An analysis of the extent to which socio-economic deprivation explains higher mortality in Glasgow in comparison with other post-industrial UK cities, and an investigation of other possible explanations.

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Abstract

Background

Despite the important, and well-established, link between poverty and poor health, previous research has shown that there is an 'excess' level of mortality in Scotland compared to England and Wales: that is, higher mortality seemingly not explained by differences in levels of socio-economic deprivation. This excess has been shown to be ubiquitous in Scotland, but greatest in and around Glasgow and the West Central Scotland conurbation. To investigate this further, the aims of this research were: first, to compare levels of mortality and deprivation – and, specifically, the extent to which differences in the latter explain differences in the former – between Glasgow and its two most comparable English cities, Liverpool and Manchester; and second, to investigate, by means of collection and analyses of new population survey data, some of the many hypotheses that have been proposed to explain Scotland's, and Glasgow's, 'excess' levels of poor health.

Methods

Geographic Information System (GIS) software was used to create small geographical units for Glasgow comparable in size to those available for the English cities (average population size: 1,600). Rates of 'income deprivation' were calculated for these small areas across all three cities. All-cause and cause-specific standardised mortality ratios were calculated for Glasgow relative to Liverpool and Manchester, standardising for age, sex and income deprivation decile. In addition, a range of historical socio-economic and mortality data was analysed.

Three of the previously suggested explanations for excess Scottish mortality were investigated: lower levels of social capital; a lower 'Sense of Coherence'(SoC); and a different 'psychological outlook' (specifically, lower levels of optimism). To do so, a representative survey of the adult population of Glasgow, Liverpool and Manchester was undertaken. Previously validated question sets and scales were used to measure the three hypotheses: levels of social capital were assessed by means of an expanded version of the Office for National Statistics (ONS) core 'Social Capital Harmonised Question Set' (covering

views about the local area, civic participation, social networks and support, social participation, and reciprocity and trust); SoC was measured by Antonovsky's 13-item scale (SOC-13); and levels of optimism were assessed using the Life Orientation Test (Revised) (LOT-R). The data were analysed by means of multivariate regression analyses, thus ensuring that any observed differences between the cities were independent of differences in the characteristics of the survey samples (age, gender, social class, ethnicity etc.).

Results

The deprivation profiles of Glasgow, Liverpool and Manchester were shown to be very similar: approximately a quarter of the total population of each city was classed as income deprived in 2005, with the distributions of deprivation across the cities' small areas also extremely alike. Despite this, after statistical adjustment for any remaining differences in deprivation, premature deaths (<65 years) in the period 2003-07 were 30% higher in Glasgow compared to Liverpool and Manchester, with deaths at all ages almost 15% higher. This excess was seen across virtually the whole population: all adult age groups, males and females, and among those living in deprived and non-deprived neighbourhoods. However, a difference was observed between the excess for deaths at all ages and that for premature deaths. For the former, the 15% higher mortality was distributed fairly evenly across deprivation deciles, and the greatest contribution (in terms of causes of death) was from cancers and diseases of the circulatory system; in the latter case, the excess was much higher in comparisons of those living in the more, rather than less, deprived areas (particularly men), and was driven in particular by higher rates of death from alcohol, drugs and suicide. Importantly, the excess appears to be increasing over time.

The analyses of the survey data showed SoC to be higher, not lower, among the Glasgow sample compared to those in both English cities. Levels of optimism (measured by the LOT-R scale) were very similar in Glasgow and Liverpool, and higher than that measured among the Manchester sample. Although not all aspects of social capital presented the Glasgow sample in a more negative light, Glasgow respondents were, however, characterised by lower levels of social participation, trust and reciprocity. A number of these differences were greatest in comparisons of those of higher, rather than lower, socio-economic status.

Conclusions

As currently measured, socio-economic deprivation does not appear to explain the differences in mortality between the cities: there is a high level of 'excess' mortality in Glasgow compared to the English cities. While many theories have been proposed to explain this, on the basis of the analyses included within this thesis, it seems highly unlikely that two of these – lower Sense of Coherence and a different psychological outlook (optimism) – play a part. However, it is possible that differences in aspects of social capital may play a role in explaining some of the excess, particularly that observed in comparisons of less deprived populations.

The concluding chapter of the thesis argues that excess mortality in Scotland and, in particular, its largest city, is a deeply complex phenomenon: the causes, therefore, are likely to be equally complex and multifactorial. It is postulated that, given the fundamental link between deprivation and mortality, the essence and reality of deprivation experienced by sections of Glasgow's population may not have been fully captured by the measures employed within research to date. More speculatively, the role of history may be important in seeking to identify the potentially different, unmeasured, facets of deprivation experienced by people in Glasgow compared to those in Liverpool and Manchester. It is also possible that protective factors (relating to, for example, ethnicity and social capital) may be at work in the two comparator English cities. However, given that excess mortality has been shown for all parts of Scotland compared to England & Wales, and not just Glasgow, this is not in any way a complete explanation.

Table of contents

List of Tables

List of Figures

List of appendices

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More generally, I have to thank Winnie, my wife, and our three children for giving me the space to complete the thesis in ‘home time’.

Finally, I would like to dedicate this thesis to the memory of my Dad, who died during its completion. Above all, a dedicated academic who believed in the power and importance of education, he would – to be perfectly honest - have been as interested in its contents as I was in his many published translations of classical Latin literature. Nonetheless, I know he would also have been immensely proud.

Author's declaration

I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature ________________________________

Printed name __David Walsh________________

Chapter 1. Introduction

I began working in health, and public health, research more than 20 years ago. In that time I have worked with many different people, within many different organisations (the Glasgow Centre for Population Health (GCPH), ISD Scotland, NHS Health Scotland, the Public Health Institute of Scotland (PHIS), NHS Greater Glasgow, NHS Argyll & Clyde, NHS Grampian) and on many different research projects. However, one project (or more accurately, one large programme of research) has been the focus of much of my professional work and interest for many of those years. In the early 2000s while working at PHIS, I became involved in a study exploring the extent to which Scotland's higher mortality compared to England & Wales could be explained in terms of differences in levels of material deprivation. This was an important set of analyses. Traditional explanations for poor population health in Scotland had previously focussed almost entirely on material deprivation, the latter, importantly, influenced by deindustrialisation. However, as will be explained in more detail in the next chapter of this thesis, the new analyses showed that *even after adjusting for differences in deprivation*, Scotland experienced significantly higher mortality than elsewhere in Great Britain. Deprivation, therefore, as conceptualised and measured in recent years, could not fully explain the country's higher mortality rates relative to England and Wales. Furthermore, this 'excess' mortality was shown to be ubiquitous in Scotland (although greatest in and around the Glasgow conurbation) and was increasing over time.

Since those days in PHIS, I (along with others) have explored this issue in national (e.g. Scotland vs. other UK countries), regional (West Central Scotland compared to other post-industrial regions of Europe) and now, as outlined in this thesis, city level analyses. The issue is of critical importance. Compared to elsewhere in Europe and the UK, Scotland's health status (and that of its most heavily populated parts) has, in relative terms, deteriorated since the middle of the 20th Century: while life expectancy has, in absolute terms, improved over time, it has done so more slowly than in any other Western European country. On average, therefore, people in Scotland now die younger than anywhere else in Western Europe, and its slow rate of improvement means that life expectancy will soon be lower in Scotland than in a number of Eastern European countries as well[i]. Compared to England & Wales, mortality in Scotland is not only higher, it is higher across all social classes – although more emphatically among those of low social class, and among those living in poorer neighbourhoods. In the last 20-30 years mortality rates among those living in particular parts of Scotland, and among those of certain age groups, increased not just in relative terms, but in *absolute* terms. As mortality rates in all age groups and in all parts of the UK and Western Europe fell, for Scots of younger working ages, and for people of all ages living in poorer parts of Glasgow, the opposite occurred. The epidemiological analyses that have described these phenomena, and those included within this thesis, tend to present these events (for very good reasons) in statistical terms: that is, as standardised rates or ratios or expected years of life. Behind these summary epidemiological expressions, however, lie genuine human tragedies: individual stories of shortened, wasted lives, pain, sickness, early death and grief, affecting individual men and women, their families, friends and communities. Understanding the causes of Scotland's and Glasgow's persistent and relatively worsening poor health profile is, therefore, a public health imperative.

Of course, to gain any measure of understanding of why health differs in one place compared to another (be that a country, region, city or even neighbourhood), we need to understand what factors determine good or bad health, and how those determinants vary, and have varied historically, in different locations and among different populations. As will be discussed in more detail in the next chapter, paramount to this are the influences of the 'social determinants', the broad societal conditions in which people live, differences (inequalities) in which, therefore, can drive differences (inequalities) in health between places[ii]. Key to this are socio-economic determinants, and socio-economic inequalities in health have widened dramatically within the UK in recent decades, a phenomenon which is referred to in the next chapter as the 'polarisation' of Britain, and within which West Central Scotland and Glasgow sit at one (lower) end of a spectrum. This has been evidenced by many research and policy reports published over several decades.

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[i] Indeed, this is already the case for female life expectancy with regard to Poland and the Czech Republic.

[ii] Please note that all these terms – health inequalities, social determinants etc., are defined, and discussed in greater depth, in the next chapter.

Socio-economic factors, particularly income, poverty and deprivation, are, therefore, fundamentally important determinants of health and, thereby, health inequalities. However, as already outlined, differences in deprivation do not seem to fully account for the higher mortality of Scotland (and parts of Scotland) compared to England & Wales: this unexplained 'excess' has been referred to as a 'Scottish Effect'. As will be discussed, this has been shown in a number of analyses, based on various different measures of both geographical (area-based) and individual social and economic characteristics. This 'excess' has been shown to be greatest in and around Glasgow, which led to the use of the term 'Glasgow effect'. Whether or not either term (Scottish Effect or Glasgow Effect) is helpful is a matter of debate. However, they are now established as shorthand for what, as the thesis will demonstrate, are truly complex phenomena. What is clear, however, is that the this 'effect' (the excess) has its most profound manifestation in Glasgow and its hinterland. That is why further research centred on Scotland's largest city is required.

One of the two overall aims of the research presented in this thesis, therefore, is to compare health (mortality) and one of the key drivers of health, socio-economic deprivation, between Glasgow and other, relevant, British cities. Although reference will be made to a number of cities, the analyses will principally concentrate on two which are the most similar in terms of their history, character and current socio-economic profile, and for which, therefore, the most meaningful comparisons can be made: Liverpool and Manchester. The second aim is to explore some of the many hypotheses put forward to explain Glasgow's 'excess' levels of mortality by means of collection and analyses of new population survey data.

The structure of the thesis is as follows: the literature review outlined in the next chapter places these broad research aims in the context of other relevant research on health and health inequalities in Scotland and the UK. This is followed by: clarification of the specific objectives and research questions which, respectively, the thesis seeks to achieve and answer (chapter 3); a detailed description of the methodologies employed in the research (chapter 4); a brief overview of the histories of three cities that are the focus for this research (chapter 5); the results from the first set of analyses, based on comparisons of deprivation and mortality in the cities (chapter 6); results from analyses of newly collected survey data aimed at achieving the second overall objective (chapter 7); and the final chapter which discusses all the results presented in this thesis, together with their implications (chapter 8).

Chapter 2. Literature review: placing the research in context.

The analyses described in this thesis compare health in Glasgow with Liverpool and Manchester. The fundamental aim of these analyses, therefore, is to enable a greater understanding of the reasons why, and the extent to which, health differs between three particular places in the U.K. To fully understand this issue, we need to place it in the context of previous research. Specifically, we need to address a number of important, and overlapping, issues. These are:

1. What determines good or bad health among populations?

2. How do we understand differences in health and its determinants between groups and – in particular – places? In other words, what do we know about health inequalities, and in particular *spatial* inequalities, within the UK and elsewhere?

3. As spatial inequalities relate to the concept of *place*, what do we need to understand about the relative effects of 'place' or 'area' on health?

4. How do we measure health, inequalities in health, and, most of all, the drivers of inequalities in health (e.g. poverty, socio-economic deprivation)?

5. What is already known about levels of 'excess' poor health in Scotland and its largest city, Glasgow, in comparison to elsewhere in the UK and the rest of Europe?

6. Based on all this knowledge, what have been the most pertinent Scottish and UK policies that have sought to address, or have influenced, health and inequalities in health among UK populations?

There are vast literatures to consider in seeking answers to these questions, but the aim of this chapter is to provide a summary of the most pertinent issues while concentrating on aspects deemed most relevant to the analyses presented in later chapters of this thesis.

The literature discussed in this chapter comes from two principal sources: material that has been assembled and studied in the course of the past 20 years of the author's professional life; and additional papers and books resulting from specific searches of the literature to supplement, and complement, the previously collected information. Details of the latter (databases, specific search terms etc.) are outlined in Chapter 4 (Methods).

2.1 What determines good or bad health among populations?

2.1.1 Social influences on health

Many years of epidemiological research, evidence building, debate and consideration have led to a sophisticated understanding of what creates or destroys the health of populations. Debate continues but, over time, an appreciation has emerged that health determinants are multiple and interwoven and impact across different life stages. Implicit in this relatively modern understanding is the impact of wider economic, social and environmental factors on an individual's health status. This contrasts with a focus on solely biological or behavioural factors and reflects a 'social' understanding of the determinants of health, as opposed to 'biomedical' or lifestyle-based views i.e. ones which concentrate on a much narrower set of risk factors.[iii]

2.1.2 History of understanding and debate

Discussion of these wider 'social determinants', and their place within a social model of health, tends to feature more prominently in the health literature of recent decades. We might assume, therefore, that such an understanding is a fairly modern development in public health. However, this is not really the case. Many would argue that modern public health took root in Victorian times: and, as shall be discussed in more detail in the next section, as far back as that era there was a clear understanding of the effects of wider environmental factors (poverty, housing etc.) on health[1]. However, by the middle of the 20th Century that had changed. There was less focus on the social influences on health, and what prevailed was a narrower focus on the importance of healthcare, and the 'biomedical' model[2,3]. This is despite the fact that the much quoted World Health Organisation (WHO) definition of health, one which reflects an

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[iii] It is worth distinguishing here between models of *health*, and what are the primary focus of this section of the thesis, models of *health determinants*. Health itself can be conceptualised in a number of different ways. The most common distinction is between the *medical (or biomedical) model* of health (a narrow, mechanistic view of the physical condition of the body, where a healthy state merely reflects the absence of disease), and the *social model*, one which instead perceives health as an interaction between the body, mind and environment. In addition, the chapter will also later refer to models of the determinants of health *inequalities*.

understanding of the social influences on health ('Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'[4]), was officially adopted by the organisation in 1948.

Authors such as Krieger have detailed the emergence, and predominance, of biomedical epidemiological theory in the mid-20th Century, alongside 'individualistic' and lifestyle approaches[2] [iv]. However, the latter half of the century saw a re-focusing on the wider social influences on health. What brought this about? The literature points to a number of important landmarks such as: the Canadian Government Minister Marc Lalonde's policy recommendations to the Canadian government in 1974[5] (and their subsequent shifting of focus away from health *care* to the wider influences on health[v]); WHO's 1978 conference at Alma Ata in what is now Kazakhstan at which WHO declared the need for global governmental action to promote and protect the health of all people (and at which it espoused (for the first time) the importance of primary health care as a vital mechanism to achieve this)[6,vi]; the adoption and publication of these principles of equal access to, and distribution of, health resources across all members of all societies in the WHO's global strategy for 'Health For All By The Year 2000' in 1981[7, 8 vii]; through to the WHO's Ottawa Charter in 1986, which built on these earlier developments to outline five 'areas of action' for the achievement of better health globally[viii]: the first of these was the need to build 'healthy public policy' which 'goes beyond health care… [and] combines diverse but complementary approaches including legislation, fiscal measures, taxation

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[iv] Krieger also highlights the persistent influence of biomedical and lifestyle approaches in 21st Century epidemiology, specifically in relation to 'gene-environment interaction' models, 'evolutionary medicine' and 'developmental origins of health and disease' as increasingly popular ways of thinking around health which ignore wider social influences, and concentrate instead on disease causation by way of genetic/epigenetic variation in combination with lifestyle factors.

[v] The Lalonde report recommended separating out two previously entwined health issues: the healthcare system, and the prevention of health problems and promotion of good health. It was viewed as the first modern Government report to explicitly acknowledge that the determinants of health existed outwith the healthcare system, and therefore, the need to move beyond a medical, or biomedical, model of health.

[vi] The WHO declaration at the Alma Ata conference on primary health care is viewed as a milestone in public health, and turning point in the definition of, and perception of the role of, primary health care, with the latter espoused as being key to attaining the WHO goal of 'health for all'

[vii] The first report - *Health For All By The Year 2000* – was published in 1977. However, the 'birth' of the Health for All movement is seen as the 1981 publication *Global Strategy for Health for All by the Year 2000*.

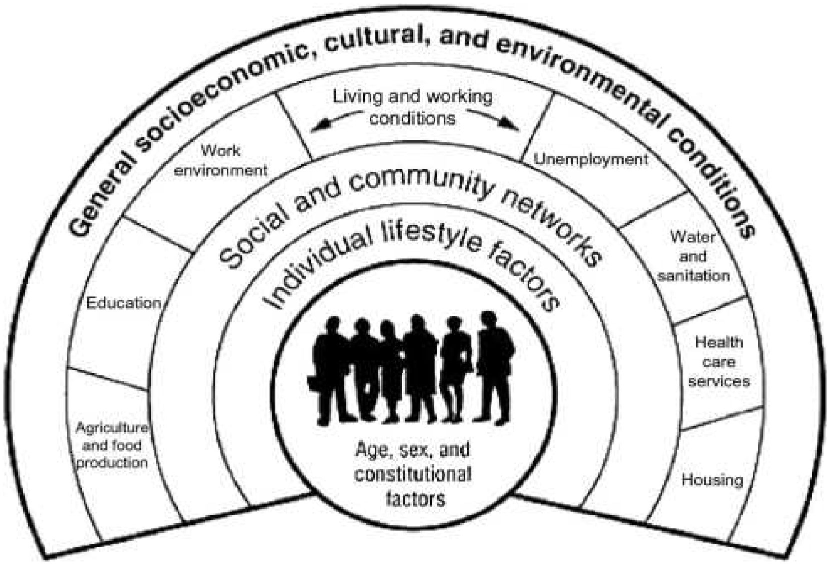
[viii] All five 'actions were: building healthy public policy; create supportive environments; strengthening community action; developing personal skills; re-orientating health care services toward prevention of illness and promotion of health.

and organizational change… coordinated action that leads to health, income and social policies that foster greater equity'[9]. In the UK, publication of the Black Report in 1980[10] and the Whitehead Report[11] in 1987 (both of which are discussed in more detail later in this chapter) were also seen as responsible for 'the surge in interest in 'the new public health' in which social and environmental conditions are regarded as at least as important for health, under modern conditions, as the more classical biomedical components'[12]. With all these developments, therefore, the focus of public health and health promotion began to centre on what became known as the 'socio-ecological model' of the determinants of health[9,13].

2.1.3 Socio-ecological model of health determinants

Many socio-ecological models of health determinants have been proposed, all reflecting the same general understanding of the wider social and environmental influences, and the many links between them. Two well-known examples are included here for illustration: however, many more have been proposed and debated[14-26]. The first is the Dahlgren & Whitehead model[27,28] presented in Figure 2.1 below. This shows various 'layers' of influences on an individual's health: thus, while age, gender, hereditary factors and lifestyle choices are clearly more proximal to one's health status, many of these are in turn influenced and governed by social networks and relations, and then by broader living and working conditions, which in turn are influenced by 'macro' socio-economic, cultural and environmental factors.

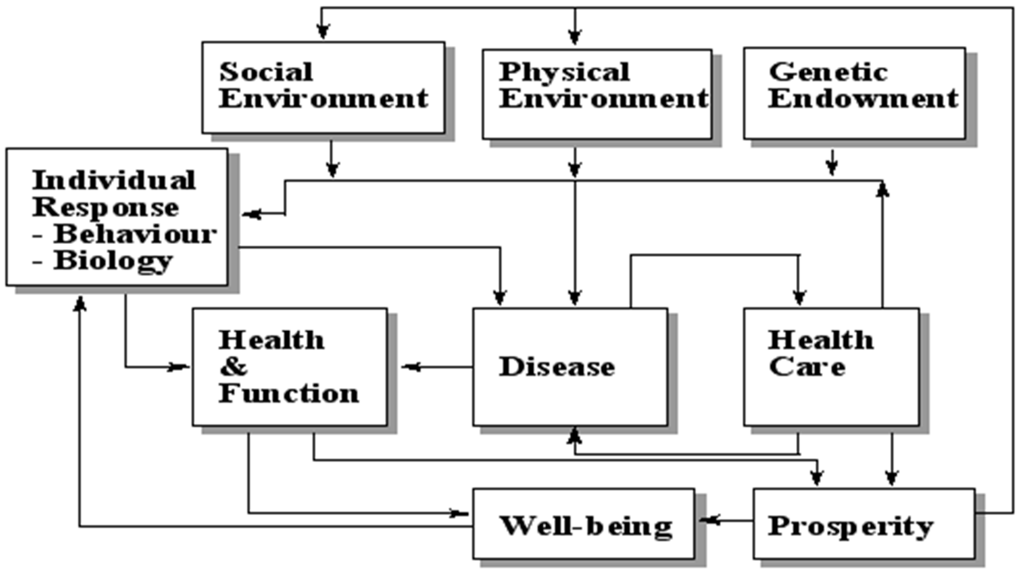
Figure 2.1. Dahlgren & Whitehead's model of the principal determinants of health (Source: Dahlgren and Whitehead, 1993[27])



A second example is Evans & Stoddart's model (or 'conceptual framework for patterns of determinants of health')[29,30] (Figure 2.2). This model acknowledges the role of healthcare, but only as one of many 'domains' of influence and not in any way the most important. Its broad definition of health is acknowledged by the inclusion of three types of 'outcome': disease, wellbeing and heath & function. It is worth noting that in a later review of their model, Evans & Stoddart criticised it on account of, in particular, the omission of *time* – 'the interaction of health determinants over the life trajectory is central to understanding their effects[31]'. They also highlighted its failure to capture the importance and impact of economic *inequalities*[ix]. Those important criticisms aside, the model is another way of presenting the same truth as that shown by Dahlgren & Whitehead: that health is the result of a complex set of linkages between multiple influences. Or, to put it another way, 'health depends on everything, all the time'[31].

[ix] Evans & Stoddart also criticised their model in relation to the 'genetic endowment' domain, acknowledging that the latter can be influenced by the physical, but in particular, the social environment, and that the model, therefore, should make that explicit.

Figure 2.2. Evans & Stoddart's model of the principal determinants of health (Source: Evans & Stoddart, 1994[30])



Implicit within models such as these, but not always explicitly highlighted, are the underlying effects of the political and economic systems within societies – the 'political economy'. Thus, the socio-economic, living and working conditions included within Dahlgren & Whitehead's model, and many of the key determinants (prosperity, the social environment) of Evans & Stoddart's model, will clearly be influenced by the economic and social policies in place in any country. The importance of the political economy for health and, in particular, health inequalities (discussed further below), has been the focus for many writers [32-36]. Examples of this impact include the positive effects of governments favouring redistribution and more generous welfare state provision[37] and the negative effects of neoliberal regimes[38-40]. The importance of the WHO declaration of Alma-Alta (mentioned above) has been cited for making explicit the connection between the political economy and population health – although, ironically, the declaration preceded by only a year or two the implementation of neoliberal policies in countries such as the UK and the US which resulted in a widening of health inequalities[2]. The political economy, therefore, is an important component of our understanding of the social determinants of health.

2.1.4 A focus on the social determinants on health

The focus of modern public health is on the social determinants of health. This is reflected in much of the recent work by the WHO which defines the social determinants as: 'the conditions in which people are born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels. The social determinants of health are mostly responsible for health inequities - the unfair and avoidable differences in health status seen within and between countries'[41]. Thus, WHO's focus is not solely on the determinants themselves, but on the inequalities and inequities associated with them (and this is discussed in more detail in the next section of this chapter). In 2008 WHO published the report of the Commission on Social Determinants of Health[42]. The Commission was created 'to marshal the evidence on what can be done to promote health equity and to foster a global movement to achieve it'. It produced three overarching recommendations: 1) 'Improve Daily Living Conditions'; 2) 'Tackle the Inequitable Distribution of Power, Money, and Resources'; 3) 'Measure and Understand the Problem and Assess the Impact of Action'.

The Commission's report makes explicit the need to tackle these issues across many social and policy areas: 'Traditionally, society has looked to the health sector to deal with its concerns about health and disease… But the high burden of illness responsible for appalling premature loss of life arises in large part because of the conditions in which people are born, grow, live, work, and age. In their turn, poor and unequal living conditions are the consequence of poor social policies and programmes, unfair economic arrangements, and bad politics. Action on the social determinants of health must involve the whole of government, civil society and local communities, business, global fora, and international agencies. Policies and programmes must embrace all the key sectors of society not just the health sector'[42].

However, although the report of the Commission on Social Determinants of Health has been much lauded, it has also been criticised for failing to address some of the fundamental issues regarding the political economy (discussed briefly above). Mooney[36] points out that although the Commission highlights the consequences of 'poor social policies and programmes, unfair economic arrangements, and bad politics', it does not adequately confront the underlying drivers in terms of the influences of political and economic systems: it 'signally fails to get to grips with neoliberalism'. Navarro concurs: 'It is not inequalities that kill people, as the report states, it is those who are responsible for these inequalities that kill people'[38]. The report's fundamental weakness, according to Navarro, is that it is 'profoundly apolitical'.

Other WHO reports and programmes of work have focussed, and continue to focus, on similar social determinants and inequalities related themes: for example, examination of these issues within a specifically European context[43], while publications such as 'The Solid Facts'[44] have highlighted important implications for policy in relation to the social determinants (for example: 'psycho-social' risk factors[x] relating to stress (including stress in the workplace); the importance of early years; social exclusion, unemployment, social support and addictions).

An understanding of the many and varied influences on population health is fundamental to the content of this thesis, as is the more specific (but entirely related) issue of why these influences, and therefore, health itself, vary so enormously between different places and populations. The next section discusses inequalities in health and its determinants in more detail.

2.2 Inequalities in health and its determinants

2.2.1 Health inequalities

Health inequality has been defined as a 'generic term used to designate differences, variations, and disparities in the health achievements of individuals and groups'[47] or, similarly, as 'differences in health status or in the distribution of health determinants between different population groups'[48]. Thus, it is distinguished from the term 'health *inequity*' which more specifically refers to those inequalities which can be termed unfair or unjust, or which can be said to

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[x] Psycho-social risk factors (discussed further later in this chapter) relate to influences on health by means of interaction with the social environment: there is debate around the precise definition of 'psychosocial' in epidemiological literature[45], but has been defined as a 'bridge' between individual and social structures[46] and thus relate to issues such as low self-esteem, social support and isolation, and lack of control over work and home life. They also relate to one's place in the social hierarchy, a notion that will be returned to in the discussion of income inequalities later in the chapter.

be derived from aspects of injustice in society[47]. There is considerable debate around this distinction[47-52] as it can obviously be argued that most differences (inequalities) across social groups are intrinsically unfair, reflecting particular advantage or disadvantage across the social spectrum. This is further complicated by the fact that not all differences between individuals or populations are driven by differences across social (or related) lines. However, this debate is not the concern of this thesis, and in this chapter I will continue to follow the likes of Kawachi[47] and the WHO[48] in using the term 'inequalities' to denote measured differences between groups or areas.

Health inequalities is an extremely complex issue. Extensive research has shown that people who are most affected by societal inequalities related to factors such as low income, gender, social position, ethnic origin, place of residence, age and disability are more likely to have poorer physical and mental health than the general population. The relationship between material deprivation and a range of diverse health outcomes has been extensively documented, and is the focus of this thesis. However, other examples of risks to health resulting from societal inequalities also include: poor access to good quality food or housing through socio-economic inequality; sexual abuse or exposure to anti-social behaviour through gender inequality; or racist assaults or poorer access to services through ethnic inequality[xi].

The literature on health inequalities reflects this complexity. Bambra, reviewing her own work and that of Macintyre, Bartley, Skalická and others, summarises the main theories of health inequalities as the following: artefact (i.e. that inequalities do not exist in reality but are instead the result of inaccuracies in data and measurement); health selection (that health status determines one's social class rather than vice-versa); cultural-behavioural (that health behaviours – influenced by cultural factors - are the main drivers of socio-economic differences in health); (neo)materialist (that the main drivers are economic (rather than behavioural) and structural (rather than individual)); psychosocial (mentioned in the previous section) (that health inequalities derive from the stress-related effects of social inequalities); and life course (that the

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[xi] Note that a version of this paragraph appears on the ScotPHO website here: http://www.scotpho.org.uk/comparative-health/health-inequalities/introduction. However, this text was written by the author of this thesis.

accumulation of disadvantages (relating to aspects embedded in some of the other theories) over time drives inequalities between groups)[53]. Some of these theories are discussed in more detail later in the chapter.

Despite this complexity, a common thread through most theories is that inequalities in health outcomes are driven principally by inequalities in the main determinants of health. Thus, the Dahlgren and Whitehead model shown in Figure 2.1 above to describe the principal determinants of health has also been used to describe the principal determinants of health *inequalities*[54] – indeed the model was first presented in the context of describing the impact of social inequalities on health, with an accompanying discussion on the social gradient associated with the main determinants. That said, however, and reflecting aspects of some of the theories of inequalities listed above, many would argue that the impact on inequalities of some determinants (for example poverty and low income (discussed in greater detail below), education[55] and gender[56]) is greater than others. More generally, other authors (e.g. Graham and Kelly[57]) have emphasised the importance of distinguishing between the determinants of health and the determinants of health inequalities, as they are different processes that require different policy responses. Other authors have also highlighted the differences between the two[2,53,58].

Macintyre additionally categorises the main causes of inequalities into 'downstream' causes (e.g. direct exposures to adverse influences on health; particular behaviours or lifestyle), 'intermediate' causes (i.e. the mechanisms or means by which particular groups find themselves at risk of, vulnerable to, those downstream causes (e.g. taxation policies; health care; the labour market)), and 'upstream' causes (e.g. 'international political and economic forces', and societal social structure)[54]. She suggests policies to address inequalities should focus on upstream and downstream causes; others have argued for the emphasis to be more on upstream factors[57-60]. I will return to this discussion in the final section of the chapter when discussing UK policy responses to inequalities.

2.2.2 Socio-economic health inequalities

Socio-economic inequality (as opposed to inequalities by gender, ethnicity etc.) is the dimension of inequality most pertinent to this thesis. Such differences can be shown both at the individual level (e.g. in terms of individual socio-economic status) and at the area level (e.g. by means of area-based deprivation indices): this will be discussed in further detail below in relation to the issues of health and place, and also the measurement of health and health inequalities. There is a 'social gradient' in health in all societies: every 'step' higher up the socio-economic 'ladder' is associated with increased health[61]. Such socio-economic inequalities can be shown for the vast majority of health outcomes (morbidity, mortality) and health determinants, although the size and nature of socio-economic gradients differ according to the outcomes and determinants examined[54]. Some of these differences are complex: for example, survey data for Scotland (and England) suggest that alcohol consumption is higher among those of higher social class[62,63], whereas alcohol-related morbidity and mortality is higher among those of lower social class[64].

Socio-economic inequalities in aspects of health have existed for a long time. However, it was in the 19th Century when evidence of 'modern' inequalities in health came to the fore in Europe, principally through the development of quantifiable means of measurement. For example, in Britain, Edwin Chadwick's 1842 report on 'The Sanitary Condition of the Labouring Population' demonstrated the link between unsanitary living conditions and mortality[65] [xii], while in France, Louis-René Villermé's study of Parisian neighbourhoods between 1817 and 1826 showed the link between poverty and early death, an analysis recently redone[66]. In Germany, Rudolf Virchow's mid-19th Century analyses of the link between social conditions and diseases such as typhus led him to be regarded as a pioneer in social medicine, with his oft quoted statement that 'medicine is a social science, and politics is nothing else but medicine on a large scale'[67] [xiii]. Of particular (geographical) relevance to this thesis is the work of

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[xii] Chadwick's report was extremely influential and its author is usually described as a social reformer. However, as Krieger notes, his motivations for reform were more economic and business related, rather than purely social. Thus, he recorded as an 'appalling fact' that over half of Manchester's 'labouring classes' died before their fifth birthday: 'that is, before they can be engaged in factory labour, or in any other labour whatsoever'. And although his work demonstrated the link between poor living conditions and poor health, he did not see poverty as a driver of disease, but rather as 'at best a correlate, if not an outcome of poor health'[2].

[xiii] Virchow's report on the 1848 typhus epidemic in Upper Silesia is described by Taylor and Rieger as 'one of the neglected classics of social medicine'. His scientific analyses highlighted the socio-economic and cultural origins of the outbreak, and he advocated a social, rather than medical solution, based on what today might be termed 'social and economic regeneration': full employment, higher wages, the establishment of cooperatives, and universal education.

another German, Friedrich Engels, whose analysis of 'The Condition of the Working Class in England'[68] (specifically, in mid-19th Century Manchester) demonstrated the impact of working and living conditions associated with industrialisation on the health of the working class population of the city. He described the high mortality of the latter as 'social murder' caused by 'the revolting greed of the middle-classes'[68] (i.e. factory owners, landlords, land-owners etc.) and, among different analyses presented, he demonstrated the huge variation in mortality rates by 'class' of street and house. At the same time that Engels was publishing his work on Manchester, similar analyses were being undertaken in the other two cities of interest to this thesis. In Glasgow, Robert Perry published his work on the 'Facts and Observations on the Sanitory (sic) State of Glasgow' in which he demonstrated the link between poverty and disease in the city, including the provision of a detailed map of Glasgow in which he categorised districts of the city in relation to cases of fever, and aligned them to descriptions of living conditions[69]. In the same year W.H. Duncan published a similar study in Liverpool (discussed further in Chapter 5). Elsewhere in England, but in the early part of the 20th Century, M'Gonigle's and Kirkby's studies of poverty and health in the town of Stockton (including an evaluation of the effects of housing improvement policies[xiv]) were ground-breaking in demonstrating inequalities in health by social class, and highlighting the link between poverty and mortality, with its foundations 'in a society that provided inadequate wages and welfare benefits' rather than it being the fault of individuals[70]. M'Gonigle's studies were a forerunner for later analyses of health and inequalities such as the 1980 Black Report[10]. The latter is attributed with initiating the 'resurgence of an active interest in…and heightened awareness of health inequalities all around Europe'[71], demonstrating for the first time the widening of health (and economic) inequalities across the United Kingdom. The Black Report is discussed in more detail later in this chapter.

However, his proposed solution also included the disestablishment of the Catholic Church, which is probably unlikely to feature in any modern day regeneration plans in Scotland.

[xiv] Interestingly, this showed the effects of a slum clearance project in the town to have been detrimental to health. Although families were moved from slum conditions to a new purpose built council estate, M'Gonigle's analyses showed increased mortality rates among the re-housed. M'Gonigle demonstrated that this was a direct result of the higher rents associated with the new housing which increased poverty rates.

It is clear, however, that between Chadwick's 19th Century analyses (and M'Gonigle's pre-second world war studies) and Black's report of 1980, overall population health in the UK improved dramatically, driven by general improvements in living conditions, allied to advances in public health and general medicine. However, socio-economic inequalities persist today because of the enduring relationship between living conditions (deprivation, income, social circumstances) and health. Gregory[72] analysed the link between area-based deprivation and mortality in England & Wales at both the start (early 1900s) and the end (2001) of the 20th century and found that although patterns of disease were clearly different in the two time periods, the relationship between deprivation and health still held true over time: 'Despite all the medical, public health, social, economic, and political changes over the 20th century, patterns of poverty and mortality and the relations between them remain firmly entrenched. There is a strong relation between the mortality levels of a century ago and those of today… and holds true for most major modern causes of death'. Thus, although the most common causes of death are different today compared to 100 years ago, and although we define poverty and deprivation in different ways (a century ago deprivation and poverty were absolute concepts – whereby, in the words of Seebohm (son of Joseph) Rowntree at the time, income was not 'sufficient to obtain the minimum necessaries for the maintenance of mere physical efficiency'[73] – and today it is defined in relative terms (this is discussed in more detail later in this chapter)), the same variation (inequalities) in health are seen today as then. This also relates to the work of Link and colleagues who emphasise that the 'fundamental social causes' of health[74] are socio-economic: 'a broad range of circumstances that affect health are shaped by socioeconomic resources', and these resources 'were equally as useful in avoiding the worst sanitation, housing, and industrial conditions of the 19th century as they are in shaping access to the current circumstances' (the latter being better neighbourhoods, occupations, social networks, healthier behaviour choices etc.)[xv].

[xv] The work by Link and colleagues emphasises the fact that policies to tackle health inequalities which focus not on these 'fundamental causes', but rather on more proximal, individual behavioural factors, will be ineffective. This is relevant to the discussion on policy later in this chapter (section 2.6). Link and colleagues' fundamental causes theory has also recently been the focus of analyses of trends in health inequalities in a specifically Scottish context[75].

The consistency of the relationship between deprivation and mortality has been shown not only over time, but also by place. This was shown by Gregory for England & Wales, but also by Sridharan and colleagues for Scotland[76]: they showed that although rates of both deprivation and mortality are higher in the West of Scotland[xvi] compared to the rest of the country, the essential relationship between the two is comparable - higher deprivation equates to higher rates of mortality. This is relevant to the issues at the heart of this thesis in terms of what drives poorer health in Scotland compared to elsewhere in the UK: just 'more' deprivation, or additional drivers of poor health over and above the effects of deprivation? I will return to this later in the chapter in discussing the literature in relation to the evidence of 'excess' mortality in Scotland.

2.2.3 The widening gap in socio-economic inequalities in health

Aside from the findings of historical analyses such as those of Gregory, a great many studies have demonstrated not just the persistence of the relationship between socio-economic circumstances and health, but a widening in the gap between different social groups and different locations in more recent times, both within the UK and elsewhere. This is because although total population health has improved over the course of the last century (and more), it has improved to different degrees and at different rates across different groups and locations – especially in recent decades. Reflecting (neo)materialist thinking on inequalities, many would argue that the widening gap in health reflects a widening gap in the socio-economic drivers of health.

To illustrate this point, Thomas *et al*[77], updating previous analyses by Davey Smith *et al*[78], analysed premature (age<65 years) mortality rates for UK local authority areas over the period 1921-2007, and showed that geographical inequalities on this scale were wider in 2007 than in any other period over the 85+ years analysed. In a separate analysis in the same paper they showed in greater detail the widening of geographical inequalities between the last decade of the 20th Century and the first decade of the 21st Century, with inequalities in mortality under the age of 75 years increasing across the UK every two years of the period analysed.

[xvi] Defined by four NHS Board areas in operation at the time of the analyses: Ayrshire & Arran, Argyll & Clyde, Forth Valley, Greater Glasgow, and Lanarkshire.

Thomas *et al* point to widening inequalities in economic conditions (particularly income inequalities, a topic discussed separately below) as the driver of health inequalities in the UK since the late 1970s. A number of other studies have highlighted a process of socio-economic and subsequent health related 'polarisation' of Britain and the U.K. that has taken place over that time period. Dorling *et al*'s analyses of poverty, wealth and place between 1968 and 2005[79] highlighted the changes in economic circumstances that had taken place within Britain, with more households having become poor (with some urban areas highlighted where half of households were termed 'breadline poor'[xvii] - this included concentrations in the Glasgow, Liverpool and Manchester areas), and already wealthy areas having become 'disproportionately wealthier'. Similarly, Wheeler *et al*[80], in examining spatial inequalities in aspects of health and related themes (education, housing, poverty, employment), highlighted the division between 'work rich' and 'work poor' areas. They pointed out that in 2001 around one million UK households had three or more cars, while another million households who might need a car (i.e. as they had dependent children) had none. (Car ownership is, of course, often used as a proxy for income in UK poverty indices, as will be discussed further below). The geographical socio-economic polarisation of the UK was further highlighted by Dorling and Thomas[81] who argued that, socially and economically, the country was divided in two: an extended Greater London metropolis (effectively covering a large section of southern England), with the remaining areas (including Scotland) described as a 'series of poorly connected city cluster islands that appear to be slowly sinking demographically, socially and economically'. They concluded that, in these terms, the UK is a 'Kingdom united only by history, increasingly divided by its geography'. This north-south division has also been highlighted recently in health terms by Hacking[82] who showed (within England) the persistent divide between the north and south of the country between 1965 and 2008, with the gap in mortality rates between the regions particularly widening in the last decade[xviii].

[xvii] This is based on Dorling *et al*'s 'Breadline Britain' analyses, discussed further in the 'measuring deprivation' section of this chapter.
[xviii] Hacking showed that mortality in the north of England (defined as the 5 northernmost English government office regions (GORs) was, on average, around 13% higher over the 43 years analysed. This excess was consistently higher among males than females, and the greatest increase was seen in the 20-34 age group (rising from no significant excess over the 1965-1995 period to 22% excess between 1996 and 2008).

The widening gap in mortality rates across Britain in the latter part of the 20th century was also highlighted in books in the 1990s by Dorling[83] and Shaw *et al*[84]. The latter is unequivocal in its judgement of the reasons for the widening gap – its determinants are social circumstances across the life course. Shaw *et al* conclude that 'health differentials are primarily related to the long-term material well-being of social groups, not to the psycho-social effects of position in hierarchies. Reduction of inequalities in health cannot be brought about by people feeling better about their (unfair) lot in the world – only the redistribution of material resources will produce such a reduction'. The authors point to social and health polarisation based on the increase of income inequalities. To address this, there is a 'simple message:… the key policy that will reduce inequalities in health is the alleviation of poverty through the reduction in income and wealth inequality'. This, therefore, is again the 'neo-materialist' approach to understanding the causes of health inequalities alluded to earlier[53, 85-87]: other approaches such as that relating to the 'psycho-social effects of… hierarchies', referred to by Shaw *et al* above, is discussed further below, as is the specific issue of income inequalities.

With particular relevance to this thesis, Shaw *et al* presented a range of analyses for the British parliamentary constituencies with the highest rates of premature mortality in 1991-95 compared to those with the lowest rates in the period. It is notable that, of the ten constituencies with the highest rates of premature death at the time, seven were in Glasgow, two were in Manchester and one in Liverpool. It is also of interest to note that although the Liverpool and Manchester areas had lower premature mortality than the 'worst' Glasgow areas, they had very similar poverty rates: for example, the Manchester Central constituency had 40% of its population living in poverty in 1991, compared to figures of 41% in Springburn and 42% in Shettleston, the Glasgow constituencies with highest premature mortality rates. The equivalent figure for the Liverpool area (Liverpool Riverside) was 39%, but this again had a lower rate of premature mortality[xix]. The same is also true of many other indicators presented: one example is the education 'failure' rate which was higher in the Manchester area than in the more 'unhealthy' Glasgow areas. Thus, on the one hand, these

[xix] Standardised mortality ratios (SMRs) for deaths under 65 - Glasgow Shettleston: 234; Glasgow Springburn: 217; Manchester Central: 173; Liverpool Riverside: 172.

analyses confirm the relationship between socio-economic circumstances and health but, on the other, they hint at potential differences in this relationship between these three UK cities.

Table 2.1 (taken from Shaw *et al*'s publication) presents some of these data for illustration.

Table 2.1 Standardised Mortality Ratios (age < 65 years), poverty rates and school education failure rates for the 15 parliamentary constituencies where people are most at risk of premature death in Britain, 1991-95. (Source: Shaw *et al*, 'The Widening Gap (1999)[84])

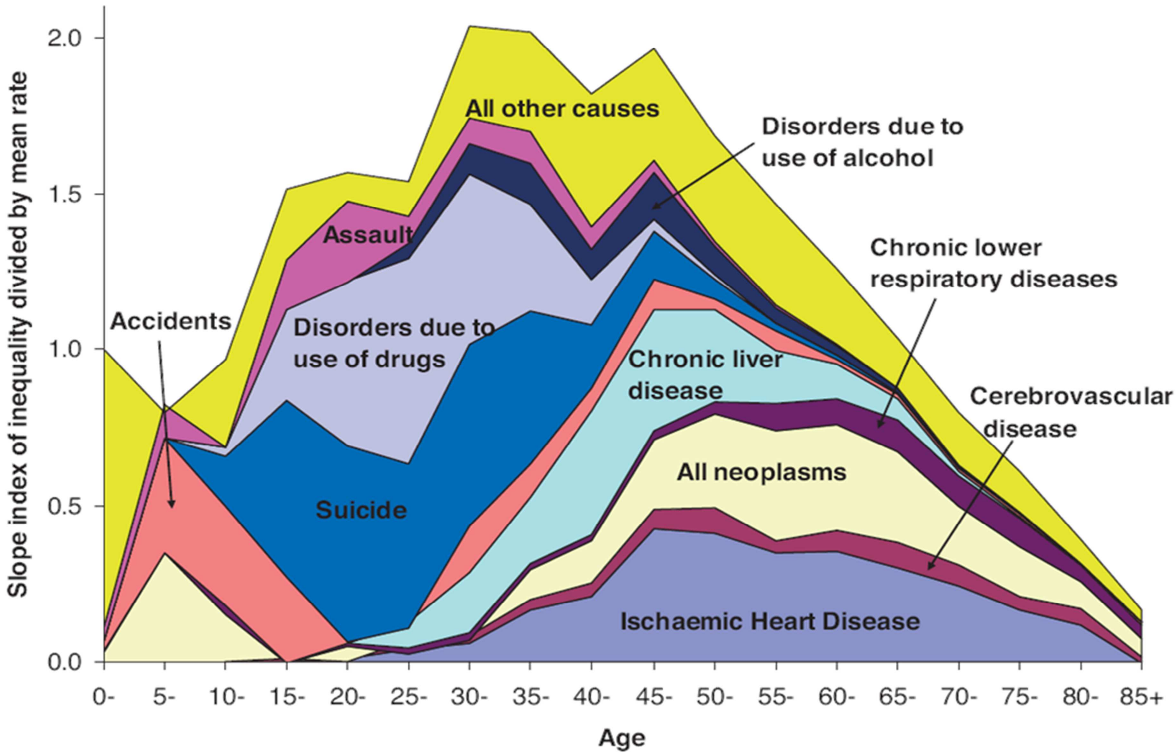
Constituency (ordered by SMR (<65 years))	Standardised Mortality Ratio (SMR) <65 years (1991-95) (GB=100)	% in poverty (1991)	% with children in poverty (1991)	School education failure rate (%) (1993)
Glasgow Shettleston	234	42	59	62
Glasgow Springburn	217	41	60	82
Glasgow Maryhill	196	41	63	77
Glasgow Pollok	187	36	52	70
Glasgow Anniesland	181	34	51	64
Glasgow Baillieston	180	39	54	72
Manchester Central	173	40	59	79
Glasgow Govan	172	31	46	70
Liverpool Riverside	172	39	57	70
Manchester Blackley	169	34	49	82
Greenock & Inverclyde	164	31	43	53
Salford	163	34	48	82
Tyne Bridge	158	37	55	65
Glasgow Kelvin	158	30	38	62
Southwark North & Bermondsey	156	38	57	83

The themes of income inequalities, polarisation, and the 'fundamental causes' of health disparities were analysed further by Mitchell *et al*[88] when they sought to assess the extent to which *changes* in rates of premature mortality across Britain between the 1980s and 1990s could be explained by changes in the social class composition of Britain (the latter changes having been driven by policies in the 1980s which widened income inequalities). They concluded that, for the vast majority of areas (95% of British parliamentary constituencies), changes in premature mortality rates were explained ('to within 5%') by changes in social structure. Interestingly, and again particularly relevant to this thesis, the exception to this was: 'a core set of areas … (notably within Glasgow, Birmingham and Liverpool) where the chances of premature mortality have remained or become inexplicably higher than the national average'. This again suggests the possibility of health in particular locations (including Glasgow) being influenced by additional factors over and above the principal socio-economic determinants.

2.2.4 Inequalities in Scotland

Much of the evidence discussed so far in this chapter points to widening inequalities in socio-economic conditions and, as a consequence, health status, across Britain in recent decades. This process of polarisation can also be shown within Scotland, with clear evidence of widening inequalities across the country, and within particular parts of the country. For example, Leyland *et al*'s 2007[89] report presented clear evidence of widening inequalities in mortality between the beginning of the 1980s and the start of the 2000s. Analyses by area-based deprivation showed that this was true for all deaths and for the majority of the particular causes of death analysed. These authors concluded that 'increasing inequalities were evident in most of the major causes of death, either because mortality was falling faster in the more affluent areas, as in the case of IHD, or was rising faster in the more deprived areas, as in the case of chronic liver disease'. The analyses also showed the contribution of particular causes to overall inequalities within particular age groups: this showed inequalities to be greatest among those of working age and, in particular, younger working ages. In the latter case, this was attributable to particular differences between deprived and non-deprived areas for deaths from alcohol related causes, drugs misuse, suicide and violence. This is illustrated in Figure 2.3 (taken from Leyland *et al*'s report): the greater the value of the y axis, the greater the level of inequality (across the gradient of deprivation in Scotland) for the particular cause of death for the relevant age group (with the latter shown on the x axis).

Figure 2.3. Age specific contribution to inequalities of specific causes of death across SIMD income quintiles, men, Scotland 2000-02[xx] (Source: Leyland *et al*, 2007[89])



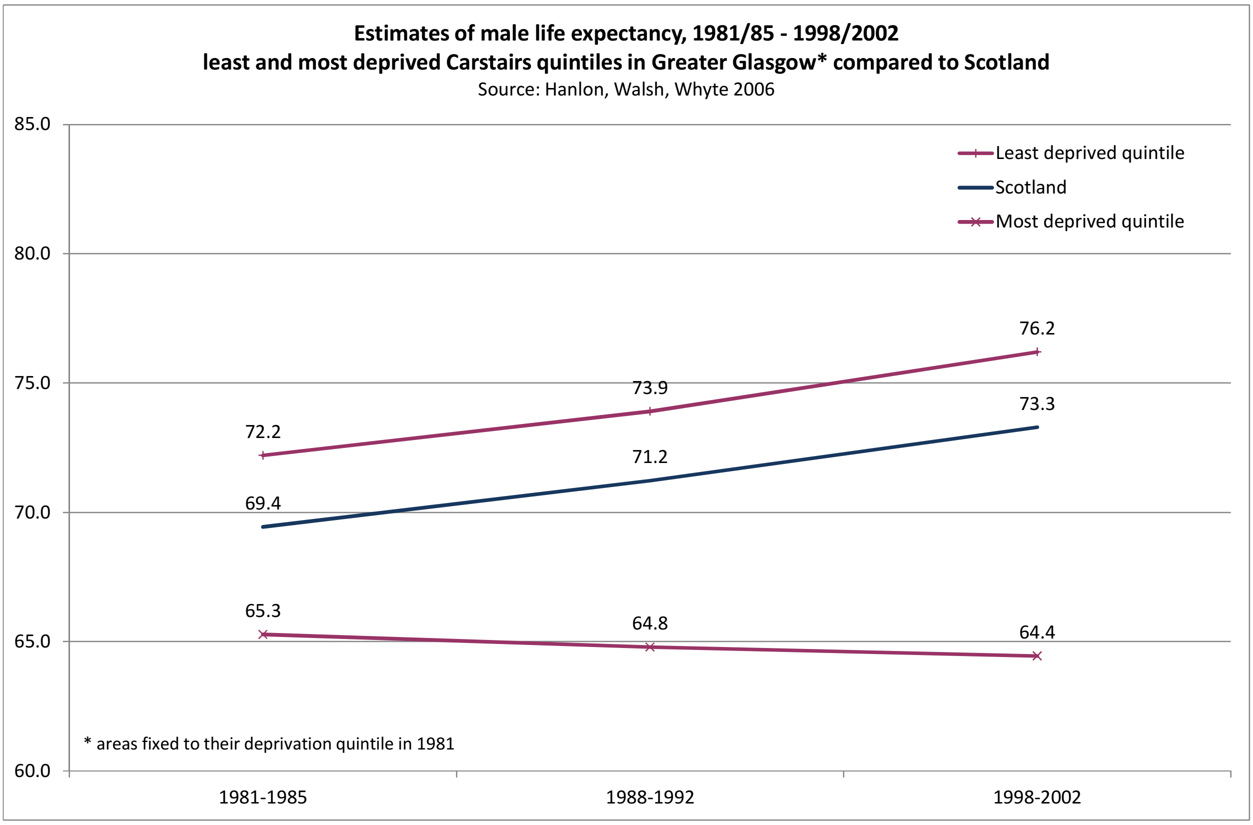
The age and cause specific dimensions of these analyses are important. As mentioned in Chapter 1, Scotland has the lowest life expectancy for both males and females in Western Europe, with the country's position relative to other European countries having worsened since the 1950s[90]: this has been shown to have been influenced by particularly high mortality among those of working age in Scotland[91,92]. This has also been demonstrated in regional comparisons of West Central Scotland (WCS) with other comparably deindustrialised regions of Europe[93]: those analyses showed particularly higher rates of death among younger working ages (15-44) in WCS, driven by high numbers of deaths in that population for many of the same causes that Leyland *et al* showed to be associated with the widest inequalities in mortality in the country. The analyses also showed *increasing* all-cause mortality rates in WCS for this age group over the course of the 1990s: this was in stark contrast to decreasing rates recorded

[xx] Note: the *y* axis shows a measure of inequality in mortality (the Slope Index of Inequality (SII) (divided by the mean rate)), based on income deprivation deciles from the Scottish Index of Multiple Deprivation. This index is discussed, along with summary measures of inequality, in a later section of this chapter.

in the other regions analysed. This upward trend has also been shown for Scotland as a whole[94].

There is ample evidence of inequalities, and widening inequalities, in many aspects of health and its determinants across Scotland as a whole, and within its constituent parts. These have been shown between individuals, and between differently defined and designated geographical areas. Many of these will be discussed briefly below under the heading of measuring health and inequalities. Of particular interest to this thesis is Glasgow. Aspects of mortality and inequalities in parts of Glasgow have been highlighted within some of the UK analyses already discussed (e.g. Shaw *et al*[84], Mitchell *et al*[88]), and more detailed analyses of health in the city published in 2006[95] clearly demonstrated a widening gap in life expectancy across the city: for example, between 1981 and 2001, male life expectancy among those living in the *least* deprived areas rose by four years (to 76.2 years), while the equivalent figure for those living in the *most* deprived areas fell slightly (to 64.4 years). Thus, the gap between the deprived and non-deprived areas widened from almost seven years in the early 1980s to almost 12 years two decades later. These data are presented in Figure 2.4. The same publication also demonstrated a worsening of Glasgow's position since the 1970s relative to the rest of Scotland both for life expectancy (as have other publications[89,96,97]), and for important causes of death such as heart disease and cerebrovascular disease. This slower rate of improvement has been demonstrated for both Glasgow and the wider WCS conurbation, relative to other, comparable, post-industrial cities and regions; and of particular relevance to this thesis is the fact that the latter include Merseyside and Greater Manchester in England.

Figure 2.4. Trends in male life expectancy in the least and most deprived areas of Greater Glasgow (compared to Scotland), 1981-2001 (Source: Hanlon *et al*, 2006[95])



The fall in life expectancy in Glasgow's most deprived areas echoes national analyses undertaken by Leyland *et al*[98] showing increased mortality between 1991/92 and 2000/02 among those living in the most deprived areas of the country. Following these publications, Norman *et al*[99] sought to examine whether rising mortality tends were apparent in other, similar, 'persistently deprived' parts of the UK. They were not. Norman's analyses confirmed that the rise in male premature mortality rates seen in the most deprived parts of Scotland between the early 1990s and 2000s was driven principally by increases in mortality in Glasgow, again confirming that despite the strong relationship between deprivation and mortality in the UK, certain aspects of mortality are particular to Glasgow. As the authors concluded: 'For these locations [persistently deprived parts of the UK] there has been no significant rise in mortality between 1991 and 2001 in any of the other countries or regions of the UK, but a rise in male mortality in Glasgow. Certainly, these results would seem to justify even more of a public health focus on Glasgow'.

These trends have contributed to a situation whereby socio-economic inequalities in mortality now appear to be greater in Scotland than elsewhere in Europe: this appears to be true both at the national level (in comparison of mortality by individual socio-economic status[xxi] [100,101]) and at the regional level (in spatial comparisons of mortality across similarly deindustrialised regions[102]). Inequalities elsewhere in Europe are discussed briefly in the following section, as well as later in this chapter.

2.2.5 Inequalities in Europe

The focus of this discussion on inequalities thus far has been, rightly, given its relevance to the subject of the thesis, Scotland and the UK. However, there is a wealth of evidence of similar socio-economic inequalities in health in other countries, for example across the European Union. For instance, Mackenbach and colleagues (2006)[71] showed inequalities by education, social class and income in premature mortality across all European countries for which comparable data could be accessed, with yet more evidence produced as part of the EUROTHINE project[103] in 2007. The latter had a specific focus on evaluating effective policies and solutions, and it is notable that Mackenbach differs from some of his contemporaries such as Shaw *et al* discussed above, in perceiving solutions not just in 'upstream' interventions (education, income) but also 'downstream' solutions such as smoking behaviour. I will return to the issue of policy later in this chapter.

Other examples from Europe abound. For example: Jagger *et al*'s analysis of inequalities in healthy life expectancy across the 25 countries of the EU[104]; Kunst *et al*'s analyses of changes (i.e. increases) in socio-economic inequalities in mortality over the 1980s and 1990s in European countries[105]; and many more[106-110]: there are countless country-specific examples in the literature of the estimation, and analyses, of socio-economic inequalities in health that are well beyond the scope of this thesis. Some have even attempted to estimate the economic costs of health inequalities: for example Mackenbach suggested that in

[xxi] Measured by educational attainment. These analyses showed mortality inequalities among females to be higher in Scotland than any of the other included Western and Eastern European countries. For males, inequalities in Scotland were higher than Western European countries (but lower than in Hungary and the Czech Republic).

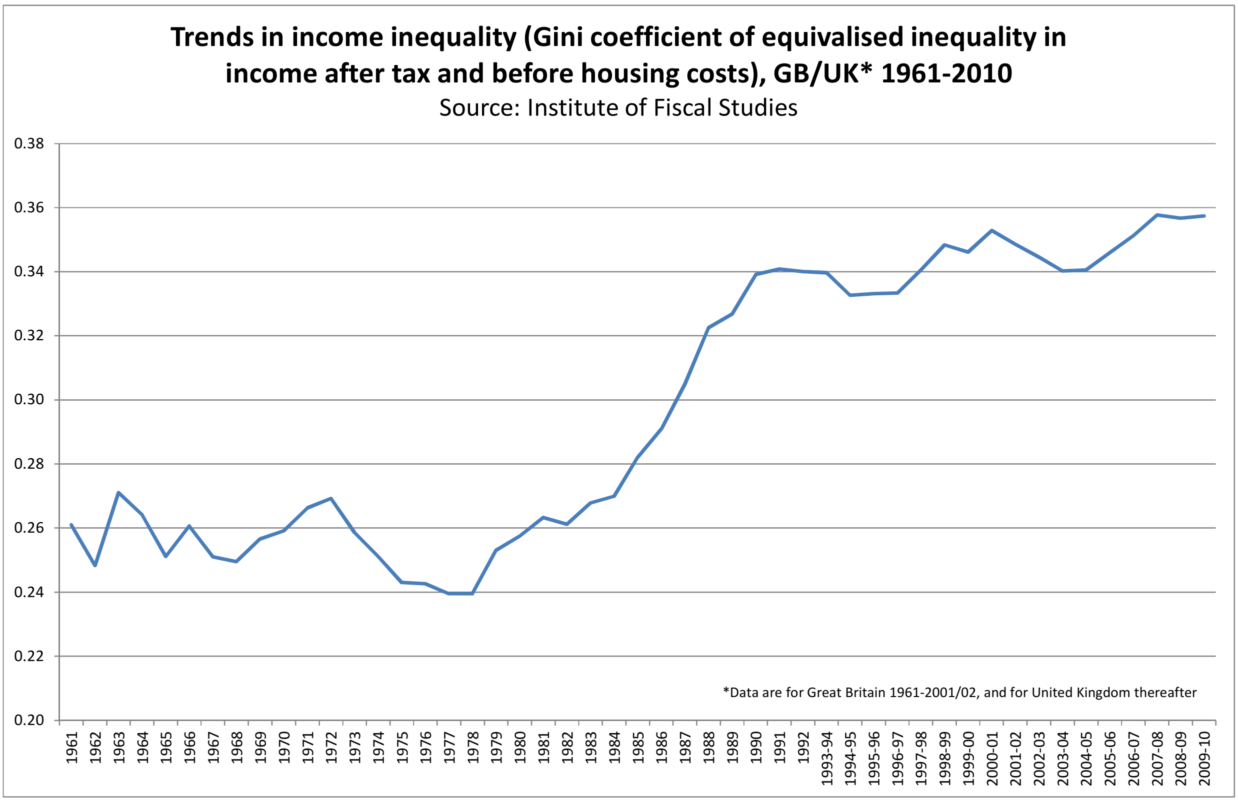
the mid-2000s, the cost of health inequalities across the European Union equated to 980 billion euros (or almost 10% of GDP) [111].

2.2.6 Income inequalities

As discussed above, many commentators point to the widening of inequalities in income in the UK as the main driver of widening inequalities in health. Figure 2.5 below clearly illustrates this widening gap in income inequality (as measured by the Gini coefficient[xxii]) that has taken place in Great Britain since the late 1970s. However, in understanding the relationship (and certainly the arguments about the relationship) between income inequalities and health outcomes, there are two issues that need to be addressed separately. The first, as described elsewhere in this chapter, is that there is a socio-economic gradient in health. People on low incomes tend to have poorer health that those on higher incomes, and health improves with every ‘step’ up the socio-economic ‘ladder’. The second issue – one that is more debated and, at times, disputed – is that among wealthy societies, those with wider income inequalities have poorer health and social outcomes across the *whole* population. Thus, in comparing two groups of people of matching social class, one in a country characterised by greater income inequality than the other, the group in the more equal society will fare better with respect to a number of health and social characteristics.

[xxii] As outlined later in this section, the Gini coefficient is a measure of income distribution which ranges from 0 (complete equality of income distribution) to 1 (complete inequality).

Figure 2.5. Trends in income inequality. (Source: charted from data from the Institute of Fiscal Studies[112])



This second issue has been much discussed of late, principally because of the work of Wilkinson and Pickett, and the publication of their book ‘The Spirit Level’ in 2009[113]. However, The Spirit Level was simply adding to well over 30 years of academic discussion of this topic. A link between income inequality and life expectancy was suggested as far back as 1975 by Preston[114], and developed in analyses published by Rodgers in 1979[115]. Further work by Wilkinson in the 1990s[116], much disputed by Judge and colleagues[117,118], added to the debate, as did reviews and additional analyses by the likes of Lynch[119] and Blanden[120]. Arguably, one of the strengths of The Spirit Level is that many more data sets (and more decades of data) are now available for epidemiological exploration than was the case 30 years ago, and these have added extra weight to the arguments presented.

The main argument of the Spirit Level (and previous publications by Wilkinson[116,121,122]) is that income inequalities are bad for all members of affluent, developed, societies because of the ‘psycho-social’ mechanism of ‘status anxiety’: that is, that greater income inequalities place people within wide social hierarchies, increasing ‘social status competition’, which leads to stress and a whole range of adverse social and health outcomes. At the population level, Wilkinson's and Pickett's analyses demonstrate relationships between income inequality and: lower life expectancy; higher infant mortality rates; more teenage births; lower social mobility; lower levels of trust; more obesity; worse educational attainment; higher homicide and imprisonment rates; and higher levels of mental illness (including alcohol and drug addiction).

The evidence has been disputed[123-125], principally on the grounds of: the measures of income inequality used by the authors (critics have argued that income inequality is not a good proxy for social stratification – for example, it does not distinguish between differences in social class and social status); the choice of the social and health outcomes analysed and presented (for example, there is evidence that some other 'social problems' are more prevalent in more equal societies); the choice of, and rationale for the choice of, the countries included in the analyses; and statistical issues such as 'outliers' and strength of linear relationship (for example, some have argued that some 'outlier' countries should have been excluded from analyses, while others have questioned the assumption of linearity in the analyses). However, these criticisms have both been refuted by the authors, and indeed have themselves been criticised by others (e.g. Noble[126]). Indeed, in a recent Joseph Rowntree Foundation (JRF) 'independent review of the evidence' of the impact of income inequalities on society, the author suggested that the evidence outweighs the criticisms: 'the basic methods in The Spirit Level are robust and the main finding on the correlation between income inequality and health and social problems stands up to these criticisms'[127].

What is still disputed, and is an uncertainty acknowledged in the JRF review, is whether the link between inequality and health and social outcomes is *causative* or merely *associative*. Some studies do suggest a causal link, but it is such a complex area that it is difficult to prove. The JRF review, therefore, concludes that: 'the key findings from this independent review are that the evidence does indeed suggest that there is a correlation between income inequality and a range of health and social problems… [however], most researchers have, in fact, gone beyond simple correlation analysis to investigate whether income inequality causes such problems, independent of other factors. There is less agreement, however, about whether or not this is the case'[127].

A few additional points from this discussion should be highlighted, given their particular relevance to the subject matter of this thesis. The first is that the geographical, or spatial, level at which income inequality is measured is extremely important. Wilkinson & Pickett demonstrate the relationship between inequality and health and social outcomes at the level of whole countries, and also U.S. states. They are of the opinion that the effects cannot be measured below the level of 'society'. This is to do with the way in which the mechanism of 'social anxiety' operates: as it is based on comparisons with others, the most relevant comparisons are ones with all of society (one's country or, in the case of a country as large as America, one's State) rather than with more local reference points (one's neighbourhood or community)[xxiii]. This argument is supported by recent (2011) analyses by Kondo *et al*[128], and it poses a number of questions for the Scottish context. First, what is the appropriate level of comparison: Scotland, as a historical country with its own sense of national identity, and devolved political powers? Or the UK, with which so many cultural, political and economic issues are shared? Is it more important to measure inequality *within* Scotland (or, indeed, West Central Scotland or Glasgow), or to be aware that Scotland (or more accurately, parts of Scotland) sits at the lower end of the UK spectrum of inequality (and that WCS and Glasgow are in a similar position compared to the rest of Scotland)?

This thesis focuses on three UK cities, each defined by their local authority boundaries. It is arguably not appropriate to measure income inequalities at this level (nor, according to Wilkinson, is it desirable), as local authority boundaries will often 'artificially' exclude neighbouring areas with potential differences in levels of average income (wealthy suburbs that sit outside the city boundaries, for example). However, a combination of different geographical definitions and different data sets can still provide an insight into likely levels of income inequality in and around the three cities.

[xxiii] As is mentioned briefly later (in the discussion or urban health), not everyone shares Wilkinson's & Picket's view on this, with others arguing that the same process can operate at a local level.

First, income inequality has been measured recently for the wider regions of West Central Scotland (incorporating Glasgow) and North-West England (incorporating Merseyside and Greater Manchester). The level of income inequalities was found to be *lower* in the Scottish region. The statistic used was again the Gini coefficient, which, as stated above, measures distribution of income across a population: it has a theoretical value ranging from zero (complete equality of income distribution) and one (complete inequality). In the mid-2000s, the Gini coefficient of WCS was 0.30, and that of North-West England was 0.32[129] [xxiv]. At the country level, the Gini coefficient for Scotland in 2004 was 0.32, while it was higher for England: 0.35. The figure for the UK as a whole was also 0.35[xxv]. These figures are interesting, not only because of the higher levels of inequality in England compared to Scotland (which casts doubt on whether income inequality plays a part in explaining Scotland's overall higher mortality compared to England & Wales), but also because some commentators have argued that there is a threshold at which the effects of income inequality affect a population: in a 2009 paper Kondo[134] suggests a threshold of 0.30, which would mean that both Scotland and England are prone to its potentially adverse effects.

Second, the distribution of income *among those in paid employment* in the three cities of interest can be examined using published data from ONS Annual Survey of Hours and Earnings[135], a one per cent sample of employee jobs in the cities

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[xxiv] The same report also presented a Gini coefficient for Merseyside (for the same period) of 0.29, almost identical to the WCS figure of 0.30. However, the Merseyside figure was calculated from a much smaller sample size.

[xxv] The Gini coefficients referred to here were based on calculations from data from the Luxembourg Income Study (LIS)[130] (for estimates for Scotland, England and North West England) and the Scottish Household Survey (for West Central Scotland). These were based on large, and representative, samples: approximately 4,500 and 20,000 for Scotland and England respectively, 3,000 for N.W. England, and 11,000 for WCS. It should be pointed out, however, that other authors[131,132] have argued that income inequality in Scotland is similar to England as a whole, but is wider than in regions such as North England and indeed Merseyside (although identical to Greater Manchester). This was based on analyses of the British Household Panel Survey (BHPS) with much smaller sample sizes (e.g. for 2004: <500 for Scotland, 600 for N.W. England). However, income estimates from the BHPS have been criticised on the basis of these relatively small sample sizes, as well as associated worries concerning accuracy[133]. The same authors above also argue (using the same data sources) that the distribution of 'unearned income' (e.g. from investments, and used as a proxy for 'wealth' as opposed to basic household income) is more unequal in Scotland than in the UK as a whole, although the same caveats regarding sample sizes and accuracy of income estimates apply.

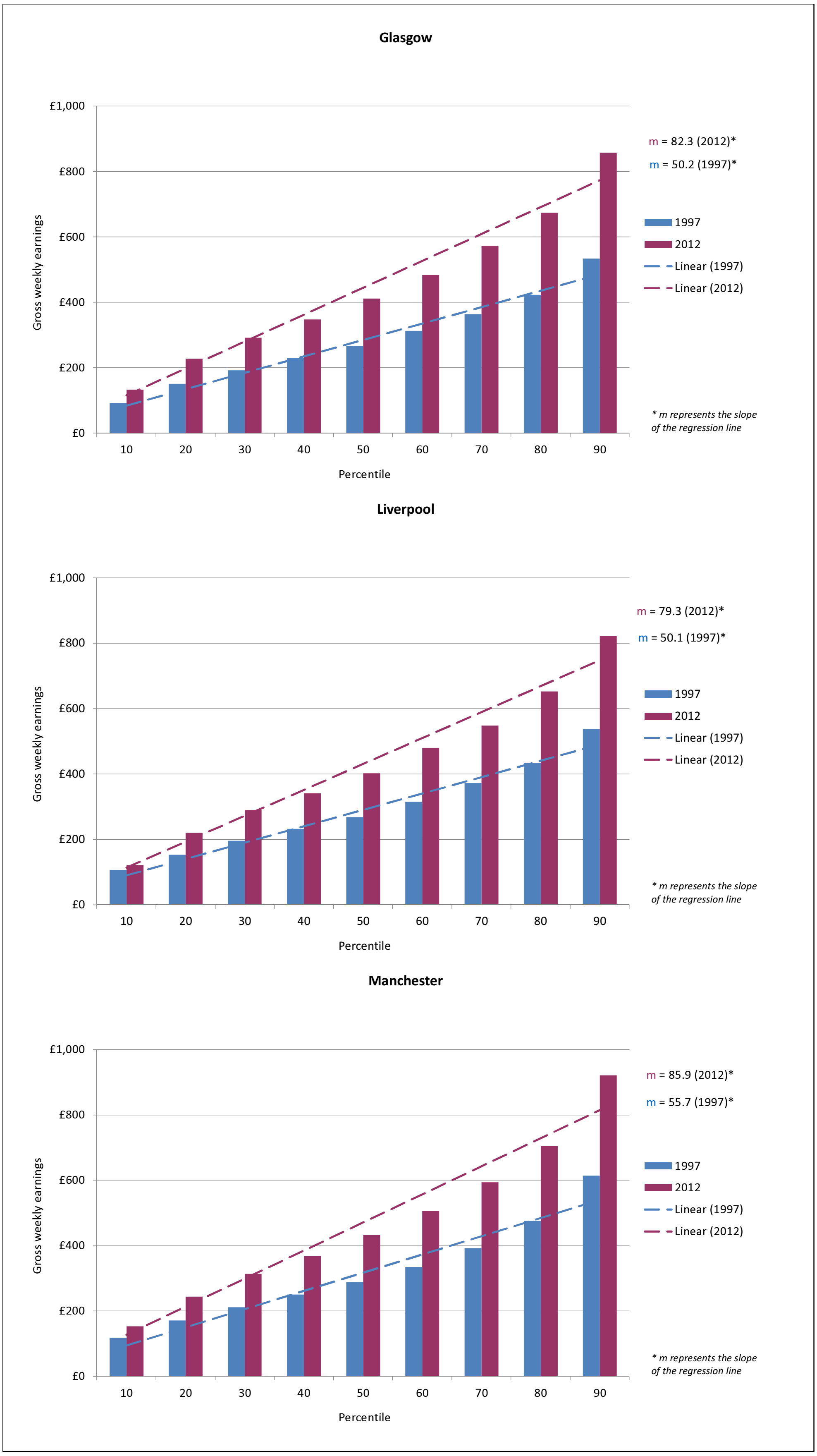
taken from HM Revenue & Customs PAYE records[xxvi]. These data are based on people working in the cities, rather than being resident there. Thus an alternative problem to that mentioned above (the exclusion of residents of wealthy suburbs from resident-based surveys) may apply if there were differences in the percentages of people commuting from outside their city to work within its boundaries.

