How 'place' influences acute coronary syndrome outcome among older people? A mixed-method study.

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The candidate confirms that the work submitted is her own and that appropriate credit

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Abstract

The impact of acute coronary syndrome has been increasingly recognised since the introduction of the National Service Framework in 2000. Interest in the relationship between place of residence and health has grown although a sound conception of what place is and how the health of older people with acute coronary syndromes relates to where they live is lacking.

This thesis aims to understand the nature and effect of place in relation to health inequalities on daily lives for older people recently diagnosed with ACS.

An exploratory sequential mixed methodology was utilised across Yorkshire and Humber. This consisted of iterations of quantitative and qualitative data collection, analysis and data synthesis. The relationship between place and survival was first explored using secondary data analysis. In-depth experiences and perceptions of the dimensions of place effect and recovery from ACS were then explored using postal questionnaires at two times and qualitative interviews and community mapping discussions with ten participants.

Conceptual data synthesis was ongoing. This informed the development of the study and built a layered picture of place effect. A second iteration of secondary data analysis explored how representations of conceptual place effect were associated with survival rates.

Where a person lived effected how they dealt with changes created by ACS and their survival.

Conceptualisation of place was summarised from the synthesised data as: *place usability; personal connection to place; level of adjustment; perceived level of support; support;* and *population density.*

By developing the different interrelated layers of place effect, these findings enable future evaluation to be more representative of the impact ACS has on an older person's daily life within their place of residence.

Table of Contents

List of Figures

List of Tables

List of abbreviations

ACS: Acute coronary syndrome
CHD: Coronary heart disease
LSOA: Lower super output area
IMD: Index of multiple deprivation
CRF: Chronic renal failure
CCF: Congestive cardiac failure
MI: Myocardial infarction
SHA: *Strategic Health Authority*
STEMI: ST Segment Elevation Myocardial Infarction
NSTEMI: non-ST segment elevation myocardial infarction
MAR: Missing at random
MCAR: Missing completely at random
MNAR: Missing not at random

Terminology

ACE inhibitors: This group of drugs causes dilation of blood vessels, which results in lower blood pressure

Acute coronary syndrome (ACS): refers to any group of symptoms attributed to obstruction of the coronary arteries.

All-subset selection: The most careful selection procedure is the all possible models procedure in which all possible models are fitted to the data, and the selection criterion is used on all the models in order to find the model which is preferable to all others

Backwards elimination: This statistical modelling strategy starts with a full set of predictor variables and removes one at a time.

Beta blockers: Beta blockers are a class of drugs that target the beta receptor found within the sympathetic nervous system

Cardiac rehabilitation course: Cardiac rehabilitation (rehab) is a medically supervised program that helps improve the health and well-being of people who have heart problems.

Censored: Censoring occurs when the value of a measurement or observation is only partially known

Chronic renal failure (CRF): Progressive loss in renal function over a period of months or years.

Clustering: A number of things of the same kind, growing or held together; a bunch

Compositional: Compositional explanations draw our attention to the characteristics of individuals concentrated in particular places (Macintyre *et al*, 2002)

Contextual: Contextual explanations draw our attention to opportunity structures in the local physical and social environment collective explanations draw our attention to socio-cultural and historical features of communities (Macintyre *et al*, 2002)

Factorability: One of two or more numbers, algebraic expressions, or the like, that when multiplied together produce a given product; a divisor

Forward selection: This statistical modelling strategy starts with the null model and adds one predictor variable at a time.

Fraction of missing information (FMI): The proportional of data missing within variable of interest

Missing at random: Values that are missing from a dataset with no discernible pattern

Missing data: Data values that are not present within a dataset

Mixed methods research: The collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone (Creswell and Clark, 2007).

Paradigm: A framework containing the basic assumptions, ways of thinking, and methodology that are commonly accepted by members of a scientific community.

Proportional hazards: Hazard rates that are constant within the time period of interest

Reperfusion: Is medical treatment that restores blood flow through blocked arteries, typically after a myocardial infarction

Social support: The interactive process in which emotional, instrumental or financial aid is obtained from one's social environment.

Statin: Any of a class of drugs that reduce the levels of lipids in the blood by altering the enzyme activity in the liver that produces lipids: used in the prevention and treatment of heart disease

Survival rate: Indicating the percentage of people in a study or treatment group who are alive for a given period of time after diagnosis

Troponin level: Level of protein of muscle tissue that binds calcium ions and is involved in contraction

Wald test: Whenever a relationship within or between data items can be expressed as a statistical model with parameters to be estimated from a sample, the Wald test can be used to test the true value of the parameter based on the sample estimate.

Chapter 1:   Introduction to the study

This chapter establishes the research parameters within this thesis. To develop the research aim and objectives discussed within section 1.2, variations between characteristics of people with acute coronary syndrome (ACS) are first explored (section 1.1). This exploration determined the principal areas of focus: people diagnosed with ACS, of older age and place effect within Yorkshire and Humber. Section 1.3 outlines how each chapter in this thesis contributes to fulfilling the research aim.

The principal areas of focus are developed using a narrative literature review in Chapter 2. This review leads to the employment of an exploratory mixed methodology, with the primary interest as the effect of place on older people with ACS.

1.1 Introduction to inequality in acute coronary syndrome

Acute coronary syndrome (ACS) entails an obstacle within a coronary artery that results in an acute event, such as a myocardial infarction (MI) or acute angina. ACS is a form of coronary heart disease (CHD), where the heart or blood vessels are diseased.

Over 12 months in 2009/2010, acute coronary syndrome (ACS) precipitated 150,802 hospitalisations in the UK. The consequences were increased disability and over 33,000 deaths (Wilson, 2011). ACS increased disability to the tune of 327,000 adjusted life years. This reduced quality of life and may have been a financial burden on the individual, as well as the health economy.

Age-standardized rates of CHD have on average decreased by 2% per year; this was consistent for men and women of all age groups between 1996 and 2005 (Davies, 2007). Around half of this decline has been attributed to lower incidence of CHD and half to reduced short-term mortality rates.

Why these improvements occurred is discussed within this section. This explores whether changes in treatment, policy, and outcome were distributed equally throughout the population.

1.1.1   ACS and policy

ACS constitutes a large proportion of the total healthcare expenditure of Western European economies (Taylor *et al.*, 2007). ACS costs the UK £3.6 billion annually due to direct healthcare expenditure and economic losses (Wilson, 2011).

Before March 2000, the importance of cardiac health was underrepresented in England. This changed following the publication of the National Service Framework (NSF) for Coronary Heart

Disease (Department of Health, 2000). The NSF aimed to improve prevention, treatment and diagnosis of CHD, with the focus on higher quality health services. This ten-year programme was implemented after CHD was identified as a common cause of mortality that was unequally geographically distributed.

> For far too long it was accepted that NHS treatment and care would be better in some parts of the country than in others – not any more. We are determined to make sure that, in future, people in every part of our country can get the top quality treatment and care they need…. National Service Frameworks set out plans, based on the evidence of what works best, to ensure that in future these standards of care are available to everyone.   (Department of Health, 2000, p.2)

The national goal of the NSF – to reduce the incidence of CHD and mortality rates – was achieved. Mortality reduced by two-fifths by 2010 for people younger than 75 years (Levene *et al.*, 2010). In England, CHD accounted for 15% of all deaths, despite the 43% fall in mortality rates between 2000 and 2010. England still has higher levels of avoidable mortality than many other countries.

This reduction had strong persistent regional inequalities across England (Davies, 2007). Prevention methods, treatment and rehabilitation varied across age, gender and geographical region throughout 2002 to 2010 (Smolina *et al.*, 2012). This may reflect unwarranted differences in access to and utilisation of health services within England (Gregory, Dixon and Ham*,* 2012; NHS Right Care, 2011).

1.1.2   Place and ACS

The introduction of the NSF has greatly reduced incidences of and mortality from CHD and ACS. Throughout this time period since 2000, there has been an imbalance of CHD across place. Gradients of area inequality have persisted or worsened in the UK between 1999 and 2007 (Pearson-Stuttard *et al.*, 2012, Lawlor, Smith and Ebrahim, 2005). This has led to increased relative area inequality. Bajekal *et al.* (2013) have suggested that small area analysis could help identify the reasons for this inequality.

Understanding place inequality has become important, in part due to the reduction of time spent within hospital. This shorter hospitalisation period for people with ACS, seen between 1975 and 2005, (Floyd, 2009) leads to recovery taking place at or closer to home.

Summary measures are commonly used as ways to represent place; for example, deprivation indices can characterise aspects related to area such as level of poverty, material deprivation, and standard of living. The advantages and disadvantages of such measurements are discussed within the next chapter (section 2.5.2).

Living within areas of high deprivation has been clearly associated with increased incidence of CHD for people with CHD of a working age. Adverse Carstairs deprivation (a measure of area level socio-economic deprivation; Carstairs and Morris, 1989) was associated with increased incidence of CHD. This was present after the consideration of personal level characteristics (Lawlor, Smith and Ebrahim, 2005).

Similarly, living in areas of high material deprivation (Townsend deprivation score) was associated with higher CHD mortality, followed for up to 13 years in Plymouth. This suggests that area deprivation inequality is present despite a universal health care system (Janghobani *et al.*, 2006). Similar findings were found within a Swedish study. Low area-level economic status was associated with poorer three-year survival (Engstrom and Goransson, 2000).

There is evidence in the literature that summary measures of place may not capture the whole phenomenon. Allender *et al*. (2012) show the importance of the relative location of the small area in which someone with CHD lives. For example, living within an area of high deprivation that is surrounded by areas of low deprivation is associated with lower CHD mortality. This was in comparison to living within homogeneous local areas. The impact of heterogeneity holds true for areas of low deprivation. This suggests that small area deprivation inequality affects the mortality rate of the individual.

Personal level characteristics such as age have also affected the outcome from ACS (Rosengren, 2006).

MacIntyre, Ellaway and Cummins (2002) asserted that both personal level (compositional) and area level (contextual) features make up an environment. The compositional features draw on individual characteristics concentrated within the same area. The contextual features draw on the physical, social, historical and cultural aspects of the location, and the community within it. MacIntyre, Ellaway and Cummins (2002) later argue that it may not be appropriate to analyse these two features separately.

Analysing compositional or contextual features without much consideration of the other is commonplace. For example, epidemiology studies often model place effect while taking into account variations in baseline compositional characteristics. Lawlor, Smith and Ebrahim (2005) report a 27% greater risk of CHD for people living in areas of above median deprivation level.

Lawlor's model provides insight into contextual effects and considers personal level characteristics. Interlinking relationships between contextual and compositional features were not explored.

How the relationship between contextual and compositional features should be conceptualised is unclear. There is a lack of adequate conceptualisation, operationalisation, and measurement of overall 'place effects', and the effect of place on health (MacIntyre, Ellaway and Cummins, 2002).

1.1.3 Aging and ACS

Life expectancies and the general age of the population have been increasing, particularly among the 'oldest-old' (over 85 years). Alongside this, there has been an increase in the proportion of older people with ACS (Rosengren, 2006).

Between 2002 and 2010, 73% of ACS deaths occurred in people over the age of 65 (Smolina *et al.,* 2012). This mortality rate for older people was disproportionately high. Around 50% of people aged over 85 died from ACS. Death rates were consistent across ACS type (Rosengren, 2006).

Older people are at higher risk of recurrent CHD and mortality. Despite this, older people have less access to health services (Ramsay, Whincup and Morris, 2006). The management of ACS is unequal across different age ranges. Older people are less likely to receive emergency treatment or evidence-based therapy (Gale *et al.,* 2012; Avezum *et al.,* 2004).

Co-morbidities are more common with older people (over 65 years). These include previous angina, transient ischemic attack/stroke, congestive heart failure and hypertension (Avezum *et al.,* 2004).

Older people have stronger ties to their neighbourhoods, with long-standing relationships with the people locally and the area itself. These ties are often built up over a long period of residence (Smith A., 2009; Yen, Michael and Perdue, 2009). Despite this clear association, there has been very little research into how neighbourhood area relates to older people with ACS. This increases the importance of understanding how place affects older people with ACS.

Older people differ from younger people with ACS in number and type of incidence, treatment, access to resources, co-morbidities, connection of neighbourhood and outcomes such as mortality. These differences suggest more treatment that is complex and more challenging experiences of ACS for older people. In the majority of the literature on ACS, place effect either is based on a working age population, or does not consider these variations by age.

Literature that is available around place and older people focuses mainly on lifestyle changes for women. For example, older women (over 60 years) who live in an area of low economic status are more likely to have CHD (Lawlor, Smith and Ebrahim, 2005). Crane (2005) suggests that older women with ACS have increased fatigue. Very little literature is available that explores how place affects older men and women differently.

1.1.4   Study location

This study is located within the strategic health authority (SHA) of Yorkshire and Humber (Figure 1.1). This region is made up of large metropolitan cities, sub-urban and rural areas. Yorkshire and Humber is the fifth largest of the ten SHAs that cover England. It had a population of 5.3 million in mid-2011, accounting for 10% of the UK population (Office for National Statistics (ONS), 2013). The age range, BMI, cholesterol level, population density, and proportion of men to women are similar to the rest of England. Alcohol consumption was higher (Table 1.1 on the next page).
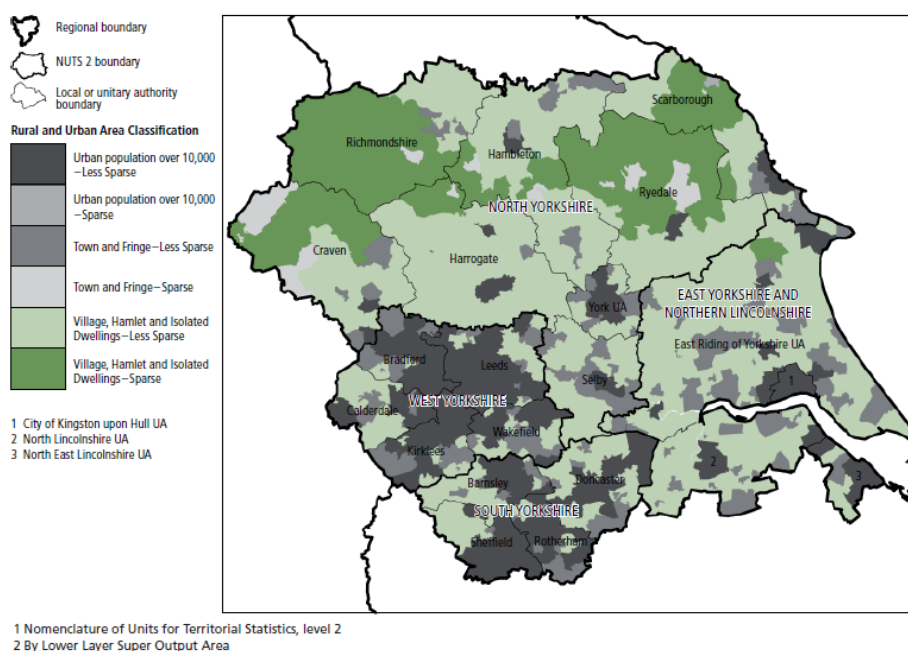
Figure 1.1: Yorkshire and Humber: local or unitary authority, sub-regions and urban/rural classifications (Kay, 2009)

North Yorkshire has strong agricultural production and two National Parks. Eastern Yorkshire and Northern Lincolnshire contain a large part of the manufacturing industry. West Yorkshire is the most densely populated sub-region with 2.2 million residents (40% of the total) with an area of 2,000 square km and is the region's greatest economic contributor. South Yorkshire is the

second most densely populated with 1.3 million residents. Coal mining and steel production were the main forms of industry. These reduced greatly in the late 20th century (Kay, 2009).

This region provides the opportunity to analyse small place differences without the added complexity of cross-regional variations.
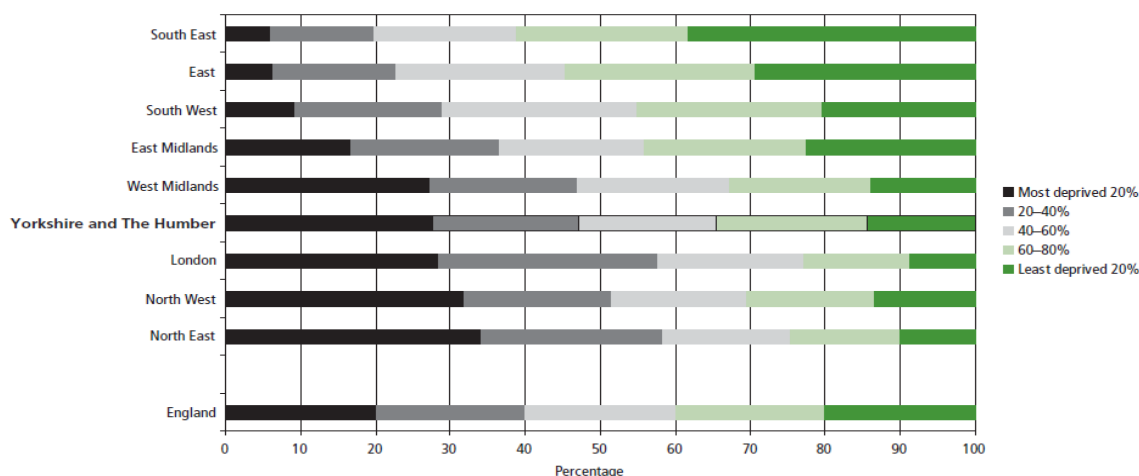
Figure 1.2: Distribution of LSOA rankings on the 2007 index of multiple deprivation (IMD) by region (Kay, 2009)

Table 1.1: Comparison statistics across England with Yorkshire and Humber (Townsend *et al.,* 2012)

	England	Yorkshire and Humber
Gender	49.2% men, 50.1% women	49.2% men, 50.1% women
Mean age	39	39
Average life expectancy	*81.7 women, 77.5 men*	*81.1 women, 76.9 men*
Percentage of the population 65 years and older	16.3%	16.6%
Average BMI greater than or equal to 25	67.8% men, 57.8% women	68% men, 61% women
High cholesterol (≥5.0 mmol/l)	57.8 men, 61.1 women	58 men, 61 women
Average weekly consumption of units alcohol	15.8	18.4
Age-standardized all-cause mortality rates per 100,000	809	866
Incidence of ACS per 100,000 in 2010	110.9	123
Age-standardised death from CHD per 100,000 in 2010	53 men, 15 women	61 men, 20 women
Age-standardised death from ACS per 100,000 in 2010	27.9	34.7
Average available hospital beds per 100,000 population	3.5	3.6

Yorkshire and Humber has twice as many areas within the top 20% level of deprivation in comparison to the rest of the country (Noble *et al.,* 2007). These small areas are classified as lower super output areas (LSOAs). Figure 1.2 on the previous page shows the distribution of deprivation by region within England. Yorkshire and Humber is shown to have a high level of deprivation in comparison to England as a whole.

Yorkshire and Humber has a high number of deprived LSOAs, incidence of and mortality from ACS in comparison to England as a whole (Department of Health, 2000) (Table 1.1 on the previous page).

Within this study, Yorkshire and Humber is used as a critical case sample (a critical case sample is a dramatic representation of the place of interest). This case is strategically chosen, using the theory 'if we understand why ACS is greater here, then the same should apply to other areas' (Patton, 1990). This form of sampling is especially useful within exploratory studies using a single site. This makes is appropriate for this study.

1.2 Development of research aims and objectives

Interest in place effect developed from a previous secondary data analysis study. This investigated short-term mortality for people with ACS. A key finding was the identification of a large 30-day mortality rate inequality between admission hospitals.

This large variation was still present after differences in clinical aspects, such as treatment, and personal characteristics, such as age, were considered. Differences in hospital treatment and the characteristics of people admitted were not sufficient to explain the variations between short-term mortality rates. To understand this difference, further exploration into the person's life was warranted, as the variation by hospital was large and unexplained specific focus was placed on where people lived.

The formation of the study research aim was based on this starting point and an initial exploration of the literature (section 1.1).

The NSF introduced in 2000 reduced incidence and mortality from ACS (Levene *et al.,* 2010). Evidence suggests this has increased place and age inequality. The NSF focus was clinical and therefore did not address place inequality (Davies, 2007).

Age inequality, especially in secondary prevention, was present. Place effect for older people with ACS is under-researched, especially for men. This led to the focus of this study being on both men and women over the age of 65 with ACS.

Much of the literature available on place effect analyses the locality and the people living within it as distinct entities. The overall 'place effect' is more difficult to represent. This led to the requirement for a flexible methodological mixed method approach for this study.

This mixed method approach is built in three parts: 1) how place and its attributes are associated with survival is explored using a quantitative approach, based on a representative sample of the population; 2) questionnaires across different time points were formulated to gain an overall picture of place, its influence and how it is perceived over the recovery period; 3) in-depth insight is gained using a qualitative approach. The aim is to investigate why and how place affects older people with ACS. This iterative exploration aimed to form an operational definition of overall place effect.

1.2.1 Research aim

The fact that the variation in ACS health outcome was not explained by personal characteristics, prior risk factors or clinical aspects led to this exploratory study into the significance of place for older people with ACS. From the current gaps in the available literature, the overall aim of the study was developed.

Research aim: To understand the influence of place on the outcome of ACS for people aged 65 years and above living within Yorkshire and Humber, in the North of England. Particular focus will be put on those characteristics of place that are associated with outcome.

Chapter 2 discusses available literature that is relevant to this research aim. The research objectives on which this study is based on are then formulated from the gaps uncovered within this search. These are presented in section 2.6.

1.3 Structure of Thesis

The research aim and objectives form the bases on which this study is structured.

The thesis starts with an expansion of the narrative review conducted in this chapter. Chapter 2 explores the available literature from a variety of methodological approaches; this literature is focused around the research aim and objectives. The review aimed to identify key components of both contextual and compositional influences on older people with ACS. This current knowledge base was then used to build the rationale for the proposed research and develop the research questions used to achieve the research aim.

The research questions reiterate the exploratory nature of this study. A single-paradigm approach was not deemed feasible, lacking the flexibility needed to explore layers of place

effect on ACS. Chapter 3 introduces the empirical and conceptual bases of the mixed method approach on which the thesis is based, using the knowledge base developed in Chapter 2 to underpin the construction and development of the frameworks.

Chapter 4 explores ways of measuring place effect, and place-effect associations with survival from ACS at six months. This chapter develops the epidemiological phase of the research design, aims, and analytical framework, presenting how each stage progresses based on the previously formed insight.

Chapter 5 presents the epidemiological phase results. This explores area deprivation and then more specific locality features in terms of six-month survival from ACS. The aim was to understand differences in place and how they related to ACS outcome, and to consider the differences in people who happened to live within certain locality types.

The ways in which perceptions and experiences of ACS can be measured are discussed in Chapter 6. The aim was to understand why and how place affects a person's recovery trajectory. The chapter outlines the progressive development of the second phase of the study. This discusses the research design, chosen methodologies, their strengths and weaknesses, and the analytical framework used to achieve the research questions. The final part of the chapter discusses the pathway used to draw out findings from the overarching integration of the data collected and the conclusions drawn throughout the thesis.

Chapter 7 discusses the questionnaire findings. These are used to survey ACS place effect over time. They provide a broad overview of the recovery period, what is seen to have influence, how neighbourhoods are perceived relative to level of deprivation, the impact that ACS has on lifestyle, and effect on general well-being.

Chapter 8 explores personal experience, using interviews and community mapping. The aim was to develop understanding of what is perceived as recovery, and this relates to the physical aspects and social ties of the local neighbourhood and community. The chapter presents palpable individual insight. Explorations are made of the sources of available support and whether it is important, of physical and emotional barriers to the local neighbourhood, and of the importance of having a neighbourhood to which a personal connection is felt.

Chapter 9 synthesises the data collected and conclusions drawn throughout the thesis. This forms a layered picture of place effect, the perception of place effect and why place is seen to have this effect. The chapter further explores how these are associated with the ACS outcome. The main focus is to answer the research questions. The usefulness and meaning behind the representation of different concepts, such as ACS outcome and place, are also discussed. This

chapter shows the benefits of using a mixed method approach. The insight formed would not have been achieved using a single paradigm approach.

The data synthesis forms a set of concepts that are used to sum up what aspects of place affect older people with ACS. These are used within the development of a second iteration of the epidemiological phase. This explores how the concepts of place effect are associated with survival at six months for older people with ACS.

Chapter 10 presents the key contributions and recommendations. The strengths and limitations of the study on which these are based are also discussed.

Chapter 2: Nature of epidemiology and experiences of ACS outcome

2.1 Overview of the narrative literature review

Diana Ridley (2012) introduces the literature review as:

> Where you identify the theories and previous research which have influenced your choice of research topic and the methodology you are choosing to adopt. You can use the literature to support your identification of a problem to research and to illustrate that there is a gap in previous research which needs to be filled. The literature review, therefore, serves as the driving force and jumping-off point for your own research investigation.
>
> (Ridley, 2012, p.3)

The relevant literature around the areas of 'place and health', 'the impact of ACS' and 'place and the impact of ACS' were evaluated to increase knowledge and understanding of the methodologies used. The broad nature of the research topic covered an extensive range of literature, making a systematic review impossible – and inappropriate given the exploratory nature of the study. A narrative review enabled an exploratory, flexible approach to be taken that was more fitting to the research aim.

Published literature was searched using the following electronic databases: *British Medical Journal*; PubMed; Medline; Web of Science; SAGE. The general search engine Google Scholar was used to carry out a large portion of the internet searches. Searches were repeated throughout the doctoral research period between September 2009 and September 2013 to remain up to date with the literature.

The search terms used to identify relevant literature included combinations of: 'Place' OR 'neighbourhood' OR 'area'; 'ACS' OR 'Acute coronary syndrome 'OR 'heart attack' OR 'coronary' OR 'cardiac' OR 'CHD' OR 'heart disease'; 'older people' OR 'elderly' OR 'over 65' OR 'aged'; 'recovery' OR 'outcome' OR 'survival' OR 'mortality'.

Several thousand potentially relevant citations were identified. The criteria for selection of articles, chapters and books were based around relevance to the research, location of the study within the UK (this was not always possible), the age of the study, and whether they were published within peer-reviewed journals. Key journals were also searched to increase coverage.

The chosen literature includes both qualitative and quantitative methodological approaches with a focus on ACS and the impact of place for older people.

Critical reading of the literature was essential. This entailed constant questioning of: the evidence presented in the literature in relation to its aims; the strength of the methodology, the findings and the way that conclusions were drawn; and the implicit assumptions made about shared beliefs. Articles by Martyn Hammersley (2007) and Diana Ridley (2012) were used as guidelines for this process. Below is a description of the different types of literature considered within this review and why.

Chapter 1 briefly outlines the rationale behind the study. This chapter will consider the literature within the field of place and ACS, with specific focus on the small amount of literature relating to older people. The literature review begins with the background literature around the importance of place with a focus on the impact on health (section 2.2), locating where this study fits with the research that already exists. This is followed by a review of literature that explores ACS, risk factors for ACS and the impact that ACS has on a person's life, including related lifestyle changes (section 2.3). Literature around the two foci of this thesis – ACS and place – are discussed and evaluated within section 2.4, with specific focus on older people. Then section 2.5 discusses the historic context discussed throughout this literature review, setting out a conceptual framework on which this study is based, and then discusses the methodological issues that have been identified within the literature. Finally, section 2.6 pulls together the gaps within the literature that this study aims to fill, and the methodological issues that it aims to explore within the research questions.

Literature

Literature from a variety of different disciplines and methodological approaches was used, due to the broad nature of the research aim.

Epidemiological literature, based mainly around quantitative studies, provided research on overall trends within the population around place, health and ACS. The relevant literature available tends to focus on preventative intervention and improvements in ACS treatments (Beard *et al.,* 2008).

Area deprivation and the built environment have been the focus of much of the epidemiological literature on place. Little attention has been given to the social environment. This led to the exploration of literature not relating to people with ACS. Place effect literature also tends to be

based on a working age population, although over 54% of people with ACS are over 65 years old (Rosengren *et al.,* 2006).

Systematic reviews of the literature draw together, and critically review, a large number of research findings. These are used to draw together the historical background and wider context in which this study is placed. Systematic reviews are formed with a specific research question to answer from the data already available. This limits the relevance that it holds for this study.

Qualitative literature is used to form a different understanding of how place affects people with ACS. It uses in-depth focused information to form understanding around the personal experiences of people with ACS, with specific focus on the effect of place, and helps to build up the layers of *how* and *why* place affects the experiences of people with ACS (Charmaz, 2006).

Relevant qualitative literature has greater focus on older people than the quantitative literature. However, the majority of the research has been based on a working age population. Qualitative literature has greater focus on women than men, especially when analysing older people. Much of the literature on ACS experience is at an individual level, with less available neighbourhood or community level research. This is especially the case for research on social support, which is primarily related to support from spouses.

Qualitative literature is often based on personal perceptions. This is a subjective assessment of the situation and does not necessarily reflect what is actually occurring; it provides access to emotions and reflects on the experience of ACS. However, perceptions can be influenced by the general state of health, and by physical or mental well-being at the time of the assessment (Berkman, 1984; Oxman, Freeman and Manheimer, 1995). This can make the analysis difficult. The author of the research is relied upon to maintain integrity, and to be open and honest about his or her own findings.

2.2 The importance of place in health research

This section discusses the wider context and complexities in research on place and health.

Only since the 1990s has research into the impact of social and physical place on health been conducted (MacIntyre and Ellaway, 2000). Since then, there has been increased interest in the role of place in a person's experience and the effect on health of where a person lives.

Understanding place inequality in health is important for targeting public health interventions (Pickett and Pearl, 2001). This increased interest in the importance of place has been reflected by policy makers within the UK. Most recently, the UK coalition government aimed to reinvent

the concept of 'localism' and citizen participation with the 'big society' programme (Bailey and Pill, 2011). The fundamental shift since 2010 has been towards a philosophy of 'self-help' and relying on volunteers to support people within the local neighbourhood.

One of the first systematic reviews of place and health literature was by Pickett and Pearl (2001). The studies available were primarily exploratory epidemiology research and the literature used was published prior to 1998. This review shows the importance of neighbourhood effect on health across a variety of study designs, datasets, country of origin and quantifications of place and health. These population inequalities could not be accounted for by individual risk factors and therefore ecological factors need to be considered, including availability of resources, infrastructure deprivation, attitudes towards health and health related behaviours, and stress and lack of social support. This paper indicates that further research is needed to understand neighbourhood, neighbourhood boundaries, and greater understanding of causal relationships of place, suggesting that qualitative ethnographic research would provide insight into this. This paper also draws attention to some of the methodological problems within quantitative modelling around the ecological fallacy and large variations in defining place, geographical boundaries and health that are still being grappled with today. These differences in how place is represented make comparisons between studies more difficult and are discussed in greater detail below (section 2.5.2).

Within a more recent literature review of neighbourhood effect on health research, similar methodological issues have been identified (Schaefer-McDaniel *et al.*, 2010). This paper suggests that there are wide variations in how neighbourhood is defined, observed and analysed.

The findings of other recent studies into place and health literature have similarly an association between place and health (Cummins *et al.*, 2005; Riva *et al.*, 2007; Meijer *et al.*, 2012). Riva *et al.* (2007) uses 86 studies published between 1998 and 2005 to explore the relationship between area and self-rated health. Variation in health was consistently found to be associated with area context, independent of personal level characteristics. The same methodological issues around variations in how place and health are measured, and the size of the spatial scale of place, were identified.

Meijer *et al.* (2012) reviews and conducts meta-analysis on 18 studies published between 1997 and 2007. The findings correspond to those within previous reviews, suggesting that people who live within areas with levels of higher socio-economic status have higher mortality rates.

This review also found that income inequality or social capital on the neighbourhood level was not clearly associated with mortality rates.

Within this field, a surprisingly small amount of research has specifically focused on older people. This research is particularly important within an aging population such as that within the UK (Stewart *et al.*, 2003). Older people are more likely to have decreased mobility and therefore are more influenced by their neighbourhood (Yen *et al.*, 2009). Yen reviews 33 quantitative studies published between 1997 and 2007, concluding that neighbourhood environment was an important factor for health and the ability to function for older adults (55 and older). Yen acknowledges that the evidence presented is limited, as assessment measurements are not specifically designed for older people, suggesting the need for understanding of neighbourhoods and how to form suitable measurements for this age group. The study presented within this thesis aims to explore what within a neighbourhood influences older people, to expand upon the knowledge base available.

The built environment is seen to affect how a person ages healthily in a number of ways. Glass and Balfour (2003) put forward four important dimensions of place: socio-economic conditions; social interactions; physical aspects of place; and availability of services and resources. This suggests that how place affects older people's health is complex.

An American study suggested providing access to transportation, a strong community, and a well-designed place in terms of terrain, open spaces, safety and aesthetics (Kerr, Rosenberg and Frank, 2012). Despite the importance of place for older people, little improvement had been made to the built environment in order to support health and independence for older adults.

2.2.1   Summary

Research within this field has demonstrated that there is an association between place and health. However, the relevant literature is mainly quantitative and over the last twenty years the same methodological issues around how health and place are measured have been raised. If the measurements used are not relevant to the people living within the neighbourhood, especially when analysing older people, this reduces the power of the analysis and makes comparisons between studies difficult. For example, the measurement 'proportion of people who can drive within an area' may have a different implication for people living in urban rather than rural areas, and for older and younger people.

These methodological issues are explored within the specific literature on place and ACS below (section 2.4), and how they will be addressed within this study is discussed further in section 2.5.2.

2.3 The impact of acute coronary syndrome

In 2009, 117,319 people were hospitalised with ACS in England and Wales: 8% of these had to be readmitted within a month and 33,000 deaths were caused by ACS alone (Wilson, 2011). ACS and CHD are burdens on the people who experience them and the society in which they live.

ACS has a profound effect on the status of the individual, both psychological and physical (Sutherland and Jensen, 2000). Although research has been conducted into the risk factors and clinical aspects of this disease, ACS remains a traumatic and life-changing experience that affects everyone differently. This section provides context around ACS, how it is treated, its risk factors, and the consequences of suffering from ACS on a person's life.

2.3.1   Clinical presentation of ACS

ACS is caused by an obstacle within the coronary artery, which results in an acute event (Figure 2.1). The severity of the ACS is determined by the amount of blockage the obstacle causes, and the consequences of the reduced blood flow. This can result in severe pain, often causing a feeling of tightness within the centre of the chest. Other symptoms may include nausea, anxiety and feeling lightheaded (Marshall, 2011).
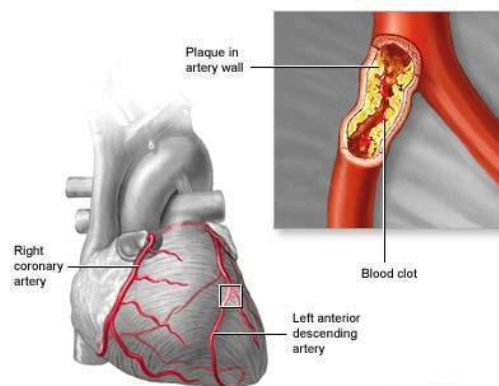
Figure 2.1: Pathogenesis of Acute Coronary Syndrome
(Bagong, 2013)

ACS comprises three categories:

a) *ST-elevation myocardial infarction (STEMI)*: this is a complete blockage of the coronary artery by a blood clot, which causes the death of the heart muscle supplied by this artery.

b) *Non ST-elevation myocardial infarction (NSTEMI)*: this is a partial blockage of the coronary artery by a blood clot.

c) *Other*: this includes patients with chest pain, unstable angina, threatened and unconfirmed myocardial infarction.

Symptoms of ACS vary with the severity of the condition and this can result in different levels of impact on a person's life and survival rate. For instance, people with a NSTEMI diagnosis have been found to have higher two-year mortality rates than those given a STEMI diagnosis (Terkelsen *et al.,* 2005).

2.3.2 Inequality in risk factors for incidence of ACS

Variations in incidences of ACS are discussed within this section. This section lays out the differences in risk factors present for incidence of ACS. These variations in when ACS occurs and how severe it is may affect how patients react, and their outcome.

The British Regional Heart study (Walker *et al.*, 2004) conducted between 1975 and 2004 states that some of the major risk factors for CHD are high cholesterol, high blood pressure and smoking. To reduce risk of CHD they suggest drinking less alcohol, maintaining a consistent weight and moderate levels of physical activity. Inequalities in the number of incidences are seen by geographical location, access to care and social differences.

Age is one of the major risk factors of ACS and CHD; as people age they are more likely to suffer an event (Sutherland and Jensen, 2000; Hirte *et al.,* 2008; Martin *et al.,* 2002), and less likely to survive (Engstrom and Goransson*,* 2000).

Differences in outcome by gender were also seen. Being a woman has been shown to have a protective effect for both incidences of, and two-year mortality from, ACS (Vaccarino *et al.,* 2001; Rosengren *et al.,* 2004). The strength of this protection was less for older age groups. However, in a study based on a working age population, women with ACS experienced greater reduction in functionality and activities, and higher levels of depression and anxiety, than men (Sutherland and Jensen, 2000). The likelihood of a person presenting with a certain form of ACS also varies by age and sex. For younger people the clinical presentation of ACS varied by gender. Younger women were less likely to present with an ST elevation, and more likely than younger men to have unstable angina. Little difference in the presentation of ACS was seen for older people (65 or greater). However, older people were seen to present more often with a diagnosis of NSTEMI than a STEMI in comparison with younger people, and were more likely to have co-morbidities and an overall higher mortality rate (Rosengren, 2006; Marshall, 2011). The

above evidence implies that age and gender have an intertwined effect on ACS. This interactive effect extends to mortality rates and recovery (Lacey and Walters, 2003; Falger, 2002).

Differences in ethnicity affect presentation of, and mortality from, ACS. For example, British Asian people are at higher risk of experiencing ACS in comparison with British White people (Champney *et al.*, 2009). British White people are more likely to present with less standard – or with silent – ACS symptoms; this could make an accurate diagnosis more difficult (Teoh *et al.*, 2007).

How healthy a person is, and co-morbidities, affect whether people suffer from ACS. Within the UK, around 16% of people with ACS are diabetic. People with diabetes have tended to present with NSTEMI and have more co-morbidities and higher mortality rates (Bakhai *et al.*, 2005). People with hypertension, which is more likely in older age, have more incidence of CHD (Roux *et al.,* 2001; Avezum *et al.,* 2004). Unhealthy diets, stress and low level of exercise are also associated with increased risk of, and reduced outcome from, ACS; the strength of this association reduces with increased age (Anand *et al.,* 2008). However, reductions in poor lifestyle have been seen to decrease the incidence of, and the number of deaths from, CHD in England (Unal *et al.,* 2004). For example, cutting back on or stopping smoking is associated with the greatest reduction in hospital admission rates and overall mortality (Pipe, Papadakis and Reid, 2010).

2.3.2.1   ACS treatments

A STEMI diagnosis requires intense treatment quickly. The most common treatment options are primary percutaneous coronary intervention (PPCI) or thrombolysis (reperfusion). These medical treatments restore blood flow through blocked arteries. PPCI has been seen to result in lower mortality rates than thrombolysis (Marshall, 2011). A NSTEMI diagnosis requires less immediate or intense treatment. The most common treatment is drug therapy, such as beta-blockers, statins and aspirin.

Treatment guidelines after leaving hospital suggested by the National Institute for Health and Care Excellence (NICE) (2010) include: information on ACS; follow-up arrangements; cardiac rehabilitation; management of cardiovascular risk factors; and drug therapy for secondary prevention.

Cardiac rehabilitation aims to optimise patients' functioning, enhance quality of life, and minimise the risk of recurrent cardiac events. Information is provided on making health lifestyle

changes and ACS management. In a study by Lane *et al.* (2001), rehabilitation courses were attended by 41% of those eligible.

       Inequality in treatment received

Geographical location has been seen to be the main factor in the differential management of ACS. For example, people living in deprived areas were less likely to attend a rehabilitation course (Lane *et al.*, 2001). Substantial differences in management of patients, including intervention treatment and drugs received were based on geographical location and hospital type (Fox *et al*., 2002). For example, admission to a teaching hospital increased the likelihood of receiving treatment

Inequality in the treatment received by men and women is also present. Women with ACS have received treatment less often than men, especially when they live in deprived areas (Lacey and Walters, 2003). Studies have shown that less aggressive secondary prevention drugs have been given to women than men; this gender bias was weaker for older people (Champney *et al.,* 2009; Bulgiardini *et al.,* 2010).

Older people received reperfusion less often than those younger than 60 years in 25 different countries; this was despite older people being more likely to have a STEMI diagnosis (Rosengren, 2006). They were also less likely to be treated by a cardiologist, receive evidence-based therapies or receive intense treatment (Avezum *et al.*, 2004). For example, Lavie and Milani (2004) found that women over the age of 75 were the least likely to be referred to and attend a cardiac rehabilitation course.

2.3.3   Summary

The management of ACS, including discussions of prognosis, medical decisions and allocation of resources are often based on systematic risk assessment models (Boersma *et al.,* 2000; Califf *et al.,* 2000; Eagle *et al.,* 2004). These models account for the variation in compositional features such as age and treatment received explored above. A large amount of unexplained variation remains within these models (Stafford and Marmot, 2003). This implies that there are other influences on whether a person has ACS and the outcome. This study explores potential contextual influences.

2.3.4   How ACS effects a person's life

The impact that ACS has on a person's life is discussed from the perspective of epidemiological and qualitative literature within this section. This provides background information on how

people with ACS survival and recovery, and the opportunity to look at differences in methodological approaches.

2.3.4.1   ACS survival

Quantitative analysis of ACS outcome requires health to be represented by a summary statistic. Survival, morbidity and hospital admissions are often-used outcomes. These measures are easy to calculate and are often pre-collected in large epidemiological databases. For example, the Office of National Statistics and the Hospital Episode Statistics system collect survival data (Office for National Statistics, 2013). Secondary data has the advantage of minor labour costs and expense. However, the context of secondary data is limited to what has already been collected.

Survival rates are one of the most common measures of ACS outcome. Data on the survival rates of a large sample of people offers the power to make theoretical generalisations about the general population. This is a meaningful and accepted quantification (Wen and Christakis, 2005; Tonne *et al.,* 2005). Survival analysis is used to analyse survival rates, uncovering information about the type of person who survives. Survival rates data encompass mortality status at endpoint, date of death and whether someone is lost to follow up (Parmer and Machin, 1995). Survival rates give the fullest picture of ACS outcome from the data available in this study.

2.3.4.2   ACS recovery

The qualitative literature is able to use in-depth personal perceptions of the experience of ACS to form an understanding about the meaning of recovery (Astin and Long, 2009). Recovery is seen to be a process over time that is unique to a person's perspective; this experience can be affected by both contextual and compositional factors.

Qualitative literature that explores ACS recovery is primarily based on women of all ages and conducted outside of the UK. Research that is specifically based on older people is less common. The most common qualitative tool used was interviews (Condon and McCarthy, 2006; Kristofferzon, Löfmark and Carlsson, 2007; Coyle, 2009). Interviews are used to investigate a person's physical and emotional state: a person's perceptions of his or her own situation are explored relative to his or her previous life.

The process of recovery presents a challenge to a person's well-being. These challenges are not limited to changes in physical health, but also affect emotional well-being. Bennett and Connell (1999) show that how a person reacts and copes after an acute coronary event is a dynamic process formed of: the impact of physical limitations; anxiety levels; coping responses; and

support available. Similarly Roebuck *et al.* (2001) found that an acute coronary event affects health-related quality of life in a number of ways: physical activity; insecurity; emotional reactions; lifestyle modifications; and healthcare concerns.

A dominant leitmotiv within the literature is a person's need to 'readjust their normality'. This can be seen as realising and accepting new limitations, while maintaining independence and control over lifestyles (Gallagher *et al.*, 2008; Brink *et al.*, 2006). For example, the ability to complete day-to-day activities after an acute coronary event was threatened by physical limitations and the fear of causing further harm. Moderations or redesigning of activities helped to make this adjustment, seen to take more than five months to accomplish. This was referred to as 'reorienting the active self' (Brink, Karlson and Hallberg, 2006). This concept moves beyond the challenges brought on by ACS to explore how an individual's life is changed and how they deal with these changes.

Adjusting to the new 'normality' and accepting the effect of a cardiac event have been explored in a variety of sources in the literature (Sutherland and Jensen, 2000; Tobin, 2000; Löfmark and Carlsson, 2005). This change was perceived as challenging, and led to anger, resentment, and bargaining. Accepting and adapting to new limitations can take a large amount of effort (Sutherland and Jensen, 2000). Sutherland and Jensen (2000) defined older women's adaptation as a 5-phase process of 'living with change'. These phases were ordered according to when they were experienced: searching for a diagnosis; being hit with reality; discovering the nature of change; adjusting to change; and moving on with the change. Each woman overcame the various challenges of managing uncertainty, being in control, making sense of the situation and claiming independence. These interviews were held within the city limits and the sample excluded older women living within more rural areas.

The motivation for reorientation of normality was a wish to continue living an independent life (Bergman and Bertero, 2003; Gallagher *et al.*, 2008). Kristofferzon *et al.* (2007) saw this as a 'striving for balance in daily life' by individuals facing the emotional and physical challenges presented to them with the resources they had available.

Based on the themes drawn out by Sutherland and Jensen (2000), and Condon and McCarthy (2006), the different aspects of recovery or 'readjustment to normality' are explored within the following five sections: managing uncertainty; influences of change; lifestyle changes; support from health professionals; and looking forward to the future.

Managing uncertainty

Fear and uncertainty caused sadness, depression and emotional liability across people aged 39 to 72 (Bergman and Bertero, 2003). Uncertainty manifests as the fear of a recurrent event, fear of death and lack of knowledge about one's disease (Kristofferzon, Löfmark and Carlsson, 2007). Being unable to undertake activities that had been previously taken for granted can be the greatest fear; for example, health problems may affect a woman's role as the family carer (Jackson *et al.,* 2000).

Jackson *et al.* (2000) found that fear and uncertainty were of short duration for both men and women. A few weeks after discharge from hospital, this fear subsided and health was expected to improve (Jackson *et al.,* 2000). Fear and uncertainty did not return a year after diagnosis (Bergman and Bertero, 2003).

Looking forward to the future

After the initial fear and uncertainty had subsided, people expressed hope for the future. People started to think about how best to cope with the disruptions and changes made to daily life (Condon and McCarthy, 2006; Sutherland and Jensen, 2000; Bergman and Bertero, 2003).

Improved emotional states were seen later on in recovery. People started to think positively and feel optimistic about their recovery and stopped living 'day-to-day'. Reflections were made about past experiences, which encouraged more fulfilled and healthier lives. Bergman and Bertero (2003) found that the experience of ACS put some people's lives into perspective and helped them to re-evaluate their life's priorities.

Influences of change

How people recover from ACS is challenged by everyday tasks, fatigue and co-morbidities. ACS can cause changes in day-to-day lives with negative effects for ongoing social interactions, and increasing feelings of isolation and depression. Adapting to changes can be difficult and an area of stress and frustration (Kristofferzon, Löfmark and Carlsson, 2007).

The motivation to make changes, both towards a more positive lifestyle and reorientation of normality, was affected by the perceived cause of ACS. In a study by Jensen and Petersson (2003), when ACS was attributed to un-modifiable factors such as psychosocial strains or genetics, lifestyle changes were considered irrelevant and unnecessary. Bergman and Bertero (2003) found that many people saw ACS as a warning or 'wake-up' call to improve their lifestyle. This led to the realisation that they had to take responsibility to improve their own health.

Gender differences were seen in how people went about making changes to their life (Brink, Karlson and Hallberg (2006). Older men tended to try to maintain their previous level of activities. This was often a challenge and activities were continued until men were unable to continue. Older women were more likely to make adjustments or reduce levels of activity in order to cope (Brink, Karlson and Hallberg, 2006).

Lifestyle changes

Recovery has been found to be enhanced by lifestyle changes, such as stopping smoking, eating a healthier diet and taking more exercise (Bergman and Bertero, 2001). Health professionals such as doctors and nurses suggest these changes. Smoking, stress, exercise, and diet were the most discussed lifestyle changes within the literature (Condon and McCarthy, 2006; Sutherland and Jensen, 2000).

The public health perspective (and whether people make lifestyle changes) has been a focus for ACS outcome within the literature. Condon and McCarthy (2006) used four themes to sum up how people with ACS perceived lifestyle changes: lifestyle warning signs; taking responsibility for lifestyle changes; professional support; and looking forward to the future. Available resources and support for people experiencing ACS (38 to 75 years old) and their family was highlighted as an area that needed development to encourage healthier lifestyles.

In a study by Bergman and Bertero (2003), a support system helped to achieve reorientation and achievement of positive lifestyle changes (Figure 2.2). This encouraged enjoyment from new and different lifestyle activities (Bergman and Bertero, 2003).
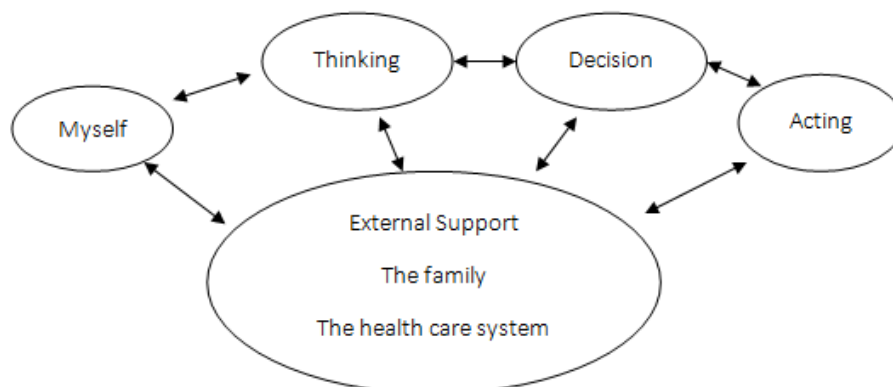
Figure 2.2: Informant's description of the prerequisites for lifestyle changes
(Bergman and Bertero, 2003)

Support from health professionals

Information about ACS and recovery is mainly received when in hospital. This is a time of confusion, stress and fear, and hence much of this information might be forgotten or not understood. It is important to have relevant information within the initial recovery period (Jackson *et al.,* 2000; Brink, Karlson and Hallberg, 2006). Many people find the information given by health professionals difficult to understand, which can cause stress (Berger *et al.,* 2008).

People who had been through a similar experience were often turned to as a source of information instead of health professionals (Bergman and Bertero, 2003).

Rehabilitation courses provide information and support during recovery; however, 30-60% of people with ACS do not attend these courses (Herber *et al.,* 2012). Bergman and Bertero (2001) suggest that successful rehabilitation consists of two factors: the personality of the individual patient and external support. Physical barriers such as the expense of transportation and access problems are reasons given for non-attendance, and these barriers are found to be especially a problem for older people. Not believing that the rehabilitation course would help has also reduced attendance; this emotional barrier meant that some people preferred to 'go it alone' (Jackson *et al.,* 2000; Jensen and Petersson, 2003).

2.3.5   Inequality as a risk factor for mortality from ACS

There have been clear trends in the reduction of mortality rates from ACS between 1993 and 2001 (Blackledge *et al.*, 2003). However, it is commonly accepted that people with certain characteristics are more likely to have worse outcomes from ACS. These have been verified within international studies and include: increased age; being male; having co-morbidities; history of heart failure or myocardial infarction; peripheral vascular disease; high systolic blood pressure; and insufficiently intense treatment (Blackledge *et al.*, 2003; Eagle *et al.*, 2004; Fox *et al.*, 2006; Gale *et al.*, 2012).

Lifestyle changes after an ACS diagnosis also affect how positive the outcome is. Chow *et al.* (2009) suggest that improvements in diet, exercise and smoking behaviour after ACS is associated with a lower risk of a recurrent event. ACS often leads to feelings of loss and dependence. Being able to make lifestyles changes, both to cope and to improve own health, is important to maintain a sense of control (Brink*,* Karlson and Hallberg*,* 2006). However, ACS health problems such as fatigue might increase the difficulty of making positive lifestyle changes, leading to loss of self-confidence (Sutherland and Jensen, 2000; Crane, 2005).

2.3.6　　　Summary

ACS is seen to affect a person's life span and their day-to-day experiences. There are inequalities present in the type of person who suffers from ACS, the treatment they receive and mortality rates. There are differences in a person's level of health, severity of ACS and treatment received that need to be considered when exploring their survival and recovery.

How the impact of ACS is measured is very different within epidemiology and qualitative literature. Survival and recovery are both related with how well a person with ACS is: however, recovery is seen to be the process of 'reorienting the self', while survival rates measure the overall outcome. The importance of these differences, and how this affects the study within this thesis, is discussed within section 2.5.2.

2.4 How place affects people with ACS

Epidemiological and qualitative literature that assesses potential influences of place on the health of people with ACS is discussed within this section. Specific focus is placed on older people; however, very limited research within this area exists. The aim was to identify the influence of contextual and geographical inequalities on people with ACS (MacIntyre, Ellaway and Cummins, 2002). Specific focus was put on the physical and social environment, due to the literature available.

2.4.1　　　Importance of place inequality for people with ACS

In England, the incidence of and mortality from CHD has reduced in recent years (Gale *et al.,* 2012). Within the same period, the imbalance of hospital admissions and CHD incidence across areas, in terms of deprivation, have persisted or worsened in the UK. This suggests a strong area-based inequality (Pearson-Stuttard *et al.,* 2012).

The greatest reduction in mortality from CHD in England was for people from the most affluent areas. This resulted in a reduction in absolute inequality. However, the speed of this reduction was faster within the least deprived areas. This resulted in an increase in relative inequality (Bajekal *et al.,* 2013).

Identifying and reducing locality differences should be of primary importance (Pearson-Stuttard *et al.,* 2012). Bajekal *et al.* (2013) suggest that analysis of small areas could provide valuable insight into why these inequalities exist.

2.4.2 Impact of place inequality on people with ACS

Evidence suggests that the effect of place, rather than just having a direct impact on the outcome, has an association with risk factors, number of incidents, treatment received, and outcome (Roux, 2003). Characteristics of 'places' exert an additional/independent effect over and above the characteristics of individuals living in those places (MacIntyre, Ellaway and Cummins, 2002).

The British Women's Heart and Health study shows geographical variations in the risk factors for cardiovascular disease (CVD), and secondary prevention measures (Lawlor *et al.*, 2003). This study shows the importance of place for older British women, of whom one fifth aged 60 to 79 have CVD. The same dataset is used to study area-level deprivation variation in incidence of CHD; this is seen over and above variations in personal characteristics (Lawlor *et al.*, 2005). These two studies analyse separately the same phenomenon from the two different viewpoints – compositional and contextual. It is felt that understanding the relationship between place and the people living within it is reduced because of this distinction within the analysis.

A study by Fox *et al.* (2002) uses the Global Registry of Acute Coronary Events (GRACE), with data collected across 14 countries, to explore management of patients in hospital and the resulting outcome. Geographical location and hospital type were seen to be substantial causes of this variation. This large-scale clinically based study analysis only considers the effect of hospital management on the outcome. The time period that does not involve clinical treatment is not considered.

Another example of treatment inequality by place is whether coronary revascularisation is received by British men. This is affected by personal level characteristics such as age and socio-economic status, and geographical location (Morris, 2005). Incidences of revascularisation were fewer for men aged 65 or more and those with manual occupations. Assessments were made in relation to: the number of cars a household possessed; the number of council tenants; residence outside southern England; and deprivation indices. The relevance of these indicators to older people is not discussed.

The substantive body of literature demonstrates the relationship between living within a disadvantaged place and less favourable outcome from a cardiac event (Huff and Gray, 2001; Chaix, 2009; Roux, 2003).

Area socio-economic status (SES) is the most widely used measure of place. This measure aims to capture the social and economic standing of the area, and hence the impact it has on the

people living there. Low SES is seen to be related to mortality and lower survival rates from ACS (Chaix *et al.*, 2007; Engstrom *et al.*, 2000).

Many studies have been developed to explore the link between overall place and ACS, with a main focus on risk factors and treatment variations. Less of the research that exists on how place influences the outcome of ACS considers both contextual and compositional factors. Studies within this area that specifically focus on older people are comparatively rare.

Relevant literature around the elements of place, built environment and social interactions are discussed within the next section. The aim is to explore what is known about how distinct aspects of place affect people with ACS.

2.4.2.1   Built local area

The built local area relates to the physical setting in which a person lives. This includes the buildings, streets, public transport, public spaces, available resources and area aesthetics (Chiax, 2009). There has been little attention given to individual aspects of place within epidemiological studies, and the built environment's effect on people with ACS is under-researched within the qualitative literature.

Distance to certain resources was seen to create a barrier to care, making them more difficult to use. Piette and Moos (1996) showed that living more than 20 miles from the admitting hospital decreased usage of ambulances and follow-up care, and was associated with increased mortality rates for people who had suffered a myocardial infarction in America. However it is unknown whether this is related to rural/urban differences, and how relevant it is to a country with a free National Health Service. Therefore, further exploration into distance to resources is explored within this study.

Epidemiological research into the effect of the built environment on people with ACS is centred on indices that measure lack of necessities (area-deprivation). These are combined measurements of whether an area lacks the necessities in society. Living within an area of high deprivation is seen to be associated with more adverse outcomes from coronary events (Winkleby *et al.,* 2007; Tonne *et al.,* 2005).

> Living in a deprived neighbourhood may have the most negative health effects on poorer individuals, possibly because they are more dependent on collective resources in the neighbourhood.   (Stafford and Marmot, 2003, p.1)

Living in an area of high deprivation, based on a variety of different measurements, within different countries, and across different timeframes, is associated with increased incidence of, and higher mortality rate from, coronary events (Morrison *et al.*, 1997; Lawlor *et al.*, 2005; Saxena *et al.,* 2007; Janghorbani *et al.,* 2006).

People who lived within areas of higher material deprivation, defined by the Carstairs deprivation score, have been shown to be related to higher incidences, higher probability of reaching hospital alive, and higher mortality rates after an MI in Glasgow between 1985 and 1991 (Morrison *et al.*, 1997). This was later related to higher incidence of CHD in British women (Lawlor *et al.*, 2005). Living within an area categorised as materially deprived using a different material deprivation score, the Townsend deprivation score, was also shown to be associated with higher CHD hospital mortality rates across all age groups (Janghorbani *et al.,* 2006).

Another measurement of deprivation considered is the Index of Multiple Deprivation (IMD) score, recently introduced in England and Scotland. This is a combination of area indicators, which include economic, social and housing issues to represent general deprivation. More recent studies within England use the IMD score to show that lower deprivation is associated with poorer quality in the management of CHD, both in initial diagnosis and in management at a local doctor's surgery (Saxena *et al.,* 2007). In Scotland, higher mortality rates for people living within increasingly deprived areas (based on the Scottish IMD score) persisted between 1986 and 2006. This area inequality decreased with increased age, especially within the oldest age groups (greater than 85) (O'Flaherty *et al.*, 2009).

There are consistent variations in incidence of, and mortality from, cardiac events by geographical location seen across different time periods. Most recently Bajekal *et al.* (2013) explore this variation in trends over time in CHD mortality by age-specific small area inequality in England, measured using the IMD score. From 1982 to 2006, CHD mortality is seen to vary by residence in areas of different levels of deprivation, despite falls in the levels of mortality from CHD for both men and women. The speed of the decrease in mortality rates from CHD however has varied by area deprivation level and age. Rates of the fall in mortality from CHD over time were consistently lower in the most deprived than the least deprived quintile groups. Mortality rates have fallen fastest for people living within the most affluent areas, but accelerated in those over the age of 45. Bajekal *et al.* (2013) expressed the need for small area analysis in order to further understanding of area inequality and how it relates to age.

However, the analytical approach taken by Bajekal *et al.* (2013) appears to be overly complex. The continuous measure IMD score is split into five equally sized categorises for the analysis.

Similarly, age is split into categories of ten years. By splitting the data in this way, information is lost and differences in certain area levels of deprivation and ages can be exaggerated when they are close to the splitting point. These aspects of the analysis make it difficult to build on these findings.

Varying findings were seen in the different ways that men and women were affected by living in areas of material deprivation. Morrison *et al.* (1997) say that women were more affected by higher deprivation than were men. However, the findings of Janghorbani *et al.* (2006) suggest that excess mortality was higher for men than for women living in materially deprived areas: 31.5% and 18.9% respectively over 13 years. Further exploration into gender differences is warranted to understand these differences in findings.

Alongside decreasing mortality rates from CHD over time, there is increasing area-level inequality in rates of incidence and mortality from CHD. Difference in gender was also seen to be present. This study aims to explore these inequalities by comparing and contrasting different sub-groups of people.

2.4.2.2   Social community

The importance of social support for people with ACS has been widely researched by qualitative and quantitative research methods. However, the literature available on social support tends to be based on individual and personal perceptions. Very little research could be found that analyses this complex aspect at the community level.

> Social support is defined as the interactive process in which emotional, instrumental or financial aid is obtained from one's social network. A social network is defined here as a set of linkages among an identified group of people, the characteristics of which have some explanatory power over the social behaviour of the people involved. It is the set of people with whom one maintains contact and has some form of social bond.
> (Bowling, 1999, p.549)

Social support affects ACS: a good example of this is the *Roseto study: A Community Study of Heart Disease* (Bruhn and Wolf, 1979; Bruhn *et al.,* 1982). This study took place in the 1960s in Roseto, Pennsylvania. An interdisciplinary team of researchers examined the low heart attack rates in Roseto that were unexplained by conventional risk factors. The research discovered that residents had brought their old-world Italian values to Roseto. A strong sense of community, respect for their elders and community organisations reduced mortality.

The major finding was the importance of social support and close family ties in buffering the deleterious effects of stress and life change, factors which have been implicated in the occurrence of myocardial infarction and sudden death.

(Bruhn *et al.*, 1982, p.575)

A review of the literature from 1966 to 2004 shows that low levels of social support are associated with increased risk of CHD (Lett *et al.*, 2005). Concern is raised about the best way to measure social support, with the majority of studies using a different measure. The question is also raised about whether improving levels of social support would reduce incidence of CHD: there was no available literature exploring this.

Social support is an important factor within the process of recovery, and the outcome status from ACS. Mookadam and Arthur (2004) discuss the relevant literature within this area between 1996 and 2002 and conclude that low social support is a predictor of one-year mortality from ACS, equating the level of the effect of social support with that of a clinical risk factor such as hypertension. Concern is expressed about the lack of understanding about the 'mediator/mechanism' role that social support plays, suggesting that further research is needed.

The nature of social support – interlinked with a person's day-to-day life and provided by a variety of sources – has made it difficult to measure within epidemiology studies. A range of different measurements has been derived to overcome this challenge. There is large variation in these measurements and hence it is difficult to assess the validity of the claims. This also raises the question of how best to conceptualise and measure social support and of who provides this support for people recovering from ACS (Lett *et al.*, 2005).

Social support is associated with the outcome from ACS. This was shown by the majority of the epidemiological literature conducted throughout the last twenty years, despite the different measurements used (Berkman, 1993; Frasure-Smith *et al.,* 2000; Scheffler *et al.*, 2008).

One approach to measuring social support is to ask a set of questions within a structured interview, such as 'Can you count on anyone to provide you with emotional support?' (Berkman *et al.*, 1993). Berkman *et al.* (1993) focused on the effect of emotional support on older people with ACS in America. The topics covered to measure emotional support were: social support, age, gender, race, education, marital status, living arrangements, presence of depression, smoking history, weight, and physical function. Positive categorical responses to support questions were associated with lower levels of six-month mortality from ACS for the elderly.

More recently a similar approach was taken by Friedmann *et al.* (2006), mainly within America. A validated social support questionnaire was used for 153 people aged 35.5 and above. This questionnaire asks about who could provide support and perceived satisfaction with the support available. Low social support was associated with a worse prognosis for CHD. Structured interviews are time consuming and expensive to conduct; this resulted in a small sample size of 194 patients within Berkman's study and 153 in Friedmann's study. Moreover, the topics covered and the questions asked need to be based on a good understanding of who provides support, and the value of different types of support in this circumstance.

An approach that has become more common recently is to form a scale of social support over a large sample size. A 5-point Likert scale based on five emotional social support questions asked via interviews or phone calls was used by Leifheit-Limson *et al.* (2010) in America for a sample of 2,411. Low levels of social support were seen to be associated with a lower health status after a cardiac event. Scheffler *et al.* (2008) measured organisational resources using local community data as a measurement of community-level social capital. This study took place in America and had a sample size of 34,752. The Petris Social Capital Index (PSCI) is the number of individuals per 1000 population employed in voluntary organizations. Higher PSCI in low-income areas was associated with reduced recurrence of ACS events. This relationship was present after adjusting for personal level characteristics. Community interactions seem to be positive in low-income areas. Scale measurements of social support varied greatly in whether participants were asked about community-level or individual-level support. Understanding where support comes from is important when forming a measurement to represent it.

Who provides social support and what effect does it have?

Understanding who provides social support, and what influence it has is important to assess accurately how it affects people with ACS. This is difficult to assess using a quantitative approach and therefore has not been attempted often. Fortunately, qualitative research is much more suited to this exploration.

Support is provided from a number of different areas. House (1981) suggests that support involves a transaction of emotional concern, instrumental aid (goods and services), informational aid, or appraisal (information relevant to self-evaluation). More recently, Stewart M. *et al.* (2000) have suggested a similar theory for people with ACS. Dependency on people who lived locally became higher during the recovery period. Support after an acute coronary event was needed, due to the emotional impact, to facilitate lifestyle changes, to help with

encounters with health professionals, and to overcome the reaction of their partner. A high proportion of this support was seen to be provided by a person's social networks and health professions, accounting for 50% emotional, 11% instrumental and 43% informational support. Emotional support was also seen to be provided by family and religion. Who provides instrumental support was not uncovered.

It is generally accepted that persons who suffer from coronary events often have feelings of depression (Ladwig *et al.*, 1994). Low social support was seen to be associated with symptoms of depression and a worse status in health after an acute coronary event (Leifheit-Limson *et al.*, 2010). In contrast, an early study by Frasure-Smith *et al.* (2000) suggests that depression is a predictor of one-year mortality, and that social support buffers this relationship. However, social support, measured on a questionnaire scale is not itself directly related to survival. These differences may indicate a complex relationship between compositional and contextual influences on ACS outcome.

Men and women with ACS were seen to differ in how they reacted to their social neighbourhood (Kristofferzon, Löfmark and Carlsson, 2003; Leifheit-Limson *et al.,* 2010; Pérez-García *et al.,* 2011). The association between social support recorded on a scale and ACS outcome is stronger for women than men; this includes how social support affects physical functioning, feelings of depression and general quality of life (Leifheit-Limson *et al.,* 2010). The reason for the difference in social support for men and women may relate to the amount of support that is received and traditional gender-role patterns (Kristofferzon, Löfmark and Carlsson, 2003). This review of studies published between 1990 and 2002 suggests that women received less social support than men up to a year after an acute coronary event. This was due to not seeking as much help from health care professionals or their spouses, feeling that their role in looking after their home came first. This lack of willingness for women to aid their own recovery was also shown by Jackson *et al.* (2000).

It is important that there is enough social support available; however too much can have a negative effect on the person who receives it (Stewart M. *et al.,* 2000). Over-protectiveness and overbearing support by spouses, friends or caregivers was mentioned by one-third of people after their acute coronary event. Boutin-Foster (2005) found that five themes in relation to unhelpful social support emerge from interviews with people with ACS: excessive telephone contact; high expression of emotions; unsolicited advice; information without means for implementation; and 'taking over'. Caregivers may need advice on how to provide appropriate and useful support for people who experience ACS.

There is consistency in the findings that social support is associated with ACS outcome. However further understanding is needed around who provides support, how social support influences a person, how this varies by demographics and how much support is needed. This has led to a great variation in how social support is conceptualised and measured.

2.4.3   Summary

The literature discussed so far concentrates on a specific time point in the process of ACS, and a set definition of place. Evidence suggests that the effect of place in terms of cardiac events is not restricted to the geographic location (Schulz *et al.,* 2005). This corresponds with the different ways that place has been measured within the literature on place and health, and place and ACS. Ana Roux (2003) provides a model for the residential environment and the risk of, and outcome from, cardiovascular disease, based on the literature available from 1988 to 2003. The very complex pathways of residential environment presented are considered in two parts: physical environment and social environment.

The construction of these pathways is based on literature relating mainly to cardiac risk factors, without consideration of the effect of place after an event has taken place. How the literature was identified, and the choice of literature on which pathways are built, are not discussed.

This model is built upon by Basile Chaix (2009) using a narrative review of 40 pieces of literature from the UK, Sweden and the United States between 1988 and 2008. The critical nature of this review and the encompassing format of the theory developed around place effect make it a useful concept. Figure 2.3 on the next page shows the outline of this model, which draws together some of the aspects of place effect discussed above and in section 2.2, the compositional variations such as risk factors and treatment received.

This model is theoretical, and needs further understanding around the meaning of place, and the relationship between subjective perceptions and environmental aspects (Chaix, 2009). Based on the literature discussed within section 2.3.4, it is felt that the outcome measures used by this theory do not accurately reflect the whole process of ACS recovery.

The macro and meso environments
-Economical level
-Income and wealth inequalities
-Political and administrative factors
-Welfare system
-Cultural background

Neighborhood spatial location factors

Local residential and nonresidential environments

Neighborhood sociodemographic structure
-Socioeconomic position
-Population density
-Population turnover
-Ethnic composition

Physical environment
-Building appearance and disposition
-Street network
-Other outdoor/indoor public spaces
-Greenery/aesthetic quality
-Physical decay

Services
-Transportation
-Food environment
-Sport facilities
-Healthcare resources
-Density of destinations

Neighborhood social interactions
-Networks of neighbors
-Weak ties/strong ties
-Social cohesion/fragmentation
-Social disorder
-Neighborhood identities
-Neighborhood stigma
-Knowledge, norms, culture

(Direct effects of resources/exposures)

Experiential factors

Experiential neighborhood
■ Affective experience
-Attachment
-Sense of community
-Feeling of relegation
-Residential captivity
-Internalized stigma

■ Cognitive experience
-Evaluations and related (dis)satisfaction

■ Relational experience
-Mistrust/hostility
-Stressful interactions
-Social integration
-Neighboring
-Social support

Psychological ill-being
-Stress
-Anxiety
-Depressive symptoms

Social-cognitive factors
-Life values
-Knowledge/beliefs
-Self-esteem
-Perceived behavioral control
-Self-efficacy
-Locus of control
-Cognitive performance
-Planning skills

Health behavior
-Physical activity
  -Recreational
  -Transportation
-Diet
-Smoking
-Alcohol consumption
-Hygiene
-Health care utilisation
  -Preventive care
  -Continuity of care
  -Compliance

Other risk factors
-Obesity
-Hypertension
-Cholesterol
-Diabetes
-Inflammation
-Heart rate profile

Outcomes
-Atherosclerosis progression

-Incidence of clinical events

-Immediate, short-, and long-term survival

(Selective migration)

Figure 2.3: Theoretical model describing hypothesised processes between place and CHD (Chaix, 2009, p.8)

Literature on place effect and ACS for older people is very limited. The studies found, and discussed above show the importance of place for older people. Little or no attempt has been made to adjust measurements or analysis to adequately represent the differences among older people in connection and reliance on place.

Chaix's (2009) theoretical model is a useful starting point on which to base exploration into place. There is a need to explore this model further – how it relates to the older population and their subjective views. This study aims to explore the whole process of ACS outcome for older people and how where they live affects this.

2.5 Discussion of the literature

The purpose of the literature review was to form an evidence base of knowledge upon which this study could develop. From this, methodological issues and areas that warrant further investigation could be identified. This section draws together this evidence base into a conceptual framework in section 2.5.1, and identifies the gaps in the literature and methodological issues that this study will address (section 2.5.2).

This narrative review was open to both quantitative and qualitative research. The epidemiology data were used to explore *what* was happening. The qualitative data were used to explore *why* and *how* place affected people with ACS.

This review of the literature has shown the importance of both compositional and contextual factors for people with ACS. Place of residence was shown to affect whether someone survives, how they cope and the level of support to which they have access.

The quantitative literature indicated that ACS survival and mortality are associated with the place where a person lives. Place was measured by deprivation, affluence or single contributing factors such as education level locally. People with ACS living in places represented positively by measurements were seen to have higher health status.

Qualitative literature gained in-depth insight from a small, specifically chosen sample. This explored personal experiences and perceptions of place influences. The qualitative literature draws attention to the process of recovery from ACS. How people experienced and changed during this process was explored. This literature also showed the importance of social support and access to resources.

2.5.1   Conceptual framework

The conceptual framework was born out of the knowledge base within the narrative review of the literature, indicating the insight that was attainable and developing the theory based on this structure. Greene, Caracelli and Graham (1989) and Collins, Onwuegbuzie and Sutton (2006) show the importance of having a conceptual framework for a mixed methods approach, to aid successful research and encourage integration of data.

Using the conceptual framework proposed by Aarons, Hurlburt and Horwitz (2010) and the concept mapping of Collins, Onwuegbuzie and Sutton (2006), the mixed method stages were mapped along two dimensions of different phenomena: phase of implementation, and inner and outer context. The results for the initial concepts developed from the background literatures, which are built upon within this study, are presented in Figure 2.4 on page 37.

Figure 2.4 shows how the conceptual model presents concepts that, in my estimation, were the most likely to influence ACS outcome, representing the theory gleaned from the literature and what this study expects to uncover. While the majority of the focus is on how the influence of place affects this outcome (which has received the least attention in the field of what factors affect ACS), also included are personal and clinical characteristics that are thought to have an influence. However, it is hypothesised that these will interact with the characteristics of the place in which the person lives.

ACS outcome

Based on the literature discussed in section 2.3.4, it is hypothesised that there will be distinct differences in what ACS outcome means in terms of a quantitative approach, asking *what* has happened, and from a more qualitative approach, looking at the perception of recovery, with people aiming to get back to *normal*. No literature was found on how perception of recovery relates to survival. It was expected that people with better prospects would be more positive about their own recovery.

Initial analysis explores influences on survival at six months, trying to understand the underlying locality aspects that increase survival rates. It was expected that in less deprived local areas survival rates would be higher. How 'recovered' a person feels is then looked at through questionnaires at initial recovery and follow-up recovery at six months, so that it can be seen how this relates to actual survival rates and the demographics of those with varying survival rates, as well as perceived recovery and ACS severity. The qualitative discussions aim to discover what is thought of as recovery, the overall attitudes towards personal recovery and what influences this.

Place

The effect of place on health is discussed in sections 2.2 and 2.4. Existing quantitative literature implies that a more deprived, less affluent environment or lower levels of social support are related to a lower survival rate. This relationship is expected to be present independent of the way in which place is measured. Over the recovery period, mortality due to ACS is expected to be initially higher and then decrease as time goes on. Both the physical, built environment and social interactions are expected to have an influence on survival rates. More resources and a better transport network, as well as a strong social community, are expected to increase survival. More affluent/less deprived places are expected to have better quality and frequency of both resources and community.

The direct relationship between place influences and survival will be explored using secondary data analysis, looking at multiple ways of defining place, including both built and social aspects of the environment, confirming and expanding on place influences with the questionnaires to find out the perceived influences on personal recovery. Exactly *why* these influences exist and how they personally affect individuals are explored through qualitative discussions.

2.5.1.1   Individual

Individual influence on survival was reported to be affected by ACS severity, age, exercise levels, sex, and various other risk factors such as smoking, shown in the background literature within Chapter 2.

More severe ACS would be expected to be related to lower survival rates and slower recoveries. However, in recent years advances in treatment for STEMI diagnosis, such as primary percutaneous coronary intervention (PPCI), have changed this dynamic. STEMI and NSTEMI diagnosis are seen to have similar prognoses (Montalescot *et al.,* 2007).

Unhealthy activities are expected to increase mortality, while healthy activities such as exercise are expected to decrease mortality. Individual and place influences are anticipated to have strong connections – and to interconnect – to influence ACS outcome. More deprived/less affluent places are expected to be related to unhealthy activities.
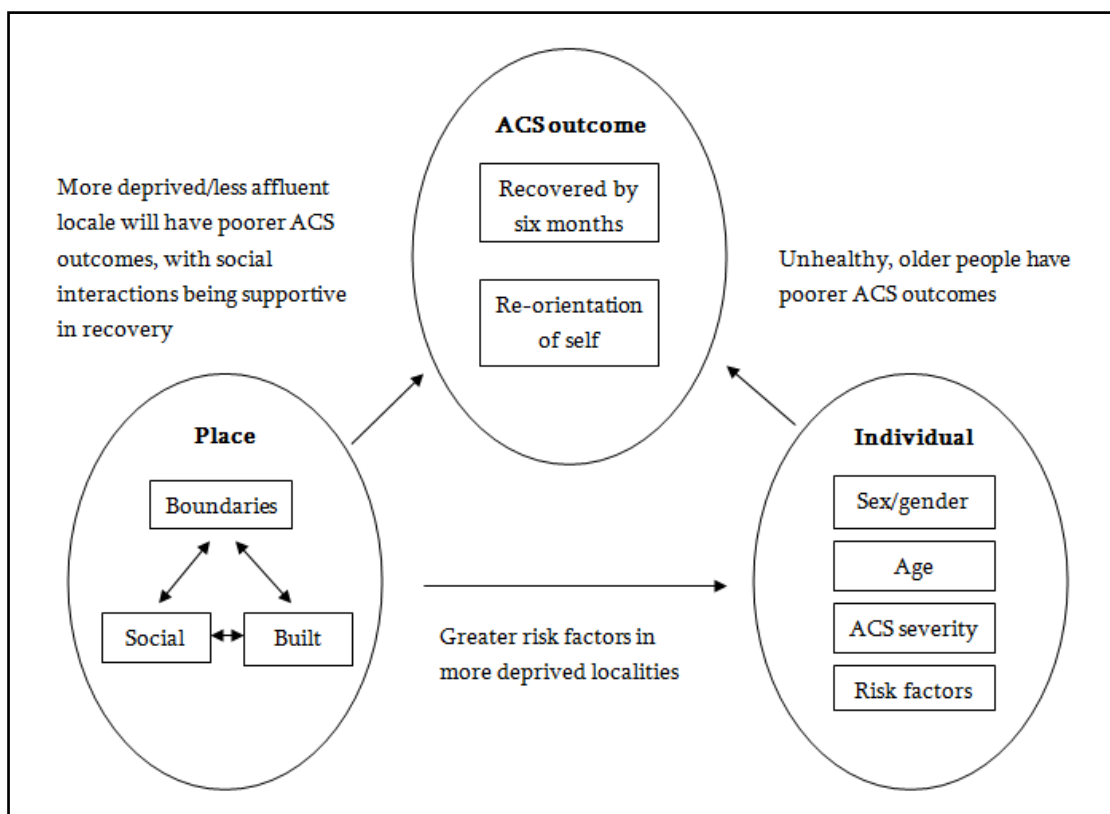
Figure 2.4: Concept map of initial theory in mixed method study

Differences by sex led to the study being split by males and females, reducing variations that need to be considered and encouraging comparisons between the sexes, and aiming to refine the differences and how they relate to place and traditional roles in the household and society. Individual characteristics and clinical factors are explored during the secondary analysis to

identify the influences on survival and how they interact with place influences. Due to the nature of human behaviour, there is much to consider and accurate interpretation of results will be complicated.

