuals within a MSOA might not be reliable as there were only five observations per MSOA on average for Bangladeshi, less than four per MSOA for the Indian group and less than seven observations per MSOA in the Pakistani group.

Evidence outside the UK

Twenty multilevel studies performed outside of the UK used birth outcomes such as infant mortality, low birth weight (LBW), preterm delivery and small for gestational age. Only four of those found minority ethnic density to be inversely associated with adverse birth outcomes in some groups (Walton, 2009, Masi et al., 2007, Shaw, Pickett, and Wilkinson 2010, Ahmad et al., 2005).

Six studies reported different findings depending on the outcome or group studied. Shaw and colleagues (2010), in a sample of over half a million Americans, found no association between Black density and infant mortality but higher prevalence rates of LBW and preterm delivery with increasing Black density. An increase in ethnic density from 0 to 0.99% up to 1 to 4.99% led to an OR of 1.25 (p<0.01) for LBW, and 1.26 (p<0.01) for preterm birth. However, as the analysis was adjusted for maternal education and county-level income only, the results might reflect higher levels of social disadvantage in areas with higher Black density. For Hispanics, results were inconsistent and a decreased prevalence rate was observed only for infant mortality with increased Hispanic density. In areas with 50% or higher Hispanic density the OR was 0.57 ($p<0.001$) compared with infant mortality in areas with 0 to 5% ethnic density.

Mason and colleagues (2010) analysed prevalence rates of preterm birth for African Americans infants of mothers born in Africa, Caribbean-born American mothers and US-born African American mothers living in New York City. Rates of preterm birth were lower in the African-born group (7.5%) than in the Caribbean-born (9.9%) and US-born group (11.9%). The Caribbean-born group lived in more affluent areas and had a higher SES measured by maternal education and enrolment in Medicaid, while the other two groups scored similarly on these measures except for a lower level of education in the African-born group. The authors showed higher odds of preterm birth with higher own ethnic density for infants of African-born mothers (adjusted risk difference 4.8, 95% CI 2.1, 7.4), but this was a comparison between the 10th and 90th percentage of ethnic density, corresponding to 0% and 7% African-born residents. For Caribbean-born mothers there was no association between preterm birth of their babies and ethnic density, and for US-born mothers an increase in ethnic density from the 10th percentile of ethnic density with at least 13% US-born residents to the 90th percentile with at least 70% US-born residents corresponded with an adjusted risk difference of 8.1 (95% CI 3.3, 12.8). In a stratified analysis, associations between ethnic density and preterm birth seemed stronger in more deprived neighbourhoods (risk difference 12.5) and no longer statistically significant in less deprived areas, which may reflect a true difference or may be the result of incomplete adjustment for social disadvantage in more deprived areas. The potential of this study to distinguish between the effects of ethnic density and the effects of other factors associated with high African American density areas and residents in these areas was limited. For African-born Americans, the sample did not vary sufficiently with regard to ethnic density to draw conclusions on ethnic density effects on health. In addition, the crude measure of area-level deprivation distinguished between less and more deprivation only. Especially in the US-born African American group, preterm birth is strongly associated with area deprivation and area deprivation is strongly associated with ethnic density. To attribute the findings of this study to the many negative effects of social disadvantage seems at this point more legitimate than to attribute it to the ‘hopelessness’ of living in areas with high African American density, as suggested by the authors (Mason et al., 2010).

Philips and colleagues (2009) studied Black American density and the risk of preterm delivery in relation to income incongruity in the neighbourhood. The authors describe characteristics of people in low (<14.4%), medium (14.4-82.7%), and high (>82.7%)

density areas, which illustrates the marked differences between residents in the different areas. Higher Black American density is associated with lower levels of maternal education, lower household income, lower rates of married mothers, higher percentages of smoking during pregnancy and higher rates of preterm birth. In neighbourhoods with a higher percentage of Black residents, having a higher relative household income is associated with a higher prevalence rate of preterm birth (OR 1.80, 95% CI 1.14, 2.82). However, these results are difficult to interpret as the same was found for residents with a lower household income than average (OR 1.61, 95% CI 0.92, 2.82). Ethnic density regardless of relative income or income incongruity was not associated with an increased or decreased rate of preterm delivery.

In section 5.1.1 I mention the recent study by Shaw and Pickett (2013), which reports on the effect of Hispanic density on infant mortality, LBW, preterm delivery and smoking during pregnancy in White, Black and Hispanic Americans. Hispanic density was associated with lower infant mortality for White and Hispanic infants, with odds ratios (ORs) of 0.60 ($p=0.085$) for White residents and 0.53 for Hispanic residents ($p<0.001$) in areas with 50% or higher Hispanic density. Smaller and less consistent associations suggesting protective effects were found for medium and high levels of Hispanic density in relation to LBW and preterm birth. The lack of findings in other groups may be due to an unequal distribution of study participants according to the ethnic composition of residential areas, as only 0.16% of White participants, 0.05% of Black participants, and 5.93% of Hispanics lived in areas of the highest ethnic density category (≥ 50%). Residual confounding has presumably influenced findings as only one measure of individual SES (maternal education) was used.

Jenny and colleagues (2001) found a negative association between higher ethnic density and prevalence rates of infant mortality for US-born Mexican mothers (OR 1.56, 95% CI 1.31-1.83), but a borderline significant association between lower rates of infants mortality and medium as opposed to low ethnic density levels for Mexican-born mothers (OR 1.13, 95% CI 0.99-1.29). The areas included in the study were very different from usual urban high minority density areas across the world, due to a close proximity to the US-Mexican border. Contrary to most areas with high minority density in the US and worldwide, these mothers living in high Mexican density areas were more educated, less likely to be foreign-born, and more likely to be married than mothers in low density areas (Jenny, 2001).

5.2.3 Mental health

Eleven multilevel studies based on data from the US, UK and Canada reported on associations between ethnic density and depressive symptoms, mostly assessed with the CES-D scale. Seven studies reported associations to suggest protective effects of ethnic density for some groups, including older Mexican Americans, Hispanics, Black American adolescents and adults, and UK Indian and Pakistani mothers (Gerst et al., 2011, Ostir et al., 2003, Wickrama et al., 2005, Wight et al., 2005, Wight et al., 2009, Mair et al., 2010, Pickett et al., 2009). An association between better mental health and higher Black ethnic density, which was not found for Hispanics, was partly explained by increased levels of social support (Vogt Yuan, 2007). Abada and colleagues (2007) were the only study to find a consistently increasing prevalence rate of depressive symptoms with increasing ethnic density measured among 'visible minorities' in Canada. Mair et al. (2010) found a higher prevalence of depression for African American men, but not for African American women and Chinese living in ethnically dense areas.

Psychological wellbeing and common mental disorder

In a study among Māori in New Zealand, ethnic density was associated with a lower risk of fair or poor self-rated health and common mental disorder, but the relationship with psychological distress was not significant (Bécares et al., 2013). In the model adjusted for area deprivation, education, work status and household income, the OR of fair/poor self-rated health was 0.92 (95% CI 0.84, 0.98) for every 10% increase in Māori density, and the OR for common mental disorder was 0.92 (95% CI 0.85-0.99). Higher Māori density was associated with a lower likelihood of reporting unfair treatment, personal attacks and racial discrimination. These findings cannot be extrapolated easily to other ethnic groups in other settings, as Māori in New Zealand may experience discrimination differently due to socio-historical and geographical differences, and have a different pattern of reporting discrimination and unfair treatment. For example, Māori are more likely to report discrimination if they have low levels of trust, are either unemployed or highly educated, do not own a home, or have many Māori friends (Cunningham and Paradies, 2013).

Lower prevalence rates of common mental disorder were also associated with higher ethnic density for Irish (OR 0.21, $p = 0.01$) and Bangladeshi adults (OR 0.75, $p < 0.01$) in the UK (Das-Munshi et al., 2010), but not for Indian and Pakistani groups. For all ethnic minority groups combined, ethnic minority density was associated with a lower prevalence rate of common mental disorder (OR 0.94, $p < 0.01$). Adding measures of racism and social support did not alter the model significantly, but this might be due to reporting bias in these measures. Interpersonal racism for example was reported by only 9% of the

Bangladeshi respondents, compared to 7% of the White British group. Reporting of social support may likewise be influenced by cultural norms and social desirability.

In Australia, associations with psychological distress suggesting very small protective effects of ethnic density were found for Australians born abroad (OR 0.97, 95% CI 0.96, 0.99) and UK-born English (OR 0.99, 95% CI 0.99, 1.0) (Feng et al., 2013). A study among Ecuadorians living in Spain found no evidence for ethnic density effects in relation to mental health measured by the General Health Questionnaire (GHQ) (Jarrín et al., 2013) and a study among adolescents living in London could not establish an association with psychosocial wellbeing for any ethnic minority group (Astell-Burt et al., 2012).

Psychotic symptoms

In the UK, psychotic symptoms have been studied in relation to ethnic density for African, Caribbean, Indian, Pakistani and Bangladeshi groups. Negative associations between ethnic density and symptoms of psychosis were reported in two studies (Bécares and Das-Munshi, 2013, Schofield et al., 2011), one of which was based on medical diagnoses of psychosis for residents of South East London (Schofield et al., 2011). Confusingly, Schofield and colleagues compared rates of psychosis between ethnic groups and not between areas with various ethnic density levels within an ethnic group. In areas where Black ethnic density was lower than 25%, the prevalence rates of psychosis for Black residents were nearly three times higher than the prevalences rate for White residents (OR 2.88, 95% CI 1.89, 4.39). In areas with high Black density, prevalence rates were not significantly higher for Black than for White residents (95% CI 0.98-2.23). These ‘adjusted’ models did not take into account individual SES. Differences in the prevalence of psychosis might therefore be explained by an unmeasured social disadvantage of Black residents compared to White residents, resulting in higher rates of illness. Another limitation of this study is the unsophisticated comparison between ‘Black’ and ‘White’, with ‘Black’ representing among others African immigrants, Caribbean immigrants and UK-born black British, and ‘White’ representing UK-born and foreign born residents from all corners of the world. The assumption that UK-born people of African origin are more similar to people born in the Caribbean than to White British in relation to associations between ethnic density and health is not justified in any way and may bias findings.

One study found no significant results for Caribbean, Indian and Bangladeshi in relation to psychotic symptoms and indicated that higher own ethnic density might increase the prevalence of psychotic symptoms for Pakistani (Bécares et al., 2009). This study was limited by low percentages of ethnic density, with the highest category of ethnic density being 20% or more. Experiences of racism were lower in areas with high ethnic density, but this measure might be limited by the reporting of socially desirable outcomes, as mentioned before.

5.2.4 Other health outcomes

Higher ethnic density among Mexican Americans and US Hispanics was found to be associated with lower mortality and years of life lost to heart disease in two studies (Eschbach et al., 2004, Franzini and Spears, 2003).

Health behaviour

Evidence on health behaviour and ethnic density has come primarily from the US. In the UK only one study has analysed ethnic density in relation to behavioural outcomes (Bécares et al., 2011), and this study suggested a protective ethnic density effect for alcohol use. Those US-based studies that used body mass index (BMI) as a health outcome either found no association (Chang, 2006, Chang et al., 2009, Robert and Reither, 2004, Park et al., 2008, Do et al., 2010), or an increase in BMI with higher ethnic density (Do et al., 2010, Park et al., 2008). Astell-Burt (2012) analysed the relationship between BMI and ethnic density for nine ethnic groups in Australia and found lower BMI to be associated with higher ethnic density only for the English and Irish groups. Findings by Kulis et al. (2007) suggested a negative effect of ethnic density on alcohol use among Americans predominantly speaking Spanish, and on marijuana use for bilingual Mexican Americans. In relation to the prevalence rate of hypertension in women, a study by Cozier and colleagues (2007) reported no significant association.

The most convincing evidence for a protective effect of ethnic density was found for smoking. Three large US studies saw the risk of smoking during pregnancy decrease with increasing own ethnic density for both Black Americans and Hispanics (Shaw, Pickett, and Wilkinson 2010, Bell et al., 2007, Ahmad et al., 2005). Shaw and Pickett (2005) reported highly significant ORs of 0.60 for 1 to 5% ethnic density, 0.38 for 5 to 15% ethnic density, 0.31 for 15 to 50% ethnic density and 0.09 for at least 50% ethnic density, compared to the lowest ethnic density category of 0 to 1%. One smaller study found a negative association between ethnic density and odds of smoking among Black adolescents (Xue et al., 2007) and another study showed the same result for Asian women (Kandula et al., 2009). Datta and colleagues did not find an association between Black ethnic density and smoking behaviour (2006).

Self-rated health

For self-rated health the evidence is mixed between those presenting positive associations with ethnic density (Robert and Ruel, 2006, Bécares et al., 2013), no significant effects (Robert and Ruel, 2006, White and Borrell, 2005), and negative associations (Abada et al., 2007, Patel et al., 2003, Roy et al., 2013). In one US study, self-rated health increased with higher ethnic density for Hispanic women, but ethnic density was associated with poorer self-rated health among Black men and women, and Hispanic men (Shaw and Pickett, 2011). Hjern and colleagues (2013) studied wellbeing in Swedish adolescents and concluded that especially for boys and for migrants of African or Asian origin, ethnic density at school seemed protective of multiple aspects of wellbeing. At schools with high own ethnic density, boys in particular experienced less bullying. As the highest category of migrant density was 50%, which represents a very heterogeneous mix of schools, and parental education was the only measure of SES, these findings may be confounded by unmeasured factors.

5.3 Methodological challenges

5.3.1 Limitations of current evidence

The ethnic density literature covers various health outcomes, different populations and settings, and is informed by many different cohort studies and datasets. The evidence continues to be mixed; while some studies suggest beneficial health effects of ethnic density for some ethnic groups, others do not find any association or find ethnic density to be associated with poorer health instead (Table 5.1). In the first multilevel studies performed from 1999 to 2004, 44% (n = 7) of the findings in one ethnic group showed no significant association. From 2005 to 2010, no association was found for 36% (n = 17) of the analyses and since 2011, 45% (n = 9) reported no association between ethnic density and health. Especially in the Black American, UK Black Caribbean and UK Black African groups, associations between higher ethnic density and illness have been reported more often than beneficial health outcomes in relation to higher ethnic density. For other ethnic minority groups, including US Hispanics and UK South Asians, the evidence also remains unconvincing. Even studies deploying multilevel techniques and taking into account individual-level and area-level confounders such as SES and area deprivation have not come to consistent findings (Roy et al., 2013, Pickett et al., 2009, Astell-Burt et al., 2012).

The ethnic density hypothesis has solid theoretical foundations, based on observations in other areas of epidemiological research such as established neighbourhood-level health effects, the growing literature on social capital and health, the relationships between discrimination or social exclusion and health, and the Hispanic paradox (Thoits, 2010, Franzini et al., 2000, Uphoff et al., 2013). All ethnic density studies aim to answer the same research question: "Is a higher level of ethnic density in a neighbourhood associated with better health for residents of this ethnic group?" Yet these studies, based on the same theory and often using similar methods, continue to report different results.

Multilevel regression analysis has become the gold standard for studying area-level and individual-level effects in social epidemiology, and the literature on ethnic density reflects this. In the context of ethnic density research this approach does not seem to have taken us much further since the ecological study of Faris and Dunham in 1939. Several authors have warned against the inconsiderate use of multilevel regression analysis (Riva et al., 2007, Oakes and Kaufman, 2006, Diez Roux, 2001), and David Halpern published a conceptual paper in 1993 addressing the difficulty of disentangling ethnic density effects from other health influences originating from the level of residents and areas (Halpern, 1993). Based on this literature and the inconsistent findings on ethnic density and health identified earlier, Table 5.2 summarises the limitations of multilevel regression techniques, the consequences of these limitations for ethnic density research, and the solutions applied in this thesis.

Table 5.2 Limitations of multilevel regression analysis applied in ethnic density research

Limitation	**Consequence**	**Solution**
Statistical models are copies of previous studies, or based on availability of data rather than theory-based (Oakes and Kaufman, 2006, Riva et al., 2007, Warnecke et al., 1997).	Literature shows no consistent evidence.	Statistical models based on the hypothesised causal pathway, informed by theory (Chapter 2,3) and previous literature (Chapter 5), and adapted to the research setting (Chapter 1,2).
Use of covariates is not theory-based.	Confounding because for ethnic minorities, measures of SES and area deprivation have a relationship with health different from that of the ethnic majority (Oakes and Kaufman, 2006). Multi-collinearity between SES measures.	Assess social gradients and relationships between different measures of SES, test relationship between area deprivation and ethnic density.
Modifiable Areal Unit Problem (MAUP): areas are predefined and do not necessarily reflect communities (Oakes and Kaufman, 2006, Warnecke et al., 1997, Baker et al., 2013).	Areas are too large and heterogeneous to detect ethnic density effects (Halpern, 1993).	Variation in LSOAs and MSOAs measured to determine best area level. Smoothing outcomes with GIS software.

Limitation	Consequence	Solution
Small sample size and low statistical power.	Not enough variation in ethnic density levels to detect effects. As a result of small samples, ethnic groups have been merged, creating highly heterogeneous groups.	Large sample size and varied ethnic and social distribution across areas in the city. Ethnic density Pakistani 0 to 85% at LSOA level. Only Pakistani and White British.
Only one standard random intercept statistical model is reported.	Reporting bias if explored models are not reported.	Explore models with multiple health outcomes and compare fit between models with different covariates.
Multilevel studies based on cross-sectional data, while area-level exposure depends on length of residence.	Underestimates area-level effects for long-term residents and overestimates effects for new residents.	Include length of residence as a potential mediator of ethnic density effects.
Self-selection: distribution of people not random.	Unjustified extrapolation of results to general population.	Take context into account. Statistical models informed by theory (Chapter 2,3).
Multilevel models do not disentangle context and composition (Warnecke et al., 1997, Baker et al., 2013).	Residual confounding , over-adjustment for confounding, statistical model poor representation of reality.	Model ethnic density effects with and without area deprivation.

5.3.2 Disentangling individual and environment

The limitations summarised in Table 5.2 lead to two conclusions: the methodology currently applied in ethnic density research requires improvement, and multilevel regression analysis cannot be relied upon as the sole method of research as it does not deal adequately with methodological issues. Some improvements to the statistical model can be made with the BiB data, such as the inclusion of a ‘length of residence’ variable, testing multi-collinearity of SES variables, using small areas (LSOAs), and a large sample size. The two remaining issues, self-selection and the entangled individual- and area-level characteristics, are intrinsic to ethnic density research.

Context and composition

The difficulty in disentangling contextual and compositional effects of ethnic density lies in the inseparable nature of residents and their social environment. It is not realistic to consider (contextual) neighbourhood effects independent of (compositional) individual differences between residents (Halpern, 1993). The tendency in research to separate individual-level from area-level effects has been called ‘a false dualism of context and composition’, because neighbourhoods influence their residents and residents shape their neighbourhoods (Baker et al., 2013). In addition, residents are not allocated randomly to neighbourhoods, but are drawn by area features. People who choose not to live in areas with a high percentage of their own ethnic group are presumably very different from people who do choose to live there. If ethnic minorities do not live in areas with high minority ethnic density, they are generally able to afford more expensive housing, ethnicity may play only a minor role in their identity, or they may not be dependent on neighbours for social support (Poortinga, 2006). This principle of self-selection is problematic because it means better health is not necessarily caused by ethnic density itself, but by the characteristics of people drawn to high minority density neighbourhoods.

The mediating role of social disadvantage

The causal graph in Figure 5.3 illustrates the central role of social disadvantage (SES and area deprivation) in the pathway. As elaborated on in Chapter 2, ethnic minorities often live in areas that are more deprived than average. The creation of these high minority density areas can partly be attributed to the hypothesised causes of beneficial ethnic density effects, namely social support, social cohesion, and protection from discrimination, and partly residency in these areas is stimulated by the affordability of deprived areas in the city. The bidirectional arrows in Figure 5.3 forming a reinforcing loop defile the principle of causal inference, which only holds true if causes precede effects (Bhopal, 2002). Adjustment for confounding by area deprivation will also mask the mediating effect of area deprivation on the relationship between ethnic density and health. This is because social disadvantage is likely to be a determining factor in the causal pathway associated with the causes of ethnic density, the working mechanisms of ethnic density and the causes of ill-health among ethnic minorities.

5.3.3 An improved strategy for ethnic density research

Ecological analysis

It follows from the limitations discussed above that traditional regression analysis on its own might not offer the answers we are looking for. At the World Congress of Epidemiology in 2002, epidemiologist Neil Pearce (2004) argued for a better understanding of the social and historical context in which research is conducted, and warned that with the popularity of multilevel regression analysis “technique might triumph over thought”. Instead of searching for more complicated and refined models that diverge further from the real world, the solution may be found in a back-to-basics approach to understand the differences in individual- and area-level characteristics between neighbourhoods with high and low minority ethnic density. Ecological analysis has fallen from grace due to the ecological fallacy, which involves inferring individual-level relationships from aggregate-level data (Bhopal, 2002). However, it has been argued that this rejection of the ecological analysis, in combination with an ‘individualistically oriented epidemiological paradigm’, has led to a neglect of contextual effects on health (Berkman and Kawachi, 2000). Fortunately, recent years have seen renewed interest in the relationship between place and health, and the use of Geographical Information Systems in epidemiology is advancing. For health effects hypothesised to operate predominantly at the neighbourhood level, such as ethnic density effects, an ecological analysis is a good way to start identifying patterns of illness (Berkman and Kawachi, 2000). Regardless of the methods used, the issue of self-selection and the loop of cause and effect cannot be addressed in a cross-sectional design. These studies only provide evidence on associations between ethnic density on health, and never on the direct effects of ethnic density, or on ethnic density as a cause of good or ill health.

The reality of people and places

Another limitation of statistical models is that they sketch hypothetical situations, and that these findings cannot be extrapolated as applicable to the general population (Dinno, 2007). The fact that residents in high ethnic density neighbourhoods are different from those not living in these neighbourhoods implies that any health effect of ethnic density can only be proven to be true for people living in these neighbourhoods. Protective ethnic density effects on health seem to exist for some people, but most likely this is not despite area deprivation and individual social disadvantage but because of it. For people who are dependent on social support and a community-based social network, living in areas with a high level of ethnic density creates a safe and inclusive enclave within the wider society from which many ethnic minorities feel excluded. The neighbourhood social network is not an added bonus, but a necessity to cope with the negative influences of social disadvantage on health. This hypothesis is backed up by qualitative research (Campbell and McLean, 2003, Whitley et al., 2006) and fits the theory behind the creation and maintenance of ethnic segregation in urban areas (Chapter 2). Residents of areas with lower levels of ethnic density, generally representing more affluent people in less deprived places, would therefore not necessarily benefit from NSC in areas with high ethnic density. Even if it would be possible to move residents between neighbourhoods so that individual differences between neighbourhoods are smaller, this would change the composition of areas and therefore also contextual effects on health (Halpern, 1993). For these reasons, the association between ethnic density and health in neighbourhoods needs to be studied with and without adjusting for other area-level factors (Table 5.2). It may be that, depending on individual characteristics and features of the neighbourhood and the community, there are protective effects of own ethnic density for some and not for others, or social capital may buffer detrimental health effects of deprivation in some neighbourhoods but not in others.

The solutions proposed in Table 5.2 regarding multilevel regression analysis will be incorporated in further chapters of this thesis. The design of the study, origin of the variables and techniques for data analysis will be discussed in detail in each analysis chapter in relation to the specific health outcomes used.

5.4 Conclusion

This chapter started with an explanation of ethnic density effects, followed by a critical examination of the evidence available from the literature on ethnic density and health. In conclusion, the evidence for all ethnic groups and health outcomes regarding the effects of ethnic density is inconsistent, conflicting and at times unreliable. Studies were often limited by lack of data from areas with a high percentage of ethnic minorities, the use of a high spatial level of analysis, grouping of a heterogeneous set of neighbourhoods and individuals, and some failed to account for differences between areas with high and low minority ethnic density. Previous research has further been compromised by ignoring the risk of residual confounding, the inability to incorporate mediators of ethnic density effects on health such as social support and discrimination, and unrealistic statistical models.

Given the close relationship between ethnic density, area deprivation and individual social position, ethnic density may not always be able to counteract negative influences resulting from social disadvantage and a minority position with stronger social support network. In addition, ethnic minorities not living in neighbourhoods with high levels of ethnic density may find social support within their ethnic group outside of the area (Whitley et al., 2006). If there are protective health effects related to ethnic density, the picture that emerges from the literature is that ethnic density will have different working mechanisms heavily influenced by individual- and area-level characteristics, operating between, as well as within, ethnic groups. Rather than one ethnic density effect, it is more appropriate to refer to these mechanisms as ethnic density effects. Health effects may be modified by country of origin (Mason et al., 2010, Hjern et al., 2013, Jenny et al., 2001), area deprivation (Roy et al., 2013), gender (Mair et al., 2010, Shaw and Pickett, 2011) and social position (Phillips et al., 2009). Apart from methodological issues in ethnic density research, inconsistent results may have been caused by the variety of people and places that lead to a different potential for ethnic composition and related social capital to influence health. The findings from this chapter will feed into informed statistical models to analyse the relationships between ethnic density and health in the following chapter.

SECTION C ANALYSES

Chapter 6

Ethnic density in relation to birth outcomes

Bradford City Park. Own photography.

6.1 Introduction

6.1.1 Low birth weight and birth weight across populations

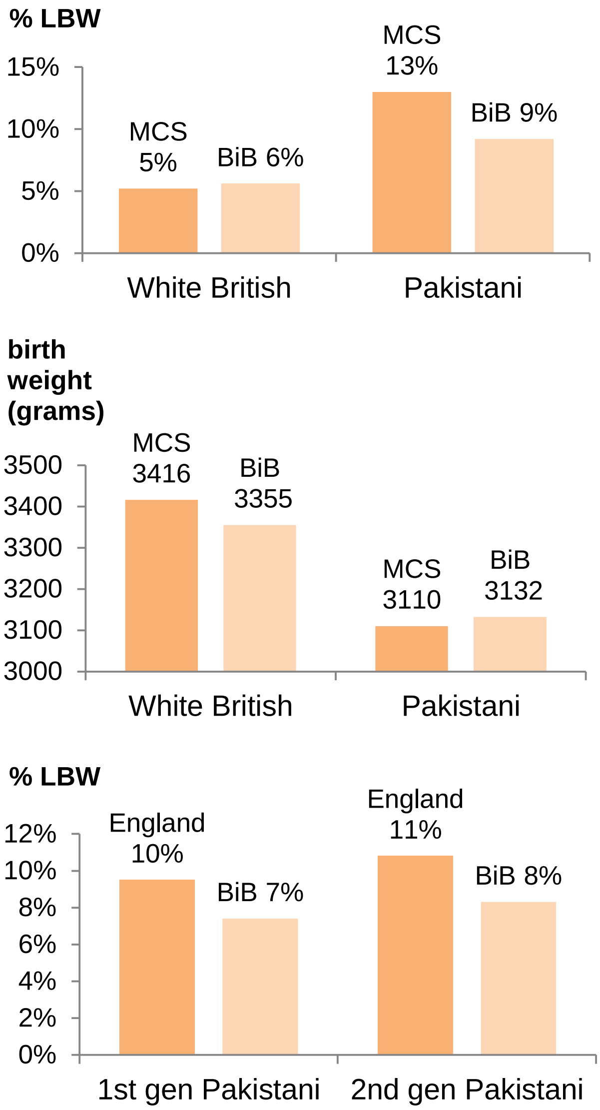
A birth weight below 2500 grams is classified as low birth weight (LBW), regardless of gestational age at birth. Apart from higher mortality rates, a multitude of problems in the health and development of children are associated with LBW. These include neurosensory, behavioural, cognitive and physical outcomes, and for most of these outcomes the odds of occurrence increase with decreasing birth weight (Hack et al., 1995). The prevalence of cerebral palsy for example is thought to be twice as high among babies with a birth weight between 1000 and 1500 grams (prevalence 14 to 17%), than among babies with a birth weight between 1500 and 2500 grams (prevalence 6 to 8%) (Hack et al., 1995). Deafness and blindness are less frequent, but have also been associated with LBW. On average, LBW babies score lower on intelligence tests, are more likely to have poor growth in childhood, and more likely to suffer from poor health in later life, for example asthma and ear infections but also hypertension, diabetes mellitus and chronic kidney disease (Reyes and Mañalich, 2005, Barker, 1995).

South Asian babies on average have a lower birth weight than babies of other ethnicities in England, and are more likely to be classified as having LBW (Leon and Moser, 2012). The incidence of LBW is estimated at 16% worldwide and between 27% and 31% in South Asia (Badshah et al., 2008, Wardlaw, 2004). In a study in Pakistan, the main identified risk factors were gestational age, maternal age and consanguinity (Badshah et al., 2008). Other factors known to affect rates of LBW globally are sex of the baby, foetal growth and body composition of the mother, poverty, maternal nutrition and other lifestyle factors (Wardlaw, 2004).

Figure 6.1 gives an overview of the incidence of LBW and average birth weight in the UK and Bradford. In a study using data from the MCS, Pakistani and Bangladeshi infants were reported to be 2.5 times more likely to have a LBW compared to White infants (Kelly et al., 2009). More recently, birth registration data comprising nearly all births in England and Wales in 2005 and 2006 was used to study birth weight across ethnic groups (Leon and Moser, 2012). This study found slightly lower incidences of LBW among Pakistani infants than in the MCS, and reported that the incidence of LBW is lower among infants born to mothers born in Pakistan than UK born Pakistani mothers.

In Bradford, researchers collected data on birth outcomes using maternity data from 1974 to 1978, and concluded that 13.1% of the Asian babies had a LBW compared to 7.9% of babies born to UK mothers (Lumb et al., 1981). Although the different categorisation of ethnicity makes comparisons difficult, data from the BiB study (Figure 6.1) seems to suggest that the incidence of LBW is now lower among Pakistani as well as White British. In line with the national data however, the odds of LBW are higher for babies born to Pakistani mothers born in the UK compared to Pakistani mothers born in Pakistan.

Figure 6.1 Incidence of low birth weight and average birth weight in the UK (MCS) (Kelly et al., 2009), England and Wales (Leon and Moser, 2012) and Bradford (BiB, own data).



Although Pakistani babies in England are more likely than White British babies to be born prematurely and with LBW, and although socioeconomic factors have been identified as important contributors towards these differences, research has not been able to fully explain differences in birth outcomes. In England, LBW in South Asian babies has previously been explained partly by low SES, which is thought to have a negative impact on levels of stress and nutrition during pregnancy (Kelly et al., 2009). The most important risk factors in this study were socioeconomic factors, as well as factors related to maternal and child characteristics (gender of the infant, maternal height, preterm delivery).

Adjusting for SES reduced the prevalence of LBW by 2% for White babies and by 18.5% for Pakistani babies, but a difference remained. West and colleagues analysed birth weight for Pakistani and White British term babies in the BiB sample and concluded that the difference in birth weight between these groups remained significant after adjusting for parents' place of birth, smoking, alcohol, maternal age, maternal hypertension, maternal fasting glucose, maternal height, maternal BMI, parity, gestation, sex, SES and cohabitation status of the parents (West et al., 2013).

6.1.2 Preterm birth across populations

Preterm birth, which is defined as delivery before 37 weeks of gestational age, exposes babies to health risks associated with low gestational age at birth, and these babies are also at higher risk of LBW. Children born prematurely have higher neonatal mortality rates, and those who survive into childhood are at higher risk of suffering from cerebral palsy, mental and physical disabilities, and developmental disorders (Moster et al., 2008). Apart from the medical consequences, social consequences of preterm birth include a decreased educational performance and an increased likelihood of having a lower income later in life, receiving social security benefits, not finding a life partner and not having children (Moster et al., 2008). In conclusion, preterm birth puts children at a social, economic and health disadvantage right from the start and throughout the life course.

Causes of preterm birth include infection during pregnancy, stress, and immunological processes which are not completely understood. Maternal characteristics such as age, parity, nutrition, and smoking are associated with preterm birth (Goldenberg et al., 2008). In a large study of live births in Birmingham between 1994 and 1998, the incidence of preterm birth was 8.5% in the Asian group, which was significantly higher than the incidence of 7.7% in the White group (Aveyard et al., 2002). Adjusting for characteristics of the baby, mother and pregnancy slightly decreased differences between groups. The authors found that the effects of area deprivation varied by ethnic group. For White babies, the incidence of preterm birth was predicted to be 5.1% for those with the most favourable individual characteristics (married, 27 years old), compared to 10.6% for White British babies born to 18 year old single mothers living in the most deprived areas. For African and Afro-Caribbean babies, area deprivation, maternal age and marital status likewise explained a big part of the variation in the prevalence of preterm birth. For Asian babies however, the risk difference between the most affluent and the most disadvantaged group was much smaller; 7.1% versus 9.9%. Potential explanations for this finding discussed by the authors include the small influence of smoking on birth weight in the Asian group, and the inaccuracy of the area deprivation measure in capturing social disadvantage in the generally deprived Asian population in Birmingham (Aveyard et al., 2002). The potential for psychosocial mechanisms of ethnic density to buffer the detrimental effects of area deprivation on preterm birth was not considered.

6.1.3 Birth outcomes and ethnic density

The study of area-level factors such as area deprivation and ethnic density in relation to birth outcomes could add to the evidence on ethnic inequalities in LBW and preterm delivery. A study conducted on the link between LBW and income deprivation in England found a positive association after controlling for individual covariates, especially for mothers aged 30 to 34 years old (Dibben et al., 2006). Another study based in Ontario, Canada reported that higher odds of LBW were associated with various factors at the neighbourhood level such as a lower average income, higher levels of unemployment, lower house values and lower rents (Meng et al., 2013). Studies on ethnic density and birth outcomes discussed in Chapter 5 provide a starting point for the analysis in this chapter, and also show room for improvement in design and methodology. The research performed by Pickett and colleagues (2009), which is the only study to analyse birth outcomes and own ethnic density in the UK, used individual- and area-level data collected around 2000. Urban areas in particular have changed over the past ten years with regard to demographics, ethnic densities, and levels of area deprivation. This study, being more up to date, will make an important contribution to the limited existing evidence on ethnic density and birth outcomes in the UK.

6.1.4 Aim and research questions

The aim of this study is to assess the associations between ethnic density and birth outcomes for Pakistani and White British infants in the BiB study. By taking into account various measures of SES, and by modelling the relationship between ethnic density and health with and without the inclusion of area-level deprivation, I consider the context of social disadvantage which may shape the associations between ethnic density and health.

I hope to achieve the aim of this study by answering four research questions:

1. *Is own ethnic density associated with birth weight for Pakistani infants?*
2. *Is own ethnic density associated with preterm birth for Pakistani infants?*
3. *Is own ethnic density associated with birth weight for White British infants?*
4. *Is own ethnic density associated with preterm birth for White British infants?*

6.2 Methods

6.2.1 Sample

The sample was derived from the BiB study, and data collection for this study was described in Chapter 4, including the selection process in Figure 4.1. Table 6.1 describes the sample (N=8,610) and subsample (N=8,098) used in this chapter. Sample 1 is the full sample and is used for the analyses of factors relating to preterm birth. Observations excluded from the analyses are multiparous births, stillbirths, second or third pregnancies of the same mother within the cohort, families living outside Bradford, or cases for which individual-level and area-level data could not be merged (N=1820). Only Pakistani and White British infants were included, as other ethnic minority groups were much smaller and did not have a similar distribution of ethnic density ranging from very low to very high. For the analysis of birth weight, only term babies were considered, to distinguish between LBW due to premature birth and small for gestational age.

Table 6.1 Composition of samples

	Sample 1 Full sample	**Sample 2 Term babies**
Total sample size (N)	8,610	8,098
Ethnic groups (N)		
Pakistani	4,561	4,302
White British	4,049	3,796
Exclusion criteria	multiple birth stillbirths second births within the cohort outside Bradford no area-level data	*In addition to sample 1:* Preterm birth (< 37 weeks)

6.2.2 Birth outcomes

Outcome measures are birth weight and preterm birth. Binary outcomes (LBW and preterm birth) have well-established cut-off points and allow comparisons with other studies. However, cut-off points are arbitrary and health implications of LBW for example might vary between ethnic groups (Wilcox, 2001, Masi et al., 2007). The cut-off point for LBW at 2,500 grams was established in 1919, at a time when babies below this birth weight often did not survive the first year of life (Morenoff, 2003). In addition, dichotomising continuous variables inevitably leads to a loss of information (Royston et al., 2006). In a previous study on the effects of ethnic density and other area-level factors on birth weight, the analysis using birth weight as a continuous variable produced significant findings whereas the model with LBW as a dichotomous variable did not

(Morenoff, 2003). Figure 6.2 shows that birth weight resembles a normal distribution in both groups, which justifies the use of birth weight as a continuous outcome variable. Gestational age was measured in weeks and as this measure is not continuous, preterm birth was the best option for this model (Figure 6.3). Birth weight when measured is rounded at 10 grams and gestational age, from which the preterm birth variable is derived, is measured in estimated completed weeks.

Figure 6.2 Frequency distribution of birth weight in both ethnic groups

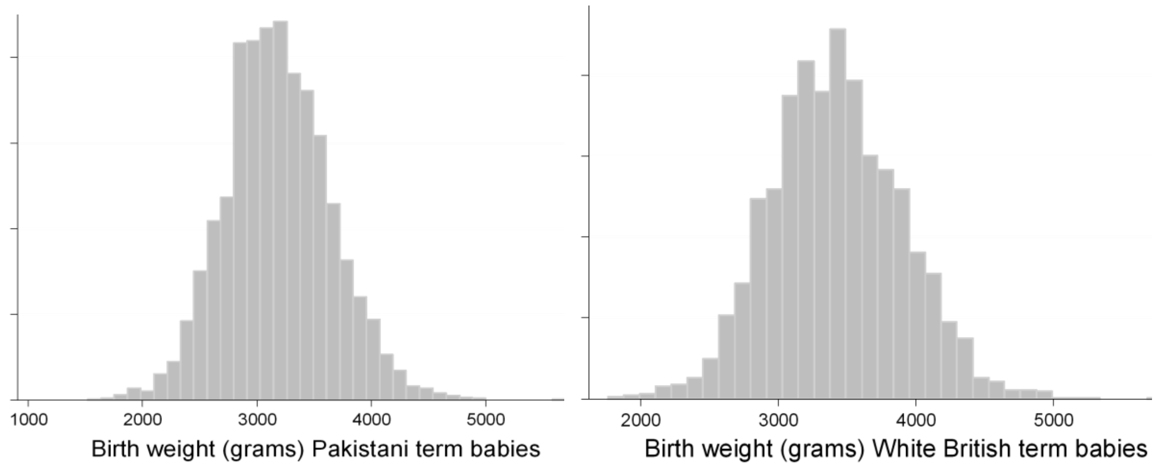
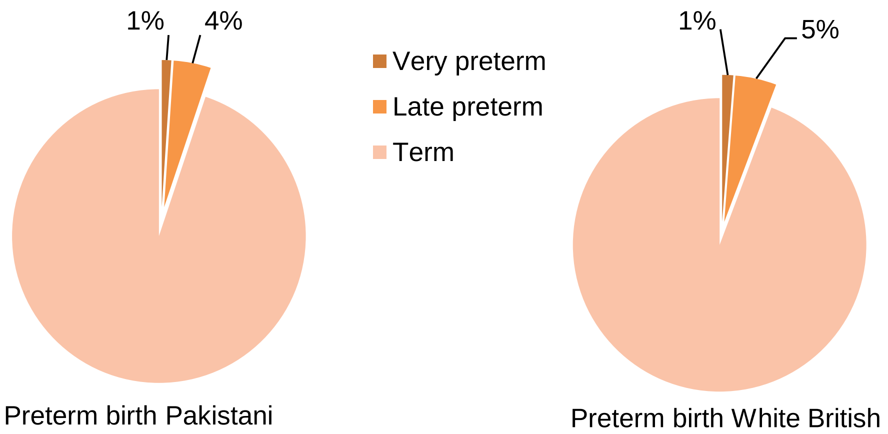


Figure 6.3 Frequency distribution of preterm birth in both ethnic groups



6.2.3 Ethnic density

The term ethnic density in this chapter refers to the density of the own ethnic group, unless stated otherwise. Ethnic density is measured as a categorical and continuous variable, as any effects of ethnic density are not necessarily linear and reliance on the categorical variable only may introduce bias (Bennette and Vickers, 2012, Royston et al., 2006). The categorical variable for the Pakistani sample consists of five categories with roughly equal numbers of mothers and infants: < 35% Pakistani residents, 35 to 49.99% Pakistani residents, 50 to 59.99% Pakistani residents, 60 to 70% Pakistani residents and > 70% Pakistani residents. For the White British group, the distribution of ethnic density is highly skewed to the right. Ethnic density is measured in five categories with approximately even numbers of mothers and infants: <55% White British residents, 55-74.99%, 75-84.99%, 85-90% and > 90%.

6.2.4 Covariates

Based on the literature, a number of variables were identified as potential covariates in the relationship between LBW and ethnic density, and preterm birth and ethnic density. Individual factors that may influence these birth outcomes are maternal age, maternal height, BMI, parity, sex of the baby, cohabitation status, and smoking during pregnancy. In addition, consanguinity and country of birth are associated with birth outcomes in Pakistani babies (Badshah et al., 2008, Shami et al., 1991, Margetts et al., 2002). Smoking during pregnancy is not included in the analyses as these data were frequently missing, but will be the focus of the following chapter. As few Pakistani women smoke during pregnancy, it is not likely to influence the relationship between ethnic density and birth outcomes in this group. Maternal weight is not included as the measure would not be valid given that women were pregnant upon measurement, with gestational age at the time of the questionnaire ranging from 11 to 41 weeks (mean 26.3 weeks).

Socioeconomic status

Low SES is considered a risk factor for LBW and preterm birth. Measures most commonly used are income, parental education and occupation, although these may not reflect best the influence of social disadvantage on health for ethnic minorities (Braveman et al., 2005). Four available SES measures in the BiB study are maternal education, employment status of the father, receiving means-tested benefits and self-reported financial situation. Levels of education were equivalised to the UK educational system, and this measure includes the following categories: lower than 5 GCSE, 5 GCSE, A-level, higher than A-level, other, don’t know, and foreign unknown. For the analysis the first four categories are included, and the others were coded missing (< 8%). Employment status of the father consists of the following categories: employed non-manual, employed manual, self-employed, student, unemployed and don’t know. Responses in the last category are considered missing (< 2%). A binary variable measured whether people receive means-tested benefits. Fourth, the variable on financial situation is phrased as: “How well would you say you and your partner are managing financially?” Response categories are: living comfortably, doing alright, just about getting by, quite difficult, very difficult, and does not wish to answer. The last category was again coded missing (< 1%). When comparing measures of SES, missing data appeared to be more likely for women of lower SES.

Area deprivation

Area deprivation is included as a potential confounder, as it has been found to affect birth weight independently of individual SES (Pearl et al., 2001) (Pattenden et al., 1999). In this study area deprivation is measured by the IMD 2010. The area deprivation score ranged from 3.65 (least deprived LSOA in Bradford) to 81.07 (most deprived LSOA in Bradford). Most of the data from this index was collected in 2008 (McLennan et al., 2011), which is close to the administration of the BiB questionnaire (March 2007 to December 2010). The IMD 2010 consists of six domains, including 'health and disability'. To avoid 'mathematical coupling' between the health domain and birth weight, this domain was removed from the IMD for use in the regression analyses (Adams and White, 2006). As a result of this, the weighting of other subdomains increased. The income and employment domains each made up 26.01% of the total score, the education domain 15.6%, and the domains barriers to housing, crime and environment each contributed 10.75%.

6.2.5 Statistical analysis

All regression analyses were performed with Stata 12 (StataCorp, 2011). The analytical strategy is shown in Table 6.2. First, individual covariates were examined in relation to health outcomes in a single level regression model. Initially all four measures of SES were included in the models. However, as these measures are correlated (Pearson's chi square test $p<0.001$ for all combinations), up to three SES variables were removed from the model if there was no evidence of an association with health in the adjusted statistical models ($p>0.1$). Other variables were removed from the models if they did not contribute to the fit of the model.

Area-level variation was tested in empty models at the level of MSOAs and LSOAs, and the latter was chosen as it showed more area-level variation. Step 3 involves a random intercepts multilevel model including area deprivation, but not ethnic density. Area deprivation and ethnic density were correlated, with a correlation coefficient of 0.358 ($p<0.001$) for Pakistani density, and a coefficient of -0.435 ($p<0.001$) for White British density. As multicollinearity is likely to affect the reliability of the results, ethnic density and area deprivation are first explored separately.

Table 6.2 Analytical strategy

Step	Description	Outcome	Dependent variable	Covariates
1	Exploring area-level factors and measures of SES	1a) LBW 1b) preterm birth	-	Paternal occupation Maternal education Financially managing Receiving means-tested benefits Area deprivation Ethnic density
2	Multiple regression model	2a) birth weight 2b) preterm birth	-	Based on literature and step 1
3	Multilevel random intercepts model	3a) birth weight 3b) preterm birth	area deprivation	based on step 2
4	Multilevel random intercepts model	4a) birth weight 4b) preterm birth	ethnic density 4a) continuous 4b) categorical	same as step 3 (excluding area deprivation)
5	Multilevel random intercepts model	5a) birth weight 5b) preterm birth	ethnic density 5a) continuous 5b) categorical	Same as step 3 (including area deprivation)
6	Non-linear regression model	6a) birth weight 6b) preterm birth	ethnic density 6a) continuous 6b) categorical	Same as step 3

In step 4, ethnic density is added to the previously established individual model. The analysis in step 5 uses the complete random intercepts multilevel model including both area-level factors. For example, the equations to estimate health outcomes in the Pakistani sample are as follows:

birth weight = b_{0ij} + b_1**maternal height* + b_2**consanguinity* + b_3**country of birth* + b_4**parity* + b_5**sex baby* + b_6**cohabitation* b_7**time at address* + b_8**maternal education* + b_9**deprivation* + b_{10}**ethnic density* + ε_{ij}

logit (probability of preterm birth) = b_{0j} + b_1**maternal age* + b_2**maternal height* + b_3**consanguinity* +b_4**country of birth* + b_5**parity* + b_6**financial situation* + b_7**deprivation* + b_8**ethnic density* + ε_{ij}

logit (probability of smoking) = b_{0j} + b_1**consanguinity* +b_2**country of birth* + b_3**parity* + b_4**cohabitation* + b_5**time at address* + b_6**maternal education* + b_7**financial situation* + b_8**deprivation* + b_9**ethnic density* + ε_{ij}

In these models, b is the coefficient, b0 the intercept of the coefficient, b0j the random intercept, i is the individual, j is level 2 (LSOA), and ε is the residual error. If post-estimation residual plots showed that one or more predictors were likely to be associated with birth outcomes in a non-linear fashion, a non-linear multilevel model would be employed in step 6.

After step 1 to 5, it was decided a non-linear model would not lead to an improved fit with the data. Two studies have previously reported very similar results predicting birth outcomes from linear and non-linear regression, and one method was not found to be significantly better than the other (Etikan and Çaglar, 2005, Bekiroğlu and Alkan, 2003).

As this chapter is based on the hypothesis that area-level ethnic density affects birth outcomes, geographic mapping is used to illustrate area-level differences in birth outcomes. All geographic maps are constructed in ArcGIS^{TM} (ESRI, 2011), and Empirical Bayes smoothing is performed with GeoDa^{TM} (Anselin et al., 2006).

6.3 Results

6.3.1 Individual- and area-level characteristics

For the Pakistani group, the analyses included data from 4,561 mothers and infants for whom health-related data are available, living in 182 LSOAs. This means that 125 LSOAs in Bradford Metropolitan District are not represented by Pakistani mothers in the BiB study. The 4,049 White British mothers and infants are spread out over 246 LSOAs, with no observations available for White British women and infants from 61 LSOAs. Table 6.3 gives a description of the study sample by ethnic group.

Table 6.3 Description of study sample

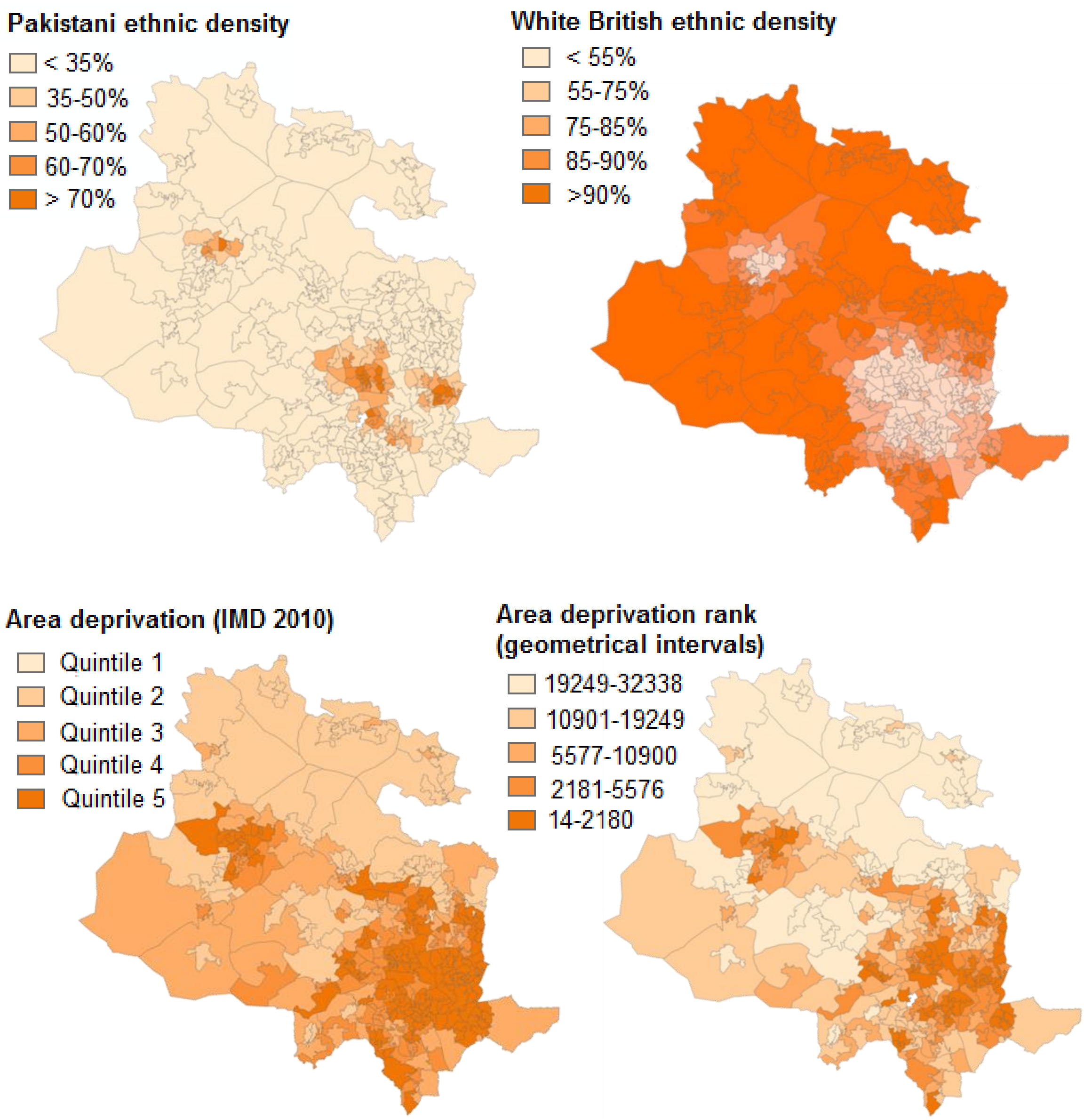
	Pakistani *N = 4,561*	**White British** *N = 4,049*
Individual-level characteristics		
Maternal age in years, mean (sd)	28.2 (0.08)	27.1 (0.10)
Time lived at address in years, mean (sd)	5.31 (5.85)	4.57 (5.41)
Parity, % first child	36.3	52.3
Sex of the baby, % male	51.1	51.3
Mother born in England (%)	42.5	96.7
Consanguineous (%)	64.1	0.0
Living with baby's father (%)	93.1	70.3
Receiving means-tested benefits (%)	45.3	37.0
Maternal level education (%)		
< 5 GCSE	27.0	22.2
5 GCSE	32.7	38.3
A level	13.1	18.9
> A level	27.3	20.6

	Pakistani	White British
	N = 4,561	*N = 4,049*
Occupation father (%)		
Non-manual	30.9	49.8
Manual	40.2	27.8
Self-employed	19.6	10.0
Student	1.3	1.4
Unemployed	6.9	9.4
Financial situation (%)		
Comfortable	26.8	26.5
Alright	41.8	40.5
Just about getting by	23.3	26.1
Quite difficult	6.3	5.1
Very difficult	1.7	1.8
Area-level characteristics		
Area deprivation (%)		
Quintile 1 (most deprived)	79.1	52.9
Quintile 2	14.3	20.7
Quintile 3	5.5	16.6
Quintile 4	0.3	4.7
Quintile 5 (most affluent)	0.2	3.4
Pakistani density: mean (sd)	54.1 (0.32)	11.4 (0.26)
White British density: mean (sd)	22.5 (0.32)	73.7 (0.36)
South Asian density: mean (sd)	61.7 (0.33)	14.7 (0.30)

Social and ethnic segregation in Bradford

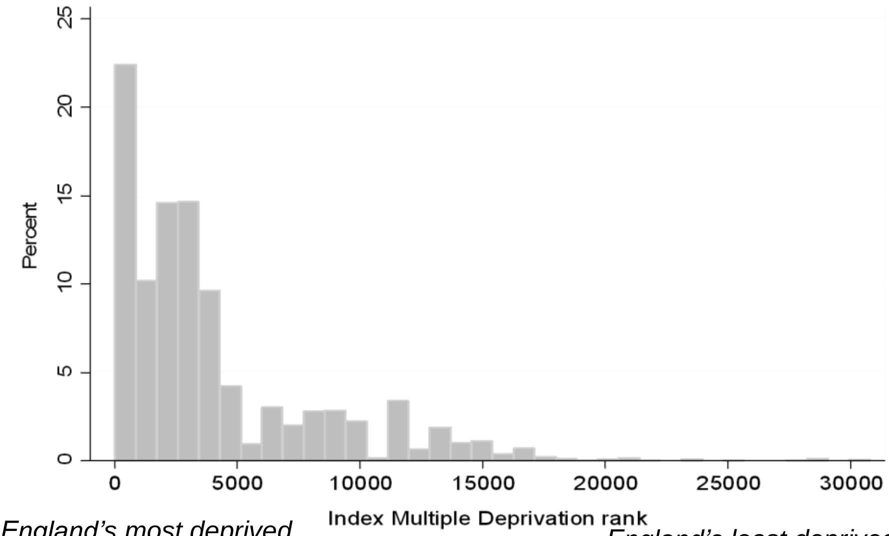
After a general description of Bradford in Chapter 2 of this thesis, a closer look at deprivation and ethnic density in the district of Bradford reveals patterns of social segregation in the city (Figure 6.4). Firstly, three clusters of high Pakistani density can be identified: north of the city centre around Manningham, the area of Thornbury and Barkerend in the east and south-west of the city centre around Horton Park (Figure 6.4, map A). The outlier north-west of the city is the town of Keighley, where the percentage of ethnic minorities has increased to more than 50% in recent years. Map B in Figure 6.4 shows that although Bradford is known for a high percentage of ethnic minority residents, the biggest part of the district has over 90% White British residents. A third observation that can be made from Figure 6.4 (map C) is that Bradford is very deprived in comparison to the rest of England, with much of the city ranking among the 20% most deprived areas. However, when area deprivation ranks are compared between areas in Bradford (Figure 6.4, map D), social inequalities between areas within the district become visible. It is areas with high Pakistani density that generally rank worse in terms of area deprivation.

Figure 6.4 (A, B, C, D) Geographical distributions of ethnic density and area deprivation over LSOAs in Bradford Metropolitan District



The areas of the subset of Pakistani families living in the least deprived neighbourhoods belong to the 6% least deprived LSOAs in the country, whereas areas of the Pakistani families living in the most deprived neighbourhoods score among the 0.05% most deprived of the country. Figure 6.5 shows that most Pakistani mothers from this sample live in areas that rank among the 5,000 most deprived in England (out of 32,482), which corresponds to the 15% most deprived areas.

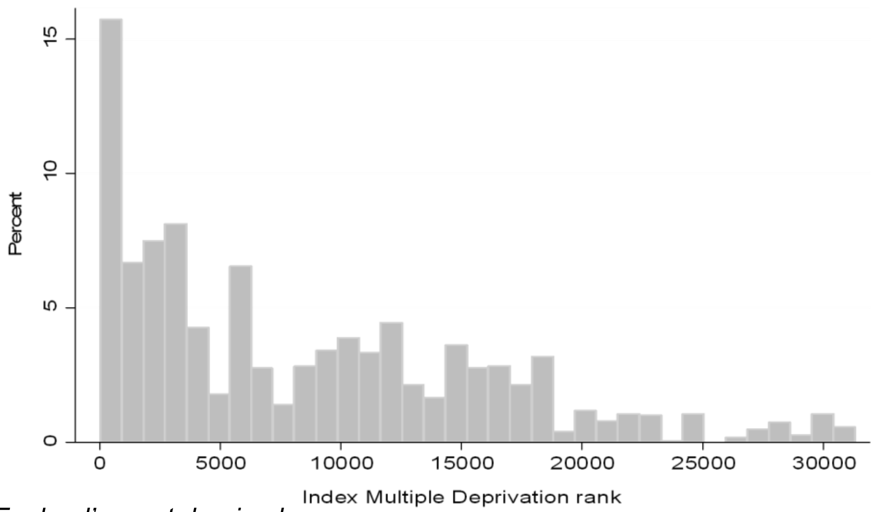
Figure 6.5 Distribution of Pakistani mothers (BiB) over Bradford LSOAs according to level of area deprivation (IMD 2010)



England's most deprived *England's least deprived*

The predominantly White British neighbourhoods are found outside the city centre, and include the suburbs of Bingley, Ilkley, and Shipley. In comparison with Pakistani mothers in the BiB study, most White British mothers live in less deprived areas. Nonetheless, most White British mothers in the sample come from areas that are more deprived than the country's average, and 35% of the White British mothers live in neighbourhoods that belong to the 10% most deprived in England (Figure 6.6).

Figure 6.6 Distribution of White British mothers (BiB) over Bradford LSOAs according to level of area deprivation (IMD 2010)

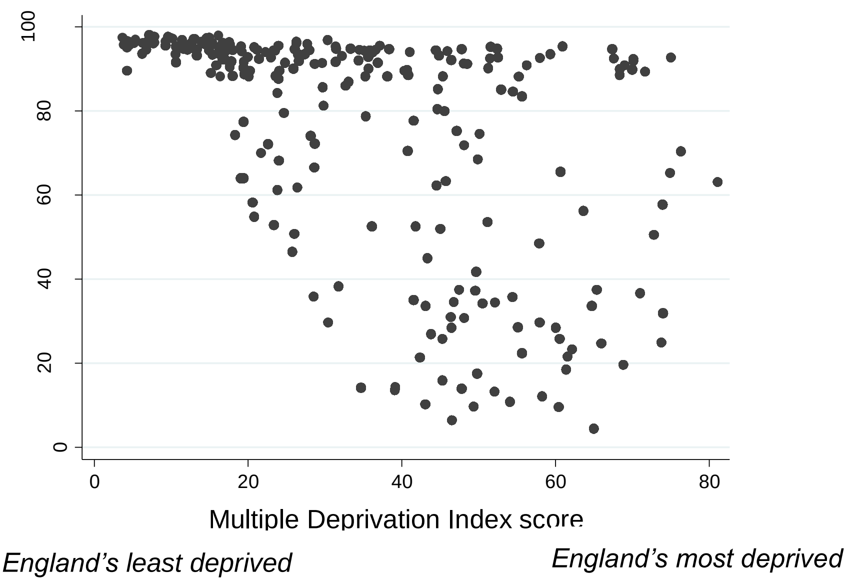


England's most deprived *England's least deprived*

Figure 6.7 shows that despite the strong association between ethnic density of the White British majority and area deprivation, areas in which the White British sample lives cover the spectrum of area deprivation found in Bradford. Areas with less than 85% White

British residents however all fall within the two most deprived quintiles. All areas with less than 20% White British residents fall within the most deprived quintile. The biggest social segregation is therefore not between very heterogeneous and predominantly White British neighbourhoods, but between neighbourhoods with a low percentage of White British residents and all other ones.

Figure 6.7 Correlation between White British density and area deprivation in Bradford LSOAs in the White British sample



Compositional differences between areas of varying Pakistani density

When looking at areas of varying Pakistani density in which the Pakistani sample lives (Table 6.4), the high level of area deprivation in areas with 50 to 60% and more than 70% Pakistani density stands out, together with the much lower level of area deprivation in the lowest ethnic density category. Pakistani women from the BiB sample living in areas with > 70% Pakistani residents are younger than average (t-test $p=0.008$), whereas Pakistani women in areas with < 35% ethnic density are older than average (t-test $p=0.047$). Higher own ethnic density is associated with a longer period of time lived at the address (linear regression, p for trend < 0.001), being less likely to be born in England (linear regression, $p<0.001$), and more likely to be in a consanguineous marriage (linear regression, $p<0.001$) (Table 6.4). In accordance with higher levels of area deprivation in higher Pakistani density areas (linear regression, p for trend < 0.001), the lowest average educational level is found in areas with 50 to 59.99% and areas with more than 70% Pakistani density (Pearson's chi square $p<0.001$).