This caveat aside, Figure 2.6 shows that among those in paid employment, levels of income inequality in 2012 were very similar in the three cities (and in the UK as a whole), and were not highest in Glasgow. Data are shown for gross weekly income at the value of the 10th through to the 90th percentiles[xxvii], with inequality measured by the slope of the regression line across these values. Figure 2.7 shows the change in distribution of income between 1997 and 2012 in each city, with a clearly widening gap evident in all three over that period. There is some suggestion that the increase may have been slightly more in Glasgow: however, the overall trend is similar across the whole of the UK.

[xxvi] Note that this excludes the self-employed: however, data from the ONS Annual Population Survey (APS) show that the percentage of adults aged 16-64 who were self-employed in each city in 2012 was identical: 6%[136].
[xxvii] Gross weekly earnings are shown at the 10th through to 90th percentile, together with the regression line for each set of values for each city. *m* represents the slope of the regression line. This is from linear regression equation $y = mx + b$, where m is the slope of the line, b is the y-axis intercept (i.e. where the line crosses the y axis), and x and y are co-ordinates for any point on the line. The slope is effectively the unit increase in y for each unit increase in x.

Figure 2.6 Distribution of gross weekly earnings, 2012 (Source: ONS ASHE)

Figure 2.7 Distribution of gross weekly earnings, 1997 and 2012 (Source: ONS ASHE)



The above data are clearly limited in that they exclude those not in employment. It will be of interest to align these with data on the distribution of income deprivation in the cities to obtain a more complete picture of the distribution of income across he populations: these will be presented in Chapter 6. Overall, however, a combination of national, regional and city level data do not suggest that income inequalities are wider in Scotland, and in parts of Scotland with particular relevance to this thesis, compared to other parts of Britain.

2.2.7 Summary of section

This section has discussed health inequalities both as a general concept, and with a particular focus on *socio-economic* inequalities in health. It has summarised the main drivers of health inequalities, including income inequalities, with the latter incorporating a separate discussion of their particular relevance to overall population health. The section has outlined historical features of socio-economic inequalities in health in Europe and the UK: this has included evidence of the consistency of relationship (over both time and place) between material deprivation and health, as well as of the increase in inequalities seen in the UK in recent decades (with talk of a 'spatial polarisation' of Britain over that time). Evidence of inequalities has been discussed in relation to Europe, the UK, Scotland and Glasgow, and the emergence of particular characteristics of health in Scotland, and in particular, Glasgow, have been highlighted. This relates to the impact in recent decades of particular causes of death (alcohol, drugs, suicide, violence) in both increasing mortality rates over time at younger age groups, and in exacerbating inequalities in mortality across the country. Similarly, the literature shows increases in mortality over time in Scotland's most deprived areas, clearly driven by the experience of Glasgow (which saw an equivalent decrease in male life expectancy among its most deprived population between 1981 and 2001). Furthermore, these changes were not seen in any other, similarly deprived, areas in the UK. Other studies have also pointed to potential differences in the relationship between deprivation and social factors in Glasgow compared to elsewhere in the UK: for example, similar poverty rates but higher rates of premature death in comparisons of parliamentary constituencies; and the city's apparent 'outlier' status in analyses of mortality trends in relation to social changes. The latter study referred to areas within Glasgow where mortality had become ‘inexplicably higher’, and suggested that: ‘it may well be that influences on health which are peculiar to certain areas are at work here: … “area effects”. Area effects are strongest in the places where mortality rates are highest or lowest’[88]. The next section of this chapter discusses area effects on health in more detail.

2.3 Health and place

2.3.1 Context vs. composition

Area effects on health, that is environmental (both physical and social) effects that, directly or indirectly, influence the health of the area’s individuals, have been the focus of an enormous amount of research in recent times – in particular since the early 1990s when there was a resurgence of interest in the subject matter[137,138], driven partly by developments in availability, and spatial detail, of relevant data[139]. Specifically, Macintyre[137] urged a focus on the role and impact of the characteristics of not only people (the composition of an area, measured in terms of age, gender, socio-economic status and other individual pre-existing features), but also place (the area context, measured in terms of ‘the social, cultural or economic environment’) to underlay public health improvements, since with few exceptions[140,141] this had not been carried out to any great extent at the time. ‘Place’, in this sense, is, therefore, more than a physical location, but one ‘conceptualised… as a more complex cultural and symbolic phenomenon constructed through relationships between people and their settings’[142].

The potential influences of place on health are many, and are discussed in greater detail below. They include direct effects of the physical environment (air quality, housing quality, traffic etc.) as well as more indirect ‘social’ effects as alluded to by Macintyre. A systematic review of the evidence of the effects of local social characteristics on health in 2001 by Pearl & Picket[143] found statistically significant associations between the social environment of local neighbourhoods and individuals’ health (i.e. over and above individual influences such as socio-economic status). However, although the contextual effects were consistent, in the majority of studies reviewed they were also modest and smaller than the compositional effects. Nonetheless significant contextual (area) effects have been found in relation to a range of health outcomes such as self-reported health[138], mortality[144,145] and morbidity[146-148], as well as health behaviours such as smoking[149,150]. Although the Pearl & Picket review was unable to determine whether there was evidence of independent compositional effects on aspects of mental health (a finding later reinforced by Propper in 2005[151]), further reviews since then have shown significant associations between neighbourhood characteristics and different aspects of mental health[152-154.]

However, this is a complex area, and distinguishing between contextual and compositional effects can be difficult. A number of studies have highlighted clear interactions between the two sets of influences, while Macintyre *et al*[139] have argued that differences between the two 'may be more apparent than real', given the high levels of interaction between them (for example an individual's social class will be affected by the area's labour market and economy, and the housing tenure of an individual's home will be influenced by the area's housing market). Furthermore, many authors[139,143,152,155,156] point to a lack of theorising and hypotheses concerning the mechanisms and causal pathways underpinning these factors' influence on individual health status, with criticism of some studies that perceive, or treat, area effects as a 'black box'[139,157] and that are not designed to explore causality[158]. There are other, related, difficulties: measurement of area effects requires both accurate and meaningful definitions of the area itself (the 'neighbourhood') which is not always available without qualitative observational methodologies[143,159]; there is a clear need for both individual and area-level data (which are not always available to all studies)[143,151], and the statistical means (principally in relation to the need for multilevel modelling) to explore and distinguish between influences on health[142,143,160] (although it should be noted that not all authors agree on the benefits of a multilevel approach to such analyses[161-163]). All these factors are relevant to varying degrees to the subject matter of this thesis, as highlighted and summarised later in this section, and further in the chapter (in the discussion of measurement).

2.3.2 Direct effects of the physical environment

Most of the discussion of the effects of 'place' in the literature relate to the 'social' aspects of context and their more indirect influences on health and health behaviours. It is clear, however, that a number of features of the physical environment impact more directly on individuals' health status. These include:

- Air quality: for example in relation to indoor air quality, WHO have highlighted the adverse effects on respiratory health of the likes of environmental tobacco smoke, radon, and asbestos[164, 165]; while there are also well established adverse effects of – for example – traffic pollution[166] and industrial pollution[167].

- Environmental pollution: this is clearly linked to the above bullet point; however, with regard to this thesis it is worth additionally pointing out that within Scotland, research has shown that those living in the more deprived parts of the country have a statistically significantly higher risk of living next to industrial sites with potentially significant levels of polluting emissions, a concept analysed under the heading of 'environmental justice'[168].

- Climate: this relates to, for example, the effects of extreme weather conditions, some of which are exacerbated by global climate change[169,170]; however, of potential interest to this thesis is also the effect of climate on vitamin D deficiency. This has been proposed as a contributory factor to Scotland's higher levels of mortality compared to elsewhere in the UK[171], given both the link between vitamin D deficiency and particular diseases, and the lower levels of sunshine in Scotland and the corresponding lower levels of Vitamin D in its population[172]. This topic will be discussed further in the final chapter of the thesis.

- Traffic: aside from traffic related pollution mentioned above, traffic accidents account for considerable numbers of injuries and deaths in all countries[173].

- Water: for example from flooding or water contamination[165,174,175] .

- Noise: for example, chronic environmental noise has been shown to have effects on levels of poor mental health, heart disease and hearing impairment[165].

- Housing: the links between poor housing and health are well known, such that – for example – the need for healthy housing has been highlighted by various WHO commissions and the US Center for Disease Control and Prevention[176,177], although the evidence for the benefits of housing *improvement* is less clear and much debated[178,179]. Within the UK, the interaction of housing and climate has also been highlighted in relation to an 'inverse housing law'[180,181] (whereby the colder parts of Britain have poorer quality of housing, and is linked to poor respiratory health[180] and high blood pressure[181]). With regard to this thesis, 2002 data showed a high percentage of Glasgow's housing stock to be in poor condition[xxviii] [95]; however, since then, a programme of housing regeneration has started, the impact of which is being independently evaluated[182].

2.3.3 Indirect effects of the environment

As stated, the discussion around the effect of place on health (context versus composition) is focused less on the direct environmental impacts on health outlined in the preceding section, and more on the less direct influences. A considerable number of studies and reviews of studies have highlighted the main factors that are seen as indirectly affecting individual health. These (many of which are clearly overlapping) are:

- Quality of neighbourhood: associations have been shown between both perceived and objectively measured quality of the physical environment and health and wellbeing[158,165,183-186], with negative impacts of poor quality neighbourhoods noted in relation to females, the elderly and unemployed[183, 187 ,188].

- 'Walkability': clearly related to the above, neighbourhoods that are assessed as more 'walkable' have been shown to be associated with higher levels of physical activity and lower levels of obesity[158,189-191].

- Access to services: proximity to, and quality of, health services could be argued to be a more direct influence on health; however, other services such as food outlets and supermarkets are also very relevant. Recent

[xxviii] For example 28% of properties were classed as being in 'urgent disrepair', 11% with mould in any room, 6% with rising or penetrating damp.

years, for example, have seen discussion about the existence of so-called 'food deserts', for which there is mixed evidence[192-198] and, as pointed out by Cummins & Macintyre[192], some confusion in policy circles[xxix]. Similar mixed evidence is available in relation to proximity to food stores, with conflicting results from studies in different countries examining such proximity in relation to different health related outcomes and behaviours (for example dietary intake, obesity). A 2011 study focusing on Glasgow found no link between distance from food retail stores and diet and BMI, probably because in UK settings 'most urban residents have reasonable access to food stores'[197].

- Other accessible facilities and places: evidence has been shown linking levels of physical activity in populations to accessibility of local facilities (e.g. parks, cycle paths, leisure centres)[158]. This is also relevant to the issue of greenspace.

- Greenspace: the links between greenspace and health have been studied to a considerable degree in recent years, with new evidence emerging frequently. Links have been shown between 'green environments' and positive levels of (for example) self-assessed health[199-201], obesity[202], blood pressure[203] and mortality[204] through mechanisms such as facilitating higher levels of physical activity[158, 190, 205], enabling social contact (discussed in further detail below), and through psychological stress reduction benefits[206-208]. Recent research has highlighted the potential role of greenspace in reducing inequalities in health outcomes, with populations in England living in proximity to the 'greenest environments' shown to have lower socio-economic inequalities in all-cause and circulatory system disease deaths[204]. As with other related topics discussed here, however, there has been debate about the strength of the evidence. A 2010 systematic review confirmed the beneficial health effects of greenspace but was cautious in its appraisal of the strength of the evidence because of what it saw as flaws in many studies[209]. The reviewers also highlighted (as has been the case with other aspects of

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[xxix] The authors referred to the existence of 'food deserts' in the UK as an example of the use of a 'factoid' (i.e. an assumption or assertion that is repeated so often it is considered to be true) within UK policy discussion.

area effects) the difficulty of understanding and proving causal mechanisms. Another complexity is the measurement of *quality* of greenspace, as it has been suggested poor quality greenspace could have negative, rather than positive, health effects[200]. A recent (2011) study supports this, showing the benefits of quality of greenspace over quantity[210].

- Social connections: in recent years an increasing amount of research has pointed to the importance of 'social capital' and social networks in relation to health status. The theory of social capital is a complex one, and it has been defined in many different ways and by many different commentators[214-217], albeit that most definitions overlap to large degrees. Perhaps the most frequently used is that of Putnam[217,218], who defines it as the 'features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit'. Although by no means exempt from criticism (particularly relating to: how it is measured[219-223]; whether it is an individual or instead a collective (e.g. of a community) attribute[214,224-226]; its potential negative effects[xxx]), there is, however, a considerable amount of convincing evidence of the beneficial impact of social capital on health and well-being. For example, evidence of significant associations between higher social capital and lower mortality have been shown in the USA[228-231], post-communist Eastern Europe[232-235], Finland[236], Australia[237], and Latin America and the Caribbean[238], and a recent (2012) review of evidence concluded that 'both individual social capital and area/workplace social capital had positive effects on health outcomes, regardless of study design, setting, follow-up period, or type of health outcome'[239]. Within an urban setting, there have been shown to be benefits of neighbourhood design which promote social connections (and, therefore, social capital) such as public spaces and meeting areas[165,240,241]. As a proposed explanation for differences in health outcomes between Glasgow and elsewhere, social capital is discussed in greater detail later in the thesis.

[xxx] For example: negative aspects of bonding capital such as criminal gang activity among disenfranchised groups[217] or negative peer effects for risky health behaviours among the young[227], or exclusion of outsiders from closely controlled social networks[214].

- Spatial patterning of affluence and poverty: this is another area effect that has been shown to be potentially important. For example, Sridharan *et al*[242] demonstrated within a Scottish context the importance of the patterning and concentration of deprivation on mortality, over and above the impact of deprivation alone: this highlighted the potential influence of levels of deprivation on health in neighbouring localities. Others have demonstrated similar effects in other places[243]. This will be discussed further in Chapter 8.

- Selective migration: the health status of an area can be affected (arguably directly, rather than indirectly) by change in its population, be it inward or outward migration. As with the majority of topics discussed in this section, there is a huge amount of literature on the subject of migration and health. This refers to the impact of so-called 'selective' migration, in the sense that migrants tend to differ from the general population in a number of ways, and that propensity to migrate is influenced by a number of factors (for example, age, level of education, socio-economic status (SES)[244-249]). Crucially, migration is often selective in terms of health status with, in general, migrants tending to be of above average health compared to non-migrants. The potential area effects of selective migration include decreases in population size in deprived areas, and corresponding increases in more affluent areas[250], since characteristic of location is an obvious influence on migration[251], and where possible, migrants will seek to move from less attractive (deprived) to more attractive (non-deprived) environments[252-254] . With migrants tending to be healthier and better educated, illness and mortality rates can fall in places where population size is increasing, and rise in places experiencing population loss[255-259]. One study has suggested that population retention is a key contributory factor in 'resilient' communities (i.e. communities that appear to fare better than their socio-economic profile might otherwise suggest[260]). This all points to an influence of selective migration on area based health measures and spatial inequalities. However, there is conflicting evidence over the scale at which this operates, and the extent of its impact. In terms of *scale*, it has been argued by some that the effects of migration on the health of areas are only felt at a small-area level (e.g. neighbourhood or electoral ward), and not in relation to migration to and from larger areas[261]. However, other studies have suggested that its influence can be significant at the level of whole cities[262]. In terms of impact, one study attributed *all* inequalities in mortality between British districts to migration[263] - although the accuracy of that finding has been questioned by others[264]. Another study suggested that 50% of the widening socio-economic gap in mortality that took place in England & Wales in the 1990s was attributable to the effects of selective migration[265], while further research in England & Wales highlighted the changes in mortality brought about by the flow of healthy migrants between 1971 and 1991 from deprived to less deprived areas (mortality rose in the former, and fell in the latter)[253]. However, other studies have contradicted these findings: for example, the widening mortality gap witnessed in Scotland between 1981 and 2001 could not be explained simply in terms of population change[266], while another study showed deprivation to be more important than population change in explaining changing mortality rates in Scotland over the same 20 year period[267]. Furthermore – and of particular relevance to this thesis – recent analysis of Glasgow's poor health and high mortality compared to other parts of Scotland suggested that in fact migration was not a significant contributory factor[268]. Similarly, separate research found that the widening health inequalities *within* Glasgow could not be explained in terms of selective migration'[269]. However, despite the conflicting evidence over scale and impact, there appears to be enough evidence to suggest that migration can potentially influence spatial measurements of health, and thus it requires serious consideration in any pertinent studies of population health[262]. Therefore, this will be discussed further later in the thesis.

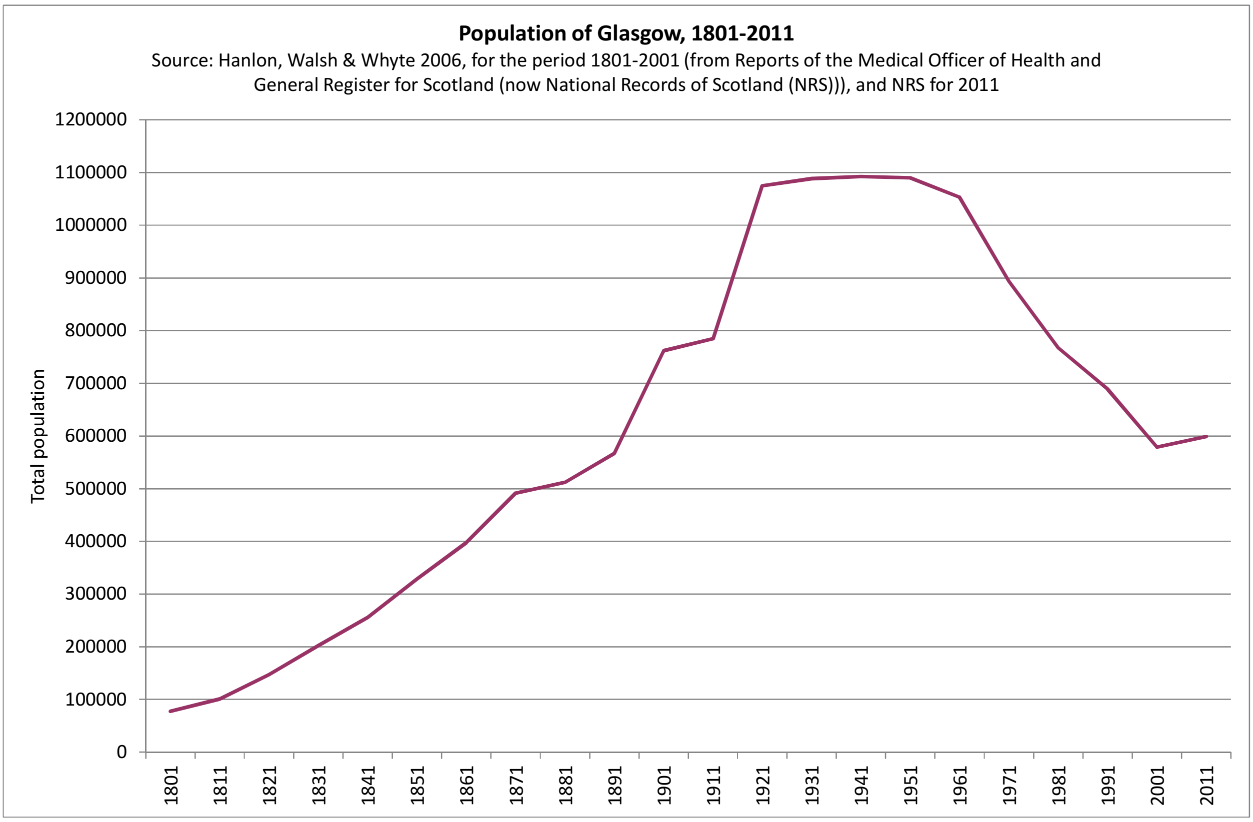
2.3.4 Urban health

Within a discussion of health and place, the concept of 'urban' health in particular is important, given that the thesis deals explicitly with health and health related factors in three urban environments, Glasgow, Liverpool and Manchester. Clearly, however, much of what has already been discussed in this section is very relevant to this concept of urban health – context vs. composition within urban neighbourhoods, direct influence of the urban physical environment (e.g. air quality, traffic, urban industrial pollution) and the more indirect influences of urban settings (social capital, access to services and facilities, greenspace). However, the literature on urban health also points to other factors of relevance to this thesis which are additionally worth examining briefly here.

Issues of urban health are important globally, as they impact (increasingly so) on such high numbers of population. As many commentators have pointed out[270-272], increasing numbers of the world's population live in urban areas. As recently as 200 years ago, only around five per cent of the global population lived in an urban setting; in 2007 the figure exceeded 50% for the first time and is expected to rise to nearly two-thirds within the next 25 years[273,274]. The historical trend in the increasing size of urban areas is relevant to Scotland and, in particular, Glasgow. As will be discussed in more detail in Chapter 5, the industrial revolution attracted thousands of migrant workers to Glasgow in the 19th Century, increasing the city's population from less than 80,000 at the start of the 19th Century to over a million by the early 20th Century (Figure 2.8), resulting in extreme levels of overcrowding and unsanitary conditions[95,275]. Similar phenomena occurred in other urban industrial settings in the UK including Liverpool and Manchester. Today, nearly 70% of Scotland's total population live in an urban setting[xxxi] [276], and more than 40% of the total live in the West Central Scotland conurbation which has the city of Glasgow at its core[96,277].

[xxxi] This figure is from 2010, based on the Scottish Government 6-fold urban-rural classification, for those living in 'large urban areas' or 'other urban areas' compared to the other categories of: 'accessible small towns'; 'remote small towns'; 'accessible rural'; 'remote rural'. The precise figure is 3.6 million of the 5.2 million total (69.5%).

Figure 2.8.



In assessing the importance of the urban setting on health, many commentators highlight the key issues already discussed above in this section, albeit with a particular urban slant. For example, Galea and Vlahov[278] discuss the 'mechanisms of disease… why cities may shape population health' under three broad headings: the urban physical environment; the urban social environment; and also health & social services. The first heading covers many of the issues discussed above in reviewing the direct influences of place on health (e.g. the built environment; pollution; environmental incivilities), as well as some others which are less relevant to a Scottish and UK context (water sanitation and, especially, excess heat in summertime). However, while the 'urban social environment' heading also covers much of the indirect effects of place on health discussed above (for example in relation to social capital, where the higher population density of urban areas potentially enhances the importance of social networks), other issues highlighted under this heading are of particular interest to this thesis. One relates both to Durkheim's concept of 'anomie', as well as to the issue of individual aspiration, both of which will be discussed later in the thesis in considering potential explanations for Scotland's and Glasgow's 'excess' levels of poor health (Chapter 8). Durkheim's theory of anomie relates to the breakdown, or absence, of social and/or moral norms that can occur at times of economic or social change, leading to crime and self-damaging behaviour. Merton[279], cited by Galea and Vlahov[278], describes a version of anomie related to a specifically urban context: 'anomie is the lack of societal integration, which arises from the tension between aspirations of industrialized persons and the means available to them to achieve those aspirations... In the urban context in particular, the exposure of persons of all social classes to high aspirations that are practically unachievable produces strain or pressure on these groups to take advantage of whatever effective means to income and success they can find, even if these means are illegitimate or illegal'. In this context, anomie has also been referred to as 'strain theory'[278-281].

The 'lack of societal integration' also connects to the issue of income inequalities within urban environments. This is another feature of the urban social environment, and Galea and Vlahov suggest that the same processes described by Wilkinson *et al* at the level of whole societies (and as demonstrated at country and U.S. state level) may well operate at the urban neighbourhood level. Similarly, the distribution of income within cities (discussed above in terms of the spatial patterning of deprivation) also links to issues of spatial segregation and 'social contagion'. The latter relates to 'social learning' theory (where the influence of individuals can impact on social norms[278,282]) and 'collective socialisation' (where groups can influence individuals)[278,283,284] [xxxii]. These factors are particularly important in urban settings of high population density. Spatial segregation can have adverse effects on the relevant (i.e. segregated) populations, especially in poorer areas, by means of (for example) limiting opportunities for 'bridging' social capital (discussed further in Chapter 7).

Galea and Vlahov's third 'heading' in relation the importance of the urban social environment on health is 'health and social services', under which many authors have highlighted inequalities in terms of provision of these services. This is

[xxxii] Social learning theory relates to the fact that people learn within a particular social context. It is seen as particularly relevant in densely populated (i.e. urban) areas where there are more people to influence others' behaviours. 'Social learning' and 'collective socialisation' suggest that those (individuals or groups of individuals) who are in positions of authority or influence can impact (directly or indirectly) on the norms and behaviours of others.

arguably less relevant to a UK context of universal health and social welfare than to poorer societies, or ones with more limited access to healthcare for their poorer residents. However, there are still relevant issues to consider: urban areas are more likely to attract potentially ‘vulnerable’ members of the population who have particular health needs: economic migrants, other immigrants, the homeless, ex-prisoners are all ‘disproportionately represented in urban areas’[278]. Glasgow has been particularly affected by one of these issues in recent years, with the housing of thousands of asylum seekers and refugees within a small number of communities in the city[285] [xxxiii]. Furthermore, the context of universal provision can change, and welfare reform is currently being undertaken by the UK Government which is likely to reduce access to welfare benefits among sections of the population and thereby widen the income gap between communities in all three of the cities examined in this thesis.

2.3.5 Summary of section

This section has reviewed recent thinking and understanding of the importance of ‘place’ on health. This has included the ‘core’ distinction between an area (context) and its residents (composition), the complex and overlapping relation between the two, and the clearly identified need for a greater understanding of the causal pathways between them in relation to health. The section has sought to summarise the main ‘direct’ and ‘indirect’ influences of environments on health, including those specifically relevant to urban settings which are the focus of this research.

In doing this, a number of issues of specific relevance to this thesis have been identified. These include a number of topics relevant to the many proposed explanations for Scotland’s, and Glasgow’s, poor health status: the spatial patterning of deprivation; the concept of ‘anomie’; individual aspiration; social capital; climate and Vitamin D. These, and other theories, will be the focus of further discussion in Chapter 8.

Other important issues highlighted in this section include: the importance of how a neighbourhood is defined; the need for both individual and area-based

[xxxiii] Glasgow started accommodating asylum seekers in 2000 under agreement with the UK Home Office. In the first five years some 12,000 asylum seekers were housed in the city, principally in areas with high levels of social housing - and social and economic deprivation.

measures; and the debated benefits of appropriate statistical modelling strategies. All of these issues are particularly relevant to the methods employed in this work, and I will return to them in that section of the thesis (Chapter 4). However, some of these issues are also relevant to the issue of *measuring* health inequalities and the drivers of health inequalities. This is the subject of the next section.

2.4 Measuring health, inequalities in health, and the drivers of inequalities in health

As alluded to earlier in this chapter, there are many different dimensions to, and types of, health inequality: inequalities by gender, ethnicity, disability, age, sexual orientation and more. This thesis, however, is concerned specifically with *socio-economic* inequalities in health (or, to be more precise, the extent to which such socio-economic factors explain differences (inequalities) in health between parts of the UK). How all these aspects are measured is crucial. This section examines a number of different issues relating to the issue of measurement: health outcomes; statistical summary measures of inequality; measures of individual socio-economic status; and area-based measures of socio-economic deprivation (including the concept of deprivation, and geographical aspects of its measurement).

2.4.1 Health outcomes

As outlined earlier, heath can be measured in many different ways, and socio-economic inequalities can be shown for the vast majority of health outcomes (as well as other determinants of health), although the size of the gradient will differ according to the particular outcome. The health inequalities related literature covers a huge number of differently measured outcomes: all-cause mortality; cause-specific mortality; ‘system-generated’ measures of morbidity (e.g. hospital discharge information; data from disease registers); self-reported general health; self-reported morbidity (including disease-specific morbidity); and many, many more. Each measure can be calculated and presented in a variety of different ways (absolute numbers, crude rates, standardised rates, ratios etc.), depending on the purpose and scale of the study, and some can be combined or modified to form different measures of outcome: for example, life expectancy can be derived from current mortality and population data, and in turn can be analysed alongside morbidity measures to derive estimates of *healthy* life expectancy in a population; or detailed registry data can be used to derive incidence and prevalence rates.

The choice of outcome is determined by the purpose of a particular study or investigation, and it is not within the remit of this review to examine all the many studies that demonstrated inequalities for different outcomes (although a good number will be cited as examples). However, a number of different outcomes have been used for the more general purpose of monitoring inequalities at a country level. For example, the Scottish Government's current 'Long-Term Monitoring of Health Inequalities'[286, 287] includes outcomes such as: healthy life expectancy at birth; all-cause premature mortality; coronary heart disease mortality and hospital admissions; cancer incidence rates; alcohol related hospitalisations and alcohol related deaths. Previous Scottish administrations have used different measures (including obesity, teenage pregnancy, self-reported health) as well as mortality outcomes for this purpose[288], while other indicators are currently used for the same purpose in England[289] [xxxiv].

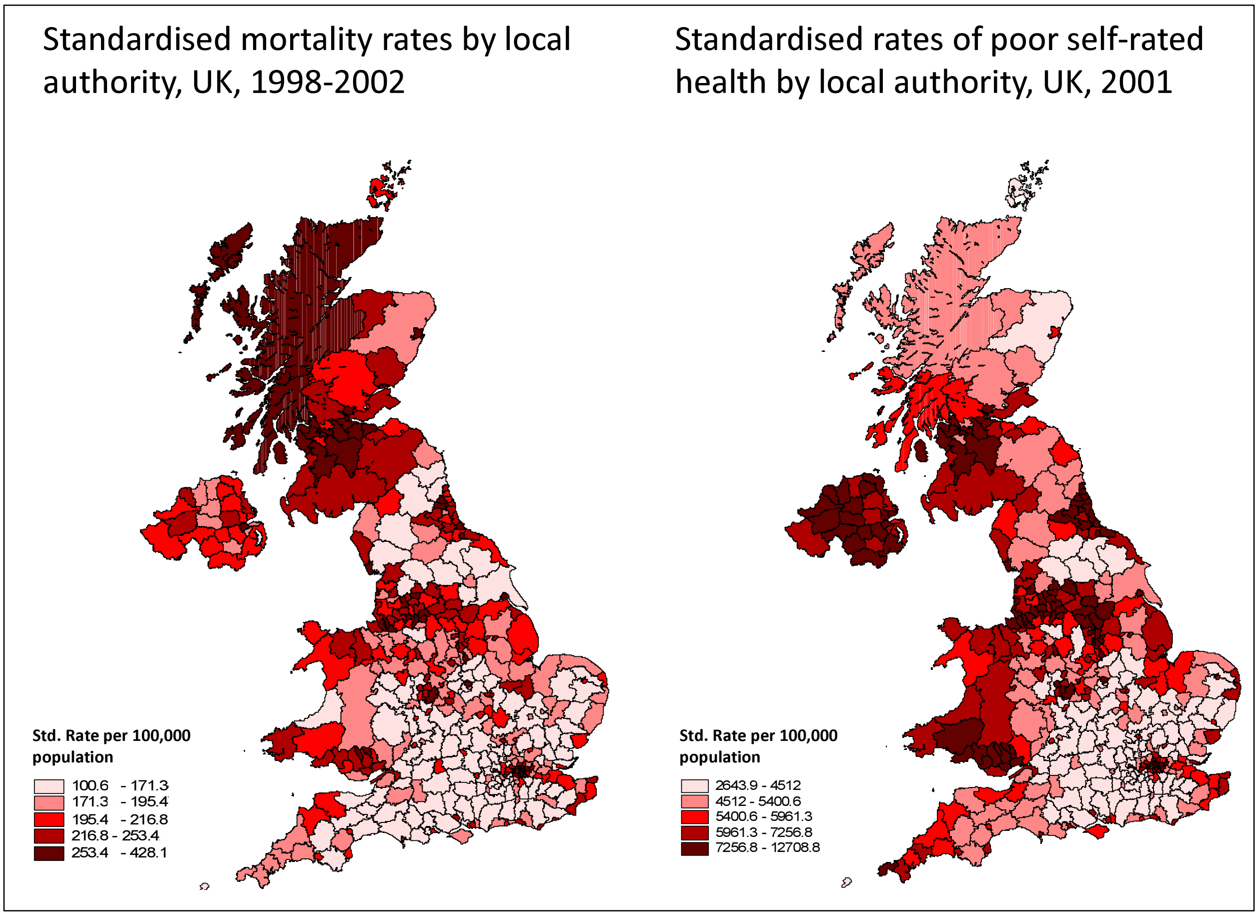
With regard to *self-reported* general health measures, studies have shown that these can be good predictors of subsequent mortality[290-292]. At the same time, however, other analyses have pointed to important demographic, socio-economic and cultural factors which can influence self-assessment of health[293-297]. At the population level, disparities between measures of self-assessed health and mortality have been shown internationally[298,299] (for example, comparisons of populations within the U.S and parts of India[298]) and, more pertinently, within the UK. Importantly for the subject matter of this thesis, a number of analyses have shown that Scottish populations under-report levels of self-assessed morbidity compared to other parts of the UK, and compared to the 'true' levels of illness reflected in relatively higher rates of mortality[300-302]. For example,

[xxxiv] There are two 'high level' outcomes in the current approach being undertaken by the Coalition Government in England: 1) increased healthy life expectancy; and 2) reduced differences in life expectancy and healthy life expectancy between communities. These are being monitored alongside four sets of 'supporting public health indicators' under the headings of: 'improving the wider determinants of health'; health improvement (with an emphasis on 'helping people… to live healthy lifestyles, make healthy choices and reduce health inequalities'); health protection; and 'healthcare, public health and preventing premature mortality'.

O'Reilly *et al* showed that compared to southern England, the worst levels of self-reported poor health in 2001 were in Northern Ireland, Wales, Scotland and northern England respectively; however, the same was not true of mortality: after adjustment for socio-economic factors, Scottish mortality rates were a third higher than in both Northern Ireland and Wales[303]. Commenting on similar findings, Mitchell asserted that: 'to put it crudely, the Scots are more likely not to report how sick they really are, and the Welsh to report higher rates of sickness, but to live longer'[304].This is illustrated in Figure 2.9, contrasting rates of mortality with rates of poor self-assessed health across UK local authorities around 2001[xxxv]: this shows that while areas in N. Ireland and southern Wales have the highest rates of poor self-assessed health, the same is not true of mortality, while the opposite (higher mortality but lower poor self-assessed health) is true of many parts of Scotland. Similarly, others have suggested these differences may relate to 'variations in pre-death health status in different parts of the UK or differences in the thresholds at which people in different parts of the UK report not having good health, or a combination of both'[290]. Wilkinson & Pickett[113] have suggested, as have Dorling and Barford[299], that discrepancies between self-reported health and mortality (or life expectancy) may be influenced by levels of inequality within countries: that is, that people in less equal societies cope by feigning optimism (convincing oneself that things are better than they actually are). However, this would not explain differences in reporting of health status between Scotland and England, given that – as previously discussed – levels of income inequality are lower in Scotland than in England (albeit that both countries have high levels of inequality compared to the majority of Western European countries). More generally, these country-specific influences on reported health status are important to bear in mind for this thesis, as is the fact that other health outcomes can be influenced by local context: for example, hospital admission rates have been shown to be influenced by a range of factors, not only the health and socio-economic profile of the local population, but also by access to, including geographical proximity to, services, availability of resources and local clinical judgement[305]. I return to the issue of self-reported health status in discussion of the literature on excess poor health in Scotland and Glasgow later in the chapter.

[xxxv] The self-assessed health data come from the 2001 census; the mortality data cover the period 1998-2002.

Figure 2.9 Comparison of mortality and poor self-assessed health across UK local authorities (Source: O'Reilly 2014[306])



2.4.2 Statistical summary measures of inequality

Just as there are many ways of measuring health outcomes, there are many ways of statistically calculating and/or summarising levels of inequality between areas or individuals. These have been assessed and summarised by a number of commentators (e.g. Regidor[307]; Carr-Hill and Chalmers-Dixon[308]; Mackenbach and Kunst[309]; Schneider *et al*[310]; Masseria *et al*[311]; Manor *et al*[312]), with particular aspects such as absolute vs. relative measures often debated (for example: Houweling *et al*[313]; Clarke *et al*[314]; Boström *et al*[315]; Scanlan[316]), as well as in-depth discussion of measures such as: the relative index of inequality (RII); the slope index of inequality (SII); the absolute range; the Lorenz curve; the Gini index; the index of dissimilarity; frequency ratios; the concentration index; and many more. It is clearly beyond the scope of this research to review the pros and cons of each statistical measure. However, I will return to this in outlining the measures used in the Methods section of the thesis (Chapter 4).

2.4.3 Measures of individual socio-economic status

In epidemiological research there is a long history of grouping individuals into social categories to explore differences in health. Chadwick's work on 'The Sanitary Condition of the Labouring Population' in the mid -19th century (referred to earlier in this chapter) employed three categories of occupational class: labourers and artisans; farmers and tradesmen; gentry and professionals; and many similar occupation based categorisations of socio-economic status (SES) have since followed in the UK. These include the development of the Registrar General's Social Class scale in the early 20th century, the later versions of which were based on five well-known groupings: social class I (professional); social class II (managerial/technical); social class III (divided into skilled manual and skilled non-manual); social class IV (partly skilled); and social class V (unskilled). This categorisation, used in countless analyses and studies over many years, was criticised for a number of reasons, including: a lack of conceptual basis for its classification; circularity in relation to its use in analysing mortality data[xxxvi]; lack of classification of female social class on mortality records; lack of availability in population denominator data (and other data sets); and changes in recent years in the skills base of many UK occupations[89, 288, 317-321]. As a result it was replaced in UK statistics and surveys (including the census) with the National Statistics Socio-Economic Classification (NS-SEC) in 2001. However, NS-SEC has also been criticised in relation to some of the same issues, including a lack of classification of high numbers of female deaths, as well as of some age groups, while regional variations in the classification of mortality records have also been noted[89] .

Other occupation-based social class groupings have been developed and used within the UK. For example, Social Grade (used both in analyses of UK census data[322] and in analyses presented in Chapter 7), Socio-Economic Group (SEG) (derived in the 1950s)[318], and the Cambridge Scale (a measure derived in the 1980s which takes into account not only the individual's occupation, but also that of their spouse and friends)[323,324]. Other studies have used different individual socio-economic measures to categorise individuals in terms of their economic and social standing in society. For example: income[325-327]; wealth (i.e.

[xxxvi] This is because mortality rates by occupation were used in calculating the scale.

reflecting a broader set of financial assets rather than just income)[328]; educational attainment[71, 329]; housing tenure[330,331]; car ownership[80,332]; overall employment status[333,334]; family affluence[335]; and more. Macintyre *et al*[317] assessed the 'predictive power' of some of these measures on different types of health outcome and showed that the relationships, and the strength of relationships, differed depending both on which socio-economic classifications were used, and on which health outcomes were the focus of the analysis. Other authors have undertaken similar comparisons[336-339], with similar conclusions.

Some of these same measures of socio-economic status have been aggregated, or used as part of broader summary measures, to categorise socio-economic aspects of *areas*, rather than *individuals*. This is particularly relevant to this study, and their measurement - and the measurement of the broader concept of socio-economic deprivation - is the subject of the next section of this chapter.

2.4.4 Area-based measures of socio-economic deprivation

This section reviews the different methods employed (both currently and historically) to characterise geographical areas (primarily in the UK) in socio-economic terms. This clearly overlaps with both the measurement of, and indeed the concept of, socio-economic deprivation. Thus, before examining the various ways by which deprivation has been measured and classified in the UK, it is worth first of all clarifying what we mean by the term 'deprivation'.

2.4.4.1 Defining deprivation

Peter Townsend, who developed an area-based deprivation index for England in the 1980s (mentioned further below)[340,341], defined deprivation in these terms: 'People are relatively deprived if they cannot obtain, at all or sufficiently, the conditions of life - that is, the diets, amenities, standards and services - which allow them to play the roles, participate in the relationships and follow the customary behaviour which is expected of them by virtue of their membership of society. If they lack or are denied resources to obtain access to these conditions of life and so fulfil membership of society, they may be said to be in poverty'[342]. This definition of deprivation has been adopted by many[343-347,] and crucially for the Scottish context was cited by Bailey and colleagues in their 2003 report to the (as was) Scottish Executive to develop a long-term strategy for measuring deprivation in Scotland (the report on which the Scottish Government's current deprivation index is based)[348]. In doing so, they highlighted four crucial aspects of this definition:

1. That deprivation is multi-dimensional: people are deprived in many senses and different ways. Thus it relates to the concept of *multiple* deprivation and needs to be measured across multiple 'domains', or themes.

2. Related to the first point, this definition of deprivation reflects not just material circumstances, but people's capacity to fully participate in society and the many social aspects of life.

3. Crucially (and again related to the first two points), it is a *relative* measure, based not on absolute levels of (for example) material goods, but levels relative to the social norms, standards and expectations in society.

4. The definition focuses on individuals, not areas. It is the individuals in an area who are deprived, not the areas themselves.

The fourth point is arguably a contentious one, given the evidence from the literature already discussed in this chapter relating to area effects on individuals: many commentators refer to 'deprived areas' as ones lacking important amenities or facilities, or incorporating barriers to beneficial activities. Bailey *et al* also argued for the need for both area-based and individual measures of deprivation to be incorporated in deprivation indices, and I will return to this issue later in the chapter.

2.4.4.2 Historical UK measures of deprivation

A considerable number of area-based measures of deprivation have been developed in the UK in the last 40 years or so. Until the relatively recent development of accessible, frequently updated, small-area administrative statistics, most of these were based on census data (and thus could be updated only every ten years). These include: the Jarman Index[349] (also known as the Jarman Underprivileged Area Score) – this was developed in the early 1980s and was originally based on results of a survey of London GPs to determine which demographic/socio-economic factors impinged most on GPs' workload, and included eight census variables such as unemployment, numbers of young children, single pensioners and lone parents, and overcrowding; the Townsend Index[340,341], based on four census variables: unemployment, lack of access to a car, overcrowding and housing tenure (numbers of non-owner occupiers) – this was not used in Scotland because of the much higher levels of social renting north of the border in the 1980s and 1990s; the Scottish equivalent of Townsend was the Carstairs & Morris index, which was based on a similar methodology and shared three of the four census measures in Townsend, with housing tenure replaced by low social class. As with the Townsend index, and reflecting Townsend's definition of deprivation, the Carstairs & Morris score was a summary measure of *relative* deprivation, with a high score reflecting an area's higher levels of deprivation compared to elsewhere in the country, and a low score identifying a more affluent area relative to elsewhere. Until recently, Carstairs was the main measure of deprivation used in Scottish epidemiological analyses, including some that are directly relevant to the subject matter of this thesis, and thus will be discussed further below; other historical UK census-based deprivation measures include the first English (Oxford) Index of Multiple Deprivation[350] in 2000, and Gordon and Forrest's 'matdep' (material deprivation)[351] and 'socdep' (social deprivation)[351] indices. The latter are all (arguably) variations on a theme.

There have only been five nationally representative British surveys of poverty in recent decades: one in the late 1960s led by Townsend[352]; one in the early 1980s by Mack and Lansley[343]; one in 1990 by Gordon and Pantazis[344]; and one in 1999 reported by Gordon *et al*[353]. The latest in the series was undertaken in 2012[354]. As representative surveys of a few thousand people (for example, the total sample size of the 1999 Poverty and Social Exclusion Survey was approximately 1,500[xxxvii]), these surveys cannot provide small-area based measures of material deprivation. However, Dorling *et al*'s analyses of 'poverty, wealth and place'[79] developed a Britain-wide measure of poverty and deprivation based on a combination of area-level data from the census and individual data from four of the five above surveys. This enabled a classification of Britain into four

[xxxvii] The most recent study undertaken in 2012 was based on a 'Necessities of Life' survey with a sample size of just under 1,500 adults. However, an additional, complementary survey ('Living standards survey') was larger, based on over 5,000 households of approximately 12,000 individuals.

categories: 'core poor'; 'breadline poor'; 'asset wealthy'; and 'exclusive wealthy', with area-based estimates derived back to 1968.

A number of other approaches to measuring deprivation and poverty have been attempted over the years. For example, Kearns *et al* produced a Scottish measure of deprivation that was not dependent on availability of census data: the Scottish Area Deprivation Index[355] was produced in the mid-1990s, but was much less used than Carstairs (to which, in any case, it was highly correlated[308]). Other measures of note include: the Arbuthnott index[356] (a small-area measure, based on a combination of socio-economic factors (e.g. unemployment) and health (mortality), used for NHS resource allocation purposes in Scotland); Connolly *et al*'s recent (2010) study which used house value as a proxy for wealth (and which they used in analyses of morbidity and mortality in older populations in N. Ireland)[357]; and Morgan & Baker's work in deriving a Carstairs index for England in 2006[358], the benefit of which is questionable given that census-based measures such as Carstairs (and Townsend) had by 2006 been superseded by superior measures of deprivation in both England and Scotland. These latter measures are listed briefly below.

2.4.4.3 Current UK measures of area-based deprivation

Following Bailey *et al*'s recommendations for the long-term monitoring of deprivation in Scotland[348], the first Scottish Index of Multiple Deprivation was published in 2004[345] [xxxviii]. Arguably superior to all previous published measures of deprivation because of the small spatial scale at which the data were calculated, thereby lessening the risk of 'ecological fallacy' (discussed further below), the index included 31 indicators across eight domains: income; employment; housing; health; education, skills and training; geographic access and telecommunications. The index was updated in 2006, 2009 and 2012. The latest version now has 38 indicators across seven domains: income; employment; housing; health; education, skills, and training; geographic access to services; crime. The index includes absolute measures of deprivation (for example the total percentage of the population in each small area who are in receipt of, or dependent on a

[xxxviii] Note that an interim index (The Scottish Indices of Deprivation), based on electoral wards and derived by Oxford University's Department of Social Policy and Social Work, was published the previous year (2003). However, the 2004 index was the first of the current series of Scottish indices of multiple deprivation.

recipient of, a low income related welfare benefit (classed as 'income deprived[xxxix]')), but the overall index is presented as a relative measure, with each area allocated an overall ranking, relative to all other areas in Scotland.

Separate indices of deprivation have been produced for England[359], Wales[360] and N. Ireland[361]. Each is similar, but differs in a number of ways. The Scottish index differs particularly because it has been calculated at a significantly smaller spatial scale, as is discussed further below. Of particular relevance to this thesis is the fact that there is no UK-wide comparable small-area based index of multiple deprivation, nor are there plans to develop one in the near future[362]. This has methodological implications for any approach to measuring deprivation in Scottish and English cities.

2.4.4.4 Other measures of UK deprivation

A number of other area-based classifications have been developed in recent years in the UK. Although not designed specifically for the measure of material deprivation, they overlap in many ways with other such indices. For example, in England the Health Poverty Index[363] (first developed in the early 2000s[364] but now in its third phase of development) is an on-line software 'tool' that facilitates analyses of inequalities in health and its determinants within or between areas across England. A specific index of health and *physical environment* related deprivation (MEDIx - Multiple Environmental Deprivation Index)[365] was developed recently for electoral wards across the UK, with a version also produced in New Zealand[366]. Other examples include those developed by private marketing companies (but which are increasingly being used within the public sector): these tend to be based on combinations of census data, surveys and statistical modelling techniques to produce classifications of small areas in the UK in terms of demographic, socio-economic and other (e.g. consumer) characteristics. They include CACI's ACORN[367] and Experian's MOSAIC[368] classifications, with past examples including 'Super Profiles' that were developed by CLARITAS[308]. Although their use is becoming more widespread, they have been criticised in the past for a lack of transparency in relation to the statistical methodologies employed[369], preventing external assessment of the

[xxxix] Note that the measure of income deprivation (as used in the 2006 SIMD) is used in many of the analyses presented in this thesis, and therefore is defined in full within the Methods section.

accuracy of the data. Other commentators[308] have pointed to a lack of evaluation of their effectiveness as proxy measures of deprivation.

A number of other types of area classification have been used, for example ONS' Area Classification[370], urban-rural classifications[371,372] and various means of profiling administrative geographies and communities[373-379] although these are arguably less relevant to the subject matter under discussion.

2.4.4.5 Non-UK deprivation measures

It goes without saying that the use of area-based measures of deprivation is not unique to UK research, planning and policy. Examples of the use of similar measures are found throughout the international literature, very often in relation to the analysis of health related inequalities. For example, in the U.S.[380], Canada[381,382], Australia[383,384], New Zealand[385], Spain[386,387], France[388,389], Belgium[390] , Italy[391,392] and elsewhere. Indeed a systematic review of recent literature on the use of area based measures of deprivation in studies of environment and health identified 41 recent articles (although 26 of those were from the UK)[393].

2.4.4.6 Criticisms of historical and current measures of deprivation

Historical measures of deprivation such as the Carstairs index have been criticised for a number of different reasons[288,356,394,395]. The first relates to the size of the geographical areas at which the index was usually calculated. As mentioned briefly earlier in this chapter, deprivation is best measured at the smallest spatial scale permitted by the available data. This increases the likelihood that areas are homogeneous, and therefore reduces the risk of the so-called 'ecological fallacy' influencing deprivation-based analyses or interpretations. The ecological fallacy can be defined as the erroneous assumption that the characteristics of the 'whole' (here, the area, or the total population of an area) apply to all 'parts of the whole' (i.e. all individuals within the area)[396, 397]. Thus, although an area may be classified as 'deprived', it is not necessarily the case that each individual within the area will be equally deprived – and the larger the size of the area, the less likely that this will be the case. (The ecological fallacy is, therefore, the opposite of the so-called 'atomistic fallacy' or the 'fallacy of composition'[397, 398], in which (in this context) characteristics of an individual are applied to a whole area or whole population). Although indices such as Carstairs and Townsend have been calculated at a variety of geographical specifications (some of which are listed later in this chapter), they have primarily been derived and analysed at the level of postcode sectors in Scotland and electoral wards in England. Scottish postcode sectors have an average size of approximately 5,000 people, with English wards similarly sized. These are relatively large ‘small areas’ which are therefore likely to include a mix of both relatively affluent and relatively deprived households.

(Note that an additional criticism of the use of such indices at the level of English electoral wards is that the latter often have considerably larger population sizes within urban settings. As will be discussed later, in 2001 the average population size of wards in Manchester and Liverpool were 11,900 and 13,300 respectively, making the use of this spatial unit even more problematic).

The second main critique of these historical indices of deprivation is the fact that they are based entirely on census data, meaning that they can only be updated every 10 years. This is a considerable limitation and one which, alongside other concerns, led to the development of the new measures of deprivation now in use in the UK (discussed above) which are instead based on other, non-census, data sources.

Other criticisms of the Carstairs and Townsend indices in particular include the selection of ‘access to a car’ as one of the indices’ components, given that need for access to a car will differ between urban and rural settings, and the fact that all four components of the indices are given an equal weighting[288,356]. Finally, all the census-based indices have also been criticised as underestimating disadvantage among older people, with measures based on low income related welfare benefits highlighted as better measures of deprivation among the elderly, especially females[399]. Such measures are now included within all the UK measures of multiple deprivation[400].

However, the current measures of area-based deprivation in the UK have also not been exempt from criticism. Absolute levels of income are seen by many as the best means of measuring levels of poverty and affluence: however, as levels of household income are not available at the small-area level, only proxies such as receipt of low income related benefits can be included[xl]: these give an indication of poverty, but not relative affluence. Furthermore, despite such measures being shown to capture elements of material deprivation better than historical census-based indices (as just discussed), the fact that they are based on *receipt of* benefits and not *eligibility for* benefits has been highlighted as another potential limitation, since it has been shown that uptake rates can differ between parts of the UK[403]. The incorporation of any welfare benefits data in measures of deprivation is also problematic because eligibility rules for the receipt of such benefits can change. Within the SIMD, for example, limited trends in the 'income deprivation' and 'employment deprivation' domains were available for the years 2004, 2006 and 2009; however, as a result of welfare reform currently underway by the UK Westminster Government, the components of these domains will change considerably, making analyses of absolute levels of deprivation over time in Scotland problematic. This modification to the index is being forced by changes to the welfare system; however, another criticism of current deprivation indices relates to the fact that the domains are continually updated and modified, again meaning that analyses of change over time are limited. It can be argued that as all the domains of these indices are so highly correlated[404, 405], reflecting the fact that areas tend not to be deprived in one or two aspects but are 'multiply' deprived, continually refining and altering the definitions of the components and domains is both unhelpful and unnecessary. Indeed, although it is important for an index to capture the multiplicity of deprivation (as recommended by Bailey *et al*[348]), in practice what is captured by the use of the overall SIMD is captured by the use of single domains such as 'income' or 'employment'[xli]. This also links to a further criticism of the UK indices that the inclusion of a 'health' domain is problematic for any analyses of deprivation in relation to health outcomes or characteristics in a population. Again, however, in practice it has been shown that the inclusion or exclusion of

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[xl] It was the intention to include a question on income in the Scottish 2011 census. However, despite successful testing and piloting of the question, and despite inclusion not only in other countries' national censuses (e.g. Australia, USA), but also in national Scottish surveys (e.g. Scottish Household Survey, Scottish Health Survey), it was removed following discussion by the Scottish Parliamentary Committee on Economy, Energy And Tourism, who deemed the question 'too intrusive'[401,402].

[xli] For example, comparisons of the 'income' domain and 'employment' domain scores with the overall SIMD scores in the 2009 SIMD produce correlation coefficients of 0.98 and 0.97 respectively. This is discussed further in Chapter 4.

the health domain makes little difference to these types of analyses, as all the domains are so intrinsically linked[405].

Despite these criticisms, the new measures of area-based deprivation in the UK, including the SIMD in Scotland, are undoubtedly improvements on the historical indices, principally for the two reasons outlined at the start of this section, and for which the historical census-based indices were most criticised: that is, the fact that the measures are based on up to date indicators, rather than potentially out of date census information; and the small spatial unit at which the data are calculated and can be analysed (particularly in Scotland). This issue of the spatial measurement of deprivation (and of population health and health inequalities) is the subject of the next section.

2.4.4.7 Spatial measurement of area deprivation and poverty (and health inequalities)

As outlined above, as a general rule, area-based indicators of deprivation are best measured at the smallest spatial unit possible. The SIMD is, therefore, derived at the level of so-called datazones, which have an average population size of approximately 750 people[406,407]. In England the equivalent administrative geography for the measure of deprivation is the so-called Lower Super Output Area (LSOA), which is approximately twice the size of a Scottish datazone. This distinction is key to some of the analyses described in this thesis, and thus will be returned to in the Methods chapter.

Despite the need for small-area based measures, in practice, however, it is not always possible to use measures at this scale. This can be for a number of reasons: data may not be available at this level, or may not be available for all areas and/or all time periods (e.g. in the case of historical analyses or analyses focussed specifically on change over time); very small geographies may not be appropriate for analyses of some data – for example, health outcome data such as mortality from particular causes, where the numbers of deaths at that level will be too small to allow ‘meaningful’ and statistically ‘robust’ analyses to be undertaken; or there may be a particular reason for focusing on other geographical areas (for example, analysing deprivation and health data at city or parliamentary constituency level for political reasons). Thus, the literature includes vast numbers of examples of relevant research in which levels of poverty and deprivation, and/or spatial inequalities in other health determinants and health outcomes, have been analysed at many different geographical levels. Restricting this overview to research carried out within the UK, examples include: census output areas[408,409] (generally, the smallest spatial unit at which census data are made available, with an average population size of only 120); Scottish datazones[345,377,410] and English LSOAs[204,359,411], as described above; Scottish 'intermediate zones' (a recently derived administrative geography built up from datazones, and with an average population size of approximately 4,000)[97,377,412]; postcode sectors[xlii] [95,373,413]; electoral wards[350,414,415]; English 'spearhead' areas[xliii] [417]; Scottish 'social inclusion partnership' (SIP) areas[xliv] [418]; parliamentary constituencies[84,260,374]; local authorities and local government districts[419]; cities[420]; health boards/authorities[95,421] and other NHS related areas such as Scottish Community Health Partnerships (CHPs)[95,373,375] or English Primary Care Trust areas[422,423].

The spatial level at which inequalities are measured, and presented, is important. Clearly greater inequalities can be shown at smaller spatial scales, given the greater variability that can be measured at that level. The 2008 WHO report from the Commission on Social Determinants on health included what were arguably inappropriate comparisons of inequalities in life expectancy between Scottish small areas of a few thousand people and entire countries of hundreds of millions of people[42]. The gap between the small areas was obviously much wider than the gap between countries[xlv].

Specific geographies have been developed to enable measurement of poverty and inequalities over time (required because postcodes and other geographies are not consistent over time: for example, new postcodes are created, and old

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[xlii] As stated above, postcode sectors have an average population size in Scotland of approximately 5,000 people. A postcode sector is derived from a full postcode (which usually has seven characters – e.g. EH10 2XX), but excludes the last two characters (e.g. EH10 2).
[xliii] 'Spearhead' areas were drawn up by the previous (New Labour) Westminster administration, and were defined as the fifth of all areas (local authorities and Primary Care Trusts) in England with the worst health and deprivation indicators[416].
[xliv] Social Inclusion Partnerships (SIPS) were established by the Scottish Office in 1999. Replacing 'Priority Partnership Areas and Regeneration Programme areas', they were the focus of regeneration activity and attempts to tackle social exclusion. They were later incorporated into Community Health Partnership areas.
[xlv] In its defence, the presentation of the data was aimed at highlighting the scale of within-country inequalities alongside inter-country comparisons.

ones are discontinued or recycled). These have included CATTs (Consistent Areas Through Time), a measure developed by Exeter *et al*[xlvi] [424,425], and 'tracts' used with Dorling *et al*'s 'Breadline Britain' analyses of poverty and affluence (a 'tract' equating to approximately half a UK parliamentary constituency, with an average population size in 2001 of around 45,000 people)[79].

Thus, health inequalities, and the drivers of inequalities, can be, and have been, measured at a number of different spatial levels. A potential weakness in all these approaches, however, is of course that they are based on measures solely aggregated to the area level: as mentioned earlier in this section, many authors (including Bailey *et al* in their review of long-term measuring of deprivation in Scotland[348]) argue that thorough analyses of health inequalities and their causes require both area-based and individual level data.

2.4.4.8 Individual vs. area based measures

In the same way that so many studies have measures health inequalities and deprivation at different spatial scales, so have countless other pieces of research combined, and compared, both area-based measures and individual level data. As discussed above (and further below), although the general consensus is that both types of measures are required, not all studies have shown this consistently. Some studies have shown individual measures of socio-economic status to be 'better' than area-based measures of socio-economic deprivation (i.e. in better explaining or accounting for inequalities in particular health outcomes): for example, a large U.S cohort study which showed individual measures to be stronger predictors of mortality[426], a Dutch analysis that found the same in relation to predictors of smoking behaviour and general (self-assessed) health[427], and English analyses which showed individual social class to be a better predictor of inequalities in stillbirth rates than area-based deprivation levels[428]. To counter this, however, area-based measures have been shown to be as good as, or better than, individual measures of SES in explaining variation in low birthweight in England[429-431] [xlvii], and better predictors of heart disease in Italy[432],

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[xlvi] CATTs were developed to allow analysis of small area data from 1981 to 2001. There are approximately 10,000 CATTs across Scotland. The average population size is approximately 500, although they vary considerably in size (from 50 to in excess of 18,000).
[xlvii] It is notable that one of these studies (by Dibben *et al*) showed 'income deprivation' to be a better measure than individual SES. This measure of deprivation is very similar to that used in some of the analyses reported in this thesis (and defined in Chapter 4).

cardiovascular disease in Scotland[433], and smoking behaviour among British women[434]. Clearly, however, these contrary sets of findings will be influenced by the context of the different studies: the setting, the population, the measures of individual SES, the area-based deprivation measures, the spatial unit at which the latter have been calculated, and the outcomes in question, and an in-depth analysis of all these factors in relation to the many studies with contrary findings is beyond the scope of this review. However, both the weight of evidence, and the earlier review of research into the effects of place on health, suggest very strongly that *both* individual and area-based measures are required to enhance the quality of inequalities related research. Countless examples of research in the literature emphasise this point. For example, analyses of cardiovascular risk factors and mortality in the Midspan cohort in West Central Scotland[xlviii] found that: ‘individually assigned and area-based socioeconomic indicators make independent contributions to several important health outcomes. The degree of inequalities in health that exist will not be demonstrated in studies using only one category of indicator’[435]. The authors concluded, therefore, that, ‘policies aimed at reducing socioeconomic differentials in health should pay attention to the characteristics of the areas in which people live as well as the characteristics of the people who live in these areas’. Similar conclusions have been reached in a wide range of studies in relation to, for instance, inequalities in (self-assessed) long-term limiting illness[436] and health behaviours[437, 438] in England, premature mortality[439] (including premature cancer mortality[384]) in Australia, childhood asthma in Italy[440], childhood injuries in Korea[441], injury-related mortality in Spain, Caesarean birth rates in Scotland[442], and in analyses of socio-environmental living conditions in the United States[443].

2.4.5 Summary of section

This section has summarised a number of issues of importance in relation to the subject matter of the thesis: the use of different types of health outcomes in analyses of inequalities between places; the use of summary measures of inequality; the measurement of both individual socio-economic status, and area-based socio-economic deprivation (including the concept of deprivation, and

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[xlviii] The Renfrew & Paisley Midspan study. More details are available from: http://www.gla.ac.uk/researchinstitutes/healthwellbeing/research/publichealth/midspan (Accessed June 2012)

crucial issues related to its measurement such as spatial scale), and the use of both measures in inequalities related research.

A number of points are of particular relevance to some of the specific analyses presented within this thesis (and which, therefore, will be returned to later). First, that in comparisons of some types of health outcomes (i.e. self-assessed health), there is a need to be aware of the potential cultural, demographic and other contextual influences on such measures. Second, there is an agreed need to measure deprivation across multiple domains, and not just in terms of specific issues; that said, however, in practice these domains are so highly correlated that the use of one can produce the same results as the use of many. There are important limitations in the use of welfare benefits based measures of deprivation of which one needs to be aware; however, these current measures of deprivation are still superior to historical measures, especially because of the finer spatial level at which they can be calculated. In analysing variations in health between populations, the use of both individual and area-based measures is preferred; however, it can often be the case that both types of measure cannot be used. All these issues will be discussed further later in the thesis.

2.5 'Excess' poor health in Scotland and its largest city, Glasgow, in comparison to elsewhere in the UK and the rest of Europe[xlix]

As outlined in the introduction to this thesis, the 'unexplained' higher levels of mortality seen in Scotland (and in particular Glasgow) compared to elsewhere in the UK have been referred to as the 'Scottish Effect' (and in the case of Glasgow, the 'Glasgow Effect'). This penultimate section of the chapter reviews the literature around these terms, and also summarises other relevant research around 'excess' or 'unexplained' variation in health status in the UK.

2.5.1 The Scottish Effect and The Glasgow Effect

The idea of a 'Scottish Effect' was first proposed by the (now defunct) Scottish Council Foundation in a report published in 1998[444]. The report's analyses suggested that Scottish levels of mortality were at odds with what would be expected given the country's socio-economic profile and urged further research

[xlix] Note that some of this section has recently been summarised on the ScotPHO website here: http://www.scotpho.org.uk/population-dynamics/deaths/data/scottish-excess-mortality. However, the website section was written by the author of this thesis.

into what might be driving this unexplained 'effect'. The subsequent literature relating to the headings of The Scottish Effect and The Glasgow Effect incorporates various types of analysis, is based on different geographical areas, and examines diverse aspects of health. For clarity, therefore, the research has been categorised here principally in two ways: first, in terms of the type of health outcome the research was based on; and second, geographically. The geographical categories used are: national; regional; and city-based. The health outcomes are: mortality; and self-reported health. For reasons already outlined in the previous section (i.e. the potential influences on reporting of self-assessed health measures), it is important to distinguish between these two types of outcomes.

A third category of research is also discussed briefly here: comparisons of Glasgow with the rest of Scotland. Reasons for examining this category separately are discussed below.

2.5.1.2 Mortality: national analyses

Traditionally, Scotland's higher rates of mortality compared to the rest of Great Britain have been explained by the country's higher levels of material deprivation. For example, Carstairs & Morris[347] showed that around the time of the 1981 census, most of Scotland's higher death rate could be explained in these terms: having statistically accounted for differences in area-based measures of deprivation (the Carstairs index, discussed earlier in this chapter), mortality in Scotland was only 3% higher than England & Wales. However, Hanlon *et al*[404] revised this estimate to 4.7% for 1981, and also showed that this excess (the higher rate of mortality which could not be explained by deprivation) had risen to 7.9% in 1991 and 8.2% in 2001 (Table 2.2). This excess mortality was seen across all deprivation groupings in Scotland (Figure 2.10), but was most pronounced in areas of the highest deprivation: as the vast majority of these areas are located in Glasgow and the West Central Scotland (WCS) conurbation, this led to talk of a more specific 'Glasgow Effect'[95, 445]. The geographical element of those comparisons is important for the research contained within this thesis. Excess mortality has been shown for *all* parts of Scotland compared to

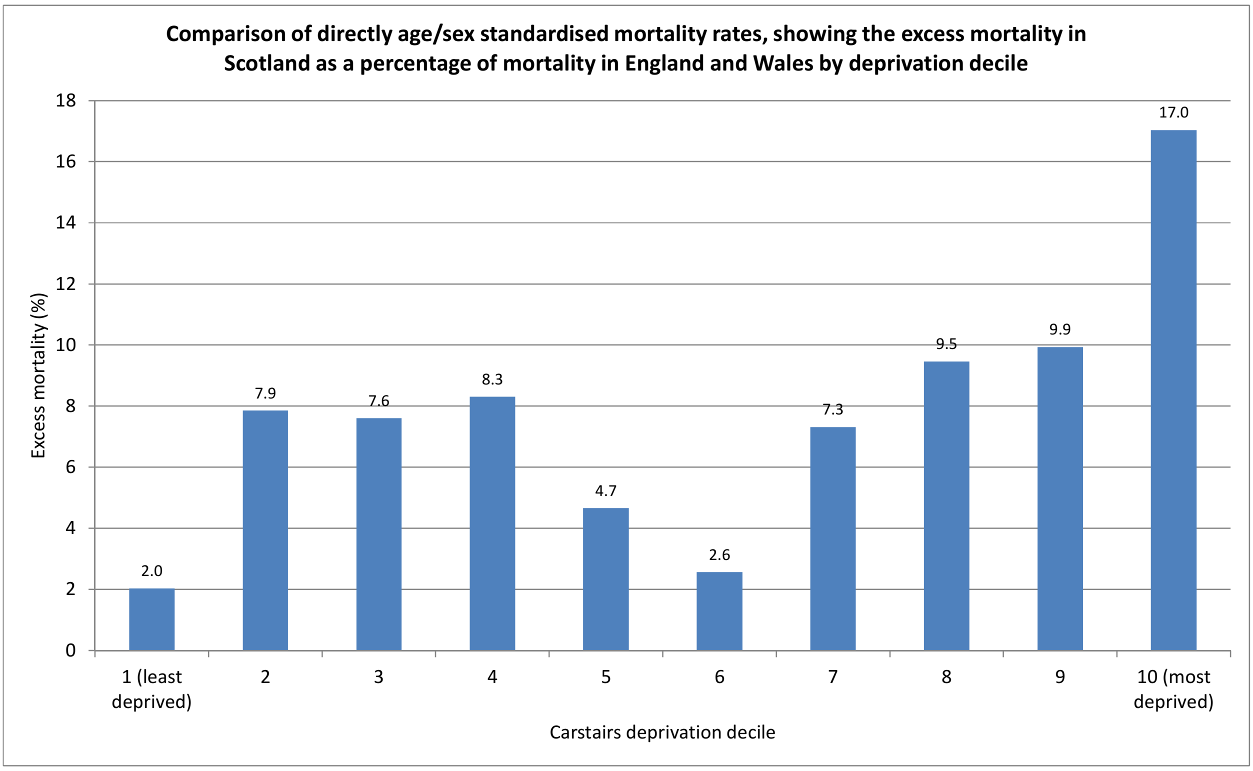
England & Wales[l]. However, a more 'concentrated' version of the excess appears to apply to the post-industrial region around Glasgow.

Table 2.2 Cause-specific mortality rates for Scotland expressed as the percentage excess relative to England and Wales based on log-linear regression models adjusted for age, sex and deprivation decile (Source: Hanlon *et al*, 2005[404])

Cause (ICD9 codes)	% excess (95% confidence intervals)		
	1981	1991	2001
All causes (001–999)	4.7 (3.9, 5.4)	7.9 (7.2, 8.7)	8.2 (7.4, 9.0)
Respiratory disease (460–519)	-23.9 (-25.3, -22.5)	12.7 (10.9, 14.5)	-15.2 (-16.6, -13.8)
Cerebrovascular disease (430–438)	29.8 (27.9, 31.7)	22.9 (21.0, 24.7)	23.9 (22.0, 25.9)
Ischaemic heart disease (410–414)	12.6 (11.5, 13.8)	12.3 (11.1, 13.4)	11.7 (10.4, 13.0)
All malignant neoplasms (140–208)	0.6 (-0.6, 1.7)	3.3 (2.2, 4.4)	10.8 (9.6, 11.9)
Lung cancer (162)	2.2 (0.4, 4.1)	14.2 (12.2, 16.4)	25.9 (23.5, 28.2)
Intentional self-harm and events of undetermined intent (950–959, 980–989)	1.2 (-2.5, 5.0)	15.1 (11.2, 19.1)	41.3 (36.9, 45.8)

[l] The ubiquitous nature of the excess mortality is seen in comparisons of deprivation deciles in Figure 2.10. However, it has also been shown in separate geographical analyses: examples of some of these are provided in this section of the chapter. However, additional unpublished analyses by Scottish NHS Board and local authority areas have also shown excess levels mortality compared to the rest of Great Britain[446].

Figure 2.10: excess mortality in Scotland compared to England &Wales by Carstairs deprivation decile, 2001 (Source: Hanlon *et al*, 2005[404])



As Table 2.2 above shows, by 2001 considerably higher excess deaths for particular causes were evident: adjusting for differences in age, sex and deprivation, deaths from heart disease, stroke, lung cancer and suicide were, respectively, 12%, 24%, 26% and 41% higher in Scotland compared to England & Wales. Drugs-related deaths were not included in the analyses; however, in a separate study Bloor and colleagues suggested that 'the higher prevalence of problem drug use in Scotland than in England accounts for a third of Scotland's excess mortality over England'[447]. The accuracy of this claim has been questioned[448], particularly as it is based on the analysis of a relatively small cohort of drug users (n=1033).