The exploratory nature of this study lends itself to a mixed method framework, used to underlie, add flexibility, and direct the study, by initially analysing the overall trends of ACS survival, exploring associations, then building on this to determine *why* and *how* place aspects are of importance over the trajectory of recovery. The aim will be to form an overarching view of the whole phenomenon. The study design considers the weaknesses of single paradigm research, such as being restricted to a certain type of question, attempting to overlap these with further understanding and flexibility, to look at the *what,* the *why*, and the *how*, as well as changes over time around place effect on older people with ACS.

2.5.2 Methodological issues and areas for further exploration

Across the literature, various different measurements are used to represent place effect and the outcome from ACS. This is one of the main methodological issues identified within the literature that explores place effect (Cummins *et al.*, 2005; Riva *et al.*, 2007; Meijer *et al.*, 2012; Pickett and Pearl, 2001).

The different ways in which ACS outcome and place are represented across epidemiology and qualitative literature are discussed within this section. These methodological challenges will be explored within this thesis in the context of older people with ACS. How ACS outcome and place were defined and measured differed across the quantitative and qualitative literature. These differences and how they interact are discussed (sections 2.5.2.1 and 2.5.2.2). The boundaries of a place and how they relate to the people living within them are discussed in section 2.5.2.2. The differences between the experiences of older people with ACS and those of people of working age are discussed (section 2.5.2.3). The majority of the literature available was based either on the working age population, or across all age ranges.

2.5.2.1 What is an outcome from ACS?

The outcome from ACS is a dynamic process that is influenced by prior level of health, severity of ACS, personal motivation, geographical location and social support. How the outcome from ACS is measured varies between quantitative and qualitative research. The epidemiology studies quantify the final event outcome of whether someone lives or dies. This gives the opportunity to explore differences in survival, and factors that may contribute.

Epidemiological approaches require the use of summary statistics to define outcome. The literature rarely discusses the choice of ACS outcome and the reason behind it. Survival analysis will be used within the quantitative analysis part of this study as this encompasses the largest amount of the information that is available. However, this method does not enable the exploration of what happens during the period between discharge from hospital and death.

The qualitative literature aimed to explore the experiences of ACS from the perspective of the individual. This process includes recovering or 'reorienting normality' (Brink *et al.,* 2006) from the physical and emotional challenges created by the ACS. This provides in-depth, contextual insight into how ACS changes a person's life and how he or she faces these challenges. This literature is based on how people see their own recovery; thus, recollection and perception bias may affect the findings. The nature of unique recoveries makes it difficult to understand how the overall process relates to place. It is not possible to determine direct influences on recovery but, rather, how people feel affected. Everyone within a qualitative sample is experiencing recovery. Therefore, the perspective of an extreme negative outcome cannot be gained within a qualitative sample.

There are clear advantages and disadvantages to each of these ways of looking at ACS outcome. A mixture of questions about the process of recovery and about what affects rates of survival can be asked. This will provide a more comprehensive picture of ACS outcome.

The use of both recovery and survival as ACS outcomes produces a methodological question about how they relate to each other, and hence how they can be used in unison to develop a greater understanding. The conceptual differences in how quantitative and quantitative approaches perceive the world makes this a complicated question. To our knowledge, this has not previously been researched. This study will explore this relationship in the context of older people with ACS.

2.5.2.2   What is place?

The place in which a person lives consists of many different aspects including the geographical area, the social community, sense of belonging and resources available (Cresswell, 2013). Place is conceptually complex: it can have a unique meaning for the individual and a shared, representative identity.

The need to adequately conceptualise and measure place, and its effect on health, has been brought to light within a range of literature (MacIntyre, Ellaway and Cummins, 2002; Cummins *et al*., 2007; Wilkinson and Pickett, 2006).

MacIntyre, Ellaway and Cummins (2002) provide a framework of place effect on health from the perspective of how well the needs of the person living there are met. Place is considered in two parts:

- *Compositional*: characteristics of individuals concentrated in particular places.
- *Contextual:* the structure in the local physical and social environment, the socio-cultural and historical features of the community.

This framework provides a basic structure of place that is used as a flexible starting point from which the meaning of place is explored within this study. This clear-cut framework encourages geographical, social, and collective personal characteristic differences to be considered.

The problems with this framework discussed by MacIntyre, Ellaway and Cummins (2002) and Cummins *et al.* (2007) will provide some of the areas of exploration of place effect within this study. These include exploring the reciprocal relationship between people and place. For example, does the income of the people living within an area relate to the level of deprivation and standard of resources available? How does this relate to the health of the people living in the area?

Methodological differences in place

The concept of place is further complicated by the different methodological viewpoints that can be taken. Epidemiological literature quantifies a certain geographical area. This provides an objective way of seeing place from which relative comparisons can be made. Qualitative literature uses a more subjective approach. Personal perceptions are used to understand how place affects the individual, both by the physiognomy of a place and the ability of the person to negotiate it.

Bowling and Stafford (2007) found that area affluence and perceived neighbourhood effect influenced social and physical functioning in older British people. This study provides a more comprehensive picture by considering the different ways that place is seen. However, it is felt that the quantitative scaling of opinions is unable to provide the level of detail on perceived place.

Cattell (2001) summarises the different layers of place – compositional, contextual, objective and subjective:

> Communities, in the sense of small localities or neighbourhoods, but also in terms
> of social interactions which take place there, and residents' perceptions, exist in

space, time and social and economic structure.

(Cattell, 2001 p.1504)

The different possible viewpoints that are taken on place are reflected within the following definitions that will be adopted within this study (Cattell, 2001):

- Neighbourhoods: include the bounded area that incorporates the physical aspects
- Communities: the different social structures that exist within the neighbourhood
- Sense of place: a person's connection to the surrounding area
- Sense of belonging: how incorporated and at home a person feels within their surroundings

This study aims for a greater understanding of inequality for the people who live within different places, perceptions of place and the objective aspects of place. How the different layers of place interact and influence each other is of particular interest. It is felt this can be best achieved using a mixture of quantitative and qualitative techniques, and mixed analysis.

Measurements of place in the epidemiological literature

Place has been defined in a variety of different ways throughout this review of the literature: for example, the use of area-level socio-economic status to represent place effect (Engstrom *et al.,* 2000). Despite the importance of using an accurate representation of place during the analysis there is often no discussion or explanation for choice of measurements used.

The quantitative approach within this study will need to use representations of place. This study chose to initiate the analysis of place with the use of three local area indices. The use of three different indices allowed a variety of the features seen to be related to place to be explored: the physical environment, the social community and general deprivation (see section 2.4.2). Each of these indices has been developed in the last 30 years within the UK: 1) the Townsend deprivation score, used to measure material deprivation (Townsend, 1979); level of under-privilege, measured by the Jarman under-privileged area score (UPA) (Jarman, 1983); 3) the Index and Multiple Deprivation score (IMD 2007) (Noble *et al.,* 2007).

This section discusses the benefits, and the limitations, of representing place by a local area index. A discussion follows of qualitative representations of place, and whether they are still relevant when analysing the older population, even though the measurements were not originally designed to be used for this age range.

Index benefits

Local area indices are a single summary statistic. These are in common use and provide large amounts of pre-collected information with easy access. The use of a single number to represent place effect simplifies the analysis. Direct analysis of how place is associated with survival is possible. Local area indices provide a generalised format that can be calculated across the country. This enables comparisons across local areas.

Local area indices are commonly used across the literature. This makes comparisons and combinations across studies that use the same indices possible; the accuracy of cross-study comparisons is increased. For example, Lakshman *et al*. (2010) and Saxena *et al*. (2007) both used the IMD score to measure place effect. From these studies, it was found that poorer quality of services is found in areas with a high IMD score. Within these areas, people reported low self-reported health. Other differences across these studies may reduce the ability to reach an association among them. However, the accuracy of the use of both studies is greatly improved by the measurement of place being the same.

Index limitations

Each local area index will have been developed for a specific purpose. This is unlikely to coincide exactly with the aim of this study and therefore not may represent place to the same level of accuracy within this different setting. In this study, the focus is on older people; however, there are no place indices specifically designed for this age range. This is discussed further below.

The use of local area indices assumes that the effect of the local area is homogeneous: for example, the level of resources available is the same for everyone, independently of where an individual lives within the local area. Sloggett and Joshi (1994) have estimated that 55% of the most deprived individuals in England and Wales live outside the 20% most deprived areas. This sheds doubt on the ability to measure an entire local area with a single statistic. Smith *et al.* (2000) nicely sum this up:

> To continue to simply use socioeconomic data to produce measures of deprivation
> as a uni-dimensional and purely cross sectional phenomenon is to ignore the
> wealth of other aspects of people's lives that affect their health and are of great
> potential importance for particular conditions.
> (Smith *et al.*, 2000, p.150)

Local area indices are usually formed using census data that are only updated every ten years. The data used within this study are from the 2001 census. This data might not still be relevant to the people who inhabit the local area.

In summary, within this study the local area indices can provide powerful and representative results. With the use of secondary data, these measurements are readily available and comparable across other studies. However, there are, potentially, errors within the measurement that may result in regression dilution. By being aware of these potential limitations and considering their implications, the impact on the accuracy of the study can be reduced.

How relevant are local area indices to analysis of older people?

There has been a paucity of research examining area level influences on older people with ACS. O'Reilly (2002) suggests that this is because there is a lack of suitable indices relevant to older people. The majority of local area indices were developed using samples of working age people. Therefore, the indices will be most accurate for this age group. There are likely to be differences in how older people relate to social, built and economic area factors. There is little reason to believe that local area indices developed on a working age population will be able to predict ill health within older people to the same level of accuracy (Alwan *et al.,* 2007).

O'Reilly (2002) concludes that commonly used deprivation indicators such as Townsend's deprivation score are not appropriate to study inequality in health for older people, due to induced bias from the index. For example, Townsend uses *owns a car* to indicate wealth. Older people may not use a car because of health reasons; this changes what the index is representing.

Within the UK, the issue of applying local area indices to the older population has been explored (O'Reilly, 2002; Alwan, 2007). Mortality rates and other representations of place are used to identify differences between younger and older people. The association of place with mortality rates was not as strong for older people. This difference may be due to local area indices being less sensitive to older people's mortality changes. However, this association may be less strong for older people and it is difficult to determine its cause.

For example, O'Reilly (2002) compared the effect of deprivation indices with level of income support in North Ireland for older people. He concluded that:

> Mortality in the over 75s was moderately associated with indicators of poverty, but the relationship between deprivation indexes and mortality was weak. (O'Reilly, 2002)

This may imply that income might be a better indicator of place effect than deprivation. It may also indicate that community income has greater effect on older people than area deprivation levels.

Grundy and Holt (2001) suggested a combination of a deprivation index and individual characteristics, such as income. Together these are used to represent place effect. It is argued that both contextual and compositional aspects need to be considered to increase accuracy of prediction models.

Despite concerns over the indices used, each of these studies recognised the importance of analysing place effect on health. How place should be measured for older people is disputed. Without an index designed specifically for older people, it is difficult to understand the association between place and ACS within this age group. These concerns may lead to doubt as to the accuracy of studies that use local area indices across all age ranges.

Local area indices will be used as an initial measurement of place within the quantitative approach of this study to explore the effect on older people (65 years and older). However, no comparisons will be made with the effect of place for younger people. Local area indices used within the context potentially have a different meaning from that for which they were originally designed. These two changes in the application of local area indices will minimise the concerns, previously raised, about indices that were constructed based on working age populations.

Representation of place in qualitative literature

The meaning of place within qualitative literature is defined by the perspective of the individual. However, the majority of the qualitative literature on place looks at the effect of social support (Colella and King, 2004).

How a person perceives his or her neighbourhood relates to the personal experiences of the inhabitants. This method can form insight into the meaning of place, how people relate to their neighbourhood and the perceived effect of place on their recovery. However, this perception of place is unique to each individual. People who share common physical and social locations may not have the same perceived neighbourhood. This makes analysis of place effect more difficult. Without a set definition of place, data cannot be collected for the locality, and direct comparisons are more difficult to make across neighbourhoods within the same study and with other studies.

Within the qualitative approach of this study, the meaning of place will be derived from the perspective of the individual. This will enable the aspects of place that are seen to affect recovery to be brought forward. How this relates to the quantified measurements will also be explored.

What are the boundaries of place?

Boundaries refer to the area within which the place of interest falls. This is another dimension of the definition of place that arose from the literature. Quantitative and qualitative methods have very different ways of approaching place boundaries; this section looks at how the two different approaches to boundaries interrelate.

Defined place boundaries are not usually set in qualitative research. The neighbourhood is defined from the perspective of the inhabitants. This may include how they relate to the physical structure, sense of community, connections with people who live locally, and any form of involvement within the neighbourhood. These subjective neighbourhoods may range from a few streets near to a person's home to the whole region. This depends on a person's level of involvement and feelings towards the place of residence (Haynes *et al.,* 2007).

In contrast to this, quantitative approaches have set boundaries of place as geographical divisions of the land, which outline different districts. This is necessary so that data can be collected at the local area level: the use of pre-defined boundaries gives access to data that have already been collected. However, the flexibility of the study is reduced by these boundaries that cannot be changed, and local areas may not be homogeneous in terms of size and population.

Flowerdew, Manlet and Sabel (2008) indicate that there is little reason to believe that the local areas defined for census data collection should relate to the resident's neighbouring 'community'. This suggests that the way that boundaries are defined may affect the findings formed. This modifiable area unit problem (MAUP) was first identified by Gehlke and Biehl (1934) and has recently been shown to affect research in England (Flowerdew, Manlet and Sabel, 2008). It is argued that the definition of place is inevitably subjective, dynamic and multi-faceted (Durose and Lowndes, 2010). The use of boundaries is seen as treating place as a static concept with a community that is unchanging (Bailey and Pill, 2011). Once any form of boundary is placed, the locality takes on a new administrative, political and social constructed reality (Bailey and Pill, 2011, p.940). Whether these locality boundaries surround the neighbourhoods in which people live, and to which they have a personal connection, is unclear.

Augustin *et al.* (2008) examined informed boundaries of the local area. This used focus groups of neighbourhood organisations to set boundaries defined by the community's definition of their

neighbourhoods. This would reduce the MAUP problem. However, the place boundaries still had to apply to the whole neighbourhood. The boundaries might not be relevant to every individual. This approach also took a considerable amount of time, was expensive and precluded the possibility of using pre-collected data and therefore is not possible within this study.

Lower super output areas (LSOAs) were the most recent small census boundary areas in England when this study began. Within the quantitative analysis, LSOAs are used for consistency and to enable comparisons to be made. They are boundaries that are homogeneous over population density (Office of National Statistics, 2012b). LSOAs are based on an average of 1600 people, used to represent small local areas.

However, the size, shape and criteria for setting these area boundaries are changed regularly. In April this year (2013), changes were made to the set districts. General trends for the local areas that have similar characteristics will still be relevant (Haynes *et al.,* 2007). However, these changes affect the accuracy of the conclusions drawn based on a certain place boundary. Changes in boundaries made comparisons across studies and over different time periods difficult.

The mixed method nature of this study, which will explore place effect using both quantitative and qualitative approaches, is an opportunity to see how perceptions of place relate to set boundaries. This will be explored within the data synthesis.

Summary

Place is set out very differently by quantitative and qualitative methods. This is further complicated by the unclear relationship between perceived boundaries and pre-defined area boundaries. For this study, both boundary approaches are used within their respective methodological approach. The effect of these different boundaries, and how people relate to them, will be explored, with the aim to determine if there is overlap and whether it is reasonable to conduct a mixed method study using sets of boundaries.

2.5.2.3   Limited place research around older people with ACS

Older people are more likely to suffer from, and die from, ACS (Smolina *et al*., 2012). This was explored further in section 1.1.3 in Chapter 1. Within this aging population (Rosengren, 2006), it is important to understand what influences older people with ACS.

Older people have different reactions and relations to their place of residence. Stronger ties to their neighbourhood, and relationships with the people and physical objects, have often been built up over many years of living locally (Smith A., 2009; Yen, Michael and Perdue, 2009).

> Social policy and social change needs to be driven by a better understanding of what constitutes a 'decent' environment in which older people are committed to ageing in place. (Smith A., 2009, p.9)

However, the literature explored within this review has primarily been based on people of all ages, or people of working age. The effect of place on people with ACS may not be the same for older people, due to differences in levels of co-morbidities and work schedules. Due to this gap within the literature, and the increasing importance of aiding older people with ACS, this study will focus on the older population (65 years or over).

2.6 Research objectives

In summary, this literature review has highlighted the impact of place inequality on a person's health, specifically focusing on the impact of people with ACS. With recent policy changes, it is evident that there is a clear intention to reduce inequality in health.

An overview of the literature on place and health, the impact of ACS, and place and ACS, has been explored within this review. This highlights a lack of research into older people with ACS.

This review exposed high levels of variation in how place and ACS are represented, and the lack of understanding behind what place and the outcome of ACS actually mean to the people experiencing them. In order for future research to report and compare place effect, it is vital to unpack the meaning of place. The contextual, compositional, objective and subjective viewpoints may provide different perspectives and measurements of impact. To understand the overall influences that place has on the people that live there, increased understanding is critical. Therefore, it is necessary to explore both *what* effect place is having on older people with ACS and *why*.

The key findings from this literature review that have emerged are summarised within the following bullet points:

- Where a person lives has a important, yet complex relationship with their level of health, and their outcome from ACS.

- People are affected by where they live differently depending on their personal circumstances.

- Living within a more disadvantaged areas, in terms of level of deprivation, social support and built environment is associated with a worse prognosis for a person with ACS.

The presence of a relationship between place and the outcome from ACS is clear, however a lack of research exists within certain important areas:

- Only a small amount of literature exists on how place affects older people with ACS. The focus is on the working age population or all age ranges, this may be due to the availability of the data.

- Within the literature there is little discussion of what constitutes place, how place interacts with compositional level features, and places pathways of affect on older people with ACS. Without this understanding it is more difficult to encourage positive outcomes from ACS.

- No literature was found that researched place effect on older people from both the objective and subjective. By exploring both of these viewpoints a more complete picture of place effect can be formed.

These gaps within the literature, and methodological issues discussed above were used to form the research objectives. The research objectives are then used to: develop the research design; determine sample sizes; and decide on the methodological approach (Onwuegbuzie and Leech, 2006).

The research objectives are:

- ➢ Explore survival, perceptions and the experience of ACS outcome, examining the relationship between 'place' (in this multi-level sense) and recovery.

- ➢ To develop a contextual and operational layered definition of place in terms of older people with ACS, relating to the contextual geographical location, physical structure and social interactions, while considering the compositional features such as age, sex, and marital status.

- ➢ Synthesise data, bringing together the different aspects of place effect, whether it is associated with survival, is seen to affect recovery, why and how it causes variations in outcome, with the aim to build up an overview of the significance of place, and identify changes over time in influence and perception.

- ➢ To investigate how place effect is associated with ACS survival, using representations of areas, such as deprivation scores, and place attributes, such as measures of the physical and social environment.

> ➢ To explore perceptions of place, their relation to place characteristics, and their influence on recovery; in particular, to look at whether perceptions and influences change during recovery.

This research therefore endeavours to understand place effect in its entirely, within an applied setting. The research design used embraces the exploratory and complex nature of this undertaking to build up understanding.

Chapter 3:   Methodology

3.1 Introduction

The methodology for this PhD project was based on the study goals and research objectives, forming a design that is operationalised in the context of place inequality in ACS outcomes. The rationale and purpose of the design is overall structure of the methodology, with emphasis on the approach taken, deriving from the research objectives. This allows flexibility and development throughout the study. The study aims to capture a rounded view of the influences of locality on ACS outcome (Johnson and Onwuegbuzie, 2004) by employing an iterative, diverse and appropriate research methodology, leading to the formation of an exploratory sequential mixed method study.

The empiricist framework is presented in this chapter building on the conceptual framework described within section 2.5.1. This sets out how multiple approaches work together to examine influences using multiple angles. The potential benefits and limitations of each approach are discussed and the rationale for undertaking this methodology, and the differences between the types of data/conclusions formed within each paradigm, are drawn out.

This chapter starts with a discussion about what mixed methods are (sections 3.2) and why a mixed methodology was developed for this study (section 3.3). How this mixed method study maintains trustworthiness and rigour is discussed in section 3.4. The empiricist framework is outlined in section 3.5. The analytical approaches for each phase of the study are presented in section 3.6; section 3.7 is used to summarise the chapter.

3.2 What are mixed methods?

Mixed method designs are defined as including at least one quantitative method and one qualitative method (Greene, Caracelli and Graham, 1989). Since the recognition of potential benefits, such as the flexibility to choose the methodology based on the research objectives, mixed methods studies started to be developed from the 1960s onwards (Tashakkori and Teddlie, 1998). Increased usage of mixed-methods research over recent years has led to the development of different designs (Greene, Caracelli and Graham, 1989; Creswell and Plano Clark, 2007) and reorganised designs (Teddlie and Tashakkori, 2009).

The concept of research approach being either quantitative or qualitative is often oversimplified and does not fit all research objectives (Wheeldon, 2010). Mixed method research provides

greater options, more flexibility and various approaches worth considering. It increases the usefulness by applying the most appropriate methods that fit the different research paradigms considered within the research. Within this recently developed research methodology, it is important to utilise the mixed approach in data gathering, analysis, interpretation and presentation (Teddlie and Tashakkori, 2009).

Quantitative research is based in post-positivism; that is, seeing how human knowledge is speculative, arguing that the external world exists independent of an individual's experiences of it and acknowledging that all research is incomplete, but that hypotheses can be tested through scientific exploration, leading to deductive generalisable, validated results. It is argued that quantitative analysis does not capture the complexities of human behaviour, missing depth and personal perception (Wheeldon and Ahlberg, 2011).

Qualitative results are more constructivist, viewing understanding and truth through the study of human behaviour, making the perception of reality unique to each person. Constructivism seeks to understand personal experience and perception, developing theories with small sample sizes through social interactions and narrative experiences (Creswell and Plano Clark, 2007). Qualitative research has limitations in the form of researcher input, interpretation bias and the great potential influence of the chosen sample on the conclusions drawn, due to the sample size.

By the use of multiple combined approaches when needed, a better understanding of a phenomenon can be gained, based on reliable empirical counts and living experiences.

> Mixed method is an abductive reasoning which can be understood as a process
> that values both deductive and inductive approaches but relies principally on the
> expertise, experience, and intuition of the researcher.
>
> (Wheeldon and Ahlberg, 2011, p.117)

Mixed methods facilitate understanding by uncovering meaning, then forming and testing theories theoretically and empirically, offering a new way to produce robust methods through this new research approach (Wheeldon, 2010). Research is no longer seen as quantitative or qualitative, but as open to all methods. A map of abductive reasoning is presented in on the next page in Figure 3.1, showing a simple way of using multiple methods to bring quantitative and qualitative research approaches together without mixing paradigms.
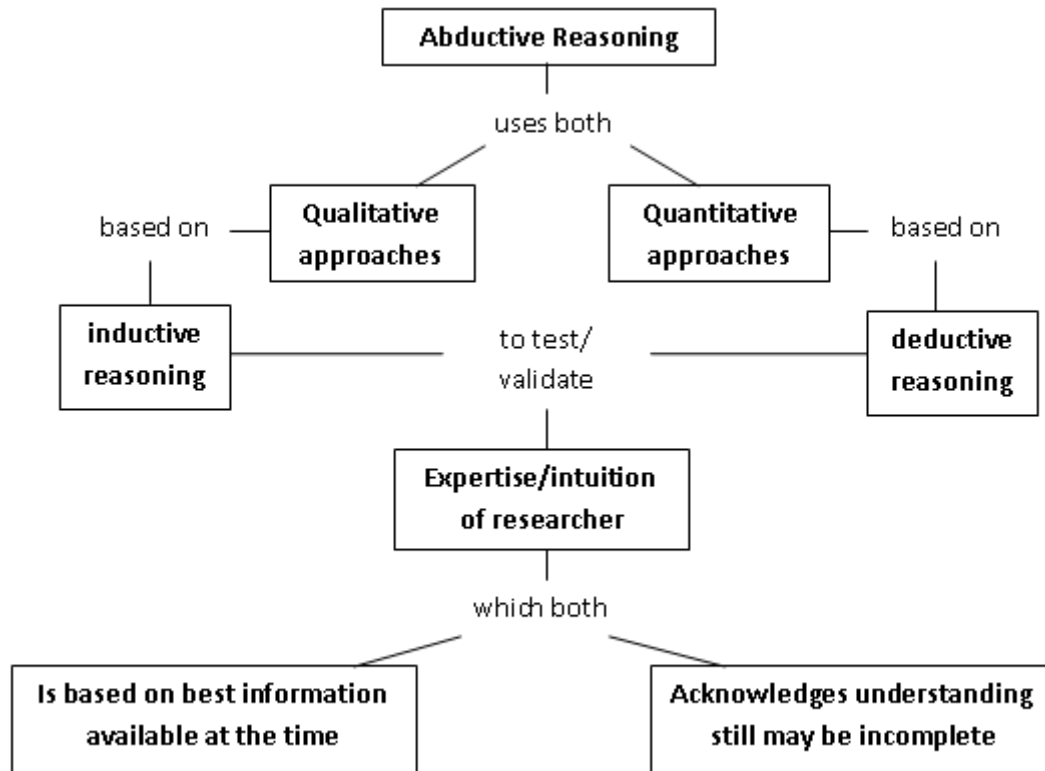
Figure 3.1: Map of abductive reasoning (Wheeldon and Ahlberg, 2011, p.117)

This opens up flexibility, because a broad research cycle is used, where theories and concepts are developed and tested through various methods, using logical ordering.

3.3 Why mixed methods?

The purpose and research objectives should determine the research approach (Greene, Caracelli and Graham, 1989). The aim was to explore both *how* and *why* place affects ACS outcome. These research objectives are broad and complex by nature; hence, a single research approach or paradigm would not be sufficient.

The research design was formed around the purpose of using mixed methods, the stage of mixing paradigms in the study and the methods chosen based on the research objectives. The rationale for using mixed methods leads from these decisions. The four-dimensional Rational and Purpose (RAP) model of Collins, Onwuegbuzie and Sutton (2006) helped to make this choice.

The choice of research design was based on the RAP model, taking a theoretical approach and the pragmatic decision rules put forward by Chen (1997). Based on the assumption that not one inquiry method is best to serve all evaluation needs, the usefulness of every method depends

on the contextual circumstances. This section is used to show the justification for the combinations of methods applied.

Chen (1997) indicates that the requirement for intensive and contextual data (such as perceptions of local support), with low availability and high openness, requires a qualitative approach. Extensive and precise information, high availability and gaining closed responses would point towards a quantitative approach. If the research does not fit within either of these paradigms, then a mixed method approach is needed. This is determined by the consideration of how the study relates to the following three points:

1) The evaluation may be required to produce intensive and contextual, as opposed to extensive and precise, information. Quantitative research is a systematic empirical investigation, seeking to summarise the general trends of a sample population by generalising to a wider audience. Qualitative research, however, focuses on meaning, process and context, where the social world is understood as dynamic and interactive.

2) There may be high availability or accessibility, or there may be low availability or accessibility, of credible data.

3) There may be low openness or high openness of environmental influence on a programme.

The broad aim of this study is to collect an extensive overview of place influences within an open environment, to explore *what* and *why* locality aspects are affecting the people living within them, and how they are perceived by the people experiencing them. These explorations into the broad topic of place influences, approaching the circumstance from multiple paradigms, lead to mixed methods being the optimal approach (Chen, 1997).

The RAP model also indicates a mixed methodology, with enriched participants' data being produced from summarising data and gaining in-depth information, thus forming a nested multi-faceted sample and data of evidence. Appropriate and validated tools used within the data collection and synthesis are used to increase the credibility of the mixed method approach. Method (treatment) integrity is integral to this study, as is the quality and meaningfulness of measurements, and approaches towards ACS outcome and place of residence. Finally, the use of multiple methods forms pictures from different angles, significantly the enhancing ability to interpret the complex interactions of human nature.

We take a mixed method approach based on an evaluation framework that is both empiricist and concept-driven. Using a mixed method framework enriches the representation of participants, by generalisation of large samples, coupled with in-depth insight into a

participant's perspectives. A well-designed mixed method study reduces limitations of both quantitative and qualitative approaches, maximising appropriateness of method to paradigms within the research. With the flexibility to assess and modify tools used on an on-going basis throughout the research study, the validity of the information can then be assessed in its appropriate context, using data from all phases of the study. This leads to credible, legitimised, validated, confirmative data, which is the overall goal of every study (Onwuegbuzie and Johnson, 2006).

> Quantitative and qualitative data analysis techniques may be side-by-side to enhance the interpretation of significance finding. (Onwuegbuzie and Leech, 2004)

It must be kept in mind, however, that quantitative and qualitative methods have incongruent assumptions and ideologies about social phenomena and social knowledge. Using various approaches 'mixed in a way that has complementary strengths and non-overlapped weaknesses' (Johnson and Turner, 2003, p.299) results in a more accurate and complete depiction (Tashakkori and Teddlie, 1998). Care needs to be taken in the design, as poorly constructed mixed method studies can lead to overlapping weaknesses, creating less reliable results. Turning to the fundamental principle of mixed methods research, which recognises that all methods have their strengths as well as their weaknesses, mixed methods can be used to: a) obtain convergence or corroboration of findings; b) eliminate or minimise key plausible alternative explanations for conclusions drawn from the research data; and c) elucidate the divergent aspects of a phenomenon.

Using overlapping, complementary and corroborative mixed methods, diverse aspects of a phenomenon are considered from multiple angles, forming a more rounded view, where research methods are utilised to reduce weaknesses and enhance strengths.

Mixed method designs are relatively rare, due to the roadblocks of greater labour-intensive studies, when compared to single paradigm studies. More time, resources and effort are needed for the design, implementation and analysis (Onwuegbuzie and Johnson, 2006). In addition, as is the case with this study, researchers tend to have a background in a certain approach and a subsequent preference towards, and expertise to undertake, a certain approach (Teddlie and Tashakkori, 2009).
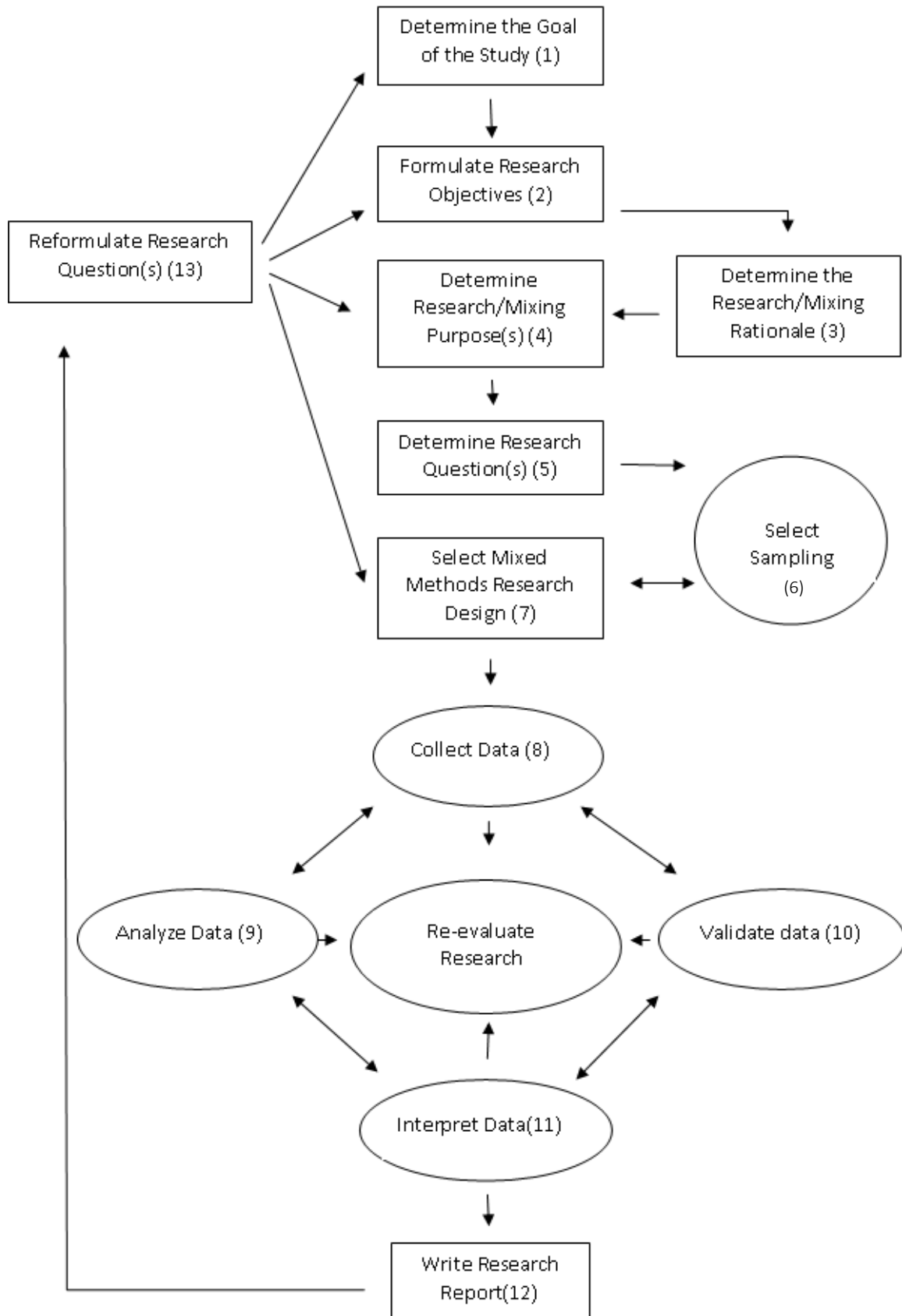
Figure 3.2: 13-step conceptualized mixed method research process (Collins, Onwuegbuzie and Sutton, 2006)

3.3.1 The mixed method philosophy of the study

The philosophical position and paradigm in which this study sits was determined by the broad nature of the research aim. The study's ontological, epistemological and methodological approach to knowledge reflects the philosophical position. For example, O'Cathain *et al.* (2010) explain three techniques for the integration of data in mixed method studies, which can all be analysed differently depending on which philosophical position is taken.

The study aims to explore both the overall picture of place effect, and the social perceptions and contextual experiences of place. By considering both the micro and macro levels, the aim was to form an understanding of place within the larger context (Hammersley, 2006).

The quantitative stage of the research follows the positivist paradigm aiming to understand what is happening, with the ontological belief that reality is objective and can be understood through understanding the laws that govern it. The qualitative side of the research follows an interpretative paradigm, with the aim to understand why something is happening, and the ontological belief that the world is created by social and contextual meaning and can be understood through personal perceptions. It was felt that, individually, neither of these approaches would allow the entirety of the research aim to be considered (Johnson and Onwuegbuzie, 2004).

By taking a pragmatic mixed method approach, more than one valid approach can be used. Research within this paradigm does not aim to represent or uncover the truth but rather to facilitate human problem solving. By using qualitative and quantitative approaches together in practical, balanced ways, advances in knowledge could be gained (Johnson and Onwuegbuzie, 2004). In essence, this philosophy allows the research approaches to be mixed in any way in order to best answer the research aim, using the advantages of the most appropriate approach for the question being asked at the time.

The positivist and interpretative paradigms discussed above are fundamentally different in what they are analysing and the questions that they aim to answer. Therefore, it is important that this mixed philosophical approach is based at a conceptual level. Within this mixed method study, the aim is not to analyse or compare data from different paradigms, but rather to use the mixed philosophical approach to build up overall understanding.

This conceptual level of integration follows a subtle realist's standpoint (Hammersley, 1992 pp: 50-54): that the world is unique from each person's perspective, based within his or her own circumstances, and hence the same phenomenon can be seen from multiple viewpoints. It is

not possible to understand the whole phenomenon from all viewpoints; however, using a reflexive process across quantitative and qualitative methodologies, a greater understanding of the relationship between action and perception can be built up (O'Cathain *et al.,* 2010).

Knowledge bases around the most suitable philosophical approach in mixed method research are underdeveloped. With this study, a pragmatic approach is taken so that the strengths of quantitative and qualitative approaches can be used to explore place effect. However a subtle realism consideration of differences in viewpoint is considered throughout in order to achieve conceptual integration without forced synthesis between fundamentally different paradigms.

3.4 Mixed method trustworthiness and rigour

Assessing validity in mixed methods research is complex and underdeveloped. With the increase in mixed method studies, the importance of validity – and how to ensure it – has started to be discussed (O'Cathain, 2008; Onwuegbuzie and Johnson, 2006). Within this study, the importance of trustworthy and rigorous research has been considered within each methodological approach. This process is discussed through Chapters 4 and 6. It was also important to be rigorous across the overall development and integration of evidence.

Transparency of, and justification for, the mixed method study were used to achieve validity. By thinking through and describing why, how and what within the mixed method study was integrated, the strengths and limitations of the study are considered and displayed (O'Cathain, 2008).

It was especially important to consider how the strengths and limitations of each methodology were associated. With this understanding, the mixed method design and data synthesis could be conducted to improve the overall validity of the study. For example, one of the fundamental weaknesses of secondary observational dataset analysis is *confirmation bias* (Johnson and Onwuegbuzie, 2004). This occurs when the focus is on testing a hypothesis without understanding the phenomena in which it is set. The use of qualitative interviews and questionnaires enabled place to be explored from multiple standpoints. This builds up a greater understanding of the effect of place and reduces the likelihood of overlooking important factors.

3.5 Development of mixed method study framework

Literature for mixed method studies is diverse, and can be confusing and contradictory. This effect is further increased by apparent prejudices towards research firmly defined as

quantitative or qualitative (Bazeley, 2009). This leads to the need to set out the underlying theory clearly. Then, by explicitly grounding the mixed method design within this theory, much of the confusion can be avoided.

The purpose of the study was to *expand* the inquiry into what aspects of locality influence ACS outcome and why. Expansion is the use of multiple methods, within different phases of the study to increase the scope of what the study discovers. Within the diverse and broad nature of the research objectives, this approach enables exploration without restriction, expanding on previous literature theories and the information resulting from each phase of the study.

The aim was to *develop* each stage throughout the study, based on the previous literature and data collected and analysed during the previous phase, creating layers across the study that build upon each other. The method aims to increase the validity of constructs and inquiry results by capitalising on inherent method strategies. As information emerges from this study regarding what place influences exist and their effect, it can be returned to the study agenda and built upon. A sequential approach was the natural choice to fulfil these aims, where each phase of the study leads to the formation of the questions, data collection and analysis for the next phase. Sequencing enabled exploration and development of each stage of the study, working towards a more rounded evidence base.

There is large diversity in mixed method approaches available, for example, the use of interviews and summary statistics. Collins, Onwuegbuzie and Sutton (2006) put forward five mixed method constructs that can be built up around the research objectives to form a design that is either concurrent or sequential. This study is sequential, iteratively moving from quantitative research into qualitative:

> Qualitative follow-up interaction analysis involves using qualitative data analysis techniques to further investigate statistically significant interactions that emerge
>
> from inferential analyses.   (Collins, Onwuegbuzie and Sutton, 2006, p.86)

For the instigation of a mixed method design, the 13 steps of the conceptualised process of Collins, Onwuegbuzie and Sutton (2006) were used as a structure (Figure 3.2 on page 55); inspiration was also taken from the Maxwell and Loomis (2003) theory-based interactive model. This presents a logically ordered research process that is open to robust iterative stages, giving proficient guidance on how to accomplish a successful mixed method study. The first five steps are linear, making up the *formulation stage* discussed within this chapter and the previous one, building to the *planning stage* in steps six and seven. This conceptualising of rationale and

purpose determined how the mixed approach runs throughout the study frameworks and informs the entirety of the study.

This study is sequential, where quantitative and qualitative components focus on different people, but are drawn from the same sample. Thus, the same influences can be examined from different paradigms, looking to answer a range of diverse questions. The final stage is the *implementation stage* from steps eight to eleven. The integration of data within this structure is undertaken by a flexible approach across five areas: collection of data, analysis of data, re-evaluation of research, validation of data and interpretation data. Integration is flexible and iterative, encouraging interlinking conclusions to be formed. This model was useful as it allowed each stage to be revisited more than once, helping the research to evolve, according to the new information uncovered, whilst the analysis was being undertaken throughout the research.

3.5.1 Terminology for mixed method studies

For mixed method research, distinctly clarified terminology is essential, with the same word having different meanings according to the paradigm from which it is considered. For example, the meaning of the word *outcome* from a quantitative perspective is likely to be interpreted in terms of survival, whereas it is interpreted as the perspective of the person experiencing his or her own personal recovery, when taking a qualitative approach. In this study, the term *survival* is used when referring to the outcome from a quantitative approach, *recovery* from a qualitative perspective and *outcome* when looking at the overall effect.

The differences in methodological approaches lead to clear differences in the way place is defined. With quantitative analysis, there is a necessary constraint in that uniform fixed boundaries are defined, which will be referred to as the *local area*. Lower super output areas (LSOAs) are used within this study – boundaries that were built around homogeneous population density. Within a qualitative approach, the neighbourhood is defined by individual connections. The differences in interpretations of place are explored throughout this thesis.

A topic recently of interest within public health and epidemiology is defined by Cattell (2001) as the norms of trust, reciprocity and the concern for the wellbeing of one's community. The word *neighbourhood* is used to refer to where there is a personal connection to the place a person lives, where the boundaries of the place are self-defined and include the social environment. It is important to note that neighbourhoods also have structural characteristics that will contribute to people's perceptions of them. This perception and the personal history of the person living there will indicate the preference to reside locally. Within this study,

neighbourhoods are mainly explored using a qualitative approach. These distinctions encourage multiple aspects to be considered, forming multiple views.

3.5.2   Empiricist framework

The empiricist framework developed from the research objectives guides the study design, resulting in a sequential design following the structure displayed in Figure 3.3, with the following typology (Greene, Caracelli and Graham, 1989). It started with the quantitative phase to gain an overview of *what* place influences existed, followed by a mixed questionnaire and qualitative phase to determine perceptions of these influences, forming *why* these influences affect people.

Methods: referring to the similarity (or differences) of research methods in terms of data collection, analysis, form, assumptions, strengths and limitations. Diverse research techniques within two phases are used in this study to encourage combination of strengths, building up insight at each phase, and to reduce weaknesses and biases, such as clarifying theory developed in previous phases.

Phenomena: this study falls into a mid-range phenomenon, positioned within different and overlapping methods, capitalising on the strengths as well as allowing separate research objectives to be addressed.

Implementation: the research objectives, methods, and interpretation are considered both separately and data *synthesis.* Using *sequential timing* is especially useful, due to the broad nature of the research objective, refined as the study progresses.

Status: Equal emphasis is put on the quantitative and qualitative aspects; in Morse's (1991) terms: QUANT=QUAL.
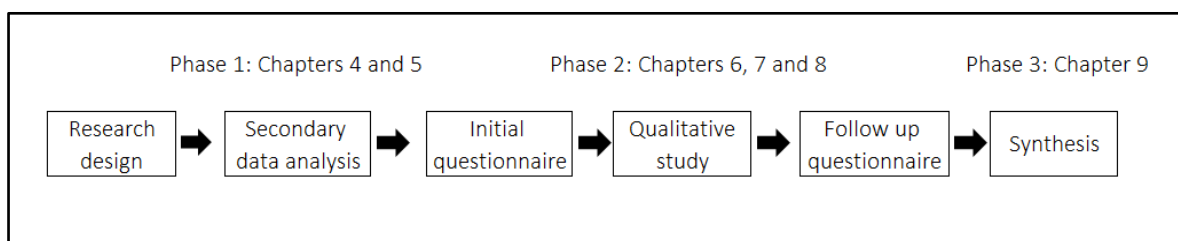
Figure 3.3: Outline of study

Phase 1: Secondary data analysis

The use of large datasets relating to ACS patients across Yorkshire and Humber enabled exploration of the relationship between patients' personal/clinical characteristics, place differences and survival at six months. The datasets facilitated the search for patterns and trends across an overview of people from different backgrounds and with ACS health problems, identifying local area influences.

This phase aimed to elicit an overview of how local area relates to ACS survival at six months, what local area aspects had influence and how personal characteristics that may affect outcome related to place differences; for example, 'is it beneficial to live in a local area close to facilities such as food shops?'. This approach was taken owing to the broad nature of the research objectives: by examining many people at once, generalisable trends within this sample population were uncovered. By basing this phase on pre-collected data, analysis began immediately with little financial implication, but was limited to the variables within datasets already collected and the quality of the data. Insightful results were formed in this phase, though further clarification about the meaning behind the results was needed, leading to smaller, more in-depth study phases.

Phase 2: Questionnaires and qualitative study

Phase 2 focuses on perceptions of place influences and recovery: 'what within the neighbourhood is seen as supportive?', 'What is the meaning of recovery?' and 'What are the characteristics of neighbourhoods perceived as important to recovery?'

This phase consists of a questionnaire study at two time points, looking at initial and follow-up recovery, and a qualitative study employing in-depth interviews and community mapping. Insight was gained into what neighbourhood aspects were important to recovery and how these varied across place differences, severities of ACS and personal motivations.

Examining initial recovery and follow up at six months gave the opportunity to look at perceived recovery over two time points, by looking at the experiences of first coming out of hospital, and then changes in experience and what was valued within the place of residence six months later. Employing two points in time offered insight into experiences and perception of local social support, deprivation and the effect of local facilities on how the participant felt they had recovered. The questionnaires were limited by a set number and type of question that could be asked and the inability to gain further in-depth information.

Phase 3: Data synthesis

Phase 3 concentrates on bringing together the conceptual findings and data formed within Phases 1 and 2, aiming to answer the research objectives formed in section 2.6, and hence shed some light on the research aim.

The phase uses a variety of methods centred on seeing the information available as a whole, determining the contributions of exploring the phenomena from multiple angles. This is both enhanced and limited by differences in the origin of the information and the types of questions being asked – the main difficulty of data synthesis.

The final part of data synthesis, and the last iteration conducted in this study, was the revision of the latent class regression models developed within the first phase. The model building strategies were based on the conceptual locality influences, formed during data synthesis. This aimed to bring together perceptions of experiences, and aspects of locality that were associated with six-month survival, comparing what was perceived to have an effect on recovery and determining whether it was actually associated with survival. This is an integrated look at locality influences, with the power to generalise to the wider population and form a link between data formats.

It is however limited by how well quantified variables can represent conceptual ideas, and the relevance of survival as the outcome from ACS.

3.6 Integrated analysis strategy

Following the iterative development of the study, all data was built upon previous phases, repeating phases to build up a more rounded view of place influences on ACS outcome. The secondary data analysis is used to encompass general patterns, moving towards the questionnaire and qualitative study that concern perceptions. The mixed methods design is built into the research design, sampling and data collection methods, as well as the analysis.

Analysis took place in three parts:

a) Quantitative analysis
b) Qualitative analysis
c) Integrated analysis by the synthesis of all data available

This analysis was undertaken throughout the research process, enabling development of different phases, and informing study direction to clarify results.

3.6.1   a) Quantitative Analysis

Quantitative analysis is defined as confirmatory, deductive, structured, closed-ended, controlled, and linear research (Johnson and Turner, 2003). Secondary data was analysed quantitatively within the first phase, together with the closed questions from the questionnaires from the second phase. In this part of the analysis, general trends were uncovered, looking at how different aspects of personal ACS outcome relate to each other and to survival at six months, forming a basis on which the rest of the research could be developed.

3.6.2   b) Qualitative Analysis

Qualitative analysis is defined as exploratory, inductive, unstructured, open-ended, naturalistic, and free-flowing research that results in qualitative data (Johnson and Turner, 2003). Interviews and community mapping, together with open questions from the second phase, were analysed qualitatively.

Analysis was conducted systematically. The focus was on uncovering trends in perceptions and the reasons behind them. The analysis was built on the insight gained in the first phase, determining what place influences exist, specifically explaining the reasons that these are important and why they varied for different characteristics of place.

3.6.3   c) Data synthesis

The focus of the analysis is placed on an inductive process, treating everything as data, and making inferences and interpretations throughout the study. This process fits well in the development process put forward as the overall research design. All data collected and analysed, and the results obtained, are used within the integrated analysis, using methods put forward by the legitimate structured model developed by Onwuegbuzie and Teddlie (2003). This takes advantage of various mixed methods techniques that were deemed appropriate, making constant comparisons between each of the analysis sections, and taking into account the limitations of each technique applied and any formed by the use of multiple techniques (legitimation: Onwuegbuzie and Teddlie, 2003).

Processes such as qualitising and quantising analysis (transforming quantitative data into qualitative data. or vice versa. for analysis) were considered, but were deemed inappropriate due to the differences in the nature of questions asked within each phase.

Conclusions were drawn by analysis of integrated data from combinations of appropriate approaches and paradigms, enabling the research objectives to be addressed.

The construction and analysis of revised latent class models supported this integration, bridging the gap between the conceptual ideas about place effect formed throughout the previous phases, and how these relate to six-month survival.

3.7 Summary

This chapter has outlined the methodologies underlying this research study, and the empiricist and conceptual framework, and has presented the rationale for a sequential exploratory development of mixed method research design with two phases of data collection, and three areas of analysis: a) quantitative; b) qualitative; and c) integrated data. This mixed approach helped to form a more rounded view of place influence without restriction on techniques used. The following chapter details the techniques used within the first phase of the study and the analysis to be undertaken.

Chapter 4: Measuring the influence of place on ACS outcomes: Epidemiological approaches and methods

4.1 Introduction

The purpose of the first phase of the study was to explore features of the localities in which older people with acute coronary syndrome (ACS) lived, with the aim of determining how place affects survival up to six months. General patterns and trends of contextual and compositional features that may have affected individual health were considered across the population of Yorkshire and Humber.

This chapter discusses the development of the epidemiological approach and the methods employed. Justifications for these methods used, their limitations and how to minimise them are considered. A secondary population level dataset of people in Yorkshire and Humber with ACS is drawn upon.

Place inequality was explored in terms of six-month survival. The place where an older person with ACS lived was represented by the level of deprivation and a combination of place features. In doing this, how place was conceptualised and measured was critiqued for this older population in terms of survival rates.

The chapter starts with a description of the data and the techniques used in management/cleaning that was necessary prior to analysis (section 4.2), and how the data was explored to determined the most appropriate approach to the analysis (section 4.3). This follows the STROBE statement by von Elm, (2007). Then, how place is associated with six-month survival is explored. This is structured around the two approaches used to measure the local area: *local area indices* in section 4.4 and *local area census variables* in section 4.5. Figure 4.1 on the next page displays how the chapter progresses though these stages.

Local area indices are represented as a single number that summarises local area inequality; survival regression analysis was the method used. Local area census variables represented a combination of place features. Many related summary statistics were in conjunction and therefore a more complex modelling technique was needed: latent class regression.

4.2 Data sources

Large population datasets are immensely valuable and enable analytical procedures to commence immediately. A limitation of secondary data is that input or changes cannot be made

to the data collected. The use of a combination of different datasets that contain different information reduces this weakness.

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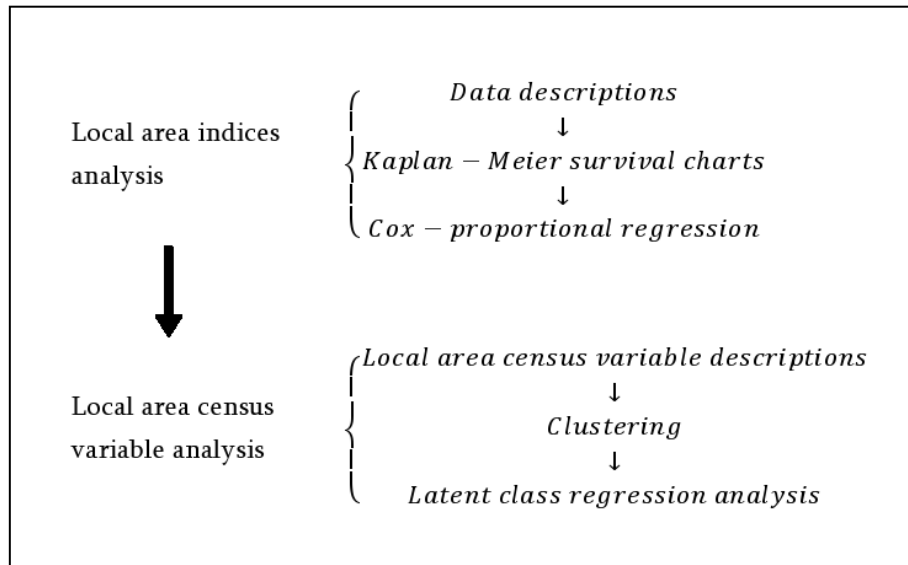
Figure 4.1: Flow chart of phase one, secondary data analysis

A number of secondary data sources were drawn upon: an observational dataset of people with ACS, 2001 census data that relates to local areas, and Office of National Statistics survival data. These datasets provided information on people with ACS, where they lived and their mortality status over the first six months.

The observational ACS dataset was collected for people with ACS who were admitted to a hospital within the strategic health authority (SHA) for Yorkshire and Humber (Q32) between 1 January 2003 and 2 October 2010. The dataset comprises individual level data on a range of personal characteristics, such as age and medical data, including diagnosis, treatment and drugs received. It was originally collected for service evaluation purposes in the Myocardial Ischaemia National Audit project (MINAP) (Herrett *et al.,* 2010).

Data was collected for the following areas: North Yorkshire and York, Bradford, Airedale, Calderdale, Leeds, Kirklees, Wakefield, Barnsley, Sheffield, Rotherham, Doncaster, Bassetlaw, North Lincolnshire, East Riding of Yorkshire, Hull and North East Lincolnshire.

Data that related to local areas was collected in the 2001 census. Information was collected based on the population of a small administrated area. From the available data, 36 local area census variables were chosen, based on the relevance to the study. This ranged from the condition of the housing to patterns of educational attainment within a particular area.

The small area boundaries in which the census data was collected are termed lower super output areas (LSOAs). LSOAs migrated from the Office of National Statistics (ONS) geography legacy systems to replace wards in the 2001 census. The aim was to improve reports of small area statistics. There are 34,378 LSOAs in England and Wales, with 3,293 in Yorkshire and Humber, each with populations between 1,000 and 3,000 people (mean 1,600). LSOA boundaries were built around population size, mutual proximity and social homogeneity. These boundaries were formed in an attempt to gain consistently-sized areas across the UK that are not subject to regular boundary changes (ONS, 2012).The Office of National Statistics provided mortality and survival data for each individual.

The combined data was restricted to those over the age of 65 and who had survived to be discharged from hospital. The resulting sample size was 35,767, of whom 20,122 (56.3%) were men and 15,645 – or under half (43.7%) – were women.

The process of data collection occurs across multiple hospitals by many different people across Yorkshire and Humber. Knowledge of any problems or differences in the way that data is collected is not possible. Differences that do exist may result in selection or record bias. For example, there may be a positive bias towards the collection of data for people who stay in hospital for long periods of time, in comparison to people who stay for shorter periods.

The season or time of the data collection could also affect the quality of the input. For example, on a slower shift, there may be more time for data input. Differences across the type of data and its quality by hospital are also likely. Ways of minimising potential biases within the datasets are considered in sections 4.2.2 and 4.2.3 below.

4.2.1   Study ethics

The ACS dataset was collected with the Myocardial Ischaemia National Audit Project (Herrett *et al.,* 2010). Data was anonymised before access was received. The National Institute for Cardiovascular Research (NICOR), which includes MINAP (Ref: NIGB: ECC 1-06 (d)/2011), has support under section 251 of the National Health Service (NHS) Act 2006. Ethical approval was not required under NHS research governance arrangements for the project.

Census data is openly available, from the Office for National Statistics, licensed under the Open Government Licence v.1.0.

4.2.2   Data cleaning

Misrecording of data is common within datasets of this size: for example, by recording a negative survival time when this could not possibly occur. Time was taken to uncover these values and categories within variables that do not make sense, cleaning the data of these inaccuracies using deletion to reduce the effect on the overall dataset.

This increases the occurrences of unrecorded values (missing data), and posed the need to deal adequately with missing data so as to increase analytic power, reduce collection bias and reduce the overall effect that missing data, misrecorded or incorrect values have on the data available.

4.2.3   Multiple imputation

Data values missing for a patient, referred to as *missing data*, *implausible data* and *low data quality*, are problems when using observational data. These may be due to data collection problems and inconsistencies; variations in data quality create recording bias and inefficient data analysis.

The most commonly used methods to deal with these problems include using only patients with complete data; this is a quick and easy application. As all patients with one or more data values missing are deleted, the sample size and related power of the analysis is greatly reduced (van Buuren, Boshuizen and Knook, 1999). It may also lead to inefficiency of statistical estimators and bias deletion of patients in the dataset. Tables 4.1 and 4.2 on page 70 show a summary comparison for a variety of variables: the differences between summarised data before and after removal of missing data. The differences between the point estimates within these datasets indicated the need for a more appropriate method when dealing with missing data.

Over recent years, multiple imputation has been an optimistic approach when dealing with missing data. The end result is analysis conducted over a dataset where no data values are missing from the dataset.

This is the process of computing an estimation of each missing value based on empirically predictive distribution of the observed data within the dataset multiple times. These estimates are substituted into multiple datasets, each of which is used to undertake analysis. Results from each dataset are then pooled. The use of multiple estimations pooled together for each missing data value increases the accuracy of the estimate (Graham *et al,* 2007). Standard errors are calculated by:

(a) averaging the squared standard errors of the five different estimates from the various datasets. This was restricted to five datasets due to processing time: five is considered an appropriately large number of datasets to account for variations in imputations (Rubin, 1987).

(b) calculating the variance of the five parameter estimates across the samples. These are then combined to form a more accurate standard error term that accounts for variations across values within and across datasets.

Steps of multiple imputation

Multiple imputations were undertaken in three steps described below (see van Buuren and Groothuis-Oudshoorn, 2007 for further details).

Data imputation: observed data was used to estimate missing data values. Imputations are drawn from a distribution modelled for each missing entry, and this is repeated to form five different datasets (Schafer, 1997). Observed values within the original dataset are identical in all five datasets, but imputed values will vary due to residual variations within distribution models. These variations across datasets are used to reflect the error caused by the uncertainty of the imputed values.

Data analysis: analysis is undertaken on each separate complete dataset forming multiple similar statistics for each dataset. The appropriate analysis is restricted by the assumption of data being from a continuous multivariate normal distribution (Rubin, 1987).

Result pooling: pooling statistics found during the analysis of the separate datasets resulted in one point estimate and an estimate of the variance between datasets. Rubin (1987, pp.76-77) sets out the rules and assumptions made during this process.

For an example of how multiple imputation can be used to overcome the impact of missing data see Gale *et al.* (2009). R library MICE was used to complete the analysis (van Buuren and Groothuis-Oudshoorn, 2010).

Forms of missing data

The five resulting datasets that have been imputed have no missing data. Within the analysis of these datasets, no deletion bias is formed or power lost due to missing values. How well the imputed data values represent the data that was missing depends on why the data was missing. If a pattern or result for these data values is not inputted into the data, a bias is formed. This

Table 4.1: Comparison of overall, complete case and missing data for men

Comparison of overall (patients with all variables completed and those that are not complete), complete case (only those patients with all variables completed) and not complete data (patients that have at least one data value missing)

Men	Overall: mean (sd)	Complete case: mean (sd)	Not complete data: mean (sd)	Difference between overall and complete (95% CI)	Difference between complete and not complete data (95% CI)
Age	76.2 (7.0)	76.4 (7.1)	75.7 (7.0)	(-0.4, -0.1)	(0.5, 0.9)
Townsend	0.2 (3.5)	0.1 (3.4)	0.4 (3.7)	(0.0, 0.2)	(-0.4, -0.2)
IMD score	26.2 (16.9)	26.3 (16.4)	25.9 (17.9)	(-0.5, 0.2)	(-0.1, 0.9)
Jarman score	-0.7 (16.8)	-1.2 (16.4)	0.3 (17.6)	(-0.8, -0.1)	(-1.9, -0.9)
6 month survival	166.9 (41.5)	167.2 (40.7)	166.5 (43.1)	(-0.6, 1.1)	(-0.5, 1.9)
Heart rate	82.4 (25.2)	82.9 (25.3)	79.3 (24.7)	(-1.1, -0.0)	(2.6, 4.6)
Systolic bp	140.0 (28.7)	140.3 (28.5)	138.02(30.2)	(-0.9, 0.3)	(1.0, 3.6)
Troponin	8.6 (18.2)	8.9 (18.6)	7.8 (16.8)	(-0.6, 0.2)	(0.4, 1.6)

Table 4.2: Comparison of overall, complete case and missing data for women

Women	Overall: Mean (sd)	Complete case: Mean (sd)	Not complete data: mean (sd)	Difference between overall and complete (95% CI)	Difference between complete and not complete data (95%)
Age	78.7 (7.6)	78.9 (7.7)	78.2 (7.5)	(-0.4,-0.04)	(0.5,0.9)
Townsend	0.2 (3.5)	0.1 (3.4)	0.5 (3.6)	(0.0,0.2)	(-0.5,-0.3)
IMD score	26.9 (16.7)	27.0 (16.2)	26.7 (17.7)	(-0.5, 0.3)	(-0.2,0.9)
Jarman score	-0.2 (16.7)	-0.7 (16.3)	0.9 (17.4)	(-0.9, -0.1)	(-2.2, -1.1)
6 month survival	166.1 (42.5)	167.0 (40.7)	164.1 (45.9)	(-0.0, 1.9)	(1.5, 4.3)
Heart rate	86.7 (25.9)	87.1 (25.8)	84.0 (26.2)	(-1.1,0.1)	(2.0, 4.3)
Systolic bp	144.0 (30.7)	144.7 (30.6)	139.8 (31.1)	(-1.4,0.1)	(3.4, 6.4)
Troponin	7.1 (16.3)	7.3 (16.4)	6.6 (16.2)	(-0.5, 0.3)	(0.04, 1.3)

can reduce the accuracy of the multiple imputation process. There are four categories of missing data:

- Missing completely at random (MCAR): The missing data has no underlying pattern; the missing data will follow a similar pattern to the observed data
- Missing at random (MAR): Differences between the observed and the missing data can be explained by the differences within the observed data
- Missing not at random (MNAR): The missing data follows a certain pattern independent of the observed data
- Missing by design: Certain data is missing due to the design of the study

Multiple imputations are most efficient when dealing with MCAR data. There is no bias present that might affect the modelling process. The process of multiple imputations can also be conducted for MAR data, although the level of accuracy may be less than for MCAR data.

Within a dataset this size, it is reasonable to assume that at least a few are MNAR and therefore will affect how appropriate the use of multiply imputation was. On reflection, this process was optimal to deal with missing data out of the available options, as it held the power of the data, as well as having estimated missing values with some accuracy in a portion of the variables within the dataset cases, and it does decrease selection bias.

To improve the plausibility of MAR data used, and the assumption that the missing values can be reasonably predicted by modelling the observed values, a number of data management techniques were used (Graham *et al*, 2007). Therefore, within the models used to predict the missing values, as much as possible of the available observed data for each patient was used.

4.3 Data exploration

Knowledge of the data available, distributions and the underlying structure of interconnections across data variables were useful prior to analysis. This was undertaken by reading through the descriptions of each variable, consulting a cardiologist on their importance and impact, and confirming the meaning of each variable, for example, use of drugs such as *Clopidogrel*. Possible ACS outcomes and locality variables that would be advantageous in achieving the research objectives were developed. Based on this greater understanding of the data available, appropriate modelling techniques were chosen. Survival analysis was the approach chosen to utilise the available ACS outcome data, undertaking regression modelling to explore the local area influences on survival, while considering the heterogeneous nature of the people within the sample.

The distribution of each variable was explored using frequency tables and density plots, to increase familiarity with the available data, and identifying data skewness, outlines and unexpected trends. Table 4.3, displays the average personal characteristics within the dataset whereas Table 4.4 shows clinical averages. Exploration helps to form insight in to the data structure. For example Table 4.2 it can be seen that majority of men (81.5%) and women (80.0%) were offered rehabilitation courses. This does not coincide with the recent literature research study that 30-60% did not attend in Scotland (Herber *et al.,* 2012).

Table 4.3: Personal characteristics from the combined dataset

	Men	Women
Sex n (%)	20122 (%)	15645 (%)
Mean age (sd)	76.2 (7.1%)	78.8 (7.7)
Heart rate	82.3 (25.2)	86.4 (25.9)
Current smoker n (%)	2757 (15.9%)	2057 (15.5%)
Ex smoker n(%)	8795 (50.8%)	4008 (30.2%)
Non/unknown history of smoking n (%)	5763 (33.3%)	7189 (54.2%)

Table 4.4: Clinical aspects from the combined dataset

	Men	Women
Diagnosis STEMI n (%)	4951 (24,6%)	3433 (21.9%)
Diagnosis NSTEMI n (%)	11038 (54.9%)	8768 (56.0%)
Diagnosis other n (%)	4133 (20.5%)	3444 (22.0%)
Reperfusion received n (%)	3863 (30.6%)	2438 (16.9%)
No reperfusion recieved n (%)	14855 (79.4%)	11959 (83.1%)
Rehab n (%)	13780 (81.5%)	10298 (80.0%)
No rehab n (%)	3137 (18.5%)	2575 (20.0%)
Diabetes n (%)	1939 (19.2%)	1374 (18.1%)
No diabetes n (%)	8167 (80.8%)	6229 (81.9%)
Received: ACE inhibitor n (%)	12683 (73.8%)	9206 (69.9%)
Not received: ACE inhibitor n (%)	4502 (26.2%)	3969 (30.1%)
Received: Beta blockers n (%)	11803 (67.6%)	8865 (65.5%)
Not received: Beta blockers n (%)	5661 (32.4%)	4668 (34.5%)
Received: Aspirin n (%)	14769 (83.6%)	11274 (82.%)
Not received: Aspirin n (%)	2896 (16.4%)	2416 (17.6%)

Within the data available, mortality rates and date of death were the only viable representation of outcome for people with ACS, as the data was reasonably complete. Individual survival rates were formed from these as they utilised the information available. The binary status *whether a patient was dead or alive* and the *length of time that the patient survived* (defined as the time between admission date to hospital and date of death) were combined (Machin, Cheung and

Parmer, 2006*)*. After six months, or when status information was no longer attainable, survival rates were censored, i.e. it was assumed that the person was alive at this point, and no further assumptions about their health were made.

Censoring survival rates enables use of all available information, maximising power and reducing non-complete data deletion bias that would affect the survival rate distribution used during modelling. Censoring at six months improves the probability of a person's death being due to ACS, rather than co-morbidities within the all-cause mortality health status variable. This is based on the assumption that six months is a sufficient time period for death from ACS to have occurred. Figure 4.2 below shows the distribution of deaths across the first six month period after the patient leaves hospital. From this a reasonably even distribution of deaths is seen over time. This starts to plateau after around 100 days.
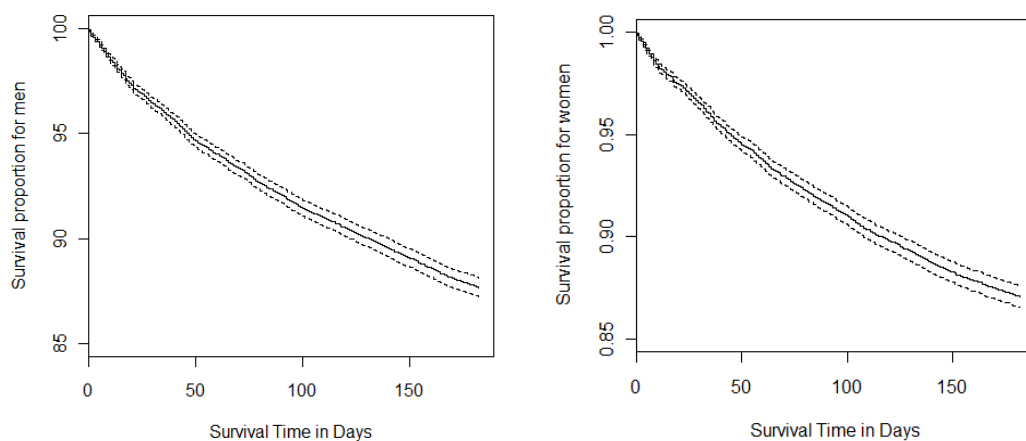
Figure 4.2: Survival rates up to six months within the combined dataset

Inequality in place was measured by local area indices. These were chosen based on the literature discussed in Chapter 2. How the local area indices scores were associated with six-month survival was explored.

It was not possible to research how the individual's level of deprivation interacted with place due to the pragmatic reason of data availability. This limits what inferences could be drawn. The secondary data analysis explored how place effected survival rates at six months. However it was not possible to explore whether this association was due to place or the deprivation/economic circumstance of the individuals living in the area.

This large, complex dataset gave great potential for discovery, with care being taken to keep an open mind to emerging ideas, while maintaining a high level of statistical integrity. The size and

complexity of the dataset makes the analysis intricate, with heavy reliance on accuracy of interpretation. Throughout the analysis, care was taken to consider the data structure and check underlying assumptions.

Variable inter-relationships were explored to uncover the underlying data structure and to identify potential non-linearity and collinearity problems. Non-linearity is present when the relationship between a predictor variable and the outcome variable within the model is not linear. For example, within a dataset of all age ranges, it would be expected that a cubic or quadratic relationship existed with survival, although this is not the case in this restricted age range dataset.

Collinearity is present when more than one predictor variable contains similar information, which causes high correlation between variables and may mask the importance of both variables. High collinearity was not present within personal and clinical characteristic variables. For example, age was not highly correlated with systolic blood pressure (correlation coefficients CI, p-value: men 0.008 to 0.02, p=0.006; women -0.002 to 0.03, p=0.013), though collinearity was discovered to be present between local area variables; this is expected given the nature of the variables.

4.4 Local area indices

Three indices of area-based deprivation were initially selected to examine characteristics of the local area, based on the background literature discussed in Chapter 2: Townsend deprivation index, Jarman scores, and the Index of Multiple Deprivation (IMD score). How these were constructed and examples of how they are used to explore local area influence on ACS outcome are discussed below.

Table 4.5: Average local area indices

Local area indices: mean(sd)	Combined dataset	
	Men	Women
Jarman score	-0.81 (16.7)	-0.29 (16.6)
Townsend deprivation score	0.14 (3.5)	1.21 (3.5)
IMD score	26.21 (16.9)	26.91 (16.6)

Townsend deprivation index

The Townsend index of deprivation was devised by Townsend (1979) in order to provide an area-based measure of material deprivation that can be constructed for geographical areas from available census data. This is one of the most commonly used indices, based on four variables:

- Unemployment as a percentage of those aged 16 and over who are economically active

- Non-car ownership, as a percentage of all households

- Non-home ownership, as a percentage of all households

- Household overcrowding

These four measures are standardised to form *z*-scores. The unemployment and housing overcrowding percentages (+1) underwent a log transformation to normalize as this data tends to be highly skewed. Each measures is then standardisation (subtract the mean value for the population and divide by the standard deviation). These values are then summed to form an overall score of material deprivation. It can then be used to make comparisons between the local areas on which the data is based, with 0 representing an area of average deprivation. Positive values indicate high material deprivation, while negative values indicate low material deprivation. This index had a great impact on the way local areas are measured and is still in regular use today (Townsend, 1979).

Jarman index

The Jarman underprivileged area score was developed in 1983 to measure the demand for primary health care services, for use by local health authorities (Jarman, 1983). Instead of looking at area deprivation, it aimed to highlight potential higher demand for primary health care services whereby a higher score would indicate a higher demand. More recently, the Jarman underprivileged area score has been used as an index of social deprivation, as a guide to health care needs and service provision. It was developed across England and Wales using questionnaires to identify social characteristics that affected service use.

Table 4.6: Jarman variables and weights

	Weights
Lone pensioners as % of all residents in households	6.6
Under 5s as % of all residents in households	4.6
Persons in single parent households as % of all residents in households	3.0
Persons in households headed by a person in socio-economic group 11 (unskilled) as % of all residents in households	3.7
Unemployed as % of economically active residents aged 16 and over	3.3
Persons in households with more than one person per room as % of all residents in households	2.9
Persons changed address in last year as % of all residents	2.7
Persons in non-white ethnic groups as % of all residents	2.5

The index is constructed in a similar manner to the Townsend deprivation index, using eight census variables that are normalised by a transformation of adding 1, followed by

standardisation. The sum is then calculated by summing the weighted standardised variables. Table 4.6 on the previous page shows the eight census variables and corresponding weights.

Due to the original application of the Jarman index, there are very few studies that relate it to ACS outcome. The Jarman index, representing neighbourhood environment, has been shown to have a significant influence on the health of an individual, defined as their BMI, whether they smoke and level of physical activity (Sundquist *et al.*, 1999).

Index of Multiple Deprivation (IMD)

The index of multiple deprivations was constructed by the Social Disadvantage Research Centre (SDRC) at the Department of Social Policy and Social Work of the University of Oxford (IMD 2007), as an update to the previously used index of deprivation (IMD 2004). The IMD score is a single score that summarises the general deprivation of small areas (Noble *et al.*, 2007) by combining multiple variables into one overall deprivation score. The purpose is to provide an efficient measure, based on seven domains containing various measurements weighted by importance, which gives a continuous variable that represents general deprivation (Table 4.7). The inclusion of health as a part of IMD may lead to 'mathematical coupling' (Adams and White, 2006). This occurs when a health representation is used as both a predictor and the outcome being predicted, resulting in correlation between the predictor and outcome measure of health. In this case, the deprivation index IMD, which has a health element, is used to predict six-month survival.

Table 4.7: Weightings of IMD

	Income	Employment	Health	Education	Barriers	Crime
Weights	22.5	22.5	13.5	13.5	9.3	9.3

There have been few studies previously based on the effect of multiple deprivations on onset and outcome from ACS, as IMD score is exclusive to the UK and relatively new.

These three local area indices were chosen from those that were discussed in the literature in Chapter 2. The three indices contain overlapping information; however, they were developed around a certain purpose. These local area indices are used to represent the aspects of place that they were developed for. The Townsend deprivation score represents the material and built environment. The Jarman score was developed to measure demand on general practice and therefore includes some individual level data. The Jarman score has been used to represent whether the area was under-privileged (Jarman, 1983) and is the representation that is used in this study. The IMD score is an overall general measure of area deprivation, and contains

components of the social and built environment. Comparisons between these local area indices enabled exploration into differences and measurement problems, and the identification of the most useful in terms of six-month survival for older people.

4.4.1   Survival regression tree categorisation

Categorisation of local area deprivation indices from their original continuous state was necessary for a variety of reasons. The first is to enable comparisons with previous studies, as most use categorised indices. These comparisons are limited by the splitting criterion used, which differs between studies. Categorisation is useful as it is only possible to fit Kaplan-Meier estimates with categorised predictor variables, fitted to examine the different relationships that the split local area indices have with survival risk. Another reason is to simplify, reducing modelling problems such as the presence of non-linearity between local area indices and survival rates.

Categorisation results in loss of the information available, as data is grouped by similarities, dependent on a certain grouping criterion or cut point, instead of using a distinct value for each person. The cut point on which data is often split is usually taken arbitrarily to form equal-sized groupings of people (quartiles). This simplifies analysis and interpretation, although it gives the inclusion/exclusion of people within each category little meaning.

Seeking to reduce this loss of information, categorisation of local area indices was undertaken, based on people's deprivation influences on survival at six months. Survival regression trees were employed to attain this; the overall aim was to gain meaningful categorisation of data with reasonably similar numbers of patients within each grouping of data.

A survival regression tree introduced by Gordon and Olshen (1985) follows a basic classification and regression tree (CART) algorithm. CARTs (Breiman *et al.,* 1984) partition the sample of people into smaller groups (nodes in the tree), which are similar according to a certain outcome – survival at six months. There are various ways of measuring how similar the patients are within each node and hence how the tree is grown. Within the local area indices there is only one predictor variable to consider, the point at which to split the data. This process is then repeated within each new subset of data until there is a single person within each node.

The tree can then be cut back (pruned) to a more manageable size by making restrictions on how complex the tree is allowed to be, putting a limit on the least number of people within a node. The three trees fitted: one for each local area index had a minimum of 4,000 people
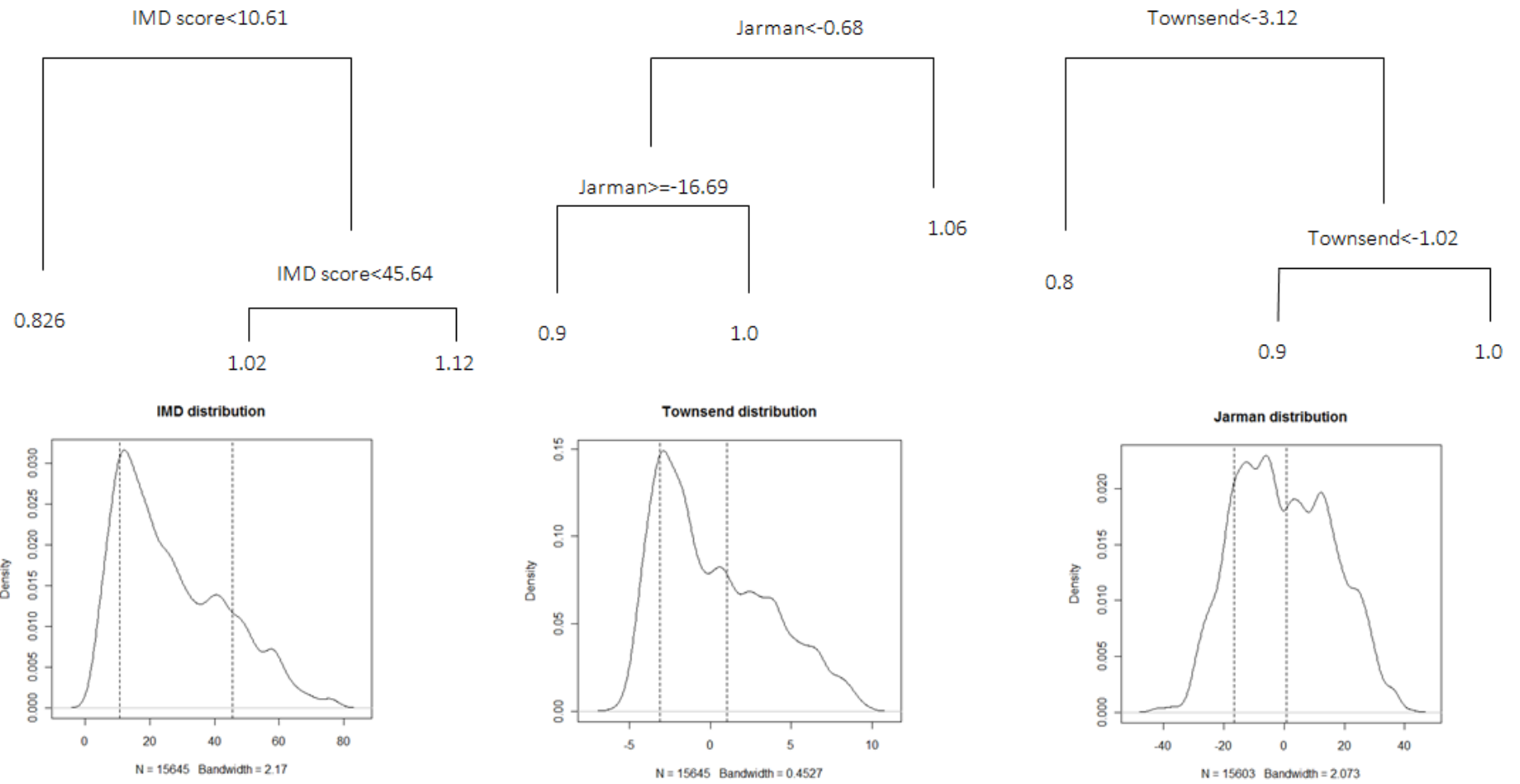
Figure 4.3: Survival trees and density plots for female patients

IMD score, Townsend and Jarman with cut points (dashed line)

within each final node. This gave some consistency within the size of the groupings, which encourages comparability and reduces the chance of categories being susceptible to outliers. Within the survival and local area indices data, there was no missingness, and hence multiple imputation within this dataset was not necessary.