Table 6.4 Composition of ethnic density areas Pakistani women and infants

Pakistani density	**< 35%**	**35-49.99%**	**50-59.99%**	**60-70%**	**> 70%**
Number of LSOAs	*114*	*22*	*17*	*16*	*12*
Number of observations	*802*	*775*	*793*	*954*	*1013*
Area-level characteristics	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Area deprivation (IMD 2010)[a]	40.2	46.7	49.6	44.6	51.8
% residents born in England	85.9	78.5	68.5	67.0	60.4
Individual-level characteristics	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**
Maternal age (years)	28.5	28.2	28.0	28.4	27.8
Time lived at address (years)	4.1	4.4	5.6	6.0	6.1
% first baby	36.0	34.2	35.23	37.6	37.5
% mothers born in England	50.0	40.5	42.50	41.5	38.5
% consanguineous	56.2	60.5	62.55	69.6	71.2
% living with baby’s father	92.4	92.0	93.31	94.3	93.3
% mothers < 5 GCSE	18.9	22.4	29.62	25.3	31.7
% receiving means-tested benefits	42.5	45.5	49.49	44.8	45.6

a) A higher score indicates a higher level of deprivation

Table 6.5 Composition of ethnic density areas White British women and infants

White British density	**< 55%**	**55-74.99%**	**75-84.99%**	**85-90%**	**> 90%**
Number of LSOAs	*82*	*33*	*30*	*34*	*65*
Number of observations	*710*	*727*	*792*	*736*	*897*
Area-level characteristics	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Area deprivation (IMD 2010)[a]	45.83	35.68	44.67	36.99	23.32
% residents born in England	78.45	91.53	93.11	94.23	94.90
Individual-level characteristics	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**
Maternal age (years)	25.86	27.02	26.90	27.19	28.26
Time lived at address (years)	4.44	4.56	4.48	4.65	4.60
% first baby	53.73	50.43	48,82	51.82	56.42
% living with baby’s father	63.56	68.69	69.53	71.06	77.90
% mothers < 5 GCSE	27.68	20.08	22.10	16.17	14.86
% receiving means-tested benefits	49.01	38.24	39.37	35.33	25.59

a) A higher score indicates a higher level of deprivation

Compositional differences between areas of varying White British density

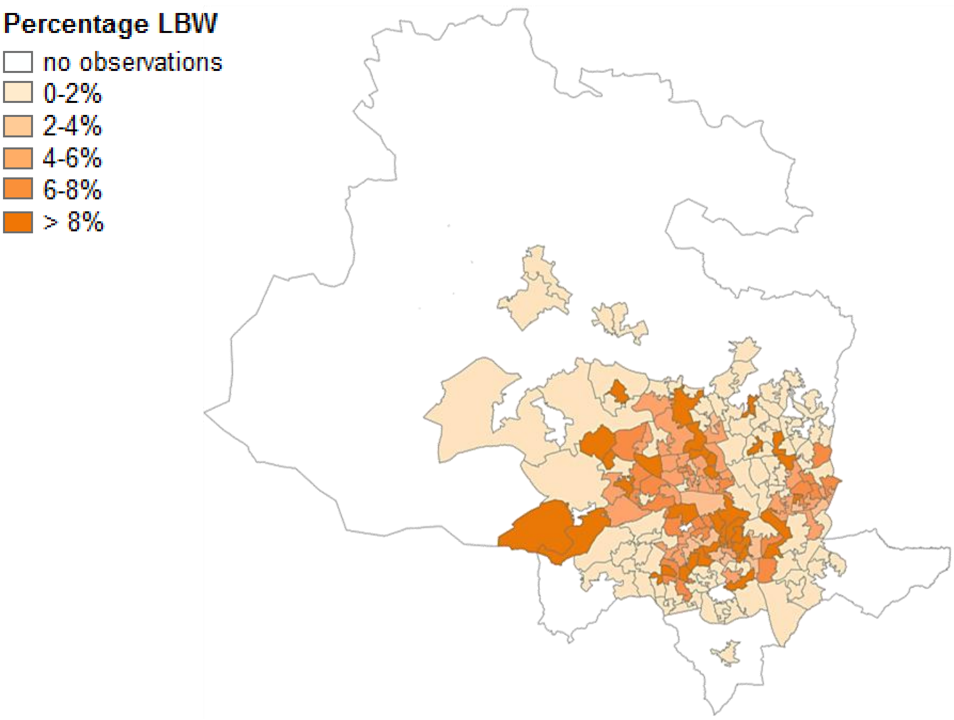
Most White British live in areas where they are in the majority. Only 628 women (16%) live in areas with < 50% White British residents, and only 164 women (4%) live in areas with < 20% White British residents (Table 6.5). Area deprivation is highest in areas with less than 55% White British residents and 75 to 85% White British density. Women were on average older if they were living in areas with higher levels of White British density (linear regression, p for trend < 0.001), they were more likely to live with the father of the baby (linear regression, p for trend < 0.001), less likely to receive benefits (Pearson's chi square p<0.001), and on average these women had higher levels of education (Pearson's chi square p<0.001).

6.3.2 Ethnic density and birth outcomes Pakistani infants

Results are presented for Pakistani and White British infants separately. All models, including those not incorporated in the results shown below, can be found in Appendix 3A.

None of the SES measures were associated with birth weight or preterm birth for Pakistani infants. Although Figure 6.8 shows considerable variation in incidences of LBW between areas in Bradford, the regression model suggests that area-level variation is small and most variation in birth outcomes can be attributed to the individual level. Area deprivation was not statistically significant in association with birth weight for Pakistani babies, but seemed to be related to higher birth weight rather than lower birth weight (Table 6.6).

Figure 6.8 Spatial distribution of low birth weight Pakistani (smooth rates)



In the full model with ethnic density as a continuous variable, one percent increase in the percentage of Pakistani residents was associated with an estimated 0.82 grams reduction in birth weight (β -0.82, 95% CI -1.63; -0.02), and higher area deprivation was associated with a higher birth weight (β 3.91, 95% CI 0.71; 7.11). When ethnic density was modelled as a categorical variable the association between ethnic density and birth weight was not statistically significant, but the coefficients point towards a lower birth weight for Pakistani infants in areas with higher Pakistani density. Higher deprivation remained associated with higher birth weight (Table 6.6).

When ethnic density was modelled as a continuous variable, a higher level of area deprivation was associated with a higher chance of preterm delivery (OR 1.03, p=0.056). The highest category of ethnic density was associated with higher odds of preterm birth (OR 1.66, 95% CI 1.06; 2.62), but this effect was no longer statistically significant after taking into account area deprivation (Table 6.6). Ethnic density measured as a continuous variable was not a statistically significant factor in this model, and neither was a squared measure of ethnic density (analysis not shown).

Table 6.6 Ethnic density in relation to birth outcomes Pakistani infants

Multilevel models[a]	*β (95% CI)* Birth weight	*OR (95% CI)* Preterm birth
	N = 3713	N = 4107
Area deprivation (IMD 2010)	3.88 (0.67;7.10)*	1.02 (0.99; 1.05)
Ethnic density (versus < 35%)		
35-49.99%	-3.64 (-51.75;44.47)	1.24 (0.75; 2.05)
50-59.99%	-31.79 (-81.24;17.66)	1.40 (0.85; 2.30)
60-70%	-29.99 (-77.30;17.31)	0.96 (0.57; 1.60)
> 70%	-45.49 (-96.92;5.95)	1.44 (0.86; 2.40)

*** p < 0.001, ** p < 0.01, * p < 0.05.

a) Random intercepts multilevel models were adjusted for maternal height, parity, sex of the baby, cohabitation status, maternal country of birth, consanguinity, and measures of SES (maternal education, employment status of the father, receiving means-tested benefits, and self-reported financial situation).

Post-estimation plots of the birth weight model show that the residuals seem to be normally distributed (Figure 6.9 and 6.10). The two outliers in both graphs are caused by observations with birth weights of 4,940 and 5,700 grams, born at respectively 37 and 39 weeks.

Figure 6.9 Normal probability plot of residuals birth weight model Pakistani

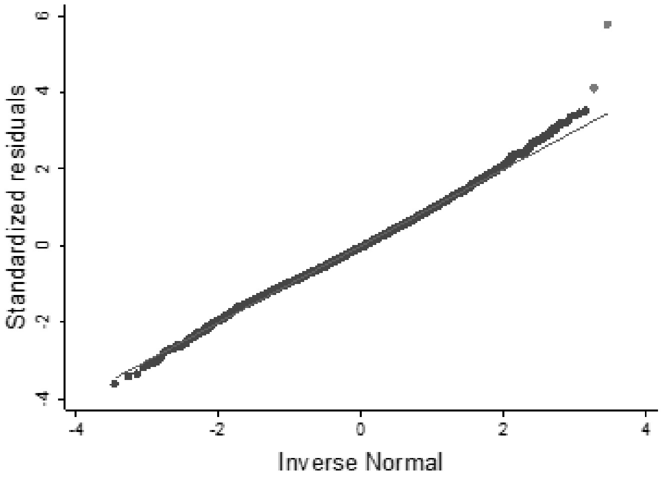
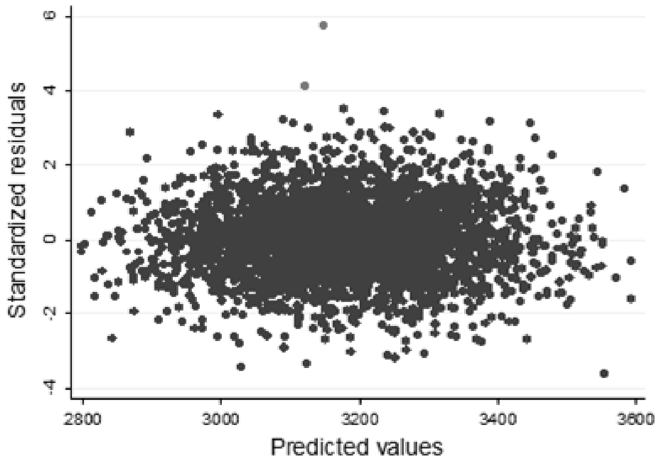


Figure 6.10 Residuals versus fit plot birth weight model Pakistani



6.3.3 Ethnic density and birth outcomes White British infants

Contrary to the analyses for Pakistani babies, measures of SES were associated with birth outcomes for White British babies (Appendix 3A). Babies born in a household receiving means-tested benefits with an educational level of the mother below 5 GCSE were estimated to have an average birth weight of 3,315 grams (95% CI 3,274; 3,355), compared to an average birth weight of 3,499 grams (95% CI 3,459; 3,538) for White British babies born to mothers not receiving means-tested benefits with an educational level higher than A-levels.

Figure 6.11 suggests that prevalence rates of LBW are higher in particular areas of Bradford, and some of the clusters are similar for LBW and preterm birth (Figure 6.12). However, there is no distinct pattern in relation to ethnic density or area deprivation.

Figure 6.11 Spatial distribution of low birth weight White British (smooth rates)

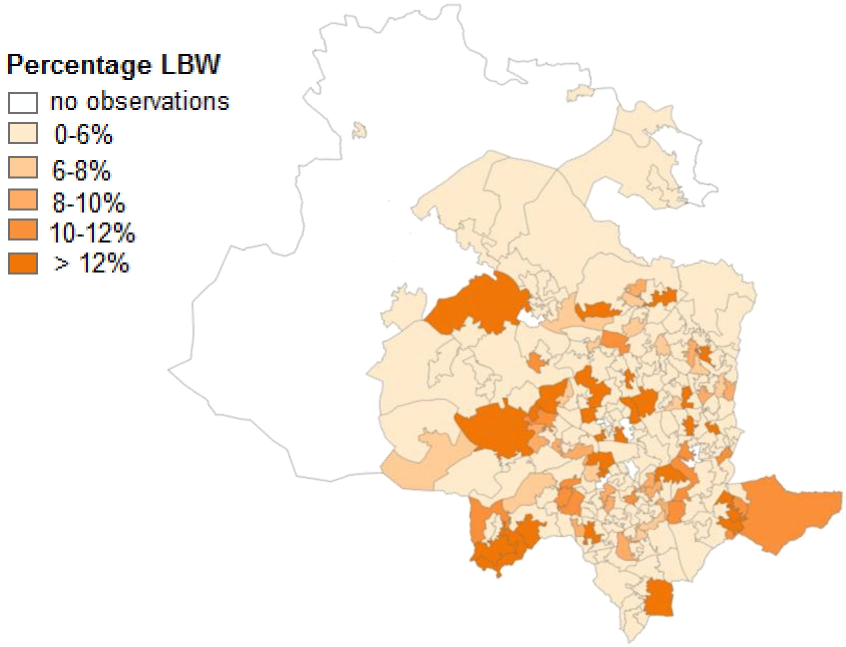


Figure 6.12 Spatial distribution preterm birth White British (smooth rates)

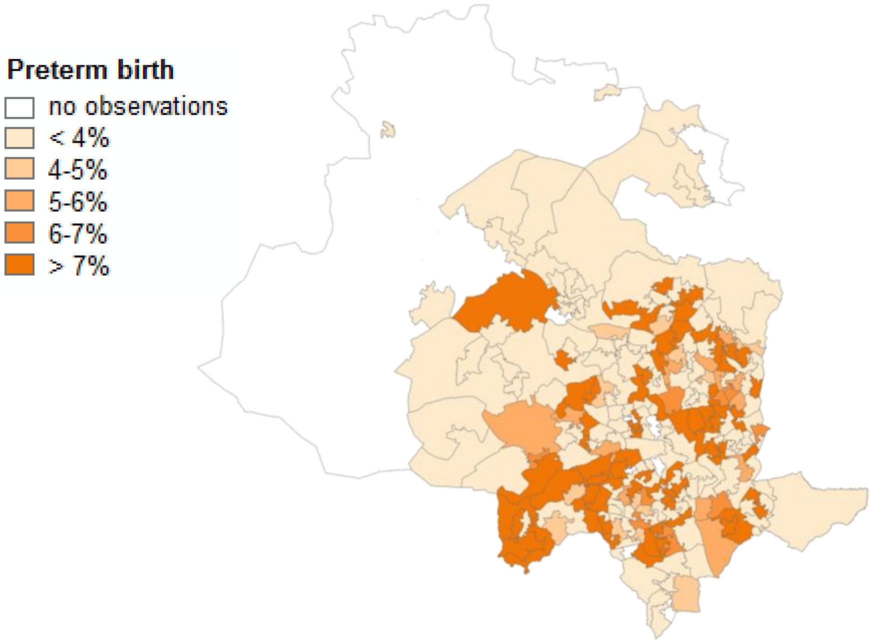


Table 6.7 summarises the results of the multilevel regression analyses for the White British sample. There was no statistically significant association between higher own ethnic density and higher birth weight after the introduction of area deprivation (β -3.26, p=0.077) in the model. However, living in areas with at least 55% White British tended to be associated with a birth weight 21 (p=0.418) to 46 (p=0.093) grams higher than in areas with less than 55% White British residents (p>0.05). The odds of preterm birth seemed slightly higher in areas with higher area deprivation (OR 1.03, p=0.074) (Table 6.7). The association between higher odds of preterm birth in areas with a higher percentage of White British residents was not statistically significant.

Table 6.7 Ethnic density in relation to birth outcomes White British infants

Multilevel models[a]	*β (95% CI)* Birth weight	*OR (95% CI)* Preterm birth
	N = 3133	N = 3707
Area deprivation (IMD 2010)	-3.26 (-6.88;0.36)	1.03 (1.00;1.06)
Ethnic density (versus < 55%)		
55-74.99%	36.97 (-16.82;90.76)	1.04 (0.63;1.71)
75-84.99%	21.39 (-30.38;73.15)	1.00 (0.63;1.60)
85-90%	22.81 (-30.08;75.69)	1.11 (0.69;1.78)
> 90%	46.54 (-7.68;100.76)	1.29 (0.79;2.10)

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

a) Analyses were adjusted for maternal height, parity, sex of the baby, cohabitation status, and measures of SES (maternal education, employment status of the father, receiving means-tested benefits).

Post-estimation plots show that a linear regression analysis seems appropriate to model the data (Figure 6.13 and 6.14). The outlier in both figures is an observation with a birth weight of 5,800 grams, born at 41 weeks.

Figure 6.13 Normal probability plot of residuals birth weight model White British

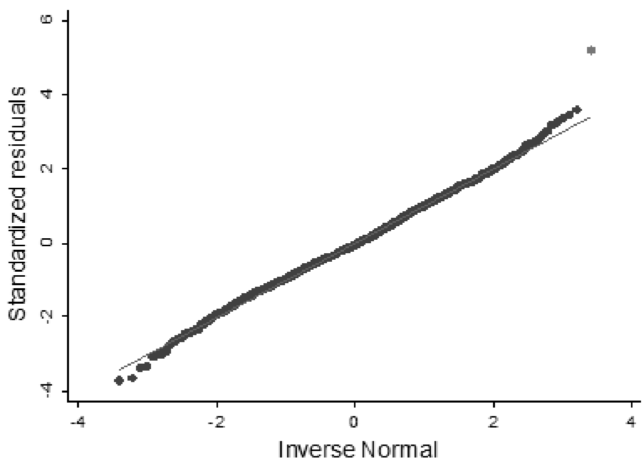
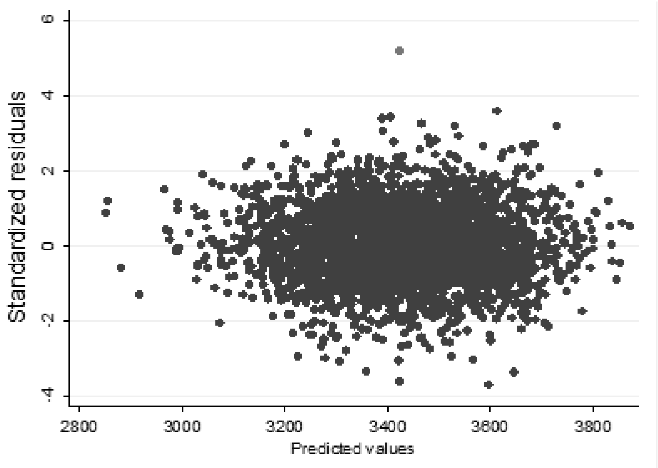


Figure 6.14 Residuals versus fit plot birth weight model White British



6.4 Discussion

6.4.1 Key findings

In this sample of Pakistani and White British women and infants, associations between more favourable birth outcomes and higher own ethnic density could not be demonstrated. High Pakistani density (>70% compared to < 35%) was associated with higher prevalence rates of preterm birth if area deprivation was not included in the model (OR 1.66, p = 0.028), and ethnic density measured as a continuous variable was associated with lower birth weight for Pakistani infants if area deprivation was included in the model (β -0.82, p = 0.045).

6.4.2 Results in relation to the literature

The literature on ethnic density and birth outcomes shows some evidence of associations between better health and higher ethnic density for ethnic minorities (Shaw and Pickett 2013; Shaw, Pickett, and Wilkinson 2010; Walton 2009; Pickett et al. 2009; Jenny, Schoendorf, and Parker 2001). Evidence suggesting a beneficial association between ethnic density and birth outcomes has predominantly been found for US Hispanics, and UK Pakistani, Bangladeshi and Indian groups, but not for Black American, UK Black Caribbean and UK Black African groups. For African Americans in particular, associations between higher ethnic density and birth outcomes detrimental to health have been reported more often than associations in the opposite direction (Table 5.1, Chapter 5).

Ethnic density as a proxy for social disadvantage

The unexpected positive association between area deprivation and birth weight for Pakistani infants suggests that this association is confounded by other factors, or that the measures used does not capture SES and area deprivation accurately for Pakistani residents of Bradford. Recently the BiB data were used to perform a latent class analysis of SES, which revealed different categories of SES for different ethnic groups. Pakistani families were more likely than White British families to fall into a category of those who have a high uptake of means-tested benefits, but who are not materially deprived (Fairley et al. 2014).

Instead of capturing positive health effects of strong community networks, ethnic density seems to act as an indicator of social disadvantage in this study. This is confirmed by the strong correlation between own ethnic density and area deprivation in the Pakistani sample, and by the initial associations between Pakistani density and poor health that disappeared once area deprivation was accounted for. In their study, Bell and colleagues (2007) attributed the lack of protective ethnic density effects in very high density areas to a higher level of deprivation. These findings are in line with a study on preterm birth in the US, which reported harmful effects of ethnic density only in more deprived neighbourhoods (Mason et al., 2010). Even though the models were tested for the risk of bias caused by multicollinearity, which was found to be small (VIF < 2 for each of the variables) (O’brien 2007), areas with high levels of Pakistani density were more deprived than the average deprivation level in Bradford, and much more deprived than the average for England. Social and tangible support from social networks in ethnically dense areas may not counteract the detrimental impact of social disadvantage on health outcomes in the most deprived areas.

6.4.3 Strengths and limitations

A number of methodological issues limiting previous research on ethnic density effects were successfully addressed in this study. The sample was sufficiently large to model multifactorial multilevel relationships, covariates were identified from the literature and tested in individual models, levels of Pakistani ethnic density covered a broad range, the area level used in the analysis was determined based on the assessment of area-level variance, and the fact that data were collected from a single city allowed for a better understanding of the context of the research. However, this study was still affected by limitations that are often encountered in ethnic density research.

Area of residence

Firstly, although LSOAs showed more area-level variance than MSOAs in the multilevel analyses, these areas are determined by administrative boundaries rather than residents' perception of communities. This 'measurable area-unit problem' implies that LSOAs do not necessarily define neighbourhoods. For example, it is evident that many Pakistani families have networks within which social- and economic capital are exchanged across national boundaries. Qualitative research and new mapping techniques less hindered by administrative boundaries, such as the use of GPS tracking software, could address these shortcomings.

Secondly, self-selection of residents into neighbourhoods was the reason for a careful consideration of the differences between residents in areas of varying ethnic density. However, without information on the exact motives behind residential choices, I could not adjust for self-selection in the analyses. Residents live in a certain area not just because they are attracted to the characteristics of the neighbourhood, but also because they are restricted by the means at their disposal and availability of appropriate housing (Oakes 2004). In the creation of areas with high minority density, there is an interaction between positive choices by residents, constraints imposed by outside agents, and supply side considerations like provision of certain sorts of housing stock by local and national policies. People who choose not to live in areas with a high percentage of their own ethnic group may have more financial flexibility to choose more expensive housing, they may be people who feel that ethnicity plays only a minor role in their identity, or they may not have a sense that neighbours are key for providing them with social support (Shon 2010).

Thirdly, characteristics of the area of residence were measured at one point in time, while neighbourhoods are subject to constant change just as residents are. Neighbourhood change might affect residents and their health, especially for residents who do not have the ability to move from deteriorating neighbourhoods, or those who stay because of benefits derived from the local community. The fact that neighbourhoods are dynamic is often not taken into account in research on health and place, because most research depends on static measures such as ethnic composition or area deprivation at a certain point in time. If the BiB study was to continue over a longer period of time, adding data points with more information on neighbourhood characteristics at different points in time would greatly benefit research on ethnic density and health.

Length of exposure

Furthermore, this study made use of cross-sectional data only, and therefore does not take into account the length of exposure to area-level determinants of health. Mohnen and colleagues (2012) reported that, especially for households with young children, the association between self-rated health and NSC grew stronger with longer duration of residence. In the case of this study, birth outcomes may be impacted by a long duration of residence in a neighbourhood, but for new residents it is more likely that LBW and preterm birth are influenced by psychosocial factors, health behaviour and environmental factors of their previous place of residence. The majority of mothers in the sample were young women who had lived in their neighbourhoods for less than five years. To capture this longitudinal effect to some extent the measure 'duration of residence' was included in the analyses. In this study I found no evidence of an interaction between duration of residence in a neighbourhood and the effect of ethnic density on health.

Research setting

Finally, although the BiB sample has been found to be reasonably representative of the maternal population of Bradford (Wright et al. 2013), results may not be generalisable to other populations and settings. The spatial patterning in Bradford according to SES and ethnicity is unique in the UK. In particular, the ethnic composition of the city centre is different from other cities in England. The literature discussed in Chapter 5 mostly measures the differences in health outcomes between areas with no or close to 0% ethnic minorities, compared to areas with just over 50% ethnic minorities. In the BiB sample, only 4% of the Pakistani mothers live in LSOAs with less than 10% Pakistani residents. Of the Pakistani sample, 63% live in areas where they are in the majority, and 88% live in areas where there are more ethnic minorities than White British residents. Protective effects of ethnic density have previously been reported to show a non-linear pattern, and may exist for medium levels of ethnic density only (Shaw, Pickett, and Wilkinson 2010). Mechanisms of social support, cohesion and shelter from discrimination might not be beneficial to health in areas where minority ethnic density and area deprivation are very high. Previous research in New Zealand reported that the influence of social disadvantage is bigger than the influence of the ethnic composition of areas, which makes the BiB sample less suitable for the detection of associations between ethnic density and health, and this may explain why no associations between ethnic density and birth outcomes were found in Bradford (Moon et al., 2012). However, I did use both continuous and categorical measures of ethnic density, and tested for non-linear associations with ethnic density, which did not alter findings.

6.4.4 Research implications

Birth outcomes

Although this chapter has seen the confirmation of several factors related to birth outcomes for White British babies, much of the variance in birth weight and preterm birth among Pakistani babies remains unaccounted for. Country of birth and consanguinity are factors that have been mentioned in relation to birth outcomes in the literature and were confirmed as statistically significant in some of the analyses in this chapter. However, the associations between birth outcomes and ethnic density remain unclear. Birth outcomes might not be sensitive enough to find associations with ethnic density, as they have previously been reported to remain remarkably stable in times of severe deprivation (Stein and Lumey 2000). For short term residents in particular, it is more likely that health behaviours are associated with ethnic density, through social networks, social support and norms in the community. In addition, health outcomes more likely to be associated with chronic stress, such as hypertension (Sparrenberger et al. 2008), cardiovascular morbidity and mortality (Öhlin et al. 2004) or health behaviours (Torres and Nowson 2007), might reveal an impact of ethnic density many years after settling in a neighbourhood. To clarify this, the next chapter will repeat the ethnic density analysis for ethnic density in relation to smoking during pregnancy, one of the health outcomes more convincingly related to ethnic density in previous studies, and known to be related to peer pressure, social norms and social support (Bell et al., 2007, Pickett et al., 2009, Shaw, Pickett, and Wilkinson 2010).

Causal pathways

Causal mechanisms should be explored further in order to clarify the nature and importance of ethnic density effects. These effects might vary by ethnic group. Social capital and related concepts referring to the potential benefits derived from social networks may function as a buffer of detrimental effects of social disadvantage for some, but they may be inhibited by a lack of economic and cultural capital for others. Chapter 8 of this thesis will explore the role of social capital, which might or might not be related to ethnic density. Research from the US published after I conducted the literature review (Chapter 5) shows that neighbourhood ethnic density was associated with poor mental health for Asian Americans and Latinos, and this relationship was partly mediated by social cohesion (Hong et al., 2014). Latino density was associated with higher social cohesion, which in turn was associated with better mental health. Asian density on the other hand was associated with lower social cohesion, which correlated with worse mental health (Hong et al., 2014).

Social gradients in health by ethnic group

Although not the main focus of this thesis, the lack of association between SES and health for ethnic minorities is reason for further research. Without a better understanding of the role of social disadvantage in the health of ethnic minorities, it is impossible to fully uncover the effects of ethnic density on health. Chapter 9 will therefore further address social gradients in health for ethnic minorities, providing direction for future research. In addition, there is a role for qualitative research to improve our understanding of the link between health, ethnic density and social disadvantage. In particular, qualitative research is needed to tackle the issue of ‘self-selection’ into areas, as not enough is known about residential preference in relation to ethnic density and area deprivation.

Chapter 7

Ethnic density in relation to smoking during pregnancy

Toller, Bradford. Own photography.

7.1 Introduction

The analysis of own ethnic density in relation to birth outcomes in the previous chapter did not confirm any protective ethnic density effects on health. This chapter approaches the ethnic density hypothesis from a slightly different angle, focussing on the health benefits people may derive from living amongst ethnic minority groups that display healthier behaviours than the White British population.

7.1.1 Smoking during pregnancy

Smoking during pregnancy has been linked to foetal growth restriction, stillbirth, preterm birth, a range of birth defects, sudden infant death syndrome, behavioural disorders and anti-social behaviour in childhood, and child overweight (Cnattingius, 2004, Oken et al., 2008, Von Kries et al., 2002, Knopik et al., 2012). These health effects may partly be mediated by the ability for tobacco smoke to trigger DNA methylation, hereby altering gene expression during pregnancy (Wakschlag et al., 2002, Knopik et al., 2012). Apart from consequences for the offspring, changing public attitudes in Britain and other countries have led to female smokers being increasingly stigmatised for what can be seen as a coping strategy to deal with stressors in life (Joubert et al., 2012). Additional stress is caused by the fact that many pregnant women wish to stop smoking, but feel unable to do so (Hackshaw et al., 2011).

7.1.2 Smoking among Britain’s ethnic minorities

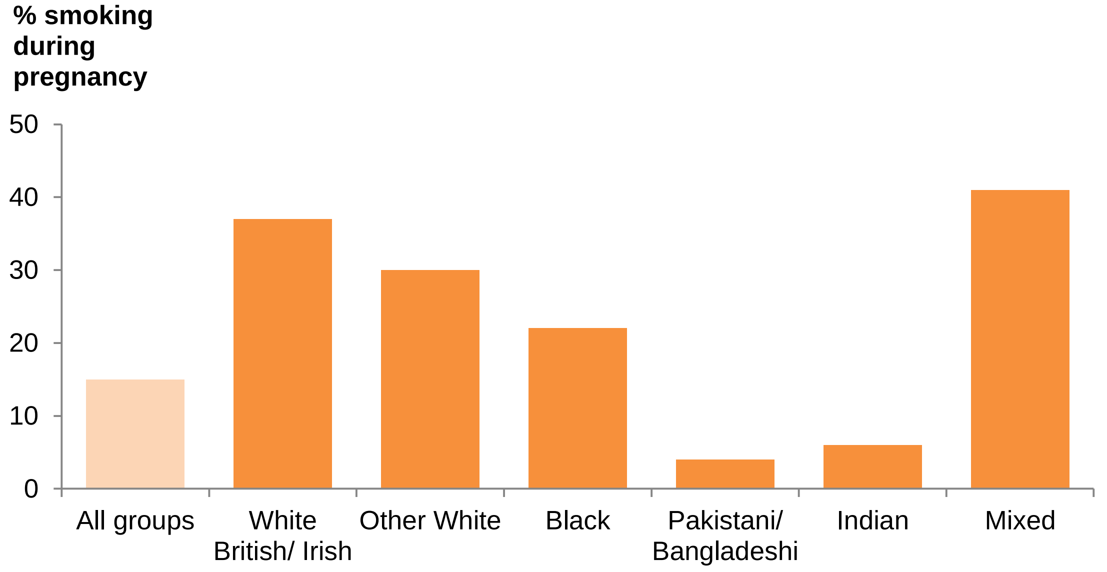
Both men and women were asked about smoking habits in the HSE of 2004, and the largest ethnic differences in the prevalence of cigarette smoking were reported for women (HSCIC, 2005). Around a quarter of women in the general population reported current smoking (23%), and figures were similar for Black Caribbean (24%) and Irish women (26%). Black African, Indian, Pakistani, Bangladeshi and Chinese women were all significantly less likely to report cigarette smoking, with prevalence rates being lowest among Bangladeshi women. For Bangladeshi women, the use of chewing tobacco was more prevalent than cigarette smoking. This was especially true for older Bangladeshi women (35 to 54 years old), of whom 26% reported to regularly use chewing tobacco. Among younger women this prevalence was lower (9%), and a downward trend in the consumption of chewing tobacco was observed for Bangladeshi men and women from 1999 to 2004 (HSCIC, 2005). When a measure was constructed to include the use of all tobacco products, combined with a test of saliva cotinine levels which indicates recent tobacco use, differences between women of various ethnic groups in the prevalence rates of tobacco use decreased somewhat. Nevertheless, Indian, Pakistani and Chinese women were still significantly less likely to consume tobacco products than other ethnic groups.

The HSE of 2004 (HSCIC, 2005) remains the main source of information on smoking prevalences across ethnic groups in England, despite the data now being more than ten years old. In a recent study, data from the Integrated Household Survey (2009 to 2012) and GP Patient Survey (2012) was combined to estimate the current prevalence rates of smoking in England and Wales (Troe et al., 2008). In the White British group, 20% of the women were current smokers. Among ethnic minority women, prevalence rates of smoking were higher for those born in the UK than those born abroad, with the exception of the ‘Other White’ group (prevalence ratio UK: non-UK 0.89, 95% CI 0.83; 0.95). Prevalence rates of smoking were lowest among South Asian women, with 3.3% for Indian women, 4.5% for Pakistani women, and 4.6% for Bangladeshi women. Among these women prevalence rates were two to three times higher for those born in the UK than those born in other countries (Troe et al., 2008).

7.1.3 Smoking during pregnancy among Britain’s ethnic minorities

Most sources of information on smoking during pregnancy in the UK do not specify prevalence rates by ethnic group. The only relatively recent source of information in this respect is the MCS. Mothers in the ‘mixed’ group wre more likely to smoke cigarettes during pregnancy (41%), followed by White British mothers (37%), those labelled ‘Other White’ (30%), and ‘Black’ (22%) (Figure 7.1) (Hawkins et al., 2008).

Figure 7.1 Prevalence rates of smoking during pregnancy by ethnic group in the Millennium Cohort Study (weighted percentages). Prevalence rates adopted from Hawkins et al (2008).



The lowest prevalence rates for smoking during pregnancy were reported by the Indian mothers (6%), and Pakistani/Bangladeshi mothers (4%) (Hawkins et al., 2008). As for smoking among UK ethnic minority groups in general, it is to be expected that prevalence rates of smoking during pregnancy are associated with country of birth and acculturation of the mother. A US study confirmed that acculturation, measured by language preference, was associated with higher odds of smoking during pregnancy for Hispanic women (Detjen, 2007).

7.1.4 Ethnic density and smoking during pregnancy

Of the twelve studies on ethnic density and behavioural outcomes identified in Chapter 5, two studies reported on smoking among ethnic minorities (Datta et al., 2006, Kandula et al., 2009), two studied smoking among youth (Xue et al., 2007, Kulis et al., 2007), and two studies reported on smoking during pregnancy (Shaw, Pickett, and Wilkinson 2010, Bell et al., 2007).

Bell and colleagues measured isolation and clustering of African Americans, rather than ethnic density (Bell et al., 2007). However, because these measures functioned as indicators of spatial segregation of the African American population from the White American population, this closely relates to African American density. Results showed a u-shaped curve, with both high and low isolation and clustering being associated with higher odds of smoking during pregnancy for African American women. The authors suggested that higher rates of smoking in areas with low segregation could be explained by the greater tolerance for smoking during pregnancy in the White American group, which makes up a bigger part of the population in these neighbourhoods. In areas with high segregation on the other hand, the detrimental effects of social disadvantage could increase odds of smoking during pregnancy despite the stigma attached to smoking during pregnancy in the African American group (Bell et al., 2007). As the previous chapter of this thesis has shown a strong dependency between Pakistani density and area deprivation in the BiB sample, ethnic density effects on smoking during pregnancy may very well be non-linear in this sample.

In another US study, ethnic density of the own ethnic group was found to strongly reduce the odds of smoking during pregnancy for Hispanic and Black mothers (Shaw, Pickett, and Wilkinson 2010). Compared to areas with 0 to 0.99% own ethnic density, the OR in areas with ≥ 50% own ethnic density was 0.12 (95% CI 0.10;0.16) for Black and 0.11 (95% CI 0.07;0.17) for Hispanic mothers. The effect of ethnic density was stronger when US born Hispanics were considered separately, because foreign-born Hispanics had a very low prevalence rate of smoking (Shaw, Pickett, and Wilkinson 2010).

What follows from these studies is that people are less likely to smoke in areas where this health behaviour is less accepted and subject to greater stigma, regardless of the ethnic group to whom they belong or the ethnic groups that influence social norms around smoking during pregnancy in their area of residence. It has been shown that Hispanic density is associated with lower odds of smoking during pregnancy for White, Black, and Hispanic US women (Shaw and Pickett, 2013). Similar to Hispanic women in the US, the prevalence of smoking during pregnancy is low for South Asian women in the UK. It might therefore be expected that effects of ethnic density 'spill over' from the South Asian group to other ethnic groups, so that the odds of smoking during pregnancy will be lower in UK areas with higher South Asian density. This hypothesis will be tested among Pakistani and White British residents in Bradford who are part of the BiB study.

7.1.5 Aim and research questions

The aim of this chapter is to examine whether White British and Pakistani mothers are less likely to smoke during pregnancy if they live in neighbourhoods with a high percentage of South Asian residents. The potential influence of social disadvantage is taken into account, to acknowledge that the associations between South Asian density and prevalence rates of smoking during pregnancy might vary depending on individual SES or the level of area deprivation. Four questions are explored to achieve this aim:

1. Is South Asian density associated with prevalence rates of smoking during pregnancy among Pakistani women?

2. Is South Asian density associated with prevalence rates of smoking during pregnancy among White British women?

3. Do the associations between South Asian density and prevalence rates of smoking during pregnancy for Pakistani and White British women vary by level of area deprivation?

4. Do the associations between South Asian density and prevalence rates of smoking during pregnancy for Pakistani and White British women vary by level of individual SES?

7.2 Methods

The methodology of this study is similar to the previous analyses on ethnic density and birth outcomes (Chapter 6).

7.2.1 Sample

The sample comprises Pakistani and White British women in the BiB study for which individual data could be linked to area-level data on ethnic density and area deprivation within Bradford Metropolitan District. Exclusion criteria are the same as those applied in Chapter 6, with the exception that stillbirths and mothers who gave birth to twins or triplets are included in this analysis. The final sample consists of 4,049 White British women living in 246 LSOAs, and 4,561 Pakistani women living in 182 LSOAs.

7.2.2 Smoking during pregnancy

Smoking during pregnancy is a binary variable (yes/no), and smoking during either the first three months of pregnancy or since the fourth month of pregnancy or both were counted as ‘smoking during pregnancy’. This measure does not capture other consumption of tobacco, but according to another question in the BiB survey tobacco products other than cigarettes were used by a very small proportion of Pakistani (0.96%) and White British (0.51%) women.

7.2.3 Ethnic density

Since evidence from the MCS shows that Pakistani, Bangladeshi and Indian women living in the UK have low prevalence rates of smoking during pregnancy (Hawkins et al., 2008), I grouped these three to construct one measure of South Asian ethnic density. Although other countries are commonly included in the region of South Asia as well, this measure was chosen to reflect the three South Asian ethnic groups with the largest population in Bradford and the UK, which are categorised separately in the UK census. According to the census of 2011, 24.9% of residents of Bradford Metropolitan District are of Pakistani, Bangladeshi or Indian ethnicity (ONS, 2012b).

Ethnic density is measured as a continuous as well as a categorical variable. Cut-off points for categories of South Asian density were chosen based on the distribution of South Asian density in the Pakistani and White British sample, to ensure sufficient statistical power in each category for both ethnic groups. The spatial segregation along ethnic lines in Bradford means that most of the White British sample lives in areas with low South Asian density, and most of the Pakistani sample lives in areas with high South

Asian density. Categories were created as follows: < 10%, 10-29.99%, 30-49.99%, 50-70%, and > 70% South Asian density.

7.2.4 Covariates

Covariates were selected based on previous literature and their association with both smoking during pregnancy and South Asian ethnic density. These include: maternal age, parity, country of birth, cohabitation, and time lived at address. In addition, measures of individual SES (maternal education, financial situation, means-tested benefits, and employment of the father) and area deprivation were similar to those used in the previous chapter.

7.2.5 Statistical analysis

Regression models were constructed in a similar fashion to those in Chapter 6, and run separately for the Pakistani and White British group. The data were analysed at the LSOA level in line with Chapter 6, and empty models indicated there was considerable area-level variation in the total sample (ICC = 0.21) and in the White British sample (ICC=0.11), but not in the Pakistani sample (ICC=0.00).

As in Chapter 6, multilevel models were run for area deprivation and ethnic density separately, before including both in the full model. Ethnic density was tested as a continuous and as a categorical variable.

Interactions

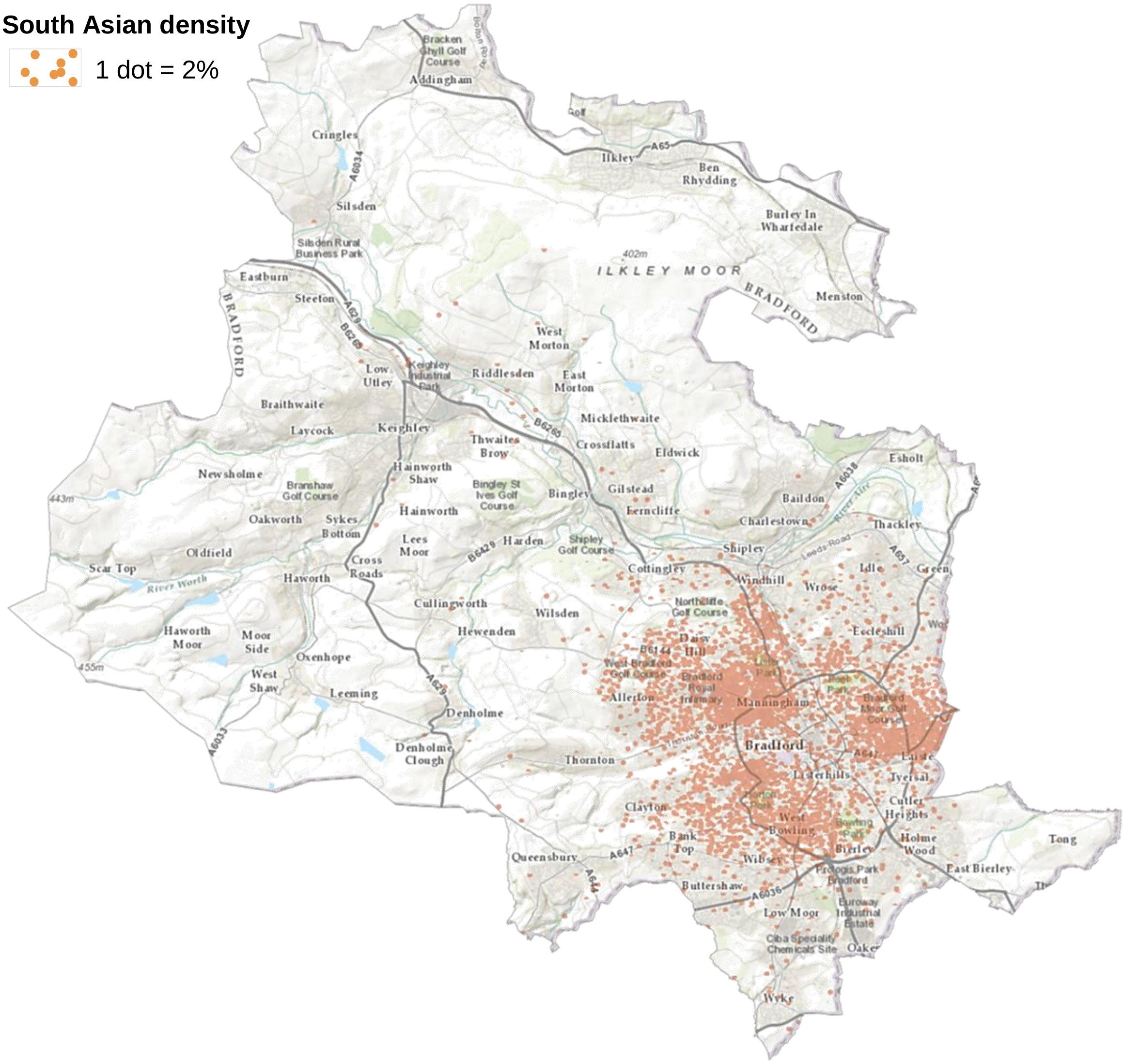
Area-level interactions between area deprivation and ethnic density were tested, in addition to cross-level interactions between financial situation and ethnic density. The original categorical variables of ethnic density and financial situation had very small sample sizes in some subgroups. For example, only two Pakistani mothers living in areas with less than 10% South Asian residents reported their financial situation to be very difficult. To ensure sufficient statistical power, I created an interaction term with the continuous measure of ethnic density and area deprivation, and stratified the analyses by low and high deprivation, and by managing well financially versus having financial difficulties. The cut-off for deprivation was a score of 20 (range 3.2-31.1) on the IMD variable excluding the health domain. A binary variable was created for financial management, with responses ‘living comfortably’ and ‘doing alright’ coded as managing well financially and responses ‘just about getting by’, ‘quite difficult’ and ‘very difficult’ coded as having financial difficulties.

7.3 Results

7.3.1 Individual- and area-level characteristics

South Asian density is highest in urban areas of Bradford Metropolitan district and low in the rural areas and suburbs of the city (Figure 7.2). In and around Manningham, Bradford Moor and Bowling, most LSOAs have over 70% South Asian residents.

Figure 7.2 Spatial distribution of South Asian density in LSOAs of Bradford Metropolitan District (ONS, 2012b). Street Map Esri, April 2014 (http://goto.arcgisonline.com/maps/World_Street_Map).



South Asian density is closely related to area deprivation, and all areas with more than 15% South Asian density are relatively deprived (Figure 7.3). Areas with predominantly White British residents and less than 10% South Asian residents range from affluent to highly deprived. Areas with the highest levels of South Asian density (<80%) however are not the most deprived LSOAs in Bradford (Figure 7.3).

Figure 7.3 Correlation between South Asian density and area deprivation in Bradford LSOAs

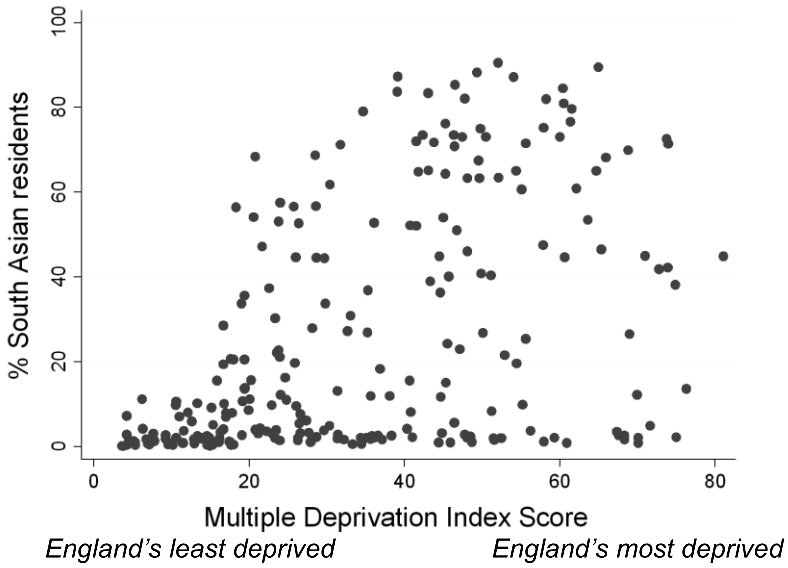


Table 7.1 shows the characteristics of the Pakistani sample living in areas of varying South Asian density. Areas with at least 30% South Asian density are more deprived than areas with ethnic density levels below 30% (pairwise comparison of means, p<0.001), and data from the BiB sample shows that Pakistani women are more likely to be living in higher density areas if they have lower levels of education (Spearman's rank correlation p<0.001), receive benefits (pairwise comparison of means, p<0.001), and if the father of the baby is unemployed (pairwise comparison of means, p<0.001). Additionally, Pakistani mothers are more likely to live in higher density areas if they are not born in England (pairwise comparison of means, p<0.001), and if they have a consanguineous relationship (pairwise comparison of means, p<0.001).

Area deprivation in areas with the lowest levels of South Asian density (<10%) is higher for women in the White British than in the Pakistani sample, because this category is made up of affluent areas with predominantly White British residents as well as deprived towns and housing estates with almost exclusively poor White British families (Table 7.2). Most White British women in Bradford live in areas with less than 10% South Asian residents, making this a heterogeneous group of people and areas. Differences in SES across groups are more pronounced in the White British than in the Pakistani sample. For example, White British fathers in areas with more than 70% South Asian residents are 2.4 times more likely to be unemployed than those living in areas with < 10% South Asian residents. For Pakistani partners, unemployment in the highest density group is only 1.25 times higher than in the lowest density group.

Table 7.1 Composition of South Asian density areas Pakistani sample

South Asian density	**<10%**	**10-29.99%**	**30-49.99%**	**50-70%**	**> 70%**
Number of LSOAs	*57*	*41*	*26*	*29*	*29*
Number of observations	*107*	*385*	*709*	*1252*	*2108*
Area-level characteristics	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Area deprivation (IMD 2010)[a]	32.56	35.95	49.37	42.47	51.03
Individual-level characteristics	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**
Maternal age (years)	29.48	28.60	28.12	28.39	27.98
Parity: first baby	63.64	66.30	65.75	64.00	62.35
Time lived at address (years)	2.56	3.29	4.68	5.34	6.01
% mothers born in England	46.73	52.21	42.72	44.41	39.26
% consanguineous	45.79	57.14	58.84	61.90	69.39
% living with baby's father	94.39	91.67	92.66	92.72	93.68
% mothers < 5 GCSE	14.56	17.78	25.41	25.78	30.49
% means-tested benefits	38.68	42.19	45.47	46.04	45.77
% unemployed father	5.71	5.96	7.02	6.88	7.15
Health outcome					
Smoking during pregnancy	6.67	5.99	3.81	3.04	3.09

a) A higher score indicates a higher level of area deprivation

Table 7.2 Composition of South Asian density areas White British sample

South Asian density	**<10%**	**10-29.99%**	**30-49.99%**	**50-70%**	**> 70%**
Number of LSOAs	*123*	*42*	*26*	*28*	*27*
Number of observations	*2437*	*890*	*396*	*228*	*98*
Area-level characteristics	**Mean**	**Mean**	**Mean**	**Mean**	**Mean**
Area deprivation (IMD 2010)[a]	35.67	34.11	44.72	39.81	51.99
Individual-level characteristics	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**	**Mean, %**
Maternal age (years)	27.32	27.46	25.80	26.69	24.37
Parity: first baby	47.18	50.18	46.32	48.62	43.48
Time lived at address (years)	4.59	4.60	4.66	4.68	3.51
% living with baby's father	71.83	70.95	61.27	69.03	64.29
% mothers < 5 GCSE	20.05	22.49	26.16	30.66	36.67
% means-tested benefits	34.17	36.00	46.56	44.74	58.16
% unemployed father	7.68	8.30	13.74	20.74	18.48
Health outcome					
Smoking during pregnancy	32.92	30.82	43.04	40.79	48.98

a) A higher score indicates a higher level of area deprivation

Contrary to Pakistani women, higher South Asian density is associated with shorter duration of residence for White British mothers (Spearman's rank correlation r -0.044, p=0.005) (Table 7.2). Also, White British mothers in areas with higher South Asian density tend to be younger (Spearman's rank correlation r -0.081, p<0.001).

The prevalence rates of smoking during pregnancy are 3.5% in the Pakistani group and 34.3% in the White British group, which is very similar to smoking rates reported for these groups in the MCS (Hawkins et al., 2008). In the Pakistani group, smoking during pregnancy is more than twice as common in the lowest compared to the highest South Asian density area (6.7% versus 3.1%). This difference is slightly smaller in the White British group, with mothers in the lowest density areas being less likely to smoke during pregnancy (32.9%) than those in the highest density areas (49.0%).

7.3.2 Ethnic density and smoking during pregnancy Pakistani women

Results from the regression analyses are presented for the Pakistani and White British group separately. Statistical models can be found in Appendix 3B.

Individual-level variables

Out of the four measures of individual SES available for this analysis, receiving means-tested benefits showed the weakest relationship with smoking during pregnancy and South Asian density in the Pakistani sample. The other three measures - financial situation, employment of the father, and education of the mother - were included in the analyses. Smoking during pregnancy was significantly related to being born in England (OR 5.70, p<0.001), not having a consanguineous relationship (OR 0.47, p<0.001), financial hardship (highest versus lowest level OR 3.29, p=0.044), and a level of maternal education below 5 GCSE (highest versus lowest level OR 0.32, p<0.001) (Appendix 3B).

Multilevel regression analysis

A multilevel regression model was created with area deprivation (minus the health domain) as the only area-level variable, which was not statistically significant in relation to smoking during pregnancy (Appendix 3B). Since including area deprivation did not alter the model, it was dropped from the analysis. Maternal age was dropped from the model as it was shown in the previous step not to be related to smoking during pregnancy after other factors were taken into consideration.

Lower South Asian density was associated with a higher probability of smoking during pregnancy for Pakistani women if ethnic density was measured as a continuous variable

(OR 0.99, 95% CI 0.98; 1.00, p=0.042). The statistical model with ethnic density measured as a categorical variable pointed in this same direction, with an OR of 0.39 (p=0.042) for areas with 50 to 70% compared to less than 10% South Asian residents, and an OR of 0.41 (p=0.056) for areas with more than 70% South Asian residents (Table 7.3). The various statistical models were compared to assess the contribution of the area-level variables to the estimation of odds of smoking during pregnancy. The full model was a better fit than the model with ethnic density as the only area-level variable (LR chi square 23.68, p<0.001), but not a better fit than the model with only area deprivation (LR chi square 6.35, p=0.174), which suggests a minor role for ethnic density in relation to smoking during pregnancy, compared to other individual and area-level variables.

Table 7.3 Statistical analysis smoking during pregnancy Pakistani women

Multilevel model[a]	*OR (95% CI)* Smoking during pregnancy
	N = 4013
South Asian density (versus <10%)	
10-29.99%	0.65 (0.25;1.67)
30-49.99%	0.47 (0.19;1.18)
50-70%	0.39 (0.16;0.97)*
> 70%	0.41 (0.17;0.99)*

*** p< 0.001, ** p < 0.01, * p < 0.05.

a) Random intercepts multilevel model was adjusted for consanguinity, maternal country of birth, parity, cohabitation, financial situation, and maternal education.

Interactions

Interaction terms and stratified analyses were used to test the hypothesis that beneficial effects of minority ethnic density on prevalence rates of smoking during pregnancy are affected by the level of social disadvantage.

When the model was run with an interaction term for the categorical variable of South Asian density and area deprivation as a continuous varable (4 degrees of freedom), South Asian density higher than 10% was associated with lower odds of smoking for all categories (Table 7.4). Although not statistically significant, the direction of the interaction effect in was for higher deprivation to be associated with higher odds of smoking especially in areas with more than 10% South Asian residents.

Table 7.4 Statistical analysis smoking during pregnancy Pakistani women with interaction between ethnic density and area deprivation

Variable	*OR (95% CI)*
Intercept	0.34 (0.05;2.48)
Consanguinity	0.49 (0.34;0.71)***
Country of birth (England)	5.73 (3.69;8.89)***
Parity (not first baby)	0.68 (0.48;0.98)*
Cohabitation (living with father baby)	0.65 (0.40;1.07)†
Time lived at address (years)	0.98 (0.95;1.01)
Financial situation (versus comfortable)	
Alright	1.99 (1.17;3.38)*
Just about getting by	3.03 (1.75;5.24)***
Difficult	3.05 (1.44;6.46)**
Very difficult	3.19 (0.99;10.30)†
Education mother (versus < 5 GCSE)	
5 GCSE	1.01 (0.65;1.58)
A-level	0.69 (0.39;1.20)
> A-level	0.30 (0.16;0.56)***
Area deprivation (IMD 2010)	0.88 (0.77;1.01)†
South Asian density (versus <10%)	
10-29.99%	0.08 (0.01;0.72)*
30-49.99%	0.07 (0.01;0.77)*
50-70%	0.06 (0.01;0.46)**
> 70%	0.07 (0.00;0.94)*
South Asian density#deprivation (versus < 10%)	
10-29.99%	1.16 (1.00;1.35)†
30-49.99%	1.14 (0.98;1.33)†
50-70%	1.15 (0.99;1.33)†
> 70%	1.14 (0.97;1.33)
Log likelihood	-524.682
Variance at LSOA level (se)	0.21
ICC	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Figure 7.4 and 7.5 show that, although the evidence is not strong, the tendency for higher categories of South Asian density to be associated with a lower prevalence of smoking is more evident in the group of women who reported to be managing well financially. These figures are based on stratified analyses, which can be found in Appendix 3B. However, the interaction model with ethnic density as a continuous variable and ‘managing financially’ as a categorical variable (4 degrees of freedom) showed no statistically significant interaction between the two (Table 7.5).

Figure 7.4 Prevalence rates of smoking during pregnancy for Pakistani women reporting to be managing well financially

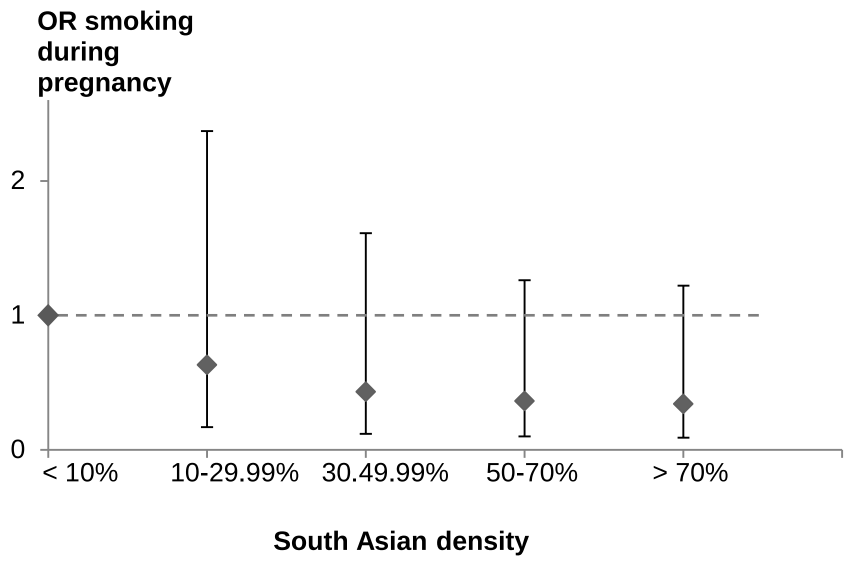


Figure 7.5 Prevalence rates of smoking during pregnancy for Pakistani women reporting financial difficulties

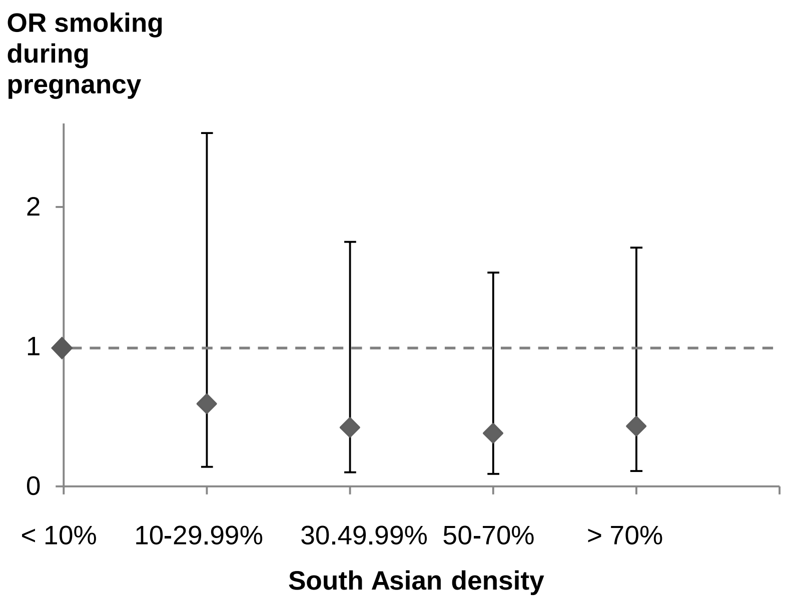


Table 7.5 Statistical analysis smoking during pregnancy Pakistani women with interaction between ethnic density and financial situation (finman)

Variable	*OR (95% CI)*
Intercept	0.02 (0.01;0.08)***
Consanguinity	0.59 (0.41;0.83)**
Country of birth (England)	5.71 (3.73;8.74)***
Parity (not first baby)	0.72 (0.51;1.02)†
Cohabitation (living with father baby)	0.52 (0.33;0.83)**
Time lived at address (years)	0.98 (0.95;1.01)
Financially managing (versus comfortable)	
Alright	2.00 (0.53;7.58)
Just about getting by	4.95 (1.29;18.92)*
Difficult	2.32 (0.35;15.45)
Very difficult	0.32 (0.01;10.27)
Area deprivation (IMD 2010)	1.02 (0.99;1.05)
South Asian density	0.99 (0.97;1.01)
South Asian density#finman (versus comfortable)	
Alright	1.00 (0.98;1.02)
Just about getting by	0.99 (0.97;1.02)
Difficult	1.01 (0.98;1.04)
Very difficult	1.05 (1.00;1.10)†
Log likelihood	-559.26
Variance at LSOA level (se)	0.32
ICC	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

7.3.3 Ethnic density and smoking during pregnancy White British women

Individual-level variables

All four measures of SES were significantly associated with smoking during pregnancy for White British women (Appendix 3B). Whereas the lower odds of smoking for women living with the father of the baby were not significant in the Pakistani group, a significant association was found in the White British group (OR 0.71, p=0.001). Also, the odds of White British women smoking during pregnancy decreased with maternal age (OR 0.94, p<0.001).