More recent (2012) analysis of the excess suicide rate in Scotland compared to England showed suicides to be almost 80% higher in Scotland between 2001 and 2006, with rates twice as high in Scotland among those aged 15-44[449]. The authors attempted to assess the influence of a range of area-based characteristics on these differences, and concluded that almost 60% of the excess could be explained by such measures, in particular rates of prescriptions for psychotropic drugs (used as a proxy measure of mental ill health) . However, the contribution of socio-economic deprivation and 'social fragmentation[li]' was shown to be 'relatively small'.

Popham *et al*[450] examined whether Scotland's excess mortality related to the country of residence or country of birth. This was in the light of previous research showing that Scots living in England & Wales have higher mortality than English & Welsh residents born in those countries[451,452], as well as related findings showing that those born in England and Wales but living in Scotland have lower mortality than native Scots residents. The authors' results confirmed that the higher mortality is more strongly related to place of birth than place of residence, and that explanations beyond current levels of deprivation were required: for example, Scots living in England & Wales had a very similar deprivation profile to the native population but considerably higher mortality (15% higher among those aged 25 and above, 32% higher for the 25-64 age group). The authors concluded that the research 'suggests that current deprivation is unlikely to be the only explanation of the country of birth excess found in this study', and queried whether socio-economic circumstances in childhood, and a more general interaction between environment and genes, might provide an explanation. As stated, this, and other suggested explanations for Scotland's excess mortality, are discussed in Chapter 8.

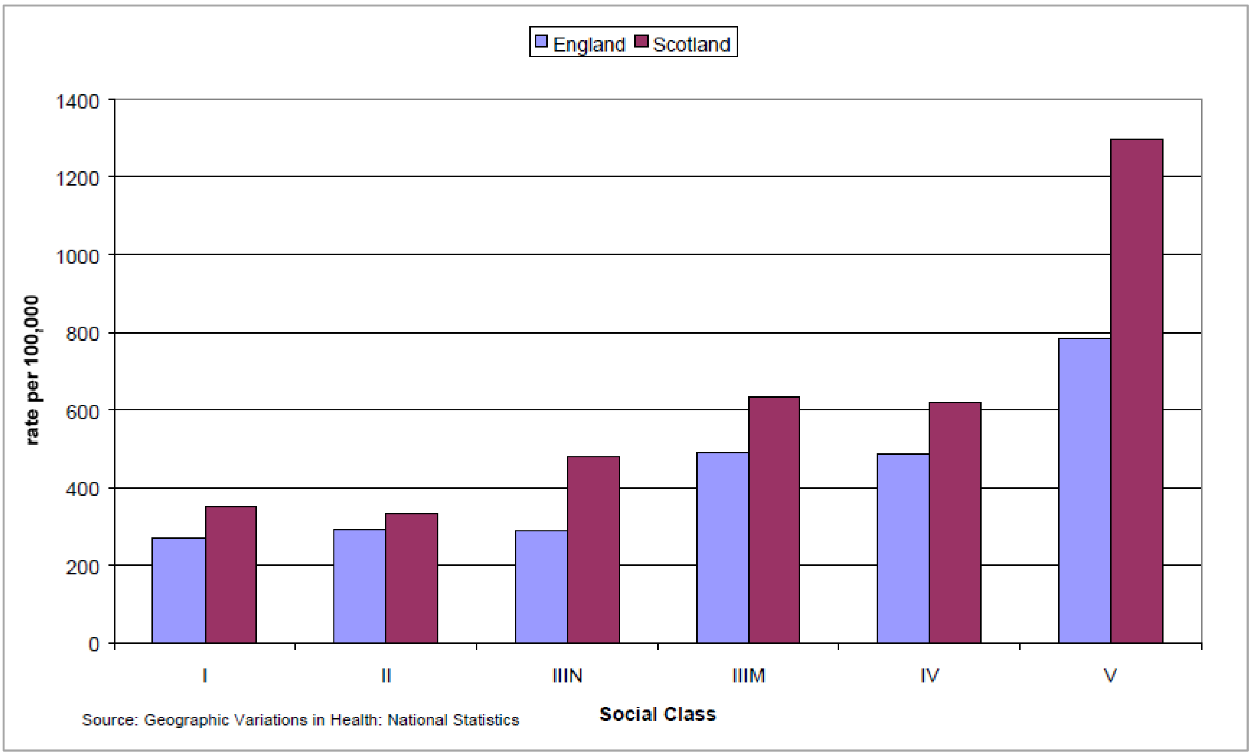
All of the above papers that included analyses of deprivation used area-based measures to do so. However, analyses of mortality by *individual* measures of socio-economic status show similar results. For example, analyses of premature mortality among males in the early 1990s showed rates to be higher in Scotland than in England in *every* social class (although especially in social class V) (Figure 2.11). More recently, and using more sophisticated techniques, Popham and Boyle used longitudinal data to examine Scottish excess mortality based on individual measures of socio-economic status[lii] (using census data linked to death registrations)[453]. They again additionally examined the influence of country of birth in the analyses. Analyses were performed over two separate periods: 1991 to 2001, and 2001 to 2007. For individuals born in Scotland and living in Scotland, the excess mortality in the first period was 8% (the same figure reported for

[li] Defined in terms of: neighbourhood population change; single and lone-parent households; and numbers of single, widowed and divorced in the population.
[lii] Individual measures of housing tenure and access to a car (as proxies for income).

2001 by Hanlon *et al* when using area-based measures of deprivation); for the second period the excess was 20%. For those born in Scotland, but living in England or Wales, the excess was around 18-19% in both periods. More generally, the authors reached a similar conclusion to that in the earlier study[450]: 'adjusting for household-level differences in socio-economic deprivation does not fully explain the Scottish excess mortality that is seen for those born in Scotland, whether living in England and Wales or Scotland'. This statement can be expanded to include Northern Ireland: a similar longitudinal study by Connolly *et al* showed that Scots-born residents of Northern Ireland (aged 25-74) had 15% higher mortality than those born locally, after adjustment for housing tenure, educational attainment, social class and area deprivation[454]. This was based on almost 11,000 Scots compared to just over 800,000 locally born residents, and interestingly, compared to the latter, higher percentages of the Scots-born population were classed as middle class and had degree level qualifications, and relatively fewer had no educational qualifications and lived in the most deprived areas of Northern Ireland[liii].

[liii] 20% of Scots born were educated to degree level compared to 16% of natives (with correspondingly fewer Scots-born having no educational qualifications (40% vs. 48%)). The equivalent figures for those classed as being of 'professional' social class was 37% compared to 29%, and 13% compared to 21% for those living in the most deprived quintile .

Figure 2.11 Age-standardised mortality rates by Social Class, England and Scotland, all causes, males aged 20-64, 1991-93 (Source: Scottish Executive, 1993[288] (from data originally presented by Uren *et al*, 2001[455]))



Most recently, analyses of Scottish Health Survey (SHS) and Health Survey for England (HSE) data (to be published in 2014[456]) covering the period 1994-2008 showed high level of excess Scottish mortality after adjustment not only for individual SES (social class and educational attainment), but also a range of behavioural (e.g. smoking status, alcohol consumption, diet, physical activity) and biological (e.g. body mass index, blood pressure, and measures of lung function such as forced expiratory volume (FEV1)) risk factors. After adjustment, Scottish respondents were associated with 29% higher mortality. Echoing the results shown in Figure 2.11 above, the excess was highest among those of social class IV and V. It was suggested that the higher overall excess figure compared to some other studies reflects the fact that the HSE sample were less representative of the wider English population (being more biased to healthier respondents) than was the case with the SHS sample in comparison with the wider Scottish population.

2.5.1.3 Mortality: regional studies

At the regional level, research published in 2008 and 2011 (and discussed briefly earlier in this chapter) showed that mortality in the West Central Scotland conurbation (which contains Glasgow and other parts of Scotland that have suffered from post-industrial decline) is higher, and is improving more slowly, than in the vast majority of other, similar, post-industrial regions of Europe – including those which currently appear to experience *worse* socioeconomic conditions[457, 458].

This, and the other mortality-based studies cited above, suggest that factors other than socio-economic deprivation (at least as measured in those studies) influence mortality. As Hanlon *et al* pointed out[404], if this is the case then it is likely that similar 'effects' would be seen elsewhere in the UK (for example in the North of England compared to the rest of England): consequently, Whynes[415] showed that this was indeed the case for particular English regions compared to England & Wales overall, and therefore concluded that a 'Scottish Effect' can be said to exist for parts of England & Wales.

2.5.1.4 Mortality: city-based studies

Reid[445] explored the extent to which Glasgow's high levels of mortality relative to the rest of Great Britain could be explained by its socio-economic profile. This included specific comparisons between Glasgow and a number of English cities, including Liverpool and Manchester. He found that controlling for differences in the Carstairs index of deprivation, Glasgow's excess mortality was 16%. However, using access to a car (as a proxy for income) explained much more of the excess: it fell to 8%. However, it is unclear whether or not this means that car ownership is a 'better' measure of deprivation: some studies have suggested that in urban settings this variable may 'overestimate' deprivation[459-463]. Furthermore, this study was problematic as it used measures of deprivation calculated for different-sized geographies north and south of the border: postcode sectors in Scotland and electoral wards in England. As mentioned earlier, in 2001 postcode sectors in Glasgow had an average population size of approximately 5,500; however, the equivalent figures for wards in Manchester and Liverpool were 11,900 and 13,300, respectively. The relatively large size of these areas (especially in the two English cities), and the variation in size between the Scottish and English geographies, is potentially problematic in measuring the effects of area based deprivation (as discussed above).

Another relevant study which can approximately be categorised as 'city' based is one in which risk factor data (including area based deprivation and individual social class, as well as other biological and behavioural markers) and mortality were compared for cohorts from a number of Scottish towns (primarily in West Central Scotland[liv]) with the London Whitehall study[464]. The analyses were based on men aged 45-64 between 1967 and 1973. This showed that the differences in all-cause mortality between the Scottish and English cohorts could be explained by a combination of individual social class and other risk factors (e.g. smoking, lung function and pre-existing self-reported morbidity). However, even when controlling for differences in social class and behavioural and biological markers, there remained significant, unexplained, higher levels of mortality in the Scottish cohorts in relation to: coronary heart disease, stroke, accidents, suicide and alcohol-related causes[lv]. It is also worth reflecting that given the ages of this cohort, many (if not the majority of) deaths will have taken place pre-1991 and 2001 i.e. when more of the Scottish 'excess' relative to England & Wales could be explained by material deprivation (as highlighted in the paper by Hanlon *et al*[404]).

2.5.1.5 Self-reported health: national studies

In contrast to the consistent findings of 'excess' mortality for Scotland compared to England & Wales described above, Popham[465] showed that most of the excess levels of ***self-assessed health*** (based on general health status, and perception of having a long-term illness)[lvi] among Scots could be explained by their relatively lower levels of individual socio-economic status. The author concluded that

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[liv] These were from the two main Midspan studies (referenced earlier in this chapter): Paisley and Renfrew, and the Midspan Collaborative cohort. The latter was recruited from 27 workplaces in Glasgow, Grangemouth, and Clydebank.
[lv] In the fully adjusted models, mortality in the two Scottish cohorts compared to the English cohort was, respectively, 11% (Paisley/Renfrew) and 16% (Collaborative cohort) higher for coronary heart disease, 45% and 37% higher for strokes, 51% and 70% higher for accidents and suicide, and 46% and 73% higher for alcohol-related causes.
[lvi] The study examined two questions in the 2001 census. The general health question asks whether respondents would assess their health in the previous 12 months as being good, fairly good or not good. Another question asks if respondents have a 'long-term illness, health problem or disability which limits your daily activities or the work you can do?'.

'there is unlikely to be an unidentified 'Scottish effect' for self-reports of health'.

However, an analysis by Mitchell *et al* of a more specific category of self-reported illness - doctor-diagnosed ischaemic health disease (IHD) - between Scottish and English health survey respondents[466] showed Scottish respondents to be at 50% more risk of IHD[lvii] than their English counterparts, even when differences in individual socio-economic status (and the other principal risk factors for cardiovascular disease e.g. smoking, alcohol consumption, physical activity, blood pressure, cholesterol, respiratory function) had been accounted for.

2.5.1.6 Self-reported health: regional studies

The same studies comparing health and its determinants in post-industrial European regions cited above showed that while the West Central Scotland population exhibited the worst (females) or almost worst (males) mortality profiles, it also exhibited among the 'best' levels of self-assessed general health[129]. This again highlights the potential difficulties in interpreting comparisons of self-reported health measures across national borders.

2.5.1.7 Self-reported health: city-based studies

Gray *et al*[467] used data from a number of routine health surveys to analyse differences in self-reported general health (and health behaviours) in relation to individual socio-economic status (SES) for Greater Glasgow and a number of other large metropolitan areas in the UK and Western Europe. Greater Glasgow was shown to have poorer self-reported health and psychological morbidity[lviii], as well as relatively higher rates of obesity and smoking (the latter especially in relation to women). Notably, adjustment for individual SES did not alter or explain these findings.

2.5.1.8 Scotland-only studies

As outlined above, the 'Scottish Effect' term was coined to describe Scotland's 'excess' mortality compared *to the rest of Great Britain*, with a Glasgow-

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[lvii] This was measured using a self-report of physician diagnosed heart attack or angina.
[lviii] This was defined by a high GHQ12 score.

specific element seemingly constituting an important proportion of that excess. However, a number of studies have sought to examine the excess mortality observed in Glasgow in comparison with other parts of Scotland rather than other parts of the UK. This is clearly a different issue: as the 'Scottish Effect' has been shown to be ubiquitous, seeking a 'Glasgow Effect' *within* Scotland is a more complex epidemiological issue.

In relation to mortality, Gray *et al*[468] showed that the higher levels of mortality among women in (Greater) Glasgow compared to the rest of Scotland could be fully explained by higher levels of deprivation (as measured by the Carstairs index). Among men, however, although higher rates of all-cause mortality for Glasgow could be explained by area-based deprivation, this was not the case for a number of causes of death. These were: all cancers, lung cancer, chronic liver disease, and drugs-related deaths[lix]. For example, living in Greater Glasgow was associated with a 24% increased risk of the latter and a 30% increased risk of death from liver cirrhosis, even after adjustment for area-based levels of deprivation. In the same study Gray also undertook similar analyses for self-reported health and health behaviours (although based on individual SES rather than area-based deprivation). These showed that once socio-economic characteristics were controlled for, excess levels of some self-reported morbidity and some adverse health behaviours persisted for Glasgow compared to elsewhere in Scotland. For example, for men: acute sickness, psychological morbidity (GHQ12) and alcohol consumption; for women: psychological morbidity (GHQ12). However, the majority of other behaviours and outcomes (for example smoking and obesity) were either not significantly higher than the rest of Scotland, or were explained by socio-economic differences between the populations.

Finally, Landy *et al*[339, 469] undertook similar analyses of self-reported health and health behaviours data, but using more up to date and extensive measures of deprivation and SES. The analyses showed that most differences in outcomes between Greater Glasgow & Clyde (GGC) and the rest of Scotland could be explained by these latter socio-economic aspects alongside differences in other biological and behavioural risk factors. However, there were two notable

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[lix] Defined as deaths from mental and behavioural disorders due to the use of drugs.

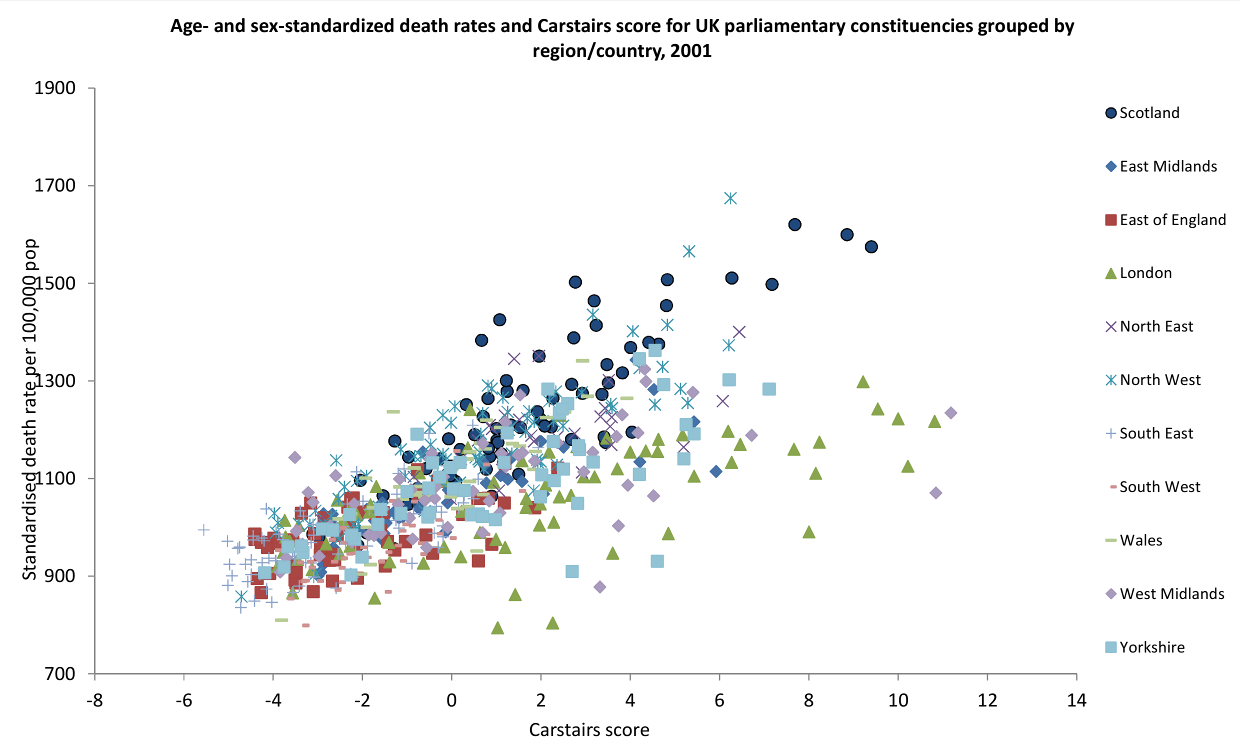
exceptions: anxiety[lx] (90% increased risk among GGC residents); and doctor diagnosed heart attack (44% increased risk for residents of GGC).

2.5.2 Other UK analyses of unexplained mortality differences

The above has summarised the most relevant literature to date on the concept of 'excess' poor health in Scotland and Glasgow. As already pointed out, however, it is unlikely that this phenomenon of unexplained higher mortality is entirely unique to Scottish areas – and this was specifically shown to be the case by Whynes who identified 'Scottish Effects' for some of the more deprived regions of England & Wales[415]. Unexplained higher mortality was also shown to exist more than 30 years ago in Middlesbrough compared to the similarly deprived, and neighbouring, town of Sunderland[470]. More recently, Tunstall *et al*[471] used Carstairs scores at parliamentary constituency level in Great Britain to compare variations in mortality rates between similarly deprived groups of areas, and found the greatest differences to exist between areas with the highest levels of deprivation. Closer examination of these data (obtained from Tunstall *et al*) shows that, predictably, Scottish constituencies tend to have higher mortality compared to other UK areas with similar levels of deprivation (Figure 2.12)[lxi].

[lx] This was based on the anxiety scale of the Revised Clinical Interview Schedule of the Scottish Health Survey (taken from the Adult Psychiatric Morbidity Survey).
[lxi] As discussed earlier, however, deprivation is best measured at spatial sizes much smaller than parliamentary constituencies.

Figure 2.12 Scatterplot of Carstairs deprivation score and standardised mortality rates for UK parliamentary constituencies (grouped by region/country) in 2001 (Source: adapted from Tunstall *et al*, 2011[471])



Higher 'unexplained' mortality between the most deprived groups of areas not only reinforces the findings of the Hanlon *et al* study on the Scottish Effect[404], but is also similar to a number of other studies which highlighted the variation in mortality between the more disadvantaged areas of the country. For example, another paper by Tunstall *et al* showed better than expected mortality in some deprived, but 'resilient', UK areas where, as the authors noted, 'there may be protective factors or practices…which weaken the usually strong relationships between economic adversity and poor health'[472]. It could be argued that the opposite of this is true of parts of Scotland; indeed, it was notable that in this study, 'resilient' areas were identified in England (including some in Liverpool) and Wales, but not in Scotland. In a similar vein a number of other studies have shown deprived parts of London to have lower than expected mortality (an issue also visible in Figure 2.12 above), and Scotland and parts of North West England to have higher than expected death rates[473,474]. This emphasises two important issues in relation to this thesis: first, that its findings may be relevant to a number of other parts in the UK, rather than just to Scotland; and second, given the quite different (lower) mortality profile of parts of London alluded to above, it is important that analyses of Glasgow's mortality experience are undertaken in relation to relevant comparator cities (such as Liverpool and Manchester). This will be discussed further elsewhere in the thesis.

The literature also includes papers which discuss excess mortality (including Scottish excess mortality) in relation only to particular suggested explanations, for example Vitamin D deficiency[171], population change[475], spatial patterning of deprivation[242], and many more. These are not discussed here, but are considered alongside other suggested hypotheses in Chapter 8.

2.5.3 Summary of section

This section has highlighted a number of important issues. First, that there is considerable evidence of levels of 'unexplained' differences in poor health across Great Britain. Foremost among this is evidence of higher in mortality in Scotland, and relevant parts of Scotland. This excess has been shown based on analyses of both area-based deprivation, and individual measures of socio-economic status. The differences in mortality that cannot be explained by variation in different measures have prompted a number of potential suggestions and theorising, but no answers.

In addition, the complexity of national comparisons based on self-reported health, as well as the difficulty of framing the excess in Glasgow within a solely Scottish context, have been touched upon. It is fair to conclude, therefore, that analyses of the so-called 'Scottish Effect' are best based on mortality data, and on comparisons with other parts of the UK.

2.6 Health and health inequalities: the policy context in Scotland and the UK.

As has been summarised in this chapter, the reasons why, and the extent to which, health and its determinants vary considerably between different places and populations, is an extraordinarily complex issue. The complexity extends to the policy implications for governments. The determinants of health are so broad that they are relevant to a considerable number of governmental departments and policy areas, and are potentially influenced by policies ranging - for example in the UK - from local to European level. A review of all relevant policies across that spectrum of government in the past few decades is beyond the scope of this work. This section, therefore, presents a 'high level' overview of the most pertinent national policies and policy documents in Scotland and, separately, in the UK in recent times. As responsibility for health, and many other policy areas relevant to health, was only devolved to Scotland in 1999, the UK policy material is summarised first.

(Note, however, that the impact of *local* decision-making and policies in the three cities is clearly also of huge potential importance. This, however, is beyond the scope of this literature review: indeed, it is the focus of a separate PhD due for completion in 2015/16[lxii]. However, the topic is discussed further in Chapter 8).

2.6.1 UK policy

As described earlier in this chapter, although health inequalities have been known about and studied since the 19th Century, the modern policy context for inequalities in the UK (and, arguably, elsewhere) is usually traced back to the publication in 1980 of the Black Report[10]. Named after the chair of 'The Working Group on Inequalities in Health', Sir Douglas Black, the report is viewed as the first UK report in modern times to set out analyses of the widening health inequalities in the country, and highlight the driving forces of economic inequality. It made 37 recommendations, focussing particularly on the health and wellbeing of children, and the need to reduce poverty. Commissioned by the then Labour Government, the report was famously 'buried' by the newly elected Conservative government (published on a Bank Holiday more than a year after its completion, and with only a small number of copies printed for the media (for whom no briefing was arranged[476])), and its recommendations explicitly *not* endorsed by Patrick Jenkins, the Secretary of State. He ended his forward to the report with the words: 'I cannot… endorse the Group's recommendations. I am making the report available for discussion, but without any commitment by the Government to its proposals'. Despite this, the report has had a lasting impression on the inequalities debate.

It is probably fair to say that the overall conclusions of the Black Report are very similar to those of later Government commissioned reports into health

[lxii] A PhD on the impact of local policy and practice on health in the three cities is being undertaken by a student at the University of the West of Scotland.

inequalities within the UK. Depressingly, each report paints the same picture in relation to population health: overall improvements, but a relative widening of the gap between social classes. The 1987 Whitehead Report ('The Health Divide')[11] was an update of the Black Report, and suffered a similar fate in being suppressed by the Conservative government of the day[lxiii]. As mentioned in the first section of this chapter, both the Whitehead Report and the Black Report have been seen as driving forces for interest in, and understanding of, the social model of health. The Acheson Report[478], commissioned by the Labour Party and published in 1998 (a year after their election) included a similar number of recommendations as the Black Report, and with similar priority areas (reducing poverty and income inequalities, improving the health of families with children); it also recommended that all government policies relevant to health should be explicitly evaluated in relation to their impact on health inequalities. The Marmot Review[61], which was published in 2010, again highlighted a similar picture of widening inequalities, and also recommended policy action around 'early years' ('Give every child the best start in life'; 'Enable all children young people and adults to maximise their capabilities and have control over their lives') and economic circumstances ('Create fair employment and good work for all'; 'Ensure healthy standard of living for all'), as well as recommendations around the development of 'healthy and sustainable places and communities' and strengthening 'the role and impact of health prevention'. The similarities between the recommendations of the Black Report, Acheson Report and the Marmot review were highlighted in an analysis by Bambra *et al*: they showed that despite differences in the political context of each report, there were 'great similarities and very few differences' in their recommendations, and that this 'calls into question the progress of health inequalities research, the use of evidence and of the links between research, politics and policy'[479].

2.6.2 English policy

In England, a strategy to reduce inequalities was implemented in various stages by the Labour government over the period 1999-2010. In 1999 the Government

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[lxiii] The report was commissioned by the Health Education Council, a 'quango' disbanded at the time of the commissioning. Similar to the publication of the Black report, a press briefing for the report's publication was not allowed on the organisation's premises, and the former chairman (who had commissioned the work) was banned from attending the briefing in a different venue[477].

published an ‘action plan’ in response to the recommendations of the Acheson report[480]. Two years later they published health inequalities targets aimed at reducing the gap in life expectancy and infant mortality by 10% by the year 2010, objectives which ultimately were not met[481,482]. Following publication of those targets, the (English) Department of Health (DoH) published its ‘cross-cutting review’ of health inequalities[483] and their subsequent ‘programme for action’ to implement the findings of the earlier review[484]. The themes identified in the review were familiar ones, including early years interventions and ‘strengthening disadvantaged communities’, and the themes highlighted in the action plan similarly so (including: ‘supporting families, mothers and children’; ‘addressing the underlying determinants of health’; and ‘engaging communities and individuals’). Despite further analyses and much more reporting and reviewing (for example: the 2004 Wanless Report[lxiv 485]; the DoH progress reports of 2005[486] and 2007[487], and the 2009 review of progress on meeting inequalities targets[481]; the 2009 House of Commons Health Committee report on health inequalities[lxv 488]), ultimately the English strategy to tackle health inequalities over the period 1997-2010 has been branded a failure. In his review of the strategy published in 2011, Mackenbach blamed this lack of success on the fact that the strategy ‘did not address the most relevant entry-points, did not use effective policies and was not delivered at a large enough scale for achieving population wide impacts’[482]. By ‘entry points’, Mackenbach pointed out that although policies addressed some of the determinants of health, few had ‘direct relevance’ for achieving the national targets; furthermore, he specifically pointed out that: ‘There were no policies addressing income inequality as such, or other important determinants of health inequalities such as working conditions and excessive alcohol consumption’. Macintyre[54] has summarised a number of ‘principles’ for effective policies to reduce inequalities in health, and these again give insight into the failure of the English strategy. Foremost among more than a dozen

[lxiv] Building on an earlier (2002) report by Wanless on the future of the *health services* in England, the 2004 report instead focussed on ‘prevention and the wider determinants of health in England and on the cost-effectiveness of action that can be taken to improve the health of the whole population and to reduce health inequalities’
[lxv] This was the Committee’s review on the Westminster Government’s approach to tackling health inequalities in England. It highlighted the continuing widening of the health inequalities gap in England, despite the ‘widespread praise and support’ for the Labour Government’s commitment to reducing inequalities. It cited the lack of prior evidence on effective policies on reducing inequalities as one of the barriers to progress, but also criticised the Government’s design and introduction of new policies ‘which make meaningful evaluation impossible’.

principles are: 'address upstream and downstream causes' and 'reduce inequalities in life circumstances ('especially education, employment and income'[lxvi]). These are some of the same key 'entry points' that Mackenbach highlights as policy failures in the English strategy.

At the time of writing, English policy on inequalities is now under control of the Conservative-Liberal Democrat Coalition Government. Their approach to health inequalities within England is summarised within the 2012 report, 'Healthy lives, healthy people: Improving outcomes and supporting transparency'[289], the update to the proposals first set out in the similarly named 2010 White Paper[489], and its 2011 'update and way forward' report[490]. The 2012 report includes a 'public health outcomes framework' for 2013 to 2016, which emphasises the role of the individual (as well as government and 'local communities') in achieving high level objectives of both general improvements in health (specifically, healthy life expectancy) across the English population, alongside reductions of health inequalities (in life expectancy and healthy life expectancy). These 'overarching' aims are supported by four other objectives which include improvements in 'the wider determinants of health', but also the need for people themselves to be 'helped to live healthy lifestyles, make healthy choices and reduce health inequalities'. Despite the emphasis on 'transparency' in the title of the report, it is not clear how these objectives will be met. There are no national targets, and responsibility for reductions in local inequalities in health have been devolved to English local authorities, with the expectation that they will 'work in partnership' with the new 'Public Health England' national body (established in 2013) to achieve these aims[491]. Although the 'wider determinants' includes topics such as child poverty, educational attainment, crime and homelessness, there are no specific 'entry points' (as cited above by Mackenbach) such as overall income; furthermore, this public health 'framework' sits alongside other policy developments by Coalition Government, such as the proposed reform of

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[lxvi] The other principles for effective policies to reduce inequalities highlighted by McIntyre are: maintain and extend equity in health and welfare systems; level up not down; prioritise early years interventions, and families with children; address both health care and non-health care solutions; target, and positively discriminate in favour of, both deprived places and deprived people; remove barriers in access to health and non-health care goods and services; prioritise structural and regulatory policies; recognise the need for more intensive support among more socially disadvantaged groups; monitor the outcome of policies and interventions, both in terms of overall cost effectiveness and differential cost-effectiveness; ensure programmes are suitable for the local context; encourage partnership working across agencies, and involvement of local communities and target groups.

the Welfare State[492]: the latter is predicted to *increase* poverty rates (particularly among children, the disabled and lone parent families[493-497]) and, therefore, result in a widening of income inequalities and, ultimately, health inequalities. The impact of this particular reform will be felt not only in England, but also north of the border.

2.6.3 Scottish policy[lxvii]

Although, as discussed, the Black Report is widely viewed as a milestone in the understanding of the scale of inequalities in the UK, the report was in fact pre-dated by other analyses of the issue. This includes the 1976 report by Scotland's Chief Medical Officer, John Brotherston, entitled 'Inequality: is it inevitable?' which presented evidence of widening health inequalities, despite social advances since the end of the second world war in establishing the NHS and the modern welfare state[498]. Some of Brotherston's analyses were included as evidence in the Black Report four years later.

With the re-establishment of the Scottish Parliament in 1999, Scotland had the opportunity to directly influence many aspects of health and health inequality (albeit that powers relating to some of the main economic drivers of health inequality were (and are) still reserved to the Westminster government), and a number of Scottish policy documents have focused specifically on the issue of health inequalities in the country. The influential 1999 White Paper, Towards A Healthier Scotland[499], recognised the broader influences on health, and that health improvement action should, therefore, encompass life circumstances as well as lifestyles and priority diseases, with all action underpinned by the need to reduce health inequalities. However, although specific targets were set for lifestyle and disease topics (e.g. reductions in smoking and deaths from coronary heart disease), none were set in relation to broader life circumstances issues.

This foundation of Towards A Healthier Scotland was built upon by subsequent policy documents such as the 2003 White Paper, Partnership for Care[500], the 'Challenge' document of the same year (Improving Health in Scotland: The

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[lxvii] Note: a modified summary of this section is included on the ScotPHO website (http://www.scotpho.org.uk/comparative-health/health-inequalities/policy-context). However, the website text was also written by the author of this thesis.

Challenge, 2003)[501], and the 2005 Delivering for Health report[502], all of which highlighted the need to reduce inequalities in health.

In 2007, the current (SNP) Scottish Government set up a Ministerial Task Force on Health Inequalities. The report of the Task Force, 'Equally Well'[503], was published in 2008 and outlined recommendations for tackling the underlying causes of health inequalities under a range of key headings including: early years & young people; poverty & employment; physical environments & transport; alcohol, drugs & violence; health and wellbeing. Equally Well is seen as one of three parts that form the basis for cross-sector action on reducing inequalities in Scotland. The other parts are the 'The Early Years Framework'[504] (the Scottish Government's 2009 policy document on improving child development and wellbeing), and 'Achieving Our Potential: A Framework to Tackle Poverty and Income Inequality in Scotland', published in 2008. The latter outlined a range of Scottish Government policies aimed at alleviating levels of poverty and low income in Scotland – although with an explicit acceptance that many of the 'levers' to do this (welfare provision, broader fiscal powers) currently lie outwith the Scottish Parliament.

Equally Well was followed up in 2008 by the Equally Well Implementation Plan[505], and the publication of indicators to be used in assessing progress in tackling health inequalities[506]. These included indicators such as healthy life expectancy, premature mortality, mental wellbeing, low birthweight babies, and morbidity and mortality from coronary heart disease, cancer and alcohol-related conditions.

The Ministerial Task Force on Health Inequalities reconvened in early 2010 to review progress since the publication of Equally Well in 2008. The report of the Equally Well review was published jointly by the Scottish Government and COSLA (the Confederation of Scottish Local Authorities) in 2010[507]. The review concluded that the three social policy frameworks listed above - Equally Well, the Early Years Framework and Achieving Our Potential - were the best mechanisms by which to reduce inequalities in Scotland and deliver long term improvements for the population.

The Ministerial Task Force convened again in 2012 with a report on their deliberations due (but at the time of writing unpublished) in 2014. As part of the review of progress, NHS Health Scotland (NHSHS) undertook a policy review of health inequalities in Scotland. The organisation's report[508] praised Equally Well as 'bold' and 'grounded on good evidence' but suggested its impact was limited because it had focussed on 'mitigating the consequences of social inequalities, like smoking and alcohol misuse, [rather] than on addressing the long term underlying causes, such as poverty and income'. The review by NHSHS was supported by a review panel chaired by Macintyre, and its conclusions and recommendations echoed her earlier work discussed above[54] in recommending solutions based on both upstream and downstream interventions (categorised in the NHSHS report as relating to 'fundamental causes', 'wider environmental influences' and 'individual experiences').

The Scottish Government's 'overall purpose' (as outlined in its National Performance Framework[509]) is one of 'sustainable economic growth'. Despite questions about the extent to which policies on reducing income inequality can be entirely compatible with such an overall purpose (and indeed, whether the two parts of one of the Scottish Government's five strategic objectives[lxviii] - 'Wealthier and Fairer' - are not potentially contradictory, as some commentators have suggested[130,132]), this purpose is supported with 'high-level' targets[lxix] which include a number of indicators relevant to health and health inequalities. For example, the 'population' target is underpinned by a commitment to increase healthy life expectancy, while their 'solidarity' target aims to not only 'increase overall income' but also 'the proportion of income earned by the three lowest income deciles as a group by 2017'. Inequality-related indicators also make up some of the 50 national indicators being used to track progress towards the achievement of national outcomes[510]: examples include decreasing the percentage of the population living in poverty (including - as a separate target - decreasing the numbers of children living in material deprivation), and reducing premature mortality.

[lxviii] The five strategic objectives are: wealthier & fairer; smarter; healthier; safer & stronger; greener.
[lxix] There are seven 'high level' targets, each associated with a set of indicators. The target areas are: growth; productivity; participation; population; solidarity; cohesion; sustainability.

The reduction of inequalities also lies at the heart of the proposed reform of the public sector, as outlined in the Scottish Government's response to the Commission on the Future Delivery of Public Services (the 'Christie report')[511].

A number of policies have been introduced by the Scottish Government in recent years which may impact on health inequalities to a degree: the ban on smoking in public places (introduced in Scotland in 2006 ahead of the rest of the UK); minimum pricing for alcohol; free prescriptions. However, with reference to Macintyre's analyses, these are 'downstream' and 'midstream' issues. They do not tackle the more important economic 'upstream' causes.

With the country's limited fiscal powers, it is perhaps unfair to criticise Scotland's approach to addressing inequalities. That said, some would argue that the current Scottish administration's focus on the need for economic growth, alongside its (and previous administrations') refusal to employ the country's limited tax-varying powers to redistribute income, is likely to hinder any local attempts to reduce income inequalities[132]. More generally, however, reviewing recent Scottish policy leads to a sense of what Whitehead and others have referred to as 'lifestyle drift'[512-514], that is policies 'that start off with a broad social determinants or upstream approach, and then drift downstream to focus largely on individual lifestyle factors… [and which] is often coupled with the drift away from recognition of the need to take action on the social gradient to a narrow focus on the most disadvantaged'[512]. This drift is most certainly true of elsewhere in the UK, and indeed the current approach in England now explicitly highlights the role of individuals in reducing inequalities (and is thus perhaps less of a 'drift' and more a 'charted course').

2.6.4 Summary of section

Discussion, reviews, strategies, recommendations, and policy 'action plans' to address health inequalities in the UK have been the focus of attention for well over 30 years. However, as discussed earlier in this chapter, inequalities across the UK have widened considerably in that time period. This is because of a fundamental failure to address the economic drivers of health inequalities - although other, related, policy failures have also been highlighted by others: 'lifestyle drift', for example, alongside inadequate policy delivery ('a deep seated inability to join up policy and delivery across government, both horizontally at central and local levels and vertically'[514]) and, at times, a lack of political will. Even where there appears to have been such political will to reduce inequalities – for example, in England between 1999 and 2009 – the strategy has failed. Scotland has also implemented a broad range of laudatory, well-intentioned and, in some cases, important policies. However, with the vast majority of fiscal powers reserved to Westminster, the upstream economic drivers of health inequalities have again not been challenged. Thus, within Scotland as well, health inequalities have continued to widen.

2.7 Summary of chapter

This chapter has:

- discussed what determines good or bad health among populations, emphasising the importance of a 'social' understanding of the many influences on health, and the interactions between them across different life stages, all of which is fundamental to understanding differences in health status in Glasgow and Scotland compared to elsewhere;
- discussed health inequalities as a general concept, but with a particular focus on socio-economic inequalities in health, and shown that in the latter terms the UK has experienced a 'spatial polarisation' in recent decades, with Glasgow and parts of West Central Scotland positioned at the most extreme end of the spectrum of UK health. Glasgow, and parts of Glasgow, have also been highlighted in the widening socio-economic inequalities in health seen within Scotland itself, characterised by increasing mortality, both in younger ages and among all ages in the most deprived areas, driven by increases in deaths from alcohol, drugs, suicide and violence (and to an extent not seen elsewhere in the UK). The particular debate around the impact of income inequalities across whole societies was discussed, although it noted that income inequalities appear no wider in Scotland compared to England, nor in West Central Scotland (including Glasgow) compared to North West England (including Liverpool and Manchester). The chapter also highlighted potential (and relevant) differences in the relationship between deprivation and health in Glasgow

compared to elsewhere in the UK, where similar poverty rates have not been matched by similar rates of premature death;

- explored the evidence around the impact of ‘place’ on health (including direct and indirect effects, and with a particular reference to urban settings such as Glasgow, Liverpool and Manchester), including the ‘core’ distinction between an area (context) and its residents (composition), the complex and overlapping relationship between the two, and the need for a greater understanding of the causal pathways between them in relation to health. This exploration touched on proposed explanations for Scotland’s, and Glasgow’s, poor health status (discussed in more detail later in a later chapter), and also highlighted a number of other issues relevant to some of the analyses included in this thesis: for example, how neighbourhoods are defined; the need for both individual and area-based measures; and the debated benefits of appropriate statistical modelling strategies;

- summarised a number of issues relating to the measurement of health, its determinants and inequalities, that are crucial to the subject matter of the thesis: the use of different types of health outcomes in analyses of inequalities between places; the use of summary measures of inequality; the measurement of both individual socio-economic status, and area-based socio-economic deprivation (including the concept of deprivation, and crucial issues related to its measurement such as spatial scale), and the use of both measures in inequalities related research;

- summarised the most relevant evidence relating to ‘excess’ poor health in Scotland and Glasgow compared to elsewhere in the UK: in doing so, the chapter emphasised the considerable evidence for this, particularly in relation to ‘unexplained’ higher mortality, based on analyses of both area-based deprivation and individual measures of socio-economic status; with evidence that the excess is increasing over time, the need to understand the causes is greater than ever.

- summarised the most significant aspects of the policy response to health inequalities in Scotland and the UK, and highlighted inadequacies in tackling the economic drivers of health inequalities as reasons for the spatial polarisation in the UK that has taken place in recent times.

All of the above provides important context for the subject matter of this thesis. An understanding of the main influences on health (including their interaction and impact in the places people live), how they are measured (and the extent to which such measurements can 'explain' Scotland's relatively higher mortality), together with a story of widening health inequalities in the UK in recent decades that has left Glasgow in particular 'isolated' at one extreme end of a gradient, all set the scene for the analyses that follow. The next chapter will build on this knowledge to outline the specific aims and objectives of the research described in this thesis.

Chapter 3. Aims and research questions

Chapter 2 reviewed the research to date on the notion of 'excess' mortality in Scotland and Glasgow in the context of other relevant health and health inequalities research. Following on from that, this brief chapter outlines the principal aims and research questions of the research presented within this thesis. The methods employed for each of the latter are described in detail in Chapter 4.

As stated at the end of Chapter 1, these analyses seek, first of all, to compare mortality and one of its principal determinants, socio-economic deprivation, between Glasgow and, in particular, the English cities of Liverpool and Manchester; and then, second, to explore some of the proposed explanations for Glasgow's 'excess' levels of poor health. In more detail, the aims of the research are as follows:

- To establish a comparable 'three city' small-area based measure of deprivation for Glasgow, Liverpool and Manchester to enable detailed analyses of levels of deprivation between, and across, the cities.
- To investigate the link between deprivation and mortality, including the extent to which the former currently explains differences in the latter between Glasgow and these two English cities.
- To examine historical trends in deprivation and mortality in the three cities.
- To undertake complementary analyses of the extent to which deprivation explains differences in mortality between Glasgow and the rest of Scotland, and between Glasgow and other large English cities.
- To describe the collection of new survey data relating to some of the hypotheses put forward to explain the 'excess' mortality seen in Glasgow (and for which no data were previously available).
- To undertake detailed analyses of new survey data to assess the extent to which relevant differences between, and within, cities, are evident.
- To assess the potential policy implications of the research findings.

In the light of these aims, the specific questions the research seeks to answer are:

1. How comparable are the deprivation profiles of Glasgow, Liverpool and Manchester?
2. Controlling for differences in area-based deprivation, how do the health (mortality) profiles of the three cities compare?
3. If there is evidence of higher mortality in Glasgow, is this restricted to certain sections of the population, or is it a city-wide effect?
4. Are there differences between the cities in relation to particular causes of death?
5. At the city level, what do historic trends in deprivation and mortality show?
6. To what extent does the employed measure of deprivation explain differences in mortality between Glasgow and the rest of Scotland, and between Glasgow and other large English cities?
7. What explanations have been proposed to explain any additional poor health seen in Glasgow?
8. What can new population survey data tell us in regard to some of the more plausible hypotheses that have been put forward to explain Scotland's and Glasgow's 'excess' mortality?
9. Using new survey data, and appropriate statistical methodologies, can we show significant[lxx] differences between the three cities for any of these newly measured factors (and while controlling for a range of area-based and individual characteristics)?
10. What are the potential policy implications of the results of the research?

As stated above, the methodology employed to answer these research questions are described in detail in the next chapter.

[lxx] For simplicity and readability, the thesis uses the term 'significant' to describe differences between values that appear meaningful in a statistical sense i.e. where results from statistical modelling are associated with a p value of less than 0.05, or – more simplistically – where two sets of 95% confidence intervals around mean values or percentages do not overlap. However, as many statisticians would point out, the latter does not always imply statistical significance; furthermore, and more fundamentally, some commentators have argued strongly that the 'arbitrary division of results' into 'significant' and 'non-significant' on the basis of p values is unhelpful, and instead significance 'should be interpreted in the context of the type of study and other available evidence'[515]. However, all the results presented in the thesis are ultimately assessed and interpreted in terms of the entirety of the data collected and analysed, rather than in terms of individual p values or percentages from single comparisons of values.

Chapter 4. Methods

This chapter details the methods employed to answer the research questions listed in the previous chapter. It does so under a series of general headings, within which the specific research questions have been listed.

It is important to note that all the analyses included within this thesis were carried out by the author. However, some aspects of the research which are described (for example, the commissioning of the 'three-city' survey) were undertaken in collaboration with others. Where this has been the case, this is clearly noted below; furthermore, Appendix I lists each component of the research included within this thesis, alongside details of all those who were involved, and their particular contribution.

It should also be noted that the first part of the research (analyses of deprivation and mortality) began in late 2009 (and was published in a peer-reviewed journal in 2010[516]), and thus is based on analyses of data that were the most up to date at that point. The survey data (the focus for the second part of the research) were collected in 2011 and analysed in 2012.

4.1 Literature review

As stated at the beginning of Chapter 2, much of the material on which the literature review was based had been amassed over the course of the author's working life in the past 20 years. This was all re-examined and assessed in terms of potential relevance. However, it was clearly important to ensure that no other relevant material was overlooked. Thus, additional searches of the MEDLINE and Embase literature databases were undertaken[lxxi], alongside internet searches (Google and Google Scholar). Initial searches were of abstracts; where the number of results was excessive, or where that appeared inappropriate (for example in specifically searching for key reviews or overviews of a topic), searches of titles were undertaken instead. The details of these are summarised briefly below under the six main headings of Chapter 2: what determines good or bad health among populations; inequalities in health and its determinants; health and place; measuring health, inequalities in health, and the drivers of inequalities in health; 'excess' poor health in Scotland and its largest city,

[lxxi] Medline from 1946 to 2011; Embase from 1974 to 2011.

Glasgow, in comparison to elsewhere in the UK and the rest of Europe; the policy context for health and health inequalities in Scotland and the UK[lxxii].

4.1.1 What determines good or bad health among populations?

Prior knowledge of relevant landmark papers and reports, and wider reading[lxxiii], was supplemented through these specific searches of the literature databases:

- *("social model" and health).ab*
- *("socio-ecological" and health).ab*
- *("medical model*" and ("social model*" or "socio-ecological model*")).ab*
- *"models of health".m_titl*
- *"social determinants".m_titl*

Some of these searches resulted in overly-large numbers of results (e.g. *"social determinants".m_titl* produced approximately 750 after removal of duplicates, *"models of health".m_titl* produced 180 after duplicates removal). However, all results were scanned for any relevant material.

Similar searches were undertaken in Google and Google Scholar, with approximately the first 50 checked.

4.1.2 Inequalities in health and its determinants

A huge amount of relevant material had already been collected through previous research endeavours. After review, these were supplemented through the following general searches:

- *((health or mortality or morbidity) and inequal* and (area* or geograph* or region* or city or cities or urban or spatial* or place or depriv* or socio-economic)).ab*

[lxxii] Note that the literature review was undertaken between 2011 and 2012. However, a small number of key papers identified after that period were later added to the discussion in Chapter 2.
[lxxiii] For example: from co-authoring a journal paper on the 'information needs' of the WHO's 'Health for All' goal within a Scottish context, and more generally authoring and co-authoring many reports and journal papers describing analyses presented explicitly within the context of an understanding of health and its broad determinants; knowledge of relevant WHO publications and programmes of work such as the Commission on Social Determinants of Health (and from being a member of WHO's Scientific Group on Equity Analysis and Research); knowledge of some of the most commonly discussed models of health such as those of Evans & Stoddart, and Whitehead & Dahlgren; knowledge of policy documents relevant to understanding of the determinants of health specifically within a Scottish context. All these examples, and more, are referenced in Chapter 2.

- *(health and inequalit* and (spatial* or area*) and (review* or summar* or overview*)).ab*

The first of these was refined through removal of duplicates, specification of English language only and mention of at least one of the UK countries. However, this still resulted in over 700 results, from which just over 200 were deemed relevant, and which were checked further. The second was an attempt to look specifically for reviews of health inequalities research: only a small number of the results were deemed relevant. A number of both sets of results were relevant to the other headings below.

4.1.3 Health and place

Aside from previously known and collected studies, a considerable amount of material from the first of the two 'inequalities' searches above was also relevant to the topic of health and place. Additional searches were also undertaken, both for overviews and reviews of the topic, and more specifically for the sub-topic of 'urban health':

- *(health and (place or area or neighbourhood or neighborhood) and (review* or summar* or overview* or evidenc*)).ti* – approximately 70 results were returned;
- *(health and (urban or city or cities or metropolitan)).m_titl* - from an initial 10,000+ results, restrictions to relevant British studies resulted in around 250 studies, a number of which were relevant;
- *(health and urban and (review* or summar* or overview* or evidenc*)).ti* - a small number of relevant studies were identified.

4.1.4 Measuring health, inequalities in health, and the drivers of inequalities in health

A number of different aspects of measurement were included under this heading (e.g. measurement of area vs. individual effects (also directly relevant to the 'health and place' review), measurement of deprivation) and, again, after a review of previously collated material, the following supplementary searches were carried out:

- (*health and inequal* and measur*).ti* - this resulted in approximately 100 results, of which 10 were deemed relevant and previously unknown;
- *((measur* or estimat* or calibrat*) and (depriv* or poverty or poor or income or wealth or socio-economic)).m_titl* - this, title-based, search resulted in just under 600 results, of which around 50 were deemed relevant; a previous search of the same terms but for abstracts produced more than 180,000 results (hence the subsequent title search);
- *(individual and area).m_titl* - around 160 results, of which approximately 30 were of potential relevance;
- *(individual and area and Scot*).ab* – this was a search for specifically Scottish studies, but very few were found;

4.1.5 'Excess' poor health in Scotland and its largest city, Glasgow, in comparison to elsewhere in the UK and the rest of Europe

Searches of all abstracts were made for the specific terms 'Scottish Effect' and 'Glasgow Effect'. All but one result (a letter in an Indian journal) was already known to the author. Additional searches combined excess mortality (or similar terms: (*(high* or excess or unexplained or additional or surplus or extra) and (mortality or death*)).ab.*)) with deprivation or similar terms (*(depriv* or "socio-economic" or "social class").ab.*)). This resulted in more than 800 results. Further restrictions to UK-based studies and, ultimately, to titles with the same terms ("excess" or synonyms, "mortality" or synonyms), resulted in around 20 studies. However, all the relevant results were already known to the author.

4.1.6 Health and health inequalities: the policy context in Scotland and the UK

Relevant policy material had been systematically collected by the author over many years. This was reviewed and checked against policy references included within the above literature searches, as well as with colleagues in public health in both Scotland and England. Relevant online sources (e.g. ScotPHO, the Scottish Public Health Observatory – to which the author is a contributor) were also checked to ensure the overview of relevant policy material included in this section of the literature was not weakened by any serious omissions.

4.2 Selection, and definitions of, Glasgow, Liverpool and Manchester

This is relevant to the entire research project, and therefore to almost every research question listed in the previous chapter. As is discussed in greater detail in the next chapter[lxxiv], Liverpool and Manchester were the chosen 'comparator' cities for this research. All three cities share similar histories of industrialisation and deindustrialisation, with associated urban and social characteristics and problems. Importantly, in a UK context all three also stand out in in terms of their high levels of deprivation and associated poor health: aspects of Glasgow's socio-economic characteristics and its health status have already been discussed, while Liverpool and Manchester have the highest levels of poverty and the lowest life expectancy of all cities in England[133, 445, 517].

In all the main analyses, the cities were defined by their current local authority boundaries. This was agreed at the outset of the research as being the most appropriate specification of the cities in terms of the size and character of their populations, and given the different socio-economic profiles of neighbouring localities[lxxv]. Furthermore, previous analyses by Reid (discussed in Chapter 2) showed that varying the definitions of Glasgow (i.e. by including particular neighbouring local authority areas) did not greatly alter the relative difference between Glasgow and other UK cities in health terms[445].

The only exceptions to these definitions of the cities were in relation to the use of some of the historical census, population and mortality data sets discussed further below, where slightly different boundaries had to be used. In addition, analyses of the 'Breadline Britain' data [79] (also discussed below) were based on 'data tracts' (described in Chapter 2) aggregated to 'best-fit' local authority areas.

[lxxiv] Note that for the overview of the three cities (the subject of Chapter 5), previously collated material for Glasgow was supplemented by consultation of a number of authoritative works on the histories of all three cities (and which are all fully referenced within that chapter): for example, by Maver (Glasgow), Kidd (Manchester) and Lane (Liverpool). These were supplemented by internet searches for additionally required, more specific material e.g. historic population data.

[lxxv] This was agreed by a range of individuals involved in public health research in all three cities.

4.3 Creation of a small-area deprivation measure for Glasgow, Liverpool and Manchester

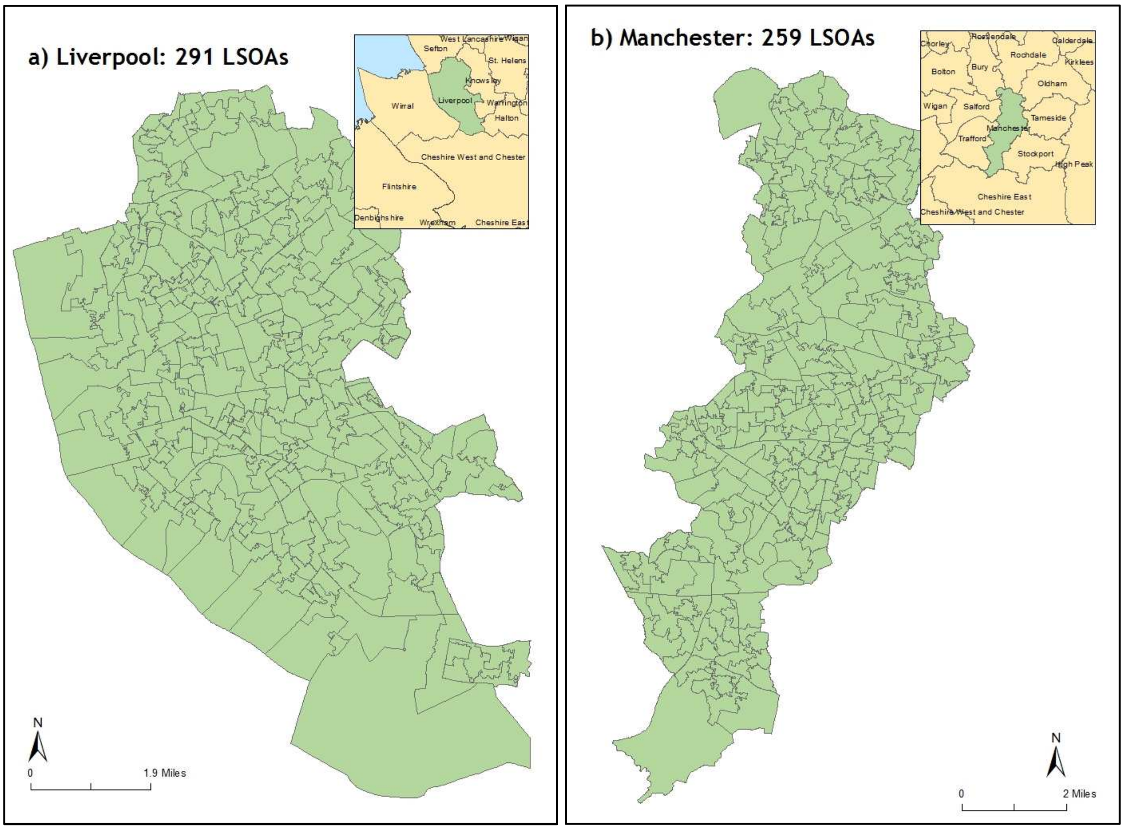
This section relates to research question 1: *how comparable are the deprivation profiles of Glasgow, Liverpool and Manchester?*

As discussed in the literature review (Chapter 2), there is no single, up-to-date, small area based deprivation measure which covers all of the United Kingdom. Instead, four different indices of multiple deprivation are used in the UK's four countries. Although very similar in nature, each index uses differently defined data components, and (with the exceptions of England and Wales) is based on sets of differently-sized small areas. These different measures, therefore, are not comparable. Thus, a new 'cross-border' index was required to enable an accurate comparison of levels of deprivation in the three cities of Glasgow, Liverpool and Manchester.

4.3.1 Spatial scale

As also outlined in Chapter 2, the smallest geographical unit of analysis for routinely available (and up to date) measures of deprivation in England is the so-called 'Lower Super Output Area' (LSOA), an administrative geography used in England and Wales with an average population size of approximately 1,500 people (and the geography at which the (English) Index of Multiple Deprivation data are published). This, therefore, was the smallest geography for which the required deprivation, mortality and population denominator data (all discussed further below) could be obtained. Liverpool is made up of 291 such LSOAs, with an average population size of 1,502 people; Manchester is made up of 259 LSOAs, with an average population size of 1,717. These are shown in Figure 4.1 (a and b).

Figure 4.1. Lower Super Output Areas (LSOAs) in: a) Liverpool and b) Manchester[lxxvi]



In Scotland, LSOAs are not used. Instead, the equivalent small area administrative geography (and the geography at which the Scottish Index of Multiple Deprivation (SIMD) data are published) is the 'datazone'. With an average population size of around 750 people, datazones are approximately half the size of the English LSOAs. Thus, to enable these analyses to be undertaken on a comparable geographical basis, Geographical Information System (GIS) software (ArcGIS) was used to merge pairs of neighbouring datazones in Glasgow with similar rates of income deprivation (defined below) (while ensuring that the population size of the combined areas would be similar to the average population size of an LSOA). In this way the 694 datazones of Glasgow were transformed into 351 'merged' areas. Figure 4.2 (a and b) shows the city broken down into these two sets of areas.

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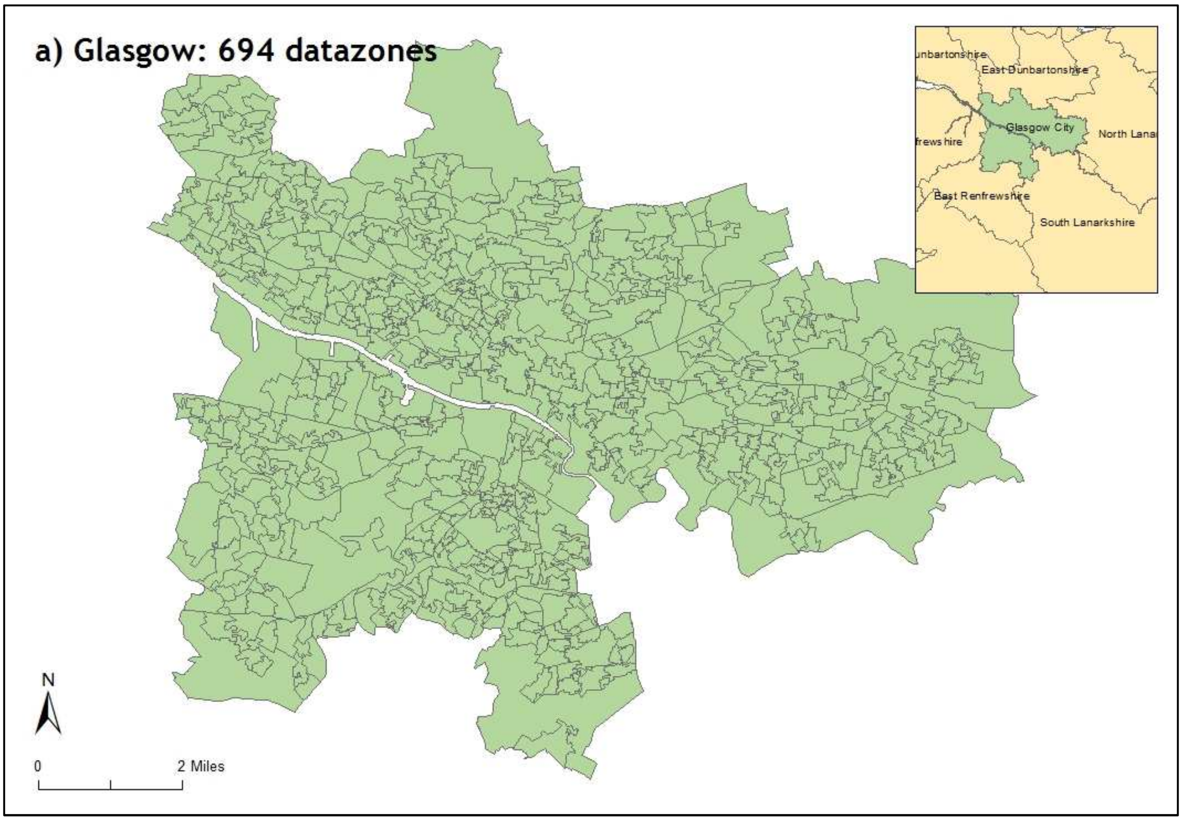
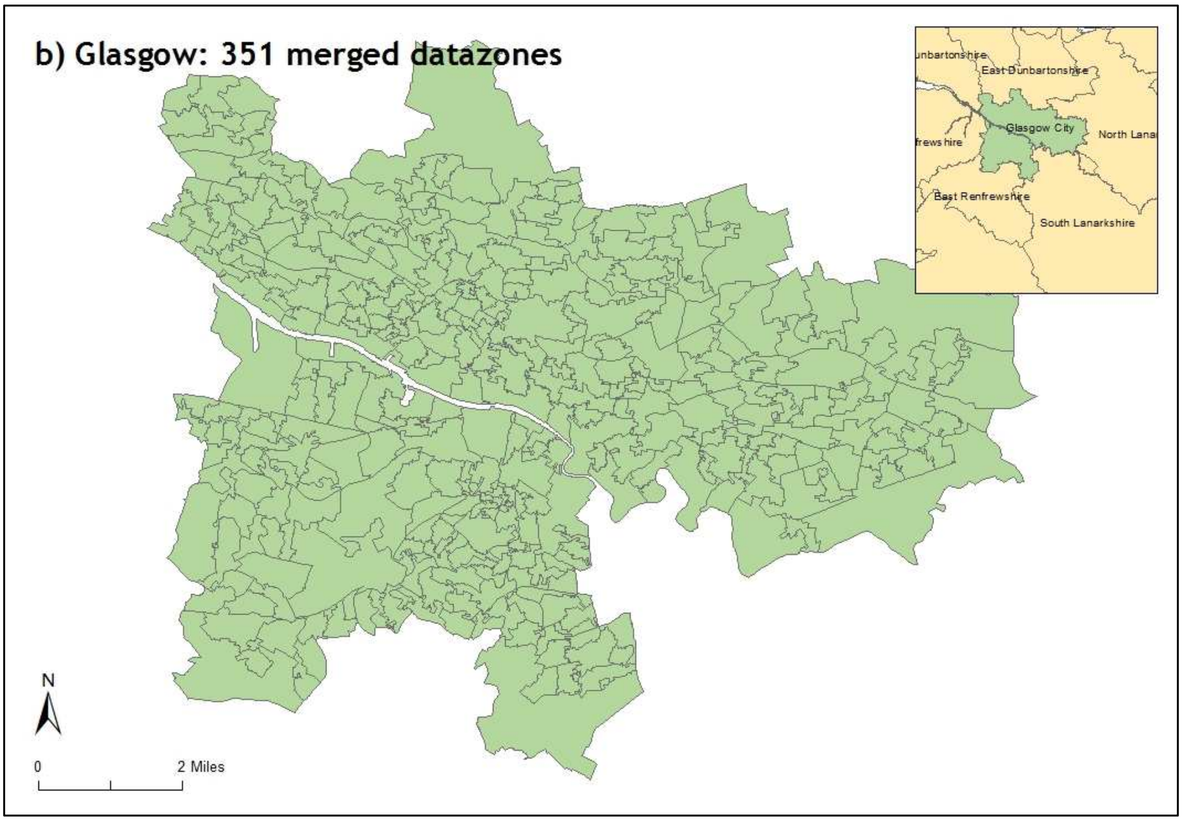
lxxvi Please note regarding the maps: this work is based on data provided through EDINA UKBORDERS with the support of the ESRC and JISC and uses boundary material which is copyright of the Crown and the Post Office. This applies to Figures 4.1 (a and b) and 4.2 (a and b).

Figure 4.2. Datazones within Glasgow City: a) original datazones and b) merged datazones





The creation of these merged areas resulted in a set of geographical boundaries which were similar in terms of population size to the LSOAs in Liverpool and

Manchester. As stated above, the average population size of LSOAs in Liverpool and Manchester is approximately 1,500 and 1,700 respectively; the equivalent size of the Glasgow merged datazones is around 1,650. These overall figures, together with the ranges of population sizes across each of the three cities' small areas, are shown in Figures 4.3-4.5 below.

Figure 4.3

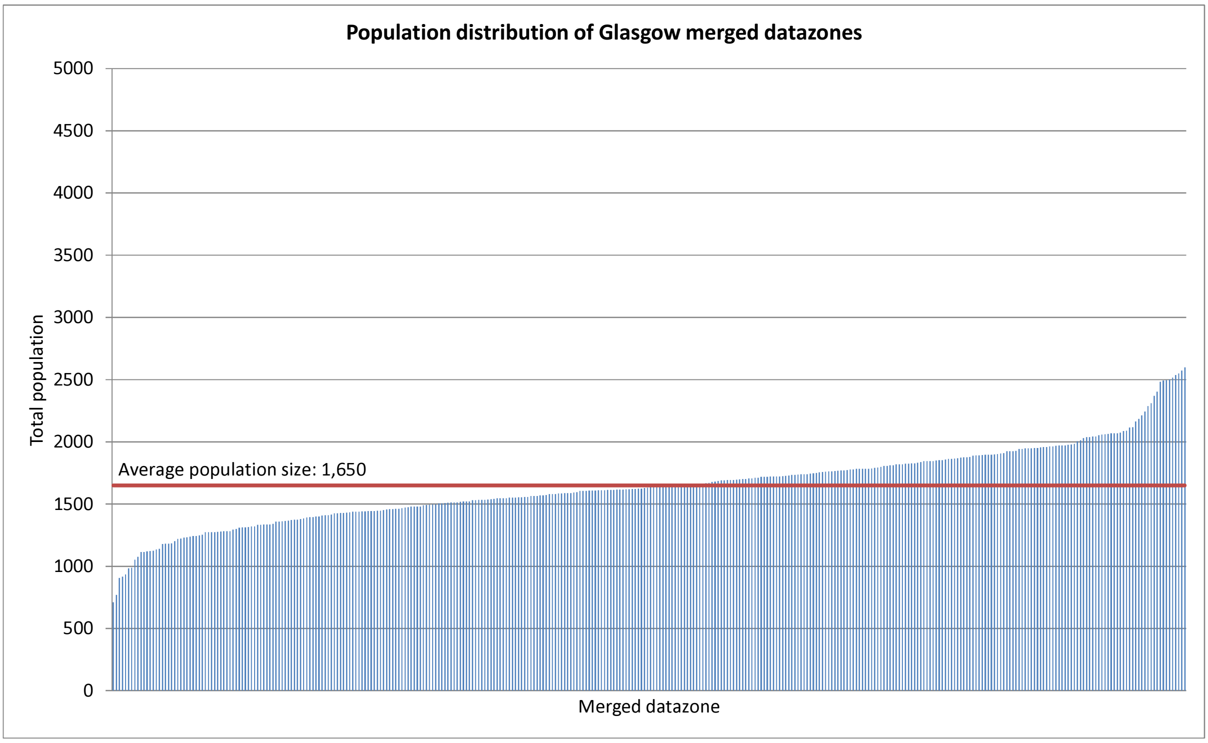


Figure 4.4

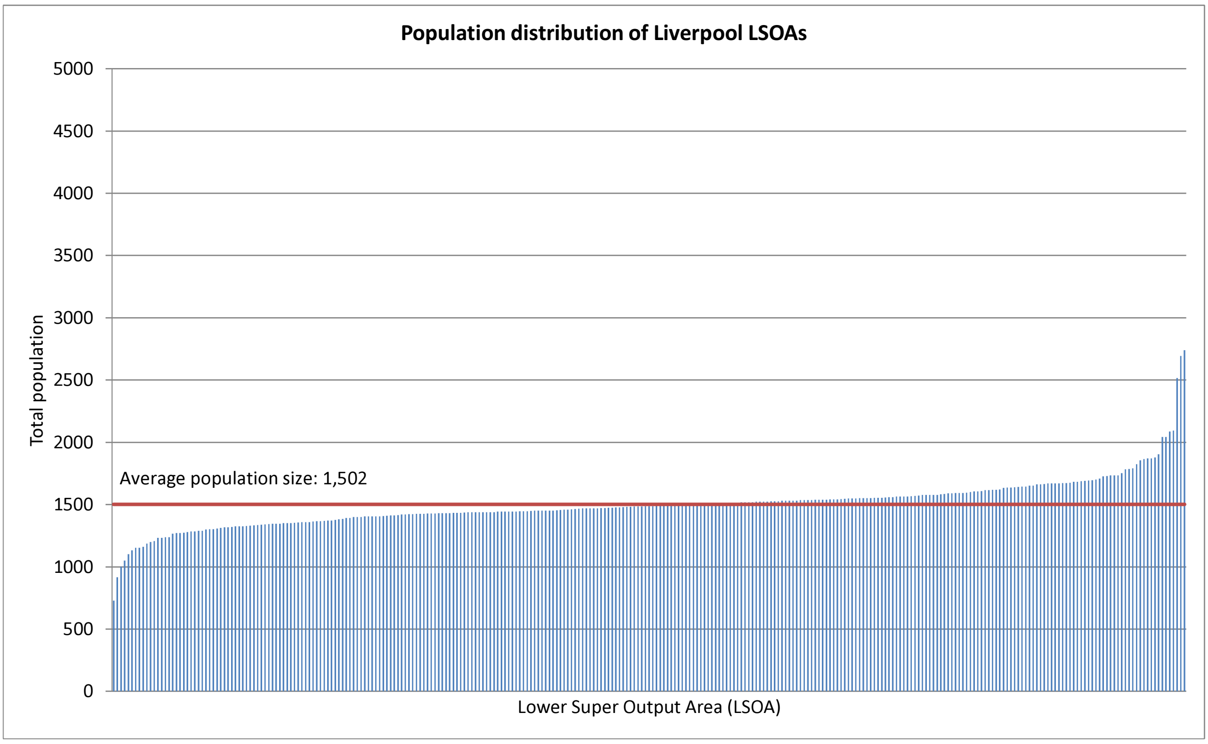
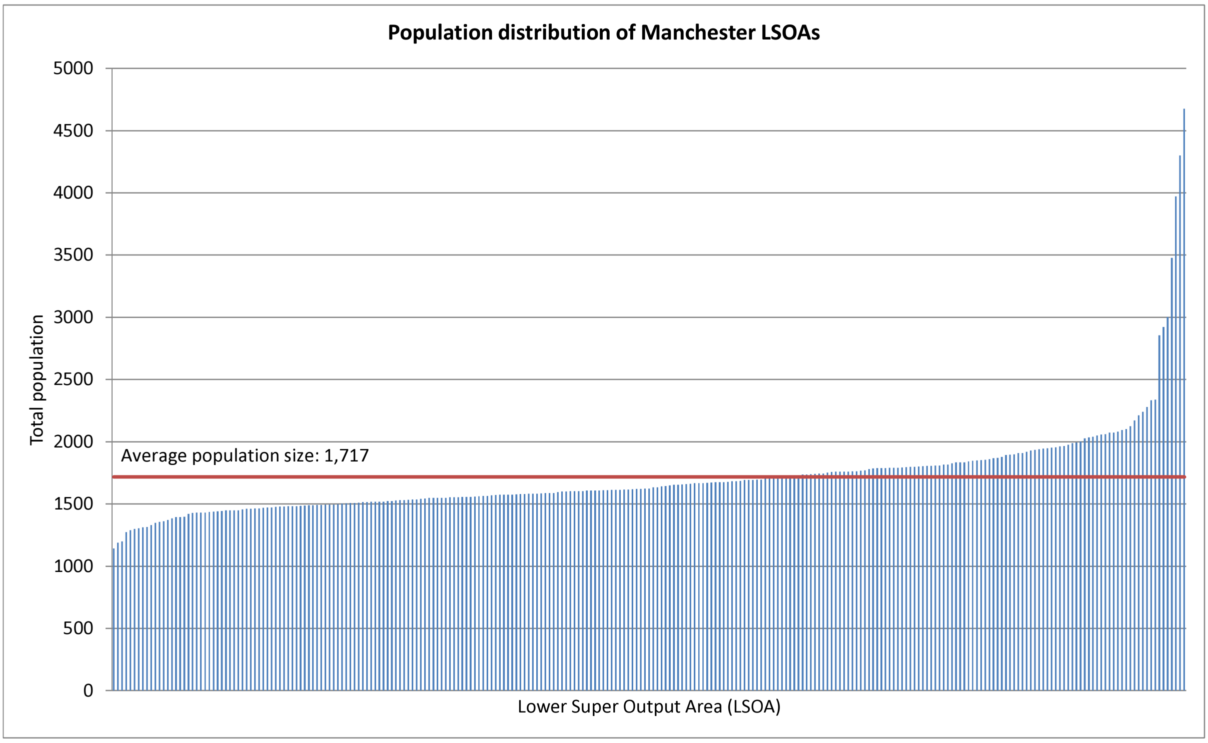


Figure 4.5



4.3.2 Income deprivation

The deprivation measure used in the analyses was 'income deprivation'. This measure is derived from Department of Work & Pensions (DWP) benefits data, and was used in the 2006 SIMD[345] – the most up to date version of the index at the time of undertaking the analyses. It is a measure of the percentage of the population in receipt of key income-related benefits in 2005, as well as children dependent on adult recipients of those benefits. The full components of income deprivation are as follows:

- number of adults (aged 16-59) receiving Income Support (April 2005);
- number of adults (aged 60+) receiving Guaranteed Pension Credit (May 2005);
- number of children (aged 0-15) dependent on a recipient of Income Support (April 2005);
- number of adults receiving (all) Job Seekers Allowance (April 2005);
- number of children (aged 0-15) dependent on a recipient of Job Seekers Allowance (all) (April 2005).