Survival trees account for the censoring that was used at six months for the survival data. This censored survival outcome used a suitable splitting algorithm that differs from ones used with CART. The data is first rescaled so that it fits an exponential baseline hazard, and then uses a Poisson method to split the data. This is possible due to the equivalence between the proportional hazards, full likelihood model and a Poisson likelihood model. The splitting criterion is based on the deviance of the node, measured between the saturated full model log-likelihood and a maximised log-likelihood. To reduce complexity, the unknown full-likelihood is approximated by replacing the baseline cumulative hazard function by the Nelson-Aalen estimator. This can be completely within the software R, by the use of the library 'rpart' built by Therneau and Atkinson (2010). The deviance is used in this estimation as defined in McCullagh and Nelder (1989).

Interpretations of these three trees were used to choose the cut points for categorisation of the local area indices. The three survival trees grown for women are displayed on the previous page in Figure 4.3; the cut points chosen by the tree algorithm are shown at the top of each *branch.* The subset of data that agrees with the criteria displayed goes into the node down the left branch of the tree, whereas the subset that disagrees with the criteria is within the node of the right branch of the tree. The splitting criterion where the data naturally splits was taken as the cut point to form categorisations of the originally continuous local area indices. The cut points found provided interesting insight: for example, higher local area indices scores are associated with higher frequency of death.

The distributions of the local area deprivation indices within Figure 4.3 show similarities between the IMD and Townsend indices, with a skew towards low deprivation levels, although their relation to survival is different, the cuts point being at different parts of the distribution. Jarman's distribution differs greatly from the other two local area indices considered: the data is more normally distributed.

4.4.2   Survival tree comparisons

Survival trees were also useful to make comparisons between local area deprivation indices and their influence on survival at six months. This would not be possible with a parametric

regression model, due to the high correlation between such local area indices (discussed in section 4.3.1). Survival trees use only one predictor variable to split on at a time; therefore, collinearity is not an issue when using trees.

This enables modelling of the three local area indices together, so that direct comparisons can be made across their influence on survival. The local area index with the most influence on survival will have the first splitting criteria; any sub-sequential splits provide further insight into the importance of different groupings of data, i.e. potential model interactions.

4.4.3 Choice of statistical techniques

Survival analysis forms regression models on survival rates, the outcome of interest. This is used frequently within epidemiology and health research, as well as other substantive areas such as actuarial sciences to examine life expectancy. By regressing on six-month survival, a range of potential influences is explored, specifically looking at the effect of place. From the survival analysis techniques available, Kaplan-Meier (Kaplan and Meier, 1958) and Cox proportional hazards (Cox, 1972) were chosen and used to map out the inter-connected influences on six-month survival for older people with ACS.

4.4.3.1 Kaplan-Meier

Kaplan-Meier estimates are simple and easy to understand, making them especially useful during exploratory analysis, when searching for general relationships among survival influences within the combined dataset (Machin, and Parmer, 2006). This non-parametric technique makes very few assumptions about the data structure, reducing restrictions: for example, survival does not need to be normally distributed.

The distribution of how local area deprivation indices relate to survival rates up to six months were plotted using Kaplan-Meier estimates, with maximum likelihood estimates that are piecewise continuous. Kaplan-Meier estimates create curves that step downwards to show when each person dies/is censored in relation to the local area index variables. Log rank tests were used to test for significant associations between each of the local area indices and survival rates at six months.

Due to the nature of Kaplan-Meier construction, only categorical predictor variables are appropriate; hence, the continuous local area indices needed to be categorised. Survival trees were used to form meaningful cut points (section 4.4.1).

Kaplan-Meier curves are useful when examining one predictor variable independent of other related aspects. This displayed the relationship between the local area index and survival. The initial visual representation showed how the local area index related to survival rates and how this changed over the six-month time period.

Kaplan-Meier estimates do not allow consideration of other related aspects that could affect the phenomenon that is under examination. For example, the severity of the ACS may also influence survival, affecting the relationship between local area deprivation indices and survival. This reduces the insight that can be gained from the analysis, as the differences in this heterogeneous sample are not considered.

4.4.3.2 Cox proportional hazards

The Cox proportional hazards model enables more complex relationships to be explored, considering whether personal characteristics and clinical factors also influence survival. Interactions across the phenomenon and their influence on survival are considered: for example, asking such questions as: 'are those who live in more/less affluent areas more likely to have previous health conditions?' and 'what is this overall influence on survival?'.

Cox proportional hazards are semi-parametric regression models using the outcome variable *hazard rates* (Machin, Cheung and Parmer, 2006). This is estimated by the ratio of the number of observed ACS events divided by the total survival time.

Hazard ratios make the assumption that the predictor variables affect survival independent of time. This assumption is referred to as the variable *having proportion hazards*. The use of a Cox proportional hazards model (Cox, 1972) only considers each predictor variable at one time point and assumes that this influence does not change over the time period considered.

When hazards are not proportional, the level of influence a variable has on survival changes over time. This results in over- or under-estimation of predicted survival rates; incorrect standard errors are calculated and the power of any significance tests is decreased (McCullagh and Nelder, 1989).

Cox proportional hazards do enable changes in the relationship over time to be assessed. This can be seen in the Kaplan-Meier charts. By considering correlations between survival times and the partial residuals of each predictor variable, the significance of whether this assumption is correct was tested using χ^2 tests. Occurrences of non-proportional hazards were usually found for predictor variables that were not of interest to this study. For example, this occurs within the category *other* of the predictor variable *follow up by cardiologist?* (χ^2 test men; p=0.005;

women; p=0.018); these are not of particular interest, so no modifications to the model were made. When non-proportional hazards were present for predictor variables of interest, categorisations were made; as a result, consistency was required only within the new categories, not across them. Categorisations were made for local area indices for this reason, using survival trees to inform the splitting criteria (section 4.4.1). Occurrences of non-proportional hazards were reduced by using a reasonably short follow-up survival time, censored at six months; thus, predictor variables only needed to be constant over this time period. In a small number of cases, it was not possible to remove or categorise. This might have led to biased parameter estimates and a decline in the power of statistical tests (Therneau, Grambsch and Fleming, 1990).

Another option would have been to use time-varying covariates, where certain predictor variables are allowed to vary over time. This was not pursued, as the aim of this study is to explore the relationship between local area and survival. The significance of the relationship was secondary to the direction of the relationship. The benefit of using time-varying covariates would have been minimal in comparison with the increase in complication of the model interpretation.

Cox proportional hazard model construction

Cox proportional regression models were built abiding by the principle of parsimony, while aiming to maximise variation explained within survival rates. Each model started with a large number of predictor variables, with the aim to explain the heterogeneous sample. These variables were chosen based on clinical importance and were drawn from the background literature discussed in Chapter 2 (Gale *et al.,* 2012; Thurston *et al.,* 2005; Blackledge, Tomlinson and Squire*,* 2003). The validity of their importance for people with ACS was then confirmed with a cardiologist.

Starting from this base model, manual selection was made of clinically and statistically significance predictor variables, based on their influence on survival (an approach favoured by Steyerberg *et al.,* 2000). Model selection strategies used were a combination of stepwise forward selection and backwards elimination, making comparisons between models using various best-fit statistics. Models were formed that were relevant to the patients following the mantra of modellers everywhere:

> *'essentially, all models are wrong, but some are useful'* (Box and Draper, 1987)

Throughout the modelling process underlying assumptions were checked, as non-linearity causes misrepresentations of the true relationships present. This increases the risk of Type II error (Faraway, 2006). For example, at high and low levels of systolic blood pressure, survival is at greater risk, though risk to survival is lower for those that have middle systolic blood pressure, creating a quadratic relationship between systolic blood pressure and survival rates. By plotting pairs of predictor variables with survival, using scatter plots, the relationships present were explored. There are many methods available to deal with this; one method is to add quadratic terms of the predictor variables, although this may result in high correlation between higher order variables, forming higher standard errors for the original predictor variable (Seber and Wild, 2003). Categorisation of a predictor variable is another option, eliminating the non-linearity, but reducing the amount of information present within the variable. A more general approach is to use a flexible non-parametric smoother (see Hastie and Tibshirani, 1990, for further details). A variety of these methods is used in the development of the risk models, depending on the nature of the non-linearity present.

Section 4.3 data exploration was used to check for collinearity, identifying strong relationships between predictor variables, plotting pairs of predictor variables to explore relationships and using correlation tests. The highest correlation between the personal/clinical variables had correlation coefficients CI (p-value: men 0.06 to 0.09; p=<0.001, women 0.07 to 0.1, p<0.001), which was between heart rate and age. This low correlation coefficient gave no indication that collinearity was present. When present, only one of the highly correlated variables was then used within the model: for example, a model did not include both admission and discharge drugs, as the data is strongly related for most people.

4.5 Local area census variables

Local area deprivation indices used to represent place within the previous section are a single statistic limited by their original development, as they are based on a working age population, and the purpose and theories of poverty/deprivation underpinning them. A list of the local area census variables considered within this analysis are shown in Table 4.8 on the next page. From the comparisons across indices and the inferences drawn around their effect on six-month survival, the results were unclear with large unexplained variation. The relationship between local area deprivation indices and population density was also unclear; this makes it difficult to decipher the meaning of the relationships uncovered. This led to the next stage of exploration into place effect. In this section, individual features of place are combined to represent place.

Table 4.8: Local area census variables by LSOA descriptions, means and variances

Variable description	Code	Women Mean (sd)	Men Mean (sd)
Proportion of persons in single parent household	Singleparent	10.1 (5.1)	10.0 (5.1)
Proportion of unskilled	Unskill	19.1 (7.9)	19.1 (8.0)
Proportion of unemployed	Unemployed	3.2 (2.1)	3.2 (2.2)
Proportion of >1 per person per room	Overcrowd	5.1 (4.4)	5.1 (4.6)
Proportion of immigrants	Immigrants	7.9 (2.8)	7.9 (2.7)
% people that are white within the area	Perwhite	88.0 (11.3)	88.1 (11.3)
% on state benefits, unemployed, lowest grade workers	Statebenefits	18.3 (7.3)	18.1 (7.1)
% with a car or van	Car	70.7 (15.4)	71.1 (15.6)
% white in the area	Whitearea	94.1 (12.)	93.6 (13.8)
% of houses occupied with 1 person	Onepersonhouse	29.2 (8.7)	28.8 (8.7)
% lowest floor level at street level	Lowfloorstreetlevel	86.5 (12.1)	86.8 (12.3)
% single (never married in the area	Singlearea	41.8 (7.4)	41.7 (7.5)
Density (Number of Persons per Hectare)	Popdensity	27.3 (22.7)	27.0 (23.2)
% Christians in the area	Christians	74.3 (11.9)	74.1 (12.8)
% of pensioners that own their house	Penownhoue	64.7 (22.8)	65.9 (22.9)
% people that own their house	Ownhouse	71.5 (20.3)	72.1 (20.3)
% of over 65 years old	Over65	16.9 (5.7)	16.8 (5.6)
Combined Living Environment Indicator	Liven	27.2 (17.9)	26.9 (18.0)
% with central heating	Centralheat	12.0 (11.3)	11.9 (11.3)
Urban/rural classifier	Urbrur	4.0 (0.9)	4.0 (0.9)
Combined Air Quality Indicator	Airqual	1.3 (0.2)	1.3 (0.2)
Mean age of population in the area	Meanage	39.3 (4.2)	39.3 (4.3)
Disability Living Allowance Claimants; Total	Disallow	92.3 (45.7)	92.6 (46.3)
Income Support Claimants; Total	Incomesupport	50.2 (46.5)	50.5 (43.2)
Jobseekers Allowance Claimants; Total	Joballow	44.1 (27.6)	44.4 (29.3)
Pension Credit Claimants; Total	Pencred	83.3 (45.8)	81.9 (44.8)
Combined Barriers to Housing and Services Indicator	Barrierhouse	18.9 (8.6)	18.9 (8.8)
Population Average Road Distance to Food Store	Avdisfood	1.6 (1.8)	1.6 (1.8)
Population Average Road Distance to GP Premises	AvdisGP	1.4 (1.1)	1.4 (1.1)
Population Average Road Distance to Post Office	AvdisPO	0.9 (0.5)	0.9 (0.5)
Combined Education, Skills and Training Indicator	Edu	28.5 (23.3)	28.4 (23.3)
Pupil Absence Rate	Absencerate	9.2 (2.2)	9.2 (2.2)
Combined Employment Indicator	Employ	0.1 (0.1)	0.1 (0.1)
Housing In Poor Condition	Housepoorcon	0.4 (0.1)	0.4 (0.1)
% of people with no qualifications	Noqual	34.2 (11.8)	34.2 (11.8)
Proportion of men to women	Malefe	48.6 (2.1)	48.6 (2.0)

A broader range of census data relating to the features of the local area was subsequently drawn upon displayed in T able, such as *Population Average Road Distance to Food Store.* The aim was to build up a picture of a wide range of interacting local area dimensions that together might have an effect on six-month survival.

4.5.1 Choice of statistical techniques

Survival analysis was the approach taken, given the format of the health outcome data available. A similar logical ordering was followed for the modelling process. This explored the underlying structure of the local area census data. The insight about the underlying data structure was then used to progress the analysis.

Exploration into the data structure was undertaken using cluster analysis, by clustering together local area census variables (discussed in section 4.5.2). The strong relationships present between variables were identified and an appropriate number of natural groupings was determined.

The number of local area census variables was seen to be large, which meant that fitting any standard regression model would have been sizeable and complex. In addition, due to the nature of the information contained in the local area census variables, high correlations were found between these variables. The resulting model would have resulted in collinearity and confounding issues. For example, a large number of *single parents* in an area is highly correlated with the number of *unskilled workers* (correlation coefficients CI, p-value: men 0.73 to 0.74; p<0.001, women 0.74 to 0.76, p<0.001). Cox proportional hazard regression was therefore no longer suitable within this context.

By first clustering the local area census variables (forming classes), the size of the model is reduced and the collinearity problems are no longer present. These classes are then regressed upon survival within a latent class regression model. Personal characteristics and clinical factors are also considered, having a different influence on survival when considered for the different classes fitted. How this is achieved is discussed in sections 4.5.3 and 4.5.4.

4.5.2 Clustering

Everitt, Landau and Leese (2001) define clustering as deriving the useful division of data into an optimal number of groupings (clusters). The properties of the local area census variables are used to determine homogeneity within the clusters and heterogeneity between clusters. Clustering is quick to conduct, with an easy and flexible administration, determined by the

criteria followed. The inferences drawn can vary greatly, depending on the clustering approach taken, as they are susceptible to high changeability and subject to the analyst's interpretation; this makes validation of results problematic.

Two clustering approaches were considered, so that a picture of the level of variability could be gained and overall interpretations made, in order to form an overview of the underlying structure of the interconnections between the 36 local area census variables (descriptions of each are given in Table 5.12).

Initially, a connectivity model using hierarchical clustering was fitted, clustering on the local area census variables – a technique known as variable clustering (Everitt, Landau and Leese, 2001). This starts with all local area census variables considered as separate groupings, then pulls together different people into larger groupings, either by how 'close' values are in terms of distance or by P-values via multi-scale bootstrap re-sampling, thus assessing the uncertainty and providing approximately unbiased (AU) p-values, as well as bootstrap probability (BP) values, computed via multi-scale bootstrap re-sampling. The process is repeated multiple times to form a hierarchy of groupings representation of the complex underlying nature of relationships between local area census variables. Hierarchical clustering draws attention to differences for men and women, indicating that between two and three clusters should be used.

Then mixture clusters were fitted. These consider each different cluster as a separate normal distribution with parameters mean and covariance; the overall data distributed is a combination of these distributions. Mixture clustering was able to capture correlations in the data and produce optimum clusters independent of their size. Assumptions of normality can be problematic within a small sample of cases, unless restrictions are put in place. Although this is less of a problem in such a large dataset, care had to be taken not to overfit to the data.

There are many different ways of fitting mixture models. An ellipsoidal, equal-shaped cluster was chosen, to maximise the fit of the data to the model, while accounting for complexity. The numbers of clusters fitted had to be chosen prior to fitting the models: three were chosen due to the hierarchical model insight, and so that comparisons could be made with fit for previous models.

Clustering provides valuable insight into the underlying relationships present in the local area census data. Hierarchical clustering determined that two or three clusters were optimum and uncovered potential groupings.

4.5.3   Latent class survival regression analysis

Latent class regression analysis combines the benefits of being able to cluster together local area census variables, according to their underlying data structure, with being able to regress on survival. Inferences about place effect on survival can be drawn from the latent class regression models. Collinearity is not present, due to the structure of the model.

Mixture clustering was used, because it was possible to fit the data structure sufficiently. Mixed type clusters were formed where people were grouped together, if they lived in areas that were similarly represented by local area statistics. The cases were assumed to have come from the same probability distribution, where distribution parameter was estimated from the data.

The regression model formed is similar to the Cox proportional hazard model discussed in section 4.4.3.2. The clustering of local area census data (latent classes) are fitted in this model, which is also known as a *finite mixture model for structured data* (Vermunt and Magidson, 2000; Latent Gold, 2011). Personal characteristics and clinical factors are fitted in this model and their influences on survival rate can vary across the different classes formed. For example, if two classes are formed within a model, then a predictor variable (for example, increased age) could have a negative influence on survival within one class and a positive influence on survival within the second class, as the classes represent different subsets of data.

Latent class regression models are parametric, and therefore make assumptions about the distribution present between the predictor and class formation variables on six-month survival. Parameters are estimated using an expectation maximization (EM) algorithm to find the maximum likelihood based on distribution assumption. This model complexity (and the large increase in the number of distribution parameters in relation to increased latent classes) meant that, although this modelling technique has been known for many years, it has only recently become feasible due to computer advancements.

To reduce complexity, a parsimonious model was sought, while maximising the survival variation explained with the model. A similar modelling strategy to the Cox proportional hazards models was used (as discussed in section 4.4.3.2). Models were built manually, considering the clinical and statistical significance of potential predictor variables (personal and clinical factors) and covariates (local area census variables that form classes within the model). This process was undertaken in three stages:

1) Determining the optimal number of classes
2) Choosing covariates that influence class formation

3) Choosing predictor variables that influence survival at six months

The number of classes was chosen by initially fitting models for one to four classes; this was restricted to four based on the information gained during the cluster analysis. These models were than compared using best-fit statistics. Akaike information criterion (AIC), Bayesian information criterion (BIC), likelihood ratio chi-square (L^2), and classification error and (coefficient of determination) R^2 were used to choose the model that had the optimal number of classes.

AIC is a single number that makes a comparison between the complexity of the model and how well the model fits the data. BIC makes a similar comparison to that of AIC, although it penalises more heavily for models that are more complex. L^2 makes a comparison between the likelihoods within the models considered. Classification error is a measure of how often the model predicts survival incorrectly and, finally, R^2 is used to measure unexplained variation within the model. The number of clusters to be chosen was not an obvious matter, with different statistics implying the use of different numbers of classes. Compromises were made: the optimal number of clusters is unknown and therefore the accuracy of this discussion is based on interpretations of the models.

Three classes were chosen. Simplification began with the latent class regression model, determined by all 36 local area census covariates and a variety of predictor variables. The number of local area census covariates was then reduced, using backwards elimination. This process was repeated, using personal characteristics and clinical factors, and the previously mentioned comparison statistics, to choose a model from which to make inference. A more complex modelling strategy was not attempted, due to the size and complexity of the models involved.

Once simplified, the models could then be used to make inferences about how locality formation influences survival at six months, exploring the different characteristics of the people who reside within these localities.

4.5.4   Approximation of a latent class survival regression model

Fitting a latent class survival regression model was complex, time consuming and resulted in multiple problems. To reduce these issues, a simple and approximately equivalent model was fitted instead. A survival model is estimated using a Poisson regression model.

A Cox model is equivalent to a Poisson regression model in the form of a piecewise exponential survival model. This requires that the data is in the form of episode records whose end points correspond with the times at which events occur (Vermunt, 1997, for further detail).

Holford (1980), and Laird and Oliver (1981), originally realised that it is possible to approximate a piecewise proportional hazards model. It was noted that the piecewise proportional hazards model of the previous subsection was equivalent to a certain Poisson regression model.

This model is approximate, as the log-likelihood for censored exponential data given coincides exactly with the log-likelihood that would be obtained by treating total number of deaths as a Poisson random variable, with mean exponential distribution at time of death. The only difference between the two models is that the total observation (or exposure) time is in log form for the Poisson model. This is a constant value and therefore does not have an overall effect on the inferences drawn from the model.

When fitting the approximate generalised Poisson regression model, the predictor and covariate (latent classes) were regressed on the binary mortality at six months, using an exposure time of the time of death so that survival is accounted for. This leads to the same estimates and standard errors as treating the exposure times as censored observations from an exponential distribution.

Thus, the piecewise exponential proportional hazards model is equivalent to a Poisson log-linear model for the pseudo observations (one for each combination of individual and interval), where the death indicator is the response and the log of exposure time enters as an offset.

4.6 Interpretation of results

Throughout this chapter, the exploration of data has led to the choice of methods. The underlying data structure and methods used were discussed with supervisors to aid rigorous application and interpretation.

Statistical analysis can be complicated and misleading. Therefore, it was important to be rigorous about satisfying underlying assumptions before and during inference. Inferences were found to be complex and sometimes unexpected; for this reason, a large amount of thought and time was put into why these results had occurred, their implications and on what assumptions they were based.

How individual circumstances such as socio-economic status relates to place could not be explored within this dataset. There is a need to further understand the relationship between people and where they live. For example understanding why, and if they choose to live there.

The next chapter sets out the results obtained from these methods and discusses the inferences drawn. This builds up a picture of *what* aspects of locality are associated with six-month survival from the viewpoint of summary statistics and interconnected census data.

Chapter 5:   Measuring the influence of place on ACS outcomes: Discussion of epidemiology findings

5.1 Introduction

This chapter presents the findings from the epidemiological analysis of the relationship between socio-economic dimensions of locality and survival from ACS of those 65 years and over. The aim was to explore *what* features of local area characteristics had influence on six-month survival for older people, the importance of this relationship, and how locality interacted with personal level characteristics.

Secondary data analyses of observational datasets are used to develop models of survival regressed on potential predictors. Use of this extensive all-inclusive data gave the advantage of representing a large variety of people, absorbing the complex relationships that exist, and creating great potential for discovery. The development and justification of methods used are discussed in Chapter 4. Analysis was undertaken using R (The R Project for Statistical Computing, 2009), with MapInfo (Pitney Bowes, 2013) and Latent Gold (Vermunt and Magidson, 2000). The combined dataset was large and complex. The necessary data management and exploration is displayed in section 5.2.

The following analysis is divided into two parts. The first part centres on local area deprivation indices chosen from the literature to represent place effect, discussed in section 5.3. Comparisons are made between these local area indices and their association with survival; general deprivation was seen to have the strongest association. Prediction models indicate variation between the influences that different characteristics of the local area have on survival, with further patterns of variation between men and women.

The second part focuses on developing a picture of which aspects of locality are associated with survival and how they interact in this overall effect, discussed in section 5.4. Personal level characteristics, and how they differ between localities, are also explored. The key points are summed up in section 5.5.

5.2 Data

The combined dataset described in section 4.2 is a combination of personal and clinical information from people with ACS in Yorkshire and Humber over the age of 65 who survived to

leave hospital. This dataset relates to survival rates and 2001 local area census data for the areas in which these people lived.

Data analysis was conducted on men and women separately. This reduced the problems of strong variations and interacting effects on survival. For example, women have longer life expectancy; hence, the relationship between age and survival is likely to be different for women in comparison to men. A discussion on the differences between men and women in terms of ACS is given in Chapter 2, sections 2.3.2 and 2.3.5. This separation also enabled useful comparisons to be made.

5.2.1   Local area indices categorisations

Three local area deprivation indices were used. The components of each local area index and how the index was constructed are set out in section 4.4. The Townsend deprivation score is used to represent local area material inequality. The Jarman score is used to represent level of area underprivilege. Finally the index of multiple deprivation score (IMD) is a general score of area inequality.

- Townsend's deprivation score ranges from low (-10) to high (10) material deprivation
- Jarman's underprivileged score ranging from low (-100) to high (100) level of area underprivilege
- Index of multiple deprivation (IMD) score ranging from low (0) to high (80) general deprivation

Local area indices were categorised, and survival regression trees were used to form meaningful cut points (presented in section 4.4.1). Categorisation was necessary to form Kaplan-Meier estimates, and to reduce non-linearity problems and non-proportional hazards in prediction models. Comparisons between categories were easier in this format for local area indices and across elements of the study. The data groupings are shown in Tables 5.1 and 5.2 on page 95.

Table 5.1: Number of patients (men) within each of the three categories of local area indices

Men	Townsend	N	%	Jarman	N	%	IMD	N	%
Low	-6.1 to -2.0	7386	36.7	-97.8 to -17.5	3133	15.6	0 to 12.5	4903	24.4
Middle	-2.0 to 3.5	4105	20.4	-17.5 to -5.3	11320	56.3	12.5 to38.0	5070	25.2
High	3.5 to 9.7	8631	42.9	-5.3 to 42.0	5669	28.2	38.0 to 79.6	10149	50.4

Categorisation provides insight into the structure of the distributions of the local area indices. Differences between men and women are also uncovered. Similarities are shown between IMD
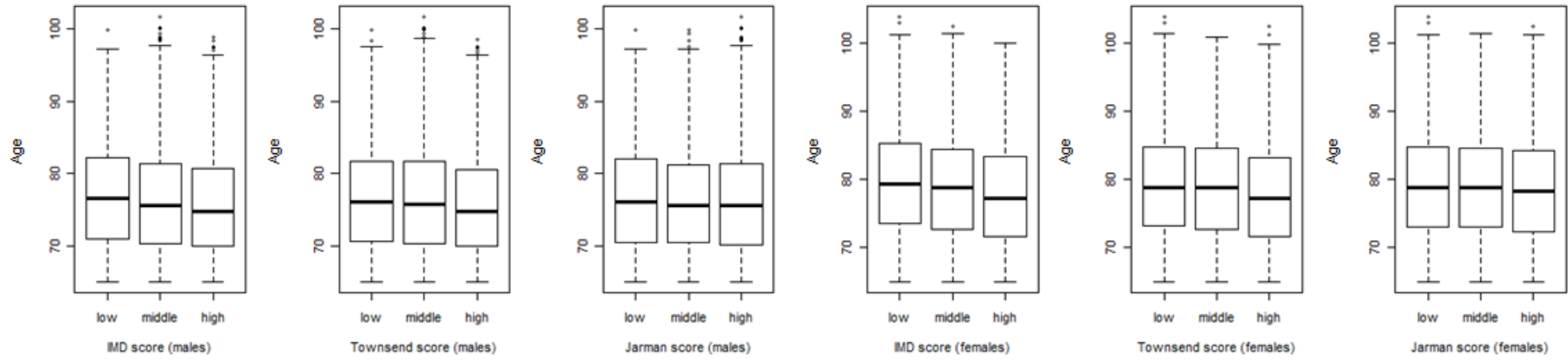
Figure 5.1: Index groupings – relation to age for men and women
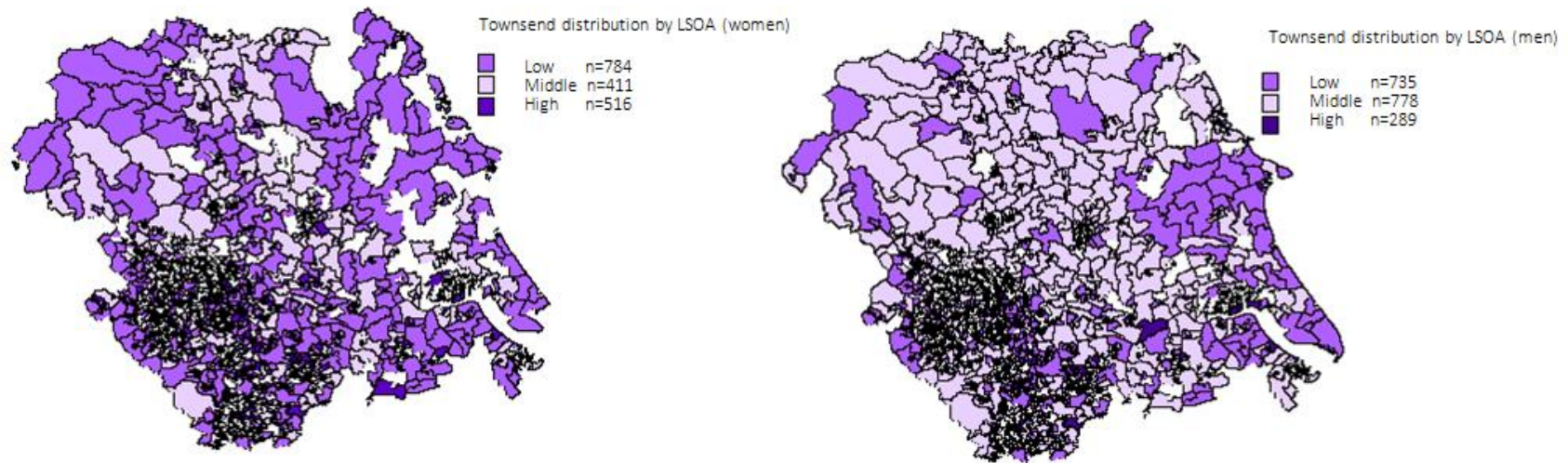
Figure 5.2: Thematic map of Yorkshire and Humber by Townsend index by LSOA

Figure 5.3: Thematic map of Yorkshire and Humber by Jarman index by LSOA
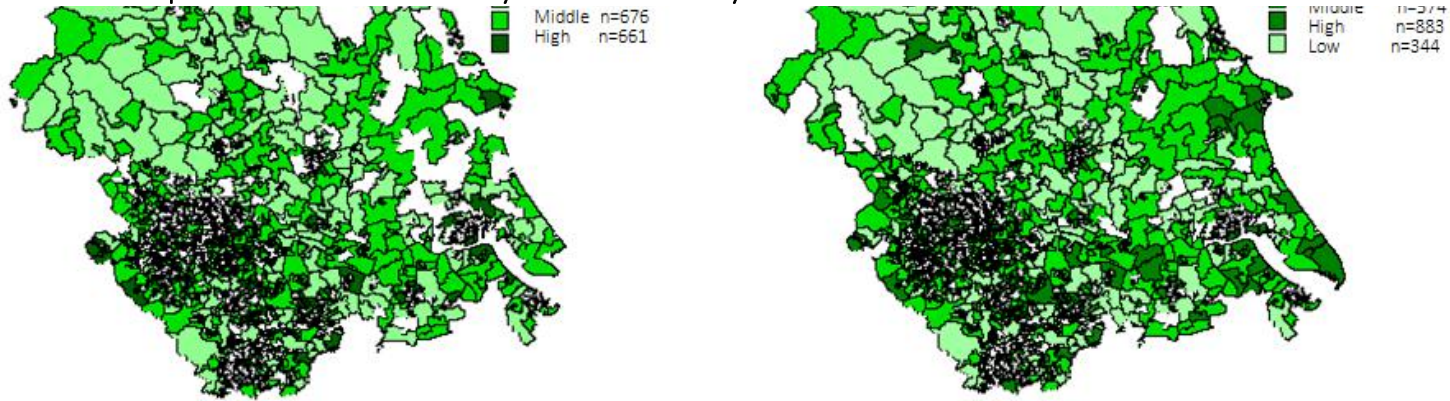
Figure 5.3: Thematic map of Yorkshire and Humber by Jarman index by LSOA
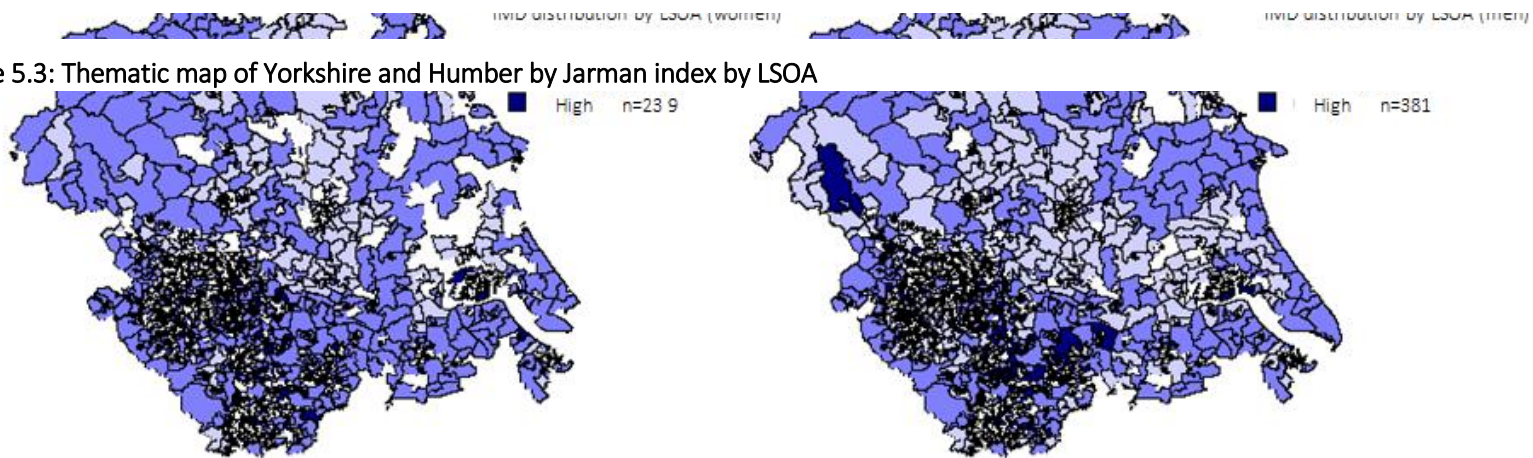
Figure 5.4: Thematic map of Yorkshire and Humber by IMD index by LSOA

Table 5.2: Number of patients (women) within each of the three categories of local area indices

Women	Townsend	N	%	Jarman	N	%	IMD	N	%
Low	-6.1 to -3.1	2876	18.4	-102.8 to -16.7	2519	16.1	0 to 10.6	2547	16.3
Middle	-3.1 to 1.0	8378	53.6	-16.7 to 0.7	7637	48.8	10.6 to 45.6	2547	16.3
High	1.0 to 9.7	4391	28.1	0.7 to 42.0	5489	35.1	45.6 to 78.4	10551	67.4

score and Townsend score for men, with the highest proportion of people within highly deprived areas. This trend is the same for IMD score across women. However, Townsend scores across women show a higher concentration of people within middle material-deprived areas. This split of data is similar to that of the Jarman score splits for men and women.

These differences indicate that locality influences, represented by local area deprivation indices, do not have a consistent relationship with survival. Categories within each local area index did not influence the diagnosis or treatment received. It is therefore assumed that people who have varying diagnosis and treatment can be analysed together when assessing place effect.

5.2.2 Age relative to local area indices

The average age of women with ACS (older than 65) is higher than for men by around two years (Tables 4.1 and 4.2). Figure 5.1 on page 93 shows that this is consistent across each of the local area index categorisations – low, middle, and high. From this, the assumption is made that it is reasonable to study all age ranges (over 65 years) together.

5.2.3 Distribution of local area indices across area boundaries

This section presents variation in the pattern of scores of local area deprivation indices across Yorkshire and Humber. Figures 5.2 to 5.4 on pages 93 and 94 show thematic maps of population densities and geographical distributions in relation to the local area indices of men and women within the combined dataset over lower super output areas (LSOAs). Men and women show differences across the thematic maps. These differences arise from the categorisation methods of the local area indices (as explained in section 4.4.1).

Townsend deprivation score distribution

Figure 5.2 shows the distribution of material deprivation across LSOAs. There are many differences between men and women. The majority of the LSOAs for women were classified as having mid-level deprivation. Only LSOAs with high population density were seen to be very deprived.

For men, there was higher variation in deprivation between low and middle deprivation, although high deprivation was seen only within densely populated LSOAs.

Jarman underprivileged score distribution

Level of area underprivilege had a higher diversity of deprivation across the geographic areas in comparison to Townsend areas. Men and women show the distribution of low and middle Jarman scores to be within the low population density LSOAs, spread out across Yorkshire and Humber in Figure 5.3. Jarman score classification did not seem to have a strong connection to population density.

IMD deprivation score distribution

Figure 5.4 shows that the distribution of deprivation classified by IMD score is strongly related to population density for men and women: for example, the small LSOAs around Leeds city centre indicate that a high proportion of people are classified as highly deprived.

The distribution of three local area indices across Yorkshire and Humber are seen to be related to population density. These differences coincide with rural/urban differences (Figure 1.1 show on page 5). This relationship may indicate that the local area indices are measuring population density or that urban/rural differences greatly affect deprivation levels. This relationship is stronger for the IMD and Townsend deprivation scores. Overall, men had more varied areas of deprivation than women had.

5.2.4   Comparison of local area indices in terms of influence on survival

Comparisons were made between general material inequality and area underprivilege to determine which has the greatest influence on survival. This was achieved by fitting six-month survival regression trees for men and women, each containing the three local area indices as predictor variables. The terminal nodes were restricted to containing a minimum of 2,500 people to avoid extreme cases influencing tree construction. A hazard ratio less than one indicates high survival, whereas greater than one indicates low survival.

Both men and women's six-month survival is seen to have the strongest association with IMD score, a measure of general deprivation (Figure 5.5 for men; Figure 5.6 for women on the next page). The IMD splitting criteria used are similar to those produced when categorising local area indices (section 4.4.1). This implies that the consideration of Townsend and Jarman scores within the model did not affect how IMD score relates to six-month survival.

IMD score<12.53

0.82; n=494/4903

Townsend<3.51

IMD score>=17.95

Jarman<1.02

1.09; n=440/335

1.20; n=588/4038

0.90; n=400/3969   1.06; n=504/3899
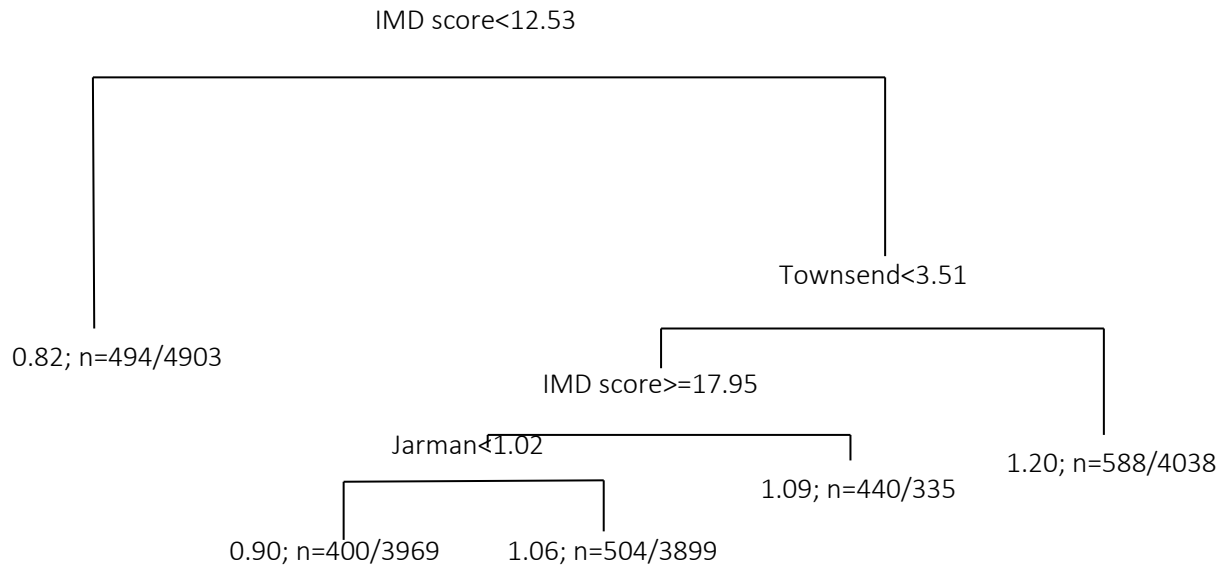
Figure 5.5: Survival tree for men, comparing three local area indices

From this tree, it can be seen that people living within areas of low general deprivation have relatively higher rates of survival. This is indicated by the hazard ratio 0.82 within the final node of the tree.

People living within areas of relatively high general deprivation are also influenced by material deprivation. People who lived within areas of high material and general deprivation had much lower relative rates of survival. The Jarman score of the area in which a man lived did not greatly affect his survival rate.

IMD score<10.61

0.83; n=271/2540

Jarman>=-8.93

Jarman<1.43

1.11; n=468/3307

0.90; n=343/2918   1.05; n=929/6880
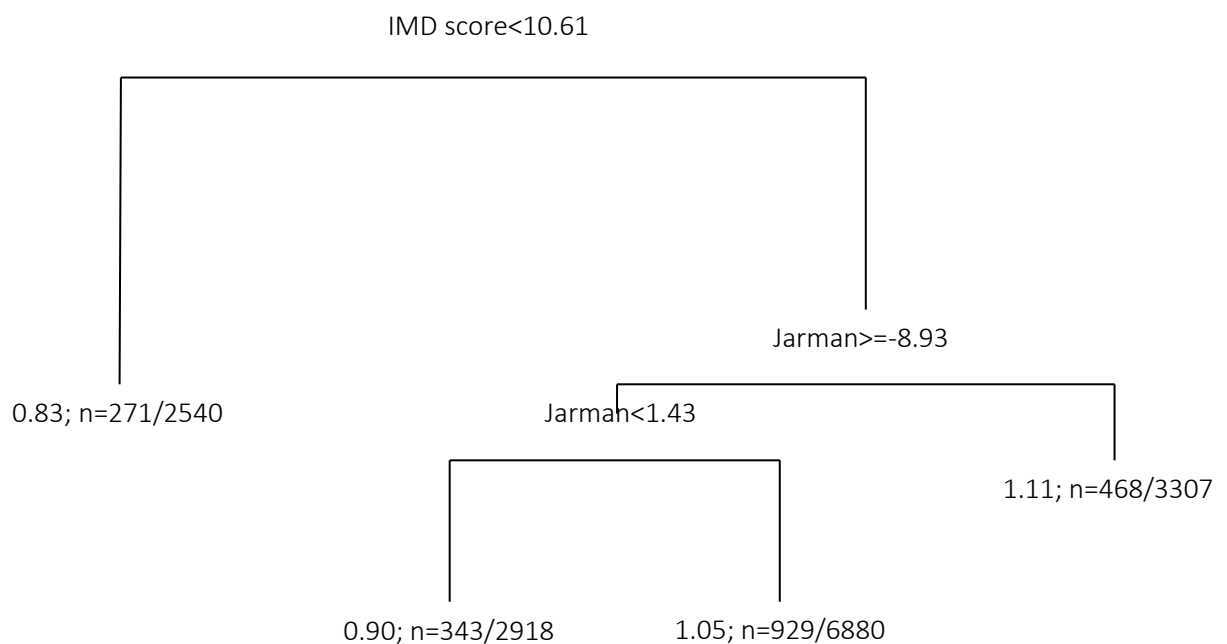
Figure 5.6: Survival tree for women, comparing three local area indices

Similarly, women living in areas of low general deprivation have high survival rates, indicated by the relative hazard rate within the final node, 0.83 (Figure 5.6 on the previous page). The survival rates of women living in areas of high general deprivation depend on the level of area underprivilege; this is in contrast to men within the grouping, who were more influenced by material deprivation.

Women from areas of high general deprivation, and whose areas have either a low or a high level of area underprivilege, have lower survival rates, which is a surprising result. Differences between Jarman scores are small. This indicates that there is little difference in survival relative to the level of area underprivilege. Only those women from areas of around an average level of area underprivilege within this group are seen to have higher rates of survival.

General deprivation classified by IMD score had the strongest influence on survival at six months for both men and women. For people living in areas of high deprivation, this was further influenced by material deprivation for men and level of area underprivilege for women, indicating fundamental differences in how men and women are affected by their environment.

5.3 Deprivation indices in association with survival rates

The patterns of variation in rates of six-month survival by place for older people are explored within this section. This is based on place represented by the three local area indices previously discussed. Survival analysis was used to model the data structure, forming associations about what influences survival and utilising all available ACS outcome data. Survival rates were taken as the time between date of admission to hospital and date of death/lost to follow up, censored at six months.

Kaplan-Meier survival charts are used to explore the general relationship present between local area indices and survival rates in section 5.3.1, looking at how this changes over time. The phenomenon surrounding the situation is modelled using Cox proportional hazards in section 5.3.2, building a picture of how locality and personal level characteristics influence survival.

Models are constructed of two parts:

- The outcome variable to be predicted, survival rate censored at six months
- The predictor variables that are used to predict survival rate; these are a combination of local area indices and personal/clinical variables (described in section 4.3 within chapter 4): for example, age.

5.3.1 Kaplan–Meier Survival Charts

Kaplan-Meier charts and log-rank tests modelled each of the local area indices separately on survival at six months. These are used to explore variations across index categories and how these change over the six-month time period.

5.3.1.1 Townsend index

Material deprivation, measured by the Townsend deprivation score was associated with men's survival rates (Table 5.3). People who lived within a local area that had a higher material deprivation score had low survival rates. Figure 5.7 shows the trajectory of the relationship between the Townsend deprivation score and survival rates over the six-month period considered.

Table 5.3: Townsend score survival times and log rank statistic tests

Deprivation: survival in days	Townsend (women)	Townsend (men)
Low: mean (sd)	166.37 (41.97)	168.12 (39.49)
Middle: mean (sd)	166.19 (41.75)	166.87 (41.37)
High: mean (sd)	165.86 (42.60)	164.28 (44.65)
Log rank statistic	1.3	33.5
P-value	0.52	5.25×10^{-8}
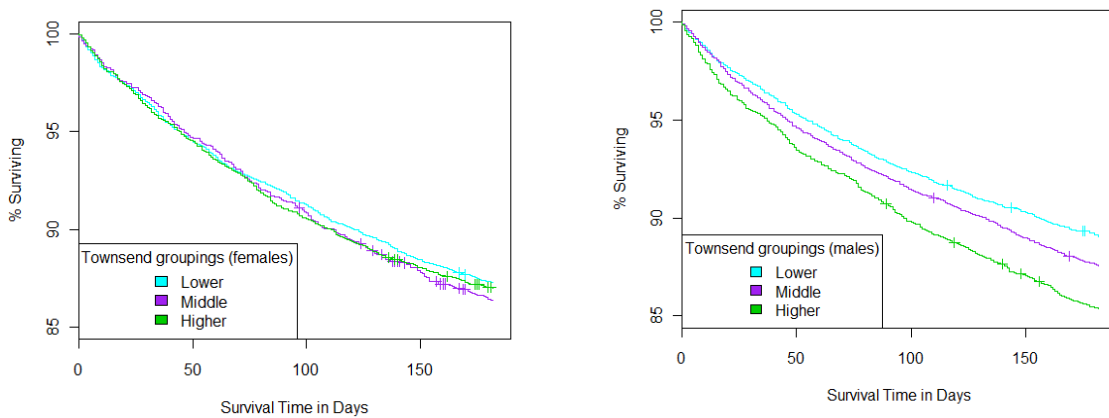
Figure 5.7: Kaplan-Meier survival estimates by Townsend index

In contrast, the Townsend score of where women live does not influence survival rates (Table 5.3). This lack of importance of material deprivation mirrors the findings when comparing local area indices in section 5.2.1. The construction of the Townsend deprivation score (described in

section 4.4) consists of information on car ownership, owner occupation and overcrowded households. This may not reflect material deprivation for older women.

5.3.1.2   Jarman index

Table 5.4 shows how local area represented by the Jarman score is associated with survival for men and women. This relationship follows a similar pattern to that shown when comparing local area indices for women in section 5.2.1. Both men and women who live in areas of mid-level deprivation have the highest survival rates; from Figure 5.8, this difference is seen to increase after approximately 40 days from ACS diagnosis. This indicates that level of area underprivilege is more influential later on in the recovery process.

Table 5.4: Jarman score index survival times and log rank statistic tests

Deprivation: survival in days	Jarman (women)	Jarman (men)
Low: mean (sd)	165.36 (43.35)	167.16 (40.41)
Middle: mean (sd)	167.47 (40.52)	168.34 (39.39)
High: mean (sd)	165.56 (42.80)	165.94 (42.62)
Log rank statistic	7.6	22.5
P-value	0.028	1.27×10^{-5}
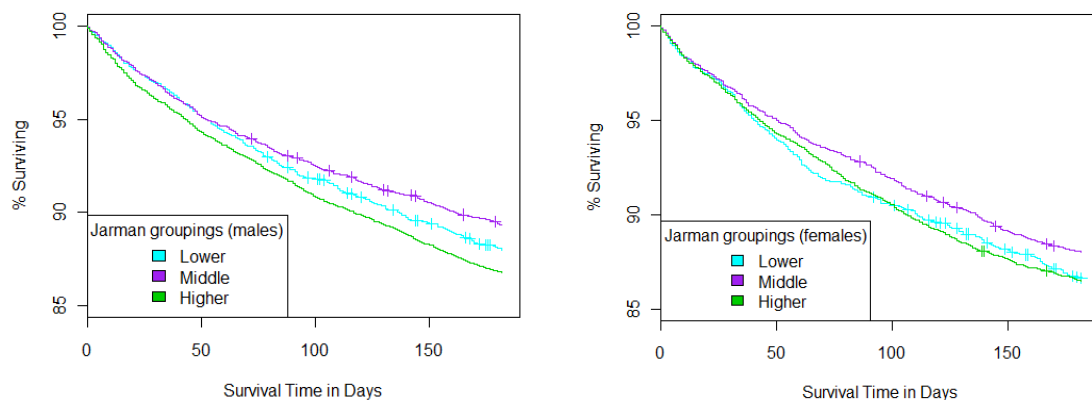
Figure 5.8: Kaplan–Meier survival estimates by Jarman index

5.3.1.3   IMD index

Living in areas with an increased level of IMD score reduces survival rates for both men and women (Table 5.5 on the next page). This relationship is more apparent after around 60 days, especially for women (Figure 5.9).

Table 5.5: IMD score survival times and log rank statistic tests

Deprivation: survival in days	IMD (women)	IMD (men)
Low: mean (sd)	167.49 (41.13)	168.95 (38.06)
Middle: mean (sd)	166.26 (41.80)	166.37 (42.08)
High: mean (sd)	164.84 (44.08)	165.59 (43.04)
Log rank statistic	12.6	36
P-value	0.00183	1.54×10^{-8}
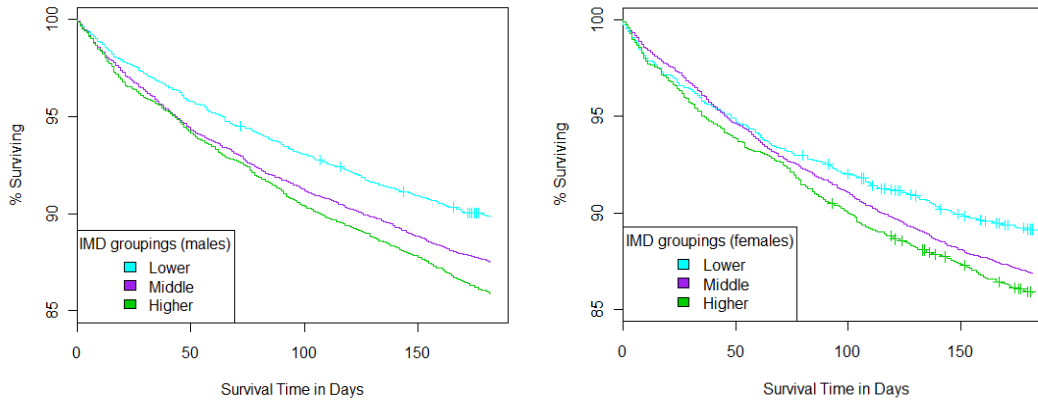
Figure 5.9: Kaplan-Meier survival estimates by IMD index

How locality directly influences survival is seen to vary depending on which local area index is used to represent place effect, with variation in the pattern for men and women. The influence of locality deprivation on women's survival was mixed. The evidence indicates that multiple deprivation as measured by the IMD is most consistently related to survival from ACS and is also strongly associated with population density. This relationship is seen to be present for all three local area indices.

5.3.2   Cox proportional hazards

How locality deprivation influenced survival within the enveloping phenomenon of this time period is explored using Cox proportional hazards regression models. Three models were fitted, one for each of the local area indices representing locality within this section. The IMD score is considered first, owing to its relative strength, indicated in section 5.2.1. Analysis was conducted over five multiply-imputed datasets to account for missing data. Adjustments to each model were made to ensure that underlying assumptions were satisfied (discussed in section 4.4.3.2).

Each model is made up of two parts, displayed across two different tables in this section. How the local area indices are associated with survival are explored in tables for IMD score, Townsend and Jarman scores. Separate tables are used to display the personal level

characteristics, such as age. Only the IMD personal level characteristics table is displayed and discussed within this chapter (Table 5.7 shown on page 103). Due to similarities across the three models, it was not considered that the Townsend and Jarman personal level characteristics needed to be shown.

Combinations of forward stepwise and backwards elimination modelling strategies were performed manually, aiming for a clinically informed parsimonious model that explains variation across survival.

5.3.2.1   Personal/clinical characteristics

Personal level variables, such as a person's characteristics and clinical aspects, were chosen according to clinical and statistical significance. Variables included within these models were *systolic blood pressure, heart rate, highest troponin level, age, final diagnosis, chronic renal failure (CRF), follow up by cardiologist or not, whether they were a smoker, taking aspirin?, taking beta blockers?, taking statin?, taking ACE inhibitors?, whether received reperfusion treatment, whether offered rehabilitation* and *having diabetes.*

5.3.2.2   IMD index

Increased level of general deprivation in local areas reduced survival for both the older men and the older women living in them, after considering the influence of personal characteristics.

Table 5.6: IMD score parameters for Cox Proportional Hazards model

Variable	Category	Women Hazard ratio	95% CI	FMI	Men Hazard Ratio	95% CI	FMI
IMD	Lower	1			1		
	Middle	1.34	1.17 to 1.52	0.005	1.31	1.18 to 1.45	0.01
	Higher	1.49	1.27 to 1.75	0.004	1.45	1.29 to 1.62	0.005

Table 5.6 shows the relevant hazard ratios, related confidence intervals, and fraction of missing information (FMI) prior to imputation, i.e. the proportion of the variability that is attributable to the uncertainty caused by accounting for missing data. These results are consistent with those drawn from the Kaplan-Meier estimates.

From the clinical predictor variables, it was seen that a more serious form of MI (STEMI) reduces survival rates for women; men however fare the same for both STEMI and NSTEMI diagnosis. Follow-up appointments, if conducted by a cardiologist, also negatively affected survival rates,

Table 5.7: Cox Proportional Hazards with local area modelled by IMD score personal/clinical predictors

Variable	Category	Women Hazard ratio	95% CI	FMI	Men Hazard ratio	95% CI	FMI
Systolic bp		0.99	0.99 to 0.99	0.21	0.99	0.99 to 0.99	0.02
Heart rate		1.01	1.00 to 1.01	0.16	1.01	1.01 to 1.01	0.02
Troponin		1.01	1.00 to 1.01	0.24	1.01	1.01 to 1.01	0.23
Age		1.06	1.05 to 1.06	0.00	1.06	1.06 to 1.07	0.01
Diagnosis	NSTEMI	1			1		
	Other	0.66	0.58 to 0.75	0.02	0.81	0.72 to 0.91	0.04
	STEMI	1.10	0.95 to 1.28	0.03	1.02	0.88 to 1.18	0.02
CRF	No	1			1		
	Yes	1.57	0.92 to 1.84	0.01	1.67	1.47 to 1.89	0.02
Follow up	Cardiologist	1			1		
	None	1.37	1.18 to 1.58	0.01	1.41	1.24 to 1.61	0.00
Smoker	Smoker	1			1		
	Ex	0.90	0.76 to 1.06	0.00	0.93	0.81 to 1.06	0.00
	Non/no hist.	0.90	0.69 to 0.94	0.01	0.80	0.70 to 0.93	0.00
Aspirin	No	1			1		
	Yes	0.80	0.71 to 0.91	0.00	0.81	0.71 to 0.91	0.00
Beta blockers	No	1			1		
	Yes	0.73	0.66 to 0.81	0.00	0.74	0.67 to 0.81	0.00
Reperfusion	No	1			1		
	Yes	0.66	0.54 to 0.79	0.01	0.60	0.50 to 0.71	0.01
Statin	No	1			1		
	Yes	0.85	0.74 to 1.69	0.01	0.77	0.68 to 0.87	0.00
Rehab	No	1			1		
	Yes	0.81	0.71 to 0.97	0.00	0.76	0.68 to 0.84	0.01
Diabetes	Yes	1			1		
	No	0.60	0.51 to 0.70	0.00	0.73	0.63 to 0.84	0.00
ACE inhibitor	No	1			1		
	Yes	0.75	0.67 to 0.84	0.01	0.80	0.72 to 0.88	0.00

especially for men. This association might reflect that people were not living long enough for the follow up to be made. Therefore, it is not possible to draw conclusions about the importance of follow-up appointments. Medical interventions such as reperfusion and drug treatments had a strong positive influence on survival rates. Other clinical variables such as heart rate and troponin levels were seen to have minor influence on survival rates.

Personal characteristics were also associated with survival rates. Variables representing personal poor health, such as having diabetes or chronic renal failure, were associated with lower survival rates, as was unhealthy behaviour such as smoking. Age was seen to have a negligible positive influence on survival, perhaps because only those over the age of 65 were

considered in this dataset. This might also account for the linear relationship present between age and survival.

Table 5.7 on the previous page, also draws attention to the difference between men and women in the number of imputed values for systolic blood pressure and heart rate, indicating that complete data collected for these variables was better for men than for women.

5.3.2.3 Townsend

Similarly, increased material deprivation was associated with lower survival rates for men; no difference in survival rates between areas of varying material deprivation was seen for women (Table 5.8). This is similar to the findings when fitting Kaplan-Meier estimates (section 5.3.1), and implies that the relationship between Townsend deprivation score and survival is not greatly influenced by differences in personal level characteristics.

Table 5.8: Cox Proportional Hazards for Townsend index

Variable	Category	Women Hazard ratio	95% CI	FMI	Men Hazard Ratio	95% CI	FMI
Townsend	Lower	1			1		
	Middle	1.10	0.97 to 1.24	0.00	**1.14**	1.04 to 1.25	0.00
	Higher	1.07	0.96 to 1.20	0.00	**1.36**	1.22 to 1.51	0.00

The personal level characteristics parameters estimated for all three models, based around the Townsend, Jarman and IMD score local area indices, have strong similarities.

5.3.2.4 Jarman

Living in an area with any level of underprivilege had little effect on six-month survival for men and women (Table 5.9 on the next page). This differs from the results obtained by fitting Kaplan-Meier estimates in section 5.3.1, implying that differences in personal level characteristics were the reason for this association.

Men living within areas of higher general or material deprivation have lower survival rates than those within less deprived areas. Women show this same relationship when considering general deprivation, although material deprivation is not seen to have influence on survival rates.

Table 5.9: Cox Proportional Hazards for Jarman index

Variable	Category	Women Hazard ratio	95% CI	FMI	Men Hazard Ratio	95% CI	FMI
Jarman	Lower	1			1		
	Middle	0.89	0.78 to 1.02	0.00	0.92	0.81 to 1.05	0.01
	Higher	1.07	0.94 to 1.21	0.00	1.11	0.99 to 1.25	0.01

For these two local area indices that show strong associations with population density, the same relationships were uncovered when fitting Kaplan-Meier estimates. This indicates that the contextual level influence on survival is present alongside compositional level influences. When the local area is represented by the Jarman index, compositional aspects were seen to account for the differences in survival rates by local area.

The differences present with regard to survival across both compositional and contextual aspects indicate the importance of analysing both place characteristics and characteristics of the people living in those places, providing a wide-ranging picture of the different aspects of a person's life in terms of their effect on survival rates.

The IMD score of a local area was seen to have the most prominent effect on survival of the local area indices considered. The relationship seen between IMD score and survival was similar to conclusions drawn out from the literature, discussed in Chapter 2. The other two local area indices relationships were not as clear. IMD score is therefore used as the main local area index when exploring deprivation throughout the rest of the study.

What IMD score represents within the locality and how these different aspects influence survival cannot be determined without further exploration. Within the next section a combination of locality representations are considered, building up a picture of what within the environment has influence on the survival rates of older people.

5.4 Exploration of the association between locality features and survival

This section explores a combination of locality features and how they are associated with survival rates. How the locality features are related to each are explored and then regressed on survival. The aim was to construct general pictures of locality types and the characteristics of the people who live within them that are associated with certain survival rates.

The local area census variables that represent locality features are described and explored in section 5.4.1. The relationships between the local census areas variables are then uncovered using cluster analysis in section 5.4.2. By considering how the local census variables are

connected, latent class regression models are formed. These models, discussed in section 5.4.3, represent place by a combination of local area census variables and explore how the characteristics of the people living in these areas are associated with six-month survival.

5.4.1   Local area census variable descriptions

There were 36 local area census variables considered as relating to the local area or trends within the population (Table 4.8). From Table 4.8 on page 84, consistency between local area census area values for men and women are seen.

The local area census values that relate to the same LSOA represent the same place. This leads to high correlation between the 36 local area census variables. This renders standard regression analysis as inappropriate, due to collinearity between predictor variables. This indicates that these variables should not be used within the same standard regression model.

5.4.2   Clustering local area census variables

How these locality aspects relate to each other and how they are grouped together, based on either locality or personal similarities, will inform the general picture of different localities, each having a different influence on survival. This underlying structure was explored using cluster analysis of the local area census variables.

Cluster analysis assumes that there are strong relations between variables: factorability. It was determined that all correlation coefficients across the local area census variables were greater than 0.3 (Mukaka, 2012). For example *living environment* and *central heating* indices were highly correlated (men CI: 0.88 to 0.89; women CI: 0.87 to 0.88). It was observed that 32 of the 36 local area census variables are correlated (correlation coefficient at least 0.45) with one or more other census area variables. This is an indication that the information within the variables is interrelated. It was observed that 25 of the local area census variables for women, and 27 for men, were very highly correlated (correlation coefficient of at least 0.8).

Successful clustering also requires relatively homogeneous variance across census area variables. Bartlett's test showed that the variance between the census area variables was sufficiently similar ($\chi^2 (41) = 1962931$, $p <0.001$); hence, cluster analysis was feasible for all 36 variables.

To uncover diverse insight into the underlying structure of the relationship between local area census variables, three clustering approaches were used, grouping together the variables, and then grouping people who were naturally similar.

Females

Distance: euclidean
Cluster method: average

Males

Distance: euclidean
Cluster method: ward
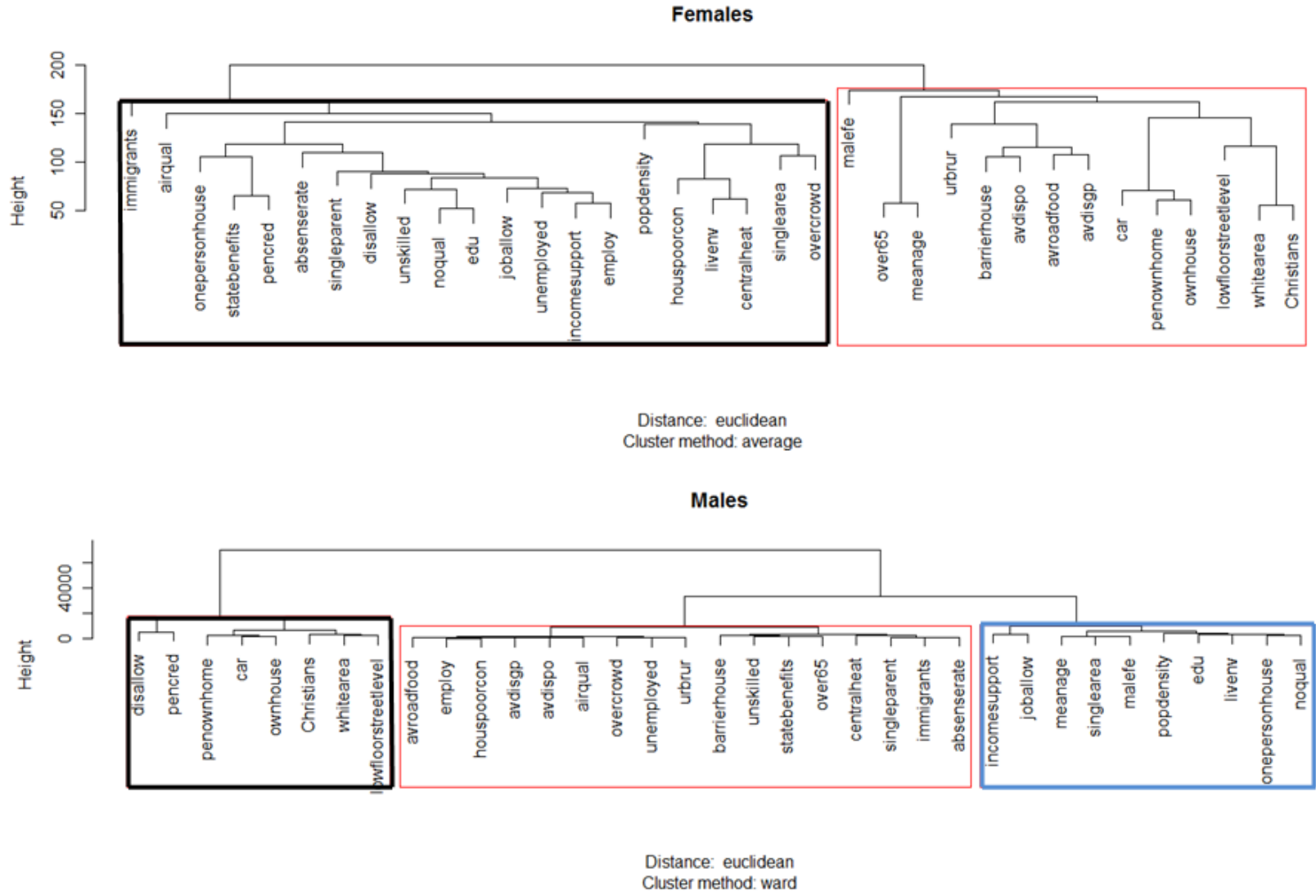
Figure 5.10: Cluster dendrograms with approximately unbiased dissimilarity values (height)

5.4.2.1 Hierarchical clustering

Local area census variables that have similar data are naturally grouped together using hierarchical clustering. The clustering approach is a simple and easy way to conduct algorithms (method details given in section 4.5.2). These relationships are shown simply in Figure 5.10 on the previous page, where the development of clusters is portrayed as a tree. Trees are plotted against *n-1* non-decreasing values, the criteria for dissimilarity of cluster based on the approximately unbiased p-values computed by multiple bootstrap re-sampling. Optimal clusters at the 95% level are shown by the red boxes.

Local area census variables for the places where women lived fell into two clusters: these seemed to represent physical locality within the black box, with the cluster consisting of locality aspects that affect area composition such as *distance to amenities, the type of housing in the area, area age* and *ethnicity.* The cluster contained by the red box seems to relate to the characteristics of the people living in the area, such as the *number of people in the area, on benefits* or *single*. These are not clear distinctions, with a variety of local area census variables that could be in either cluster.

Similarities are seen within the groupings of local area census variables for men, with a physical locality cluster (black box) and a cluster relating to the characteristics of the people living there (red box). The third cluster for men seems to portray level of area affluence. For example, it contains local area census variables, such as *owning own home* and *having a car*, that seem to portray level of area affluence. This seems to suggest that the built aspects of the local area are grouped together.

5.4.2.2 Mixture clustering

Similarities across people and how this relates to where they live are explored using mixture clustering. Mixture clustering fits separate normal distributions to different clusters, modelling the underlying structure of the data within each cluster (descriptions of methods are given in section 4.5.2). People are grouped into three clusters, the relationships between census area variables within each of the three groupings of people make up the centroid of each cluster, and the averages of those that show the largest differences shown in Figure 5.11 on page 109.

The women are grouped into two clusters based on how similar they are to the other women within each cluster. These groupings of women indicate low affluence; for example, having high levels of unemployment and low number of women owning their own homes. In contrast, the other cluster contained women from areas of high qualifications and low numbers of women on
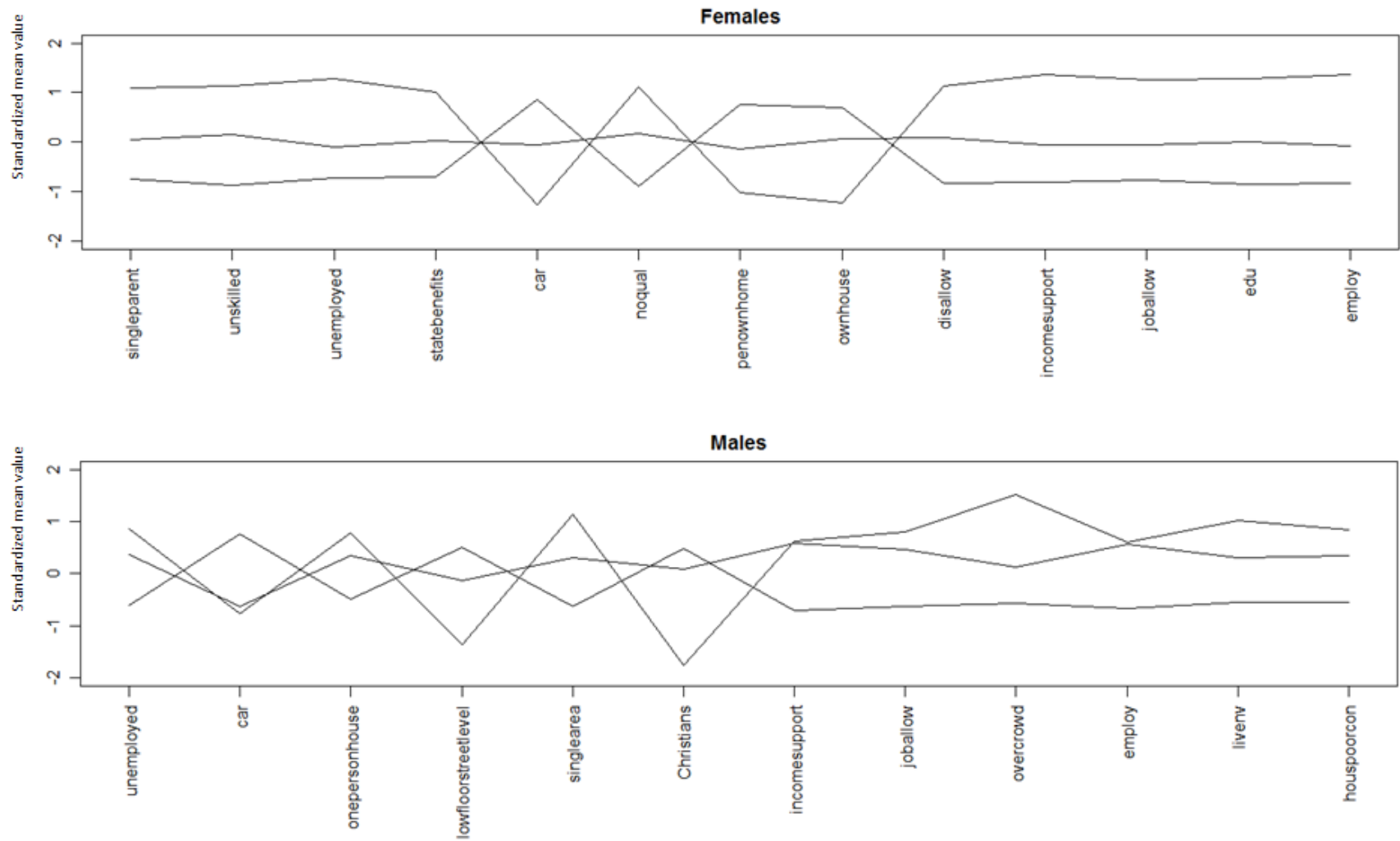
Figure 5.11: Clusters centre outputs (mixture clustering; linked to show differences clearly)

income support. Groupings of men were less clear-cut: the only clear relationships were associations between such locality aspects as low levels of overcrowding and employment. Within this sample, the relevance of employment for older people may be questioned. However, the employment levels in a local area may be related to level of area affluence and the demographics of the people who live there.

Cluster analysis has shown strong relations between certain local area census variables and the people living within an area. Between two and three clusters are suggested to cover all the natural groupings of similarities. The clustering of place characteristics formed the base picture of the local area census variables related to one another. This was then used to inform how local area census variables were combined to represent place within regression models that explore place effect on survival.

5.4.3 Latent class regression analyses

Pictures of the general interconnected characteristics of different localities are formed within this section, exploring the type of people who live within them, and how the interactive contextual and compositional effects have influence on six-month survival. This builds on the information uncovered using cluster analysis, where the underlying relationships between local area census variables were explored, uncovering a more complex overlay of characteristics of locality for men than women. This determines the importance of local area composition and the characteristics of the people living within the area. Moreover, the optimal number of clusters was seen to be between two and four.

The combined dataset described within section 5.2 was analysed with the software Latent GOLD (Vermunt and Magidson, 2000), using the 36 local area census variables described in section 5.4.1 to represent locality. Complete-cases analysis was undertaken, deleting cases with missing data despite the possible incorporation of deletion bias, due to the complexity of the models formed. A piecewise exponential Poisson regression model was used as an estimate of the Cox proportional hazards regression model to simplify calculations (see section 4.5.4 for further explanation).

Latent class regression models cluster together people within different types of locality, referred to as *classes*; locality classes are formed using local area census variables (covariates). Within each of these classes personal level characteristics such as *age* are used to predict survival, referred to as *predictors.* Therefore latent class regression models are formed in three parts:

1) Outcome variable to be predicted, binary mortality at six months regressed on within a generalized linear Poisson regression model. The inclusion of survival rates offset within the model creates an approximate Cox proportional model (Vermunt, 1997).

2) Covariate variables that influence the latent class formations around local area census variables. Each latent class is a subset of the data that can influence survival rate differently from other classes.

3) Personal level characteristics are used to predict the outcome variable *survival*. Each predictor variable within a latent class can have a varying influence on survival.

A parsimonious regression model was sought that would explain as much as possible of the variation in survival. A backwards elimination modelling strategy was used, starting with the full model that contains all 36 local area census covariates and all personal level predictors. The covariates were then reduced based on statistical significance, and then the personal level predictors were reduced based on statistical and clinical significance within each class.

5.4.3.1 Men

The optimal number of classes to be used within the latent class regression model was first determined. Latent class regression models were fitted for men, using personal level predictors and all 36 local census area covariates to form four models. These contained one through to four classes so that comparisons could be made.

Table 5.10: Probability of six-month survival and proportion of sample (n) within respective class for men

Model	1st: Survival	N	2nd: Survival	n	3rd: Survival	n	4th: Survival	n
1	0.89	1						
2	0.91	0.89	0.21	0.11				
3	0.92	0.72	0.68	0.15	0.20	0.12		
4	0.88	0.63	0.74	0.16	0.26	0.12	0.23	0.08

Table 5.11: Comparison statistics across one up to four latent cluster models fitted for men

Classes (men)	BIC	AIC	L^2	Number parameters	Degrees freedom	Class error	R^2
1	20537.7	20309.0	20251.0	29	19648	0	0
2	20640.1	19898.7	19710.7	94	19583	0.10	0.09
3	21101.2	19847.1	19529.1	159	19518	0.24	0.15
4	21523.2	19756.5	19308.5	224	19453	0.32	0.18

The probability of survival for men within each class and the proportion of men are given in Table 5.10. Each model consists of one large class where the probability of survival is high, and then smaller classes where the probability of survival is lower. This accurately models the skew

towards people being alive at six months. Using more than one class uncovers knowledge about the type of localities and people that have lower probability of survival.

Best fit comparison statistics are used to determine the number of classes. Table 5.11 indicates that there is no clear optimal number. BIC increases as the number of the clusters increase which suggests that one class is best, whereas AIC and L^2 decrease indicating that higher numbers of classes are optimal. Due to the amount of variation explained by the model levelling of (R^2 value) and the increase in the classification error, three classes were chosen to form the final model as a compromise.

Table 5.12: Comparison statistics for optimal latent class regression model for men

Model: 3 classes	BIC	AIC	L^2	Number parameters	Degrees freedom	Class error	R^2
Full	21101.2	19847.1	19529.1	159	19518	0.24	0.15
Parsimonious	20351.9	19468.5	19244.5	112	19565	0.35	0.26

Following simplification of the three-class model, this parsimonious model was compared to the full model. AIC, BIC and L^2 decreased (Table 5.12), indicating a better fit of the parsimonious model within these nested models. The increase in R^2 showed that a greater amount of the variation in survival is explained by this model. There is also a small increase in the classification error, indicating that the accuracy of predicting survival was reduced.

Table 5.13: Class sizes, expected event and probability of survival up to six months for men

Covariate	Class 1	Class 2	Class 3
Classes (size)	0.65	0.22	0.13
Expected event	0.05	0.50	1.47
Probability of survival	0.95	0.61	0.23

The three parts of the parsimonious latent class model for men (discussed above) are separated into three tables:

Part 1: the outcome is shown in Table 5.13, with the size of each class, expected number of events and the probability of survival.