Multilevel regression analysis

As in the Pakistani group, multilevel models were created with the variable area deprivation, ethnic density, and both area-level variables. Area deprivation was significantly associated with smoking during pregnancy (OR 1.03, p<0.001), in addition to measures of individual SES. The probability of smoking during pregnancy was lower in areas with 10 to 29.99% compared to less than 10% South Asian density (OR 0.79, p=0.030), and an association in the same direction was found for 30 to 49.99% and more than 70% South Asian density, although not statistically significant. When ethnic density was modelled as a continuous variable, no statistically significant association was found. In the full model, both area deprivation (OR 1.03, p<0.001) and the second category of ethnic density (OR 0.79, p=0.030) remained significantly associated with smoking during pregnancy (Table 7.6).

Table 7.6 Statistical analysis smoking during pregnancy White British women

Multilevel model[1]	*OR (95% CI)* Smoking during pregnancy
	N = 3152
Area deprivation (IMD 2010)	1.03 (1.02;1.05)***
South Asian density (versus <10%)	
10-29.99%	0.79 (0.64;0.98)*
30-49.99%	0.99 (0.72;1.30)
50-70%	1.13 (0.80;1.61)
> 70%	0.82 (0.50;1.34)

*** p< 0.001, ** p < 0.01, * p < 0.05.

1) Analyses were adjusted for maternal age, parity, cohabitation status, time lived at address, and measures of SES (maternal education, employment status of the father, receiving means-tested benefits, and self-reported financial situation).

A sensitivity analysis was performed with a modified ethnic density variable, to distinguish between areas with very low and low South Asian density (analysis not shown). Although differences in the odds of smoking have previously been reported between areas with < 1%, 1-5%, 5-15% and < 15% minority ethnic density (Shaw, Pickett, and Wilkinson 2010), this result was not found in the BiB sample.

Interactions

The same interactions between ethnic density and social disadvantage that were tested in the Pakistani sample were tested in the White British sample. Testing the interaction between ethnic density and area deprivation for White British women (4 degrees of freedom), there was no statistically significant association with smoking during pregnancy (Table 7.7). In the stratified analyses, as for the Pakistani mothers, there was an association between South Asian density and lower rates of smoking during pregnancy in less deprived areas, but not in more deprived areas (Appendix 3B).

Table 7.7 Statistical analysis smoking during pregnancy White British women with interaction ethnic density and deprivation

Variable	*OR (95% CI)*
Intercept	4.77 (2.58;8.81)***
Maternal age (years)	0.95 (0.93;0.97)***
Parity (not first baby)	1.12 (0.91;1.38)
Cohabitation (living with father baby)	0.69 (0.57;0.85)***
Time lived at address (years)	0.99 (0.98;1.01)
Receiving means-tested benefits	1.40 (1.14;1.71)**
Occupation father (versus unemployed)	
Manual	0.60 (0.45;0.81)**
Self-employed	0.55 (0.38;0.80)**
Non-manual	0.49 (0.37;0.66)***
Student	0.37 (0.19;0.74)**
Education mother (versus < 5 GCSE)	0.54 (0.44;0.67)***
5 GCSE	0.39 (0.30;0.51)***
A-level	0.17 (0.12;0.24)***
> A-level	
Area deprivation (IMD 2010)	1.03 (1.01;1.05)**
South Asian density (versus < 10%)	
10-29.99%	0.56 (0.31;1.02)†
30-49.99%	0.84 (0.36;2.00)
50-70%	1.23 (0.42;3.54)
> 70%	0.65 (0.04;10.68)
South Asian density#deprivation (versus < 10%)	
10-29.99%	1.02 (0.99;1.05)
30-49.99%	1.01 (0.97;1.05)
50-70%	1.00 (0.94;1.05)
> 70%	1.01 (0.90;1.14)
Log likelihood	-1689.13
Variance at LSOA level (se)	0.12
ICC	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

In the interaction model with ethnic density as a continuous and financial situation as a categorical variable, White British mothers who reported to be managing well financially were not less likely to smoke in areas with higher South Asian density (Table 7.8). In the stratified analyses, mothers who reported to be managing well financially had lower prevalence rates of smoking in areas with more than 70 % South Asian residents than in areas with less than 10% South Asian residents (OR 0.25, p=0.021), and there was a borderline significant association for mothers in areas with 50 to 70% South Asian residents (OR 0.33, p=0.063) (Appendix 3B). Figure 7.6 and 7.7 illustrate the difference in prevalence rates of smoking in association with ethnic density for White British women who are managing well and those reporting financial difficulties. Although in both groups there seems to be a tendency for prevalence rates of smoking to be lower in areas with higher South Asian density, only in the group of women who report to be managing well financially is this difference statistically significant.

Table 7.8 Statistical analysis smoking during pregnancy White British women with interaction ethnic density and financial situation (finman)

Variable	*OR (95% CI)*
Intercept	3.00 (1.60;5.62)**
Maternal age (years)	0.95 (0.93;0.97)***
Parity (not first baby)	1.09 (0.88;1.34)
Cohabitation (living with father baby)	0.72 (0.59;0.89)**
Time lived at address (years)	1.00 (0.98;1.01)
Receiving means-tested benefits	1.30 (1.06;1.59)*
Occupation father (versus unemployed)	
Manual	0.61 (0.45;0.81)**
Self-employed	0.57 (0.40;0.83)**
Non-manual	0.52 (0.39;0.70)***
Student	0.38 (0.19;0.76)**
Education mother (versus < 5 GCSE)	
5 GCSE	0.54 (0.44;0.66)***
A-level	0.39 (0.30;0.50)***
> A-level	0.18 (0.13;0.26)***
Financial situation (versus comfortable)	
Alright	1.19 (0.89;1.58)
Just about getting by	1.71 (1.26;2.31)**
Difficult	2.01 (1.19;3.42)***
Very difficult	3.26 (1.50;7.08)**
Area deprivation (IMD 2010)	1.04 (1.02;1.05)***
South Asian density	1.00 (0.99;1.01)
South Asian density#finman (versus comfortable)	
Alright	1.00 (0.99;1.02)
Just about getting by	1.01 (0.99;1.02)
Difficult	1.00 (0.98;1.02)
Very difficult	0.99 (0.97;1.02)
Log likelihood	-1668.82
Variance at LSOA level (se)	0.16
ICC	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Figure 7.6 Prevalence rates of smoking during pregnancy for White British women reporting to be managing well financially

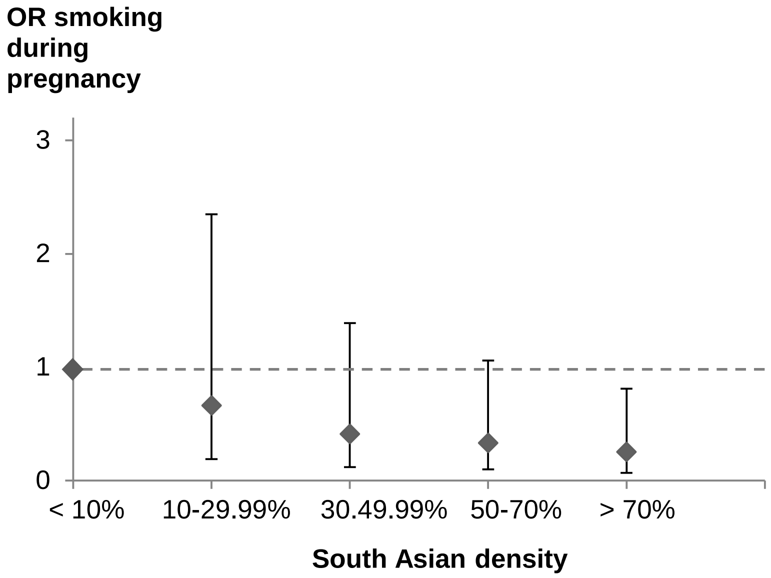
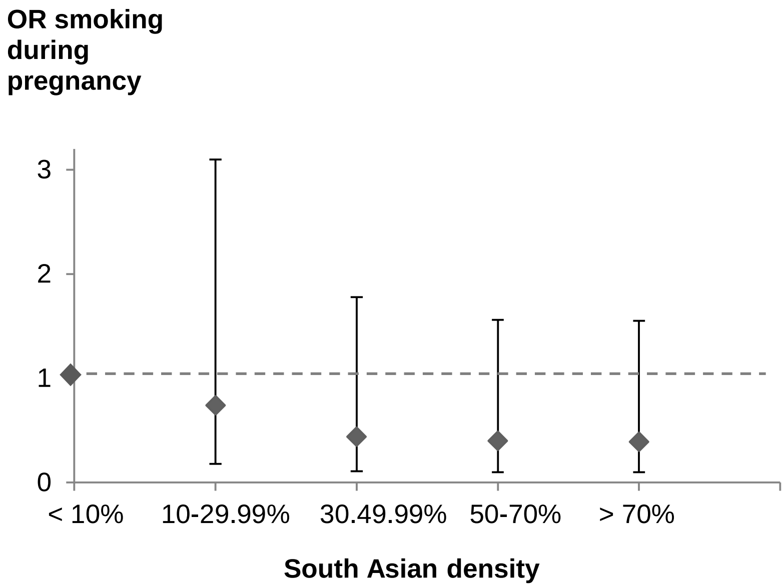


Figure 7.7 Prevalence rates of smoking during pregnancy for White British women reporting financial difficulties



7.4 Discussion

7.4.1 Key findings

The prevalence of smoking during pregnancy is low in Pakistani, Bangladeshi and Indian women, which is mostly due to cultural practice and social norms restricting smoking among women. The BiB sample is no exception, with a tenfold increased risk for smoking among the White British compared to the Pakistani group. In addition to lower SES and factors associated with greater acculturation (mother born in England, no consanguineous marriage), Pakistani mothers were more likely to smoke during pregnancy if they lived in areas with lower South Asian density.

White British women were more likely to smoke during pregnancy if they lived in areas with less than 10% versus 10 to 30% South Asian density. However, no linear association with smoking was found in the White British group, and there was no evidence for a difference in the odds of smoking between areas with the lowest and highest levels of South Asian density in the full sample.

As a lower SES was associated with higher odds of smoking in both ethnic groups, social disadvantage may inhibit the positive influence of social norms and support on health behaviour. The stratified analyses could be interpreted as a confirmation of this presumption, as these showed more evidence of associations between higher South Asian density and lower odds of smoking for women in less deprived areas or with a better financial position. However, interaction analyses did not show significant findings.

7.4.2 Results in relation to the literature

The findings from this chapter are similar but not identical to results from a study among White, Black, and Hispanic American women in the US (Shaw and Pickett, 2013). The two samples are comparable because both studies included mothers who were recently pregnant, and smoking during pregnancy was uncommon in the ethnic minority group (2.9% for US Hispanics and 3.5% for UK Pakistani women). In the US study, there seemed to be a linear reduction in the odds of smoking for Hispanic, White, and Black women as Hispanic density increased from less than 1% to over 50%. In the BiB study, results do not necessarily indicate a linear association between higher South Asian density and lower odds of smoking during pregnancy. This may partly be because the categories of South Asian density in the BiB sample are reflective of the ethnic composition of the city, meaning that it is not possible to make the distinction between areas with less than 1% and 1 to 5% South Asian density, while I did include a category with more than 70% South Asian density. Areas with high levels of South Asian density were generally highly deprived, and the stratified analyses showed that reduced rates of smoking during pregnancy were found particularly in areas with higher South Asian density which were more affluent, or among mothers who were managing better financially. Previous research has linked social disadvantage on a neighbourhood level to higher odds of smoking during pregnancy, for example as measured by the percentage of working class residents (Pickett et al., 2002), neighbourhood violence (Patterson et al., 2012), incivilities in the neighbourhood (Messer et al., 2012), and area-level SES (Shoff and Yang, 2013).

Area deprivation was a statistically significant factor in the model estimating odds of smoking for White British women. Since the IMD was not associated with smoking among Pakistani women, this may indicate that ethnic density rather than the IMD captured disadvantage on a neighbourhood level, outweighing any potential beneficial effects of ethnic density on smoking during pregnancy. As social norms prohibit smoking during pregnancy among South Asian women, and facilitate smoking during pregnancy among women of lower SES, it is likely that in this study women of higher SES, or those living in more affluent areas, were already less likely to smoke and were therefore more likely to be influenced by the no-smoking culture of South Asian women in their neighbourhood. It is possible that this greater tendency not to smoke among those of higher SES explains the results of the stratified analysis for White British women, while for Pakistani women, ethnic density may seem to have a bigger impact among those of higher SES because those of lower SES are less acculturated, more likely to adhere to Pakistani social norms, and therefore less likely to be influenced by levels of ethnic density in their neighbourhood when it comes to smoking during pregnancy.

7.4.3 Strengths and limitations

Strengths and limitations mentioned in the previous chapter largely apply to the research presented in this chapter as well.

Findings may have been influenced by small sample sizes in some subgroups. Most White British mothers lived in areas with less than less than 10% South Asian residents (60.2%). The smallest subgroup was formed by White British mothers living in areas with over 70% South Asian density (N=98). The interaction analyses in particular were underpowered to provide reliable estimates of the measures of association in each group. For example, only 8 White British mothers were living in areas with over 70% South Asian density and a low level of deprivation. In the Pakistani sample, the categorical variable of South Asian density was not reliable for use in the interaction analysis with deprivation due to small subsamples and low prevalence rates of smoking. For example, none of the 35 Pakistani women living in more affluent areas with less than 10% South Asian density smoked. The stratified analyses showed associations between higher South Asian density and lower odds of smoking for mothers of higher SES and in more affluent areas predominantly. This may reflect a true finding, or it may be caused by the fact that smoking rates for Pakistani women of lower SES are too low to find an association, and for White British women of lower SES the power of the analysis was limited by the fact that they rarely live in areas with higher South Asian density. Given that estimates were often similar for the stratified analyses, interaction analyses were not significant, and statistical insignificance was caused by wide confidence intervals around the estimates, this is a plausible explanation.

Even more so than the analyses of birth outcomes, this study of smoking during pregnancy in relation to ethnic density is limited by a lack of knowledge of residential preference. Pakistani women who are more similar to the White British culture with regard to their social norms and habits are more likely to smoke during pregnancy, and they are also more likely to live in areas with a lower percentage of South Asian residents. It is therefore not surprising that I found higher rates of smoking for Pakistani women who chose to live in areas with a higher percentage of White British residents. Although I included information on country of birth and consanguinity, this does not fully capture the extent to which Pakistani women adopted elements of the White British culture. However, it is less likely that White British women chose to live in areas with higher South Asian density because they adhere more to South Asian social norms. As statistically significant associations were found in both groups, this offers at least some indication of potential ethnic density effects.

7.4.4 Research implications

A few suggestions have been made in the literature to move forward research on the relationships between health and place, and ethnic density research can benefit from these insights as well.

Geographical boundaries

Especially for ethnic minority groups such as UK Pakistani, relationships can cover large physical distances, and increased mobility means that people are not confined to the boundaries of a neighbourhood. The close link between the city of Bradford and the Mirpur region in Pakistan, where most Pakistani people in Bradford have their origins, is an example of this. On top of neighbourhood ethnic density effects on health, ethnic ties with a short social but large geographical distance may encourage or discourage healthy behaviour. Exploring mechanisms behind ethnic density effects, such as social capital and social support, might reveal health benefits of strong ethnic minority communities that neighbourhood-level analyses cannot uncover.

Static versus dynamic measures

Communities are dynamic, whether they represent a space within geographical boundaries or not (Baker et al., 2013, Warnecke et al., 1997). Instead of using static measures such as area deprivation to characterise neighbourhoods, measures that capture processes such as the deterioration of buildings, a rise in crime, or an increase in the percentage of immigrants reflect how residents are affected by change in a neighbourhood. This may have a bigger influence on health and wellbeing than absolute levels of deprivation, crime, or percentages of immigrants measured at one point in time.

Interactions between people and places

It becomes increasingly clear that the characteristics of people and places interact, so that the health effects of a certain neighbourhood vary between residents with different characteristics, and neighbourhood features may buffer or amplify the effects of individual determinants of health (Baker et al., 2013). Residents' individual social norms and cultural practices shape what is considered acceptable behaviour in a neighbourhood. Depending on attitudes towards smoking during pregnancy, a strong community network may either encourage or discourage smoking. When strong bonds between community members do not exist, the effects of place on health may be smaller (Ahern et al., 2009). This mix of context and composition has been called the 'collective' dimension, comprising shared social norms, values, and traditions (Warnecke et al., 1997).

Multilevel models separating contextual and composition factors do not fully capture this third dimension, although I have aimed to examine cross-level interactions between residents and their environment by considering the associations between ethnic density and smoking during pregnancy for people of different SES (managing well versus financial difficulties), and for different areas (lower versus higher deprivation). Although the data are cross-sectional and therefore cannot support causal inference, this study suggests that the area-level effect of ethnic density on smoking during pregnancy might differ depending on individual- and area-level characteristics. This finding is reinforced by qualitative research. Stead and colleagues (2001) argued that in poor communities, social support encourages smoking, whereas smoking is challenged in more affluent communities. Apart from community norms detrimental to health, disadvantaged communities may also be isolated from wider, and possibly healthier, social norms (Stead et al., 2001). In addition to quantitative analyses, there is a role for qualitative research in improving our understanding of the importance of ethnic composition for different people in different neighbourhoods.

Chapter 8

Social capital and health in context

Toller, Bradford. Own photography.

8.1 Introduction

8.1.1 Social capital and health: a recapitulation of findings

In Chapter 3 of this thesis, I presented the results from a systematic review of the literature on social capital in relation to socioeconomic inequalities in health. The majority of the sixty papers included in the review confirmed an association between higher social capital, higher SES and better health. In addition, two hypotheses could be extracted from the results; one suggesting that social capital can buffer some of the detrimental effects of low SES or poverty on health, and the other suggesting that social capital is lower or less able to provide health benefits in a context of social disadvantage. One study found that the health benefits of community social capital were dependent on the level of individual social capital (Subramanian et al., 2002).

Chapters 6 and 7 addressed the associations between ethnic density and health in the BiB cohort, and partly support the hypothesis of the dependency between social, cultural and economic capital. Prevalence rates of smoking during pregnancy were lower for White British and Pakistani women in areas with higher South Asian density, but only if these mothers were of higher SES, or if areas were less deprived (Chapter 7). No associations were found between ethnic density and birth outcomes, suggesting that in a relatively deprived environment such as Bradford, health benefits provided by ethnic density may not be able to counteract negative influences of social disadvantage on health. This hypothesis is supported by literature on social capital. For example, NSC may only be beneficial for the health of ethnic minorities in affluent neighbourhoods, while it is a harmful factor in deprived neighbourhoods (Caughy et al., 2003). Another study reported that NSC was associated with lower mortality rates for White Americans but not for Black Americans (Lochner et al., 2003). What sets social capital of ethnic minority groups apart from social capital of the ethnic majority is that it may have developed in part in response to social disadvantage. Areas with high minority ethnic density illustrate this. As discussed in Chapter 2, it is likely that these areas develop in part as a result of social exclusion, leading to a network with strong bonds within the community, but simultaneously stimulating further segregation of ethnic groups. This has been reported to have both positive and negative effects on health and wellbeing (Cederberg, 2012).

Social capital may also act independently from neighbourhood ethnic density. As discussed earlier, social networks need not be confined to geographical boundaries, and bonds between people of the same ethnic group may cross national boundaries (Cummins et al., 2007). Many people of the Pakistani community in Bradford and residents of Mirpur in Pakistan are socially close while physically distant for instance, and both places shape each other in terms of culture, economy, and politics (Bolognani, 2007). The associations between social capital and health may vary between residents with different individual characteristics, or between neighbourhoods with different area-level characteristics. This interaction between the composition and context of areas has been used as an argument to include interaction terms in multilevel studies (Macintyre et al., 2002).

8.1.2 Aim and research questions

Evidence from the literature and from this thesis shows the importance of considering the context in which social capital might be associated with health. In this chapter, I focus on four research questions:

1. Is area-level social capital associated with health in Bradford?

2. Is individual social capital associated with health of White British and Pakistani mothers and infants?

3. Does any association between health and social capital vary with social disadvantage?

4. Does any association between health and social capital vary with ethnic density?

Together, these four questions fulfil the aim of this chapter: to study the associations between social capital and health for White British and Pakistani mothers and infants in the BiB study.

8.2 Methods

8.2.1 Sample

Social capital-related questions were included in Phase 1 and Phase 3 of the BiB questionnaire (Figure 8.1). In Phase 1, 1,570 mothers answered questions on trust, social support, the neighbourhood, and social participation. In Phase 3, 3,370 mothers answered a slightly different set of questions, which included items on support from family, trust, and neighbours. Data from White British and Pakistani families were analysed separately.

Figure 8.1 Overview of data collection and sample sizes of the Born in Bradford study

	Total[a]	**Phase 1** **March-Sept '07**	**Phase 2** **Oct '07-July '09**	**Phase 3** **July '09-Dec '10**
General: Marital status, maternal age, time at address, country of birth.	10,385			
Social capital section K: Trust, neighbourhood, social support, social participation	1,570			
Social capital section N: Social support, trust, neighbours	3,370			
GHQ	8,590			
Eclipse birth outcomes	10,059			

a) Sample sizes of mother-infant pairs after merging with area-level data, and excluding second and third pregnancies within the cohort to the same woman.

8.2.2 Health outcomes

Birth weight, maternal mental health, and smoking during pregnancy were used as health outcomes. Preterm birth was not used because statistical power of the analyses was limited by small sample sizes in subgroups, and the incidence of preterm birth was too low to perform multilevel analyses with a wide range of covariates. Descriptions of birth weight and smoking during pregnancy as measured in the BiB questionnaire were given in chapters 6 and 7, respectively. Data on maternal mental health, measured with the General Health Questionnaire (GHQ), were available for Phase 3 of the BiB study only.

The GHQ was developed in 1978 as a screening tool to assess the risk of psychiatric disorders such as depression and anxiety (Goldberg, 1978), but it is most commonly used as an indicator of mental wellbeing (Jackson, 2007). Although validated in different populations, the GHQ has been shown to be invalid for comparisons of psychological distress between ethnic groups (Prady et al., 2013a). I therefore do not use cut-off points for the GHQ, but instead present the total score. Responses to the GHQ were scored 0/0/1/1, resulting in a minimum score of 0 and a maximum score of 28. A higher score indicates worse mental health, or more specifically, mental distress. As women in BiB were pregnant at the time the GHQ was administered, reported mental health is likely to be heavily influenced by their pregnancy. This makes the GHQ unsuitable as a screening device for psychiatric disorders, and it is used in this thesis only to give an indication of mental health.

In addition to individual health outcomes, two area-level outcomes were chosen for examination in relation to area-level social capital. The Health Deprivation and Disability Domain was extracted from the IMD 2010 (Adams and White, 2006). A higher score on the health domain of the IMD indicates higher health deprivation. The measure is based on four indicators:

- Years of potential lives lost (age and sex-standardised rates of premature death)
- Comparative illness and disability ratio (age and sex-standardised)
- Rate of emergency admissions to hospital (age and sex-standardised)
- Proportion of adults under 60 suffering from mood and anxiety disorders

The Child Well-being Index (CWI) was used as an area-level measure of health, because it has similarities with the IMD but focusses on deprivation affecting children (Bradshaw et al., 2009). The index was first published in 2009, and is largely based on data from 2005. Out of 354 districts in England, with 1 being the least deprived and 354 being the most deprived, Bradford District ranked 335. Like the IMD, the CWI consists of seven domains: material deprivation, health, education, crime, housing, environment, and children in need. In contrast to the IMD, all domains of the CWI are weighted equally. I used the health domain of this measure, which is based on rates of chronic illness, emergency admissions to hospital and child disabilities. A higher score on the health domain indicates the area scores worse on child health. Out of 354 districts in England, with 1 having the highest level of child health and 354 the lowest, Bradford District ranked 232.

8.2.3 Social capital

Phase 1: overview

A section related to social capital and the neighbourhood was part of the BiB baseline questionnaire in the first phase of data collection, from March 2007 until September 2007. The 19 social capital-related items consist of four parts covering perceptions of the neighbourhood, trust, social support and social participation. Table 8.1 shows the items, response categories and the source of the original item.

Table 8.1 Social capital-related items Born in Bradford Phase 1

Items	**Response categories**	**Origin of question**
Perceptions of the neighbourhood		
To what degree do you agree with the following statement? 1. This area is a place I enjoy living in 2. This area is a place where neighbours look after each other 3. This area has good local transport 4. This area has good leisure things for people like myself, such as leisure centres or community centres	Strongly agree Agree Disagree Strongly disagree	HSE 2000 (NCSR, 2000) Social capital and social exclusion module
5. From home, how easy is it for you to get to a medium to large supermarket using your usual type of transport? 6. From home, how easy is it for you to get to a post office using your usual type of transport?	Very easy Fairly easy Fairly difficult Very difficult	HSE 2000 Social capital and social exclusion module
7. In your local area how much of a problem are teenagers hanging around on the streets? 8. In your local area how much of a problem is vandalism, graffiti or deliberate damage to property?	Not a problem at all No big problem Fairly big problem Very big problem	HSE 2000 Social capital and social exclusion module
Social participation		
9. Do you regularly join in the activities of any of these organisations? Political parties, trade unions, environmental groups, parent-teacher association, tenants group, education, arts or music group, religious group or church, charity, caring for mothers, youth group, women's institute, social club, sports club.	Yes No	HSE 2000
Social support		
There are people I know - amongst my family and friends - who: 10. do things to make me happy 11. make me feel loved 12. can be relied on no matter what happens 13. would see that I am taken care of if needed 14. accept me just as I am 15. make me feel an important part of their lives 16. give me support and encouragement	Not true Partly true Certainly true	HSE 2000
General trust		
17. Generally speaking, would you say that most people can be trusted or you can't be too careful in dealing with people?	Can be trusted Can't be too careful Don't know	HSE 2000 & WVS

Items	Response categories	Origin of question
18. Would you say that most of the time people try to be helpful or just look out for themselves?	Try to be helpful Look out for themselves Don't know	HSE 2000 & WVS
19. Do you think most people would take advantage of you if they got the chance or would try to be fair?	Try to be fair Take advantage Don't know	HSE 2000 & WVS

All questions were originally used in the HSE, and the three items on trust are well-known questions included in international and national surveys; in particular the WVS. Items on perceptions of the neighbourhood were derived from the condensed module for social capital and social exclusion, developed for use in the HSE in 2000 (Bajekal and Purdon, 2001). Upon development of this module, underlying constructs were assessed with factor analysis and associations with health outcomes were measured making use of multilevel logistic regression analysis and adjusting for age, sex, household income, education, and employment status. All items were related to at least one of the following health outcomes in the HSE data: self-rated health, limiting longstanding illness, psychosocial health measured with the GHQ, smoking and obesity (Bajekal and Purdon, 2001).

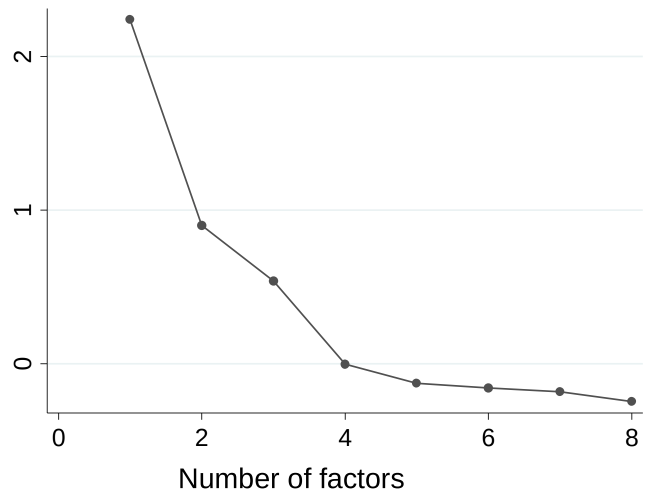
Phase 1: Neighbourhood social capital

Eight items included in the questionnaire during the first data collection phase of BiB ask participants about their perceptions of the neighbourhood. Although there is no uniform definition or measure of NSC, it often includes aspects related to consequences of social organisation (Chapter 3, Figure 3.4), and views of the neighbourhood or area of residence (Chapter 3, Table 3.2). For the analyses of this chapter I consider the eight questions on perceptions of the neighbourhood to be an indication of NSC, although I acknowledge the questions have not been validated for this purpose and can therefore not be used to give an indication of the level of NSC in comparison to other sources. As the neighbourhood questions were not developed to capture a single construct of NSC, I analysed the correlations between answers to the eight items. The analysis was based on 1,056 observations for which all questions were answered, and showed that all questions were correlated with the exception of ‘access to the post office’ and ‘problems with teenagers’, and ‘access to the post office’ and ‘problems with vandalism’ (Appendix 3C).

Factor analysis was then used to assess whether the questions measure one construct. The ratio of observations to items of 132:1 is considered highly sufficient for a factor analysis (Hogarty et al., 2005). The Kaiser-Meyer-Olkin measure indicates that factor analysis is a useful tool in this case, with values between 0.58 and 0.77 (Dziuban and Shirkey, 1974). A principle factor analysis with orthogonal varimax rotation was applied. Using oblique rotation did not improve the factor structure.

The scree plot (Figure 8.2) shows that two or possibly three factors can be distinguished. The strongest factor consists of the items ‘teenagers hanging around’ and ‘problems with vandalism’ as both questions load strongly on this factor (factor loading > 0.8) and not on other factors. The second factor is the weakest and consists of ‘enjoy living in the area’, ‘neighbours look after each other’, ‘transport’ and ‘leisure’. The answer categories of these factors are similar, but grouping these items together leaves a considerable part of the variance unexplained, especially for ‘transport’ and ‘leisure’. The third identified factor consisting of the items ‘access to post office’ and ‘access to supermarket’. Excluding items ‘transport’ and ‘leisure’ from factor 2 did not improve the rest of the model.

Figure 8.2 Scree plot factor analysis neighbourhood social capital items



In conclusion, all items are correlated and contributed to the measurement of NSC. Three factors can be distinguished, but apart from differences in the type of NSC, these different factors seem to reflect differences in measurement. I therefore consider it appropriate to use a composed measure of NSC which includes all items.

For the analyses, a composed measure NSC was created (Appendix 3C). It weighs all items equally and is computed simply as the sum of all responses, by adding up responses, with 1 referring to the most negative category and 4 referring to the most positive category, so that a higher score indicates more positive perceptions of the neighbourhood. Scores for items with 1 referring to the most positive category and 4 referring to the most negative category were reversed. Responses were missing for some of the items, especially for the item related to vandalism (14.3% missing). Participants who did not answer this question were more likely than those who did to report negative responses regarding the other NSC questions. To include these participants, the composed measure reflects the average of completed questions times eight, with a minimum score of 0 and a maximum score of 24.

Phase 1: Social support, social participation and trust

The seven social support items were all significantly correlated ($p<0.001$), and factor analysis showed that two sets of questions received the same pattern of responses: ‘there are people who make me feel important/ who give me support and encouragement’, and ‘there are people who do things to make me feel happy/ make me feel loved’ (Appendix 3C). In much the same way as for the neighbourhood questions, a composed measure for the seven social support items was constructed. Scores range from 0 to 14 and a higher score indicates more social support. Missing values were found particularly for the first and last question, and to include these participants in the composed measure, the measure reflects the average of completed questions.

Social participation was captured in a binary measure to show the likelihood that women participate in none or at least one activity.

The score to measure general trust was computed as a combination of three items, with three response categories comprised of a negative response, a positive response, and ‘don’t know’. The composed score is computed as follows:

0	three negative scores
1	two negative and one ‘don’t know’
	one negative and two ‘don’t know’
	two negative and one positive score
	one positive, one negative, one ‘don’t know’
2	one positive and two ‘don’t know’
	two positive and one negative
	two positive and one ‘don’t know’
3	three positive
-	three ‘don’t know’.

The calculation of this score is based on the assumption that ‘don’t know’ is an indication of a lack of trust. The score was labelled ‘missing’ if the same person gave three ‘don’t know’ responses (N=53), or if one of the questions was not completed (N=2).

Another set of social capital-related questions was added to the baseline questionnaire in Phase three of the data collection, from July 2009 to December 2010. Because the GHQ was included in the questionnaire in this period of the data collection, these questions allow for an analysis of social capital in association with mental health of the mother. Seven questions in this set related to social support from friends and family, one to general trust, and one enquires about problems with neighbours (Table 8.2). The question on trust was included in the analysis with the five original response categories. For the question on neighbours, only 'yes' and 'no' responses were analysed, labelling 'don't know' and 'prefer not to say' as missing.

Table 8.2 Social capital-related items Born in Bradford Phase 3

Items	**Response categories**	**Origin of question**
Social support		
1. My husband/partner doesn't seem to listen to me 2. I wish there was more warmth and affection between us 3. I feel closely attached to my family 4. My family takes notice of my opinions 5. Sometimes I feel excluded in my own family	Totally agree Agree Neither agree nor disagree Disagree Totally disagree	MCS first survey, 2001-2003. Growing up in Australia: longitudinal study of Australian children
6. Do you eat at least one meal at home with your husband, partner, family or friends? 7. Do you have people living with you –relatives or friends- that you wish weren't there?	Yes No Prefer not to say	MCS first survey, 2001-2003. Growing up in Australia: longitudinal study of Australian children
General trust		
8. Generally speaking, would you say most people can be trusted or that you can't be too careful in dealing with people?	Can be trusted 2 3 4 Can't be too careful	HSE 2000 & WVS
Neighbours		
9. Do you have neighbours who are really unfriendly or giving you problems?	Yes No Don't know Prefer not to say	Developed for BiB study

Phase 3: Social support

A measure combining the seven items on social support was created in the same way as the other composed measures, so that a higher score indicates a higher level of social support. Statistically significant correlations were found for all item pairs, except for ‘meal with others’ and ‘closely attached to family’ (r=0.037, p=0.058) (Appendix 3C). Factor analysis revealed two potential factors: ‘partner doesn’t seem to listen/ warmth and affection’ and ‘feel closely attached to family/family takes notice of my opinions’ (Appendix 3C). For questions 1 to 5, zero points were allocated to the most negative response and four to the most positive response. For questions 6 and 7, ‘prefer not to say’ was treated as a missing value, a negative response was given zero points, and a positive response three points. The sum score for non-missing responses only is used instead of the average sum score, because response categories vary between questions.

8.2.4 Covariates

Covariates were included if it could be assumed they would influence the association between social capital and health. The sources of the evidence and the rationale for these choices are summarised in Table 8.3. At the individual level, included measures were maternal age, marital status, cohabitation, country of birth, SES, and time lived at address (Mohnen et al., 2012). In relation to birth outcomes, the models also include parity.

At the area level, I took into account area deprivation, ethnic density, and population density. These measures only provide a snapshot of the neighbourhoods in which families live, as areas change over time. Dynamic processes such as gentrification (the redevelopment of areas followed by an influx of more affluent people), an increase of international immigrants, a growing population density and deterioration of the neighbourhood could influence both social capital and health, and affect the relationship between them (Cummins et al., 2007, Diez Roux, 2001, Sampson et al., 1999). Measures of population change were constructed by comparing data from the IMD 2010 and 2004, and from the Census 2010 and 2000. The created variables of change were: change in area deprivation, change in ethnic density, change in percentage of UK born residents, and change in population density. However, as none of these measures were associated with NSC in simple regression models, they were dropped from the analyses.

Table 8.3 Rationale for selection of independent variables for analyses

Variable	Rationale	Source of evidence
Social capital variables BiB		
Composed measure NSC	All eight questions contribute to NSC	Factor analysis section 8.2.3
Aspects of NSC: place I enjoy living in neighbours look after each other good local transport good leisure things access to supermarket access to post office	NSC is related to health	(Carpiano, 2007) Literature review section 3.2
NSC/ safety: teenagers hanging around vandalism	Neighbourhood safety is an aspect of NSC related to health	(Ziersch et al., 2005, Ross et al., 2001) Literature review section 3.2
Social participation	Social participation is an aspect of social capital and related to health	(Jusot et al., 2008) (Hyyppä and Maki, 2001, Carpiano, 2007, Van Der Wel, 2007). Chapter 3
Social support summary score: There are people amongst my family and friends who: … do things to make me happy … make me feel loved … can be relied on no matter what happens … would see that I am taken care of if needed … accept me just as I am … make me feel an important part of their lives … give me support and encouragement	Social support is an aspect of social capital and related to health Social support is a potential mechanism underlying the ethnic density hypothesis	(Bartley et al., 2004, Barger et al., 2009, Baron-Epel et al., 2008) Chapter 3
General trust	Trust is related to health, social position and spatial segregation of ethnic minorities	(Subramanian et al., 2002, Uslaner, 2011, Veenstra, 2005) Chapter 3
Individual-level explanatory variables BiB		
Cohabitation	Mothers living with a partner might report higher social capital	-
Marital status	Married mothers might report higher social capital	-

Variable	Rationale	Source of evidence
Maternal age	Age is related to health and possibly to social capital	-
Parity	Parity is related to birth outcomes and might be related to social capital	Chapter 6
Ethnicity	Related to economic, cultural and social capital Relationship between NSC and area deprivation differs between ethnic groups Related to health	(Putnam, 1995) (Baron-Epel et al., 2008) (Campbell and McLean, 2003) (Bell et al., 2010, Cederberg, 2012, Karlsen and Nazroo, 2009)
Country of birth **UK / outside UK**	Possible correlation with social capital Related to health	(Small, 2012, Subramanian et al., 2003)
Receiving means-tested benefits	Social and economic capital are related, and SES is related to health	(Bourdieu, 1986)
Occupation of the father	Social and economic capital are related, and SES is related to health	(Bourdieu, 1986)
Self-assessed financial situation	People managing well financially report higher NSC Subjective measure better indicator of SES than objective measure	(Singh-Manoux et al., 2005)
Highest educational qualification father	Social and cultural capital are related	(Bourdieu, 1986)
Length of residence How long have you lived in this local area?	Length of residence influences relationship NSC and health	(Putnam, 2004, Pearson et al., 2012, Mohnen et al., 2012, Hagan, 1998, Keene et al., 2013)
Area-level explanatory variables LSOA		
Index of Multiple Deprivation 2010	Relationship NSC, health and area deprivation Stronger relationship NSC and health for more deprived areas	(Caughy et al., 2003, Aminzadeh et al., 2013, Poortinga et al., 2008)
White British ethnic density	Ethnic density might be associated with health and social capital	Chapter 5-7
Pakistani ethnic density	Ethnic density might be associated with health and social capital	Chapter 5-7
Population density	Population density might be associated with health and social capital	-

Variable	Rationale	Source of evidence
Interaction factors and stratification		
Social capital x economic capital	Social and economic capital interact to influence health	(Jusot et al., 2008, Mao et al., 2009, Van Der Wel, 2007, Businelle et al., 2010, Gee et al., 2006, Mulder et al., 2011, Soskolne and Manor, 2010, Sun et al., 2009, Stafford et al., 2008, Bohn and Richter, 2011)
Social capital x deprivation	NSC was only beneficial in less deprived areas	(Caughy et al., 2003)
Social capital by ethnic group	The effect of NSC on health is higher in some ethnic groups than others	(Bell et al., 2010) (Baron-Epel et al., 2008, Lochner et al., 2003)

8.2.5 Statistical analysis

Similar to chapters 6 and 7, the relationship between health outcomes and social capital was assessed with regression models. Multivariate regression techniques were used to model individual social capital, and multilevel regression analysis to model NSC, in relation to individual- and area-level health outcomes.

Stratified analyses

Analyses were then stratified by level of deprivation, and by financial situation, to test whether the associations between social capital and health would vary by area-level and individual-level SES. The cut-off point for area deprivation was a score below 20 on the IMD index without the health domain for Pakistani women, and a score below 15 for White British women. For financial situation, the two most positive scores indicated households were managing well financially, and the three most negative scores indicated financial difficulties. Also, the analyses were stratified by level of ethnic density to test for a difference in the associations between social capital and health for areas with higher and lower ethnic density. For Pakistani women, more than 60% Pakistani residents in a LSOA was considered high ethnic density, and up to 60% was considered low ethnic density. For White British women, more than 80% White British residents in a LSOA was considered high ethnic density, and up to 80% was considered low ethnic density.

Whenever possible the analyses were repeated with interaction factors to check the consistency of results. However, small sample sizes in subgroups did not always permit the use of multilevel analyses with a wide range of covariates. This means that in some cases no stratified analyses or tests for interactions were performed, and in some cases the model was simplified to a single-level model with a reduced set of covariates. For example, marital status was excluded because I assumed it to measure largely similar aspects of household life as the variable 'cohabitation', and the same was true for various measures of SES.

8.3 Results

8.3.1 Individual- and area-level characteristics

The data used in this chapter were selected based on the availability of social capital-related information, which means participants recruited during two different phases were included, while another group of participants was excluded from these analyses. Tables 8.4 and 8.5 show that differences between people in various phases of the data collection are small.

Individual characteristics

Pakistani women tend to be slightly older in Phase 3, are less likely to be living with the father of the baby, more likely to be born in the UK, and less likely to have another child (Table 8.4). Rates of smoking during pregnancy are higher for women included in Phase 3 of the data collection compared to Phase 1 (Table 8.4).

Table 8.4 Individual- and area-level characteristics of Pakistani participants[a]

	Total sample[b] *N = 4,357*	**Phase 1 only** *N=671*	**Phase 3 only** *N = 1,268*
Individual-level			
Maternal age (years)	28.2 (28.02;28.33)	27.9 (27.46;28.26)	28.6 (28.30;28.87)
Marital status (%)			
First marriage	91.9	90.6	91.8
Cohabitation			
Living with father baby	93.1	94.9**	91.1
Country of birth			
UK	42.4	38.3**	45.5
Time at address (years)	5.3 (5.15;5.50)	5.11 (4.69;5.54)	5.35 (5.03;5.67)
Parity			
First child	36.1	34.9***	41.5
Birth weight (grams)	3,133 (3,117;3,149)	3,123 (3,082;3,165)	3,139 (3,111;3,166)
Smoking during pregnancy (%)	3.5	1.2**	3.9
GHQ (total score)	6.4 (6.22;6.96)	5.35 (4.13;6.57)	6.0 (5.74;6.33)

	Total sample[b] *N = 4,357*	Phase 1 only *N=671*	Phase 3 only *N = 1,268*
Area-level (LSOAs)			
Deprivation 2010 (score)	46.8 (46.33;47.20)	47.49 (46.43;48.55)	46.22 (45.39;47.04)
Deprivation change 2010-2004	-2.3 (-2.41;-2.15)	-2.4 (-2.73;-2.07)	-2.1 (-2.32;-1.85)
Ethnic density (% Pakistani residents, 2010)	54.0 (53.34;54.58)	55.3 (53.74;56.82)	52.5 (51.32;53.69)
Ethnic density change 2010-2001	9.9 (9.62;10.19)	9.6 (8.94;10.34)	10.20 (9.67;10.73)
UK born residents (%) 2010	72.1 (71.69;72.56)	72.18 (71.06;73.30)	71.92 (71.13;72.72)
Change UK born residents 2010-2001	-0.2 (-0.83;0.18)	0.28 (-1.03;11.59)	-1.4 (-2.30;-0.45)
Population density 2010	76.8 (75.16;78.45)	76.3 (72.07;80.56)	76.9 (74.0;79.9)
Population density change 2010-2001	-2.0 (-3.72;-0.31)	-4.6 (-9.05;-0.22)	0.9 (-2.22;4.10)
Health domain IMD score	1.1 (1.07;1.10)	1.1 (1.07;1.14)	1.1 (1.04;1.10)
Health domain CWI score	0.4 (0.43;0.46)	0.4 (0.43;0.50)	0.4 (0.42;0.47)

a) Singleton Pakistani infants for which data could be merged with area-level data.
b) Pearson chi square tests for difference in distribution of characteristics between samples: * p < 0.05, ** p<0.01, *** p<0.001.

In the White British sample there were no large differences in individual- and area-level characteristics between phases either, except for a higher level of area deprivation in the third data collection Phase (Table 8.5).

Table 8.5 Individual- and area-level characteristics of White British participants[a]

	Total sample[b] *N = 3,869*	Phase 1 only *N= 589*	Phase 3 only *N = 1,381*
Individual-level			
Maternal age (years)	27.1 (26.91;27.30)	27.3 (26.84;27.83)	27.1 (26.73;27.36)
Marital status (%)			
First marriage	29.8*	30.7	27.1
Cohabitation			
Living with father baby	70.5*	71.6	67.9
Country of birth			
UK	98.2	98.0	98.6
Time at address (years)	4.5 (4.38;4.71)	4.4 (3.98;4.83)	4.82 (4.52;5.12)
Parity			
First child	52.3	55.2***	55.7
Birth weight (grams)	3,355 (3,338;3,373)	3,354 (3,309;3,399)	3,356 (3,326;3,386)
Smoking during pregnancy (%)	34.1	24.5***	36.0
GHQ (total score)	5.4 (5.19;5.53)	5.0 (3.52;6.56)	5.3 (5.02;5.54)

	Total sample[b]	Phase 1 only	Phase 3 only
	N = 3,869	*N= 589*	*N = 1,381*
Area-level (LSOAs)			
Deprivation 2010 (score)	36.8 (36.20;37.40)	35.0 (33.45;36.51)	37.8 (36.81;38.78)
Deprivation change 2010-2004	-0.1 (-0.25;-0.01)	-0.1 (-0.39;0.24)	-0.0 (-0.22;0.17)
Ethnic density (% White British residents, 2010)	73.5 (72.77;74.20)	73.1 (71.31;74.93)	73.1 (71.85;74.29)
Ethnic density change 2010-2001	-11.9 (-12.18;-11.57)	-12.51 (-13.33;-11.68)	-11.81 (-12.32;-11.30)
UK born residents (%) 2010	85.1 (84.68;85.50)	84.1 (82.98;85.23)	85.1 (84.40;85.79)
Change UK born residents 2010-2001	-7.5 (-7.90;-7.16)	-8.6 (-9.61;-7.57)	-7.30 (-7.92;-6.68)
Population density 2010	44.5 (43.54;45.41)	46.2 (43.52;48.82)	44.3 (42.68;45.85)
Population density change 2010-2001	5.3 (4.37;6.30)	8.3 (5.51;11.16)	5.3 (3.72;6.97)
Health domain IMD score	0.8 (0.82;0.86)	0.8 (0.74;0.84)	0.9 (0.84;0.90)
Health domain CWI score	0.3 (0.29;0.30)	0.3 (0.27;0.30)	0.3 (0.29;0.31)

a) Singleton White British infants for which data could be merged with area-level data.
b) Pearson chi square tests for difference in distribution of characteristics between samples: * p < 0.05, ** p<0.01, *** p<0.001.

In this selected sample of mothers and infants, as in the total sample, the expected differences between the Pakistani and White British participants arise. White British mothers are slightly younger (p<0.001), less likely to be in their first marriage (p<0.001), and less likely to be living with the father of the baby (p<0.001). As such, the family situation of Pakistani mothers and infants might on average be more stable. As previously observed, birth weight is lower in the Pakistani group (p<0.001) and so is the prevalence rate of smoking during pregnancy (p<0.001).

Neighbourhood characteristics

At the LSOA-level, the biggest differences are a higher level of deprivation for Pakistani residents, and lower levels of White British density. For the Pakistani sample in particular, their neighbourhoods have in the years prior to the survey become less deprived in comparison with other LSOAs (Table 8.4). For both Pakistani and White British families, neighbourhoods had a lower percentage of White British residents in 2010 than in 2000. Especially the White British sample has seen a decrease in the percentage of UK born residents in their neighbourhoods (Table 8.5). Population density of the LSOA has gone down slightly for Pakistani families, and up for White British families.

Comparing area-level health measured by the health domains of the IMD and the ICW shows that these indicators point towards slightly higher health scores for LSOAs in which the White British sample lives than for LSOAs of the Pakistani sample.

8.3.2 Descriptive analysis of social capital

For a descriptive overview of social capital scores by ethnic group see Appendix 3C.

Perceptions of the neighbourhood

Scores for the composed measure of perceptions of the neighbourhood in Phase 1 were not statistically different between Pakistani and White British mothers. Around 90% of all mothers said their area is a place they enjoy living in. Even in the five most deprived LSOAs in the sample (N=22), falling within the 0.5% most deprived in England, 77.3% of the mothers said they enjoy living in the area.

Pakistani mothers were more likely than White British mothers to say that neighbours look after each other (85.5% versus 73.7%), and that their neighbourhood has good leisure facilities (78.6% versus 65.9%). There were no large differences between ethnic groups in reported problems with vandalism and teenagers hanging around. In both groups, over 30% of the mothers reported there was a very or fairly big problem with teenagers hanging around. Vandalism was said to be a very or fairly big problem by around 25% of the mothers. In general, participants were unlikely to ‘strongly disagree’ with any statement, or to choose the option ‘very difficult’. This finding may reflect a reluctance to opt for extreme responses.

Phase 3 includes one question on neighbours. White British mothers were more likely to report problems with their neighbours than Pakistani mothers (10.7% versus 5.2%).

Social participation

Participation in one or more activity was reported by 37.2% of the White British and 32.8% of the Pakistani mothers in Phase 1. The most popular organisations and activities were sports (9.6%), religious groups (7.7%), and parent-teacher associations (7.2%). Participation in sports was more common among White British than Pakistani mothers (13.8% versus 6.1%), while Pakistani mothers were more likely to be active in parent-teacher associations (8.3% versus 5.8%).

General trust

In Phase 1, only 25.0% of the White British and 21.1% of the Pakistani mothers said other people can be trusted. The score was composed of three questions, namely trust, helpfulness and fairness, and indicates that Pakistani mothers were more likely to have the most negative score (15.9% versus 11.8%), and less likely to have the most positive score (11.2% versus 18.4%). The question on trust in Phase 3 of the questionnaire shows a similar result, with the level of trust being slightly lower among Pakistani mothers.

Mothers from the BiB sample scored low on general trust compared to people from the United Kingdom, as measured by the WVS in 2005 (Teitler et al., 2007). In the UK in general, 30.0% said most people can be trusted (Table 8.6). Trust has been shown to be associated with income inequality, and is generally higher in the more socially equal European countries (Uslaner, 2010).

Table 8.6 Trust comparison between countries (World Values Survey, 2005)

	UK	**India**	**Sweden**	**Romania**	**US**	**Mexico**
Most people can be trusted	30.0%	20.7%	65.2%	19.3%	39.1%	15.4%
Need to be very careful	68.3%	68.2%	30.7%	75.6%	60.3%	83.3%
Don't know	1.5%	11.1%	4.1%	3.0%	0.2%	0.4%

Social support

Questions on social support in Phase 1 apply to the wider social network and benefits derived from this network. On the composed measure of these questions, White British women scored 13.2 on average (95% CI 13.07; 13.35), while Pakistani women scored significantly lower with 12.0 (95% CI 11.76; 12.19) points, indicating less social support. Questions on social support in Phase 3 largely involved close family and the partner. Although both ethnic groups had similar scores for the composed measure of social support in Phase 3 (Appendix 3C), there were differences for some of the questions. Of the White British women, 82.9% said there certainly are people who make them happy, while only 63.9% of Pakistani women said the same. Of the Pakistani women 74.9% reported that there certainly are people around who can be relied on, compared to 91.7% of White British women. Of the Pakistani women, 24.8% agreed or strongly agreed with the statement ‘I wish there was more warmth and affection between us’, while the same was true for only 10.6% of White British women. Pakistani women were also more likely to report they sometimes feel excluded in their own family (8.0% versus 4.5% strongly agree), and there are people living with them they wish weren’t there (4.3% versus 2.2%).

8.3.3 Area-level social capital and health

Aggregate social capital measures were computed for LSOAs with at least three observations, and these variables were tested in association with the health domains of the IMD and the ICW, adjusting for other contextual factors at the LSOA-level. Contextual factors were: domains of the deprivation indices other than the health domain, percentage of White British residents according to the Census 2010, and population density (people per hectare) according to the Census 2010. There are 183 LSOAs from Phase 1 and 212 LSOAs from Phase 3 of the data collection with social capital information.

The output of all regression models for this section can be found in Appendix 3C. Table 8.7 provides a summary of results. The summary score of NSC was associated with better area-level health (β -0.04, $p=0.027$), and there was a non-significant association in the opposite direction for child health (β 0.03, $p=0.098$). No associations were found between area-level health and social support as measured in Phase 1 of the questionnaire, but social support questions in Phase 3 of the questionnaire did correlate with area-level health. Higher social support was associated with better health as measured by the IMD (β -0.05, $p=0.008$), but not with child health (β -0.02, $p=0.416$).

In general, associations between area-level factors and health were small. It is therefore likely that the influence of context on individual social capital is small, and individual factors will be more important in the relationship with health than area-level factors.

8.3.4 Individual social capital and health

Analyses were performed separately for the Pakistani and White British sample (summary in Table 8.7). The statistical code for all regression models is reported in Appendix 3C.

Birth weight

No associations were found between birth weight and social capital for Pakistani or White British mothers and infants.

GHQ

The GHQ items were not added to the questionnaire until Phase 3 of the data collection, which limits the information on social capital available for this subsample. A higher level of social support from the partner and close family was associated with better mental health for Pakistani women (β -0.06, $p<0.001$), and for White British women (β -0.07, $p<0.001$).

Also, a higher level of trust was associated with better mental health. On a five point scale, Pakistani women with the highest level of trust (score 1) had significantly lower GHQ scores than those with a score of 2 (β 0.09, $p=0.025$), a score of 4 (β 0.28, $p<0.001$), and a score of 5 (β 0.16, $p<0.001$). For White British women, mental health significantly increased with every category of trust. The difference in the GHQ score was biggest for women with the highest level of trust compared to the lowest level of trust (β 0.55, $p<0.001$).

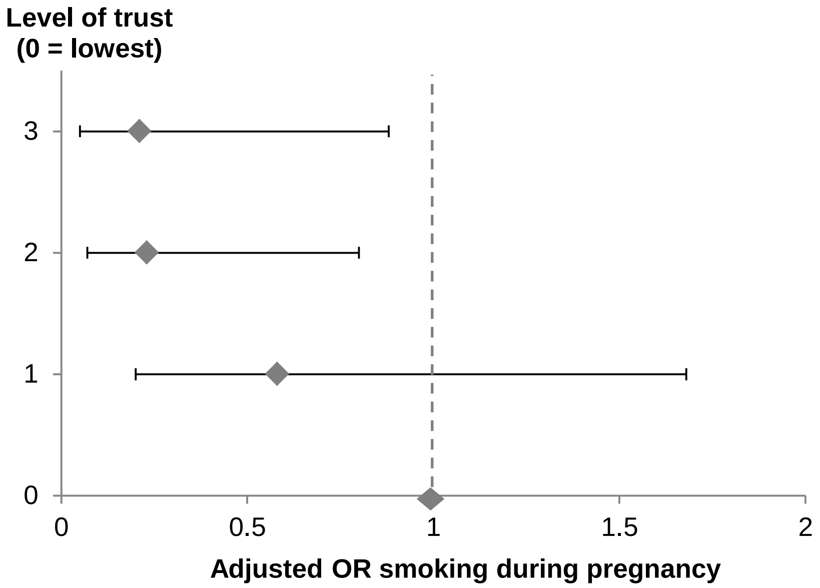
The association between reporting problems with neighbours and worse mental health was not significant for Pakistani women (β 0.09, $p=0.103$), while it was for White British women (β 0.27, $p<0.001$).

Smoking during pregnancy

Because very few Pakistani women in the sample smoked during pregnancy (3.5%), it was not possible to perform the same analyses as for the other health outcomes. Instead, a reduced set of variables was used in single-level statistical models (Appendix 3C).

In Phase 1 of the questionnaire, a higher level of trust was associated with lower odds of smoking during pregnancy for White British women (Figure 8.3). Women had lower odds of smoking if they scored the second highest level of trust (OR 0.23, $p=0.020$) or the highest level of trust (OR 0.21, $p=0.033$), compared to women with the lowest level of trust. However, with the Phase 3 questions on trust in the full multilevel model there was no statistically significant association between smoking during pregnancy and trust for Pakistani or White British women.

Figure 8.3 Smoking during pregnancy in association with trust for White British women



For White British women there was a borderline significant association between social participation and lower odds of smoking (OR 0.52, p=0.085). No associations were found for NSC in either phase of the questionnaire. For White British women, a higher level of social support was associated with lower odds of smoking in Phase 1 (OR 0.81, p=0.015) and Phase 3 of the questionnaire (OR 0.95, p=0.026). For Pakistani women, a higher level of social support in Phase 3 of the questionnaire was associated with lower odds of smoking (OR 0.91, p=0.016).

Table 8.7 Summary of results on associations between social capital and health

	Area-level health		**Individual-level health**					
Social capital measure 1=Phase 1 3=Phase 3	Health (IMD)	Child health (CWI)	Smoking during pregnancy		Mental health (GHQ)		Birth weight	
Ethnic group			PK[a]	WB[b]	PK	WB	PK	WB
Neighbourhood (1)	Positive	Negative	No association	No association	No data	No data	No association	No association
Trust (1)	Positive	Positive	No association	Positive	No data	No data	No association	No association
Social support (1)	No association	No association	No association	Positive	No data	No data	No association	No association
Social participation (1)	Positive	Positive	No association	Positive	No data	No data	No association	No association
Neighbourhood (3)	No association	No association	No association	No association	No association	Positive	No association	No association
Trust (3)	No association	No association	No association	No association	Positive	Positive	No association	No association
Social support (3)	Positive	No association	Positive	Positive	Positive	Positive	No association	No association

a) PK = Pakistani mothers and infants
b) WB = White British mothers and infants

- No data available
- No association social capital and health (p > 0.1)
- Positive association social capital and health (p < 0.1)
- Negative association social capital and health (p < 0.1)

8.3.5 Social capital and health, stratification by social disadvantage

Analyses performed in the previous section were repeated whenever possible, stratified first by level of area deprivation (summary in Table 8.8) and secondly by individual financial situation (summary in Table 8.9), and tested in interaction models with area deprivation as a continuous variable and financial situation as a categorical variable (Appendix 3C).

Birth weight of Pakistani infants

Birth weight of Pakistani infants did not seem to be related to social capital in the full model, but when the analyses were stratified some associations did appear. For infants in areas with a higher level of deprivation, higher NSC was associated with higher birth weight (β 32.14, $p=0.013$) (Table 8.8). However, there were only 154 observations in this group, which produced very wide confidence intervals. The interaction model with NSC and deprivation both as continuous variables indicated that the combination of higher NSC and higher deprivation was associated with higher birth weight (β 2.90, $p=0.045$) (Appendix 3C). No statistically significant interaction was found for households' financial situation.

There was some evidence of an association between a higher level of trust (as measured in Phase 1 of the questionnaire), and higher birth weight for Pakistani infants in more deprived areas (β 234.96, $p=0.084$), and for those of lower SES (β 313.80, $p=0.091$) in the stratified analyses, but not in the interaction analyses and not with the Phase 3 questions on trust (Appendix 3C).

In less deprived areas only, social participation was associated with higher birth weight (β 123.26, $p=0.039$) (Table 8.8). The interaction term for social participation and area deprivation in relation to birth weight was borderline significant (β -16.31, $p=0.077$).

Higher social support in Phase 3 was associated with lower birth weight for Pakistani women in more deprived areas only (β -15.19, $p=0.061$), but the effect size was very small and the interaction factor not statistically significant. No interaction was found for financial situation, or for higher social support in Phase 1.

Smoking during pregnancy for Pakistani women

In the main analyses, odds of smoking during pregnancy were lower for Pakistani women when social support (Phase 3) was higher (OR 0.91, $p=0.016$). Because very few Pakistani women smoked during pregnancy, it was not possible to split the sample into groups with higher and lower deprivation, or higher and lower SES, or to perform interaction analyses.

Mental health for Pakistani women

When the complete sample was analysed, mental health for Pakistani women was better when levels of social support and trust were higher. A higher level of social support was associated with better mental health for Pakistani women in more affluent (β -0.06, $p<0.001$) and more deprived areas (β -0.06, $p<0.001$) (Table 8.8), and for those of higher SES (β -0.06, $p<0.001$) and lower SES (β -0.05, $p<0.001$) (Table 8.9). There was a small interaction effect for social support and area deprivation, so that social support was associated with mental health especially for those in more deprived areas (β -0.001, p=0.042). However, the model with an interaction term for social support and financial situation showed that while social support was associated with better mental health, social support was associated with worse mental health for those who reported there financial situation to be difficult (β 0.03, p=0.057) or very difficult (β 0.05, p=0.035).