The overall income domain score is derived from a simple sum of the above indicator counts divided by the total population. There is no overlap between the indicators, thus the resulting domain score is the percentage of the total population affected by income deprivation.

Scottish data were obtained from the SIMD website at datazone level, and recalculated for each ‘merged’ area. Identical data for each LSOA in Liverpool and Manchester were obtained from DWP.

It is important to note that this measure of deprivation is highly correlated with both the overall SIMD (R=0.98 for Glasgow areas) and, for Liverpool and Manchester, the English Index of Multiple Deprivation[519] (R=0.97). These correlations are shown in Figures 4.6 and 4.7 below. Thus, income deprivation was judged to be a good proxy for multiple deprivation, as measured in both Scotland and England.

Figure 4.6

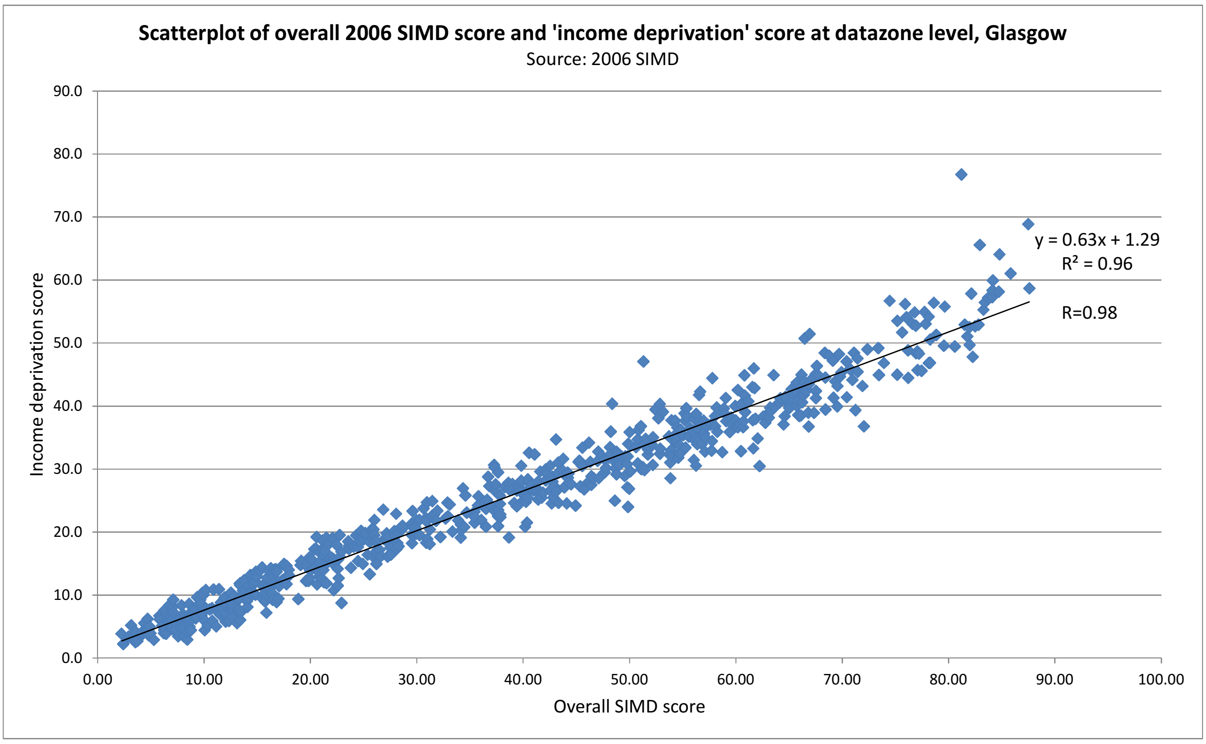
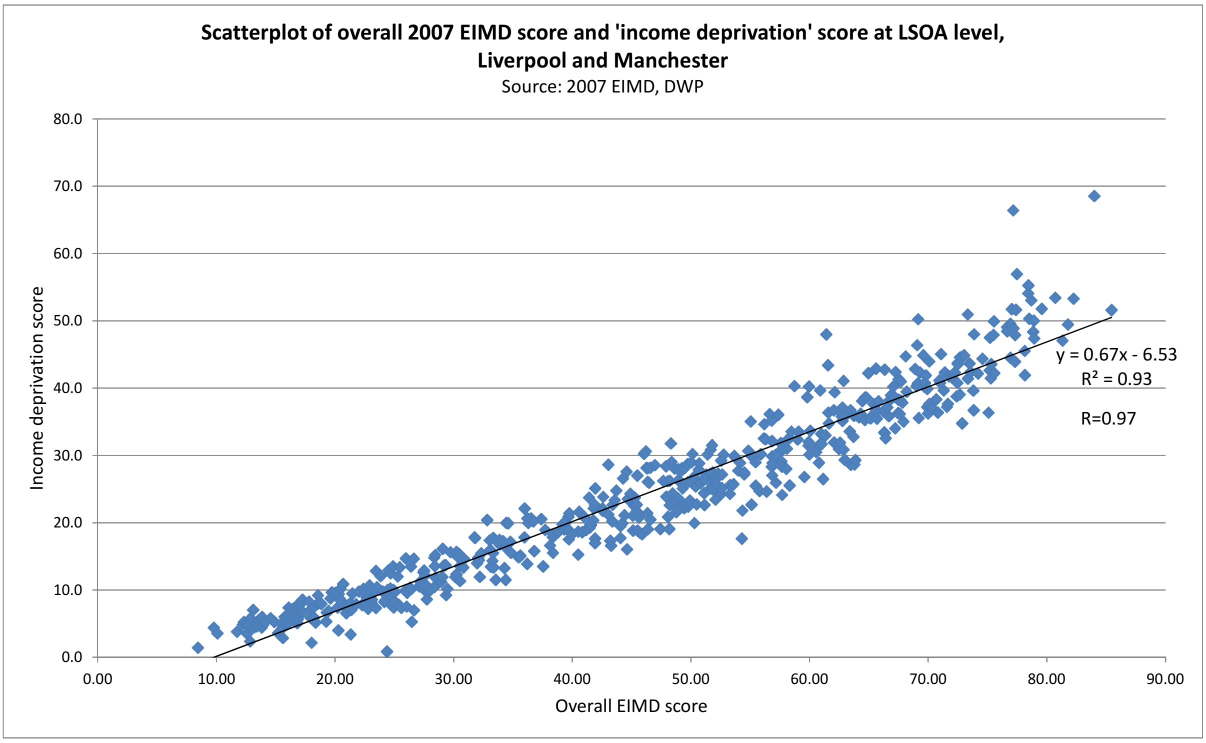


Figure 4.7



With these deprivation data assembled for each Glasgow merged datazone and Liverpool/Manchester LSOA, a three-city deprivation index was created. From this, population-weighted deprivation deciles were created (used principally for the purposes of mortality standardization (described below)). Thus, all small areas across the three cities were ranked according to the percentage of the population classed as deprived in each, and deciles were then assigned to each area (while ensuring that each decile included 10% of the total population of the three cities combined). It should be noted that, separately and solely for the purposes of comparison of the cities' deprivation profiles, individual *city-specific* sets of deprivation deciles (i.e. one set each for Glasgow, Liverpool and Manchester) were also created. However (and as is discussed in more detail in the relevant results chapter (Chapter 6)), in fact the deprivation profiles of the cities are so similar that there was little difference between the three-city set of deciles, and the three, separate, city-specific sets of deciles: areas were ranked (and assigned a decile) similarly in both.

The three city-specific sets of deciles were used to compare the distribution of deprivation in each city. This was done, first, by means of comparing levels of deprivation in the most and least deprived deciles by means of a ratio of most deprived:least deprived decile. Second, regression lines were drawn across the deciles in each city, with the slope of each line measured.

4.4 Analyses of deprivation and mortality data for Glasgow, Liverpool and Manchester.

This section relates to research questions 2, 3 and 4 i.e.:

- *Controlling for differences in area-based deprivation, how do the health (mortality) profiles of the three cities compare?*
- *If there is evidence of higher mortality in Glasgow, is this restricted to certain sections of the population, or is it a city-wide effect?*
- *Are there particular differences between the cities in relation to particular causes of death?*

Mortality data for each small area[lxxvii], five-year age band, gender and a range of causes were obtained for the period 2003-2007 from the General Register Office for Scotland (GRO(S))[lxxviii] for Glasgow, and for Liverpool and Manchester, from

[lxxvii] i.e. LSOA for Liverpool and Manchester; merged datazone for Glasgow.
[lxxviii] Renamed in 2011 the National Records of Scotland (NRS), following their merger with the National Archives of Scotland (NAS).

the Office of National Statistics (ONS). Matching population data were obtained from the same sources.

Standardised mortality ratios (SMRs) were calculated for Glasgow relative to Liverpool and Manchester, indirectly standardising for age, sex and income deprivation decile (of the three cities). The SMRs compare Glasgow's actual ('observed') deaths with the figure that would be 'expected' if Glasgow experienced the same mortality profile as Liverpool and Manchester. The latter 'expected' figure is derived from applying Liverpool & Manchester's age/sex/deprivation specific crude mortality rates to Glasgow's age/sex/deprivation specific population (and summing the resulting values). The ratio is expressed as the summed 'observed' figure divided by the summed 'expected' value.

Analyses were undertaken for Glasgow relative to Liverpool and Manchester separately, and also relative to the two English cities combined. There was little difference in the results, and thus the results of the latter set of analyses are presented in Chapter 6. However, the results from the individual comparisons with Liverpool and Manchester are included in Appendix II.

Separate analyses were undertaken by age (0-14, 15-44, 45-64, 65+), gender, deprivation decile and cause of death. The latter included all causes, plus: all malignant neoplasms (defined by ICD10 codes C00-C97); lung cancer (malignant neoplasm of trachea/bronchus/lung) (ICD10 C33-C34); diseases of the circulatory system (I00-I99); external causes (V01-Y98)[lxxix]; suicide & self-inflicted injury (including undetermined intent) (X60-X84; Y10 -Y34); alcohol-related mortality (as defined by the agreed set of ONS and GRO(S) ICD codes[520]; and drugs-related poisonings (F11-F16, F18, F19, X40-X44, X60-X64, X85,Y10-Y14), the drugs-related grouping deemed to be most comparable between Scotland and England[521].

4.5 Historical trends in deprivation and mortality

This is the subject of research question 5: *at the city level, what do historic trends in deprivation and mortality show?*

[lxxix] 'External causes' is a grouping of ICD codes which includes: accidents, intentional self-harm (suicide), assault, complications of medical and surgical care, and other external causes of accidental injury (e.g. drowning, exposure to fire, poisoning).

Historical census data were obtained from a range of sources: ISD Scotland for the period 1981-2001[lxxx], UK Data Service Census Support for 1971 data[522], and the University of Portsmouth and the Great Britain Historical GIS Project[523] for the period 1951-2001. Distributions of 1971 overcrowding and unemployment data were analysed by means of city-specific deciles (using data for 1971 census enumeration districts (EDs)), and based on the same methodology discussed in section 4.3.2 for the analysis of income deprivation data[lxxxi]. Historical mortality and population data were obtained from the SASI Research Group at Sheffield University[524], from which age-standardised premature (<65 years) mortality rates were calculated for males and females in the three cities from 1921/25 to 2001/05 (with a gap between 1936/39 and 1969/73, due to unavailability of data).

Data on households classed as 'core poor' for the period 1970-2000 were derived from SASI's 'Breadline Britain' analyses[79]. Note that the Portsmouth University data, and the mortality and population data from Sheffield, used city boundaries that are very slightly different from the current local authority boundaries[lxxxii].

4.6 Comparisons with elsewhere in Scotland, and with other English cities

This relates to research question 6: *to what extent does the employed measure of deprivation explain differences in mortality between Glasgow and the rest of Scotland, and between Glasgow and other large English cities?*

Given the results of the analyses of mortality and deprivation in the three cities, it was of interest to know what similar analyses would show for Glasgow in relation to other, less deprived, English cities.

Birmingham, Leeds, Sheffield and Bristol were chosen as the comparator cities. Aside from Liverpool and Manchester, these are four of the largest English cities

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[lxxx] These data originated from GRO(S) and ONS, but were made available, with permission, by ISD Scotland.

[lxxxi] Enumeration districts (EDs) are administrative geographies used for historical census data. Their size varies between Scotland and England: this is discussed in Chapter 6. Deciles were again population weighted. For analyses of unemployment, the population denominator was the male economically active population in each ED; for overcrowding, the population denominator was the number of households in each ED.

[lxxxii] The historical mortality and population data obtained from SASI at Sheffield University were derived at what was described as 'county burgh' level: however, in the case of Glasgow, Liverpool and Manchester, these are actually very similar to current local authority boundaries[525]. Data from University of Portsmouth/Great Britain Historical GIS Project are based on older districts aggregated to approximate current local authority boundaries[526].

outside London[527]. From previous analyses they were known to differ considerably in terms of their overall levels of deprivation[445], and thus to provide a more varied basis for analysis than (as will be shown in Chapter 6) the very similarly deprived cities of Glasgow, Liverpool and Manchester.

'Income deprivation' data identical to those used in the main analyses were obtained from DWP for each LSOA; matching population and mortality (all-cause only) data were obtained from ONS. As with the three-city analyses, deprivation data were from 2005; mortality data from the period 2003-2007.

Analyses were carried out in an identical fashion to those undertaken for Glasgow, Liverpool and Manchester. Thus, a five-city deprivation index was created (combining the small areas of Glasgow with the LSOAs of the four English cities), and all-cause SMRs for Glasgow in relation to the other four cities were calculated, indirectly standardising for five-year age band, sex and income deprivation decile. For contrast, similar SMRs were calculated, standardising for age and sex only.

It was also of interest to know whether, using the same measure of income deprivation, there was evidence of 'excess' mortality for Glasgow compared to elsewhere in Scotland, rather than just in comparison to other English cities. As mentioned in Chapter 2, previous analyses suggested that Glasgow's higher rates of *all-cause* mortality in relation to elsewhere in Scotland could be explained by its higher levels of deprivation[468]. However, those analyses were based on different statistical methodologies, on a different measure of deprivation (Carstairs & Morris) calculated at a considerably larger spatial scale[lxxxiii], and in relation to the 'Greater Glasgow' area, rather than the local authority area of Glasgow City (which is the basis for all analyses reported here).

To investigate this, identical methodologies were employed as those described above, but with one significant exception. As only Scottish comparisons were required, all calculations were based on datazones, rather than merged datazones and LSOAs. This, therefore, provided a considerably more spatially sensitive geographical unit of analysis.

[lxxxiii] Postcode sectors, as discussed in Chapter 2.

All-cause SMRs were calculated for Glasgow City relative to the rest of Scotland, indirectly standardising for (a) age and sex, and (b) age, sex and all-Scotland deprivation decile.

The results of all the analyses outlined in section 4.3 to 4.6 above are presented in Chapter 6.

4.7 Potential explanations for ‘excess’ poor health in Glasgow.

This relates to research question 7: *what explanations have been proposed to explain any additional poor health seen in Glasgow?*

As described in more detail below, Chapter 7 presents analyses of survey data, collected in 2011, relating to three hypotheses that have been proposed to explain Glasgow’s higher levels of mortality compared to Liverpool and Manchester (and by extension, the higher mortality seen in Scotland as a whole compared to the rest of the UK). These are just three of the many potential explanations that have been suggested. These many suggestions have been proposed via books[528], peer reviewed journals[529-534], official government reports[535,536], invited commentaries[537], personal communications, and in discussion at numerous events where evidence of Scottish excess mortality had been presented by the author. A considerable number of these were prompted by the publication of the analyses of deprivation and mortality in the three cities (described above and in Chapter 6, and published in 2010[516]). An attempt to summarise and assess some of these many potential explanations was made in a paper co-authored by the author of this thesis, but led by Gerry McCartney of NHS Health Scotland (NHSHS)[538, 539]. This work identified no fewer than 17 separate hypotheses that had been proposed by the point of publication (and which are discussed briefly in Chapter 8). The paper categorised the hypotheses into five categories: artefactual, ‘downstream’, ‘midstream’, ‘upstream’, and genetic. For some theories (e.g. ‘upstream’ explanations such as differences in income inequalities, or ‘downstream’ explanations such as prevalence of particular health behaviours), evidence already existed in the literature, or data were already available, by which it was possible to assess their plausibility. For other hypotheses, however, no data were available by which they could be tested, or at least examined in more detail. These included seven sets of hypotheses for which new data were collected in a population survey, the details of which are provided below. As mentioned, analyses of three of these new sets of data are presented within the thesis.

4.8 Collecting and analysing new data from a survey of the populations of Glasgow, Liverpool and Manchester.

This section relates to research question 8 and 9:

- *What can new population survey data tell us in regard to some of the more plausible hypotheses that have been put forward to explain Scotland's and Glasgow's 'excess' mortality?*
- *Using new survey data, and appropriate statistical methodologies, can we show significant differences between the three cities for any of these newly measured factors (and while controlling for a range of area-based and individual characteristics)?*

Some of the hypotheses deemed (in the paper by McCartney *et al*) as potentially plausible, but for which no existing evidence or data could be identified, subsequently became, and in some cases still are, the subject of specific research projects: these are discussed briefly in the final chapter of the thesis. For others new data were collected by means of a bespoke population survey. This was funded jointly by the Glasgow Centre for Population Health (GCPH) and NHSHS, and commissioned to an external company (AECOM Social and Market Research[540]) by the latter. The process entailed a number of different components, and involved a number of different people[lxxxiv], and is summarised here under the following headings: questionnaire design; ethical approval; survey design and implementation; comparisons with other data; and statistical analyses.

4.8.1 Questionnaire design

The overall aim was to carry out a representative survey of the populations of Glasgow, Liverpool and Manchester by means of which new data could be collected relating to some of the more plausible hypotheses that had been proposed. As mentioned above, data for seven such hypotheses were collected in

[lxxxiv] As stated, Appendix I summarises each person's role, and clarifies the precise contribution of the author of thesis to the process.

the survey: however, analyses of only three such sets of data are included within this thesis. This is principally to ensure that the thesis is of a manageable length. In addition, the three sets of selected data are those which, arguably, related most clearly to their associated hypotheses in terms of using the most relevant, and previously validated, question sets and scales. Results of the analysis of the data relating to the other hypotheses are referred to briefly in Chapter 8.

The three hypotheses are discussed in more depth in Chapter 7. A brief outline of each is presented here principally for the purpose of describing the questionnaire design. The hypotheses were:

- **There is a lower 'sense of coherence' among Glasgow's population.** Antonovsky's concept of 'sense of coherence' (SoC)[541,542] relates to the extent to which individuals are 'resilient' to the impact of stress on their health and wellbeing. It has three components – comprehensibility, manageability and meaningfulness (of life) – and has been shown in the research literature to be significantly and independently associated with a number of health outcomes (particularly mental health). It has been hypothesised by some (including within Scottish Government reports) that a lower sense of coherence among Glasgow's population might explain aspects of its poorer mortality profile[535,536]. Elements of this hypothesis overlap with other proposed theories: for example, the 'meaningfulness' component of the SoC scale used in the survey has also been used as a measure of people having 'purpose in life', or caring about what happens – which links to other hypotheses around psychological outlook (discussed below), as well as the notion of 'anomie' (discussed briefly in Chapter 2, and further in Chapter 8).
- **Social capital is lower in Glasgow than in the other cities.** As discussed in Chapter 2, social capital (related to the idea of social connectedness, and the value of social networks) is a complex topic, involving a number of different components and which, therefore, has been defined and measured in a number of different ways. However, there is a considerable amount of evidence linking social capital to health outcomes. For this reason it has been hypothesised that social capital may be lower in Glasgow than in Liverpool and Manchester, thereby helping to explain the

city's higher mortality rates in comparison to the two English cities. To the author's knowledge, no comparable data on social capital have ever been collected previously for these three cities.

- **Glasgow's population is characterised by different individual 'values' compared to those of cities such as Liverpool and Manchester.** It has been suggested that differences in such 'values' would influence health behaviours and choices and, therefore, ultimately health outcomes. This 'values' thesis embraces a number of overlapping concepts. One of these is psychological outlook, specifically that people in Glasgow are associated with lower level of **optimism** and hope for the future (thereby influencing their current behaviours). This the particular hypothesis examined within the thesis. Another component of the individual values thesis is that people in Glasgow are more individualistic. As will be discussed in more detail in Chapter 7, the measure of individualism included in the survey overlaps considerably with the measurement of some aspects of social capital.

The three hypotheses above are the subject of the analyses presented in Chapter 7. The other hypotheses (or other components of hypotheses) for which data were collected in the survey, but the analyses of which are not presented in this thesis were: that Glasgow's poor health has been influenced by the effects of historical UK and local government policy (the 'political attack' or 'political effects' thesis); that levels of social mobility are lower in Glasgow; that there is evidence of 'anomie' (or boundlessness and alienation) among Glasgow's population; that Glasgow's health profile is influenced by more adverse early years experiences compared to the other cities' populations. In addition, the other components of the 'individual values' thesis for which data were collected in the survey were: further aspects of psychological outlook, i.e. that Glaswegians have lower aspirations than residents of the other UK cities; hedonism (there is a more hedonistic culture in Glasgow compared to elsewhere); time and risk 'preferences' (that Glaswegians are more 'present-oriented', placing relatively less value on future outcomes, and are more risk seeking). These are all discussed briefly in Chapter 8, alongside some of the other hypotheses that have been proposed to explain Scotland's and Glasgow's excess mortality.

A review of existing survey questions and scales was undertaken to identify the best means of capturing these various hypotheses[lxxxv]: wherever possible, the aim was to use previously validated question sets and scales.

The questionnaire was piloted by AECOM in all three cities prior to implementation.

Table 4.1 below lists the scales/question sets used to measure the three hypotheses outlined above. In all cases, the measures used are discussed in more detail in Chapter 7.

Table 4.1 Survey questions/scales and associated hypotheses

Hypothesis	Questions/scales used in the survey
Lower sense of coherence	• Antonovsky's 13-item 'Sense of Coherence' scale (SOC-13)[542,543] was used. The 13 questions (shown within Appendix V) are scored from 1 to 7 from which a total SoC score is derived from each respondent. Five of the questions are reverse-coded in the analysis to ensure that in all questions a higher score equates to a higher SoC[lxxxvi]. Five questions make up the 'comprehensibility' sub-scale (2, 6, 8, 9, 11). The 'meaningfulness' sub-scale is derived from four questions (1, 4, 7, 12). The remaining questions (3, 5, 10, 13) make up the 'manageability' sub-scale.
Lower social capital	• An expanded version of the Office for National Statistics (ONS) core 'Social Capital Harmonised Question Set'[544] [lxxxvii] was used, covering the five core areas of:

[lxxxv] This was initially led by Ruth McLaughlin of GCPH, alongside: the author of this thesis; Gerry McCartney (NHS Health Scotland); Phil Hanlon (University of Glasgow); and Carol Tannahill (GCPH). Contributions were also made by Sarah McCullough (NHSHS) and Russell Jones (GCPH). Appendix I includes full details of each person's involvement.

[lxxxvi] For example Question 1 in the scale is: 'Do you have the feeling that you don't really care about what goes on around you?', with possible answers ranging from 1 ('Very seldom or never') to 7 ('Very often'). These scores are reverse coded so that 7 equates to 'Very seldom or never' (an indication of high SoC) and 1 equates to 'Very often' (indicating low SoC). The questions that are reverse-coded are 1, 2, 3, 7 and 10.

[lxxxvii] The 'core' ONS questions were all included, as well as a selection of questions from the broader ONS set. However, a small number of questions from other surveys were added to collect further information on the five topic areas listed.

Hypothesis	Questions/scales used in the survey
	1. views about the local area (this includes a series of questions regarding potential problems (e.g. vandalism, litter, alcohol/drugs use, racism, troublesome neighbours) faced by people in their neighbourhood); 2. civic participation (e.g. questions regarding whether people have taken action to solve problems in their area); 3. social networks and support (e.g. frequency of contact with friends and neighbours, having people to turn to in a crisis); 4. social participation (e.g. questions on volunteering); 5. reciprocity and trust (e.g. questions on people doing things together/helping each other, exchanging favours, trustworthiness of people in the neighbourhood). • Some of the questions created to assess the 'political effects' hypothesis (i.e. perception of ability to influence local and national decisions) were also relevant to the *civic participation* element of social capital. • As is discussed in Chapter 7, the notion of 'religious' social capital was also considered: a modified version of the question on religious affiliation from the 2011 Scottish Census was used for this purpose. • Schwartz's 21 item Human Values Scale[545-550] was included in the questionnaire to measure a number of different 'individual values' (the analyses of most of which are not presented within the thesis). However, two of the values from Schwartz's scale were relevant to the *reciprocity & trust* element of social capital: *benevolence* and *universalism*. The *benevolence* value

Hypothesis	Questions/scales used in the survey
	is derived from questions on the perceived importance of loyalty to friends and of helping others[lxxxviii]. The *universalism* value is derived from three statements in Schwartz's scale relating to the importance of equal opportunities, tolerance and understanding of others, and care for the environment[lxxxix]. Both scores were adjusted to allow for scale use differences by individuals and groups. This follows the guidance of the European Social Survey[551] (in which the Human Values Scale is included), and of Shalom Schwartz himself, the author of the Human Values Scale[552]. Scores were also reverse-coded to aid interpretation: options that can be selected by respondents for this scale range from 1 ('very much like me') to 6 ('not at all like me'); scores were therefore reverse-coded so that the higher the score, the greater the association with the value.
Different individual values/ psychological outlook: lower optimism	• Optimism was measured using the Life Orientation Test (Revised) (LOT-R)[553]. The LOT-R scale is made up of ten statements against which respondents' level of agreement (from 'strongly disagree' to 'strongly agree') is recorded. Four of the statements are 'dummy' statements (or 'fillers') and are excluded from the overall score. Thus, the minimum score that can be calculated is 0 (representing extreme pessimism) and the maximum is 24 (representing extreme optimism). In

[lxxxviii] The *benevolence* value is derived from two statements, in relation to which respondents are asked to rate the extent to which they are similar to the person described. The statements (using here the male version of the question) are: *It is important to him to be loyal to his friends. He wants to devote himself to people close to him*; and *It's very important to him to help the people around him. He wants to care for their wellbeing.*

[lxxxix] The *universalism* value is derived from three statements, with respondents assessing the extent to which they identify with this type of person. These are (again, using the male version of the question): 1) *He thinks it is important that every person in the world should be treated equally. He believes everyone should have equal opportunities in life*; 2) *It is important to him to listen to people who are different from him. Even when he disagrees with them, he still wants to understand them*; and 3) *He strongly believes that people should care for nature. Looking after the environment is important to him.*

Hypothesis	Questions/scales used in the survey
	calculating the total score for each question, negatively-worded statements (e.g. 'if something can go wrong for me it will') are reverse-coded (i.e. 'strongly agree' is coded as 0 rather than 4) to ensure higher scores represent higher levels of optimism.

Aside from the questions listed in Table 4.1, the questionnaire also included questions on demographics (age, gender, housing tenure, length of residence, educational attainment, employment status, marital status, ethnicity and household income[xc]), health status (self-assessed health, long-term limiting illness) and smoking status (the latter included principally for use in analyses of the Time Preferences questions (not presented within this thesis)).

Note that in seeking to better understand these hypotheses, and the survey scales chosen to measure them, the author undertook a number of additional literature searches. This supplemented the work of the group that had originally identified the various survey questions and scales. Brief details of these additional searches are as follows:

- Sense of coherence: Google and Google Scholar were used to search for any systematic reviews and reviews of evidence that may have been undertaken[xci]. Approximately the first 50 results were examined resulting in a number of relevant papers being identified including systematic reviews by Eriksson and Lindstrom[554-556]. As the latter were based on research up until the end of 2003, additional searches of MEDLINE and Embase databases were undertaken for 2004-2012:
    - *"sense of coherence" and "systematic review".ab* returned 5 additional papers
    - "*sense of coherence".ab* returned almost 1,000 results, with the search consequently restricted to title only (*"sense of coherence".m_titl*),

[xc] Note, however, that because of extensive missing data, household income could not be used in the analyses of the survey data.
[xci] These searches were made: 1)'Sense of coherence' and 'review'; 2) 'Sense of coherence' and 'systematic review'.

which resulted in just under 550 papers. This was restricted further to research based on mortality outcomes, adding *(mortality or death).ab* to the original search terms (53 results), and then *(mortality or death).m_titl* (4 results)

- Similar searches of both abstracts and titles were undertaken for other health related outcomes: (*"sense of coherence" and (morbidity or illness or disease)).ab* (235 results), and (*"sense of coherence" and (morbidity or illness or disease)).m_titl* (31 results).

A number of relevant papers were identified from this process.

- Similar search strategies to that undertaken for sense of coherence above was adopted for the life orientation test (measuring optimism) and identified a number of relevant papers for each.
- Similarly, searches for social capital (especially those based on 'reviews') provided a considerable amount of relevant material. More specific searches for analyses based on the ONS set of questions found very little, however.
- Religious social capital was also the focus for additional literature searches.

4.8.2 Ethical approval

The survey was approved by the University of Glasgow Medical Faculty Ethics Committee (project reference no. zFM06910). A copy of the approval letter is included in Appendix X.

4.8.3 Survey design and implementation

As stated, the survey was carried out by AECOM Social and Market Research. The process was overseen by a GCPH-NHSHS project group[xcii], with the aim of obtaining the most representative sample within the available budget. A report by AECOM details the methodologies that the company employed[557]. Here, the most pertinent aspects are briefly reviewed for the purposes of this thesis:

[xcii] This comprised of: the author of this thesis; Gerry McCartney (NHSHS); Sarah McCullough (NHSHS); Russell Jones (GCPH). In commissioning the survey (i.e. assessing bids from, shortlisting, and interviewing different companies) assistance was also obtained from Catherine Ferrell, MRC/CSO Social and Public Health Sciences Unit, Glasgow. The same project group, with the addition of Duncan Buchanan from ISD Scotland, were used by the author as a group with which emergent findings from the analyses of the final survey data (with all analyses undertaken exclusively and solely by the author) could be presented and discussed.

- Following discussion and agreement on costs, the target sample size was 3,600 across the three cities (i.e. 1,200 in each): ultimately, a slightly larger sample size was obtained: 3,701 in total (1,288 in Glasgow, 1,202 in Liverpool and 1,211 in Manchester)[xciii]. This was achieved with an overall 55% response rate, ranging from 53% in Manchester to 58% in Glasgow (the rate for Liverpool was 55%), and from 53% in the least deprived areas of the three cities to 58% in the most deprived areas. Further details of response rates are included in Chapter 7.

- A stratified clustered random probability sample design was employed. Survey samples can be drawn using a number of different methodologies (for example non-probability sampling such as 'convenience', 'snowball', and 'quota' sampling, and other probability sampling such as simple random sampling), but this type of design is recognised as one of the most practical and cost effective ways of minimising bias, and thereby obtaining a representative sample[558]. The populations of each city were stratified into ten population-weighted deciles based on the three-city deprivation index described earlier in this chapter (the data for which were supplied by the author to AECOM). Within each decile in each city, 24 'sampling points' were randomly selected. The sampling points were 'output areas' from the 2001 Census. Output areas are larger in England (average population size in 2001: 297) than in Scotland (average population size: 119)[522], so for Glasgow pairs of output areas were merged into single sampling points. 10 addresses were then randomly sampled from each sampling point. This, therefore, produced an initial selection of 2,400 households across each city from which the target sample size was to be obtained: 10 (deciles) x 24 (output areas) x 10 (addresses). Households were identified from the Royal Mail's Postcode Address File (PAF)[559].

[xciii] This represented the largest sample size that could be afforded. Prior to commissioning the survey, the project group estimated the sample size that would be required to detect differences in proportions and means between sub-samples (i.e. of each city). This was based on online statistical tools made available by the University of British Columbia's Department of Statistics (see: http://www.stat.ubc.ca/~rollin/stats/ssize/b2.html; and http://www.stat.ubc.ca/~rollin/stats/ssize/n2.html). All companies who were interested in bidding to for the survey project were asked to provide different quotes for total achieved sample sizes of 500 per city (1,500 in total), 750 per city (2,250), 1000 per city (3000) and 1,500 per city (4,500). Ultimately, AECOM's bid was successful and enough capital was available to pay for 1,200 per city.

- A number of strategies were employed in a bid to maximise response rates. AECOM interviewers were briefed by a member of the project group on the relevance and importance of the work. Letters sent to selected households in Liverpool and Manchester in advance of the interviewer's visit were signed by, and included the local office address of, the Director of Public Health in each city: this was to provide a more local focus to the survey for those respondents[xciv]. In addition, other, more 'routine' survey management techniques were employed e.g. a minimum of 5 'call-backs' at addresses with no-one at home, use of a £1,000 prize draw as enticement to take part, reallocation of sample points with low contact rates to other interviewers.

- Where the PAF identified more than one household within a single property, interviewers used a 'Kish grid' to randomly select one household[xcv]. In a single person household an interview was attempted with that person; where two or more individuals were resident, the person whose birthday was next was selected for interview.

- Face-to-face 'in home' household interviews were carried between July and November 2011, using computer assisted personal interviews (CAPI) and computer assisted self-complete interviews (CASI).

- For potential future research use, written consent for the linkage of respondents' personal details to administrative health data was requested.

- Weighting: the data were weighted by AECOM using standard methodologies to ensure the samples were as representative of the households and cities as possible. The importance of weighting to enhance representativeness of cross-sectional surveys such as this is obvious, and is emphasised in the statistical literature[560-563]. Three types of weights are commonly applied: those which adjust for unequal probability of selection; those which correct for unit non-response; and those which further adjust the weighted sample estimates to ensure key variables conform with

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[xciv] Letters were sent to each household in advance of a visit from the interviewer. In Glasgow, the letter was signed by Gerry McCartney of NHS Health Scotland.
[xcv] Named after the American statistician and author of works on survey methodologies, Leslie Kish, a Kish grid is a tabular tool for the selection of household interviews. The grid is included within the AECOM report referenced above.

known population values[560-562]. In this survey, therefore, AECOM: applied weights related to the unequal probability of selection of particular household types resulting from use of the PAF as the sampling frame[xcvi]; adjusted for non-response within deprivation deciles and by age and gender; further adjusted the existing weighted estimates in comparison with published population data. In total the weighting comprised six separate steps[xcvii] which overall adjusted for differential response by deprivation decile and 'up-weighted' multiple households, large households, younger ages and men to adjust for the lower probability of sampling in the former two and the lower response rates in the latter two. Separate weights were produced for analysis at city and whole sample level. Further adjustment (for example for socio-economic or ethnic differences) was not possible because 2011 small-area census data were not (and, at the time of writing, still are not) available. The weighting methodology which was proposed, and implemented, by AECOM was assessed as appropriate by independent statistical experts.

In assessing the overall representativeness of a survey sample, three sources of potential bias tend to be highlighted: the use of a non-probability sampling method; an inadequate sampling frame; and non-response[558]. For this survey, the first two were addressed by means of the use of a stratified probability sampling method, based on the comprehensive sampling frame of the Postcode Address file (and from which a relatively large sample size was obtained). As stated, a 55% response rate was achieved. Appropriate weighting methodologies were employed to correct for potential selection and non-response biases. Response rates are discussed in more detail in Chapters 7 and 8.

[xcvi] The commonly used selections of one dwelling per PAF address, one household per dwelling and one adult per household, tends to over represent single person households and underrepresent large households and multiple households (for example where a single dwelling (e.g. house) has been converted into multiple households (e.g. flats, bedsits)).

[xcvii] The six steps (as recorded in AECOM's report) were: adjustment for population bias across deciles; multiple households adjustment; household size correction; age and gender weights; final weight for cities analysis (derived from combining decile/multiple household/household size/age/gender weights); total sample weight (following final adjustment based on comparisons of weighted population estimates from the sample with published estimates for the total populations of the cities).

4.8.4 Comparisons with other data

The final, weighted, survey data were received by the author from AECOM in early 2012. The data were then compared with a range of other survey and administrative data to assess reliability and representativeness. These included 2011 Census data[564,565] and national survey data (for example the Annual Population Survey[566]).

4.8.5 Statistical analyses

4.8.5.1 Descriptive and modelling analyses

All the data collected in the survey were analysed, with detailed comparisons made between, and within, cities carried out. First, descriptive analyses were undertaken, comparing answers to questions in terms of percentages of respondents, or average survey scale scores, between and within the city samples. For these comparisons, 95% confidence intervals were calculated based on standard equations[567] [xcviii]. To ensure any differences between cities were not simply the result of differences in the characteristics of the sample (e.g. age, gender, social class/social grade[xcix]), all the main questionnaire topics were then analysed by means of a series of multivariate regression models. In all models the 'outcome' (or dependent) variable was the particular questionnaire topic or question (for example, each respondent's score in the 'sense of coherence' scale, or for one of the social capital questions, whether or not the respondent said that 'most people in the neighbourhood could be trusted'), and the 'predictor' (or independent) variables were the city of residence (Glasgow, Liverpool or Manchester) and the following sample characteristics: age, gender, ethnicity, social class, area deprivation quintile, educational attainment, employment

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[xcviii] Confidence intervals for proportions were calculated manually; confidence intervals for means were produced automatically by the statistical software program SPSS.

[xcix] Social class was assessed by means of approximate 'Social Grade'. As mentioned in Chapter 2, Social Grade is the socio-economic classification used by the Market Research and Marketing Industries, and is used in the analysis of UK census data. The scale is used for individuals aged 16 and over, classified by the Social Grade of their Household Reference Person (HRP). The categories, derived from occupation, are: A: High managerial, administrative or professional; B: Intermediate managerial, administrative or professional; C1: Supervisory, clerical and junior managerial, administrative or professional; C2: Skilled manual workers; D: Semi and unskilled manual workers; E: unemployed, on state benefits or 'lowest grade workers'. In the analyses, Social Grades 'A' and 'B' were combined into one single category because of the very small number of respondents in each city classed as Social Grade 'A'. In the presentation and discussion of the survey results, the terms 'social grade' and 'social class' are used interchangeably.

status, marital status, health status[c], and length of residence in the city. All the independent variables and their categories are shown in Table 4.2 below. Note that there were very few missing values in the data, and thus imputation was not required.

Table 4.2 Predictor/independent variables used in regression modelling analyses

Variable	Categories († denotes reference category)
City of residence	Glasgow†
	Liverpool
	Manchester
Gender	Male†
	Female
Age	16-29†
	30-44
	45-64
	65 and older
Social Grade	A (higher managerial, administrative or professional) and B (intermediate managerial, administrative or professional)† [ci]
	C1 (supervisory, clerical and junior managerial, administrative or professional)
	C2 (skilled manual workers)
	D (semi and unskilled manual workers)
	E (on state benefits/unemployed/lowest grade workers)
Employment status	Employed (PT/FT)†
	Unemployed

[c] Note that the inclusion of health status in the models is discussed further below.
[ci] As stated above, please note that Social Grades 'A' and 'B' were combined into one single category because of the very small number of respondents in each city classed as Social Grade 'A'.

Variable	Categories († denotes reference category)
	Ill/disabled
	Retired
	Looking after home/family
	In education/training (PT/FT)
Educational attainment	No qualifications†
	Some qualifications, but not degree level[cii]
	1st degree and above (includes NVQ/SVQ Level 5 or equivalent)[ciii]
Deprivation quintile[civ]	1 (Most deprived)†
	2
	3
	4
	5 (Least deprived)
Ethnicity	Not a member of ethnic minority group†
	Member of ethnic minority group[cv]
Marital status	Never married†
	Married/civil partnership

[cii] No degree level qualifications but one of the following categories: O Grade, Standard Grade, O Level, Access 3 Cluster, Intermediate 1 or 2, GCSE, CSE, Senior Certificate or equivalent; SCE Higher Grade, Higher, Advanced Higher, CSYS, A level, AS Level, Advanced Senior Certificate or equivalent; GNVQ/GSVQ Foundation or Intermediate, NVQ/SVQ Level 1 or 2, SCOTVEC Module, City and Guilds Craft or equivalent; GNVQ/GSVQ Advanced, NVQ/SVQ Level 3, ONC, OND, SCOTVEC National Diploma, City and Guilds Advanced Craft or equivalent; HNC, HND, NVQ/SVQ level 4 or equivalent; Professional qualifications; Other school qualifications not already mentioned (including foreign qualifications); Other post-school but pre-Higher Education qualifications not already mentioned (including foreign qualifications); Other Higher Education qualifications not already mentioned (including foreign qualifications); Other vocational/work related qualifications.

[ciii] Full list on questionnaire: First Degree, Postgraduate qualifications, Masters, PhD, NVQ/SVQ Level 5 or equivalent

[civ] Based on the same ‘income deprivation’ measure described earlier in this chapter.

[cv] Includes the following categories: White and Black Caribbean; White and Black African; White and Asian; Any other mixed or multiple ethnic groups ; Indian; Pakistani; Bangladeshi; Chinese; Any other Asian background; African; Caribbean; Black; Any other Black / African / Caribbean background; Arab; Any other ethnic group.

Variable	Categories († denotes reference category)
	Separated/divorced
	Widowed/surviving partner
Long-term limiting illness[cvi]	None†
	Limited a little
	Limited a lot
Self-assessed health[cvi]	Good/very good†
	Fair
	Bad/very bad
Length of residence (approximate)	Time in city not known†
	Possibly long-term resident[cvii]

Models were either based on linear regression or logistic regression, depending on the type of outcome variable being examined: linear regression was used for 'continuous' outcome variables such as the sense of coherence score, while logistic regression was used for 'binary' outcomes (0 or 1) such as whether or not respondents recorded that they thought people in their neighbourhood could be trusted (e.g. recorded as '1' if the respondent said people could be trusted, or recorded as '0' if they did not).

Models were built incrementally, but only significant variables were included in the final models. All models were run using SPSS statistical software. For logistic regression models, categorical predictor variables were included as shown in

[cvi] As stated above, the inclusion of self-assessed health variables in the models is discussed further below.

[cvii] In analysing the data it seemed important to distinguish the views of those who had been resident in their city for a long time and those who had not. However, no specific question on length of residence in the city was included in the survey. Thus, a crude measure of likely length of residence was derived from other available information: respondents were asked how long they had lived in their neighbourhood as part of the social capital questions (with options ranging from 'under six months' to 'over five years', and those who lived through the 1980s (i.e. were aged at least 36 at the time of the survey) were additionally asked in which city they were resident for most of that decade. From those two questions, respondents were categorised as being 'possibly long-term resident' (based on either being resident in their neighbourhood for 5 years or more, or having been in the same city in the 1980s) or 'length of residence in city unknown'.

Table 4.2 above; for the linear regression models, ‘dummy’ variables were derived matching the above categories.

Models were run using weighted and unweighted data. Weighted analyses are important for the purposes of this research given the need for the results to be as representative as possible of the three cities. Thus, results of the weighted analyses only are presented in Chapter 7. Modelling of the unweighted data was undertaken as a precaution as the use of weights in some regression analyses can complicate interpretation of the results. Generally, however, there were very little differences between the values (coefficients or odds ratios) obtained for the cities in the weighted compared to the unweighted models.

A number of tests were employed and statistics checked to ensure accuracy and ‘robustness’ of the models (for example, checking the ‘goodness of fit’ of the data in the models, checking that required assumptions had been met, and that the results were not overly influenced by specific cases). These are listed briefly below.

Linear regression models:

- The assumption of normally distributed errors[567,568] was checked through examination of histograms and normal probability plots of the residuals in each model.
- The independent errors assumption[568,569] (i.e. the independence of the residuals in the models) was checked by means of the Durbin-Watson test[569], ensuring values were close to 2[568]. However, the test could only be run with unweighted data (although, as stated, the results of weighted and unweighted models were broadly very similar).
- All variables were checked beforehand to ensure there was ‘non-zero variance’[568].
- The assumption of homoscedasticity[568] (i.e. that the variance of the residuals in the model should be constant) was checked by means of plotting the standardised residuals with the standardised predicted values of the outcome variable.

- All predictor variables were tested for co-linearity by means of calculation and checking of the Variance Inflation Factor (VIF) and 'Tolerance' statistics: any VIF values greater than 10 or Tolerance statistics less than 0.1 or 0.2 would potentially indicate problematic levels of co-linearity[568,570,571].

- The fit of the model was checked through the value of R^2 and adjusted R^2 statistics, and the value and significance of the *F* ratio statistic in the analysis of variance (ANOVA). The potential for cases exerting undue influence in the model was checked by means of: examining the distribution of the standardised residuals to ensure that no more than approximately 5% had values above 2, and no more than 1% had values above 2.5[568]; ensuring values of the Cook's Distance statistic was less than 1[572]; checking for values two or three times the average leverage[573,574]; checking the DFBeta statistic (the standardised version of the Cook's Distance) for any values greater than 1[568]; examining the covariance ratio (CVR) (for any values outside the acceptable range)[cviii] [575].

Logistic regression models:

- The 'goodness of fit' of the data in the logistic regression models was checked by means of: the -2 x log-likelihood statistic and its chi-square statistic (a chi-square value of <0.05 indicating a significant fit); the Homer & Lemeshow test (a significant value suggesting a poor goodness of fit); and the value of the Cox & Snell R^2 statistic[568]. A number of the same tests and statistics listed above were used to identify cases with undue influence i.e. Cook's Distance, distribution of standardised residuals, average leverage and DFBeta.

- The Tolerance and VIF statistics were again checked to assess any problems with co-linearity among the independent variables.

[cviii] i.e. 1 plus three times the average leverage (for upper limit), and 1 minus three times the average leverage.

Interactions

Interactions between the independent variables (excluding city) were tested for: although some were significant, they did not impact on the coefficients of the cities, the main focus of all the analyses undertaken; nor did they increase the amount of variation explained in the models by any great extent. Thus, for clarity and ease of interpretation, these are not reported in the relevant results chapter (Chapter 7).

To quantify differences between social groups (social grade or area deprivation) across the cities, city-social grade and city-deprivation quintile interactions were also tested for: where significant, a separate set of (non-main effects) models was run and odds ratios between the cities compared.

Glasgow-only analyses

For the main topics included in the questionnaire, a series of additional models was run for the Glasgow sample only. This was to show which characteristics of the sample were significantly associated with differences in the outcomes (survey questions) within a specifically Glasgow context.

Presentation of results

The following are presented in the reporting of all linear regression analyses:

- Adjusted mean: the mean value predicted by the full fitted model. For reference categories, this is the mean of the reference category of *all* the variables included in the model (e.g. city = Glasgow, gender = male, age = 16-29 years). For other categories it is that mean value added to the value of the regression coefficient of the category in question[cix].
- $\Delta\mu$ (with 95% confidence intervals): this is the regression coefficient for each variable category i.e. the difference in the mean compared to reference category after adjustment for other factors in the model.

[cix] For example in the Sense of Coherence model reported in Chapter 7, the adjusted mean for all reference categories is 65.7. The regression coefficient for Liverpool (compared to the reference category of Glasgow) is -4.9. Thus, the adjusted mean for Liverpool is 60.8.

- *t* statistic and significance: these indicate whether an independent (predictor) variable significantly predicts a change in the value of the outcome (dependent) variable[cx].
- R^2 and adjusted R^2 values: these show how much of the variation in the outcome is explained by the model[cxi].

For logistic regression analyses, the following are presented:

- Wald statistic and significance: as with the *t* statistic (and significance) above, these show whether the independent/predictor variable significantly predicts a change in the value of the outcome[cxii]
- Odds ratio (and 95% confidence intervals)
- R^2 value (Cox & Snell[cxiii])

Multi-level modelling

As was discussed in Chapter 2, a number of authors have emphasised the importance of multi-level modelling (MLM) to explore and distinguish between individual and area influences on health[142,160,576,]. In the case of these survey data, it seemed unlikely that MLM would make much difference to the modelling analyses, simply because in the non-MLM regression analyses so little of the variation in outcomes was explained by the independent variables[cxiv]. However, to verify that this assumption was correct, a number of models, using both linear regression[cxv] and logistic regression[cxvi], were also run as multi-level models, and the results compared with those from the non-MLM models. The MLM was undertaken using MlwiN software version 2.26. There were two levels: individual and neighbourhood (the latter being the sampling points with an average population size of approximately 300 people). However, there was almost no

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[cx] The *t* statistic tests the null hypothesis that the value of the regression coefficient is zero (i.e. the variable predicts no change in the outcome). Thus if it is significant it suggests the value of the coefficient is significantly different from zero and the variable (or category) contributes significantly to predicting the outcome.

[cxi] The adjusted R^2 value adjusts for bias in the value of R^2 and relates to the number of independent variables in the model.

[cxii] i.e. whether the coefficient for the predictor/independent variable is significantly different from zero (and therefore significantly contributes to predicting the outcome)

[cxiii] This is a version of the R^2 statistic (i.e. indicating the amount of variation in the outcome explained by the model) used in logistic regression.

[cxiv] As will be seen in Chapter 7, R^2 values, a measure of the amount of variation explained in the models by the independent variables, were generally very low.

[cxv] Models with outcomes of: Sense of Coherence; and Life Orientation Test (Revised) (LOT-R).

[cxvi] Models with outcomes of: volunteering; and exchanging favours with neighbours (reciprocity).

difference between the MLM and non-MLM results in terms of the odds ratios, regression coefficients and significance values for the cities. Thus, the results of the non-multilevel modelling are reported within the thesis. Comparisons of the results of the two sets of modelling (MLM and non-MLM) are shown in Appendix IX.

Health status: self-assessed health and long-term limiting illness

As Table 4.2 shows, two health status variables (self-assessed health (SAH) and long-term limiting illness (LLI)) were included as predictor variables in the models. This seemed appropriate, given the possible influence of an individual's health status on, for example, likelihood of volunteering (one of the social capital questions included in the survey). On the other hand, it could be argued that inclusion of these variables represents an over-adjustment: as the aim of the analyses is to establish whether there are differences between the cities for a number of measures that are potentially relevant to health outcomes, inclusion of health status variables in the models could be deemed as problematic. Thus, all models in which the SAH and/or LLI variables were significant were re-run excluding those variables, and the odds ratios or regression coefficients and significance levels associated with the city variable compared. However, as with the MLM analyses, this made virtually no difference to the results of the models. Thus, the results of the modelling incorporating the health status variables are presented in Chapter 7.

In addition, a series of logistic regression models was run with SAH as the dependent, rather than independent, variable. The aims of this additional modelling were twofold: first, to quantify differences between the samples in self-reported health status; second, to establish whether any differences between the samples in the main topics of interest (social capital, SoC and optimism) modified any observed variation in SAH. However, it is important to stress that these analyses were a secondary, not primary, interest, and were undertaken principally for the sake of completeness. Given the evidence presented in Chapter 2 regarding the demographic, socio-economic and cultural influences on self-assessment of health between different UK populations, differences in SAH were not a key outcome of interest in the research (and thus, this was not included as one of the research questions listed in Chapter 3).

In all these models the outcome was a binary variable coded either 1 ('bad' or 'very bad' SAH) or 0 (other answers (i.e. 'very good', 'good', 'fair')), derived from the possible answers to the question 'How is your health in general?'. In the first of these models the same predictor variables shown in Table 4.2 were included, with two exceptions: the health status questions were omitted, while smoking status was included, given its relevance to the outcome measure[cxvii]. In subsequent models additional predictor variables were included relating to social capital, SoC and optimism (LOT-R). The social capital variables were included as binary variables (listed in Appendix VIII), SoC and LOT-R as continuous variables.

4.9 Policy implications

Note that the final research question (*What are the potential policy implications of the results of the research?*) is discussed in Chapter 8.

All the methods employed that are described in this chapter were aimed at enabling understanding of, and analysis of potential reasons for, differences in health status between Glasgow and the two English cities of Liverpool and Manchester. Before examining the results of the first set of those analyses (in Chapter 6), the next chapter briefly describes the three cities in question, providing evidence for why Liverpool and Manchester are such good comparator cities for the analyses undertaken.

[cxvii] The smoking variable was categorised as: never/hardly ever smoked (reference category); ex-smoker; occasional smoker; regular smoker

Chapter 5. Glasgow, Liverpool and Manchester: a historical overview

To help place the analyses described in this thesis within a relevant geographical and historical context, this chapter provides a brief overview of the three cities that are the focus for the research. As such this chapter serves merely as background to the main research presented in subsequent chapters: it is not intended to be viewed as part of the empirical evidence presented within the thesis.

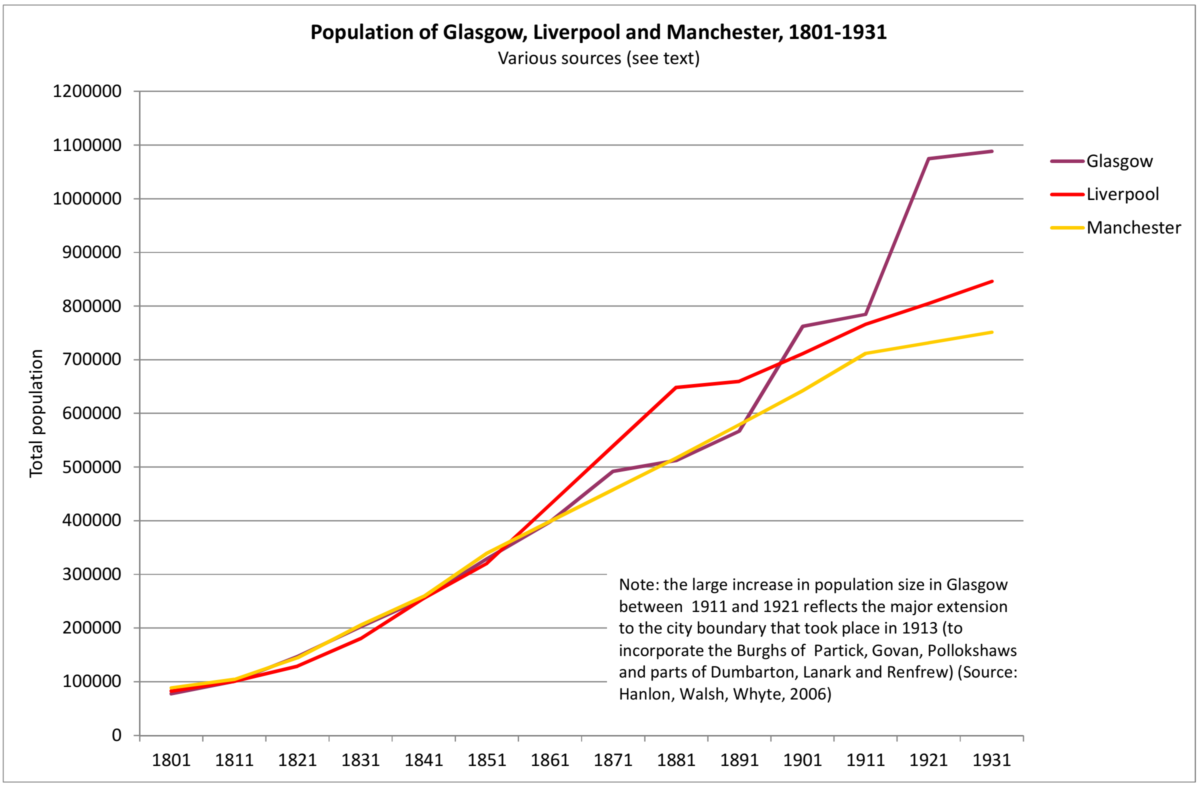
The social and economic histories of Glasgow, Liverpool and Manchester are remarkably similar: at one level, they appear so alike that the cities' names seem almost interchangeable within a single unfolding story. Naturally, there are a number of important and fundamental differences, and these will be discussed; however, those differences are outnumbered by the many similarities in the way each city has developed over the last three centuries: from relatively small beginnings to industrial revolution led expansion (the latter both literally, in terms of population size and city boundaries, and figuratively in terms of economic wealth and importance), the side effects of which included populations subjected to appalling living conditions, poverty and poor health; from industrial might to dramatic post-industrial decline and deterioration, embracing large-scale changes to the physical and social fabric and structure of the cities along the way; and from decline to post-industrial service sector economies, 'reinvention' and 're-branding', and to the current 'polarised' (socially, economically, and in health terms) societies that characterise each.

5.1 Expansion and the industrial revolution

As late as 1700, Glasgow, an emerging trade city, had a population of only around 15,000, its size having doubled over the course of the previous century[577]. Liverpool's growth from small parish to significant trading port can be traced back to the same time, its emergence linked to the slave trade[578]. Manchester at this time was still a small 'cloth town', combining both manufacture and trade[579].

By 1801, the population of each city was approximately 80,000[95,580,581]. Although this represented considerable growth (Liverpool's population size had quadrupled during the 1700s, Manchester's had doubled in just the previous 30 years as the Lancashire cotton industry expanded), this was nothing compared to what would occur over the next century and a half: by the 1930s, Manchester's population would exceed 750,000, Liverpool's almost 850,000, and Glasgow's more than one million (Figure 5.1)[95,523].

Figure 5.1[cxviii]



Industrialisation drove this extraordinary transformation. Glasgow's was based on shipbuilding, engineering, metal works and associated industries[577,275]. Liverpool's was founded on the docks: stretching for 14 miles at one point, they were a focus for both trade, and for one of the principal gateways for European emigration (extraordinarily, between 1830 and 1930, nine million people sailed from Liverpool to begin new lives in America and Australia); however, other industries (e.g. sugar-processing) also played a part[578,580]. Manchester (known as the 'capital of the industrial revolution' and the 'workshop of the world) was the centre of the world's cotton trade in the 19th Century, although it also diversified into textile-related industries (e.g. machine tool making and other, related, types of engineering) [582].

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cxviii Sources: Glasgow – Hanlon, Walsh & Whyte, 2006 (from Reports of the Medical Officer of Health); Liverpool and Manchester – Census data from University of Portsmouth Great Britain Historical GIS Project (www.visionofbritain.org.uk).

The growth in industry and population size was not confined by city boundaries. The wider areas around all three cities experienced similar expansion. In direct response to the increase in population size within Glasgow, tens of thousands of people moved into neighbouring county districts in search of better housing: approximately 80,000 did so between 1903 and 1910, a period known as the 'Years of the Great Trek'[583], and to which the city responded by further extending the city boundaries (already expanded several times in the latter half of the 19th Century). Further extensions followed in 1926, 1930 and 1938[584]. Similar expansions to city limits occurred in Liverpool (in 1835, 1895, 1902, 1905 and 1913)[585] and Manchester (in 1885, 1890, 1903, 1904, and 1931)[586]. In the case of the latter city, Manchester was located in the centre of a ring of mill towns (including Blackburn, Burnley, Oldham and Rochdale) which also experienced industry-driven population growth of an extraordinary scale[cxix].

A significant component of this population growth was immigration from other countries, in particular from Ireland in the mid-19th Century following the potato famine[577,578,580,587]. For example, in 1848 1,000 Irish emigrants were recorded as arriving in Glasgow each week, and by 1851 almost 20% of the city's population had been born in that country[577]. In Liverpool, an estimated quarter of a million Irish emigrants reached the city in that same late 1840s period, many of whom (especially the poorest who could not afford further travel) remained in the city permanently[578,580]. Similarly, one third of the population increase in Manchester between 1841 and 1851 was attributable to Irish migration (with 15% of the city's population in 1851 recorded as being Irish)[587]. In the middle of the 19th Century almost half of Britain's Irish population were living in Glasgow, Liverpool, Manchester and London[587].

(Indeed, waves of immigration over a longer period is another shared characteristic of all three cities: each became home to the Irish in the mid-19th century, Jewish immigrants in the late 19th and then mid-20th century, Italians in the late 19th and early 20th century, and immigrants from different parts of Asia in the mid-20th century[275,577,578,580, 587]; however, an important difference is that

[cxix] Of course, such expansion was also a feature of all the major urban centres (e.g. London, Birmingham, Nottingham, Sheffield) in 19th and early 20th Century Great Britain: however, as Glasgow, Liverpool and Manchester were already – alongside London and Birmingham – the most heavily populated cities, the impact was arguably greater.

the modern day ethnic profile of Manchester differs considerably from the other two cities, as discussed briefly below and elsewhere in this thesis).

As their populations expanded, the importance of all three cities in economic terms in this period cannot be overstated. Glasgow was a renowned world-leader in ship building and associated industries: at its peak in the 1870s, there were more than 20 shipyards in and around the city producing half of all Britain's shipping tonnage[577,588]. Liverpool was unarguably Britain's most important port city, handling almost half of all exports and one third of all imports in Britain[578,580]. In the early to mid-19th century, Manchester was the centre of the world cotton market, and in economic terms 'one of the world's great cities' and a 'centre of wealth creation'[579] [cxx]. Claims have been made for the relative importance of each in world terms in this period of industrial might. Some have described Manchester as the second most important city in the UK and, arguably therefore, in the British Empire[579]. However, Liverpool has also been described as 'the second city of the empire' at this point in history[578,589]; yet the same description has been applied frequently to Glasgow as well[577,590.]

However, this extraordinary growth in industry and population size was accompanied by the creation of equally extraordinary - and appalling - living conditions for many of the cities' residents. Poverty and overcrowding was rife. Early 20th century Glasgow was described as the most heavily populated urban area in Europe, with 700,000 people believed to be housed within just 3 square miles[591], and the 1911 census showed that almost half the city's population lived in a 'room and kitchen'[cxxi] (this at a time when the average family size in Scotland was six people[cxxii] [592]). Liverpool's citizens in late to mid-19th century were described as living in 'some of the densest urban quarters in Europe', with many of its Irish immigrants housed in overcrowded courts and cellars[580]. A study in 1843 by W.H. Duncan, a General Practitioner who would soon after become Liverpool's, and England's, first Medical Officer of Health, stated that a quarter

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[cxx] An extraordinary statistic quoted by Kidd[587] is that by the 1880s the *weekly* turnover in trade in Manchester was £10 million.

[cxxi] A 'room and kitchen' was a two apartment tenement flat comprising of only those two rooms; toilet facilities were shared with other families on the same landing.

[cxxii] This is derived from the average number of children per marriage in Scotland in 1911 being 4. Clearly, however, the average household size may have been bigger than this where households included extended family. Also, figures for Glasgow may have differed considerably from Scotland as a whole.

of his patients lived in 'cellar dwellings' containing 15-30 people 'in a single airless room'[593,594]. The overcrowded conditions in Manchester (where cellar dwellings were also a feature), allied to the working environments in the city's various industries, were such that they inspired Engels, resident in the city at the time, to produce his 1845 study of The Condition of The Working Class in England, mentioned in Chapter 2[68]. Given such living conditions, it is no surprise that the cities were also characterised by high rates of disease and early death. At the start of the 20th century mortality rates in the poorest and most overcrowded parts of Glasgow were five times higher than in the wealthier areas, and across the city infant mortality rates were thirty times higher than they are today[95].In Liverpool, cholera outbreaks in the mid-19th century claimed the lives of thousands (as they did in the other cities) – for example more than 1500 in 1832, over 5000 in 1849, 2100 in 1866 – and the overall mortality rate in the city over the period 1840-1846 was the highest in the UK[580]. By the turn of the 20th Century infant mortality in Manchester was considerably higher than in Glasgow (almost 200 deaths per 1,000 births, compared to 149 per 1,000 in Glasgow[cxxiii]), while overall mortality rates in all three cities were similar (21 per 1,000 population in Glasgow, 22 per 1,000 in Liverpool and Manchester), and very high compared to the rest of Britain[cxxiv] [95].

5.2 Deindustrialisation and decline

While so many lived in poverty, poor health and squalid living conditions, the industries in which they worked amassed great riches for their owners. This economic success, however, did not last, and there are again remarkable parallels in the cities' stories in this regard. Glasgow's industrial fortunes had started to decline in the early part of the 20th century and the economy of the Clyde Valley almost collapsed in the inter-war period for a number of reasons including post war recession and depression, and associated reduction in world trade and demand for ships. The second world war, and the post-war period's

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[cxxiii] Almost half of all recorded deaths in Manchester in the period were among children aged 5 years or less, the majority being infants (under 12 months)[587].

[cxxiv] For example, the equivalent figure was 17.6 in London[95] and 17.9 for all Scotland[595]. These are crude rates per 1,000 population. Data presented later in the thesis shows that age-standardised premature (age < 65 years) mortality rates for men in 1921-25 were still similar in all three cities, but the rate for Glasgow was 24% higher than that of Scotland, and the rates for both Liverpool and Manchester 40% higher than the rate for England & Wales (the latter being considerably lower than the rate for Scotland).

requirements for rearmament and replacement, only temporarily masked the problems, and decline soon set in in the face of international competition[596]. The start of Liverpool's decline can also be traced back to the inter-war years and the loss of global trade links. After a similar process of temporary relief in the shape of the second world war, the advent of 'containerisation' in the 1950s (whereby cargo was transported in individual ship containers, thereby dramatically reducing the manpower requirements of the docking process[cxxv]) effectively made much of the docks redundant, and signalled 'the beginning of a relentless period of economic and demographic decline'[578,597]. Manchester's reversal of industrial fortunes can also be traced back to the early part of the 20th century, with the advent of the first world war which cut off trade links to its export market, and then the impact of foreign competition which by the 1930s had reduced exports dramatically, and by the 1960s had rendered the British textile industry obsolete. Deindustrialisation and economic decline continued through the course of the 20th century in all three cities, reaching its peak (or nadir) in the 1980s, by which time all three were characterised by having the highest levels of poverty and deprivation of any British city – a situation that remains to this day[79,133]. Figure 5.2 shows the remarkably similar trends in declining levels of industrial employment experienced by the three cities between 1931 and 2001. Figure 5.3 quantifies that total loss of industrial jobs over the period, and shows how each city's experience compared to that of Scotland and England (and Wales) as a whole: all three cities experienced more than 80% decline in levels of industrial employment, considerably more than that experienced by Scotland (-47%) and, especially, England (-30%). In addition, Figure 5.4 shows, over a shorter period (1971-2001), the identical trends observed in the cities in relation to loss of manufacturing jobs (a subset of industrial employment).

[cxxv] Lane cites a US study which showed that the man-hours required to load and then unload 11,000 tons of general cargo was reduced from 10,500 to 546 with the advent of 'containerisation'[597].