Part 2: shows the representation of locality using local area covariates in Table 5.14 on page 114. This table shows the mean values of each local area census variable, split by class, and a corresponding test of whether this variable has a significant influence on class formation (absolute z-value greater than two considered significant). There is also a Wald test of overall significance for each covariate. The relationships of the local area census covariates within each class are portrayed in Figure 5.12 on the next page.
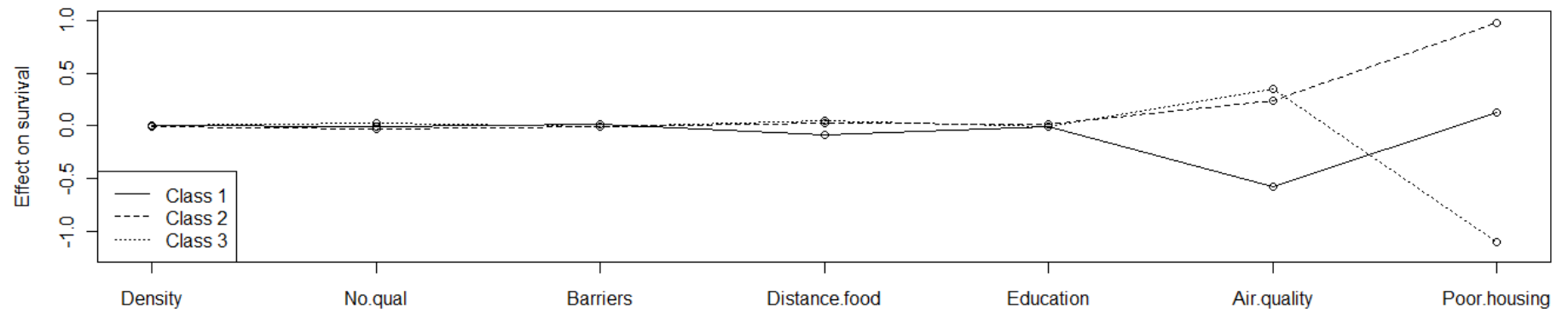
Figure 5.12: Latent classes for men (linked to show differences in class membership)
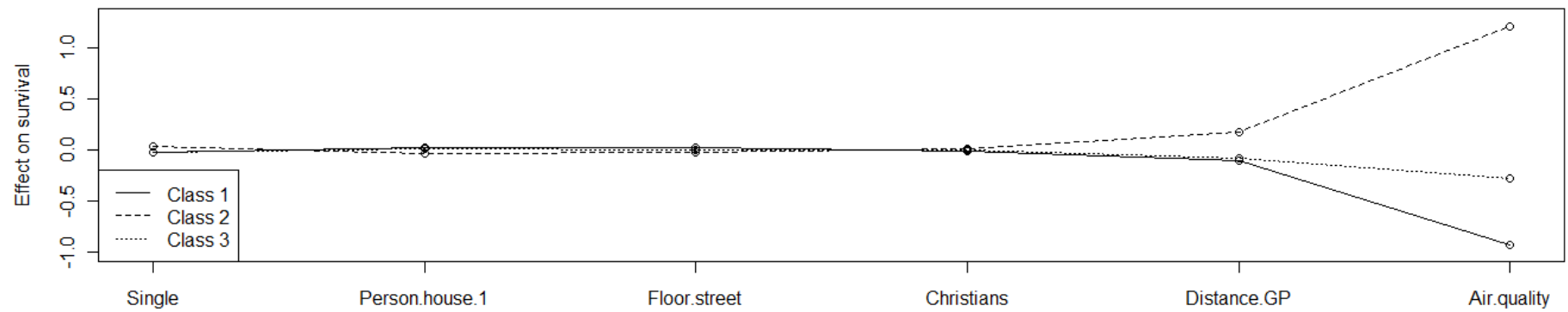
Figure 5.13: Latent classes for women (linked to show differences in class membership)

Part 3: the mean and standard deviations of the predictors of survival within each of the three classes are given (Table 5.15 on page 116). The significance of the influence on survival is tested within each class for each predictor (z-value survival difference test). Finally, whether values of predictors and their influence on survival are significantly different between classes is tested (Wald class difference test).

Pen pictures of the three different locality classes formed are developed, using all the information available for the model to describe the locality being represented, the characteristics of the people living within the locality and the effect on survival.

Table 5.14: Latent covariate estimates and test of significance model for men

Covariate	Class 1	z-value	Class 2	z-value	Class 3	z-value	Wald
Intercept	1.59	4.69	-0.06	-0.19	-1.53	-3.30	22.02
Education	-0.006	-1.37	0.01	3.56	-0.01	-1.25	16.02
Barrier house	0.02	2.77	-0.01	-2.06	-0.01	-0.64	13.62
No qualifications	-0.004	-0.45	-0.03	-3.57	0.03	2.49	12.77
Air quality	-0.58	-3.04	0.24	1.36	0.35	1.25	12.55
Average road to food	-0.08	-2.64	0.03	1.31	0.05	1.07	10.30
Pop density	0.004	2.22	-0.004	-1.94	-0.001	-0.30	9.40
House poor condition	0.13	0.31	0.97	2.72	-1.10	-1.86	7.42

Description of Class 1

Class 1 describes a highly populated area close to food shops and other resources; this seems to represent an urban neighbourhood. There are many barriers to housing and services; this includes high overcrowding and homelessness, with difficulty of access to owner-occupation. Air quality is seen to be low, supporting the theory that these are LSOAs within towns or cities: for example, within Leeds city centre.

A large proportion of older people live within the type of locality described by Class 1 – 65% of those within the combined dataset. These people have high survival rates. This association between urban/rural local areas and survival rates differs greatly from that seen when representing area with local area indices.

Men who lived in areas represented by Class 1 had a higher probability of survival when diagnosed with a NSTEMI. This diagnosis is less severe than a STEMI. Not being followed up by a cardiologist or going to rehabilitation within the group did not reduce survival rates. Drug treatment, especially *statins* and *beta-blockers*, increase survival rates; these are the best form of treatment for a NSTEMI diagnosis. These men tended to be very slightly older and have some history of smoking.

Men living within these urban localities, with barriers to owning and accessing homes, are seen to have high survival rates, especially when given a NSTEMI diagnosis and receiving the appropriate treatment. This result is contra to the implication given by the analysis using local area indices. A large proportion of the population will live within this type of locality. This class may reflect the proportion of people in this circumstance, and the benefit of having amenities close by and quality health services.

Description of Class 2

Class 2 describes areas of low population density, with few barriers in place, with low levels of homelessness and overcrowding, and easy access to owner-occupation, and where a large proportion of people have some educational qualifications, although young people are seen to not continue in education after attending high school, and housing within this area is of poor condition. A mixed area is represented, in a more rural or sub-urban locality than Class 1, although it is not affluent. The type of locality in a Class 2 area is a former mining community such as Rothwell.

The people living in these types of localities comprise a fifth (22%) of older people within the combined dataset. Survival rates for people here are lower, with a probability of survival of 0.61.

Having a STEMI diagnosis gave a better prognosis, whereas not receiving adequate treatment (reperfusion) reduced survival rates. Aspirin had the most positive effect of all drugs considered.

Men with chronic renal failure were the most at risk, indicating the problems associated with co-morbidities.

The men living with this rural/sub-urban locality had reasonable survival rates, though not as high as within the first class. Men with a less severe diagnosis living in these localities should be targeted as at higher risk.

Description of Class 3

Class 3 represents areas with low numbers of poor housing and there are relatively high numbers of people living there with no qualifications. The large distance to amenities indicates a rural location such as Shadwell. However, unlike Classes 1 and 2, these aspects were not important to the formation of this class.

Only 13% of people within the combined dataset live in this type of locality. They also have the lowest probability of survival (0.23), indicating that this is a high-risk group.

Men within these areas had a better prognosis if they had less severe diagnosis and received reperfusion instead of drug therapy. Not being followed up by a cardiologist or attending rehabilitation significantly reduced survival rates. This may be due the person's death before it was possible for these to occur.

Table 5.15: Personal/clinical predictors within latent three-class cluster model for men

Variable	Categories	Class 1	Class 2	Class 3	Wald (survival diff)	Wald (class diff)	Mean (SD)
Intercept		-13.2	-12.3	-12.4	**318.2**	0.7	-12.86 (0.42)
Heart rate		0.002	0.02	0.02	**91.6**	**32.5**	0.01 (0.01)
Troponin		0.01	0.01	0.01	**36.1**	1.1	0.01 (0.002)
Age		0.1	0.07	0.08	**283.7**	2.5	0.08 (0.01)
Diagnosis	NSTEMI	0.3	0.04	0.02			0.18 (0.11)
	Other	-0.3	-0.3	0.05			-0.26 (0.12)
	STEMI	0.03	0.3	-0.07	**28.8**	5.7	0.07 (0.11)
CRF	no	-0.1	-0.6	0.9			-0.12 (0.43)
	yes	0.3	-0.03	0.8	**54.6**	**25.4**	0.31 (0.24)
Follow up	Cardiologist	-0.2	-0.3	-1.5			-0.40 (0.43)
	No cardiologist	0.3	0.03	-0.02	**103.0**	**32.0**	0.18 (0.13)
Smoking status	Current smoker	0.1	0.1	0.2			0.11 (0.02)
	Ex-smoker	0.2	-0.07	0.3			0.15 (0.13)
	Non/unhis	-0.1	-0.1	-0.09	**17.6**	7.1	-0.11 (0.01)
Aspirin	no	-0.4	0.3	1.6			0.04 (0.66)
	yes	-0.05	0.1	-2.5	**35.8**	**31.9**	-0.33 (0.82)
Beta Blockers	no	0.3	0.09	1.2			0.39 (0.32)
	yes	0.2	-0.2	-4.0	**36.0**	**19.2**	-0.45 (1.36)
Reperfusion	No	0.5	0.3	-0.8			0.27 (0.41)
	Received	-0.7	-0.4	0.8	**58.1**	**43.7**	-0.44 (0.51)
Statin	no	0.2	0.03	1.1			0.28 (0.33)
	yes	-0.3	-0.04	-1.4	**26.3**	**16.2**	-0.37 (0.41)
Rehab	no	0.05	0.09	1.5			0.24 (0.47)
	yes	-0.03	-0.2	-0.7	**91.0**	**63.4**	-0.16 (0.23)
CCF	no	-0.9	2.3	-0.6			-0.16 (1.30)
	yes	0.04	2.7	0.2	**52.7**	6.0	0.65 (1.09)
Ace inhibitors	no	-0.1	0.1	1.2			0.11 (0.4)
	yes	-0.2	-0.3	-2.3	**44.8**	**16.6**	-0.45 (0.72)
Hypertension	no	-0.06	-0.1	-0.6			-0.14 (0.17)
	yes	-0.01	-0.09	-0.5	**14.4**	8.1	-0.09 (0.15)

Having co-morbidities such as chronic renal failure (CRF) and congestive cardiac failure (CCF) was associated with survival rates within this class. Men who smoked within this class were seen be associated with lower survival rates. This association was more detrimental within this class than for Class 1 or Class 2.

Men living in Class 3 areas with severe ACS, and who did not receive treatment, had the lowest survival rate at six months. This may be due to poorer access to amenities or services. There may also be a confounding effect for older people in poorer health in moving to rural localities; further insight is needed to understand this relationship.

The latent class regression model for men has enabled the identification of aspects of locality that influence survival at six months, and determine the men at risk within these localities. The construction of the three locality types centred on urban/rural differences and the access barriers that are present.

The men that lived within Class 1 areas were more affected by the severity of their ACS diagnosis than those than lived within Class 3 areas. Men living in Class 3 localities are more at risk when not receiving drug treatments than men living in other areas are. Older men living in Class 1 localities should be targeted as being at higher risk than those in other localities.

5.4.3.2   Women

Similarly, a latent class regression was fitted for women. This is used to form local area descriptions that affect survival. The characteristics of the women living within the local areas were also explored.

Table 5.16: Probability of survival to six months; proportion of n for women

Model	1st: Survival	N	2nd: Survival	N	3rd: Survival	N	4th: Survival	N
1	0.88	1						
2	0.92	0.87	0.25	0.13				
3	0.92	0.54	0.80	0.35	0.15	0.11		
4	0.90	0.45	0.83	0.35	0.18	0.12	0.07	0.08

Table 5.17: Comparison statistics across one up to five latent cluster models fitted for women

Classes (women)	BIC	AIC	L^2	Number parameters	Degrees freedom	Class error	R^2
1	17012.6	16790.8	16732.8	29	15499	0	0
2	17134.0	16414.9	16226.9	94	15434	0.12	0.05
3	17530.6	16314.2	15996.2	159	15369	0.37	0.11
4	17950.5	16236.8	15788.8	224	15304	0.40	0.11

The optimal number of classes is determined for women by fitting one through four full latent class models and comparing these. A similar distribution to men was shown: one large class with high probability of survival and a number of small ones (Table 5.16). The small classes for women did not have low probabilities of survival; this was more distributed across classes than it was for men. This may indicate that the way that locality characteristics influence survival is less clear-cut for women.

Moving from the latent models with two to three classes (models two and three) breaks open the larger class, determining compositional characteristics that influence differences in levels of variation.

Best fit statistics that were used to compare these models are shown in Table 5.17. The model chosen was a compromise between the increase seen in the BIC value and classification error, and the decreases in AIC and L^2 values. Within an ideal model, these four comparison statistics would be low. The compromise made was similar to the one chosen for the above model for men. The amount of variation explained by the model (R^2) levelled off at three classes, indicating that four classes would be too many.

Table 5.18: Comparison statistics for optimal latent class regression model for women

Model: 3 classes	BIC	AIC	L^2	Number parameters	Degrees freedom	Class error	R^2
Full	17530.6	16314.2	15996.2	159	15369	0.37	0.11
Parsimonious	16945.2	16264.3	16086.3	89	15439	0.21	0.14

The reduced, parsimonious model based on statistical and clinical significance was compared to the full model (Table 5.18). BIC, AIC and the classification error reduced, indicating a better fit to the data and lower numbers of errors when predicting survival. L^2 increased very slightly, which may indicate reduction in fit to the data, although this is a negligible amount. The R^2 increased; this implies that a larger amount of the variation in survival rates was explained within the parsimonious model in comparison to the full model.

Table 5.19: Class sizes, expected event and probability of survival up to six months for women

Covariate	Class 1	Class 2	Class 3
Classes (size)	0.77	0.15	0.08
Expected event	0.10	0.43	3.31
Probability of survival	0.90	0.65	0.04

Table 5.20: Latent covariate estimates and test of significance model for women

Covariate	Class 1	z-value	Class 2	z-value	Class 3	z-value	Wald
Intercept	1.25	1.86	-1.04	-0.85	-0.20	-0.21	**3.60**
Air quality	**-0.93**	-3.87	**1.21**	2.58	-0.28	-0.84	**15.21**
Low floor street level	**0.02**	3.20	-0.02	-1.45	-0.003	-0.28	**10.34**
One person house	**0.03**	3.14	**-0.03**	-2.20	0.01	0.65	**9.90**
Average distance to GP	**-0.10**	-2.42	**0.18**	2.49	-0.08	-1.15	**8.70**
Single parent	**-0.02**	-2.04	**0.04**	2.15	-0.02	-1.21	**5.56**
Christians	**-0.01**	-2.14	0.01	1.14	-0.001	-0.10	**4.64**

Tables 5.19, 5.20 and 5.21 (page 120) provide information relating to the survival rates, local area census variables informing class formation and personal level characteristics that influence

survival at six months. Pen pictures are formed of each of the three localities. These describe the characteristics of the place and the people that live within them.

Description of Class 1

Class 1 describes a local area very close to amenities. Within the area there was a high number of people living alone and low air quality, indicating an urban locality. This is a similar trend to the largest class formed for men. Single parent households are not common and houses are at street level; this tends to imply that the locality is not highly deprived. An example is an urban area with access to resources and low levels of deprivation, such as Harrogate.

The largest proportion of older women lived within the type of locality described by Class 1 (77% of the combined dataset). These women had very high probabilities of survival, with only a 0.1 probability of death at six months.

Women's distribution into different class locations was less affected by the diagnosis they received than it was for men. Women who lived within locations described by Class 1 and had either a STEMI or NSTEMI diagnosis had worse prognoses. They received a variety of drugs and treatments, and lower survival was seen.

Smoking, or having smoked in the past, reduced survival, as did having a variety of co-morbidities such as diabetes and CRF. This associated risk was higher for women who lived in areas represented by Class 1 than for those in areas represented by Classes 2 or 3.

Within this affluent locality that has access to resources, women had very high survival rates. This is especially the case when the diagnosis was not severe and treatments were not needed. Women with unhealthy lifestyles and co-morbidities were particularly at risk.

Description of Class 2

Class 2 represents an area far from local amenities with low numbers of people living alone, and air quality is very high, indicating a rural locality. The number of single parent households is high locally. This seems to represent a relatively rural or a former mining area, perhaps a family locality such as Fitzwilliam.

A much smaller number of older women live in the type of location described by Class 2, with only 15% of the women in the combined dataset. The probability of survival for these women is still quite high, with the probability of death at six months being 0.35.

Women living within localities described by Class 2 have personal level influences on survival rates. Diagnosis had varying effects, as did the use of drugs and reperfusion. Older women were at a higher risk, as were those who had CCF and were seen to need rehabilitation.

This more rural locality had quite high survival rates. Personal level characteristics had little impact on survival, implying the importance of living within such a locality. Older women from this type of locality should be considered at higher risk.

Table 5.21: Personal/clinical predictors within latent three-class cluster model for women

Variable	Categories	Class 1	Class 2	Class 3	Wald (Survival diff)	Wald (class diff)	Mean (SD)
	Intercept	-11.9	-14.8	-7.9	**1063.73**	**12.52**	0.01 (2.03)
	Heart rate	0.01	0.01	0.001	**43.63**	2.91	0.01 (0.002)
	Troponin	0.01	0.01	0.01	**28.69**	0.66	0.01 (0.003)
	Age	0.04	0.09	0.02	**131.23**	**15.23**	0.06 (0.03)
	NSTEMI	0.3	0.09	-0.4			0.13 (0.20)
	Other	-0.6	-0.2	-0.1			-0.42 (0.20)
Diagnosis	STEMI	0.3	0.1	0.5	**37.44**	**12.55**	0.28 (0.13)
	no	-0.4	-0.3	0.2			-0.28 (0.15)
CRF	yes	-0.6	0.9	0.2	**52.07**	**25.47**	-0.01 (0.68)
	Cardiologist	-0.4	-0.04	-0.3			-0.25 (0.15)
Follow up	non card	0.2	-0.1	-0.02	**35.57**	3.82	0.07 (0.11)
	current smoker	0.3	0.1	0.1			0.21 (0.09)
Smoking	Ex-smoker	0.2	-0.2	-0.7			-0.03 (0.26)
status	non/unhist.	-0.03	-0.2	0.2	**24.78**	**16.64**	-0.04 (0.11)
	Received	0.2	0.4	-0.3			0.21 (0.20)
Reperfusion	Not received	-1.0	0.5	0.6	**46.39**	**42.71**	-0.30 (0.75)
	no	0.3	-0.7	0.6			0.03 (0.50)
Statin	yes	0.3	-0.7	-0.6	**46.89**	**30.51**	-0.11 (0.47)
	no	-0.4	0.7	0.4			0.03 (0.53)
Rehab	yes	0.09	-0.3	-0.5	**42.51**	**26.38**	-0.09 (0.22)
	no	0.3	-0.5	-0.3			-0.02 (0.40)
CCF	yes	0.3	0.7	0.3	**52.81**	**15.44**	0.43 (0.22)
Beta	no	0.2	0.4	0.01			0.22 (0.13)
Blockers	yes	0.2	-0.4	-1.6	**46.01**	**31.53**	-0.18 (0.56)
	Diabetes	0.6	-0.2	-0.4			0.21 (0.41)
Diabetes	none	-0.2	-0.2	0.002	**58.68**	**16.46**	-0.19 (0.07)
	no	0.2	0.1	0.3			0.19 (0.06)
Aspirin	yes	0.08	0.2	-0.6	**13.06**	7.53	0.04 (0.23)
Ace	no	0.08	-0.2	2.3			0.22 (0.71)
Inhibitors	yes	-0.2	0.3	-4.08	**13.44**	**12.05**	-0.48 (1.25)

Description of Class 3

Class 3 indicates no significant elements of the locality influencing its formation; distance to amenities is low, as is air quality, indicating similarities to Class 1. It is not possible to determine what type of locality Class 3 refers to. The reason for this class may be due to the personal level characteristics of the people living there or due to overfitting to the data.

Only 8% of older women lived within the type of locality described by Class 3. The women who lived in these localities tended not to survive to six months, with the probability of death being 0.96.

Women living in Class 3 localities are affected to a greater extent by having had a severe ACS diagnosis. Survival rates were lower when treatment or drug therapy was not received. Women who had congestive cardiac failure (CCF) or chronic renal failure (CRF) and were younger (though older than 65 years) had the lowest survival rates.

Within this class, locality is not well defined, with little influence of the local area census variables on its construction. The person level characteristics suggest women with severe events are at very high risk within this group.

This class fits around the personal level characteristics of the women rather than the localities, probably representing a large range of different area characteristics. This indicates that when the prognosis is very bad, where women live does not influence survival rates.

The relationship between location and survival for women suggest that those living in urban locations with resources – and to lesser extent affluent rural localities – have high rates of survival.

5.4.4 Latent class distributions

The distributions of the three localities represented by local area census covariates are shown in Figure 5.14 on page 123. These are based on probabilistic assignment to latent classes, based on the largest proportional fit of the person to the latent class. Hence, although Figure 5.14 displays the basic distribution of latent classes across geographical locations, it is not fully representative of the latent class results.

For both men and women, the majority in Yorkshire and Humber are assigned to Class 1, with high probability of survival. This covers urban, rural, high and low areas of population density. Classes 2 and 3 do not seem to follow any obvious pattern. The latent class distributions across

LSOA's shown in Figure's 5.14 on page 123 vary greatly in relation to the distribution of the local area indices in section 5.2.3.

This implies that the local area covariates are measuring locality differently from the local area indices, with little connection to population density, which was previously seen to be important. This may be due to a strong connection between population density and some of the local area census variables within the model. This re-enforces the importance of population density, although it implies that it is not the only aspect of locality that influences survival for older people.

5.5 Summary

The interconnection of contextual and compositional influences on six-month survival for older men and women within Yorkshire and Humber has been clearly portrayed in this chapter. A variety of representations of place were explored, and how these representations of place were associated with survival was compared.

General material deprivation and level of area underprivilege were analysed in terms of six-month survival, using the local area indices, IMD score, Townsend's score and Jarman score. The relationship between locality and survival was strongest when looking at general deprivation, indicating that with a more multidimensional measure of deprivation there was a clearer inverse relationship between deprivation and survival from ACS in older age.

No relationship between place (represented by the Jarman score) and survival was seen when the individual level characteristics of the people living there were considered. Both general and material deprivation showed strong ties to the population density of LSOAs, suggesting the potential importance of urban/rural differences and levels of overcrowding.

Exploration was made into what aspects within the environment are naturally associated together. These were used to examine survival rates up to six months of people who lived within these groupings that represented place. This layered view provided wide-ranging insight into influences on survival, identifying both people and localities with the highest risk for survival.

The local area census variables were grouped into three classes. There were fundamental differences across the type of areas that these classes represented, and the personal level characteristics of the men and women who lived within them. This grouping was chosen based on the construction of the cluster analysis and a variety of models fitted to the data. There was
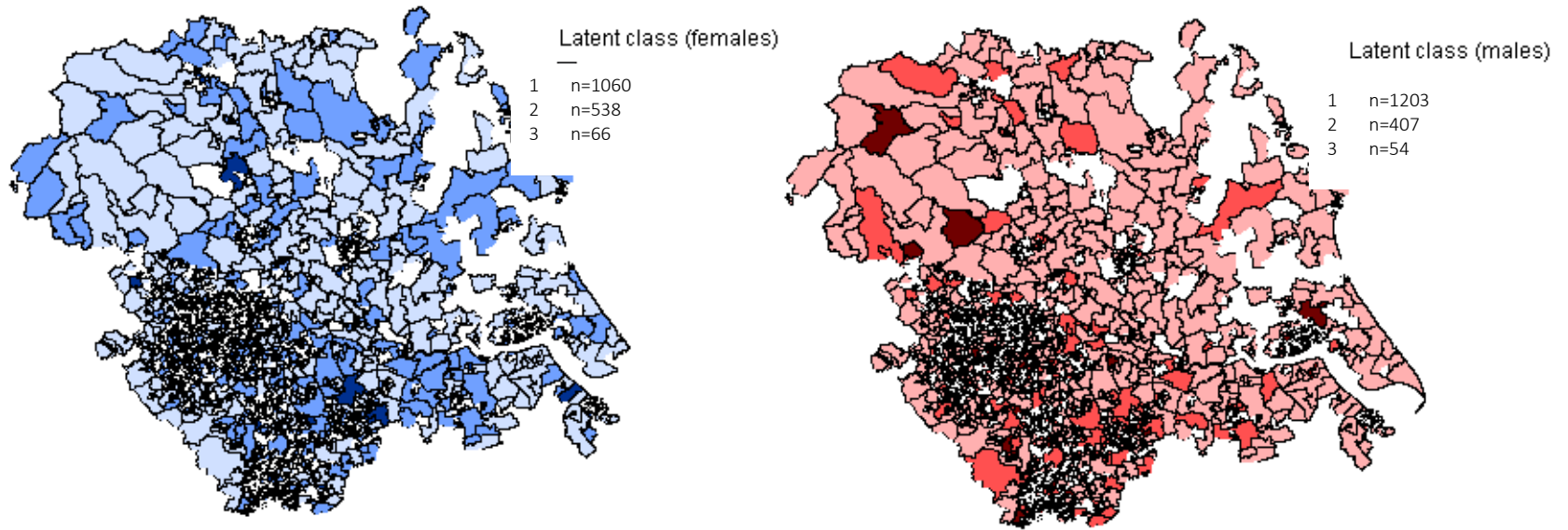
Figure 5.14: Thematic map of Yorkshire and Humber for patients within our dataset, by highest inclusion to latent class of each LSOA

NB Class 1contains the lowest expected event up to Class 3, which contains the highest expected event

no obvious choice of number of classes and the modelling strategy used was open to interpretation.

The different classes formed for men showed that important aspects of place in terms of survival were access to resources, barriers and urban/rural differences; these had the most influence and seemed to be material-based place aspects.

The latent class regression models indicated that the women who lived in areas that were urban with families or affluent rural areas had high survival rates. The latent classes formed around where women lived also indicated the importance of access, as well as the community locally. This insight is based on these latent classes, including the proportion of single people and the local religion. This suggests that there are strong differences between how older men and women with ACS are affected by place.

The effect that the severity of ACS severity had on survival was linked to the place where the person lived. For example, men who lived in urban local areas and who did not have a *STEMI* or *NSTEMI* diagnosis were more at risk than men with the same diagnosis who lived elsewhere.

Similarly, for women Class 3 indicates that locality is of little importance to the risk of death. Due to the unspecific nature of the locality description, there is reason to believe that the model is fitted directly on the personal level characteristics of these women. This only represents a small number of women, many of whom die by six months. Given how this model has been fitted, the influence of the locality formation within Class 3 is not a believable inference.

Investigation of such a large and complex dataset relating to the health of people, with the necessity to model multiple layers of influence (both compositional and contextual), has been challenging. The results provided insight that could not have been uncovered without this intricate modelling approach.

The complex models formed were fitted to the data based on the understanding of the data available. The modelling strategy was however open to my interpretation. The high values of classification errors 0.35 and 0.21 for men and women respectively underline the difficulties in fitting an adequate model. However, this suggests that the models are not overfitted to the data within the combined dataset.

The secondary data analysis has provided valuable insight into locality influences and the people most at risk living within them. Some differences in the measurement used for place and place effects on survival were seen, depending on how place is measured. This insight has raised

many questions around why these relationships exist, with the wish to understand why men are more influenced by material-based problems and women are more influenced by community-based aspects, and to explore whether this relationship changes over time and how the people experiencing them perceive these influences.

The main questions that were taken forward into the next phase of the study for further investigation were:

- Were the area variables considered all-encompassing in terms of area effect?
- Did the variables identified have meaning for the people being considered?
- Did the areas (LSOAs) being considered have meaning for the people living in them?

This chapter set out to present the results and discuss the initial phase of the study and secondary data analysis.

Further exploration into why these relationships exist and what they mean to the people experiencing them was not possible using a quantitative methodology. These fundamentally different questions had to be approached employing a qualitative research methodology.

By using this mixed method approach, the complexities of fitting latent class regression models can be reduced; by understanding the process of why influences occur, the modelling process can be focused.

The remainder of the thesis focuses on exploring perceptions, aiming to understand why the relationships uncovered exist and what they mean to the people experiencing them, finally drawing together the insight developed within each methodological approach, in order to build up a wide-ranging picture of 'place effect'.

Chapter 6: Experiences and perceptions of place effect on ACS recovery: Approaches and methods

6.1 Introduction

The aim of this PhD is to understand the influence of place. The secondary data analysis phase helped to understand the effect that deprivation has on survival from ACS. This uncovered the importance of certain aspects of the local area, such as distance to amenities.

The secondary phase of the study aimed to understand the experience and perceptions of place effect: why place was seen to be influential in terms of recovery was of interest. This called for more in-depth analysis, with the focus on the meaning and experiences of the subjective and experiential dimensions of the localities in which older people with ACS live. This explored people's perception of what features of places contributed to their recovery. This phase uses the knowledge formed in the first phase to build up understanding of the different dimensions and questions posed around place effect.

This phase of the study consists of two interconnected parts: questionnaires and qualitative discussions. Questionnaires were sent out to 200 older people two and six months after they were hospitalised for ACS within Yorkshire and Humber. The questionnaires aimed to gain understanding of perceptions of own recovery and place across a reasonably sized sample at initial and follow-up recovery.

Qualitative discussions which consisted of interviews and walks around personal neighbourhoods (community mapping) took place between the two questionnaires, around three to five months after hospitalisation. Qualitative discussions took place with a small sub-sample of ten of the 200 initial questionnaire respondents, for further in-depth information to be collected within the qualitative study phase. The choice of respondents was based on their responses from the initial questionnaire. Four of the qualitative participants also undertook community mapping to explore personal connections and boundaries. The timescale, and how this phase was structured, is outlined in Figure 6.1 on page 127 and Table 6.1 on page 128.

The justifications, limitations and problems that occurred with the approaches and methods used within this second phase of the study are discussed within this chapter. The questionnaires and qualitative study sampling methods, and data collection and analytic strategies are presented in sections 6.2 and 6.3 respectively.
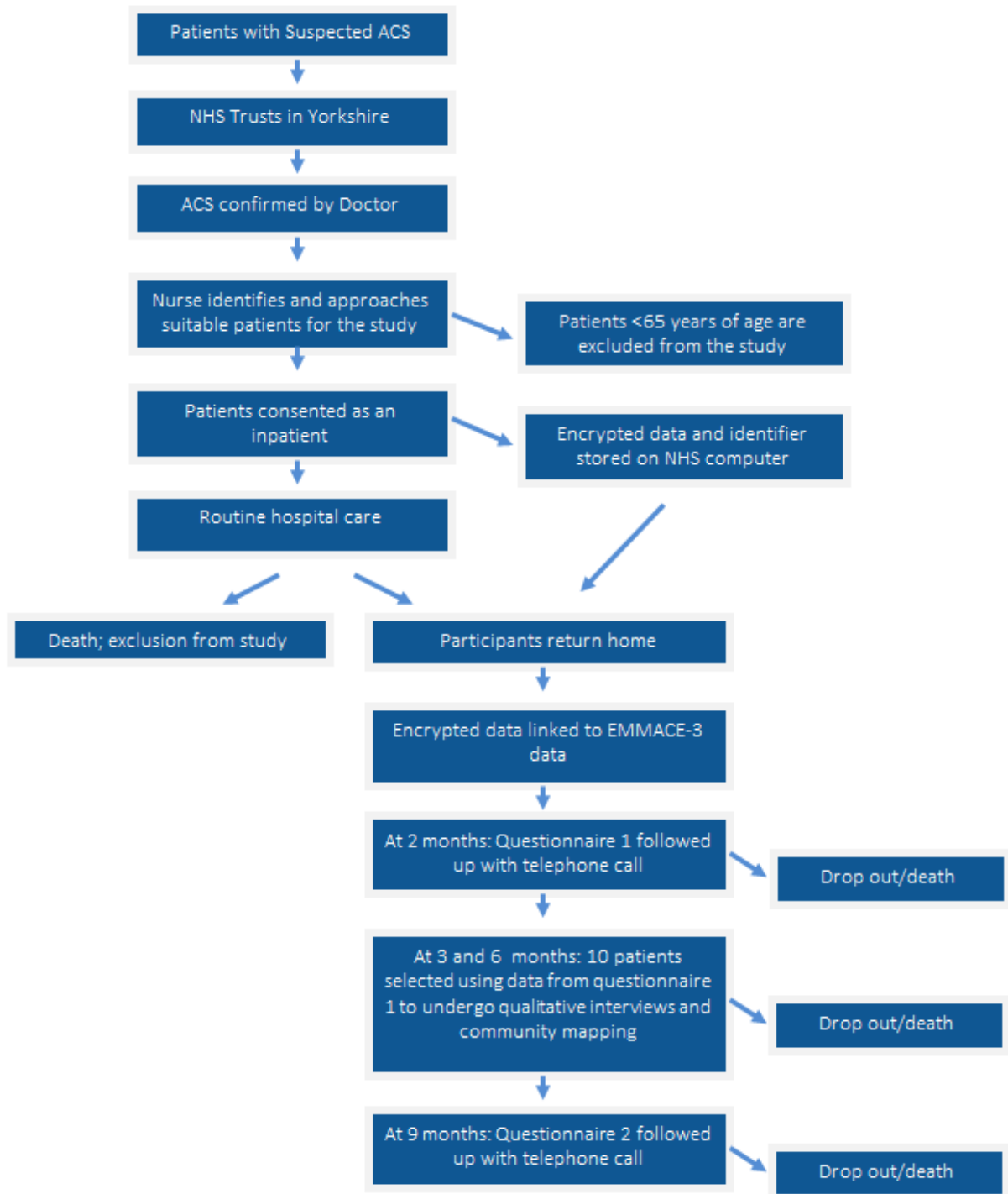
Figure 6.1: Flowchart of Phase 2 study process

Table 6.1: Time schedule of phases

Study commencing	2010	2011												2012								
December 2012	Dec	Jar	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Ethical approval and permissions																						
First hospital recruitment																						
Second hospital recruitment																						
Third hospital recruitment																						
Fourth hospital recruitment																						
Receive questionnaire one																						
Interviews and community mapping																						
Receive questionnaire two																						

Section 6.4 of this chapter discusses how the findings from the different study phases were synthesised. This third and final phase aimed to form a wide-ranging view of the phenomena around place effect.

Finally, a second iteration of the secondary data analysis is discussed in section 6.5. This is based on the findings formed throughout the phases of the study and brought together within the data synthesis. How the conceptually formed place aspects that were seen to effect ACS outcome were modelled on six-month survival is presented within this section.

 A summary of the two phases discussed in this chapter is given in section 6.6.

6.2 Questionnaires

The questionnaires provided an overview of perceptions and experiences of ACS from a systematically collected sample. The aim was to form a better understanding of what place meant to the people who lived there. The effect of place on the recovery process was assumed to be consistent over time within the secondary data analysis. The questionnaires gave the opportunity to explore this assumption and identify changes over the six-month period.

The advantage of questionnaires was the quick collection of a reasonable sample of data with low costs. Questions that are specific to the study can be asked and the analysis was relatively simple as it was based on standardised questions (Gillham, 2000a).

6.2.1 Questionnaire sampling

A systematic consecutive sampling strategy was used to recruit 200 people over the age of 65 who were newly admitted to a Yorkshire hospital with ACS. The aim was to form a representative sample of older people with ACS in accordance with the aim of the study. Recruitment took place between June 2011 and March 2012.

Each of the main hospitals within Yorkshire with a cardiac research nurse on site was approached about taking part in this study. The four Yorkshire hospital districts that joined were Mid-Yorkshire Trust (Pinderfields), Bradford Teaching Hospitals NHS Foundation Trust, Airedale NHS Trust and Leeds Teaching Hospitals NHS Trust.

The sampling criteria included people who were diagnosed with acute coronary syndrome and over the age of 65 years. This study was not able to include people who could not speak/write English or who did not have the capacity to consent, due to time/financial constraints of the PhD study. People who lived in care facilities were also excluded, as their experiences would not be relevant to this study.

[Appendix A contains the questionnaire patient information sheet and consent form]

In practice the collection of the sample was only approximately consecutive, being dependent on the availability of research nurses to recruit patients. Some patients might be missed if their acute stay was very short or they were transferred to another hospital soon after admission. It is possible therefore that the sample underestimates those patients.

During the course of recruitment, the sample being collected was skewed towards those from less deprived local areas. Discussions with the research nurses led to the understanding that this was due to such people being more likely to consent to joining the study. Figure 7.2 on page 162 shows the distribution of local area deprivation for the questionnaire sample.

This will influence the conclusions drawn from the questionnaires. Within this study, it was not possible to rectify this bias; the effect that the bias might have on the conclusions drawn was considered throughout the analysis.

6.2.1.1   Questionnaire sample size

The size of the sample recruited was determined by the capacity for adequate power to conduct appropriate analysis. The size of the sample affects the study design and the size of the expected effect (Everitt, Landau and Leese, 2001). In general, the larger the sample size, the more reliable the results are. Within this study, the sample size was restricted by the time frame.

As no questionnaire data was available prior to the start of this phase of the study, the sample size was determined based on a similar dataset: the English longitudinal study of aging (ELSA). Data for ELSA had been collected with the aim to understand the economic, social, psychological and health elements of the aging process, by studying a sample of people over the age of 50 (Rogers, 2011).

A sub-set of the ELSA was taken to represent the questionnaire sample that would be collected. People over 65 years old with cardiac problems were selected. Based on this data, a sample size sufficient to perform linear modelling regression analysis was determined. The index national statistics socio-economic classification (NS-SEC) was used to represent place in this model, due to the availability of the data.

Linear regression models were run within 1,000 re-sampled datasets; these concluded that 114 patients would need to be recruited in order to estimate the influence of socio-economic classification adequately, with a Type I error of 0.05 and an empirical power of 0.801.

A sample of 200 patients was recruited for the study to account for high non-response rates for postal questionnaires, often greater than 40%, for a variety of reasons.

The representativeness of the sample was restricted by people within the inclusion criteria who did not consent to the study. These people were not included within the sample size of 200. However, people who were recruited into the study and did not respond to questionnaires were included within the 200 sample. Reasons for non-response were:

1. Deceased
2. Persons who had left the country to live abroad (emigrants)
3. Unable to contact
4. Withdrawal from the study.

Recruiting 200 participants was sufficient to complete analysis, as a reasonable response rate was achieved.

The accuracy of this estimated sample is limited. The sample that it is based on does not directly relate to the population of interest, as both the measure of locality used and the outcome used within these calculations were not those used in this study. The models used for the power calculations and some of those used for the questionnaire differed. This could affect the accuracy of the sample size calculation. With this limitation in mind, care is taken in the analysis, using only statistical techniques designed to be used with small sample sizes.

6.2.1.2   Response and completion rates

A total of 200 participants were recruited to the study. Prior to the first questionnaire being sent out, five individuals withdrew and eight died. Of the 187 questionnaires sent, 129 were returned (68.9% response rate). This response rate is excellent, given that a response rate of 10%-50% is common for mail surveys (Neuman, 2000). The second questionnaire was sent out six months after initial diagnosis of ACS. There were 125 responses (62.5% response rate). Given the elapsed time since consent, this is encouraging for the validity of the sample and consequential comparisons drawn.

Comparisons were made between participants who returned the questionnaires and those who did not, looking for patterns in the characteristics of people who were likely to respond. There appeared little difference between responders and non-responders, except that non-responders were slightly younger, although not significantly so (T test p values 0.44, 0.35 respectively for differences in age across first and second questionnaire). This led to the assumption that there was an underlying cause for non-responders (who were still alive) to fail

to return questionnaires, and hence there is no reason to believe that there is a systematic bias in the sample.

Relatively proportional response rates for participants recruited from different hospitals are shown by Figure 6.2; differences in proportion of recruitment within the differing samples are non-significant (p= 0.57). The LGI hospital recruited by far the greatest number of participants, but had the lowest response rate.
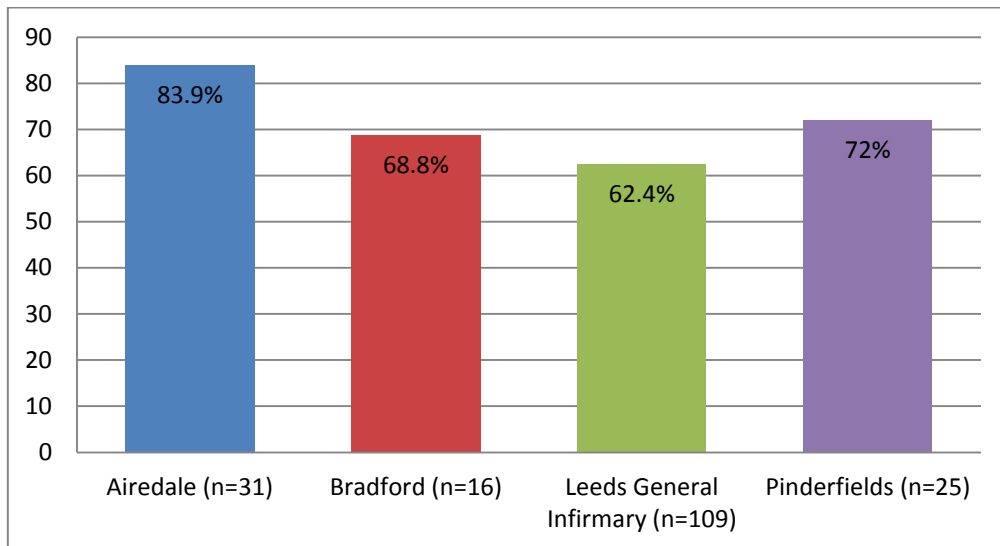
Figure 6.2: Bar chart of proportional response rates by participating hospitals

Completion within questionnaires was high, with the majority of structured response questions being completed; non-response occurred more with open text response questions.

6.2.2   Gaining access

Sampling took place during hospitalisation. This required NHS ethical approval, and approval from the research and development departments of each hospital.

Ethical approval was sought from the Leeds (Central) Research Ethics Committee (Leeds REC), through the National Research Ethics Service. This was gained following minor revisions for clarification of questionnaire wording and extension of the consideration time for consenting to the study

[Appendix B contains the letter of favourable response]

Ethical considerations such as informed consent and data protection were conformed to, in accordance with REC requirements.

Restrictions on information relating to patients in hospital are in place to ensure confidentiality prior to expressing an interest in participating in the study and agreeing for their details to be

passed to the researcher. The National Institute for Health Research (NIHR) Co-ordinated System granted UK Clinical Research Network (UK CRN) Study Portfolio adoption (Research Ethics Committee (REC) number: 10/H1313/100). This enabled the use of CRN resources and support from the research nurses to recruit for the study. Adoption of this portfolio gave the opportunity for research institutes across the country to request involvement in the study. Requests came from hospitals outside the target area (Yorkshire) and hence were not accepted.

A presentation at the quarterly meeting of the Yorkshire cardiovascular research nurses gained support from research nurses. Appropriate local governance approvals were obtained at the level of the local hospital trusts for each involved.

R&D was not approved by York Hospital, due to lack of resources available at that time. A further minor ethical amendment was made to open the study up to more hospitals across Yorkshire.

As seen in Table 6.1 on page 128, gaining ethical approval and access to multiple hospitals was time consuming. This created constraints on the time available for the doctoral research to complete the study, resulting in alterations to reduce the study length from nine months to six months. This potential amendment was built into the initial ethical application, in case this eventuality arose. These time restraints resulted in the follow-up questionnaire being sent out at six months after initial recruitment, instead of at the originally planned nine months. Moreover, only one qualitative discussion was conducted per participant, between three to five months following discharge from hospital. A second qualitative discussion had aimed to explore changes over time, verify data collected and conclusions formed.

6.2.3   Questionnaire study

The questionnaires contained questions based on the gaps within the literature that were identified in Chapter 2 and the questions formed within the secondary data analysis (section 2.6 and section 5.5).

The questionnaires consisted of six sections concerning different aspects of the relationship of neighbourhood to recovery:

- *Basic information:* This first section collected basic demographic information
- *Recovery:* Perception of heart attack severity and how well recovered a person felt
- *Neighbourhood:* Perception of neighbourhood, neighbourhood support and effect on recovery
- *Impact on life style:* Changes in smoking, drinking, exercise and transportation.

- *Social relationships:* Involvement with family, friends and organisations
- *Quality of life questionnaire CASP-19:* Quality of life was measured with the Control, Autonomy, Self-realisation and Pleasure questionnaire (CASP-19).

The questionnaire was designed to encourage the participant to complete and return it. To achieve this, work was put into the design to make it interesting, short and simple to follow. This is especially important as postal questionnaires tend to have low return and completion rates. This would affect the power of the analysis, the cost of data collection and the representativeness of the sample (Simmons, 2001). A relatively high response rate was achieved (68.9% and 62.5% for the initial and follow-up questionnaire respectively). This reduced the limitations of using a questionnaire study.

The questionnaires were given a professional appearance in a booklet format, preventing pages being lost. The University of Leeds heading was used, so that the origin and authenticity was clear; hence, the questionnaires could not be mistaken for junk mail. The questionnaires were printed in black and white to reduce printing costs. The front cover stated that the participants had received these questionnaires because they had opted to join the SCENARY study, and provided instructions on how and where the questionnaires should be returned.

With around 16% of adults in England being 'functionally illiterate', readability was also important; 5.2 million adults have literacy levels at or below those expected of an 11-year-old (Jama and Dugdale, 2012). The Flesch Reading Ease score (Flesch, 1948) was used to rate the text readability on a 100-point scale: easily understood documents have higher scores, with a standard document score approximately 60 to 70.

The Flesch Reading Ease Score:

$$206.835 - (1.015 \times ASL) - (846 \times ASW)$$

where ASL is the average sentence length and ASW is the average number of syllables per word.

The two questionnaires had a readability score of 72.3 and 70.2 respectively, making them suitable for their audience and aiming to be easily understood but not patronising.

Logical order of questions encouraged completion throughout, starting with general non-intrusive questions and moving on to specific ones that needed more thought (Hayes, 2000).

6.2.3.1   Question response format

Questions allowed for responses in a variety of formats. These included Likert-type scales (Likert, 1932) and open text responses.

Likert-type scales were used to capture attitudes towards recovery and deprivation levels in an ordinal scale format. The Likert-type scale used was a continuous scale, symmetrical around the median 50, which was useful when there was a range of degrees to which a participant could agree or disagree with a given statement; an example from the questionnaires is given in Figure 6.3.

For each of the following questions a scale is given on which the best state you can imagine is marked as 100 and the worst state is marked as 0. Please indicate on each scale the answers to your questions, in your opinion by drawing a line downwards across the scale:

2a) In your opinion how severe was your heart attack? (where 0 is as bad as possible and 100 is not a problem to health):

0: Worst Possible outcome |++| 100: Best possible outcome
                              10   20   30   40   50   60   70   80   90
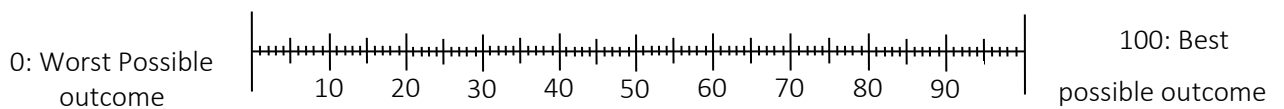
Figure 6.3: Example of continuous Likert-type scale question

The other Likert-type scale used was to measure distinct levels of variation; an example from the questionnaires is shown in Figure 6.4. The original design of the Likert scale was a five-point scale. Throughout the questionnaires a four-point scale was used instead, to account for the incursion of bias due to the *central tendency bias* described by James, Demaree and Wolf (1984): an even number of options forces a choice being made. Culture bias towards under/over representation of opinion may also be present in response (Semon, 2001), but is difficult to identify or account for.

5a) Are you an active member of a local organisation or club (e.g. sport, craft, social club)?

Often		**Not Often**		**Sometimes**		**Never**	

Figure 6.4: Example of four-part Likert-type scale question

The use of open text within narrow parameters gave respondents the opportunity to expand on structured questions using their own words.

The CASP-19 was at the end of each questionnaire. This is a validated self-completion, quality of life tool developed for use with older people (Sim, Bartlam and Bernard, 2011; Hyde *et al.,* 2003). Wellbeing scores can be calculated from the CASP-19 responses to the two questionnaires. These were used to explore wellbeing between the two time-points. CASP-19 is made up of four sections of data on finite Likert scales similar to the one shown in Figure 6.4.

- **Control** – the ability to actively participate in one's environment (e.g. 'My age prevents me from doing the things I would like to').

- **Autonomy** – the right of the individual to be free from the unwanted interference of others (e.g. 'I can do the things that I want to do').

- **Self-realisation** – the fulfilment of one's potential (e.g. 'I feel that life is full of opportunities').

- **Pleasure** – the sense of happiness or enjoyment derived from engaging with life

When combined, the total score ranges from 0 (no quality of life) to 57 (very high quality of life).

[Appendix C contains the initial questionnaire, the follow up questionnaire was very similar]

6.2.3.2   Piloting the questionnaire

The questionnaire was piloted with three volunteers aged 32, 86 and 88. The aim of this was to check the usability and readability of the questionnaires, identifying ambiguous questions. The feedback was used to increase the ease of following the questionnaires and separate sections more clearly. Due to the small number of participants in the full questionnaire study and the time restrictions of a PhD study, a full questionnaire pilot was not possible.

6.2.3.3   Data collection

The first questionnaire data collection commenced in June 2011. A questionnaire was sent to each individual two months after their hospitalisation for ACS. The first questionnaire aimed to examine views on recovery and place at acute discharge. A second questionnaire that was very similar to the first was send to the same individuals six months after their hospitalisation for ACS. This questionnaire aimed to examine views on recovery and place further along in the recovery process.

Pre-paid envelopes were provided for return of the questionnaires to the Leeds General Infirmary Cardiovascular Research Centre for data input. Participants who did not return questionnaires within one month were followed up by a phone call from a research nurse. A pre-paid envelope was enclosed with each questionnaire so that the participant would not have to worry about the financial cost of responding.

6.2.4   Questionnaire analytic strategy

Questionnaires collected both discrete responses and open text. The open text responses were often incomplete or short responses, which limited the depth and accuracy of the analysis.

The sample size recruited was 200 people; 129 and 125 questionnaires were returned for the initial and follow up questionnaires respectively. The original sample size to be collected was determined by a power calculation to adequately model recovery (section 6.2.1). Basic calculation and limited simple linear regression were possible within this sample size. Questionnaire analysis employed simple statistical techniques, especially in comparison to the secondary data analysis. More complex analysis would have required a much larger sample size, which was not possible to collect within the scope of this study.

Quantitative data analysis was performed using the software R (version 2.10.1) (The R Project for Statistical Computing, 2009), initially by looking at distribution plots and frequency tables for each of the quantifiable responses. This exploration helped to understand the data and the type of analytical tests that might be of use. Spearman's product moment correlation, χ^2 tests, and non-parametric Kruskal Wallis tests were used to test whether responses received within each questionnaire were related. Transition matrices and paired t tests were used to make comparisons between the two questionnaires, with the aim to uncover changes over time.

These tests were specifically used to determine the significant strength of the relationships present, while accounting for the small sample sizes. Multiple tests were conducted across the two questionnaires. By multiple testing there is an increased probability of incorrectly finding a positive difference (type one error). Within each different section of the questionnaires, corrections were made to account for multiple testing.

Adjustment for multiple testing was especially important given the large quantity of different tests used. Adjustments were made using the Benjamini & Hochberg correction; this takes into account the number of tests being undertaken, controlling for false discovery rate caused by multiple testing (Benjamini and Hochberg, 1995). These were conducted within each section of each questionnaire; for example, when comparing perceived deprivation to all possible variables for which a relationship might be present, adjustments were made.

Simple linear regression modelling was used to identify relationships that are more complex. The small sample size restricted the number of predictor variables that can be considered within the model. Robson (2002) suggests there should be between five and ten observations per predictor variable, resulting in a maximum of 12 (rounded down from 12.9) potential predictor variables considered within a model.

The linear regression models are based on a number of underlying assumptions which are satisfied. A linear relationship was seen between the predictor variables and perceived recovery within a plot of the residuals versus the predicted values (Figure 6.5 on the next page). The

random distribution of the residuals within this plot also indicates a small violation of homoscedasticity present. Robust normality of the error distributions was seen by the normal probability plot of the residuals. This is shown by the majority of the points lying on the straight dotted line. Figure 6.5 shows that the residuals have similar mean and variances across the sample.
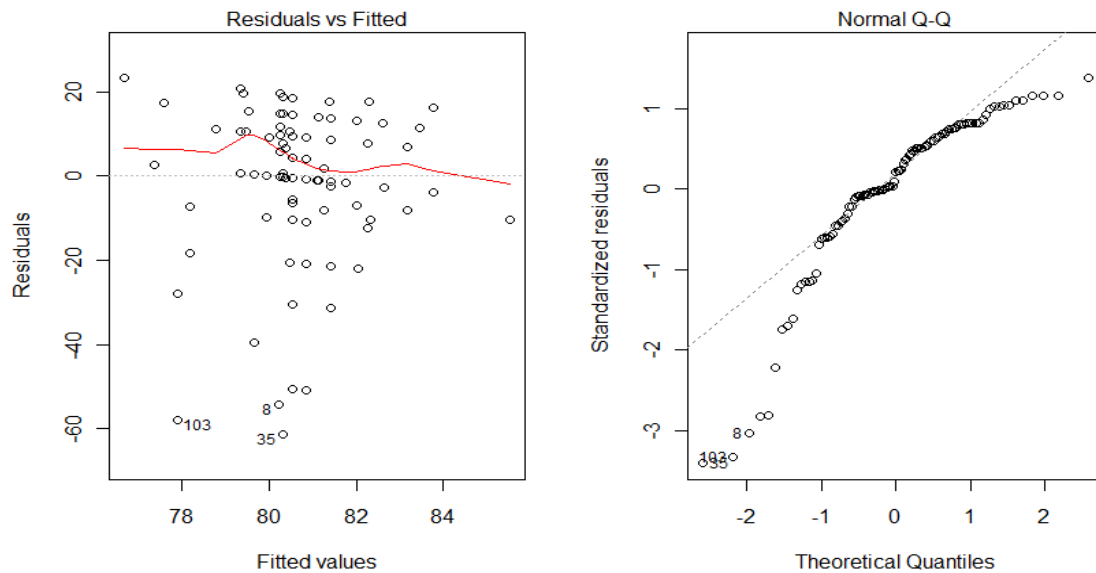
Figure 6.5: Perceived recovery linear model assumption check

The questionnaire quantitative analysis was limited by the lack of representativeness of this small sample. The sample was biased against people from less deprived neighbourhoods. The conclusions drawn had to consider this limitation, adjusting for these differences in the sample compared to the general ACS population.

This quantitative analysis shed some light on what the perception of recovery, deprivation influence and available resources were. The analysis of the open text responses was used to gain further insight on *why* these perceptions existed. The open text responses were compared and contrasted first separately within each questionnaire and then between the two time points.

6.3 Qualitative discussions

Questionnaires provided insight into perceived experience, recall of changes in self, feelings of well-being and neighbourhood influences on health over two time points. Questionnaires are limited in terms of depth and detail of the information, and there is little opportunity to clarify the meaning behind responses. These limitations are minimised within this mixed method study

by combining questionnaires and qualitative data to build up a more in-depth picture of personal recovery experiences, and participants' understanding of how this relates to dimensions of their neighbourhood.

> Questionnaires are of most value when used in tandem with other methods. This multi-method approach to real-life questions is important, because one approach is rarely adequate. (Gillham, 2000a, p.2)

Interviews and community mapping took place between three and six months after the participants' hospitalisation for ACS. The aim was to talk openly about personal experiences in relation to their neighbourhood, and expand on and clarify some of the topics that the secondary data analysis and questionnaires had uncovered.

Qualitative research opens up new areas for exploration. Perceptions and a person's sense of belonging to the place in which they live could be explored using this methodological approach.

The experience recalled and perceptions attained were at a single time point within a person's recovery process. The circumstances of the qualitative discussion could have affected the point of view received. For example, Heather spoke about the drugs that she took at the beginning of the week making her feel ill. She stated that, as it was near the end of the week, she was in a better mood and could talk more easily.

6.3.1 Qualitative sampling

The participants for the qualitative study were a sub-sample of the questionnaire survey respondents. The ten participants were purposely chosen based on their relevance to the interests of the study. The sample all lived within Yorkshire and Humber, the locality corresponding with the strategic health authority explored within the previous analysis. Yorkshire and Humber also provided a diverse environment, containing rural and urban areas of varying levels of affluence, ethnic diversity, and age range.

The sample was chosen purposely (Patton, 1990), with the selection of participants theoretically informed. The aim was to gain in-depth insight into a variety of different neighbourhoods and characteristics of the people living within them. Therefore, the sample was chosen to reflect the interests of the study based on the information within the initial questionnaire. Diversity was sort by choosing people who: lived in neighbourhoods with different levels of deprivation; by whether a person had access to resources and care facilities; and by how deprivation each person perceived their neighbourhood to be. Differences in characteristics were also

considered. For example, the questionnaires and combined dataset had observed more men than women with ACS: this was reflected in the qualitative sample.

The sample of qualitative participants was chosen based on the initial questionnaire responses. The questionnaires enabled a brief insight into each person's perceptions and how useful it would be to talk to them. The decision tree on which the sample choice was based on is shown in Figure 6.6. The choice of participants remained flexible so that people who, it was felt, could provide insight could be selected from the initial questionnaires without restrictions.

There were difficulties in achieving the desired sample. People who were older than 80, lived in more deprived areas or were in very poor health were less likely to agree to be interviewed. Therefore, the sample is not as diverse as was originally planned.

Data split criteria	Split categories											
Level 1: Sample					Full sample							
Level 2: Sex			Men					Women				
Level 3: Area category		Low	Middle	High			Low	Middle		High		
Level 4: Perceived level of deprivation	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi
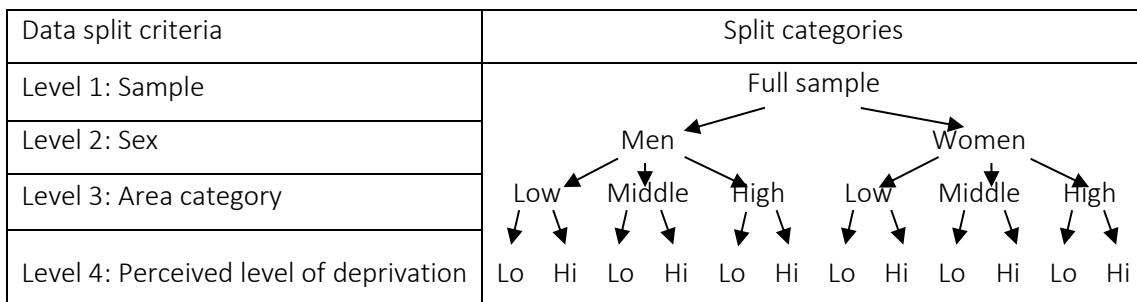
Figure 6.6: Sequence of sampling decisions within each geographical area

6.3.1.1 Qualitative sample size

The size of the sample was largely dictated by the resources and time available. The in-depth nature of qualitative research enabled a large amount of information to be gathered on the ten participants. With this in mind and restrictions on the amount of time available within this study, a small sample of ten participants was chosen. Overall, 19 members of the original questionnaire participant sample who had completed the first questionnaire were approached to find this sample. Even though the study would have benefited from a larger sample size, it was found that multiple common concepts emerged from the data (Charmaz, 2006). The small size of the sample limited the qualitative study.

6.3.1.2 Characteristics of sample

Table 6.2 on the next page displays characteristics of the participants within the qualitative study. There were more men than women; this is similar to the sample population of people with ACS. The age range shows a younger (over 65 years) sample than the average population

of people with ACS. People in extreme older age (greater than 85) were more difficult to recruit, as the questionnaire sample mostly comprised younger people.

Of the ten participants, six were from middle-range deprived neighbourhoods based on IMD scores. This may affect the ability to draw conclusions about more extreme deprivation or affluent neighbourhoods. Other measurements from responses to questions in the initial questionnaire concerning recovery and severity, with a 100-point Likert-type scale (see section 6.2.3.1), show reasonable diversity. The perceived level of deprivation of the local area was low throughout the questionnaires and hence this is also the case for the sample of qualitative participants.

Table 6.2: Overview of sample characteristics

Gender	Age (yrs)	Deprivation group
Men n = 7 (70%) Women n = 3 (30%)	Mean(sd) = 75.3(5.3) Median = 74 Range = 66 – 82	Low n=2 (20%) Middle n=6 (60%) High n=2 (20%)
Ethnic Group	Marital status	
White n = 10 (100%)	Married n = 7 (70%) Widowed n = 3 (3%)	
Heart attack recovery	Heart attack severity	Perceived deprivation
Scale from low (0) to fully recovered (100)	Scale from low (0) to high severity (100)	Scale from high (0) to low perceived deprivation (100)
Mean = 82.4(12.6) Median = 80 Range = 60 – 100	Mean = 59.7 (30.2) Median = 60 Range = 10 – 100	Mean(sd) = 87.5 (9.8) Median = 90 Range = 70 – 1000

6.3.2   Qualitative data collection

6.3.2.1   Preparation of qualitative discussions

Prior to the qualitative discussions, a summary sheet was created from the participant's responses to the questionnaire and the nature of the place in which the person lived. This was drawn from the secondary data analysis and the literature discussed in Chapter 2.

A contact sheet was completed after each qualitative discussion to record key points raised, the context in which the interview took place, perceptions of the rapport developed with the participant and emerging ideas about the content.

6.3.2.2   Interview preparation

A topic guide was developed as a general framework for the interviews (Charmaz, 2006). The topic guide was developed by considering the questions formed during the initial discussion of

the background literature in Chapter 2, and those brought forward from the secondary data analysis in Chapter 5 and the findings from the initial questionnaires.

Interviews commenced with a discussion of personal experience of the participant's acute event. The symptoms experienced, getting to hospital and the treatment received were easily recalled. The remainder of the topic guide fell into five sections of experiences: 'ACS', 'neighbourhood', 'recovery', 'lifestyle impact' and 'social relationships'.

Topic guides were updated to reflect aspects that needed clarification following each interview. The statement 'well, I think that's everything, unless there's anything else you can think of?', asked at the end of each interview often resulted in a further 10-15 minute conversation. Interviewees often seemed to relax and chat more freely at this point, providing further insightful information.

The topic guide was tried out with three individuals to check comprehension and relevance of questions.

[Appendix D contains the interview topic guide]

6.3.2.3   Community mapping preparation

Community mapping is the act of 'mapping out what constitutes the neighbourhood', encouraging insight into personal connections and experiences by walking around the area with which the participant identifies. It was a means to explore in this environment the personal neighbourhood, personal connection to physical aspects, the related importance of community, and the usability of the neighbourhood that exists in terms of mobility, access, attitudes towards resources, usefulness and cost of use. Participants were encouraged to talk about what they identified with, and their experiences and memories in connection with these.

This also aided discussion of the physical boundaries of their personal neighbourhood and why these boundaries were present. For example, was there a main road that was difficult to cross? Were resources clustered within a geographical space or along a certain bus route? How people perceived the boundaries of their neighbourhood was of interest as it may affect the meaning of place.

Where we walked, for how long and what was discussed was decided by the participants; there was no pre-defined route or specific conversational topic guide prepared for this part of the data collection. This very flexible structure encouraged self-expression and openness.

Each of the qualitative participants was asked whether they would like to do community mapping. Four of the ten participants agreed to this; the other six decided not to, due to their low mobility. No pressure was placed on the participant to undertake or to continue community mapping.

6.3.2.4   Conducting interviews

Potential interviewees were sent a patient information sheet and consent form for the qualitative part of the study, explaining the purpose and process of this phase. This was followed up with a phone call to answer questions and, if agreed, to set up an appropriate time to meet.

Interviews were conducted within participants' own homes. This was to encourage identification with their surroundings. This also enabled the locality and house to be explored and put into context. This placed the environment in which conversations took place within the participant's control.

Interviews commenced with a reiteration of the process of the qualitative discussions and the overall aims, and answering any questions, as well as gaining written informed consent. Permission was sought to make a recording of the conversation; all participants agreed to be audio-recorded. The qualitative patient information sheet(PSI) and consent followed a similar format to the PSI and consent shown within Appendix A.

These informal conversations were an open discussion between two people. It was made clear that I was interested in hearing about their personal experiences and anything that they felt had influenced this process. Interviewers are widely recognised as having influence on the data retrieved; hence, how I presented and conducted myself was important. For example, clothing and formality of address were chosen appropriately, especially given the difference in age between all the interviewees and me.

> Preconceptions that emanate from such standpoints as class, race, gender, age, embodiment, and historical era may permeate an analysis without the researcher's awareness.   (Charmaz, 2006, p.67)

A relaxed format was adopted, putting the participant at ease and encouraging a responsive/ interactive relationship. Probes were used to gain clarifications and further explanation (Patton, 1990), attention to details made my curiosity clear, positioned as actively interested, non-judgemental and neutral (Patton, 1990). Non-verbal cues were used to facilitate further explanation (e.g. *um*, nodding) (Fielding and Thomas, 2001).

Conversations continued until they reached a natural ending, when all topics of interest were covered. Problems that were encountered during interviews included the conversation going off topic. With one participant spending much of the time talking about his previous career, multiple attempts were made to focus the conversation on health-related issues but, due to the open nature of the interview, this was difficult to achieve.

6.3.2.1   Conducting community mapping

Community mapping took place following the interviews in three out of the four cases; one participant lived very rurally and identified with his local village, to which we had to drive. In this case, community mapping was conducted prior to the interview.

Before commencing, we discussed where the participant would like to walk. The community mapping was conducted in a much more open manner than the interviews, encouraging open conversations both about the neighbourhood and the community close by and other places visited often. These discussions brought up topics of transportation, local shops and social relationships. The dialogue, route and length of the community mapping were determined by the participant, giving control to discuss and walk towards the parts of the place that they personally connected with.

It was encouraged that the route taken should reflect where the participant would usually transverse. Questions that were asked were directly related to aspects of the neighbourhood and how the participant related to them.

A microphone, attached to the Dictaphone, was used to limit external noise interfering with the recording of the on-going conversation. There was only one occasion during the transcription process when the conversation could not be heard over the sound of a car.

6.3.2.2   Transcription of the interview and community mapping

Audio recordings were made throughout the qualitative phase of interviews and community mapping. Transcriptions were made personally soon after the qualitative discussions, so that the atmosphere and non-verbal interpretations could be considered within the transcript.

Interviews and community mapping sessions were transcribed separately. Maps that showed the routes taken during community mapping were created alongside the transcripts. The maps were linked to the transcripts by the use of colour-coded virtual pins. During the analysis, these links allowed the dialogue to be analysed in terms of the location as well as the occurring conversation.

Transcripts provided the opportunity to review conversations and start developing concepts. Information is lost during transcriptions – for example, it is not possible to transcribe tones and other cues such as nodding of the head. Recordings were kept available and revisited during the analysis when necessary, to clarify meaning.

6.3.3 Interview and community mapping analytic strategy

Analysis was conducted throughout data collection, uncovering topics of interest that could be developed and clarified within the future sections of the data collection and analysis. The techniques used in the analysis, chosen within the study design, are based on the type of data collected, the research objectives and the appropriateness of the method within this framework. Within this section, the techniques and problems encountered with the qualitative discussions are considered.

Each participant was given a pseudonym to maintain anonymity throughout the analysis and writing process.

The analytical approach was informed by the principles of grounded theory. A theory-based methodology was followed. The procedures are set out by Corbin and Strauss (1998). This system has been advanced and built upon by Charmaz (2006). The approach involved deriving concepts from what was expressed as meaningful by participants.

Initial analysis began after the first qualitative discussion. This involved writing transcripts and reading them to identify topics of interest or areas that needed further clarification. The early analysis helped to inform the content of the subsequent discussions. This enabled the concepts considered to overlap and inform further data collection, so that theories could be developed and ideas clarified through a continuous process.

Once the ten qualitative discussions were complete, a full analysis was undertaken across all the transcripts and recordings. The transcripts for both the interviews and community mapping were analysed together. Further analysis of the community mapping transcripts is discussed in section 6.3.3.4; this was undertaken alongside the routes taken and the neighbourhood aspects spoken about.

The transcriptions, together with the recordings, were used to uncover what was expressed as meaningful. There was specific focus placed on how people related to where they lived and how place had affected their recovery.

To build up concepts around place effect, constant comparisons were made across what each participant said. The same approach was then used across the different participants, with the

aim to identify trends within the data from the similarities and differences expressed by the participants.

The process of analysis was non-linear and iterative. There were three stages to the analysis explored in the sections below: *identifying concepts, confirming and merging concepts* and *applying core concepts.*

The initial data formularisation and coding were completed manually. As the analysis developed, computer-assisted analyses of qualitative data (CAQDAS) package N-Vivo (version 9) was used for data management with more structured coding for tracking and retrieving data units (QSR International's NVivo 9 software, 2010).

> The computer provides an excellent medium for storing data. As qualitative data is notoriously voluminous, this is an important contribution to managing data efficiently.
>
> (Dey, 1993, p.56)

By analysing the interview and community mapping transcripts together, all data collected was utilised. The varying data collection methods were considered throughout the coding process and further analysis on the community mapping data was undertaken during the data synthesis of all study data and conclusions.

Qualitative data analysis was a long process that took multiple iterations. Interpretations are subject to personal interpretations and therefore a strong evidence base needed to be developed to clarify concepts. With the large amount of data collected and codes formed surrounding the complex nature of human behaviour, capturing the whole interconnected process was difficult. The experiences discussed were the participants' perceptions.

6.3.3.1   Stage one: Identifying concepts

Concept development was progressive in nature, using a methodical analytic approach, derived in the stages: *identification* and *confirmation*. The first stage was familiarization and initial coding of the data, guided by the theoretical concepts being built.

> Qualitative codes take segments of data apart, name them in concise concepts, and prepare an analytic handle to develop abstract ideas for interpretation each segment of data.   (Charmaz, 2006, p.45)

Codes were grounded in the data itself, developed from the transcriptions. The accuracy of each transcription was checked against the audio recording and read through multiple times

before analysis commenced. Initial ideas formed and were recorded as codes; comparisons across the emerging data released further codes. Line-by-line free coding of data was used to look for further codes, while the following questions of the available data were constantly asked:

- *What is going on?*
- *What are people doing?*
- *What is the person saying?*
- *What do these actions and statements take for granted?*
- *How do structure and context serve to support, maintain, impede or change these actions and statements?* (Charmaz, 2006, pp.94-95)

Reading, comparisons and free coding of transcription continued until the process of analysis did not create any more codes. This resulted in hundreds of codes and data that were considered reasonably saturated (Corbin and Strauss, 1998).

Next, comparisons between developed concepts from qualitative data and existing published research resulted in concepts being reformed, and becoming focused. Codes were developed towards becoming more analytical, rather than descriptive, at this early stage in the analysis.

Codes were examined and compared across the different participants to identify similarities and differences. Codes were reduced to 53 codes based on trends, and expressions of meaning for a number of participants. For example, one of the participants (George) spoke about the importance of having a community on which to rely. He spoke about the ways he had gone about forming this community since his recent move to the area. Ted similarly spoke about the importance of having a community, which was possible because he had lived locally most of his life. The important similarity here was the importance of community. However, the different way that this was achieved, based on personal circumstances, was also interesting.

The 53 codes were further reduced by comparisons across and within transcripts. This was aided by the use of insight drawn from the previous parts of the study. Strong urban/rural and gender difference was seen in the responses to the questionnaires. Differences in deprivation levels were also of interest to the overall study and to enable links within the secondary data analysis. Transcripts were split into groups by these categories and comparisons in the 53 reduced codes were made. This helped to identify the underlying trends, and the questionnaire and secondary data analysis were used to support the analysis. This was especially useful given the small sample size within the qualitative study.

Seven initial concepts were form, each with underlying subcategories shown in Table 6.3 on the next page.

Table 6.3 Initial qualitative concepts and related sub-codes

Concept 1: **Area structure**	Concept 5: **Reliance on others**
➢ Perception of area ➢ Change over time ➢ Personal area boundaries ➢ Forming a community ➢ Traffic ➢ Location of house	➢ Relationship with people determines how much willing to rely on them ➢ Having people to rely on ➢ Burden
Concept 2: **Access to amenities**	Concept 7: **Burden**
➢ Having facilities available ➢ Transportation ➢ Reliance on others ➢ Area structure ➢ Willingness to go into area	➢ On professionals ➢ Makes feeling of helplessness ➢ Would rather go without rather than be a burden
Concept 3: **Dealing with limitations**	Concept 6: **Sense of belonging**
➢ Accepting heart attack ➢ Lose ➢ Time to recover ➢ Getting older	➢ Length of history in the area ➢ Burden of too much responsibility ➢ Knowing there is a social community that is there and willing to help if needed ➢ Family ties ➢ Involvement helps build circle f close friends and family ➢ Homogenous nature of community ➢ Area structure
Concept 4: **Motivation for recovery**	
➢ Fear ➢ Hope for the future ➢ High quality/aesthetic facilities motivate us ➢ Pressure ➢ Not wanting to miss out	

6.3.3.2 Stage two: Confirming and merging concepts

The core concepts formed the bases of the analytical approach. Confirmation and reduction of the number of concepts was important to produce an overarching set of core concepts that reflected the trends within the data.

The core concepts were compared to the background literature discussed in Chapter 2. Similarities and differences were considered. Further discussions were made with supervisors external to the study, and whose extensive experience with this type of data analysis helped to clarify concepts and evolve their meanings. Further comparisons and contrasts were made across and within transcripts. This helped to focus the concepts and sub-categories further,

verifying the relevance, the wording and the meaning behind the core concepts. Any overlapping meaning within the concepts merged and the complexity of the structure reduced.

The changes to the initial concepts shown in Table 6.3 above were mainly based around developments in how place is considered. Constant comparisons were made between the transcripts to look for connections between the codes and concepts. The core concepts moved away from individual motivations and difficulties, towards looking at the process of how people with ACS are affected by place.

Table 6.4 Four core concepts: Descriptions and extracts of transcriptions from which concepts were developed

Concept	Description
Built environment	The geographical and built aspects of the neighbourhood in which a person lives. This includes its available resource, physical barriers such as land contours and the public transport system, and personal connection to physical aspects.
Example extract of transcript for **built environment**: *'I think possibly, possibly environmentally, because you've got the traffic, I mean my recovery would have been worse down South, um because ... I think we were both getting more and more wound, wound up about environmental noise, um,...*	
Dealing with change	The effect of ACS on a person's life and how they deal with it the emotional, physical and social changes.
Example extract of transcript for **dealing with change**: *'Well, they say you'll be a new man afterwards, I'm not there yet, but I'm on the way to I'm just a different man at the moment (laugh).'* *'Um and suddenly I've become, I don't know, semi-invalid in a way and, ... I don't like it. (Laugh) I really don't like it.'*	
Available support	The types of support that are available, who provides this support and how the person feels about receiving support.
Example extract of transcript for **available support**: *'Yes, well I had no choice Liz, you know like I couldn't walk and I couldn't drive so I was stuck in this chair, so I was grateful for any help I could get, in fact I had more offers than I needed, ya, they were absolutely fabulous and of course I've got a lot of friends as well, widows mostly (laugh) who are very good, I had them all baking for me, meat and potato pies, and fish pies and chocolate cake and coffee and walnut cakes, it's marvellous, I live a life of Riley actually (laugh).'*	
Belonging to a community	Having a community on which to rely, personal connection to their community and the consequences of having a community.
Example extract of transcript for **belonging to a community**: *'Um and we got so many offers of help when I was ill, um I think I ended up with about (car passing), FROM THE area think I ended up with about, well over 30 get well cards.'*	

For example, the initial concept 'burden' is only applicable if that person has a family, friends or a supporting community on which to be a burden. It also makes the assumption that ACS has caused the person to become a 'burden', which was not the case when only a minor event had occurred. The overall effect of belonging to a community and having support available was

more suitable as a general trend. This also enabled 'burden' to be explored within the context of place.

Similarly, 'access to amenities' was dependent on the built environment in which participants lived, and changes in the person's ability to travel within this environment.

The four core concepts that were developed represented the aspects of, and the people living within, the neighbourhood that affected the participants in the qualitative part of the study. Table 6.4 on the previous page shows a description of each concept and an example extract of text from a participant transcript that was used to develop the related concept are given.

The initial stages of applying the core concepts to the transcripts identified the strong affiliation that 'dealing with change' had with each of the other core concepts. The three other concepts 'built environment', 'available support' and 'belonging to a community' were all related to place. Each of these had some interacting effect with how a person dealt with the changes in their life. For example, how a person coped with walking up a hill depended on: the presence of a hill; the need to walk up it; and a change in their ability to be able to walk up it.

From this initial analytical stage, it became clear that the over-arching concept was how a person 'dealt with change'. Therefore, this outcome was used to focus the analysis on how place affects the way people 'deal with change'.

6.3.3.3   Stage three: Applying core concepts

These core concepts were then applied throughout the transcripts. This was used to draw together evidence within each core concept to help understand and confirm the four core concepts. Patterns, differences and topics of interests across different people and neighbourhood types were sought.

> Focused coding means using the most significant and/or frequent earlier codes to sift through large amounts of data. Focused coding requires decisions about which initial codes make the most analytic sense to categorise your data incisively and completely.
>
> (Charmaz, 2006, p.57)

As well as using these four core concepts, identified personal characteristic differences were used to compare experiences, opinion and differences across core concepts: for example, the way that dealing with changes is approached differently by men and women.

The analysis of the qualitative discussions was developed by constant comparisons across all data forming multiple viewpoints. This was used to interpret connections within and between different concepts to uncover valid concepts. Emerging information from the analysis was written up in comprehensive memos about different processes and ways of coping that participants used.

The final part of the analysis was the write up, bringing together memos in a logical order with descriptive evidence of importance, making further comparisons and re-evaluating the theory, while the writing helped to make concrete conclusions and identify areas that needed further analysis to clarify the theory.

6.3.3.4   Community mapping narrative writing

Another approach taken for the community mapping analysis was narrative descriptions of the process of the walk taken. This approach focuses on meaning and interpreting the context. It involved paying attention to the sequencing of the walk, the conversation and what factors were seen to have influence on the participants, pulling together the overall picture of the process, not simply a moment-by-moment exchange within a conversation, and comprehending personal culture, society and connections, as a whole (Richardson, 1995).

Narratives were constructed for the community mapping participants, following the model structure put forward by Riessman (2008) based on Labov's (1997) structure for narrative writing:

- The *abstract*, summarises the point of the narrative.
- The *orientation* provides information about the time, the place, the situation and the overall setting for the narrative.
- The *complicating action* provides details to do with the content, the sequence and the focus of the narrative.
- The *evaluation* is the narrator's interpretation of the events of the narrative.
- The *resolution*, describes the way in which the narrative works toward its conclusion and how issues within it might be resolved.
- The *coda* is designed to end the narrative by returning the listener to the present.

(Labov's, 1997, pp.4-5)

The benefits of community mapping were to draw out information relative to the changing situation. The narrative was able to capture and display this change, helping to interpret personal connection and importance of the place of residence. For example, during one of the

community mapping discussions, participants encountered people they knew on the street, chatted on friendly terms and asked for a favour, which was accepted. This demonstrated interaction and support from social contacts that would not have been seen within an interview or data analysis data collection method.

6.4 Data synthesis

Throughout the two phases of this study, both quantitative and qualitative data collection, and analytical approaches have been used to make interpretations, mixing secondary observational data analysis with questionnaires over two time points (with both quantified and open text response), and finally conducting qualitative discussions using interviews and community mapping. Tashakorri and Creswell define mixed methods research as:

> research in which the investigator collects and analyses data, integrates the
> findings, and draws inferences using both qualitative and quantitative approaches
> or methods in a single study or program of inquiry.   (Tashakorri and
> Creswell, 2007, p.4)

The original mixed method study design organised each study section to build upon previous data collections and conclusions drawn, using an iterative sequential process. This adds to the power of the study by targeting certain types of insight, using the appropriate methods and overlapping weaknesses across the overall study. Each of the sections has been analysed separately, making constant comparisons throughout, while considering the theory and insight gained from a different approach to research. The final stage of analysis was to bring together all the data collected and draw conclusions, integrating the data to build on previous theory towards a more rounded view of neighbourhood influences.