A higher level of trust was also associated with better mental health for Pakistani women in all subgroups.

Reporting problems with neighbours was not associated with mental health in the full sample, but it was associated with worse mental health for Pakistani women in more affluent areas (β 0.16, p=0.023) (Table 8.8), and for those of higher SES (β 0.27, p<0.001) (Table 8.9). The interaction model shows an association between problems with neighbours and worse mental health (β 0.45, p=0.018), but for people in more deprived neighbourhoods problems with neighbours is associated with better mental health (β -0.02, p=0.052).

Birth weight of White British infants

In the full sample, birth weight was not associated with any social capital measures for White British infants. In the stratified analyses, some statistically significant associations were found.

For White British infants of lower SES, higher NSC was associated with higher birth weight (β 36.09, p=0.017), while for infants of higher SES a borderline significant association in the opposite direction was found (β -15.97, p=0.080) (Table 8.9). Both associations had a small effect size and are possibly due to chance rather than a true relationship, as interaction terms did not show a significant interaction.

In the interaction model, social participation of White British women was associated with higher birth weight only if those women reported that managing financially was difficult (β 728.9, p=0.038), but the analyses were underpowered.

For infants in less deprived areas, the lowest level of trust (Phase 3) was associated with higher birth weight (β 166.86, p=0.026), while for infants of lower SES a higher level of trust was associated with higher birth weight (β 214.05, p=0.043).

Although social support as measured in Phase 1 did not show any interactions with social disadvantage in relation to birth weight, social support as measured in Phase 3 did. Higher birth weight was associated with lower social support (β-22.48, p=0.081) and lower deprivation (β-43.97, p=0.026), but women living in areas with higher levels of deprivation and reporting higher levels of social support had infants with a higher birth weight (β1.72, p=0.050).

Smoking during pregnancy for White British women

In the analyses of the full sample, odds of smoking during pregnancy were lower for women with higher levels of trust, social support, and social participation. As sample sizes were not large enough to perform stratified analyses with the full multilevel model, a simplified single-level model was used. The variables 'marital status' and 'time at address' were not significant covariates in the full analyses, and were removed from the model to increase statistical power. Models taking into account area-level and cross-level interactions were not performed due to low sample sizes.

Higher levels of trust were associated with lower levels of smoking for women of higher and lower SES (Table 8.8), for women in more deprived areas (highest versus lowest level: OR 0.03, p=0.008), but not for women in less deprived areas (Table 8.8).

Women in areas with higher levels of deprivation were less likely to smoke if they reported problems with their neighbours (OR 0.49, p=0.043), while the same was not true for women who lived in less deprived areas (Table 8.9).

White British women who reported higher levels of social support in Phase 1 of the questionnaire were less likely to smoke if they lived in areas with higher deprivation (OR 0.72, p=0.015), or if they were of lower SES (OR 0.82, p=0.043). In Phase 3 of the questionnaire, higher social support was associated with lower odds of smoking for White British mothers living in areas with higher deprivation (OR 0.92, p=0.005), or if they were of higher SES (0.93, p=0.009). Although the direction of the association was similar for women of lower SES, this result was not significant (OR 0.96, p=0.147).

Mental health for White British women

White British women scored better on mental health if they had a higher level of trust, more social support, and a better relationship with their neighbours. These associations were found for women in more affluent and more deprived areas, and for women of higher and lower SES. The association between social support and better mental health for example was highly significant for women in more affluent areas (β -0.07, p<0.001) and more deprived areas (β -0.06, p<0.001) (Table 8.8). Interaction analyses showed no significant results in the interaction between social disadvantage and social capital.

Table 8.8 Summary of results on associations between social capital and health, analysis stratified by level of deprivation

Level of deprivation	High		Low		High		Low		High		Low	
Ethnic group	PK[a]	WB[b]	PK	WB	PK	WB	PK	WB	PK	WB	PK	WB
	Smoking				Mental health				Birth weight			
Neighbourhood (1)												
Trust (1)												
Social support (1)												
Social participation (1)												
Neighbourhood (3)												
Trust (3)												
Social support (3)												

a) PK = Pakistani mothers and infants
b) WB = White British mothers and infants

No data available

No association social capital and health (p > 0.1)

Positive association social capital and health (p < 0.1)

Negative association social capital and health (p < 0.1)

Table 8.9 Summary of results on associations between social capital and health, analysis stratified by individual socioeconomic status

Individual SES	High		Low		High		Low		High		Low	
Ethnic group	PK[a]	WB[b]	PK	WB	PK	WB	PK	WB	PK	WB	PK	WB
	Smoking				Mental health				Birth weight			
Neighbourhood (1)												
Trust (1)												
Social support (1)												
Social participation (1)												
Neighbourhood (3)												
Trust (3)												
Social support (3)												

a) PK = Pakistani mothers and infants
b) WB = White British mothers and infants

No data available

No association social capital and health (p > 0.1)

Positive association social capital and health (p < 0.1)

Negative association social capital and health (p < 0.1)

8.3.6 Social capital and health, stratification by ethnic density

Stratified analyses with high and low ethnic density neighbourhoods were performed in addition to models with interaction terms. For the interaction models, the variables of marital status and time lived at address were removed from the model as they have not previously been statistically significant in relation to health. Stratified analyses or interaction analyses were not possible for smoking during pregnancy in Pakistani women due to the low prevalence of smoking.

Most of the analyses did not reveal any differences in the associations between health and social capital for areas with high and low ethnic density (summary in Table 8.10). Higher levels of trust, higher levels of social support, and good relationships with neighbours were associated with better mental health for Pakistani and White British women in areas with lower and higher ethnic density.

For White British women, higher ethnic density tended to be associated with higher birth weight (β 2.57, p=0.068), but if women reported social participation higher ethnic density was more likely to be associated with lower birth weight (β -3.87, p=0.089). For other interaction models of birth weight, no interactions were found.

A higher level of trust was associated with higher birth weight for White British infants in areas with lower White British density (β 199.07, p=0.046), and associated with lower birth weight for Pakistani infants in areas with higher Pakistani density (β 199.51, p=0.016).

White British women were more likely to smoke during pregnancy if they perceived their neighbourhood as less favourable (OR 0.71, p=0.038). However, there was a very small but statistically significant interaction effect suggesting that women in areas with higher White British density were more likely to smoke during pregnancy if they rated the neighbourhood higher (OR 1.005, p=0.039).

Prevalence rates of smoking during pregnancy for White British women were lower for those in areas with higher White British density who reported higher levels of social support from the wider social network (Phase 1) (OR 0.82, p=0.054), and trust (Phase 3) (OR 1.88, p=0.058). When the Phase 3 measure of trust was tested in the interaction model, lower trust was associated with higher odds of smoking only in areas with lower White British density. Ethnic density was associated with higher odds of smoking for those with trust scores of 3 out of 5 (OR 1.02, p=0.024), 4 of out 5 (OR 1.03, p=0.039), and 5 out of 5 (OR 1.02, p=0.076), with a score of 5 representing the lowest level of trust.

The measure of social support from the partner and family (Phase 3) was associated with lower odds of smoking in areas with higher (OR 0.94, p=0.036) and lower (OR 0.94, p=0.046) ethnic density.

Prevalence rates of smoking during pregnancy were lower for White British women who reported higher social participation in areas with lower White British density (OR 0.22, p=0.004), but the interaction model did not show a statistically significant interaction.

Table 8.10 Summary of results on associations between social capital and health, analysis stratified by ethnic density

Own ethnic density	High		Low		High		Low		High		Low	
Ethnic group	PK[a]	WB[b]	PK	WB	PK	WB	PK	WB	PK	WB	PK	WB
	Smoking				Mental health				Birth weight			
Neighbourhood (1)												
Trust (1)												
Social support (1)												
Social participation (1)												
Neighbourhood (3)												
Trust (3)												
Social support (3)												

a) PK = Pakistani mothers and infants
b) WB = White British mothers and infants

No data available

No association social capital and health (p > 0.1)

Positive association social capital and health (p < 0.1)

Negative association social capital and health (p < 0.1)

8.4 Discussion

8.4.1 Key findings

Participants were mostly positive about the area they live in, despite relatively high levels of area deprivation. However, various measures indicated that levels of individual social capital were low for mothers in the BiB study. The results point towards a lack of general trust, and a lack of social support from friends and family for Pakistani women in particular. The results of this study generally confirm the association between higher social capital and better health for White British and Pakistani women. Better mental health was most consistently associated with higher social capital, and no associations were found between birth weight and social capital in the full sample.

Variation by level of social disadvantage

Statistically significant associations between social capital and health outcomes were found for high and low levels of area deprivation, and high and low individual SES. Smoking during pregnancy seemed to be associated with social capital especially for White British women living in areas with high levels of deprivation, but these results could not be confirmed with interaction models. Findings for birth weight were ambiguous as well, with most associations between higher birth weight and social capital being found among Pakistani women in areas with high levels of deprivation, and among White British women of low SES. For example, the association between higher social support and higher birth weight for White British living in deprived areas only was confirmed as being statistically significant in an interaction model. For Pakistani women, interaction analyses showed that higher NSC was associated with higher birth weight especially if areas were more deprived.

No statistically significant interaction effects were found regarding mental health in the White British group, but for Pakistani women with financial difficulties higher social support from partner and family was associated with worse instead of better mental health. Also in the Pakistani sample, neighbourhood problems were associated with worse mental health in less deprived areas only.

Variation by level of ethnic density

The associations between health and social capital did not show substantial variation by level of ethnic density, except for some of the findings related to smoking during pregnancy. White British mothers were less likely to smoke if they had higher levels of trust (Phase 3 question) and lived in areas with lower White British density.

8.4.2 Results in relation to the literature

Social capital and health

Although the results showing associations between health and social capital confirm findings from previous studies (Chapter 3), this study adds to the evidence by showing that different measures of social capital have a different relationship with health, and these relationships possibly vary by ethnic group. Social support from partner and family for example was more often associated with health than social support from the wider social network (Table 8.7). Trust, social support, and social participation were associated with lower odds of smoking for White British but not for Pakistani women. This may be the results of small prevalence rates of smoking in the Pakistani group, or it might indicate that other factors diminish the positive influence of social capital on health for Pakistani women.

Finding that White British women who reported a higher level of trust were less likely to smoke during pregnancy is perhaps more surprising than finding an association between social support and smoking during pregnancy. However, previous research has found that people who are more trustful are less likely to smoke (Poortinga, 2006, Takakura, 2011, Chuang and Chuang, 2008, Siahpush et al., 2006), and more likely to quit smoking (Giordano and Lindström, 2011). Both trust and smoking are linked to social stress. Qualitative research has shown that smoking is a coping mechanism to deal with stress, and many women struggle to give up smoking when they get pregnant, despite strong social disapproval (Hackshaw et al., 2011). The negative attitude of peers towards their health behaviour during pregnancy might increase levels of stress, making it even harder to quit (Hackshaw et al., 2011). Levels of trust are known to be lower in societies that are more socially unequal, where people experience higher levels of stress because there is continuous pressure to excel and improve one's social status, which has a damaging effect on social networks (Chapter 3, Section 3.3.3) (Kawachi et al., 1997, Rothstein and Uslaner, 2005). In conclusion, a lower level of trust might indicate more social stress, which is in turn associated with smoking.

Social disadvantage

The literature review in Chapter 3 of this thesis identified the hypothesis of the dependency of capital, meaning that social capital is thought to provide health benefits only, or especially, when economic and cultural capital are available as well. This hypothesis is supported by some of the findings of this chapter, but not by most. For example, social participation was associated with lower odds of smoking during pregnancy only for White British women of higher SES (only in stratified analyses). This may indicate that social norms only discourage smoking in social networks with people of higher SES. Having good relationships with neighbours was associated with better mental health for Pakistani mothers in areas with lower levels of deprivation. This may be because of the dependency between social and economic capital, so that the social support received from neighbours in more deprived areas does not benefit health. However, most findings in this chapter point in a different direction.

Better mental health for example was associated with higher levels of trust and social support for White British and Pakistani women with low and high SES, and for those in areas with lower and higher levels of deprivation. Some results seem to indicate that the associations between social capital and health are especially prevalent in a context of higher social disadvantage, fitting the buffer hypothesis discussed in Chapter 3. For example, higher birth weight for Pakistani infants was more strongly associated with higher NSC in more deprived areas. For White British infants, higher birth weight was associated with higher social support only in more deprived areas. This may indicate that individual social capital buffers some of the detrimental effects of social disadvantage on health.

Ethnic density

Evidence on the ‘ethnic density hypothesis’ identified in Chapter 5 could only be confirmed for smoking during pregnancy (Chapter 7), and not for birth outcomes (Chapter 6). In this chapter, I found no clear indication that the association between health and social capital is associated with ethnic density.

Social capital seems to be related to individual characteristics first of all, while the influence of area-level factors seems much smaller, and ethnic density does not seem to play a significant role in this particular case. The overall level of social support from partner and family for example was not higher for Pakistani women than for White British women, and on the summary measure of support from the wider social network Pakistani women scored significantly lower than White British women. This is despite the fact that most Pakistani women in Bradford live in areas with a high percentage of Pakistani residents, and they are often part of a *biraderi* (kinship network within the Pakistani community), which is thought to be an important social structure that offers social and economic capital (Bolognani, 2007).

The only indication of a potential ethnic density effect is that for White British women, social participation was associated with lower odds of smoking during pregnancy for women in areas with lower White British density but not for those in areas with higher White British density. Social norms in areas with more South Asian residents possibly restrict smoking during pregnancy, and women who are more involved in the community are more likely to adhere to these social norms. This explanation is contradicted by the finding that social support from the wider social network was associated with lower odds of smoking for White British women in areas with higher White British density only, although the lack of an association in areas with lower White British density may be due to limited statistical power. Neither of these findings were confirmed in interaction analyses.

There was a statistically significant interaction between higher levels of trust and lower odds of smoking for White British women in areas with lower White British density. It could be argued that in areas where smoking during pregnancy is less accepted, having a higher level of general trust promotes the adaption of social norms in the neighbourhood (low acceptance of smoking in areas with lower White British density).

8.4.3 Strengths and limitations

The strengths and limitations of this study are largely similar to those reported in previous chapters using the same BiB dataset. Instead of being dependent on one or two measures of social capital, I was able to consider a range of measures which cover various aspects of social capital, in relation to multiple health outcomes. As different social capital measures showed different associations with health outcomes, this study demonstrates the importance of a careful and evidence-based choice of measures. However, measurement issues and a limited sample size may have affected this study.

Health outcomes

Although the results of this study generally confirm the literature on health benefits of social capital, associations between social capital and health were not found for every health outcome, nor could they be confirmed for every measure of social capital. This difference in results between health outcomes may in part be caused by the measurement of health outcomes. Mental health for example is a subjective outcome, and people who are more positive about their mental health may also respond more positively to social capital-related questions. In relation to birth weight, many findings were borderline significant (p 0.050-0.099), and some of these associations may be due to chance. This is more likely to happen with an outcome such as birth weight, as it is a continuous variable with a wide distribution. A difference of a few grams may be statistically significant, but has no clinical implications. Especially the stratified analyses may be affected by small sample sizes in subgroups.

Measures of social capital

Findings varied not only between different health outcomes, but also between different measures of social capital. Associations between trust and health for example were different for Phase 1 and Phase 3, despite samples in Phase 1 and Phase 3 having a similar distribution of individual characteristics (Table 8.4 and 8.5). These differences may have arisen because the measure of trust in Phase 1 included concepts of helpfulness and fairness, while in Phase 3 only general trust was measured. Social support questions might also measure slightly different concept in Phase 1 and Phase 3 of the questionnaire. Questions in Phase 3 were mainly focused on the partner and close family, while question in Phase 1 are applicable to friends and extended family. However, this does not explain why social support from partner and family was associated with lower odds of smoking only for White British women of higher SES, while social support from the wider social network was associated with lower odds of smoking only for White British women of lower SES. Stratification of the sample does reduce sample sizes and therefore statistical power, which may explain why associations between social capital and health were no longer statistically significant in the subsamples.

8.4.4 Research implications

The associations between health and social capital may vary between measures of social capital, health outcomes, and individual- and area-level characteristics such as ethnicity, individual SES, area deprivation, and ethnic density. In particular, more research is needed to establish whether the association between health and social capital is stronger or weaker in a context of social disadvantage. This study suggests that it is possible for social capital to provide health benefits in a context of social disadvantage, and that it may in fact buffer some of the detrimental effects of social disadvantage. However, social capital seemed low in general, which may be related to the fact that the city of Bradford is deprived overall, and all residents of Bradford suffer from stigma and social disadvantage to some extent (Chapter 1). Future studies may be able to clarify the associations between health, social capital, and social disadvantage by studying other populations, and by using analyses that go beyond the crude distinctions between higher or lower SES, and higher or lower area deprivation.

Ethnic density pathways

More research is needed to establish whether associations between higher minority ethnic density and better health are the result of social capital, or arise because of the protection from discrimination and stigma in community that is excluded from the wider society. Alternatively, this study suggests it may be the healthier social norms in particular, that promote health in areas with a higher percentage of South Asian residents. Although no associations were found with birth outcomes, healthier behaviour will over the life course result in better health and even impact on infant health in the offspring. A longitudinal study design would be the ultimate way to pick up on any effects of ethnic density or social capital that exert their influence over a longer period of time.

The role of social disadvantage

The studies on ethnic density (Chapter 6 and 7) were affected by a lack of understanding of the associations between social disadvantage and health for different ethnic groups, and this study has made only a minor contribution to understanding the impact social disadvantage could have on the relationship between social capital and health. Previous studies have reported conflicting findings, namely that the association between social capital and health may either be stronger or weaker in a context of social disadvantage. It is not known which of these two mechanisms is most likely to be true, under which circumstances, and whether ethnicity and ethnic minority status are relevant factors in this case. This study has shown that the associations between social capital and health seem to exist even in a context of poverty and area deprivation, for White British as well as Pakistani families. A better understanding of the basics, in particular the associations between social disadvantage and health for different ethnic groups, would help to improve more in-depth research on determinants of health and wellbeing.

Chapter 9

Social gradients in health

Allerton, Bradford. Own photography.

9.1 Introduction

9.1.1 Social gradients in health for ethnic minorities

It is well established that people from ethnic minority groups are more deprived and have worse health outcomes on average than the White ethnic majority in the UK. However, the extent to which ethnic inequalities in health are due to social inequalities between ethnic groups remains uncertain (Fischbacher et al., 2014). In the Fourth National Survey of Ethnic Minorities, which was one of the first UK studies to produce information on the health of ethnic minorities, the difference between social classes within the Pakistani/Bangladeshi group did not always conform to the general expectation of worse health correlating with lower social class (Nazroo, 1997). For example, the standard mortality rate for adult men stratified by social class showed a clear gradient for the total sample, but a weaker one for the Pakistani group, and inconsistent results for Caribbean, East African and West/South African people (Smith, 2003).

Previous research confirms that social gradients, although well-established in many different societies for a range of health outcomes, are less evident and sometimes absent for ethnic minority adults (Bhopal et al., 2002, Fischbacher et al., 2014, Bécares et al., 2012a), and children (Thomas et al., 2012, Aveyard et al., 2002, Zilanawala et al., 2014, Nepomnyaschy, 2009, Teitler et al., 2007). A study on prevalence rates of preterm birth in the UK found that socioeconomic factors were associated with preterm birth for UK White, African, and Afro-Caribbean infants, but for UK Asian babies SES did not explain much of the variance in preterm birth (Aveyard et al., 2002). In the MCS, adjusting for SES explained some of the variation in low birth weight (LBW) between ethnic groups, but only in the Black African group did it fully account for the excess proportion of LBW. In the Indian and Pakistani groups, the prevalence of LBW remained more than double the prevalence of LBW in the White British group after taking into account SES (Kelly et al. 2009). Another study confirmed that SES did not explain much of the variance in prevalence rates of LBW for UK Asian infants in the MCS, nor for US Asians and US Hispanic infants in the ECLS-B study (Teitler et al., 2007). A study making use of the same cohorts found that, in contrast to other UK and US ethnic minority groups, UK Pakistani children did not seem to share the burden of overweight and obesity caused by low SES (Zilanawala et al., 2014). However, other studies have reported social gradients in developmental delay for Pakistani and Bangladeshi children in the MCS (Kelly et al., 2006), and social gradients in wheeze and asthma symptoms for UK Black Caribbean and Bangladeshi children (Panico et al., 2007).

9.1.2 The importance of capturing social disadvantage

Since measures of SES and area deprivation are commonly treated as covariates rather than being the focus of studies involving ethnic minorities, the lack of associations between these measures and health outcomes has been mentioned but not fully explored or explained yet.

The evidence of attenuated social gradients in health for ethnic minorities suggests an underexplored phenomenon that influences the validity of research findings on a variety of topics, such as ethnic density, discrimination, and social support. In any study which considers ‘ethnic minority status’ in the context of social disadvantage, studying the ‘effect of ethnicity’ on health whilst ‘controlling for SES’ becomes problematic when the relationship between SES and health is poorly understood. Previous studies have suggested that the social position of ethnic minorities is not fully captured using conventional measures of SES, which implies analyses using these measures may underestimate the true effect of social disadvantage (Braveman et al., 2005, Kelaher et al., 2009). The findings in Chapter 6 of this thesis are exemplary of this problem. Not only did the analyses reveal a lack of associations between measures of SES, area deprivation and birth outcomes, but for preterm birth in particular, area deprivation and ethnic density were strongly correlated and seemed to partly account for the same variance in preterm birth. In relation to birth weight, an attempt to disentangle the health effects of ethnic density and area deprivation in a multilevel model led to the unlikely finding that higher levels of area deprivation were associated with higher birth weight, and higher levels of ethnic density with lower birth weight. Presumably this model was biased by multicollinearity between ethnic density and deprivation, and by the inadequate measurement of social disadvantage in the Pakistani group.

9.1.3 Aim and research questions

Earlier chapters in this thesis illustrate that ethnic density research in particular cannot progress from the inconsistent evidence available to date until social gradients in health for ethnic minorities are better understood. However, previous attempts to clarify what proportion of ethnic inequalities in health is due to social factors have been criticised for suggesting an ‘ethnicity’ effect, which emphasizes cultural or biological explanations instead of social and socio-economic ones (Bhopal, 2013). With this study I intend to do exactly the opposite, as I argue that the effect of social disadvantage on the health of ethnic minorities may be underestimated in health studies, and is in fact responsible for a bigger proportion of ethnic inequalities in health than previously reported. The aim of this chapter is to examine social gradients in health for Pakistani and White British women and infants in the UK. In particular, I focus on the following research questions, to be answered in two birth cohorts:

1. Is there a social gradient in LBW for Pakistani and White British infants?

2. Is there a social gradient in preterm birth for Pakistani and White British infants?

3. Is there a social gradient in smoking during pregnancy for Pakistani and White British women?

4. Is there a social gradient in maternal mental health for Pakistani and White British women?

9.2 Methods

9.2.1 Sample

This study compares social gradients in health for the Pakistani and White British groups in the BiB study and the first sweep of the MCS, as Pakistani people form one of the largest minority ethnic groups in the UK, and are the largest group in the BiB sample. Excluded from the samples were women and infants of other ethnic groups, stillbirths, second or third pregnancies of the same mother within the cohort, twins and triplets, and in BiB, observations which could not be merged with area-level data. From the BiB study, the sample for these analyses consists of 4,462 Pakistani and 3,979 White British mothers and infants. Ethnicity was classified as self-reported ethnicity of the mother in the BiB study sample, and self-reported ethnicity of the main respondent in the MCS cohort, which was the natural mother in 99.7% of cases.

Millennium Cohort Study

The MCS is a national UK birth cohort study with longitudinal data on nearly 19,000 participants (Ketende and Jones, 2011). In England, the first survey was sampled from a population of children born between September 2000 and August 2001, who were living in the UK at the age of nine months. The final sample size for England, largely obtained through Child Benefit records, includes 11,695 children (Plewis et al., 2004). Electoral wards with a high minority ethnic population and those with high levels of child deprivation were over-sampled (Plewis et al., 2004). The sample size of Pakistani and White British participants who fit the inclusion criteria for this study was 856 Pakistani mothers and infants, and 8,124 White British mothers and infants.

9.2.2 Health outcomes

Outcome measures include LBW in term babies (<2,500g), preterm birth (< 37 weeks), smoking during pregnancy, and maternal mental health. Infants' weight and estimated gestational age were registered directly after birth, and binary variables were constructed from this information. In the BiB study, a binary variable of smoking during pregnancy was derived from questions on smoking three months before pregnancy, smoking in the first three months of pregnancy, and smoking since the beginning of the fourth month. In the MCS, a binary variable of smoking during pregnancy was constructed from questions on smoking before pregnancy, a change of smoking habits during pregnancy, and smoking during pregnancy. Women who reported to have stopped smoking in the first month of pregnancy were counted as non-smokers during pregnancy. The GHQ-28 is used as a measure of mental health for the BiB cohort, and the Malaise Inventory for the MCS. Responses to the four categories of the GHQ items (not at all, no more than usual, rather more than usual, much more than usual) were scored 0/0/1/1, resulting in the sum of 28 binary measures, with a minimum score of 0 and a maximum score of 28. Responses to the Malaise Inventory resulted in a minimum score of 0 and a maximum score of 9. It is the specific goal of this study to compare social gradients in mental health, and not the level of mental health itself. I therefore do not use cut-off points for the GHQ or Malaise Inventory, but instead present the total score.

9.2.3 Socioeconomic status

Measures of SES included in these analyses are: maternal education, financial situation, receiving means-tested benefits, and employment of the father. Whether or not families receive means-tested benefits was derived from a list of benefits women reported to be receiving, and this information was used to create a binary variable. 'Financial situation' was measured by asking women how well they were managing financially, with five answer categories ranging from 'living comfortably' to 'very difficult'. Employment of the father was categorised as 'unemployed', 'semi-routine/ routine', 'self-employed', and 'professional' in the MCS, and as 'unemployed', 'employed manual', 'self-employed', and 'employed non-manual' in BiB. As not all mothers were aware of their partners' occupation and some were not living with a partner, employment status is missing for 252 Pakistani and 1,970 White British partners in the MCS, and for 194 Pakistani and 262 White British partners in BiB. Maternal education was categorised as '< GCSE A-C', 'GCSE A-C', 'A level', and '> A level' in the MCS, and as '< 5 GCSE', '5 GCSE', 'A level', and '> A level' in BiB. For the descriptive analysis, the deprivation score of the IMD 2010 was used.

9.2.4 Statistical analysis

Social gradients in health were assessed with multivariate regression analysis using Stata 12, and all analyses were adjusted for maternal age and parity. To facilitate comparison between the analyses no other covariates were included. For the analyses of the MCS data, I took into account the country specific weight, and adjusted for clustering at the area-level (Ketende and Jones, 2011). The statistical code for all regression models can be found in Appendix 3D.

9.3 Results

9.3.1 Individual- and area-level characteristics

Table 9.1 shows the individual characteristics of women and infants in the two cohorts, stratified by ethnic group. In the BiB cohort but not in the MCS, fathers of Pakistani babies were less likely to be unemployed than fathers of White British babies (Chi2 = 3.83(1), p<0.001).

Table 9.1 Demographics and health outcomes

	BiB Pakistani	**BiB White British**	**MCS Pakistani[a]**	**MCS White British[a]**
N	*4462*	*3979*	*856*	*8124*
Maternal age (mean, sd)	28.2 (0.08)	27.1 (0.10)	27.4 (0.23)	29.6 (0.15)
	t(8206)=-8.58, p<0.001		*t(1084)=-10.33, p<0.001*	
Parity				
First baby	40.4%	59.6%	34.8%	52.7%
Multiparous	52.3%	47.7%	65.2%	47.3%
	χ^2(1)=210.20, p<0.001		*χ^2(1)=116.20, p<0.001*	
Born in UK[b]	42.5%	98.2%	39.6%	97.9%
	χ^2(1)= 3000, p<0.001		*χ^2(1)= 3000, p<0.001*	
Maternal education				
< A level	57.0%	54.5%	67.2%	62.6%
A level	12.5%	17.0%	8.3%	9.2%
> A level	26.1%	18.6%	10.6%	26.9%
Other/missing	4.4%	9.9%	13.9%	1.3%
	χ^2(3)= 106.41, p<0.001		*χ^2(3)= 504.21, p<0.001*	

	BiB Pakistani	BiB White British	MCS Pakistani[a]	MCS White British[a]
Financial situation				
Very difficult	1.7%	1.8%	2.8%	2.3%
Quite difficult	6.4%	5.1%	10.4%	7.3%
Just about getting by	23.4%	26.1%	32.7%	26.1%
Doing alright	41.9%	40.5%	35.7%	37.0%
Living comfortably	26.7%	26.5%	18.3%	27.3%
	$\chi^2(4)$= 12.60, p=0.013		*$\chi^2(4)$= 59.83, p<0.001*	
Means-tested benefits				
Yes	45.4%	37.0%	62.5%	50.4%
No	54.6%	63.0%	37.5%	49.6%
	$\chi^2(1)$= 62.04, p<0.001		*$\chi^2(1)$= 54.86, p<0.001*	
Employment father/partner[c]				
Unemployed	7.1%	9.7%	22.4%	9.0%
Manual/ routine	40.8%	28.1%	39.1%	31.5%
Self-employed	19.7%	10.1%	21.9%	15.3%
Non-manual/ professional	31.1%	50.7%	22.4%	43.8%
Student	1.3%	1.4%	1.3%	0.5%
	$\chi^2(4)$= 412.20, p<0.001		*$\chi^2(4)$= 239.68, p<0.001*	
LBW term babies	5.8%	2.0%	8.9%	2.3%
	$\chi^2(1)$= 71.35, p<0.001		*$\chi^2(1)$= 72.30, p<0.001*	
Preterm birth[d]	5.0%	5.6%	6.3%	6.9%
	$\chi^2(1)$= 1.55, p=0.21		*$\chi^2(1)$= 0.06, p=0.81*	
Smoking during pregnancy	3.5%	34.3%	4.0%	31.2%
	$\chi^2(1)$= 1300, p<0.001		*$\chi^2(1)$= 313.67, p<0.001*	
Poor mental health BiB[e]	42.0%	39.6%		
	$\chi^2(1)$= 32.59, p<0.001			
Poor mental health MCS[e]			23.5%	12.8%
			$\chi^2(1)$= 49.24, p<0.001	

a) MCS figures based on weighted data for England.

b) Country of birth from sweep 2 MCS; missing for 204 Pakistani and 1,345 White British mothers.

c) Employment status missing for 252 Pakistani and 1,970 White British partners in the MCS, and for 194 Pakistani and 262 White British partners in BiB.

d) Due to recruitment for BiB around 28 weeks of pregnancy very premature babies are excluded.

e) Poor mental health is classified as a score of ≥ 4 on the 9 items of the Malaise Inventory for the MCS sample (Dex and Joshi 2004) and a score of ≥ 5 on the GHQ-28 in the BiB sample (Goldberg 1986; Goodwin et al. 2013).

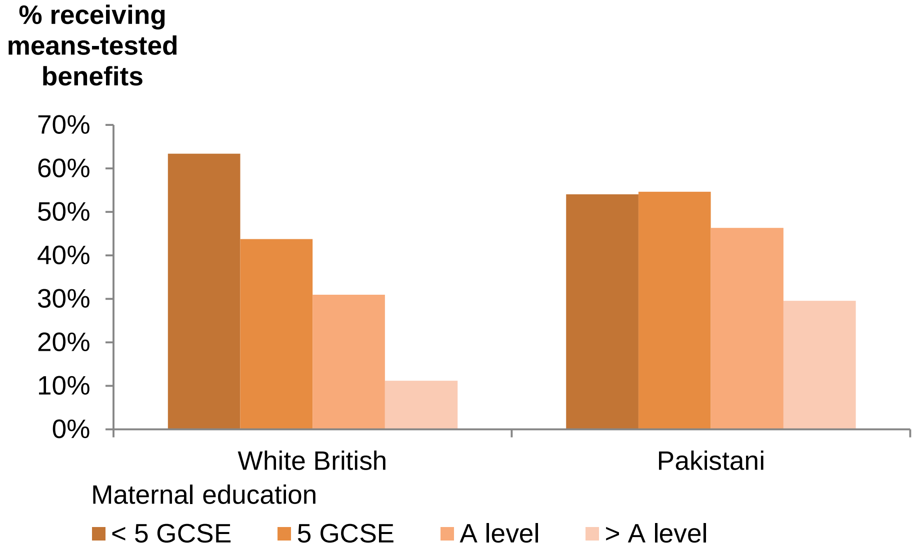
9.3.2 Correlations between measures of socioeconomic status

Correlations between all measures of SES in the BiB cohort and MCS cohort were confirmed in Pearson's chi-squared tests. As expected, higher levels of education correlated significantly with higher level employment, a lower likelihood of receiving benefits, and managing better financially ($p<0.05$). I took a closer look at these correlations in the BiB study.

Maternal education

Pakistani mothers are more likely than White British to fall into the categories of lowest and highest level of education (Table 9.1). For the White British group, educational level of the mother seemed a better indicator of SES later in life than for the Pakistani group. Pakistani mothers appeared to profit less from a high level of education than White British mothers. Of the White British mothers with the highest level of education, 11% reported to be receiving means-tested benefits, while in the Pakistani group 30% of those with the highest level of education reported means-tested benefits (Figure 9.1). White British mothers with the highest level of education were more than twice as likely as those with the lowest level of education to assess their financial situation as comfortable. Pakistani mothers with the highest level of education were only 1.5 times more likely than those with the lowest educational level to report living comfortably.

Figure 9.1 Receiving means-tested benefits by maternal education

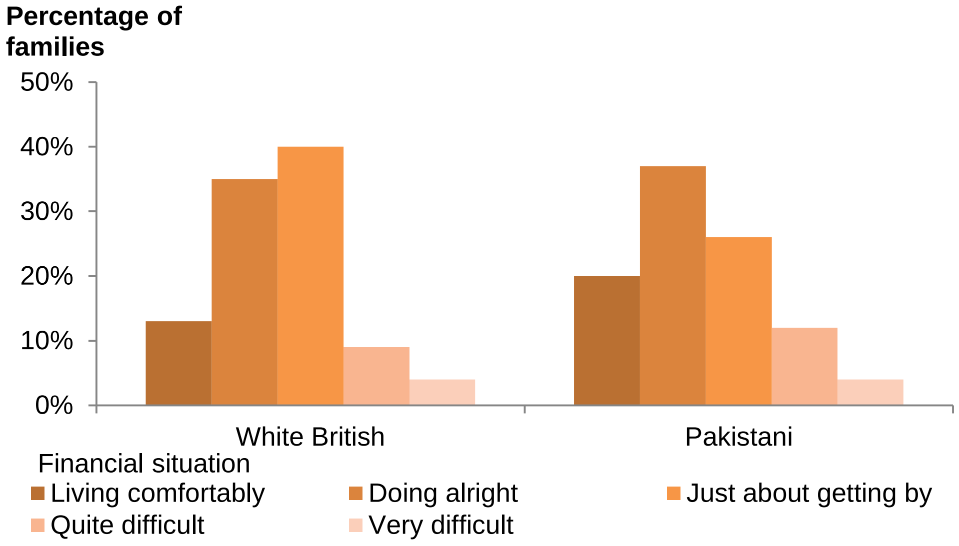


Managing financially

Pakistani women were more likely to report to be managing well financially despite receiving means-tested benefits or the father of the baby being unemployed (Figure 9.2).

Also, Pakistani men in higher occupations or those who did not receive benefits were more likely than White British men in these categories to report that they were struggling financially. For example, only 20% of the White British mothers who perceive their financial situation as ‘comfortable’ reported to be receiving means-tested benefits, compared to 34% of the Pakistani mothers.

Figure 9.2 Financial situation for families with unemployed father



Means-tested benefits

Pakistani families were more likely to receive means-tested benefits than White British families: 45% versus 37% (Table 9.1). In the White British sample, receiving benefits is more strongly related to struggling financially, having a low level of education and being unemployed than in the Pakistani sample.

Employment of the father

In general Pakistani fathers are less likely than White British to be unemployed (7% versus 10%) (Table 9.1). They are more likely to be in manual and self-employed occupations. However, Pakistani families in which the father of the baby is unemployed seem to be faring better than White British unemployed (Figure 9.2). Pakistani fathers who are unemployed only received means-tested benefits in 58% of the cases, compared to 70% of unemployed White British fathers receiving benefits.

Area deprivation

In the White British sample, area deprivation was much more strongly related to SES than in the Pakistani sample. Pakistani women lived in more deprived areas even if they had a high individual SES. This is in line with earlier analyses in this thesis on the spatial distribution of Pakistani families, who are mainly clustered in deprived inner city neighbourhoods. However, there are gradients in area deprivation for every measure of SES, also in the Pakistani group. Figure 9.3 and 9.4 illustrate mean levels of area deprivation by maternal education.

Figure 9.3 Area deprivation score by maternal education Pakistani sample

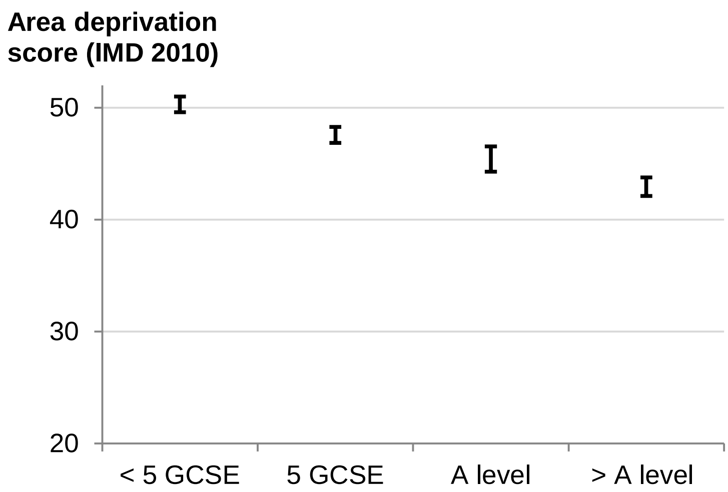
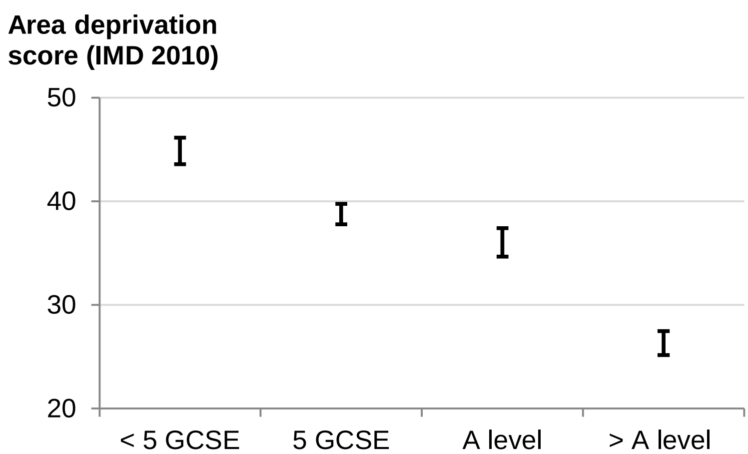


Figure 9.4 Area deprivation score by maternal education White British sample



9.3.3 Social gradients in low birth weight

Social gradients in LBW were not observed in either of the cohorts for Pakistani infants (Table 9.2). For White British infants, the odds of LBW decreased with a higher employment status of the father in both cohorts, and a higher educational level of the mother in the MCS. In both the MCS and BiB study, receiving means-tested benefits was associated with a higher prevalence rate of LBW for White British infants.

Table 9.2 Social gradients in low birth weight

	OR (95%CI)	*OR (95%CI)*	*OR (95%CI)*	*OR (95%CI)*
	Born in Bradford		**Millennium Cohort Study**	
	Pakistani	**White British**	**Pakistani**	**White British**
Maternal education				
* ref. < 5 GCSE / < GCSE A-C				
5 GCSE/ GCSE A-C	1.23 (0.87;1.73)	1.34 (0.72;2.52)	1.32 (0.60;2.87)	0.52 (0.37;0.73)***
A level	0.80 (0.49;1.30)	0.74 (0.33;1.70)	1.90 (0.69;5.20)	0.60 (0.35;1.04)†
> A level	0.78 (0.53;1.16)	0.72 (0.31;1.65)	0.88 (0.25;3.07)	0.22 (0.13;0.38)***
p for linear trend	*0.073*	*0.189*	*0.697*	*<0.001*
Financial situation				
* ref. very difficult				
Quite difficult	0.40 (0.13;1.28)	0.72 (0.13;4.02)	1.77 (0.34;9.35)	0.69 (0.23;2.03)
Just about getting by	0.77 (0.30;1.99)	0.85 (0.20;3.71)	1.57 (0.38;6.50)	0.72 (0.29;1.78)
Doing alright	0.80 (0.31;2.03)	0.55 (0.13;2.37)	0.95 (0.25;3.55)	0.75 (0.30;1.86)
Living comfortably	0.81 (0.31;2.08)	0.54 (0.12;2.42)	1.63 (0.30;8.85)	0.54 (0.21;1.37)
p for linear trend	*0.337*	*0.138*	*0.755*	*0.227*
Means-tested benefits				
* ref. benefits				
No benefits	1.03 (0.77;1.38)	0.52 (0.31;0.88)*	1.16 (0.58;2.35)	0.57 (0.40;0.80)**
Employment father				
*ref. unemployed				
Employed manual/ Semi-routine/ routine	0.79 (0.48;1.30)	0.57 (0.26;1.21)	2.39 (0.81;7.08)	0.33 (0.21;0.52)***
Self-employed	0.95 (0.55;1.62)	0.22 (0.06;0.83)*	1.93 (0.75;4.97)	0.28 (0.15;0.53)***
Employed non-manual / professional	0.74 (0.44;1.24)	0.44 (0.21;0.92)*	2.48 (0.72;8.46)	0.19 (0.11;0.32)***
p for linear trend	*0.480*	*0.063*	*0.360*	*<0.001*

† p< 0.1, * p < 0.05, ** p < 0.01, *** p<0.001

9.3.4 Social gradients in preterm birth

Incidence rates of preterm birth were not associated with any of the measures of SES for Pakistani infants (Table 9.3). This was in contrast to the White British group, for which social gradients in preterm birth were statistically significant in relation to financial situation in the BiB study, for maternal education in the MCS, and for employment of the father in both cohorts.

Table 9.3 Social gradients in preterm birth

	OR (95%CI)	*OR (95%CI)*	*OR (95%CI)*	*OR (95%CI)*
	Born in Bradford		**Millennium Cohort Study**	
	Pakistani	**White British**	**Pakistani**	**White British**
Maternal education * ref. < 5 GCSE / < GCSE A-C				
5 GCSE/ GCSE A-C	0.70 (0.48;1.03)†	0.70 (0.48;1.03)†	1.47 (0.77;2.82)	1.07 (0.84;1.37)
A level	0.87 (0.56;1.34)	0.87 (0.56;1.34)	1.29 (0.31;5.28)	0.66 (0.43;1.00)†
> A level	0.83 (0.52;1.30)	0.83 (0.52;1.30)	1.01 (0.37;2.77)	0.72 (0.55;0.95)*
p for linear trend	*0.631*	*0.631*	*0.742*	*0.003*
Financial situation * ref. very difficult				
Quite difficult	1.16 (0.38;3.55)	0.71 (0.27;1.83)	0.79 (0.26;2.41)	0.83 (0.44;1.57)
Just about getting by	0.87 (0.31;2.49)	0.59 (0.26;1.33)	1.42 (0.47;4.25)	0.71 (0.40;1.24)
Doing alright	0.94 (0.34;2.64)	0.51 (0.23;1.15)	1.01 (0.30;3.43)	0.72 (0.42;1.23)
Living comfortably	1.03 (0.36;2.91)	0.46 (0.20;1.06)†	0.68 (0.26;1.79)	0.63 (0.35;1.12)
p for linear trend	*0.841*	*0.038*	*0.412*	*0.056*
Means-tested benefits * ref. benefits				
No benefits	1.04 (0.77;1.40)	0.84 (0.61;1.15)	0.74 (0.33;1.62)	0.87 (0.73;1.04)
Employment father *ref. unemployed				
Employed manual/ Semi-routine/ routine	1.56 (0.83;2.96)	0.48 (0.30;0.76)**	0.56 (0.26;1.20)	0.58 (0.42;0.80)**
Self-employed	1.56 (0.80;3.06)	0.54 (0.31;0.97)*	0.46 (0.17;1.24)	0.52 (0.35;0.78)**
Employed non-manual / professional	1.18 (0.61;2.28)	0.46 (0.30;0.72)**	-	0.47 (0.34;0.65)***
p for linear trend	*0.427*	*0.021*	-	*0.001*

† p< 0.1, * p < 0.05, ** p < 0.01, *** p<0.001

9.3.5 Social gradients in smoking during pregnancy

In both groups of White British mothers, lower SES was associated with increased odds of smoking during pregnancy for all four measures of SES (p for trend < 0.001) (Table 9.4). For Pakistani mothers, social gradients in smoking during pregnancy were observed in relation to all four of the measures in the larger BiB sample, and in relation to financial situation and receiving benefits in the MCS.

Table 9.4 Social gradients in smoking during pregnancy

	OR (95%CI)	*OR (95%CI)*	*OR (95%CI)*	*OR (95%CI)*
	Born in Bradford		**Millennium Cohort Study**	
	Pakistani	**White British**	**Pakistani**	**White British**
Maternal education				
* ref. < 5 GCSE / < GCSE A-C				
5 GCSE/ GCSE A-C	1.52 (1.00;2.31)†	0.46 (0.38;0.55)***	0.80 (0.41;1.54)	0.45 (0.40;0.52)***
A level	1.57 (0.94;2.61)†	0.29 (0.23;0.36)***	1.49 (0.40;5.52)	0.23 (0.19;0.29)***
> A level	0.55 (0.32;0.95)*	0.10 (0.08;0.14)***	0.54 (0.12;2.45)	0.15 (0.12;0.18)***
p for linear trend	*0.037*	*< 0.001*	*0.706*	*<0.001*
Financial situation				
* ref. very difficult				
Quite difficult	0.75 (0.26;2.15)	0.66 (0.37;1.17)	0.75 (0.12;4.51)	0.71 (0.52;0.98)*
Just about getting by	0.83 (0.32;2.16)	0.56 (0.34;0.94)*	0.55 (0.15;2.09)	0.59 (0.43;0.81)**
Doing alright	0.45 (0.17;1.15)†	0.32 (0.19;0.53)***	0.29 (0.08;1.12)†	0.34 (0.25;0.46)***
Living comfortably	0.25 (0.09;0.68)**	0.21 (0.13;0.36)***	0.10 (0.01;1.19)†	0.22 (0.16;0.31)***
p for linear trend	*< 0.001*	*< 0.001*	*0.002*	*<0.001*
Means-tested benefits				
* ref. benefits				
No benefits	0.64 (0.45;0.92)*	0.38 (0.33;0.45)***	0.33 (0.12;0.93)*	0.49 (0.44;0.55)***
Employment father				
*ref. unemployed				
Employed manual/ Semi-routine/ routine	0.55 (0.32;0.93)*	0.42 (0.32;0.54)***	0.36 (0.10;1.32)	0.42 (0.35;0.51)***
Self-employed	0.47 (0.25;0.86)*	0.34 (0.25;0.47)***	0.51 (0.15;1.69)	0.29 (0.22;0.37)***
Employed non-manual / professional	0.43 (0.24;0.76)**	0.24 (0.19;0.31)***	0.20 (0.02;1.68)	0.16 (0.13;0.20)***
p for linear trend	*0.017*	*< 0.001*	*0.116*	*<0.001*

† p< 0.1, * p < 0.05, ** p < 0.01, *** p<0.001

9.3.6 Social gradients in mental health

A lower SES among White British mothers was associated with worse mental health for all measures in the MCS (p for trend < 0.001), and for maternal education (p for trend < 0.001), receiving means-tested benefits (p<0.01) and a more difficult financial situation (p for trend < 0.001) in the BiB study (Table 9.5). Among Pakistani mothers, social gradients in mental health were found for financial situation (Figure 9.5 and 9.6) and employment of the father in both cohorts, and for receiving means-tested benefits in BiB. Contrary to other measures of SES, a higher level of maternal education was not associated with better mental health in the MCS, and an association in the opposite direction was found with the BiB data (p for trend < 0.001).

Figure 9.5 Gradient in mental health by ‘financial situation’ for Pakistani women in Born in Bradford

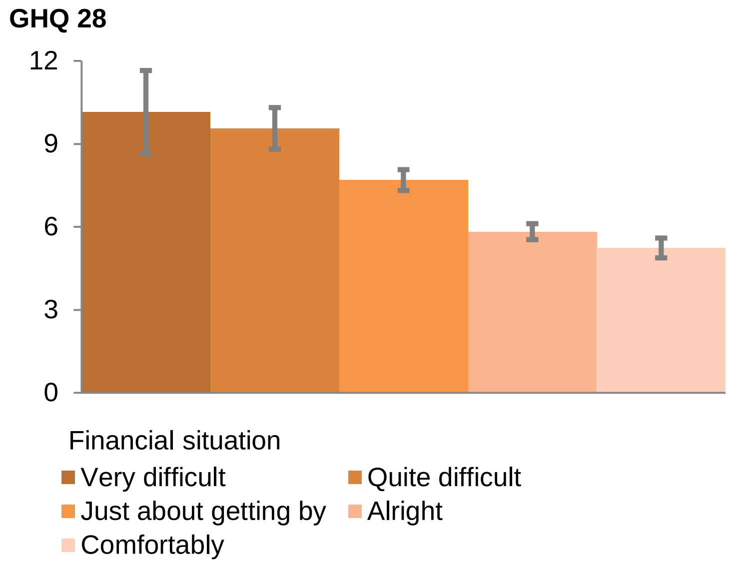


Figure 9.6 Gradient in mental health by ‘financial situation’ for Pakistani women in the Millennium Cohort Study

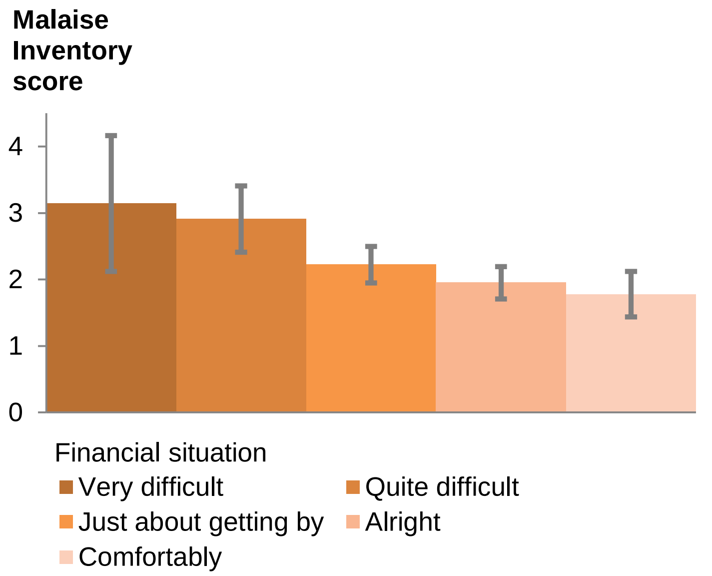


Table 9.5 Social gradients in mental health

	β (95%CI)	β (95%CI)	β (95%CI)	β (95%CI)
	Born in Bradford		**Millennium Cohort Study**	
	Pakistani	**White British**	**Pakistani**	**White British**
Maternal education * ref. < 5 GCSE / < GCSE A-C				
5 GCSE/ GCSE A-C	0.10 (0.07;0.14)***	-0.09 (-0.13;-0.05)***	0.13 (-0.07;0.33)	-0.19 (-0.24;-0.13)***
A level	0.20 (0.15;0.24)***	-0.15 (-0.20;-0.10)***	0.12 (-0.05;0.29)	-0.31 (-0.39;-0.22)***
> A level	0.09 (0.05;0.12)***	-0.16 (-0.21;-0.11)***	-0.09 (-0.46;0.27)	-0.29 (-0.37;-0.21)***
p for linear trend	*< 0.001*	*< 0.001*	*0.971*	*<0.001*
Financial situation * ref. very difficult				
Quite difficult	-0.05 (-0.14;0.05)	-0.04 (-0.14;0.05)	-0.17 (-0.52;0.17)	-0.26 (-0.38;-0.15)***
Just getting by	-0.28 (-0.37;-0.19)***	-0.31 (-0.40;-0.22)***	-0.29 (-0.67;0.09)	-0.44 (-0.54;-0.34)***
Doing alright	-0.55 (-0.64;-0.46)***	-0.55 (-0.64;-0.47)***	-0.52 (-0.88;-0.15)**	-0.80 (-0.90;-0.70)***
Living comfortably	-0.67 (-0.76;-0.58)***	-0.66 (-0.75;-0.57)***	-0.65 (-1.00;-0.29)**	-0.97 (-1.07;-0.86)***
p for linear trend	*< 0.001*	*< 0.001*	*<0.001*	*<0.001*
Means-tested benefits * ref. benefits				
No benefits	-0.10 (-0.13;-0.07)***	-0.14 (-0.18;-0.11)***	-0.09 (-0.26;0.08)	-0.19 (-0.25;-0.14)***
Employment father *ref. unemployed				
Employed manual/ Semi-routine/routine	-0.17 (-0.22;-0.12)***	-0.05 (-0.11;0.00)†	-0.13 (-0.38;0.13)	-0.25 (-0.33;-0.16)***
Self-employed	-0.20 (-0.26;-0.15)***	-0.03 (-0.10;0.03)	-0.19 (-0.45;0.08)	-0.43 (-0.54;-0.32)***
Employed non-manual/ prof	-0.19 (-0.24;-0.14)***	-0.03 (-0.09;0.02)	-0.39 (-0.76;-0.02)*	-0.48 (-0.57;-0.39)***
p for linear trend	*< 0.001*	0.868	*0.045*	*<0.001*

† p< 0.1, * p < 0.05, ** p < 0.01, *** p<0.001

a) Poisson regression analysis with summary score of the GHQ-28; higher β indicates higher probability of poor mental health.

b) Poisson regression analysis with summary score of the Malaise Inventory (9 items); higher β indicates higher probability of poor mental health.

9.4 Discussion

9.4.1 Key findings

This study suggests a lack of social gradients in health among Pakistani mothers and their infants living in the UK, which has occasionally been reported for other health outcomes and various ethnic minority groups (Bhopal et al., 2002, Fischbacher et al., 2014, Thomas et al., 2012). Social gradients in the four health outcomes studied were steeper and more consistent for the White British than the Pakistani group, which was in line with multilevel modelling results from Chapters 6, 7 and 8 of this thesis. Birth outcomes were associated with measures of SES in the MCS and BiB for the White British samples, but not for the Pakistani samples. The subjective measure of self-assessed financial situation was the measure of SES most consistently and strongly associated with smoking during pregnancy and mental health among Pakistani mothers, compared to maternal education, employment of the father and receiving means-tested benefits.

9.4.2 Results in relation to the literature

There are a number of explanations for a lack of social gradients in health among ethnic minorities: measurement of SES may be biased so that social gradients cannot be observed, people of higher SES may have worse health than expected, people of lower SES may have better health than expected, or there may be a combination of these.

Claiming benefits

Findings might be explained by the methodology used to assess social gradients in health, which may not be optimal for ethnic minority groups, or may be affected by measurement bias. Questions about means-tested benefits for example assume that women are aware of the earnings and incomings of the household. Also, they measure whether people report to be receiving benefits, not whether families are eligible. There has been shown to be a discrepancy between these two; people may be unaware of their eligibility for benefits, not able to complete the process necessary to receive them, choose not to apply due to the stigma attached to ‘living on benefits’, or have a preference for other sources of financial support (Parliament, 2005). In the BiB sample, more than 40% of the Pakistani families with an unemployed father reported they did not receive means-tested benefits, while they are likely to be eligible for Jobseekers Allowance and Housing Benefit. As shown in this study, different measures of SES might have different associations with health. In a study of self-rated health among UK ethnic groups, area deprivation and income explained a large part of the excess poor health in the Pakistani and Bangladeshi group, while SES measured by occupation did not (Chandola, 2001).

Differences within ethnic groups

Also, the assumption that an ethnic minority group is homogenous in its pattern of social gradients in health might be flawed. Gradients may be obscured by differences within ethnic groups, for example between UK born and foreign born Pakistani women. In general, the health of migrants deteriorates with longer residence in the host country (Nazroo, 1997). For example, Pakistani women born in the UK have a higher risk of a baby with LBW than women living in the UK who were born in Pakistan (Margetts et al., 2002, Leon and Moser, 2012). A study from the US found that social gradients in health behaviour, obesity, work limitations and fair or poor health were flatter in foreign-born than US born ethnic groups, mostly due to foreign born residents of low SES displaying healthier behaviours than expected (Kimbro et al., 2008).

Minority status and social defeat

If the results represent a true finding not caused by methodological limitations, social gradients in health may be less visible for Pakistani people because those of higher SES are less healthy than expected. It could be argued that ethnic minorities, despite variation in SES within an ethnic group, all suffer to some extent from social exclusion and social disadvantage, regardless of their income, employment, or education (Chapter 2). For example, the lack of associations between health and maternal education for Pakistani women in this study could indicate that a higher educational level does not lead to higher social mobility, and therefore does not benefit health (Platt, 2005). A recent study among Latino immigrants in the US found that perceived downward social mobility was associated with poor health and depression independent of income (Alcántara et al., 2014). Higher rates of schizophrenia in migrants have previously been explained by 'social defeat'; social stress caused by the position of the outsider in society (Selten and Cantor-Graae, 2005, Cantor-Graae and Selten, 2005). However, social gradients were demonstrated for 'smoking during pregnancy' and mental health. This suggests that even in areas with relatively high levels of deprivation, inequalities in SES contribute to inequalities in health.

Health buffers

On the other hand, social gradients in health may be attenuated because health is better than expected for ethnic minorities of low SES. A potential explanation for this is that

Pakistani families of low SES are buffered from the detrimental effects of social inequality and social disadvantage on health. Social networks may provide financial, social and emotional support to poor families within the community, making them less vulnerable despite having a low SES by conventional measurement. Although the evidence is mixed, some studies indicate that social capital buffers health of poor and disadvantaged groups (Pearson and Geronimus, 2011, Sun et al., 2009, Van Der Wel, 2007) (Chapter 3). Evidence on the 'Hispanic paradox' suggests Hispanics in the United States have lower mortality rates because of their strong community networks (Markides and Coreil, 1986), and the 'ethnic density hypothesis' states that ethnic minorities derive health benefits from living in areas with a high percentage of their own ethnic group (Chapter 5) (Pickett and Wilkinson, 2008, Bécares et al., 2012, Shaw et al., 2012). Research on UK Pakistani in Bradford mentions the *biraderi* – kinship networks within the Pakistani community – as an important social structure within which social and economic capital are exchanged (Bolognani, 2007), and other studies have shown various health implications of the *biraderi* (Sheridan et al., 2013, Darr et al., 2013).

In this study, rates of LBW were higher for Pakistani infants than White British infants across socioeconomic groups, but this is due to the systematically different variation in the distribution of birth weight in the South Asian babies and therefore not necessarily an indication of poor health. The Pakistani sample seems to report higher prevalence rates of poor mental health in both cohort studies, but mental health questionnaires are not necessarily valid for comparison between ethnic groups (Prady et al., 2013a). The only indication of better health across socioeconomic groups for Pakistani infants in this study is the lower rate of preterm birth in both cohorts, and these differences were not statistically significant.

9.4.3 Strengths and limitations

The BiB study has the largest Pakistani birth cohort sample in the world, and homogeneity is higher than in most cohort studies because all participants live in the same city. I had access to detailed information on this sample, making it possible to compare social gradients in health for various measures of SES, various health outcomes, and adjusted for individual covariates. The study greatly benefited from the inclusion of a subjective measure on perceived financial situation, which was more strongly correlated with smoking during pregnancy and mental health than conventional measures of SES. This measure possibly reflects aspects of social disadvantage not captured by other measures, for example the experience of social exclusion or discrimination.

Generalisation

The fact that the BiB sample is unique in terms of its ethnic and social composition potentially limits the generalisation of results to a wider population. To increase the generalisability of the results I compared the BiB study to data from the MCS, and it is in this sample that the lack of social gradients in the Pakistani compared to the White British group was most pronounced. However, the study provided results on UK White British and Pakistani women and infants only, which means that these results may not apply to other ethnic minority groups, nor can they be extrapolated to men or to other age groups.

Statistical power

The likelihood of significant findings was influenced by sample size, and by the prevalence of health outcomes in the various samples. In the MCS for example, the Pakistani group was much smaller than the White British group and analyses might therefore be underpowered to detect significant associations. Probably as a result of this, more evidence was found for social gradients in smoking during pregnancy and mental health for Pakistani women in the BiB sample than for Pakistani women in the MCS. LBW, preterm birth and smoking during pregnancy in the Pakistani group all have a low prevalence (<10%), which makes it more difficult to detect differences. It was not possible to assess social gradients in preterm birth by employment of the father in the Pakistani group of the MCS sample, as none of the babies with a father in the highest level of occupation were born preterm. For the measure of financial situation, 'very difficult' was used as the reference category so results could be presented in a coherent way. However, the fact that this category had few responses may have introduced error to the measures of association.