Figure 5.2

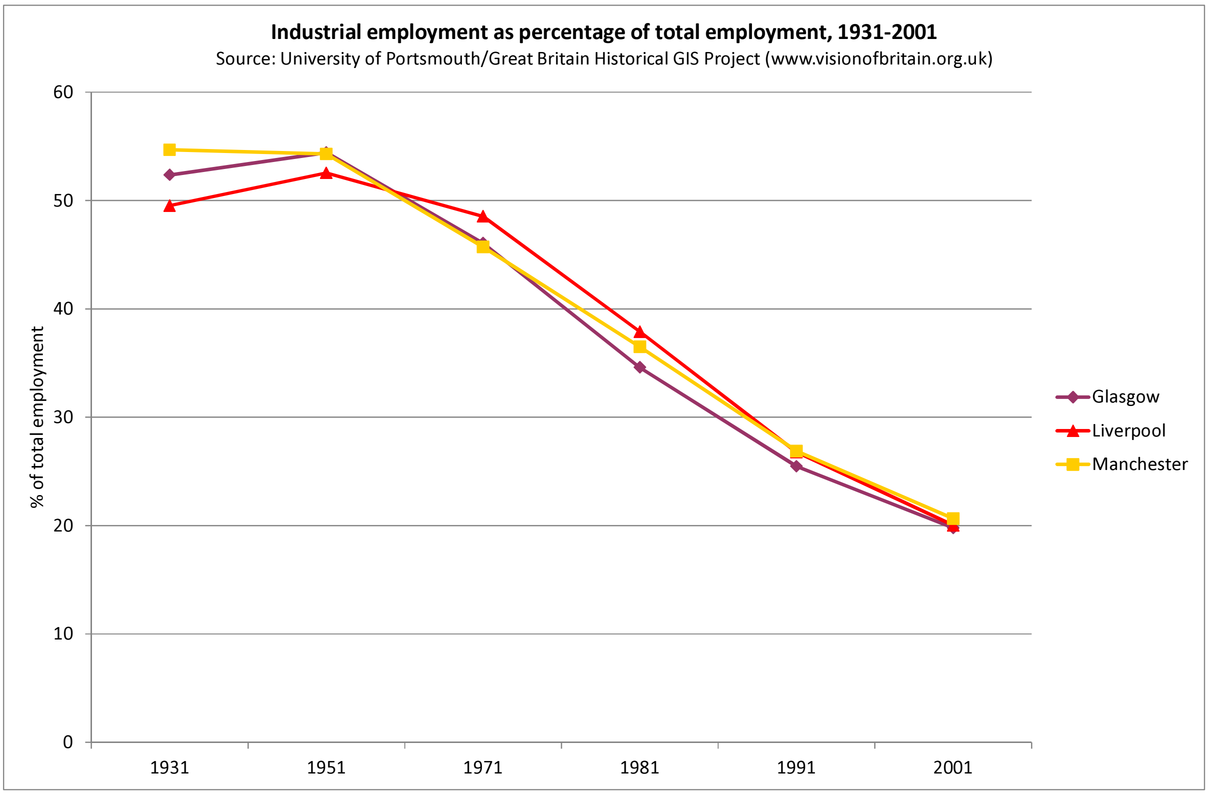


Figure 5.3

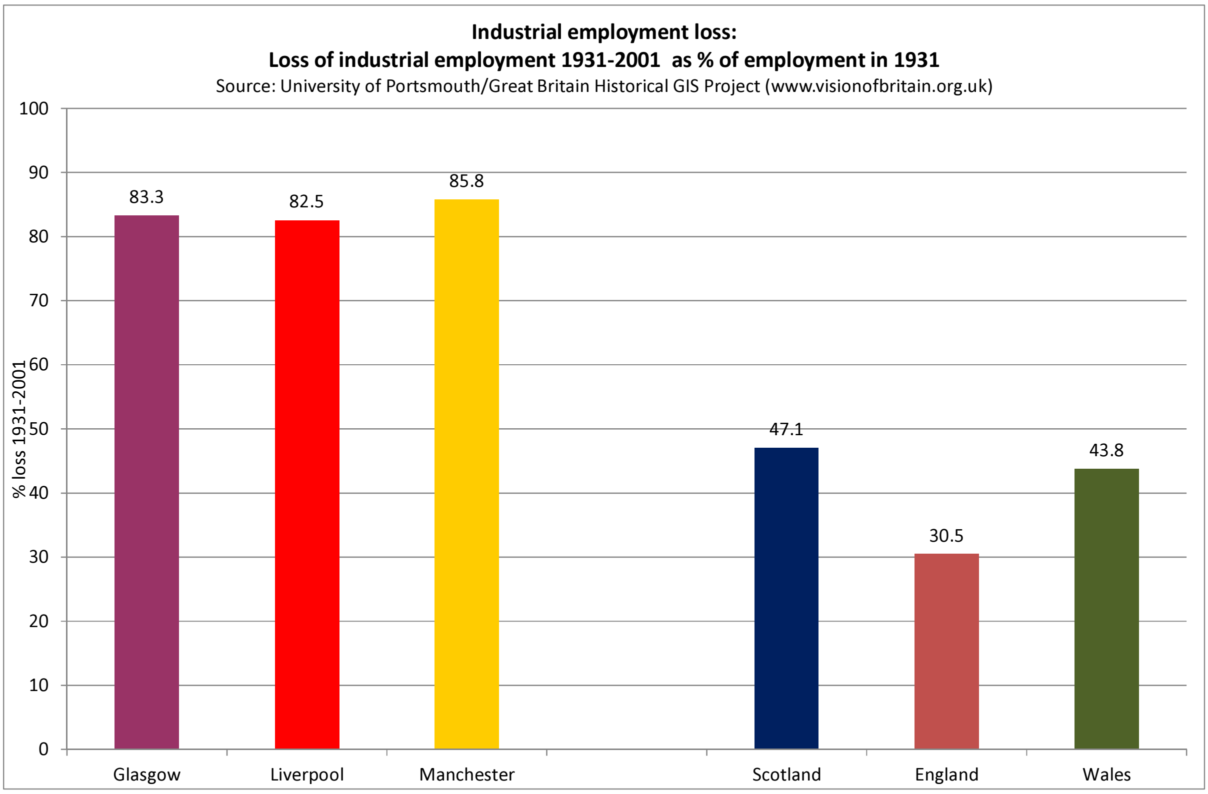
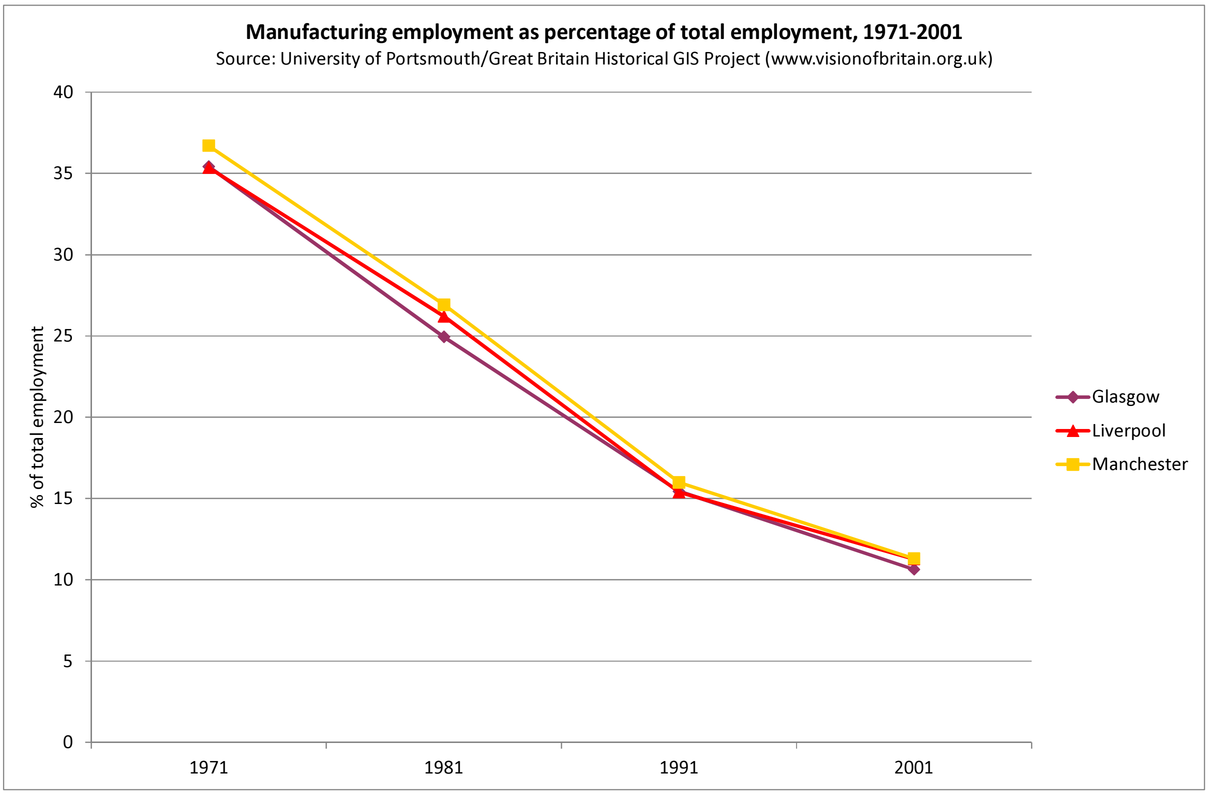


Figure 5.4



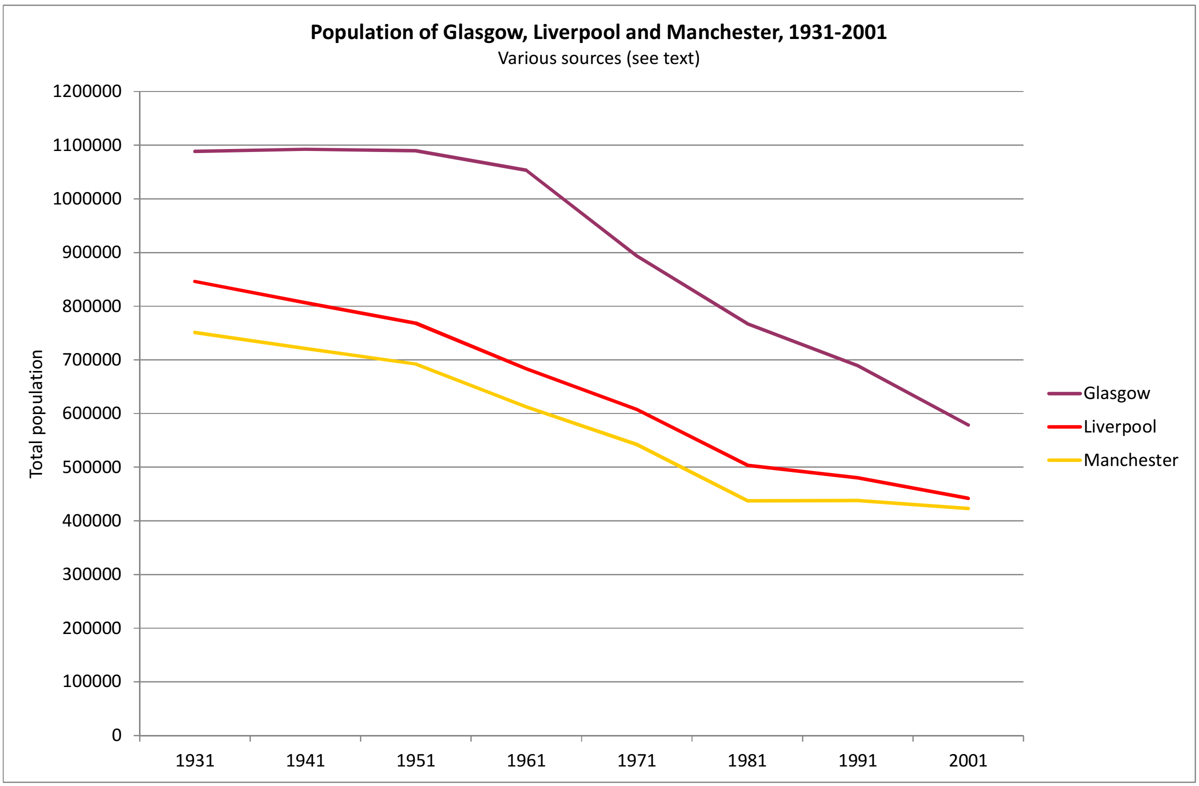
In all three cities industrial decline was accompanied by important social and physical changes to the composition of the cities. All three were subject to waves of vast slum clearances, accompanied by re-building programmes. A feature of the latter in all three cities (and elsewhere in the UK) was the development of large housing estates, often on the peripheries of the cities. As a result existing communities were broken up and dispersed, geographically and socially dislocated to new developments that were often deprived of both facilities and previously existing social networks, and which in time developed into areas with considerable social problems. In Glasgow, for example, large scale slum clearances in the 1950s (building on previous clearances in the 1920s, and predating vast amounts of demolition which peaked in the 1970s), were accompanied by the creation of new peripheral estates in Pollok, Easterhouse, Castlemilk and Drumchapel, each aimed at housing between 25,000 to 35,000 residents. In Liverpool, following similar clearances and demolition, 50,000 people were moved to the new Kirkby estate outside the city boundaries in the 1950s and 1960s. In Manchester, between 1954 and 1976 90,000 properties were demolished and 71,000 built, with half of the latter on 'overspill' housing estates outside the city boundaries; 100,000 people were eventually housed in

Wythenshawe, an estate aimed at being a ‘meticulously planned utopian environment’[598] but which - like the new estates in Glasgow - was built without provision of any shops, amenities or services.

Following the dramatic expansion in population size that accompanied the industrialisation of the cities, deindustrialisation was, in turn, characterised by enormous population loss. From their population peaks in the inter-war period, the number of people living in each city almost halved over the subsequent 60 years: from over one million to less than 600,000 in Glasgow, from around 850,000 to 450,000 in Liverpool, and from more than 750,000 to little over 400,000 in Manchester (Figure 5.5). Although demographic factors such as a the reduction in birth rates played a part in this trend, population decreases on such scales are principally indicative of economic decline[599], and these population losses in Glasgow, Liverpool and Manchester were the greatest of any of the large cities in Britain in that period[579]. For Glasgow and Liverpool, part of this population loss was to the New Towns that were built close to each city following the 1946 New Towns Act[600]: Cumbernauld and East Kilbride in Scotland, Runcorn and Skelmersdale near Merseyside[cxxvi][601, 602].

[cxxvi] Runcorn and Skelmersdale are relatively close to Manchester as well as Liverpool, but were specifically designed for overspill from Liverpool.

Figure 5.5[cxxvii]

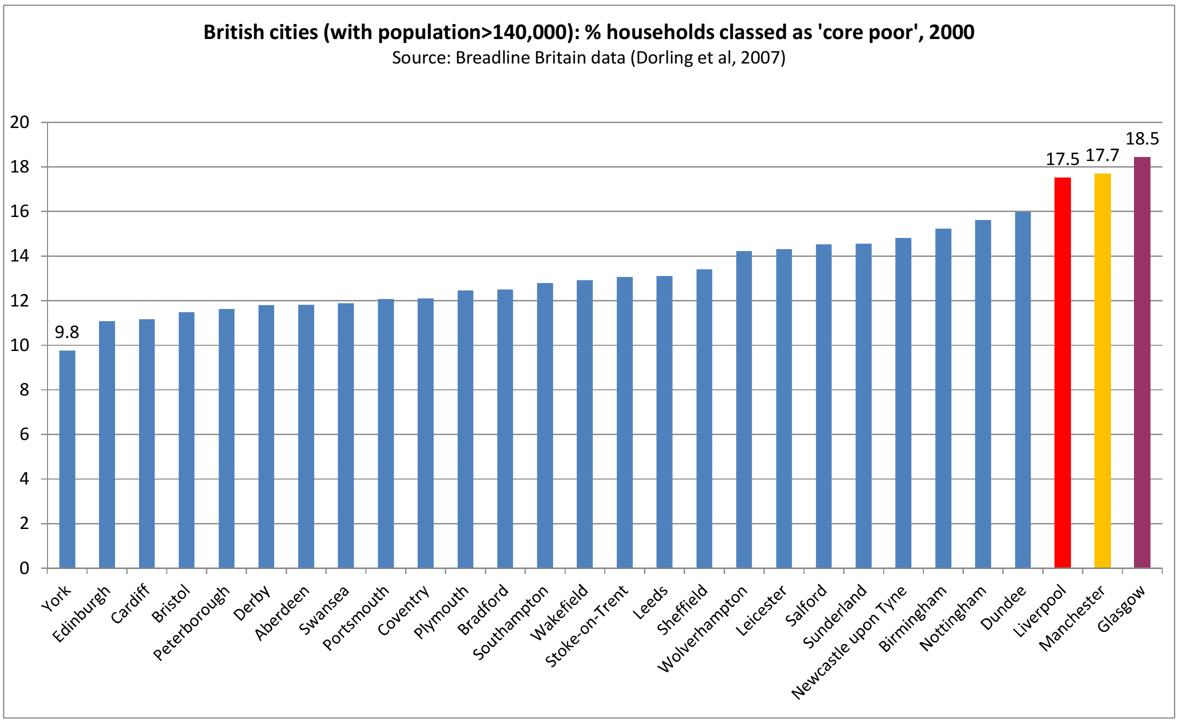


By the end of the 20th Century, Glasgow, Liverpool and Manchester had among the highest levels of poverty of any British cities. This is shown in Figure 5.6, based on analyses of the SASI 'Breadline Britain' data (described in Chapters 2 and 4) for local authority areas[cxxviii].

[cxxvii] Sources: Glasgow – Hanlon, Walsh & Whyte, 2006, for the period 1931-2001 (from Reports of the Medical Officer of Health and General Register for Scotland (now National Records of Scotland (NRS))); Liverpool and Manchester – Census data from University of Portsmouth Great Britain Historical GIS Project (www.visionofbritain.org.uk) for period 1801-1991, and Office for National Statistics (ONS) for 2001.

[cxxviii] Data have been aggregated to 'best-fit' local authority areas from census 'tracts' (discussed in Chapters 2 and 4). Local authorities deemed to be cities, and with a population of over 140,000, have been included. For simplicity, London (which is obviously made up of a number of different local authority areas) has been excluded.

Figure 5.6



5.3 Regeneration and rebranding

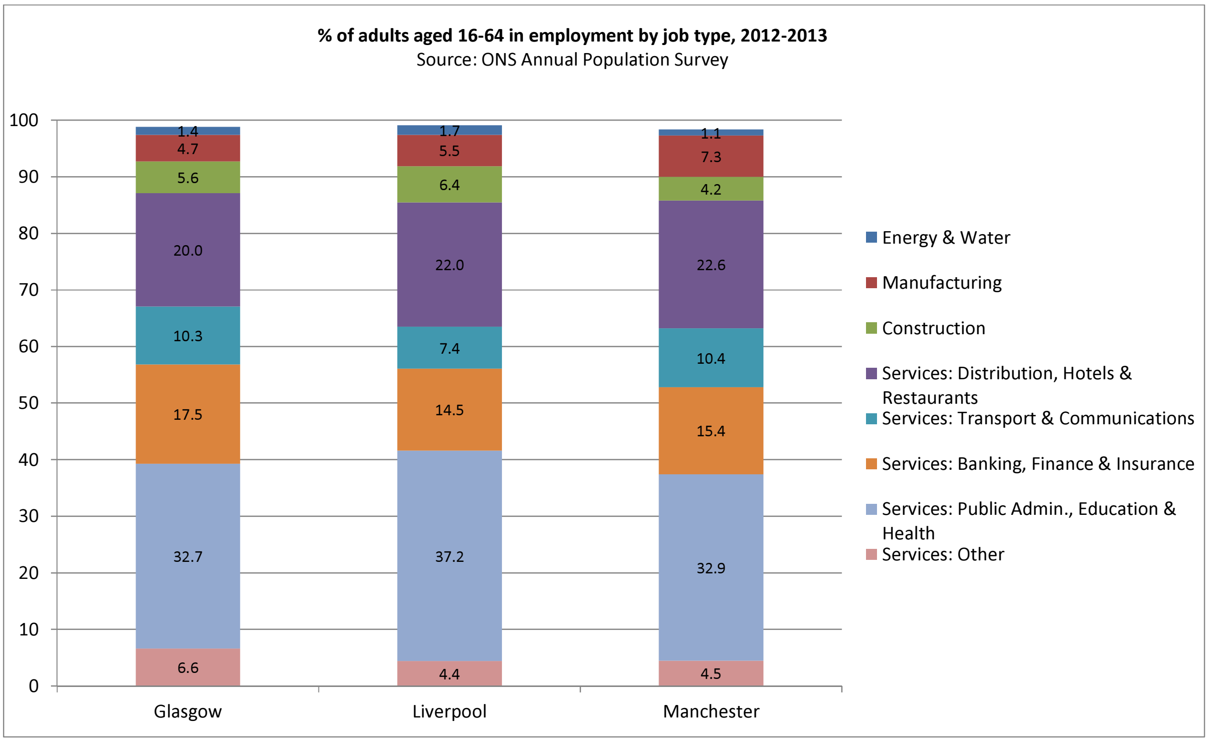
In the face of relentless deindustrialisation and economic decline in the latter decades of the 20th Century, accompanied by continuing physical (and social) deterioration, all three cities were the focus for numerous regeneration initiatives. In Glasgow, for example, there was Glasgow Eastern Area Renewal programme (GEAR), established in the mid-1970s[603], followed by New Life for Urban Scotland[604] (1980s) (which included the Castlemilk area of the city), Priority Partnership Areas[605] (1990s), Social Inclusion Partnerships[606] (1990s) and more. Similar initiatives took place in Liverpool (e.g. by the Merseyside Development Corporation[607] which was established in the 1980s, and included projects such as the regeneration of the Albert Docks, the regeneration of the Kensington inner-city district in the late 1990s, and a raft of other initiatives in that decade which were funded by the city having obtained 'Objective One' status from the European Union, in recognition of it being one of the poorest parts of Europe[578]) and in Manchester (for example the East Manchester Initiative in the 1980s, the regeneration of the southern part of the city by the Central Manchester Development Corporation in the same decade, and the 'Hulme City Challenge' in the 1990s[608]). Of course, the context for the regeneration of Manchester's city centre is not comparable with the other two cities, as it took place in the aftermath of the 1996 IRA bomb which caused extensive damage to the centre of the city and spurred a subsequent large programme of rebuilding and regeneration.

Alongside, and as part of, these regeneration initiatives, all three cities also sought (and continue to seek) to attract economic investment through ‘rebranding’ and ‘reinventing’ themselves as attractive destinations for tourists, shoppers, and potential employers alike. This was, and is, done through marketing campaigns (e.g. Glasgow: ‘Glasgow’s Miles Better’, ‘Scotland with Style’[609]; Liverpool: ‘It’s Liverpool!’[610]; Manchester: ‘We’re up and going’[611]) and seeking to attract cultural events (e.g. Garden Festivals in Liverpool (1984) and Glasgow (1988)) and titles (e.g. European Capital of Culture for Glasgow (1990) and Liverpool (2008)), as well as bringing large scale sporting attractions to the cities (e.g. Commonwealth Games in Manchester (2002)[cxxix] and Glasgow (2014)).

However, the employment opportunities created in the cities on the back of such ‘rebranding’ and investment in the late 20th and early 21st centuries are clearly different to those that characterised the cities in earlier decades. The scale of deindustrialisation experienced by each city means that in all three places industry has been replaced by a predominantly service sector economy: as Figure 5.7 shows, according to the ONS Annual Population Survey[566], in 2012/13 over 85% of employed adults in each city worked in ‘services’.

[cxxix] Manchester’s successful bid for the 2002 Commonwealth Games followed previous unsuccessful bids for the 1996 and 2000 Olympic Games.

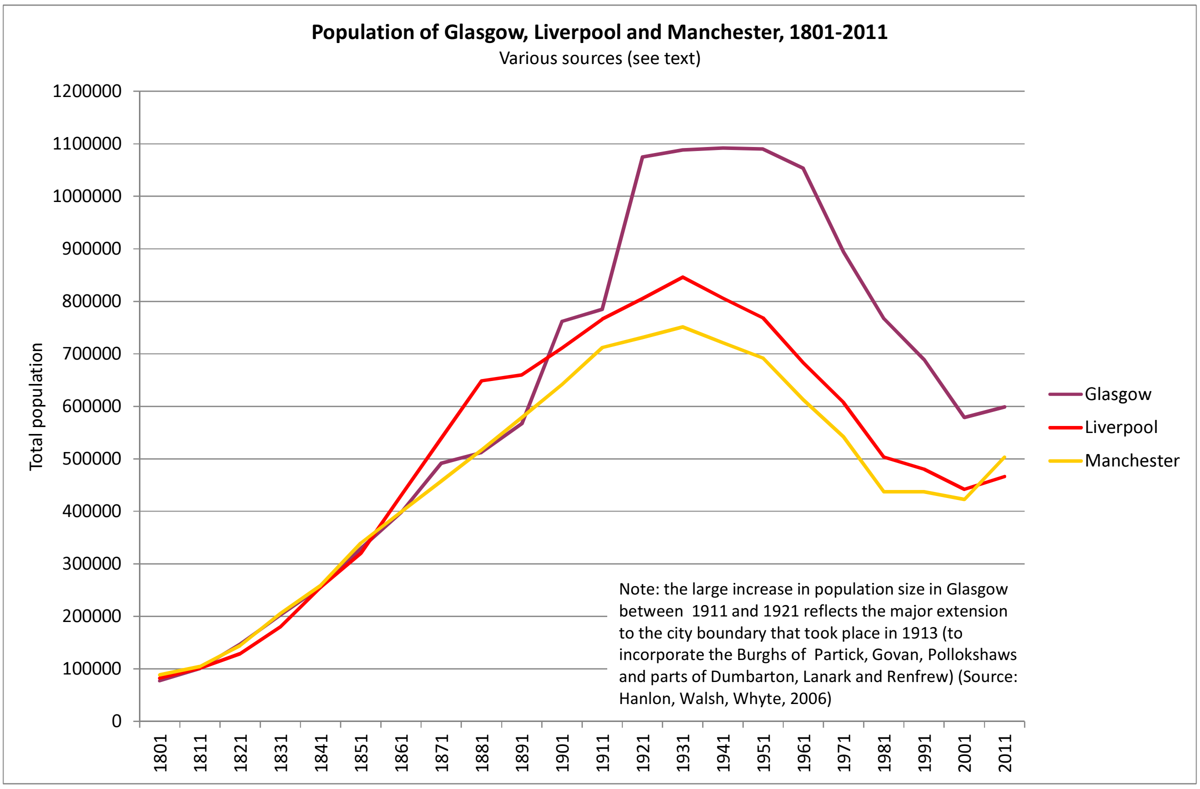
Figure 5.7



Furthermore the extent to which this change in the economic basis of the cities, allied to the ‘rebranding’ and ‘rebirth’ of each as cultural, sporting and retail destinations, has benefited and been inclusive to all their citizens is much debated: a final, and important, shared characteristic of Glasgow, Liverpool and Manchester is that each city has emerged from their respective historical processes as deeply divided, ‘polarised’ urban centres. Chapter 2 presented examples of health inequalities in Glasgow that are driven by stark inequalities in socio-economic circumstances of the city’s population. Other authors have discussed in more detail the gentrification of parts of the city[612,613] and the resulting sharp contrasts between those areas and others characterised by persistent high levels of material and social deprivation. The same is clearly true of Liverpool and Manchester. Regenerated and gentrified city centre areas sit in proximity to neighbourhoods with the highest rates of deprivation in all England. Manchester has been described as a ‘highly polarised city where successful regeneration clashes with continuous deprivation’ and where that deprivation is ‘pushed out of the city rather than solved’[582], and the same author has stated that as Liverpool continues to regenerate, the city will face ‘ongoing and possibly deepening polarisation’.

On a more positive note, however, it should also be noted that the relentless population decline that has characterised all three cities since the 1930s appears to have come to an end. The most recent data show increases in population size between 2001 and 2011, most notably in Manchester. Population trends over the whole period 1801-2011 are shown in Figure 5.8.

Figure 5.8[cxxx]



5.4 Conclusions

The histories of Glasgow, Liverpool and Manchester have, to a very large degree, developed along parallel lines. The cities have shared remarkably similar historical trajectories which have resulted in notably similar present day characteristics. The aim of this chapter has been to present a brief overview only, and clearly not all aspects have been covered: other similarities between the cities that could be discussed in greater detail (but which could be subjects of PhD theses in their own right) include such varied topics as religious

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[cxxx] Sources: Glasgow – Hanlon, Walsh & Whyte, 2006, for the period 1801-2001 (from Reports of the Medical Officer of Health and General Register for Scotland (now National Records of Scotland (NRS))), and NRS for 2011; Liverpool and Manchester – Census data from University of Portsmouth Great Britain Historical GIS Project (www.visionofbritain.org.uk) for period 1801-1991, and Office for National Statistics (ONS) for the period 2001-2011.

sectarianism in Glasgow and Liverpool and their influence on 20th century local politics[cxxxi], the influence of motor vehicle transport on the urban development of Glasgow and Manchester in the latter half of the 20th century[cxxxii], and the historical importance of cultural issues such as football and popular music in all three cities.

However, there are obviously a number of important differences between the cities that should also be noted, and which may be of potential relevance to the subject matter of this thesis. Local government response to both deindustrialisation and the accompanying Westminster policies in the 1980s differed notably in each location. Local politics in 1980s Liverpool was characterised by the rise of Militant, their confrontation with the Thatcher Government, and ending with the abolishment of Merseyside County Council which commentators have described as leaving Liverpool 'in a state of free-fall'[578,597]. In Glasgow, it has been argued that reaction to the neo-liberal policies of the day was different: that notwithstanding its Labour majority, Glasgow local government was both highly acquiescent to the policies of the Conservative Government, and also, in significant respects, quite willing to innovate in adapting neo-liberal policy measures to its own particular circumstances[615]. Manchester's 'ruling fathers' resisted any cooperation with the Thatcher government until 1987 when, faced with the third consecutive Westminster electoral victory for the Conservative Party, it reversed its previous policy of non-co-operation to work with the Government to facilitate urban renewal and regeneration[581,582].

[cxxxi] The influence of Irish immigration on both Glasgow and Liverpool, and corresponding anti-Catholic discrimination in the late 19th and 20th Century, is well documented[590, 597]. However, in Glasgow the Irish (or Irish descent) community came to have considerable influence on The Labour Party (and its predecessor, the Independent Labour Party) in the city and, in time, in the Labour-run Glasgow Corporation, the largest local authority in Britain. The political and influential element of the Glasgow Irish community was described by Damer and others as The Murphia, and their members the Murphiosi[590]. In Liverpool 'sectarianism bedevilled Liverpool's politics to an extent unequalled anywhere else in mainland Britain – except Glasgow': an Irish Nationalist MP represented one of its Westminster constituencies for almost 45 years until 1929 (and as in Glasgow, Labour profited from Irish/Catholic support in later years), while The Liverpool Protestant Party was active, and was represented on the local council, over many decades of the 20th Century until the early 1970s[597].

[cxxxii] Although not all of the 1960s transport plans for Glasgow came to fruition, those that were implemented resulted in large-scale demolition of parts of the city to facilitate the creation of inner-city motor ways and express-ways[275]. Other UK cities experienced similar developments, notably Newcastle, Leeds and Manchester - but not Liverpool where the 1962 Liverpool Inner Motorway plan[614] was never implemented. Transport pans for Manchester have resulted in the wider Manchester region having the second highest number of motorway miles of any UK conurbation after London[579].

There are a number of other differences between the cities that should be noted. For example: late 20th century social responses to the fragmentation, dislocation and deprivation that had developed in the cities was different: riots erupted in Toxteth in Liverpool in the 1980s, but not in Glasgow and Manchester (the more recent English riots in 2011- the causes of which are more disputed[616,617] – included outbreaks in Liverpool and Manchester, but not Glasgow); the composition of the populations have differed at certain points in time – currently, for example, the ethnic profile of Manchester is much more diverse than that of Liverpool and Manchester (discussed further in Chapter 8); types of housing have been, and remain, different in Glasgow compared to the two English cities[cxxxiii]; some argue that religious sectarianism persists in Glasgow[619-621], whereas it has developed differently in Liverpool and is not comparable in nature in Manchester; as discussed, the industries on which each city was built differed. Finally, although their 20th century histories include many important shared characteristics (e.g. slum clearances, building of poor quality, geographically dispersed, housing estates and their impact on social relations), the absolute scale of those changes may differ to potentially important degrees[cxxxiv].

A number of these differences are potentially very important to the subject matter of this thesis and I will return to them in the final chapter. There are other distinctions which are not discussed here. However, in taking an overview of the historical development of the cities, it is surely fair to argue that the similarities outnumber the differences. And this shared history and development, from industrial growth to decline, decay and regeneration, and to current polarised societies with the highest levels of poverty and lowest life expectancy in their respective countries, means that in seeking to explore the issue of

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[cxxxiii] Glasgow, alongside other Scottish towns and cities, has obviously always been characterised by more tenement buildings rather than, for example, terraced housing more popular in English urban areas. In addition, 20th Century development and regeneration resulted in many more multi-storey flats in Glasgow per head of population than in Liverpool and Manchester, reflecting a strong desire on the part of planers for this type of housing to be built in the city. Crawford *et al* quote David Gibson, the Chairman of Glasgow's Housing Committee in the early 1950s: 'Let the planners check that all available city land is being built on. Let them push the frontier upwards instead of outwards. Where 10 floors are planned let them build 20 instead'[275]. In the post-WWII period up to 1987, 25% of the newly publicly-built dwellings in Glasgow were located within high-rise (6 storeys or more) tower blocks, including 15% within 'super high-rise' (20 storeys or more) blocks. The equivalent figures for Liverpool and Manchester were 15% (1% in super high-rise) and 14% (0%) respectively[618].

[cxxxiv] It appears that this scale of change has never been quantified. However, as will be discussed further in Chapter 8, it seems likely that the scale was larger in Glasgow than in Liverpool and Manchester. This is the subject of ongoing research.

Scottish excess mortality within a specific urban (Glasgow) context, Liverpool and Manchester are surely the most suitable British comparator cities with which to do that. The next chapter presents the first set of results of the analyses of deprivation and mortality in all three locations.

Chapter 6. Results 1: deprivation and mortality in Glasgow, Liverpool and Manchester

6.1 Introduction

This is the first of two results chapters in the thesis.

The previous chapter (and, to a lesser degree, Chapter 4) outlined the historical and contemporary similarities between Glasgow, Liverpool and Manchester, and the reasons why, therefore, Liverpool and Manchester represent an appropriate selection of British cities with which to undertake comparative analyses of deprivation and mortality in Glasgow. In presenting the results of those analyses, this chapter seeks to answer the first six of the twelve research questions posed in Chapter 3, namely:

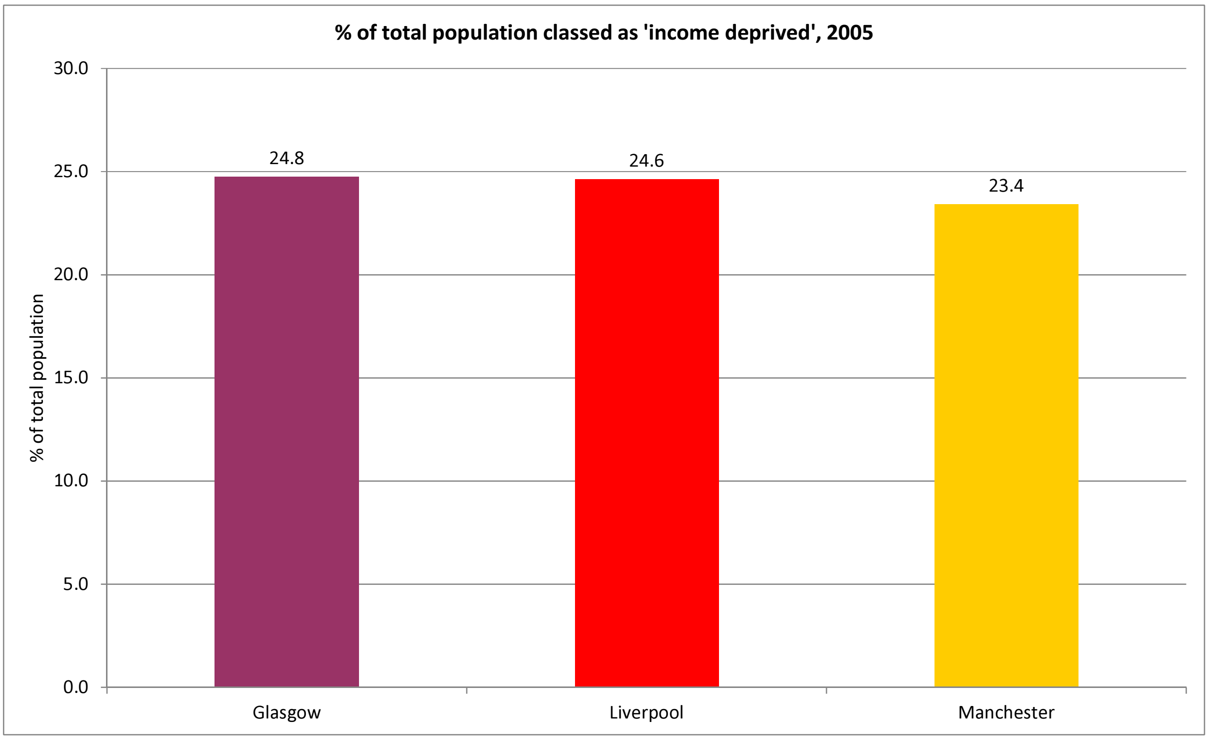
1. How comparable are the deprivation profiles of Glasgow, Liverpool and Manchester?
2. Controlling for differences in area-based deprivation, how do the health (mortality) profiles of the three cities compare?
3. If there is evidence of higher mortality in Glasgow, is this restricted to certain sections of the population, or is it a city-wide effect?
4. Are there particular differences between the cities in relation to particular causes of death?
5. At the city level, what do historic trends in deprivation and mortality show?
6. To what extent does the employed measure of deprivation explain differences in mortality between Glasgow and the rest of Scotland, and between Glasgow and other large English cities?

For clarity, the results will be presented under these six headings.

6.2 Research question 1: how comparable are the deprivation profiles of Glasgow, Liverpool and Manchester?

The data, time periods and methods used to create comparable deprivation profiles of the three cities were described in detail in Chapter 4. Figure 6.1 shows that, based on these data and definitions of deprivation, overall levels of deprivation in Glasgow, Liverpool and Manchester in 2005[cxxxv] were almost identical, with nearly a quarter of the total population in each classed as income deprived: 24.8%, 24.6% and 23.4% respectively.

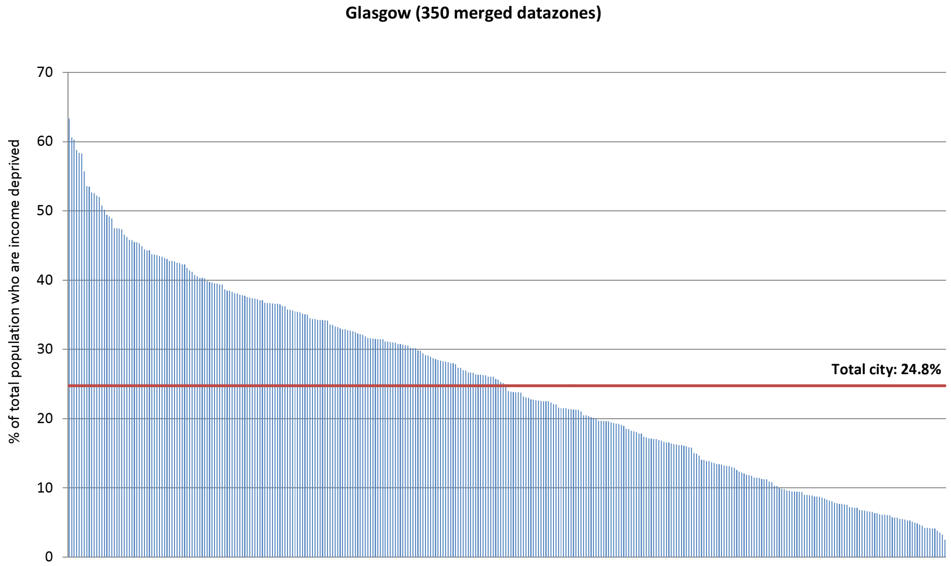
Figure 6.1

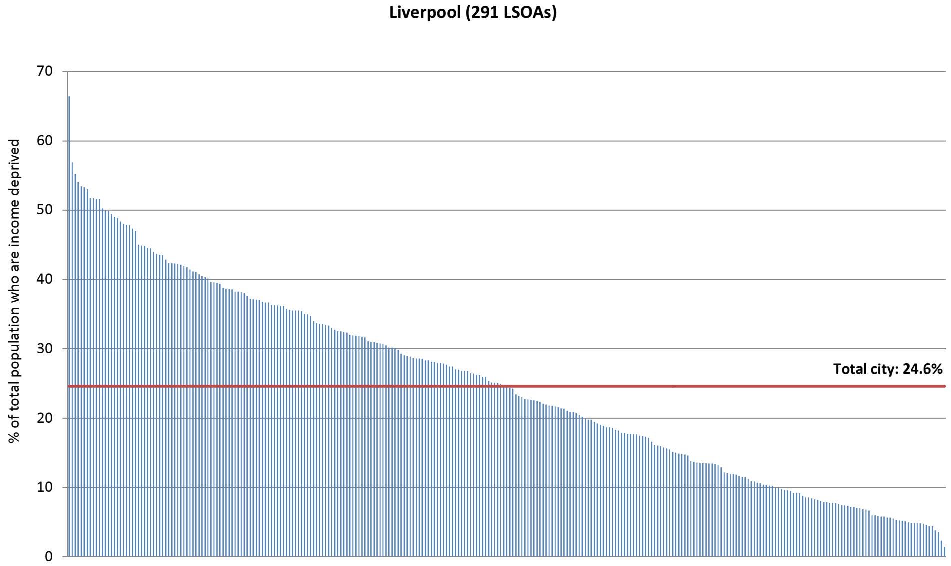


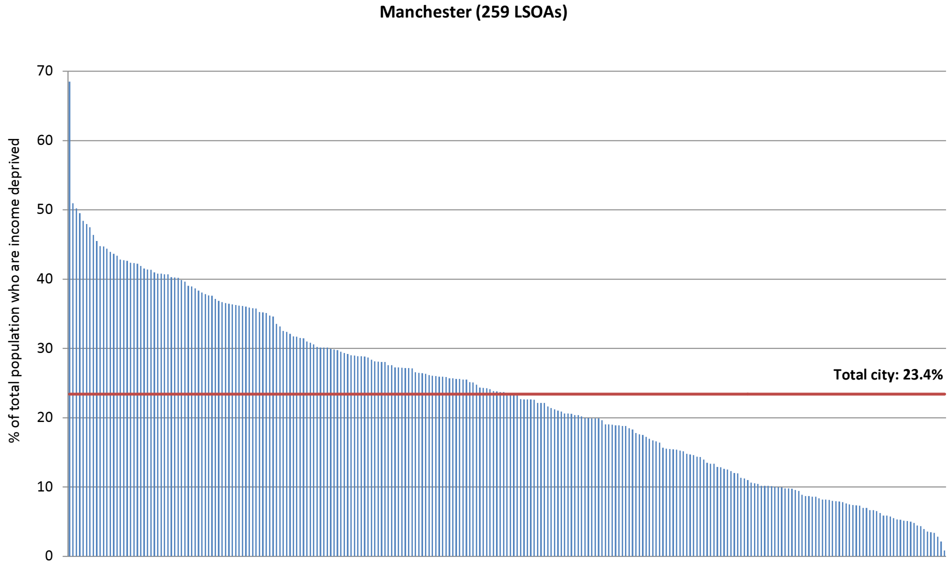
In addition, the *distribution* of deprivation across each city's small areas was also very similar. This can be seen in Figure 6.2 which shows the percentage of the total population classed as 'income deprived' in each of the cities' small areas (LSOAs in the English cities; merged datazones in Glasgow). In each city, it ranged from areas with less than 5% of the population classed as income deprived to areas with over 50% classed as such. The similarity in the distributions in Glasgow and Liverpool is particularly noticeable.

[cxxxv] As described in Chapter 4, the analyses described in this chapter were undertaken in 2009: at that point the most up to date deprivation data for Scotland were the 2006 SIMD, based on data collected in 2005.

Figure 6.2. Distribution of 'income deprivation' across Glasgow, Liverpool and Manchester

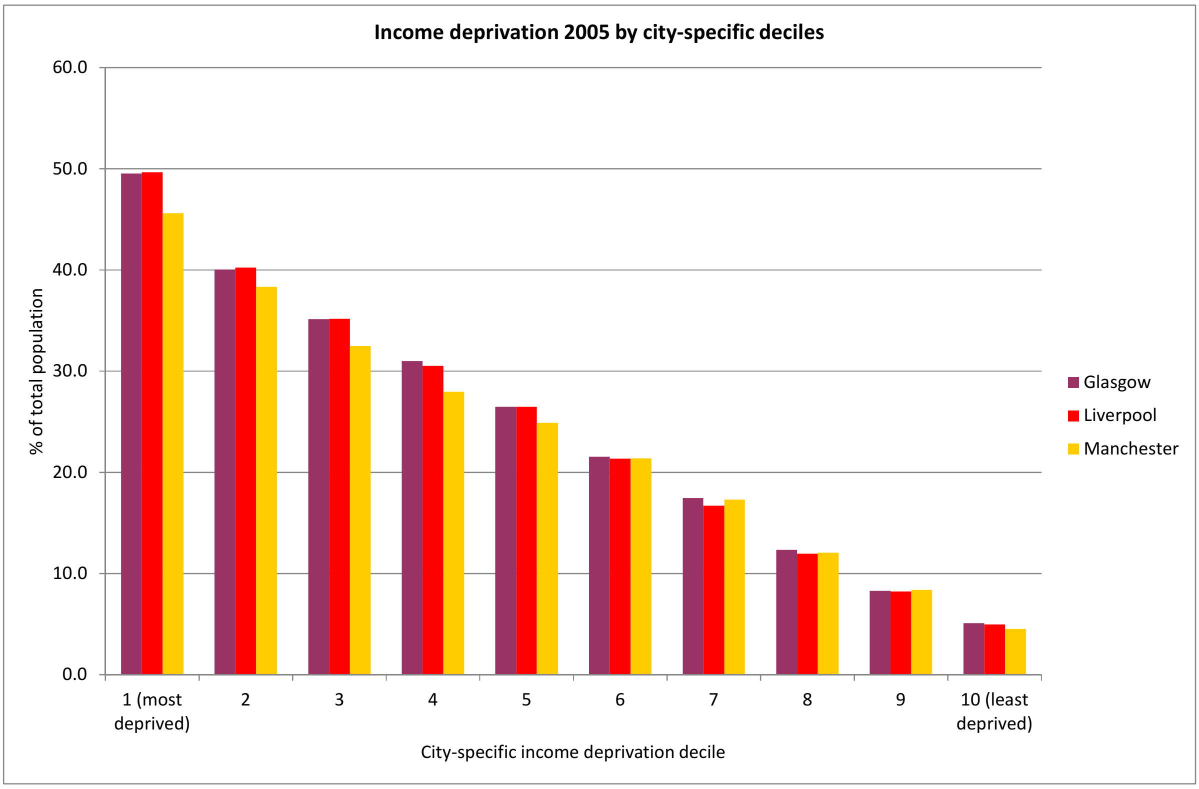






To compare these distributions in more detail, three sets of *city-specific* deprivation deciles were created. As described in Chapter 4, these are different from the single set of deciles derived from the deprivation data from across all three cities and which were used in the mortality analyses (the results of which are presented later in this chapter)[cxxxvi]. Analysis of levels of deprivation across these city-specific deciles confirmed the similar distributions in all three cities, with the ratio of the percentage of the population classed as deprived in decile 1 (most deprived): decile 10 (least deprived) in each city being virtually identical: 9.7 (Glasgow), 10.0 (Liverpool) and 10.1 (Manchester) respectively[cxxxvii]. Furthermore, comparison of the slopes of the regression lines across the deciles in each city also produced similar results. All these data are shown in Figure 6.3 and Table 6.1 below.

Figure 6.3



[cxxxvi] As a reminder, two sets of deciles were created. One set was derived from deprivation data *across all three cities* for use in the mortality standardisation analyses. The second set (in fact comprised of *three* sets of separate *city-specific* deciles) was derived to enable comparison of the distribution of deprivation between cities.

[cxxxvii] The similarity in the distributions of deprivation across the three cities is further confirmed by the fact that the same ratios were obtained from analysis of the city-specific deciles as were obtained from comparison of deciles based on the three-city deprivation index.

Table 6.1 Comparisons of distributions of deprivation in Glasgow, Liverpool and Manchester

City	% of population classed as 'income deprived': Decile 1 (most deprived)	% of population classed as 'income deprived': Decile 10 (least deprived)	Ratio of most deprived: least deprived decile	Value of *m*[cxxxviii] (representing slope of the line across deciles)
Glasgow	49.5	5.1	9.7	-4.7
Liverpool	49.7	5.0	10.0	-4.8
Manchester	45.6	4.5	10.1	-4.3

As described in Chapter 4, the measure of deprivation used in these analyses is extremely highly correlated with the best available measures of multiple deprivation in both Scotland and England, and, based on this measure and definition of deprivation, in 2005, Glasgow, Liverpool and Manchester (the former two in particular) were cities with remarkably similar deprivation profiles.

6.3 Research questions 2 and 3: controlling for differences in area-based deprivation, how do the health (mortality) profiles of the three cities compare? And if there is evidence of higher mortality in Glasgow, is this restricted to certain sections of the population, or is it a city-wide effect?

Figures 6.4-6.6 compare the mortality profile of Glasgow in the period 2003-07 with that of Liverpool & Manchester, standardising for age, sex and deprivation decile. It should be noted, however, that such was the similarity of the deprivation profiles of the cities, standardising for deprivation made almost no difference to the results[cxxxix]. The results are presented as standardised mortality ratios (SMRs)[cxl] for the whole population (Figure 6.4), and for males

[cxxxviii] From linear regression equation $y = mx + b$, where m is the slope of the line, b is the y-axis intercept (i.e. where the line crosses the y axis), and x and y are co-ordinates for any point on the line. The slope is effectively the unit increase in y for each unit increase in x.

[cxxxix] For example, for deaths at all ages, and standardising for age and sex only, the SMR for Glasgow relative to Liverpool and Manchester was 115.7 (114.5 - 116.9): this reduced only to 114.4 (113.2 – 115.5) after further adjustment for income deprivation decile. The equivalent figures for deaths under 65 years were 132.1 (129.3 - 134.8) (adjusted for age and sex only) and 131.4 (128.6 - 134.1) (adjusted for age, sex and deprivation decile).

[cxl] As explained in Chapter 4, the SMRs compare Glasgow's actual ('observed') deaths with the figure that would be 'expected' if Glasgow experienced the same mortality profile as Liverpool and Manchester. The latter 'expected' figure is derived from applying Liverpool & Manchester's age/sex/deprivation specific crude mortality rates to Glasgow's age/sex/deprivation specific

and females separately (Figures 6.5 and 6.6 respectively). Data are presented for all ages and for different age groups. These results show that, despite their near identical deprivation profiles, for deaths under 65 years all-cause mortality in Glasgow relative to Liverpool and Manchester combined was more than 30% higher: SMR of 131.4 (95% confidence intervals: 128.6 – 134.1). For deaths at all ages, mortality in Glasgow was 14% higher (SMR: 114.4 (113.2 – 115.5)). This 'excess' was greatest in the working age groups of 15-44 years and 45-64 years, where it was 45% and 30% higher respectively (although it should be noted that the actual number of deaths in the 45-64 group is much higher than in the 15-44s[cxli]). However, childhood (age 0-15) mortality was significantly lower in Glasgow relative to Liverpool and Manchester – SMR: 81.3 (71.2 – 91.3). Across most age groups, SMRs were highest in comparisons of deaths among males.

population (and summing the resulting values). The ratio is expressed as the summed 'observed' figure divided by the summed 'expected' value.

[cxli] Over the five year period (2003-2007) there were a total of 2,111 deaths in Glasgow in the 15-44 age group (compared to 984 in Liverpool and 1,139 in Manchester). However, in the 45-64 age group, there were more than three times that number of deaths in Glasgow - 6,385 (compared to 3,727 and 3,268 in Liverpool and Manchester respectively).

Figure 6.4

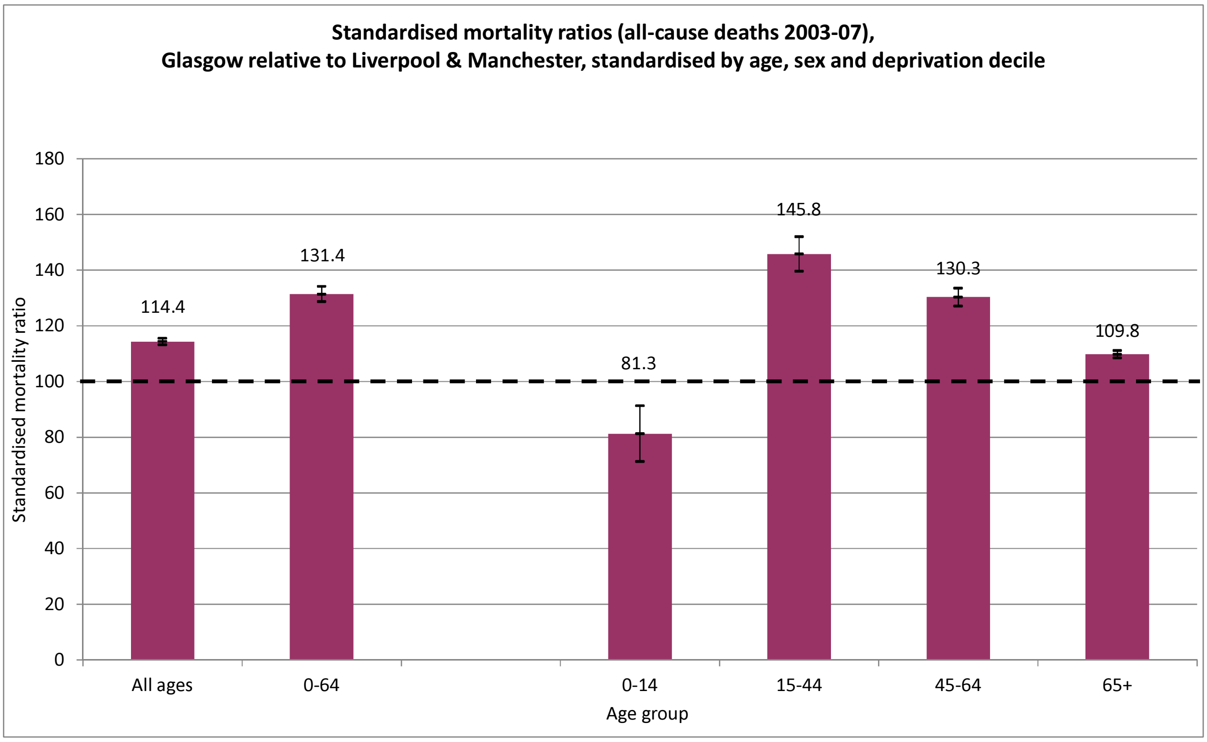


Figure 6.5

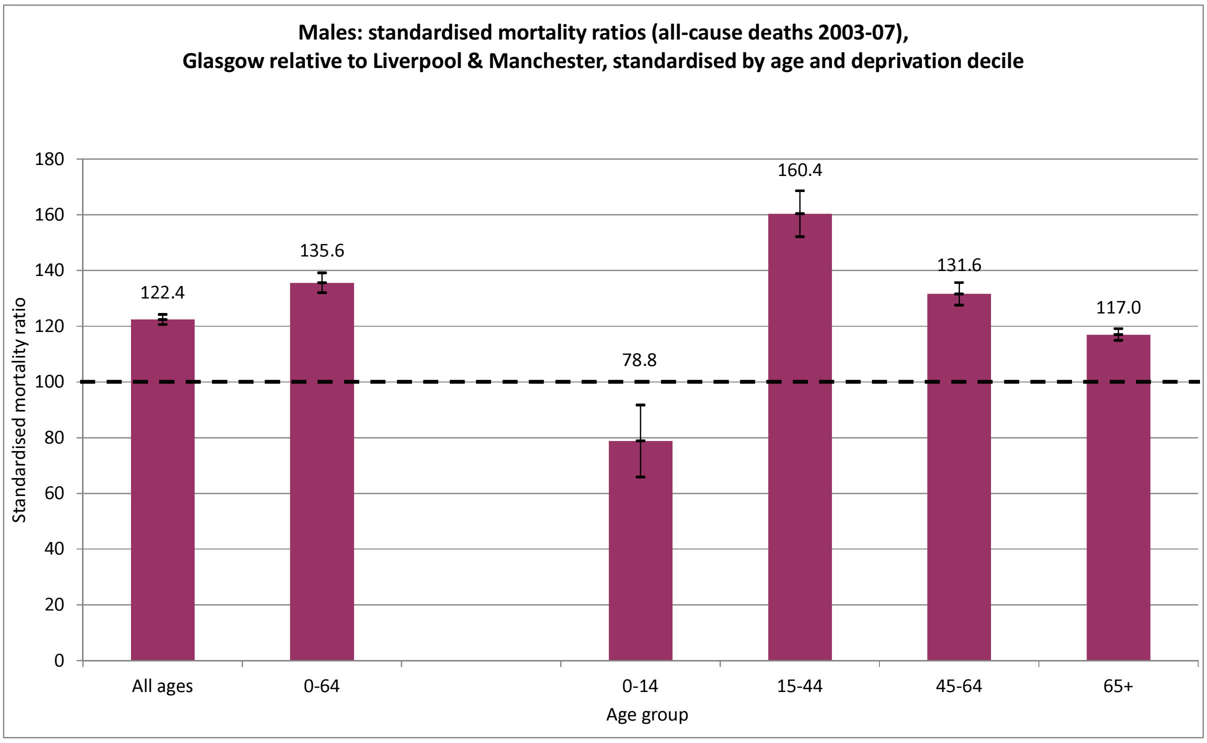
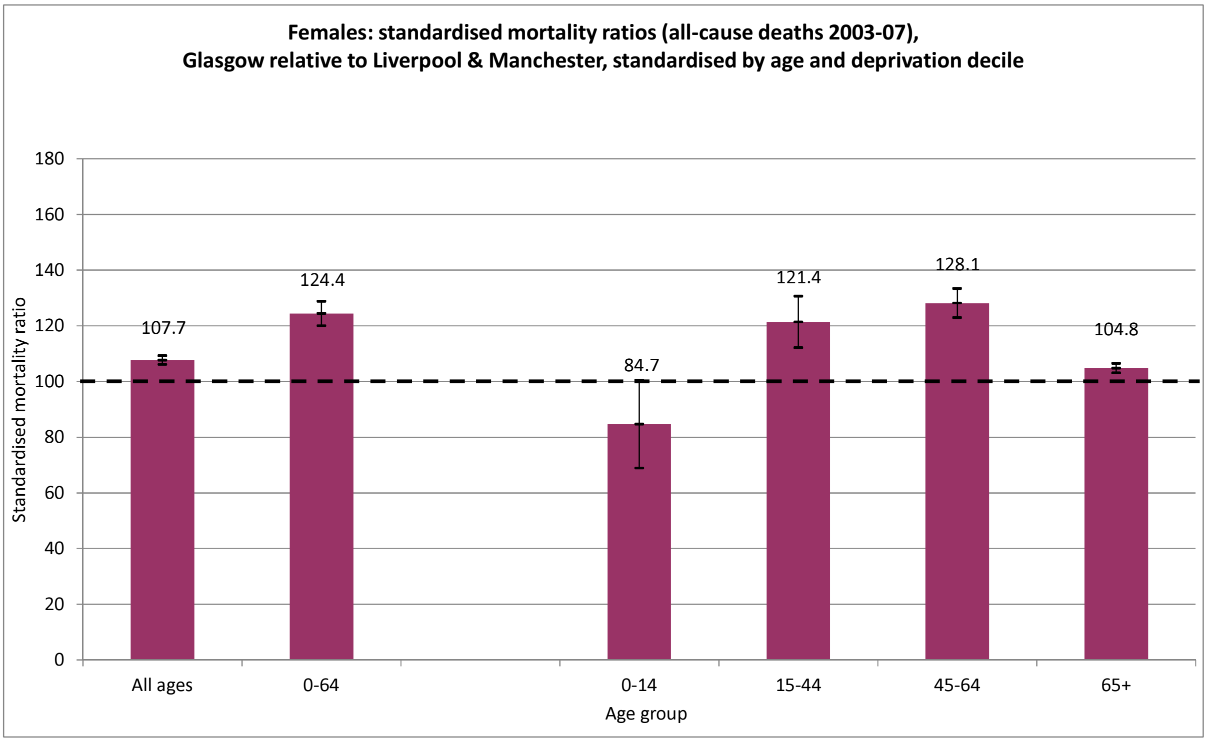


Figure 6.6



6.3.1 How does mortality compare across the spectrum of deprivation?

The above figures compare age standardised mortality rates by age and gender. Another important analysis is by level of deprivation in order to establish whether higher mortality was seen across all of Glasgow's neighbourhood types (deprived and non-deprived), or whether it was concentrated in particular types of areas. Figure 6.7 presents all-cause SMRs for Glasgow relative to Liverpool and Manchester, broken down by deprivation decile, for (a) deaths at all ages, and (b) deaths for age <65 years. For deaths at all ages, a similar level of 'excess' mortality for Glasgow relative to Liverpool/Manchester can be seen across the whole population: for example 19% and 20% higher in the two most deprived deciles (deciles 1 and 2) (SMRs: 118.6 (115.3 - 121.9) and 119.8 (116.0 - 123.7) respectively), but also 20% and 15% higher in the two least deprived deciles (deciles 9 and 10) (SMRs: 119.7 (114.9 – 124.4) and 115.1 (110.4 - 115.3) respectively). For premature mortality (deaths <65 years), however, a different picture emerged with SMRs higher in the five more deprived deciles (1-5) compared to the less deprived (6-10). Similar analyses by gender (Figures 6.8 and 6.9) showed that this pattern mainly related to deaths among males, for whom SMRs were also generally higher compared to females.

Figure 6.7 Standardised all-cause mortality ratios 2003-2007 for Glasgow relative to Liverpool and Manchester (combined), broken down by deprivation decile, for (a) all deaths and (b) deaths under 65 years

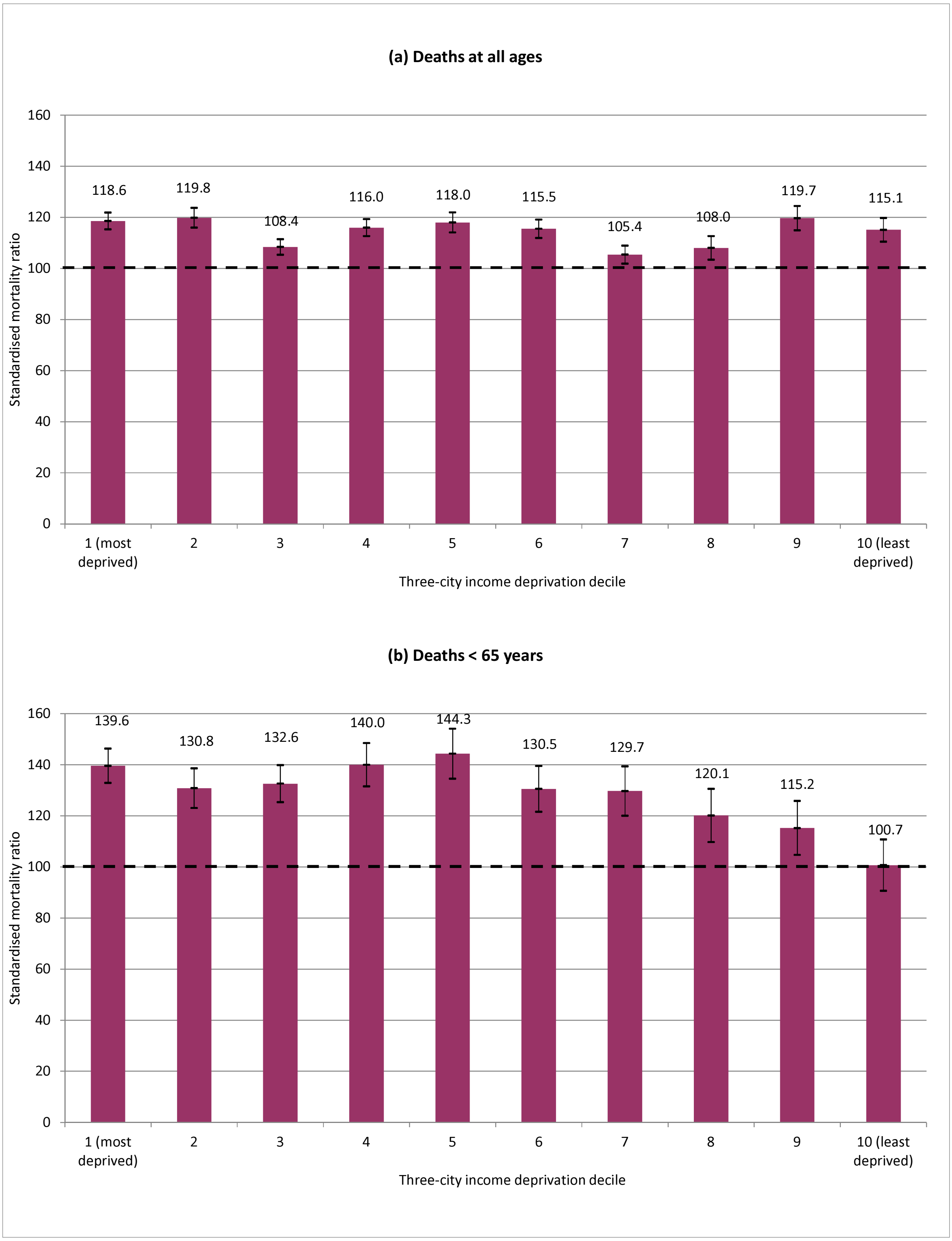


Figure 6.8 Standardised all-cause mortality ratios 2003-2007 for Glasgow relative to Liverpool and Manchester (combined), broken down by deprivation decile, for (a) all deaths and (b) deaths under 65 years (MALES ONLY)

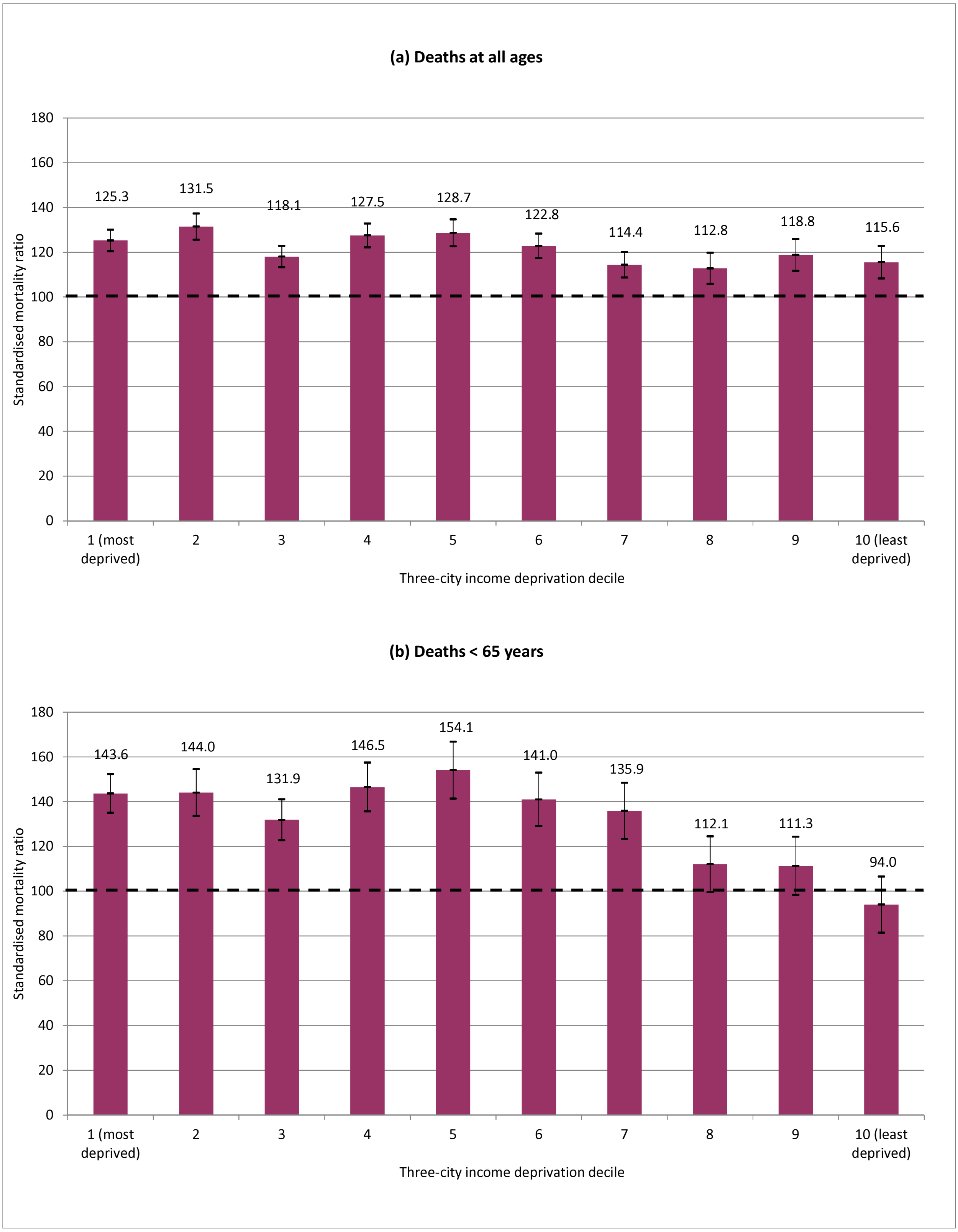
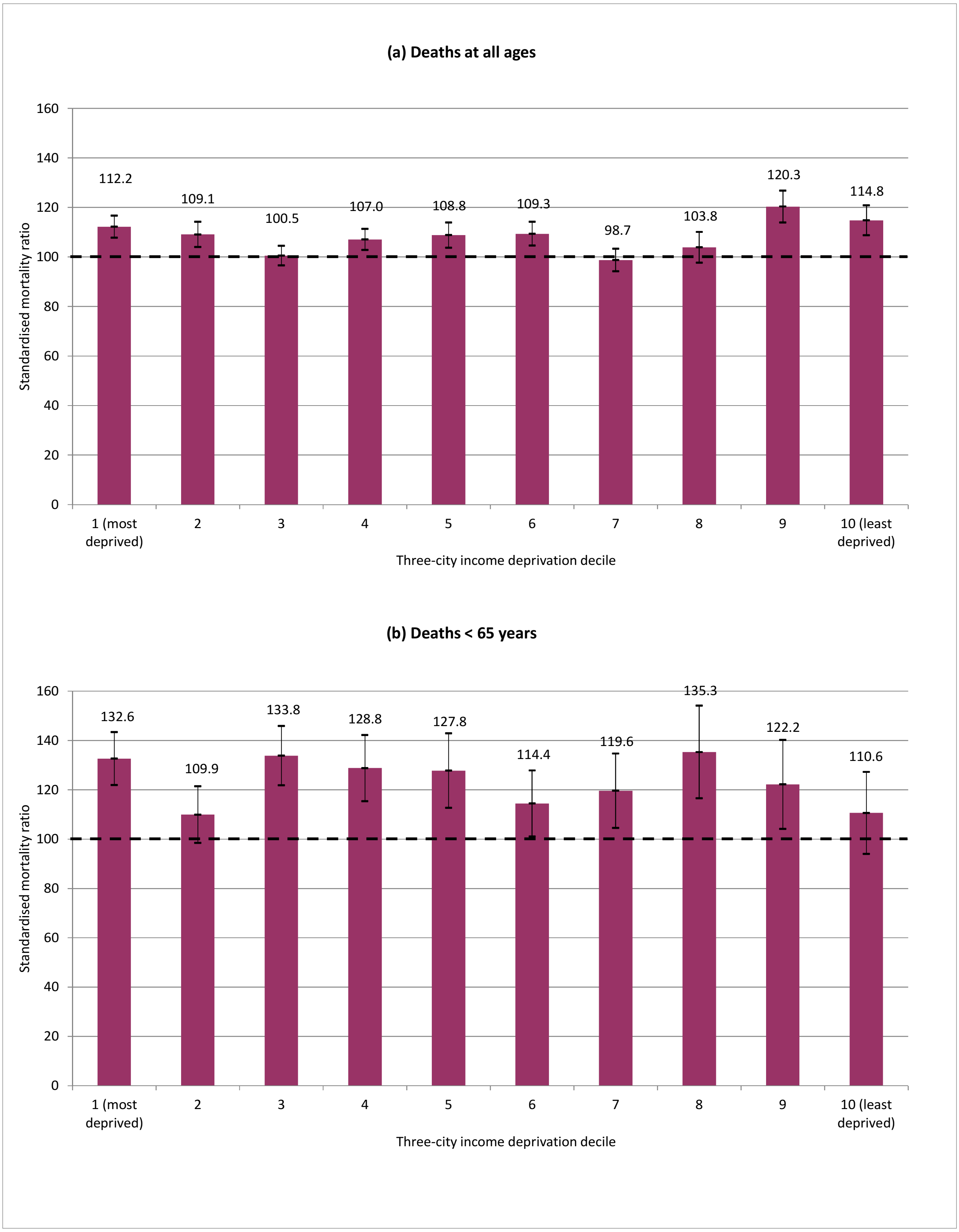


Figure 6.9 Standardised all-cause mortality ratios 2003-2007 for Glasgow relative to Liverpool and Manchester (combined), broken down by deprivation decile, for (a) all deaths and (b) deaths under 65 years (FEMALES ONLY)



6.3.2 Individual city comparisons

The results presented above derive from analysis of deprivation and mortality data for Glasgow relative to *both* English cities combined. As explained in Chapter 4, this is because the results of separate comparisons between Glasgow and Liverpool, and between Glasgow and Manchester, were broadly similar. For example, for deaths at all ages the SMR of 114.4 for Glasgow relative to both cities combined (Figure 6.4 above) is comparable to the SMR of 112.6 (95% intervals 111.4 - 113.7) obtained from separate analysis of Glasgow's mortality relative to that of Liverpool, and to the SMR of 115.7 (114.5 - 116.9) for Glasgow relative to Manchester. Similarly, the SMR for deaths under 65 years in Glasgow compared to both cities (131.4 (128.6 - 134.1)) is similar to that obtained from the separate analyses: 136.0 (133.1 - 138.8) compared to Liverpool alone and 125.8 (123.2 - 128.5) compared to Manchester alone. Further details of these analyses are included within Appendix II.