This section discusses the overall design already presented in Chapter 3, the mixed method techniques used and problems that occurred during data integration – both technical and theoretical conflicts.

6.4.1   Mixed methods research design

The overall structure of the mixed method design ran throughout each element of the research. This design has been discussed in Chapter 3. The process of following abductive reasoning, set out by Aarons, Hurlburt and Horwitz (2010) and Collins, Onwuegbuzie and Sutton (2006), was mapped along two dimensions of different phenomena, phase of implementation and inner and outer context.

The secondary data analysis, quantitative and qualitative analysis, are asking fundamentally different questions. Hence, the results can only be used when considered in relation to the methodology with which the data was originally sought.

The secondary data analysis gave the opportunity to gather a large representative sample of the population of interest, providing a static picture. While the data is limited by level of completeness and representativeness of the original sample, it does provide a valid picture and way of processing what is actually taking place within a complex situation. This secondary data could not be followed up for clarification or further details. This cohort study aimed to find the *what*, *where* and *when* of local area influences on people's health status. The next parts of the study, the questionnaires and the qualitative discussions, aimed to understand the reasons *why* such locality factors and personal perspectives of place effect had influence.

The questionnaires provided information on perceptions across initial and follow-up recovery from a potentially representative sample. This enabled change over time to be explored. The questionnaires were limited by the size of the sample, and the depth and clarity that can be obtained with this method.

Qualitative analysis was more concerned about the phenomena of understanding the perception and reasons for people's behaviour. The *why* and *how* of reactions and coping with ACS recovery and why it is felt that a certain type of neighbourhood has influence on this.

Together, quantitative and qualitative research methods offer different perspectives on understanding place effect. This compensates for some shortcomings and expands into comprehensive data of a complex situation (Hammersley, 1996).

This continuous process, building up insight through a variety of different methods, relating the data available to the research objectives, is displayed in Chapter 9. To pull the data together logically, each of the five research questions developed in Chapter 2 was considered separately, and the analysis for these is displayed in five sections in Chapter 9.

From the findings drawn from the synthesis of this study, it was considered that a final iteration was appropriate. This was to include latent class modelling informed by the qualitative findings of the survey and the qualitative research, rather than modelling driven by statistical significance. The justification and methods used are discussed after the synthesis methods, in section 6.5.

6.4.2   **Synthesis methods**

According to the mixed methodology, researchers should use pragmatist philosophy and follow the compatibility of methods, fruitfully mixing quantitative and qualitative compatibly. There are few approaches described within the literature for how to integrate data for mixed method studies. A large proportion of the mixed methods described centre on triangulation. This was not the objective of this mixed method approach. The methods adopted were chosen to elicit the appropriate information in a format that could be used to combine different research methodologies.

The nature of mixed method research, dealing with multiple paradigms, made approaches to the analysis complex. The concepts on which the data was collected and analysed are different, depending on the methodology. Place effect on the ACS outcome has been viewed from different angles to achieve related – but not directly comparable – data. This led to the acceptance that triangulation, confirmative theory from the different methodological approaches, was not possible in this case or within the aims of the research objectives.

The data integration took considerable time, both in determining the synthesis of the conceptual data and contrasting where data synthesis was possible. With the multiple types of data available, each of which could be considered in many ways, the combinations of analysis are immensely complex (Bryman, 2007). Focus had to be kept on the research questions to gather understanding, which may have resulted in potential findings being overlooked.

The main problem encountered (and the largest potential pitfall within any mixed method study) related to the importance of not forcing data to integrate when it is not directly comparable or there is no sensible way to form connections. For example, direct comparisons between the concept of recovery and survival status at six months should be avoided .This particular problem was difficult to overcome, but the process provided valuable insight into how useful survival is as a measurement, and whether recovery is ever reached or a readjustment within self to new circumstances. Time was taken to think through each research question where the available data would be useful and being willing to use data from only one area when appropriate.

A problem encountered that has been previously discussed as an area of difficultly is writing up mixed method research (Sandelowski, 2003). Advice given suggested that the thesis should be written in the same order as the design of the research study, sequentially moving from quantitative to qualitative, in the style appropriate for the methodological approach discussed within that section, and very clear about terminology used. This resulted in an attempt to adapt

and change my writing style throughout development of the terminology used, forcing further thought to be put into the exact justification of each decision.

6.4.3 Descriptive data

The mixed method analysis started with a re-examination of the data available, its origins and the paradigm employed, determining where interactions are viable in the data and making constant comparisons across the data available when appropriate. Medication, for example, is a subject looked at within all approaches. Secondary data analysis provided a description of medications prescribed at admission and discharge from hospital, with the majority of patients on a range of different drugs. This was built upon by finding out whether these drugs were taken initially and further along within recovery, using the questionnaire data, which suggested that the vast majority of participants took the drug prescribed, and only did not when they perceived the drug as causing side effects. Finally, the qualitative analysis was able to shed light on why medication was taken or not, with responses concerning factors such as trust in the effects of the drugs and problems experienced with medication (wrong prescriptions, perhaps, or having trouble taking pills). This example shows how the different methodological approaches are used to build up a fuller picture of what is supposed to happen, what is actually happening and the reasons why, over different time points within the recovery period.

In other places, by initial exploration it was uncovered that building up a picture would not be as easy, or even possible; for example, survival is not directly relatable to the process, experience and perception of recovery.

6.4.4 Charts

Following this initial exploration, various methods were used to pull together data where appropriate with the aim to answer the research questions. A useful method was creating charts. These were constructed by bringing together data in the same place in a table format, so that comparisons could be made across the different data formats. This visualising of the data made it easier to form connections throughout the available data, identifying places where there were interconnections. These could then be further explored, putting thought into how this accumulation of data is informative and what it says about the validity of the conclusion.

Charts were built centred around each of the interview participants for a range of different questions, such as: 'What influences resource usage?' and 'What affects perception of deprivation?'. Table 6.5 on the next page displays the format for each chart.

Table 6.5 Chart for participants looking at area influence over time

General area description (Quantitative descriptive data) Descriptive data for the type of area in which this participant lives		
Recovery questionnaire Results for participants within the area in which participant lives during initial recovery	*Qualitative study* Data from the qualitative study with this participant	*Follow up questionnaire* Results for participants within the area in which participant lives during follow up

6.4.5   Locality mapping

Maps of the neighbourhood localities were formed over the routes walked within the community mapping discussions during the qualitative analysis phase of the study. Two types of maps were created. The first showed the neighbourhood, the route taken, resources and aspects that were mentioned by the participant. From these a picture of connections to locality, usefulness of different aspects and usability of the neighbourhood was formed; this was then connected with the questionnaire data and the combined dataset. Comparison was then carried out between perception of neighbourhood expressed over initial and follow-up recovery from responses to the questionnaires, and the facilities shown to actually exist within the locality from the secondary data analysis. Interpretation of perception of neighbourhood from both the qualitative analysis and qualitative responses could also be related to local area measurements such as IMD scores.

The second type of map formed was also based around the community mapping discussions, mapping out the route taken within these discussions and overlapping plots of the LSOA local area boundaries on which both the secondary data analysis and some of the questionnaire analysis was based. From these, it was possible to identify how perceived neighbourhoods relate to census boundary areas, deliberating how meaningful census boundary areas were for the people living within them and hence the level of usefulness of analysis based on these boundaries.

Maps were formed using an online mapping source (Esri, 2013). Road names and location of house on this route were not included in the maps, to preserve anonymity. Limitations of these maps arose from the nature of the community mapping sample bias (already discussed) towards those from less deprived areas, with participants in reasonable health.

6.4.6   Concept maps

Flow charts were used to build up theories and connections to research questions. These were very useful to keep track of data formats and paradigms, focusing and building up concepts. Concept maps were used more as a background tool and are not displayed within the results.

6.5 Revision of latent class analysis

As a greater evidence base had been created, concerning place effect on older people with ACS, what is associated with better survival rates, and experiences of dealing with change and how this relates to place, a second iteration of secondary data analysis was deemed appropriate. This formed a link between perception and generalisation of associated influences on survival rates. Conceptually formed latent class models provided further insight into this link.

It was also possible to compare conceptually formed latent class models with the statistically formed model, determining which represented a better fit to the data, using already discussed best-fit statistics, such as AIC. This comparison led to further understanding of what within the environment influence informed both conceptually and statistically, thereby reducing the initial modelling problems present due to the complex nature of the data structure and regression model used, focusing the analysis and producing models in which greater faith can be placed.

Latent class regression models were revised for men and women, built following the same structure as within the initial statistically based models (discussed in section 4.5.3). Fitting latent classes formed around place effect; then, based on the differences across these classes, personal level characteristics were used to model survival at six months. Similarly, this model is approximated using a Poisson regression model (Vermunt, 1997).

The number of classes used within each model was three, due to consistency throughout the study; this simplified comparisons. The same personal level characteristics, used to predict survival at six months were also kept the same.

The latent classes, used to represent place effect, were formed based on the seven locality influences on ACS outcome, developed within the chapter discussing data synthesis (section 9.3.4). These interconnected concepts were found to form characteristics of place that were associated with ACS outcome.

Local area census variables were used to represent these place effects, using knowledge of the available data and how the conceptual ideas had come to inform choices. As the questionnaire

sample size did not allow a split by men and women during the analysis, the same local area census variables are used in the construction of these two models.

This second data analysis iteration provides further insight. However, it is based on the assumption that local area census variables can sufficiently quantify conceptual ideas. This is suspect, especially as the data is dependent on what was pre-collected, and should be considered when interpreting the results. This also opens up the question of whether qualitative concepts have any basis within a quantitative format. This is difficult to determine and outside the scope of this thesis.

6.6 Summary

Using the data from the questionnaires and qualitative research, the questions around *why* and *how* recovery occurs over three different time points were explored, looking at the importance of neighbourhood and community during this process, and with the aim to shed light on the research objectives and the questions that came forward within the secondary data analysis phase.

Secondary data analysis, the questionnaires and the qualitative discussion data and conclusions drawn were then brought together to build up a fuller picture of *what* was happening and *why,* considering different points of recovery.

This more complex, more challenging approach was necessary within the broad nature of the research objectives. Although there were many difficulties in the design and implementation, by interpretation further insight was formed throughout, identifying interconnections; this would not have been possible within a single paradigm study.

The next three chapters follow the methods described within this chapter, displaying the results and related discussion of the questionnaires study, the qualitative discussions and the mixed method data synthesis. The final chapter, Chapter 10, discusses these results and their implications, areas that warrant further investigation, reflecting on the study, what it has achieved and its limitations, and personal reflection of the PhD process.

Chapter 7:   Experiences and perceptions of place effect on ACS recovery: Discussion of questionnaire findings over two time points

7.1 Introduction

Perceptions of own experiences, their recovery, neighbourhood affluence, and how place is seen to affect this experience are explored within this chapter. The aim was to survey perceived compositional and contextual influences, and how they varied over the trajectory of recovery. The questionnaires explore those place aspects that were brought forward from the previous phase, and provide the opportunity for new ideas to come forward.

Questionnaires provided efficient collection over a sample population of macro-level data, enabling collection of data over multiple time points. This made questionnaires an efficient tool to explore perceived place influences on initial recovery. Follow up four months later with a second questionnaire surveys changes that have been made, and how those changes vary across characteristics of place, and by personal level characteristics.

This analysis provides an overview of personal perceptions; clarification and expansion into this insight cannot be gained using this technique. Qualitative analysis is explored within the next chapter, building on these results and reducing this limitation.

The questionnaire analysis techniques used are kept relatively simple in comparison with the secondary data analysis within the previous phase. As the sample size is small, only simpler statistical models and tests were used, reducing the possibility of having underpowered results. This limits the insight that can be formed from these questionnaires. The potential usefulness of more extensive analysis, such as multi-level modelling and longitudinal analysis were reduced by the strong similarities between the quantified results within the two questionnaires. This implies that these methods would have been unlikely to provide further understanding. The similarities are discussed throughout this chapter.

The demographic information from responses to the questionnaires – and the representativeness of the sample – is explored in section 7.2. The remainder of the chapter is used to display the results and discussions of the two questionnaires that were sent out at two and six months following ACS diagnosis in hospital. This enables comparisons between initial

and follow-up recovery. A discussion of the methods, data collection and techniques used within the analysis are displayed in Chapter 6.

Section 7.3 presents the results, following the structure used within the questionnaires: recovery, neighbourhood, the impact of lifestyle, social relationships and, finally, the quality of life tool CASP-19. Then more complex relationships, and associations with recovery and perceived deprivation, are explored using linear regression modelling (section 7.3.6).

The quantitative and open text analysis, and comparisons of the two questionnaires, are presented together within each of these sections to form a fuller picture. These draw together information from each of the previous sections, the background literature and the secondary data analysis.

Then direct comparisons are made between the two time points, exploring changes in response that took place and what this means for the overall interpretation (section 7.4).

7.2 Demographic information

Recruitment was conducted systematically for 200 people over 65 years old, admitted to participating hospitals with ACS, with the aim to obtain a diverse and representative sample. The demographic information for the sample (following the withdrawal of five and death of eight people) is presented in Table 7.1 on the next page.

The sample collected was predominately men (72%), with the women tending to be older. This was consistent with both the combined dataset results, and the Global Registry of Acute Coronary Events (GRACE), collected from 1999 to 2006 across 14 countries. GRACE also indicated that women were more likely to have cardiovascular disease (Dey *et al.*, 2009).

Marriage within this sample was high, indicating a certain level of support available. However, rates of divorce and widowhood were much higher for women.

It was reported that rehabilitation courses were offered to the majority of people, though less so for women. Lane, *et al* (2001) postulates that only 40% of those for whom rehabilitation courses were available will actually attend.

The age range of the sample varies from the represented population, with a younger sample recruited. Figure 7.1 on the next page shows this comparison with the combined dataset and the UK population. The questionnaire sample was unable to recruit many people of much older age (85+), and will have been influenced by men having ACS earlier on in their lives. This

Table 7.1: Participants' demographic characteristics

	Male		Female		Total Sample	
	N	%	N	%	N	%
Overall	134	71.7%	53	28.3%	187	100%
Age group						
65-75	78	58.2%	30	56.6%	108	57.6%
75-85	56	41.8%	19	35.9%	75	40.1%
85-95	0	0%	4	7.6%	4	2.1%
Marital status						
Married	82	71.9%	23	51.1%	105	66.0%
Single	3	2.6%	1	2.2%	4	2.5%
Divorced	3	2.6%	7	15.6%	10	6.3%
Widowed	23	20.2%	13	28.9%	36	22.6%
Long-term partner	3	2.6%	1	2.2%	4	2.5%
Rehab						
Yes	83	81.3%	28	80%	111	81.1%
No	19	18.6%	7	20%	26	18.9%
Medication use						
Yes	85	93.4%	32	100%	120	94.6%
No	7	7.60%	0	0%	7	5.5%

	Overall			Males			Females		
	UK	Combined dataset	Questionnaire	UK	Combined dataset	Questionnaire	UK	Combined dataset	Questionnaire
■ 65-75	53.5	41.6	57.6	57.6	47.1	58.2	50.3	34.4	56.6
■ 75-85	33	41.2	40	32.4	40	41.8	33.5	42.3	35.9
■ 85+	13.5	17.3	2.1	10	12.9	0	16.3	23	7.6
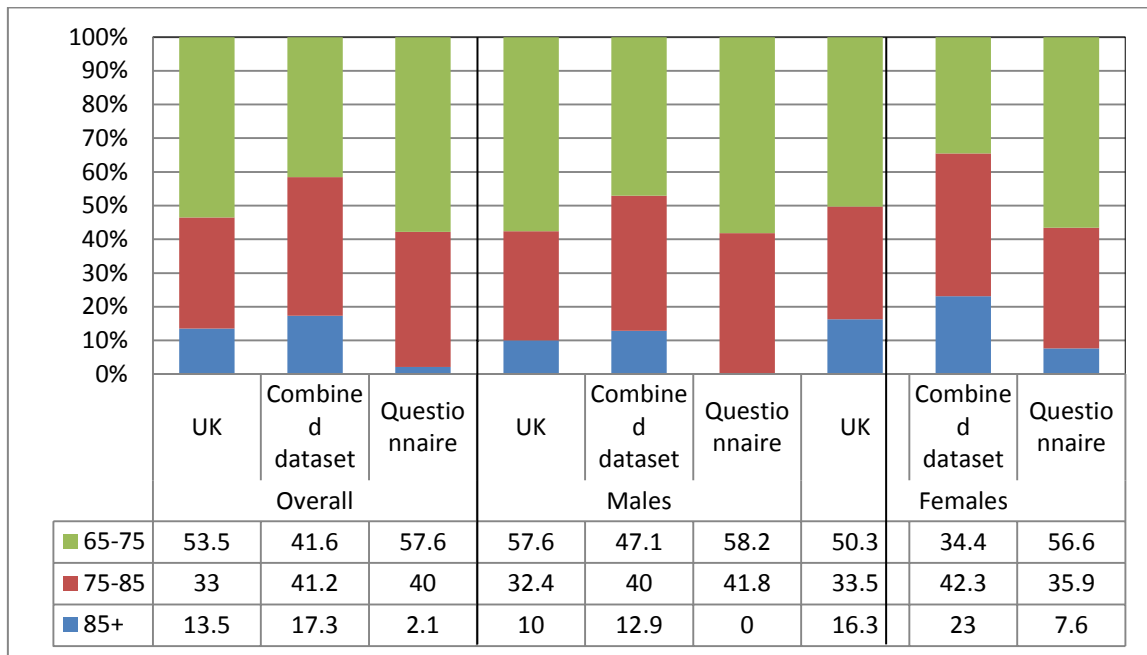
Figure 7.1: Comparison of age of UK population and questionnaire sample (ONS, 2012)

reduces the generalisability of the results. Similar proportions of people are portrayed within the other age ranges. The sample of neighbourhoods in which people lived was biased towards lower levels of deprivation. Figure 7.2 indicates that this bias is less than would be expected in comparison to the combined dataset, given the data collection method. This skew towards less deprived neighbourhoods will decrease representativeness of these results. The questionnaire analysis was not split by men and women and Figure 7.2 reflects this.

7.3 Recovery questionnaires

The two questionnaires provided the opportunity to survey experiences, with the aim to identify underlying patterns across six months of the recovery trajectory, and to explore personal perceptions of neighbourhood and recovery, transport needs and support available.
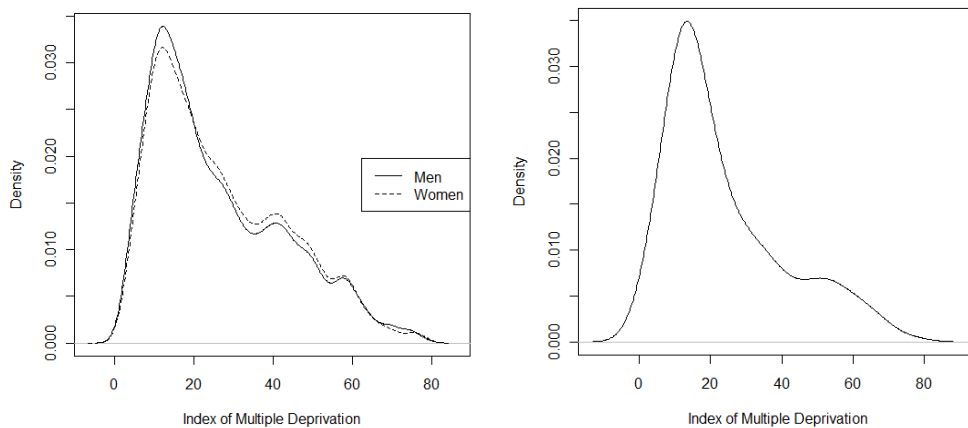
Figure 7.2: Distribution of IMD scores for combined dataset (left) and questionnaire participants' neighbourhoods (right)

The two questionnaires were sent via post, being returned to the Leeds General Infirmary cardiology research department. Five topics within the questionnaire are discussed in this section, in the same order, first analysing the initial recovery questionnaire and making comparisons across the different sections. Then, building up a picture of the personal trajectory of recovery was achieved by exploring differences between the two questionnaires received.

Insight into this trajectory across recovery was limited by the number of time points for which data was collected, leaving much of the exploration reliant on retrospective accounts.

7.3.1   Recovery

From the literature, personal perceptions of own health status were seen to have an influential effect on both physical and emotional health (Bailis, Segall and Chipperfield, 2003). Hence,

perceived recovery was explored within the questionnaires, examining how well people perceive their own recovery rates, whether this is related to the severity level of their ACS and whether it changes across the recovery period.

Perception of recovery

Perceptions of ACS severity and recovery rates were recorded on 100-point Likert-type scales, where 50 would be considered median score and 100 the best possible outcome. A mean (sd) perceived severity of 54.8 (28.7) during initial recovery indicated that most people believed their level of health problems were average, relative to others in a similar situation. A similar perception was recorded by the majority of people four months later, during the follow up questionnaire: mean (sd) =55.9(28.1) (non-significant difference, paired t test p value 0.4). This implies consistency in perception and belief that their health problems are 'average'.

People perceived their recovery to be high – mean (sd) 78.0 (19.9) – with the lowest score reported being 60. These very high values indicate perceptions of fast recovery, though may be biased as the sample contained only people who were able to complete the questionnaire.

Perceptions of fuller recovery were positively related to perceived lower levels of ACS severity (Spearman's correlation test $\rho = 0.43$, p value 0.0003).

Following four months of recovery, perceptions of recovery did not improve greatly (mean (sd) = 79.8 (19.4), paired t test p value 0.4). This may indicate recollection bias, or that recovery had taken place within the first two months or would take longer than six months.

Within the combined data between two and six months following ACS diagnosis, 29% of men and 26% of women died. Further investigation is needed to understand how this relates to perceptions of recovery and survival over the same period.

Open responses to perceived recovery

Open response questions gave the opportunity for greater expression, and new topics of interest to be brought forward.

Emotional recovery was brought up regularly, affecting how people coped in terms, for instance, of stress and confidence levels. How people felt they could cope and their confidence levels were expressed as affecting their physical health. This difficulty with emotional well-being was discussed mainly by people with more severe ACS.

> Questionnaire extract: *'I am more concerned about getting and staying physically fit and I worry somewhat less about "small" problems'*

Questionnaire extract: *'Lack of self confidence when physical effect is required'*

The other aspect spoken about concerning recovery was available support. To have people in support was seen as positive for recovery, particularly in the responses to the follow-up questionnaire.

Questionnaire extract: *'The close-knit area in which I live, all want to help in some way'*

Most of this support was seen to be provided by close friends and family, rather than participants turning to health services for help.

Questionnaire extract: *'Take things steady. Don't dash about. Get more help from my family'*

This reliance on support from others was greater for people with reduced physical abilities, mobility and higher levels of fatigue from ACS health issues.

Questionnaire extract*: 'None at present, I have started doing my own housework and shopping again, after resting for approx one month when my family were helping'*

This initial insight re-enforces the interconnections between compositional and contextual influences. It also shows little evolution of perceived recovery over the six months period.

7.3.2 Neighbourhood information

Perceptions of neighbourhood and its influence on recovery are explored within this section, focusing on the complex nature of place effect determined within the secondary data analysis.

Perception of deprivation

To uncover further insight into the meaning of local area indices and how they correspond to related perception, the level of perceived deprivation of the neighbourhood was recorded on a 100-point Likert scale. Very low perceived levels of deprivation were reported across initial and follow-up recovery (mean (sd) of 82.1 (23.1) and 82 (23) respectively), with very little variation within the samples and no difference in values reported by the individuals (paired t test, p-value = 0.86). This result will have been biased by the small numbers of people from neighbourhoods of low level of deprivation.
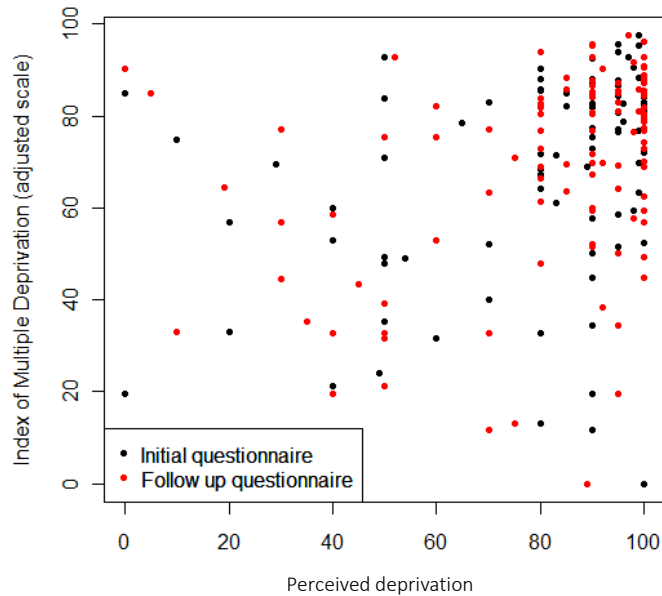
Figure 7.3: Perceived deprivation relationship to IMD score

Higher levels of perceived deprivation were related to lower local area index measure of general deprivation scores (IMD) (Initial and follow-up recovery correlation with IMD score: $\rho = -0.40$ with p-value, $p = 0.009$; $\rho = -0.34$ with p-value, p= 0.01 respectively). IMD score was re-scaled to range from 0 most deprived to 100 least deprived (the same format as perceived deprivation); the relationships for both the initial and follow-up questionnaire results are shown in Figure 7.3. This relationship is seen to be strongest for low deprivation and perceived deprivation neighbourhoods, with the relationship being less straightforward in other places. The results are very similar for both questionnaires.

Low levels of deprivation were perceived to be due to positive physical neighbourhood aspects, such as local resources and access to transportation.

> Questionnaire extract*: 'A pleasant area to live in with amenities to shops and open aspects'*

> Questionnaire extract: *'Local hospital with coronary aftercare, relatively clean air (rural situation)'*

Perception of support

Cattell (2001) claims that the local neighbourhood and its community is the closest source of support and the one most relied on. This was difficult to assess using secondary data, so respondents were asked whether they found their neighbourhood supportive.

The environments in which people lived were seen to be supportive by the majority of people within initial recovery (86.2%, n=100). A quiet and peaceful place increased this sense of support; reference was often made to rural and urban differences.

Questionnaire extract: *'Very pleasant neighbours, very supportive quiet area'*

Questionnaire extract: *'Close to parks for walking, close to shops, nice neighbours'*

Non-supportive environments were formed when there were limited resources on which to rely and difficult access.

Questionnaire extract: *'There is no neighbourhood support at all. As for contact from the coronary aftercare services I was not listed for attention after I was diagnosed from LGI.'*

This changed over the four-month period between initial and follow-up recovery, with 10% reduction of perceived levels of environmental support. A transition matrix (Table 7.2) seems to indicate a change in perception over time towards environment in terms of support; however, there was insufficient data to test the stability of the matrix.

Table 7.2: Transition matrix of perceived supportive environment

		Follow up recovery n (% of initial recovery group)	
		Not supportive	Supportive
Initial recovery n (%)	Not supportive	7 (58.3%)	5 (41.7%)
	Supportive	11 (13.9%)	68 (86.1%)

This change may be due to the differences discussed as to why the environment was perceived as supportive. The focus changed from urban/rural differences (the physical aspects of the neighbourhood) to more emotional support: for example, feeling 'at home' in a well-established neighbourhood.

Questionnaire extract: *'I have been living in the same house since 1956 and I feel comfortable here. Good neighbours'*

Questionnaire extract: *'Plenty going on in the town (drama, operatic societies), plenty of areas to go and relax, of social support'*

This may indicate that emotional support was less available than physical support, though further insight is needed.

Perception of support in relation to neighbourhood deprivation

Whether neighbourhood deprivation and support were related was explored in this section. Within initial recovery, surprisingly no relationship was seen with perceived deprivation or IMD

score (Kruskal-Wallis non-parametric sum rank test, p value 0.10, 0.09 respectively). Figure 7.4 (left graph) explores this result for perceived deprivation, indicating that this lack of correlation is probably due to the high variation in perceived neighbourhood deprivation for those who did not see their environment as supportive. This is based on a very small sample size (14.6%, n=16), though may indicate that lower deprivation does not imply a less supportive environment.

The relationship between deprivation and perceived support was more to be expected within the follow-up questionnaire (Figure 7.4, right graph). Lower deprivation was related with lower perception of support (Kruskal-Wallis non-parametric sum rank test: p-value=0.0002).
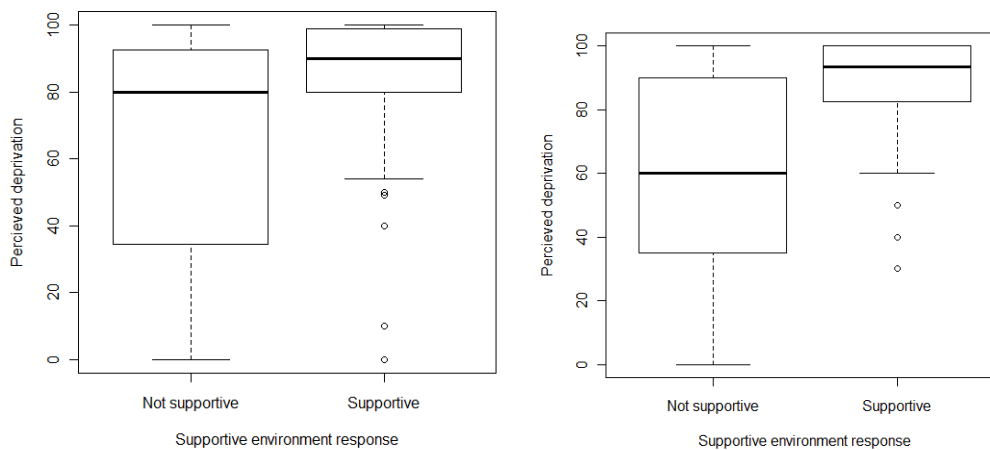
Figure 7.4: Relationship between environmental support and perceived deprivation for initial (left) and follow-up (right) recovery questionnaires

The difference seen here between the initial and follow-up questionnaires may indicate a change in relation to neighbourhood, or perhaps a reduction in level of support available; further investigation is warranted.

Open responses to neighbourhood differences

Exploration was made into this change in relationship between deprivation and support using the open response text. This uncovered that greater importance was placed on the built environment early on in the recovery process, while later on attention becomes more focused on feeling supported and having access to social support. This explains the change in perceived environmental support and its relationship to deprivation.

Physical neighbourhood aspects centred on urban-rural differences, with rural neighbourhoods considered as a good environment for recovery, being pleasant and quiet.

> Questionnaire extract: *'Ability to walk in open spaces with trees and fields, it is not a concrete jungle!'*

> Questionnaire extract*: 'Rural environment, accessible and clean air. A peaceful small village. Non aggressive'*

In contrast, the positive aspects of urban neighbourhoods concerned access to local resources, although relatively more negative comments were made about urban environments. Participants described them as noisy and stressful environments, and the socio-economic status of the people within the neighbourhood was also raised a number of times as a negative feature.

> Questionnaire extract: *'Small urban council estate. Socially deprived/benefit oriented'*

> Questionnaire extract: *'My flat is on a major crossroads public transport main route, ambulance sirens several times a day (ambulance station nearby) police sirens. Gets a bit stressful at times'*

These accounts were seen to be highly related with the deprivation levels and population density of the local area (the impact of which is discussed in section 5.2.3), and corresponded with the results obtained above, indicating that people perceive their neighbourhood in accordance with its IMD score.

The need for a supportive environment, perceived to be greater later on in recovery, was seen to come from feeling that people close by cared about their well-being and were willing to help if needed.

> Questionnaire extract: *'Being concerned about me'*

The availability and impact of social support is discussed further in section 7.3.4 below.

Perception of own neighbourhoods did not seem to have changed over the time period considered. However, what was seen as important did seem to vary – from appreciating the physical neighbourhood, towards the greater need for local support. This may relate to change in perception, change in what is needed as recovery progresses or varying amounts of support being available depending on the timing of the question. Further exploration is needed to clarify why this change is taking place.

7.3.3   Impact on lifestyle

This section explores the changes in lifestyle that take place due to health problems associated with ACS. This builds on previous results in section 5.4.3, indicating the importance of having

	Smoking (%)			Drinking (%)			30 min exercise (%)		
	Prior	Initial	Follow up	Prior	Initial	Follow up	Prior	Initial	Follow up
Never	71.135	86.2	86	27.15	37.7	33.3	18.25	15.4	18.5
Not often	5.35	9.8	8.8	41.05	45.9	40.8	27.85	24.8	21
Sometimes	4.55	1.6	2.6	15.75	5.7	18.3	12.25	12	11.8
Often	19	2.4	2.6	16.05	10.7	7.5	41.6	47.9	48.7
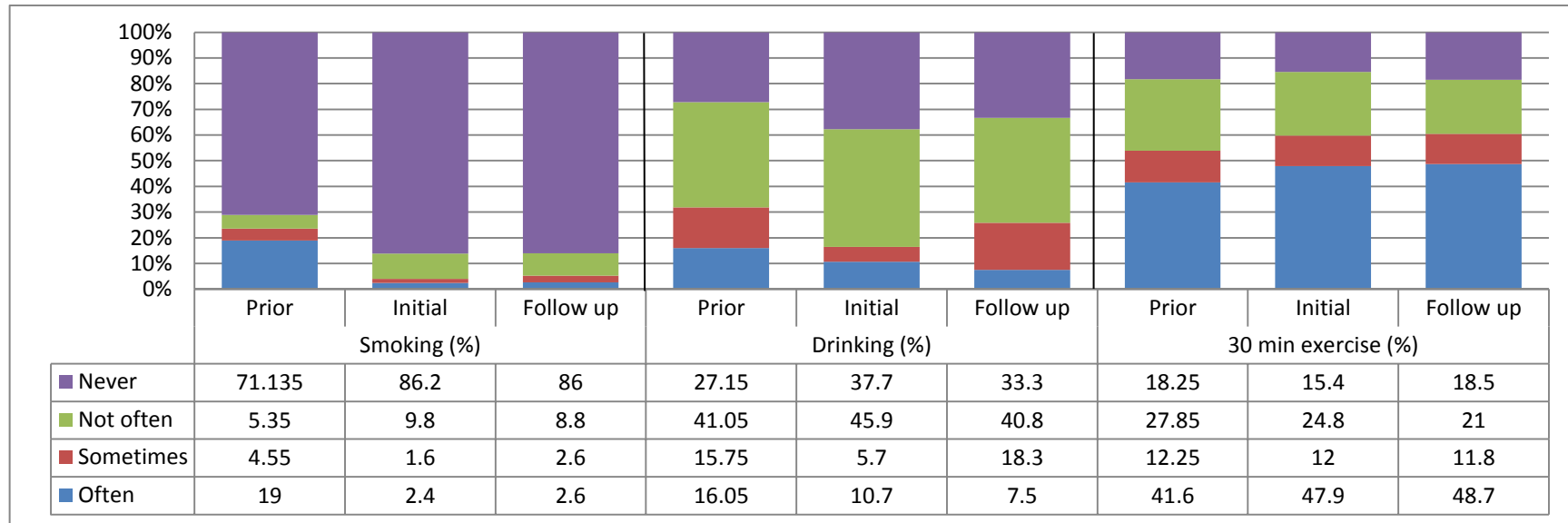
Figure 7.5: Smoking, drinking and exercise (%) for prior to ACS (mean), at initial and follow-up recovery

access to local resources and focusing on changes in ability to travel (recorded in responses to the initial questionnaire only). Lifestyle changes and their relationship to the place in which participants live is then examined, looking retrospectively and at the present time for both questionnaires.

Changes to access

Throughout the questionnaire, a common concept was the importance of being able to get about, lack of mobility being mentioned as one of the main potential hindrances to recovery. This was seen to reduce ability to socialise, exercise and do necessary day-to-day chores.

> Questionnaire extract: *'As long as I can walk into the village, and drive, good-locals shopping and friends. If not able to drive and walk into village I would be very isolated'*

How ACS had affected this ability to travel was assessed for the initial recovery questionnaire using a standard Likert scale. Table 7.3 shows cross-tabulation of retrospective belief about the transport used prior to their ACS diagnosis (before), and what they used two months later, at the time of the questionnaire (after).

Table 7.3: Cross tabulation of changes in transportation

(between before ACS event and at time of initial questionnaire)

		Follow up recovery n (% of initial recovery grouping)				
		Car	Bus	Walk	Assisted walking	No response
Initial recovery n(%)	Car	56 (77.8%)	3 (4.2%)	0 (0%)	11 (15.3%)	2 (2.8%)
	Bus	2 (16.7%)	10 (83.3%)	0 (0%)	0 (0%)	0 (0%)
	Walk	3 (9%)	1 (3%)	1 (3%)	27 (81.9%)	1 (3%)
	Assisted walking	0 (0%)	0 (0%)	0 (100%)	0 (0%)	0 (0%)
	No response	2 (2.5%)	0 (0%)	0 (0%)	0 (0%)	79 (97.5%)

Table 7.3 seems to indicate that the way that people saw themselves travelling changed between perceived transport and mobility prior to ACS and two months later. However, there was insufficient data to test change over time. The transportation used was seen to be reasonably consistent. The majority of people continued to drive their cars or use the bus if they had done so beforehand. However many people who had previously walked now needed assistance.

Greater changes had been expected, especially given the many references made in the open text responses. However over 50% (n=79) of questionnaire respondents did not respond to this specific question. This may imply that it was not presented well, or that people did not want to answer it. This will affect the results, and was removed from the second questionnaire for this

reason. Further exploration was made during the qualitative study to try to understand these findings.

Within the open text, reduced mobility was spoken about regularly in both questionnaires. This reduction in personal mobility increased the effect that the local neighbourhood had on participants' lives; for example, hills were seen as a newly-formed barrier that had to be overcome to be mobile.

Questionnaire extract: *'Too hilly for 'walks'*

Questionnaire extract: *'[Town name] is also "Hilly" but not severely other than for reasons like myself.'*

Participants also talked about increased reliance on friends and family, as well as taxis, to overcome this limitation.

Questionnaire extract: *'Limited mobility restricts to car/taxi only'*

This draws attention to the interconnected nature of environmental effect with personal experiences, the ability to use, willingness, and access. Overall, this has been referred to as *usability of neighbourhood*. This was raised as a topic for further discussion within the qualitative analysis.

These differences uncovered some of the difficulties that reduced health has on mobility, and ways in which the neighbourhood and community can aid or hinder usability. In spite of the perceived importance of remaining mobile to overall recovery, however, no changes were seen in the type of transportation used. This difference is interesting, and warrants further investigation.

Changes to individual lifestyle

How lifestyle is affected by ACS is explored, trying to determine whether people makes changes, and the type of people that do change. Generally, people over the age of 65 tend to have lower mobility than the younger population, have a higher likelihood of smoking and have had poorer diets in the past (Chassin *et al.,* 1996). This may have been due to increased knowledge of health implications among younger patients.

Rates of smoking, drinking and exercise were recorded both retrospectively, to before ACS diagnosis, and for the present, for both questionnaires. These gave two scores for retrospective lifestyle and one at each of initial and follow-up recovery. Figure 7.5 on page 169 shows the

change over time experienced in each case, taking the mean of the retrospective values reported.

The recorded change in lifestyle displayed in Figure 7.5 on page 169 indicates reduced levels of smoking and drinking following ACS diagnosis by 21.3% and 29.8% (McNemar: p value=0.01, p value=0.01) respectively, at initial recovery. A similar reduction was reported within the follow-up recovery questionnaire for smoking and drinking, by 22.8% and 17.7% (McNemar: p-value=0.003, p-value=0.03) respectively. These reported changes show motivation and effort put into improving own health; this is the same improvement reported within the initial recovery questionnaire (Pipe, Papadakis and Reid, 2010).

Changes between initial and follow-up lifestyle were seen to be small, with only 7% (n=6) and 31.9% (n=30) of participants reporting changes in levels of smoking and drinking respectively. With 50% (n=3) reducing smoking, and 60% (n=18) reducing drinking, an overall reduction in these damaging lifestyle choices was seen. That was reported to have continued through the six months following first diagnosis (change between initial and follow up smoking and drinking, paired t tests, p values 0.4, 0.6).

A large proportion of those that were smokers and drinkers had made an attempt to reduce this behaviour due to their ACS. This is especially important given the indication from the secondary data analysis that for both men and women smoking increased risk to survival at six months (section 5.4.3). This reduction of smoking and drinking was mostly reported by the same people (Spearman correlation test between change in smoking and drinking p value<0.001, $\rho = 0.67$).

The accuracy of these results relies on honest and consistent retrospective reports. By asking about retrospective views of previous lifestyle, change in perception levels could be accessed. Little change was seen in perception from the reported levels of smoking, drinking and regular 30 minutes of exercise prior to their ACS diagnosis (Fisher's exact text p values <0.001, <0.001 and <0.001 respectively). Changes in recollection seen were mostly between *not often* and *sometimes*, which was not considered to be a major difference. This consistency in perception provides some validation to the retrospective results.

The amount of exercise being reported did not change following ACS diagnosis (χ^2 test p value 0.21). Further, no difference was seen in the follow-up questionnaire (paired t test, p value 0.86). This was contrary to expectations, as exercise and ways to increase mobility were discussed regularly within the open response text. Mobility problems were also brought up as a large hindrance to recovery, which might account for no change in the results.

Open responses to changes in lifestyle

The closed questions within the questionnaires were based around influences brought forward by the secondary data analysis. Within this section, the opportunity was given for new effects on lifestyle to be put forward. Within initial recovery, the focus was on aspects that encourage recovery such as perceiving an aesthetically pleasing neighbourhood within which they would want to interact.

Questionnaire extract: *'Public park which has many flower beds and sports facilities'*

This was mentioned from both a positive and negative viewpoint, indicating its overall importance.

Questionnaire extract: *'No close paths etc. to exercise. Not very 'exciting' walks to shops etc. Shopping centre not very attractive'*

Individual level impacts were also mentioned, such as having to slow down and have help from others when necessary.

Questionnaire extract: *'Take things steady. Don't dash about. Get more help from my family'*

Common references were made to changing diets to improve own health: for instance, eating more fish and generally becoming healthier. This continued into the follow-up questionnaire, considered an ongoing impact of awareness.

Questionnaire extract: *'Dietary i.e. eating less fats etc.'*

Greater impact was discussed in relation to motivation, with participants stating the problems of not feeling recovered.

Questionnaire extract: *'Lack of interest, tiredness'*

Questionnaire extract: *'I am not able to be as active as I was before and so I now spend the majority of my time at home'*

More attitudes that are positive were expressed by those who went on a rehabilitation course, increasing confidence and mobility. No change was reported to the amount of exercise undertaken (discussed above), which might indicate that the people who attended these courses were already of a reasonable level of fitness.

Questionnaire extract: *'At first I was a little hesitant but time passed my confidence built up the N.H.S. exercise course was great and all should join'*

The impact on lifestyle over the two time points indicates that, following ACS, people tried to improve their own health, though often with barriers that restricted their progress, such as mobility problems. The level of change reported was consistent across initial and follow-up recovery. The affluence of their neighbourhood and severity of their health problems seemed to affect the level of impact on their lifestyle that they experienced.

7.3.4   Social relationships

Social relationships and levels of support have been mentioned throughout both the quantitative and qualitative literature as supportive towards recovery (Boutin-Foster, 2005; Frasure-Smith *et al.,* 2000). The importance of local, social relationships was expressed across the questionnaires, for reasons of both emotional and physical help.

> Questionnaire extract: *'My friends+relatives are near'*

> Questionnaire extract: *'Good friends, good and varied walking Art club=contacts'*

The complex nature of where support comes from and its level of use are difficult to measure. The questionnaires were able to elicit information on the people close by, on whom participants relied, and whether the support received was influenced by the participant being involved within the neighbourhood.

Access to support

Friends, family and neighbours were mentioned many times as an area of support across initial and follow-up questionnaires. Appreciation for local support increased over time, though access to support, assessed on a Likert scale, was seen to be consistent throughout the recovery period.

At initial recovery, the majority of people felt that they had contact with friends and family often (79.7%, n=98), with 10.1%, n=12 participants stating that this had changed since they had their ACS diagnosis. The change was usually an increase in contact, due to their reduced level of health.

> Questionnaire extract: *'My children visit more regularly. Neighbours will help with shopping etc., particularly during bad weather'*

Little change was seen in this level of contact between initial and follow up recovery (Table 7.4 on the next page). On reflection, that question does not provide enough information for whom and why people provide support, although the reasonably consistent perceptions of little change over time is an interesting insight.

Table 7.4: Transition matrix of contact with friends and family

		Follow-up recovery n (% change from initial recovery category)			
	Category	Often	Sometimes	Not often	Never
	Often	72 (90%)	2 (2.5%)	5 (6.3%)	1 (1.3%)
Initial	Sometimes	2 (50%)	1 (25%)	1 (25%)	0 (0%)
Recovery n (%)	Not often	4 (33.3%)	0 (0)	8 (66.7%)	0 (0%)
	Never	0 (0)	1 (100%)	0 (0%)	0 (0%)

Sources of support differed between men and women, giving the impression that men were more likely to turn to their partner for help.

Questionnaire male's extract: *'My recovery is helped by my wife'*

Women were more likely to have help from their friends and neighbours from within their communities, making many more references to the need for and appreciation of social relationships.

Questionnaire female's extract: *'Many friends and neighbours give support. Empting bins/tidying garden/going for a walk with me/baking/ and general care'*

These differences divide relationships into two types: those personally close, and those that are more within the wider social community.

The need and appreciation of social support was mentioned much more within the follow-up questionnaire, although there was little indication that more was available. It was of interest whether this was due to greater need, greater appreciation or having less support available.

Social involvement

Social relationships are increased by involvement within the community. The type of involvement depends on the characteristics of the neighbourhood and the motivation of the person (Anderson, Deshaies and Jobin, 1996). Participants were asked about involvement in local organisations and clubs within their neighbourhood, and changes over the six months were assessed.

Only about one half of people felt they were involved locally during initial recovery, with 46.3% expressing that they were *never* involved in clubs or organisations within their neighbourhood. Table 7.5 on the next page shows that this did not change greatly between initial and follow-up recovery. For 18% (n=17) of participants, 35% (n=6) became more active, while 52% (n=9) made reductions in their involvement.

These reductions in activities were expressed as due to reduced mobility, fatigue, and access problems.

> Questionnaire extract: *'Don't feel well enough or safe to go out'*

> Questionnaire extract: *'No able to take part in social activities now due to poor health'*

Table 7.5: Transition matrix for level of involvement within the neighbourhood

		Follow up n (% change from initial category)			
	Category	Often	Sometimes	Not often	Never
	Often	33 (91.6%)	1 (2.8%)	1 (2.7%)	1 (2.8%)
Initial	Sometimes	0 (0%)	0 (0%)	1 (50%)	1 (50%)
recovery n(%)	Not often	2 (13.3%)	0 (0%)	9 (60%)	4 (26.7%)
	Never	4 (10.3%)	0 (0%)	2 (5.1%)	33 (84.6%)

Greater access to social relationships may be encouraged by greater involvement within the community or, following ACS diagnosis, by greater support to facilitate continued involvement. The type of support needed, from whom and its availability needs further exploration, with the requirement to determine differences in social support between the *social community*, and *close friends and family.*

7.3.5 CASP-19

This theory-based Quality of Life measure developed in the UK, chosen as it was specifically developed for older people (Hyde *et al., 2003;* Sim, Bartlam and Bernard, 2011*)*, was the final part of each questionnaire. The final score is built from four subsections based on personal characteristics. The breakdown of the initial and recovery questionnaire results are shown in Table 7.6 (see section 6.2.3 for a fuller description of the CASP-19 survey).

Table 7.6: Descriptive data for CASP-19 results

	Control	Autonomy	Self-realisation	Pleasure	CASP-19
Initial mean (sd)	7.8 (2.7)	10.6 (2.9)	8.5 (3.6)	12.7 (2.9)	39.8 (9.4)
Follow up mean (sd)	7.7 (2.9)	10.4 (3.2)	12.5 (3.9)	8.7 (3.4)	39.9 (11.2)
Possible range	0-12	0-15	0-15	0-15	0-57
Collected range	0-12	4-15	0-15	3-15	10-57

People record high levels of quality of life at initial recovery, with the lowest score recorded being 10/57. The breakdown of this score showed that people took a great deal of pleasure from life, though did not feel that they had very much control over it. This feeling of lack of control could lead to frustration, and hence its origin is worth investigating.

Similarly, within the follow-up recovery questionnaires, the same high levels of quality of life were reported (shown in Table 7.6 on the previous page), with no changes seen between initial and follow-up recovery (paired t test between both questionnaire results: p-value=0.18, mean difference=1.1). This corresponds to the high levels of recovery perceived earlier on in this chapter.

This measure of quality of life, CASP-19, did not vary with a person's age (Spearman correlation test between age and CASP-19 p-value = 0.11, $\rho = -0.19$). This implies that older age does not imply a lower quality of life within this sample, though the sample was biased towards those at the younger end of the age range. These results are consistent with previous findings based on the English Longitudinal Study of Aging (Netuveli *et al.,* 2006).

The level of neighbourhood deprivation was associated with perceived quality of life. The lower the level of deprivation that a person attributed to their neighbourhood, the greater their recorded quality of life (Spearman correlation test, p-value =0.004,$\rho = 0.32$).

Further along in recovery, this association was no longer present (Spearman correlation ρ=117447, p-value=0.09). This may indicate that perception of neighbourhood was more important early on in recovery.

CASP-19 has shown that people perceive their quality of life as high, remaining high over six months.

7.3.6   Linear regression

Throughout this chapter perception of recovery, neighbourhood and ACS impact have been discussed and analysed using basic comparisons and association tests. This section explores what makes people perceive greater recovery, and lower levels of deprivation within their neighbourhood.

Simple linear regression models were formed, to explore many potential influences on perceived recovery and neighbourhood deprivation. The two models that gave the most explanation are shown in Tables 7.7 and 7.8 on the next two pages. The complexity of these models was limited by the small sample size, which also prevented the formulation of separate models for men and women. Sex was kept as a predictor within each model to account for differences. Due to strong similarities in these results between the initial and follow-up questionnaire, only initial models are shown.

Perceived recovery

Table 7.7 shows the model built around the outcome – perceived recovery – recorded on a 100-point Likert-type scale (section 7.3.1), with predictor variables for perceived deprivation, and the perceived severity of the ACS, both similarly recorded. Section 6.2.4 contains a discussion of the modelling used.

From this model, it is seen that people who perceived their neighbourhood to have low levels of deprivation saw themselves as more recovered. Despite the correlation between perceived deprivation and general deprivation, IMD was not seen to be associated with perceived recovery.

Table 7.7: Perceived recovery at two months in relation to sex, area deprivation and ACS severity

(Perceived recovery is recorded on a continuous scale from 0: not recovered to 100: fully recovered.)

Variables	Coefficient (95% CI)	P value
Sex: Female (Comparison to male)	4.5 (–3.8 to 2.8)	0.3
Deprivation (higher value less deprived)	0.3 (0.07 to 0.5)	0.008
ACS severity (higher value lower severity)	0.2 (0.1 to 0.4)	0.0002

Perception of the ACS severity level as low was associated with higher perceived recovery. No difference between men and women in their perceived recovery was seen.

These findings are what would be expected: lower severity and a neighbourhood with a low level of deprivation are better for recovery. They also correspond with the previous questionnaire analysis (section 7.3.1).

Perceived deprivation

Table 7.8 shows the model built around the outcome, perceived deprivation, on a 100-point Likert scale. Predictor variables were: perceived supportive environment, binary response (supportive or not) and sex.

People who considered their environment to be supportive also believed that their neighbourhoods were less deprived. The same was true for the measure of general deprivation, the IMD score. This implies that a supportive environment is associated with a less deprived area and a perceived less deprived area.

This relationship was only seen to be present in the follow-up recovery questionnaire in the previous analysis (section 7.3.2). These differences may stem from men and women recording support differently, although no difference in perceived deprivation was seen.

These models imply interactions between recovery, support and deprivation of neighbourhood.

Table 7.8: Perceived deprivation at two months in relation to sex and supportive environment

(Perceived deprivation is recorded on a continuous scale from 0: very deprived to 100: not deprived.)

Variables	Coefficient (95% CI)	P value
Sex: Female (Comparison to male)	-2.7 (-12.7 to 7.3)	0.6
Supportive environment (Comparison to no support)	23.9 (11.7 to 36.0)	0.0002

7.4 Summary

Throughout this chapter, the aim was to explore perceptions of recovery and neighbourhood, and the impact on life from experiencing ACS over a six-month period. These questionnaires were a unique opportunity to ask questions that linked together viewpoints and actual occurrences. This was designed to build on the secondary data analysis results, to explore in more detail the aspects that had impact on six-month survival.

This mixed method questionnaire has enabled interesting insight, exploring differences in recorded measures and open text responses. These did not always correspond, but did lead to further theories about why certain trends were seen. These working theories are discussed below (section 7.4.2), following a discussion of the changes that were seen over time.

The questionnaires were limited by the small sample size; this restricted the complexity of the analysis. It would have also been useful to have collected data at a larger number of time points. From these time points, a longitudinal picture of the recovery process could have been analysed. This was not possible within the scope of this study. The two time points used, at two and six months after hospitalisation, did not show a great number of differences in the results. It might have been useful to have assessed the process earlier on in recovery, such as within a couple of weeks, and then at another time point a couple of years later, to form a more in-depth view of the process.

Recollection differences can also be a problem. With the questionnaire format, it is not possible to determine whether the differences between time points existed or if they were remembered differently at a different time point. Throughout this analysis, recorded values and open text responses have been treated as perceptions, keeping in mind that they may not represent what is actually happening. Exploring this difference has provided further insight.

7.4.1 Trajectory across initial and follow-up recovery

Initial recovery, two months following diagnosis, was influenced by physical aspects of the neighbourhood, such as local resources, population density and usability of the local area. Social relationships were also considered to help recovery.

Perception of a deprived neighbourhood arose from seeing the environment as not supportive, with barriers caused by the physical structure that made access difficult, while having friends, family and neighbours close by was seen as an area of support.

Lifestyle changes were attempted by a reasonable proportion of people, including reductions in smoking and drinking, and eating more healthily. However, the amount of exercise undertaken did not change, and it was indicated that this might be due to mobility difficulties.

In explorations further along the recovery trajectory, six months after first diagnosis, very few changes in perceptions were recorded. Few changes in perceived ACS severity, recovery, neighbourhood deprivation or differences in lifestyle were seen.

The changes that were seen seemed to centre on moving from physical appreciation of the environment, to more emotional needs and wish for support further along in the recovery process. Evidence of this change was seen by the change in association between perceived deprivation and environmental support. It was also seen that quality of life was only associated with perceived deprivation within initial recovery, indicating a change in attitude or need. This greater appreciation for social support during the follow-up questionnaire was most evident within the open response questions. With the second questionnaire, far fewer references were made to the physical neighbourhood.

With follow-up recovery, perceptions of influences focused on feeling at home, a personal connection to place. This change in appreciation was consistent for all levels of neighbourhood deprivation and perceived recovery.

> Questionnaire extract at two months: *'The "hilly" environment around me means walking became a challenge which should become easier as time goes on'*

> Questionnaire extract at six months: *'Visits from good and caring friends have definitely played a part in my recovery'*

Other differences seen between the two questionnaires were the attitude to personal lifestyle; many participants in initial recovery expressed effort made to improve personal health. Within the follow-up questionnaire, more references were made to the mobility problems created by health issues, either because of co-morbidities, or because the participant had not fully healed

from the original event. This may relate to the increase in appreciation of social support later on in recovery.

> Questionnaire extract at two months: *'My diet, my attitude to life (quit smoking)'*

> Questionnaire extract at six months: *'not being able to walk as far without having a rest'*

7.4.2   Interesting insight that needs further investigation

Interesting insight into many aspects of the recovery process has come forward within the chapter, linking together perception and the effects of ACS, as a result of using a mixed method approach. However, it was not possible to postulate and confirm all the ideas and theories formed from the questionnaire responses.

To further the exploration and clarify these theories and ideas, a qualitative study was undertaken around five months following ACS diagnosis, for a small nested sample of people who responded to the first questionnaire. The findings are displayed in Chapter 8 and concentrate on the reasons why these relationships exist between the neighbourhood and recovery, by gaining in-depth information about the participants' experiences.

The main theories and ideas formed in the chapter, building on the insight from the secondary data analysis phase, were:

- One of the main points of interest was the trajectory explored above (section 7.4.1), suggesting that the physical aspects of the environment were seen to be more important early on in recovery. Further down the line, social interactions become more valued, especially a sense of belonging within the neighbourhood. Greater insight is needed into why this might be the case, and whether it relates to the type of neighbourhood and availability of support.

- Throughout both questionnaires, the majority of people reported their health, recovery and quality of life to be high. This corresponds with the low death rate shown at six months although, given that the sample contained only people who had experienced ACS recently, there may be a positive report bias taking place. This is not likely to change the underlying trends uncovered, although further exploration into how well people are within the qualitative study are needed to clarify these results.

- The initial idea that amount of access influences whether a neighbourhood is used was built upon. However, this was not a straightforward relationship, as it is influenced by location and available transport, physical structure such as hills, and cost. Barriers, both physical and

perceived, were seen to affect the *usability* of the environment. Further insight into what these barriers were, and whether they actually prevented involvement and interaction within the local neighbourhoods needed further exploration.

- The relationships seen between general deprivation (IMD score), perceived deprivation and perceived supportive environment implied associations in most cases. Further exploration will be made into whether there are interacting influences present: for example, does a supportive environment protect against the feeling that a neighbourhood is deprived? And do these relationships affect well-being and recovery?

- Differences were seen in who was needed for support, especially between men and women. The two types of support locally seemed to be *close friends and family,* and *social community*. Further exploration is needed to clarify this point, trying to understand the reason behind why help is sought from certain people, looking to see whether this varies by neighbourhood and personal characteristics.

- Contrary to expectations, care from health services were rarely mentioned, either as supportive or as a limitation to recovery, the exception being rehabilitation courses, which were seen as positive. Whether health services were seen to have an effect, but not mentioned here, needs further investigation.

Chapter 8: Experiences and perceptions of place effect on ACS recovery: Discussion of qualitative findings

8.1 Introduction

This chapter presents the findings and discussions formed around personal experiences of acute coronary syndrome (ACS). This discussion explores *how* and in *what ways* dimensions of neighbourhoods and community have influenced the recovery process for older people with ACS.

Questions that were raised by the secondary data analysis and questionnaires focused the topics of interest in the data collection. The insight into place effect is therefore developed in terms of personal perspectives.

Qualitative methods were employed to gather in-depth perspectives on the relationship between dimensions of the places where people lived and their recovery from ACS. Conversational interviews and community mapping (CM) were used to develop a number of concepts that relate to ACS recovery. Personal and neighbourhood level attributes were seen to affect how a person recovered. Theoretical sampling selected ten participants for interview. Four of these ten participants also carried out open walking discussions (community mapping). These ten participants are discussed relative to the places where they lived in section 8.2.

Section 8.3 presents retrospective perspectives on the early experience of ACS. This discusses symptoms, treatments, and initial reactions to an ACS diagnosis. The overarching concept encapsulating the experience and consequences of suffering from an ACS – *dealing with change*– is discussed in section 8.4. This comprises three interacting sub-categories that are considered in sections 8.5 to 8.7. Flow diagrams are used to convey visually the relationships between these sub-categories and the concept of *dealing with change.*

Chapter 6 provides details of the methodology, sampling, data collection and analysis techniques used. The software NVivo was used to organise and analyse the data (QSR International NVivo 9 software, 2010).

The method of constant comparison was employed to develop codes, categories and concepts, and the relationships between them, returning to the empirical data to check and refine them.

8.2 Demographics

The ten participants were chosen, based on a theoretical sampling strategy, from the 200 people recruited into the questionnaire study. These people were purposely selected to gain in-depth insight that reflects the interests of the thesis. Qualitative discussions commenced between three and five months after ACS diagnosis. The ages of the ten people ranged from 66 to 82 years old. The age of women was higher relative to men. However, there was a much higher proportion of men to women within the sample. Table 8.1 displays some of the participants' demographics and shows that all ten participants were White British and seven were married; the other three had been widowed within the last five years. Pseudonyms are used to provide anonymity.

The neighbourhoods in which the ten people lived had a mean IMD score of (sd)=16.86(6.2). This indicates that the level of deprivation varied around the middle. Two people lived in highly deprived neighbourhoods and two within neighbourhoods of low deprivation. The other four lived within neighbourhoods of middle-level deprivation. This classification was based on IMD scores. One of the neighbourhoods was very rural and the others varied from sub-urban to city centres.

Table 8.1: Participant pseudonyms demographics (CM: community mapping participants)

Participant pseudonyms	Age	Sex	Marital status	Area	Deprivation	Medical Limitations
GEORGE (CM)	66	M	Married	Rural	Low	None reported
TED	80	M	Widowed	Urban	High	Mobility problems, shortness of breath
JEFFREY (CM)	72	M	Married	Sub-urban	Middle	Leg not healing quickly, mobility problems
PAUL	74	M	Widowed	Mixed	Middle	Arthritis in legs
MATT	82	M	Married	Sub-urban	Middle	Breathing problems, mobility problems
SIMON (CM)	70	M	Married	Urban	Middle	None reported
HEATHER	74	F	Married	Mixed	Low	Vasculitis causing mobility problems
BONNY	74	F	Married	Sub-urban	Middle	Previous ACS problems, unstable angina, numerous stents
ENID	82	F	Widowed	Urban	High	Mobility problems caused by need for hip replacements, previous heart problems
PETER (CM)	79	M	Married	Mixed	Middle	Mobility problems

Four of the ten people also carried out community mapping (CM). This was a walking discussion of their perception of place. Such aspects as personal connections to neighbourhoods, boundary lines, and resources were discussed.

These four people were all men and were slightly younger on average than the ten interviewees: mean (sd)= 72.6 (5.4). Rural and urban neighbourhoods were explored within the community mapping discussions. The levels of deprivation for these neighbourhoods were low to middle.

8.2.1 Descriptions of participants and their neighbourhoods

In-depth insights into perceptions of compositional and contextual influences on ACS recovery were formed. Each person perceived recovery and its relation to place differently. This provided a wide scope of focused information to explore.

A pen picture was developed for each person and his or her neighbourhood. These were used to set the scene in which the qualitative discussions were carried out. Two of these pen pictures are displayed below. George and Ted were chosen to show personal connection to a rural and urban neighbourhood.

George

George lived in a remote rural neighbourhood. A few miles away, there was a local village to which George was connected. George appeared to consider this village part of his neighbourhood. He suggested that the community mapping should take place here instead of near his home, where the houses were sparely distributed among green fields and farms.

The remoteness of George's house increased the importance of being able to drive. George talked about the need to drive to reach any form of facilities. This was an expected and accepted consequence of living in a rural neighbourhood.

The neighbourhood seemed to be affluent. Many local facilities were discussed and praised for their high quality. George saw the community being made up of people of retirement age, many of whom, like him, had moved there later in their lives.

Throughout his life, George had been employed in a highly paid and stressful job. He and his wife had moved out of a large city to his current place of residence four years ago. George described that his connection to the neighbourhood had been built up from 20 years of holidaying locally. George liked his neighbourhood, but did not think that he had many strong friendships locally. There were people on whom he could rely for support, but he thought true

friends took many years to form. He felt he would never be considered a 'local', but did not think this or only having a small community of close friends affected him.

> *George:* *'You've got to live here for about 30 years to be considered a local anyway, but then does it matter if you can be called a local, and I don't think it does. It's where you live, um….'*

George was involved in many communities locally, such as the church. This involvement encouraged interaction within the neighbourhood. However, George felt that he was expected to be part of the community, even when he had no wish to.

George felt fully recovered from his ACS, which was quite severe. He took more exercise and ate more healthily than he had done before. George talked about not needing help from others for himself. However, any support offered to his wife, who was also ill, was greatly appreciated. This led to talking about emotional problems with close friends, as he did not want to put further stress on his wife.

Ted

Ted lived within a block of flats in the centre of a large urban town. There were shops and other facilities accessible within a short walking distance. Ted had relied heavily on his car to get around for many years. After his ACS diagnosis, he had increased the amount of walking he did, with the aim to improve his health.

Ted had two local communities with which he felt a connection: the flats where he lived and the local rugby club, of which he had been part throughout his life. The other people who lived in the flats were mainly women with some form of health problem and of a similar age to him. Ted expressed appreciation for the strong community that was so close by. He talked about how they looked out for each other and organised social gatherings. The rugby club was where he went to socialise with people he had known for many years. He felt that knowing and being known by these people was a source of companionship and emotional support.

A close friend provided the majority of his instrumental aid. Ted had lost his wife four years previously, which he felt meant that he had to accept the help available. Ted spoke about his appreciation for this support, but at the same time of feeling overwhelmed and frustrated at not being allowed to live his own life.

Ted felt that he was fully recovered. He believed that the rehabilitation course, and his son-in-law who ran it, were the reason for his improved health.

8.2.1   Community mapping narratives

A community mapping narrative was developed for each person involved. These aimed to capture how place was perceived relative to place differentials, and the perceived effect of place on health. Information given within the two questionnaires is related to this person's perspective. The local area in which the person lives is also analysed with the use of the secondary data analysis. This helped to build up a layered understanding of place effect and how place is seen to influence ACS outcome.

The community mapping narratives could then be used to explore the perspective of the older person with ACS who lives locally and how he or she relates to the neighbourhood.

The structure of the community mapping narrative followed the model put forward by Riessman (2008). There are five stages: *abstract, orientation, complicating action, evaluation* and *summary.* Peter and Simon's narratives are displayed below. These two were chosen as they show different attitudes towards place.

Peter's community mapping narrative of attachment to locale

Orientation

'The local urban town was explored. High levels of traffic were seen with a complex road system locally. The neighbourhood was based around a small central area that had market stalls, shops, and benches. Community mapping took place around 4 pm.

The narrative provided had a negative atmosphere. Peter felt connected to the neighbourhood, but resented physical changes. Much of the conversation centred on retrospective insight into when the neighbourhood had easier access and a more connected social community. The area boundaries scores were: IMD 22.73; Townsend 1.16; and Jarman 3.33. This suggests a mid-level deprived local area.'

Complicating action

'Peter's initial reaction to neighbourhood exploration was anger towards a busy road. He was particularly concerned for older people and children who had to cross the road. This road was both a physical and perceived barrier between his house and the local neighbourhood. The usability of the neighbourhood, which contained the market and other amenities, was reduced.

The hill on the way into town was another barrier of the local neighbourhood. This served as a reminder to Peter of the reduction in his mobility.

Peter found that he appreciated his connection to the place where he lived more since his diagnosis, especially with regard to neighbours, friends and family, whom he felt he could rely on for support. This sense of belonging was believed to have been due to the period of time that he had lived locally. Peter talked about memories and experiences throughout his life: for example, he was able to show me the shop where he had bought his first suit.

The hill and road were both barriers that reduced Peter's interaction within the local neighbourhood. He seemed to connect more to the streets closer to his house. He spoke about trying to improve this local area by contact with the local council. In the past, he had been involved in the reduction of speed limits and the cutting back of overhung trees. Peter had been put into an unofficial position of responsibility and received respect from those who lived close by. He took this position seriously and it was talked about with pride.

Peter's wife worried about him greatly and often told him not to undertake activities. Peter found this frustrating. He found it difficult to relinquish activities and let other people help. This was despite his admission that in the past he had caused more harm than help by gardening.

There had been changes to the built environment within the town centre in recent years. Peter expressed regret and disappointment at these changes. He felt that the town had reduced access and was less aesthetically pleasing. Peter saw a reduction in the amount of socialising that took place; he felt that there was reduced usability and because of this the local community was not as strong. The recession was also seen to affect the neighbourhood. Many shops had closed down or changed hands, which reduced familiarity with the area.

Peter found it difficult to talk about how he felt. He stated that he was disappointed about changes to his neighbourhood, but that he would not let himself worry about them.

Lack of information about his own diagnosis was expressed as a concern. Peter did not feel that there was anywhere locally where he could ask for advice or information.'

Evaluation

'Constant comparisons to past life experiences were made throughout both the interview and community mapping discussions. These implied a strong personal connection to the neighbourhood built up over time. A sense of loss was expressed towards both his own abilities and his neighbourhood. Peter felt it was important not to let his emotions emerge or take over.

Peter level of health was greatly reduced. He had accepted that he would not get any better. Comparisons were made to a range of people he knew who had passed away. He used them as a point of reference, stating that in later life reduced health and death were inevitable.'

Simon's community mapping narrative of attachment to locale

Orientation

'Simon lived within an urban, former mining town. He was very active for his age, of which he was proud. Over the last few months, he had used a daily exercise route into town to build up his mobility, which he wished to show me. Simon believed that his neighbourhood had not affected his recovery in any way.

Simon had lived and had family connections locally for the majority of his life. He had a good knowledge of the built environment, and many close friends and family. Despite this, Simon felt a personal connection with only the few streets close to his house. This connection to the small area close to a person's home was more common within urban neighbourhoods. Simon saw his local neighbourhood – the streets around his house – as safe, clean and a source of social cohesion.

It took ten minutes to walk to the local town down a slight slope. The route taken is shown in Figure 9.1 on page 236. The local indices for where Simon lived were IMD, Townsend and Jarman scores of 23.06, 1.35 and 5.45 respectively, with local area deprivation level around middle to high. Despite these summary statistics, the town seemed to have facilities of reasonable quality and a good public transport system. This provided easy access to the neighbourhood, as well as to towns and cities further afield.

These measurements may indicate the high levels of unemployment that are likely to be present within a former mining town.'

Complicating action

'On leaving his home Simon pointed out every house on the street, and talked about how he knew the occupants and the strength of his relationship with them. Simon stated that people did not want to leave the area, as it was friendly, safe and a reassurance to have such a strong community.

This community provided instrumental aid and emotional support. For example, close to Simon's house, we met a neighbour who was able to help with an electrical problem that Simon had.

Traffic and the large number of parked cars were raised as an issue that reduced access to his house. This was due to a school close by. Simon believed that this problem had increased over recent years due to parents not thinking it safe to let their children walk to school.

The route into town was on a hill. Simon saw this barrier as a challenge that needed to be overcome. He expressed pride in his increased ability to walk quickly up this hill.

The local shops, takeaways and pubs were seen as expensive. Little personal or social connection was felt towards local amenities, as Simon did not know the other people who worked at/attended them. For example, the management of the local pub changed regularly, so that there was little continuity over time in terms of landlord and customers. This was seen to reduce the community atmosphere. Simon's ability to drive reduced the importance to him of both local amenities and the environment's usability.

Away from the house, Simon felt comfortable enough to mention gingerly the level of frustration he felt towards his wife. Simon believed she worried about his health more than he did. This had led her to try to control his level of activities: for example, he was not 'allowed' to wash the car or to take the vacuum cleaner upstairs. Simon found this interference difficult to accept. He felt guilty for having these feelings, as he knew that his wife was only trying to help him.

On reaching the extensive allotments close to the centre of town, Simon expressed that he enjoyed renting his. However, the allotments were not seen to increase the sense of community within the neighbourhood. Work on the allotment had been restricted due to his reduced health. Simon looked forward to making more progress next year.

Simon did not have a strong community within this part of the town. He had little knowledge of the area or the people who lived locally: for example, he did not know whom to turn to for help when people put rubbish on his allotment.

Simon did not see himself as old or in need of support, despite his ACS. He did not feel that he needed to seek help or take part in community facilities that he saw as designed to help people without a support system: for example, he had not considered entering the local community centre, as it was there to help older people.

Simon had attended a rehabilitation course and subsequently joined a local group for people with similar health problems. This course – and later the local group – had provided support and, information, and had improved his mobility. However, Simon and many others he knew in similar situations still felt that they lacked enough information on how to aid their own recovery. One of the greatest sources of information was shared knowledge from people who had had similar experiences.

Simon attributed a large proportion of his recovery to the rehabilitation course and having been admitted to a high quality hospital. He had specifically asked the paramedics not to take him to the hospital that was technically closest.'

Evaluation

'Personal connection to the neighbourhood was mainly formed by social relationships. These were with the people who lived close by, such as neighbours in his street, friends (through hobbies) and family. This community determined the size of Simon's 'neighbourhood'. The built environment was of little importance to him.

This lack of connection to the built environment may have been why Simon did not believe that his recovery was affected by place.

Simon's health was only slightly reduced by his ACS. His recovery period was short and he did not fear death. Simon could not understand why he had ACS, as he had always been in good health. This was an area of frustration for him.

Despite this, Simon worked hard to improve his health by a healthier diet and exercise. At the time of the community mapping discussion his level of health was higher than prior to his ACS diagnosis.'

8.3 Initial experiences of ACS

Recollections of initial experiences of ACS portrayed feelings of fear and confusion. These descriptions often included experiences of the symptoms and diagnosis, and initial reactions.

Five of the ten people delayed seeking medical treatment by not ringing an ambulance. Help and advice from friends and family was sought instead. Peter had experienced three acute events, each of which needed intensive medical treatment. However, he talked about the fear he felt when needing to call an ambulance.

> *PETER: 'Ya you don't want to be, you don't want to be, it's like I dread, I dread phoning the ambulance, you know I always say "oh no, I don't want to have to do this, I hope this third spray works" ... As the cardiac nurse told me, "each one Peter, has registered as a heart attack, so you've done the right thing in each case, you're not a hoaxster, like people tend to be".'*

Disruptions and delays that were experienced for various reasons were seen to cause stress and concern. Ted describes his thoughts when the ambulance took 25 minutes to reach his house.

> *TED: '(laugh) Christ! I could have been dead and buried first- ... Well (laugh) I thought I was dying (laugh), it didn't do a great deal for my peace of mind and*

heart condition, the fact that I was wondering where the hell the ambulance (laugh) had got to.'

Within a few days, this initial fear of death or further health problems seemed to dissipate. Paul laughed about being so scared on his first night home. He feared that if he went to bed that he might not wake up. This led to falling asleep in his chair.

PAUL: *'Ya once I woke up the next morning I thought might as well go to bed now (laugh). No point sitting around waiting to fall asleep in a chair, um and it hasn't worried me since (laugh).'*

After this initial short period of fear and uncertainty, the impact of longer-term alterations in circumstances had to be faced. This took place within a person's home, surrounded by their neighbourhood and community.

The remainder of this chapter discusses the concept of recovery and how place affects this process.

8.4 Dealing with change

Recovery up to six months was seen to be an on-going unique process that interacted with an individual's age, co-morbidities, and position in life course. This was used as the overarching concept in which place was assessed. Place was discussed in terms of this process, exploring how and at what point the neighbourhood had influence on recovery. This section discusses what recovery means to the person experiencing it and how this relates to some compositional level aspects.

Within the qualitative discussions, experiences from the onset of ACS until the time of the interview were discussed. A large proportion of the participants spoke about how their ACS had changed them as a person. By talking about views on, and hopes for, the future, a perspective picture of the process of recovery was formed for each person.

JEFFREY: *'Well, they say you'll be a new man afterwards, I'm not there yet, but I'm on the way to … I'm just a different man at the moment (laugh).'*

Recovery was seen to take varying periods of time. It had not been reached by all the qualitative participants. Some people did not believe that they would reach the same level of health as prior to their ACS diagnosis.

This unique process was considered in terms of how people dealt with the changes that were forced upon them by their ACS. This definition of *dealing with change* was used to look at how

place affects people's reactions, ability to cope and integration within the community during the recovery period.

The remainder of this section discusses compositional level aspects in relation to *dealing with change.* This discusses attitudes towards own recovery (section 8.4.1), effect of previous health status (section 8.4.2), older age and how this is perceived to affect *dealing with change* (section 8.4.3) and, finally, the types of coping, strategies and style used (section 8.4.4).

Throughout the remaining sections of this chapter, the three place effect concepts that emerged are discussed. These sub-concepts look at differences across neighbourhood types and how this relates to *dealing with change* and attitudes towards own recovery (sections 8.5 to 8.7). Figure 8.1 is a flowchart centred on *dealing with change* that visualises these sub-concepts and how they interrelate.

Built environment: the built aspects, such as buildings, land contours, transport system and available resources, were shown to have influence on neighbourhood usability and community formation. The built environment also had influence on personal attitudes and connection to the neighbourhood.

Available support and *belonging to a community* were seen to be most important to a person's recovery. These provided instrumental aid, companionship, emotional and perceived support.
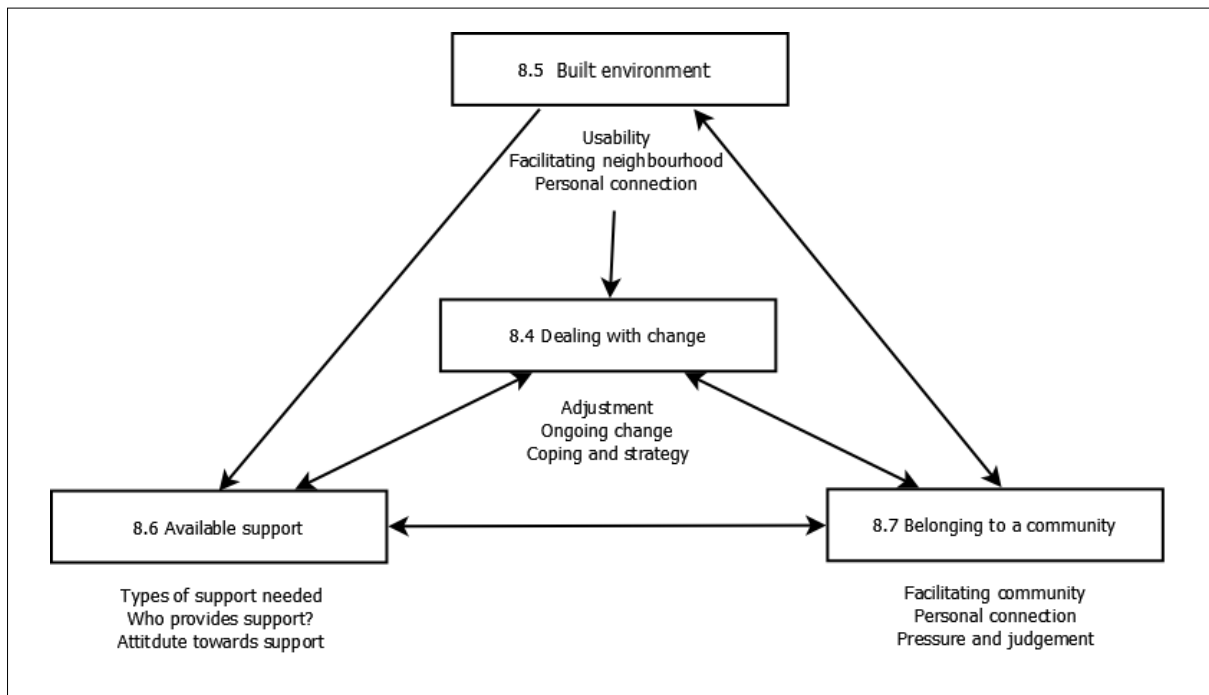
Figure 8.1: Concept relationships

8.4.1   Attitude towards dealing with change

How a person reviewed their own recovery was related to many aspects of *dealing with change.* George was aware that attitude affected actions.

> *GEORGE: 'I think the people in the environment do have an effect as much as the ... physical type of environment, um, but then I suppose it's a question also of you as a person, as how you interact with people, um, because if you, I can only say for myself, because if, if I was as miserable as sin all day then recovery would be totally different.'*

Fear of death or recurrent event was not seen as motivation or a cause of anxiety. The majority of people either did not see themselves as at risk, or did not see death as a negative event.