Confounding factors

Maternal age and parity were taken into account in the regression analyses to adjust for the influence of these factors on health, as age and parity differ substantially between mothers of higher and lower SES, and these are important factors especially in relation to birth outcomes. However, age and parity may also modify the relationships between health and SES, for example through diet, smoking, or stress during pregnancy. Adjusting for the confounding effects of these factors may have led to an underestimation of social inequalities in health.

Finally, the regression analyses were adjusted for parity and maternal age only, while it is beyond doubt that other factors are simultaneously related to SES and health outcomes.

For the Pakistani group in particular, country of birth and age of migration may influence the relationship between SES and health. I encourage a more refined study of factors related to migration and acculturation in future research, including longitudinal research, on social gradients in health for ethnic minorities.

9.4.4 Research implications

Measuring SES

This study adds to the evidence of a lack of social gradients in health for ethnic minorities. The ways in which different measures of SES are related to health needs to be investigated further, as they capture different components of SES. For example, maternal education may have a long-term influence on health through health literacy (Nutbeam, 2008), while being in a difficult and stressful financial situation may cause harm over the life course (Pearlin et al., 2005). A higher level of employment provides financial benefits but may also lead to a different network of colleagues and friends affecting health through social support and shared social norms. There is a need for valid and reliable measures of SES for the UK South Asian population, and for other ethnic minority groups (Braveman et al. 2005). Recently, researchers from the BiB study have made a step in this direction, by using latent class analysis to develop a multidimensional indicator of SES for different ethnic groups (Fairley et al. 2014). It has been suggested that for measures of SES to be useful for ethnic minority groups, health researchers should 1) consider plausible explanatory pathways and mechanisms, 2) include as much information on SES as possible, 3) specify which aspect of SES is measured, and 4) systematically consider the importance of unmeasured aspects of SES (Braveman et al., 2005).

Further research should test if findings can be applied to a wider population in different settings, and to other ethnic minority groups. More nuanced research on the health effects of social disadvantage for ethnic minorities should be a priority, especially for poorly understood ethnic inequalities in health such as LBW and mental health, but also for child outcomes such as obesity, asthma, cognitive function and educational attainment. More subjective measures such as self-assessed financial situation may capture aspects of social disadvantage missed by more conventional measures. A careful examination of factors related to international migration, acculturation, *biraderi*, health behaviour, social capital and social support, and the area of residence may contribute to explaining attenuated social gradients in health. A better appreciation of the true effects of social disadvantage on health over the life course has the potential to benefit people of all ethnic groups, and to improve wellbeing for our society as a whole.

Chapter 10

Discussion

Black Abbey, Bradford. Own photography.

10.1 Key findings

The chapters of this thesis address different aspects of research on social connections and health in a context of social disadvantage and ethnic diversity. Together, these studies give insight into the associations between ethnic density, social capital and health for Pakistani and White British mothers and infants in the BiB study, which was the aim of the thesis. Two hypotheses were identified that summarise the current evidence, and these were used as a framework to guide the analyses of this thesis. This section summarises the key findings of the thesis in relation to the buffer and dependency hypotheses.

10.1.1 Evidence for the dependency hypothesis

The background section of the thesis shows that the spatial segregation of ethnic minorities is not accidental, and it is not the sole result of residents' preferences. Individual choices, societal influences and local and national governmental policies shape neighbourhood composition. The existence of areas with high minority ethnic density is a consequence of these processes. Bradford has a history of spatial segregation along ethnic and social lines, social unrest between resident groups, and social exclusion of ethnic minorities. There have been countless efforts to explain these social tensions (Ouseley, 2001), and to fight stereotypes commonly applied to the city and its residents (Alam, 2006). Despite the fact that neighbourhoods with a high percentage of ethnic minorities are on average relatively deprived, ethnic minorities may derive health benefits from living in such areas (Chapter 5). This fits the buffer hypothesis, which states that resources of the social network (social capital) can be used to buffer harmful influences of social disadvantage on health. However, according to the dependency hypothesis such beneficial effects of social capital on health are inhibited in a context of social disadvantage.

In the BiB sample, no associations were found between higher ethnic density and more favourable birth outcomes for Pakistani and White British infants (Chapter 6). This finding is in contrast with another study which found associations between higher own ethnic density and lower prevalence rates of preterm birth for UK Pakistani infants (Pickett, 2009). It may be that high levels of deprivation prevent those positive health effects in Bradford. However, higher South Asian density was associated with a lower prevalence of smoking during pregnancy for Pakistani women, and there was an association between a lower prevalence of smoking and medium South Asian density for White British women (Chapter 7). For White British women who reported to be managing well financially, higher South Asian density was associated with lower odds of smoking during pregnancy. The same was true for Pakistani women of higher SES. This adds to the evidence on ethnic density and smoking during pregnancy from two US studies, and is supportive of the suggestion by Bell and colleagues (2007) that social disadvantage may inhibit positive effects of a non-smoking culture on prevalence rates of smoking during pregnancy, as stated by the dependency hypothesis.

The analyses highlight how the influence of social disadvantage complicates the relationship between ethnic density and health, and it also shows the difficulty of capturing and singling out this multifaceted factor with conventional, cross-sectional measures. Chapter 8 was set up as an attempt to look into the working mechanisms of these relationships, by exploring the potential role of social capital for health, in relation to social disadvantage and ethnic density. Chapter 9 in turn examined whether associations between health and social disadvantage vary by ethnic group, a question originating from methodological challenges encountered in the analyses on ethnic density and health. In addition, I repeated these analyses in the MCS cohort, to test whether results could be replicated in a sample which is different but has a similar composition.

10.1.2 Evidence for the buffer hypothesis

Individual characteristics were more strongly associated with health than features of the neighbourhood, which is usually the case for research on health and place (Mohan et al., 2005, Pickett and Pearl, 2001). Mothers were generally positive about the area they live in, even if these neighbourhoods were deprived compared to the country’s average, or compared to Bradford district as a whole. However, levels of social support and trust seemed low, for Pakistani mothers in particular.

In the BiB sample, associations between better health outcomes and higher levels of social capital were found for Pakistani and White British mothers of higher and lower SES, and in poorer and more affluent areas. The evidence was particularly strong for mental health, smoking during pregnancy by White British women, and area-level general health. When analyses were stratified by deprivation, prevalence rates of smoking during pregnancy were lower for White British women with higher levels of trust and social support living in more deprived rather than less deprived areas. Also, higher birth weight was more often associated with higher social capital for Pakistani infants in deprived areas compared to those in more affluent areas, and for White British infants with lower rather than higher SES.

Results from the stratified analyses may have been due to chance rather than being a reflection of true differences by level of social disadvantage. Nevertheless, the fact that associations between social capital and health were found even in highly deprived areas and among people of low SES may be an indication of a buffer effect, as associations remained in a context of social disadvantage.

In general, the results do not suggest that associations between social capital and health vary by level of ethnic density. The exception is that in areas with lower White British density, White British women were less likely to smoke if they reported higher levels of trust.

10.1.3 The role of social disadvantage

Whereas the analyses on ethnic density suggest that social disadvantage may limit the potential for social connections and social norms to benefit health (dependency hypothesis), the analyses on social capital showed clear associations with various health outcomes even in a context of high area-level deprivation and low individual SES. Some interaction models pointed towards stronger associations between health and social capital in a context of higher social disadvantage. Although there were inconsistencies in the results due to limitations of the dataset and analyses, it is possible that ethnic density and aspects of social capital simultaneously have positive and negative effects on health and wellbeing. These relationships may vary between and within ethnic groups.

It is difficult to fully understand the role of ethnic density and social capital without good comprehension of the effect of social disadvantage on health for different ethnic groups. Social gradients in health were less evident for Pakistani than for White British women and infants for a range of SES measures, especially in relation to LBW and preterm birth (Chapter 9). Not only do these findings question the validity of conventional measures of SES, but they may reflect underlying mechanisms, for example related to social capital, which impact on relationships between social disadvantage and health for ethnic minorities. The analyses I performed with the MCS dataset further strengthen the evidence, as findings were reproduced in an independent sample of Pakistani and White British women and infants in the UK, and can therefore not be attributed to the particular setting of Bradford or characteristics of the BiB sample.

10.1.4 Summary of findings

In this thesis I have provided evidence for associations between higher South Asian density and lower prevalence rates of smoking during pregnancy for Pakistani and White British UK women, and I have demonstrated associations between various elements of social capital and health in both ethnic groups. These associations are affected by social disadvantage. Firstly, the results indicate that social capital may buffer some of the detrimental effects of area deprivation on health. Secondly, the analyses show that with conventional measures and statistical techniques, it is virtually impossible to distinguish the effects of various individual- and area-level determinants of health which in reality are inseparable. Thirdly, analyses of both the BiB and MCS cohorts confirm that social gradients in health are attenuated for Pakistani women and infants in the UK.

10.2 Directions for future research

10.2.1 Understanding health and place

In this sample, mothers were positive about their neighbourhoods despite many of these being among the most deprived areas in England. This may be because what people value in terms of their neighbourhood is not linked to deprivation. Alternatively, it may be due to social capital as manifest in neighbourhood satisfaction, or it may indicate bias in the measurement of social capital. Around 90% of women reported they enjoy living in their area, and around 80% said neighbours look after each other. This is higher than scores by participants in the HSE of the year 2000, mostly representing White British households living in areas in England more affluent than the majority of Bradford's neighbourhoods (NCSR, 2000). Poor people in poor places may be positive about their health, the neighbourhood, and their social connections because they feel they have no other option. When living in a deprived area without any opportunity to move, preserving a sense of self-worth by accepting and defending the local community may be a better alternative than a negative, defeatist attitude. It has been suggested that ethnic minorities are more concerned with social desirability and social acceptance, and are often positive about their situation despite struggling to cope socially or financially (Johnson and Van de Vijver, 2003, Warnecke et al., 1997). This may have been a motive for unexpectedly positive scores of neighbourhood perceptions in the BiB study.

In addition, those people suffering from social disadvantage and social exclusion, and ethnic minorities in particular, may turn to their immediate families and close-knit support networks instead of turning outwards to the wider community. The neighbourhood may in this case be of lesser importance in someone's life, and therefore have a smaller influence on health. The positive associations between individual social capital and health in deprived life circumstances support this idea. People may create a physical barrier, for example by moving to neighbourhoods with a high level of their own ethnic density, or a social barrier, by strengthening bonds between family and close friends at the expense of investing in bridging social capital. These coping mechanisms are meant to protect people from an environment perceived to be hostile and harmful, and it is therefore not surprising that individual factors and individual social capital seem to have stronger associations with health than features of the environment.

At the same time, the inseparability of people and places means that individual characteristics are influenced over time by societal and community characteristics and mechanisms, so that multilevel statistical models are likely to underestimate the true influence of place. Taking this into account, finding any evidence for associations between area-level features such as ethnic density, and health is noteworthy and a reason for closer examination. Qualitative research could elucidate social capital and ethnic density pathways by studying people's perceptions of the neighbourhood and its characteristics. This could reveal effects of area-level factors on health not measured accurately by uniform questionnaires. Qualitative research would clarify why people express positive attitudes towards their neighbourhood even in some of the most deprived parts of England, and why the same positive attitude was not found for indicators of individual social capital such as trust and social support.

10.2.2 Understanding social disadvantage

The seemingly small influence of measures of SES and area deprivation on health for Pakistani women and infants suggest these measures do not capture the influence of social disadvantage accurately. Aspects of social disadvantage such as stigma and the reputation of an area are not taken into account.

Given the history of Bradford and its ongoing struggle with social tensions and poverty, all ethnic minorities in Bradford are likely to experience social exclusion and discrimination to some degree. In addition, all Bradfordians are likely to suffer from the stigma attached to living in a city with a bad reputation. Recently, results from an opinion poll were published along with a headline stating that Bradford was perceived to be the most dangerous city in England, accompanied by a picture of the Bradford riots which took place more than a decade ago (Figure 10.1) (Dahlgreen, 2014). The article also suggests feelings of unsafety were reported by residents from Bradford, while it was in fact a panel of people from regions across Great Britain. Other media then picked up on this, resulting in headlines with false information that further damages the reputation of the city and its residents (Figure 10.2) (Yorkshire Voice, 2014).

Figure 10.1 Online publication of an opinion poll on safety in English cities (Dahlgreen, 2014)

Figure 10.2 Interpretation of opinion poll by other media (Yorkshire Voice, 2014)

The author of the report did not make mention of actual police recorded crime rates in Bradford, which are close to the national average. In comparison with other cities in the North with relatively high levels of deprivation, such as Middlesbrough, Manchester, Hull and Leeds, Bradford has lower levels of total police recorded crime, violence, and theft (ONS, 2014). In a previous study among adolescents in London, perceptions of safety and area reputation were not associated with objective crime rates (Fagg et al., 2008). This bad reputation might make it difficult to measure social disadvantage, as even people who live in relatively affluent areas, and those who have a relatively high SES by conventional measurement, may be disadvantaged just because of the city they live in. Qualitative research could reveal aspects of social disadvantage such as stigma, neighbourhood reputation and discrimination which largely remain unmeasured in quantitative studies using conventional measures of SES.

10.2.3 The role of ethnicity

This study has focused on the life circumstances of people of different ethnic and social composition in the UK. The associations between ethnicity, SES, social connections and health are likely to vary in societies with different histories and different social structures. Pakistani people living in Bradford, and in the UK in general, are either first, second, or third-generation immigrants. This is in contrast to Aboriginal people and Torres Strait islanders in Australia and Māori in New Zealand for example, who became ethnic minorities after the colonisation of their countries. The situation is different again for African American people, whose origins lie in the slave trade between Africa, Europe and America. These distinct histories mean that areas in the UK with a high concentration of ethnic minorities cannot easily be compared with segregated areas in the United States for example. While there are similarities in experiences of discrimination, social disadvantage, and restrictions in residential choice in the UK and USA, the long history of systematic and institutional discrimination of African Americans and the existence of ghettos creates a different context for considering the experience of ethnic density in the US (Wacquant, 2013).

None of thirteen studies in the US have found associations between more favourable birth outcomes and higher ethnic density for African American infants, while this evidence does exist for US Hispanic infants (Table 5.1). Possibly, US Hispanics are able to use their community networks to boost health, while social disadvantage inhibits these pathways for African American and UK Pakistani people. Comparisons between different ethnic groups may show distinct working mechanisms of ethnic density, social capital and social disadvantage in relation to health. In addition, a more in-depth investigation of within-group differences is needed. For example, the effects of social capital on health within the Pakistani group may vary by level of acculturation, or migrant status. Clarity on this topic will advance research on ethnicity in relation to health and wellbeing in general, and research on ethnic density and health in particular.

10.3 Policy implications

10.3.1 Promoting social capital

Findings relevant to the buffer hypothesis, the ability of social capital to provide a buffer against the detrimental effects of low SES on health, have resulted in a call for the stimulation of social capital in vulnerable groups. For example, Waterston and colleagues suggested that social participation in neighbourhoods can protect children from the negative health effects of poverty and even has the power to decrease infant mortality (Waterston et al., 2004). Putnam advocates a revival of social capital in American society, which he argued should be achieved primarily through civic engagement (Putnam, 2000, Ch. 24). In 2010 the UK Conservative party launched their 'Big Society' vision, based upon the idea that stimulating community participation and cohesion would empower people to bring positive changes to their communities. However, despite there being evidence of associations between higher social capital and better health outcomes, there is very little evidence to suggest that the promotion of social capital leads to an improvement in health (Pearce and Smith, 2003). Even if it would be possible to 'build' social capital where stocks are thought to be low, there are three main reasons to be cautious about the promotion of social capital as a public health strategy.

Firstly, the promotion of social capital through togetherness and social cohesion is often based on the social norms and values of the empowered religious and ethnic majority, and may not take into account minority groups that deviate from the norm (Arneil, 2006). Religious participation for example will only appeal to those who consider themselves religious, while interventions at work will exclude the unemployed. Sports clubs are a way to promote health and sociability, but their facilities might not be compatible with certain cultural norms, and women can experience barriers to participation. There is a risk that especially ethnic minorities are further excluded from activities, clubs and networks based on the social norms, traditions and values of White British culture.

Secondly, researchers have stressed that policy implications of social capital research should be approached cautiously, since an emphasis in health promotion on self-advocacy through social capital holds the danger of blaming the victim (Pearce and Smith, 2003, Coburn, 2000). The idea that disadvantaged groups are to be held accountable for their position in society is likely to stimulate distrust and further social exclusion. This will, in turn, reduce social capital among the groups that need it most. The focus on individual social capital takes attention away from the structural causes of health inequality, mostly related to social inequalities and poverty. This is not dissimilar to what has been called 'lifestyle drift' in the literature related to health inequality, which has been described as "the tendency for policy to start off recognizing the need for action on upstream social determinants of health inequalities only to drift downstream to focus largely on individual lifestyle factors" (Popay et al., 2010, p.1). Shifting the responsibility from society and government to individuals, because they do not invest enough in their social networks, ignores the possibility that people use social capital as a health buffer not out of luxury, but out of necessity.

Thirdly, the dependency hypothesis suggests that social capital is beneficial to the health of some, but access to and use of social capital are restricted by social disadvantage and social inequality in communities and societies. Abel and Frohlich (2012) discuss these implications of Bourdieu's framework in the light of socioeconomic inequalities and power differences. Those who hold substantial power in a society are able to acquire social capital, either for personal use or for the benefit of their network. Economic and cultural capital can be converted into social capital and vice versa, and with the accumulation and transmission of capital within a network, outsiders cannot access it for the benefit of their health. In line with Bourdieu, Coburn (2000) argues that, especially in unequal societies based on a neo-liberal model, social capital is only freely available to the better-off. Even if social capital could be built in a neighbourhood or community, not everyone may have access to it, or derive health benefits from it. Social connections may in fact be harmful to health, for example when social norms facilitate smoking during pregnancy, or when giving social support drains someone's financial resources. The suggested dependency between social and economic capital means that people of higher SES might benefit most from an increase in social capital, which would further increase inequalities in health. It will take active and equal involvement by members from all layers of society, and a redistribution of power from the higher to the lower social classes, to 'build' social capital that is accessible and beneficial to all. Without shifting decision-making powers from those in charge to the wider community, there is no true empowerment and social capital is likely to mainly benefit those who already had a head start.

10.3.2 Ethnic density

Just as this research should not be used to support policies aimed at 'building' social capital without true empowerment, nor do the results justify involuntary movement of ethnic minorities to high minority density areas, or the restriction of possibilities for them to settle in other areas. Strong community networks within ethnic minority groups may illustrate the resilience of people in disadvantaged situations, but they do not provide the solution. There is no causal evidence to suggest that the clustering of ethnic minorities in deprived, disadvantaged, and in many ways unhealthy surroundings is beneficial to health. Besides, it does not deal with the social disadvantage and social inequality underlying ill health, just like a smog mask does not reduce pollution, an airbag does not create safe roads, and sleeping pills do not cure insomnia.

There is not one 'ethnic density effect', and ethnic majority groups such as White British women may derive health benefits from social norms in ethnic minority communities, for example by a reduction in prevalence rates of smoking during pregnancy (Chapter 7). In a society inclusive of all ethnicities, people are likely to benefit more from strong social networks within and between ethnic groups. In addition, ethnic minorities would benefit from greater social mobility, more material wealth to support healthier lifestyle choices, healthier work environments, healthier homes and neighbourhoods, and less stress due to greater societal acceptance and a better financial position.

10.3.3 Social inequality

Bradford is a city of social contrast, with relatively affluent, predominantly White British, suburban areas, and ethnically diverse inner-city areas with high levels of deprivation. Stocks of social capital were found to be low in the BiB sample, and this may in part be due to the high level of social inequality. It has been argued that social inequality damages the social fabric by eroding trust, creating social barriers, and breaking down social cohesion (Wilkinson and Pickett, 2007, Rothstein and Uslaner, 2005, Kawachi and Kennedy, 1997, Kawachi et al., 1999). Coburn argues that social inequalities, and as a consequence low social trust and cohesion, are inherent characteristics of a capitalist society (Coburn, 2000). A system in which the success of one person comes at the expense of others breeds mistrust. If trust and equality are related, because those who form a minority in terms of power have little reason to trust, then reducing social inequality is inevitably part of the solution. The state reinforces inequality or stimulates equality, hereby affecting social capital. Social capital can in turn affect equality, in a positive way by the creation of a more cohesive society, and in a negative way by promoting social exclusion. Social capital should thus be built not only from the bottom up but facilitated from the top down (Newton, 1997). Consequently, social capital is encouraged by actively reducing social inequalities, and shifting the focus from increasing a society's economic capital to the promotion of social wellbeing.

A reduction of social inequality would lead to health improvements not only through the direct effects of psychosocial stress on health, but also through a strengthening of social networks and the promotion of social connections that are beneficial rather than detrimental to health (Pickett and Wilkinson, 2015). In the case of Bradford, even without definite proof of the negative effects of social inequality on social capital and health, it is clear that major improvements in health could be made by creating an environment in which social capital can thrive, and residents give and receive support from their communities regardless of its ethnic composition.

APPENDICES

Appendix 1 Published literature review

Appendix 2 Systematic review

Appendix 3 Statistical analyses

Appendix 1 Published literature review

Systematic review of the literature (adapted from Chapter 3)

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RESEARCH Open Access

A systematic review of the relationships between social capital and socioeconomic inequalities in health: a contribution to understanding the psychosocial pathway of health inequalities

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Abstract

Introduction: Recent research on health inequalities moves beyond illustrating the importance of psychosocial factors for health to a more in-depth study of the specific psychosocial pathways involved. Social capital is a concept that captures both a buffer function of the social environment on health, as well as potential negative effects arising from social inequality and exclusion. This systematic review assesses the current evidence, and identifies gaps in knowledge, on the associations and interactions between social capital and socioeconomic inequalities in health.

Methods: Through this systematic review we identified studies on the interactions between social capital and socioeconomic inequalities in health published before July 2012.

Results: The literature search resulted in 618 studies after removal of duplicates, of which 60 studies were eligible for analysis. Self-reported measures of health were most frequently used, together with different bonding, bridging and linking components of social capital. A large majority, 56 studies, confirmed a correlation between social capital and socioeconomic inequalities in health. Twelve studies reported that social capital might buffer negative health effects of low socioeconomic status and five studies concluded that social capital has a stronger positive effect on health for people with a lower socioeconomic status.

Conclusions: There is evidence for both a buffer effect and a dependency effect of social capital on socioeconomic inequalities in health, although the studies that assess these interactions are limited in number. More evidence is needed, as identified hypotheses have implications for community action and for action on the structural causes of social inequalities.

Introduction

Since the late 1980's, the concept of social capital has gained prominence in research and in the discourse of policy making [1]. This prominence has emerged from, and built upon, a long tradition in sociology and inter-disciplinary fields of study that have considered patterns in human relationships and links with social solidarities. In the field of health inequalities research the social environment is acknowledged as a multi-faceted social determinant of health that can promote or harm health through multiple mechanisms [2]. There is an abundance of evidence that confirms the relationship between different measures of social capital and health, and some evidence that social capital mediates the relationship between income inequality and health [3]. However, the relationship between social capital and socioeconomic inequalities in health remains unclear. We aim to clarify this relationship, as knowledge of the pathways involved in the development and maintenance of health inequalities can inform changes that contribute to a healthier society for all.

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Defining and measuring social capital

Despite its potential to clarify the origin of health inequalities, the use of social capital has suffered from a

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lack of consensus regarding its definition and measurement [4,5]. Sociologists [6,7], economists and political scientists have made major contributions to the theoretical framework [8,9]. As a comprehensive theoretical overview goes beyond the purpose of this paper, we refer interested readers to key texts by Coleman [7], Bourdieu [6] and Putnam [9]. Putnam regards social capital above all as an attribute of society, and its value lies in social networks and the norms of reciprocity and trustworthiness that arise from them [9,10]. Changes in social capital over time are attributed to structural societal changes instead of individual influences [9]. Bourdieu emphasises the way that social capital reproduces inequality by allowing some people to mobilise the capital of their family, sports club, school or other associations to their advantage. He defines social capital as: 'the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition' [6]. Instead of Putnam's idea of social capital as a freely available community resource, Bourdieu argues that a lack of economic and cultural capital creates barriers for subgroups in society to acquire and use social capital. Coleman [7] approached social capital as a way of integrating social theory with economic theory using "rational action theory". He argued that social capital involves an expectation of reciprocity within networks characterised by high degrees of trust and shared values. According to Coleman social capital constitutes a public good, benefiting all those who are part of a structure and, as such, it is a potential asset for the underprivileged and not just an instrument of privilege.

In order to measure and utilise social capital in research, the concept is often deconstructed into bonding, bridging and linking components [11,12]. Bonding social capital refers to close relationships between family members or good friends, measured by indicators such as social support. These relations form a strongly tied network based on a shared social identity. Bridging social capital is based on Granovetter's idea of 'weak ties' [13] and refers to relationships between people who are more loosely connected and have a distinct social identity, such as neighbours, members of a sports club or colleagues [14]. Linking social capital is used to describe relationships that are characterized by power differences, such as the hierarchical relationship between employer and employee, or between citizen and government.

A distinction can also be made between structural and cognitive components of social capital [12]. Cognitive social capital refers to the social cohesion keeping networks together, measured by subjective indicators such as trust, social support and neighbourhood satisfaction. Structural social capital refers to objectively measurable activities and resources such as participation in neighbourhood activities, membership of a religious association or election turnout. It facilitates sharing of knowledge and collective action.

Social capital and health inequalities: the theory

In high-income countries, each step down the social ladder is associated with worse health outcomes [15]. This 'social gradient' suggests that social inequalities in health do not only reflect material disadvantage related to socioeconomic status, but also a psychosocial pathway associated with social position [16]. Two mechanisms through which the psychosocial pathway operates are the limited availability and utility of social capital and the stress arising from status comparisons [17]. In this paper we focus on the role of social capital in the production of socioeconomic inequalities in health.

At the individual level, social capital can counteract the negative effects of stress or improve one's ability to cope with stress by enhancing emotional or financial support [16]. A healthier way of coping with stress may mean people are less likely to smoke, consume alcohol or indulge in comfort eating as coping mechanisms [1].

Recently, research interests have shifted from assessing social capital at an individual level to applying an area-level focus often referred to as 'contextual social capital'. At the community level, the influence of social networks and norms could have a health effect in addition to the effects of individual social capital. The social space, rather than the individuals who live in it, is the reservoir of social capital [18]. Examples of mechanisms related to social capital that operate at the community level are the presence of health-related social norms, collective efficacy facilitating collective action, reciprocity and diffusion of health-related information [19].

Societies with a higher level of social equality seem to enjoy higher stocks of social capital and have better health outcomes, together with a lower incidence of social problems such as violence, drug abuse, school drop-outs and teenage pregnancies [20]. Social capital creates solidarity, stimulating the government to opt for fairer policies aimed at reducing health and social inequalities [3]. Simultaneously, it might enhance the capacity of the socially privileged to further bolster their position. Both Bourdieu and Coleman argue that social capital might improve health but may also exacerbate inequalities. Not everyone has access to the same sources of social capital and not everyone will benefit in the same way.

When studying contextual social capital, the key is to distinguish between the effect of individual social resources on health and the health effects that can be attributed to characteristics of the wider environment. This contextual perspective poses measurement challenges. Individuals usually report on their own social support, level of trust, social participation or other indicators. While some structural measures, such as a count of voluntary organisations in an area, by-pass this problem, they provide very general indicators. These measures fail to address individual differences between the people that take part in activities or organisations, for example with regard to their socioeconomic status. This becomes problematic when contextual social capital has different effects on health and wellbeing for different individuals or groups in a community.

Hypotheses of interaction

Given the likelihood that the effects of social capital on health will vary in size and nature between groups with different positions in society, it is worthwhile considering the influence of social inequality. We will offer three main hypotheses on the interaction between social capital, socioeconomic inequalities and health. Firstly, components of social capital such as social cohesiveness can provide a *buffer* against stress and other negative influences on health and wellbeing in tight-knit communities. It has been suggested that in areas with a high density of ethnic minorities, the social network serves as a spatial barrier against the negative impacts of discrimination or stigmatization on health [21]. Although this ethnic density hypothesis has been explored independently of social capital theory, the protective health effects resulting from strong ethnic bonds show the importance of bonding social capital for health. Ethnic minority groups often occupy lower positions on the social ladder. Since their social disadvantage is based on a lack of power rather than numbers, they can be considered a minority in a neighbourhood where they constitute the majority of residents, as is the case with many Black Americans or Pakistani UK residents. Other studies provide examples of solidarity among working class communities being manifest in health initiatives, for example around chronic illnesses associated with particular industries [22].The buffer hypothesis suggests a greater benefit of social capital on health for people with a disadvantaged position in society, and no effects or limited health benefits for those with a position higher up the social ladder. People with high levels of social capital would be healthier than expected considering their low socioeconomic status. This effect is illustrated in Figure 1.

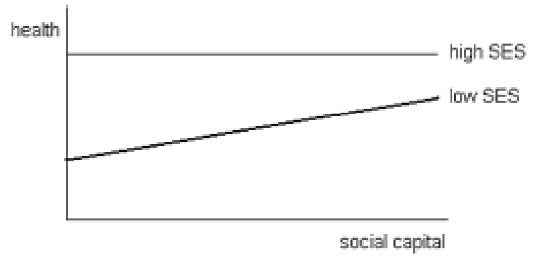

Figure 1 The buffer effect of social capital on socioeconomic inequalities in health.

A second hypothesis, based on Bourdieu's [6] model of social capital, suggests a *dependency* between social, economic and cultural capital (Figure 2). Economic and cultural capital is required in order to use and accumulate social capital for the benefit of health. In health research, economic and cultural capital is often combined into measures of socioeconomic position. This review will consider the distinction between economic and cultural capital by developing a nuanced understanding of social capital as including aspects that foster both local area solidarities, bonding social capital, and those that can link individuals or groups with different levels of economic and cultural capital, bridging social capital. People with a low socioeconomic status will generally have less social capital and the amount of capital available to them cannot be used as effectively for the benefit of health. Although seemingly in contrast with the *buffer* hypothesis, these two ideas do not necessarily contradict each other. Socially disadvantaged individuals might benefit from bonding social capital in closely connected family or community networks, but miss out on the beneficial effects of bridging social capital.

The third hypothesis relates to the effect of *contextual* social capital on health, as opposed to social capital measured at an individual level that is considered to be an attribute of the individual. In line with the dependency hypothesis, it has been argued that social capital might not be available or beneficial to everyone living in an area. Mechanisms of control and social pressure can cause social exclusion [23]. Social capital might benefit the better-off in society, while excluding people with a lower socioeconomic status or minority position (Figure 3). For those lower on the social ladder, being surrounded by inaccessible social capital might lead to further deteriorations in health.

Research aim

This paper offers two contributions to the debate on social capital and inequalities in health. First, we offer a systematic review of published papers on this topic. As far as we are

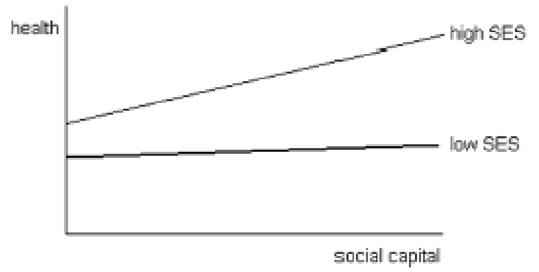

Figure 2 Dependency of social capital and socioeconomic satus influencing health.

Figure 3 Effect of contextual social capital on socioeconomic inequalities in health.

aware, Carlson and Chamberlain [24] have performed the only overview of social capital in relation to health inequalities. Although the authors discussed the implications of their findings for health disparities, they did not include any inequality-related terms in the search strategy. Their review included studies published from 1997 to 2002 and they used a restricted version of social capital, mainly focussing on the measure of civic trust while excluding concepts such as social cohesion. Their approach has captured only part of the body of work that has developed social capital conceptually and empirically. No overview has been presented on the different types of social capital, economic inequality and health outcomes used in research, and it is unknown which measures are most likely to show significant correlations [25].

Second we hope to find evidence for interaction effects between socioeconomic position and social capital in relation to health. Above we have introduced three hypotheses to help frame our findings. In pursuing this aim we move beyond a conventional systematic review in which current evidence and gaps in knowledge are identified and we offer an interpretation of the associations and the pathways between social capital and socioeconomic inequalities in health.

Methods

The methods and results of this systematic review are reported according to the PRISMA guideline to facilitate the transparency and reproducibility of our findings [26]. The search strategy and selection of studies was deliberately broad to allow for a wide variety of study designs and interpretations of social capital to be included. We reviewed studies published before July 2012 that could be located through online databases MEDLINE, EMBASE, CINAHL and Cochrane. The search identified studies that included terms related to social capital, health inequalities and/or socioeconomic status in the article, title or abstract. The complete search in all four databases is documented in detail in Additional file 1.

Studies were included regardless of study design, setting, social capital measure, type of health outcome and date of publication. No language restrictions were applied. Grey literature was excluded and background papers and reviews were separated from the main results.

The systematic literature search was performed on the 25th of July 2012 in all four databases and step 1 resulted in the identification of 618 studies after removing duplicates (Figure 4). In step 2 titles were independently screened by NU and BC and in step 3 studies for which inclusion was agreed and studies on which no first agreement was reached were reviewed. Abstracts were assessed by two authors independently (NU and BC) and rejected if they did not analyze socioeconomic inequalities in health in relation to social capital or any of the related indicators. Abstracts of studies not agreed upon after this step were discussed until complete agreement between the two researchers was reached to either exclude or include the study for further analysis. A table with excluded studies after disagreement and reasons for exclusion can be found in Additional file 2.

The full-text review and data extraction were performed by one reviewer (NU) based on a summary table developed and piloted by the research team. (Additional file 3). A second reviewer (BC) checked a random 10% sample of the completed summary table. After the full-text review, studies were excluded if they failed to address social capital or any of the related indicators, if they did not use any health outcomes or if they did not include any measure on socioeconomic status or health inequalities. No summary measures were reproduced given the incomparability of dependent and independent variables used in the studies.

Quality assessment

Given that most of the criteria for risk of bias provided by the PRISMA statement are related to trials with a more biomedical orientation, we assessed the quality of the study rather than the risk of bias. Firstly, the suitability of social capital and economic capital measures in relation to the aim or research question was assessed. This included an examination of potential logical fallacies and we verified whether a sound theoretical motivation for the choice of the social capital measure or related indicator was provided. Transparent use of the social capital concept was emphasized; we expected studies to either use measures independently of the social capital concept, for example 'trust,' or to use measures such as social support as indicators of social capital. Secondly sample size and design of the study were assessed in relation to the type of analyses and reported conclusions. Studies were assigned one point if they failed on any of these quality criteria, two if there was substantial room for improvement and three if all quality criteria were met.

Results

A total of 60 studies were included in the analysis. A summary table of selected studies and main results is

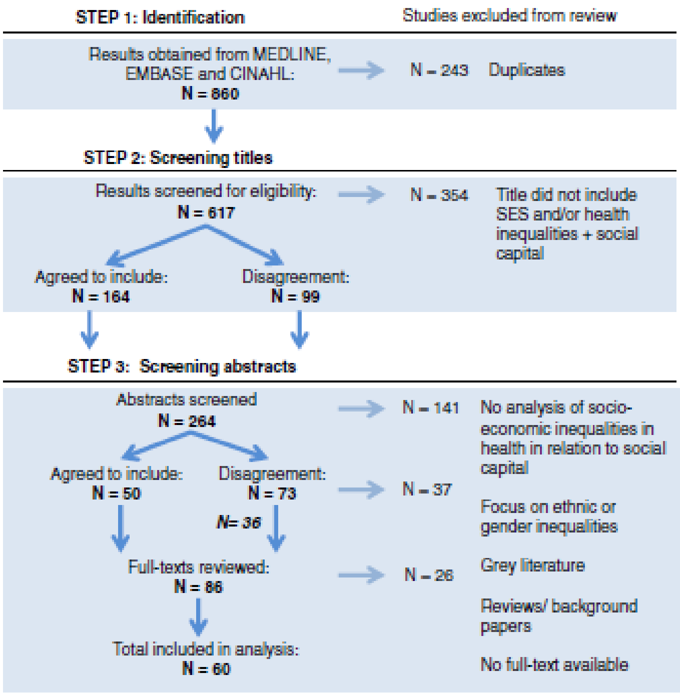

Figure 4 Selection process systematic literature search.

presented in Additional file 3. The collected data represents an array of geographical regions, with studies from the United States, Europe, Asia, Australia, Canada and the former Soviet Republic. Studies relying on data from the United States made up the biggest portion, but due to smaller sample sizes these participants represent only 24% of the total sample.

Self-reported measures of health were most frequently reported, and used as the only measure in 42% of all studies. Other indicators of health and illness were measures of health behaviour, hypertension, obesity, mental health, mortality, access to care or a combination of multiple measures.

Correlation between social capital and socioeconomic inequalities in health

Figure 5 shows nineteen studies testing for interaction effects of social capital and socioeconomic inequalities in health. The remaining studies assessed the correlation between social capital, health and socioeconomic status without taking into account interaction effects.

Out of sixty studies reviewed for analysis, only four did not confirm this three-way correlation. One of the studies did not analyse this hypothesis [27], another study only used structural measures of social capital to test the relationship with self-rated health [28] and two studies did not find an effect of social capital on mortality [29,30]. Turrell and colleagues [29] attributed this finding mainly to a lack of spatial segregation within the study population of Tasmania, while Mohan and colleagues [30] focussed on area-level measures of social capital.

The studies that did confirm this hypothesis were mainly cross-sectional studies, often making use of data from large surveys. Sixteen studies analysed a sample consisting of more than 8000 people, representing countries with low levels of socioeconomic inequality (e.g., Sweden and Norway), high-income countries with relatively high inequality (e.g., the United States and United Kingdom), and middle-income countries with high inequality (e.g., countries from the former Soviet Republic).

The studies revealing a relationship between social capital and socioeconomic inequalities in health often included multiple measures of social capital or related concepts, although the choice for these measures and components was not always clearly explained. The bonding measure of friendship and the bridging measure of trust were most often associated with health measures. Linking social capital was the least likely component to be measured, although various studies found significant relationships with health outcomes. In the study of Veenstra [31] for example, political trust was a strong predictor of long-term illness and self-rated health. Hyyppä [32] found general mistrust to be correlated with negative health effects, but other social capital measures related to friendship and religious participation produced stronger effects. Although these

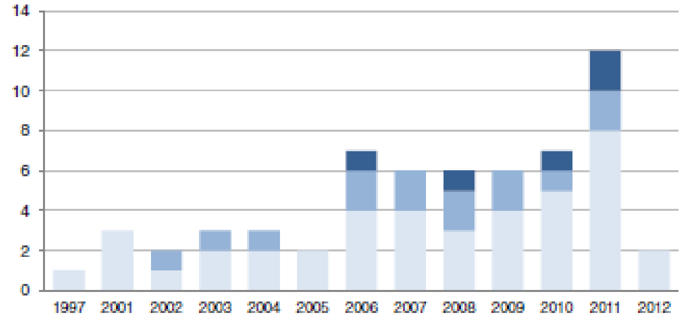

Figure 5 Trend of research on interaction social capital and socioeconomic inequalities in health. Light Blue rectangle, No interaction tested; Blue rectangle, Interaction confirmed; Dark Blue rectangle, No interaction found.

findings confirm the co-existence of high social capital, high socioeconomic status and good health, they do not explain differences in this relationship between groups in society and might therefore obscure interaction effects.

Buffer effect of social capital on health inequalities

The previous results identified a correlation between social capital and socioeconomic inequalities in health. Tables 1 and 2 show nineteen studies that sought to explain and nuance these findings by studying interaction effects. The buffer hypothesis suggests that people with a low socioeconomic status can use social capital as a buffer against the negative impact of low economic and/or cultural capital on health (Figure 1). There were eighteen studies that looked at the effect of socioeconomic status on the relationship between social capital and health, of which eleven confirmed the buffer hypothesis (Table 1).

Studies that focussed on minority populations provided valuable insights, such as the research by Pearson and colleagues [33], who concluded that - especially for low-income American Jews - ties bonding according to religion were related to better self-rated health. In an underdeveloped area in Western China, Sun and colleagues [34] observed an association between self-rated health and social capital only for residents suffering from deprivation. Social capital was measured as individually assessed neighbourhood cohesion, reciprocity and social support. Van der Wel [35] studied the effect of trust and volunteering at a neighbourhood level among residents of Norwegian communities. Communities rich in social capital (measured by aggregating individual responses to social capital questions) were found to exhibit an impact of social capital that only benefited self-rated health of the lowest income group, while no effect on health could be observed for residents with a higher income. Stafford and colleagues [36] found a buffer effect for contact amongst local friends, but a negative effect for attachment to the neighbourhood on common mental disorders. A study from Germany developed a specific social capital index for eleven to fifteen year olds and reported the strongest effect of school and neighbourhood social capital on self-rated health for children with the lowest level of education [37].

Studies that did not find a buffer effect are presented in Table 2. They used a variety of social capital measures ranging from neighbourhood satisfaction to trust, civic participation and political participation. The authors of these studies discuss various explanations for their findings. In a study from Norway the absence of a buffer effect is attributed to the low level of income inequality in the society under study [38], whereas a study from Sweden did not show a significant effect when analysing contextual and individual social capital separately [39].

Dependency effect of social capital and socioeconomic inequalities on health

In three out of nineteen papers reporting on interaction effects it is argued that there is a dependency between social capital and socioeconomic inequalities in health. Baron-Epel [40] found evidence for both hypotheses of interaction in one Israeli sample. For the Arab ethnic minority, in line with the buffer hypothesis, social support was positively correlated with health. For the more affluent Jewish group bridging and linking types of social capital were significantly associated with higher self-rated health as well. A large survey conducted in the United States found an interaction between education, the probability of hypertension and social integration measured as participation in six different activities [41]. Those who did not finish high school saw their probability of hypertension increased with more social integration, while social integration was protective of hypertension in all groups who had received more education. The same interaction effect was shown for the social capital indicator 'visited friends or family'. Beaudoin [42] compared groups of White and Black Americans plus high and low income groups and concluded that self-rated health of high income Whites profited most from high

Table 1 Studies reporting an interaction between social capital and socioeconomic inequalities in health

Study (year)	Sample	Social capital measure	Health measure	Measure SES	Confirmed interaction hypothesis	Quality 1=poor, 2=average, 3=high
Abdou (2010)	297 pregnant US women	Cognitive Bonding	Symptoms of mental illness, wellbeing	Childhood + adult SES	Buffer	2
Altschuler (2004)	49 Americans	Cognitive Structural Bridging	Self-rated health	Average household income	Buffer	2
Baron-Epel (2008)	4350 adult Jews and Arabs in Israel	Cognitive Structural Bonding	Self-rated health	Income, occupation and education	Buffer + dependency	2
Beaudoin (2009)	5586 US residents	Cognitive Structural Bridging	Self-rated health	Household income	Dependency	2
Bohn (2011)	4323 German students	Cognitive Structural Bonding Bridging	Self-rated health	Education	Buffer	3
Cohen (2003)	8782 Chicago residents	Cognitive Bridging	Premature mortality	Concentrated neighbourhood disadvantage	Buffer	2
Gee (2006)	2241 Filipino Americans	Cognitive Bonding	Unfair medical treatment	Education Employment	Buffer	3
Gorman (2007)	29816 US citizens ≥ 25 years old	Cognitive Structural Bonding Bridging	Self-rated health Hypertension	Education, relative family income, employment, financial barriers, insurance	Buffer + dependency	3
Jesse (2006)	130 low-income pregnant US women	Cognitive Bonding	Smoking and substance abuse	Level of education, insurance status	Buffer	2
Pearson (2011)	8566 Americans	Cognitive Structural Bridging Bonding	Self-rated health	Education, household income	Buffer	2
Stafford (2008)	9082 UK residents	Cognitive Structural Bridging Bonding	Common mental disorders	Household deprivation	Buffer	3
Subramanian (2002)	21456 US residents	Cognitive Bridging	Self-rated health	Educational attainment, income	Area-level	3
Sun (2009)	1605 Chinese urban residents ≥ 15 years old	Cognitive Structural Bonding Bridging	Self-rated health	Education, poverty, household income	Buffer	3
Van der Wel (2007)	11807 residents from Oslo (Norway)	Cognitive Structural Bridging	Self-rated health	Median income, income inequality, education	Buffer	2

social capital, while poor Black Americans profited least. Eight studies, of which key findings are presented in Table 2, rejected the dependency hypothesis. Some of these reported they found a buffer effect instead [34,35,43], while others confirmed a dependency effect only for certain populations [44] or rejected any type of interaction effect [38,39,45,46]. Bjornstrom [45], interestingly, did not find a relationship between health and relative position, although a significant relationship between health, family income and social capital was confirmed. Studies that could not identify a buffer or dependency relationship mostly used data from European countries, suggesting that the relationship between social capital and socioeconomic inequalities in health might differ across countries.

Effect of contextual social capital on health inequality

Studies that aggregated individually measured data to an area level generally did not produce significant results [35,39]. Engstrom and colleagues [39] found an effect of contextual social capital on self-rated health, but this was no longer significant when adjusting for the effect of individual socioeconomic status. This finding indicates that initial results reflected the effects of individual socioeconomic status on health rather than the effect of contextual social capital. However, one large US study did show an effect for contextual bridging social capital on a community level [47]. This significant effect disappeared after controlling for individual factors in a multilevel analysis, but further analysis of subgroups showed an interaction with individual trust. For people who reported a high level of trust, community level trust was protective of health, while for people with a low trust score, high community level trust negatively affected health. This result reported by Subramanian [47] is in line with the dependency hypothesis of individual social capital, since both suggest a lack of social capital or inability to use it

Table 2 Studies falsifying an interaction between social capital and socioeconomic inequalities in health

Study (year)	Sample	Social capital measure	Health measure	Measure SES	Rejected hypothesis	Quality 1=poor, 2=average, 3=high
Abdou (2010)	297 pregnant US women	Cognitive Bonding	Symptoms of mental illness, wellbeing	Childhood + adult SES	Dependency	2
Abel (2011)	3068 Dutch and Hungarian adolescents	Cognitive Structural Bonding	Self-rated health	Self-assessed financial resources	Buffer + dependency	2
Bjornstrom (2011)	2176 Los Angeles residents	Cognitive Bridging	Self-rated health	Relative income	Buffer + dependency	3
Dahl (2010)	3190 Norwegian adults	Cognitive Structural Bonding Bridging Linking	Self-rated health Longstanding illness	Education, employment status, subjective poverty, household income	Buffer + dependency	2
Engstrom (2008)	31182 adults from Stockholm, Sweden	Cognitive Structural Bonding Bridging Linking	Self-rated health	Occupation, education, income, area income	Buffer + dependency	3
Gallo (2006)	304 San Diego residents	Cognitive Structural Bridging Linking	Self-rated health	Education	Buffer + dependency	2
Sun (2009)	1605 Chinese urban residents ≥ 15 years old	Cognitive Structural Bonding Bridging	Self-rated health	Education, poverty, household income	Dependency	3
Van der Wel (2007)	11807 residents from Oslo (Norway)	Cognitive Structural Bridging	Self-rated health	Median income, income inequality, education	Dependency	2

for people with a lower socioeconomic position. However, it remains unclear whether neighbourhood social capital truly is an attribute of the community or simply a reflection of individual social capital.

Discussion

Summary of key findings

This review provides an overview of current evidence on the associations between social capital and socioeconomic inequalities in health. Findings from a total of sixty studies can be summarised into four categories. Firstly, there is strong evidence to suggest that people with a lower socio-economic status generally have lower levels of social capital, and that lack of social capital is related to socioeconomic inequalities in health. This hypothesis is supported by studies with various designs, sample sizes and settings [48-59]. The studies report on different types of social, economic and cultural capital, although the choice of a certain measure is not always based on a thorough theoretical framework.

Secondly, there is an indication that social capital, especially bonding social capital between close relations or tight-knit communities, can buffer some of the negative effects of low socioeconomic status on health [33-37,40,43,60-64]. Studies confirming this hypothesis generally focussed on social capital measured at the individual level and most significant buffer effects were observed among deprived communities and ethnic minorities. These findings are supported by literature on ethnic density, which suggests that ethnic minorities concentrated within neighbourhoods have better health outcomes than would be expected based on their, often low, socioeconomic position. Recently, two extensive literature reviews have shown some evidence of this effect for mortality, physical morbidity, health behaviour and mental health [65,66].

Thirdly we find that disadvantaged groups or people can be restricted in their opportunities to obtain and use social capital [40,42,63]. This hypothesis is consistent with the concept of social capital as described by Bourdieu. In much of his writing social capital is pictured as an asset of the privileged and a means of maintaining their superiority [67].

Our fourth hypothesis focuses on the negative effects of bridging and linking social capital for individuals with low economic capital [47]. Groups that do not have access to bridging social capital in a community might be better off in an environment where bridges between people are less strong, rather than in a community where disadvantaged groups are socially excluded. It has been shown before that poor mothers are less healthy in affluent areas compared to more deprived areas, suggesting an important role for psychosocial factors in the risk of illness [68].

Strengths and limitations

This study is the first to systematically review the literature on the relationship between social capital and socioeconomic inequalities in health. We sought evidence for interaction effects between social capital, health and social inequality that have been discussed in previous research, but never before backed up by an overview of relevant studies on the subject. Whereas social capital has previously been taken for granted as a health benefit, our review distinguishes two main pathways that lead to a positive health effect for some and no or negative effects for others, depending on socioeconomic position.

Limitations should be taken into account when interpreting the results from this systematic review. Firstly, it is possible that our results are biased because relevant studies have not been identified through the literature search. However, apart from excluding grey literature our search was deliberately broad to include all definitions and measures of social capital and different interpretations of 'socioeconomic inequalities in health'. To further reduce the risk of selection bias, all studies were screened by two researchers independently and reasons for disagreement were discussed. Aiming at maximum transparency of the selection process, we have reported all reasons for exclusion after initial disagreement (Additional file 2).

Secondly, findings of this review may be affected both by the quality of individual studies and by bias across studies. We rated the quality of individual studies with special emphasis on the suitability and validity of social and economic capital measures to clarify the relationship between social capital and socioeconomic inequalities in health. The quality of thirty-one out of sixty studies was rated suboptimal, mainly because they failed to address social capital based on a sound theoretical framework, resulting in a seemingly arbitrary choice of measurement (Additional file 3). Fortunately, the other half of the studies did base their research on a theoretical discussion of the social capital concept. Cene [69] for instance performed a qualitative study based on the framework developed by Carpiano [70] and others used standardised questionnaires for the measurement of social capital and related concepts. An example of the latter is the study by Johnson [71], which makes use of a social capital index consisting of six items with tested internal consistency.

A third limitation of the study, relating to the interpretation of findings, is that none of the hypotheses are confirmed by all included studies, and the finding that social capital can lead to social exclusion for people with a lower socioeconomic position is only supported by five studies out of nineteen. The majority of research does not specifically address the interaction between social capital and socioeconomic inequalities in health. However, studies generally made use of large samples, often representing a diverse population in terms of age, gender and ethnicity. Findings indicate a growing interest in this area since 2006. There is a shift from confirming and emphasizing the contribution of psychosocial factors to health inequalities, to a more in-depth study of these psychosocial pathways, in an attempt to explain the social gradient in health. Our study contributes to this trend, and hopefully more studies will follow with the aim to test the identified hypotheses.

Implications for research and policy

This review once more confirms the correlation between social capital, socioeconomic inequalities and health. Evidence for the buffer hypothesis, the dependency theory and the area-level interaction however remains much weaker. Nevertheless, it is worth considering the implications of these theories.

Findings relevant to the buffer hypothesis have resulted in a call for the stimulation of social capital in vulnerable groups, such as the suggestion by Waterston [72] that social participation in neighbourhoods can protect children from the negative health effects of being poor and even has the power to decrease infant mortality. Putnam advocates a revival of social capital in American society, which he argues should be achieved primarily through civic engagement [9]. In 2010 the UK Conservative party launched their 'Big society' vision, based upon the idea that stimulating community participation and cohesion would empower people to bring positive changes to their communities from the bottom up. These and similar initiatives have received two major points of criticism. Firstly, recent literature suggests that the promotion of social capital through togetherness and social cohesion is based on the social norms and values of the empowered religious and ethnic majority, not taking into account minority groups that deviate from the norm [23]. Religious participation for example will only appeal to those who consider themselves religious, while interventions at work will exclude the unemployed. Sports clubs are a way to promote health and sociability, but their facilities might not be compatible with certain cultural norms, and women can experience barriers to participation [73]. Secondly, researchers have stressed that policy implications of social capital research should be treated cautiously, since the emphasis of health promotion on self-advocacy through social capital holds the danger of blaming the victim [74,75]. Indeed, the idea that disadvantaged groups are to be held accountable for their position in society is likely to stimulate distrust and social exclusion. This will further reduce bridging and linking social capital among the groups that need it most. Paradoxically, Putnam himself showed in an early study of Italian society that it is distrust that makes people turn inward to their family, explaining bonding social capital not as a luxury but as a necessity to which people are forced by the negative influences of bridging and linking social capital in an unequal society [76].

This criticism touches upon a second implication of our findings related to the dependency and area-level hypotheses, namely that social capital is not a function of free choice, but restricted by external factors at the community level. Abel [77] discusses these consequences of Bourdieu's framework in the light of socioeconomic inequalities and power differences. Those that hold substantial power in a society are able to acquire social capital, either for personal use or for the benefit of their network. Economic capital can be converted into social capital and vice versa, and with the accumulation and transmission of capital within a network, outsiders cannot access it for the benefit of their health. This concept of social capital seems more relevant for bridging and linking than for bonding capital, and Bourdieu indeed considers bonding social resources such as social support to be distinct concepts [70]. In line with Bourdieu, Coburn [75] argues that, especially in unequal societies based on a neo-liberal model, bridging social capital is only freely available to the better-off. Social inequalities are, according to Coburn, a requirement for the viability of capitalism, so that decreased social trust and cohesion are inevitable. On a societal level, this hypothesis complements the finding that Western countries with a high level of income inequality score worse on many health outcomes and social indicators than more equal countries [78]. Consequently, in order to build social capital successfully social inequalities would have to be actively reduced. Uslaner [79] uses a similar argument when he argues that trust cannot simply be built. If trust and equality are related, because those who form a minority in terms of power have little reason to trust, then reducing social inequality is inevitably part of the solution. The state reinforces inequality or stimulates equality, hereby affecting social capital. Social capital can in turn affect equality, in a positive way by the creation of a more cohesive society and in a negative way by promoting social exclusion. Social capital should thus be built not only from the bottom up but also facilitated from the top down [80].

Conclusion

This review builds on existing literature to highlight two separate interaction effects between social capital and socioeconomic inequalities in health. These have been observed to contribute to the psychosocial pathway of health inequalities. Firstly, types of bonding and bridging social capital such as social support, social cohesion in a neighbourhood, close friends and emotional support from family members can buffer some of the negative effects of poverty on health, and might decrease the vulnerability of people with a lower position on the social ladder. Secondly, certain types of social capital might only benefit the health of those who have access to them through their having sufficient economic capital and it may harm the health of those who are excluded from participation in the relevant networks. Measures of social capital found to confirm this hypothesis include social support, trust, social integration and neighbourhood safety [40,42,63]. As evidence is limited, no conclusions can be drawn on the types of social capital through which this mechanism operates.

The debate in relation to social capital and health inequalities sees some advocate the building of social capital for health benefits, while others put an emphasis on the negative effects of social capital that they consider inherent to unequal modern societies. As we have shown that the various components of social capital may have multiple effects on the health of people with different positions in society, future research should establish whether promoting social capital can improve health for all. If the dependency between social capital and health inequalities is confirmed in future research, this implies the urge for structural changes of society to tackle the psychosocial pathway of health inequalities.

Additional files

Additional file 1: Systematic literature search.

Additional file 2: Reasons for exclusion after initial disagreement (N=37).

Additional file 3: Summary table.

Competing interests

The authors, Noortje Uphoff, Kate Pickett, Báltica Cabieses, Neil Small and John Wright, declare that they have no competing interests.

Authors' contributions

NU coordinated the study, designed the protocol, summarized results and led the writing of the manuscript. KP assisted in design of the study and writing. BC contributed to development of the protocol, extraction and summary of results and writing. NS contributed to interpretation of results and writing the manuscript. JW assisted in the design and writing of the manuscript. All authors have read and approved the final manuscript.

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References

1. Halpern D: *Social capital*. Cambridge: Polity Press; 2005.
2. Wilkinson RG, Pickett KE: **Income inequality and population health: A review and explanation of the evidence.** *Soc Sci Med* 2006, **62**:1768–1784.
3. Kawachi I, Kennedy BP, Lochner K, Prothrow-Stith D: **Social capital, income inequality, and mortality.** *Am J Public Health* 1997, **87**:1491–1498.
4. Adams J, White M: **Evidence concerning social capital and health inequalities is still lacking.** *J Public Health Med* 2003, **25**:184–185.
5. Stephens C: **Social capital in its place: using social theory to understand social capital and inequalities in health.** *Soc Sci Med* 2008, **66**:1174–1184.