6.4 Research question 4: are there particular differences between the cities in relation to particular causes of death?

Figure 6.10 shows a similar set of SMRs, for deaths at all ages, this time presented by principal cause of death. The SMRs for all cancers and diseases of the circulatory system are, at around 112, similar to the overall SMR of 114 for all-cause deaths. This is to be expected, given that these causes make up the majority of all deaths. However, notably higher SMRs are evident for the other causes of death presented, with deaths among Glaswegians (relative to residents of Liverpool and Manchester) 27% higher in relation to lung cancer, 32% higher for external causes, almost 70% higher for suicide, 2.3 times higher for alcohol-related causes, and almost 2.5 times higher for drug-related poisonings. Figures 6.11 and 6.12 show that SMRs for Glasgow males were slightly higher than these for most causes, and those for females slightly lower. The exception to this was suicide, with deaths among females in Glasgow more than two times higher relative to females in the two English cities (SMR: 216.5 (184.4 – 248.6)).

Similar results were obtained from cause-specific analyses of deaths under 65 years (Appendix III).

Figure 6.10

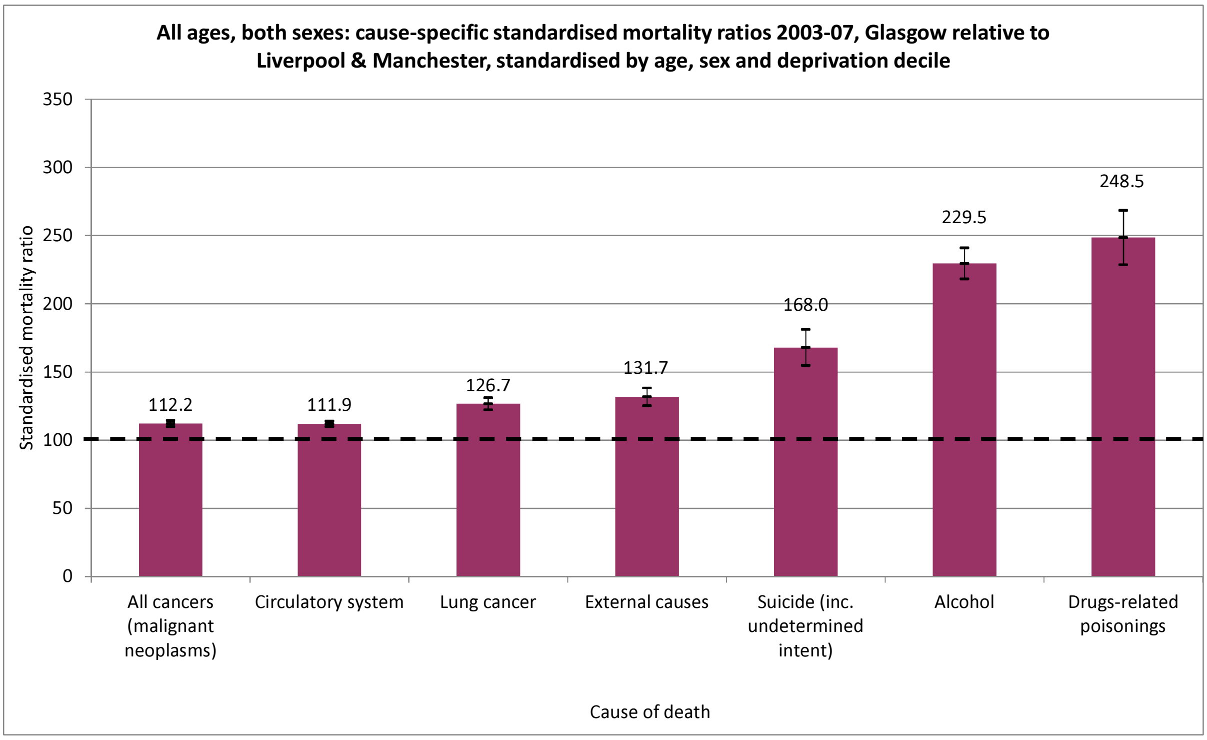


Figure 6.11

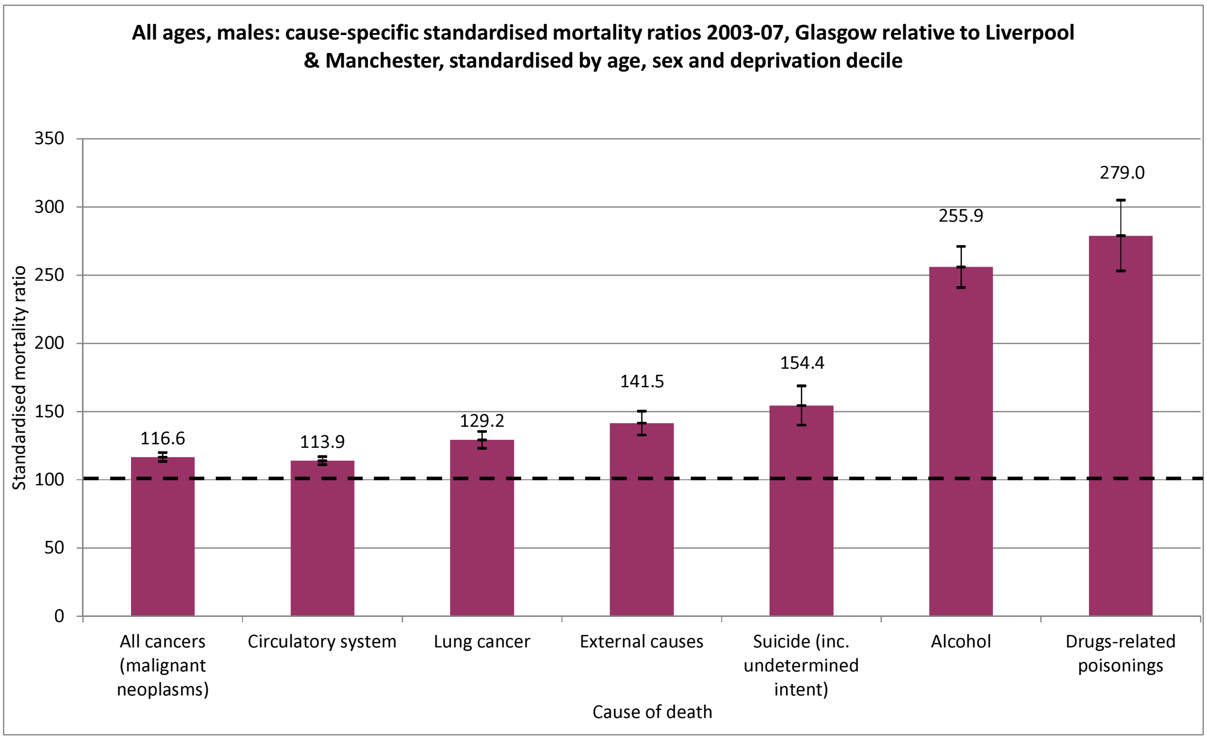
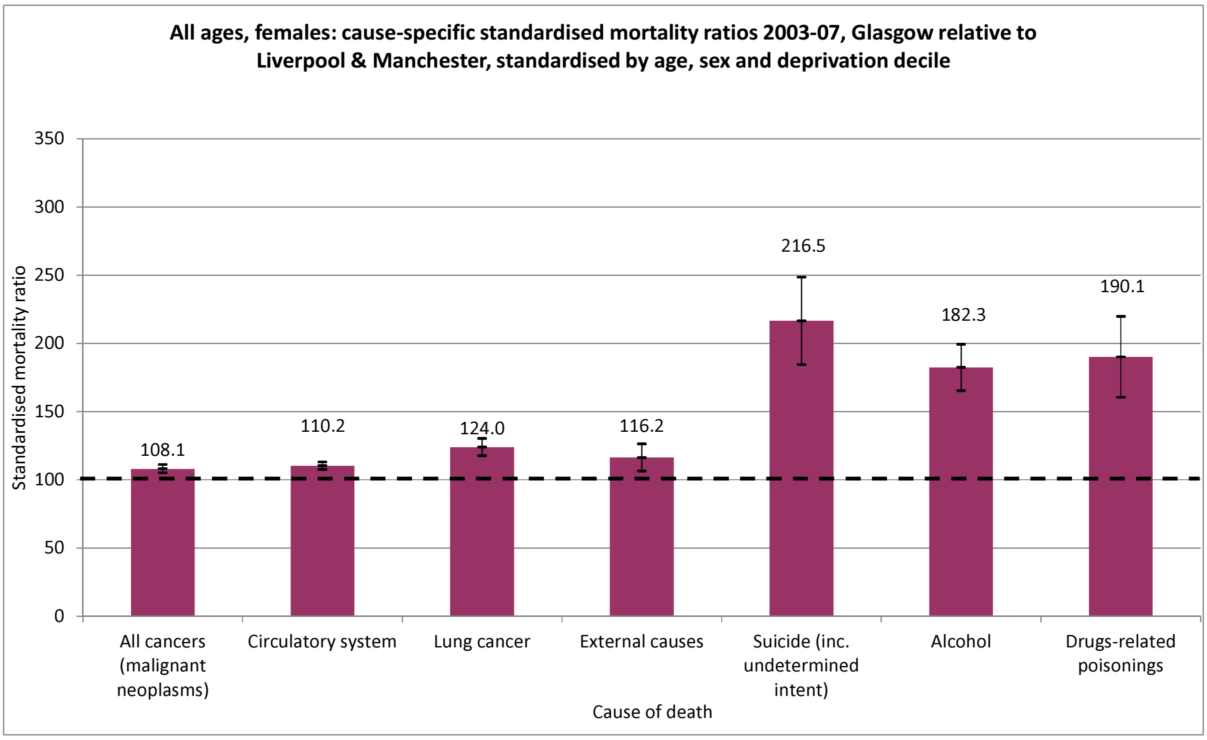


Figure 6.12



6.4.1 What is the relative contribution of these causes of death to the overall levels of 'excess' mortality in Glasgow?

'Excess mortality' in these analyses can be defined as the additional deaths experienced in Glasgow over and above what might be expected if Glasgow displayed the same age, sex and deprivation specific mortality profile as Liverpool and Manchester. On that basis, it can be calculated that between 2003 and 2007 there were more than 4,500 'excess' deaths in Glasgow, of which almost half (2,090) occurred under the age of 65 years. Analysis by age, sex and cause showed that for all deaths, around half of the Glasgow excess was attributable to all cancers (23.2%) and diseases of the circulatory system (27.5%), and around 20% were a result of alcohol related conditions. For deaths under 65 years, however, almost half of the excess was due to deaths from alcohol related causes (32%) and drugs related poisonings (17%). These figures are summarised in Table 6.2.

Table 6.2 'Excess' deaths experienced in Glasgow relative to Liverpool and Manchester, shown as percentage of all excess deaths by age group[cxlii].

	Cause of death						
Age	All cancers (malignant neoplasms)	Circulatory system diseases	Lung cancer	External causes	Suicide (incl. undetermined intent)	Alcohol-related	Drugs-related poisonings
0-14	5.6	1.4	0.0	-3.7	0.1	0.0	1.9
15-44	-3.6	0.8	2.6	30.5	25.3	22.4	48.0
45-64	16.3	20.8	11.2	6.0	4.5	35.4	2.7
65+	34.3	38.3	20.3	3.3	0.7	8.4	0.2
0-64	10.3	15.0	8.8	14.1	11.2	32.3	17.1
All ages	23.2	27.5	14.9	8.3	5.6	19.5	8.0

6.5 Research question 5: what do historic trends in deprivation and mortality show?

6.5.1 Trends in poverty and deprivation

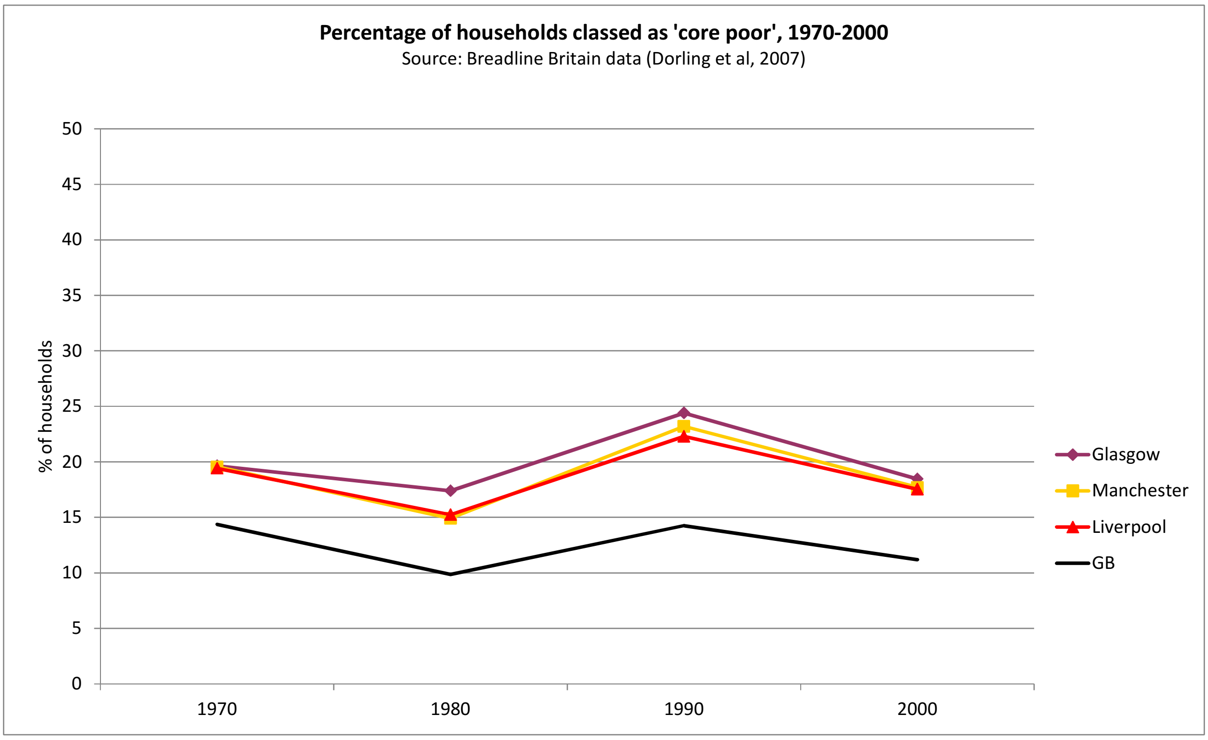
The above analyses show that levels of deprivation, as defined by this measure of income deprivation in 2005, were very similar in all three cities. However, it is possible that the deprivation profiles of the cities may have changed in recent decades. This would be potentially important because current levels of mortality for some causes may have been influenced by the socio-economic circumstances of the population decades ago, not now. Thus, some of the findings might be explained if Glasgow had experienced relatively more deprivation in the past, but has since improved its relative position.

However, examination of a range of historical data suggests that, at an overall city level at least, this appears unlikely to be the case. For example, Figure 6.13 shows that the percentage of households in each city which were classed as 'core poor' by Sheffield University's 'Breadline Britain' data analyses[79] was virtually identical in both 1970 (the earliest year for which data are available) and 2000 (the latest year in which data are presented). Although there was some fluctuation in rates between those years, with slightly higher figures in Glasgow

[cxlii] Note that some cause groupings are overlapping (e.g. external causes and suicide). Note also that not all causes of death are included, thus rows do not add up to 100%.

in 1980 and 1990, the differences between the cities over the whole period were slight.

Figure 6.13



Going back further, analyses of historical census data[523] also suggest there has been little change over time: for example, Figure 6.14 shows that between 1951 and 2001 there was no more than around three percentage points difference between the cities' rates of male unemployment over 50 years. A similar 50 year trend in the proportion of adult males in a low social class (as discussed in Chapter 2, alongside male unemployment, this indicator has been commonly used as a component of deprivation indices) also shows no relative improvement in Glasgow's position over this time period (Figure 6.15).

Figure 6.14

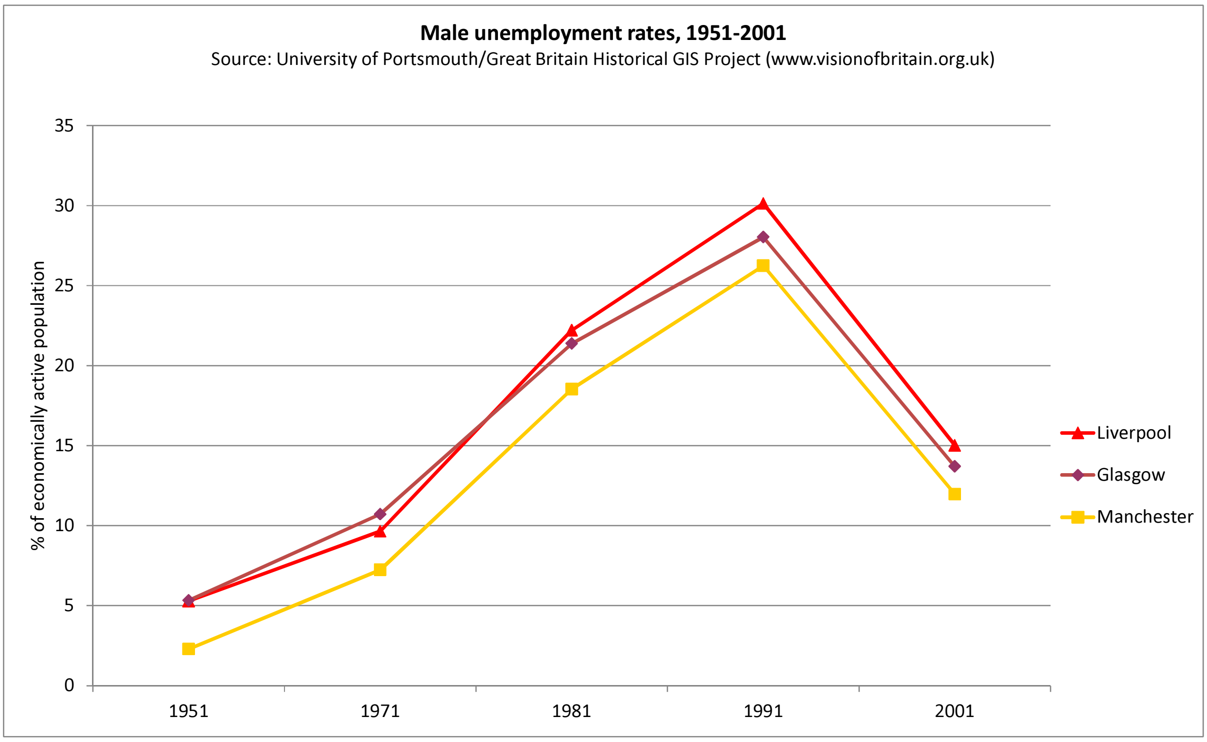
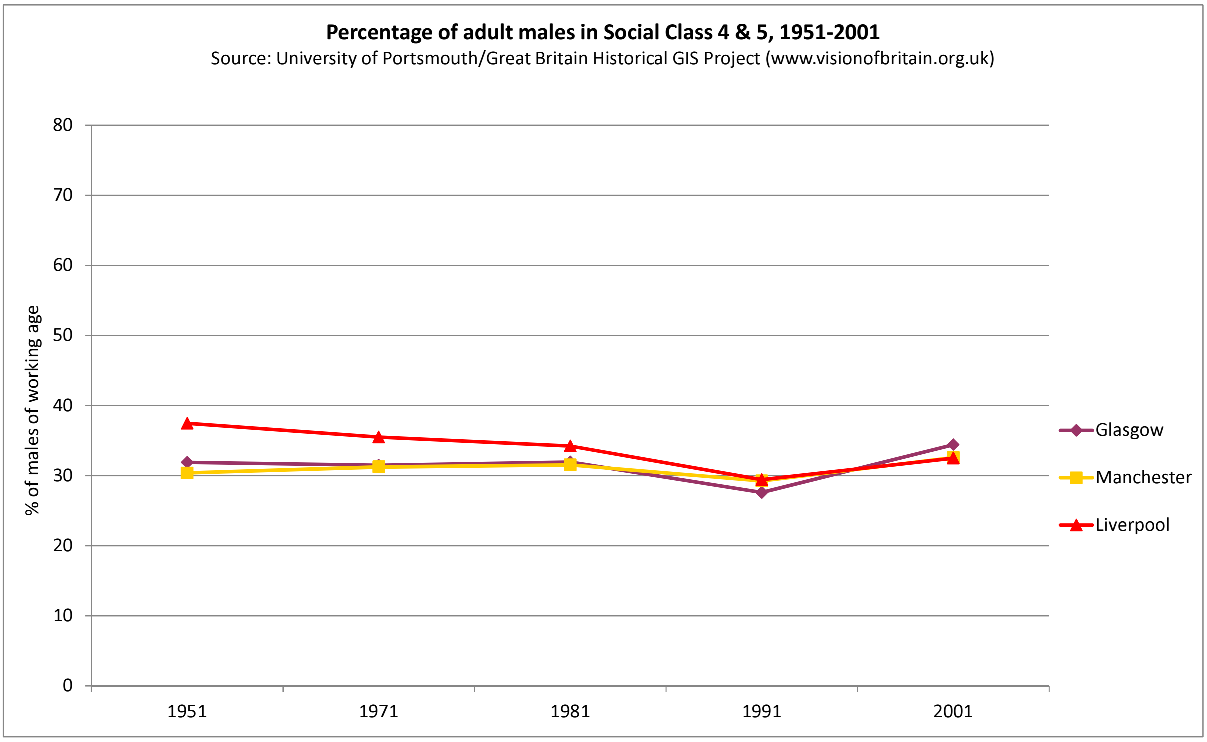
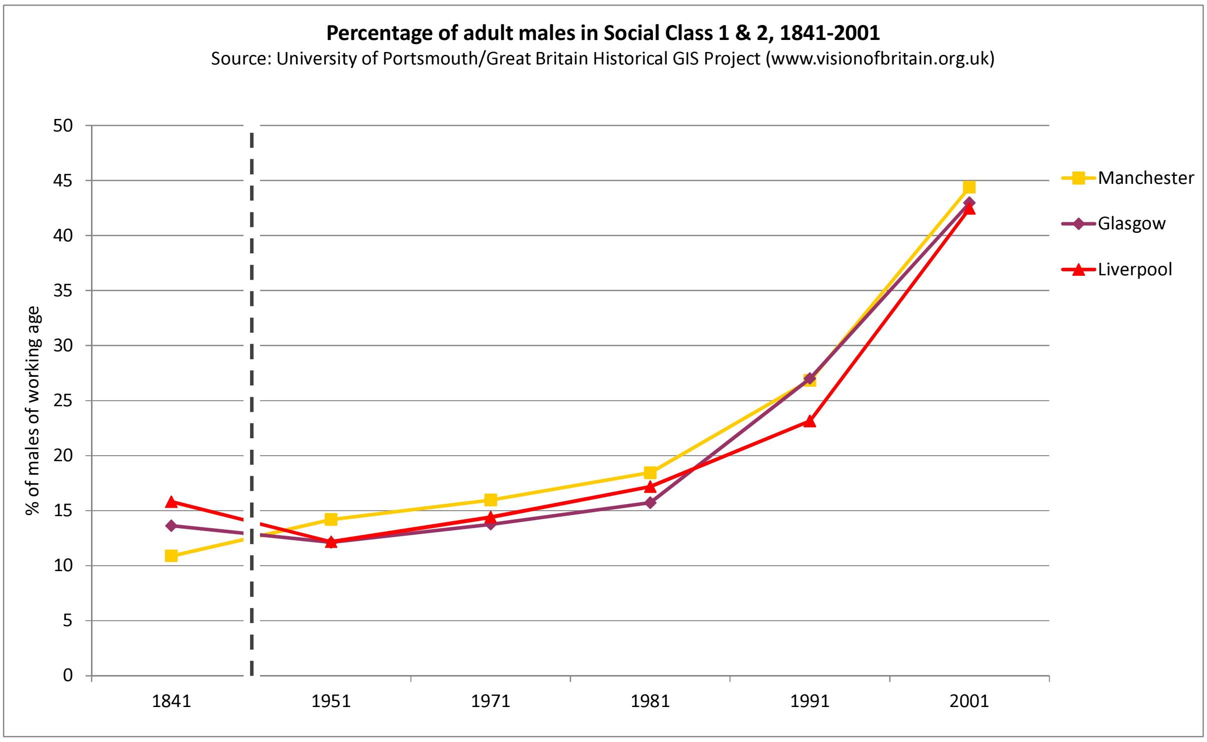


Figure 6.15



(As an aside, analysis of the same census-based social class data confirms the similarity of the social composition of the three cities over time in relation to high, rather than low, social class: Figure 6.16 shows the percentage of adult males in social class I and II in the middle of the 19th Century, and in the years 1951-2001. As with the percentage of adult males of low social class, there is little difference between the cities in any of the years analysed[cxliii]).

Figure 6.16

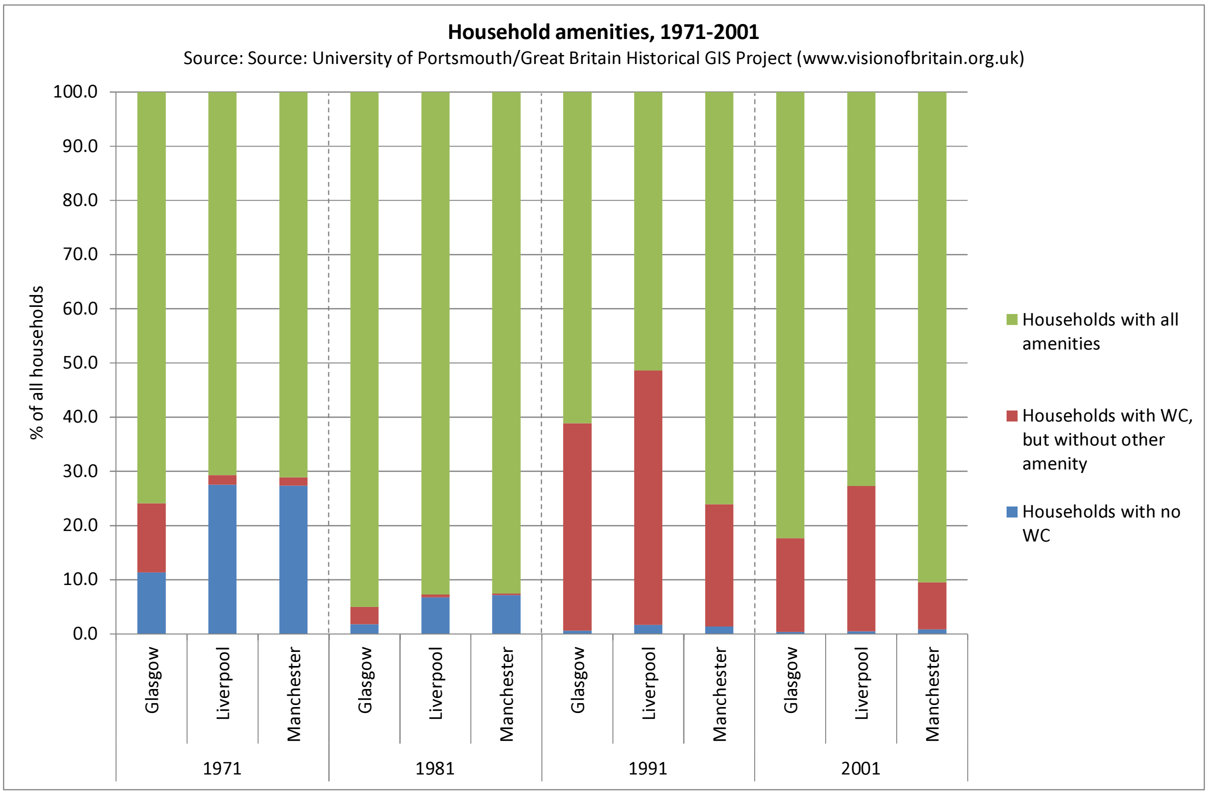


Analyses of historical census data relating to household amenities (as a reflection of material circumstances) produce a mixed picture, but not one which suggests a particularly worse profile for Glasgow compared to the English cities. The list of household amenities included in census questions has varied at different time points. For example, questions concerning access to an inside toilet, and fixed bath or shower, were included between 1971 and 2001 (but not 2011), access to a cooking stove, kitchen sink, and hot water supply were included between 1951 to 1971, and access to central heating was added in 1991[622]. For amenities such as toilets, hot water, baths etc., the questions relate to exclusive (rather than shared) access. Figure 6.17 summarises a subset of these data for the period 1971-2001, with the amenities grouped under three headings: lack of access to an indoor flush toilet; lack of access to at least one

[cxliii] The dramatic rise in the percentage of adults in social class I and II between 1981 and 2001 in Glasgow has been described before[95], and may be influenced by measurement and definitional issues driven by the change in those decades from employment opportunities in an industry-based economy to one dominated by the service sector. This is the subject of ongoing research.

other amenity other than toilet; not lacking any amenities[cxliv]. This shows some differences between the cities, but in general Glasgow did not tend to have proportionally higher numbers of households lacking such amenities. In 1971 the percentage of households without exclusive access to an indoor toilet in Glasgow was lower than the equivalent figures for Liverpool and Manchester; however, the percentage of households lacking other core amenities at that time (e.g. fixed bath or shower) was higher in Glasgow (differences that are likely to reflect variation in the predominant housing types in the cities e.g. large numbers of tenement properties in Glasgow, terraced houses in Liverpool and Manchester). There were few differences in 1981, and Liverpool had relatively higher percentages of households lacking amenities in 1991 and 2001.

Figure 6.17

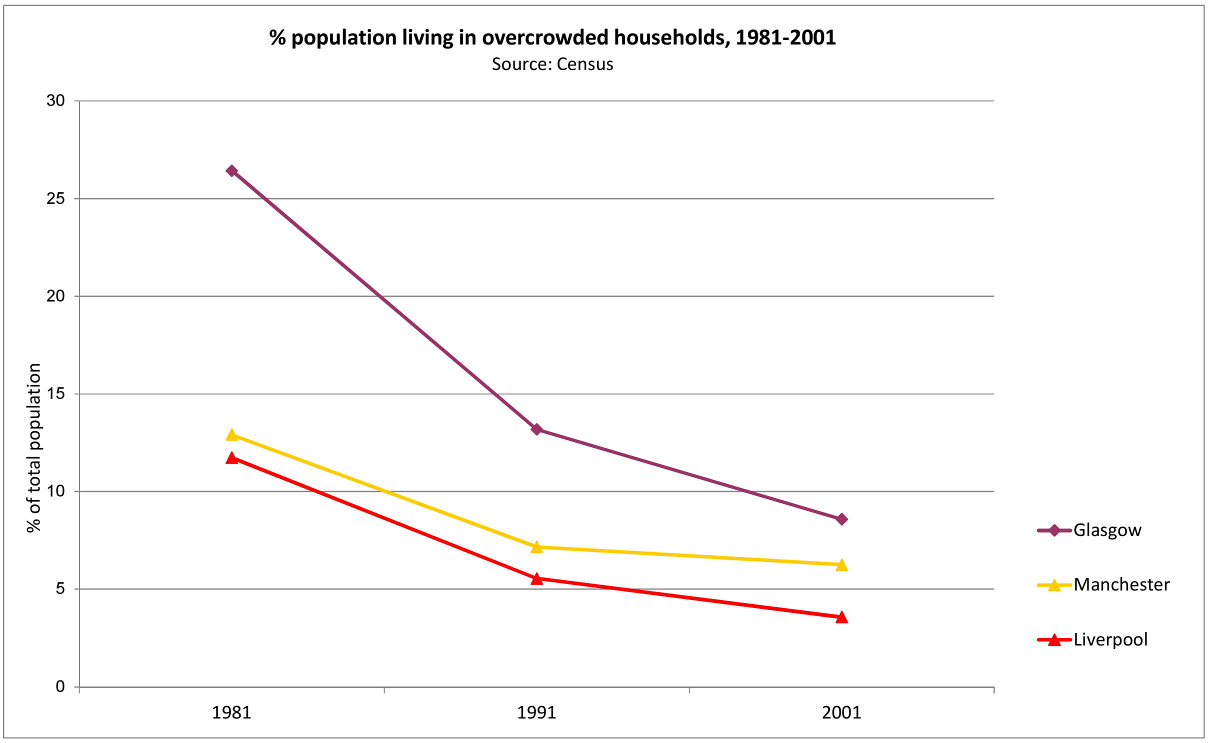


Some other census data do, however, show clearer differences between the cities. For example, car ownership has been shown to be lower in Glasgow since the question was introduced in 1971[522], although the extent to which that

[cxliv] The full list of household amenities included in the analyses are as follows: 1971 - hot water supply, fixed bath or shower, inside WC; 1981 - fixed bath or shower, inside WC; 1991 - fixed bath or shower, inside WC, central heating; 2001 - fixed bath or shower, inside WC, central heating. As stated, for amenities such as toilets, hot water, baths etc., the census questions relate to exclusive (rather than shared) access.

indicator is an accurate measure of material deprivation is very unclear, as was mentioned in Chapter 2. Decreases in this (potential) measure of deprivation have not been relatively greater in Glasgow over time (i.e. suggesting no change in the relative deprivation status of the city)[cxlv]. Reductions in levels of overcrowding between 1981 and 2001 have been greater in Glasgow compared to Manchester, although not compared to Liverpool[cxlvi]. More generally, however, levels of overcrowding have been considerably higher in Glasgow for many years. This indicator has been defined in different ways over time, making interpretation of some trends problematic. However, Figure 6.18 presents data for one definition of overcrowding[cxlvii], showing much higher percentages of individuals living in overcrowded households in Glasgow compared to Liverpool and Manchester between 1981 and 2001.

Figure 6.18



With the exception of overcrowding for Glasgow compared to Manchester, the majority of indicators presented within this section suggest that it is unlikely, at

[cxlv] Change in the percentage of the population without access to a car or van between 1981 and 2001 in Glasgow, Liverpool and Manchester was, respectively, -27%, -27% and -26%.
[cxlvi] Change in the percentage of the population living in overcrowded households between 1981 and 2001 in Glasgow, Liverpool and Manchester was, respectively, -68%, -70% and -52%.
[cxlvii] Defined as the percentage of people in private households with a density of more than one person per room.

least at the overall city level, that any significant change in relative deprivation status between the three cities has taken place which might account easily for the mortality trends reported earlier in the chapter. However, it is possible that changes in the *distribution* of deprivation within each city may have occurred over time. Analyses of the distribution of income deprivation in 2005 by city-specific deciles (presented in Figure 6.3 and Table 6.1) showed very little difference between the cities. Repeating such an analysis for a census-based measure of poverty for an earlier time period is problematic because of the differently sized spatial units (census enumeration districts (EDs)) used in the Scottish and English censuses: the units in Glasgow contained on average 25% less population than those in Liverpool and Manchester in both 1971 and 1981[cxlviii]. Figure 6.19 and Table 6.3 replicate the previous analysis of the distribution of income deprivation for male unemployment in 1971. Despite the caveat of differently sized geographical units, there was in fact little difference in the distribution of unemployment between Glasgow and Liverpool. However, it was slightly less unequally distributed in Manchester compared to the other cities.

[cxlviii] For example, for 1971 census data, enumeration districts (EDs) are the smallest geographical unit for which comparable data are available. In Liverpool and Manchester, the average population size of an ED was approximately 475 people, while in Glasgow it was approximately 350 (more than 25% smaller). For 1981 data, EDs are available for England and census output areas (OAs) for Scotland. The average population size of an ED in Liverpool and Manchester in 1981 was approximately 430, while in Glasgow an OA contained on average approximately 300 people (again more than 25% smaller)[522].

Figure 6.19

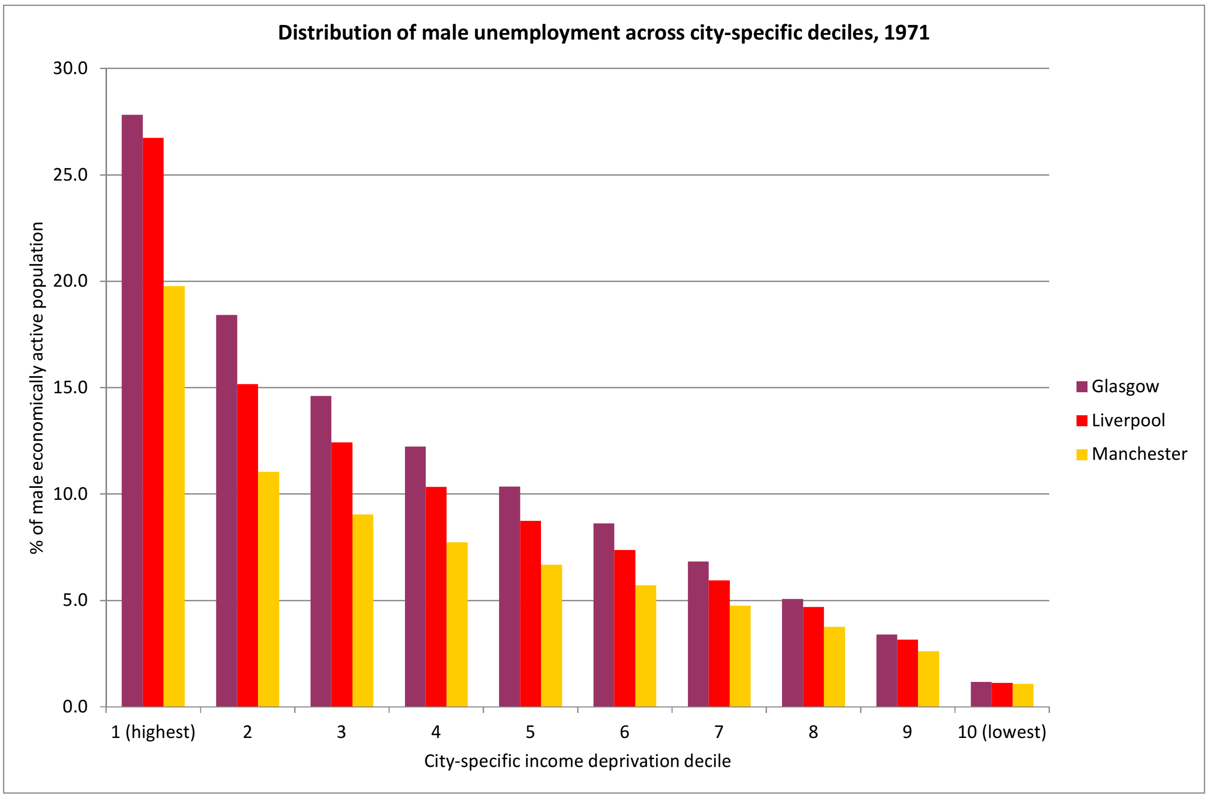


Table 6.3 Comparisons of distributions of male unemployment in 1971 in Glasgow, Liverpool and Manchester

City	% of economically active males who were unemployed: decile 1 (highest)	% of economically active males who were unemployed: decile 10 (lowest)	Ratio of highest: lowest decile	Value of m[cxlix] (representing slope of the line across deciles)
Glasgow	27.8	1.2	23.7	-2.5
Liverpool	26.7	1.1	23.8	-2.3
Manchester	19.8	1.1	18.3	-1.6

The results of similar analyses for overcrowding (but using a slightly different measure to that shown in Figure 6.18[cl]) show a completely different picture for

---

[cxlix] From linear regression equation $y = mx + b$, where m is the slope of the line, b is the y-axis intercept (i.e. where the line crosses the y axis), and x and y are co-ordinates for any point on the line. The slope is effectively the unit increase in y for each unit increase in x.
[cl] This is the percentage of households (rather than individuals living in households) with a density of more than one person per room.

Glasgow compared to the English cities. In 1971 29% of households in Glasgow were classed as overcrowded compared to 10% in Liverpool and 9% in Manchester. The distribution of overcrowding is presented in Figure 6.20 and Table 6.4, showing much higher levels, and less equal distribution (based on the slope of the regression line across the deciles), in Glasgow. For example, in the 10% most overcrowded small areas in Glasgow in 1971, 60% of households were classed as overcrowded. The equivalent figure for Liverpool was 27% and for Manchester it was 23%.

These analyses are discussed further in Chapter 8.

Figure 6.20

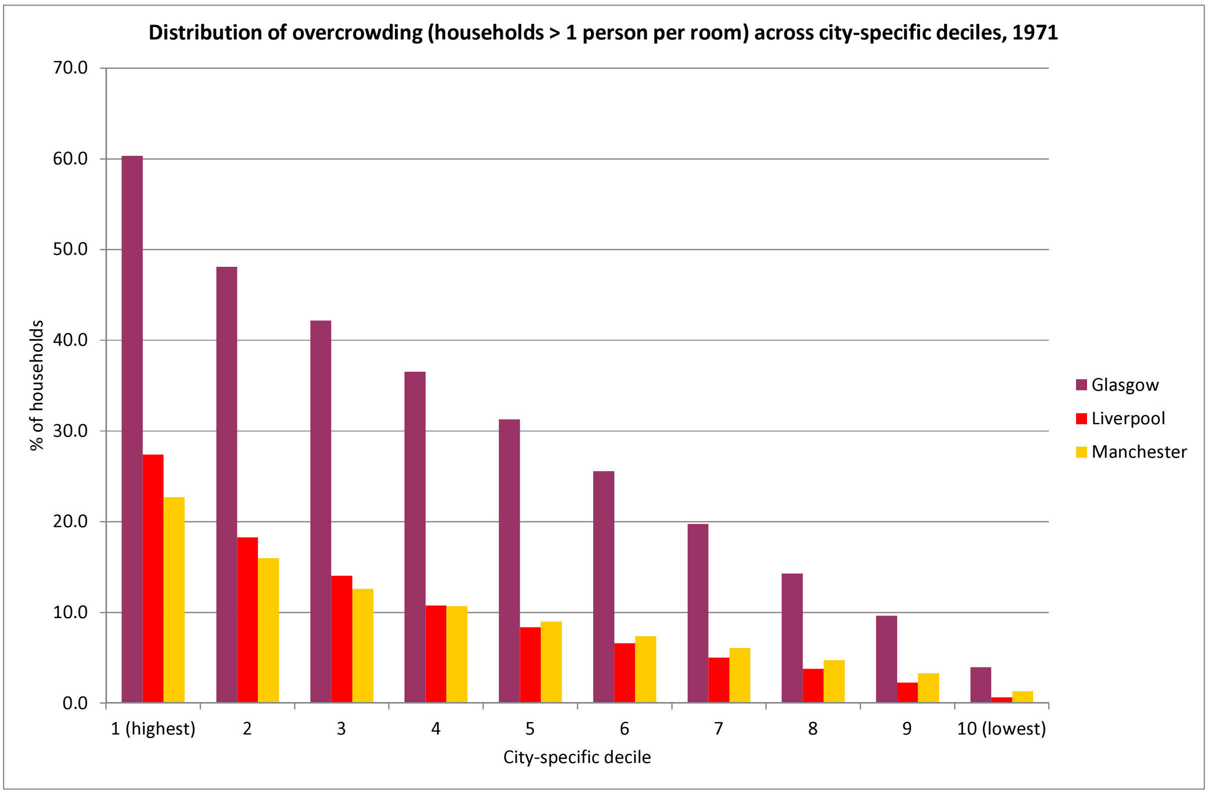


Table 6.4 Comparisons of distributions of overcrowding in 1971 in Glasgow, Liverpool and Manchester

City	% of households classed as overcrowded: decile 1 (highest)	% of households classed as overcrowded: decile 10 (lowest)	Ratio of highest: lowest decile	Value of *m*[cli] (representing slope of the line across deciles)
Glasgow	60.3	4.0	15.2	-5.8
Liverpool	27.4	0.6	42.7	-2.6
Manchester	22.7	1.3	17.5	-2.0

6.5.2 Trends in mortality

As described in Chapter 4, data obtained from the University of Sheffield allowed the calculation of historical mortality trends for the three cities. Figure 6.17 and 6.18 shows age-standardised premature mortality rates (age < 65 years[clii]) among males and females respectively for the three cities from 1921/25 to 2001/05 (with a gap between 1936/39 and 1969/73, due to unavailability of data). Although the 30-year gap in data makes interpretation slightly problematical, the data suggest that, for males at least, Glasgow has not always experienced higher mortality compared to Liverpool and Manchester (a finding alluded to in the historical overview of the cities presented in Chapter 5). Figure 6.21 shows that in the earlier part of the 20th Century there was little difference between the cities' rates. However, a widening gap (with rates in Glasgow improving more slowly than rates in the English cities (particularly Liverpool)) can be seen in the years for which data are available in the latter part of the 20th Century. Data for females (Figure 6.22) display a similar picture in relation to the widening gap in mortality since the early 1970s, although rates in the earlier part of the century also tended to be higher in Glasgow than those of the other two cities.

[cli] From linear regression equation $y = mx + b$, where m is the slope of the line, b is the y-axis intercept (i.e. where the line crosses the y axis), and x and y are co-ordinates for any point on the line. The slope is effectively the unit increase in y for each unit increase in x.
[clii] Note that age-standardised rates for deaths at *all* ages could not be accurately calculated because the available historical death data were only available for five-year age bands up to the age of 64 years, with all other deaths classified as '65 years plus'. However, age-standardised premature death rates are highly relevant given that, as the previous analyses have shown, the excess mortality is greatest among those of working ages.

Figure 6.21

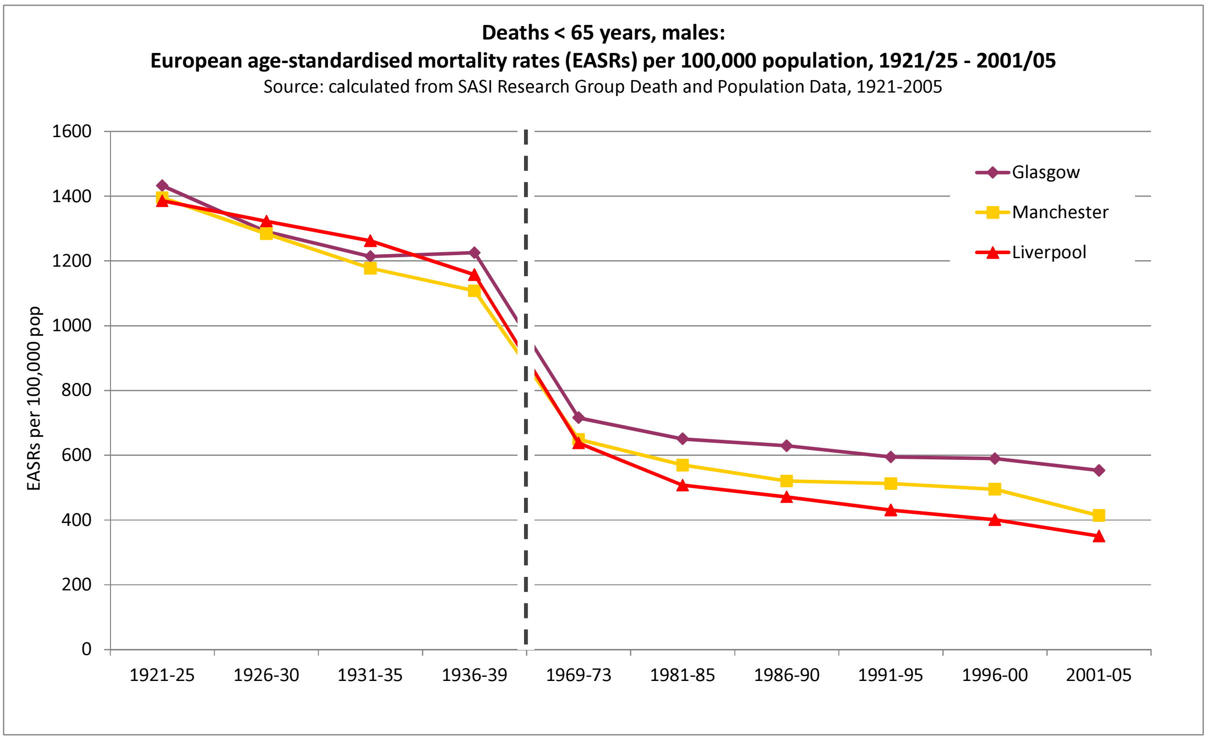
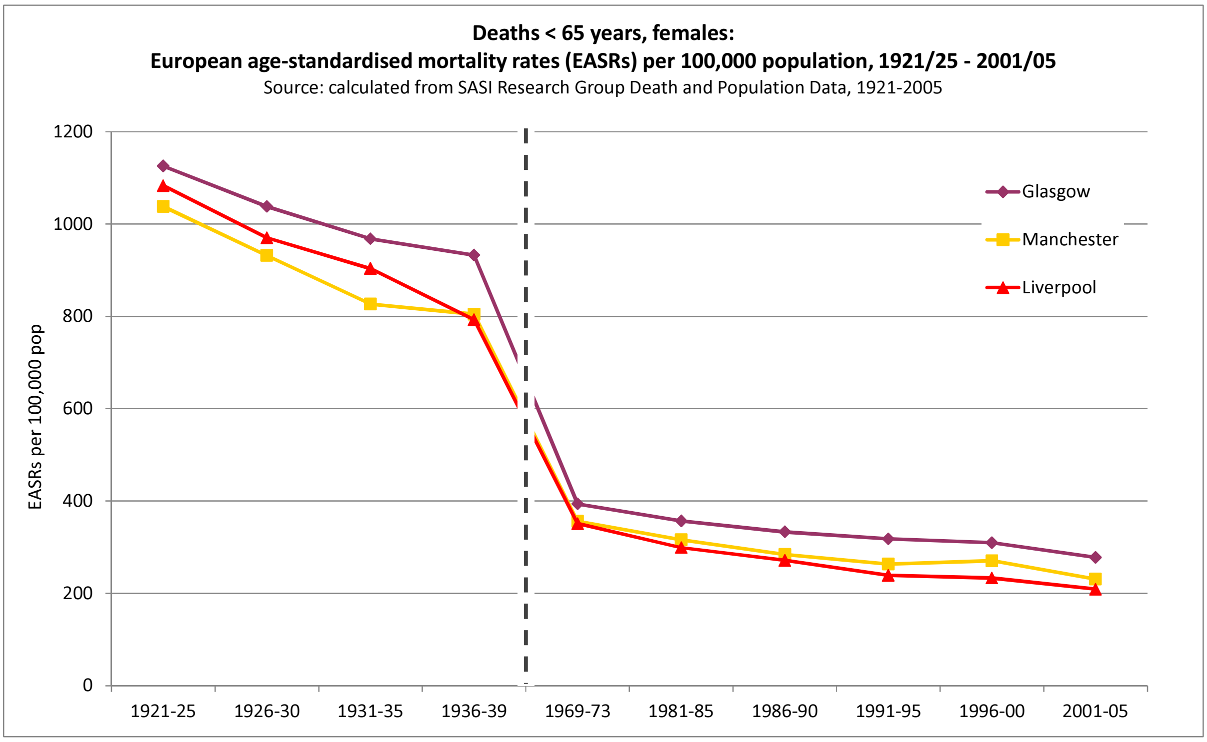


Figure 6.22



These historical analyses support the findings of other research (discussed in Chapter 2) in suggesting that the Scottish 'excess' levels of mortality (particular among males) began to emerge and widen in the latter decades of the 20th Century.

6.6 Research question 6: to what extent does the employed measure of deprivation explain differences in mortality between Glasgow and the rest of Scotland, and between Glasgow and other large English cities?

Although the cities of Glasgow, Liverpool and Manchester are the principal focus of this research, for comparative purposes, similar analyses of deprivation and mortality (for all causes only) were undertaken for Glasgow in relation to (a) four other major English cities and (b) all of Scotland.

6.6.1 Glasgow compared to other English cities

As described in Chapter 4, Birmingham, Leeds, Sheffield and Bristol were chosen as the comparator cities on the basis of being, aside from Liverpool and Manchester, four of the largest English cities outside London. Figure 6.23 shows the overall levels of deprivation in each of the five cities included in the analyses, based on the same 2005 data used in the main analyses described in this chapter. Leeds was the least deprived of these four English cities in that year (12% of the total population being classed as income deprived), and Birmingham the most deprived (21%). All four cities, however, were less deprived in this respect than Glasgow[cliii].

[cliii] Note, however, that these figures may be influenced to an extent by the different nature of the local authority areas' boundaries of these cities compared to that of Glasgow. Whereas many affluent suburbs of Glasgow are situated outside the Glasgow City local authority boundary (and this is also generally the case for Liverpool and Manchester), this may be less true of these four English cities.

Figure 6.23

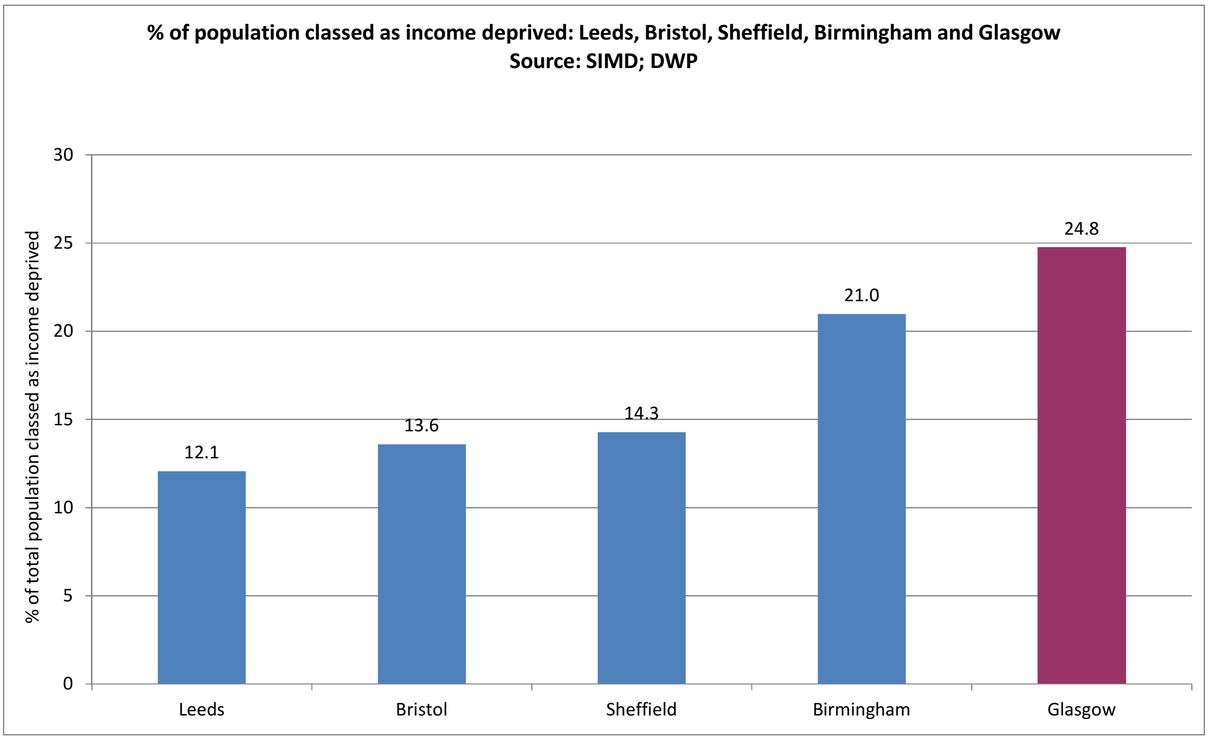


Table 6.5 presents the all-cause SMRs for Glasgow relative to the other four cities, standardising for (a) age and sex only, and (b) age, sex and deprivation decile. This shows that overall mortality in 2003-07 Glasgow was around 40% higher than Birmingham, Leeds, Sheffield and Bristol (combined): SMR of 141.0 (139.5 - 142.5). When Glasgow's higher levels of deprivation were taken into account, this 'excess' fell to around 25% (SMR: 125.4 (124.1 - 126.7). In all cases, SMRs were higher among males, and especially high in relation to deaths under the age of 65 years.

Table 6.5 Age, sex and deprivation standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to Birmingham, Bristol, Leeds and Sheffield

Population	Standardised by age and sex only	Standardised by age, sex and deprivation decile
All ages	*SMR (95% confidence intervals)*	*SMR (95% confidence intervals)*
Males & females	141.0 (139.5, 142.5)	125.4 (124.1, 126.7)
Males only	153.5 (151.2, 155.7)	131.0 (129.1, 132.9)
Females only	130.9 (129.0, 132.8)	120.5 (118.8, 122.3)
0-64 years	*SMR (95% confidence intervals)*	*SMR (95% confidence intervals)*
Males & females	180.7 (176.9, 184.5)	143.3 (140.3, 146.3)
Males only	186.9 (182.0, 191.8)	144.6 (140.8, 148.4)
Females only	170.5 (164.5, 176.5)	141.0 (136.1, 146.0)

Thus, deprivation (as measured in these analyses) explained some of the higher mortality seen in Glasgow compared to these four other English cities; however, as with the Liverpool and Manchester comparisons, a large excess remained even when deprivation was accounted for in the calculations.

Comparisons of deprivation and mortality between Glasgow and another UK city, Belfast, are discussed briefly in Chapter 8.

6.6.2 Glasgow compared to the rest of Scotland

As discussed in Chapter 2, the issue of excess mortality in Glasgow is best analysed in comparison with areas *outwith* Scotland: as excess mortality is seen in *all* parts of Scotland compared to the rest of Great Britain, examination of the 'excess' *within* Scotland is a more complex issue. However, given the results presented above, and the focus of the thesis being Scotland's largest city, it is still of interest to know whether a similar excess (i.e. based on the same deprivation and mortality data) exists for Glasgow compared to other parts of Scotland.

Again, the methodology for these analyses was described fully in Chapter 4. As also discussed in Chapter 2, previous analyses suggested that Glasgow's higher rates of all-cause mortality compared to elsewhere in Scotland could be largely explained by its higher levels of deprivation[468, cliv]. However, those analyses were based on different statistical methodologies, on a different measure of deprivation (Carstairs & Morris), calculated at a considerably larger spatial scale[clv], and in relation to the 'Greater Glasgow' area, rather than the local authority area of Glasgow City (which is the basis for all analyses reported here).

Table 6.6 shows that, based on new analyses presented here, overall levels of mortality in Glasgow City were 26% higher than in the rest of Scotland (SMR: 126.4 (125.1 to 127.7)). When deprivation decile was included in the standardisation, the excess reduced to 12%. As before, this excess was higher for males (17%), and higher for premature mortality (23%).

Table 6.6 Age, sex and deprivation standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to the rest of Scotland

Population	Standardised by age and sex only	Standardised by age, sex and deprivation decile
All ages	*SMR (95% confidence intervals)*	*SMR (95% confidence intervals)*
Males & females	126.4 (125.1, 127.7)	112.0 (110.9, 113.2)
Males only	138.6 (136.5, 140.6)	117.3 (115.6, 119.1)
Females only	116.7 (115.0, 118.3)	107.4 (105.9, 109.0)
0-64 years	*SMR (95% confidence intervals)*	*SMR (95% confidence intervals)*
Males & females	162.4 (159.0, 165.8)	122.7 (120.2, 125.3)
Males only	169.0 (164.6, 173.5)	125.5 (122.3, 128.8)
Females only	151.6 (146.3, 157.0)	118.0 (113.8, 122.1)

Glasgow's overall levels of mortality, therefore, appear to be significantly higher than that of the rest of the country, even once the effects of deprivation (as measured on an extremely small spatial scale) are taken into account.

[cliv] As also discussed in Chapter 2, however, 'excess' mortality was recorded for a number of specific causes of death.
[clv] Postcode sectors, described in Chapter 2.

6.7 Summary of chapter

This chapter has presented results of a series of analyses of deprivation and mortality data for the three cities. The results show that, using a contemporary measure of income deprivation which is highly correlated with what are deemed to be the best available measures of multiple deprivation in both Scotland and England, the deprivation profiles of Glasgow, Liverpool and Manchester are (as measured in 2005) very similar. Despite this, premature deaths around this period (2003-07) in Glasgow were more than 30% higher, with deaths at all ages almost 15% higher than in the other cities. This 'excess' mortality was seen across virtually the whole population: all ages (except the very young), both males and females, in deprived and non-deprived neighbourhoods. For premature mortality, SMRs tended to be higher for the more deprived areas (particularly among males), and around a half of 'excess' deaths under 65 years were directly related to alcohol and drugs. Analyses of a range of historical data suggest it is unlikely that the deprivation profile of Glasgow has changed significantly relative to Liverpool and Manchester in recent decades (although it was noted that overcrowding, unlike other indicators such as unemployment, core poverty, breadline poverty and low social class, has historically been considerably higher in Glasgow); however, the mortality gap appears to have widened since the early 1970s, confirming the results of other research which suggest that the emergence of Scotland's excess levels of mortality relative to other parts of Great Britain is a relatively recent phenomenon.

These results are discussed further in Chapter 8. However, they show that socio-economic deprivation, as currently measured, does not appear to fully explain the higher levels of mortality experienced by Glasgow in relation to two very similar UK cities. This suggests that additional explanations may be required, some of which are the focus of the next chapter of the thesis.

Chapter 7. Analyses of new survey data for Glasgow, Liverpool and Manchester

7.1 Introduction

As described in Chapter 4 (Methods), following publication (in 2010) of the analyses presented in the previous chapter, a considerable number of theories were proposed to explain the excess levels of mortality seen in Glasgow compared to Liverpool and Manchester. These were summarised, and assessed, in work carried out by McCartney *et al*, and are discussed in more detail in the next, final, chapter of the thesis. However, the assessment of a number of those hypotheses was initially hindered by a lack of comparable data and, to address that, new data were collected by means of a population survey in the three cities.

These new data were collected though a survey which included data relating to seven sets of hypotheses (many overlapping), the analyses of three of which are presented within this thesis. The three hypotheses are:

- that there is a lower ‘sense of coherence’ among Glasgow’s population compared to those in Liverpool and Manchester
- that social capital is lower in Glasgow than in the other cities
- that Glasgow’s population is characterised by a different ‘psychological outlook’ i.e. specifically with lower levels of optimism [clvi]

The results are presented in the following order. First, a brief section considers the representativeness of the survey sample, as this is a key consideration for the overall content of the chapter. This is followed by an equally brief profile of the three survey samples (i.e. the respondents in Glasgow, Liverpool and Manchester), another useful aid to interpretation of the results of the main analyses. The chapter then presents the analyses of the data relating to the above three hypotheses. In each case, the analyses aim to assess whether or not there are significant differences between the cities for the various topics presented. In doing so, descriptive analyses are presented alongside the results

[clvi] As outlined in Chapter 4, optimism was one aspect of psychological outlook examined in the survey (the others including aspirations, meaningfulness of life and self-efficacy). Psychological outlook itself was included under the broader heading/hypothesis of ‘different individual values’, alongside related concepts such as hedonism, time and risk preferences, and materialism.

of the statistical modelling analyses described in detail in Chapter 4[clvii,clviii]. Thus, this chapter seeks to answer research questions 8 and 9:

- What can new population survey data tell us in regard to some of the more plausible hypotheses that have been put forward to explain Scotland's and Glasgow's 'excess' mortality?
- Using new survey data, and appropriate statistical methodologies, can we show significant differences between the three cities for any of these newly measured factors (and while controlling for a range of area-based and individual characteristics)?

7.2 Representativeness of the survey samples

This section is brief, but important. There is a need to be sure that the data that were collected in the survey are reasonably representative of all three cities and, to the same degree, to have confidence that the results, including any differences between the cities that they appear to show, are likely to be true of the populations as a whole (rather than just the survey samples). Two topics are addressed: response rates and comparisons with other data. Appendix IV contains additional details of the latter.

7.2.1 Response rates

An overall response rate of 55% was achieved. This is on a par with response rates achieved by many national surveys such as the Labour Force Survey[623], the British Social Attitudes Survey[624], and the Scottish Health Survey[625]. On the one hand, therefore, this is an acceptable rate: on the other hand, we have to be aware that such population surveys, and especially those with response rates at this level, are unlikely to reach (and therefore represent) all sections of society.

[clvii] As described in Chapter 4, unless specified, the results of the main effects models only are presented in this chapter. Tests for interaction terms were carried out in all the modelling analyses undertaken, but generally made little difference to the overall results: for clarity, therefore, they are not included within the results presented here. The only exceptions are where differences between social groups across the cities were explored further within separate models based on city-social grade or city-deprivation quintile interactions. These are discussed within the text of the chapter.

[clviii] As will be observed, however, generally the differences between the cities that are evident from the descriptive analyses (for example the differences in average sense of coherence score, or the different percentages of the city samples stating that people in the neighbourhood can be trusted) were very similar to those obtained in the modelling analyses. This is because in many cases variations in responses for some 'outcomes' (e.g. the question on trust) were not explained greatly by the 'predictor' information included in the models.

One might, therefore, expect a ‘healthy respondent effect’[626] and this, alongside other potential sources of bias, is something there is a need to be aware of in interpreting the results.

Figure 7.1 shows the overall response rate by income deprivation decile[clix] across all three cities (where ‘Decile 1’ includes the tenth of the population living in the *most* deprived areas in each city, and ‘Decile 10’ the tenth of the population living in the *least* deprived areas). This shows that the overall rate of 55% varies according to neighbourhood type, with higher response rates in the more deprived areas compared to the less deprived areas. Given lower rates of employment and economic activity in more deprived urban areas, this is likely to reflect greater availability of potential respondents when contacted by a survey interviewer. It may also, to a degree, counter any potential healthy respondent effect across the sample as whole (i.e. as health is such a socially patterned issue). Figure 7.2 (presenting response rates by deprivation decile within each city) also shows that this gradient differs by city, with the greatest variation in Glasgow (where response rates range from 53% in the least deprived areas to 65% in the most deprived) compared to the two English cities.

[clix] As stated in Chapter 4, this is the same measure of deprivation used in the analyses presented in the previous chapter.

Figure 7.1

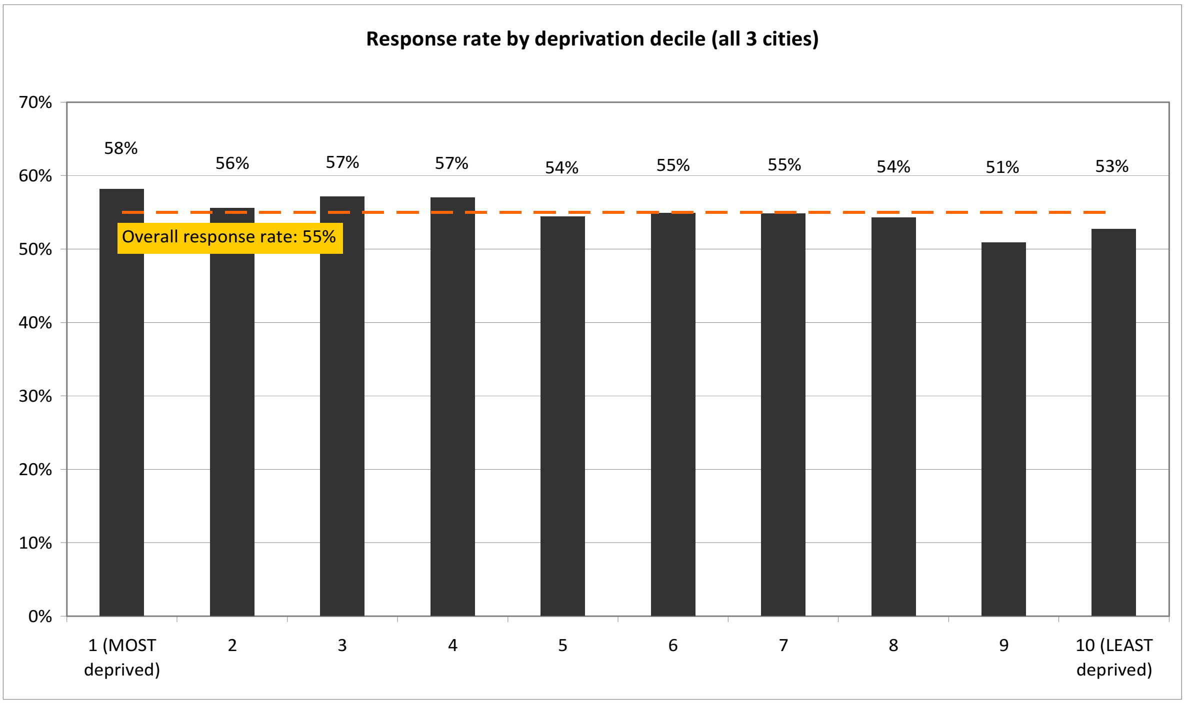
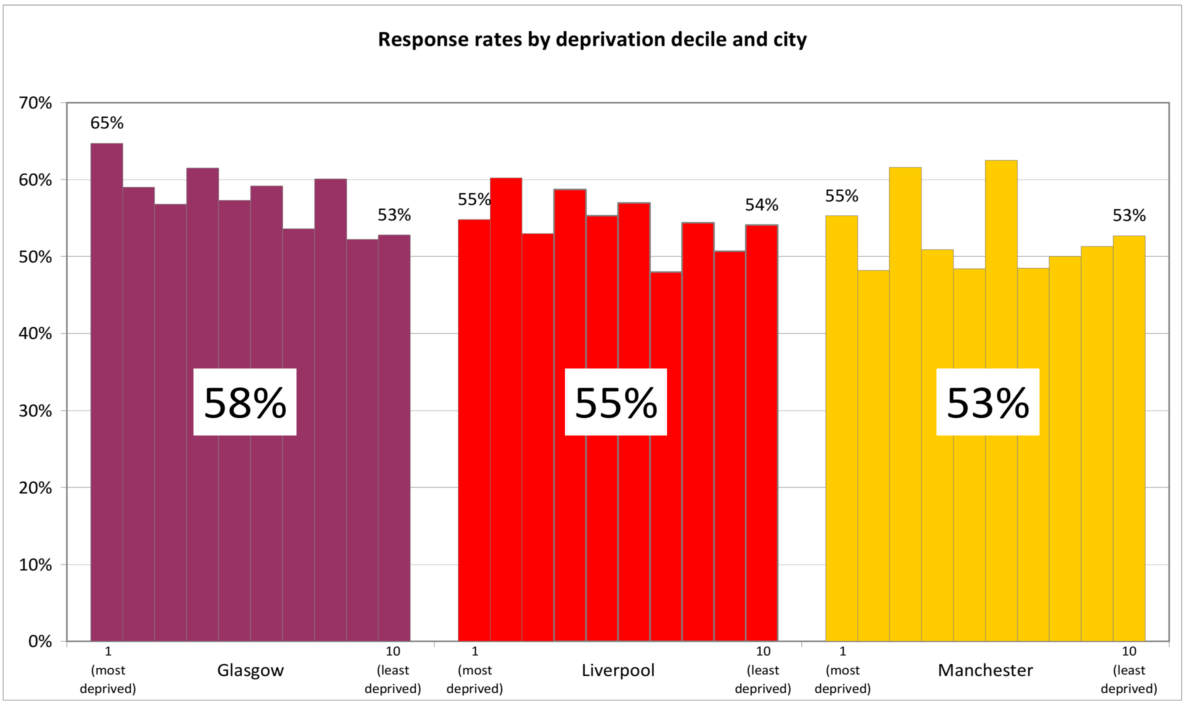


Figure 7.2



7.2.2 Comparisons with other data

The representativeness of the samples was also assessed by means of comparisons with other survey and administrative data. This included the 2011 census (although not all census data were available at the required levels (e.g.

for particular age groups or geographical areas) at the time of undertaking the analyses), as well as additional data sources.