> *MATT: 'if I'm going to have another heart attack, well I'm 82 year old, we've been married 53 year and I suppose we've had a good marriage'*

However, fear of having to leave their homes and become dependent on other people was expressed by the majority of people. This was especially the case for people who lived in more deprived and urban neighbourhoods.

The way that people viewed their own recovery fell into three groupings. These could be described as: *enhanced health*; *incomplete recovery* (but with expectation of further improvements); and *reduced health* (recovery complete but at a lower level than previously). The way that people viewed their recovery was related strongly to prior health, ACS severity and age.

People who saw themselves as in *enhanced health* were often in good health and were positive about their future. These people were seen to want to aid their own health by making positive lifestyle changes and were happy to discuss their problems openly.

People who saw their recovery as *incomplete* were seen to have delayed treatment or had recurrent events. Relative to expectation, recovery was often expressed as taking a long time. These people often found it difficult to discuss the process of recovery so far, the problems they had had and their current health. A full recovery was often spoken about and expected to occur in the future.

People who saw their health as *reduced* were often in quite poor health and had co-morbidities. There appeared to be the belief that their health would not improve in the future. This led to the belief that there was no way in which they could aid their own recovery. The overall goal seemed to be changing lifestyle and finding ways to cope with their new level of health.

The way that a person viewed their recovery seem to influence their reaction to ACS, whether they sought or accepted help from others and their continued involvement within their community.

8.4.2 Previous health

A person's level of health prior to their ACS diagnosis seemed to be related to how they viewed their recovery. People with severe prior experience of poor health often spoke about these new health problems as just being part of life. This acceptance of reduced health tended to cause little stress and concern to be expressed towards their health.

In contrast, people who spoke about having been in good health expressed frustration and concern, owing to not understanding the origins of their ACS. There seemed to be a relation between being in good health at the time of the qualitative discussion and low severity of ACS. These people tended to associate ACS with people who were unhealthy, which led to confusion and annoyance about why they had been afflicted.

> *SIMON:* *'''I don't think you've had a heart attack" he says, he says "you're too bloody fit", he said just like that. ... now heart attack never worried me at all cause I just couldn't believe I would ever have one. Cause I played football, squash, rugby league, cricket, I played everything.'*

Within this group of people, a strong wish to improve health was articulated. This often included healthier diets and more exercise, despite many people seeing themselves as *fully recovered.*

8.4.3 Older age

The ten participants were all over the age of 65. Age was perceived by four people as affecting their health and recovery process. For these people, there was a lower expectation of mobility and ability to interact within their neighbourhood and community. Similarly to having prior health problems, seeing oneself as older seemed to normalise ill health. This reduced the stress and worry about their health that some people thought they would have experienced earlier on in their lives.

> *ENID:* *'Not that I've slowed up that I can take my time (laugh). Ya, I have slowed – but then again – I've had two birthdays haven't I, and having two birthdays it makes you feel a lot older.'*

From the ten participants, little relation was seen between a person's age and how they perceived their age.

Friends and family of similar ages, who were also in ill health, were spoken about as points of reference. These people were turned to for information and support. However, it was also often accepted that a smaller community of supportive people would be available within older age due to people passing away.

> *PETER:* '*No but you have to accept it, you look in the papers at the obituary columns every week (laugh), and you think "oh he's gone, my mate" you know, um, two score years and ten. So there's another one, it's the same.*'

8.4.4 Coping, strategies and style

This section looks at ways that people manage, lessen and adapt to the burden of ACS. There is variation present in the way that people respond to and adapt to new circumstances. The aim was to explore the meanings attached and reasons behind the actions taken. Any onset of longer-term ill health causes disruption in a person's physical self and their sense of identity. This is related to loss of confidence and lower social interactions (Charmaz, 2006).

These actions draw upon a range of resources, varying from health services to personal adaptation in order to improve personal quality of life. Three terms coined to define these actions for analytical purposes in terms of chronic illness were *coping*, *strategy* and *style* (Bury, 1991).

Coping

> Coping: the cognitive processes whereby the individual learns how to tolerate or
>
> put up with the effects of illness.   (Bury, 1991 p.460)

The process of coping is a way to maintain a sense of value and meaning in life. This may have been affected by the biological disruption and emotional turmoil caused by ACS. The nature of *coping* is affected by the views held by the participant, how this person is treated by others and levels of social interactions. The way in which a person tried to cope seemed to be strongly linked to the attitude they held on dealing with change.

Rationalisation for why ACS had happened to them was difficult for people who had been in good health prior to their ACS. These people tended to view their health as *enhanced* at the time of the qualitative discussions. However, there still seemed to be a need to regain control of their life by understanding its origin. These people had healthy lifestyles and therefore found that advice on aiding their recovery was not relevant to them. This came across as one of the main areas of frustration.
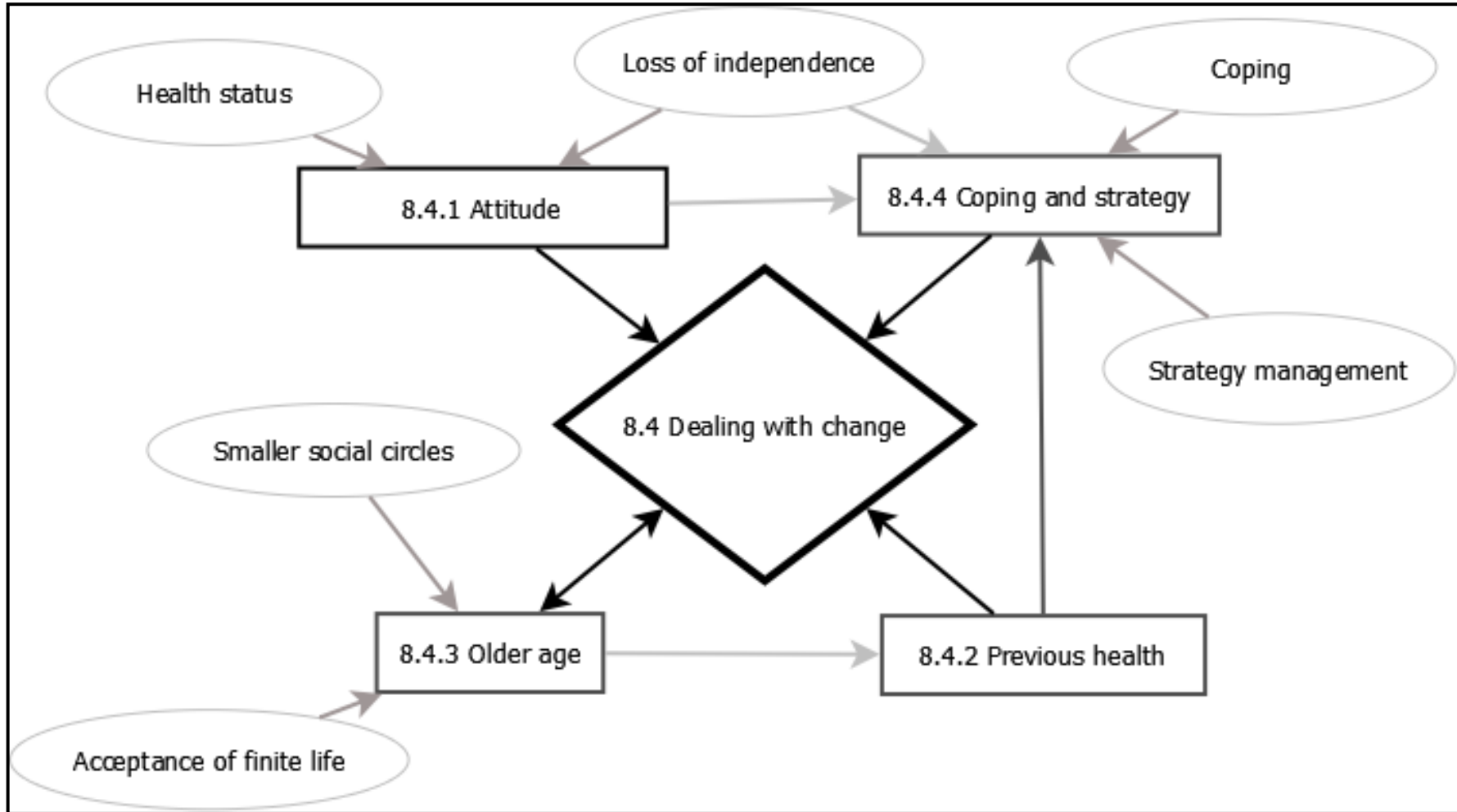
Figure 8.2: Flowchart of 'dealing with change' concepts

People who viewed their recovery as *incomplete* seemed to find it most difficult to cope emotionally with their ACS. There was a sense that they were often waiting to regain their identities once they had recovered.

> **HEATHER:** *'suddenly I've become, I don't know, semi-invalid in a way and, ... I don't like it. (Laugh) I really don't like it.'*

To cope with these feelings of loss of self and independence, it was often expressed that not complaining and looking to the future were the best ways to cope.

> **ENID:** *'(Laugh) Everybody has aches and pains and everybody has days when they feel down in the dumps, but, think positive. Um....'*

Seven of the ten people showed a wish to improve their own health. This seemed to help people think of their health problems as only temporary.

People with *incomplete* recoveries spoke about looking forward to returning to day-to-day responsibilities: for example, the shopping and cooking which they had had to allow somebody else do. Throughout the recovery process, little responsibilities that had been taken up were referred to with a sense of achievement.

> **HEATHER:** *'I'm doing the house work that I can do, so I've taken that over and, and I'm back to the cooking proper meals (laugh), you know with all the vegetables'*

People that viewed their recovery as complete, though with *reduced health* in most cases, had fewer problems coping with their ACS. The belief that they were not able to improve their health seemed to make coping easier, as they put no pressure on themselves.

Humour was often used to talk about reduced health. This occurred in the qualitative discussions and was spoken about as a way of expressing oneself to a friend or family member.

> **MATT:** *'Sense of humour, no honest, that's, you've got to have a sense of humour, it's like marriage there's no point being bloody serious all the time is it, you've got to have a good laugh now and again. ... It's taking things seriously, ya, worrying, worry, worry, worry kills people doesn't it? Worrying about this and worrying about that.'*

Strategy

Strategy: the actions taken to mobilise resources and maximise favourable outcomes.

<div align="center">(Bury, 1991, p.462)</div>

Strategies were employed to maintain day-to-day activities, social interactions and appearance from other people's points of view. In many cases, strategies were used to take advantage of resources and their settings, to help maintain previous responsibilities and lifestyles.

Similarly to how a person coped, the type of strategies employed seemed to be linked to the attitude that people held towards their own recovery, as well as the need to use strategies, and how well a person was coping emotionally.

ACS often led to people needing instrumental help from others. This involved either seeking help or consenting to be helped, which was seen as difficult by many people: for example, reduced strength meant that Heather had to let her husband carry the shopping home. This strategy was more necessary for people who lived alone or when no one in the house drove. This seemed more likely to be the case when the participant lived in an urban neighbourhood.

A strategy that was referred to by many people was 'taking their time'. By slowing down, a task could still be completed. However, this was often seen as frustrating and re-enforced a sense of self-loss.

> **PETER:** *'(laugh) nobody used to pass me on this little hill out here, now everybody passes me, and you're thinking as you're walking up, you're walking reasonably steady but no (laugh) they all, pass you, you know, you think "Oh my God" you know.'*

For people who found coping difficult or were waiting for their recovery to be complete, strategies were used to keep emotions under control. Keeping busy was mentioned as a way of achieving this. Many of the women referred to reading or knitting when they felt overwhelmed. Enid describes the importance of keeping a set routine.

> **ENID:** 'Try to have regular meal times. Because I think if you don't, if you let it slide, that's the time when things go wrong, but if you can keep a regular time that's better. ... Sometimes you don't feel hungry at that time but then you sit down and you eat anyway so, ya....'

An environment with usability and a strong social community were seen to reduce problems associated with these strategies used.

Style

> *Style: the way people respond to, and present, important features of their illnesses or treatment groups.* (Bury, 1991, p.462)

Two different approaches were seen in response to ACS that correspond with those described by Bury (1991). With the first approach, people *accommodated* their ACS into their lives. This

involved changing activities that were no longer possible and being willing to hand over responsibilities to other people. This was seen to be very difficult, as many of the day-to-day roles, activities and responsibilities had been part of people's lives for many years. Women and people who lived alone seemed more likely to accommodate their ACS than did men. This realisation that certain activities were no longer possible was expressed by many people as frustrating and something that 'got them down'.

> BONNY: *'in my body I felt why can't I do it, I can do anything, I feel fine, absolutely fine. And that's what's frustrating, it's a bit like, you can't lift (pause) or carry anything heavy when you know (pause) your arms are alright, why can't I? ... I sitting here now and I feel really bored, (laugh) um and I could do that. It irritates you.'*

The other approach was *active-denial*. This involved opposing the effect of their ACS by continuing with everyday activities. When an activity was not within a person's capacity because of their health, this could have detrimental effects. For example, Jeffrey talked about his work decorating and working behind the bar at his local theatre, despite his recent operation, and the way that his leg hurt afterwards as a result.

Strategies that were undertaken to improve day-to-day life included more exercise, better diets and reduced smoking. Six of the ten participants spoke about the increased amount of exercise they had taken since their ACS. Easy access to flat surfaces or a cheap local gym were seen as useful when trying to exercise. Three of the seven men spoke about the walking route they had devised around their local neighbourhood. Pride was expressed in each case about having increased the length and difficulty of this walk over the period of their recovery.

Every one of the participants talked about improvements to their diet to aid their own day-to-day health. This often involved eating more fish and less fattening foods. Knowledge about what would be best to eat and the prices of health food were hindrances often expressed.

Guilt was communicated when these strategies to improve health could not be undertaken. For example, Ted was concerned about not succeeding in stopping smoking. He felt that he owed it to the health services that had helped him overcome his ACS.

These contextual level influences on dealing with change have strong connections with the localities in which people live. They are discussed in the next three sections, exploring place effect on dealing with change.

8.5 Built environment

The built environment in which someone lives influences whether they can interact within it, take advantage of what it has to offer and form a community within it. The built environment includes: the buildings; resources available; built barriers (for example, land contours); and the public transport system.

In this section built environments are discussed, looking at how they influence neighbourhood interaction and dealing with change, seeking out general patterns by locality types. Figure 8.3 on page 206 maps out the sub-concepts and their relationships to the core concept. From this, we can see that the major sub-concepts relate to differences in the general neighbourhood characteristics of the built locality (section 8.5.1) and how these aspects influence usability (section 8.5.2) and community formation (section 8.5.3).

8.5.1   Characteristics of the built environment

The types of neighbourhood in which the ten people lived varied in terms of affluence, deprivation, and urban/rural differences. This section discusses these differences in the built environment and how they relate to *dealing with change*.

Some of the main differences in the characteristics of a neighbourhood stemmed from whether it was urban or rural. Living in a rural neighbourhood meant less traffic, pleasant places to walk, and peace and quiet. Community support was also seen to be high, so that it was perceived as the perfect place to recover.

> *GEORGE: 'You know, which is great, and um, so, ya so, there's a lot of this, there is a lot of this help, community wise, which you don't get in, to a certain extent urban areas um, it is, it's a different lifestyle, honestly.'*

Rural neighbourhoods also meant that distances had to be travelled; as this was expected by the people living there, this was less of an issue. However, it might have resulted in isolation if driving was not possible.

Urban environments provided good transport systems, and facilities and people close by. Variations in these localities were high both within each neighbourhood, and between the different places in which people lived. People living in very urban localities tended to be very optimistic about their own recovery, even if their health issues are severe.

Access to local health services was similar for everyone spoken to, with access to NHS services that are not dependent on where the patient lives. The hospital of admission and the quality of the services did vary. Those who lived in more affluent localities reported having services such

as rehabilitations courses and acupuncture, which were not offered to some of the people living within other localities.

The quality of other resources locally was considered as influencing participants' ACS health problems. Most people had lived in the area for many years and therefore were familiar with what was available. Similarly, the quality of the buildings and general neighbourhood was familiar to the people living there and therefore had little influence on change in health.

With long residences, often spanning many years, the built aspects of the locality did not always reflect personal circumstances in terms of socio-economic status or the lives that they had lived there. Many neighbourhoods had lowered in deprivation level, often being perceived as less interactive communities. Sense of belonging to their neighbourhood, seen to provide feelings of comfort and support, were expressed to have been influenced by built aspects of the neighbourhood changing over time. This was often resented, especially during this period, when access was lower.

For example, Bonny lived in a small urban area that had one central street, giving the neighbourhood a central point. Regret and resentment were expressed at having seen small shops closing down, changing the dynamic of the neighbourhood.

> BONNY: *'There's five charity shops! (pause) and there's so many banks! Building societies, travel agents, and the odd shop but they all seem to be closing, card shop that we had, we had this lovely card shop that's just closed down, the um….'*

8.5.2   Facilitating usability of environment

Within the questionnaire study, the importance of environment usability was developed. This was built around both access to the environment, and what affects willingness and ability to use it. Being able to get out and interact in the neighbourhood environment was expressed as important. Especially for women, as their reliance on social support was higher than for men, not being able to use their neighbourhood could be very isolating. Many people spoken about reduced mobility and inability to use their neighbourhood as being the main difficulty of their health problems, creating segregation, dependence and loss of confidence.

> JEFFREY: *'what you read in some of the books, you go through a range of emotions, ups and downs and err, I still get those, but not as often, I get them really about this leg, I keep thinking is it ever going to heal up?'*

Access, barriers and the wish to use the neighbourhood emerged as factors affecting usability. It was seen that, similarly to the discussion of different distances within urban and rural neighbourhoods in section 8.5.1, usability of environment was relative to expectations.

> GEORGE: *'remoteness is relative I suppose, it's accessible even though it might not be ... on a main route.'*

At the other extreme was Enid, living in a city centre very close to a number of different shops and resources, but unable to leave the house without help. The street which she saw out of her window became her neighbourhood. Her health problems meant that, for her, the local neighbourhood was not usable.

> ENID: *I don't get down to the local shops, - I used to do, to the greengrocers, not in the other one. Um....'*

Living within a more urban environment led to the expectation that access would be easier. Pearce *et al.,* (2006) show that access to resources is easer in urban areas. For participants who experienced reduced mobility and were not able to drive, even getting to the shops became difficult. This affected overall mood, creating feelings of being incapable, which led to frustration and lack of confidence.

> TED: *'But I couldn't walk from here to Morrison's (just down the road) ... err, and it was ridiculous, I tried one day and went to Morrison's, and I'd have a taxi back and that was a laugh'*

In less urban environments, mobility and access to resources were always more difficult. Adding health issues only increased an existing difficulty, which had less effect on emotional state.

The usability of the transport system greatly influenced level of access to neighbourhoods and social relationships. Being able to drive, or having a partner who drove, reduced reliance on the neighbourhood; however, traffic was an issue, especially with the great increase in number of cars in recent years.

The period of four weeks after being in hospital in which driving was forbidden caused difficulties in some cases. If the usual form of transport was by car, public transport or walking were not considered as alternative ways to travel. This resulted in reliance on other people and, for those who lived alone, perhaps staying with close friends and family for a number of weeks.

> PETER: *'Well it was an issue initially, if I wanted to go in the first fortnight um because I didn't want walk, I wasn't walking up but otherwise no I went in the car, but you see I had to wait four weeks before I took the car.'*

No long-term changes in the type of transportation used were seen; this is consistent with the questionnaire study results in section 7.3.3.

Reduced personal mobility was one of the greatest problems, especially for those who did not drive, greatly influenced by environment usability. Increased effort and thought had to go into

using the locality, and planning routes walked and time taken. For example, Bonny would have walked into town, but she now gets out of breath easily. She does not go out as much and has to plan when the bus leaves.

> *BONNY: 'Ya, well I do, I do leave it, I just walk to the bus stop, catch the bus to town, but I don't go out very much like that now because, I have to keep stopping, I can't walk very far so ….'*

Reduced mobility highlighted the influences that hills had on neighbourhood usability. People who lived in very hilly neighbourhoods or at the top of a hill would be aware that they would struggle to walk up them. Hills even affected people who drove; Peter expressed that he now needed to drive to a flat area in order to walk the dog.

> *PETER: 'Well just up the road down, there's a big hotel called Holiday Inn now and err, big playing field at the side and its flat, and that's lovely for me cause I just walk round you know, without stopping.'*

The difficulties of hills were expressed by everyone, both in terms of access, exercise and a deterrent to going out.

Increased use of buses to help with reduced mobility was discussed by four of the ten people, especially when there were many hills locally. Those who lived at the top or bottom of a hill often increased their use of bus transport, taking a bus to go up the hill, while walking down. The regularity of the bus, train and coach services, and the closeness of the stop to their house, influenced how willing people were to use them.

Health problems also changed neighbourhood usability of places to walk and undertaking hobbies. Two people referred to access to flat land as motivating, when considering increasing exercise.

> *GEORGE: 'it's very easy to put a pair of boots on and walk up the road and, you know, you're not walking in traffic, you're not walking in lots of people, and um, and, um I found it good.'*

Rural localities tended to have very limited public transport. If mobility problems removed the ability to drive, isolation would be greater. This was often easier in more urban localities, although, within more deprived neighbourhoods, train stations and bus stops were indicated as places where 'youths' were, which may have influenced willingness to use them.

The financial cost of using public transport and local facilities was a hindrance to usability, especially for people of low wealth. This was discussed by people living in more urban neighbourhoods, often of higher deprivation levels. Gyms were mentioned by two people as being expensive. Both decided to pay, believing that it would benefit their health.

Having access to medical facilities was also seen as important – a topic not brought forward within the questionnaire study. Difficulties in usability of the doctor's surgery were expressed, specifically in relation to seeing own GP. This would often involve multiple phone calls and waiting for an appointment. If an appointment could be made, getting to the surgery was often troublesome. Sometimes participants would have to travel long distances and would not always feel that it was worth it.

Gaining an appointment with the GP was difficult at times, especially within more urban neighbourhoods where doctors were busy. Five of the ten people discussed their strong frustration at not being able to see their doctor without a great deal of effort. Peter explained in detail that to see his GP would mean waiting on the phone for almost an hour in the morning, often finding that he could not get an appointment for up to three weeks.

> **PETER:** *'So ya, he's probably got a big clientele, cause they build it up, I don't know if they just share them out, and um, and um, but it is. Everybody complains about the system, cause it must be people who are, who perhaps haven't a phone. There'll have to go to, well I suppose they are not many people nowadays, but if people can't get up there, to book.'*

A greater wish was expressed to use a neighbourhood if personal connection to the locality was strong, feeling that it was a communal area where they could socialise and feel at home.

Environment usability was not clearly linked to deprivation or affluence level: greatest importance was placed on land contours, personal connection to neighbourhood and population density.

8.5.3   Personal connection to the built neighbourhood

Personal connection to the neighbourhood gave a sense of belonging, improved feelings of independence and motivated a sense of usability. During community mapping, three of the four people expressed the advantages of their neighbourhood as a place in which to recover.

> **JEFFREY:** *'council estate and I think, if I lived in a place like that ... it would be entirely different to where I am now, um, cause it's, it's pretty quiet where I live, there's nothing, no noise or nuisance, to er worry about, er, so it's, it's quite a good place, I'm quite happy with it there.'*

There was no connection expressed between deprivation levels, level of resources or affluence of the neighbourhood, and people's perception of the place. A personal connection was more important to them than the attributes themselves.
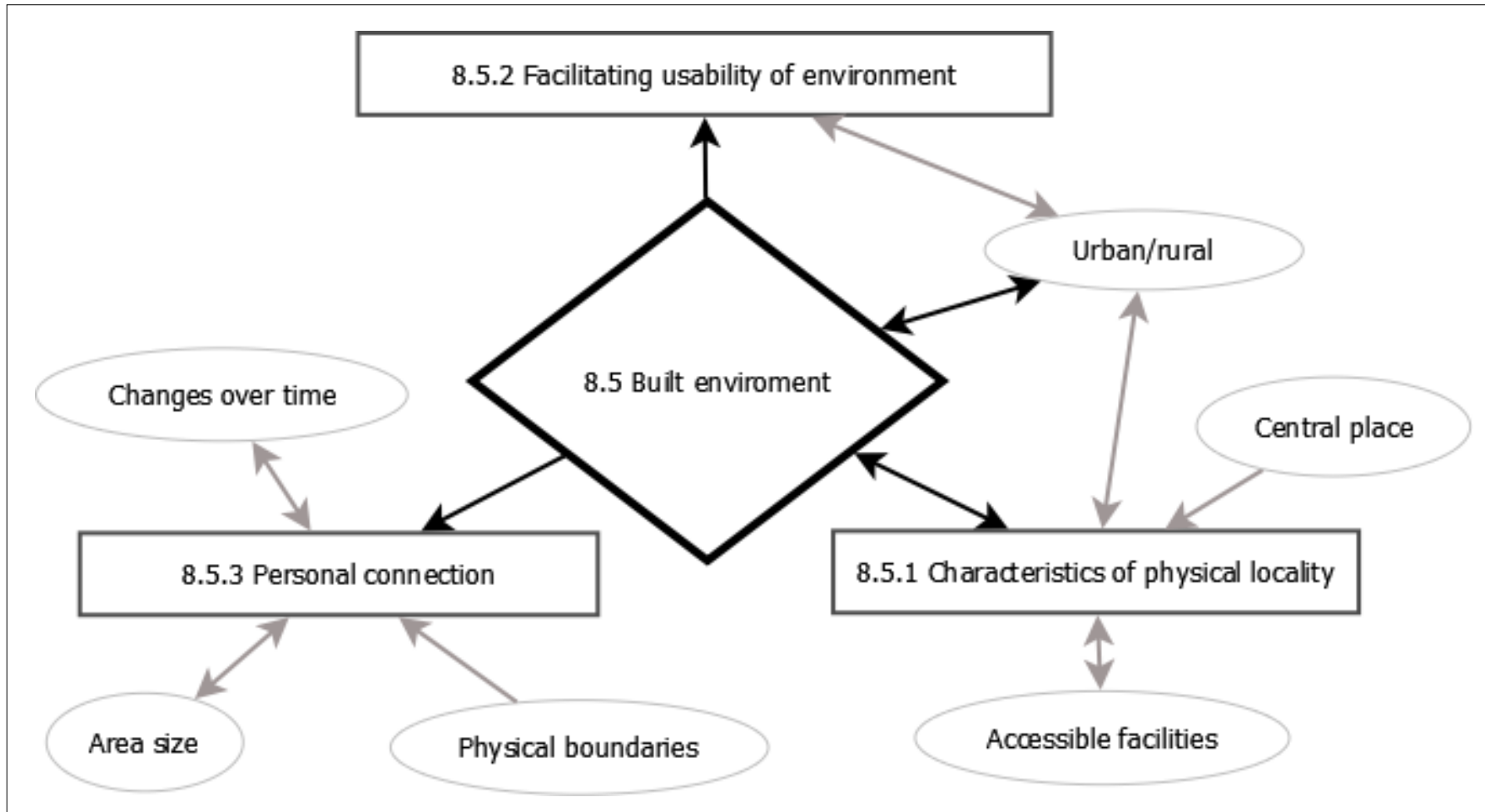
Figure 8.3: Flowchart of 'built environment' concept

This sense of connection to the built neighbourhood was motivating towards increased personal health levels. Ted gave a heartfelt example of wishing to be able to go out more, having walked up to his local fish and chip shop every Saturday since his children were young.

> *TED:* 'and I still have fish and chips on a Saturday lunch time, and I couldn't walk up to [fish and chip shop] *so I should that I used to have to take my car up to get my fish and chips. Now you know, I can walk up, it's absolutely marvellous for me.*'

A general trend existed in the boundaries of the neighbourhood to which a personal connection was formed. People who lived in areas that were classified as higher deprivation locations did not relate to the area directly close to their house. Instead, they often related to a nearby neighbourhood that was less deprived. Further exploration would be needed to confirm this theory.

The size of the neighbourhood with which a personal connection was formed varied depending on the usability of the environment, mobility levels and whether it was urban or rural. People living in rural locations formed connections across the whole locality; this may have been due to the expectation and willingness to travel further. In larger towns and sub-urban localities, personal connections were made closer to home, usually within a few streets of the house. Within more deprived urban locations, personal connection was formed to a central point within a more pleasant local town.

Personal connection to neighbourhood formed over time; longer residence resulted in memories and personal experiences within the neighbourhood, often with close friendships formed locally which participants would prefer not to leave. Personal connection was expressed more strongly in small urban neighbourhoods, especially when deprivation levels were high. Bonny made references to her street being deprived, but expressed that she should never leave; this was her home.

Built features also influenced both personal attachment and usability of neighbourhood. For example, a neighbourhood that had a central point to socialise encouraged interactions within that neighbourhood, rather than elsewhere.

Built barriers that existed also restricted the boundaries of the area for personal attachment. For example, a main road that was difficult to cross could decrease usability and personal attachment to the locality beyond this road. Hills became a barrier with increased mobility problems, reducing the neighbourhood to which people felt they belonged.

Restricted access also changed the boundaries of the neighbourhood to which connection was formed. For example, Bonny describes her neighbourhood in relation to the bus route near her

house, talking about looking forward to a new route just starting, as this would widen her neighbourhood.

The built environment influences the way that people use and interact within it, as well as personal connection to it. Built access barriers such as hills can cause problems for people with reduced mobility. Personal connection to a neighbourhood improved emotional well-being. This did not show a clear link between usability of the environment and deprivation or urban/rural differences.

With each locality having its own advantages and weaknesses relative to the problems the person is experiencing, the next two sections discuss other aspects of neighbourhood that influence dealing with change.

8.6 Available support

ACS was seen to be the cause of reduced environment usability, higher fatigue, reduced mobility and the need for emotional support. Having support available was perceived to reduce stress and make it easier to deal with change. Sources of support were the people within the community, and close circles of friends and family. Other providers of support were health services and charities.

Personal willingness to seek and accept help was seen to be one of the main barriers. A strong relationship with the person increased the likelihood of seeking and accepting help. This was also increased by self-confidence and a sense of belonging to the neighbourhood. These findings were consistent with those presented by Wellman and Wortley (1990).

This section discusses the available support, the type of people who provide it (section 8.6.1), the resources that provide it (section 8.6.2) and attitude towards support being provided (section 8.6.3). Figure 8.4 on page 213 displays the build-up of this concept.

8.6.1 Types of support

The three types of support most spoken about were *instrumental aid*, *emotional support,* and *information.* This corresponds with House's (1981) suggested categories of support. These included transaction of emotional concern, instrumental aid (goods and services), informational aid, and appraisal (information relevant to self-evaluation).

Support received seemed to come mainly from people who lived close by. The people spoken about who provided much of the support had been known for many years. These were often close friends or family.

Instrumental aid was any form of tangible help. Instrumental aid was mostly used to complete chores around the house, and provide access to the neighbourhood and community when needed. For example, Bonny express her gratitude many times to her brother-in-law who drove her to the local supermarket, which enabled her to buy food.

Instrumental aid was also useful to assist continuation of hobbies and activities. This aid was praised and mentioned more often than potentially more necessary support. This was most often from people who found environment usability difficult. This aid was provided by people who were connected via these activities. The appreciation may stem from a link to a previously held identity of self. It also provided the opportunity for companionship. For example, Peter expressed gratitude towards his friends who helped him to set up his fishing trolley, stating that without his friends he would not be able to go fishing.

Emotional support was to provide comfort and remove feelings of depression and despair. This was provided by the companionship of friends and family, perceptions of being supported and by strategies for coping. Having access to instrumental aid also gave a sense that people were there to help if it was needed. This was seen to be emotionally supportive.

> **HEATHER:** ' And cakes, and oh, it's, they've been absolutely fantastic, absolutely, I didn't realise that, you know we ... well we were so well thought of to be honest, it made me feel quite humble really, you start to think, well I'm not such a good friend I don't. But anyway I must have done something right, somehow.'

Information about diagnosis, treatment, and recovery were needed. This came from health services, or friends in similar situations. Informational aid helped people to feel less overwhelmed and confused about their situation. However, the information received was seen to be insufficient by the majority of the participants. Even after speaking to the doctor and attending rehabilitation courses, a lack of knowledge was felt. Information in written form was seen as more useful.

> **HEATHER:** 'I think, ya, they did say that um, I mean I don't really know, when I've had my last treatment where we go from there, doctors are terribly cagey you know you ask them a question you never really get a straight answer, it's sort of go around in circles and when you're finished and they walk away and you think well, what was all that about?'

Frustration and de-motivation were expressed at the difficulty of obtaining adequately understandable information that was personally relevant.

> **GEORGE:** 'You get so many, so much bumph about what you should and shouldn't eat and, what's good for you, what isn't, but that varies what who's writing it and what time of year, cause I mean er, eggs are now good for you.'

It was believed that a greater understanding of ACS, the process of recovery and treatments would reduce anxiety.

In some cases, this frustration led to people seeking advice from other people in similar situations. Seven of the ten people made reference to relying on their own general common sense and prior knowledge instead of health services.

> **BONNY:** *'Yer I think I've probably used my own common sense and, general knowledge ....'*

8.6.2   Who provides support?

Who provided support depended on a number of factors: the type of support needed, the willingness of the person to seek and accept the support, how close the source of support lived to the participant and the closeness of the relationship held with the participant.

Support was provided by people within the neighbourhood, such as friends, neighbours and acquaintances. This *social community* was formed of people who did not have strong relationships with the participant. People with whom there was a strong relationship present, such as *close friends and family* made up another area of support. The other source of support was from *health services*, such as the local GP, the nurses who conducted follow-up appointments, and rehabilitation courses. This section discusses the different sources of support and what type of support they provide.

Different levels of appreciation towards support were expressed. Support from close friends and family was appreciated; however, when this support was available, it was seen to be almost expected. In contrast, any form of support from a person's social community, accepted or not, was greatly appreciated. Support provided by health services was greatly valued if it was of benefit.

Appreciation for support from different people seemed to vary depending on its availability and how necessary it was. For example, the value of support from the social community increased the further along the recovery period. However, having support available from the social community was perceived to reduce over time.

8.6.2.1   Social community support

The social community provided some instrumental aid, although was most useful in providing perceived support. Knowing that people were there and willing to be supportive if needed came across as more important than any actual help provided.

> *GEORGE:* 'I think because it's a very sort of friendly envi, because it's sort of a friendly environment, um, I think that's makes it, that aids recovery in a funny way as well, um (...)'

Social community was highly valued, with people expressing the wish to maintain and even expand it. Appreciation of 'get well' cards and people expressing concern was mentioned many times. However, very few people accepted or sought guidance or help from their social community, above what they usually would have accepted or sought.

Three people said that concern and offers of help had reduced over the time period since being in hospital. Earlier on, they were often overwhelmed, feeling that they had too much support. As time went on, when companionship and concern would have been more useful, it was more difficult to come by.

The importance of social community to dealing with change was reasonably consistent, with everyone expressing that they had support available. Women were seen to turn to their social community for emotional support much more readily than men.

Availability depended on involvement within the community and the usability of the environment, specifically, the advantages of having a central point or street at which people could meet and socialise. Urban/rural differences also changed the dynamic of the community formed. Within more rural neighbourhoods, social communities were spread out, covering the entire neighbourhood; this was also seen within some of the mixed neighbourhoods. More urban social communities were restricted to a few streets. These streets were close to where the person lived within less deprived places, although were often away from the person's house and within a pleasanter locality when place of residence was in a more deprived location.

8.6.2.2   Close friends and family

Close friends and family, especially those that reside within the neighbourhood, were the primary source of instrumental aid, especially for men. These relationships were often built up over many years, creating trust and a mutual flow of support.

The neighbourhood, with support available from trusted people, gave a sense of connection to participants' lives. Paul describes how his friends who lived close by had become more like a family that he could rely on, especially since his wife had passed away. Matt talked about the importance of his family being close by, as he could still feel part of the family by reminiscing about old times with them.

Much instrumental aid was provided by close friends and family: help with shopping, transport, the garden and providing someone to talk to. This facilitated day-to-day life, enabling coping.

Close friends and family were also often involved in the choice to undertake positive strategies to improve health.

If the relationship was very strong, often between married couples, then some men expressed that they would prefer not to worry their partner with emotional problems. Often they would either not talk to anyone, or would discuss problems with someone in a similar situation.

The number of close friends and family tended to decrease in older age, due to migration and deaths. These relationships had often been formed over long periods of time, based on a mutual interest such as work or school. People with high chronological age found it difficult to make new close friends, often feeling that they were too old to interact locally. Ted talked about a friend in this situation.

> *TED: 'he knew everybody, moved down to Meadow Head and came up with a sudden reluctance to be particularly friendly with people, anyway he was 94 when he died and he was absolutely miserable.'*

When close friends and family lived far away, increased health problems resulted in less connection and support. This worked in both directions: three of the people interviewed spoke about having to reduce or relinquish responsibilities towards other people. This was the cause of a great deal of anxiety and guilt, increasing the feeling of frailty and inadequacy.

> *ENID: 'No, er my husband had to be taken into respite cause, (heavy sigh) <I'd looked after him for 23 years>, and er they <just had to take him away>. And that was it! They said I couldn't do it anymore.'*

Availability of close friends and family was expressed as important, especially when they were close by. They provided the essential support to manage day-to-day. Differences in formation of both social community, and close friends and family, are discussed in section 8.7.

Length of history in the neighbourhood increased the strength of relationships formed, but also a greater appearance of loss when circles decreased was perceived. Involvement within the community created the opportunity to form these relationships, though a neighbourhood with a strong history in industry seemed to reduce the ability to form new connections.

8.6.2.3 Health services and resources

Heath services provided treatment, guidance, and general help with recovery. This was useful for instrumental aid and emotional reassurance. Everyone within the study had some experience with health services. General satisfaction was expressed towards these services.
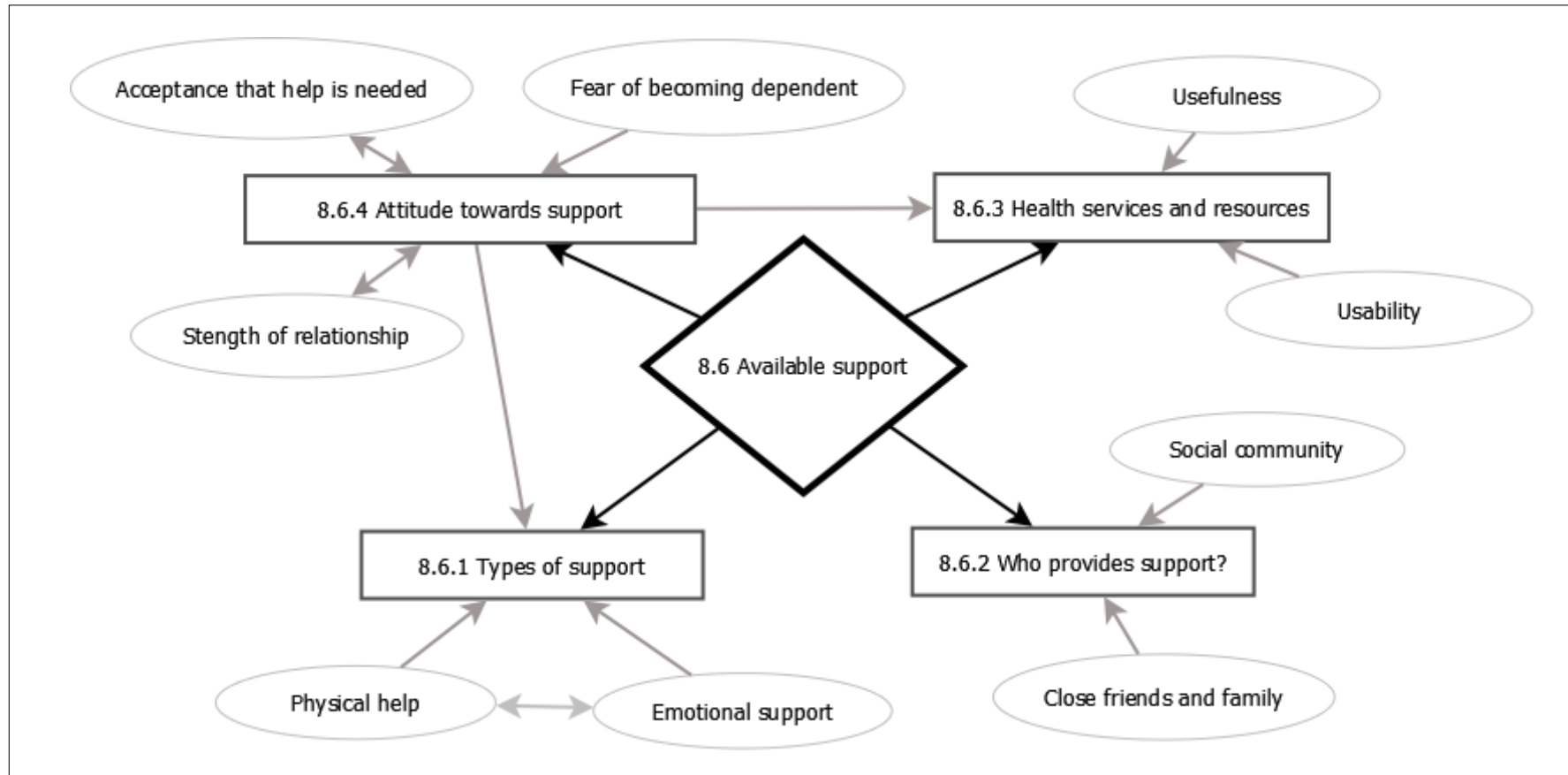
Figure 8.4: Flowchart of 'help from others' concept

After leaving hospital, the talked-about forms of support provided by health services were: rehabilitation courses; follow-up appointments with a nurse; and access to the local doctors. Whether health services were used was affected by the usability of the environment and the ability to access these resources, knowledge of the existence of such services and personal attitude towards their usefulness.

Attendance at a rehabilitation course was suggested to eight of the ten participants by health professionals. Rehabilitation courses were seen by the three out of ten participants who attended to provide information, and encourage healthier eating and exercise. This was similar to the findings of previous studies that stated that 30-60% of people do not undertake rehabilitation (Herber *et al.,* 2012). These three people all expressed how immensely useful it had been.

> **TED:** *'That was in Airedale, but er, when I went I was on two sticks, and when I came out, you know these beep tests that they do? They had me on the beep test on 900 yards'*

Two of these three people viewed their health as *enhanced* at the time of the qualitative discussion and the other expected to recover in future. No discernible patterns in neighbourhood characteristics or age were seen. George and Simon had both been in good health prior to their ACS. Ted saw his son-in-law as the reason he attended and that the course had greatly improved his health. He said that the son-in-law had not given him a choice about his attendance.

Four participants who had not attended a rehabilitation course at the time of the qualitative discussion talked about waiting for further treatment before attending. In each case, further treatment was necessary. The majority of these people viewed their recovery as *incomplete*. The four people had co-morbidities that reduced their health further, were between 72 and 82 years old, and each lived within a more urban neighbourhood of low to middle deprivation.

Bonny was offered rehabilitation, but did not plan on attending, as she did not believe that it would be of benefit. This may be due to her strong knowledge base as a nurse.

Paul and Enid were not told about a potential rehabilitation course. It is not clear why they were not offered this resource. When the idea was introduced, Paul saw that it might have been beneficial to attend. Enid talked about her co-morbidities making it impossible for her attend, as it was difficult to leave the house. Paul and Enid were widowed and lived in urban neighbourhoods of middle and high deprivation.

Another form of support from health services often spoken about were check-up appointments with cardiac nurses, which took place a few times over the course of the recovery process. Eight of the participants valued these appointments as an opportunity to ask questions and check their health levels.

However, Bonny and Ted felt that the check-ups were a waste of time and could not see the benefit of them. They were especially annoyed at the feeling that appointments were standard procedures used for everyone in same situation.

> TED: 'probably a directive come from up higher, the ministry of health, that people who have had a heart attack have to be reviewed after six months, so er, you know I think it was, it was the obligatory thing, and that get me ticked off, I've had a review after six months er, and that was it, so the surgery will get another few thousand in fees for their back pockets to be lined.'

Bonny and Ted lived in urban-based neighbourhoods of middle to high levels of deprivation. Usage of resources was based on environment usability and whether the resource was viewed as helpful. The next section discusses these attitudes and how they relate to place.

8.6.3   Attitude towards support being provided

It was expressed that seeking or accepting help from people, especially those for whom there was not a strong relationship present, could be difficult. This reluctance was the main obstacle to gaining help and influenced who provides what type of support.

A stronger or more intimate relationship resulted in a flow of mutual support between close friends and family. If this exchange of support was established prior to health problems, it would be more likely to be relied upon. Social communities were less likely to be turned to for help, participants not wanting to be 'a burden' or seen as incapable in front of other people.

> HEATHER: 'No I don't think so, um, I mean I've been very lucky with having Alan here, I mean there are some people who are totally on their own and have to rely on friends and family and it must be terrible, but he's been absolutely fantastic and er, he still can't cook but um, he's very good at Tesco's fish pie.'

Help and advice was expressed as being easier to accept from those within this inner circle of close friends and family. Ted attributes his success in rehabilitation to his son-in-law, the physician who had pushed him to become healthier.

> TED: 'was there shouting out instructions and things, and of course he called me Gramps, my granddaughter calls me gramps, there's this music, keep going keep going, get your knees up Gramps (laugh).'

The influence of strength of relationship extended to within the health services. As participants had experienced and heard of other people's issues, doctors were not naturally trusted. The general trend was that people were only willing to see their own GP. Since they had often built up a relationship over many years, it was felt that only their doctor would know the best course of action. Even when aware that, if willing to see another, just as well-qualified doctor, the wait would up to a month shorter, six of the ten people were willing to wait.

> **TED:** *'So I say, you know, "Are you telling me I've got two doctors who look after me and one's away for a month and the other I can't see until the 12th of June? Christ I could be dead before then'"', so they said "oh well there are plenty of other doctors", so I said "oh well, I'll think about it" … because actually I know Peter Whitehead and Natalie, and I can sit and chat to them, and they know me.'*

Without a relationship present with the doctor, concern was expressed about their abilities; this worry led to delays and sometimes a reluctance to seek help from health services.

> **PETER:** *'I know, no, no they're not to be trusted you know, sometimes the um my friend pointed out to me the er prescip, you've got to watch your prescriptions. The, you know they can get them wrong.'*

The exception to this was a disposition to automatically trust specialists, whereas GPs and nurses had to build up trust over time.

> **PAUL:** *'That's what I thought. Ya so, I think I'd need to speak to the, the surgeon, what do call him, to find out exactly what would happen, rather than the GP or whatever.'*

When seeking or accepting any form of support, there was an acceptance that they were no longer capable themselves. This was difficult, even if the health problems were only temporary. Differences in attitude were associated with the attitude towards their own health. People who saw their recoveries as complete with *reduced health* were also more willing to accept support. Those who saw their recovery as *incomplete* tended to struggle on, especially men of low socio-economic status, even if this resulted in further harm. Peter acknowledged this flaw, believing that not accepting or seeing help had caused further acute events.

> **PETER:** *'That, that, that, that actually I think was self-inflicted, I mean I, I, I, I cannot not do things, I've got to doing some, I've always got to be active, well you know I was always active and er, I suddenly decided one day to do things too much you know.'*

Self-identity was also challenged when having to hand over responsibilities; traditional roles held for many years changed hands, both at home and within the community. For example, Bonny found it difficult to let her husband do the washing, which she had always done.

> *BONNY: 'Well can't you do it now, and because I can't do it, and that's more irritating, whereas if I say I'll do that in a minute, I'll go and do it, but because I couldn't. Irritating.'*

Seeking and acceptance of help was especially important for participants who were widowed or in isolation.

> *TED: 'Yes, well I had no choice Liz, you know like I couldn't walk and I couldn't drive so I was stuck in this chair, so I was grateful for any help I could get.'*

Reasons for finding it difficult to accept or seek help were often emotionally based, with fear of dependency and loss of personal identity being especially influential.

Being reluctant to seek or accept help was expressed by everyone, although it was more of a problem for those with much lower health and/or without strong friends and family who would force the help upon them. This attitude stemmed from a wish to remain as capable as they were before. Participants accepted that new challenges were difficult, as challenges made them question who they were on a personal level. The surrounding community also had a strong influence on this attitude, affecting the amount of support that was received (discussed in the next section 8.7). This stemmed from having been involved within the community before and not wanting to be seen as a less capable or different person from those around them.

8.7 Belonging to a community

The people within a neighbourhood were seen as extremely important for both instrumental aid and emotional support. Creating a personal connection to the community is based there. The level of support available is strongly linked with the community to which people belong, increasing access to support. Being part of a community created a 'sense of belonging', which provided a level of support above and beyond instrumental aid and emotional support.

When discussing available support, seven people took the time to go into detail about their neighbours and the type of support they could provide, explaining that they would rarely, if ever, accept or seek this help. The support itself came from feeling that they could turn to people, that they were surrounded by people they knew and who cared about their well-being. From this came a sense of reassurance and support that was readily accepted and appreciated, without feeling guilt or a sense of loss of identity.

> *BONNY: 'but if I was on my own I would have all sorts of help from everybody if I needed it. I still would if I needed it now.'*

Belonging to a community and feeling a sense of belonging towards it was influenced by many aspects of the neighbourhood and the attitude of the person. A long residence, involvement

locally, having family ties within the locality and having made the effort to get to know people were some of the main influences discussed in section 8.7.1. The format of the neighbourhood in terms of size and facilitation of socialising also affected interaction within it.

How personal connection to the community creates a sense of belonging and the resulting support are discussed in section 8.7.2. Finally, the different types of actual and perceived pressure on the person to recovery are discussed, often formed due to being part of the community and feeling connected and judged by it (section 8.7.3).

8.7.1 Facilitating community

The geographical space in which people reside had influence on the meaning of place for the people within it and the sense of belonging to the neighbourhood and community. These interconnections stemmed from usability of the environment and the length of history locally, including length of residence and family connections to the neighbourhood.

Formation of a community within the neighbourhood was influenced by the built structure and available transport system. This was especially helped by having a central facility, such as a set of benches or a street with shops or an organisation with easy access, that was expressed as encouraging socialising and interaction by six out of the ten people interviewed. Heather talked about how there was nowhere to meet with others close by, and that she had to travel to other places to meet up with friends.

Locality sizes influenced how spread out personal communities were. For example, social communities within villages and small towns were across entire neighbourhoods, including a diverse group of people. Communities within restricted smaller boundaries were formed within larger neighbourhoods, such as towns and cities. These were often based within a few streets where most of participants' close friends and families lived. Gratitude was expressed at having these people close by. Although technically the close friends and family do not have to live close by to provide support, closer proximity does increase frequency and amount of contact (Wellman, 1996).

> HEATHER: *'I have had to cope with recovery yes, I told my son when he said he wanted to come over from Australia, don't come I said I am fine, it's not life threatening, he said "you've had a heart attack" (laugh)'*

Four people referred to close friends and family who lived outside their neighbourhood, often children who had moved abroad, and talked about the loss of connection and support experienced. Despite more regular contact being made during this recovery period, both in person and by phone, support was mainly sought and received from those who lived much

closer. Participants often felt that it was too much trouble for people to travel long distances, even if they offered. This implied that distance can create a rift in personal connections between people.

The presence of a strong social community was increased by close proximity and similar circumstances. Living in the same building with other older people, especial others with health problems, facilitated forming friendships and mutually supportive relationships with other people.

> *TED: 'So I have some good neighbours, would you believe there's 12 of us in this little square and there's only two of them younger than me, talk about age concern, help the aged, we all stagger around helping each other (laugh).'*

Similarities in hobbies and activities, together within the close proximity, created a supportive environment. An extreme example of this was seen in Paul's boating community, where he lived on a barge. His community also lived on narrow boats, having moored in the same place for over 25 years. The private clubhouse had the advantage of being close by and only attended by other people who were also interested in barges. He said that these people had become his family and spoke about how much they had helped him without needing to be asked.

This was in contrast to the findings of Wellman and Wortley (1990) that similarities in circumstances and personal characteristics do not increase social support. Heterogeneity in the age of neighbours was expressed as an advantage by two people, with younger people being willing and able to help. Both Heather and Peter lived in reasonably pleasant locations and had been highly involved with their community prior to their ACS, but were less able to take part at the present time.

> *PETER: 'the eldest probably now, ya it's funny when you open as youngest with a young family, and the old codger is you (laugh), you know everybody, they've put my dustbins out for me you know, and take them in you know, ever so good ya. Um....'*

Having stability in the resources available and the people running them also encouraged a strong social community. Three of the ten people mentioned that shops and pubs changing hands regularly reduced their personal connection to these amenities and the neighbourhood in general.

> *SIMON: 'if it were cheap beer we could come but it's not cheap beer, but er, ya we used to go, ya we used to go, that changes hand a lot as well, you never get a, a constant going where they say, you know, 'Hello Jo' and all that sort of thing you know.'*

Communities formed around mutual interests and convenient ways of intermingling. Perceptions of community support were high for the majority of people spoken to. Perceived differences did not seem to relate to the deprivation level of the neighbourhood, but the connection was made rather with the built structure, population density, and size of the community. This is a similar conclusion as that formed from the questionnaire analysis.

8.7.1.1 Activities and social interactions

Communities formed away from home and the general community of friends were most often developed through similar interests. Clubs, organisations, and similarities in interests often formed separate communities.

> *HEATHER: 'Most of them are, you know, my friends from the choir and my WI friends and um, you know friends over the years so yes they are fairly locally, and offers to take us here there and everywhere.'*

This kind of activity, and the people that participants knew through it, provided a connection to their previous lives and support from people they knew. Bonny talked about having worked in a charity shop for many years, making her feel part of the community and keeping her in touch with many people she knew.

> *BONNY: 'Er now where I work at St. Gemma's, the girl, the manager comes from Skipton, and the assistant manager comes from Guisley, and I, I've been there like 14 years, since I retired and um, when I first went there they kept saying "everybody knows you"... Ya, I said I do know everybody and everybody knows me (laugh). But I do, I wouldn't go anywhere else.'*

ACS health problems often resulted in lower levels of involvement; Bonny spoke about not seeing people as much as before when she reduced her hours at the charity shop. Over a long period of time this can lead to a feeling of isolation and reduce the size of the social community available.

> *ENID: 'I haven't been able to go ... and mix with people or be out. Been 23 years I've hhh been looking after my husband so it's a long time, you lose contact with a lot of people.'*

Community involvement, both locally and with local organisations, should be encouraged, especially for those whose available support is limited or far away, or when treatment and recovery is prolonged. The importance of having a personal connection to the community is discussed within the next section.

8.7.2 Personal connection to the community

A sense of belonging both to the built neighbourhood and the community provided a perception of support. Feeling comfortable at home, where people cared about their well-being, was emotionally supportive for participants, reducing anxiety. All ten people spoken to expressed the importance of personal connection to their neighbourhood and community. They often believed that their location was superior to other neighbourhoods, providing a feeling of luck and appreciation for what they have around them.

> *GEORGE: 'Um and we got so many offers of help when I was ill, um I think I ended up with about (car passing), FROM THE area think I ended up with about, well over 30 get well cards. You know which is, which is really nice, um, and er....'*

Being known by the people close by and knowing them, even briefly, gave this feeling of connection and belonging.

> *TED: 'I suppose knowing everybody, Yes, yes, and as I say I love* [town name]*, it's super, and knowing it, and being known is great as well, it appeals to me no end.'*

> *JEFFREY: 'Yer, yer rely on people, and people who are concerned about you so.'*

Having health problems and reduced mobility often resulted in people having to, at least temporarily, relinquish involvement with their communities: for example, being in the choir or going fishing. These had formed their communities and made up part of their personal identity. Thinking about returning to these activities was motivating during the recovery process, providing goals and hope for the future.

> *HEATHER: '...so I shall be back at choir and back at WI, um, and you know other various things that we....'*

Wishing to maintain involvement and connection to neighbourhood and community extends into the desire to remain within the locality itself. Three people talked about having been given the opportunity to be supported by staying with family or friends. Each turned down the opportunity, feeling that it was worth coping without the extra support if they could live within their own neighbourhood, surrounded by their communities. Bonny explained that the offer was appreciated, but they would have to live in isolation from the people they knew, becoming dependent on their relatives.

> *BONNY: 'I would and I would be relying on them, with the car, and I wouldn't want to do that, but it's lovely to go as a holiday.'*

A strong history within the neighbourhood encouraged this personal connection to the neighbourhood and community, formed either by long residence locally or a family history

connecting them to the neighbourhood. This encouraged long-standing relationships built over many years to be in place, forming a community and giving the place a feeling of home. This was similar across all types of location. Pride was expressed in having lived locally for many years, seven people expressing how fortunate they were to have lived there for so long, as it gave them the opportunity to establish their home within the neighbourhood.

> **HEATHER:** 'Well we're hoping to stay in the area obviously, because of, well the life that we're made here.'

Four of the ten people had been offered places to stay with relatives. Each person had turned down the offer and expressed a strong desire to stay at home, surrounded by the people they knew.

During the community mapping, famous and important features of the neighbourhood were commonly pointed out with pride; participants talked about experiences that had occurred there and how these had influenced their life. This pride and nostalgia for time gone by was greatest for those with long local history. For example, Ted discussed in detail the different shops he had owned locally, the people he knew through these times and the strong sense of belonging he felt within the neighbourhood.

> **TED:** '"You don't recognise me do you I used to deliver papers for you" and this that and the other, well I've now got to the stage where these kids come and play rugby and they're 18, 19, 20s, and I say to them, "hey, is your father so and so?" and they'll say, "that's my grandfather" (laugh) which really rubs it in, and they laugh who it is you see, cause the grandfathers and the fathers say "Hello Mr. [surname]. how are you? you know everything" and their grandsons will say "hello [nick-name], are you alright?" (laugh). Which is lovely.'

Having a personal investment in the well-being of a neighbourhood and the community, especially when this has built up over many years, resulted in a greater feeling of loss when there was change. Changes were seen to have occurred, in both the built attributes, personal usability and the people who lived locally during participants' history within the neighbourhood. This created a sense of loss, producing negative recollections of experiences and activities in which they were now unable to take part, especially with regard to loss of friends and family within this later period of life, and following ACS lower mobility.

Changes within the neighbourhood's built attributes were brought up by three of the ten people. As they felt that it had reduced in quality over the years, especially since the recession, this had resulted in a perceived reduction in community presence. Their personal connection to the neighbourhood was expressed to be as strong, though a sense of loss and regret towards their neighbourhood was shown, especially for women.
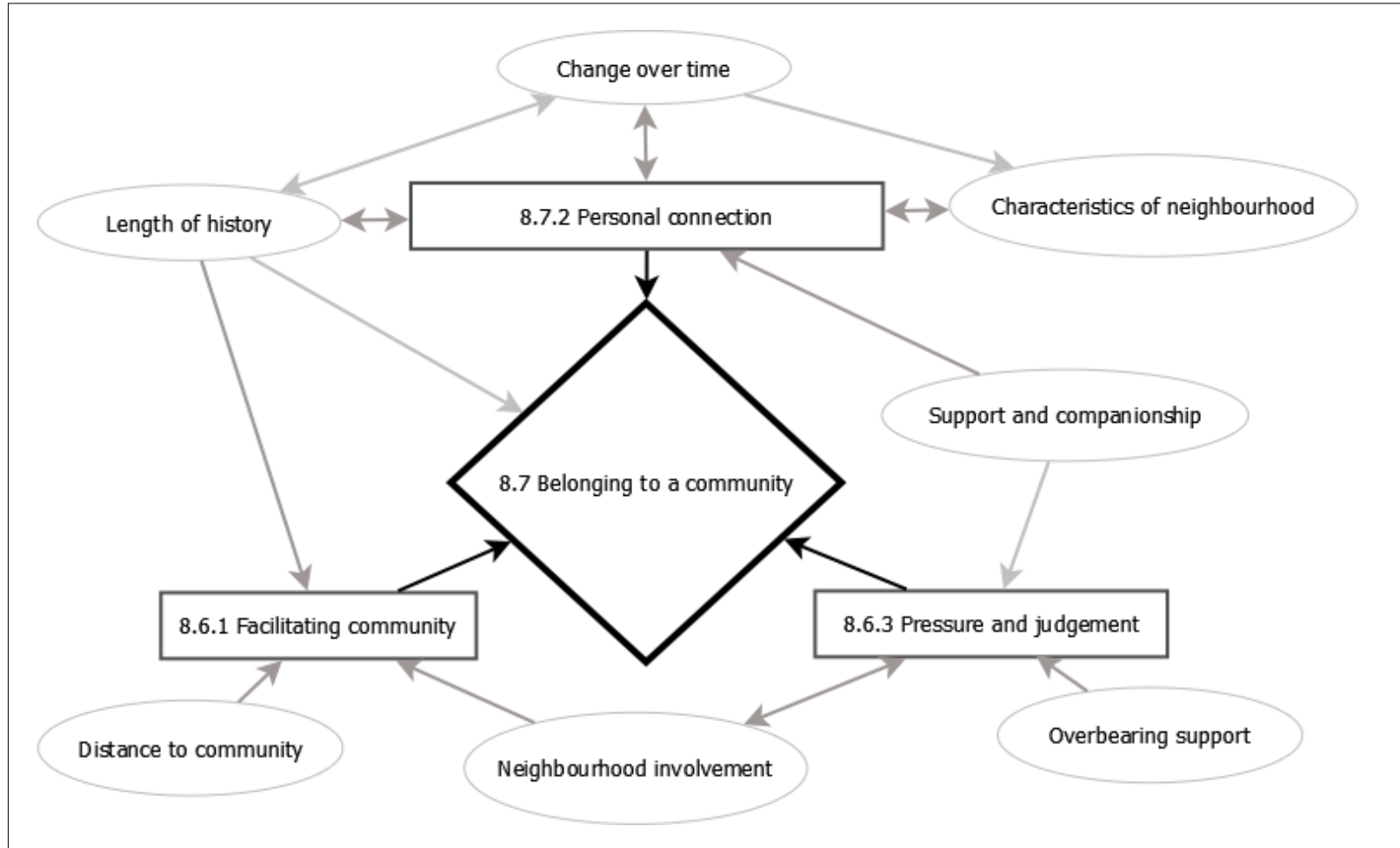
Figure 8.5: Flowchart of 'belonging to a community' concept

> *BONNY: 'A little bit yes because, the these are, um, ex-council houses a lot of um, some of them are still council houses, and some people have moved out obviously and, they've come in from inner Leeds, from the (pause) rough places in Leeds, in to here, and it's become a bit rough with the (pause) teenagers, in the park.'*

George and Paul were the only people to move to their neighbourhoods later on in life, settling into and forming communities around them, due to similarities in their circumstances with other people who lived locally. Both explained how they had made the effort to involve themselves in the local community initially, and the positive effect this had on the levels of support available during their recovery.

> *GEORGE: 'No, no I think, I think you've, I think you do need to have the er, HI [to passer-by] you do need to have the involvement, otherwise you would be very much a stranger in the area.'*

This was only possible due to the type of neighbourhoods that they moved to, suited to the type of people they were and the interests they held.

A strong personal connection to the community and neighbourhood was expressed by everyone, though was most present for those with strong histories locally. There were both benefits and limitations to this connection. A personal connection created a sense of belonging and being supported by the people surrounding them. A greater investment also means that reduced usability and quality of the neighbourhood have more effect on them. The attitudes and responses to the participant's health problems also had a greater impact, which is explored in the next section.

Variations in levels of personal connection by neighbourhood were limited. The connection itself did not always reside close to home, but was always present to a certain extent.

8.7.3 Pressure and judgement

Feeling pressure to improve recovery, react in a certain way, and not appear incapable was constantly present. With varying levels of influences, sometimes results were beneficial, although more often they were a cause of frustration and were demotivating. Much of this pressure came from the participants themselves, feeling that they should be in better health than they were. This was often born from how they thought other people within their social community perceived them. Other forms of pressure came from partners and health professionals.

Suggested action and advice from health service professionals was often useful, although only when it was within the person's capabilities, helping the realisation and ability to aid own recovery.

> **SIMON:** *'the cardiac nurse, she came here and she scared me to death, (laugh) she had a hat, a paper hat on the floor and she said "there ent such a thing as a minor heart attack" she said "once you've had a heart attack", she said "you've had a heart attack", ... 'I thought 'cor' but er....'*

If people felt that they were not able to follow the advice given, this caused distrust and frustration. For example, Bonny felt she could not do the exercises suggested to her because of her angina; she then felt judged for not trying, which made her angry for being put in this situation.

A high level of pressure came from the person themselves, feeling that they should be doing more to further their recovery. This was most present in those who saw their recovery as *incomplete* or *enhanced.* Even for people who had complete recovery, but with *reduced health*, their new lower level of health put pressure on them not to appear incapable in front of their social community.

Fear of being judged or pitied by their social community was expressed by many people, especially those with a strong sense of belonging or/and history in the neighbourhood. Ted talked about feeling pitied and seen as unable to cope by people he had known for many years, and to whom he had been an authority figure when he was on the committee at his local rugby club.

> **TED:** *'you know with three legs and a seat on it ... um, you know, everyone says "are you alright?" which is very nice, very embarrassing, having to accept that I can't stand up all the time and watch the rugby match. ... I think "oh dear God I'm on the way out here" and that would be awful with people saying "are you alright dear?" you know, couple of idiots, I can't deal with that, can't deal with people making a fuss.'*

This did reduce or stop involvement, but was motivating to improve mobility in many cases. Those from neighbourhoods of very high and low deprivation seemed less likely to experience this fear.

Being judged for decline in appearance was an area of immense worry, mentioned by three of the ten people. Gaining weight due to medication and reduced exercise, and various swellings in the face and legs, were talked about. Heather was so embarrassed about what her friends would think that she refused to interact with her social community, and this isolated her from her friends and the connection to her previous lifestyle.

> *HEATHER: 'a lot of my friends wanted to come but I said no, I didn't want them to see me as I was, when I looked horrific really and I didn't, the vein, you see the vein's coming out again, and I said to tell them I'll see them when I come home, so really is was just family really.'*

Heather was aware that her friends would not criticise her for her appearance, but was not willing to risk being seen as less than she previously was, preferring to wait to return to how she had looked before seeing people again. This did not extend to close friends and family; participants felt more comfortable around these people, even if they did judge them for their changes.

> *PETER: 'I'm going down (laugh), well trouble is my daughter-in-law says, well and my daughter "I've never seen your waist as big Dad", "oh", I thought, "'thank you", tut.'*

Following these comments, Peter then went on a diet, showing the power of pressure and judgement. Decline in appearance was only mentioned as an area of judgement for people living within neighbourhoods of middle to low levels of deprivation.

The greatest area of pressure came from close friends and family, who had often taken control of overall lifestyle, making people feel helpless. This sense of dependency was extremely frustrating, with participants feeling that they had to do as they were told and had no say in their own lives. Simon spoke about how his wife made him follow every guideline on recovery they had been given down to the letter. Being told exactly what he could eat and how much exercise he could do, he expressed his frustration at being told that he was not well enough to vacuum upstairs.

Both Ted and Peter expressed relief when people who had been interested in their welfare went away for a span of time as it allowed them to relax; the concern and wish to help had become a burden that was hard to bear.

> *PETER: 'he comes up every fff, weekend to see what he can do you know, ya ya ya, I says "don't bother Kevin" you know, but you know, as I say he's away in France but he did....'*

Despite this, pressure from the people close by was motivating to increase health levels. Ted's son-in-law made sure that he exercised and ate well. Though he was not happy with being told what to do, he accepted that it was beneficial to him.

> *TED: 'Well I didn't walk anywhere before, I was bone idle I force myself to walk now, cause [son-in-law] checks up on me, "have you been out? Have you done your exercise?" (laugh)'*

This awareness that those close to them were only trying to help led to feelings of guilt, arising from the knowledge that they should feel grateful for the concern and the willingness to try and help them, although this was expressed to be difficult, given that they felt they were not allowed to live their own lives.

> **BONNY:** *'So it's, no it's good, um, (pause) and he, it's over good sometimes, you know um "I'll do it, don't do it, I'll do it". The doctor when I left hospital, gave me a book, and the nurse came, and they give you a book on what you're to do on your first week home, and the second week. And by gum we're reading it and, you now, gonna stick to it, it's really quite frustrating (laugh).'*

A certain level of frustration from being over-supported was expressed by everyone, including those living alone. Rebelling against this strong guidance was seen to be greatest within middle deprivation and more urban neighbourhoods.

This feeling of overbearing support was seen to have stemmed from close friends and family being more worried than participants were about their own health. Three of the ten people spoke about their own lack of worry in comparison to the people around them.

> **SIMON:** *'Ya, no, I think it affected Joan more than it did me to be honest I think Joan, I don't know why, she were more worried than I were worried you know, er....'*

Having a strong social community, and many close friends and family who are willing to help, was perceived as supportive. These provided instrumental aid and emotional support as well as a sense of belonging and perceived support, often finding it motivating to know that people cared, wanting to return to their company. Heather gave an example of this support. Despite wanting to avoid her friends due to her reduced appearance, she was pressured, and forced herself to attend a friend's surprise party. This helped her to overcome her fears of judgement and to spend time with her friends, which she believed immensely helping her recover emotionally.

However, there were also negative effects of having a strong social community and many friends and family. Feeling connected to the people and the neighbourhood meant that a greater sense of loss was felt when changes had to be made. In addition, overbearing support was frustrating, and was expressed as slowing down the reduction of both emotional and biological disruption, as participants sensed that they were prevented from undertaking what they felt they could.

8.8 Summary

The complexities of contextual and compositional influences on the experiences of older people with ACS have been explored within this chapter. This uncovered four main concepts that relate to neighbourhoods, communities, interconnected with personal level characteristics and attitudes, as well as developing the representation of place and recovery. This built on the insight that was reached within previous chapters.

The effect that ACS had on people's lives throughout the period of this study, and looking into the future, was an ongoing process. How people reacted and dealt with these changes, and the support used over this time constituted the recovery progress and the overall changes that happened within the person's life. These reactions were highly dependent on how participants viewed their recovery. Those who saw their recoveries as *incomplete,* but expected improvements in the future, those who saw their health as *enhanced* and people who had complete recoveries with *reduced health* and felt that they had a low standard of health.

How people view recovery was affected by chronological age and their previous level of health; this influenced how they coped with dealing with change and whether they attempted strategies to improve their health and further their recovery.

The participants who lived within areas of middle deprivation (IMD score) seemed more likely to view their recovery to be complete with *reduced health*. This implies that neighbourhood deprivation levels may have some influence on how 'recovered' a person feels. Throughout this chapter, differences by neighbourhood deprivation level have been unclear indicating that, although it does have an influence, overall place effect is more complex.

The viewpoint of each individual reflected personal circumstances interrelated with place effect. Whether it is the individual deprivation or area deprivation that has influence on the person is difficult to assess. This chapter has shown that how a person relates to, and is influenced by the environment is strongly affected by his or her own circumstances. The opposite was also often true: financial circumstances throughout the life-course and family ties were seen to influence where a person lived. This implies that it is not appropriate to analyse place deprivation without considering individual deprivation or vice versa.

Similar to the questionnaire results, perception of neighbourhood was expressed positively by everyone, irrespective of differences across neighbourhood deprivation, population density, and resource level. What did vary was what were classified as personal neighbourhood

boundaries: within more deprived locations, the place that was associated was often away from the streets in which participants lived.

The lack of differences in perception may be connected to everyone having access to health care and a pension in older age, as well as free bus passes that enable transportation. Although the quality of these resources and the distance that needs to be travelled may vary, they are available to everyone.

What was apparent was that perceived differences in how people reacted fell into similar categories to those uncovered within the latent class regression analysis within the chapter on secondary data analysis (section 5.4.3), especially for men. Urban and rural differences had the greatest influence, and affected access and usability of the neighbourhood and community. Usability and resource quality were especially important in more urban localities. For women, the importance of the social community came across, although not always with a positive influence.

The deprivation or financial circumstance of the individual could not be assessed within the secondary data analysis. This limits the conclusions that can be drawn. The qualitative analysis was able to explore how people from different circumstances perceived, and interacted with, their neighbourhoods.

The three sub-concepts: *built environment*; *available support*; and *belonging to a community* centred on personal connection and usability of the environment. What makes a neighbourhood accessible and a supportive community to be formed were discussed.

These were all based on pre-established connections and being willing to use the help available. This extended to the health services and willingness to trust the people giving advice and treatment. Those with strong relationships with close friends, family and their doctor formed mutually supportive relationships that could be relied on for instrumental aid and emotional help, without their feeling judged or beholden. However, people providing support were in a position to be overbearing, taking control away, which was demotivating and frustrating.

Feeling a sense of belonging to the neighbourhood and community supported emotional well-being, and knowing that the people close by care and would help was extremely supportive and motivating. This was encouraged by length of history locally and involvement within the community. On the other hand, having this strong social community gave rise to anxiety about the perceptions of people close. The stronger the relationship, the more vulnerable participants were to how the people around them reacted to their ACS health problems, and therefore the

support that was available. This led to avoiding going out into the neighbourhood and interacting with people. Peter worried about what the people on his street must think about him, having had to call an ambulance four times.

The usability of the environment always had a positive influence on ability to interact and gain support.

Further insight into changes over the trajectory of recovery could have gained through further qualitative discussions with the same person at different time points. The conclusions drawn within this chapter are based on retrospective perceptions and foresights, open to recollection bias. However, the qualitative sample being nested within the questionnaire respondent sample reduces this limitation (discussed in Chapter 9).

Only ten people were involved in the qualitative approach. This limits the ability for general trends to be captured by the data. The ten people lived within Yorkshire and Humber, and lived in varying circumstances. Therefore, it is not possible to say whether the same findings would apply in a different area, or when involving different people.

Despite these limitations, this chapter has drawn attention to interesting insight into the importance of place and community, and also potential drawbacks. This identified some of the different aspects of neighbourhood that encouraged the formation of a supportive environment. By drawing together the insight gained from the three interconnected sections within this study, a more rounded picture of ACS experiences and outcome can be formed. Within the next chapter, the conclusions drawn from the quantitative and qualitative analysis are synthesised, and further inferences formed and discussed, with the aim to achieve a rounded evidence base built around the interconnected contextual and compositional influences on ACS outcome.

Chapter 9:   Mixed methods: Conceptual synthesis of the multiple approaches to analysing place effect on ACS

9.1 Introduction

The mixed method framework discussed in Chapter 3 has guided the exploratory study throughout this thesis. The framework was designed to explore broad and complex concepts. A layered mixed method approach was used to develop insight into the *what, how* and *why* of place effect on ACS outcome. This formed a stronger, more diverse evidence base around place than would be possible within a single-paradigm approach.

> The fundamental rationale behind mixed methods research is that we can learn more about our research topic if we can combine the strengths of qualitative research with the strengths of quantitative research while compensating at the same time for the weaknesses of each method. This has been called the fundamental principle of mixed methods research.   (Johnson and Onwuegbuzie, 2004, p.18)

The study progressed across three layers of methodological approaches. Each of these added to the evidence base from which the research questions are answered within this chapter.

The secondary data analysis focused on uncovering how place was associated with survival at six months. The questionnaires collected data on perceptions towards recovery and the effect of place. The use of two time points enabled changes over time to be assessed. The quantitative data from the secondary data analysis and questionnaire data were compared. This gave some insight into how perception related to the effect that place was seen to have. Qualitative discussions were used, based on this insight, and questions raised throughout the study. These sought in-depth person-level information, with the aim to understand why people believed that where they lived influenced their recovery.

The three methodological approaches led naturally to fundamentally different types of questions being asked. The sample used, the data collected and the analysis conducted reflect these differences. This mixed method approach developed understanding by providing the opportunity to ask different questions about place effect. Initial analysis within each methodology indicated that there was not a one-to-one mapping for different place effect and ACS outcome. This chapter uses all available data and conceptual ideas brought forward

throughout the thesis to understand the relationship between place and ACS outcome. This will built upon the conceptual framework put forward in Chapter 3.

These fundamental differences in approach bring many advantages within this exploratory study on overall place effect. Triangulation or confirmatory analyses were avoided during data synthesis. These commonly used mixed-method approaches would not have taken advantage of the whole range of data available. Furthermore, conceptual differences, such as differences in the form of ACS outcome used (survival or recovery) would have made these mixed method approaches problematic.

Synthesis based on the construction of conceptual ideas is undertaken instead. This considers what each methodological approach says about the question of interest, how the data interrelates and differences in conclusions across methodological approach. These insights are then used in unison to form answers. This conceptual approach builds up multiple layers of understanding used to answer the research questions. This is done without the need for the data collected to relate directly to the same aspects of the phenomena considered.

The differences in sampling methods and the age of the data used will be considered throughout this chapter. These differences would be more of a problem within a confirmatory study. However, they still pose difficulties as it assumed that the data from the different methodologies relate to the same population of interest.

The conceptual framework in Chapter 3 was used as a base of evidence. The synthesis of the data collected and conceptual ideas formed within this study build upon this framework. This chapter discusses how this joint insight was used to answer the research questions formulated in Chapter 2.

This chapter is presented in two parts: Part 1: Data synthesis used to answer the research questions and form aspects of conceptual place effect (sections 9.2 and 9.3); Part 2: Revised latent class regression models based on the conceptual place effect aspects formed in Part 1 (section 9.4).

Part 1a explores the compositional level research question (section 9.2). Community mapping narratives were used to develop this information and relate personal perspectives to place effect.

Part 1b explores the contextual level research questions (section 9.3). These questions develop the ways in which place effect is understood for older people. From this insight, a list of conceptual aspects of place effect are formed.

Part 2a revises the latent class regression models formed within the secondary data analysis (Chapter 5). The conceptual place effect aspects are used to inform the choice of local census area variables used within the model (section 9.4). This second iteration of secondary data analysis brings together the informed place effect concepts within a large represented dataset.

9.2 Part 1a: Compositional level data synthesis

Data synthesis is based around the research questions. This draws together the data collected and concepts formed within each methodological approach (Chapter 6 discusses the mixed methods employed). The aim was to maximise the potential benefits of mixed method analysis by implementation throughout the design, data collection and analysis stages. The mixed method study design followed throughout the theories is detailed in Chapter 3.

Community mapping narratives were used in the combination of quantitative and qualitative data. The aim was to build up layers of understanding of place effect around each of the people in the sample. This brings together the compositional and contextual influences on ACS outcome. Peter and Simon's community mapping narratives have previously been given as examples within the chapter on experiences and perceptions (section 8.2.2).

Section 9.2.1 discusses how compositional level features affect ACS outcome. This specifically aims to uncover compositional trends across the type of place in which a person lives.

9.2.1 What are the compositional influences and how do they vary across locality type?

From the community mapping narratives for Peter and Simon (Chapter 8, section 8.2.2) it was seen that they had very different outlooks towards, and levels of, recovery. They both lived in urban neighbourhoods that were classed as having mid to high levels of deprivation. Within this section, differences in composition level features are explored. The aim was to understand differences in ACS outcome for people living in similar places. *Age, ACS severity* and *differences across sex/gender* are discussed, based on data drawn from the different stages of this study.

9.2.1.1 Age

Increased age within those over the age of 65 years with ACS was associated with decreased survival up to six months for men and women. This was drawn from the latent class regression models within the secondary data analysis.

The questionnaires implied that age was not associated with recorded perceived recovery. However, perceived recovery was reported as high on average. Increased age was discussed as a cause of reduced health within the open text of both questionnaires. The qualitative discussions uncovered that this belief that older age would prolong or stop recovery was related to whether a person believed they would recover. Matt's second ACS event was much less severe than his first. However, he believed that he would be less likely to recover due to his increased age.