6. Bourdieu P: The forms of capital. In Handbook of theory and research for the sociology of education. Edited by Richardson R. New York: Greenwood Press; 1986.
7. Coleman J: Foundations of social theory. Cambridge: Harvard University Press; 1990.
8. Fukuyama F: Trust: the social virtues and the creation of prosperity. London: Hamish Hamilton; 1995.
9. Putnam RD: Bowling alone : the collapse and revival of American community. New York: Simon & Schuster; 2000.
10. Putnam RD: Who killed civic America? Prospect 1996, 7:66–72.
11. Islam M, Merlo J, Kawachi I, Lindström M, Gerdtham U-G: Social capital and health: Does egalitarianism matter? A literature review. Int J Equity Health 2006, 5:1–28.
12. Harpham T, Grant E, Thomas E: Measuring social capital within health surveys: key issues. Health Policy Plan 2002, 17:106–111.
13. Granovetter MS: The strength of weak ties. Am J Sociol 1973, 78:1360–1380.
14. Szreter S, Woolcock M: Health by association? Social capital, social theory, and the political economy of public health. Int J Epidemiol 2004, 33:650–667.
15. Marmot MG, Smith GD, Stansfeld S, Patel C, North F, Head J, White I, Brunner E, Feeney A: Health inequalities among British civil servants: the Whitehall II study. Lancet 1991, 337:1387–1393.
16. Wilkinson R, Marmot M (Eds): Social determinants of health. The solid facts. 2nd edition. Copenhagen: WHO Regional Office for Europe; 2003.
17. Wilkinson RG, Pickett K: The spirit level : why more equal societies almost always do better. London: Allen Lane; 2009.
18. Lochner K, Kawachi I, Kennedy BP: Social capital: a guide to its measurement. Health Place 1999, 5:259–270.
19. Kawachi I: Social capital and health. In Handbook of medical sociology. 6th edition. Edited by Bird C, Conrad P, Fremont A, Timmermans S. Nashville, US: Vanderbilt University Press; 2010.
20. Wilkinson RG, Pickett K: The spirit level : why equality is better for everyone. New [ed.]. edn. London: Penguin; 2010.
21. Pickett KE, Wilkinson RG: People like us: ethnic group density effects on health. Ethn Health 2008, 13:321–334.
22. Small N, Gardiner C, Barnes S, Gott M, Halpin D, Payne S, Seamark D: "You get old, you get breathless, and you die": Chronic obstructive pulmonary disease in Barnsley, UK. Health Place 2012, 18:1396–1403.
23. Arneil B: Diverse communities : the problem with social capital. Cambridge: Cambridge University Press; 2006.
24. Carlson ED, Chamberlain RM: Social capital, health, and health disparities. J Nurs Scholarsh 2003, 35:325–331.
25. Pilkington P: Social capital and health: measuring and understanding social capital at a local level could help to tackle health inequalities more effectively. J Public Health Med 2002, 24:156–159.
26. Moher D, Liberati A, Tetzlaff J, Altman DG, Grp P: Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. J Clin Epidemiol 2009, 62:1006–1012.
27. Van Duyn MA, McCrae T, Wingrove BK, Henderson KM, Boyd JK, Kagawa-Singer M, Ramirez AG, Scarinci-Searles I, Wolff LS, Penalosa TL, Maibach EW: Adapting evidence-based strategies to increase physical activity among African Americans, Hispanics, Hmong, and Native Hawaiians: a social marketing approach. Prev Chronic Dis 2007, 4:A102.
28. Emerson E, Hatton C: Poverty, socio-economic position, social capital and the health of children and adolescents with intellectual disabilities in Britain: a replication. J Intellect Disabil Res 2007, 51:866–874.
29. Turrell G, Kavanagh A, Subramanian SV: Area variation in mortality in Tasmania (Australia): The contributions of socioeconomic disadvantage, social capital and geographic remoteness. Health Place 2006, 12:291–305.
30. Mohan J, Twigg L, Barnard S, Jones K: Social capital, geography and health: A small-area analysis for England. Soc Sci Med 2005, 60(66):1267–1283.
31. Veenstra G: Location, location, location: contextual and compositional health effects of social capital in British Columbia, Canada. Soc Sci Med 2005, 60:2059–2071.
32. Hyyppa MT, Maki J: Individual-level relationships between social capital and self-rated health in a bilingual community. Prev Med 2001, 32:148–155.
33. Pearson JA, Geronimus AT: Race/ethnicity, socioeconomic characteristics, coethnic social ties, and health: evidence from the national Jewish population survey. Am J Public Health 2011, 101:1314–1321. United States.
34. Sun X, Rehnberg C, Meng Q: How are individual-level social capital and poverty associated with health equity? A study from two Chinese cities. Int J Equity Health 2009, 8:2.
35. Van Der Wel KA: Social capital and health - A multilevel analysis of 25 administrative districts in Oslo. Norsk Epidemiologi 2007, 17(1):71–78.
36. Stafford M, Gimeno D, Marmot MG: Neighbourhood characteristics and trajectories of health functioning: a multilevel prospective analysis. Eur J Public Health 2008, 18:604–610.
37. Bohn V, Richter M: Type of School, Social Capital and Subjective Health in Adolescence. Gesundheitswesen 2011. doi:10.1055/s-0031-1285860.
38. Dahl E, Malmberg-Heimonen I: Social inequality and health: the role of social capital. Sociol Health Illn 2010, 32:1102–1119.
39. Engstrom K, Mattsson F, Jarleborg A, Hallqvist J: Contextual social capital as a risk factor for poor self-rated health: a multilevel analysis. Soc Sci Med 2008, 66:2268–2280.
40. Baron-Epel O, Weinstein R, Haviv-Mesika A, Garty-Sandalon N, Green MS: Individual-level analysis of social capital and health: a comparison of Arab and Jewish Israelis. Soc Sci Med 2008, 66:900–910.
41. Gorman BK, Sivaganesan A: The role of social support and integration for understanding socioeconomic disparities in self-rated health and hypertension. Soc Sci Med 2007, 65(65):958–975.
42. Beaudoin CE: Social capital and health status: assessing whether the relationship varies between Blacks and Whites. Psychol Health 2009, 24:109–118.
43. Abdou CM, Dunkel Schetter C, Campos B, Hilmert CJ, Dominguez TP, Hobel CJ, Glynn LM, Sandman C: Communalism predicts prenatal affect, stress, and physiology better than ethnicity and socioeconomic status. Cultur Divers Ethnic Minor Psychol 2010, 16:395–403. United States.
44. Abel T, Fuhr DC, Bisegger C, Ackermann Rau S: Money is not enough: exploring the impact of social and cultural resources on youth health. Scand J Public Health 2011, 39:57–61.
45. Bjornstrom EE: The neighborhood context of relative position, trust, and self-rated health. Soc Sci Med 2011, 73:42–49.
46. Gallo LC, Smith TW, Cox CM: Socioeconomic status, psychosocial processes, and perceived health: an interpersonal perspective. Ann Behav Med 2006, 31:109–119.
47. Subramanian SV, Kim DJ, Kawachi I: Social trust and self-rated health in US communities: a multilevel analysis. J Urban Health 2002, 79:S21–S34.
48. Aldabe B, Anderson R, Lyly-Yrjanainen M, Parent-Thirion A, Vermeylen G, Kelleher CC, Niedhammer I: Contribution of material, occupational, and psychosocial factors in the explanation of social inequalities in health in 28 countries in Europe. J Epidemiol Community Health 2011, 65:1123–1131. England.
49. Chavez R, Kemp L, Harris E: The social capital:health relationship in two disadvantaged neighbourhoods. J Health Serv Res Policy 2004, 9(Suppl 2):29–34.
50. Klein J, Vonneilich N, Baumeister SE, Kohlmann T, von dem Knesebeck O: Do social relations explain health inequalities? Evidence from a longitudinal survey in a changing eastern German region. Int J Public Health 2012, 57:619–627.
51. German D, Latkin CA: Social stability and health: exploring multidimensional social disadvantage. J Urban Health 2012, 89:19–35.
52. Daoud N, Soskolne V, Manor O: Examining cultural, psychosocial, community and behavioural factors in relationship to socioeconomic inequalities in limiting longstanding illness among the Arab minority in Israel. J Epidemiol Community Health 2009, 63:351–358.
53. Henderson HJ, Memon A, Lawson K, Jacobs B, Koutsogeorgou E: What factors are important in smoking cessation amongst deprived communities?: A qualitative study. Health Educ J 2011, 70:84–91.
54. Jusot F, Grignon M, Dourgnon P: Access to psycho-social resources and health: exploratory findings from a survey of the French population. Health Econ Policy Law 2008, 3:365–391.
55. Power C, Matthews S: Origins of health inequalities in a national population sample. Lancet 1997, 350:1584–1589.
56. Dean WR, Sharkey JR: Food insecurity, social capital and perceived personal disparity in a predominantly rural region of Texas: an individual-level analysis. Soc Sci Med 2011, 72:1454–1462.
57. Soskolne V, Manor O: Health inequalities in Israel: explanatory factors of socio-economic inequalities in self-rated health and limiting longstanding illness. Health Place 2010, 16:242–251.
58. Aida J, Kondo K, Kondo N, Watt RG, Sheiham A, Tsakos G: Income inequality, social capital and self-rated health and dental status in older Japanese. Soc Sci Med 2011, 73:1561–1568.

59. Mao L, Kidd MR, Rogers G, Andrews G, Newman CE, Booth A, Saltman DC, Kippax SC: **Social factors associated with Major Depressive Disorder in homosexually active, gay men attending general practices in urban Australia.** *Aust N Z J Public Health* 2009, **33**:83–86.
60. Altschuler A, Somkin CP, Adler NE: **Local services and amenities, neighborhood social capital, and health.** *Soc Sci Med* 2004, **59**:1219–1229. England, Elseiver Ltd.; 2004.
61. Cohen DA, Farley TA, Mason K: **Why is poverty unhealthy? Social and physical mediators.** *Soc Sci Med* 2003, **57**:1631–1641.
62. Gee GC, Chen J, Spencer MS, See S, Kuester OA, Tran D, Takeuchi D: **Social support as a buffer for perceived unfair treatment among Filipino Americans: differences between San Francisco and Honolulu.** *Am J Public Health* 2006, **96**:677–684. United States.
63. Gorman BK, Sivaganesan A: **The role of social support and integration for understanding socioeconomic disparities in self-rated health and hypertension.** *Soc Sci Med* 2007, **65**:958–975. England.
64. Jesse DE, Graham M, Swanson M: **Psychosocial and spiritual factors associated with smoking and substance use during pregnancy in African American and White low-income women.** *J Obstet Gynecol Neonatal Nurs* 2006, **35**:68–77. United States.
65. Becares L, Nazroo J, Jackson J, Heuvelman H: **Ethnic density effects on health and experienced racism among Caribbean people in the US and England: a cross-national comparison.** *Soc Sci Med* 2012, **75**:2107–2115.
66. Shaw RJ, Atkin K, Becares L, Albor CB, Stafford M, Kiernan KE, Nazroo JY, Wilkinson RG, Pickett KE: **Impact of ethnic density on adult mental disorders: narrative review.** *Br J Psychiatry* 2012, **201**:11–19.
67. Field J: *Social capital.* London: Routledge; 2003.
68. Albor C, Pickett K, Wilkinson RG, Ballas D: **Are poor mothers and their infants healthier in richer areas? The protective effect of area socio-economic density.** *J Epidemiol Community Health* 2009, **63**:91.
69. Cene CW, Akers AY, Lloyd SW, Albritton T, Powell Hammond W, Corbie-Smith G: **Understanding social capital and HIV risk in rural African American communities.** *J Gen Intern Med* 2011, **26**:737–744.
70. Carpiano RM: **Neighborhood social capital and adult health: An empirical test of a Bourdieu-based model.** *Health Place* 2007, **13**:639–655.
71. Johnson CM, Sharkey JR, Dean WR: **Eating Behaviors and Social Capital are Associated with Fruit and Vegetable Intake Among Rural Adults.** *J Hunger Environ Nutr* 2010, **5**:302–315.
72. Waterston T, Alperstein G, Brown SS: **Social capital: a key factor in child health inequalities.** *Arch Dis Child* 2004, **89**:456–459.
73. Walseth K: **Bridging and bonding social capital in sport—experiences of young women with an immigrant background.** *Sport, Education and Society* 2007, **13**:1–17.
74. Pearce N, Smith GD: **Is social capital the key to inequalities in health?** *Am J Public Health* 2003, **93**:122–129.
75. Coburn D: **Income inequality, social cohesion and the health status of populations: The role of neo-liberalism.** *Soc Sci Med* 2000, **51**(51):135–146.
76. Putnam RD, Leonardi R, Nanetti RY: *Making democracy work : civic traditions in modern Italy. Princeton, N.J.* Chichester: Princeton University Press; 1993.
77. Abel T, Frohlich KL: **Capitals and capabilities: linking structure and agency to reduce health inequalities.** *Soc Sci Med* 2012, **74**:236–244.
78. Wilkinson RG: **Socioeconomic determinants of health: Health inequalities: relative or absolute material standards?** *BMJ* 1997, **314**:591.
79. Uslaner EM: **Producing and Consuming Trust.** *Polit Sci Quart* 2000, **115**:569–590.
80. Newton K: **Social capital and democracy.** *Am Behav Sci* 1997, **40**:575–586.

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Appendix 2 Systematic review

Appendix 2A Literature search strategy

25 June 2012

<u>MEDLINE (searched through PUBMED)</u>

Mesh terms:
"Socioeconomic Factors"[Mesh] "Health Status Disparities"[Mesh] "Social Support"[Mesh] "Community Networks"[Mesh] "Social Isolation"[Mesh] "Trust"[Mesh]

"health status disparities" OR "health inequality" OR "health inequity" OR "health inequalities" OR "health disparity" OR "health disparities" OR "Health Status Disparities"[Mesh]

AND

"socioeconomic status" OR "social class" OR poverty OR poor OR income OR disadvantaged OR deprivation OR deprived OR "socioeconomic factors" OR "socioeconomic position" OR deprivation OR deprived OR "Socioeconomic Factors"[Mesh]

AND

"social capital" OR "social support" OR "social participation" OR trust OR "emotional support" OR "social network" OR "social cohesion" OR "psychosocial support" OR "community capital" OR "neighbourhood cohesion" OR "neighborhood cohesion" OR "collective efficacy" OR "Social Support"[Mesh] OR "Community Networks"[Mesh] OR "Social Isolation"[Mesh] OR "Trust"[Mesh]

N = 413

<u>EMBASE (searched through Ovid)</u>

EMBASE subject headings (Emtree):
health disparity/ social status/ poverty/ social class/ social capital/ social support/ social isolation/ social network/ social participation

"health status disparities" OR "health inequality" OR "health inequity" OR "health inequalities" OR "health disparity" OR "health disparities" OR health disparity/

AND

"socioeconomic status" OR "social class" OR poverty OR poor OR income OR disadvantaged OR deprivation OR deprived OR "socioeconomic factors" OR "socioeconomic position" OR deprivation OR deprived OR social status/ OR poverty/ OR social class/

AND

"social capital" OR "social support" OR "social participation" OR trust OR "emotional support" OR "social network" OR "social cohesion" OR "psychosocial support" OR "community capital" OR "neighbourhood cohesion" OR "neighborhood cohesion" OR "collective efficacy" OR social capital/ OR social support/ OR social isolation/ OR social network/ OR social participation/
N = 355

<u>CINAHL</u>

CINAHL subject headings:
(MH "Socioeconomic Factors") (MM "Health Status Disparities") (MH "Social Capital") (MH "Social Networks") (MH "Social Isolation") (MH "Trust")

"health status disparities" OR "health inequality" OR "health inequity" OR "health inequalities" OR "health disparity" OR "health disparities" OR (MM "Health Status Disparities")

AND

"socioeconomic status" OR "social class" OR poverty OR poor OR income OR disadvantaged OR deprivation OR deprived OR "socioeconomic factors" OR "socioeconomic position" OR deprivation OR deprived OR (MH "Socioeconomic Factors")

AND

"social capital" OR "social support" OR "social participation" OR trust OR "emotional support" OR "social network" OR "social cohesion" OR "psychosocial support" OR "community capital" OR "neighbourhood cohesion" OR "neighborhood cohesion" OR "collective efficacy" OR (MH "Social Capital") OR (MH "Social Networks") OR (MH "Social Isolation") OR (MH "Trust")

N = 92

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"health status disparities" OR "health inequality" OR "health inequity" OR "health inequalities" OR "health disparity" OR "health disparities" OR "Health Status Disparities"[Mesh]

AND

"socioeconomic status" OR "social class" OR poverty OR poor OR income OR disadvantaged OR deprivation OR deprived OR "socioeconomic factors" OR "socioeconomic position" OR deprivation OR deprived OR "Socioeconomic Factors"[Mesh]

AND

"social capital" OR "social support" OR "social participation" OR trust OR "emotional support" OR "social network" OR "social cohesion" OR "psychosocial support" OR "community capital" OR "neighbourhood cohesion" OR "neighborhood cohesion" OR "collective efficacy" OR "Social Support"[Mesh] OR "Community Networks"[Mesh] OR "Social Isolation"[Mesh] OR "Trust"[Mesh]

N = 1

Appendix 2B Table of excluded studies

Study	Reason for exclusion[a]
Ashing-Giwa et al., 2009	Ethnic inequalities not socioeconomic inequalities
Bardach et al., 2011	Rural/ spatial inequalities not socioeconomic inequalities
Coday et al., 2002	No socioeconomic inequalities
Dailey, 2006	Grey literature
Dong et al., 2010	No socioeconomic inequalities
Emmons et al., 2007	No socioeconomic inequalities
Finlayson et al., 2007	No socioeconomic inequalities
Hodge et al., 2011	No socioeconomic inequalities
Holden et a., 2011	Does not discuss association health and social capital
Murdock et al., 2009	No socioeconomic inequalities
Schulz et al., 2005	Protocol for research; no research findings
Song and Lin, 2009	No socioeconomic inequalities
Zoellner et al., 2011	No socioeconomic inequalities
Bell et al., 2010	Ethnic inequalities not socioeconomic inequalities
Campbell and McLean, 2002	Ethnic inequalities not socioeconomic inequalities
Campbell and McLean, 2003	Ethnic inequalities not socioeconomic inequalities
Cislo et al., 2010	Ethnic inequalities not socioeconomic inequalities
Jackson et al., 2006	Does not discuss association health and social capital
Jaksic, 2007	Not specific to social capital and socioeconomic inequalities
McLean et al., 2003	Ethnic inequalities not socioeconomic inequalities
Rachlis et al., 2011	Does not address (components of) social capital
Van Duyn et al., 2007	Ethnic inequalities not socioeconomic inequalities
Chandola, 2012	symposium report
Cohen et al., 2008	no health measure
Elovainio et al., 2011	no analysis of social capital
Kramer et al., 2010	no analysis of social capital
Litaker et al., 2005	no analysis of social capital
Mackerth and Appleton, 2008	no quantitative or qualitative analysis
Novak, Ahlgren and Hammarstrom, 2012	no analysis of social capital
Roberts, 1997	no analysis of social capital
Gonzalez-Perez et al., 2008	no analysis of social capital
Gonzalez-Perez et al., 2011	no analysis of social capital
Dixon, 2004	grey literature
Wallerstein, 2011	no analysis of social capital
Hajna et al., 2011	grey literature
Ebrahim et al., 2009	no analysis of social capital
Marmot et al., 1991	background information; no analysis of social capital

a) Reasons for exclusion after initial disagreement between authors

Appendix 2C Summary table of studies

Study	Health measure	Social capital measure	Type of social capital	Level of measurement social capital	Quality assessment	Quality rating
Emerson and Hatton (2007)	Self-rated health (mother reports on child's health)	Satisfaction with area	Bridging, cognitive	Individual	poor measurement and rational for measurement of social capital	2
Abdou (2010)	Depressive symptoms, perceived stress, anxiety, blood pressure, combined index of wellbeing	Communalism as a non-material cultural resource	Bonding, cognitive	Individual	small sample size, communalism well defined and measured by validated questionnaire	2
Abel (2011)	Self-rated health	Social resources	Bonding, cognitive, structural	Individual; compared at country level	limited theoretical motivation for choice of measures	2
Aldabe (2011)	Self-rated health	Psychosocial factors: social support, social network, trust, social participation, social exclusion	Bonding, bridging, linking, cognitive, structural	Individual	choice of psychosocial factors not clearly motivated, social capital not mentioned	2
Altschuler (2004)	Self-rated health	Perception of neighbourhood, local activism, trust, facilities	Bridging, linking, cognitive, structural	Neighbourhood	small qualitative study, choice for social capital measure unclear	2
Baron-Epel (2008)	Self-rated health	Social trust, neighbourhood safety, perceived helpfulness, trust in authorities, social support	Bonding, bridging, linking, cognitive, structural	Individual	measurement of social capital partially based on literature	2
Beaudoin (2009)	Self-rated health	Group membership, religious participation, auxiliary friendship and health discussion networks	Bonding, bridging, linking, cognitive, structural	Individual	Limited interpretation of social capital	2
Bjornstrom (2011b)	All-cause mortality, mortality from heart disease	Collective efficacy (informal social control, social cohesion and trust), social interaction	Bridging, cognitive	Individual, neighbourhood (aggregated)	Unclear where measures are derived from	2
Chavez (2004)	Self-rated health	Trust, reciprocity, feeling at home and interest in the community, local participation, friends and family in community, safety	Bonding, bridging, linking, cognitive, structural	Individual	choice of social capital measures unclear	2
Cohen (2003)	Premature mortality	Collective efficacy (informal social control, social cohesion and trust)	Bridging, cognitive	Neighbourhood	choice for measure unclear	2

Study	Health measure	Social capital measure	Type of social capital	Level of measurement social capital	Quality assessment	Quality rating
Dahl (2010)	Self-rated health, longstanding illness	Emotional support, practical support, friends and acquaintances, neighbourhood satisfaction, civic participation, professional resources, general trust	Bonding, bridging, linking, cognitive, structural	Individual	no validated questionnaire, theoretical background	2
Daoud (2009)	Limiting longstanding illness	Exploitation, mutual help and trust among community members.	Bonding, bridging, cognitive	Individual	Social participation and civic engagement excluded from social capital measure	2
Emerson (2007)	Self-rated health	Social participation and networks	Bonding, bridging, structural	Individual	social participation measured; partially motivated	2
Gallo (2006)	Self-rated health	Social-contextual experiences (home, work, neighbourhood)	Bonding, bridging, linking, cognitive, structural	Individual	small sample size for testing interaction, validated measures, social capital not mentioned	2
German (2012)	Chronic and mental illness	Social integration (children, social network, religious service attendance) and neighbourhood integration	Bonding, bridging, cognitive, structural	Individual	theoretical framework, origin of measures unclear	2
Grundy (2003)	Self-rated health, longstanding illness, health conditions, prescriptions, hypertension, psychological health	Social resources (marital status, social support)	Bonding, cognitive, structural	Individual	limited conceptualisation	2
Henderson (2010)	Smoking cessation	Support	Bonding, bridging, cognitive	Individual	qualitative, small sample	2
Heritage (2009)	Self-rated health	Social ties	Bonding, bridging, cognitive, structural	Individual	limited motivation for measurement of social ties	2
Hyyppa (2001)	Self-rated health and health behaviour	Interpersonal trust, civic engagement	Bonding, bridging, linking, cognitive, structural	Individual	motivation for measures, limited use of theoretical framework	2
Hyyppa (2003)	Self-rated health	Social ties, friendship networks, integrity, voluntary participation, trust	Bonding, bridging, linking, cognitive, structural	Individual	measures poorly explained, theoretical framework	2
Jesse (2006)	Smoking and substance use during pregnancy	Social support	Bonding, cognitive	Individual	low sample size, validated measure social support	2

Study	Health measure	Social capital measure	Type of social capital	Level of measurement social capital	Quality assessment	Quality rating
Jusot (2008)	Self-rated health	Psychosocial resources (civic engagement, reliance, social and emotional support, position in social hierarchy, relative deprivation)	Bonding, bridging, linking, cognitive, structural	Individual	social support separate from social capital, choice not well motivated	2
Lynch (2001)	Low birthweight, life expectancy, self-rated health, age-specific mortality, cause-specific mortality	Psychosocial environment (distrust, member of organisation, volunteering, perception of control, females in government)	Bridging, linking, cognitive, structural	Individual, country (aggregated)	background theory, random use social capital measures	2
Mao (2009)	Major depressive disorder	Social support	Bonding, cognitive	Individual	social capital not mentioned, limited theory social support	2
Pearson (2011)	Self-rated health	Co-ethnic social ties	Bonding, bridging, cognitive, structural	Individual	social capital not mentioned, background but no validated measures for social ties	2
Power (1997)	Self-rated health, longstanding illness, health conditions and symptoms	Social support	Bonding, bridging, cognitive	Individual	measures poorly explained, some validated questionnaires	2
Reading (2001)	Maternal depression	Social support and access to social networks	Bonding, bridging, cognitive, structural	Family	small sample size, choice of social network variables unclear, theoretical background	2
Scott (2011)	Social determinants of health	Community cohesion and social support	Bonding, bridging, cognitive	Individual and community level	small sample size, social capital approach unclear	2
Aida (2008)	Dental caries	Social support (no. of case workers) and social cohesion (community centres)	Bonding, bridging, structural	Individual	limited theoretical motivation	2
Barger (2009)	Life satisfaction, self-rated health	social ties, emotional support	Bonding, bridging, cognitive , structural	Individual	limited theoretical back-up	2
Van der Wel (2007)	Self-rated health	Contextual social capital (generalised trust and participation in voluntary organisations)	Bridging, linking, cognitive , structural	Individual + aggregated to district level	theoretical background, explanation for measures missing	2
Bartley (2004)	Cardio-vascular risk factors; smoking, diet, exercise, alcohol	Positive and negative social support	Bonding, cognitive	Individual	rationale for social support measures and validated questionnaire	3

Study	Health measure	Social capital measure	Type of social capital	Level of measurement social capital	Quality assessment	Quality rating
Bjornstrom (2011)	Self-rated health	Trust in neighbours	Bridging, cognitive	Individual	only one social capital measure, theoretical framework	3
Bjornstrom (2011c)	Obesity	Collective efficacy (informal social control, social cohesion and trust)	Bridging, cognitive	Individual, neighbourhood (aggregated)	good quality; social capital concept not used	3
Bull (2006)	Physical activity, dietary behaviour	Multilevel support for chronic illness	Bonding, bridging, cognitive	Individual	validated questionnaire social support	3
Businelle (2010)	Smoking cessation	Social support	Bonding, bridging, cognitive	Individual	validated questionnaire social support	3
Daen (2011)	Food insecurity	Extra-familial support	Bonding, bridging, cognitive	Individual	One dimension of social capital, validated	3
D'Hombres (2008)	Self-rated health	Trust, membership in local organisations, social isolation	Bonding, bridging, linking, cognitive, structural	Individual, country level (aggregated)	well-motivated measures	3
Engstrom (2008)	Self-rated health	Contextual social capital: civic and political trust, civic and political participation	Bridging, linking, cognitive, structural	Individual, parish (aggregated)	use of framework and theoretical motivation	3
Fiorillo (2011)	Self-rated health	Social interaction (friends, relatives, memberships, religious participation)	Bonding, bridging, cognitive, structural	Individual	dimension of social capital, rationale for measures	3
Gee (2006)	Unfair treatment for current health conditions	Social support (emotional, instrumental)	Bonding, cognitive	Individual, country (aggregated)	rationale for measures, social capital not mentioned	3
Gorman (2007)	Self-rated health, hypertension	Social support and social integration	Bonding, bridging, cognitive, structural	Individual	social support, well defined	3
Mulder (2011)	Health behaviour	Resources (perceived life control, social support, social cohesion)	Bonding, bridging, cognitive	Individual	good explanation of theory, validated or tested measures	3
Prentice (2006)	Access to primary care	Neighbourhood social capital (% in same house as 5 years ago, predominant ethnic group, close-knit, trust, neighbourhood friends)	Bonding, bridging, linking, cognitive, structural	Individual	standardised questionnaire, rationale for measures used	3
Rankin (2006)	Food-related health promotion	Social inclusion	Bonding, bridging, cognitive	Individual	small qualitative study	3

Study	Health measure	Social capital measure	Type of social capital	Level of measurement social capital	Quality assessment	Quality rating
Sabbah (2011)	periodontal disease	Social network and social support (need for emotional support, close friends, marital status)	Bonding, bridging, cognitive, structural	Individual	social capital not mentioned, rationale for used measures	3
Soskolne (2010)	Self-rated health, limiting longstanding illness	Social participation, social trust and community measure	Bridging, linking, cognitive, structural	Individual + community (aggregated)	own framework developed, standardised scales used	3
Stockdale (2007)	alcohol, drug, and mental health disorders	Social support	Bonding, cognitive	Individual	conceptual model developed	3
Subramanian (2002)	Self-rated health	Social trust	Bridging, cognitive	Individual + community (aggregated)	theoretical background	3
Turrell (2006)	Standardised (age, sex) mortality	Political participation, trust, social cohesion	Bonding, bridging, linking, cognitive, structural	Individual	factor analysis, theoretical background	3
Veenstra (2005)	Self-rated health; physical, emotional, longstanding illness, overall health	Individual social capital (trust, political trust, participation) and community social capital (public spaces, voluntary organisations, average trust)	Bridging, linking, cognitive, structural	Individual + community (aggregated)	theoretical background, limited overview of social capital concept	3
Aida (2011)	Self-rated health, dental status	Trust and volunteering	Bridging, linking, cognitive, structural	Individual + community (aggregated)	theoretical background and motivation for measures	3
Cene (2011)	HIV risk	Social cohesion, civic engagement	Bonding, bridging, cognitive	Individual	Adopted framework	3
Johnson (2010)	Fruit and vegetable intake	Standardised social capital index (community level)	Bonding, bridging, cognitive	Individual	theoretical motivation and standardised index	3
Klein (2012)	Self-rated health	Social relations; Social Integration Index, emotional support, instrumental support	Bonding, bridging, linking, cognitive, structural	Individual	standardised questionnaires	3
Mohan (2005)	Mortality	Individual social capital (altruistic activity, social activity, political activity, local friends, feeling of belonging, voting, community spirit)	Bonding, bridging, linking, cognitive, structural	Individual + community level (aggregated)	rationale for measures	3

Study	Health measure	Social capital measure	Type of social capital	Level of measurement social capital	Quality assessment	Quality rating
Sun (2009)	Self-rated health	Reciprocity and social support, social participation, perception of trust and safety, interpersonal relationship network, neighbourhood cohesion	Bonding, bridging, linking, cognitive, structural	Individual	theoretical background and rationale for measures	3
Stafford (2008)	Common mental disorders	Family ties, friendships, trust, neighbourhood, tolerance, reciprocity	Bonding, bridging, linking, cognitive, structural	Individual + neighbourhood (aggregated)	theoretical background and rationale for measures	3
Bohn (2011)	Self-rated health	Social capital index with four contexts: family, friends, school and neighbourhood	Bonding, bridging, linking, cognitive, structural	Individual	adaption of measures to setting, theoretical discussion	3
Kamphuis (2008)	Sports participation	Neighbourhood network, social cohesion, feeling at home, social disorganisation	Bridging, cognitive, structural	Individual + neighbourhood (aggregated)	good quality; social capital concept not used	3

Appendix 3 Statistical analyses

Appendix 3A Statistical analyses Chapter 6

Birth weight Pakistani term babies

Variable	*β (95% CI)* 1. Individual	*β (95% CI)* 2. Area deprivation	*β (95% CI)* 3. Ethnic density	*β(95% CI)* 4. ED and deprivation
Intercept	568.22 (126.64;1009.79)*	546.54 (129.32; 963.75)*	615.85 (201.57; 1030.12)**	553.92 (136.88; 970.96)**
Maternal height (cm)	16.15 (13.52;18.77)***	16.00 (13.45; 18.55)***	15.96 (13.41; 18.50)***	16.04 (13.50; 18.59)***
Consanguinity	-63.38 (-95.64;-31.11)***	-65.96 (-97.11; -34.82)***	-63.39 (-94.60; -32.18)***	-63.89 (-95.08; -32.70)***
Country of birth (England)	-30.48 (-62.79;1.83)	-32.65 (-64.25; 01.04)*	-36.80 (-68.36; -5.23)*	-34.03 (-65.65; -2.41)*
Parity (not first baby)	137.64 (101.81;173.46)***	142.37 (111.28; 173.46)	140.86 (109.72; 171.99)***	140.71 (109.59; 171.82) ***
Sex baby (female)	-105.12 (-134.69;-75.56)***	-102.32 (-131.10; -73.53)***	-101.91 (-130.71; -73.11)***	-101.56 (-130.34; -72.78)***
Cohabitation (living with father baby)	53.73 (-14.84;122.30)	55.20 (-3.59; 113.99)	54.95 (-3.87; 113.76)	58.10 (-0.73; 116.92)
Time lived at address (years)	2.32 (-0.39;5.04)	2.23 (-0.37; 4.82)	2.63 (0.02; 5.25)*	
Education mother (versus < 5 GCSE)				
5 GCSE	-34.74 (-74.21;4.72)	-29.37 (-67.44; 8.70)	-32.53 (-70.55; 5.49)	-29.88 (-67.94; 8.17)
A-level	7.80 (-44.85; 60.44)	20.50 (-30.28; 71.27)	16.59 (-34.12; 67.30)	19.97 (-30.78; 70.72)
> A-level	-12.49 (-55.10; 30.12)	-3.04 (-44.40; 38.33)	-10.97 (-51.98; 30.04)	-4.16 (-45.51; 37.20)
Occupation father (versus unemployed)				
Manual	-20.90 (-80.75; 38.94)			
Non-manual	-24.26 (-85.71; 37.19)			
Self-employed	-37.87 (-102.26; 26.51)			
Student	45.04 (-93.17; 183.25)			
Area deprivation (IMD 2010)		2.38 (-0.46; 5.21)		3.91 (0.71; 7.11)*
Percentage Pakistani residents			-0.36 (-1.07; 0.35)	-0.82 (-1.63; -0.02)*
R^2	0.08			
Log Likelihood		-27341.41	-27342.27	-27339.41
Variance at LSOA level (se)		0.00	0.00	0.00
ICC		0.00	0.00	0.00

*** p < 0.001, ** p < 0.01, * p < 0.05

Birth weight White British term babies

Variable	β (95% CI) 1. Individual	β (95% CI) 2. Area deprivation	β (95% CI) 3. Ethnic density	β (95% CI) 4. ED and deprivation
Intercept	998.64 (563.08;1434.20)***	1094.92 (656.76;1533.08)***	965.53 (529.14; 1401.93)***	1045.48 (603.27; 1487.69)***
Maternal height (cm)	14.37 (11.71;17.02)***	14.28 (11.64;16.93)***	14.31 (11.66; 16.95)***	14.27 (11.62; 16.91)***
Parity (not first baby)	151.96 (113.06;19.86)***	156.67 (118.17;195.16)***	155.76 (117.24; 194.28)***	155.95 (117.46; 194.95)***
Sex baby (female)	-156.82 (-189.15;-124.48)***	-157.11 (-189.34;124;88)***	-156.84 (-189.08; -124.60)***	-157.40 (-189.63; -125.18)***
Cohabitation (living with father baby)	34.77 (-4.88;74.42)			
Education mother (versus < 5 GCSE)				
5 GCSE	71.53 (27.34; 115.72)**	69.85 (25.75;113.96)**	72.57 (28.56; 116.57)**	68.90 (24.80; 113.01)**
A-level	95.25 (42.17;148.33)***	95.55 (42.96;148.15)***	98.53 (46.05; 151.02)***	94.05 (41.44; 146.66)***
> A-level	130.66 (74.44;186.88)***	123.86 (67.55;180.17)***	131.92 (76.33; 187.51)***	121.55 (65.20; 177.91)***
Receiving means-tested benefits	-53.45 (-93.64;-13.26)**	- 51.53 (-91.37;11.68)*	-55.44 (-94.99; -15.89)**	-49.25 (-89.18; -9.32)*
Area deprivation (IMD 2010)		-4.39 (-7.74;-1.05)*		-3.75 (-7.19; -0.31)*
Percentage White British residents			0.79 (0.07; 1.52)*	0.60 (-0.14; 1.35)
R^2	0.10			
Log Likelihood		-23395.57	-23396.67	-23394.40
Variance at LSOA level (se)		0.00	0.00	0.00
ICC		0.00	0.00	0.00

*** p < 0.001, ** p < 0.01, * p < 0.05

Preterm birth Pakistani babies

Variable	*β (95% CI)* 1. Individual	*OR (95% CI)* 2. Area deprivation	*OR (95% CI)* 3. Ethnic density	*OR (95% CI)* 4. ED and deprivation
Intercept	-2.18 (-6.24; 1.89)	0.04 (0.00; 2.21)	0.09 (0.00; 5.20)	0.06 (0.00; 3.70)
Maternal age (years)	0.00 (-0.00; 0.00)	1.00 (1.00; 1.00)	1.00 (1.00; 1.00)*	1.00 (1.00; 1.00)*
Maternal height (cm)	-0.00 (-0.03; 0.02)	1.00 (0.97; 1.02)	1.00 (0.97; 1.02)	1.00 (0.97; 1.02)
Consanguinity	0.11 (-0.19; 0.41)	1.07 (0.79; 1.44)	1.11 (0.82; 1.50)	1.10 (0.82; 1.49)
Country of birth (England)	0.19 (-0.11; 0.48)	1.30 (0.98; 1.74)	1.25 (0.94; 1.68)	1.27 (0.95; 1.70)
Parity (not first baby)	-0.58 (-0.91; -0.25)**	0.55 (0.40; 0.76)***	0.55 (0.40; 0.77)***	0.55 (0.39; 0.76)***
Cohabitation (living with father baby)	-0.33 (-0.82; 0.17)			
Time lived at address (years)	0.01 (-0.02; 0.03)			
Financial situation (managing well)	0.13 (-0.18; 0.45)		1.14 (0.83; 1.56)	1.15 (0.84; 1.58)
Area deprivation (IMD 2010)		1.03 (1.00; 1.06)*		1.02 (0.99; 1.05)
Percentage Pakistani residents (vs < 35%)				
35-50%			1.29 (0.78; 2.12)	1.24 (0.75; 2.05)
50-60%			1.51 (0.93; 2.44)	1.40 (0.85; 2.30)
60-70%			1.04 (0.63; 1.70)	0.96 (0.57; 1.60)
> 70%			1.66 (1.06; 2.62)*	1.44 (0.86; 2.40)
Log Likelihood		-805.52	-797.92	-797.22
Variance at LSOA level (se)		0.00	0.00	0.00
ICC		0.00	0.00	0.00

*** p < 0.001, ** p < 0.01, * p < 0.05

Preterm birth White British babies

Variable	β (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
	1. Individual	2. Area deprivation	3. Ethnic density	4. ED and deprivation
Intercept	2.53 (-1.31; 6.38)	3.98 (0.09; 185.08)	6.87 (0.16; 300.82)	3.60 (0.08; 172.13)
Maternal age (years)	0.00 (-0.00; 0.00)	1.00 (1.00; 1.00)*	1.00 (1.00; 1.00)	1.00 (1.00; 1.00)*
Maternal height (cm)	-0.03 (-0.05; -0.01)*	0.97 (0.95; 1.00)*	0.97 (0.95; 1.00)*	0.97 (0.95; 1.00)*
Parity (not first baby)	-0.33 (-0.67; 0.02)			
Cohabitation (living with father baby)	0.22 (-0.16; 0.59)			
Occupation father (versus unemployed)				
Manual	-0.73 (-1.22; -0.24)**	0.47 (0.30; 0.75)**	0.46 (0.29; 0.73)**	0.47 (0.29; 0.75)**
Self-employed	-0.65 (-1.27; -0.04)*	0.55 (0.30; 0.99)*	0.51 (0.28; 0.92)*	0.54 (0.30; 0.98)*
Student	-0.50 (-1.73; 0.74)	0.62 (0.18; 2.13)	0.60 (0.18; 2.04)	0.62 (0.18; 2.12)
Non-manual	-0.72 (-1.20; -0.24)**	0.52 (0.33; 0.81)**	0.48 (0.31; 0.75)**	0.51 (0.33; 0.80)**
Receiving means-tested benefits	0.00 (-0.36; 0.37)			
Area deprivation (IMD 2010)		1.02 (0.99; 1.05)		1.02 (0.99; 1.06)
Percentage White British residents			1.00 (0.99; 1.01)	1.00 (0.99; 1.00)
Log Likelihood		-753.19	-754.34	-753.09
Variance at LSOA level (se)		0.12	0.15	0.11
ICC		0.004	0.007	0.004

*** p < 0.001, ** p < 0.01, * p < 0.05

Smoking during pregnancy Pakistani women

Variable	OR (95% CI) Step 1. Individual model	OR (95% CI) Step 2. Area deprivation	OR (95% CI) Step 3. Ethnic density
Intercept	0.03 (0.01;0.11)***	0.03 (0.01; 0.08)***	0.06 (0.02;0.18)***
Maternal age	0.99 (0.95;1.03)		
Consanguinity	0.47 (0.33;0.67)***	0.47 (0.33;0.68)***	0.49 (0.34;0.71)***
Country of birth (England)	5.70 (3.68;8.83)***	5.72 (3.69;8.86)***	5.61 (3.61;8.69)***
Parity (not first baby)	0.74 (0.49;1.11)	0.70 (0.49;1.00)*	0.69 (0.48;0.99)*
Cohabitation (living with father baby)	0.65 (0.40;1.07) †	0.64 (0.39;1.05)†	0.64 (0.39;1.04)†
Time lived at address (years)	0.98 (0.95;1.01)	0.98 (0.95;1.00)	0.98 (0.95;1.01)
Financial situation (versus comfortable)			
Alright	1.97 (1.17;3.34)*	1.99 (1.18;3.37)*	1.97 (1.16;3.33)*
Just about getting by	2.99 (1.73;5.15)***	2.99 (1.73;5.15)***	2.96 (1.72;5.11)***
Difficult	3.03 (1.44;6.38)**	3.04 (1.44;6.40)**	2.98 (1.42;6.29)**
Very difficult	3.29 (1.03;10.49)*	3.27 (1.02;10.41)*	3.00 (0.93;9.65)†
Education mother (versus < 5 GCSE)			
5 GCSE	1.00 (0.64;1.57)	1.00 (0.64;1.57)	1.00 (0.64;1.57)
A-level	0.71 (0.41;1.22)	0.70 (0.40;1.21)	0.69 (0.40;1.20)
> A-level	0.32 (0.17;0.60)***	0.31 (0.17;0.58)***	0.30 (0.16;0.56)***
Area deprivation (IMD 2010)		0.99 (0.96;1.02)	
South Asian density (versus < 10%)			
10-29.99%			0.65 (0.25;1.67)
30-49.99%			0.47 (0.19;1.18)
50-70%			0.39 (0.16;0.97)*
> 70%			0.41 (0.17;0.99)*
Log likelihood		-529.69	-526.94
Variance at LSOA level (se)		0.23	0.22
ICC		0.00	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Smoking during pregnancy Pakistani women with interaction effect (ED continuous)

Variable	OR (95% CI)
Intercept	0.09 (0.02;0.40)**
Consanguinity	0.49 (0.34;0.71)***
Country of birth (England)	5.62 (3.62;8.71)***
Parity (not first baby)	0.68 (0.48;0.98)*
Cohabitation (living with father baby)	0.65 (0.40;1.06)†
Time lived at address (years)	0.98 (0.95;1.01)
Financial situation (versus comfortable)	
Alright	1.98 (1.17;3.36)*
Just about getting by	2.99 (1.73;5.17)***
Difficult	3.04 (1.44;6.42)**
Very difficult	3.10 (0.96;9.98)†
Education mother (versus < 5 GCSE)	
5 GCSE	1.01 (0.65;1.58)
A-level	0.69 (0.40;1.20)
> A-level	0.31 (0.16;0.57)***
Area deprivation (IMD 2010)	0.96 (0.90;1.02)
South Asian density	0.97 (0.95;1.00)*
South Asian density#deprivation	1.00 (1.00;1.00)
Log likelihood	-526.46
Variance at LSOA level (se)	0.23
ICC	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Smoking during pregnancy Pakistani women with stratification by deprivation

Variable	OR (95% CI)	OR (95% CI)
	Low deprivation	High deprivation
Intercept	0.05 (0.01;0.27)***	0.04 (0.01;0.12)***
Consanguinity	0.52 (0.28;0.98)*	0.47 (0.30;0.73)**
Country of birth (England)	4.92 (2.20;10.99)***	5.93 (3.51;10.02)***
Parity (not first baby)	0.41 (0.22;0.77)**	0.92 (0.58;1.45)
Cohabitation (living with father baby)	0.68 (0.26;1.78)	0.56 (0.31;1.00)†
Time lived at address (years)	1.02 (0.97;1.07)	0.97 (0.94;1.00)†
Financial situation (versus comfortable)		
Alright	1.89 (0.79;4.52)	1.98 (1.02;3.86)*
Just about getting by	4.83 (2.03;11.50)***	2.17 (1.07;4.43)*
Difficult	0.81 (0.09;7.05)	3.85 (1.64;9.05)**
Very difficult	-	4.06 (1.16;14.18)*
Education mother (versus < 5 GCSE)		
5 GCSE	1.36 (0.55;2.40)	0.99 (0.59;1.67)
A-level	0.66 (0.22;1.94)	0.77 (0.40;1.48)
> A-level	0.40 (0.14;1.16)†	0.30 (0.13;0.68)**
South Asian density	0.98 (0.97;1.00)*	0.99 (0.98;1.00)
Log likelihood	-169.34	-349.01
Variance at LSOA level (se)	0.26	0.79
ICC	0.00	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Smoking during pregnancy Pakistani women with stratification by managing financially

Variable	OR (95% CI) Managing well	OR (95% CI) Financial difficulties
Intercept	0.05 (0.01;0.19)***	0.13 (0.03;0.50)**
Consanguinity	0.44 (0.27;0.74)**	0.54 (0.32;0.93)*
Country of birth (England)	6.13 (3.24;11.58)***	5.40 (2.91;10.01)***
Parity (not first baby)	0.63 (0.38;1.03)†	0.75 (0.43;1.29)
Cohabitation (living with father baby)	0.54 (0.26;1.12)†	0.71 (0.36;1.37)
Time lived at address (years)	0.98 (0.95;1.02)	0.97 (0.93;1.02)
Education mother (versus < 5 GCSE)		
5 GCSE	1.37 (0.72;2.63)	0.76 (0.40;1.43)
A-level	0.96 (0.45;2.05)	0.46 (0.19;1.10)†
> A-level	0.23 (0.09;0.59)**	0.43 (0.18;1.00)†
Area deprivation (IMD 2010)	1.02 (0.97;1.07)	0.99 (0.95;1.04)
South Asian density	0.99 (0.98;1.00)†	0.99 (0.98;1.01)
Log likelihood	-298.07	-227.50
Variance at LSOA level (se)	0.23	0.24
ICC	0.09	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Smoking during pregnancy White British women

Variable	OR (95% CI) Step 1. Individual model	OR (95% CI) Step 2. Area deprivation	OR (95% CI) Step 3. Ethnic density
Intercept	6.45 (3.81;10.90)***	2.90 (1.58;5.32)**	6.86 (4.02;11.70)***
Maternal age	0.94 (0.93;0.96)***	0.95 (0.93;0.97)***	0.95 (0.93;0.96)***
Parity (not first baby)	1.10 (0.89;1.35)	1.08 (0.88;1.34)	1.10 (0.89;1.35)
Cohabitation (living with father baby)	0.71 (0.58;0.87**	0.72 (0.59;0.88)**	0.70 (0.57;0.86)**
Time lived at address (years)	1.00 (0.98;1.01)	1.00 (0.98;1.01)	1.00 (0.98;1.01)
Financial situation (vs comfortable)			
Alright	1.27 (1.01;1.58)*	1.25 (1.00;1.56)†	1.25 (1.00;1.56)†
Just about getting by	1.90 (1.49;2.41)***	1.84 (1.45;2.35)***	1.87 (1.47;2.38)***
Difficult	1.88 (1.26;2.81)**	1.91 (1.28;2.85)**	1.82 (1.22; 2.71)**
Very difficult	2.68 (1.48;4.85)**	2.78 (1.53;5.04)**	2.56 (1.41;4.64)**
Education mother (versus < 5 GCSE)			
5 GCSE	0.52 (0.42;0.64)***	0.54 (0.43;0.66)***	0.52 (0.42;0.64)***
A-level	0.37 (0.29;0.48)***	0.39 (0.30;0.50)***	0.38 (0.29;0.49)***
> A-level	0.17 (0.12;0.23)***	0.18 (0.13;0.26)***	0.16 (0.12;0.23)***
Receiving means-tested benefits	1.38 (1.13;1.69)**	1.29 (1.06;1.59)*	1.38 (1.13;1.69)
Occupation father (versus unemployed)			
Manual	0.59 (0.45;0.80)**	0.61 (0.46;0.82)**	0.60 (0.45;0.81)**
Self-employed	0.53 (0.37;0.77)**	0.58 (0.40;0.83)**	0.53 (0.37;0.77)**
Non-manual	0.49 (0.37;0.66)***	0.52 (0.39;0.70)***	0.49 (0.37;0.66)***
Student	0.36 (0.18;0.72)**	0.38 (0.19;0.76)**	0.37 (0.18;0.73)**
Area deprivation (IMD 2010)		1.03 (1.02;1.05)***	
South Asian density (versus < 10%)			
10-29.99%			0.75 (0.61;0.93)**
30-49.99%			1.03 (0.78;1.36)
50-70%			1.11 (0.78;1.57)
> 70%			0.95 (0.58;1.56)
Log likelihood		-1669.69	-1678.36
Variance at LSOA level (se)		0.16	0.23
ICC		0.00	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Smoking during pregnancy White British women - full model

Variable	OR (95% CI)
Intercept	3.15 (1.70;5.85)***
Maternal age	0.95 (0.93;0.97)***
Parity (not first baby)	1.08 (0.88;1.34)
Cohabitation (living with father baby)	0.72 (0.59;0.88)**
Time lived at address (years)	1.00 (0.98;1.01)
Financial situation (versus comfortable)	
Alright	1.23 (0.98;1.54)†
Just about getting by	1.82 (1.43;2.32)***
Difficult	1.86 (1.24;2.78)**
Very difficult	2.70 (1.49;4.90)**
Education mother (versus < 5 GCSE)	
5 GCSE	0.54 (0.43;0.66)***
A-level	0.39 (0.30;0.50)***
> A-level	0.18 (0.13;0.25)***
Receiving means-tested benefits	1.30 (1.06;1.60)*
Occupation father (versus unemployed)	
Manual	0.62 (0.46;0.82)**
Self-employed	0.57 (0.40;0.83)**
Non-manual	0.52 (0.39;0.71)***
Student	0.38 (0.19;0.76)**
Area deprivation (IMD 2010)	1.03 (1.02;1.05)***
South Asian density (versus < 10%)	
10-29.99%	0.79 (0.64;0.98)*
30-49.99%	0.99 (0.72;1.30)
50-70%	1.13 (0.80;1.61)
> 70%	0.82 (0.50;1.34)
Log likelihood	-1666.52
Variance at LSOA level (se)	0.14
ICC	0.00

*** $p< 0.001$, ** $p < 0.01$, * $p < 0.05$, †<0.1

Smoking during pregnancy White British women with stratification by deprivation

Variable	*OR (95% CI)* Low deprivation	*OR (95% CI)* High deprivation
Intercept	5.98 (2.82;12.71)***	7.09 (3.19;15.75)***
Maternal age (years)	0.95 (0.93;0.97)***	0.94 (0.92;0.97)***
Parity (not first baby)	1.01 (0.77;1.33)	1.25 (0.90;1.73)
Cohabitation (living with father baby)	0.63 (0.47;0.83)**	0.83 (0.62;1.11)
Time lived at address (years)	0.98 (0.96;1.00)†	1.02 (0.99;1.04)
Financial situation (versus comfortable)		
Alright	1.25 (0.93;1.68)	1.24 (0.87;1.76)
Just about getting by	1.93 (1.40;2.67)***	1.83 (1.26;2.65)**
Difficult	1.94 (1.13;3.34)*	1.76 (0.95;3.23)†
Very difficult	1.57 (0.72;3.40)	6.48 (2.19;19.21)**
Education mother (versus < 5 GCSE)		
5 GCSE	0.61 (0.45;0.82)**	0.44 (0.32;0.59)***
A-level	0.42 (0.30;0.60)***	0.34 (0.23;0.49)***
> A-level	0.16 (0.10;0.25)***	0.23 (0.13;0.40)***
Receiving means-tested benefits	1.28 (0.96;1.70)†	1.34 (0.99;1.81)†
Occupation father (versus unemployed)		
Manual	0.53 (0.34;0.83)**	0.66 (0.45;0.98)*
Self-employed	0.52 (0.31;0.88)*	0.55 (0.32;0.95)*
Non-manual	0.48 (0.31;0.74)**	0.51 (0.34;0.77)**
Student	0.62 (0.23;1.66)	0.20 (0.07;0.55)**

South Asian density (versus < 10%)		
10-29.99%	0.72 (0.55;0.94)*	0.92 (0.64;1.33)
30-49.99%	0.90 (0.59;1.37)	1.09 (0.74;1.60)
50-70%	1.02 (0.64;1.61)	1.34 (0.76;2.36)
> 70%	1.42 (0.30;6.76)	0.82 (0.48;1.40)
Log likelihood	-943.48	-713.46
Variance at LSOA level (se)	0.31	0.16
ICC	0.00	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Smoking during pregnancy White British women with stratification by managing financially

Variable	*OR (95% CI)* Managing well	*OR (95% CI)* Financial difficulties
Intercept	0.27 (0.03;2.65)	2.59 (0.24;27.52)
Maternal age (years)	1.00 (0.95;1.06)	0.96 (0.91;1.02)
Parity (not first baby)	0.54 (0.29;1.00)†	0.80 (0.41;1.57)
Cohabitation (living with father baby)	0.37 (0.16;0.83)*	0.48 (0.22;1.01)†
Time lived at address (years)	0.99 (0.95;1.03)	0.99 (0.94;1.04)
Education mother (versus < 5 GCSE)		
5 GCSE	1.87 (0.96;3.65)†	0.93 (0.49;1.77)
A-level	2.29 (1.08;4.86)*	1.03 (0.44;2.42)
> A-level	0.44 (0.17;1.11)†	0.61 (0.27;1.38)
Receiving means-tested benefits	1.10 (0.61;1.97)	1.20 (0.66;2.20)
Occupation father (versus unemployed)		
Manual	0.81 (0.33;1.97)	0.77 (0.35;1.70)
Self-employed	0.58 (0.22;1.54)	0.40 (0.14;1.16)†
Non-manual	0.59 (0.23;1.51)	0.66 (0.27;1.61)
Student	0.65 (0.07;5.89)	1.00 (0.11;8.92)
Area deprivation (IMD 2010)	1.01 (0.96;1.05)	0.97 (0.92;1.01)
South Asian density (versus < 10%)		
10-29.99%	0.66 (0.19;2.35)	0.74 (0.18;3.10)
30-49.99%	0.41 (0.12;1.39)	0.44 (0.11;1.78)
50-70%	0.33 (0.10;1.06)†	0.40 (0.10;1.56)
> 70%	0.25 (0.07;0.81)*	0.39 (0.10;1.55)
Log likelihood	-304.42	-233.97
Variance at LSOA level (se)	0.30	0.22
ICC	0.04	0.00

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Appendix 3C Statistical analyses Chapter 8

Spearman correlation matrix neighbourhood items Phase 1

	Enjoy area	Neighbours	Transport	Leisure	Super-market	Post office	Teenagers	Vandalism
Enjoy area	*							
Neighbours	0.501 *p<0.001*	*						
Transport	0.367 *p<0.001*	0.353 *p<0.001*	*					
Leisure	0.276 *p<0.001*	0.214 *p<0.001*	0.313 *p<0.001*	*				
Super-market	0.155 *p<0.001*	0.128 *p<0.001*	0.226 *p<0.001*	0.151 *p<0.001*	*			
Post office	0.102 *p<0.001*	0.116 *p<0.001*	0.206 *p<0.001*	0.103 *p<0.001*	0.529 *p<0.001*	*		
Teenagers	0.240 *p<0.001*	0.278 *p<0.001*	0.126 *p<0.001*	0.191 *p<0.001*	0.076 *p=0.007*	0.024 *p=0.387*	*	
Vandalism	0.285 *p<0.001*	0.295 *p<0.001*	0.123 *p<0.001*	0.204 *p<0.001*	0.101 *p<0.001*	0.037 *p=0.219*	0.833 *p<0.001*	*

Composed social capital-related measures Phase 1

Composed measure	Calculation	Pakistani	White British
		Mean [95% CI]	
Perceptions neighbourhood	Sum total score of eight items on a 4 point-scale	16.5 16.29;16.77)	16.5 16.27;16.77)
Social support	Sum total score of 7 questions on a 3 point-scale	12.0 11.76;12.19)	13.2 13.07;13.35)
		Percentage	
General trust	*0 (most negative)* *1* *2* *3 (most positive)*	15.9% 44.4% 28.5% 11.2%	11.8% 39.4% 30.5% 18.4%
Social participation	*0 no activities* *1 one or more activities*	67.2% 32.8%	62.8% 37.2%

Spearman correlation matrix social support items Phase 3

	Husband doesn't listen	Warmth and affection	Closely attached family	Family takes notice	Feel excluded	Meal with others	People you wish weren't there
Husband doesn't listen	*						
Warmth and affection	0.557 *p<0.001*	*					
Closely attached family	0.196 *p<0.001*	0.158 *p<0.001*	*				
Family takes notice	0.239 *p<0.001*	0.176 *p<0.001*	0.651 *p<0.001*	*			
Feel excluded	0.218 *p<0.001*	0.184 *p<0.001*	0.390 *p<0.001*	0.407 *p<0.001*	*		
Meal with others	0.051 *p=0.011*	0.059 *p=0.003*	0.037 *p=0.058*	0.068 *p<0.001*	0.069 *p<0.001*	*	
People you wish weren't there	0.075 *p<0.001*	0.044 *p=0.031*	0.057 *p=0.004*	0.067 *p<0.001*	0.076 *p<0.001*	0.053 *p=0.007*	*

Composed social support measure Phase 3

Composed measure	Calculation	Pakistani	White British
		Mean [95% CI]	
Social support	Sum total score of 7 questions, range 0-26	21.9 (21.64;22.06)	22.0 (21.83;22.24)

Responses to social capital items Phase 1 by ethnic group

Item[a]	**Total sample**	**Pakistani**	**White British**
Sample size	*1255*	*668*	*587*
Enjoy living in area			
Strongly agree	19.0%	19.8%	18.1%
Agree	71.5%	73.7%	69.0 %
Disagree	7.8%	5.4%	10.6%
Strongly disagree	1.8%	1.2%	2.4%
Neighbours look after each other			
Strongly agree	13.8%	14.8%	12.6%
Agree	66.4%	71.0%	61.1%
Disagree	16.9%	12.6%	21.8%
Strongly disagree	2.9%	1.2%	4.4%
Good local transport			
Strongly agree	16.2%	16.0%	16.4%
Agree	76.5%	78.1%	74.7%
Disagree	6.3%	4.5%	8.2%
Strongly disagree	1.0%	1.4%	0.7%
Good leisure facilities			
Strongly agree	8.5%	10.5%	6.2%
Agree	64.2%	68.1%	59.7%
Disagree	24.6%	18.5%	31.4%
Strongly disagree	2.8%	2.9%	2.7%
Access to facilities			
Easy to get to supermarket			
Very easy	48.7%	35.9%	63.1%
Fairly easy	45.5%	55.8%	33.8%
Fairly difficult	4.9%	6.6%	3.1%
Very difficult	0.9%	1.2%	0.0%
Easy to get to post office			
Very easy	63.1%	52.7%	74.8%
Fairly easy	33.5%	42.1%	23.8%
Fairly difficult	2.8%	4.0%	1.4%
Very difficult	0.6%	1.2%	0.0%
Safety			
Teenagers hanging around			
Not a problem at all	16.8%	21.1%	11.9%
Not a very big problem	51.5%	46.3%	57.3%
Fairly big problem	21.0%	20.9%	21.1%
Very big problem	10.7%	11.7%	9.7%
Vandalism			
Not a problem at all	19.5%	25.5%	7.8%
Not a very big problem	55.4%	49.0%	16.9%
Fairly big problem	17.8%	18.6%	62.1%
Very big problem	7.3%	6.9%	13.3%
Social participation			
Joining in activities of organisations:			
Political parties	0.8%	0.9%	0.8%
Trade unions	1.4%	0.5%	2.4%
Environmental groups	0.7%	0.5%	0.9%
Parent-teacher association	7.2%	8.3%	5.8%
Tenants group	2.3%	2.7%	1.8%

Education, arts or music group	6.7%	5.4%	7.8%
Religious group or church	7.7%	7.2%	8.0%
Charity	3.0%	2.7%	3.4%
Caring for mothers	4.7%	5.2%	4.1%
Youth group	1.5%	0.5%	2.6%
Women’s institute	0.6%	0.9%	0.2%
Social club	1.3%	0.8%	1.8%
Sports club	9.6%	6.1%	13.8%
Other	2.4%	1.9%	2.9%
Social support; There are people who…			
make me happy			
Not true	4.6%	6.6%	2.4%
Partly true	22.6%	29.5%	14.8%
Certainly true	72.8%	63.9%	82.9%
make me feel loved			
Not true	0.7%	0.9%	0.4%
Partly true	23.5%	31.3%	15.1%
Certainly true	75.8%	67.8%	84.6%
can be relied on			
Not true	3.6%	6.3%	0.5%
Partly true	13.7%	18.9%	7.8%
Certainly true	82.7%	74.9%	91.7%
see that I’m taken care of			
Not true	1.8%	3.0%	0.3%
Partly true	10.4%	15.5%	4.6%
Certainly true	87.8%	81.5%	95.1%
accept me just as I am			
Not true	1.8%	3.1%	0.3%
Partly true	12.6%	18.1%	6.5%
Certainly true	85.5%	78.8%	93.2%
make me feel important part of their lives			
Not true	2.1%	3.4%	0.5%
Partly true	13.6%	16.9%	9.9%
Certainly true	84.3%	79.7%	89.6%
give support and encouragement			
Not true	1.0%	1.7%	0.2%
Partly true	13.8%	17.2%	9.9%
Certainly true	85.3%	81.1%	89.9%
General trust; People…			
Can be trusted	22.9%	21.1%	25.0
Can’t be too careful	62.1%	59.4%	65.2%
Don’t know	14.9%	19.5%	9.8%
Try to be helpful	47.7%	44.2%	51.6%
Look out for themselves	33.5%	35.4%	31.2%
Don’t know	18.9%	20.4%	17.2%
Try to be fair	46.5%	39.6%	54.5%
Take advantage	26.3%	31.6%	20.3%
Don’t know	27.2%	28.9%	25.3%

a) Phrasing is shortened to fit table. See Table 8.1 for exact phrasing of items as used in questionnaire.