Further details of analyses undertaken are presented in Appendix IV, but a brief summary of the main results is as follows:

- The sample tends to under-represent the young (especially in Manchester) and over-represent the elderly (Appendix IV). However, this is corrected through application of the survey weighting.
- Reflecting to a degree the higher response rates achieved in the more deprived areas of the cities compared to the least deprived areas, the survey over-represents those who are not working: in each city there tends to be lower percentages of employed respondents and higher percentages of unemployed respondents compared to total population levels. The survey also over-represents some groups of the economically inactive such as those looking after their home and family. All these data are shown in Figures 7.3-7.5 which compare categories of economic status for the cities between the survey and the 2011 census. The comparisons are for a subset of respondents aged 16-74 years (as this is the age group for which the census data were available).
- As Figure 7.5 also demonstrates, the biggest concern relates to the Manchester sample, for which differences in employment status between the three-city survey and the census are greatest. 16% of adults aged 16-74 years in the survey were unemployed, compared to 6% in the census. However, there are also twice as many unemployed in the Glasgow sample compared to that shown by the census (Figure 7.3).

Figure 7.3

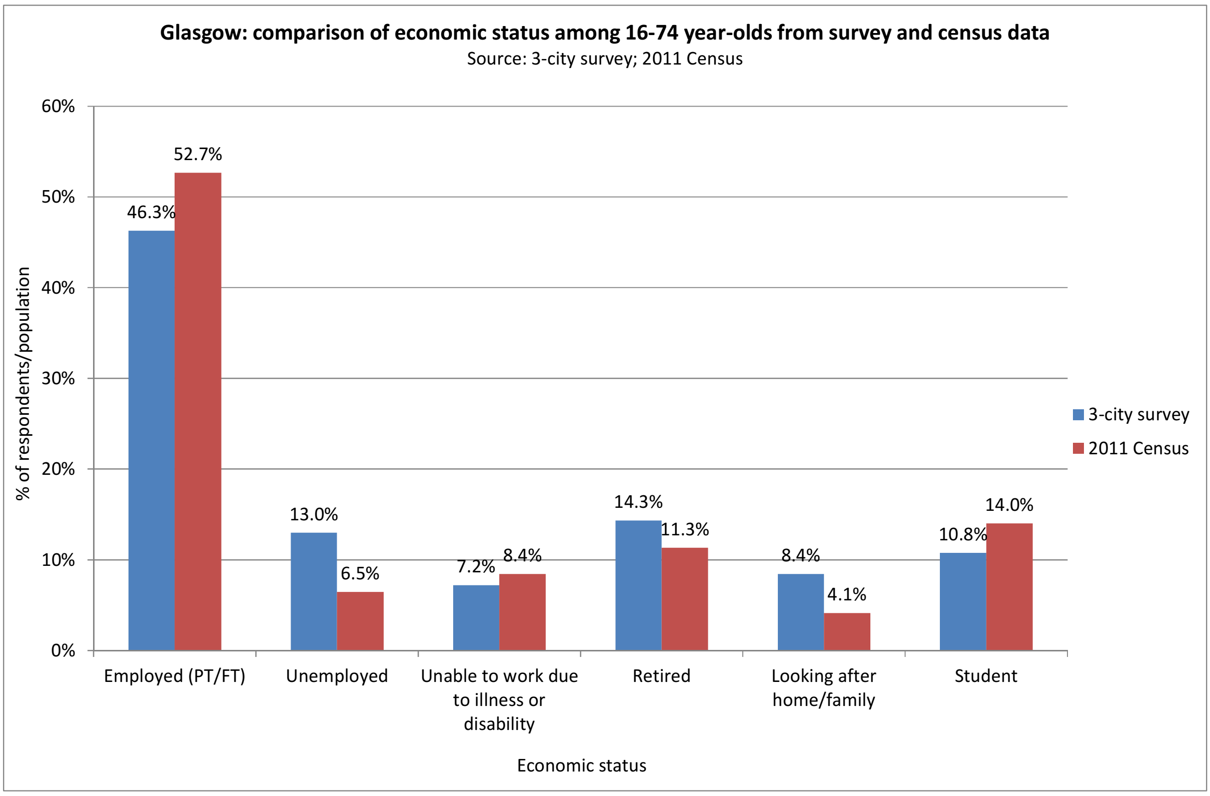


Figure 7.4

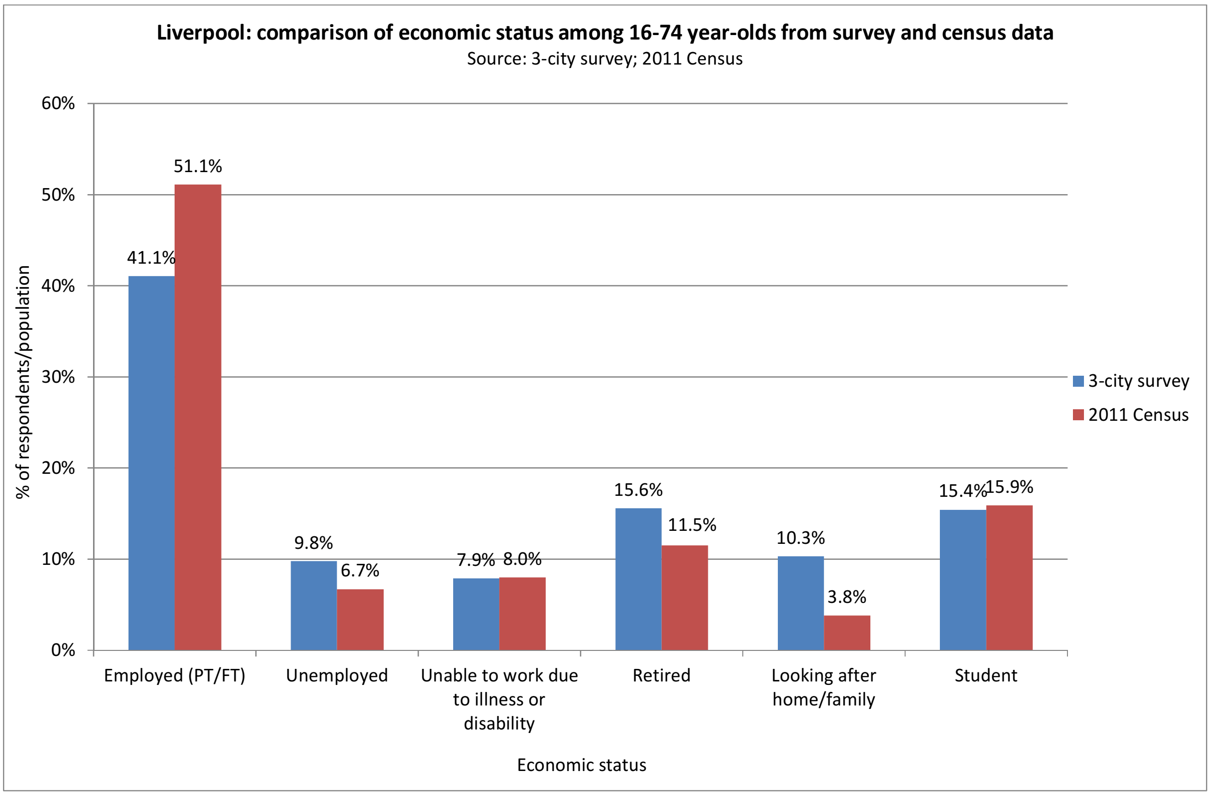
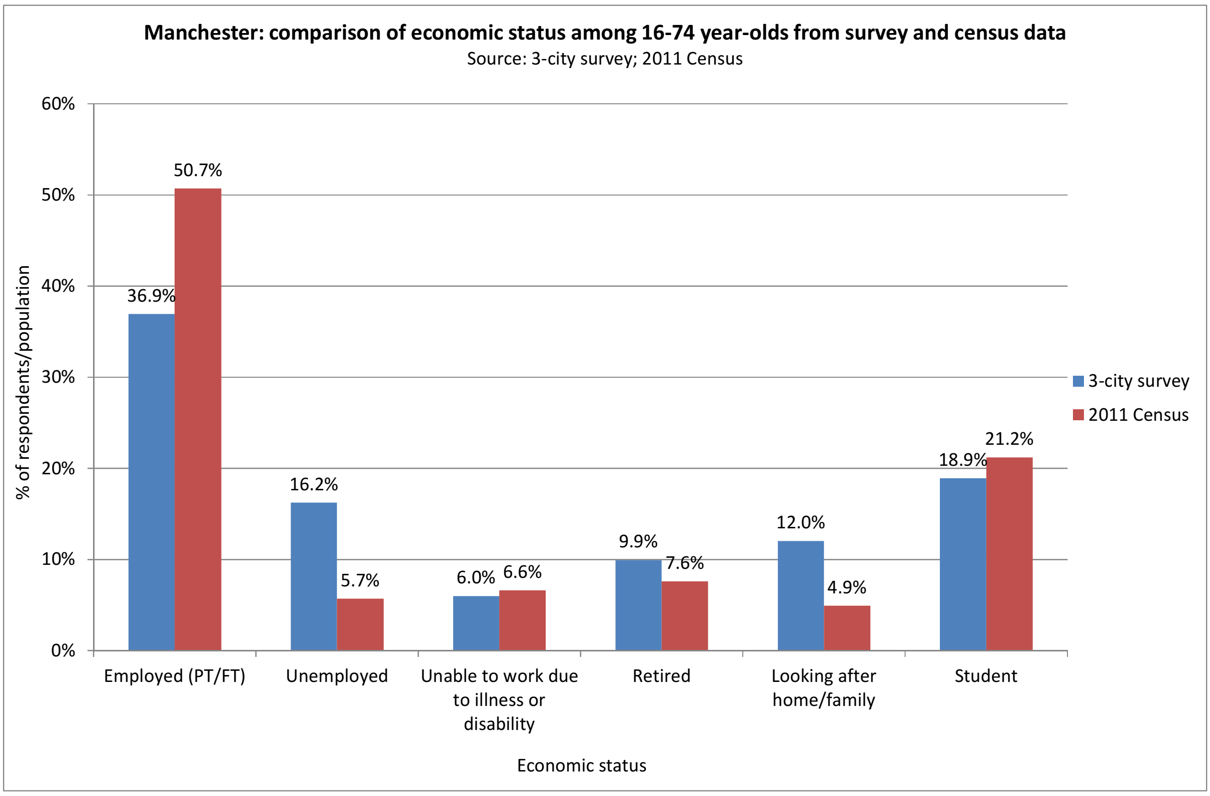


Figure 7.5



- However, as Figures 7.3-7.5 also show, other economically inactive groups (e.g. students, the retired, those unable to work due to illness or disability) appear to be reasonably well represented in the survey.

- Those similarities (compared to the 2011 census) in the percentages classed as unable to work due to illness/disability suggest that the sample may be less biased towards healthy respondents (the so-called 'healthy respondent effect') than has been shown to be the case with other health related population surveys[626]. The same lack of bias is shown in comparisons of people of working age (16-64 years) classed as being unable to work for these reasons compared to the 2010/11 Annual Population Survey (APS)[566 clx] (8% versus 9%, 9% versus 7% and 6% versus 8% for Glasgow, Liverpool and Manchester respectively). Furthermore, comparisons with 2011 census data for those (in the same 16-64 age group) reporting a limiting long-term illness (LLI) also do not provide evidence of a healthier sample in the three-city

[clx] The Annual Population Survey (APS) is run by the Office for National Statistics (ONS) and combines data from the Labour Force Survey (LFS) and the English, Welsh and Scottish LFS boosted samples.

survey[clxi]. The percentage of respondents of that age reporting such an LLI was 20% in Liverpool (compared to 18% in the census) and 14% in Manchester (15% in the census) (data not shown). At the time of writing, equivalent 2011 census data were not available for Glasgow. However, as discussed further below, 73% of the Glasgow sample aged 16+ reported their health to be 'good' or 'very good', and 10% to be 'bad' or 'very bad'. The equivalent figures from the census (although for all ages, not 16 years and above) were 77% and 9%. Comparisons of the same data (and for the same age groups) for Liverpool and Manchester suggest the samples are very representative of the wider population in this regard[clxii].

- Comparisons with a range of other data – housing tenure (Figure 7.6), smoking status (Figure 7.7), and marital status (Appendix IV) – also provide evidence that the sample is, in many other ways, reasonably representative.

[clxi] The wording of the question (in both the three-city survey and the 2011 census) was: 'are your day to day activities limited because of a health problem or disability which has lasted, or is expected to last, at least 12 months? (include problems related to old age)?' Possible responses were 'yes – limited a lot', 'yes – limited a little', and 'no'. Data reported above are for those aged 16-64 who responded either 'yes – limited a lot' or 'yes – limited a little'.

[clxii] 72% of the Liverpool sample reported good or very good health, and 9% reported bad/very health: the equivalent figures from the census (for the same 16+ years age group) were 73% and 10%. In Manchester, 75% reported good/very good health, and 6% reported bad/very health: the equivalent census figures were 77% and 9%.

Figure 7.6

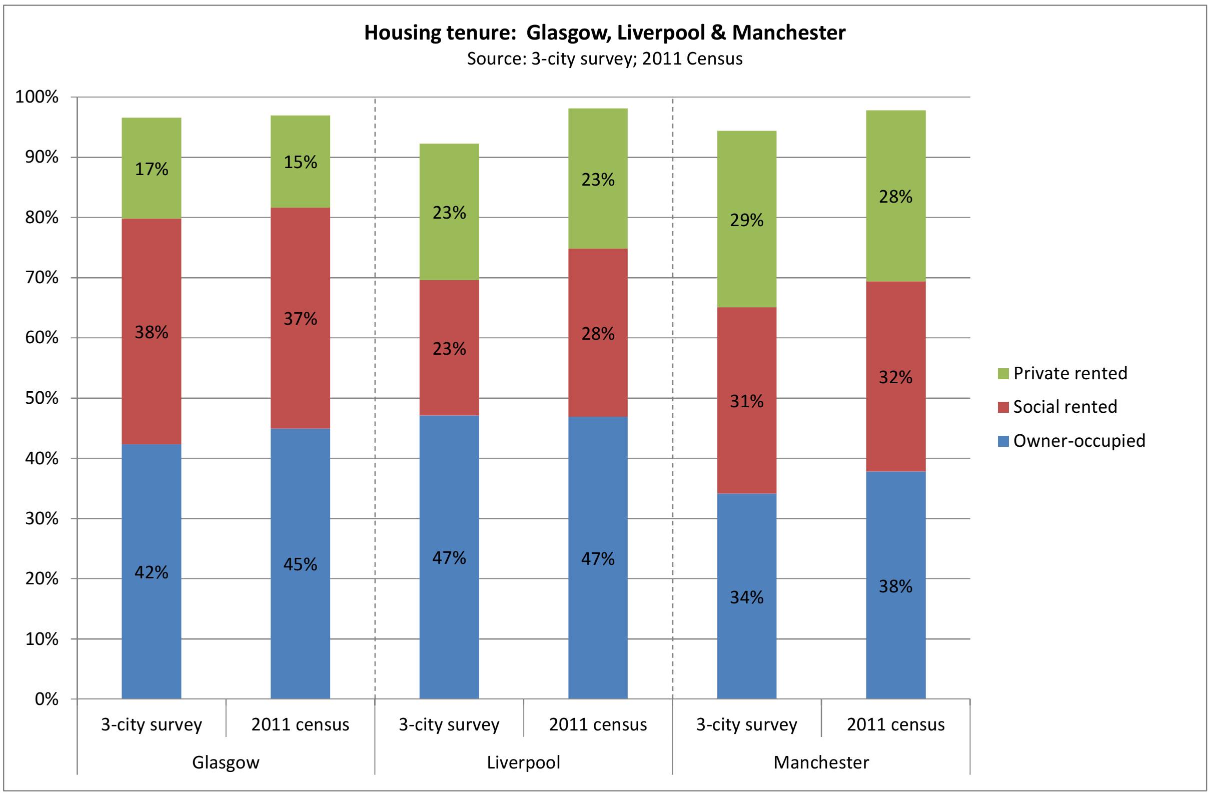
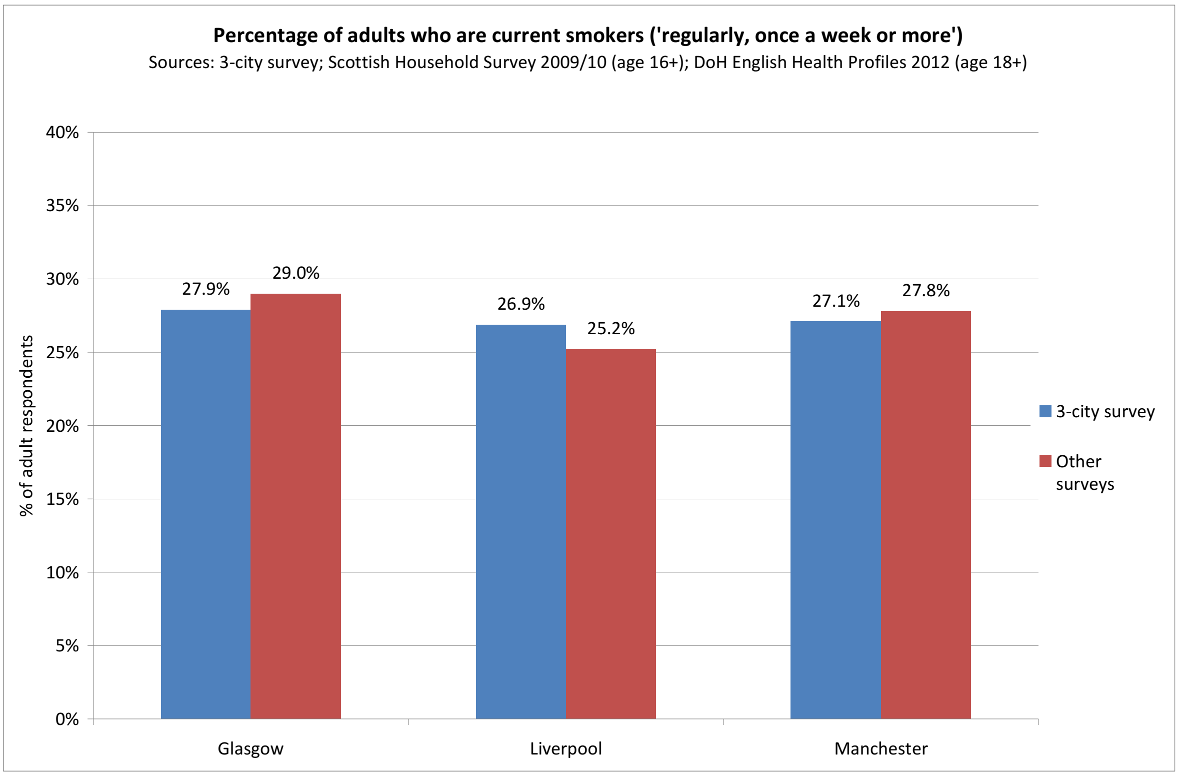


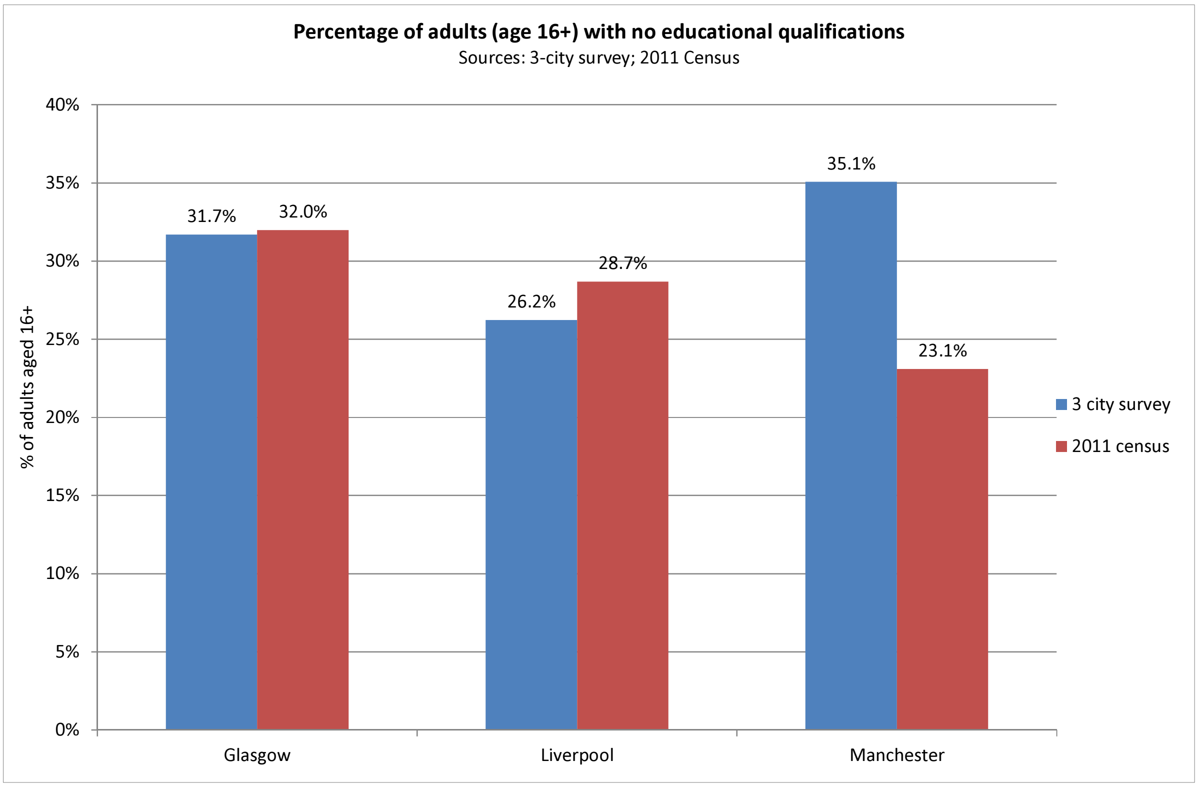
Figure 7.7



- For comparisons of educational attainment, the picture is more complex: compared to the 2011 census, the survey seems to under-represent those with degree-level qualifications[clxiii], particularly in Glasgow and Manchester (12% versus 26% and 14% versus 29% respectively), but less so in Liverpool (17% versus 22%) (Appendix IV); however, there are very similar percentages of the survey sample with *no* educational qualifications in Glasgow and Liverpool compared to the census, although the same is not true of the Manchester sample – see Figure 7.8.

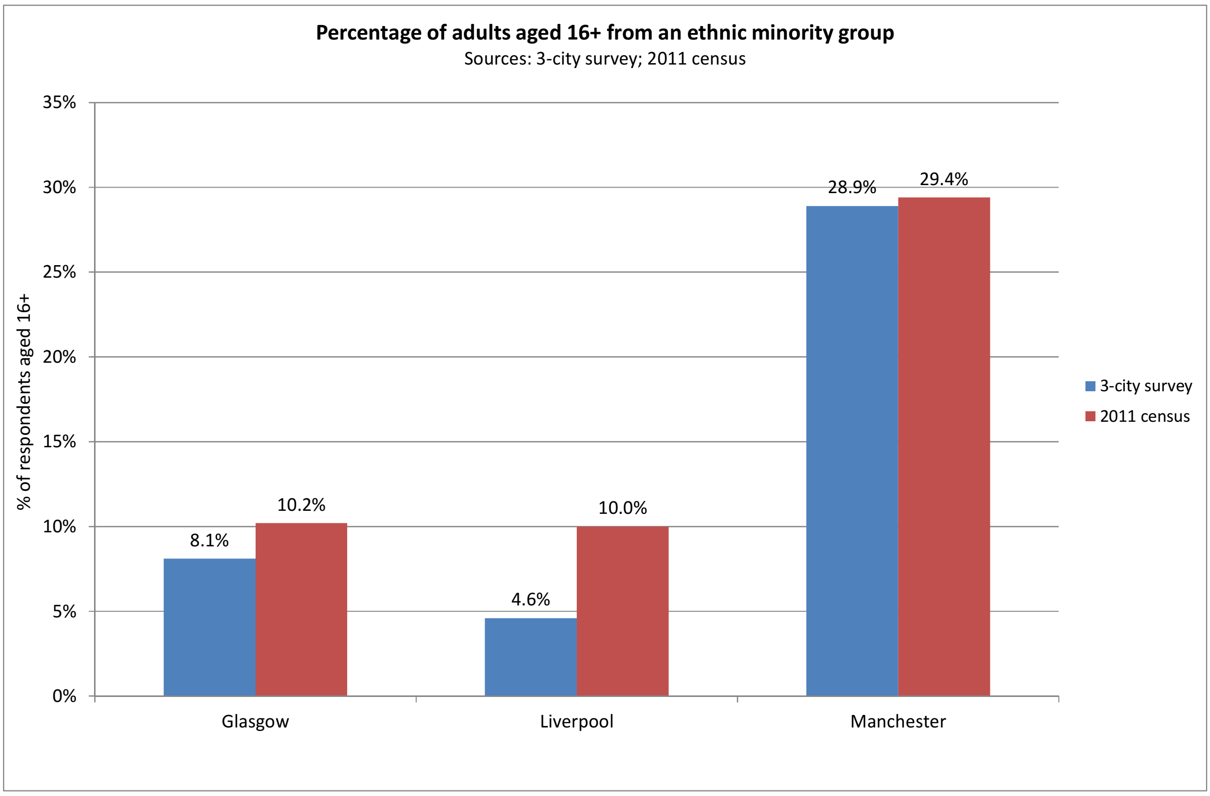
- Comparisons of ethnicity can be made with 2011 Census data, the most reliable data source for this measure. These suggest that this three-city survey is representative of Glasgow and Manchester in this regard, but less so of Liverpool (Figure 7.9).

Figure 7.8



[clxiii] Degree-level qualifications were defined in both the three-city survey and the 2011 census (the same question was used) as 'Level 4' qualifications and above. Level 4 includes: degree, Postgraduate qualifications, Masters, PhD, SVQ level 5 or equivalent; professional qualifications (for example, teaching, nursing, accountancy); other Higher Education qualifications not already mentioned (including foreign qualifications).

Figure 7.9



In summary, given the response rate, we would expect differences between the profile of the samples and the general population, and this is the case: the sample generally over-represents unemployed people, and under-represents those in employment. The Manchester sample is particularly affected in this way.

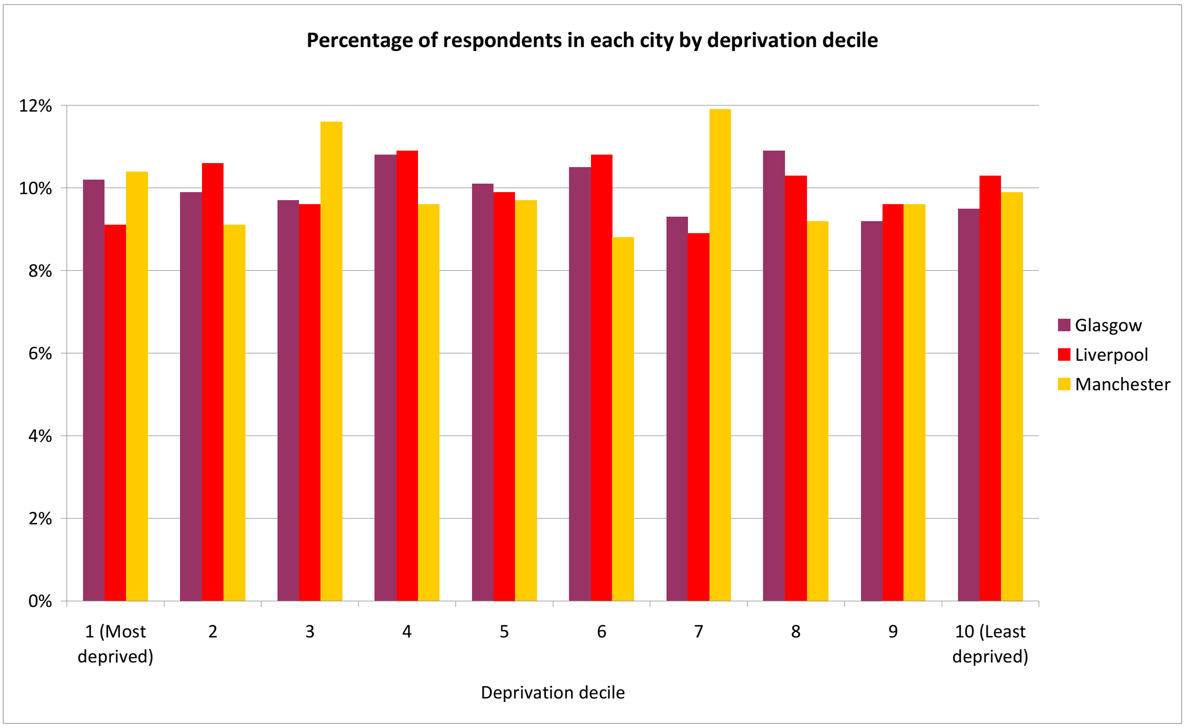
However, a range of other data – housing tenure, marital status, smoking behaviour, health status, aspects of educational attainment, ethnicity (with the exception of Liverpool) – suggest the sample is reasonably representative. The differences in other factors emphasise the importance of controlling for variations in the characteristics of the samples within the modelling analyses. In that way we can be sure that any observed differences (for example, between Manchester and the other two cities) hold true over and above the influence of the characteristics of the Manchester sample (e.g. higher unemployment among respondents).

7.3 Profile of the survey respondents

Before proceeding to the results of the main analyses, this section briefly profiles the respondents in terms of some of the other (e.g. socio-demographic) information collected in the survey. Some of this overlaps with the data presented or discussed in the previous section. However, the intention here is not to compare the survey data with other data sources but, instead, to assess similarities and differences between the three cities' samples and, thereby, to provide further relevant context to the results that follow.

Echoing the presentation of response rates by area type (Figures 7.1 and 7.2), Figure 7.10 shows the percentage of respondents living in each deprivation decile, confirming a reasonably equal distribution of respondents in this regard.

Figure 7.10



However, not all individuals living in areas classed as 'deprived' are themselves deprived: similarly, deprived individuals may reside within areas classed as affluent[627]. Figure 7.11 shows the social grade (defined in Chapter 4) profile of the samples: the higher percentage of the Manchester sample in social grade E (on state benefits/unemployed/lowest grade workers) is noticeable, reflecting the higher percentage of that sample that was unemployed. Figure 7.12 shows these individual social grade classifications within each deprivation quintile (quintiles, rather than deciles, are used here, and in all other deprivation-based analyses, to ensure comparisons are based on large enough samples of respondents): this shows that the Manchester sample has a higher percentage of respondents in social grade E in each of the five quintiles.

Figure 7.11

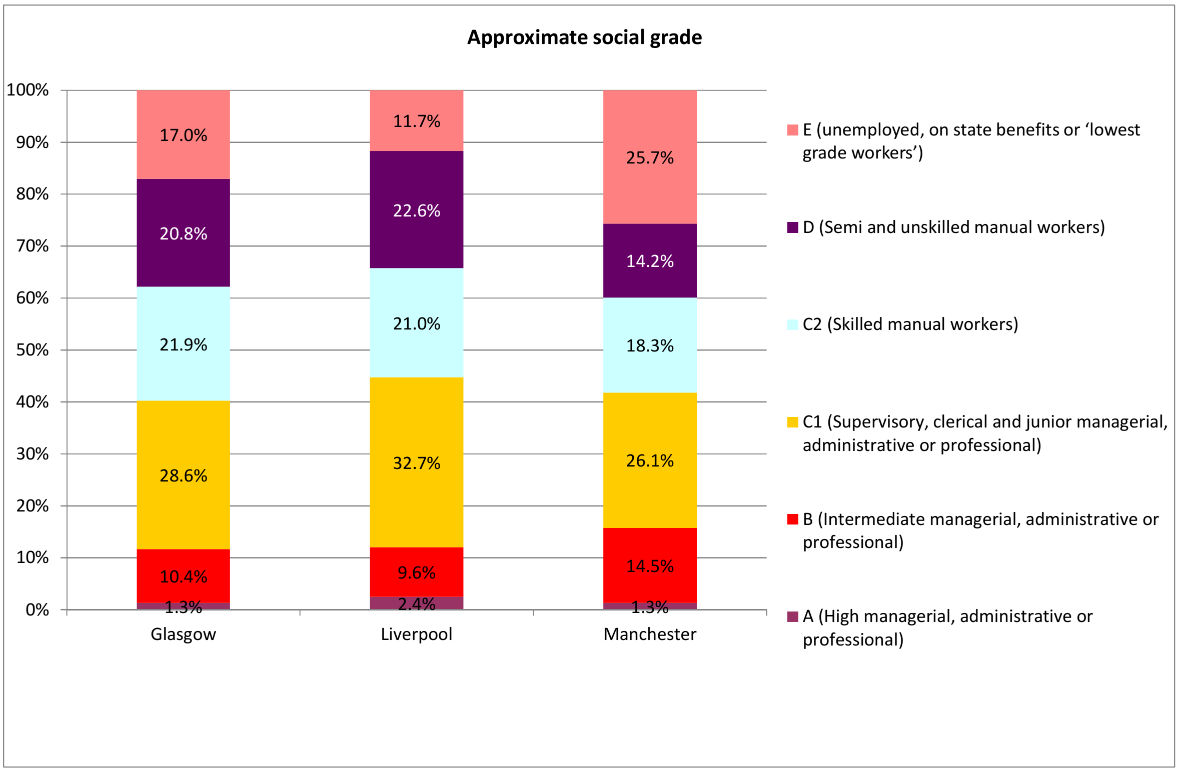
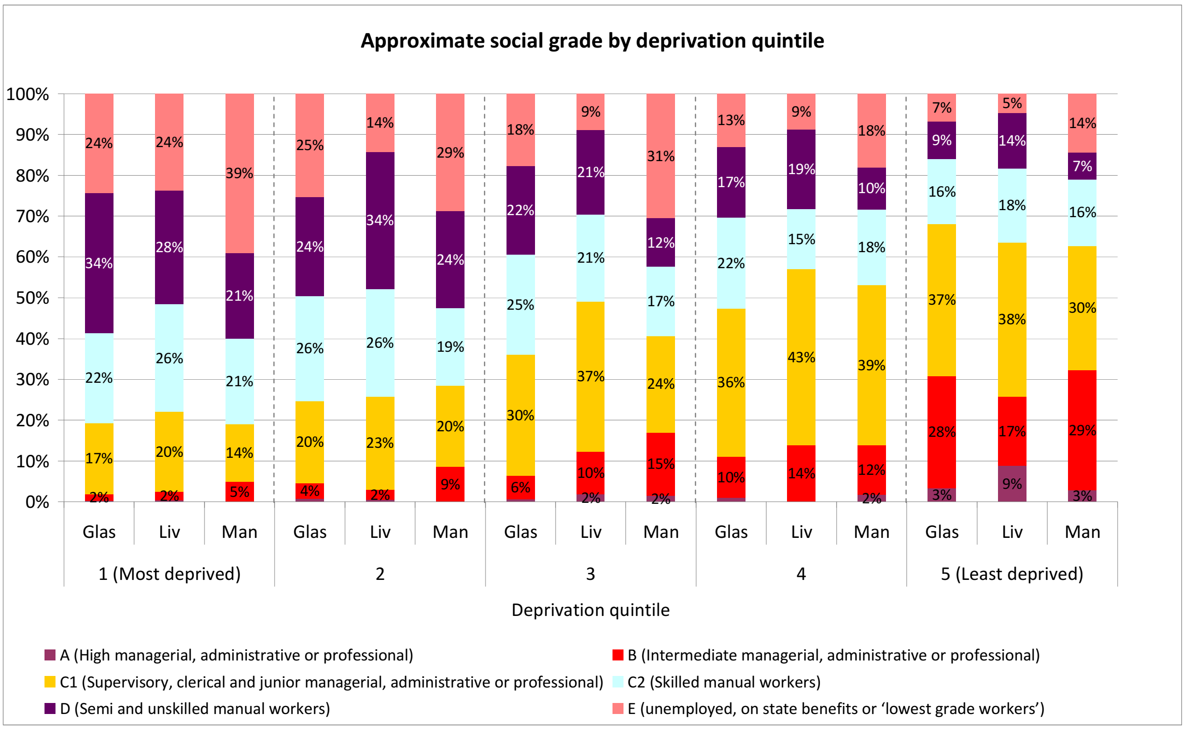


Figure 7.12



Figures 7.13 and 7.14 show educational attainment levels broken down by deprivation quintile and city. With the obvious exception of the higher percentage of Liverpool respondents with degree-level qualifications in the most deprived quintile (and, to a lesser extent, quintile 3), there are very few differences between the cities in this regard.

Figure 7.13

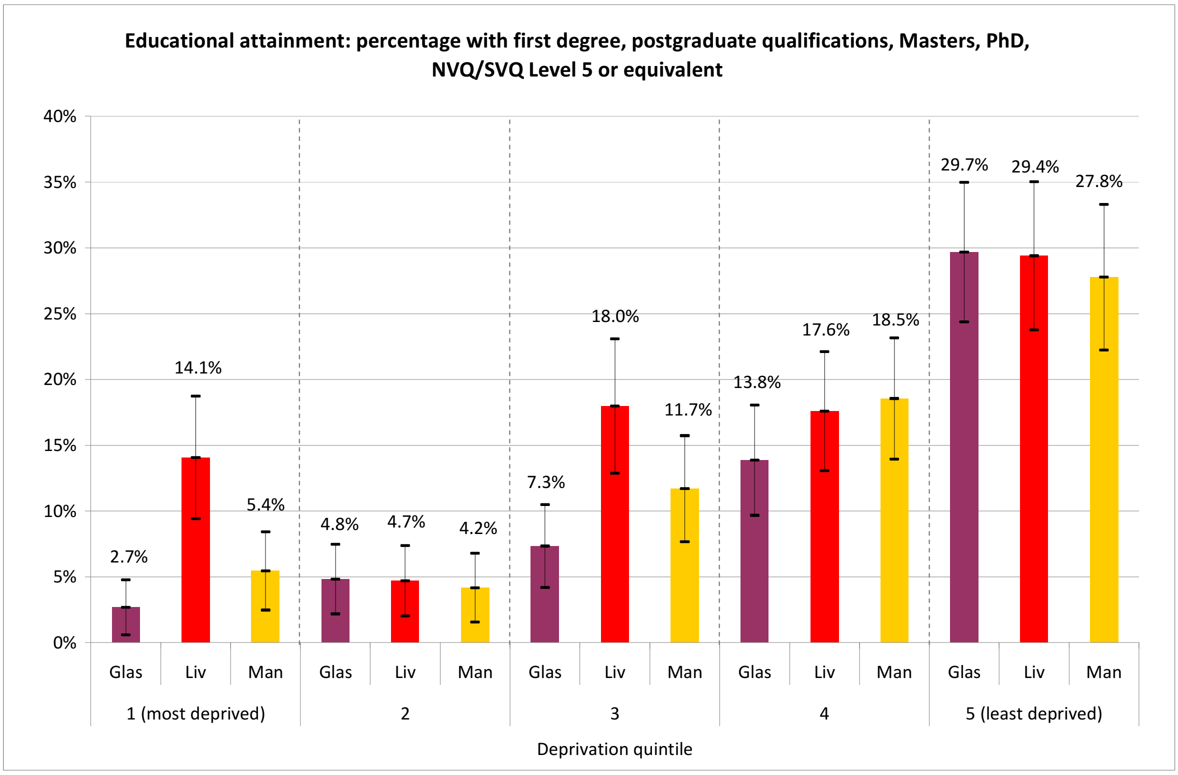
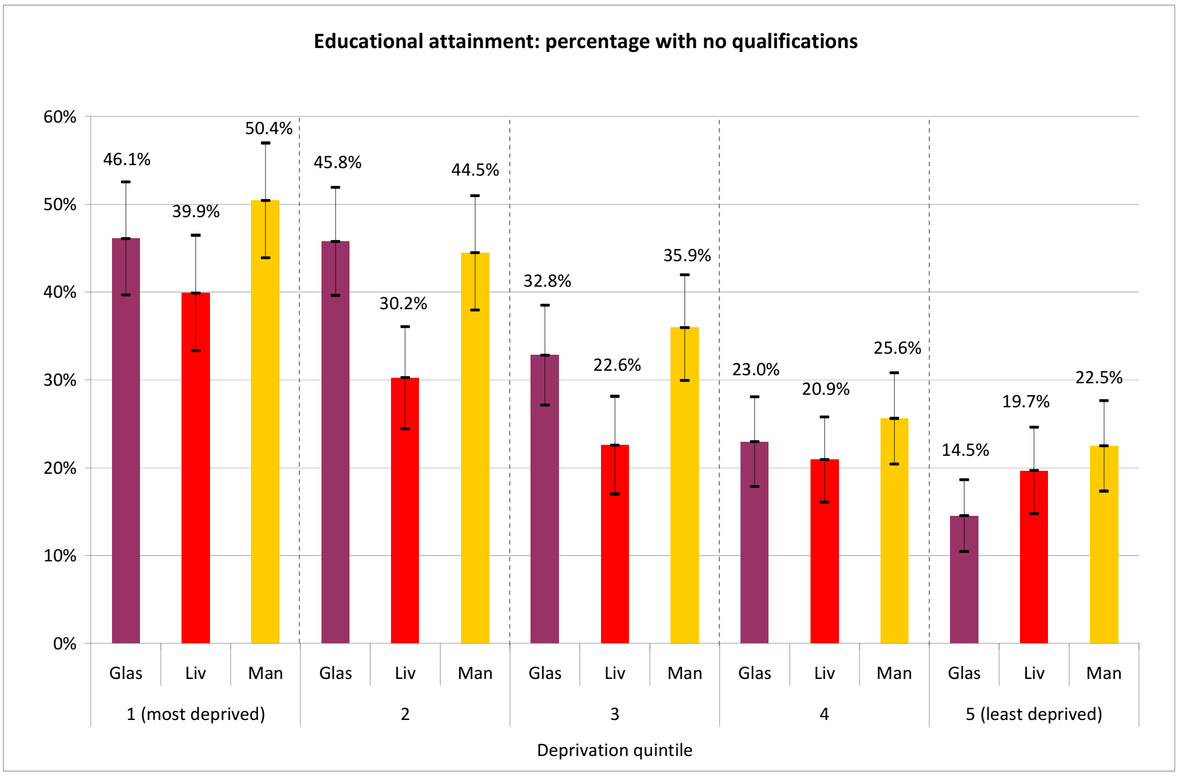


Figure 7.14



Similarities are also seen across the cities in terms of smoking status (Figure 7.7), marital status (Figure 7.15) and self-assessed health (Figure 7.16). However, a relatively higher percentage of respondents in Liverpool with a limiting long-term illness is apparent in Figure 7.17, higher especially in the most deprived quintile (Figure 7.18). Self-assessed health is discussed further later in the chapter.

Figure 7.15

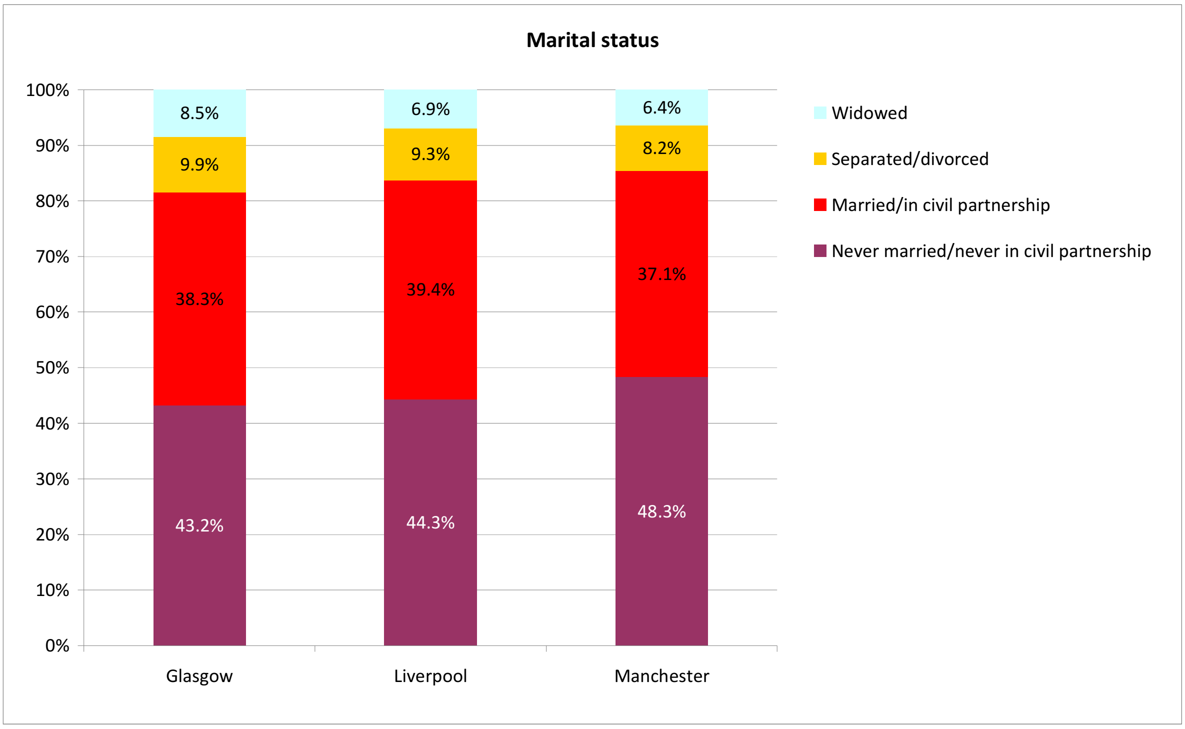


Figure 7.16

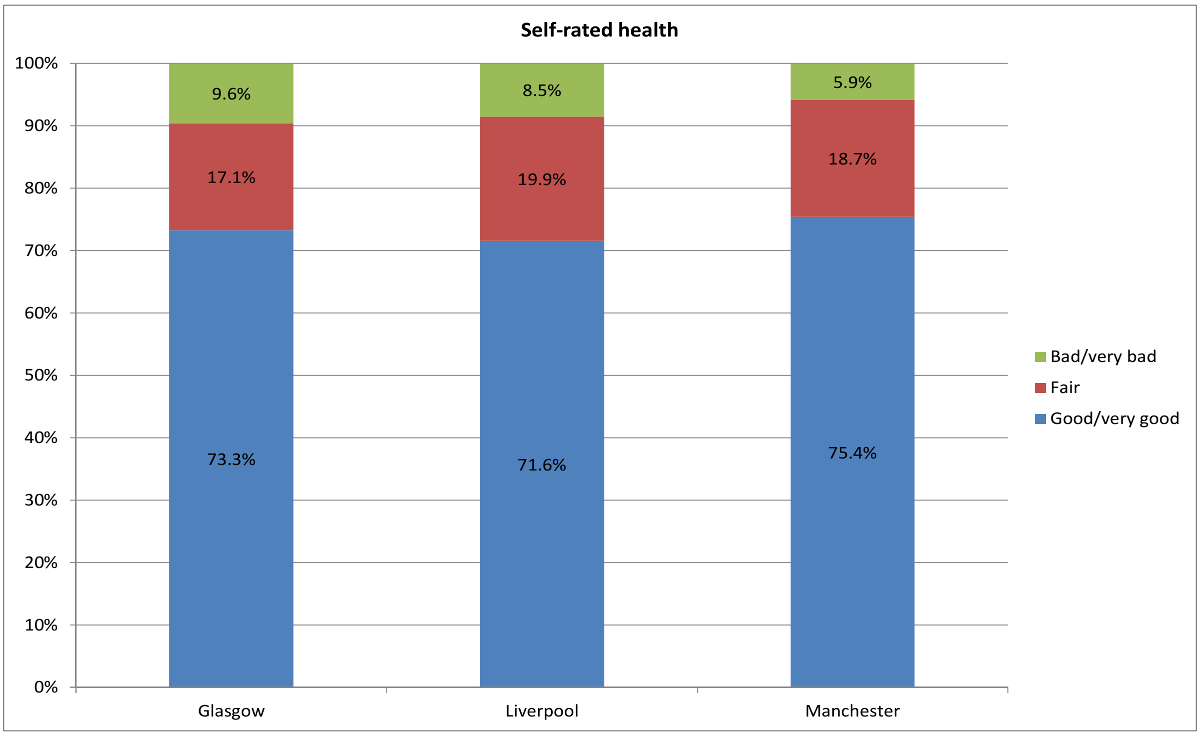


Figure 7.17

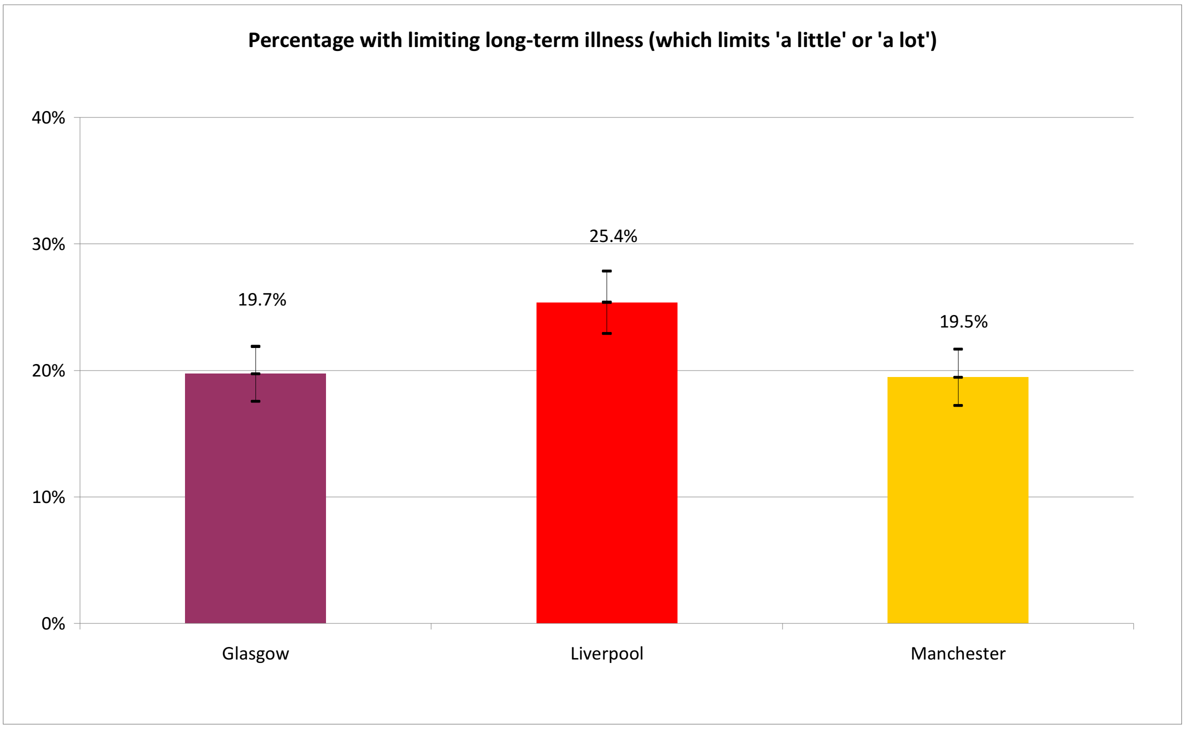
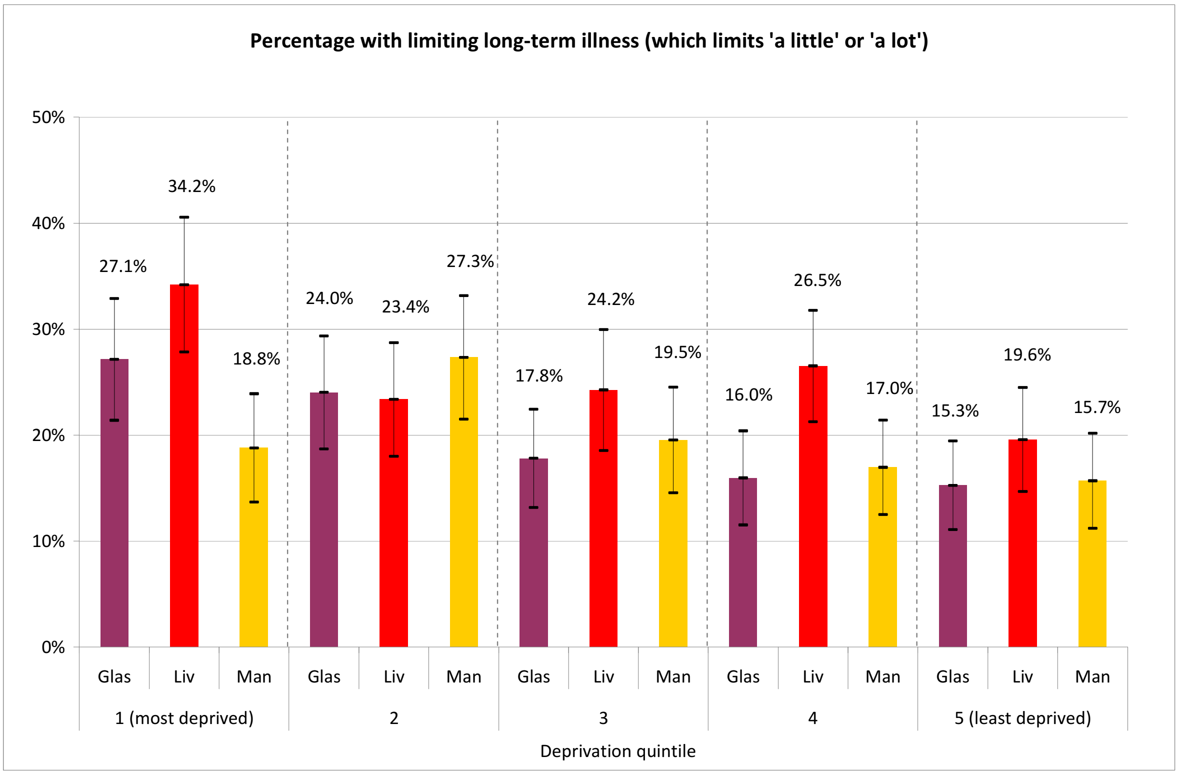


Figure 7.18



With these profiles of the samples as context, and bearing in mind the slightly more disadvantaged characteristics of the Manchester sample, the rest of the chapter presents the main results of the survey analyses.

7.4 Sense of coherence

7.4.1 Background

Sense of coherence (SoC) is a theory developed by the American-Israeli sociologist Aaron Antonovsky. Emerging from his work around the concept of salutogenesis (a focus on the mechanisms that promote and support good health, in contrast to pathogenesis, the factors that create disease), and in particular the relationship between health and stress, the theory seeks to capture the extent to which people can manage, or be resilient to, the negative effects of stress on health and wellbeing. It was famously developed from his studies of women who survived Nazi concentration camps in the Second World War. It is made up of three components: comprehensibility (the extent to which events in one's life can be readily understood and predicted), manageability (having the necessary skills and resources to manage and control one's life) and meaningfulness (there being a clear meaning and purpose to life)[542], of which the third was viewed by Antonovsky to be the most important. Two versions of the SoC scale were created by Antonovsky, one with 29 questions (SOC-29) and a later one with 13 questions (SOC-13: the one employed in this survey), although a considerable number of modified versions of both have also been used[628]. Overall the measure has been deemed to be a 'reliable, valid and cross-culturally applicable instrument'[628], and has been shown to be significantly associated with a wide variety of outcomes, in particular: various measures of quality of life[555,629] and perceived health status[556]; mental health[556,630] (e.g. depression, hopelessness[628,631-634], anxiety, post-traumatic stress symptoms[635], psychiatric disorders[636] and suicide[637]); crime[638]; risk of tobacco use[639]; alcohol and drug problems[640,641]. Some reviewers have questioned its association with physical health[630], citing considerably mixed evidence. However, it has been shown to be significantly associated with, for example, circulatory health problems[642], diabetes[643], post-surgery recovery[644,645], and a recent (2008) UK study of almost 20,000 individuals suggested that strong SoC was associated with a 20% reduction in all-cause mortality[646].

Given the above evidence of links to a variety of health related outcomes, it has been hypothesised (including within Scottish Government reports) that SoC may be lower among the Scottish and Glaswegian populations[535,536]. Furthermore, given its links to hopelessness and meaningfulness and purpose of life, it is also, to a degree, relevant to the 'psychological outlook' hypothesis discussed later in the chapter.

7.4.2 Results

Contrary to the hypothesis, SoC was found to be significantly higher among the Glasgow sample compared to the samples for Liverpool and Manchester. It was higher overall (Figure 7.19), among both males and females (Figure 7.20), among most age groups (Figure 7.21), in four out of five deprivation quintiles (Figure 7.22) and in the majority of social classes (Figure 7.23): with regard to the latter, a clear social gradient is evident across all three cities, but in the vast majority of cases, SoC remains higher among the Glaswegian respondents.

These results are generally true of the three subscales, including 'meaningfulness' (Figures 7.24-7.26).

Figure 7.19

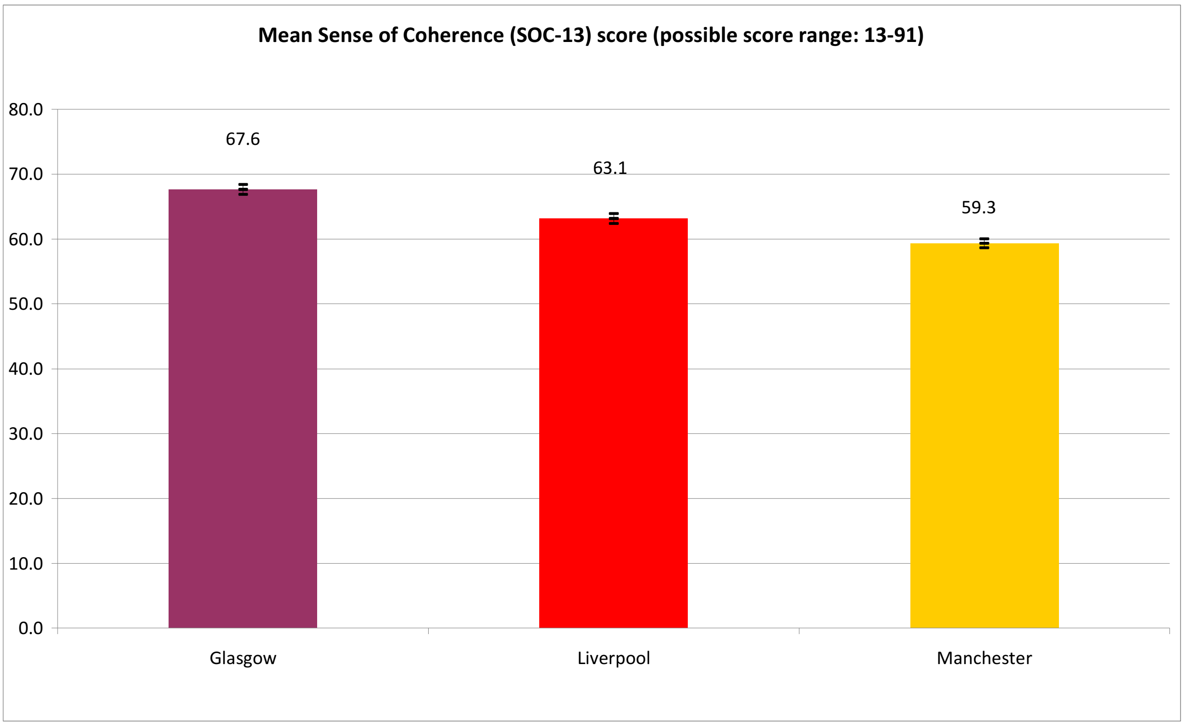


Figure 7.20

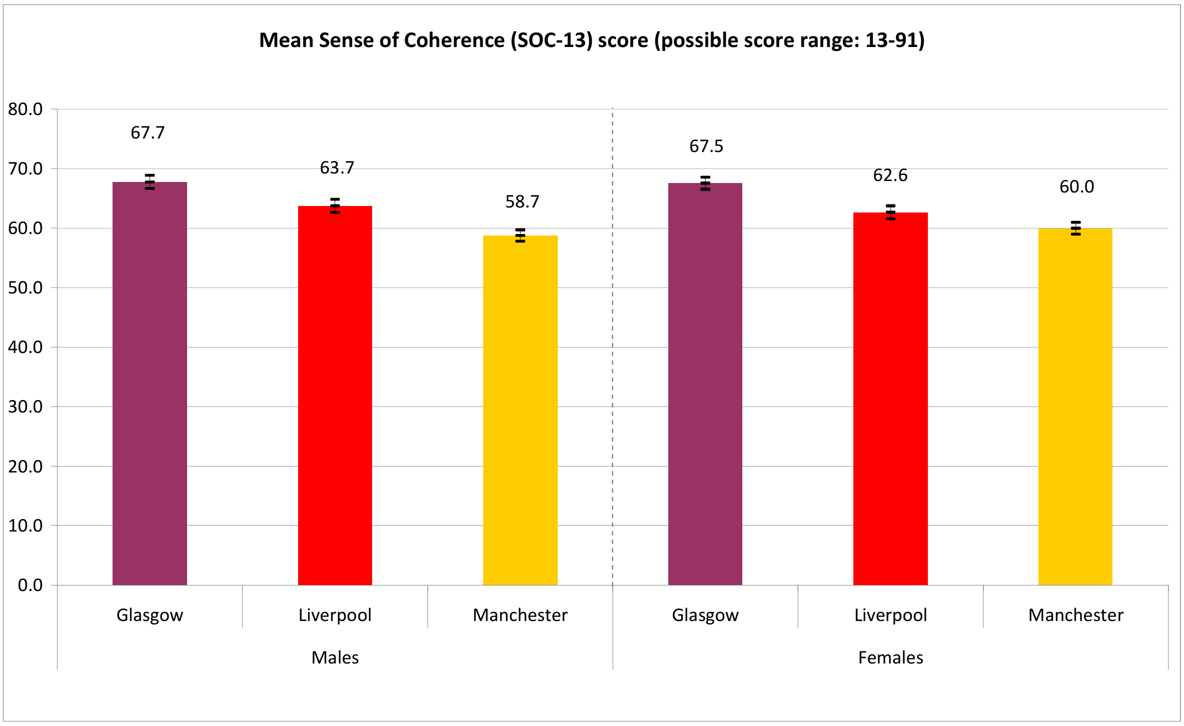


Figure 7.21

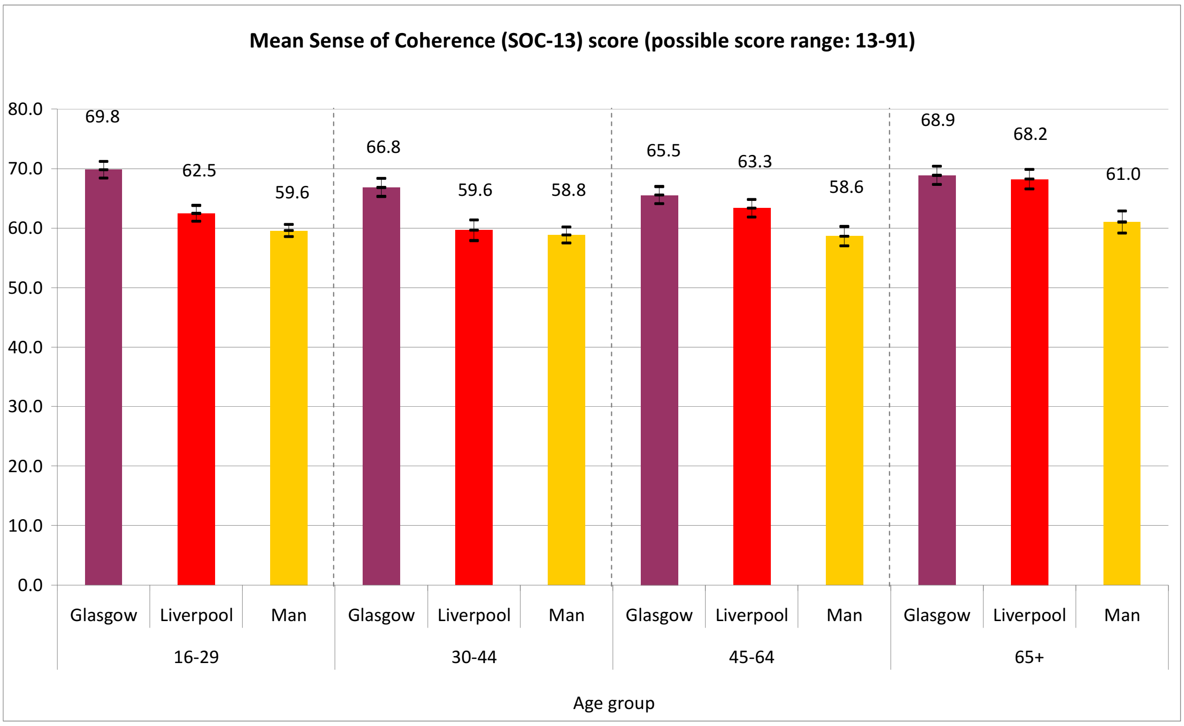


Figure 7.22

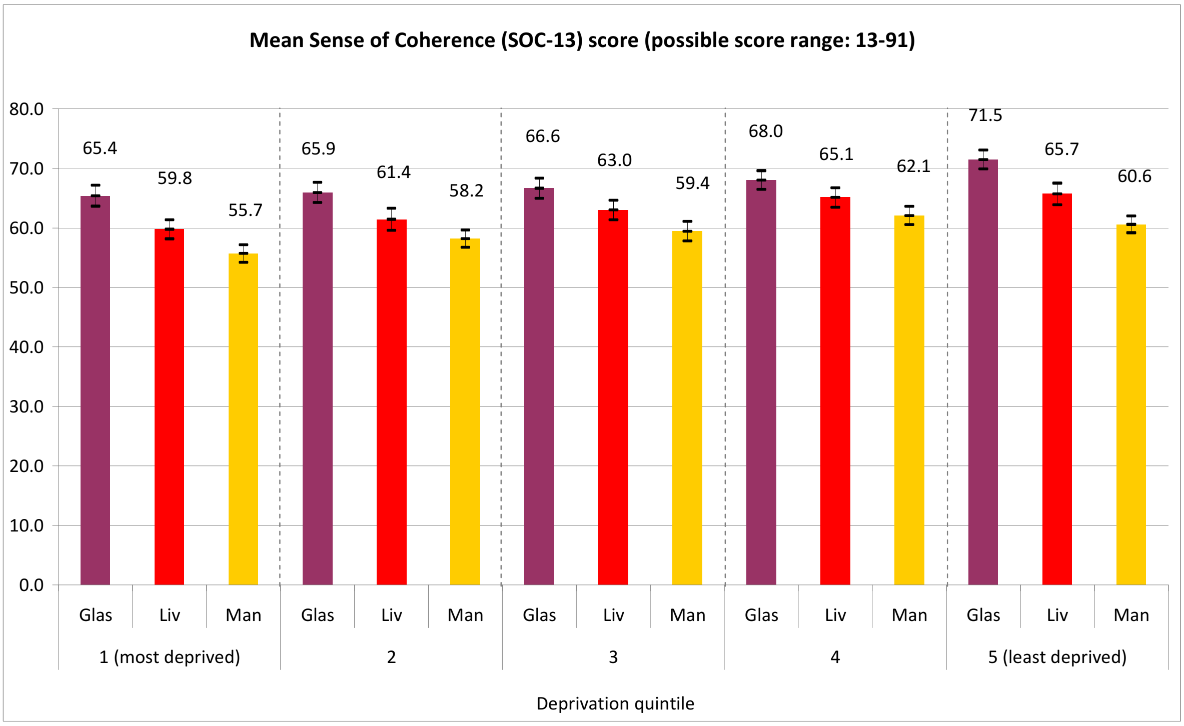


Figure 7.23[clxiv]

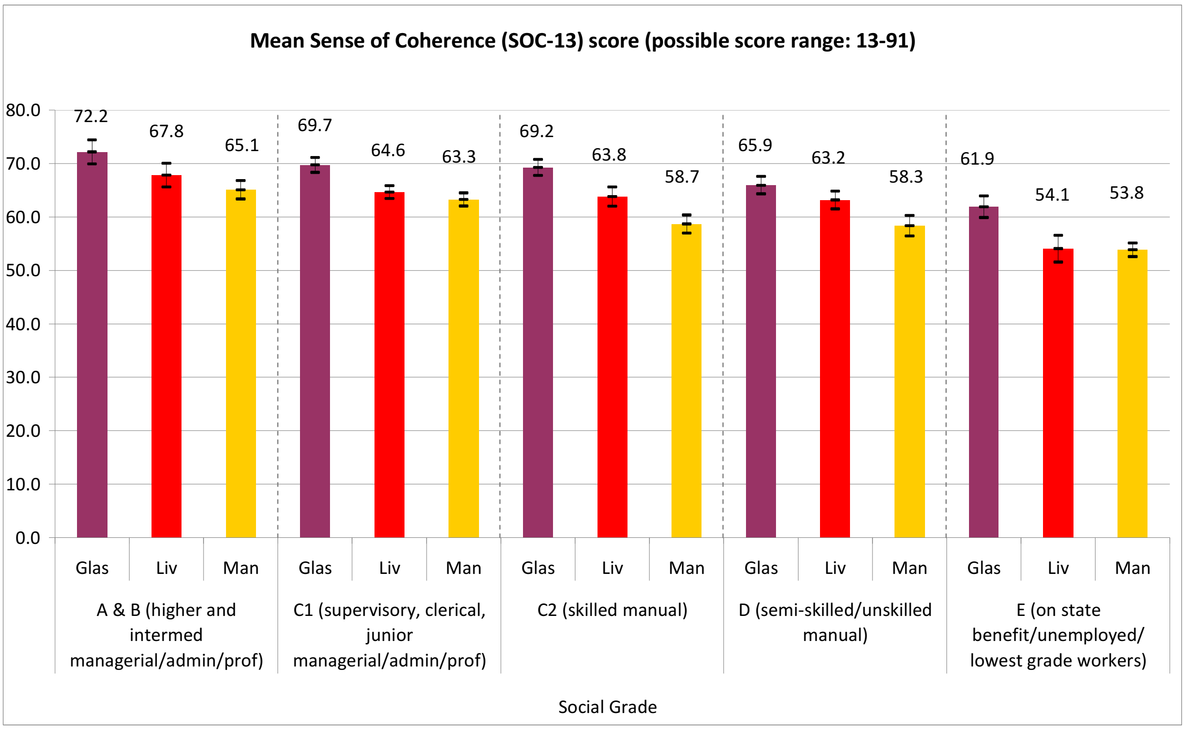
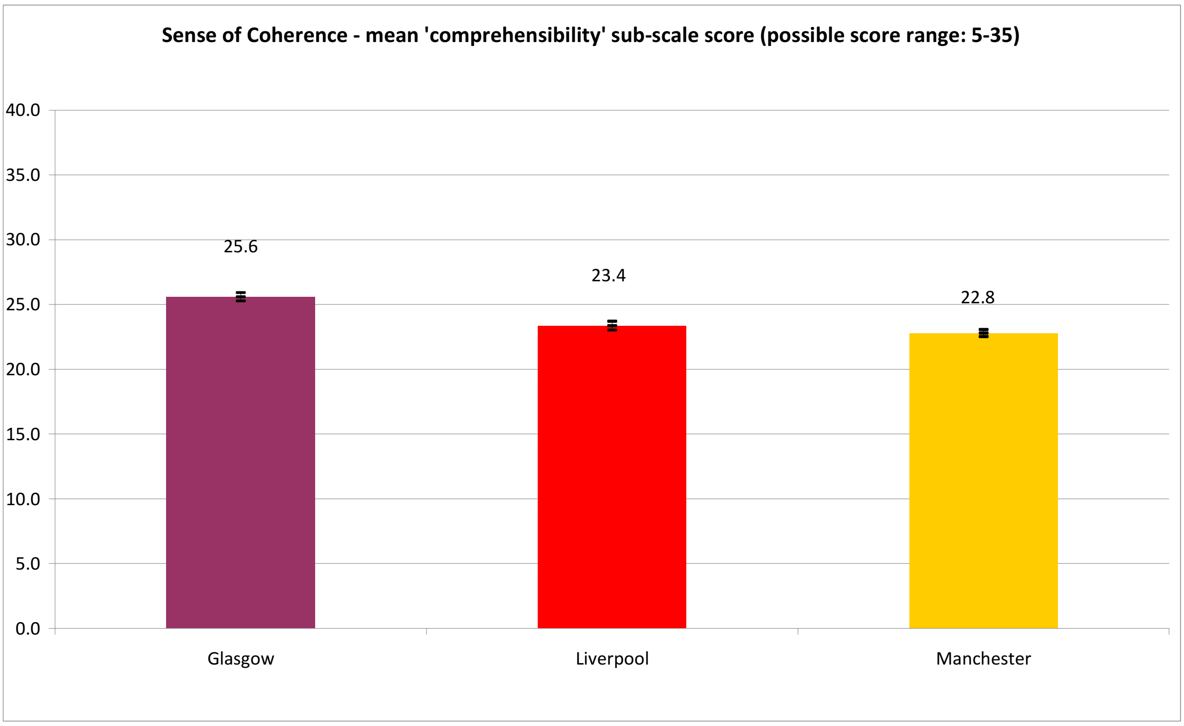


Figure 7.24



[clxiv] As described in Chapter 4, note that in Figure 7.23, as in all analyses by social grade (including the modelling analyses), social grades ‘A’ and ‘B’ were combined into one category. This was because of the very small number of respondents classified as social grade ‘A’.