> MATT: *'Er, 19, 20 years ago, 20 years ago and er last one in November and er, I am 82 years, but then I'm 20 years older, ant I, so I'm bound to be, so I've no complaints.'*

Overall, this seems to imply that increased age reduces survival and can affect how someone sees their own recovery. The questionnaire results are of particular interest. These seem to imply that, on average, age is not perceived to reduce recovery.

9.2.1.2   ACS severity

ACS severity was associated with survival up to six months. The effect of the ACS diagnosis was strongly linked to the type of place in which a person lived, especially for men. A *STEMI* or *NSTEMI* diagnosis was often seen to have a similar effect on ACS outcome. This may be due to the use of intensive treatment when ACS is more severe.

The questionnaire results implied consistency in perceived level of ACS severity between initial recovery and follow-up recovery at six months. An average score is seen across both questionnaires, which implied that the majority of people believed that their level of health is similar to others who have ACS. Lower perceived ACS severity was associated with higher perceived recovery.

The qualitative discussions indicated that the severity of their ACS was not often considered by participants. The limitations imposed by their ACS were of greater importance.

ACS severity had an important influence on ACS outcome. However, its perceived importance was low to the person who experienced it. The community mapping narratives (chapter 8, section 8.2.2) draw attention to Peter and Simon's responses to the perceived ACS severity question. They both reported scores close to 40 out of 100 at initial recovery and at follow-up. This was despite Peter and Simon being seen to have very different views towards their own experience of ACS. Once ACS was diagnosed, greater attention was placed on personal limitations and ways to cope, rather than on the severity of their ACS.

9.2.1.3 Differences across men and women

Differences in ACS outcome for men and women are widely accepted (Sutherland and Jensen, 2000; Rosengren *et al.,* 2004). Men and women were seen to be affected by place differently throughout the study. Six-month survival was slightly higher in men than in women. However, on average women with ACS were slightly older than men, which may account for the slightly worse prognosis.

In general, men were influenced by and valued the built environment and instrumental aid. Women saw social interactions as having a greater influence on their ACS.

This theory was formed based initially on the secondary data analysis. Education level and the condition of houses contributed to place effect on men's six-month survival. The effect of place on women was based on dynamic/family structure and religion. Both were similarly affected by overcrowding, distance to facilities and air quality.

These differences were discussed within the qualitative discussions. Women expressed the importance of a strong community on which to rely. Strong traditional roles were seen, such as the responsibility to cook and clean the house. Women found it difficult to relinquish these roles. Disappointment and frustration was expressed; hence, they were willing to accept that help was necessary to complete these tasks.

Men were more likely to rely only on their partners for support. They often expressed that they were not willing to seek or accept help from people they knew. The men tended to focus on hobbies and work on the house (DIY). This corresponds to the occupations and characteristics of people locally being of important to them, as well as the quality of physical aspects close by, such as houses. This may also have related to the traditional role of the husband as being the provider. All the men within this sample had earned the majority of the household income throughout their lives.

9.3 Part 1b: Contextual level data synthesis

Place was seen to affect ACS outcome throughout the study. Place inequality was associated with compositional differences, survival rates at six months and recovery. This part discusses the four research questions that relate to contextual features. Each question relates to a different aspect of place. Together the answers within each section are used to inform a list of place aspects that affect ACS outcome.

Figure 9.1: Community mapping for Simon

Figure 9.2: How LSOA relates to community mapping: Jeffrey's route

9.3.1 How does the meaning attached to place affect older people's outcome from ACS?

Place has been shown throughout this study to affect ACS outcome. The questionnaire analysis drew attention to the relationship between how place is perceived and how it has been defined by a local area index. A correlation was seen between the measurement of perceived deprivation and the IMD score for the local area; this was especially the case for local areas of low IMD score (high deprivation). However, this relationship was less clear for people living within local areas of high IMD scores (see Figure 7.3 on page 165).

To live in a place with a perceived higher level of deprivation was associated with lower perceived recovery. However, there was no association between IMD score and perceived recovery. This implies that how a place in perceived, and hence the connection a person feels towards it, affects the recovery they experience.

The perception of place and place effect were then explored within the qualitative discussions. A personal connection to the place where a person lived was expressed by everyone. This was especially the case for people who had lived for a long time or had strong family ties within the neighbourhood. However, a longer residence or history locally increased the chance of experiencing change. The changes locally were often perceived negatively, such as the loss of friends. This was seen to cause distress.

This personal connection was formed with both the built and the social environment. For example, pride was shown towards well-known attributes of the place that were close by. Meaning was also attached to many of the shops and buildings that had been used over the period of participants' residence. This connection to place seemed to provide an incentive to continue interaction within the neighbourhood.

The community mapping narratives were especially useful in acquiring information on personal connection to place. The example given for Simon in section 8.2.2 discussed how his connection linked to the built environment in which he lived (Figure 9.1 displays the route on page 236). Simon knew the local area well and felt comfortable within it. This was evident from the daily exercise route that he took when he walked into town, rather than the more rural areas that were close by and ideal for walking.

Personal attachment to the neighbourhood was often centred on the social relationships that existed. Strong social communities had also been built up over time and through involvement in the neighbourhood. These provided support, a sense of belonging and memories of the people who lived within the neighbourhood. A strong social community also created a wish not to be seen as less able than before. The desire to return to social activities was expressed as a motivating factor towards recovery.

Population stability and density affected the level of personal connection that was felt towards a place: for example, immigration into a local area was associated with six-month survival. Changes in the people who ran shops and pubs locally were also seen to affect the sense of belonging. The effect of change in social relationships was particularly evident within this older sample. Many family members and friends had passed away, which resulted in smaller communities.

Changes within the built environment, such as reduced public transport, were also seen to affect the feeling of personal connection.

Personal attachment to place seemed to be based on experiences, length of history locally and involvement within the neighbourhood. Certain neighbourhood characteristics appeared to be connected to higher levels of connection to the neighbourhood. In more urban neighbourhoods, a personal connection was expressed to be closer to where the person lived. However, in less urban, and often smaller neighbourhoods, a sense of personal connection seemed to be placed over a wider area.

The level of personal connection expressed did not seem to vary based on the level of area deprivation. When a neighbourhood was seen to be deprived within urban areas, a personal connection was expressed towards the local town centre. It was apparent that within these areas that personal connection is not felt to the immediate area close to the person's house. For example, Peter had a personal attachment to his neighbourhood, which had formed over many years. The neighbourhood itself had reduced in usability over recent years. Peter expressed a strong connection to the built environment and social interactions closer to his house, especially since his ACS (see section 8.2.2 for a description of the community mapping discussion). The strength of this personal connection was expressed as motivating. It gave him a perception of support and access to help from the people close by. However, changes in the built environment and reductions in own ability produced a sense of loss.

A strong sense of connection to their neighbourhoods was expressed by everyone who could interact within them. This feeling of connection was highly valued and was referred to

throughout both the questionnaires and qualitative discussions. This feeling seemed to have become more valued or more apparent following health problems from ACS. The characteristics of the place in which a person lived seemed to mainly affect what area and community was perceived as a personal neighbourhood.

9.3.2 Influences on place usage during ACS recovery

The built and social environment affected how people saw their own recovery. The level of deprivation and features of the local area, such as whether there was overcrowding, affected survival rates up to six months. A person's ability to interact within their neighbourhood was important for men and women. This might affect positive and negative influences of place. For example, Enid had been unable to leave her house unaccompanied for many years, which had resulted in a much smaller neighbourhood and community. She was aware that the owners of the local shop had changed, but expressed that this did not affect her as she was unable to shop there.

Interaction with a place, defined as place usability, seemed to be affected by compositional aspects, such as mobility, transportation and motivation, as well as contextual aspects, such as public transport, topography and quality facilities.

Place and resource usage was seen to change over the period of the study. These changes were seen across the questionnaires and emerged within the qualitative discussions. Access was seen to be more difficult earlier on within recovery, due to mobility problems and related barriers such as hills. Later on within recovery, the importance of being able to interact socially was more prominent.

Usability of place across the different methodological approaches was explored using charts. Within the second methods chapter, section 6.4.4 describes how these were formed. Table 9.1 on the next page considers Simon's neighbourhood interaction and resource usage over time formed during community mapping. Four influences on place usability were identified: *access*, *barriers, community* and *area deprivation.*

Access

Distance to a food store and GP surgery were associated with survival up to six months for men and women respectively. These distances were pivotal local area aspects in terms of survival within the secondary data analysis study.

Table 9.1: Simon's chart, looking at neighbourhood interaction and resource usage over time

General area description (Quantitative descriptive data)		
Deprivation score IMD general deprivation score: 23.06 (26.26) Townsend material deprivation score: 1.35 (53.28) Jarman underprivileged score: 5.45 (55.59)	*Latent class value:* 1	
Recovery questionnaire	*Qualitative study*	*Follow up questionnaire*
Deprived: 90 "We live in a semi-rural village with no restriction and can turn left or right or straight a-head and walk, we live in a small pleasant Avenue." *Transportation:* Walking changed to car Change in involvement: Yes "I played golf twice a week and hit 100 golf balls at a local driving range weekly all stopped at present."	*Access:* Having a car made access easy, relying on his wife to drive when he was not able. *Barriers:* Hills became more of an issue, as did the weather, resulting in more care being taken when leaving the house. Having lived in the area for long time, knowledge of new facilities was not updated. Best to go to places that are known; if a facility changes hands, often then the people there are not known; no feeling of community. Also high prices will dissuade usage. Willing to travel for good value and quality resources. *Community:* Difficulty in social situations such as restaurants and pubs, as know should not drink as much as before. Also having to cut down on physical activities was difficult as it was a big part of his life.	Deprived: 90 "The people who live locally + truffles restaurant Kippax owners who phoned me and told me that anything I would like" Change in involvement: "At first I was a little hesitate but as time past my confidence built up the NHS exercise course was great and all should join"

The type of transportation used was not seen to change greatly between the initial and follow-up recovery questionnaires. However, many people spoke about the need to rely more on friends and taxis to gain access to local facilities. The four weeks following ACS diagnosis were the most difficult for people who relied on their cars. Within this period, each of the qualitative participants spoke about relying on someone for help.

The importance of distance, and being able to use transportation, seemed to depend on the distribution of facilities within the built environment – for example, whether there were shops and houses close by. A person living in a sparsely distributed neighbourhood seemed to be used to travelling further. This expectation of having to overcome the barrier of distance appeared to reduce the deterrent incurred by increased health problems. Similarly, when a person lived in an area with easy access to facilities, there was an expectation that this would continue. This was a cause of frustration.

The distance itself affected survival rates. However, the expectation of distance was seen to affect how a person coped with overcoming this distance, when barriers were introduced by their ACS-related health problems.

The differences in how people perceived distance draws attention to place usability as both contextual and compositional. A place is usable if the environment can be traversed and the person can transverse it.

Barriers

Access barriers, such as not living on the ground floor, and poor housing conditions were associated with survival up to six months. The latent class regression analysis identified these as important aspects of place.

People within the qualitative discussions spoke about access barriers relative to their own situation and level of mobility. For example, Matt had trouble breathing and walking, and neither he nor his wife drove. This reduced his ability to interact within his neighbourhood. However, Matt spoke about his increased health problems, meaning that he spent more time within the building complex where he resided. His neighbourhood and community had greatly reduced due to a less usable environment. This led to Matt redefining the 'place' where he lived.

Hills were perceived to be the greatest barrier to neighbourhood usability. This was especially the case when a person's house was on a hill. Concern was expressed about being able to walk

up hills, when a person had experienced reduced mobility. This led to public transport being used to travel up hills.

The questionnaire was not able to capture this increased reliance on public transport, although four of the ten people in the qualitative discussions mentioning increased usage. This could be because the main form of transportation continued the same and public transport was only used when the environment was less usable.

Mobility problems increased the problems presented by barriers such as hills; for example, by not being able to/advised not to carry shopping, some independence was lost. A friend or relative had to be relied upon.

Community

Access to a community provided instrumental and emotional support. This was seen to be useful when trying to interact with the local neighbourhood.

Barriers and reduced access seemed to make it more difficult to interact within communities. Around 23% of the questionnaire respondents believed that they were less involved with clubs and organisations locally after their ACS diagnosis (significant difference between questionnaires; p-value <0.001). Less contact with the local community resulted in feelings of isolation. Frustration was also expressed about not being able to take part in social activities.

However, the knowledge that their community, and friends and family, were there was motivating. Within the qualitative discussions, people, especially the women, expressed a strong desire to increase their health and mobility in order to see people again.

Deprivation level

The type of place in which a person lived seemed to affect usability. From the qualitative discussions, it came across that people who lived in less deprived local areas (rated by IMD score) were more likely to put on a 'brave' face and not complain about their problems. People living within more deprived local areas seemed to express loss and regret. They also seemed more likely to accept their new health situation and the limitations that came with this.

These differences in attitude were also explored within the questionnaires. A similar pattern emerged. People living in less deprived local areas were more inclined to perceive them as a supportive neighbourhood, as 'nice', open and quiet areas, places that were aesthetically pleasing, with enjoyable walks in the area. People living in areas with relatively higher levels of

deprivation made greater reference to the importance of convenient and economical resources. These people were more likely to be negative about their neighbourhoods.

This generalisation of attitudes towards own recovery is based on my own interpretation of people being open within the qualitative discussions and questionnaires. There was a correlation between less deprived neighbourhoods and more rural places, which may be reflected within these findings.

9.3.3   Are the way ACS outcome, locality boundaries and time perceived similar to their related quantified measurements?

This study aimed to build up layers of understanding of place effect. These layers included: what aspects of place affected six-month survival; how did place affect ACS outcome change over time and how do people perceive place influencing their recovery? How a question is understood and answered will vary by person and the environment in which it is asked. These differences provided the opportunity to compare quantified place effect and how place is perceived to have effect. Table 9.2 on the next page shows the different measurements used within the different methodological approaches.

The two questions that were particularly of interest were: how do the measurements used within this study relate to how what they represent is perceived? Does this affect the validity of either approach? This section discusses these questions in relation to *ACS outcome, time, locality* and *boundaries.*

9.3.3.1   Meaning of ACS outcome

The ambiguous term ACS outcome has been used throughout this study. This provided the opportunity to explore different aspects of this process. The secondary data analysis used survival up to six months. This is a validated and often used measure (Chaix *et al.*, 2007). The questionnaires recorded perceived recovery on a 100-point Likert-type scale across two time points. The qualitative study aimed to understand perceptions of personal experiences over the recovery period. The core concept of perceived ACS outcome was: dealing with the personal changes and limitations enforced by ACS. The choice of representation of ACS outcome depended on the methodology used and hence the type of insight that was sought.

Each of these ways used to explore ACS outcome provided valuable insight. Table 9.2 on the next page gives descriptions of each ACS measurement. However, there was little crossover in the observed measurements and the meanings behind them.

Table 9.2: Table of different measurements used

Measurement	Secondary data analysis	Questionnaires	Interviews and community mapping
ACS outcome	Survival censored at six months	Perceived recovery on a 100-point Likert type scale	Stage/level of perceived recovery
Time	Data collected during hospital stay and in 2001 census	Data collected two and six months after admission to hospital	Data collected between three and five months after discharge from hospital
Place	Three local area indices; IMD score, Jarman score and Townsend deprivation score Range of local area variables collected in the 2001 census	Perceived area deprivation on a 100-point Likert type scale Open text questions on neighbourhood Binary response to level of support available.	Perceived neighbourhood; this includes the geographical area and the support available locally.
Place boundaries: effects concept of 'locality usability'	The Lower Super Output Area (LSOA) administrative boundaries were used. LSOA' are homogeneous over population density and hence the size of the local area is relative to the amount of people. The mean number of people in a LSOA is 1500.	What the participant perceived as their neighbourhood	Personal connections to place; personal perceptions of (natural) boundaries eg. Hills; length of history with the area Mobility influences e.g. ability to travel

Within the first 30 days there were 58% of all deaths within the six-month period considered. Within the same period, survival was a matter of great concern to someone with ACS. Anxiety and fear were expressed towards death or further health problems within the qualitative discussions. However, this fear dissipated within a few days for the majority of people.

> PAUL: 'to be quite honest with you I sat here and I was scared to go to bed, case I didn't wake up, um, until I fell asleep in the chair.... '

> Researcher: 'Did that fear pass?'

> PAUL: 'Ya once I woke up the next morning I thought might as well go to bed now (laugh). No point sitting around waiting to fall asleep in a chair, um and it hasn't worried me since. (laugh)'

Survival was no longer seen as of such concern in the majority of cases following this initial period.

This reduction in perceived importance of survival may be explained by a high level of recovery at this point. This related to the reasonably high perception of recovery expressed by the majority of people within the initial recovery questionnaire. A mean (sd) score of 78.0 (19.9) out of 100 was reported. This score did not change greatly across the next four months. If recovery is seen to have occurred within the first two months, this would explain why survival was not expressed as a concern a few weeks after diagnosis.

The rate of death between the two questionnaires, two and six months after ACS diagnosis, doubled. Deaths rates increased for men from 6.0% to 6.2% and for women from 12.3% to 12.9%. As it is not possible to gain the perspective of the people who did not survive, this may account for the way that questionnaire and qualitative discussion respondents viewed their survival.

What the experience of ACS outcome meant to the people who did survive was explored within the qualitative discussions. The recovery period revolved around dealing with the changes that had occurred due to their ACS. This was affected by contextual and compositional features of a person's life.

Perceptions of recovery within the qualitative discussions were discussed in regards to the way people felt they had recovered. The feelings expressed were: *enhanced health*; *incomplete recovery* (but with expectation of further improvements); and *reduced health* (recovery complete but at a lower level than previously).

The people who viewed their health as *enhanced* were less likely to express worry about their survival a few weeks into the recovery period. These people had the highest level of health and were the most likely to live healthy lifestyles. This corresponded directly to the questionnaire results. People with low perceived ACS severity scores showed high-perceived initial and follow-up recovery. Despite this, people within this group expressed a wish to improve their own lifestyle. Many talked about increased levels of exercise and healthier diets. This did not seem to relate to survival, but rather with a wish to return to previous activities.

People who viewed their recovery to be *incomplete* were often waiting for further treatment. This was a frustrating process, especially when the delay had not been expected. However, a full recovery was expected at some point in the future. Similarly, to the people who viewed their health as *enhanced,* survival was no longer a concern after the first few weeks of the recovery process. These two feelings towards recovery may be considered as two different points on the trajectory of recovery from illness to health (Godfrey and Townsend, 2008). For example,

Jeffrey had a prolonged recovery due to an operation. He found his reduced mobility frustrating and stressful; however, he expected his health to improve with time.

> JEFFREY: '...I mean just like I say, if your body goes through so much it needs time to recover ... Um, but I've been out in the garden doing chores, I haven't been sat on my backside all the time. So, um, hopefully, next month, it will be sorted out completely, everything back to normal.'

ACS severity was higher within this group of people who *were waiting to recover*. Previous lifestyles were also perceived to be less healthy. This may account for the differences in recovery length.

People who reviewed their recovery as complete with *reduced health* often saw death as inevitable. The majority of these people believed that there was no way for them to improve their level of health. Despite this, they did not worry about survival; rather it was accepted as part of their future. ACS severity was often high within this group, with many people having co-morbidities to contend with.

Many of the people within this group spoke about coming to terms with their new level of health. This involved trying to get on with life, consciously trying not to worry and being willing to rely on other people to help them. This acceptance might have been related to the belief expressed that these health problems could not have been avoided. Older age and genetics were alternative reasons given.

Higher perceived age was seen within this group; this seemed to be independent of their actual age. This was often stated as a reason that they did not worry about death. The overall attitudes were 'having had a good life' and 'living on borrowed time'.

> TED: 'if I dropped dead tomorrow it wouldn't bother me (laugh)' which it wouldn't, it wouldn't bother me if I dropped dead tomorrow you know. Er, but er, I have no fear of death, I don't worry about it at all.'

Within this group, little worry or stress was expressed. Acceptance of *reduced health* seemed to help overcome some of the emotional problems associated with ACS outcome.

How a person perceived their own recovery process seemed to influence how they coped and dealt with change. However, there were strong links between ACS severity, level of prior health, affluence and, at times, links with place in how recovery was perceived. It was not possible to determine distinct influences, due to the interconnected nature of a person's experience

Perceptions of recovery seem not to be related to survival. The experience itself appeared not to be affected by the fear of death after the first few weeks. Moreover, survival did not come across as a motivating/de-motivating factor.

Survival analysis was unable to capture these differences in perceptions of recovery. The qualitative approach taken did not reflect the deaths that were occurring. None of the methodologies used within this study was able to provide a full picture of ACS outcome. This mixed method study has outlined the trajectory of survival, how people perceived survival and what is seen as recovery across the first six months. This has provided some insight into the importance of place usability and community in increasing survival rates. There was also a need to help people deal with the change that was imposed on their lives.

9.3.3.2 Time

Throughout this study, six months has been used as a cut-off point for the outcome of ACS. It was assumed that this was enough time for a person to reach their ACS outcome. Six months was chosen to minimise the number of unrelated deaths within the available all-cause mortality data. The time available to conduct the questionnaire and qualitative phase also restricted the time period considered.

The 'meaning of outcome' section above brought to light that a certain period of time passing does not imply the same level of/stage in recovery within different people. Hence, the six-month cut off might be sufficient for some people and not others, depending on complications and recovery lengths.

Open text responses within the questionnaire, and further discussions within the qualitative discussions, indicated that the time point considered within the six-month period could affect the relationship between place and ACS outcome. Early on within the recovery period, the built environment and instrumental support were mentioned as important aspects of place. Later on, access to and perception of social support were seen as more important.

Jeffrey discussed how, early on in his recovery, he had greater access to support than further on in his recovery. This was despite his belief that support would have been more beneficial later on.

9.3.3.3 Place

How place was defined came from the data itself. This reduced problems that would have been caused by differences in definitions of place across methodologies. Table 9.2 on page 244

describes the different measurements of place. Within the secondary data analysis, deprivation was used initially, followed by uncovering the local area census variables that had the greatest effect on six-month survival. The questionnaires used perceived deprivation and level of environmental support alongside discussions of what aspects of place were supportive. The qualitative discussions explored perceptions of place. Each of the three methods was open to built and social aspects.

The completeness of the picture of place developed was limited by what could be quantified, and the place aspects considered within the secondary data analysis. Similarly, the questionnaires and qualitative discussions were affected by the level of completeness and openness revealed.

Without a set definition of place, elements of importance in terms of support, perceived recovery, and survival emerged, such as environment usability, including both contextual and compositional features (section 9.3.2). Similarly, the way people saw their environment was affected by the physiognomy of a place and the ability of the person to negotiate it. This strong interaction between personal circumstance and the way that a person is affected by, and perceives, place was present throughout the study.

The questionnaire portrayed similarities between perceived deprivation and IMD score of a local area at initial and follow-up recovery: for example, correlation test p-values 0.011 at follow-up recovery. The qualitative discussions suggested a positive perception of personal neighbourhoods. This appeared to be independent of the characteristics and affluence of the place.

9.3.3.4   Boundaries

Boundaries of place were based on administration boundaries from which census data was collected at a local area level in the secondary data analysis. The questionnaires and qualitative discussions were based on the built neighbourhood with which each person had a personal connection. How these two different approaches interrelate is discussed within this section.

The administration boundaries used were Lower Super Output Areas (LSOAs). These were designed to be homogeneous over population density. The size of the local areas varies based on the number of people present. Population density was shown to be an integral part of place effect throughout the study: for example, greater population density increased traffic, noise and air pollution. These affected six-month survival and perceived recovery. LSOAs based around population density were therefore considered relevant to the study.

Neighbourhoods defined by personal connection were explored within the qualitative interviews and community mapping discussions. Walking routes of the community mapping discussions were formed. These included any part of the environment with which the participant expressed a personal connection. Figure 9.2 on page 236 shows a typical example for Jeffrey.

Jeffrey's perceived neighbourhood included four different LSOAs. Each of these had different descriptive statistics attributed to them: the four different IMD scores were 4.25, 12.96, 14.93 and 44.43. This gave a mean (sd) value for the overall neighbourhood of 19.14 (17.49). These values indicate high variation in levels of deprivation across a small-perceived neighbourhood. This shows differences in the place that local area boundaries cover and the perceived neighbourhood in which a person lives.

Jeffrey also expressed strong personal connections with the local town. This was around a 20-minute walk away and was visited often. The most prominent IMD score within the town was 32.23. This higher deprivation score should be considered as part of Jeffrey's personal neighbourhood. Differences between LSOAs (with the related IMD scores) and the boundaries of perceived neighbourhoods were seen for each of the qualitative participants.

The size of the perceived neighbourhood was related to a person's level of mobility, urban/rural differences and place usability; for example, Enid's personal neighbourhood was the street on which she lived. This small area of connection was due to her low level of mobility for the past 25 years. Within this small area, she had a community in place that she felt she could rely on.

People living in rural neighbourhoods tended to form a personal connection to a larger proportion of the built environment than people living in more urban places. For example, Simon's community mapping narrative (section 8.2.2) shows a strong personal connection to the few streets around his house. However, despite having lived locally for many years, little emotional connection was expressed towards the rest of the town. He felt that the people who lived very nearby had the greatest influence on his sense of belonging and his overall recovery.

The size of the perceived neighbourhood did not seem to be affected by the level of deprivation. Social connections, resources and previously formed memories were more likely to create the feelings of connection.

However, the level of deprivation within urban neighbourhoods did seem to affect the choice of geographical location with which to form a personal connection. Within more deprived urban

neighbourhoods, personal connection to place was sometimes directed away from the areas near to the house where participants actually lived.

For different people, variations were seen in the size of place to which a personal connection was formed. In addition, variation between LSOA boundaries and the place with which personal connection is formed uncovers a potential fundamental problem in summarised area-based statistics. Flowerdew, Manlet and Sabel (2008) also question the relevance of area boundaries to the people living within them. This draws attention to the potential dangers of using local area boundary statistics to generalise the effect of place.

Direct comparisons between local area statistics and perceptions of place are inappropriate as they relate to different area boundaries. However, the overall impact of these differences cannot be determined without further understanding of the relationship between perceived place effect and aspects of place that are associated with survival from ACS. This seems to be the missing piece of the puzzle in understanding place effect on ACS within this study.

9.3.4 How does place effect ACS outcome for older people?

This study has explored place effect on the outcome for older people with ACS. The interconnection relationship between compositional and contextual influences was seen to be important throughout the study.

The main problems that occurred in researching place effect were differences in measurements of ACS outcome, place and boundaries. Measurement errors and differences in approaches across methodological approaches have also caused complications: for example, what is the significance of the physiognomy of the place and does this relate to the way that it is perceived?

Section 9.3.3 refers to place affecting how people *deal with change* caused by ACS. Place cannot change the health implications of ACS, although it does affect how a person reacts and copes with these changes. This study has looked at the associations between place, the demographics of the people living in particular places and the effect on survival. It has then considered perceptions of place at three points within the recovery process and how people feel that place has affected them. Similarly, charts were drawn up for each of the qualitative participants to map out place effect. Peter's chart is displayed in Table 9.3 on page 252 as an example.

From these charts, three place effect aspects emerged, summarised as *usability*, *built connection* and *social interactions*. The key points were usability of environment, having interests/hobbies and social interactions, maintaining sense of own identity by involvement within the community, and knowing/being known by people locally.

Levels of deprivation used to represent place inequality were seen to be associated with six-month survival. The nature of this relationship varied depending on the aspect of place being represented. Strong links were shown between local area indices and the population density of the LSOA.

Men and women were affected, perceived, and reacted to place differently. For example, older men's survival up to six months was affected by local area indices more than that of women; the local area index effect on women's survival depended on the aspect of place that was being represented.

The local area census variable analysis draws out more focused place effects. Place was seen to be associated with six-month survival for both men and women. *Population density* and *distance to amenities* were two of the main aspects of place that were associated with survival. These two census area variables were seen to have strong ties to rural/urban differences. Rural/urban differences were also perceived to affect contextual features and hence the place in which recovery was affected.

The questionnaires showed that people had a high regard for where they lived. The majority of neighbourhoods were perceived to have low deprivation and to be supportive. The built environment was expressed to be of particular importance within initial recovery. However, within follow-up recovery, having access to social support seemed to be seen as more beneficial.

The qualitative discussions drew attention to the importance of a personal connection with the place where a person lived. This created a sense of belonging, a community from which it was perceived that support was available and a wish to remain involved within the neighbourhood. Personal attachment to place, social relationships, and how the physical structure of the neighbourhood influenced these were the main perceived locality influences on recovery.

Usability and connection to the built environment were affected by how connected a person felt to their neighbourhood. This was influenced by the length of history locally, past experiences and memories, social connections and perceptions of support. This connection was seen also to incur a negative attitude towards changes that occurred locally. For example, Bonny spoke about a park that she had walked around in the past; she expressed regret at feeling unsafe in the park in recent years, due to the number of young people who gathered there.

Table 9.3: Chart for Peter, looking at place effect

General area description (Quantitative descriptive data)		
Deprivation score IMD general deprivation score: 13.24 Townsend material deprivation score: -3.76 Jarman underprivileged score: -15.69	*Latent class value:* 1.25	
Recovery questionnaire Deprived: CASP-19: *Supportive environment:* Yes Area influences mentioned were hills and physical barriers. "Slight inclines" "Cannot enjoy walking as before because of angina. Also cannot do DIY for same reason"	*Qualitative study* *Usability:* Being close to town made access to facilities easier; this gave a sense of keeping own independence. Struggling to get a doctor's appointment was a worry, as well as being frustrating. *Built connection:* Traffic causes stress from noise and worry when crossing roads; there was also a worry about shops closing down and local 'kids' hanging around. *Social interactions:* Following reform of town centre there is less integration between local people.	*Follow up questionnaire* Deprived: CASP-19: 39 *Supportive environment:* Area influences continued to be important six months down the line. "Easy access to amenities"

Social interactions provided support. The importance of having access to support was expressed throughout the study, especially for women. This importance seemed to increase over time.

Support was received by two types of people: the social community, and close friends and family. Access to social support was increased by involvement within the local community. Social interactions were facilitated by a central meeting point within the neighbourhood. For example, Bonny felt that changes within the built environment, such as fewer shops, had reduced its usability. This led to less of a social community locally.

The perception of a strong social community was seen to be as important, if not more so than the support received from it. This gave a sense of belonging and support without a sense of being beholden. In the majority of cases, people would not accept help from others, even when it was needed. However, they were thankful for having people who cared about them.

Close friends and family provided the majority of support that was accepted. This seemed to be based on relationships of mutual exchanges of support that were built up over many years. However, support from close friends and family was not always positive. Frustration when the support was overbearing was expressed by both men and women.

9.3.4.1   Summarised locality influences

How place affects older people with ACS has been discussed throughout this study. Conclusions have been drawn out about the complexities that exist when researching place. These include: the interconnected relationship between contextual and compositional aspects; how inequality affects access to resources and social support; the relationships between perception of place and the effect it is seen to have on survival; whether the time point within the recovery process affects how place is influential; and how the different ways that place can be represented in terms of size, personal connection, geographical location, facilities and community available affect the results obtained.

The main effects of place discussed throughout this chapter have been summarised in the following six simplified points. This is not a complete list of the aspects of place that were uncovered.

- Usability of the environment

Place usability encompassed having access and overcoming barriers that existed. This was achieved by transportation, help from others and an accessible built environment. Usability

depended on contextual and compositional aspects such as terrain, motivation, cost, and a sense of belonging.

- Personal connection to place

This concerns perceived quality of locality, length of history in the place of residence and change over time. Personal connection to place gave a sense of belonging. This was seen to build up over time, and be affected by urban/rural differences and level of deprivation.

- Adjustment

How a person dealt with the changes caused by ACS was affected by their ability and willingness to adjust to their new circumstances. The level of adjustment was related to previous level of health, friends and family's experience of ill health, and chronological age.

- Perceived supportive environment

Perception of support was valued greatly. This provided emotional support, a sense of belonging, and was often expressed as the reason a person would not want to live anywhere else.

- Social interaction: reliance on others and marital status

Close friends and family, and a social community, provided instrumental aid and emotional support (for example, taking the bins out and being willing to talk). Moreover, having a partner to rely on was especially important for men. This may be due to men seeming to be less likely to seek or accept help from other people than are women.

- Number of people locally

Population density, urban/rural differences, and overcrowding were important aspects of place. These affected such factors as traffic, resources, feeling safe, access and noise, which, when perceived as negative, were seen to cause some stress. This was especially the case for men.

9.4 Part 2: Revision of latent class analysis

The conceptual place effects developed throughout this chapter are modelled against six-month survival within this section. Revised versions are formed of the latent class regression models in the secondary data analysis (Chapter 5). The construction of the latent classes used to represent place are based on the six conceptual ideas developed above within section 9.3.4.1. This utilises the insight formed throughout the study, instead of emphasising the statistical significance of certain variables.

Conceptual latent class regression models were built up with three parts. The structure of the models is similar to the statistically-formed models. A modelling strategy was not necessary, as the conceptual place effect variables were used independently of statistical significance.

1) Outcome variable to be predicted, binary mortality at six months, regressed on within a generalised linear Poisson regression model. The inclusion of survival rates offset within the model creates an approximate Cox proportional model (Vermunt, 1997).

2) Latent classes formed to represent differences in locality using local area census variables. These were chosen to represent the conceptual place effects developed throughout the study (section 9.3.4.1).

3) Survival at six months within each of the latent classes is predicted using personal/clinical variables. The influence that this variable had on survival could be different within each of the three latent classes.

In this section, the optimal local area census variables to represent the conceptual place effects are first discussed. This relates how place is related to perceptions of influence to form a potentially more insightful model. Then the conceptual models for men and women are discussed. These are compared with the statistically formed models (Chapter 5). The differences between how well the models fit the data, the local census areas variables chosen and the relationship between place and survival are discussed.

9.4.1 Choice of local area census variables to represent conceptual place effects

There were 36 possible local area census variables (see the first methods chapter for a description of each within section 4.5). It was necessary to choose from these list representations of the six conceptual place effects developed throughout this chapter. The optimal choice was open to interpretation.

Six place effects were represented by local area census variables: *usability, personal connection to place, perceived supportive environment, social interaction,* and *number of people in the area*. The local area census variables used are displayed in Table 9.4 on page 256.

It is not possible to fully encompass the breadth of information portrayed within each of these aspects, either by the short descriptions used here or by using local area census variables. This limitation is unavoidable when quantifying place effect.

Usability

Usability was represented by *percentage of people with a car or a van.* This was chosen to display ability to travel to facilities. Having a car or van also represented some rural and urban differences that were present and affected access, with specific focus on the expectation and level of preparedness to travel further distances.

Access was represented by *distance on average to the local GP surgery.* The importance of distance and being able to get to the surgery formed the bases for this choice.

The *Combined Barriers to Housing and Services Indicator* was used to represent barriers within the neighbourhood.

Table 9.4: Representation of local influence concept using local census area variables

Concept of local influence	Local census area variables
Access and usability within the locality	➢ *Population Average Road Distance to GP* ➢ *% with a car or van* ➢ *Combined Barriers to Housing and Services Indicator*
Locality quality	➢ *Combined Living Environment Indicator* representing locality quality ➢ *% of pensioners that own their house* representation length of stage (though this is not directly relevant, owning own house is an indicator of personal connection) ➢ *Proportion of immigrants* (changes in the locality were related to the characteristics and number of people.)
Adjustment	➢ Adjustment was difficult to represent as it is personal; this was left to be covered by the individual characteristics that are also within the model.
Perceived support	➢ *Combined Living Environment* ➢ *% single* within the LSOA
Number of people in the locality	➢ *Population density* ➢ *% of houses occupied by one person*

Personal connection to place

Three different aspects of personal connection were represented. *Place quality* was represented by the *Combined Living Environment Indicator,* a variable that combined different information about the general locality quality.

A person's *length of history* in the neighbourhood was seen to increase personal connection. This was represented by the *percentage of pensioners who own their house.* This is not an ideal representation, as it is more an index of wealth than time. It does however also represent homogeneous levels within the locality in terms of age and level of wealth. These were also seen to affect personal connection to the neighbourhood.

Change over time was also difficult to represent. *Proportion of immigrants* was used as it related to change in the community. High levels of change in the community were seen to reduce personal connection to place.

Adjustment

The level of adjustment was represented using personal and clinical characteristics. These compositional level variables indicated such aspects as ACS severity and age that related to a person's adjustment.

Perceived level of support

Representation of a person's perception is difficult without qualitative input across a wide sample. The C*ombined Living Environment* was used to give a feeling for the type of place in which the person lived. Personal characteristics were also used to indicate the type of person. However, this is unlikely to fully encompass personal perceptions and is a limitation of using secondary data to explore human behaviour.

Support

Support was mainly provided by close friends and family. This was represented by a community of married people locally. The variable *percentage single* within the locality was used to represent potential marital status and whether the neighbourhood had a family-based community.

Population density

The number of the people within the neighbourhood interconnected with many aspects. This was represented by *Population density.* This was seen to be important throughout the study: for example, interacting with urban/rural differences, traffic problems and overcrowding.

Overcrowding was represented by *percentage of houses occupied by one person*. This is also likely to indicate urban/rural differences that were seen to affect place differences greatly.

The models formed for men and women aimed to bring together the different stages within the study. How place effect is represented within the latent class models should be more relevant to the people who live there than the statistically formed models. The conceptual models were able to assess meaningful place representation in terms of six-month survival.

The local area census variables to represent place were used for both men and women, as the questionnaire sample size precluded separate analyses for men and women. This led to the conceptual place effects being developed across gender.

These models are limited by the secondary data that is available and their relevance to the conceptual ideas presented above in section 9.3.4. The assumption is made in this modelling approach that conceptual ideas formed from perceptions can be represented by summary statistics. It is also assumed that LSOAs are relevant to the people living in them (Figure 9.2 on page 236).

The next two sections discuss the conceptually built latent class regression models for men and women.

9.4.2 Representative conceptual latent class regression for men

This section discusses the fitted conceptual latent class regression for men. This is compared with the similarly built statistical model within the secondary data analysis chapter (section 5.4.3). The model contains latent classes that represent place and compositional level variables of the people living in each place, regressed on survival at six months. The variables used within the latent classes are discussed in the previous section.

Table 9.5 shows the comparison statistics for the conceptually and statistically built latent class regression models. The higher values of BIC, AIC and L^2 indicate that the conceptual model does not fit the data as well as the statistical model, accounting for the complexity of the model. The amount of variation that is explained with this model is also lower. This is indicated by the lower R^2 value. However, the number of errors made when classifying a people into a certain place (latent class) is estimated to be much lower in the conceptual model. The statistical and conceptual models provide interesting information on place effect. Which of the two models is optimal is open to interpretation.

Table 9.5: Comparison statistics for conceptual latent class regression model for men

Model	BIC	AIC	L^2	Number parameters	Degrees freedom	Class error	R^2
Statistical	20351.9	19468.5	19244.5	112	19565	0.35	0.26
Conceptual	20525.42	19665.71	19447.71	109	19568	0.1832	0.2315

Table 9.6 on the next page displays the size of the classes that represent place for the conceptual model. This also shows expected number of deaths and probability of survival for the people who live in these places.

The three classes formed follow a similar pattern, although a more extreme pattern than the statistically-formed model. One large class was of people with high survival rates; in two smaller classes, people have lower survival rates.

Table 9.6: Class sizes, expected event and probability of survival for conceptual model for men

Model	Conceptual			Statistical		
Covariate	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
Classes (size)	0.80	0.09	0.11	0.65	0.22	0.13
Expected event	0.08	1.16	1.59	0.05	0.50	1.47
Probability of survival	0.92	0.31	0.20	0.95	0.61	0.23

Tables 9.7 below and 9.8 on the next page show the latent class formations for the conceptual and statistical models. Within each table, the different local area census variables are presented in terms of their influence on class formation. An absolute z-value greater than two indicates statistical significance within that class of the variable of interest. In each case, a Wald test was used to show overall significance of the local area census variable on class formation (shown in bold).

The conceptual model relates quite strongly to the statistically-formed model. The importance of *distance*, *car or van ownership* and *percentage of pensioners that own their house* is clear within both models. This draws to attention to the value of access, usability and personal connection to place of residence both in terms of survival and, conceptually, in terms of recovery.

Table 9.7: Latent covariate estimates and test of significance for conceptual model for men

Covariate	Class 1	z-value	Class 2	z-value	Class 3	z-value	Wald
Intercept	-0.76	-0.92	-0.43	-0.43	1.19	0.89	0.98
Average distance to GP	-0.09	-1.50	0.064	1.04	0.028	0.33	**3.23**
% with a car or van	0.009	1.20	-0.016	**-1.76**	0.006	0.57	**4.33**
Combined Barriers Indicator	0.013	**1.94**	-0.009	-1.17	-0.004	-0.42	**4.86**
Combined Living Environment Indicator	-0.002	-0.47	-0.004	-1.20	0.006	1.25	1.74
% of pensioners own house	0.006	**1.62**	0.009	**2.09**	-0.02	**-2.62**	**6.91**
Proportion of immigrants	0.008	0.42	-0.01	-0.42	0.003	0.095	0.31
% people single	0.008	0.78	0.02	1.46	-0.03	-1.60	**2.69**
Overcrowding	0.01	1.54	0.004	0.41	-0.02	-1.29	**2.49**
Population density	0.002	1.02	-0.003	-1.16	0.0007	0.22	**2.18**

Population density is also important within both models. The importance of the number of people living locally was seen to be connected to rural/urban differences and expected

distances to resources. This is one of the main place effect aspects that have been present throughout the study.

The two models differed in the importance of education. This was not perceived to affect recovery and hence was left out of the conceptual model. However, education level may have been highly related to socio-economic status; this was referred to occasionally, although no conclusion on its influence was reached.

Table 9.8: Latent covariate estimates and test of significance model for men

Covariate	Class 1	z-value	Class 2	z-value	Class 3	z-value	Wald
Intercept	**1.59**	4.69	-0.06	-0.19	-1.53	-3.30	**22.02**
Education	-0.006	-1.37	**0.01**	3.56	-0.01	-1.25	**16.02**
Barrier house	**0.02**	2.77	**-0.01**	-2.06	-0.01	-0.64	**13.62**
No qualifications	-0.004	-0.45	**-0.03**	-3.57	**0.03**	2.49	**12.77**
Air quality	**-0.58**	-3.04	0.24	1.36	0.35	1.25	**12.55**
Average road to food	**-0.08**	-2.64	0.03	1.31	0.05	1.07	**10.30**
Population density	**0.004**	2.22	**-0.004**	-1.94	-0.001	-0.30	**9.40**
House poor condition	0.13	0.31	**0.97**	2.72	**-1.10**	-1.86	**7.42**

The pen diagrams below describe the formation of each class and how this compares to the statistical models class formation. Figure 9.3 on the next page displays the relationships between the local area census variables for each class. These are ordered from smallest differences between influences across classes to greatest.

Description of Class 1

People who lived within places represented by Class 1 had the largest number of people (80%); they had the highest probability of survival. The local area census variables for this class indicated that the proportion of pensioners who owned their own houses was relatively high. This may indicate a higher level of stability and wealth within the area. Within this place, there was the shortest distance to the local GP and the greatest access to a car or van, in comparison with the other two classes. This may indicate easy access to resources.

The population density is the highest of the three classes. There is also some indication that overcrowding is high and that there are barriers present within the area. From this a picture of a more urban place is formed.

This is very similar to the picture formed within the secondary data analysis chapter (section 5.4.3) for Class 1 of the statistically-formed model for men. Alongside the compositional level features, this more urban place with high environment access (although with barriers present) has a low death rate up to six months.
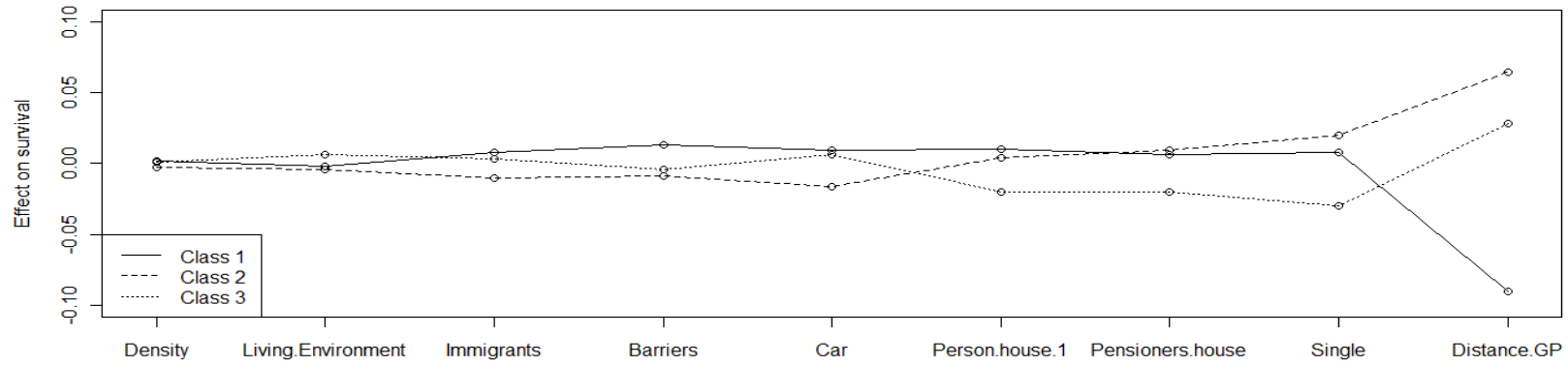
Figure 9.3: Conceptual latent regression model covariates for men
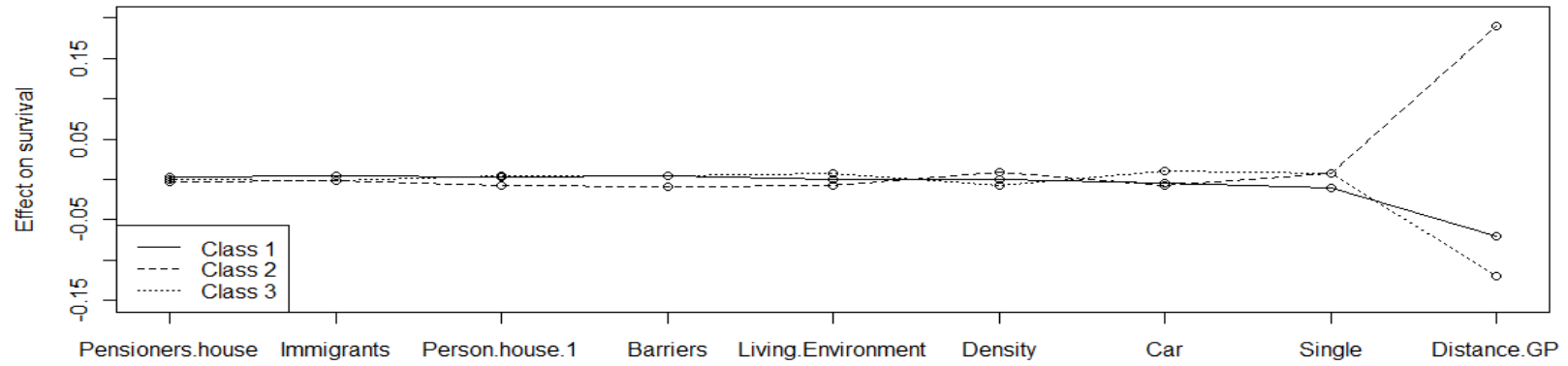
Figure 9.4: Conceptual latent regression model covariates for women

Description of Class 2

A much smaller proportion of people lived in places represented by Class 2 (9%). These people had a much lower survival rate relative to Class 1 within the same model and Class 2 of the statistically-formed model. The local area census variables indicated that the people within these places had relatively lower access. The distance to the local GP was longer and access to a car or van was lower. The population density indicates the lowest proportion of people within the local area. The general living environment was the lowest of all three classes and there was the highest proportion of single people locally. From these variables the pictures implies a more rural/lower population density environment that has relatively high deprivation.

However, within these local areas, the percentage of pensioners who owned their own houses was similar to the percentage within the first class. There was also the lowest index of barriers within the environment relative to the other classes.

Class 2 is again quite similar to the statistically-formed model equivalent. The conceptual Class 2 is smaller and the probability of survival is lower. However, a rural/sub-urban place is represented with low barriers to the environment in both models.

Description of Class 3

The proportion of people living in areas represented by Class 3 was also small; these people had the lowest probability of survival. The size and survival rates within this class were similar to those within the third class of the statistically-formed model.

Population density and access did not have a great influence on the conduction of this class. Place aspects that were important centred on the people who lived locally. Low levels of wealth and stability were shown by the lower number of pensioners who own their houses. Overcrowding of people was seen by the low number of houses with only one occupant, while there was also the lowest number of single people. However, the living environment was seen to be high overall.

This class differs greatly from the statistically-formed model Class 3. This might be due to the importance of education within this class for the statistical model that has not been considered here. This may also account for the differences in comparison statistics seen in Table 9.5 on page 258.

9.4.3   Representative conceptual latent class regression for women

The conceptual latent class regression model for women is discussed within this section. The model structure is the same as the above model built for men. The model is compared with the statistically-formed model for women within the secondary data analysis chapter (section 5.4.3) throughout.

Table 9.9 displays comparison statistics for the statistically- and conceptually-formed latent class regression models for women. The lower values of ACS and L^2 indicate that the conceptual model fits the data better than the statistical model, once model complexity is accounted for. A lower error rate of classifying people into places was seen. In addition, a higher amount of the variation within the conceptual model was explained (higher R^2 value). The conceptual model is arguably a better fit to the data than the statistically-formed model, both statistically and in relevance to personal perceptions of place effect.

The BIC value is slightly higher. This is probably due to BIC placing a higher penalty on larger number of parameters than other commonly used comparison statistics.

Table 9.9: Comparison statistics for conceptual latent class regression model for women

Model	BIC	AIC	L^2	Number parameters	Degrees freedom	Class error	R^2
Statistical	16945.2	16264.3	16086.3	89	15439	0.21	0.14
Conceptual	17095.2	16261.3	16043.3	109	15419	0.18	0.20

Table 9.10 shows similarities in the size structures of the three classes formed by conceptual and statistical modelling. There is one large class for which people have high probability of survival. There were also two smaller classes with middle and low probability of survival for the people who live in the places represented by these classes.

Table 9.10: Class sizes, expected event and probability of survival for conceptual model (women)

Model	Conceptual			Statistical		
Covariate	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
Classes (size)	0.80	0.12	0.08	0.77	0.15	0.08
Expected event	0.08	0.73	2.75	0.10	0.43	3.31
Probability of survival	0.92	0.48	0.06	0.90	0.65	0.04

Similarly, to the model for men, place effect was dominated by distance to facilities and population density. This, together with the number of single people locally, was also similar to the statistically-formed model for women.

Differences between the statistical and conceptual model are larger for women than they were for men. The conceptual model has fewer significant local area census variables. The relative

differences in influence on survival up to six months of the local area census variables are

shown in Figure 9.4 on page 261, ordered from smallest difference to greatest.

Table 9.11: Latent covariate estimates and test of significance for conceptual model for women

Covariate	Class 1	z-value	Class 2	z-value	Class 3	z-value	Wald
Intercept	1.76	**2.39**	0.31	0.23	-2.06	-1.79	**8.36**
Average distance to GP	-0.07	-1.30	0.19	**1.94**	-0.12	-1.32	**4.12**
% with a car or van	-0.005	-0.72	-0.008	-0.57	0.01	1.08	1.58
Combined Barriers Indicator	0.005	0.83	-0.009	-0.72	0.004	0.35	0.87
Combined Living Environment Indicator	-0.001	-0.19	-0.008	-1.12	0.008	1.46	**2.25**
% of pensioners own house	0.003	0.90	-0.003	-0.41	-0.0006	-0.1	0.81
Proportion of immigrants	0.004	0.27	-0.002	-0.09	-0.002	-0.08	0.07
% people single	-0.01	-1.64	0.007	0.46	0.007	0.5	**2.73**
% houses occupied 1 person	0.003	0.35	-0.007	-0.46	0.004	0.33	0.22
Population density	-0.001	-0.21	0.009	**2.31**	-0.008	**-2.25**	5.72

The small distances in the local area census variables that represent place are reflected in Figure

9.4 on page 261 and in Table 9.11. This indicates that only four of the nine variables have a

significant effect on the latent class construction.

Table 9.12: Latent covariate estimates and test of significance model for women

Covariate	Class 1	z-value	Class 2	z-value	Class 3	z-value	Wald
Intercept	1.25	1.86	-1.04	-0.85	-0.20	-0.21	**3.60**
Air quality	**-0.93**	-3.87	**1.21**	2.58	-0.28	-0.84	**15.21**
Low floor street level	**0.02**	3.20	-0.02	-1.45	-0.003	-0.28	**10.34**
One person house	**0.03**	3.14	**-0.03**	-2.20	0.01	0.65	**9.90**
Average distance to GP	**-0.10**	-2.42	**0.18**	2.49	-0.08	-1.15	**8.70**
Single parent	**-0.02**	-2.04	**0.04**	2.15	-0.02	-1.21	**5.56**
Christians	**-0.01**	-2.14	0.01	1.14	-0.001	-0.10	**4.64**

Description of Class 1

The high proportion of people who lived within places represented by Class 1 had high

probability of survival. In these places, distance to the GP was low and the number of people

with a car or van was also low. This may indicate a more urban local area; however, the

population density is low and not of importance. A low number of single people live locally,

which might indicate levels of social support available.

Apart from distance to GP, the formation of this class does not seem to be highly related to the local area census variables. This is very different from the statistically-formed model, in which the first class was affected by every variable within the model.

Description of Class 2

The people who lived in places represented by Class 2 have lower survival rates than those in Class 1. The main place effects were the longer distance to the local GP and the high population density. This implies an urban neighbourhood. The living environment was also seen to be low, which may indicate a certain level of deprivation.

These seem to imply a relatively deprived urban local area that does not have easy access to resources. The effects of the local area census variables on class formation were reasonably similar to those in the statistically-formed model. However, the picture formed was different, as the place information available was different. This shows the advantage of using the focused and informed local area census variables to represent place.

Description of Class 3

People living in places represented by the third class had a high probability of death. This is similar to the statistical model. The local area census variables indicate a low population density and high standard of living environment. Distance to the GP and the proportion of cars/vans locally was high. These indicate a rural environment with available access to resources.

These results are similar to those within the statistically-formed model and may indicate that compositional features are more important to the people within this class.

9.4.4   Summary of representative conceptual latent class regression models

The revision of the latent class regression models placed further emphasis on the importance of access and neighbourhood usability for ACS outcome. Differences were also seen between neighbourhoods of varying population density.

The conceptual latent classes formed for men were very similar to the statistically-formed model. This seems to imply that the conceptual place effects uncovered throughout this thesis coincide with statistically chosen place effect variables in terms of survival up to six months for men. Of particular importance was stability/wealth within the neighbourhood, represented by the proportion of pensioners who owned their own homes. As well as environment usability, this was related to the differences in urban/rural neighbourhoods.

The conceptual latent classes for women were quite different from the statistically-formed classes. The importance of population density and environmental usability was still clear. Only a few of the conceptually chosen local area census variables had a significant effect on the latent class construction.

The third latent class formed by both the conceptual and the statistical model is interesting. The majority of people who live in these local areas do not survive up to six months. The same pattern emerging from the two different approaches implies that the model may not be overfit to the data as was originally hypothesised. These places have low population density and low distances to local resources, indicating more rural neighbourhoods with access to resources.

Potential hypotheses are: a) women in ill health move to rural neighbourhoods later on in life and therefore have lower survival rates or b) being isolated from people locally does not provide support on a day-to-day basis or in a case of an emergency, which may result in higher death rates. Why women living in these places have such high mortality rates warrants further investigation.

The conceptual models were able to compare the impact of the conceptually and the statistically determined latent classes. This brings together the findings throughout the study. Place aspects that are seen to affect recovery are compared with their effect on survival up to six months.

However, this method is limited to a purely quantitative mixed method approach. The models greatly simplify the in-depth insight formed within the other stages of the study. It is important to recognise and question the relevance that can be placed on quantification of conceptual ideas.

9.5 Summary

This chapter has discussed compositional and contextual influences on ACS outcome. The research questions were considered in turn. This brought together the available and appropriate data and conclusions drawn from the different phases of the study.

The findings on place effect were simplified into six main points:

- Usability of environment
- Personal connection to locality: a) perceived quality of locality; b) length of history; c) change over time
- Adjustment

- Perceived level of support

- Support

- Population density

These points are not an exhaustive list of place aspects that affect recovery; they represent the aspects of place that emerged as important throughout this study. They are complex and interconnected by nature. These are simplified points that represent the place effects concepts and by no means fully encompass place effect.

Compositional level aspects were seen to interrelate with these place aspects. It is necessary to consider both the compositional and contextual level features to form a picture of influences on ACS outcome.

Differences in the way that representing place was approached were explored. This uncovered some of the complexities of place research. For example, environment usability was seen to be affected by distance and the barriers present. These were affected by the expectation of travelling and the ability of each person to overcome the different barriers.

Differences in the boundaries of place were of particular interest. There was little connection between administrative boundaries (LSOAs) and personal perceptions of neighbourhood. This may affect how relevant place summary statistics are to the people who live within the areas.

The second part of this chapter explored how these place aspects affected six-month survival. Representations of these concepts were used to form latent classes that represented place. These were regression on survival up to six months. The latent class regression models fitted were based on the insight formed throughout this thesis.

Conceptually- and statistically-built models did not correspond on all aspects of place effect and their contribution to latent class construction. Environment usability, access, and population densities were of particular importance.

The strong similarities between the statistical and conceptual latent class regression models for men appear to indicate that men are affected by and perceive similar effects of place of ACS outcome. Women seem to perceive different place effects from those that are affecting their outcome.

These models were able to bring further insight into the secondary data analysis. This sheds further light on differences between what is happening and how this relates to what is perceived during personal experiences.

This chapter has brought attention to the different types of questions that are being answered when using different methodologies. By undertaking different methodologies, these differences were shown to be able to compensate for limitations of other methods. This provides further information that can be iteratively used to build a better picture of place effect. Limitations and difficulties in data synthesis were also seen. By understanding these differences, insight into differences in place effect from the methodological approaches was better understood.

Differences in measurements made direct relations between the various data sources inappropriate at most points. The data synthesis was aimed to be conducted across the conceptual theories and ideas that came forward within each section. This enabled comprehensible insight into what was happening and perceptions of experiences. Within certain aspects of the data synthesis, such as section 9.3.3 that explores differences in representation, it was useful to make direct comparisons across the data.

Data synthesis took advantage of the different approaches and data available by being aware of the purpose for which the data was collected. By using this different collection of data, a more rounded picture of place effect has been formed within this chapter. This does not just rely on direct confirmation of methodologies, direct comparisons, perceptions or data summaries.

Across this study, a missing element of understanding was brought forward. This missing piece of the puzzle was how perceptions relate to and affect the influence that place can have on an older person with ACS. Is there a reason that place is perceived in a certain way and does this attitude change the way that place affects the person? By understanding this relationship further, insight could be drawn out of the data collected within this thesis.

Within the final chapter, the contributions and recommendations formed throughout the study are discussed. Then the study methodology and the experience of conducting the research are reflected upon.

Chapter 10:   Discussion and concluding remarks

10.1   Introduction

The premise that developed from the background literature, discussed in Chapter 2, was that a prosperous living environment encouraged better health for older people with ACS. The findings throughout this study have supported this theory. Through in-depth exploration, this study has shed light on the complex nature of interconnecting locality influences, between locality elements and across compositional level characteristics.

This thesis contributes a clearer evidence base of knowledge, where the compositional and complex contextual effects on health have been explored in unison (MacIntyre, Ellaway and Cummins, 2002). It builds up a rounded view of the health problem associated with ACS and the added difficulties that come with older age, such as co-morbidities, and explores how, why and what aspects of the locality have influence on this process.

Representation of conceptual ideas, specifically ACS outcome and place definitions, were also explored. It was seen that the representation used in each case had the ability to affect what inferences were drawn. Any portrayal of each concept must be based on the specific question being asked and will have influence on how well the data depicts the situation.

A mixed method and multiple-disciplinary approach enabled a more insightful overall view of the ACS process to be developed. This developing field of research opens up multiple methodologies, enabling advancement from multiple angles to contribute to the overall study, building up the strengths of different approaches and overlapping weaknesses. Using the research objectives developed based on the gap in the existing literature, this research design made explorations into multiple paradigms, answering questions that would not be possible within a single-approach study. The complexity of the study and the large amount of analysis necessary, especially during data synthesis, was time consuming and required the accumulation of a variety of new skills, and uncovered multiple problems in data synthesis (discussed further below in section 10.2). The flexibility to develop this exploratory study, being able to ask unobstructed questions and use any appropriate methods, provided wide-ranging insight, making the mixed method approach valuable. Innovative mixed integration methodology was used to bring together different types of data – for example, exploring boundary areas (LSOAs) and how people identify with them. From this it was clear that, despite small area definitions being homogeneous over population density, they were not perceived to hold meaning for the people living within the areas.

This chapter discusses the findings from this study and their implications, and how this thesis has contributed to the knowledge base available (as considered in Chapter 2). Contributions and recommendations based on these findings are presented in section 10.2. The strengths and limitations of the study from which these conclusions are drawn are then discussed in section 10.3, looking at the various methodological approaches employed (quantitative, qualitative and mixed methods). Section 10.4 contains reflections on the study design and implementation, as well as personal reflections about my own experiences throughout the course of this doctoral research. The chapter concludes with a discussion of topics that have emerged that warrant further exploration.

10.2   Contributions and recommendations

This section discusses the contributions to knowledge formed during this study. This was structured around the research aim and objectives formed in Chapter 1. Recommendations based on these findings are made.

Research aim: To understand the influence of place on the outcome of ACS for people aged 65 years and above living within Yorkshire and Humber, in the North of England. Particular focus will be put on those characteristics of place that are associated with outcome.

The conceptual framework displayed in Chapter 3 was used as a base to begin the study. This was based on the existing literature discussed in Chapter 2. The study itself developed the knowledge base around the meaning of place (Cattell, 2001) and ACS outcome, as well as a deep understanding of the wider trends and perceptions of the effect of place on ACS outcome.

A complex relationship was seen to exist between place effect, compositional features of the individual and ACS outcome. The place effect is integrated into a person's life and needed to be analysed within this context.

By focusing on people over the age of 65, the experiences of older age and environmental ties were explored. This is an age group that is under-researched within place effect research.

The mixed method design of this study enhanced the range of the research undertaken. This enabled a layered view on place effect to be formed. The iterative design allowed questions to be raised without restriction and an attempt made to answer them. For example, from the questionnaires, 'hills' emerged as a negative aspect of an environment. The qualitative discussions were used to explore this further. Hills were seen to be a barrier when mobility was reduced.

This study has uncovered even more than it set out to do, by achieving wide-ranging insight into trends, a grounded evidence-based overview of influences and personal perceptions of this experience. To state the main points identified, the study:

- Identified the basic areas of influences on ACS outcome in terms of patient perspective and locality influences grounded in the data
- Developed a place effect questionnaire that measures patient perspectives that are comparable over time
- Demonstrated the importance of personal connection to the local environment, based on opinions of those involved, level of community both personal and social, as well as physical attributes of the neighbourhood
- Explored the build-up of different levels of support (instrumental, emotional and perceived), where they came from and whether they were taken advantage of
- Highlighted some of the personal characteristics that interact with locality influences to affect ACS outcome
- Built up a working definition of ACS outcome as the process of dealing with the changes and limitations that occur from ACS health problems
- Explored what makes up an older person's definition of boundary areas and locality

The contributions and recommendations that have been formed from this study are now discussed based on the research objectives (Chapter 1). These objectives broke the research aim down into manageable questions.

Survival, perceptions and the experience of ACS outcome

The events and experiences following an ACS diagnosis for older people have been represented by survival and recovery within this study. How useful these commonly used definitions have been, and how they interrelate in this context were of interest: for example, 'how important is survival to an older person with ACS?'.

An older person's survival was dependent on both compositional and contextual features. Survival rates up to six months were high within the combined dataset: 87.8% of men and 87.1% of women were alive six months after ACS diagnosis. This was reflected in the responses to the questionnaires and the qualitative discussions. Very little fear of death or of a recurrent event was expressed, and high recovery rates were perceived at initial and follow-up recovery.

The ability to *deal with the changes* that ACS enforced upon a person was seen to be of greater importance to the individual than survival. This process was seen to change over time and led to the working definition of perception and experiences of ACS outcome:

'the process of dealing with the changes and limitations resulting from ACS health problems'

This process encompasses support available, how usable the local environment is, the individual's ability to cope and how a person views his or her own recovery.

The three ways a person viewed their own recovery were: *enhanced health; incomplete recovery* (but with expectation of further improvements); and *reduced health* (recovery complete but at a lower level than previously).

It is recommended that the meaning of ACS outcome should be explored within the context of any study conducted. The meaning of outcome varies greatly in relation to how it is measured and its interpretation, both within the study itself and by the person reading/hearing about it.

What is place effect?

Place effect, in the context of older people with ACS, was seen to be a complex combination of contextual and compositional features. Place effect on survival was dominated by environment usability and population density.

Administration boundaries were seen to have little connection to a person's perceived neighbourhood. Personal connections to neighbourhoods were most affected by length of history within the area. A longer history gave a sense of connection and belonging; however, it also provided an environment with which the person's present situation could be compared. Changes in health levels and changes in the built and social neighbourhood caused negative feelings.

The size and geographical location of the neighbourhood towards which a personal connection was felt varied. This seemed to relate to urban/rural differences and the deprivation of the neighbourhood.

Development of the mixed method study

One of the key advantages of a mixed method study was the flexibility to choose appropriate methods based on the research aim. The use of a range of different methods that targeted layered information about a place effect increased the strength of the study. The iterative approach enabled the limitations and weaknesses of a certain method to be overlapped within a different approach.

The mixed method design formed the underlying structure of the study conducted. This design was based on the literature available. A strong theoretical base of literature was available; however, guidance on the empirical side of conducting data synthesis was limited.

Within this study, the design developed based on the insight formed throughout. It is recommended that the design in centred on the research objectives and put securely in place before the study starts. The design should be flexible to changes. This helps to make decisions on the structure of the study, to choose the method of data collection, and then determine how the data and concepts that are uncovered may take shape within an overall picture of the phenomenon. From this structure, some of the difficulties that would occur in the on-going data synthesis can be identified. These developments can then be used within the remainder of the study, expanding on and validating knowledge at each stage.

On-going data synthesis was the most difficult part of the study. The mixed method design was a useful guide throughout. Difficulties stemmed from fundamental differences in methodological approaches. The types of questions being asked and the data sought formed layers of information that did not always overlap in a meaningful way.

Within this study, a conceptual approach was taken. The conclusions and concepts formed within each phase were brought together in a layered picture of place effect on ACS outcome. This reduced the need to directly compare data from different methodologies that was collected based on different underlying aims.

There are many different mixed method approaches. It is recommended that the approach taken reflects the aims of the study. The iterative approach taken within this study enabled it to develop the insight formed throughout each phase. Further iterations would have developed understanding further. It would have been especially useful to explore the relationship between place effect and perceptions of place effect. Within the time scale of this PhD, this was not possible.

How does place relate to survival?

Inequality caused by neighbourhood deprivation was seen to be associated with six-month survival from ACS for older people. General deprivation, represented by the IMD score was seen to have the greatest effect on survival in comparison with the other two local area indices considered. People living in local areas of higher general deprivation had lower survival rates. This relationship was still present after taking into account a range of individual level aspects.

The same relationship was seen between survival rates for men and the level of material deprivation of the local area. This was represented by the Townsend deprivation score. Women's survival was not affected by the level of material deprivation within the local area.

A higher survival rate was associated with a middle level deprived local area represented by the Jarman index of social inequality. This relationship was no longer significant once individual level aspects were taken into account. This may be due to the strong links between the variables from which the Jarman index is formed and individual level features.

The aspects of the local area that were seen to effect survival at six months were assessed by taking both a statistical (discussed within the secondary data analysis chapter; section 5.4.3) and conceptual modelling strategy (discussed within the data synthesis chapter; section 9.4). Similar results were seen between the statistically- and conceptually-built latent class models.

Overall, environment usability was seen to account for a large portion of neighbourhood compositions. These local area representations were formed in terms of effect on six-month survival. Environment usability was represented by barriers, distance to facilities, and differences between rural and urban areas.

Population density and housing ownership were also seen to affect the relationship between place and survival.

Place affects six-month survival for older people with ACS. It is recommended that where a person lives should be considered when assigning the amount and type of support that a person receives.

Insight formed from layered definition of place and integrated compositional aspects

The contextual and related compositional features that affected ACS outcome for older people uncovered within this study were summarised in six points.

- Usability of local environment
- Personal connection to place: perceived quality of locality; length of history; and change over time
- Adjustment
- Perceived supportive environment
- Social interaction: reliance on others and marital status
- Number of people locally

The conceptually-formed latent class models within the secondary data analysis assessed these place effect aspects in terms of six-month survival. This indicated that the majority of these points had both an overall trend of effect on six-month survival and were perceived to influence recovery.

Insight formed from this layered definition of place and integrated compositional aspects not considered so far within this chapter are discussed below.

Usability of local environment

Environment usability developed as a major concept throughout this study, with the importance of access barriers, both perceived and physical, being of paramount importance. These barriers were present prior to ACS diagnosis. Therefore inconveniences such as there being a long distance to the local shop was seen to be relative to expectations.

However, existing barriers such as hills can become more of a problem when health problems are present. These new difficulties were seen to be difficult to accept. Frustration was expressed when a person was unable to use their environment in a way that they used to and still believed they could.

Environment usability, perceived and physical, formed an interacting influence on survival. It is recommended that research and policy based around usability of the environment for older people with ACS is based primarily around new problems that are formed by the ACS. One way to aid usability might be community-based resources, such as aiding travel to and from appointments. These were seen to be available in more rural localities, providing support and reassurance. It is suggested that this might be more useful within an urban environment where easy access is expected.

Social community, and close friends and family

Having a social community had a positive influence on the instrumental aid available, the emotional support received, and the perception of being supported by other people. The importance of social support was seen to be greatest later on within the recovery process. This was seen both from the Kaplan-Meier estimate analysis of the Jarman index, and the differences seen across the questionnaire study. Qualitative participants indicated that later on in the recovery process there was less help available.

Within Simon's neighbourhood, a weekly 'meet up' was organised to continue after the rehabilitation course he had attended finished. This provided opportunities for exercise, talks and socialising with people in a similar situation. Having such facilities available locally would be

an advantage, provide support and reduce isolation. Any form of community-based activities can provide social support and motivation, creating a feeling of community, reducing feelings of loneliness and the sense of having no one to whom to turn for help.

Within the background literature, much of the focus of support concerned spouses. It transpired that this is because much of the offered and accepted support comes from family and close friends. Support from close friends and family was seen to be sought and accepted more easily. This may have been due to a mutually supportive relationship or a higher level of trust.

A perceived social community was seen to provide feelings of support and comfort. Help that was offered by people within the social community was often turned down, but the knowledge that support was available was greatly appreciated.

Were information requirements met?

Information needs were not seen to be met. Most information was received in hospital when an individual was too overwhelmed to take in the information, or the information was in technical language and was received as vague impersonal instructions and advice.

It is recommended that general knowledge of the symptoms and treatment of ACS are made more readily available and understandable.

Heather's suggestion of a timeline of personal recovery would help to clarify the process and reduce uncertainty. The unpredictable nature of this time period would make this difficult at a personal level. A version of average recovery periods and different treatment possibilities for ACS symptoms may be more realistic. This availability of knowledge could give power, hope and a way of attaching meaning to this process for the people experiencing it.

Methodological developments

A large range of methods were used in this study. This section discusses new applications of methods within the context of the study.

Survival trees were used to categorise the continuous local area indices that represented area inequality. In each case, three groups of people who lived in areas of varying levels of deprivation were formed. This form of categorisation resulted in less information being lost than would be the case when using an arbitrary splitting criterion: for example, a commonly used technique is to take quartiles (this process is explained in greater detail within the first methods chapter; section 4.4.1).

Community mapping is a recent development that has not been undertaken in this area of study before. This was useful to draw out insightful information relating directly to a personal perception of place. Community mapping focused the conversation on the place, helped with memory recall of experiences and was useful in exploring personal neighbourhood boundaries. Details of the method are discussed within the second methods chapter; section 6.4.

Within the second iteration of the secondary data analysis latent, class regression models were constructed. The latent classes were formed based on conceptual ideas of place effect. These models were used to see the relationship between the representations of the conceptual place effect aspects and survival. The similar findings within the statistically- and conceptually-formed models also increased the confidence held in the latent classes that represented place effect.

This exploratory study has uncovered some interesting insight into place effect. Based on this insight, the support and advice given needs to be tailored around the individual and where they live. For this to occur, a better understanding of attitudes towards recovery and place are needed.

10.3   Strengths and limitations

Strengths and limitations are present within any research undertaken. The main limitations of this PhD study were due to time and resource restrictions. Throughout the study every effort has been made to enhance strengths and minimise limitations within these confines; these efforts are discussed within this section.

The quality of the data on which inferences are based is discussed below in section 10.3.1, the limitations present within the analysis stages of the study in section 10.3.2, and the reliability of the findings in section 10.3.3.

10.3.1   Data quality

The analysis conducted and emergence of conclusions are based on the data available, the quality of which affects both what is uncovered and how accurate it is. The interconnected sources of data are formed from the combined secondary dataset, questionnaires at two time points and the qualitative discussions.

Throughout this study care has been taken to be ethical at every stage of the research, putting people and their right to anonymity above the needs of the study:

- Data was kept securely in accordance with the Data Protection Act of 1998.
- Study participation was voluntary and it was made clear that participants could leave the

study at any time without giving a reason.

- No harm came to the participants, or interference with treatment as a result of this study.

- Privacy, anonymity and confidentiality were upheld at all times.

The combined secondary dataset was collected across Yorkshire and Humber. This large sample of 35,767 older people (20,122 men and 15,645 women) represented the population of interest, giving the opportunity for powerful analysis.

Yorkshire and Humber has large diversity in the type of people and places in which they live, with both high and low deprivation, levels of affluence and urban/rural differences. For example, within the West, the urban area of central Leeds can be considered, alongside more rural areas found within the North and smaller towns where cultures and resources vary. From this, analysis of locality difference was greatly supported.

Whether analysis based on Yorkshire and Humber is relevant to other places across the UK and internationally is limited by north/south (Doran *et al.*, 2006) and culture variations: for example, the quality of hospitals within certain areas. Yorkshire and Humber has high levels of deprivation, and was chosen to support generalisability to localities of both more and less deprivation, by critical sampling.

All secondary data comes with the limitations of having no input on the type of data collected and collection biases. The ACS dataset was collected for service evaluation purposes and hence is clinically based, overlooking more personal level data that would have been useful. Collection was conducted over multiple hospitals by many different people. This will influence whether data is imputed, the accuracy and type of data, creating selection bias.

Data cleaning and multiple imputation where possible were used to minimise collection and selection bias. The accuracy of the imputation used was increased by the size and number of predictor variables used within the dataset, increasing the acceptance of the normality assumption and how well the data is modelled. Five imputed datasets were used, considered adequate (Rubin, 1987). However, it has been argued that more imputations are needed for the results to be valid (Graham, Olchowski and Gilreath, 2007), requiring more time and processing power.

The latent class regression analysis was based on the complete-case combined dataset (deleting patients with any missing data from the dataset). Multiple imputations were not used due to complications in computations and fulfilling underlying assumptions. Latent class classification is not influenced by the lack of imputation, as it is based only on the observed data available;

multiple imputation would have only been beneficial during prediction of survival. It is recognised that this is not optimal (discussed in Chapter 4), but was unavoidable within the scope of this study.

The general nature of questionnaires makes them quick and inexpensive, with low response rates. Careful thought and planning went into the questionnaires' construction, making them short, flowing logically from one question to the next and easy to understand (discussed within the second methods chapter; section 6.2.3). The high return rate and level of completeness for both the initial and follow-up recovery questionnaires greatly increased the quality and reliability of the questionnaire data collection.

Despite the high response rate, the relatively small sample size restricted the insight that could be sought from the data. Basic calculations and limited simple linear regression were possible, although more complex analysis would have required a much larger sample size. This flaw was built into the design of the study, as the time and resources were not available to collect the necessary sample size for this level of analysis.

The completeness of the systematic recruitment into the questionnaire study by cardiac research nurses was limited by the willingness of the people approached to take part, and whether the nurses had time to approach every person meeting the criteria during their stay in hospital. People with very short hospitalisation periods were less likely to be approached.

The questionnaire sample was biased towards individuals from areas of mid to low levels of deprivation. Encouragement was given to approach people from less affluent localities to account for this bias, adopting a theoretical sampling strategy, both within the questionnaire and qualitative stages of recruitment. Within the time scale of the study, it was not possible to recruit a highly representative sample from more deprived localities. This bias within the sample will have influenced the inferences drawn; allowances were made in the representation of results, drawing analysis to take account of this.

Collecting comprehensible dialogue from qualitative conversations was improved using a quality dictation machine, and then an external microphone during community mapping to reduce external noise interference, such as traffic. To reduce loss of information since transcriptions were in written form, recordings were kept available during analysis and listened to when clarification of meaning was needed (MacLean, Meyer and Estable, 2004).

Forming relationships with people helps the flow of information when conducting interviews and community mapping (Gillham, 2000b). This was addressed by reducing the boundaries between the researcher and the participant by, for example, dressing appropriately, and

attempting to create a relaxed, unpressured atmosphere (Manderson, Bennet, and Andajani-Sutjahjo, 2006). In each qualitative discussion, it was felt that open and honest responses were received.

Talking about close relationships and emotions were difficult topics. Community mapping provided distance from participants' homes, where these matters could be discussed more openly. It encouraged an open discussion of a wide range of more difficult topics, although was only undertaken with four of the ten participants.

10.3.2   Limitations

Minimisation of limitations within the conduct and analysis of this study are discussed in this section.

The meaning of some terminology is grounded in its paradigm of research, leading to misinterpretations and accidental misrepresentation, especially early on during the use of this mixed methodology. For example, the term *recovery* can be interpreted differently, depending on who is hearing/reading it. Time was taken to clarify interpretations, forming certain definitions when necessary to reduce misunderstandings, such as the defined terms *local area* and *neighbourhood,* used in the secondary data analysis and qualitative discussion respectively*.*

The defined boundaries formed around strategic health authorities (SHAs) were taken out of use on 31 March 2013, following the Health and Social Care Act, 2012 (Local Government Association, 2012). The Yorkshire and Humber boundary lines on which this study was based will therefore be less relevant to future definitions of locality.

SHAs have been replaced by local health watch areas, aiming to give citizens and communities a stronger voice, by giving more freedom to local authorities to improve their own living environments. These changes in power distribution and locality definitions will enable evaluation of process and the effect of change within neighbourhoods.

The complexity and size of the combined data increases difficulties when modelling, with interacting and hierarchical underlying structures within the data that need to be identified and considered within the model. Due to the size of the dataset and time restrictions, it was not possible to generate directed acyclic graphs that may have helped to understand these relationships.