Responses to social capital items Phase 3 by ethnic group

Item[a]	Total sample	Pakistani	White British
Sample size	*2449*	*1239*	*1210*
Social support			
Partner doesn't listen			
Strongly agree	2.8%	3.2%	2.3%
Agree	6.5%	6.3%	6.6%
Neither agree nor disagree	15.6%	13.2%	18.1%
Disagree	36.5%	36.3%	36.8%
Strongly disagree	38.6%	40.9%	36.2%
Wish there was more affection			
Strongly agree	5.3%	8.7%	1.7%
Agree	12.5%	16.1%	8.9%
Neither agree nor disagree	14.7%	14.3%	15.1%
Disagree	30.4%	27.7%	33.1%
Strongly disagree	37.1%	33.2%	41.2%
Feel closely attached to family			
Totally agree	72.7%	76.6%	69.1%
Agree	13.9%	11.4%	16.1%
Neither agree nor disagree	8.2%	7.7%	8.8%
Disagree	2.8%	1.9%	3.7%
Totally disagree	2.4%	2.4%	2.4%
Family takes notice of opinions			
Totally agree	60.8%	67.7%	54.5%
Agree	22.5%	17.6%	26.9%
Neither agree nor disagree	10.6%	9.5%	11.7%
Disagree	3.3%	2.4%	4.1%
Totally disagree	2.9%	2.8%	2.9%
Sometimes I feel excluded			
Totally agree	6.2%	8.0%	4.5%
Agree	7.6%	7.2%	8.0%
Neither agree nor disagree	8.1%	8.3%	7.8%
Disagree	10.5%	7.9%	13.0%
Totally disagree	67.6%	68.6%	66.7%
Eat at least one meal at home			
Yes	96.2%	96.8%	95.7%
No	3.3%	2.4%	4.1%
Prefer not to say	0.5%	0.8%	0.2%
People you wish weren't there			
Yes	3.2%	4.3%	2.2%
No	94.9%	93.4%	96.2%
Prefer not to say	2.0%	2.3%	1.7%
General trust			
Most people can be trusted			
Can be trusted	24.7%	23.1%	26.2%
2	21.9%	17.5%	25.9%
3	29.5%	29.8%	29.3%
4	8.0%	9.1%	7.0%
Can't be too careful	15.9%	20.6%	11.6%
Neighbours			
Problems with neighbours			
Yes	8.1%	5.2%	10.7%
No	91.9%	94.8%	89.3%

a) Phrasing is shortened to fit table. See Table 8.2 for exact phrasing of items as used in questionnaire

Regression analyses area-level health and social capital

Area-level health outcomes in relation to neighbourhood social capital (Phase 1)

Variable	*β (95% CI)* Health (IMD 2010)	*β (95% CI)* Child health (ICW 2010)
Intercept	0.63 (-0.19;1.44)	-0.81 (-1.69;0.07)†
Area deprivation (IMD 2010 no health)	0.07 (0.06;0.09)***	-0.02 (-0.05;0.01)
Child deprivation (CWI)		
Education		0.01 (0.00;0.02)**
Crime		0.03 (-0.07;0.13)
Housing		0.01 (-0.00;0.01)†
Environment		-0.00 (-0.01;0.01)
Children in need		3.78 (-2.17;9.73)
White British residents (%)	0.00 (-0.00;0.00)	-0.01 (-0.01;-0.00)***
Population density (people/hectare)	-0.00 (-0.00;0.00)	0.00 (-0.00;0.00)
Neighbourhood social capital score	-0.04 (-0.08;-0.01)*	0.03 (-0.01;0.08)†

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Area-level health outcomes in relation to social support (Phase 1)

Variable	*β (95% CI)* Health (IMD 2010)	*β (95% CI)* Child health(ICW 2010)
Intercept	0.20 (-0.67;1.07)	0.27 (-0.66;1.20)
Area deprivation (IMD 2010 no health)	0.08 (0.07;0.09)***	-0.02 (-0.06;0.01)
Child deprivation (CWI)		
Education		0.01 (0.00;0.02)**
Crime		0.02 (-0.08;0.11)
Housing		0.01 (0.00;0.01)*
Environment		-0.00 (-0.01;0.00)
Children in need		2.55 (-3.39;8.48)
White British residents (%)	0.00 (-0.00;0.00)	-0.00 (-0.01;-0.00)**
Population density (people/hectare)	-0.00 (-0.00;0.00)	0.00 (-0.00;0.00)
Neighbourhood social capital score	-0.04 (-0.10;0.03)	-0.03 (-0.10;0.03)

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Area-level health outcomes in relation to social support (Phase 3)

Variable	β (95% CI) *Health (IMD 2010)*	β (95% CI) *Child health (ICW 2010)*
Intercept	0.93 (0.03;1.83)*	0.20 (-0.84;1.23)
Area deprivation (IMD 2010 no health)	0.08 (0.07;0.09)***	-0.03 (-0.06;0.01)
Child deprivation (CWI)		
Education		0.01 (0.01;0.02)***
Crime		0.01 (-0.09;0.11)
Housing		0.01 (0.00;0.01)*
Environment		0.00 (-0.01;0.01)
Children in need		1.54 (-4.47;7.55)
White British residents (%)	0.00 (-0.00;0.00)	-0.00 (-0.01;-0.00)**
Population density (people/hectare)	0.00 (-0.00;0.00)	0.00 (-0.00;0.00)
Neighbourhood social capital score	-0.05 (-0.09;0.01)**	-0.02 (-0.06;0.02)

*** p< 0.001, ** p < 0.01, * p < 0.05, †<0.1

Statistical code regression analyses health and social capital

Given the large number of regression models produced for this chapter only the statistical syntax is reported.

Pakistani women, birth weight

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xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits neigbSC_score PercPk2011 IMD2010_nohealthPop_density_2010pplhectare  if ethgrp3==2 & eclpreterm==0, ||  LSOA1: ,covariance (independent)
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White British women, birth weight

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Pakistani women, GHQ

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White British women, GHQ

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Pakistani women, smoking during pregnancy

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White British women, smoking during pregnancy

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Stratified/interaction analyses area deprivation:

Birth weight Pakistani:

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Birth weight, White British:

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Pakistani women, GHQ

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercPk2011 Pop_density_2010pplhectare if ethgrp3==2 &IMD2010_nohealth< 20, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercPk2011 Pop_density_2010pplhectare if ethgrp3==2 &IMD2010_nohealth> 19.99, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercPk2011 Pop_density_2010pplhectare IMD2010_nohealthint_socialsup3xIMD2010_nohealth if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 PercPk2011 Pop_density_2010pplhectare if ethgrp3==2 &IMD2010_nohealth< 20, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 PercPk2011 Pop_density_2010pplhectare if ethgrp3==2 &IMD2010_nohealth> 19.99, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 PercPk2011 Pop_density_2010pplhectare if ethgrp3==2 &IMD2010_nohealth< 20, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 PercPk2011 Pop_density_2010pplhectare if ethgrp3==2 &IMD2010_nohealth> 19.99, || LSOA1:

White British women, GHQ

xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercWB2011 Pop_density_2010pplhectare if ethgrp3==1 &IMD2010_nohealth< 15, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercWB2011 Pop_density_2010pplhectare if ethgrp3==1 &IMD2010_nohealth> 14.99, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercWB2011 Pop_density_2010pplhectareIMD2010_nohealthint_socialsup3xIMD2010_nohealth if ethgrp3==1 , || LSOA1:
xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 PercWB2011 Pop_density_2010pplhectareif ethgrp3==1 &IMD2010_nohealth< 15 , || LSOA1:
xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 PercWB2011 Pop_density_2010pplhectareif ethgrp3==1 &IMD2010_nohealth> 14.99 , || LSOA1:
xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 Pop_density_2010pplhectare if ethgrp3==1 &IMD2010_nohealth< 15, || LSOA1:
xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 Pop_density_2010pplhectare if ethgrp3==1 &IMD2010_nohealth> 14.99, || LSOA1:

Pakistani, smoking:

no analyses; sample sizes and prevalence rates too small.

White British, smoking:

logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.trust_phase1 PercWB2011 if ethgrp3==1 &IMD2010_nohealth < 15, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.trust_phase1 PercWB2011 if ethgrp3==1 &IMD2010_nohealth > 14.99, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits neigbSC_score PercWB2011if ethgrp3==1 &IMD2010_nohealth < 15, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits neigbSC_score PercWB2011 if ethgrp3==1&IMD2010_nohealth > 14.99, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp PercWB2011 if ethgrp3==1 &IMD2010_nohealth < 15 , or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp PercWB2011 if ethgrp3==1 &IMD2010_nohealth > 14.99 , or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits socialsupp_scorePercWB2011 if ethgrp3==1 &IMD2010_nohealth < 15, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits socialsupp_scorePercWB2011 if ethgrp3==1 &IMD2010_nohealth > 14.99, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits socialsupp_score IMD2010_nohealth int_socialsupp_deprPercWB2011 if ethgrp3==1, or

logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 PercWB2011 if ethgrp3==1 &IMD2010_nohealth < 15, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 PercWB2011 if ethgrp3==1 &IMD2010_nohealth > 14.99, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 if ethgrp3==1 &IMD2010_nohealth < 15, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 if ethgrp3==1 &IMD2010_nohealth > 14.99, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercWB2011 if ethgrp3==1 &IMD2010_nohealth < 15, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercWB2011 if ethgrp3==1 &IMD2010_nohealth > 14.99, or
logit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total PercWB2011 IMD2010_nohealth int_socialsup3xIMD2010_nohealthif ethgrp3==1, or

Stratified by financial situation:

Birth weight Pakistani:

regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits neigbSC_score PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 & finbin_strat==1
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits neigbSC_score PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 & finbin_strat==2
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase1 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase1 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits socialsupp_score PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits socialsupp_score PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.Participation_comp PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.Participation_comp PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &finbin_strat==2

White British, birth weight:

regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits neigbSC_score PercWB2011 IMD2010_nohealthif ethgrp3==1 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits neigbSC_score PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase1 PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase1 PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits socialsupp_score PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits socialsupp_score PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==2

regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.Participation_comp PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.Participation_comp PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==2
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==1
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercWB2011 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &finbin_strat==2

Pakistani, GHQ:

poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercPk2011 IMD2010_nohealth if ethgrp3==2 &finbin_strat==1
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercPk2011 IMD2010_nohealth if ethgrp3==2 &finbin_strat==2
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 &finbin_strat==1
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 &finbin_strat==2
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 &finbin_strat==1
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 &finbin_strat==2

White British women, GHQ

poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercWB2011 IMD2010_nohealth if ethgrp3==1 &finbin_strat==1
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercWB2011 IMD2010_nohealth if ethgrp3==1 &finbin_strat==2
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 &finbin_strat==1
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 &finbin_strat==2
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 &finbin_strat==1
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 &finbin_strat==2

Smoking, Pakistani:

No analyses possible due to small sample sizes and prevalence rates of smoking

Smoking, White British:

logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase1 PercWB2011 IMD2010_nohealth if ethgrp3==1 & finbin_strat==1 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase1 PercWB2011 IMD2010_nohealth if ethgrp3==1& finbin_strat==2 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits neigbSC_score PercWB2011 IMD2010_nohealth if ethgrp3==1 & finbin_strat==1 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits neigbSC_score PercWB2011 IMD2010_nohealth if ethgrp3==1& finbin_strat==2 , or

logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.Participation_comp PercWB2011 IMD2010_nohealth if ethgrp3==1 & finbin_strat==1 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.Participation_comp PercWB2011 IMD2010_nohealth if ethgrp3==1& finbin_strat==2 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits socialsupp_scorePercWB2011 IMD2010_nohealth if ethgrp3==1 & finbin_strat==1 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits socialsupp_scorePercWB2011 IMD2010_nohealth if ethgrp3==1& finbin_strat==2 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 & finbin_strat==1 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.trust_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1& finbin_strat==2 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1 & finbin_strat==1 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.neigbh_phase3 PercWB2011 IMD2010_nohealth if ethgrp3==1& finbin_strat==2 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercWB2011 IMD2010_nohealth if ethgrp3==1 & finbin_strat==1 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits ssupPhase3_total PercWB2011 IMD2010_nohealth if ethgrp3==1& finbin_strat==2 , or

Ethnic density stratified analyses:

White British; mean 73.5 % White British.Cut-off; 80%
Pakistani; 54.0% Pakistani residents.Cut-off; 60%.

Birth weight Pakistani:

regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits neigbSC_score i.finman IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011<60
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits neigbSC_score i.finman PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011>59.99
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase1 i.finman PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 <60
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase1 i.finman PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 >59.99
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman socialsupp_score PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 <60
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman socialsupp_score PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 & PercPk2011 >59.99
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.Participation_comp PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 <60
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.Participation_comp PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 & PercPk2011 >59.99
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase3 i.finman PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 <60
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.trust_phase3 i.finman PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 >59.99
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 <60
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 >59.99
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 <60
regress eclbirthwt questage i.parity i.BornUK i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total PercPk2011 IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 &PercPk2011 >59.99

White British, birth weight:

regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman neigbSC_score IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 < 79.99

regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman neigbSC_score IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 > 80
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase1 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 < 79.99
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase1 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 > 80
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman socialsupp_score IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 < 79.99
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman socialsupp_score IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 > 80
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.Participation_comp IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 < 79.99
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.Participation_comp IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 > 80
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase3 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 < 79.99
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase3 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 > 80
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 < 79.99
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 > 80
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 < 79.99
regress eclbirthwt questage i.parity i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 &PercWB2011 > 80

Pakistani, GHQ:

poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total IMD2010_nohealth if ethgrp3==2 &PercPk2011< 60
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total IMD2010_nohealth if ethgrp3==2 &PercPk2011> 59.99
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total PercPk2011 int_socialsup3xED_Pk IMD2010_nohealth if ethgrp3==2
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase3 IMD2010_nohealth if ethgrp3==2 &PercPk2011 < 60
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase3 IMD2010_nohealth if ethgrp3==2 &PercPk2011 > 59.99
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 IMD2010_nohealth if ethgrp3==2 &PercPk2011 < 60
poisson GHQ_sum_bin questage i.BornUK i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 IMD2010_nohealth if ethgrp3==2 &PercPk2011 > 59.99

White British women, GHQ:

poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits ssupPhase3_total i.finman IMD2010_nohealth if ethgrp3==1 & PercWB2011< 79.99
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits ssupPhase3_total i.finman IMD2010_nohealth if ethgrp3==1 & PercWB2011> 80
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits ssupPhase3_total i.finman IMD2010_nohealth PercWB2011 int_socialsup3xED_WBif ethgrp3==1
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.trust_phase3 i.finman IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.trust_phase3 i.finman IMD2010_nohealth if ethgrp3==1 & PercWB2011 > 80
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99
poisson GHQ_sum_bin questage i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3 IMD2010_nohealth if ethgrp3==1 & PercWB2011 > 80

Pakistani mothers smoking:

no analysis possible

White British mothers smoking:

logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finmani.trust_phase1 IMD2010_nohealth if ethgrp3==1 &PercWB2011 < 79.99, or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase1 IMD2010_nohealth if ethgrp3==1 &PercWB2011 > 80, or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman neigbSC_score IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman neigbSC_score IMD2010_nohealth if ethgrp3==1 & PercWB2011 > 80 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.Participation_comp IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefit i.finman i.Participation_comp IMD2010_nohealth if ethgrp3==1 & PercWB2011 > 80 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman socialsupp_score IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman socialsupp_score IMD2010_nohealth if ethgrp3==1 & PercWB2011 > 80 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase3 IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.trust_phase3 IMD2010_nohealth if ethgrp3==1 & PercWB2011 > 80 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman i.neigbh_phase3IMD2010_nohealth if ethgrp3==1 & PercWB2011 > 80 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total IMD2010_nohealth if ethgrp3==1 & PercWB2011 < 79.99 , or
logit smkpreg questage i.parity i.cohabitation i.empl_ft i.benefits i.finman ssupPhase3_total IMD2010_nohealth if ethgrp3==1 &PercWB2011 > 80 , or

Interaction syntax Chapter 8

Birth weight Pakistani:

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits neigbSC_score IMD2010_nohealth int_nscxIMDnohealth if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.finman##c.neigbSC_score if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase1 i.trust_phase1##c.IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase1 IMD2010_nohealth i.finman#i.trust_phase1 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp i.Participation_comp##c.IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp IMD2010_nohealth

i.Participation_comp#i.finman if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits socialsupp_score IMD2010_nohealth c.socialsupp_score#c.IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth c.socialsupp_score##i.finman if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total IMD2010_nohealth c.ssupPhase3_total#c.IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth c.ssupPhase3_total##i.finman if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 i.trust_phase3##c.IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 IMD2010_nohealth i.finman#i.trust_phase3 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 i.neigbh##c.IMD2010_nohealth if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 IMD2010_nohealth i.finman#i.neigbh_phase3 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

Pakistani women, GHQ

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits c.ssupPhase3_total IMD2010_nohealth c.ssupPhase3_total#c.IMD2010_nohealth if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth c.ssupPhase3_total##i.finman if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 i.trust_phase3##c.IMD2010_nohealth if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 IMD2010_nohealth i.finman#i.trust_phase3 if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 i.neigbh_phase3##c.IMD2010_nohealth if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 IMD2010_nohealth i.finman#i.neigbh_phase3 if ethgrp3==2, || LSOA1:

Birth weight, White British:

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits neigbSC_score IMD2010_nohealth int_nscxIMDnohealth if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.finman##c.neigbSC_score if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase1 i.trust_phase1##c.IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase1 IMD2010_nohealth i.finman#i.trust_phase1 if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent) --> *sample too small, interaction analysis not possible*

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp i.Participation_comp##c.IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp IMD2010_nohealth i.Participation_comp#i.finman if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits socialsupp_score IMD2010_nohealth c.socialsupp_score#c.IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth c.socialsupp_score##i.finman if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits ssupPhase3_total IMD2010_nohealth c.ssupPhase3_total#c.IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth c.ssupPhase3_total##i.finman if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 i.trust_phase3##c.IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 IMD2010_nohealth i.finman#i.trust_phase3 if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent) *--> sample sizes too low for categorical variable trust*

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 i.neigbh##c.IMD2010_nohealth if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 IMD2010_nohealth i.finman#i.neigbh_phase3 if ethgrp3==1 & eclpreterm==0 , || LSOA1: ,covariance (independent)

White British, GHQ:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits c.ssupPhase3_total IMD2010_nohealth c.ssupPhase3_total#c.IMD2010_nohealth if ethgrp3==1, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth c.ssupPhase3_total##i.finman if ethgrp3==1, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 i.trust_phase3##c.IMD2010_nohealth if ethgrp3==1, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 IMD2010_nohealth i.finman#i.trust_phase3 if ethgrp3==1, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 i.neigbh_phase3##c.IMD2010_nohealth if ethgrp3==1, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.marital res0timadd i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 IMD2010_nohealth i.finman#i.neigbh_phase3 if ethgrp3==1, || LSOA1:

Interactions with ethnic density

Birth weight Pakistani:

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits neigbSC_score IMD2010_nohealth PercPk2011 c.neigbSC_score#c.PercPk2011 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.trust_phase1 i.trust_phase1##c.PercPk2011 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp IMD2010_nohealth i.Participation_comp##c.PercPk2011 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits PercPk2011 socialsupp_score IMD2010_nohealth c.socialsupp_score#c.PercPk2011 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits PercPk2011 ssupPhase3_total IMD2010_nohealth c.ssupPhase3_total#c.PercPk2011 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.trust_phase3 IMD2010_nohealth i.trust_phase3##c.PercPk2011 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.neigbh_phase3 IMD2010_nohealth i.neigbh##c.PercPk2011 if ethgrp3==2 & eclpreterm==0 || LSOA1: ,covariance (independent)

Pakistani women, GHQ

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits c.ssupPhase3_total IMD2010_nohealth PercPk2011 c.ssupPhase3_total#c.PercPk2011 if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.trust_phase3 i.trust_phase3##c.PercPk2011 if ethgrp3==2, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.BornUK i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.neigbh_phase3 i.neigbh_phase3##c.PercPk2011 if ethgrp3==2, || LSOA1:

Birth weight White British:

xtmixed eclbirthwt questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits neigbSC_score IMD2010_nohealth PercWB2011 c.neigbSC_score#c.PercWB2011 if ethgrp3==1 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.trust_phase1 i.trust_phase1##c.PercWB2011 if ethgrp3==1 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp IMD2010_nohealth i.Participation_comp##c.PercWB2011 if ethgrp3==1 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits PercWB2011 socialsupp_score IMD2010_nohealth c.socialsupp_score#c.PercWB2011 if ethgrp3==1 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits PercWB2011 ssupPhase3_total IMD2010_nohealth c.ssupPhase3_total#c.PercWB2011 if ethgrp3==1 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.trust_phase3 i.trust_phase3##c.PercWB2011 if ethgrp3==1 & eclpreterm==0 || LSOA1: ,covariance (independent)

xtmixed eclbirthwt questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.neigbh_phase3 i.neigbh##c.PercWB2011 if ethgrp3==1 & eclpreterm==0 || LSOA1: ,covariance (independent)

White British women, GHQ

xtmepoisson GHQ_sum_bin questage i.cohabitation i.mumedu i.finman i.empl_ft i.benefits c.ssupPhase3_total IMD2010_nohealth PercWB2011 c.ssupPhase3_total#c.PercWB2011 if ethgrp3==1, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.trust_phase3 i.trust_phase3##c.PercWB2011 if ethgrp3==1, || LSOA1:

xtmepoisson GHQ_sum_bin questage i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.neigbh_phase3 i.neigbh_phase3##c.PercWB2011 if ethgrp3==1, || LSOA1:

White British women, smoking

xtmelogit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits neigbSC_score IMD2010_nohealth PercWB2011 c.neigbSC_score#c.PercWB2011 if ethgrp3==1 || LSOA1: ,covariance (independent) or

xtmelogit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.trust_phase1 i.trust_phase1##c.PercWB2011 if ethgrp3==1 || LSOA1: ,covariance (independent) or

```
xtmelogit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits i.Participation_comp IMD2010_nohealth  i.Participation_comp##c.PercWB2011 if ethgrp3==1 || LSOA1: ,covariance (independent) or
```

```
xtmelogit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits PercWB2011 socialsupp_score IMD2010_nohealth c.socialsupp_score#c.PercWB2011 if ethgrp3==1 ||  LSOA1: ,covariance (independent) or
```

```
xtmelogit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits PercWB2011 ssupPhase3_total IMD2010_nohealth c.ssupPhase3_total#c.PercWB2011 if ethgrp3==1 ||  LSOA1: ,covariance (independent) or
```

```
xtmelogit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.trust_phase3 i.trust_phase3##c.PercWB2011 if ethgrp3==1 ||  LSOA1: ,covariance (independent) or
```

```
xtmelogit smkpreg questage i.parity i.cohabitation i.mumedu i.finman i.empl_ft i.benefits IMD2010_nohealth i.neigbh_phase3 i.neigbh##c.PercWB2011 if ethgrp3==1 ||  LSOA1: ,covariance (independent) or
```

Appendix 3D Output Chapter 9

Correlations between measures of SES for White British

	Financial situation	**Means-tested benefits**	**Employment father**
Maternal education	Chi^2 = 230.96 p<0.001	Chi^2 = 454.41 p<0.001	Chi^2 = 443.89 p<0.001
Financial situation		Chi^2 = 337.14 p<0.001	Chi^2 = 219.59 p<0.001
Means-tested benefits			Chi^2 = 389.52 p<0.001

Correlations between measures of SES for Pakistani

	Financial situation	**Means-tested benefits**	**Employment father**
Maternal education	Chi^2 = 69.54 p<0.001	Chi^2 = 190.11 p<0.001	Chi^2 = 200.70 p<0.001
Financial situation		Chi^2 = 163.45 p<0.001	Chi^2 = 152.50 p<0.001
Means-tested benefits			Chi^2 = 202.39 p<0.001

Regression analyses Chapter 9

Given the large number of regression models produced for this chapter only the statistical syntax is reported.

MCS, low birth weight

```
svy: logit LBW i.mumedu agemum i.parity if preterm==0 & ethgrp==1, or
svy: logit LBW mumedu agemum i.parity if preterm==0 & ethgrp==1, or
svy: logit LBW i.finman_rev agemum i.parity if preterm==0 & ethgrp==1, or
svy: logit LBW finman_rev agemum i.parity if preterm==0 & ethgrp==1, or
svy: logit LBW i.benefits_rev agemum i.parity if preterm==0 & ethgrp==1, or
svy: logit LBW i.empl_ft_rev agemum i.parity if preterm==0 & ethgrp==1, or
svy: logit LBW empl_ft_rev agemum i.parity if preterm==0 & ethgrp==1, or
svy: logit LBW i.mumedu agemum i.parity if preterm==0 & ethgrp==0, or
svy: logit LBW mumedu agemum i.parity if preterm==0 & ethgrp==0, or
svy: logit LBW i.finman_rev agemum i.parity if preterm==0 & ethgrp==0, or
svy: logit LBW finman_rev agemum i.parity if preterm==0 & ethgrp==0, or
svy: logit LBW i.benefits_rev agemum i.parity if preterm==0 & ethgrp==0, or
svy: logit LBW i.empl_ft_rev agemum i.parity if preterm==0 & ethgrp==0, or
svy: logit LBW empl_ft_rev agemum i.parity if preterm==0 & ethgrp==0, or
```

MCS, preterm birth

```
svy: logit preterm i.mumedu agemum i.parity if ethgrp==1, or
svy: logit preterm mumedu agemum i.parity if ethgrp==1, or
svy: logit preterm i.finman_rev agemum i.parity if ethgrp==1, or
svy: logit preterm finman_rev agemum i.parity if ethgrp==1, or
```

```
svy: logit preterm i.benefits_rev agemum i.parity if ethgrp==1, or
svy: logit preterm i.empl_ft_rev agemum i.parity if ethgrp==1, or
svy: logit preterm empl_ft_rev agemum i.parity if ethgrp==1, or
svy: logit preterm i.mumedu agemum i.parity if ethgrp==0, or
svy: logit preterm mumedu agemum i.parity if ethgrp==0, or
svy: logit preterm i.finman_rev agemum i.parity if ethgrp==0, or
svy: logit preterm finman_rev agemum i.parity if ethgrp==0, or
svy: logit preterm i.benefits_rev agemum i.parity if ethgrp==0, or
svy: logit preterm i.empl_ft_rev agemum i.parity if ethgrp==0, or
svy: logit preterm empl_ft_rev agemum i.parity if ethgrp==0, or
```

MCS, smoking during pregnancy

```
svy: logit smk_preg2 i.mumedu agemum i.parity if ethgrp==1, or
svy: logit smk_preg2 mumedu agemum i.parity if ethgrp==1, or
svy: logit smk_preg2 i.finman_rev agemum i.parity if ethgrp==1, or
svy: logit smk_preg2 finman_rev agemum i.parity if ethgrp==1, or
svy: logit smk_preg2 i.benefits_rev agemum i.parity if ethgrp==1, or
svy: logit smk_preg2 i.empl_ft_rev agemum i.parity if ethgrp==1, or
svy: logit smk_preg2 empl_ft_rev agemum i.parity if ethgrp==1, or
svy: logit smk_preg2 i.mumedu agemum i.parity if ethgrp==0, or
svy: logit smk_preg2 mumedu agemum i.parity if ethgrp==0, or
svy: logit smk_preg2 i.finman_rev agemum i.parity if ethgrp==0, or
svy: logit smk_preg2 finman_rev agemum i.parity if ethgrp==0, or
svy: logit smk_preg2 i.benefits_rev agemum i.parity if ethgrp==0, or
svy: logit smk_preg2 i.empl_ft_rev agemum i.parity if ethgrp==0, or
svy: logit smk_preg2 empl_ft_rev agemum i.parity if ethgrp==0, or
```

MCS, mental health

```
svy: poisson malaise_sum i.mumedu agemum i.parity if ethgrp==1
svy: poisson malaise_sum mumedu agemum i.parity if ethgrp==1
svy: poisson malaise_sum i.finman_rev agemum i.parity if ethgrp==1
svy: poisson malaise_sum finman_rev agemum i.parity if ethgrp==1
svy: poisson malaise_sum i.benefits agemum i.parity if ethgrp==1
svy: poisson malaise_sum i.empl_ft_rev agemum i.parity if ethgrp==1
svy: poisson malaise_sum empl_ft_rev agemum i.parity if ethgrp==1

svy: poisson malaise_sum i.mumedu agemum i.parity if ethgrp==0
svy: poisson malaise_sum mumedu agemum i.parity if ethgrp==0
svy: poisson malaise_sum i.finman_rev agemum i.parity if ethgrp==0
svy: poisson malaise_sum finman_rev agemum i.parity if ethgrp==0
svy: poisson malaise_sum i.benefits agemum i.parity if ethgrp==0
svy: poisson malaise_sum i.empl_ft_rev agemum i.parity if ethgrp==0
svy: poisson malaise_sum empl_ft_rev agemum i.parity if ethgrp==0
```

BiB, low birth weight

```
logit eclbirthwt_low i.mumedu questage i.parity if eclpreterm==0 & ethgrp3==1, or
logit eclbirthwt_low mumedu questage i.parity if eclpreterm ==0 & ethgrp3==1, or
logit eclbirthwt_low i.fin_cat questage i.parity if eclpreterm ==0 & ethgrp3==1, or
logit eclbirthwt_low fin_cat questage i.parity if eclpreterm ==0 & ethgrp3==1, or
logit eclbirthwt_low i.mtben_rev questage i.parity if eclpreterm ==0 & ethgrp3==1, or
logit eclbirthwt_low i.empl_ft_rev questage i.parity if eclpreterm ==0 & ethgrp3==1, or
logit eclbirthwt_low empl_ft_rev questage i.parity if eclpreterm ==0 & ethgrp3==1, or
logit eclbirthwt_low i.mumedu questage i.parity if eclpreterm ==0 & ethgrp3==0, or
logit eclbirthwt_low mumedu questage i.parity if eclpreterm ==0 & ethgrp3==0, or
logit eclbirthwt_low i.fin_cat questage i.parity if eclpreterm ==0 & ethgrp3==0, or
logit eclbirthwt_low fin_cat questage i.parity if eclpreterm ==0 & ethgrp3==0, or
logit eclbirthwt_low i.mtben_rev questage i.parity if eclpreterm ==0 & ethgrp3==0, or
logit eclbirthwt_low i.empl_ft_rev questage i.parity if eclpreterm ==0 & ethgrp3==0, or
logit eclbirthwt_low empl_ft_rev questage i.parity if eclpreterm ==0 & ethgrp3==0, or
```

BiB, preterm birth

```
logit preterm i.mumedu questage i.parity if ethgrp3==1, or
logit preterm mumedu questage i.parity if ethgrp3==1, or
```

```
logit preterm i.fin_cat questage i.parity if ethgrp3==1, or
logit preterm fin_cat questage i.parity if ethgrp3==1, or
logit preterm i.mtben_rev questage i.parity if ethgrp3==1, or
logit preterm i.empl_ft_rev questage i.parity if ethgrp3==1, or
logit preterm empl_ft_rev questage i.parity if ethgrp3==1, or
logit preterm i.mumedu questage i.parity if ethgrp3==0, or
logit preterm mumedu questage i.parity if ethgrp3==0, or
logit preterm i.fin_cat questage i.parity if ethgrp3==0, or
logit preterm fin_cat questage i.parity if ethgrp3==0, or
logit preterm i.mtben_rev questage i.parity if ethgrp3==0, or
logit preterm i.empl_ft_rev questage i.parity if ethgrp3==0, or
logit preterm empl_ft_rev questage i.parity if ethgrp3==0, or
```

BiB, smoking during pregnancy

```
logit smk_preg i.mumedu questage i.parity if ethgrp3==1, or
logit smk_preg mumedu questage i.parity if ethgrp3==1, or
logit smk_preg i.fin_cat questage i.parity if ethgrp3==1, or
logit smk_preg fin_cat questage i.parity if ethgrp3==1, or
logit smk_preg i.mtben_rev questage i.parity if ethgrp3==1, or
logit smk_preg i.empl_ft_rev questage i.parity if ethgrp3==1, or
logit smk_preg empl_ft_rev questage i.parity if ethgrp3==1, or
logit smk_preg i.mumedu questage i.parity if ethgrp3==0, or
logit smk_preg mumedu questage i.parity if ethgrp3==0, or
logit smk_preg i.fin_cat questage i.parity if ethgrp3==0, or
logit smk_preg fin_cat questage i.parity if ethgrp3==0, or
logit smk_preg i.mtben_rev questage i.parity if ethgrp3==0, or
logit smk_preg i.empl_ft_rev questage i.parity if ethgrp3==0, or
logit smk_preg empl_ft_rev questage i.parity if ethgrp3==0, or
```

BiB, mental health

```
poisson GHQ_sum_bin i.mumedu questage i.parity if ethgrp3==1
poisson GHQ_sum_bin mumedu questage i.parity if ethgrp3==1
poisson GHQ_sum_bin i.fin_cat questage i.parity if ethgrp3==1
poisson GHQ_sum_bin fin_cat questage i.parity if ethgrp3==1
poisson GHQ_sum_bin i.mtben_rev questage i.parity if ethgrp3==1
poisson GHQ_sum_bin i.empl_ft_rev questage i.parity if ethgrp3==1
poisson GHQ_sum_bin empl_ft_rev questage i.parity if ethgrp3==1
poisson GHQ_sum_bin i.mumedu questage i.parity if ethgrp3==0
poisson GHQ_sum_bin mumedu questage i.parity if ethgrp3==0
poisson GHQ_sum_bin i.fin_cat questage i.parity if ethgrp3==0
poisson GHQ_sum_bin fin_cat questage i.parity if ethgrp3==0
poisson GHQ_sum_bin i.mtben_rev questage i.parity if ethgrp3==0
poisson GHQ_sum_bin i.empl_ft_rev questage i.parity if ethgrp3==0
poisson GHQ_sum_bin empl_ft_rev questage i.parity if ethgrp3==0
```

Abbreviations

Body mass index (BMI)

Born in Bradford (BiB)

Child Well-being Index (CWI)

Confidence Interval (CI)

General Certificate of Secondary Education (GCSE)

General Health Questionnaire (GHQ)

Health Survey for England (HSE)

Index of Multiple Deprivation (IMD)

Intraclass correlation coefficient (ICC)

Low birth weight (LBW)

Lower Layer Super Output Area (LSOA)

Middle Layer Super Output Area (MSOA)

Millennium Cohort Study (MCS)

Modifiable Areal Unit Problem (MAUP)

Neighbourhood social capital (NSC)

Odds Ratio (OR)

Office for National Statistics (ONS)

Organisation for Economic Co-operation and Development (OECD)

Socioeconomic status (SES)

United Kingdom (UK)

United States (US)

World Values Survey (WVS)

List of references

ABADA, T., HOU, F. & RAM, B. 2007. Racially mixed neighborhoods, perceived neighborhood social cohesion, and adolescent health in Canada. *Social Science & Medicine,* 65, 2004-2017.

ABDOU, C. M., DUNKEL SCHETTER, C., CAMPOS, B., HILMERT, C. J., DOMINGUEZ, T. P., HOBEL, C. J., GLYNN, L. M. & SANDMAN, C. 2010. Communalism predicts prenatal affect, stress, and physiology better than ethnicity and socioeconomic status. *Cultural Diversity & Ethnic Minority Psychology,* 16, 395-403.

ABEL, T. & FROHLICH, K. L. 2012. Capitals and capabilities: linking structure and agency to reduce health inequalities. *Social Science & Medicine,* 74, 236-244.

ABEL, T. 2008. Cultural capital and social inequality in health. *Journal of Epidemiology & Community Health,* 62, e13.

ABEL, T., FUHR, D. C., BISEGGER, C. & ACKERMANN RAU, S. 2011. Money is not enough: exploring the impact of social and cultural resources on youth health. *Scandinavian Journal of Public Health,* 39, 57-61.

ABRAÍDO-LANZA, A.F., DOHRENWEND, B.P., NG-MAK, D.S. & TURNER, J.B. The Latino mortality paradox: a test of the “salmon bias” and healthy migrant hypotheses. *American Journal of Public Health*, 89, 1543-1548.

ACEVEDO-GARCIA, D., SANCHEZ-VAZNAUGH, E. V., VIRUELL-FUENTES, E. A. & ALMEIDA, J. 2012. Integrating social epidemiology into immigrant health research: A cross-national framework. *Social Science & Medicine*, 75, 2060-2068.

ADAMS, J. & WHITE, M. 2003. Evidence concerning social capital and health inequalities is still lacking. *Journal of Public Health Medicine,* 25, 184-185.

ADAMS, J. & WHITE, M. 2006. Removing the health domain from the Index of Multiple Deprivation 2004—effect on measured inequalities in census measure of health. *Journal of Public Health,* 28, 379-383.

AFSHAR, H., AITKEN, R. & FRANKS, M. 2005. Feminisms, islamophobia and identities. *Political Studies,* 53, 262-283.

AHERN, J., GALEA, S., HUBBARD, A. & SYME, S. L. 2009. Neighborhood smoking norms modify the relation between collective efficacy and smoking behavior. *Drug and Alcohol Dependence,* 100, 138-145.

AHMAD, K., JAFARY, F., JEHAN, I., HATCHER, J., KHAN, A. Q., CHATURVEDI, N. & JAFAR, T. H. 2005. Prevalence and predictors of smoking in Pakistan: results of the National Health Survey of Pakistan. *European Journal of Cardiovascular Prevention & Rehabilitation,* 12, 203-208.

AIDA, J., KONDO, K., KONDO, N., WATT, R. G., SHEIHAM, A. & TSAKOS, G. 2011. Income inequality, social capital and self-rated health and dental status in older Japanese. *Social Science & Medicine,* 73, 1561-1568.

ALAM, M. 2006. *Made in Bradford*. Pontefract: Route Publishing.

ALCÁNTARA, C., CHEN, C.N. & ALEGRÍA, M. 2014. Do post-migration perceptions of social mobility matter for Latino immigrant health? *Social Science & Medicine*, 101, 94-106.

ALDABE, B., ANDERSON, R., LYLY-YRJANAINEN, M., PARENT-THIRION, A., VERMEYLEN, G., KELLEHER, C. C. & NIEDHAMMER, I. 2011. Contribution of material, occupational, and psychosocial factors in the explanation of social inequalities in health in 28 countries in Europe. *Journal of Epidemiology and Community Health,* 65, 1123-1131.

ALTSCHULER, A., SOMKIN, C. P. & ADLER, N. E. 2004. Local services and amenities, neighborhood social capital, and health. *Social Science & Medicine,* 59, 1219-1229.

ALZUBAIDI, H., CARR, J., COUNCELL, R. & JOHNSON, G. 2013. *Households Below Average Income. An analysis of the income distribution 1994/95 - 2011/12.* London: Department for Work & Pensions.

AMINZADEH, K., DENNY, S., UTTER, J., MILFONT, T. L., AMERATUNGA, S., TEEVALE, T. & CLARK, T. 2013. Neighbourhood social capital and adolescent self-reported wellbeing in New Zealand: A multilevel analysis. *Social Science & Medicine,* 84, 13-21.

ANSELIN, L., SYABRI, I. & KHO, Y. 2006. GeoDa: an introduction to spatial data analysis. *Geographical analysis,* 38, 5-22.

APHO, 2012. *Health Profile 2012*. [Online]. York: Public Health Observatory. Available at: http://www.apho.org.uk/resource/item.aspx?RID=117066 [Accessed 14 January 2015].

ARNEIL, B. 2006. *Diverse communities: the problem with social capital.* Cambridge: Cambridge University Press.

ASTELL-BURT, T., MAYNARD, M. J., LENGUERRAND, E. & HARDING, S. 2012. Racism, ethnic density and psychological well-being through adolescence: evidence from the Determinants of Adolescent Social well-being and Health longitudinal study. *Ethnicity & Health,* 17, 71-87.

ATKIN, K. 2009. Negotiating ethnic identities and health. *In:* GRAHAM, H. (ed.) *Understanding health inequalities.* 2 ed. Berkshire: Open University Press.

Australian Bureau of Statistics, 2010. [Online]. *General Social Survey: Summary results, Australia, 2010*. Belconnen: Australian Bureau of Statistics. Available at: http://www.abs.gov.au/ausstats/abs@.nsf/mf/4159.0 [Accessed 14 January 2015].

AVEYARD, P., CHENG, K., MANASEKI, S. & GARDOSI, J. 2002. The risk of preterm delivery in women from different ethnic groups. *BJOG: An International Journal of Obstetrics & Gynaecology,* 109, 894-899.

BABB, P. 2005. *Measurement of social capital in the UK*. London: Office for National Statistics.

BADSHAH, S., MASON, L., MCKELVIE, K., PAYNE, R. & LISBOA, P. J. 2008. Risk factors for low birthweight in the public-hospitals at Peshawar, NWFP-Pakistan. *BMC Public Health,* 8, 197.

BAJEKAL, M. & PURDON, S. 2001. *Social capital and social exclusion: development of a condensed module for the Health Survey for England*. London, UK: National Centre for Social Research.

BAKER, J., MITCHELL, R. & PELL, J. 2013. Cross-sectional study of ethnic differences in the utility of area deprivation measures to target socioeconomically deprived individuals. *Social Science & Medicine,* 85, 27-31.

BARGER, S. D., DONOHO, C. J. & WAYMENT, H. A. 2009. The relative contributions of race/ethnicity, socioeconomic status, health, and social relationships to life satisfaction in the United States. *Quality of Life Research,* 18, 179-189.

BARKER, D. J. 1995. Fetal origins of coronary heart disease. *British Medical Journal,* 311, 171-174.

BARON-EPEL, O., WEINSTEIN, R., HAVIV-MESIKA, A., GARTY-SANDALON, N. & GREEN, M. S. 2008. Individual-level analysis of social capital and health: a comparison of Arab and Jewish Israelis. *Social Science & Medicine,* 66, 900-910.

BARTLEY, M. 2003. *Health inequality: an introduction to theories, concepts, and methods.* Cambridge: Polity Press.

BARTLEY, M., MARTIKAINEN, P., SHIPLEY, M. & MARMOT, M. 2004. Gender differences in the relationship of partner's social class to behavioural risk factors and social support in the Whitehall II study. *Social Science & Medicine,* 59, 1925-1936.

BEAUDOIN, C. E. 2009. Social capital and health status: assessing whether the relationship varies between Blacks and Whites. *Psychology & Health,* 24, 109-118.

BÉCARES, L. & DAS-MUNSHI, J. 2013. Ethnic density, health care seeking behaviour and expected discrimination from health services among ethnic minority people in England. *Health & Place,* 22, 48-55.

BÉCARES, L. & NAZROO, J. 2013. Social capital, ethnic density and mental health among ethnic minority people in England: a mixed-methods study. *Ethnicity & Health*, 18(6):544-562.

BÉCARES, L. 2009. *The ethnic density effect on the health of ethnic minority people in the United Kingdom: a study of hypothesised pathways.* PhD Thesis. University College London. Available at: http://discovery.ucl.ac.uk/18689/ [Accessed 15 January 2015].

BÉCARES, L., CORMACK, D. & HARRIS, R. 2013. Ethnic density and area deprivation: Neighbourhood effects on Māori health and racial discrimination in Aotearoa/New Zealand. *Social Science & Medicine,* 88, 76–82.

BÉCARES, L., NAZROO, J. & STAFFORD, M. 2009. The buffering effects of ethnic density on experienced racism and health. *Health & Place,* 15, 700-708.

BÉCARES, L., NAZROO, J. & STAFFORD, M. 2011. The ethnic density effect on alcohol use among ethnic minority people in the UK. *Journal of Epidemiology and Community Health,* 65, 20-25.

BÉCARES, L., NAZROO, J., ALBOR, C., CHANDOLA, T. & STAFFORD, M. 2012a. Examining the differential association between self-rated health and area deprivation among White British and ethnic minority people in England. *Social Science & Medicine,* 74, 616-624.

BÉCARES, L., NAZROO, J., JACKSON, J. & HEUVELMAN, H. 2012. Ethnic density effects on health and experienced racism among Caribbean people in the US and England: a cross-national comparison. *Social Science & Medicine,* 75, 2107-2115.

BÉCARES, L., SHAW, R., NAZROO, J., STAFFORD, M., ALBOR, C., ATKIN, K., KIERNAN, K., WILKINSON, R. & PICKETT, K. 2012b. Ethnic Density Effects on Physical Morbidity, Mortality, and Health Behaviors: A Systematic Review of the Literature. *American Journal of Public Health*, 102, e33-e66.

BEIDER, H. 2011. *Community cohesion: The views of white working-class communities*. [Online]. York: Joseph Rowntree Foundation. Available at: www.jrf.org.uk/sites/files/jrf/working-class-community-cohesion-full.pdf [Accessed 14 January 2015].

BEKIROĞLU, N. & ALKAN, A. 2003. Comparison of linear and nonlinear prediction methods for babies' birth weight. *Annals of Epidemiology,*13, 592.

BELL, C. N., THORPE, R. J., JR. & LAVEIST, T. A. 2010. Race/Ethnicity and hypertension: the role of social support. *American Journal of Hypertension,* 23, 534-540.

BELL, J. F., ZIMMERMAN, F. J., MAYER, J. D., ALMGREN, G. R. & HUEBNER, C. E. 2007. Associations between residential segregation and smoking during pregnancy among urban African-American women. *Journal of Urban Health,* 84, 372-388.

BENNETTE, C. & VICKERS, A. 2012. Against quantiles: categorization of continuous variables in epidemiologic research, and its discontents. *BMC Medical Research Methodology,* 12, 21.

BERKELEY, R., KHAN, O. & AMBIKAIPAKER, M. 2006. *What's new about new immigrants in twenty-first century Britain?* York: Joseph Rowntree Foundation.

BERKMAN, L. & KAWACHI, I. 2000. *Social Epidemiology.* New York: Oxford University Press.

BERRY, J. W. 2001. A psychology of immigration. *Journal of Social Issues,* 57, 615-631.

BHARADWAJ, P., KHWAJA, A. & MIAN, A. 2008. The big march: Migratory flows after the partition of India. *Economic and Political Weekly,* 43, 39-49.

BHOPAL, R. S. 2002. *Concepts of epidemiology: an integrated introduction to the ideas, theories, principles and methods of epidemiology*. Oxford: Oxford University Press.

BHOPAL, R. S. 2013. *Migration, Ethnicity, Race, and Health in Multicultural Societies.* Oxford: Oxford University Press.

BHOPAL, R., HAYES, L., WHITE, M., UNWIN, N., HARLAND, J., AYIS, S. & ALBERTI, G. 2002. Ethnic and socio-economic inequalities in coronary heart disease, diabetes and risk factors in Europeans and South Asians. *Journal of Public Health,* 24, 95-105.

BJORNSTROM, E. 2011a. To live and die in L.A. County: Neighborhood economic and social context and premature age-specific mortality rates among Latinos. *Health & Place,* 17, 230-237.

BJORNSTROM, E. E. 2011b. The neighborhood context of relative position, trust, and self-rated health. *Social Science & Medicine,* 73, 42-49.

BLOKLAND, T. & SAVAGE, M. 2008. *Networked urbanism. Social capital in the city.* Aldershot: Ashgate Publishing Limited.

BOHN, V. & RICHTER, M. 2011. Schulform, soziales Kapital und subjektive Gesundheit in der Adoleszenz. [Type of School, Social Capital and Subjective Health in Adolescence] *Gesundheitswesen,* 74, 691-701.

BOLOGNANI, M. 2007. The Myth of Return: dismissal, revival or survival? *Journal of Ethnic and Migration Studies*, 33, 59-76.

BOURDIEU, P. & NICE, R. 1977. *Outline of a theory of practice.* Cambridge: Cambridge University Press.

BOURDIEU, P. & WACQUANT, L. C. J. D. 1992. *An invitation to reflexive sociology.* Chicago: University of Chicago Press.

BOURDIEU, P. 1984. *Distinction: a social critique of the judgement of taste.* London: Routledge & Kegan Paul.

BOURDIEU, P. 1986. The forms of capital. *Handbook of theory and research for the sociology of education.* New York: Greenwood Press.

BOWLING, A., BARBER, J., MORRIS, R. & EBRAHIM, S. 2006. Do perceptions of neighbourhood environment influence health? Baseline findings from a British survey of aging. *Journal of Epidemiology and Community Health,* 60, 476-483.

BRADSHAW, J., BLOOR, K., HUBY, M., RHODES, D., SINCLAIR, I., CIBBS, I., NOBLE, M., MCLENNAN, D. & WILKINSON, K. 2009. *Local Index of Child Well-Being. Summary Report.* [Online]. London: Communities and Local Government. Available at: http://php.york.ac.uk/inst/spru/pubs/ipp.php?id=1158 [Accessed 14 January 2015].

BRAVEMAN, P. A., CUBBIN, C., EGERTER, S., CHIDEYA, S., MARCHI, K. S., METZLER, M. & POSNER, S. 2005. Socioeconomic status in health research. *Journal of the American Medical Association,* 294, 2879-2888.

BROOKS-GUNN, J., DUNCAN, G. J., KLEBANOV, P. K. & SEALAND, N. 1993. Do neighborhoods influence child and adolescent development? *American Journal of Sociology*, 99, 353-395.

BROOKS-GUNN, J., KLEBANOV, P. K. & DUNCAN, G. J. 1996. Ethnic differences in children's intelligence test scores: Role of economic deprivation, home environment, and maternal characteristics. *Child Development*, 67, 396-408.

BURT, R. S. 1992. *Structural holes: the social structure of competition.* Cambridge, MA: Harvard University Press.

BUSINELLE, M. S., KENDZOR, D. E., REITZEL, L. R., COSTELLO, T. J., COFTA-WOERPEL, L., LI, Y., MAZAS, C. A., VIDRINE, J. I., CINCIRIPINI, P. M., GREISINGER, A. J. & WETTER, D. W. 2010. Mechanisms linking socioeconomic status to smoking cessation: a structural equation modeling approach. *Health Psychology,* 29, 262-273.

CAMPBELL, C. & MCLEAN, C. 2002. Ethnic identities, social capital and health inequalities: factors shaping African-Caribbean participation in local community networks in the UK. *Social Science & Medicine,* 55, 643-657.

CAMPBELL, C. & MCLEAN, C. 2003. Social capital, local community participation and the construction of Pakistani identities in England: implications for health inequalities policies. *Journal of Health Psychology,* 8, 247-262.

CANTOR-GRAAE, E. & SELTEN, J.-P. 2005. Schizophrenia and migration: a meta-analysis and review. *American Journal of Psychiatry*, 162, 12-24.

CARLSON, E. D. & CHAMBERLAIN, R. M. 2003. Social capital, health, and health disparities. *Journal of Nursing Scholarship,* 35, 325-31.

CARPIANO, R. M. 2007. Neighborhood social capital and adult health: an empirical test of a Bourdieu-based model. *Health & Place,* 13, 639-655.

CASTLE, E. 1998. A conceptual framework for the study of rural places. *American Journal of Agricultural Economics,* 80, 621-631.

CASTLES, S. & MILLER, M. J. 2009. *The age of migration: international population movements in the modern world.* 4th ed. New York: Guilford Press.

CAUGHY, M. O. B., O'CAMPO, P. J. & MUNTANER, C. 2003. When being alone might be better: neighborhood poverty, social capital, and child mental health. *Social Science & Medicine,* 57, 227-237.

CEDERBERG, M. 2012. Migrant networks and beyond: Exploring the value of the notion of social capital for making sense of ethnic inequalities. *Acta Sociologica,* 55, 59-72.

CENE, C. W., AKERS, A. Y., LLOYD, S. W., ALBRITTON, T., POWELL HAMMOND, W. & CORBIE-SMITH, G. 2011. Understanding social capital and HIV risk in rural African American communities. *Journal of General Internal Medicine,* 26, 737-44.

CHANDOLA, T. 2001. Ethnic and class differences in health in relation to British South Asians: using the new National Statistics Socio-Economic Classification. *Social Science & Medicine*, 52, 1258-1296.

CHANG, V. W. 2006. Racial residential segregation and weight status among US adults. *Social Science & Medicine,* 63, 1289-1303.

CHANG, V. W., HILLIER, A. E. & MEHTA, N. K. 2009. Neighborhood racial isolation, disorder and obesity. *Social Forces,* 87, 2063-2092.

CHAVEZ, R., KEMP, L. & HARRIS, E. 2004. The social capital: health relationship in two disadvantaged neighbourhoods. *Journal of Health Services Research & Policy,* 9 Suppl. 2, 29-34.

CHESHIRE, P. 2007. *Are mixed communities the answer to segregation and poverty? Viewpoint: Informing debate.* [Online]. York: Joseph Rowntree Foundation. Available at: www.jrf.org.uk/sites/files/jrf/2114.pdf [Accessed 14 January 2015].

CHUANG, Y.-C. & CHUANG, K.-Y. 2008. Gender differences in relationships between social capital and individual smoking and drinking behavior in Taiwan. *Social Science & Medicine,* 67, 1321-1330.

CNATTINGIUS, S. 2004. The epidemiology of smoking during pregnancy: smoking prevalence, maternal characteristics, and pregnancy outcomes. *Nicotine & Tobacco Research,* 6, S125-S140.

COBURN, D. 2000. Income inequality, social cohesion and the health status of populations: The role of neo-liberalism. *Social Science & Medicine,* 51, 135-146.

COCKERHAM, W. 2007. *Social causes of health and disease*, Cambridge: Polity Press.

COHEN, D. A., FARLEY, T. A. & MASON, K. 2003. Why is poverty unhealthy? Social and physical mediators. *Social Science & Medicine,* 57, 1631-1641.

COHEN, D. A., INAGAMI, S. & FINCH, B. 2008. The built environment and collective efficacy. *Health & Place,* 14, 198-208.

COLEMAN, J. S. 1990. *Foundations of social theory.* Cambridge, MA: Harvard University Press.

CONSTANT, A. F., KAHANEC, M., ZIMMERMANN, K. F., HARTOG, J. & ZORLU, A. 2009. Ethnic segregation in The Netherlands. *International Journal of Manpower,* 30, 15-25.

COZIER, Y. C., PALMER, J. R., HORTON, N. J., FREDMAN, L., WISE, L. A. & ROSENBERG, L. 2007. Relation between neighborhood median housing value and hypertension risk among black women in the United States. *American Journal of Public Health,* 97, 718-724.

CUMMINS, S., CURTIS, S., DIEZ-ROUX, A.V. & MACINTYRE, S. 2007. Understanding and representing ‘place’ in health research: A relational approach. *Social Science & Medicine*, 65, 1825-1838.

CUNNINGHAM, J. & PARADIES, Y. C. 2013. Patterns and correlates of self-reported racial discrimination among Australian Aboriginal and Torres Strait Islander adults, 2008–09: analysis of national survey data. *International Journal for Equity in Health,* 12, 47.

DAHL, E. & MALMBERG-HEIMONEN, I. 2010. Social inequality and health: the role of social capital. *Sociology of Health & Illness,* 32, 1102-1119.

DAHLGREEN, W. 2014. *Bradford considered Britain's most dangerous city.* [Online]. YouGov. Available at: https://yougov.co.uk/news/2014/09/09/bradford-considered-most-dangerous-city/ [Accessed 14 January 2015].

DANIEL, W. W. 1968. *Racial discrimination in England: Based on the PEP report.* Harmondsworth: Peguin Books.

DAOUD, N., SOSKOLNE, V. & MANOR, O. 2009. Examining cultural, psychosocial, community and behavioural factors in relationship to socioeconomic inequalities in limiting longstanding illness among the Arab minority in Israel. *Journal of Epidemiology and Community Health,* 63, 351-358.

DARR, A., SMALL, N., AHMAD, W., ATKIN, K., CORRY, P., BENSON, J. and MORTON, R. 2013 Examining the family-centred approach to genetic testing and counselling among UK Pakistanis: a community perspective. *Journal of Community Genetics*, 4, 49-57.

DAS-MUNSHI, J., BECARES, L., DEWEY, M. E., STANSFELD, S. A. & PRINCE, M. J. 2010. Understanding the effect of ethnic density on mental health: multi-level investigation of survey data from England. *British Medical Journal,* 341, c5367.

DATTA, G. D., SUBRAMANIAN, S., COLDITZ, G. A., KAWACHI, I., PALMER, J. R. & ROSENBERG, L. 2006. Individual, neighborhood, and state-level predictors of smoking among US Black women: a multilevel analysis. *Social Science & Medicine,* 63, 1034-1044.

DE SILVA, M. J., HARPHAM, T., TUAN, T., BARTOLINI, R., PENNY, M. E. & HUTTLY, S. R. 2006. Psychometric and cognitive validation of a social capital measurement tool in Peru and Vietnam. *Social Science & Medicine,* 62, 941-953.

DE SILVA, M. J., MCKENZIE, K., HARPHAM, T. & HUTTLY, S. R. 2005. Social capital and mental illness: a systematic review. *Journal of Epidemiology and Community Health,* 59, 619-627.

DE SOUZA BRIGGS, X. 1998. Doing democracy up-close: culture, power, and communication in community building. *Journal of Planning Education and Research,* 18, 1-13.

DEAN, W. R. & SHARKEY, J. R. 2011. Food insecurity, social capital and perceived personal disparity in a predominantly rural region of Texas: an individual-level analysis. *Social Science & Medicine,* 72, 1454-1462.

DENHAM, L. 2001. *Building cohesive communities: A report of the Ministerial Group on Public Order and Community Cohesion*. [Online] London: Home Office. Available at: http://www.tedcantle.co.uk/publications/005%20Building%20Cohesive%20Communities%20%28The%20Denham%20Report%29%202001.pdf [Accessed 15 January 2015].

DEROSE, K. P. & VARDA, D. M. 2009. Social capital and health care access: a systematic review. *Medical Care Research and Review,* 66, 272-306.

DETJEN, M.G., NIETO, F.J., TRENTHAM-DIETZ, A., FLEMING, M. and CHASAN-TABER, L. Acculturation and cigarette smoking among pregnant Hispanic women residing in the United States. *American Journal of Public Health*, 97, 2040-2047.

DIBBEN, C., SIGALA, M. & MACFARLANE, A. 2006. Area deprivation, individual factors and low birth weight in England: is there evidence of an “area effect”? *Journal of Epidemiology and Community Health,* 60, 1053-1059.

DIEZ ROUX, A. & MAIR, C. 2010. Neighborhoods and health. *Annals of the New York Academy of Sciences,* 1186, 125.

DIEZ ROUX, A. V. 2001. Investigating neighborhood and area effects on health. *American Journal of Public Health,* 91, 1783-1789.

DINNO, A. 2007. Loop analysis of causal feedback in epidemiology: an illustration relating to urban neighborhoods and resident depressive experiences. *Social Science & Medicine,* 65, 2043-2057.

DO, Y. K., CARPENTER, W. R., SPAIN, P., CLARK, J. A., HAMILTON, R. J., GALANKO, J. A., JACKMAN, A., TALCOTT, J. A. & GODLEY, P. A. 2010. Race, healthcare access and physician trust among prostate cancer patients. *Cancer Causes & Control,* 21, 31-40.

DUMMETT, A. 1973. *A portrait of English racism.* Harmondsworth: Penguin Books.

DURKHEIM, E. 1897. *Suicide: A study in sociology.* New York: The Free Press.

DZIUBAN, C. D. & SHIRKEY, E. C. 1974. When is a correlation matrix appropriate for factor analysis? Some decision rules. *Psychological Bulletin,* 81(6), 358-361.

EGAN, M., TANNAHILL, C., PETTICREW, M. & THOMAS, S. 2008. Psychosocial risk factors in home and community settings and their associations with population health and health inequalities: a systematic meta-review. *BMC Public Health,* 8, 239.

EGOLF, B., LASKER, J., WOLF, S. & POTVIN, L. 1992. The Roseto effect: a 50-year comparison of mortality rates. *American Journal of Public Health,* 82, 1089-1092.

ELGAR, F. J., DAVIS, C. G., WOHL, M. J., TRITES, S. J., ZELENSKI, J. M. & MARTIN, M. S. 2011. Social capital, health and life satisfaction in 50 countries. *Health & Place,* 17, 1044-1053.

ELLEN, I. G. & TURNER, M. A. 1997. Does neighborhood matter? Assessing recent evidence. *Housing Policy Debate,* 8, 833-866.

EMERSON, E. & HATTON, C. 2007. Poverty, socio-economic position, social capital and the health of children and adolescents with intellectual disabilities in Britain: a replication. *Journal of Intellectual Disability Research,* 51, 866-874.

EMPHO & LHO 2011. *Life expectancy at birth. Mid-year population estimates by age and sex 2006-2010*. Mansfield: East Midlands Public Health Observatory, London Health Observatory.

EMPHO 2011. *Child poverty - IMD 2010 Income Deprivation Affecting Children Index (IDACI).* Mansfield: East Midlands Public Health Observatory.

ENGSTROM, K., MATTSSON, F., JARLEBORG, A. & HALLQVIST, J. 2008. Contextual social capital as a risk factor for poor self-rated health: a multilevel analysis. *Social Science & Medicine,* 66, 2268-2280.

ERENS, B., PRIMATESTA, P. & PRIOR, G. 2001. *Health Survey for England 1999: The health of minority ethnic groups.* London: NatCen Social Research, University College London.

ESCHBACH, K., OSTIR, G. V., PATEL, K. V., MARKIDES, K. S. & GOODWIN, J. S. 2004. Neighborhood context and mortality among older Mexican Americans: is there a barrio advantage? *American Journal of Public Health,* 94, 1807-1812.

ESRI 2011. *ArcGIS Desktop: Release 10*. Redlands, CA: Environmental Systems Research Institute.

ETIKAN, I. & ÇAGLAR, M. K. 2005. Prediction methods for babies' birth weight using linear and nonlinear regression analysis. *Technology and Health Care,* 13, 131-135.

ETZIONI, A. 1959. The Ghetto - a Re-Evaluation. *Social Forces,* 37, 255-262.

European Commission, 2005. *Special Eurobarometer 223 Social capital.* [Online]. Brussels: European Commission. Available at: ec.europa.eu/public_opinion/archives/ebs/ebs_223_en.pdf [Accessed 14 January 2015].

EVS Foundation, 2012. *European Values Survey.* [Online]. Tilburg: EVS Foundation. Available at: http://www.europeanvaluesstudy.eu/frmShowpage?v_page_id=2361023477820045 [Accessed 14 January 2015].

FAGG, J., CURTIS, S., CLARK, C., CONGDON, P. & STANSFELD, S. A. 2008. Neighbourhood perceptions among inner-city adolescents: Relationships with their individual characteristics and with independently assessed neighbourhood conditions. *Journal of Environmental Psychology,* 28, 128-142.

FAIRLEY, L., PETHERICK, E. S., HOWE, L. D., TILLING, K., CAMERON, N., LAWLOR, D. A., WEST, J. & WRIGHT, J. 2013. Describing differences in weight and length growth trajectories between white and Pakistani infants in the UK: analysis of the Born in Bradford birth cohort study using multilevel linear spline models. *Archives of Disease in Childhood,* 98, 274-279.

FARAJZADEGAN, Z., JAFARI, N., NAZER, S., KEYVANARA, M. & ZAMANI, A. 2012. Social capital - a neglected issue in diabetes control: a cross-sectional survey in Iran. *Health and Social Care in the Community,* 21, 98-103.

FARIS, R. & DUNHAM, H. 1939. *Mental disorders in urban areas.* Chicago: University of Chicago Press.

FENG, X., ASTELL-BURT, T. & KOLT, G. S. 2013. Do social interactions explain ethnic differences in psychological distress and the protective effect of local ethnic density? A cross-sectional study of 226 487 adults in Australia. *BMJ open,* 3, pii: e002713.

FIELDHOUSE, J. 1981. *Bradford.* 2nd ed. Bradford: Watmoughs and City of Bradford Metropolitan Council.

FISCHBACHER, C. M., CEZARD, G., BHOPAL, R. S., PEARCE, J. & BANSAL, N. 2014. Measures of socioeconomic position are not consistently associated with ethnic differences in cardiovascular disease in Scotland: methods from the Scottish Health and Ethnicity Linkage Study (SHELS). *International Journal of Epidemiology*, 43, 129-139.

FISCHER, C. 2001. *Bowling alone: What's the score?* [Online]. Available at: ucdata.berkeley.edu/rsfcensus/papers/BowlingAlone.pdf [Accessed 13 January 2015].

FLEISCHER, N. & ROUX, A. D. 2008. Using directed acyclic graphs to guide analyses of neighbourhood health effects: an introduction. *Journal of Epidemiology and Community Health,* 62, 842-846.

FONE, D., DUNSTAN, F., LLOYD, K., WILLIAMS, G., WATKINS, J. & PALMER, S. 2007. Does social cohesion modify the association between area income deprivation and mental health? A multilevel analysis. *International Journal of Epidemiology,* 36, 338-345.

FRANZINI, L. & SPEARS, W. 2003. Contributions of social context to inequalities in years of life lost to heart disease in Texas, USA. *Social Science & Medicine,* 57, 1847-1861.

FRANZINI, L., RIBBLE, J. C. & KEDDIE, A. M. 2000. Understanding the Hispanic paradox. *Ethnicity & Disease,* 11, 496-518.

FUKUYAMA, F. 1995. *Trust: the social virtues and the creation of prosperity.* London: Penguin.

FUKUYAMA, F. 1997. Social capital and the modern capitalist economy: Creating a high trust workplace. *Stern Business Magazine* 4.

GALLO, L. C., SMITH, T. W. & COX, C. M. 2006. Socioeconomic status, psychosocial processes, and perceived health: an interpersonal perspective. *Annals of Behavioral Medicine,* 31, 109-119.

GEE, G. C., CHEN, J., SPENCER, M. S., SEE, S., KUESTER, O. A., TRAN, D. & TAKEUCHI, D. 2006. Social support as a buffer for perceived unfair treatment among Filipino Americans: differences between San Francisco and Honolulu. *American Journal of Public Health,* 96, 677-684.

GERMAN, D. & LATKIN, C. A. 2012. Social stability and health: exploring multidimensional social disadvantage. *Journal of Urban Health,* 89, 19-35.

GERST, K., MIRANDA, P. Y., ESCHBACH, K., SHEFFIELD, K. M., PEEK, M. K. & MARKIDES, K. S. 2011. Protective neighborhoods: neighborhood proportion of Mexican Americans and depressive symptoms in very old Mexican Americans. *Journal of the American Geriatrics Society,* 59, 353-358.

GESTHUIZEN, M., VAN DER MEER, T. & SCHEEPERS, P. 2009. Ethnic diversity and social capital in Europe: tests of Putnam's thesis in European countries. *Scandinavian Political Studies,* 32, 121-142.

GIORDANO, G. N. & LINDSTRÖM, M. 2011. The impact of social capital on changes in smoking behaviour: a longitudinal cohort study. *The European Journal of Public Health,* 21, 347-354.

GLAESER, E. P., LAIBSON, D., SCHEINKMAN, J. A. & SOUTTER, C. L. 2000. Measuring trust. *Quarterly Journal of Economics,* 115, 811-846.

GOLDBERG, D.P. 1978. *Manual of the General Health Questionnaire*. Windsor: *NFER*-Nelson.

GOLDENBERG, R. L., CULHANE, J. F., IAMS, J. D. & ROMERO, R. 2008. Epidemiology and causes of preterm birth. *Lancet,* 371, 75-84.

GONÇALEZ, T. T., DI LORENZO OLIVEIRA, C., CARNEIRO-PROIETTI, A. B., MORENO, E. C., MIRANDA, C., LARSEN, N., WRIGHT, D., LEÃO, S., LOUREIRO, P., DE ALMEIDA-NETO,

C., LOPES, M. I., PROIETTI, F. A., CUSTER, B., SABINO, E. & REDS-II, 2012. Motivation and social capital among prospective blood donors in three large blood centers in Brazil. T*ransfusion,* 53, 1291-301.

GORMAN, B. K. & SIVAGANESAN, A. 2007. The role of social support and integration for understanding socioeconomic disparities in self-rated health and hypertension. *Social Science & Medicine,* 65, 958-975.

GRAHAM, H. 2012. Smoking, stigma and social class. *Journal of Social Policy,* 41, 83-99.

GRAHAM, H., HAWKINS, S. S. & LAW, C. 2010. Lifecourse influences on women's smoking before, during and after pregnancy. *Social Science & Medicine*, 70, 582-587.

GRANOVETTER, M. S. 1973. The strength of weak ties. *American Journal of Sociology*, 78, 1360-1380.

GREENWOOD, M. J. 1985. Human Migration - Theory, Models, and Empirical Studies. *Journal of Regional Science,* 25, 521-544.

GRIFFITH, J. A. G. & INSTITUTE OF RACE, R. 1960. *Coloured immigrants in Britain.* London: Oxford University Press.

HACK, M., KLEIN, N. K. & TAYLOR, H. G. 1995. Long-term developmental outcomes of low birth weight infants. *The Future of Children*, 5, 176-196.

HACKSHAW, A., RODECK, C. & BONIFACE, S. 2011. Maternal smoking in pregnancy and birth defects: a systematic review based on 173 687 malformed cases and 11.7 million controls. *Human Reproduction Update,* 17, 589-604.

HAGAN, J. M. 1998. Social networks, gender, and immigrant incorporation: Resources and constraints. *American Sociological Review*, 63, 55-67.

HALL, C. & ONS, 2011. *Social capital: Introductory user guide. V 1.5.* [Online]. Colchester, Essex: Economic and Social Data Service. Available at: www.esds.ac.uk/government/docs/soccapguide.pdf [Accessed 14 January 2015].

HALPERN, D. 1993. Minorities and mental health. *Social Science & Medicine,* 36, 597-607.

HALPERN, D. 2005. *Social capital.* Oxford: Polity Press.

HARKER, R., MAHAR, C. & WILKES, C. 1990. *An introduction to the work of Pierre Bourdieu: The practice of theory.* Houndmills, Hampshire: The Macmillan Press.

HARPER, R. & KELLY, M. 2003. *Measuring social capital in the United Kingdom*. Newport: Office for National Statistics.

HARPHAM, T., GRANT, E. & THOMAS, E. 2002. Measuring social capital within health surveys: key issues. *Health Policy and Planning,* 17, 106-111.

HARRIS, C., ROACH, P., THIARA, A., D & YUSUF, R. 2003. *Emergent citizens? African-Caribbean and Pakistani young people in Birmingham and Bradford.* [Online] Leicester: The National Youth Agency. Available from: http://www.esrc.ac.uk/my-esrc/grants/L134251043/read [Accessed 16 January 2015].

HAWKINS, S. S., LAMB, K., COLE, T. J. & LAW, C. 2008. Influence of moving to the UK on maternal health behaviours: prospective cohort study. *British Medical Journal,* 336, 1052.

HAWKINS, S. S., LAW, C. & GRAHAM, H. 2010. Lifecourse influences on maternal smoking before pregnancy and postpartum among women from ethnic minority groups. *European Journal of Public Health*, 20, 339-345.

HENDERSON, H. J., MEMON, A., LAWSON, K., JACOBS, B. & KOUTSOGEORGOU, E. 2011. What factors are important in smoking cessation amongst deprived communities? A qualitative study. *Health Education Journal,* 70, 84-91.

HIGGINS, J. P. T. & THOMPSON, S. G. 2002. Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine,* 21, 1539-1558.

HILL, K., SELTZER, W., LEANING, J., MALIK, S., RUSSEL, S. & MACKINSON, C. 2004. *A demographic case study of forced migration: The 1947 partition of India.* [Online]. [Accessed 3 December 2010]. Cambridge: Harvard University. Available at: http://paa2004.princeton.edu/papers/41274.

HIRD, H. 1968. *Bradford in history. Twenty-four essays on life by the broad ford from the Celtic age to the present day,* Bradford: H. Hird.

HJERN, A., RAJMIL, L., BERGSTRÖM, M., BERLIN, M., GUSTAFSSON, P. A. & MODIN, B. 2013. Migrant density and well-being—A national school survey of 15-year-olds in Sweden. *The European Journal of Public Health,* 23, 823-828.

HOGARTY, K. Y., HINES, C. V., KROMREY, J. D., FERRON, J. M. & MUMFORD, K. R. 2005. The quality of factor solutions in exploratory factor analysis: The influence of sample size, communality, and overdetermination. *Educational and Psychological Measurement,* 65, 202-226.

HONG, S., ZHANG, W. & WALTON, E. 2014. Neighborhoods and Mental Health: Exploring Ethnic Density, Poverty, and Social Cohesion among Asian Americans and Latinos. *Social Science & Medicine,* 111, 117-124.

HOOGHE, M., REESKENS, T., STOLLE, D. & TRAPPERS, A. 2009. Ethnic Diversity and Generalized Trust in Europe A Cross-National Multilevel Study. *Comparative Political Studies,* 42, 198-223.

HSCIC, 2005. *Health Survey for England 2004: The Health of Minority Ethnic Groups.* [Online]. Leeds: Health and Social Care Information Centre. Available at: www.hscic.gov.uk/pubs/hse04ethnic [Accessed 14 January 2015].

HSCIC, 2007. *Health Survey for England 2005. Social capital and health: The health of older people.* [Online]. Leeds: Health and Social Care Information Centre. Available at: www.hscic.gov.uk/pubs/hse05olderpeople [Accessed 14 January 2015].

HUGH, R.I. 1969. *Bilingualism and Biculturalism: An abridged version of the Royal Commission Report.* Ottowa: McClelland and Stewart.

HYYPPA, M. T. & MAKI, J. 2001. Individual-level relationships between social capital and self-rated health in a bilingual community. *Preventative Medicine,* 32, 148-155.

Illustrated London News, 1882. Bradford (engraving) [photograph]. London: Illustrated London News.

ISLAM, M. K., MERLO, J., KAWACHI, I., LINDSTROM, M. & GERDTHAM, U. G. 2006. Social capital and health: does egalitarianism matter? A literature review. *International Journal for Equity in Health,* 5, 3.

JACKSON, C. 2007. The General Health Questionnaire. *Occupational Medicine*, 57, 79.

JAMES, D. D. 1990. *Bradford.* Halifax: Ryburn.

JAMES, J. 1977. *Continuation & additions to the History of Bradford, and its parish. In three volumes.* Queensbury: Mountain Press.

JARRÍN, I., GARCÍA-FULGUEIRAS, A., IBÁÑEZ-ROJO, V., ALVAREZ, D., GARCÍA-PINA, R., FERNÁNDEZ-LIRIA, A., GARCÍA-ORTÚZAR, V., DÍAZ, D., RODRÍGUEZ-ARENAS, M. Á. & MAZARRASA, L. 2013. Absence of protective ethnic density effect on Ecuadorian migrants' mental health in a recent migration setting: a multilevel analysis. *Social Psychiatry and Psychiatric Epidemiology,* 48, 95-103.

JENNY, A., SCHOENDORF, K. & PARKER, J. 2001. The association between community context and mortality among Mexican-American infants. *Ethnicity & Disease,* 11, 722-731.

JESSE, D. E., GRAHAM, M. & SWANSON, M. 2006. Psychosocial and spiritual factors associated with smoking and substance use during pregnancy in African American and White low-income women. *Journal of Obstetric, Gynecologic & Neonatal Nursing,* 35, 68-77.

JOHNSON, C. M., SHARKEY, J. R. & DEAN, W. R. 2010. Eating Behaviors and Social Capital are Associated with Fruit and Vegetable Intake Among Rural Adults. *Journal of Hunger & Environmental Nutrition,* 5, 302-315.

JOHNSON, N. & MISLIN, A. 2012. How much should we trust the World Values Survey trust question? *Economic Letters*, 116, 210-212.

JOHNSON, T. P. & VAN DE VIJVER, F. J.R. 2003. Social desirability in cross-cultural research. *In:* HARKNESS, J.A., VAN DE VIJVER, F.J.R. & MOHLER, P. Ph., (eds.) *Cross-cultural Survey Methods*, New York: Wiley, pp. 195-204.

JONAS, A. B., YOUNG, A. M., OSER, C. B., LEUKEFELD, C. G. & HAVENS, J. R. 2012. OxyContin® as currency: OxyContin® use and increased social capital among rural Appalachian drug users. *Social Science & Medicine,* 74, 1602-1609.

JONES, T. 1993. *Britain's ethnic minorities.* London: Policy Studies Institute.

JOUBERT, B. R., HÅBERG, S. E., NILSEN, R. M., WANG, X., VOLLSET, S. E., MURPHY, S. K., HUANG, Z., HOYO, C., MIDTTUN, Ø. & CUPUL-UICAB, L. A. 2012. 450K epigenome-wide scan identifies differential DNA methylation in newborns related to maternal smoking during pregnancy. *Environmental Health Perspectives,* 120, A455.

JURCIK, T., AHMED, R., YAKOBOV, E., SOLOPIEIEVA-JURCIKOVA, I. & RYDER, A. G. 2013. Understanding the role of the ethnic density effect: Issues of acculturation, discrimination and social support. *Journal of Community Psychology*, 41, 662-678.

JUSOT, F., GRIGNON, M. & DOURGNON, P. 2008. Access to psycho-social resources and health: exploratory findings from a survey of the French population. *Health Economics, Policy and Law,* 3, 365-391.

KANDULA, N. R., WEN, M., JACOBS, E. A. & LAUDERDALE, D. S. 2009. Association between neighborhood context and smoking prevalence among Asian Americans. *American Journal of Public Health,* 99, 885-892.

KARLSEN, S. & NAZROO, J. Y. 2009. Religion, ethnicity and health inequalities. *In:* GRAHAM, H. (ed.) *Understanding health inequalities.* 2 ed. Berkshire: Open University Press.

KAWACHI, I. & KENNEDY, B. P. 1997. Health and social cohesion: why care about income inequality? *British Medical Journal,* 314, 1037-1040.

KAWACHI, I. 1999. Social capital and community effects on population and individual health. *Annals of the New York Academy of Sciences,* 896, 120-130.

KAWACHI, I., KENNEDY, B. P. & GLASS, R. 1999. Social capital and self-rated health: a contextual analysis. *American Journal of Public Health,* 89, 1187-1193.

KAWACHI, I., KENNEDY, B. P., LOCHNER, K. & PROTHROW-STITH, D. 1997. Social capital, income inequality, and mortality. *American Journal of Public Health,* 87, 1491-1498.

KAWACHI, I., KIM, D., COUTTS, A. & SUBRAMANIAN, S. V. 2004. Commentary: Reconciling the three accounts of social capital. *International Journal of Epidemiology,* 33, discussion 700-704.

KEARNS, A. & PARKES, A. 2003. Housing, neighbourhoods and communities. *In:* BROMLEY, C., CURTICE, J., HINDS, K. & PARKS, A. (eds.) *Devolution: Scottish answers to Scottish questions.* Edinburgh: Edinburgh University Press.

KEENE, D., BADER, M. & AILSHIRE, J. 2013. Length of residence and social integration: The contingent effects of neighborhood poverty. *Health & Place,* 21, 171-178.

KELAHER, M., PAUL, S., LAMBERT, H., AHMAD, W. & SMITH, G. D. 2009. The applicability of measures of socioeconomic position to different ethnic groups within the UK. *International Journal for Equity in Health,* 8, 4.

KELLY, Y., PANICO, L., BARTLEY, M., MARMOT, M., NAZROO, J. & SACKER, A. 2009. Why does birthweight vary among ethnic groups in the UK? Findings from the Millennium Cohort Study. *Journal of Public Health,* 31, 131-137.

KELLY, Y., SACKER, A., NAZROO, J. & SCHOON, I. 2006. Ethnic differences in achievement of developmental milestones by 9 months of age: The Millennium Cohort Study. *Developmental Medicine and Child Neurology*, 48, 825-830.

KENYON, S., LYONS, G. & RAFFERTY, J. 2002. Transport and social exclusion: Investigating the possibility of promoting inclusion through virtual mobility. *Journal of Transport Geography,* 10, 207-209.

KETENDE, S. C. & JONES, E. M. 2011. *User guide to analysing MCS data using STATA.* [Online]. London: Centre for Longitudinal Studies, Institute of Education, University of London. Available at: www.cls.ioe.ac.uk/shared/get-file.ashx?id=1372&itemtype=document [Accessed 14 January 2015].

KIM, D., SUBRAMANIAN, S. V. & KAWACHI, I. 2006. Bonding versus bridging social capital and their associations with self rated health: a multilevel analysis of 40 US communities. *Journal of Epidemiology and Community Health,* 60, 116-122.

KIMBRO, R. T., BZOSTEK, S., GOLDMAN, N. & RODRÍGUEZ, G. 2008. Race, Ethnicity, And The Education Gradient In Health. *Health Affairs*, 27, 361-372.

KIRKBRIDE, J. B., BOYDELL, J., PLOUBIDIS, G., MORGAN, C., DAZZAN, P., MCKENZIE, K., MURRAY, R. M. & JONES, P. B. 2008. Testing the association between the incidence of schizophrenia and social capital in an urban area. *Psychological Medicine,* 38, 1083-1094.

KIRKBRIDE, J. B., MORGAN, C., FEARON, P., DAZZAN, P., MURRAY, R. M. & JONES, P. B. 2007. Neighbourhood-level effects on psychoses: re-examining the role of context. *Psychological Medicine,* 37, 1413-1425.

KLEIN, J., VONNEILICH, N., BAUMEISTER, S. E., KOHLMANN, T. & VON DEM KNESEBECK, O. 2012. Do social relations explain health inequalities? Evidence from a longitudinal survey in a changing eastern German region. *International Journal of Public Health,* 57, 619-627.

KNOPIK, V. S., MACCANI, M. A., FRANCAZIO, S. & MCGEARY, J. E. 2012. The epigenetics of maternal cigarette smoking during pregnancy and effects on child development. *Development and Psychopathology,* 24, 1377-1390.

KRAMER, M. R., COOPER, H. L., DREWS-BOTSCH, C. D., WALLER, L. A. & HOGUE, C. R. 2010. Metropolitan isolation segregation and Black–White disparities in very preterm birth: A test of mediating pathways and variance explained. *Social Science & Medicine,* 71, 2108-2116.

KULIS, S., MARSIGLIA, F. F., SICOTTE, D. & NIERI, T. 2007. Neighborhood effects on youth substance use in a southwestern city. *Sociological Perspectives,* 50, 273-301.

KULLDORFF, M. 2009. *SaTScanTM v.8.0: Software for the spatial and space-time scan statistics.* Cambridge, MA: Information Management Services.

LANCEE, B. & DRONKERS, J. 2011. Ethnic, religious and economic diversity in Dutch neighbourhoods: Explaining quality of contact with neighbours, trust in the neighbourhood and inter-ethnic trust. *Journal of Ethnic and Migration Studies,* 37, 597-618.

LARA, M., GAMBOA, C., KAHRAMANIAN, M. I., MORALES, L. S. & BAUTISTA, D. E. H. 2005. Acculturation and latino health in the United States: A review of the literature and its sociopolitical context. *Annual Review of Public Health,* 26, 367-397.

LARA-CINISOMO, S., XUE, Y. & BROOKS-GUNN, J. 2013. Latino youth's internalising behaviours: links to immigrant status and neighbourhood characteristics. *Ethnicity & Health,* 18, 315-335.

LEES, L. 2008. Gentrification and social mixing: towards an inclusive urban renaissance? *Urban Studies,* 45, 2449-2470.

LEON, D. A. & MOSER, K. A. 2012. Low birth weight persists in South Asian babies born in England and Wales regardless of maternal country of birth. Slow pace of acculturation, physiological constraint or both? Analysis of routine data. *Journal of Epidemiology and Community Health,* 66, 544-551.

LEONARD, R. & ONYX, J. 2004. *Social capital & community building: spinning straw into gold.* London: Janus Publishing Company.

LETKI, N. 2008. Does diversity erode social cohesion? Social capital and race in British neighbourhoods. *Political Studies,* 56, 99-126.

LEVENTHAL, T. & BROOKS-GUNN, J. 2000. The neighborhoods they live in: the effects of neighborhood residence on child and adolescent outcomes. *Psychological Bulletin,* 126, 309-337.

LI, Y., PICKLES, A. & SAVAGE, M. 2005. Social capital and social trust in Britain. *European Sociological Review,* 21, 109-123.

LOCHNER, K. A., KAWACHI, I., BRENNAN, R. T. & BUKA, S. L. 2003. Social capital and neighborhood mortality rates in Chicago. *Social Science & Medicine,* 56, 1797-1805.

LOCHNER, K., KAWACHI, I. & KENNEDY, B. P. 1999. Social capital: a guide to its measurement. *Health & Place,* 5, 259-270.

LOOMAN, W. S. 2006. Development and testing of the social capital scale for families of children with special health care needs. *Research in Nursing & Health,* 29, 325-336.

LUMB, K., CONGDON, P. & LEALMAN, G. 1981. A comparative review of Asian and British-born maternity patients in Bradford, 1974-8. *Journal of Epidemiology and Community Health,* 35, 106-109.

LUTTERS, W. & ACKERMAN, M. 1996. *An introduction to the Chicago School of Sociology*. Chicago: Interval Research Proprietary.

LYNCH, J. & DAVEY SMITH, G. 2003. Rates and states: reflections on the health of nations. *International Journal of Epidemiology,* 32, 663-670.

LYNCH, J. W., SMITH, G. D., KAPLAN, G. A. & HOUSE, J. S. 2000. Income inequality and mortality: importance to health of individual income, psychosocial environment, or material conditions. *British Medical Journal,* 320, 1200-1204.

MACINTYRE, S., ELLAWAY, A. & CUMMINS, S. 2002. Place effects on health: how can we conceptualise, operationalize and measure them? *Social Science & Medicine*, 55, 135-139.

MAIR, C., DIEZ ROUX, A. V., OSYPUK, T. L., RAPP, S. R., SEEMAN, T. & WATSON, K. E. 2010. Is neighborhood racial/ethnic composition associated with depressive symptoms? The multi-ethnic study of atherosclerosis. *Social Science & Medicine,* 71, 541-550.

MAO, L., KIDD, M. R., ROGERS, G., ANDREWS, G., NEWMAN, C. E., BOOTH, A., SALTMAN, D. C. & KIPPAX, S. C. 2009. Social factors associated with Major Depressive Disorder in homosexually active, gay men attending general practices in urban Australia. *Australian & New Zealand Journal of Public Health,* 33, 83-86.

MARGETTS, B., YUSOF, S. M., AL DALLAL, Z. & JACKSON, A. 2002. Persistence of lower birth weight in second generation South Asian babies born in the United Kingdom. *Journal of Epidemiology and Community Health,* 56, 684-687.

MARKIDES, K.S., COREIL, J. 1986. The health of Hispanics in the southwestern United States: an epidemiologic paradox. *Public Health Reports*, 101, 253-265.

MARMOT, M. G., SHIPLEY, M. J. & ROSE, G. 1984. Inequalities in death - Specific explanations of a general pattern? *Lancet,* 323, 1003-1006.

MARX, K. 1992. *Marx's capital: a student edition / edited and introduced by C. J. Arthur.* London: Lawrence & Wishart.

MASI, C. M., HAWKLEY, L. C., HARRY PIOTROWSKI, Z. & PICKETT, K. E. 2007. Neighborhood economic disadvantage, violent crime, group density, and pregnancy outcomes in a diverse, urban population. *Social Science & Medicine,* 65, 2440-2457.

MASON, S. M., KAUFMAN, J. S., EMCH, M. E., HOGAN, V. K. & SAVITZ, D. A. 2010. Ethnic density and preterm birth in African-, Caribbean-, and US-born non-Hispanic black populations in New York City. *American Journal of Epidemiology,* 172, 800-808.

MCALONEY, K., STRINGER, M. & MALLETT, J. 2011. Social Capital in Divided Societies: Development of a Social Capital Questionnaire in Northern Ireland. *International Journal of Social Inquiry,* 4, 113-131.

MCLEAN, S., SCHULTZ, D. & STEGER, M. 2002. *Social capital: critical perspectives on community and 'Bowling alone'.* New York: New York University Press.

MCLENNAN, D., BARNES, H., NOBLE, M., DAVIES, J. & GARRAT, E. 2011. *The English Indices of Deprivation 2010.* Oxford: Oxford Institute of Social Policy, University of Oxford.

MCLEOD, J. D. & SHANAHAN, M. J. 1993. Poverty, parenting, and children's mental health. *American Sociological Review*, 58, 351-366.

MEIJER, M., RÖHL, J., BLOOMFIELD, K. & GRITTNER, U. 2012. Do neighborhoods affect individual mortality? A systematic review and meta-analysis of multilevel studies. *Social Science & Medicine,* 74, 1204-1212.

MENG, G., THOMPSON, M. E. & HALL, G. B. 2013. Pathways of neighbourhood-level socio-economic determinants of adverse birth outcomes. *International Journal of Health Geographics,* 12, 32.

MESSER, L. C., VINIKOOR-IMLER, L. C. & LARAIA, B. A. 2012. Conceptualizing neighborhood space: consistency and variation of associations for neighborhood factors and pregnancy health across multiple neighborhood units. *Health & Place,* 18, 805-813.

MOHAN, J., TWIGG, L., BARNARD, S. & JONES, K. 2005. Social capital, geography and health: A small-area analysis for England. *Social Science & Medicine,* 60, 1267-1283.

MOHER, D., LIBERATI, A., TETZLAFF, J. & ALTMAN, D. G. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *British Medical Journal*, 339, b2535.

MOHNEN, S. M., VÖLKER, B., FLAP, H., SUBRAMANIAN, S. V. & GROENEWEGEN, P. P. 2012. You have to be there to enjoy it? Neighbourhood social capital and health. *European Journal of Public Health,* 23, 33-39.

MOON, G., PEARCE, J. & BARNETT, R. 2012. Smoking, Ethnic Residential Segregation, and Ethnic Diversity: A Spatio-temporal Analysis. *Annals of the Association of American Geographers,* 102, 912-921.

MORENOFF, J. D. 2003. Neighborhood mechanisms and the spatial dynamics of birth weight. *American Journal of Sociology,* 108, 976-1017.

MOSTER, D., LIE, R. T. & MARKESTAD, T. 2008. Long-term medical and social consequences of preterm birth. *New England Journal of Medicine,* 359, 262-273.

MULDER, B. C., DE BRUIN, M., SCHREURS, H., VAN AMEIJDEN, E. J. & VAN WOERKUM, C. M. 2011. Stressors and resources mediate the association of socioeconomic position with health behaviours. *BMC Public Health,* 11, 798.

MUSTERD, S. 2005. Social and ethnic segregation in Europe: levels, causes, and effects. *Journal of Urban Affairs,* 27, 331-348.

NAGAOKA, K., FUJIWARA, T. & ITO, J. 2012. Do income inequality and social capital associate with measles-containing vaccine coverage rate? *Vaccine,* 30, 7481-7488.

NAZROO, J. Y. & WILLIAMS, D. R. 2006. The social determination of ethnic/racial inequalities in health. *In:* MARMOT, M. & WILKINSON, R. G. (eds.) *Social determinants of health.* Oxford: Oxford University Press.

NAZROO, J. Y. 1997. *The health of Britain's ethnic minorities: findings from a national survey*. London: Policy Studies Institute.

NCSR, 1999. *Health Survey for England.* [Online]. Colchester, Essex: National Centre for Social Research, University of London. Available at: discover.ukdataservice.ac.uk/catalogue/?sn=4365 [Accessed 14 January 2015].

NCSR, 2000. *Health Survey for England.* [Online]. Colchester, Essex: National Centre for Social Research, University of London. Available at: discover.ukdataservice.ac.uk/catalogue/?sn=4487 [Accessed 14 January 2015].

NCSR, 2012. *British Social Attitudes 28th Report.* [Online]. Colchester, Essex: National Centre for Social Research, University of London. Available at: http://www.natcen.ac.uk/our-research/research/british-social-attitudes/ [Accessed 14 January 2015].

NEPOMNYASCHY, L. 2009. Socioeconomic gradients in infant health across race and ethnicity. *Maternity and Child Health Journal*, 13, 720-731.

NESS, R. B., KOOPMAN, J. S. & ROBERTS, M. S. 2007. Causal system modeling in chronic disease epidemiology: a proposal. *Annals of Epidemiology,* 17, 564-568.

NEWTON, K. 1997. Social capital and democracy. *American Behavioral Scientist,* 40, 575-586.

NORC, 2012. *General Social Survey.* [Online]. Chicago: National Opinion Research Center, University of Chicago. Available at: http://www3.norc.org/GSS+Website [Accessed 14 January 2015].

NUTBEAM, D. 2008. The evolving concept of health literacy. *Social Science & Medicine*, 67, 2072-2078.

OAKES, J. M. & KAUFMAN, J. S. 2006. *Methods in Social Epidemiology*. San Francisco: Jossey-Bass.

O'BRIEN, M. S., BURDSAL, C. A. & MOLGAARD, C. A. 2004. Further development of an Australian-based measure of social capital in a US sample. *Social Science & Medicine,* 59, 1207-1217.

O'BRIEN, R.M. 2007. A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, 41, 673-690.

OECD, 2001. *The well-being of nations: the role of human and social capital*. Paris: Centre for Education Research and Innovation.

ÖHLIN, B., NILSSON, P.M., NILSSON, J.A. & BERGLUND, G. 2004. Chronic psychosocial stress predicts long-term cardiovascular morbidity and mortality in middle-aged men. *European Heart Journal*, 25, 867-873.

OKEN, E., LEVITAN, E. & GILLMAN, M. 2008. Maternal smoking during pregnancy and child overweight: systematic review and meta-analysis. *International Journal of Obesity,* 32, 201-210.

ONS, 2011b. *GCSE achievement.* [Online]. Newport: ONS. Available at: https://neighbourhood.statistics.gov.uk/ [Accessed 14 January 2015].

ONS, 2008. *Resident population estimates, females.* [Online]. Newport: Office for National Statistics. Available at: https://neighbourhood.statistics.gov.uk/ [Accessed 14 January 2015].

ONS, 2010a. *Births by area of usual residence of mother, England and Wales.* [Online]. Newport: Office for National Statistics. Available at: http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm% 3A77-222793 [Accessed 12 September 2012].

ONS, 2010b. *Population estimates for UK, England and Wales, Scotland and Northern Ireland - Mid 2010.* [Online]. Newport: Office for National Statistics. Available at: http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm %3A77-231847 [Accessed 25 June 2012].

ONS, 2011a. *Index of Multiple Deprivation 2010.* [Online]. Newport: Office for National Statistics. Available at: https://www.gov.uk/government/statistics/english-indices-of-deprivation-2010 [Accessed 14 January 2015].

ONS, 2012a. *Ethnicity and country of birth.* [Online]. Newport: Office for National Statistics. Available at: http://www.ons.gov.uk/ons/index.html [Accessed 14 January 2015].

ONS, 2012b. *Ethnicity and National Identity in England and Wales 2011.* [Online]. Newport: Office for National Statistics. Available at: http://www.ons.gov.uk/ons/dcp171776_290558.pdf [Accessed 14 August 2013 2013].

ONS, 2014. *Recorded Crime Data by Community Safety Partnership area - 2012/13 and 2013/14. Crime in England & Wales, year ending March 2014.* [Online]. Titchfield: Office for National Statistics. Available at: http://www.ons.gov.uk/ons/rel/crime-stats/crime-statistics/period-ending-march-2014/sty-police-recorded-crime.html [Accessed 14 January 2015].

ONYX, J. & BULLEN, P. 2000. Measuring Social Capital in Five Communities. *Journal of Applied Behavioral Science,* 36, 23-42.

OSTIR, G. V., ESCHBACH, K., MARKIDES, K. S. & GOODWIN, J. S. 2003. Neighbourhood composition and depressive symptoms among older Mexican Americans. *Journal of Epidemiology and Community Health,* 57, 987-992.

OUSELEY, H. 2001. *Community pride not prejudice - making diversity work in Bradford.* [Online]. Bradford: Bradford Vision. Available at: http://resources.cohesioninstitute.org.uk/Publications/Documents/Document/Default.aspx?recordId=98 [Accessed 14 January 2015].

Oxford Dictionaries, 2010. Oxford: Oxford University Press.

PANICO, L., BARTLEY, M., MARMOT, M., NAZROO, J. Y., SACKER, A. & KELLY, Y. J. 2007. Ethnic variation in childhood asthma and wheezing illnesses: findings from the Millennium Cohort Study. *International Journal of Epidemiology*, 36, 1093-1093.

PARK, Y., NECKERMAN, K. M., QUINN, J., WEISS, C. & RUNDLE, A. 2008. Place of birth, duration of residence, neighborhood immigrant composition and body mass index in New York City. *International Journal of Behavioral Nutrition and Physical Activity,* 5, 19.

PARLIAMENT 2005. *Work and Pensions - Fourth Report.* [Online]. House of Commons, UK Parliament. Available at: http://www.publications.parliament.uk/pa/cm200304/cmselect/cmworpen/456/45602.htm [Accessed 14 January 2015].

PATEL, K. V., ESCHBACH, K., RUDKIN, L. L., PEEK, M. K. & MARKIDES, K. S. 2003. Neighborhood context and self-rated health in older Mexican Americans. *Annals of Epidemiology,* 13, 620-628.

PATTENDEN, S., DOLK, H. & VRIJHEID, M. 1999. Inequalities in low birth weight: parental social class, area deprivation, and" lone mother" status. *Journal of Epidemiology and Community Health,* 53, 355-358.

PATTERSON, F., SERAVALLI, L., HANLON, A. & NELSON, D. B. 2012. Neighborhood safety as a correlate of tobacco use in a sample of urban, pregnant women. *Addictive Behaviors,* 37, 1132-7.

PEARCE, N. & SMITH, G. D. 2003. Is social capital the key to inequalities in health? *American Journal of Public Health,* 93, 122-129.

PEARCE, N. 2004. The globalization of epidemiology: introductory remarks. *International Journal of Epidemiology,* 33, 1127-1131.

PEARL, M., BRAVEMAN, P. & ABRAMS, B. 2001. The relationship of neighborhood socioeconomic characteristics to birthweight among 5 ethnic groups in California. *American Journal of Public Health,* 91, 1808-1814.

PEARLIN, L. I., SCHIEMAN, S., FAZIO, E. M. & MEERSMAN, S. C. 2005. Stress, health, and the life course: Some conceptual perspectives. *Journal of Health and Social Behavior*, 46, 205-219.

PEARSON, A. L., PEARCE, J. & KINGHAM, S. 2012. Deprived yet healthy: Neighbourhood-level resilience in New Zealand. *Social Science & Medicine,* 91, 238-245.

PEARSON, J. A. & GERONIMUS, A. T. 2011. Race/ethnicity, socioeconomic characteristics, coethnic social ties, and health: evidence from the national Jewish population survey. *American Journal of Public Health,* 101, 1314-1321.

PHILLIPS, D. 1998. Black Minority Ethnic Concentration, Segregation and Dispersal in Britain. *Urban Studies,* 35, 1681-1702.

PHILLIPS, D. 2006. Parallel lives? Challenging discourses of British Muslim self-segregation. *Environment and Planning D: Society and Space,* 24, 25-40.

PHILLIPS, G. S., WISE, L. A., RICH-EDWARDS, J. W., STAMPFER, M. J. & ROSENBERG, L. 2009. Income incongruity, relative household income, and preterm birth in the Black Women's Health Study. *Social Science & Medicine,* 68, 2122-2128.

PICKETT, K. E. & PEARL, M. 2001. Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *Journal of Epidemiology and Community Health,* 55, 111-122.

PICKETT, K. E. & WILKINSON, R.G. 2008. People like us: ethnic group density effects on health. *Ethnicity & Health,* 13, 321-334.

PICKETT, K. E., ABRAMS, B. & SELVIN, S. 2000. Defining preterm delivery–the epidemiology of clinical presentation. *Paediatric and Perinatal Epidemiology,* 14, 305-308.

PICKETT, K. E., SHAW, R. J., ATKIN, K., KIERNAN, K. E. & WILKINSON, R. G. 2009. Ethnic density effects on maternal and infant health in the Millennium Cohort Study. *Social Science & Medicine,* 69, 1476-1483.

PICKETT, K. E., WAKSCHLAG, L. S., RATHOUZ, P. J., LEVENTHAL, B. L. & ABRAMS, B. 2002. The working-class context of pregnancy smoking. *Health & Place,* 8, 167-175.

PICKETT, K.E. & WILKINSON, R.G. 2015. Income inequality and health: A causal review. *Social Science & Medicine*, 128, 316-326.

PLATT, L. 2005. Migration and social mobility. The life changes of Britain's minority ethnic communities. Bristol: Policy Press, Joseph Rowntree Foundation. Available at: www.jrf.org.uk/system/files/1861348223.pdf [Accessed 14 January 2015].

PLEWIS, I., CALDERWOOD, L., HAWKES, D., HUGHES, G. & JOSHI, H. 2004. *Millennium Cohort Study: technical report on sampling.* [Online]. London: Institute of Education, University of London. Available at: http://www.cls.ioe.ac.uk/page.aspx?&sitesectionid=878&sitesectiontitle=Technical+Reports [Accessed 16 January 2015].

PODSAKOFF, P. M., MACKENZIE, S. B. & PODSAKOFF, N. P. 2012. Sources of Method Bias in Social Science Research and Recommendations on How to Control It. *Annual Review of Psychology,* 63, 539-569.

POORTINGA, W. 2006. Do health behaviors mediate the association between social capital and health? *Preventive Medicine,* 43, 488-493.

POORTINGA, W., DUNSTAN, F. D. & FONE, D. L. 2008. Neighbourhood deprivation and self-rated health: the role of perceptions of the neighbourhood and of housing problems. *Health & Place,* 14, 562-575.

POPAY, J., WHITEHEAD, M. & HUNTER, D. J. 2010. Injustice is killing people on a large scale—but what is to be done about it? *Journal of Public Health,* 32, 148-149.

POWER, C. & MATTHEWS, S. 1997. Origins of health inequalities in a national population sample. *Lancet,* 350, 1584-1589.

PRADY, S. L., MILES, J. N., PICKETT, K. E., FAIRLEY, L., BLOOR, K., GILBODY, S., KIERNAN, K., MANN, R. & WRIGHT, J. 2013a. The psychometric properties of the subscales of the GHQ-28 in a multi-ethnic maternal sample: results from the Born in Bradford cohort. *BMC Psychiatry*, 13, 55.

PRADY, S. L., PICKETT, K. E., CROUDACE, T., FAIRLEY, L., BLOOR, K., GILBODY, S., KIERNAN, K. E. & WRIGHT, J. 2013b. Psychological Distress during Pregnancy in a Multi-Ethnic Community: Findings from the Born in Bradford Cohort Study. *PLoS One,* 8, e60693.

PRENTICE, J. C. 2006. Neighborhood effects on primary care access in Los Angeles. *Social Science & Medicine,* 62, 1291-1303.

PUTNAM, R. D. 1993. *Making democracy work: civic traditions in modern Italy / Robert D. Putnam with Robert Leonardi and Raffaella Y. Nanetti.* Princeton: Princeton University Press.

PUTNAM, R. D. 1996. Who killed civic America? [Online]. *Prospect Magazine,* 7, 66-72. Available at: 83.223.124.158/magazine/whokilledcivicamerica/ [Accessed 14 January 2015].

PUTNAM, R. D. 2000. *Bowling alone: the collapse and revival of American community.* New York: Simon & Schuster.

PUTNAM, R. D. 2004. Commentary: "Health by association": some comments. *International Journal of Epidemiology,* 33, 667-671; discussion 700-704.

PUTNAM, R. D. 2007. E pluribus unum: Diversity and community in the twenty-first century the 2006 Johan Skytte Prize Lecture. *Scandinavian Political Studies*, 30, 137-174.

RATCLIFFE, P. 2004. *'Race', ethnicity and difference: imagining the inclusive society.* Maidenhead: Open University Press.

RAYNOR, P. 2008. Born in Bradford, a cohort study of babies born in Bradford, and their parents: protocol for the recruitment phase. *BMC Public Health,* 8, 327.

READER, S. 2001. Detecting and analyzing clusters of low-birth weight incidence using exploratory spatial data analysis. *GeoJournal,* 53, 149-159.

REYES, L. & MAÑALICH, R. 2005. Long-term consequences of low birth weight. *Kidney International,* 68, S107-S111.

RIVA, M., GAUVIN, L. & BARNETT, T. A. 2007. Toward the next generation of research into small area effects on health: a synthesis of multilevel investigations published since July 1998. *Journal of Epidemiology and Community Health,* 61, 853-861.

ROBERT, S. A. & REITHER, E. N. 2004. A multilevel analysis of race, community disadvantage, and body mass index among adults in the US. *Social Science & Medicine,* 59, 2421-2434.

ROBERT, S. A. & RUEL, E. 2006. Racial segregation and health disparities between Black and White older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 61, S203-S211.

ROBISON, L. J., SCHMID, A. A. & SILES, M. E. 2002. Is Social Capital Really Capital? *Review of Social Economy,* 60, 1-21.

ROSS, C. E., MIROWSKY, J. & PRIBESH, S. 2001. Powerlessness and the Amplification of Threat: Neighborhood Disadvantage, Disorder, and Mistrust. *American Sociological Review,* 66, 568-591.

ROTHMAN, K. J., GREENLAND, S. & LASH, T. L. 2008. *Modern Epidemiology*, Philadelphia: Lippincott Williams & Wilkins.

ROTHSTEIN, B. & USLANER, E. M. 2005. All for all: Equality, corruption, and social trust. *World Politics,* 58, 41-72.

ROY, A. L., HUGHES, D. & YOSHIKAWA, H. 2013. Intersections Between Nativity, Ethnic Density, and Neighborhood SES: Using an Ethnic Enclave Framework to Explore Variation in Puerto Ricans' Physical Health. *American Journal of Community Psychology*, 51, 468-479.

ROYSTON, P., ALTMAN, D. G. & SAUERBREI, W. 2006. Dichotomizing continuous predictors in multiple regression: a bad idea. *Statistics in Medicine,* 25, 127-141.

RUDMIN, F. W. 2003. Critical history of the acculturation psychology of assimilation, separation, integration, and marginalization. *Review of General Psychology,* 7, 3-37.

SAMPSON, R. J., MORENOFF, J. D. & FELTON, E. 1999. Beyond Social Capital: Spatial Dynamics of Collective Efficacy for Children. *American Sociological Review,* 64, 633-660.

SANTORELLI, G., PETHERICK, E., WAIBLINGER, D., CABIESES, B. & FAIRLEY, L. 2013. Ethnic Differences in the Initiation and Duration of Breast Feeding–Results from the Born in Bradford Birth Cohort Study. *Paediatric and Perinatal Epidemiology,* 27, 388-392.

SCHOFIELD, P., ASHWORTH, M. & JONES, R. 2011. Ethnic isolation and psychosis: re-examining the ethnic density effect. *Psychological Medicine,* 41, 1263-1269.

SELTEN, J.-P. & CANTOR-GRAAE, E. 2005. Social defeat: risk factor for schizophrenia? *British Journal of Psychiatry*, 187, 101-102.

SHAMI, S., QADEER, T., SCHMITT, L. & BITTLES, A. 1991. Consanguinity, gestational period and anthropometric measurements at birth in Pakistan. *Annals of Human Biology,* 18, 523-527.

SHAW, R. & PICKETT, K. 2010. 054 Another Hispanic paradox? The health benefits of Hispanic communities for non-Hispanic mothers and infant. *Journal of Epidemiology and Community Health,* 64, A21-A22.

SHAW, R. J. & PICKETT, K. E. 2011. The association between ethnic density and poor self-rated health among US Black and Hispanic people. *Ethnicity & Health,* 16, 225-244.

SHAW, R. J. & PICKETT, K. E. 2013. The health benefits of Hispanic communities for non-Hispanic mothers and infants: another Hispanic paradox. *American Journal of Public Health,* 103, 1052-1057.

SHAW, R. J., ATKIN, K., BÉCARES, L., ALBOR, C. B., STAFFORD, M., KIERNAN, K. E., NAZROO, J. Y., WILKINSON, R. G. & PICKETT, K. E. 2012. Impact of ethnic density on adult mental disorders: narrative review. *British Journal of Psychiatry,* 201, 11-19.

SHAW, R. J., PICKETT, K. E. & WILKINSON, R. G. 2010. Ethnic density effects on birth outcomes and maternal smoking during pregnancy in the US linked birth and infant death data set. *American Journal of Public Health,* 100, 707-713.

SHERIDAN, E., WRIGHT, J., SMALL, N., CORRY, P. C., ODDIE, S., WHIBLEY, C., PETHERICK, E. S., MALIK, T., PAWSON, N., MCKINNEY, P. A. & PARSLOW, R. C. 2013. Risk factors for congenital anomaly in a multiethnic birth cohort: an analysis of the Born in Bradford study. *Lancet,* 382, 1350-1359.

SHERIDAN, L. P. 2006. Islamophobia pre- and post-September 11th 2001. *Journal of Interpersonal Violence,* 21, 317-336.

SHOFF, C. & YANG, T. C. 2013. Understanding maternal smoking during pregnancy: does residential context matter? *Social Science & Medicine,* 78, 50-60.

SHON, J.-L. P. K. 2010. The ambivalent nature of ethnic segregation in France's disadvantaged neighbourhoods. *Urban Studies,* 47, 1603-1623.

SHRIER, I. & PLATT, R. W. 2008. Reducing bias through directed acyclic graphs. *BMC Medical Research Methodology,* 8, 70.

SIAHPUSH, M., BORLAND, R., TAYLOR, J., SINGH, G. K., ANSARI, Z. & SERRAGLIO, A. 2006. The association of smoking with perception of income inequality, relative material well-being, and social capital. *Social Science & Medicine,* 63, 2801-2812.

SINGH-MANOUX, A., MARMOT, M. G. & ADLER, N. E. 2005. Does subjective social status predict health and change in health status better than objective status? *Psychosomatic Medicine,* 67, 855-861.

SMALL, N. 2012. Infant Mortality and Migrant Health in Babies of Pakistani Origin Born in Bradford, UK. *Journal of Intercultural Studies,* 33, 549-564.

SMALL, N., GARDINER, C., BARNES, S., GOTT, M., HALPIN, D., PAYNE, S. & SEAMARK, D. 2012. "You get old, you get breathless, and you die": Chronic obstructive pulmonary disease in Barnsley, UK. *Health & Place,* 18, 1396-1403.

SMITH, G. D. 2003. Learning to live with complexity: ethnicity, socioeconomic position, and health in Britain and the US. *In:* SMITH, G. D. (ed.) *Health inequalities. Lifecourse approaches.* Bristol: Policy Press.

SMITH, R. B., TOLEDANO, M. B., WRIGHT, J., RAYNOR, P. & NIEUWENHUIJSEN, M. J. 2009. Tap water use amongst pregnant women in a multi-ethnic cohort. *Environmental Health,* 8, Suppl. 7.

SMITH, T. 1987. Assur Rehman's fish-and-chips shop, Cornwall Road, Manningham, Bradford, England [photograph]. *Destination Bradford: A century of immigration: Photographs and oral history.* Bradford: Bradford Heritage Recording Unit.

SOSKOLNE, V. & MANOR, O. 2010. Health inequalities in Israel: explanatory factors of socio-economic inequalities in self-rated health and limiting longstanding illness. *Health & Place,* 16, 242-251.

SPARRENBERGER, F., CICHELERO, F., ASCOLI, A., FONSECA, F., WEISS, G., BERWANGER, O., FUCHS, S., MOREIRA, L. & FUCHS, F. 2008. Does psychosocial stress cause hypertension? A systematic review of observational studies. *Journal of Human Hypertension,* 23, 12-19.

STAFFORD, M. & MARMOT, M. 2003. Neighbourhood deprivation and health: does it affect us all equally? *International Journal of Epidemiology,* 32, 357-366.

STAFFORD, M., DE SILVA, M., STANSFELD, S. & MARMOT, M. 2008a. Neighbourhood social capital and common mental disorder: testing the link in a general population sample. *Health & Place*, 14, 394-405.

STAFFORD, M., GIMENO, D. & MARMOT, M. G. 2008b. Neighbourhood characteristics and trajectories of health functioning: a multilevel prospective analysis. *European Journal of Public Health,* 18, 604-610.

STATACORP 2011. Stata Statistical Software: Release 12. College station, Texas: StataCorp LP.

Statistics Canada, 2003. *General Social Survey on Social Engagement*. Ottawa: Statistics Canada.

STEAD, M., MACASKILL, S., MACKINTOSH, A.-M., REECE, J. & EADIE, D. 2001. “It's as if you’re locked in”: qualitative explanations for area effects on smoking in disadvantaged communities. *Health & Place,* 7, 333-343.

STEIN, A.D. & LUMEY, L.H. 2000. The relationship between maternal and offspring birth weights after maternal prenatal famine exposure: the Dutch Famine Birth Cohort Study. *Human Biology*, 72, 641-654.

STEPHENS, C. 2008. Social capital in its place: using social theory to understand social capital and inequalities in health. *Social Science & Medicine,* 66, 1174-1184.

SUBRAMANIAN, S. V., KIM, D. J. & KAWACHI, I. 2002. Social trust and self-rated health in US communities: a multilevel analysis. *Journal of Urban Health,* 79, S21-34.

SUBRAMANIAN, S., LOCHNER, K. A. & KAWACHI, I. 2003. Neighborhood differences in social capital: a compositional artifact or a contextual construct? *Health & Place,* 9, 33-44.

SUN, X., REHNBERG, C. & MENG, Q. 2009. How are individual-level social capital and poverty associated with health equity? A study from two Chinese cities. *International Journal for Equity in Health,* 8, 2.

SUSSER, M. & SUSSER, E. 1996a. Choosing a future for epidemiology: I. Eras and paradigms. *American Journal of Public Health,* 86, 668-673.

SUSSER, M. & SUSSER, E. 1996b. Choosing a future for epidemiology: II. From black box to Chinese boxes and eco-epidemiology. *American Journal of Public Health,* 86, 674-677.

SZRETER, S. & WOOLCOCK, M. 2004. Health by association? Social capital, social theory, and the political economy of public health. *International Journal of Epidemiology,* 33, 650-667.

TAKAKURA, M. 2011. Does social trust at school affect students’ smoking and drinking behavior in Japan? *Social Science & Medicine,* 72, 299-306.

TEITLER, J. O., REICHMAN, N. E., NEPOMNYASCHY, L. & MARTINSON, M. 2007. A Cross-National Comparison of Racial and Ethnic Disparities in Low Birth Weight in the United States and England. *Pediatrics,* 120, e1182-e1189.

TESKE, R. H. C., JR. & NELSON, B. H. 1974. Acculturation and Assimilation: A Clarification. *American Ethnologist,* 1, 351-367.

THOITS, P. A. 2010. Stress and health: major findings and policy implications. *Journal of Health and Social Behavior,* 51, Suppl. 41-53.

THOMAS, C., NIGHTINGALE, C. M., DONIN, A. S., RUDNICKA, A. R., OWEN, C. G., SATTAR, N., COOK, D. G. & WHINCUP, P. H. 2012. Socio-economic position and type 2 diabetes risk factors: patterns in UK children of South Asian, black African-Caribbean and white European origin. *PLoS One*, 7, e32619.

THOMAS, W. I., ZNANIECKI, F. & ZARETSKY, E. 1996. *The Polish peasant in Europe and America: a classic work in immigration history.* Champaign: University of Illinois Press.

TORRES, S.J. & NOWSON, C.A. 2007. Relationship between stress, eating behavior, and obesity. *Nutrition*, 23, 887-894.

TOWNSEND, P., DAVIDSON, N. & WHITEHEAD, M. 1992. *Inequalities in health: The Black Report and the health divide.* London: Penguin Books.

TROE, E.-J. W., RAAT, H., JADDOE, V. W., HOFMAN, A., STEEGERS, E. A., VERHULST, F. C., WITTEMAN, J. C. & MACKENBACH, J. P. 2008. Smoking during pregnancy in ethnic populations: the Generation R study. *Nicotine & Tobacco Research,* 10, 1373-1384.

TURRELL, G., KAVANAGH, A. & SUBRAMANIAN, S. V. 2006. Area variation in mortality in Tasmania (Australia): The contributions of socioeconomic disadvantage, social capital and geographic remoteness. *Health & Place,* 12, 291-305.

UPHOFF, E. P., PICKETT, K. E., CABIESES, B., SMALL, N. & WRIGHT, J. 2013. A systematic review of the relationships between social capital and socioeconomic inequalities in health: a contribution to understanding the psychosocial pathway of health inequalities. *International Journal for Equity in Health,* 12, 54.

USLANER, E. M. 2010. Segregation, mistrust and minorities. *Ethnicities*, 10, 415-434.

USLANER, E. M. 2011. Trust, Diversity, and Segregation in the United States and the United Kingdom. *Comparative Sociology,* 10, 221-247.

VAN DER WEL, K. A. 2007. Social capital and health - A multilevel analysis of 25 administrative districts in Oslo. *Norsk Epidemiologi*, 17, 71-78.

VAN DUYN, M. A., MCCRAE, T., WINGROVE, B. K., HENDERSON, K. M., BOYD, J. K., KAGAWA-SINGER, M., RAMIREZ, A. G., SCARINCI-SEARLES, I., WOLFF, L. S., PENALOSA, T. L. & MAIBACH, E. W. 2007. Adapting evidence-based strategies to increase physical activity among African Americans, Hispanics, Hmong, and Native Hawaiians: a social marketing approach. *Preventing Chronic Disease,* 4, A102.

VEENSTRA, G. 2005. Location, location, location: contextual and compositional health effects of social capital in British Columbia, Canada. *Social Science & Medicine,* 60, 2059-2071.

VELING, W., SUSSER, E., VAN OS, J., MACKENBACH, J., SELTEN, J.-P. & HOEK, H. 2008. Ethnic density of neighborhoods and incidence of psychotic disorders among immigrants. *American Journal of Psychiatry,* 165, 66-73.

VOGT YUAN, A. S. 2007. Racial composition of neighborhood and emotional well-being. *Sociological Spectrum,* 28, 105-129.

VON KRIES, R., TOSCHKE, A. M., KOLETZKO, B. & SLIKKER, W. 2002. Maternal smoking during pregnancy and childhood obesity. *American Journal of Epidemiology,* 156, 954-961.

WACQUANT, L. 2013. *Urban Outcasts: A Comparative Sociology of Advanced Marginality*. Cambridge: Polity Press.

WAKSCHLAG, L. S., PICKETT, K. E., COOK JR, E., BENOWITZ, N. L. & LEVENTHAL, B. L. 2002. Maternal smoking during pregnancy and severe antisocial behavior in offspring: a review. *American Journal of Public Health,* 92, 966-974.

WALTON, E. 2009. Residential segregation and birth weight among racial and ethnic minorities in the United States. *Journal of Health and Social Behavior,* 50, 427-442.

WARDLAW, T. M. 2004. *Low Birthweight: Country, regional and global estimates.* [Online]. New York: UNICEF, WHO. Available at: http://www.unicef.org/publications/index_24840.html [Accessed 14 January 2015].

WARNECKE, R. B., JOHNSON, T. P., CHÁVEZ, N., SUDMAN, S., O'ROURKE, D. P., LACEY, L. & HORM, J. 1997. Improving question wording in surveys of culturally diverse populations. *Annals of Epidemiology,* 7, 334-342.

WATERSTON, T., ALPERSTEIN, G. & STEWART BROWN, S. 2004. Social capital: a key factor in child health inequalities. *Archives of Disease in Childhood,* 89, 456-459.

WEBB, J., SCHIRATO, T. & DANAHER, G. 2002. *Understanding Bourdieu.* London: SAGE Publications.

WEST, J., LAWLOR, D. A., FAIRLEY, L., BHOPAL, R., CAMERON, N., MCKINNEY, P. A., SATTAR, N. & WRIGHT, J. 2013. UK-born Pakistani-origin infants are relatively more adipose than white British infants: findings from 8704 mother-offspring pairs in the Born-in-Bradford prospective birth cohort. *Journal of Epidemiology and Community Health,* 67, 544-551.

WEST, J., LAWLOR, D., FAIRLEY, L. & WRIGHT, J. 2011. Birth size differences between white and Pakistani origin infants by generation: results from the born in Bradford cohort study. *Journal of Epidemiology and Community Health,* 65, A217-A218.

WHITE, K. & BORRELL, L. N. 2005. Racial/ethnic neighborhood concentration and self-reported health in New York City. *Ethnicity & disease,* 16, 900-908.

WHITLEY, R., PRINCE, M., MCKENZIE, K. & STEWART, R. 2006. Exploring the ethnic density effect: a qualitative study of a London electoral ward. *International Journal of Social Psychiatry,* 52, 376-391.

WICKRAMA, K., NOH, S. & BRYANT, C. M. 2005. Racial differences in adolescent distress: Differential effects of the family and community for blacks and whites. *Journal of Community Psychology,* 33, 261-282.

WIGHT, R. G., ANESHENSEL, C. S., BOTTICELLO, A. L. & SEPÚLVEDA, J. E. 2005. A multilevel analysis of ethnic variation in depressive symptoms among adolescents in the United States. *Social Science & Medicine,* 60, 2073-2084.

WIGHT, R. G., CUMMINGS, J. R., KARLAMANGLA, A. S. & ANESHENSEL, C. S. 2009. Urban neighborhood context and change in depressive symptoms in late life. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences,* 64, 247-251.

WILCOX, A. J. 2001. On the importance—and the unimportance—of birthweight. *International Journal of Epidemiology,* 30, 1233-1241.

WILKINSON, R. G. & MARMOT, M. 2003. *Social determinants of health. The solid facts.* 2 ed. Copenhagen: WHO Regional Office for Europe.

WILKINSON, R. G. & PICKETT, K. E. 2006. Income inequality and population health: a review and explanation of the evidence. *Social Science & Medicine,* 62, 1768-1784.

WILKINSON, R. G. & PICKETT, K. E. 2007. The problems of relative deprivation: why some societies do better than others. *Social Science & Medicine,* 65, 1965-78.

WILKINSON, R. G. & PICKETT, K. E. 2009. *The spirit level: why more equal societies almost always do better.* London: Allen Lane.

WIRTH, 1928. *The Ghetto*, Chicago: Phoenix.

World Bank, 2012. *Social Capital Assessment Tool.* Washington DC: World Bank.

WRIGHT, J., SMALL, N., RAYNOR, P., TUFFNELL, D., BHOPAL, R., CAMERON, N., FAIRLEY, L., LAWLOR, D. A., PARSLOW, R., PETHERICK, E. S., PICKETT, K. E., WAIBLINGER, D. & WEST, J. 2012. Cohort profile: The Born in Bradford multi-ethnic family cohort study. *International Journal of Epidemiology,* 42, 978-991.

XUE, Y., ZIMMERMAN, M. A. & CALDWELL, C. H. 2007. Neighborhood residence and cigarette smoking among urban youths: the protective role of prosocial activities. *American Journal of Public Health,* 97, 1865-1872.

YEN, I. H. & KAPLAN, G. A. 1999. Neighborhood social environment and risk of death: multilevel evidence from the Alameda County Study. *American Journal of Epidemiology,* 149, 898-907.

Yorkshire Voice, 2014. Residents feel unsafe in Bradford. *Yorkshire Voice.* [Online]. Available at: http://www.yorkshire-voice.com/survey-finds-bradford-is-britains-most-dangerous-city/ [Accessed 12 November 2014].

ZIERSCH, A. M., BAUM, F. E., MACDOUGALL, C. & PUTLAND, C. 2005. Neighbourhood life and social capital: the implications for health. *Social Science & Medicine,* 60, 71-86.

ZILANAWALA, A., DAVIS-KEAN, P., NAZROO, J., SACKER, A., SIMONTON, S. & KELLY, Y. 2014. Race/ethnic disparities in early childhood BMI, obesity and overweight in the United Kingdom and United States. *International Journal of Obesity.* (Accepted for publication 2 September 2014, Epub ahead of print).