Throughout regression analysis, every attempt has been made to try to satisfy the underlying assumptions on which models are based. Attempts were made to model the underlying structure of the data to avoid problems such as non-linearity and co-linearity. Within such a

complex dataset, their presence are still plausible, which may have resulted in the standard errors formed not accurately reflecting the level of variance (Faraway, 2006). The consequences of violating proportional hazards assumptions within Cox proportional hazards regression models are discussed within the first methods chapter (section 4.4.3): overestimation of predictor variables is created relative to risk of survival (Machin, Cheung and Parmer, 2006). These limitations were minimised by removal or categorisation of offending predictor variables. Other approaches that may have increased the appropriateness of the model, but would have greatly increased its complexity and taken more time than was available, were stratification or time-varying covariates.

The initial stage of secondary analysis was based on local area indices. The analysis was simplified by categorisation of these variables based on an informed splitting criterion. Maximising the differences between survival rates within each category was undertaken to try to retain the originally continuous information (Gordon and Olshen, 1985). The limitation of this approach is that these categorisation predictor variables are then modelled on survival. This could influence the significance of the relationship between the local area index and survival. This was appropriate within this study, as the direction and comparative strength of the relationship was what was of importance.

The second stage of the secondary data analysis, latent class regression, was conducted with the software Latent Gold (Vermunt and Magidson, 2000). Multiple imputations of the combined dataset was not possible with this software; complete-case analysis was used instead. The sample size on which the analysis was performed was therefore reduced and non-recording bias incorporated into the dataset. Comparability between the local area indices and local area census variable analysis is also reduced as the analysis of the datasets is different.

As with all questionnaire data the main limitation was the inability to clarify meaning and interpretation of the responses given, or prompt for further explanation. The importance of interpretation from the context is because the viewpoint of the researcher can influence inferences formed. Mixed method analysis within a nested sample enabled clarification and further insight to be gained from the qualitative discussions, based on the initial questionnaire insight.

In the design of the questionnaire, certain terminology was left undefined. This was to encourage identification with self and the neighbourhood. On reflection, this made the analysis and interpretation more difficult, as there was no way to determine personal definitions.

Questionnaires and the interview topic guide were piloted (to confirm the clarity and effectiveness of each question) with only a small number of people due to time restrictions. It is felt that a full pilot study would have improved the questionnaire further.

In qualitative research, it is widely recognised that any recorded interaction will be influenced by the researcher and the circumstance of their presence. In attempting to present perspectives as openly and honestly as possible, I aimed to disclose the effect of these interactions and acknowledge the influence on the results (Charmaz, 2006). In the majority of cases, people were happy to discuss their experiences and there is with very little reason to believe that the conversation was misrepresentative of their circumstances.

Qualitative discussions were conducted within the person's home, encouraging identification with own circumstances. The flow of interviews was often interrupted by phone calls and people dropping by, sometimes resulting in changes in the topic of conversation. Although this made the interview more difficult, the interruptions provided insight into connections with social community and its importance.

The nature of the qualitative methods used collected information that was retrospective, open to memory and subjective reflection bias. This can limit the accuracy of the information given, though provided the opportunity to analyse personal perceptions of participants' own experiences and how they saw their own recovery trajectory. Mixed method analysis across questionnaires and qualitative discussions provided more information on the recovery trajectory, as it looked at changing perceptions of the experience over time.

Due to time constraints on the data collection and analysis during the qualitative approach, it was only possible to involve ten people, with only four of those ten people undertaking community mapping. The use of theoretically informed sampling aimed to identify people who were typical examples within the different areas of interest within this study. In reality, each person is unique, have varying personal circumstances, and with their own connection to the place in which they live. These limitations make it more difficult for general concepts to emerge from the data and hence to determine how applicable findings are in other circumstances.

Questions about sensitive subjects such as death were difficult to discuss for both parties to the conversation. How to broach such questions was researched and discussed with my supervisor; as qualitative discussions progressed, this became easier and greater insight was formed.

Ongoing analysis throughout the time period when qualitative discussions were conducted was limited. Only initial transcripts and notes were possible due to time constraints and my

inexperience with the analysis process. Having been able to identify new topics of interest that could be raised in the next discussion would have provided the opportunity for further clarifications and draw out differences in experiences. For example, a direct question about the perceived importance of survival would have been included, to explore the relationship between survival and recovery, if it had been identified as an area of interest before data collection had finished.

Early on in the qualitative study, the design was altered to concede to time constraints, bringing forward the follow-up questionnaire from nine to six months and only conducting one qualitative discussion per person. Exploration into change during the trajectory of recovery could have been explored.

The route walked around the neighbourhood during community mapping was decided by the participant, encouraging exploration of their personal neighbourhood. On reflection, more direction might have been useful. A suggestion to walk the same route that they had walked earlier in the week would have reduced this pressure to think of somewhere to walk.

Within the combined dataset, the data used to represent locality was from the 2001 census. Analysis started prior to the release of the 2011 census; therefore, this data may no longer be relevant to the people living within the locality boundaries. Repeating the analysis based on the 2011 census data would enable differences over time to be explored.

The ACS dataset was collected between 2003 and 2010. How appropriate it is to analysing 'place effect' based on locality data from an earlier time period will affect the accuracy of the analysis. The same problem is present when synthesising the secondary data analysis with the recently collected questionnaire and qualitative data. The disparity between the times of collection could influence the differences in conclusions, reflecting the changes over time, rather than the effect of collecting data from different paradigms.

The second iteration of latent class models was limited by the model selection strategy; the complex nature of the model meant that multiple different models were possible. Without the overall aim being to fit the model to the data, it was difficult to determine the optimal model to use. The conceptual insight formed and applied in these revised models was drawn from the exploration into various paradigms. It is reasonable to question whether it is possible to represent conceptual ideas using quantified variables and how representative they are.

Throughout this study, place effect has been analysed. This included exploration of the built and social environment. However, it has not been possible to explore the difference between the individual and ecological effect. This limitation occurs throughout the study. A measure of

individual level socio-economic status or deprivation was not available within the combined data. It is not possible to state that place has an effect without the consideration of this. Within the qualitative approach, it was not possible to determine whether perceptions of place only applied to the individual or were as a result of place having an effect. During the analysis, care was taken not to fall into the ecological fallacy by drawing conclusions about the individual based on place level data. The focus was kept on the overall effect of place in the context of the individual rather than grouping people together. However, this was not always possible within the limitations of the data available.

10.3.3   Reliability

Rigour necessitates that researchers attempt to be fully accountable for their data collection, analyses, and interpretative methodologies (Onwuegbuzie and Johnson, 2006). Inferences are based on the reliability of the study, with accuracy relative to the level of rigour applied throughout. Sections 10.3.1 and 10.3.2 above have discussed the quality of the data used and how limitations throughout the study have been approached, aiming to form reliable conclusions. Within this section, other steps taken to maintain high levels of study reliability are discussed, bringing forward issues that may affect rigour.

To increase the reliability of the secondary data analysis, regression models were replicated. Models were refitted using similar modelling strategies multiple times, so that comparisons of models could be formed. This provided a means to check the validity of the relationships identified, as well as question interpretations. Cross-validation would have been a more thorough approach, but time restrictions on the large number of models used made this impractical.

Clarification and expansion of ideas were also possible using this mixed method format. reducing the restrictions of single paradigm research that determine certain question formats. Another way in which this was useful was to illuminate and develop questionnaire responses using the qualitative discussions. For example, questionnaire results indicated that changes in the type of transportation used was minimal; the qualitative discussions were able to show that this is only true for the main type of transport used. A large proportion of people had changed some form due to reduced mobility, such as having to use public transport to support their walk into their neighbourhood.

Qualitative discussions were conducted, transcribed and analysed by myself, standardising the entire process and reducing the likelihood of misinterpretation errors.

Throughout the qualitative discussions, the same sets of overall topics were covered. This enabled direct comparisons between people and where they lived, while maintaining the flexibility to cover new topics of interest. Analysis was undertaken in a logical order with care, using constant comparisons and returning to the raw data often, so that concepts emerged naturally.

Rigour was achieved within the qualitative analysis by the formation and testing of coding structures, grounding the concepts within the data using guidelines in published literature, to establish and verify high-quality practice.

In mixed method research, rigour and reliability has been termed *legitimation*, due to arguments about the interpretation of the word *rigour*. The process of legitimation was undertaken at the data collection, analysis and integration stages as an ongoing process (Onwuegbuzie and Teddlie, 2003). By maintaining highly rigorous practice throughout the different stages of study and then, during synthesis, by being aware of the limitations present, the conclusions brought forward within each section were integrated in a legitimated manner.

Using the research objective and questions to drive the methodology development and implementation throughout the study, data synthesis was inbuilt. An iterative, constantly developing design enabled ideas and interpretations to be developed; areas of confusion were explored using alternative methods when needed, to clarify and expand on concepts.

10.4   Research reflections

Reflexivity is a self-assessment of personal influences on the research process (Hall and Callery, 2001). Including reflections from the researcher's perspective offers insight into the development of the study, furthering the education of the researcher, as it puts the decisions made in context. This was especially important within this study due to the complex nature of a mixed method study design.

As I have been the designer, conductor and analyst for this study, personal influence has been exerted over the way it was conducted. The attempt has been made to maintain consistency in these influences by engaging reflexivity (Robson, 2002), by being aware of how my preconceptions have influence. With this knowledge, I have engaged in self-monitoring and personal dialogue to reflect constantly on my own thoughts.

This is presented within two stages: firstly, a retrospective appraisal of the study design, conduct and analysis in section 10.4.1, specifically discussing how the study could have been improved with hindsight; secondly, personal reflexivity, used to reflect on how my purely

quantitative background has influenced this thesis (section 10.4.2) and the experience of working with two new research methodologies.

10.4.1   Methodological challenges

Previous to starting this PhD, all my experience and expertise was in quantitative research; this influenced many aspects of the study. The diverse nature of the research objectives led to the decision to incorporate questionnaires and qualitative methods in a mixed method framework. Understanding and conducting reliable qualitative and mixed method research within the scope of this study was challenging.

My understanding of the different approaches increased during training courses and reading into qualitative research, NVivo and best approaches when using survival analysis. This helped me to see how other people had approached similar questions and therefore to think about how I should approach my own. Thus, I gained an appreciation for the benefits of methodological flexibility, to approach the research objective unrestricted in the type of questions that can be asked.

By starting the study using a purely quantitative approach with secondary data with which I had previous experience, the time was available to develop qualitative skills and, specifically, to meet the challenge of accepting that research can be approached from an alternative mind-set: that generalisability to a wider population based on a sample may not be the main objective, but rather understanding human behaviour and the reasons behind it. This was very beneficial towards my continued training, widening my understanding of the realms within research.

The amount of literature available for qualitative, quantitative and mixed methods approaches, as well as surrounding place effect on ACS, was overwhelming. This was approached by focusing on the methods that were to be employed and the area of study. The literature read and discussed for this thesis is by no means comprehensive; only a narrative review was possible.

Secondary data analysis also expanded my knowledge base of different quantitative approaches. The data structure was complex, leading to the use of complex quantitative methods. The resulting models were difficult to interpret and validate.

After having obtained ethical approval, the questionnaire study developed insight into change over time and personal perspectives. The challenge of developing a simple yet informative questionnaire was approached through insight from the literature and advice from a colleague who had previously developed a similar survey.

Qualitative analysis was especially challenging: the amount of data acquired was overwhelming. Following guidelines on how to conduct qualitative analysis, as well as advice from my supervisor, helped me to manage the data and form concepts.

The main methodological challenge was mixed method synthesis. Difficulties were born from the extreme nature of the methods used, the differences in paradigms and use of various measurements (Glaser and Strauss, 1967). This was complex and underlined the design and conduct of the study. The broad and inter-paradigm research objectives made the mixed methodology appropriate, developing exploration and synthesis at each stage, based on the strengths and weaknesses of the previous phase.

Synthesis at the data level resulted in clashes of representative measurements and paradigm approaches. Conducting the data synthesis using conceptual integration overcame some of these difficulties, as did being open to using single paradigm data when there was no natural fit across different data formats.

The complexity of mixed method data synthesis was increased by the many different possible approaches. The decision was taken to focus on the research objectives derived during the background literature review. This enabled conclusions to be drawn from all areas of the study. On reflection, this will have reduced the emergence of findings that did not directly relate to these questions. If more time were available, a more extensive and ongoing data synthesis would have been conducted.

The second iteration of latent class regression models, reflecting the conceptual insight formed during the data synthesis indicated crossover between the insights formed within each paradigm. Given the difficulty of quantification of conceptual concepts, undertaking this method was not ideal, although it did provide surprisingly confirmative results.

10.4.2   Personal growth and realisations

The most important lesson throughout this study was to trust the data, constantly returning to looking at how it was collected, comparing findings and being open to new ideas, even when the methods used were unfamiliar. This involved considerable time and repeated analysis, critiquing every step taken, which slowed the progress of the study.

Much of the initial analysis was descriptive, attempting to map out the population of interest. This worked well in the secondary data analysis and at times with the questionnaires; however, it hindered progress during the qualitative discussions and analysis of qualitative data. Opening up to this new way of thinking about data units, codes and ways of uncovering representative

information was a steep learning curve, and the way I thought changed through the course of the PhD.

During the progress of the study, I found that a conscious effort had to be made to maintain focus on the research objective, and to avoid exploring too many tangents, while being open to new ideas; this was a constantly re-evaluated compromise between level of depth and breadth.

Throughout the study, a conscious effort was made to integrate different methodological approaches, synthesising conclusions to inform the next phase. However, it was during the writing-up stage that the power of mixed method research was realised. During writing, I had the freedom to look over the results and form further conclusions from a broader perspective. This led to going back over the data collection and forming further data synthesis that would not have been realised, if the research had been conducted with a single research methodology.

The journey through this PhD study has increased my respect for the interstices of research development and analysis. The mixed method structure and synthesis in particular has encouraged the full picture to be seen. It is felt that designing a mixed method study, obtaining NHS ethical approval, conducting cross-paradigm data collection and analysis has provided valuable experience, increased my knowledge base, and given me an enhanced perceptive and appreciation for research.

10.5   Recommendations for further research

In the area of research into place effect, there are seemingly endless amounts of possible research to be realised. The exploratory nature of this thesis has uncovered further topics of interest, raising many questions of its own. The findings having illustrated a complex relationship, exploring some of the underlying reasons for place influence. It is also acknowledged that further validation and exploration within this subject area is needed. By reflecting on the study as a whole, this section makes recommendations for further research and suggests topics that warrant further investigation. These are confirmatory and expansions of the evidence and knowledge base developed within this study.

- Develop research to explore how the compositional and contextual influences on people with ACS differ between older and younger people, with exploration into the differences in support available and how important neighbourhood is across recovery trajectory.
- Further testing of the reliability and validity of the statistical (formed within the secondary data analysis chapter; section 5.4.3) and conceptual latent class regression models (formed

within the data synthesis chapter; section 9.4). The complexity of the models formed provides a great amount of exploratory power. Cross-validation could examine variations across the sample, forming more consistent models.

- Use the latent class model format to explore place effect within other strategic health authorities (SHAs) across the nation. This could be used to determine trends across different countries. This is complicated by recent changes in the boundaries used to divide the country from SHAs into local health watch areas (Local Government Association, 2012).

- Consider further exploration into how individual level socio-economic status (SES) affects the relationship between place and ACS outcome. This could be achieved by using a hierarchical model with place as an upper level and various individual level characteristics, including SES, within the base level.

- A key development was how area boundary (LSOA) has little relation to perceptions of neighbourhoods. There is need for substantive in-depth research to understand this relationship and its implications for quantified locality-based studies, to identify whether this connection and usage is needed for the analysis relating to the area to be valid. This could be achieved by collaborating across disciplines.

- Consider exploration over larger neighbourhood boundaries as personal connection with neighbourhoods is often made to local areas larger than a single LSOA. Defining local area boundaries by middle super output areas (MSOAs) may be able to better represent the local area.

- Further assessment of the reliability and validity of the recovery questionnaires, using a larger sample to explore inconsistencies in interpretations, consistency and data scales.

- Use of the recovery questionnaire to explore changes over time, further needs and further time points, forming a longitudinal exploration of place effect, and the perception of own recovery.

- Develop research to explore the compositional differences uncovered, such as the importance of social community, especially for women, while the physical aspects of the neighbourhood have a greater effect on men, thus moving the research agenda forward based on this exploratory knowledge base for older people with ACS, to understand reactions and differences in recovery.

- Consider the application and use of analysing *dealing with change,* accounting for the ongoing changes in attitudes and activities of older people who experience ACS. This more defined construct could provide insight into why people react differently when faced with similar problems.

- Develop research to explore experiences of fear, such as why people were not afraid of death, although the fear of dependency and loss of identity acted as motivators, and exploring how remaining within own neighbourhood was seen to help overcome this fear, giving a sense of comfort and support. By exploring the impact and origins of this strong, often held belief, the benefits of supporting older people remaining within their own home could be uncovered, with potential reductions of financial costs, delaying entry into a care home, and the increased support provided by being at home.

- A key community effect, influenced by the neighbourhood, was the impact of the strength of the relationship between people, influencing whether help and support are accepted, and the overwhelming effect of too much support. There is a need for more in-depth research into this complex relationship, identifying when seeking support needs to be encouraged, and when too much support needs to be discouraged, especially from partners.

- During the search for a layered view of place effect on recovery from ACS, a missing phase was uncovered. In order to develop this picture further, exploration into the relationship between perception of experiences, and the association between place and survival is needed, questioning whether perception of influence has consequences for health.

References

Aarons, G. A. et al. 2010. Advancing a conceptual model of evidence-based practice implementation in child welfare. *Administration and Policy in Mental Health and Mental Health Services Research.* **38**(1), pp.4-23.

Adams, J. and 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**(4), pp.379-383.

Allender, S. et al. 2012. Relative deprivation between neighbouring wards is predictive of coronary heart disease mortality after adjustment for absolute deprivation of wards. *Journal of Epidemiol Community Health.* **66,** pp:803-808. doi:10.1136/jech.2010.116723.

Alwan, N. et al. 2007. Do standard measures of deprivation reflect health inequalities in older people. *Journal of Public Health Policy*. **23**(3), pp.356-362.

Anand, S. S. et al. 2008. Risk factors for myocardial infarction in women and men: insights from the INTERHEART study. *BMJ.* **319**(7221). Pp.932-940. doi: 10.1093/eurheartj/ehn018.

Anderson, D. et al. 1996. Social support, social networks and coronary artery disease rehabilitation: a review. *The Canadian Journal of Cardiology*. **12**(8), pp.739-744.

Astin, F. and Long, A. F. 2009. Qualitative research: An overview. *British Journal of Cardiac Nursing*. **4**(8), pp.390-393.

Augustin, T. et al. 2008. Neighborhood psychosocial hazards and cardiovascular disease: the Baltimore Memory Study. *American Journal of Public Health*. **98**(9), pp.1664-1670. doi: 10.2105/AJPH.2007.125138.

Avezum, A. et al. 2004. Impact of age on management and outcome of acute coronary syndrome: Observations from the Global Registry of Acute Coronary Events (GRACE). *American Heart Journal*. **149**(1), pp.67-73.

Bagong, M. 2013. Pathogenetic of Acute Coronary Syndrome. [Online]. [Accessed: 7 August 2013]. Available from: http://mbahdukunbagong.blogspot.co.uk/2012/07/pathogenetic-of-acute-coronary-syndrome.html#chitika_close_button.

Bailey, N. and Pill, M. 2011. The continuing popularity of the neighbourhood and neighbourhood governance in the transition from the 'big state' to the 'big society'

paradigm. *West minster Research. Environment and Planning C: Government and Policy*. **29**(1), pp.927-942. doi: 10.1068/c1133r.

Bailis, D. et al. 2003. Two views of self-rated general health status. *Social Science and Medicine*. **56**(1), pp.203-217.

Bajekal, M. et al. 2013. Unequal Trends in Coronary Heart Disease Mortality by Socioeconomic Circumstances, England 1982–2006: An Analytical Study. *PLoS ONE*. **8**(3). e59608. doi:10.1371/journal.pone.0059608.

Bakhai, A. et al. 2005. Diabetic patients with acute coronary syndromes in the UK: high risk and under treated. Results from the prospective registry of acute ischaemic syndromes in the UK (PRAIS-UK). *International Journal of Cardiology*. **100**(1) pp.79-84. doi.org/10.1016/j.ijcard.2004.08.035.

Bazeley, P. 2009. Analysing Qualitative Data: More Than 'Identifying Themes. *Malaysian Journal of Qualitative Research*. **2**(2), pp.6-22.

Beard, J. R. et al. 2008. Socioeconomic Disadvantage and Acute Coronary Events. *Epidemiology*. **19**(3), pp.485-492.

Benjamini, Y. and Hochberg, Y. 1995. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *Journal of the Royal Statistical Society Series* B. **57**, pp.289–300.

Bennett, P. and Connell, H. 1999. Dyadic processes in response to myocardial infarction. *Psychol Health Med*. **4**(1), pp.45-55.

Berger, A. et al. 2008. Relation of length of Hospital Stay in Acute Myocardial Infarction to Post-Discharge Mortality. *American Journal of Cardiology*. **101**(4), pp.428-434.

Bergman, E. and Bertero, C. 2001. You can do it if you set your mind to it: a qualitative study of patients with coronary artery disease. *Journal of Advanced Nursing*. **36**(6), pp.733-741.

Bergman, E. and Bertero, C. 2003. 'Grasp life again'. A qualitative study of the motive poser in myocardial infarction patients. *European Journal of Cardiovascular Nursing*. **2**(1), pp.303-310.

Berkman, L. 1984. Assessing the physical health effects of social networks and social support. *Annual Review of Public*. **5**(1), pp.413-432.

Berkman, L. F. et al. 1992. Emotional Support and Survival after Myocardial Infarction : A

Prospective, Population-based Study of the Elderly. *Annals of Internal Medicine*. **117**(12), pp.1003-1009. doi:10.7326/0003-4819-117-12-1003.

Blackledge, H. M. et al. 2003. Prognosis for patients newly admitted to hospital with heart failure: survival trends in 12 220 index admissions in Leicestershire 1993-2001. *Heart*. **89**(1), pp.615-620.

Boersma, E. et al. 2000. Predictors of outcome in patients with acute coronary syndromes without persistent ST-segment elevation. Results from an international trial of 9461 patients. The PURSUIT Investigators. *Circulation*. **101**(22), pp.2557-2567.

Boutin-Foster, C. 2005. Getting to the heart of social support: A qualitative analysis of the types of instrumental support that are most helpful in motivating cardiac risk factor modification. *Heart and Lung*. **34**(1), pp.22-29.

Bowling, A. and Stafford, M. 2007. How do objective and subjective assessments of neighbourhood influence social and physical functioning in older age? Findings from a British survey of ageing. *Social Science and Medicine.* **64** (12), pp.2533-2549. doi:10.1016/j.socscimed.2007.03.009

Bowling, A. 1999. Ageism in cardiology. *BMJ*. **319**(7221), pp.1353–1355.

Box, G. and Draper, N. R. 1987. *Empirical Model-Building and Response Surfaces*. Oxford: John Wiley & Sons.

Breiman, L. et al. 1984. *Classification and regression trees*. California: Chapman and Hall.

Brink, E. et al. 2006. Readjustment 5 months after a first-time myocardial infarction: reorienting the active self. *Journal of Advanced Nursing*. **53**(4), pp.403-11.

Bruhn, J. et al. 1982. Lessons From Roseto 20 Years Later: A Community Study in Heart Disease. *Southern Medical Journal*. **75**(5), pp.575-580.

Bruhn, J. G. and Wolf, S. 1979. *The Roseto Story: An Anatomy of Health. Norman*. Norman, Okla: Norman, Okla.

Bryman, A. 2007. Barriers to integrating quantitative and qualitative research. *Journal of Mixed Methods Research January.* **1**(1), pp.8-22. doi: 10.1177/2345678906290531.

Bulgiardini, R. et al. 2010. Gender Bias in Acute Coronary Syndromes. Current Vascular Pharmacology. 8(2), pp.276-284.

Bury, M. 1991. The sociology of chronic illness: a review of research and prospects. Sociology

of Health & Illness. 13(4), pp.451-468.

Califf, R. M. et al. 2000. Prediction of 1-year survival after thrombolysis for acute myocardial infarction in the global utilization of streptokinase and TPA for occluded coronary arteries trial. *Circulation*. **101**(19), pp.2231-2238.

Carstairs V and Morris R. 1989 Deprivation, mortality and resource allocation. *Community Medicine*. **11** (4), pp.364–372.

Cattell, V. 2001. Poor people, poor places, and poor health: the mediating role of social networks and social capital. *Social Science and Medicine*. **52**(10), pp.1501-1516.

Chaix, B. et al. 2007. Neighborhood socioeconomic deprivation and residential instability: Effects on incidence of ischemic heart disease and survival after myocardial infarction. *Epidemiology*. **18**(1), pp.104-111. doi: 10.1097/01.ede.0000249573.22856.9a.

Chaix, B. 2009. Geographic Life Environments and Coronary Heart Disease: A Literature Review, Theoretical Contributions, Methdological Updates, and a Research Agenda. *Annual Review of Public Health*. **30**, pp.81-105. doi: 10.1146/annurev.publhealth.031308.100158

Champney, K. et al. 2009. The Joint Contribution of Sex, Age and Type of Myocardial Infarction on Hospital Mortality Following Actue Myocardial Infarction. *Heart online*. **95**(1), pp.896-899. doi:10.1136/hrt.2008.155804.

Charmaz, K. 2006. *Constructing Grounded Theory*. Los Angeles: Sage.

Chassin, L. et al. 1996. The natural history of cigarette smoking from adolescence to adulthood: Demographic predictors of continuity and change. Health Psychology. 15(6), pp.478-484. doi: 10.1037/0278-6133.15.6.478.

Chen, H. 1997. Applying Mixed Methods Under the Framework of Theory-Driven Evaluations. *New directions for evaluation*. **74**(1), pp.61-72.

Chow, C. K. et al. 2010. Association of Diet, Exercise, and Smoking Modification with Risk of Early Cardiovascular Events After Acute Coronary Syndromes. *Circulation*. **121**, pp.750-758. doi:10.1161/CIRCULATIONAHA.109.891523.

Colella, T. J. F. and King, K. M. 2004. Peer support. An under-recognized resource in cardiac recovery. *European Journal of Cardiovascular Nursing*. **3**(1), pp.211-217. doi: 10.1016/j.ejcnurse.2004.04.001.

Collins, K. M. T. et al. 2006. A Model Incorporating the Rationale and Purpose for Conducting Mixed-Methods Research in Special Education and Beyond. *Learning Disabilities: A Contemporary Journal*. **4**(1), pp.67-100.

Condon, C. and McCarthy, G. 2006. Lifestyle changes following acute myocardial infarction: Patients perspectives. *European Journal of Cardiovascular Nursing*. **5**(1), pp.37-44.

Corbin, J. and Strauss, A. 1998. *Basics of qualitative research: techniques and procedures for developing grounded theory*. 3rd ed. Los Angeles: Sage.

Cox, D. R. 1972. Regression models and life-tables (with discussion). *Journal of Royal Statistics Society*. **34**(1), pp.187-220.

Coyle, M. K. 2009. Over time: reflections after a myocardial infarction. *Holistic Nursing Practice*. **23**(1), pp.49-56.

Crane, P. B. 2005. Fatigue and physical activity in older women after myocardial infarction. *Heart and Lung*. **34**(1), pp.30-38.

Cresswell, T. 2009. Place. In: Thrift, N. and Kitchen, R *International Encyclopedia of Human Geography. Oxford: Elsevier, **8** pp. 384-395.*

Creswell, J. and Plano Clark, V. 2007. *Designing and Conducting Mixed Methods Research*. Thousand Oaks, CA: Sage

Cummins, S. et al. 2005. Neighbourhood environment and its association with self rated health: evidence from Scotland and England. *Journal of Epidemiol Community Health*. **59,** pp. 207-213. doi: 10.1136/jech.2003.016147.

Cummins, S. et al. 2007. Understanding and representing 'place' in health research: A relational approach. Social Science and Medicine. 65, pp.1825-1838. doi: 10.1016/j.socscimed.2007.05.036.

Davies, A. R. 2007. Contribution of changes in incidence and mortality to trends in the prevalence of coronary heart disease in the UK: 1996–2005. *European Heart Journal.* **28**(17), pp.2142-2147. doi: 10.1093/eurheartj/ehm272.

Department of Health. 2000. National service framework: coronary heart disease. *National service framework.* [Online]. London: National Health Service. [Accessed April 2013]. Available at: <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/198931/National_Service_Framework_for_Coronary_Heart_Disease.pdf>.

Dey, I. 1993. *Qualitative data analysis: a user-friendly guide for social scientists*. London: Routledge.

Dey, S. et al. 2009. Sex-related differences in the presentation, treatment and outcomes among patients with acute coronary syndromes: the Global Registry of Acute Coronary Events. *Heart.* **95***,* pp.20-26. doi:10.1136/hrt.2007.138537.

Ridley, D. 2012. *The Literature Review. A step-by-step guide for students*. *Second Edition*. London: SAGE.

Doran, T. et al. 2006. Health underachievement and overachievement in English local authorities. *Journal of Epidemiol Community Health.* **60***,* pp.686-693. doi:10.1136/jech.2005.041889.

Durose, C. and Lowndes, V. 2010. Neighbourhood Governance: Contested Rationales within a Multi-Level Setting – A Study of Manchester. *Local Government Studies*. **36**(3), pp.341-359. doi**:**10.1080/03003931003730477.

Eagle, K. A. et al. 2004. A validated prediction model for all forms of acute coronary syndrome: estimating the risk of 6-month post discharge death in an international registry. *Journal of the American Medical Association*. 291(22), pp.2727-2733. doi: 10.1001/jama.291.22.2727.

Elm, V. E. et al. 2007. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: Guidelines for reporting observational studies. Preventive Medicine. 45(4), pp.247-251. doi: http://dx.doi.org/10.1016/j.ypmed.2007.08.012.

Engstrom, G. et al. 2000. Trends in long-term survival after myocardial infarction: less favourable patterns for patients from deprived areas. *Journal of Internal Medicine*. **248**(5), pp.425-434.

Esri (2013). GeoCommons. (Version 2.1.9.3.4.12). (Software). [Downloaded March 2013]. Available from: http://geocommons.com/.

Everitt, B. et al. 2001. *Cluster analysis*. London: Oxford University Press.

Falger, P. R. J. 2002. Why do women fare worse than men after acute coronary syndromes. *European Journal of Internal Medicine*. **13**(8), pp.471-473.

Faraway, J. J. 2006. *Extending the linear model with R: generalized linear, mixed effects and*

nonparametric regression models. London: Chapman & Hall/CRC.

Fielding, N. and Thomas, H. 2001. Qualitative Interviewing. In: Gilbert, N *Researching Social Life*. 2nd ed. London: Sage, pp.123-144.

Flesch, R. 1948. A new readability yardstick. *Journal of Applied Psychology*. 3**2**(3), pp.221-233.

Flowerdew, R. et al. 2008. Neighbourhood effects on health: Does it matter where you draw the boundaries? *Social Science and Medicine*. **66**(6), pp.1241-1255.

Floyd, K. C. et al. 2009. A 30-Year Perspective (1975–2005) Into the Changing Landscape of Patients Hospitalized With Initial Acute Myocardial Infarction. *Circulation: Cardiovascular Quality and Outcomes*. **2**, pp.88-95. doi: 10.1161/ CIRCOUTCOMES.108.811828.

Fox, K. A. A. et al. 2006. Prediction of risk of death and myocardial infarction in the six months after presentation with acute coronary syndrome: prospective multinational observation study (GRACE). *BMJ*, **333. pp. 1091-1094.**

Fox, K. A. A. et al. 2002. Management of acute coronary syndromes. Variations in practice and outcome. *European Heart Journal*. **23**, pp.1177–1189. doi:10.1053/euhj.2001.3081.

Frasure-Smith, N. et al. 2000. Social support, depression and mortality during the first year after myocardial infarction. *Circulation*. **101**(1), pp.1919-1924.

Friedmann, E. et al. 2006. Relationship of depression, anxiety, and social isolation to chronic heart failure outpatient mortality. *American Heart Journal, **152*** (5), pp. 940-948. doi: 10.1016/j.ahj.2006.05.009.

Gale, C. P. et al. 2009. Evaluation of risk scores for risk stratification of acute coronary syndromes in the Myocardial Infarction National Audit Project (MINAP) database. *Heart*. **95**(3), pp.221-227. doi: 10.1136/hrt.2008.144022.

Gale, C. P. G. et al. 2012. Resolving inequalities in care? Reduced mortality in the elderly after acute coronary syndromes. The Myocardial Ischaemia National Audit Project 2003-2010. *European Heart Journal*. **33**(5), pp.630-639. doi: 10.1093/eurheartj/ehr381.

Gale, C. P., Metcalfe, E. A. et al. 2011. An Assessment of the Concentration-Related Prognostic Value of Cardiac Troponin I Following Acute Coronary Syndrome. The American Journal of Cardiology. 108(9), pp.1259-1265. doi: http://dx.doi.org/10.1016/j.amjcard.2011.06.041.

Gallagher, R. et al. 2008. On my own: Experiences of recovery from acute coronary syndrome

for women living alone. *Heart and Lung*. **37** (6), pp.417-424. doi: 10.1016/j.hrtlng.2007.12.007.

Gehlke, C. E. and Biehl, K. 1934. Certain effects of grouping upon the size of the correlation coefficient in census tract material. *Journal of the American Statistical Association*. **29**(1), pp.168-170.

Gillham, B. 2000a. *Developing a questionnaire*. London: Continuum.

Gillham, B. 2000b. *The Research Interview*. London: Continuum.

Glass, T. A. and Balfour, J. L. 2003. Neighbourhoods, Aging, and functional limitations. In: Neighbourhoods and health *Neighbourhoods and health*. Oxford: University Press, pp.303-334.

Godfrey, M. and Townsend, J. 2008. Older people in transition from illness to health: Trajectories of recovery. *Qualitative health res*. **18**(1), pp.939-951. doi: 10.1177/1049732308318038.

Gordon, L. and Olshen, R. A. 1985. Tree-structured survival analysis. *Cancer Treat Rep*. **69**(10), pp.1065-1069.

Graham, J. W. et al. 2007. How Many Imputations are Really Needed? Some Practical Clarifications of Multiple Imputation Theory. *Prevention Science*. **8**(1), pp.206-213.

Great Britain National. 1990. *National Health Service (NHS) Act 2006*: Elizabeth II. Section 251, London: The Stationery Office.

Greene, J. C. et al. 1989. Toward a conceptual framework for mixed method evaluation designs. *Educational Evaluation and Policy Analysis*. **11**(3), pp.255-274. doi: 10.3102/01623737011003255.

Gregory, S. et al. 2012. *Health policy under the coalition government. A mid-term assessment*. London: The Kings Fund.

Grundy, E. and Holt, G. 2001. The socioeconomic status of older adults: how should we measure it in studies of health inequalities. *Journal of Epidemiology Community Health*. **55**(1), pp.895-904.

Hall, W. and Callery, P. 2001. Enhancing the rigour of grounded theory: incorporating reflexivity and relationality. *Qualitative Health Research*. **11**(2), pp.257-272.

Hammersley, M. 1992. *What's wrong with Ethnography?* London and New York: Routledge.

Hammersley, M. 1996. The relationship between qualitative and quantitative research: Paradigm loyalty versus methodological eclecticism. In: Richardson, J. T. E. *Handbook of research methods for psychology and the social sciences*. Leicester: BPS Books.

Hammersley, M. 2006. Ethnography: problems and prospects. *Ethnography and Education.* **1**(1), pp.3-14. doi:10.1080/17457820500512697.

Hastie, T.J. and Tibshirani, R.J. 1990. *Generalized additive models*. London: Chapman and Hall.

Hayes, N. 2000. *Doing Psychological Research: Gathering and Analysing Data*. Buckingham: Open University Press.

Haynes, R. et al. 2007. Modifiable neighbourhood units, zone design and residents perception. *Health and Place*. **13**(1), pp.812-825.

Herber, O. R. et al. 2012. Assessing acute coronary syndrome patients' cardiac-related beliefs, motivation and mood over time to predict non-attendance at cardiac rehabilitation. *Journal of Advanced Nursing*. **68**(1), pp.2778-2788.

Herrett, E. et al. 2010. The Myocardial Ischaemia National Audit Project (MINAP). *Heart*. **96**(1), pp.1264-1267.

Hirte, L. et al. 2008. The changing regional pattern of ischaemic heart disease mortality in southern Europe: still healthy but uneven progress. *Journal of Epidemiology Community Health*. **62**(4). doi: 10.1136/jech.2007.067637.

Holford, T. R. 1980. The analysis of rates and of survivorship using log-linear models. *Biometrics*. **36**(2), pp.299-305.

House, J. 1981. *Work, Stress and Social Support*. Reading: Mass: Addison-Wesley.

Huff, N. and Grey, D. 2001. Coronary heart disease inequalities: deaths and the socio-economic environment in Nottingham, England. *Health and Place*. **7**(1), pp.57-61.

Hyde, M. et al. 2003. A measure of quality of life in early old age: The theory, development and properties of a needs satisfaction model (CASP-19). *Aging and Mental Health*. **7**(3), pp.186-195. doi: 10.1080/1360786031000101157.

Jackson, D. et al. 2000. Women recovering from first-time myocardial infarction (MI): a feminist qualitative study. *Journal of Advanced Nursing*. **32**(1), pp.1403-1411.

Jama, D. and Dugdale, G. 2012. Literacy: State of the Nation A picture of literacy in the UK today [Online]. National Literacy Trust. [Accessed 1 September 2012]. Available at: <http://www.literacytrust.org.uk/assets/0001/2847/Literacy_State_of_the_Nation_-

_2_Aug_2011.pdf>.

James, R. L. et al. 1984. Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology*. **69**(1), pp.85-98.

Janghobani, M. et al. 2006. Neighbourhood deprivation and excess coronary heart disease mortality and hospital admissions in Plymouth, UK: an ecological study. *Acta Cardiologica*. **61**(3), pp.313-320. doi: 10.2143/AC.61.3.2014834.

Jarman, B. 1983. Identification of underprivileged areas. *British Medical Journal*. **287**(6385), pp.130-131.

Jensen, B. and Petersson, K. 2003. The illness experiences of patients after a first time myocardial infarction. *Patient Education and Counseling*. **51**(1), pp.123-131.

Johnson, B. and Onwuegbuzie, A. J. 2004. Mixed Methods Research: A research paradigm whose time has come. *Educational Researcher*. **33**(7), pp.14-26.

Johnson, B. and Turner, L. A. 2003. Data collection strategies in mixed method research. In: Tashakkori, A. and Teddlie, C *Handbook of Mixed Methods in social and behavioural research*. California: Sage, pp.297-319.

Kaplan, E. L. and P. Meier. 1958. Non-parametric Estimation from Incomplete Observations. *Journal of American. Statistical Association.* **53**, pp.457–481.

Kay' I. 2009. Portrait of Yorkshire and The Humber. *Regional Trends* (2009) **41**, pp.52–64. doi:10.1057/rt.2009.4

Kerr, J. et al. 2012. The role of the built environment in healthy aging: Community design, physical activity, and health among older adults. *Journal of Planning Literature.* **27**(1), pp.43-60. doi: 10.1177/0885412211415283.

Krisofferzon, M. et al. 2003. Myocardial infarction: gender differences in coping and social support. *Journal of Advanced Nursing*. **44**(4), pp.360-374.

Krisofferzon, M. et al. 2007. Striving for balance in daily life: experiences of Swedish women and men shortly after a myocardial infarction. *Journal of Clinical Nursing*. **16**(2), pp.391-401.

Labov, William. 1997. Some further steps in narrative analysis. *Journal of Narrative and Life History.* **7**, pp.395-415.

Lacey, E. and Walters, S. 2003. Continuing inequality: gender and social class influences on self

perceived health after a heart attack. *Journal of Epidemiologic Community*. **57** (1), pp.622-627.

Ladwig, K. H. 1994. Post-infarction depression and incomplete recovery 6 months after acute myocardial infarction. *The Lancet.* **343**, pp.20-23. doi: 10.1061/S0140-6736(94)90877-X.

Laird, N and Olivier, D. 1981. Covariance analysis of censored survival data using log-linear analysis techniques. *Journal of the American Statistical Association*. **67**(1), pp.231-240.

Lakshman, R. et al. 2010. Association between area-level socioeconomic deprivation and a cluster of behavioural risk factors: cross-sectional, population-based study. *J Public Health,* **33**(2) pp. 234-245. doi: 10.1093/pubmed/fdq072.

Lane, D. et al. 2001. Predictors of attendance at cardiac rehabilitation after myocardial infarction. *Journal of Psychosomatic Research.* **51**(3) pp.497-501. doi.org/10.1016/S0022-3999(01)00225-2.

Lang, I. A. et al. 2008. Neighbourhood deprivation and incident mobility disability in older adults. *Age & Ageing*. **37**(4), pp.403-410. doi: 10.1093/ageing/afn092.

Lang, I. A. et al. 2009. Neighborhood deprivation, individual socioeconomic status, and frailty in older adults. *Journal of the American Geriatrics Society*. **57**(10), pp.1776-1780. doi: 10.1111/j.1532-5415.2009.02480.x.

Latent Gold. 2011. *Statistical Innovations Inc., Belmont, MA*. (Version 4.5). (Software). [Downloaded 2009]. Available from: <http://statisticalinnovations.com/products/latentgold.html>.

Lavie, C. J. and Milani, R. V. 2004. Prevalence of anxiety in coronary patients with improvement following cardiac rehabilitation and exercise training. *The American Journal of Cardiology.* **93**(3), pp.336–339. doi.org/10.1016/j.amjcard.2003.10.015.

Lawlor, D. A et al. 2003. Geographic variation in cardiovascular disease, risk factors and their control in older women: British Women's Heart and Health Study. Journal of *Epidemiol Community Health*. **57**, pp.134–140.

Lawlor, D. A. et al. 2005. Life-Course Socioeconomic Position, Area Deprivation, and Coronary Heart Disease: Findings From the British Women's Heart and Health Study. Am J Public Health, 95(1), pp.91–97. doi: 10.2105/AJPH.2003.035592.

Leifheit-Limson, E. et al. 2009. The role of social support in health status and depressive

symptoms after acute myocardial infarction: Evidence for a stronger relationship among women. *Circulation: Cardiovascular Quality and Outcomes*. **3**(1), pp.143-150.

Lett, H. et al. 2005. Social support and coronary heart disease: Epidemiologic evidence and implications for treatment. *Psychosomatic Medicine*. **67** (1), pp.869-878.

Levene, L. S. et al. 2010. Association of Features of Primary Health Care With Coronary Heart Disease Mortality. *JAMA*. **304**(18), pp.2028-2034. doi:10.1001/jama.2010.1636.

Likert, R. 1932. A Technique for the Measurement of Attitudes. *Archives of Psychology*. **140**(1), pp.1-55.

Local Government Association, 2012. Health and Social Care Act 2012 (c.7) [Online]. London: TSO (The Stationary Office). [Accessed May 2013]. Available at: http://www.legislation.gov.uk/ukpga/2012/7/pdfs/ukpga_20120007_en.pdf.

Lofmak, R. and Carlsson, M. 2005. Coping, social support and quality of life over time after myocardial infarction. *Journal of Advanced Nursing*. **52**(2), pp.113-124.

Machin, D. et al. 2006. *Survival analysis: a practical approach*. 2nd ed. Chichester: Wiley.

MacIntyre, S. et al. 2002. Place effects on health: how can we conceptualise, operationalise and measure them? Social Science & Medicine. 55(1), pp.125-139. doi: http://dx.doi.org/10.1016/S0277-9536(01)00214-3.

MacLean, L, M. et al. 2004. Improving accuracy of transcripts in qualitative research. *Qualitative health research*. **14**(1), pp.113-122.

Manderson, L. et al. 2006. The social dynamics of the interview: Age, Class, and Gender. *Qualitative Health Research*. **16**(1), pp.1317-1334.

Marshall, K. 2011. Acute coronary syndrome: diagnosis, risk assessment and management. *Nursing Standard*. **25**(23), pp.47-57.

Martin, R. et al. 2002. Population need for coronary revascularisation: are national targets for England credible? *Heart*. **88**(1), pp.627-633. doi: 10.1136/heart.88.6.627.

Maxwell, J, A. and Loomi, D, M. 2003. Mixed methods design: An alternative approach. In: Tashakkori, A. and Teddlie, C. *Handbook of Mixed Methods in social and behavioural research*. California: Sage, pp.241-296.

McCullagh, P. and Nelder, J. A. 1989. *Generalized Linear Models*. 2nd ed. London: Chapman and Hall.

Meijer, M. et al. 2012. Do neighbourhoods affect individual mortality? A systematic review and meta-analysis of multi-level studies. Social Science and Medicine. *74 (8), pp.1204-1212. doi: 10.1016/j.socsimed.2011.11.034.*

Montalescot, G. et al. 2007. STEMI and NSTEMI: are they so different? 1 year outcomes in acute myocardial infarction as defined by the ESC/ACC definition (the OPERA registry). *European Heart Journal.* **28**(12), pp.1409-1417. doi: 10.1093/eurheartj/ehm031.

Mookadam, R. and Arthur, H. 2004. Social support and its relationship to morbidity and mortality after acute myocardial infarction. *Achieves of Internal Medicine*. **164**(1), pp.1514-1518.

Morris, R. W. 2005. Inequalities in coronary revascularisation during the 1990's: evidence from the British regional heart study. *Heart.* **91**, pp.635-640. doi: 10.1136/hrt.2004.037507.

Morrison, C. et al. 1997. Effect of socioeconomic group on incidence of, management of, and survival after myocardial infarction and coronary death: analysis of community coronary event register. *BMJ.* **31**(4), pp.541-546.

Morse, J. M. 1991. Approaches to qualitative-quantitative triangulation. *Nursing Research*. **40**(1), pp.120-123.

Mukaka, M. M. 2012. Statistics Corner: A guide to appropriate use of Correlation coefficient in medical research. *Malawi Medical Journal*. **24**(3), pp.69-71.

National Institute for Health and Care Excellence. (2007*). Secondary prevention in primary and secondary care for patients following a myocardial infarction.* [CG48]. London: National Institute for Health and Care Excellence.

National Institute for Health and Care Excellence. 2010. *Unstable angina and NSTEMI: The early management of unstable angina and non-ST segment-elevation myocardial infarction*. [CG94]. London: National Institute for Health and Care Excellence.

Netuveli, G. et al. 2006. Quality of life at older ages: evidence from the English longitudinal study of aging (wave 1). *Journal of Epidemiol Community Health.* **60**(4), pp.357-63.

Neuman, W. L. 2000. *Social research methods: Qualitative and quantitative approaches*. 4th ed. Boston: Allyn and Bacon.

NHS Right Care. 2011. *NHS atlas of variation in healthcare: reducing unwarranted variation to increase value and improve quality* [Online]. London: National Health Service. [Accessed 15 October 2012]. Available at:

<http://www.rightcare.nhs.uk/atlas/qipp_nhsAtlas-LOW_261110c.pdf>.

Noble, M. et al. 2007. *The English Indices of Deprivation 2007.* [Online]. Communities and Local Government: London [Accessed April 2013]. (The Stationery Office). Available at: <http://webarchive.nationalarchives.gov.uk/20100410180038/http://communities.gov.uk/documents/communities/pdf/733520.pdf>.

NVivo qualitative data analysis software. 2010. *QSR International Pty Ltd*. (Version 9).

O'Cathain, A. 2010. Mixed Methods Involving Qualitative Research. In: Bourgeault, I. Dingwall, R. and De Vries, R, C *The SAGE Handbook Qualitative Methods Health Research* . London: Sage, pp. 575-589. doi:10.4135/9781446268247.n30.

O'Cathain, A. et al. 2008. The quality of mixed methods studies in health services research. *Journal of Health Services Research and Policy*. **13**(2), pp. 92-98. doi:10.1258/jhsrp.2007.007074.

O'Cathain, A. et al. 2010. Three techniques for integrating data in mixed methods studies. *BMJ*. **341** pp. 1147-1150. doi:10.1136/bmj.c4587.

O'Flaherty, M. et al. 2009. Coronary Heart disease mortality among young adults in Scotland in relation to social inequalities: time trend study. *BMJ*. **339**(1), pp.1-7. dio: 10.1136/bmj.b2613.

Office for National Statistics. 2012a. *Health Expectancies at birth and at age 65 in the United Kingdom, 2008–2010*. [Online]. [Accessed 13 November 2012]. Available at: <www.ons.gov.uk/ons/rel/disability-and-health-measurement/health-expectancies-at-birth-and-age-65-in-the-united-kingdom/2008-10/stb-he-2008-2010.html>.

Office for National Statistics. 2012b. *Super output areas (SOAs).* [Online]. [Accessed 12 November 2012]. Available at: <http://www.ons.gov.uk/ons/guide-method/geography/beginner-s-guide/census/super-output-areas--soas-/index.html>.

Office of National Statistics. 2013. *Neighbourhood statistics* [Online]. [Accessed 1 February 2013]. Available at: <http://neighbourhood.statistics.gov.uk>.

Onwuegbuzie, A. J. and Johnson, R. B. 2006. The Validity Issue in Mixed Research. *Mid-South Educational Research Association*. **13**(1), pp.48-63.

Onwuegbuzie, A. J. and Leech, N. L. 2004. Enhancing the interpretation of "significant" findings: The roles of mixed methods research. *The Qualitative Report*. **9**(4), pp.770-

792.

Onwuegbuzie, A. J. and Leech, N. L. 2006. Linking research questions to mixed methods data analyses procedures. *The Qualitative Report*. **11**(3), pp.474-498.

Onwuegbuzie, A. J. and Teddlie, C. 2003. A framework for analysing data in mixed method research. In: Tashakkori, A. and Teddlie, C *A framework for analysing data in mixed method research*. California: Sage, pp.351-381.

O'Reilly, D. 2002. Standard indicators of deprivation: do they disadvantage older people. *Age and Ageing*. **31**(3), pp.197-202.

Oxman, T. et al. 1995. Lack of social participation or religious strength and comfort as risk factors for death after cardiac surgery in the elderly. *Psychosomatic Medicine*. **57**(1), pp.5-15.

Parmer, M. K. B. and Machin, D. 1995. *Survival analysis: a practival approach*. Chichester, England. ; New York : J.Wiley.

Patton, M. 1990. Qualitative evaluation and research methods. Beverly Hills, CA: Sage, pp.169-186.

Pearce, J. et al. 2006. Are socially disadvantaged neighbourhoods deprived of health-related community resources? *International of Epidemiology*. **36**(1), pp.348-355. doi: 10.1093/ije/dy1267.

Pearson-Stuttard, J. et al. 2012. Recent UK trends in the unequal burden of coronary heart disease. *Heart*. **98**(1), pp.1573-1582. doi:10.1136/heartjnl-2012-302435.

Pérez-García, A. M. et al. 2011. The Association of Social Support and Gender with Life Satisfaction, Emotional Symptoms and Mental Adjustment in Patients Following a First Cardiac Coronary Event. *Stress and Health*. **27**(1), pp.252-260.

Pickett, K. E. and Pearl. M. 2001. Multilevel analses of neighbourhood socioeconomic context and health outcomes: a critical review. *Journal of Epidemiol Community Health.* **55**, pp. 111-122. doi: 10.1136/jech.55.2.111.

Piette, J. D. and Moos, R. H. 1996. The influence of distance on ambulatory care use, death, and readmission following a myocardial infarction. *Health Services Research*. **31**(5), pp.573-591.

Pipe, A. L. et al. 2010. The Role of Smoking Cessation in the Prevention of Coronary Artery Disease. *Current Atherosclerosis Reports*. **12**(2), pp.145-150.

Pitney Bowes Software. 2013. MapInfo, Global Ethics and Business Practices (Version 9). (Software). [Downloaded 2010]. Available from: http://www.mapinfo.com/product/mapinfo-mapbasic/.

R: A language and environment for statistical computing. 2009. *R Foundation for Statistical Computing, Vienna, Austria*. (Version ISBN 3-900051-07-0 2.10.1). (Software). [Downloaded 2009]. Available from: <http://www.R-project.org.>.

Ramsay, S. E. et al. 2006. Secondary prevention of coronary heart disease in older patients after the national service framework: population based study. BMJ. 332(7534), pp.144–145. doi: 10.1136/bmj.38704.770127.BE.

Richardson, G. 1995. 1.2 Reflection-on-practice: enhancing student learning. *Journal of Advanced Nursing*. **22**(2), pp.235-242. doi: 10.1046/j.1365-2648.1995.22020235.x.

Riessman, C. 2008. *Narrative Methods for the human sciences*. Thousand Oaks: Sage.

Riva, M. et al. 2007. Toward the next generation of research into small area effects on health: a synthesis of multilevel investigations published since July 1998. *Journal of Epidemiol Community Health*. **61**, pp.853-861. doi: 10.1136/jech.2006.050740.

Robson, C. 2002. *Real World Research: a resource for social scientists and*

Roebuck. A. et al. 2001. Health-related quality of life after myocaridal infarction: an interview study. *Journal of Advanced Nursing*. **34** (6), pp. 787-794. doi: 10.1046/j.1365-2648.2001.01809.x.

Rogers, N. 2011. English Longitudinal study of Aging. [Online]. The Institute for Fiscal Studies.[Accessed 13 March 2013]. Available at: <http://www.ifs.org.uk/ELSA/availableData>.

Rosengren, A. et al. 2004. Sex, age, and clinical presentation of acute coronary syndromes. *European Heart Journal.* **25**, pp.663–670.

Rosengren, A. et al. 2006. Age, clinical presentation, and outcome of acute coronary syndromes in the Euroheart acute coronary syndrome survey. *European Heart Journal.* **27**(7), pp.789-795. doi: 10.1093/eurheartj/ehi774.

Roux, A.V. et al. 2001. Neighbourhood of residence and incidence of coronary heart disease. *New England Journal of Medicine*. **345**(1), pp.99-106.

Roux, A. D. 2003. Residential environments and cardiovascular risk. *Journal of urban health*.

80(4), pp.569-589.

Rubin, D. B. 1987. *Multiple Imputation for Nonresponse in Surveys*. USA: John Wiley & Sons.

Sandelowski, M. 2003. Tables or tableaux? The challenges of writing and reading mixed methods studies. In: Tashakkori, A. and Teddlie, C *Handbook of Mixed Methods in social and behavioural research*. California: Sage, pp.321-350.

Saxena, S. et al. 2007. Practice size, caseload, deprivation and quality of care of patients with coronary heart disease, hypertension and stroke in primary care: national cross-sectional study. *BMC health Services Research*. **7**(96), pp.1-9. dio: 10.1186/1472-6963-7-96.

Schaefer-McDaniel, N. et al. 2010. Examining methodological details of neighbourhood observations and the relationship to health: A literature review. *Social Science and Medicine*. **70** (2), pp. 277-292. doi: 10.1016/j.socsimed.2009.10.018.

Schafer, J. L. 1997. *Analysis of Incomplete Multivariate Data*. London: Chapman and Hall.

Scheffler, R. et al. 2008. Community-level social capital and recurrence of acute coronary syndrome. *Social Science and Medicine*. **66**(1), pp.1603-1613.

Schulz, A. J. *et al.* 2005. Social and physical environments and disparities in risk for cardiovascular disease: the healthy environments partnership conceptual model. *Environment Health Prespective*. **113** (12), pp. 1817-1825. doi: 10.1289/ehp.7913.

Seber, G.A.F. and Wild, C.J. 2003. *Nonlinear Regression*. New Jersey: John Wiley &Sons.

Semon, T. T. 2001. Symmetry shouldn't be goal for scales. *Marketing News*. **35**(9).

Sim, J. et al. 2011. The CASP-19 as a measure of quality of life in old age: evaluation of its use in a retirement community. *Qualitative Life Research*. **20**(7), pp.997-1004.

Simmons, R. 2001. Questionnaires. In: Gilbert, N *Researching Social Life*. London: Sage, pp.85-104.

Sloggett, A. and Joshi, H. 1994. Higher mortality in deprived areas: community or personal disadvantage? *BMJ*. **309**(6967), pp.1470-1474, doi: http:dx.doi.org/10.1136/bmj.309.6967.1470.

Smith, A. 2009. *Ageing in Urban Neighbourhoods: Place attachment and social exclusion*. The Policy Press: The Policy Press.

Smith, G. et al. 2000. Area based measures of social and economic circumstances:; cause

specific mortality patterns depend on the choice of index. *Journal of Epidemiology Community Health*. **55**(1), pp.149-50.

Smolina, K. et al. 2012. Determinants of the decline in mortality from acute myocardial infarction in England between 2002 and 2010: linked national database study. *BMJ*. **344**. doi: 10.1136/bmj.d8059.

Stafford, M. and Marmot, M. 2003. Neighbourhood deprivation and health: does it affect us all equally? *International Journal of Epidemiol*. **32**(3), pp.357-366. doi: 10.1093/ije/dyg084.

Stewart, M. et al. 2000. Myocardial infarction: survivors' and spouses' stress, coping, and support. *Journal of Advanced Nursing*. **31**(6), pp.1351-1360.

Stewart, S. et al. 2003. Heart failure and the aging population: an increasing burden in the 21st century? *Heart*. **89**(1), pp.49-53, doi:10.1136/heart.89.1.49.

Steyerberg, E. W. et al. 2000. Prognostic modelling with logistic regression analysis: a comparison of selection and estimation methods in small data sets. *Statistics in Medicine*. 19 (**8**), pp.1059-1079. doi: 10.1002/(SICI)1097-0258(20000430)19:8<1059.

Subramanian, S. V. et al. 2009. Revisiting Robinson: The perils of individualistic and ecologic fallacy. *International Journal of Epidemiology*. **38**(2), pp.342-360. doi: 10.1093/ije/dyn359 2009.

Sundquist, J. et al. 1999. Cardiovascular risk factors and the neighbourhood environment: a multilevel analysis. *International Journal of Epidemiology*. **28,** pp.841–845. doi: 10.1093/ije/28.5.841.

Sutherland, B. and Jensen, L. 2000. Living with Change: Elderly Women's Perceptions of Having a Myocardial Infarction. *Qualitative Health Research*. **10**(5), pp.661-676.

Tashakkori, A. and Teddlie, C. 1998. *Mixed methodology: Combining qualitative and quantitative approaches. Applied social research methods.* California: Sage.

Tashakorri, A. and Creswell, J. 2007. The New Era of Mixed Methods (editorial). *Journal of Mixed Methods Research*. **1** (1), pp.3-7. doi: 10.1177/2345678906293042.

Taylor, M. J. et al. 2007. Acute coronary syndrome in Europe: 1-year costs and outcomes. *Current Medical Research and Opinion*. **23**(1), pp.495-503.

Teddlie, C. B. and Tashakkori, A. 2009. *Foundations of mixed methods research: Integrating*

quantitative and qualitative approaches in the social and behavioral sciences. California: Sage.

Teoh, M. et al. 2007. Acute coronary syndromes and their presentation in Asian and Caucasian patients in Britain. *Heart*. **93**(2) pp.183–188. doi: 10.1136/hrt.2006.091900.

Terkelson, C. J. et al. 2005. Mortality rates in patients with ST-elevation vs. non-ST-elevation acute myocardial infarction: observations from an unselected cohort. *European Heart Journal.* **26**(1), pp.18-26. doi: 10.1093/eurheartj/ehi002.

Therneau, T. M. and Atkinson, B. R port by Brian Ripley. 2010. *rpart: Recursive Partitioning. R package*. (Version 3.1-45). (Software). [Downloaded 2009]. Available from: <http://CRAN.R-project.org/package=rpart>.

Therneau, T. M. et al. 1990. Martingale based residuals for survival models. *Biometrika*. **77**(1), pp.147-160.

Thurston, R. C. et al. 2005. Is the association between socioeconomic position and coronary heart disease stronger in women than in men? *American Journal of Epidemiology*. **162**(10), pp.57-65.

Tobin, B. 2000. Getting back to normal: women's recovery after a myocardial infarction. *Canadian Journal of Cardiovascular Nursing*. **11**(1), pp.11-19.

Tonne, C. et al. 2005. Long-term survival after acute myocardial infarction is lower in more deprived neighbourhoods. *Circulation*. **111**(23), pp.3063-3070. doi: 10.1161/ CIRCULATIONAHA.104.496174.

Townsend N, et al. 2012. *Coronary heart disease statistics 2012 edition.* British Heart Foundation: London.

Townsend, P. 1979. *Poverty in the UK: a survey of household resources and standards of living*. Middlesex: Penguin books.

Unal, B. et al. 2004. Clinical Investigation and Reports: Explaining the Decline in Coronary Heart Disease Mortality in England and Wales Between 1981 and 2000. *Circulation. **109,*** pp.1101-1107. doi: 10.1161/01.CIR.0000118498.35499.B2.

Vaccarino, V. et al. 2001. Sex differences in 2-year mortality after hospital discharge for myocardial infarction. *Annual Internal Medicine*. **134** (1), pp.173-181.

Van Buuren, S. and Groothuis-Oudshoorn, K. 2011. Mice: Multivariate Imputation by Chained Equations in R. *Journal of Statistical Software*. 45 (**3**), pp.1548-7660.

Van Buuren, S. et al. 1999. Multiple Imputation of Missing Blood Pressure Covariates in Survival Analysis, *Statistics in Medicine*. **18**(1), pp.681-694.

Van Buuren, S. V. and Groothuis-Oudshorn, K. 2013. *Mice: Multivariate Imputation by Chained Equations. R package.* (Version 2.18). (Software). [Downloaded 2009]. Available from: <http://cran.r-project.org/web/packages/mice/index.html>

Vermount, J. K. 1997. *Log-linear Models for Event Histories*. California: Sage.

Vermunt, J.K. 2003. Multilevel latent class models. *Sociological Methodology*. **33**(1), pp.213-239.

Vermunt, J.K. and Magidson, J. 2000. *Latent GOLD's User's Guide.* Boston: Statistical Innovations Inc.

Wellman, B. and Wortley, S. 1990. Different strokes from different Folks: community ties and social support. *American Journal of Sociology*. **96**(3), pp.558-588.

Wellman, B. 1996. Are personal communities local? A Dumptarian reconsideration. *Social Networks.***18** (4), pp.347-354. doi: 10.1016/0378-8733(95)00282-0.

Wen, M. and Christakis, N. A. 2005. Neighbourhood effects on post hospitalization mortality: a population-based cohort study of the elderly in Chicago. *Health Services Research*. **40**(4), pp.1108-1127.

Wheeldon, J. and Ahlberg, M. K. 2011. *Visualizing Social Science Research: Maps, Methods, & Meaning*. California: Sage.

Wheeldon, J. P. 2010. Mapping mixed methods research: Methods, measures, and meaning. *Journal of Mixed Methods Research*. **4**(2), pp.87-102.

Wilkinson, R. G. and Pickett, K. E. 2006. Income inequality and population health: A review and explanation of the evidence. *Social Science and Medicine*. **62** (7). Pp. 1768-1784. doi: 10.1016/j.socscimed.2005.08.036.

Wilson, T. 2011. The burden of acute coronary syndromes in the United Kingdom [Online]. *Charles River Association*. [Accessed 18 October 2012]. Available at: <www.crai.com/publications>.

Winkleby, M. et al. 2007. Inequities in CHD incidence and case fatality by neighbourhood deprivation. *American Journal of Preventive Medicine*. **32** (2), pp.97-106. doi: 10.1016/j.amepre.2006.10.002.

Yen, I. H. et al. 2009. Neighbourhood environment in studies of health of older adults: a systematic review. *American Journal of Preventive Medicine*. **37**(5), pp.455-463. doi:10.1016/j.amepre.2009.06.022.

Appendix A: Questionnaire patient information sheet and consent form

Questionnaire Patient Information Sheet

Surveying the comprehensive effect of neighbourhoods on acute coronary syndrome recovery within Yorkshire (SCENARY)

A large-print version of this sheet is available on request

We would like to invite you to take part in a research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. Please take the time to read the following information carefully. One of our research team will take you through the information sheet and answer any questions you may have. Please ask if there is anything that is not clear or if you would like more information. The sheet is set in two parts:

Part 1 tells you the purpose of this study and what will happen to you if you take part.

Part 2 gives you more detailed information about the conduct of the study.

Please take time to decide whether or not you wish to take part.

Part 1 of the information sheet

What is the purpose of the study?

We are undertaking this study to see if we can understand why patients from different neighbourhoods are more or less likely to make a good recovery from a heart attack.

Why have I been invited?

You have been invited to participate in this study because you were admitted to a hospital in Yorkshire with a suspected acute coronary syndrome (type of heart attack) and are over the age of 65 years. This study will recruit 100 patients per hospital who have been admitted with a suspected acute coronary syndrome.

Do I have to take part?

Participation is completely voluntary, so it is up to you to decide. Whatever you decide it will not affect your treatment in any way. Even if you do decide to take part you can still withdraw at any point without giving a reason with no effect to the standard of care you receive.

What will happen to me if I take part?

You will be asked to sign a consent form a copy of which you will be given along with the information sheet. With your permission we will look at your medical records to identify the type of heart attack and any other cardiac problems you have experienced and the treatment you have received for these. This information will be followed up for 1 year. We will also register your data with the Office of National Statistics so that we can track your progress over the study time period.

We would like to explore your recovery over 1 year. This would involve completing 2 questionnaires at 2 months and 9 months following your discharge from hospital. With your agreement we will contact you be telephone to answer any questions you may have about the questionnaires.

Between 9 and 12 of the recruited patients will also be approached for involvement within a qualitative study (up to 2 conversational type interviews at 3 and 9 months after discharge from hospital, and community mapping which involves walking around your neighbourhood). The patient's that are approached to be in this part of the study will be sent a second information sheet and consent form in the post and will receive a telephone call to discuss their potential involvement, answer any questions and if agreed arrange a time for the first interview.

What will I have to do?

If you agree to be within this study you will need to sign the consent form and fill in two questionnaires that will be sent to you in the post at 2 and 9 months following your discharge from hospital. If you have been selected for interviewing you will receive a second information sheet and second consent form within the post and a member of the team will telephone you to discuss this part of the study further.

What happens when the research study stops?

Your access to healthcare and the treatment you receive will be no different during or after the study.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and everything that you say will be kept confidential and the information collected about you will be handled strictly in accordance with the consent

that you have given and also the 1998 Data Protection Act. Personal information that contains your name and biographical details will be kept within the NHS Trust. All information such as questionnaire answers will be kept at the University of Leeds and will be identified using a code name. These will either be kept in a locked filing cabinet or on a password-protected encrypted hard drive.

This completes part I. If the information in Part 1 has interested you and you are considering participation, please read the additional information in Part 2 before making any decision.

Part 2 of the information sheet

What if there is a problem?

If you have any concerns about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions. If you remain unhappy about any part of this study or any activity of a member of the research team and wish to make a formal complaint we advise that you contact your local Patient Advice and Liaison Service (PALS) who will talk you through the complaints process.

Leeds Teaching Hospital NHS Trust by e-mail: patient.relations@leedsth.nhs.uk or telephone: 0113 2067168

What will happen to the results of the research study?

The results of the study will be presented at local and international cardiology meetings, and published in medical journals. The results will also be made available to local Cardiologists and to Acute Coronary Syndrome Specialist Nurses. You will not be identified personally in any report/publication. A summary of the general findings will be sent by post to you at the end of the study.

Who is organising and funding the research?

The Principle researcher Elizabeth Metcalfe is funded by the Mary and Alice Smith Memorial scholarship, University of Leeds.

Who has reviewed the study?

All research in the NHS is looked at by independent group of people, called a Research Ethics Committee to protect your safety, rights, wellbeing and dignity. This study has been reviewed and given favourable opinion by Leeds (Central) Research Ethics Committee.

Further information and contact details

If you require further information about the study, then please contact the Chief Investigator for the study Miss E Metcalfe, PhD student, Centre for Epidemiology and Biostatistics, University of Leeds, LS2 9JT, 07882874446.

What happens now?

If you decide you would like to take part in this study, please complete the consent form attached. You can keep this information sheet. You will be provided with a photocopy of the signed consent form (if you decide to take part).

Thank you for taking the time to read this information sheet and consider this study. If you would like to discuss the study or require further information please contact me at the address below.

Yours Sincerely,

Elizabeth Metcalfe

PhD student,

University of Leeds, Email: mat5em@leeds.ac.uk

Postal address:

Miss. Elizabeth Metcalfe

Room 8.001, Level 8, Worsley Building,

University of Leeds,

LS2 9JT

Questionnaire Patient Consent Form

Surveying the comprehensive effect of neighbourhoods on acute coronary syndrome recovery within Yorkshire (SCENARY)

(Please initial box's below)

1. I confirm that I have read and understand the information sheet dated: .... (Version 1.2) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐

3. I understand that my medical notes and data collected during the study may be looked at by individuals from regulatory authorities or from Leeds University (the study sponsor), where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records. ☐

4. I understand that my details will be registered with the Office of National Statistics ☐

5. I understand that my GP will be informed of my participation in this study ☐

6. I understand that anonymised direct quotes to may be used in publications resulting from this study ☐

7. I understand that my data may be used in future research studies, subject to ethical approval, and that appropriate researchers from other research groups within the Universities of Leeds, and researchers from other institutions, may have access to my data after my personal details have been removed. ☐

8. I agree to take part in this study. ☐

Participant's Name (in block letters) …………………………………………….......................

Signature.. Date: ..../......./.......

Name of Person taking consent (in block letters)..
(if different from researcher)

Signature.. Date: ..../......./.......

Researcher's Name (in block letters)…………………………………………………….........

Signature………………………………………………..…….....…… Date: …../…../……..

Patient ID:	Initials:
Date of birth:	
Researcher:	

Appendix B: Letter of favourable ethical response

NHS

National Research Ethics Service

Leeds (Central) Research Ethics Committee
Yorkshire and Humber REC Office
First Floor, Millside
Mill Pond Lane
Meanwood
Leeds
LS6 4RA

Telephone: 0113 3050127

02 February 2011

Miss Elizabeth A Metcalfe
PhD student
8.001 Worsley Building
University of Leeds
Leeds
LS2 9JT

Dear Miss Metcalfe

Study Title:	**Surveying the comprehensive effect of neighbourhoods on acute coronary syndrome recovery within Yorkshire (SCENARY)**
REC reference number:	**10/H1313/100**

Thank you for your letter of 06 January 2011, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Vice-Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

For NHS research sites only, management permission for research ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research

Appendix C: Initial recovery questionnaire

Study participant id:

Questionnaire 2 months post discharge from hospital

Title: Surveying the comprehensive effect of neighbourhoods on acute coronary syndrome recovery within Yorkshire (SCENARY)

Principle investigator: Miss Elizabeth Metcalfe

Dear Sir / Madam,

Thank you for taking the time to complete this survey.

Following your admission to hospital you agreed to kindly complete 2 questionnaires.

This is the first questionnaire (within 2 month post discharge from hospital)

Please take time to complete the questionnaire and return to Miss Elizabeth Metcalfe in the stamped Addressed Envelope provided.

Yours faithfully,

Elizabeth Metcalfe

SECTION 1: BASIC INFORMATION

1a) Date of questionnaire completion (day/month/year): ....

1b) Telephone
number:..

1c) Postcode:...

1d) How many years have you lived in your current neighbourhood (please circle the

appropriate

1	2	3	4	5+

answer):

SECTION 2: RECOVERY INFORMATION

For each of the following questions a scale is given on which the best state you can imagine is

marked as 100 and the worst state is marked as 0. Please indicate on each scale the answers to

your questions, in your opinion by drawing a line downwards across the scale:

2a) In your opinion how severe was your heart attack? (where 0 is as bad as possible and 100 is

not a problem to health):

0:                    1   2   3   4   5   6   7   8   9   100:

Worst   0   0   0   0   0   0   0   0   0   Best possible

possible

outcome
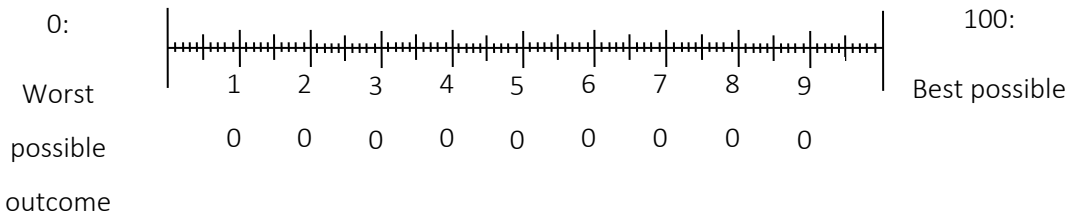
2b) I   ow well do you think you have recovered (where 0 is not at all and 100 is

completely):

0:                    1   2   3   4   5   6   7   8   9   100:

Worst   0   0   0   0   0   0   0   0   0   Best possible

possible

outcome

2c) Ha   ng all medication that was suggested by your Doctor? Yes/No

If not please explain why? ....

....

SECTION 3: NEIGHBOURHOOD INFORMATION

3a) Do you feel that your neighbourhood is a supporting environment for your recovery?
Yes/No

Please explain your answer..

……

……

3b) In your opinion how deprived is your neighbourhood? (where 0 is very deprived and 100 is not deprived at all):

0:		100:
Worst	1 2 3 4 5 6 7 8 9	Best possible
possible	0 0 0 0 0 0 0 0 0	
outcome		

3c) In your opinion what aspects of the neighbourhood most effect your

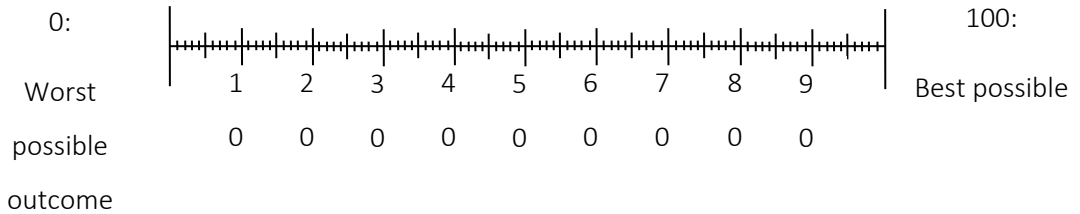recovery?………

……

…………………………………………………………………………………

SECTION 4: LIFE STYLE CHANGES

4a) What was your main form of daily transport before your heart attack?

Walking		Assisted walking		Car		Bicycle		Bus		Other	

If other please explain:

……

……

……………………………………………………………………………………………

4b) What is your main form of daily transport now?

Walking		Assisted walking		Car		Bicycle		Bus		Other	

If other please explain:

………

……

4c) How often did you partake in each of the following before your heart attack? (Please tick the appropriate box)

	Often	Not often	Sometimes	Never

Smoking				
Drinking				
30 minutes of exercise				

4d) How often do you partake in each of the following now? (Please tick the appropriate box)

	Often	Not often	Sometimes	Never
Smoking				
Drinking				
30 minutes of exercise				

4e) What other changes to your life style do you think have occurred since your heart

attack?..

...

SECTION 5: SOCIAL INTERACTIONS

5a) Are you an active member of a local organisation or club (eg, sport, craft, social club)?

Often		Not Often		Sometimes		Never	

Has this changed since your heart attack?: Yes/No

If Yes please explain the changes...

....

....

5b) How often do you have contact with family and friends which in your neighbourhood?

Often		Not Often		Sometimes		Never	

Has this changed since your heart attack?: Yes/No

If Yes please explain the changes..

....

....

SECTION 6: QUALITY OF LIFE QUESTIONNAIRE (CASP-19)

Please read the statements below and decide which of: *Often, not often, sometimes or never*

applies to you the most. Then tick the relevant box.

1. My age prevents me from doing the things I would like to

Often		Not Often		Sometimes		Never	

2. I feel that what happens to me is out of my control

Often		Not Often		Sometimes		Never	

3. I feel free to plan for the future

Often		Not Often		Sometimes		Never	

4. I feel left out of things

Often		Not Often		Sometimes		Never	

5. I can do the things that I want to do

Often		Not Often		Sometimes		Never	

6. Family responsibilities prevent me from doing what I want to do

Often		Not Often		Sometimes		Never	

7. I feel that I can please myself with what I do

Often		Not Often		Sometimes		Never	

8. My health stops me from doing things I want to do

Often		Not Often		Sometimes		Never	

9. Shortage of money stops me from doing things I want to do

Often		Not Often		Sometimes		Never	

10. I look forward to each day

Often		Not Often		Sometimes		Never	

11. I feel that my life has meaning

Often		Not Often		Sometimes		Never	

12. I enjoy the things that I do

Often		Not Often		Sometimes		Never	

13. I enjoy being in the company of others

Often		Not Often		Sometimes		Never	

14. On balance, I look back on my life with a sense of happiness

Often		Not Often		Sometimes		Never	

15. I feel full of energy these days

Often		Not Often		Sometimes		Never	

16. I choose to do things that I have never done before

Often		Not Often		Sometimes		Never	

17. I feel satisfied with the way my life has turned out

Often		Not Often		Sometimes		Never	

18. I feel that life is full of opportunities

Often		Not Often		Sometimes		Never	

19. I feel that the future looks good for me.

Often		Not Often		Sometimes		Never	

This is the end of the questionnaire

Thank you for you time

Please return the questionnaire to Miss Elizabeth Metcalfe in the stamped addressed envelope
provided

Appendix D: Interview topic guide

Orientation

> *Could you tell me a little about your life before you went into hospital?*

Expansion: For instance what do you do for a living?

Ex: Did you have any children?

Experience of heart attack

> It's been a few months now since your time in hospital, how did you feel at the time?

Ex: Did it come on suddenly?

Ex: How did the experience make you feel?

> Do you think you've recovered? And what does this mean to you?

Ex: Has your pattern of day-to-day life returned to what it was?

Ex: If you were to visualise a path leading from where you were before your event to where you want to be, where would you put yourself at the moment?

Prompt: Did you have the option to undertake rehab?

Experience of neighbourhood

> How would you describe your locality?

Ex: What do you think of the buildings? The people etc?

Prompt: Are you involved in any social groups such as at clubs or pubs?

> What made you first move to the area?

Prompt: Is this the reason you stayed?

> If someone asked you where you what are you lived how would you describe the boundaries of the neighbourhood?

Ex: Is there a main road or a river or something else that divides what you consider your neighbourhood from anywhere else?

Prompt: Is there a reason why you consider these as boundaries? Emotional connections?

> Have you been able to get out and about in the area? Do you feel that your neighbourhood has made it more difficult to?

Ex: Are there hills or other aspects that make it difficult to walk?

Ex: Are there aspects that effect whether you want to go out? For example crime in the area may make hinder you going out?

Prompt: Has this changed your mode of transport?

➢ Localities such as this one have been described as deprived, does this mean anything to you?

Effect of neighbourhoods on recovery

➢ How do you think your neighbourhood has affected you recovery?

Prompt: What aspects and in what way did they affect you?

➢ Did you get any help or support from neighbours?

➢ Did you feel like you could turn to anyone in your area?

Ex: For example if you needed something from the shop and couldn't get out, or for someone to do you're washing for you?

Life style changes

(Will have questionnaires so bring up changes made and anything they mentioned as changing)

Social relationships

(Build on previous knowledge on families and friends, asking about how things have changed; making distinctions between family, friend and neighbours)

➢ You mentioned a (friend/family) that helped you are you also able to talk to them or is there someone else that you can talk to?

Prompt: Practical support-is there someone who helps around the help

Prompt: emotional support:-is there someone you can talk to

Prompt: Informational support:-where/from whom do you get information about your recovery from?

Is there anything else that you would like to add?