Figure 7.25

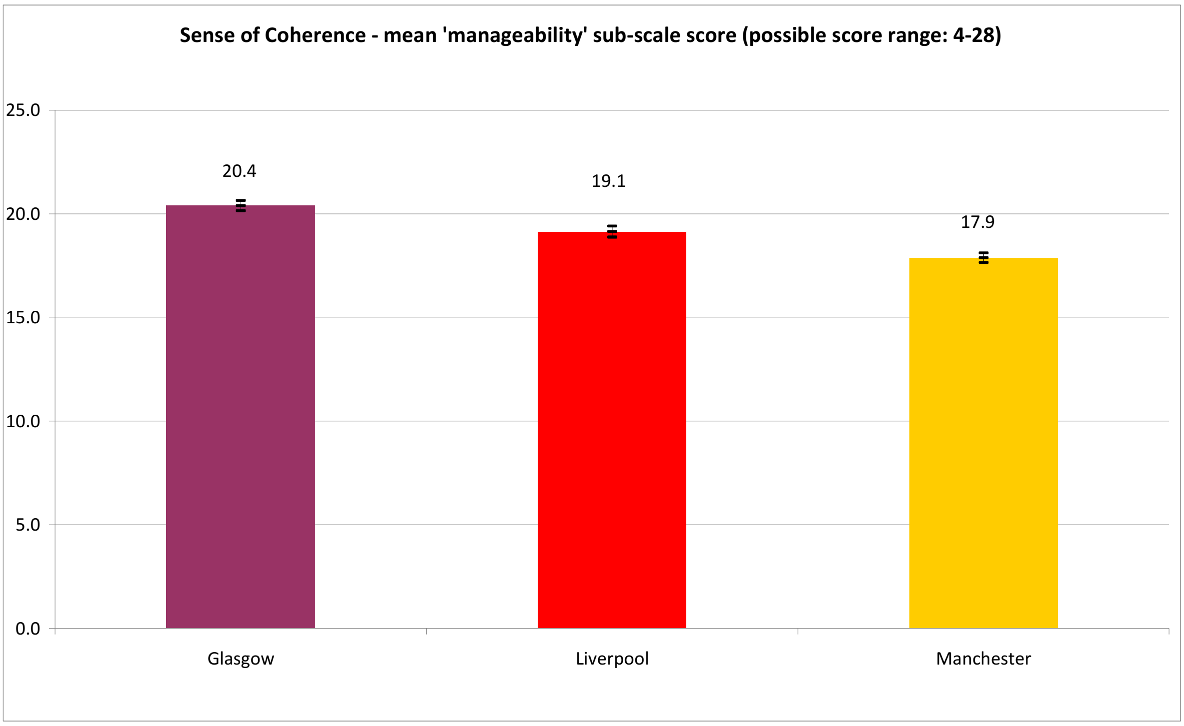
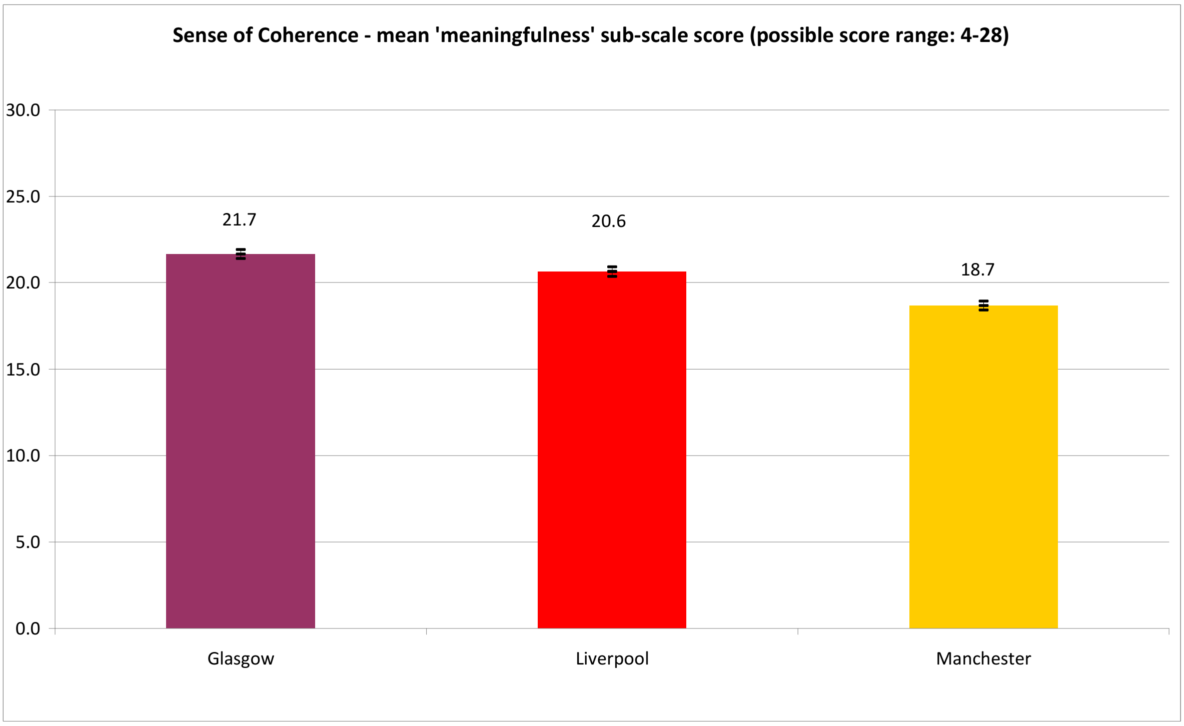


Figure 7.26



These findings are confirmed by the results of the multivariate linear regression analyses presented in Table 7.1. Adjusting for all differences in the characteristics of the samples (e.g. age, gender, deprivation, social grade, educational attainment, employment status), residents of Liverpool were associated with a mean SoC score of 4.9 lower than residents of Glasgow, with the adjusted mean score of the Manchester sample being 8.1 lower than that of Glasgow. Significant differences between the cities were also seen in the modelling of the comprehensibility, manageability, and meaningfulness scores: these are shown in Tables 7.2, 7.3 and 7.4. As explained in Chapter 4, only significant independent variables were included in the final models and are therefore shown in the tables.

Table 7.1

Multivariate linear regression analysis of the factors associated with Sense of Coherence (SoC) score

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
City				
Glasgow†	65.71			
Liverpool	60.78	-4.93 (-5.90 to -3.97)	-9.99	****
Manchester	57.65	-8.07 (-9.04 to -7.10)	-16.35	****
Deprivation quintile				
1 (Most deprived)†	65.71			
2	66.41	0.69 (-0.60 to 1.98)	1.05	
3	66.84	1.13 (-0.17 to 2.43)	1.70	
4	68.05	2.34 (1.05 to 3.63)	3.55	***
5 (Least deprived)	67.92	2.21 (0.89 to 3.52)	3.29	**
Educational attainment				
No qualifications†	65.71			
Some qualifications, but not degree level	68.23	2.51 (1.51 to 3.52)	4.89	****
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	69.91	4.20 (2.77 to 5.63)	5.76	****
Employment status				
Employed (PT & FT)†	65.71			
Unemployed	59.31	-6.40 (-7.77 to -5.04)	-9.19	****
Ill/disabled	59.45	-6.27 (-8.23 to -4.30)	-6.24	****
Retired	68.66	2.95 (1.17 to 4.73)	3.25	**
Looking after home/family	65.07	-0.64 (-2.11 to 0.83)	-0.85	
In education/training (PT/FT)	65.92	0.20 (-1.23 to 1.63)	0.28	
Marital status				
Never married†	65.71			
Married/civil partnership	67.73	2.02 (0.93 to 3.12)	3.62	***
Separated/divorced	66.20	0.48 (-1.11 to 2.08)	0.59	
Widowed/surviving partner	66.57	0.86 (-1.15 to 2.86)	0.84	
Longterm limiting illness (LLI)				
No LLI†	65.71			
Limited a little	64.78	-0.94 (-2.33 to 0.45)	-1.32	
Limited a lot	63.76	-1.95 (-3.83 to -0.06)	-2.03	*
Self-assessed health				
Good/very good†	65.71			
Fair	61.19	-4.52 (-5.71 to -3.34)	-7.47	****
Bad/very bad	59.53	-6.18 (-8.14 to -4.22)	-6.17	****
Age group				
16-29†	65.71			
30-44	64.68	-1.03 (-2.25 to 0.18)	-1.67	
45-64	65.68	-0.03 (-1.41 to 1.34)	-0.05	
65+	67.89	2.18 (0.02 to 4.33)	1.98	*

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

R^2 = 0.21; Adjusted R^2 = 0.20

Table 7.2

Multivariate linear regression analysis of the factors associated with Sense of Coherence sub-scale of manageability

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
City				
Glasgow†	20.47			
Liverpool	19.09	-1.37 (-1.70 to -1.04)	-8.07	****
Manchester	18.05	-2.42 (-2.75 to -2.08)	-14.15	****
Gender				
Male†	20.47			
Female	20.13	-0.34 (-0.62 to -0.05)	-2.31	*
Social grade				
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†	20.47			
C1(Supervisory, clerical, junior managerial/admin/prof)	20.52	0.05 (-0.38 to 0.48)	0.23	
C2 (Skilled manual)	20.27	-0.20 (-0.67 to 0.27)	-0.84	
D (Semi-skilled/unskilled manual)	20.17	-0.29 (-0.78 to 0.20)	-1.17	
E (On state benefit/unemployed/lowest grade workers)	19.86	-0.61 (-1.18 to -0.03)	-2.06	*
Deprivation quintile				
1 (Most deprived)†	20.47			
2	20.78	0.31 (-0.13 to 0.76)	1.38	
3	20.64	0.18 (-0.27 to 0.62)	0.77	
4	20.99	0.52 (0.07 to 0.97)	2.29	*
5 (Least deprived)	20.89	0.43 (-0.03 to 0.89)	1.81	
Educational attainment				
No qualifications†	20.47			
Some qualifications, but not degree level	20.97	0.51 (0.16 to 0.86)	2.83	**
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	21.01	0.54 (0.02 to 1.06)	2.05	*
Employment status				
Employed (PT & FT)†	20.47			
Unemployed	18.63	-1.84 (-2.38 to -1.30)	-6.70	****
Ill/disabled	19.02	-1.45 (-2.14 to -0.76)	-4.11	****
Retired	21.94	1.47 (1.00 to 1.95)	6.10	****
Looking after home/family	20.50	0.04 (-0.51 to 0.59)	0.13	
In education/training (PT/FT)	20.28	-0.18 (-0.67 to 0.30)	-0.74	
Marital status				
Never married†	20.47			
Married/civil partnership	20.87	0.41 (0.06 to 0.75)	2.33	*
Separated/divorced	20.62	0.15 (-0.36 to 0.67)	0.59	
Widowed/surviving partner	20.79	0.32 (-0.34 to 0.98)	0.95	
Self-assessed health				
Good/very good†	20.47			
Fair	18.69	-1.77 (-2.15 to -1.39)	-9.11	****
Bad/very bad	18.31	-2.15 (-2.73 to -1.58)	-7.33	****

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

R^2 = 0.16; Adjusted R^2 = 0.15

Table 7.3

Multivariate linear regression analysis of the factors associated with Sense of Coherence sub-scale of meaningfulness

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
City				
Glasgow†	20.96			
Liverpool	19.75	-1.22 (-1.56 to -0.87)	-6.86	****
Manchester	18.02	-2.94 (-3.29 to -2.59)	-16.52	****
Social grade				
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†	20.96			
C1(Supervisory, clerical, junior managerial/admin/prof)	21.16	0.20 (-0.26 to 0.65)	0.85	
C2 (Skilled manual)	20.63	-0.33 (-0.82 to 0.16)	-1.31	
D (Semi-skilled/unskilled manual)	20.54	-0.42 (-0.94 to 0.09)	-1.63	
E (On state benefit/unemployed/lowest grade workers)	20.32	-0.64 (-1.25 to -0.04)	-2.09	*
Deprivation quintile				
1 (Most deprived)†	20.96			
2	21.29	0.32 (-0.14 to 0.79)	1.37	
3	21.68	0.72 (0.25 to 1.19)	3.03	**
4	22.05	1.09 (0.62 to 1.55)	4.57	****
5 (Least deprived)	21.65	0.69 (0.21 to 1.17)	2.83	**
Educational attainment				
No qualifications†	20.96			
Some qualifications, but not degree level	21.96	1.00 (0.63 to 1.36)	5.37	****
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	22.82	1.86 (1.32 to 2.40)	6.76	****
Employment status				
Employed (PT & FT)†	20.96			
Unemployed	18.73	-2.23 (-2.79 to -1.67)	-7.83	****
Ill/disabled	18.40	-2.56 (-3.28 to -1.84)	-6.97	****
Retired	21.89	0.93 (0.44 to 1.42)	3.70	***
Looking after home/family	20.93	-0.03 (-0.58 to 0.53)	-0.09	
In education/training (PT/FT)	20.98	0.02 (-0.49 to 0.52)	0.06	
Marital status				
Never married†	20.96			
Married/civil partnership	21.52	0.55 (0.20 to 0.91)	3.05	**
Separated/divorced	21.15	0.19 (-0.34 to 0.73)	0.71	
Widowed/surviving partner	21.58	0.62 (-0.07 to 1.31)	1.77	
Self-assessed health				
Good/very good†	20.96			
Fair	19.47	-1.49 (-1.88 to -1.09)	-7.34	****
Bad/very bad	18.48	-2.49 (-3.09 to -1.89)	-8.12	****

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

R^2 = 0.22; Adjusted R^2 = 0.22

Table 7.4

Multivariate linear regression analysis of the factors associated with Sense of Coherence sub-scale of comprehensibility

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
City				
Glasgow†	24.91			
Liverpool	22.53	-2.38 (-2.80 to -1.96)	-11.19	****
Manchester	22.18	-2.72 (-3.14 to -2.30)	-12.81	****
Deprivation quintile				
1 (Most deprived)†	24.91			
2	24.92	0.01 (-0.54 to 0.57)	0.05	
3	25.07	0.17 (-0.39 to 0.73)	0.59	
4	25.52	0.61 (0.06 to 1.17)	2.17	*
5 (Least deprived)	25.84	0.94 (0.37 to 1.51)	3.25	**
Educational attainment				
No qualifications†	24.91			
Some qualifications, but not degree level	25.65	0.74 (0.31 to 1.18)	3.37	***
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	26.18	1.27 (0.65 to 1.89)	4.05	****
Employment status				
Employed (PT & FT)†	24.91			
Unemployed	23.03	-1.87 (-2.46 to -1.29)	-6.25	****
Ill/disabled	22.79	-2.11 (-2.96 to -1.27)	-4.89	****
Retired	26.08	1.18 (0.41 to 1.94)	3.01	**
Looking after home/family	24.71	-0.20 (-0.83 to 0.43)	-0.61	
In education/training (PT/FT)	25.18	0.27 (-0.34 to 0.89)	0.87	
Marital status				
Never married†	24.91			
Married/civil partnership	25.77	0.87 (0.40 to 1.34)	3.62	***
Separated/divorced	24.96	0.06 (-0.63 to 0.74)	0.16	
Widowed/surviving partner	25.02	0.12 (-0.75 to 0.98)	0.27	
Longterm limiting illness (LLI)				
No LLI†	24.91			
Limited a little	24.42	-0.49 (-1.08 to 0.11)	-1.59	
Limited a lot	24.03	-0.87 (-1.69 to -0.06)	-2.11	*
Self-assessed health				
Good/very good†	24.91			
Fair	23.48	-1.42 (-1.93 to -0.91)	-5.46	****
Bad/very bad	22.83	-2.08 (-2.92 to -1.23)	-4.83	****
Age group				
16-29†	24.91			
30-44	24.45	-0.46 (-0.98 to 0.07)	-1.71	
45-64	25.00	0.09 (-0.50 to 0.68)	0.30	
65+	26.07	1.17 (0.24 to 2.09)	2.46	*

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

R^2 = 0.15; Adjusted R^2 = 0.15

Tables 7.1 to 7.4 also highlight the association between SoC and respondents' socio-economic status (social class, area deprivation, educational attainment, employment status all featuring as significant independent variables in the models), as well as with self-assessed health (significantly lower SoC scores being associated with respondents with bad/very bad reported health status). Marital status was also significant in all four models, married respondents being associated with significantly higher scores than those who had never been married.

Among the Glasgow sample only, the factors associated with a lower SoC were similar to those in the modelling of the data across all three cities and included: employment status (i.e. not working compared to those who were employed), social class (those of lower social class compared to those of higher), living in a deprived area, and self-assessed health. These results are shown in Appendix VII.

7.4.3 Summary and conclusions

Based on these samples of the cities of Glasgow, Liverpool and Manchester, SoC is higher, not lower, in Glasgow. This finding is relevant to the specific hypothesis concerning SoC, as well as to the hypotheses around psychological outlook (partly discussed later in this chapter) and 'anomie' (discussed briefly in Chapter 8). These findings are discussed further in the final chapter of the thesis.

7.5 Social capital

7.5.1 Background

As outlined briefly in Chapter 2, the notion of 'social capital' and its importance to population health has been much discussed in recent years, particularly in the last two decades. However, it is not a new phenomenon, with some commentators having highlighted its origins in 19th Century sociology[214,224]. That said, it is undoubtedly a concept that has been developed, and for which more evidence has been assembled, in recent times. It is also a theory that is complex: it has been defined in many different ways and by many different commentators[214-217], although most definitions tend to overlap to large degrees. As stated in the earlier chapter, Putnam's is arguably the most frequently used definition[217,218]: the 'features of social organisation such as networks, norms, and social trust that facilitate co-ordination and co-operation for mutual benefit'. Other definitions of social capital tend to be based on four similar, key, notions: 'social trust/reciprocity; collective efficacy; participation in voluntary organisations; social integration for mutual benefit'[224,647].

Its complexity is seen in its different sub-concepts or dimensions (structural versus cognitive[224,648-650]) and its different types (bonding, bridging, vertical (linking) and horizontal). The *structural* dimension relates to the 'externally observable aspects of social organisation'[224] ('behavioural' components such as participation, or the density of social networks), while the *cognitive* element relates more to issues such as trust[651]. *Bonding* social capital refers to social networks between homogeneous groups (e.g. people within the same community), while *bridging* refers to connections between heterogeneous groups[217]: virtually all the evidence of links between social capital and health relates to bonding capital[224]. *Horizontal* social capital refers to connections made between people or groups perceived as equals, while *vertical* or 'linking' social capital instead refers to unequal or hierarchical connections (for example between a community and formal local government organisation or structure)[652].

As mentioned in Chapter 2, the concept of social capital has been criticised on a number of different grounds. These include: how it is measured[219-223]; whether it is an individual or a collective attribute[214,224-226]; and its potential negative effects[214,217,227]. However, there is a considerable amount of convincing evidence linking social capital to higher levels of health and wellbeing: a number of examples were cited in the earlier chapter.

As detailed in Chapter 4, the principal means by which social capital was measured in the survey was an expanded version of the ONS (Office for National Statistics) core 'Social Capital Harmonised Question Set'[544]. The ONS questions cover five topics relevant to the definitions and concepts discussed above: civic participation; social networks and social support; social participation; reciprocity and trust; as well as views of the local area. Closely linked to the concepts of social networks and participation, the notion of 'religious social capital' was additionally considered. The latter has been confirmed as a 'valid construct'[653], and there is a considerable amount of evidence (albeit principally from the USA) of the beneficial impact of religious participation on health outcomes: a 'meta-analytic' review of the evidence in 2000 suggested that higher levels of religious attendance were associated with almost 30% lower all-cause mortality compared to those with lower levels of participation[654]. Other reviews have confirmed the association, and although they point to caveats associated with some of the studies, they show that the significantly lower mortality is not explained by potential confounders[655,656]. Studies have also shown that the association with lower mortality may be stronger in women[654], while separate research has suggested an important role for religion in impacting specifically on suicide mortality[657].

The mechanisms by which social capital, including religious social capital, may impact on health and wellbeing are discussed in the final chapter of the thesis.

Given all the above, it has been hypothesised that social capital may be lower in Glasgow than in Liverpool and Manchester, thereby helping to explain the city's higher mortality rates in comparison to the two English cities[538,539].

7.5.2 Results

The results are grouped under the five headings of the ONS question set i.e.: views of the local area; civic participation; social networks and support; social participation; reciprocity and trust. However, as will become apparent, some questions are potentially relevant to more than one of these headings. As mentioned in Chapter 4, questions from the 'political effects' section of the survey questionnaire on perceptions of ability to influence local and national decisions are included under the heading of *civic participation*. Religious social capital is included within the section on *social participation* (although it is also relevant to the heading of *social networks*), while questions from Schwartz's Human Values Scale[545-550] are relevant to the cognitive social capital topic of *reciprocity and trust* and so are included under that heading.

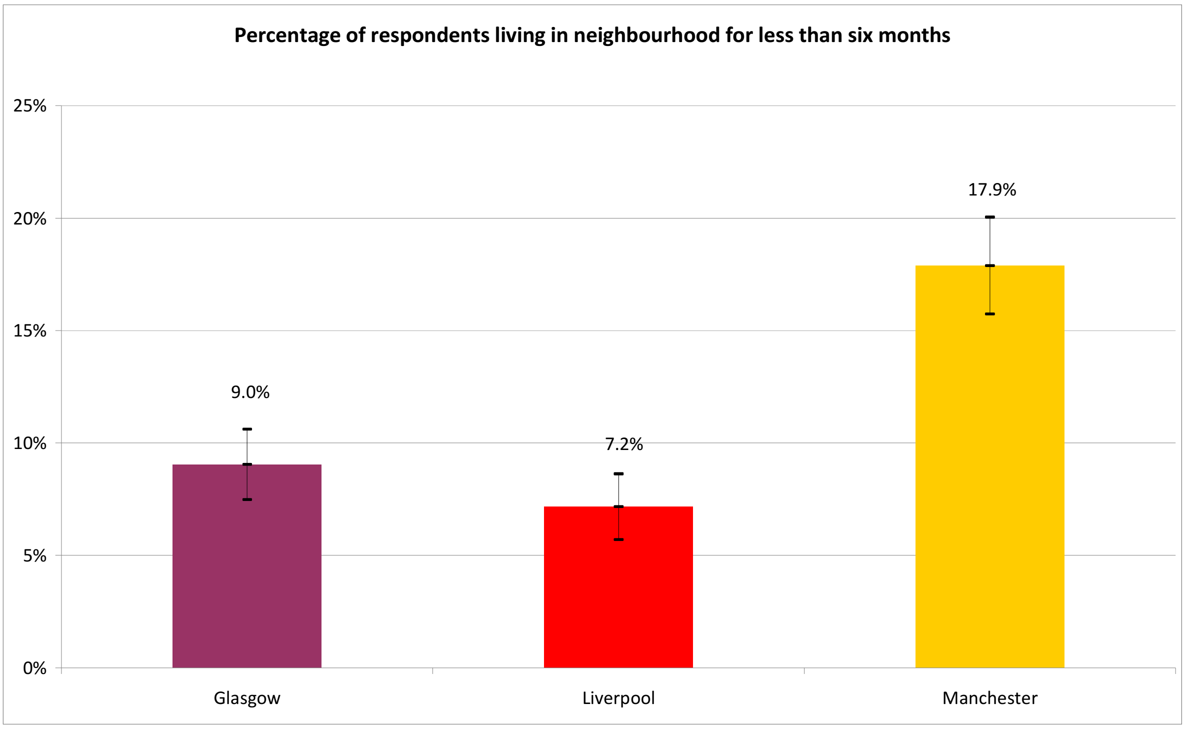
7.5.2.1 Views on the local area

Respondents were first asked about how long they have lived in the neighbourhood: clearly that may influence an individual's opinion of the place in which they live[clxv]. As Figure 7.27 shows, a significantly higher percentage of the Manchester population had lived in the neighbourhood for less than six months and, correspondingly, significantly fewer had lived there for five years or more (see Appendix V). This difference is particularly marked among younger respondents, and is seen across all neighbourhood types (data not shown).

[clxv] For this reason an indicator of length of residence in the city was included within the statistical modelling analyses (as shown in Chapter 4).

Census data confirm that a higher level of population turnover is a characteristic of Manchester as a whole[clxvi].

Figure 7.27

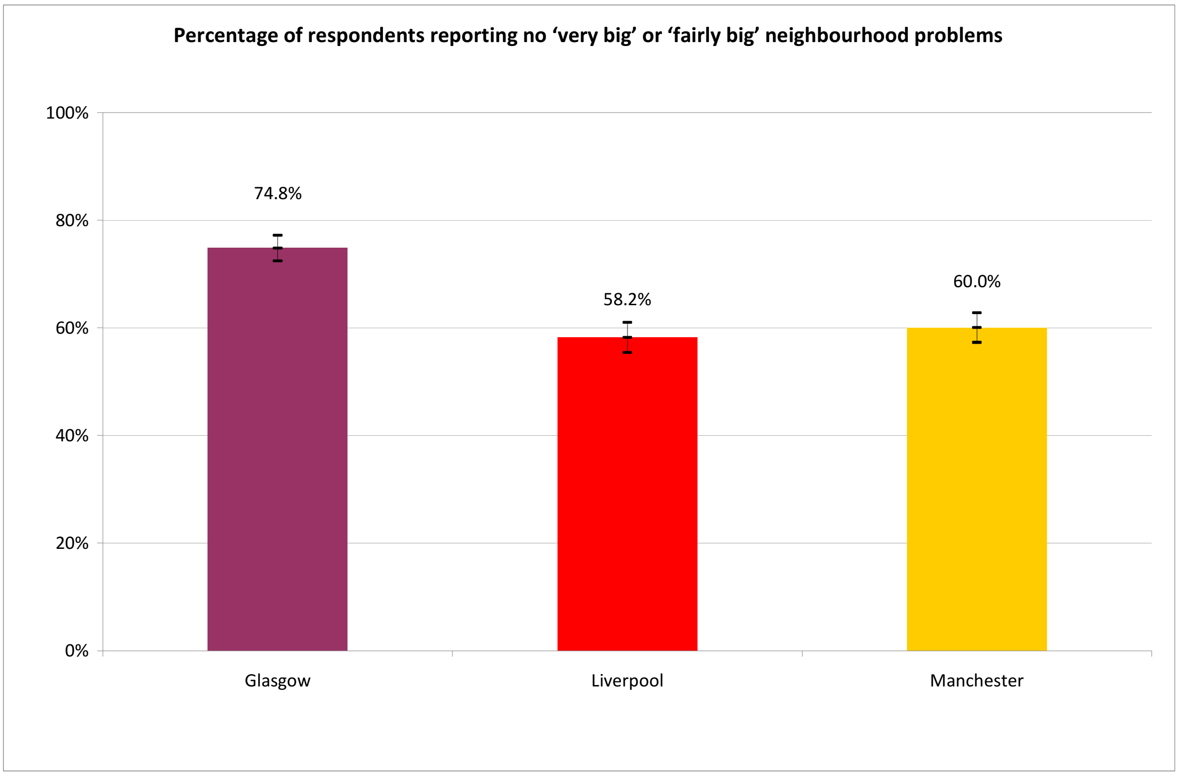


A series of questions were asked about potential neighbourhood problems. These were: people being drunk or rowdy; rubbish or litter lying around; vandalism and graffiti; people using or dealing drugs; racial or religious harassment; teenagers hanging around on the street; and troublesome neighbours. Figure 7.28 summarises the responses to these questions, suggesting a significantly more positive perception of the neighbourhood in these terms on the part of the Glasgow respondents compared with residents of the two English cities: 75% of the Glasgow sample did not describe any of these issues as being a 'very big' or 'fairly big' problem, compared to 58% and 60% of the Liverpool and Manchester samples respectively. These differences are seen for both genders and across all age groups (data not shown), and as Figure 7.29 shows, they are also seen across all neighbourhood types: in all three cities, reported problems decreased in line with decreasing levels of area deprivation, but in every area type the

[clxvi] In the three-city survey around twice as many Manchester respondents had lived in the area for less than six months compared with respondents in Glasgow and Liverpool. The 2001 Census showed that twice as many people had moved into Manchester in the previous year compared with the other two cities. Equivalent data from the 2011 census for all three cities were not available at the time of writing.

percentage reporting no 'very/fairly big' problems was significantly higher in Glasgow[clxvii].

Figure 7.28



[clxvii] Note that the analyses of the individual questions by area deprivation highlighted a number of interesting differences between the same types of areas across the cities. For example, higher numbers of respondents in the most deprived areas (deprivation quintile 1) in Glasgow (24%) and Manchester (22%) reported people being 'drunk or rowdy' as 'fairly big' or 'very big' problem compared to Liverpool (9%); however, this was not the case in the other deprivation quintiles. Similarly, rubbish/litter lying around, vandalism/graffiti and racial attacks/harassment were identified by higher numbers of Manchester respondents in the more deprived quintiles compared to Liverpool and Glasgow.

Figure 7.29

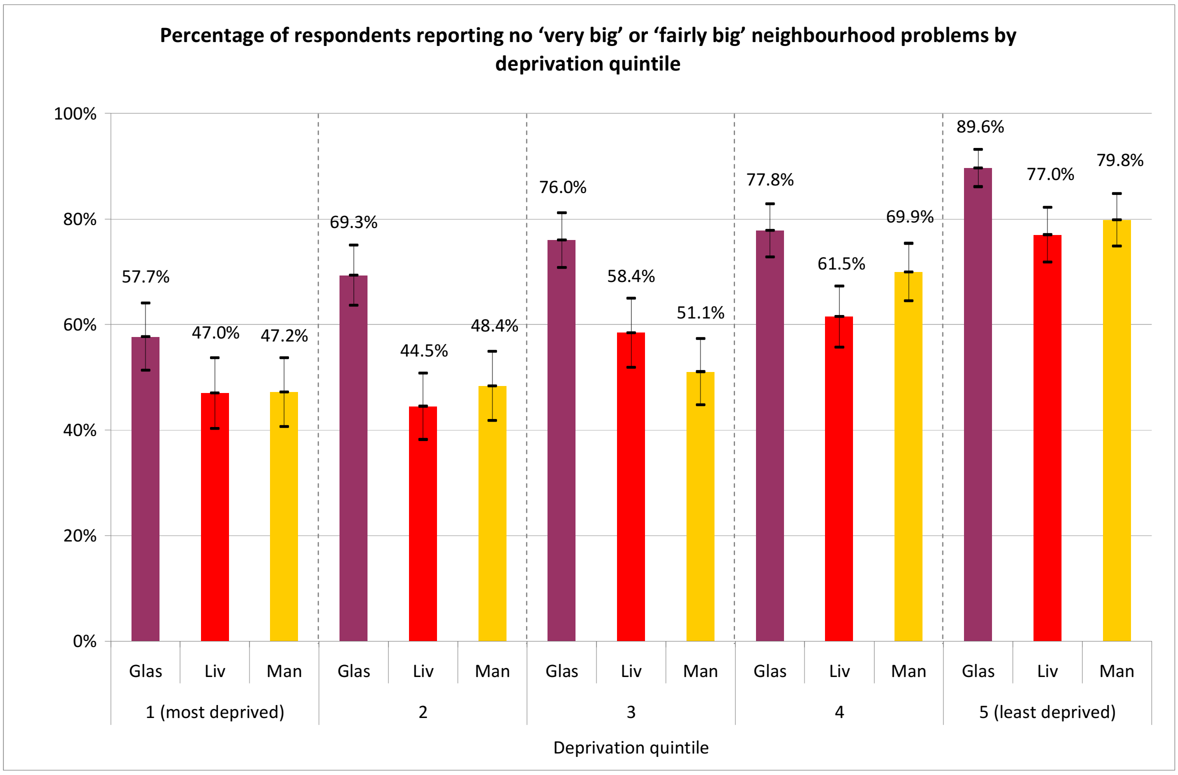


Table 7.5 shows that the statistical modelling confirms the overall differences between the cities. Using multivariate logistic regression analyses, and adjusting for all other factors in the model, respondents in both Liverpool and Manchester were more than twice as likely as those in Glasgow to report at least one 'very big' or 'fairly big' neighbourhood problem - odds ratios for Liverpool: 2.3 (95% confidence intervals 1.9, 2.7), p<0.0001; for Manchester: 2.1 (95% confidence intervals 1.7, 2.5), p<0.0001.

Only two other variables were significant in the model: area deprivation and marital status.

Table 7.5

Multivariate logistic regression analysis of the factors associated with likelihood of recording at least one very or fairly big neighbourhood problem

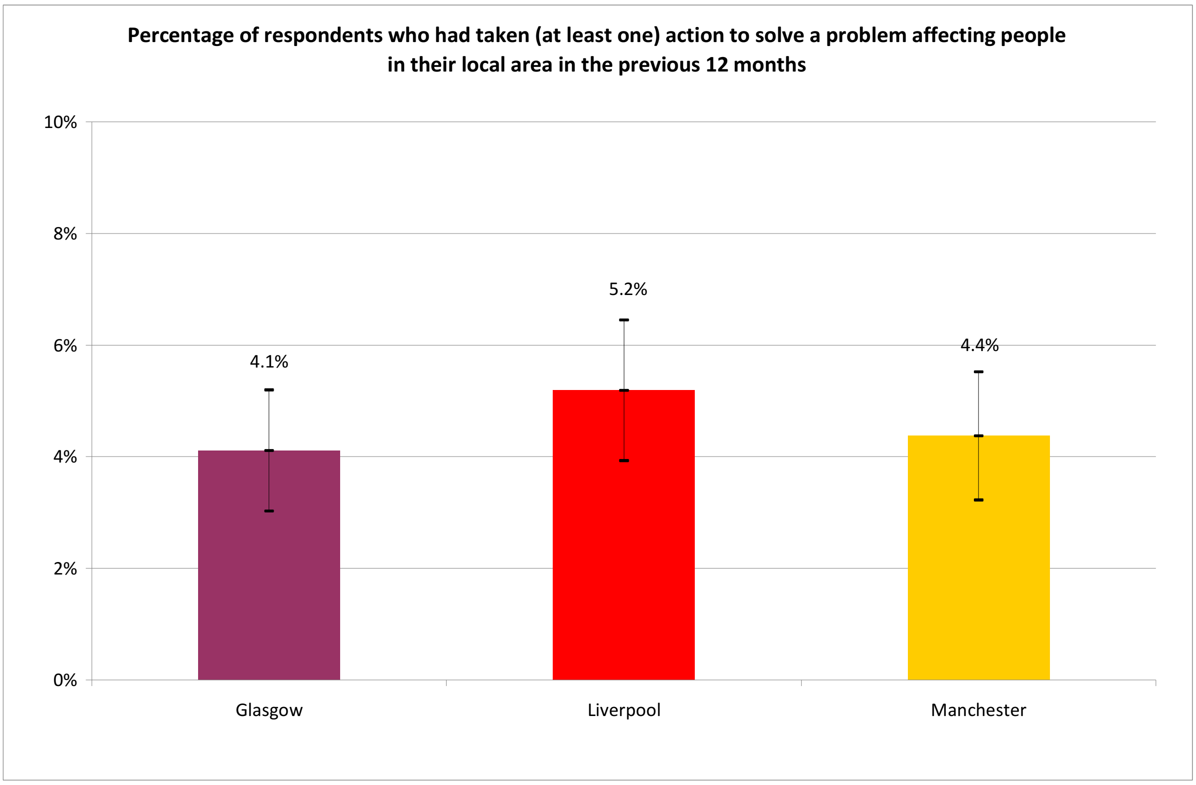
Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**96.57**	********	
Glasgow†			1.00
Liverpool	81.81	****	2.26 (1.90 to 2.70)
Manchester	66.44	****	2.09 (1.75 to 2.49)
Deprivation quintile	**196.72**	********	
1 (Most deprived)†			1.00
2	1.24		0.88 (0.71 to 1.10)
3	18.03	****	0.62 (0.50 to 0.78)
4	57.34	****	0.43 (0.35 to 0.53)
5 (Least deprived)	150.13	****	0.22 (0.17 to 0.28)
Marital status	**28.36**	********	
Never married†			1.00
Married/civil partnership	5.08	*	0.84 (0.71 to 0.98)
Separated/divorced	9.23	**	1.46 (1.15 to 1.87)
Widowed/surviving partner	9.30	**	0.63 (0.47 to 0.85)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable
R^2 = 0.09 (Cox & Snell)

7.5.2.2 Civic participation

The survey data suggest there are relatively low levels of civic participation across all three cities (at least as defined by the questions used). Respondents were asked whether in the previous 12 months they had taken any action to solve a problem affecting people in their local area, with response options including: contacting the local media (radio/television station or newspaper), the local council (or similar organisation) or a local representative (councillor or MP); attending a public discussion meeting, tenants'/residents' group, protest meeting or action group; and helping to organise a petition. As Figure 7.30 shows, only 4-5% of each sample said they had done this: similarly small numbers were recorded in most sub-categories (e.g. age, sex, social grade) (data not shown). The statistical modelling confirmed there were no significant differences between the cities in this regard (data presented in Appendix VI).

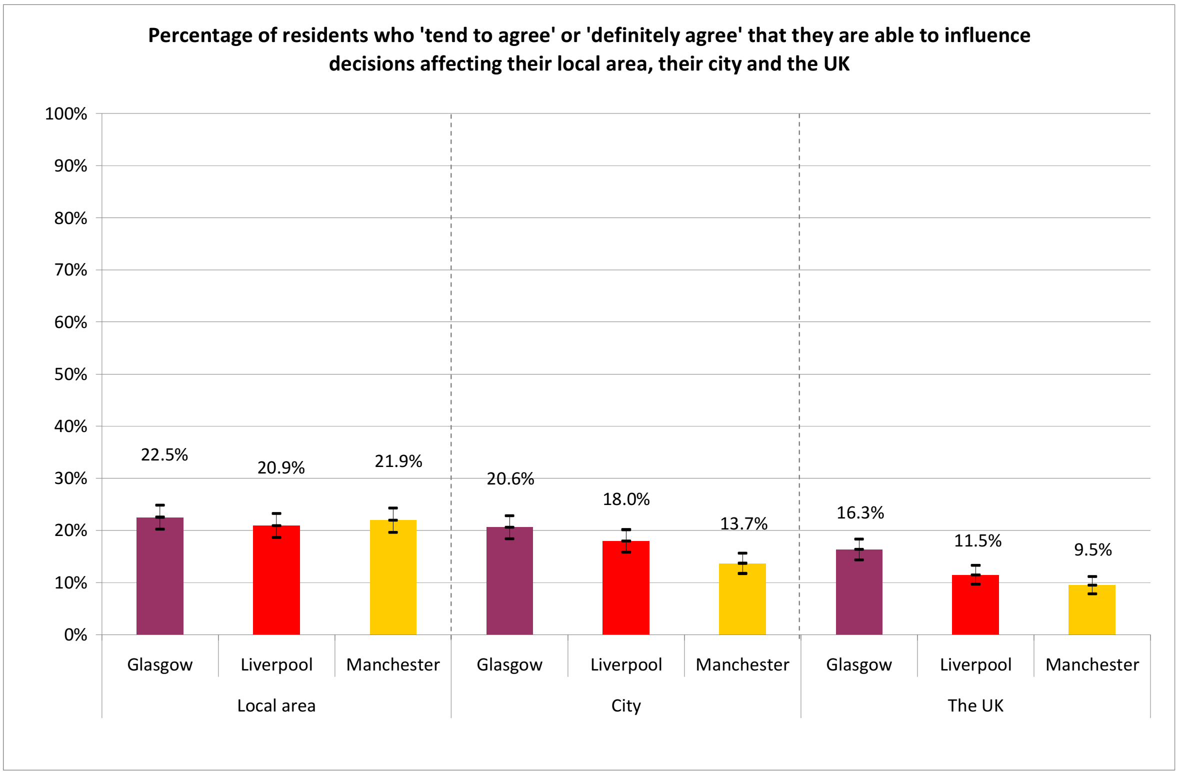
Figure 7.30



Relatively few respondents in each city said they felt able to influence decisions affecting their local area – 21% to 22% in each city 'definitely agreeing' or 'tending to agree' that they had any such influence – with even fewer believing they were able to influence decisions affecting their city or the UK as a whole. Analyses of these questions are shown in Figure 7.31. Particularly few Manchester respondents felt they could influence city-level (14%) or UK-level (9.5%) decisions. A significantly higher percentage of the Glasgow sample (although still only 16%) felt able to influence decisions affecting the UK – the higher figure in Glasgow compared with Liverpool (11.5%) and Manchester (9.5%) possibly reflecting awareness of the potential impact of the 2014 referendum on Scottish independence (although this is purely speculative). The statistical modelling generally confirmed the results shown in Figure 7.31: for example, after adjustment for all other factors, there were no significant differences between the cities in terms of perceptions of ability to influence local decisions, while Liverpool and Manchester respondents were significantly less likely than those in Glasgow to believe they could influence UK-level decisions. In all three models (local area, city and UK), the most important predictors were area deprivation (respondents from the most deprived areas being especially unlikely to believe they could influence decisions) and educational attainment (respondents educated to degree level were significantly *more* likely to feel they could influence decisions compared with those with no educational qualifications). All three models are included within Appendix VI.

(Note that Glasgow respondents were also asked about their perceived ability to influence decisions affecting Scotland. The percentage ‘definitely agreeing’ or ‘tending to agree’ that they could influence decisions was, at just 18%, fairly similar to the percentages agreeing they could influence local, city or UK decisions).

Figure 7.31



7.5.2.3 Social networks and support

A number of questions were asked in relation to respondents’ frequency of contact with friends, relatives and neighbours. In relation to *regular contact with neighbours* (Figure 7.32), *telephone contact with friends and relatives*, and *meeting up with relatives* (Appendix V), results for the Glasgow sample were either similar to, or slightly more positive than, those for the two English samples. However, alongside those in Manchester, the Glasgow sample had slightly less frequent *personal contact with friends* than those in Liverpool (Figure 7.33), while *social media contact with friends and relatives* appeared less frequent in Glasgow compared with Liverpool and, especially, Manchester (Figure 7.34).

Figure 7.32

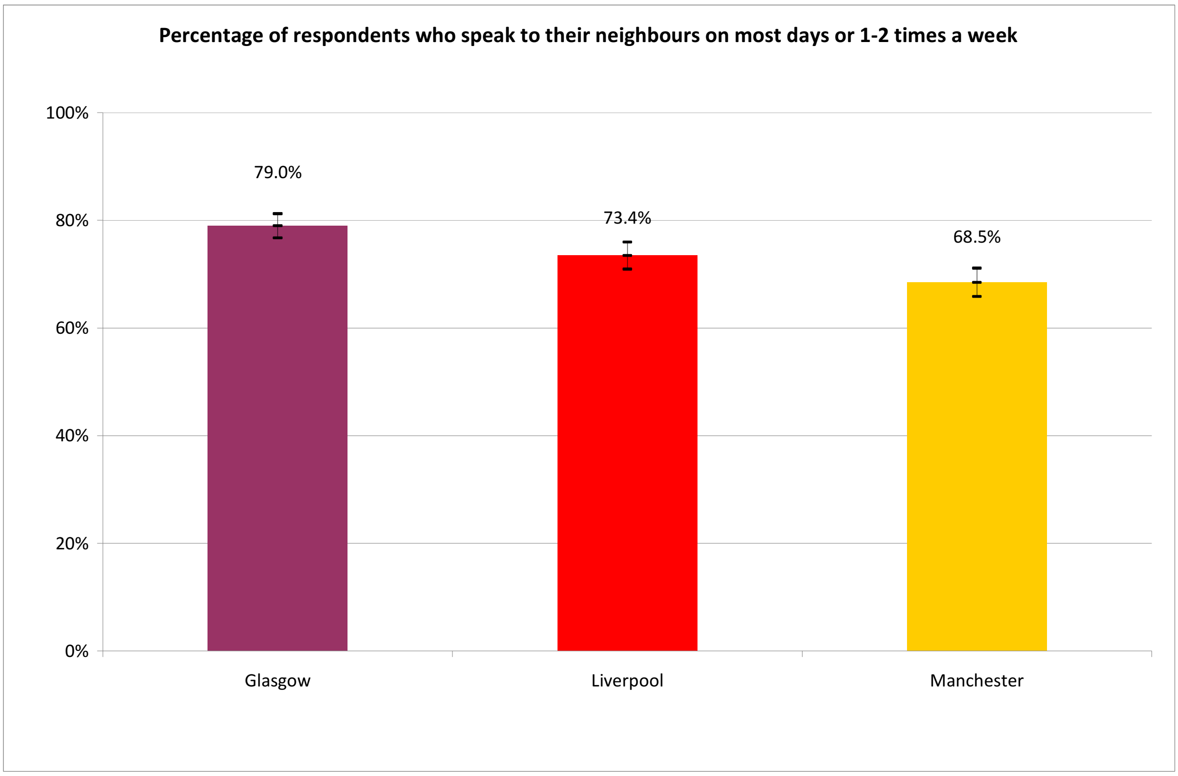


Figure 7.33

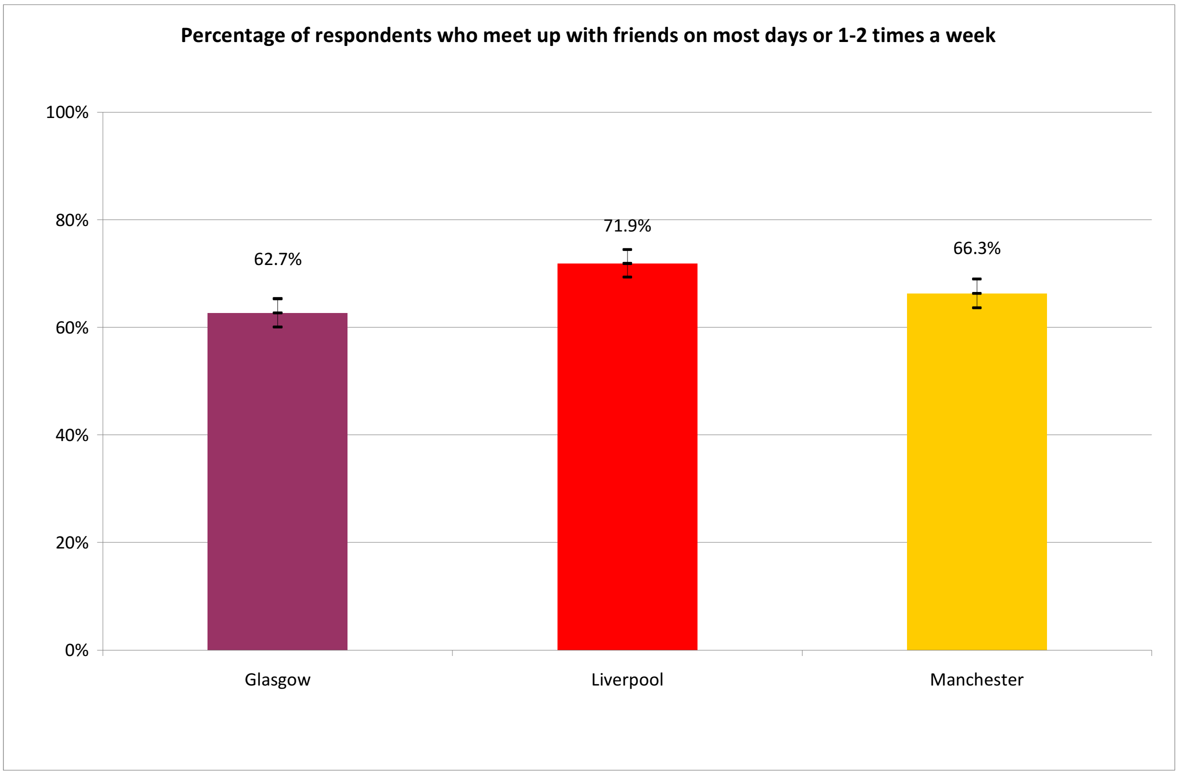
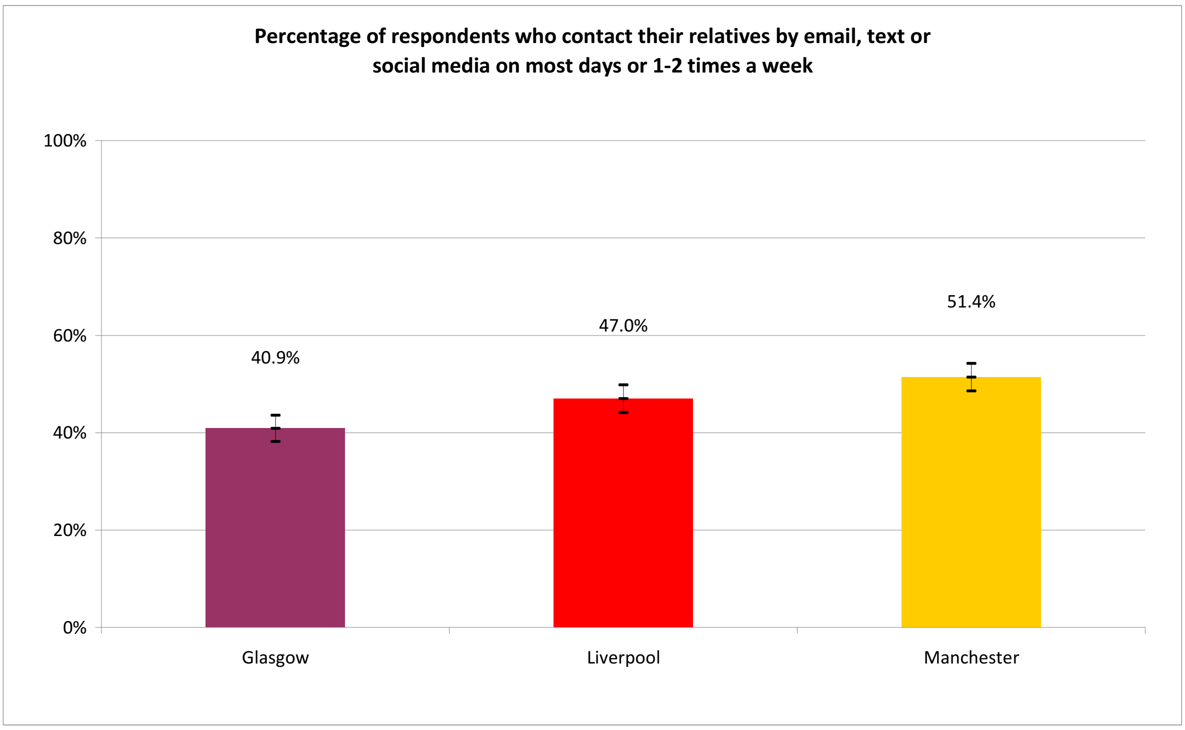


Figure 7.34



In terms of social support, respondents were asked how many people outside their home (e.g. friends, relatives and neighbours) they could ask for help in relation to: going to the shop for them if unwell; lending them some money for a few days; and giving advice and support in a crisis. Again, probably reflecting the nature of the sample (in terms of having higher numbers of people who had been living in the area a relatively short time), significantly higher numbers of Manchester respondents reported that they had no one to ask for any of those kinds of help: 16% compared to 7% and 4% respectively in the Glasgow and Liverpool samples (Figure 7.35). This was true across all ages, both genders, and all area types (but especially for those living in the most deprived areas (Figure 7.36)). The statistical modelling analyses confirmed this: after adjustment for all other factors in the model, those in Manchester were twice as likely to have no one to turn to for help compared with those in Glasgow. In turn, however, Liverpool respondents were almost 40% *less* likely to have no one to turn to for help compared with those in Glasgow. Other variables that were significant in the modelling included gender (females less likely than males to report lack of social support), ethnicity (members of ethnic minority groups at greater risk than other groups), social class, area deprivation and length of the residence in the city. These data are shown in Table 7.6.

Figure 7.35

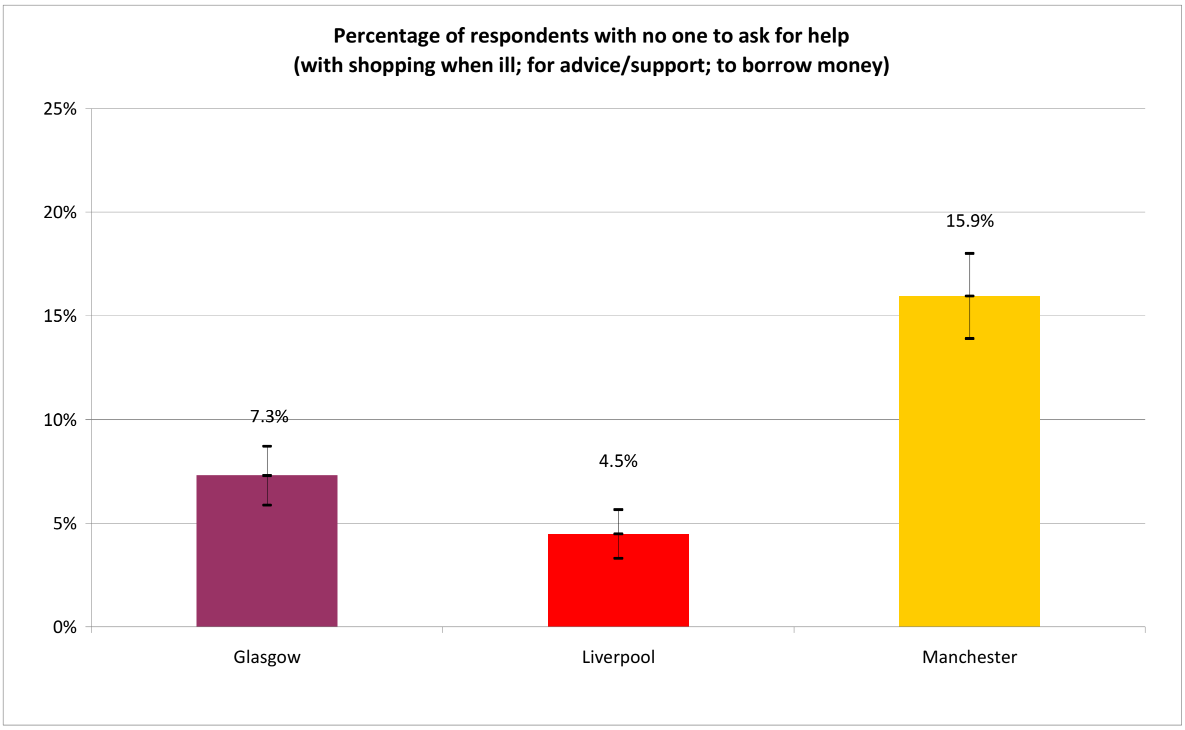


Figure 7.36

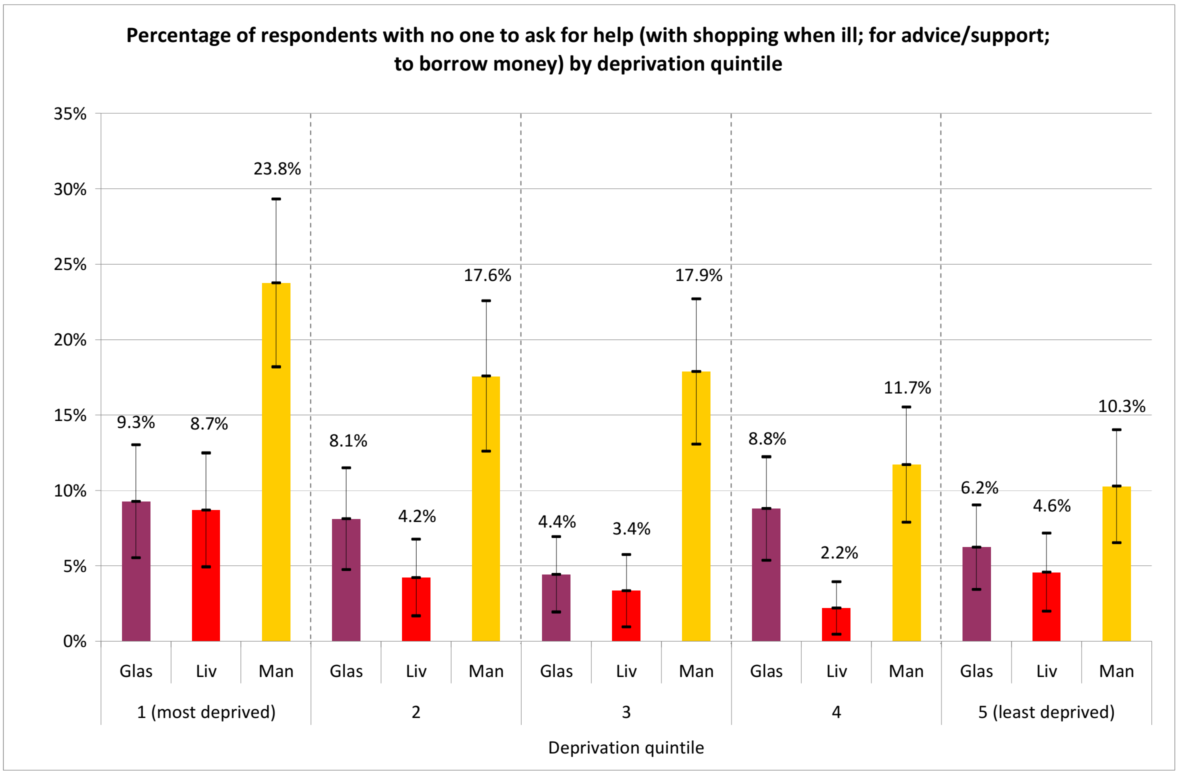

Percentage of respondents with no one to ask for help (with shopping when ill; for advice/support; to borrow money) by deprivation quintile
35%
30%
25%
20%
15%
10%
5%
0%
9.3%
8.7%
23.8%
8.1%
4.2%
17.6%
4.4%
3.4%
17.9%
8.8%
2.2%
11.7%
6.2%
4.6%
10.3%
Glas
Liv
Man
1 (most deprived)
2
3
4
5 (least deprived)
Deprivation quintile

Table 7.6

Multivariate logistic regression analysis of the factors associated with likelihood of reporting having no-one to ask for help (for shopping/advice/support/to borrow money)

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**54.37**	********	
Glasgow†			1.00
Liverpool	7.39	**	0.61 (0.43 to 0.87)
Manchester	24.11	****	2.00 (1.52 to 2.64)
Gender	**7.31**	******	
Male†			1.00
Female	7.31	**	0.72 (0.57 to 0.91)
Ethnicity	**8.17**	******	
Not a member of ethnic minority group†			1.00
Member of ethnic minority group	8.17	**	1.54 (1.15 to 2.07)
Social grade	**10.98**	*****	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	0.46		1.16 (0.75 to 1.81)
C2 (skilled manual)	0.76		1.23 (0.77 to 1.96)
D (semi-skilled/ unskilled manual)	0.73		1.23 (0.76 to 1.99)
E (on state benefit/ unemployed/ lowest grade workers)	6.92	**	1.82 (1.16 to 2.84)
Deprivation quintile	**17.97**	******	
1 (Most deprived)†			1.00
2	2.90		0.74 (0.52 to 1.05)
3	9.80	**	0.56 (0.39 to 0.81)
4	10.68	**	0.54 (0.38 to 0.78)
5 (Least deprived)	12.24	***	0.50 (0.34 to 0.74)
Length of residence	**13.69**	*******	
Time in city not known†			1.00
Possibly long-term resident	13.69	***	0.63 (0.49 to 0.80)

Notes
1. Significance level: * = $p<0.05$; ** = $p<0.01$; *** = $p<0.001$; **** = $p<0.0001$
† - reference category of variable
$R^2 = 0.05$ (Cox & Snell)

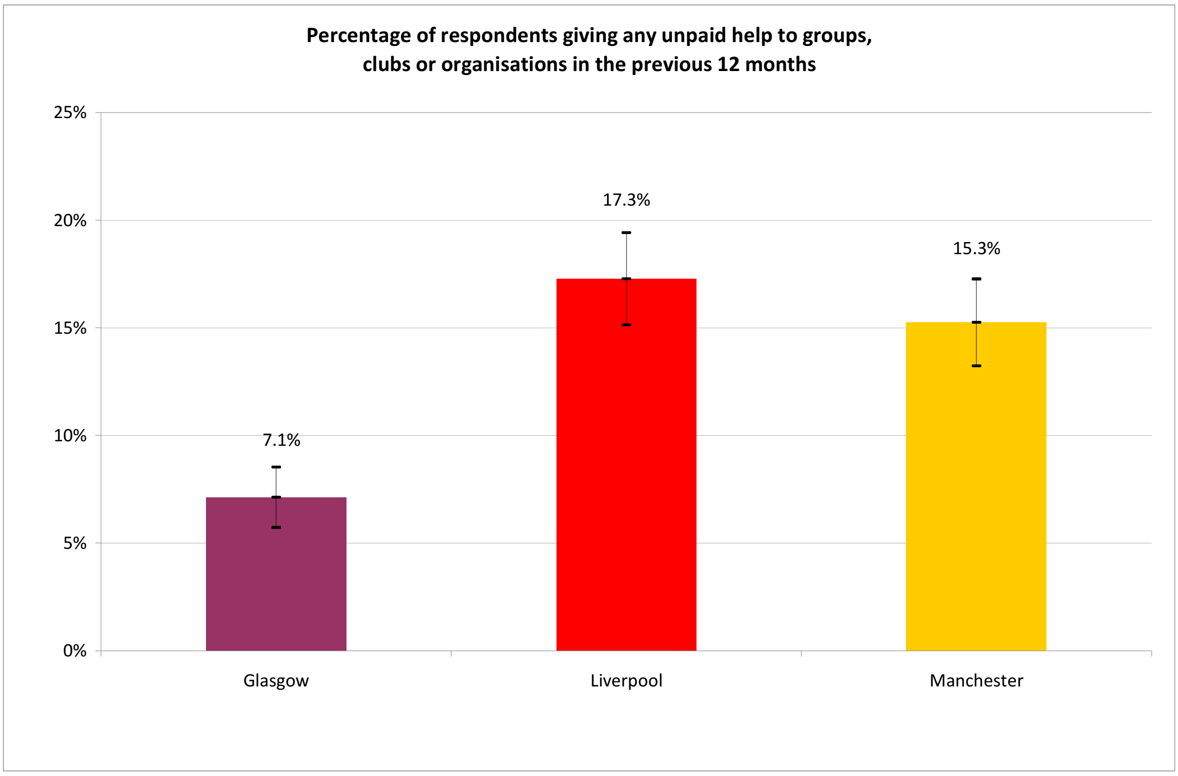
Among the Glasgow-only sample, the independent variables significantly associated with likelihood of having no one to ask for help were slightly different: employment status (those who were unemployed, looking after home/family, and in education/training were all more likely to have no one to ask for help compared to those who were in employment); long-term limiting illness (LLI) (those with a condition that limited them ‘a lot’ were almost three times more likely to say they had no one to turn to for help compared with those with no LLI); and length of residence in the city: those who were probably long-term residents were significantly less likely to have no one to turn to for help. Those data are shown in Appendix VII.

7.5.2.4 Social participation

Volunteering is a commonly used measure of social participation in studies of social capital, and indeed was referred to earlier in the chapter as one of the four key components of the concept. The ONS question used in the survey asked whether participants had given any 'unpaid help to any groups, clubs or organisations' in the previous 12 months, with a wide range of options that could be selected: raising or handling money/taking part in sponsored events; leading a group or being member of a committee; organising or helping to run an activity or event; visiting people; befriending or mentoring people; giving advice/information/counselling; secretarial, administrative or clerical work; providing transport/driving; representing; campaigning; or other practical help (e.g. helping out at school or a religious group).

Figure 7.37 shows that only 7% of Glasgow respondents said they had volunteered in the previous year: less than half the equivalent figures for those in Liverpool (17%) and Manchester (15%).

Figure 7.37



The statistical modelling analyses confirm this difference between the cities. As Table 7.7 shows, controlling for all other factors in the model, Liverpool and Manchester respondents were 2.6 and 2.5 times more likely to have volunteered in the previous 12 months than those in Glasgow. Other factors that were significant in the modelling were social class, area deprivation, educational attainment and health status (both self-assessed health and long-term limiting illness).

Table 7.7

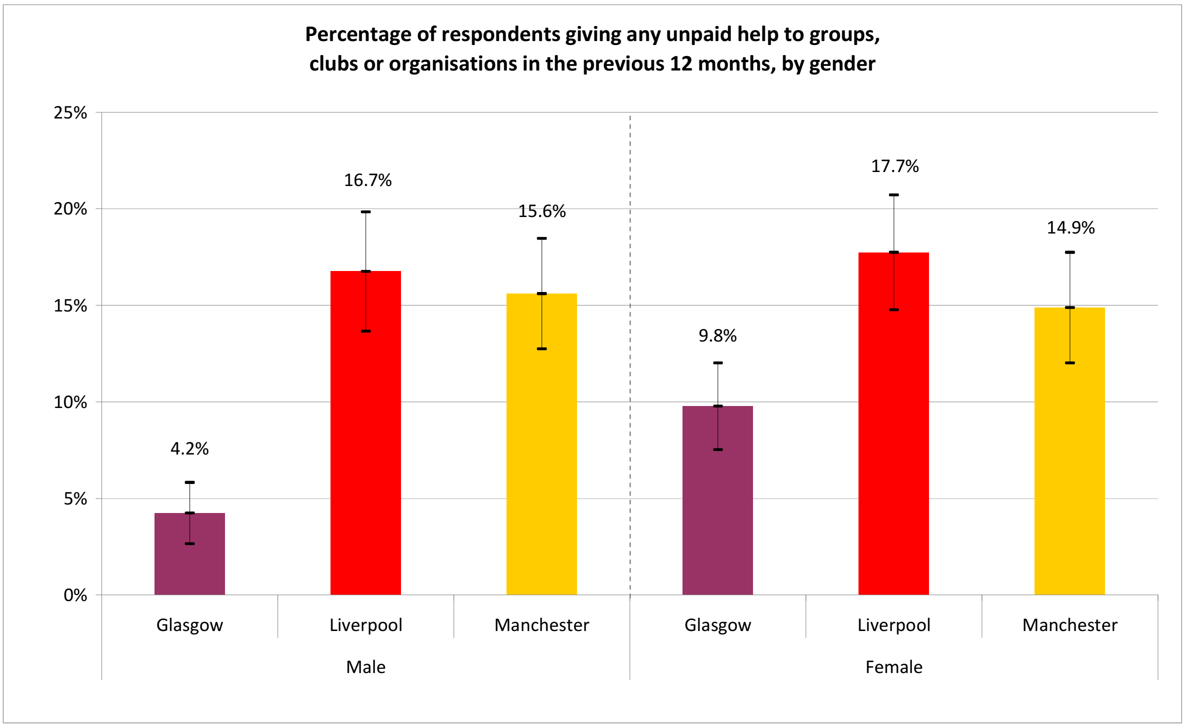
Multivariate logistic regression analysis of the factors associated with having volunteered in last 12 months

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**55.53**	********	
Glasgow†			1.00
Liverpool	47.68	****	2.60 (1.98 to 3.41)
Manchester	43.36	****	2.52 (1.92 to 3.33)
Social grade	**34.80**	********	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	1.56		0.84 (0.63 to 1.11)
C2 (skilled manual)	19.54	****	0.44 (0.30 to 0.63)
D (semi-skilled/ unskilled manual)	9.01	**	0.56 (0.38 to 0.82)
E (on state benefit/ unemployed/ lowest grade workers)	21.29	****	0.37 (0.24 to 0.56)
Deprivation quintile	**18.37**	******	
1 (Most deprived)†			1.00
2	0.14		0.93 (0.63 to 1.37)
3	0.01		1.02 (0.70 to 1.48)
4	2.19		1.31 (0.92 to 1.86)
5 (Least deprived)	8.75	**	1.70 (1.20 to 2.41)
Educational attainment	**25.41**	********	
No qualifications†			1.00
Some qualifications, but not degree level	10.83	***	1.63 (1.22 to 2.18)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	25.31	****	2.49 (1.75 to 3.56)
Longterm limiting illness (LLI)	**14.87**	*******	
None†			1.00
Limited a little	14.02	***	1.86 (1.34 to 2.58)
Limited a lot	4.24	*	1.69 (1.03 to 2.77)
Self-assessed health	**7.43**	*****	
Good/very good†			1.00
Fair	0.31		0.91 (0.67 to 1.25)
Bad/very bad	7.34	**	0.43 (0.24 to 0.79)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable
$R^2 = 0.07$ (Cox & Snell)

This difference in volunteering rates between Glasgow and the English cities is seen for both genders (Figure 7.38), all age groups (Figure 7.39), and most social classes (Figure 7.40). With regard to the latter, it is noteworthy that the greatest relative differences are seen between those of higher, rather than lower, social class. A similar result was obtained from analysis by area deprivation, with the greatest relative differences being between those living in the *least* deprived areas. These differences by social class and area deprivation were quantified by the additional models (described in Chapter 4) which incorporated significant city-social grade and, separately, city-deprivation quintile interaction terms. Tables 7.8 and 7.9 each present odds ratios for the cities derived from these extra models. As Table 7.8 shows, among those of high social class[clxviii], odds ratios of 4.5 were obtained for both Liverpool and Manchester[clxix]. The equivalent odds ratios for those living in the least deprived areas were 6.8 (95% confidence intervals 3.8, 12.2), p<0.0001, and 8.8 (95% confidence intervals 4.9, 15.8), p<0.0001 (Table 7.9).

Figure 7.38



clxviii Defined as social grades A (higher managerial, administrative or professional) and B (intermediate managerial, administrative or professional).

clxix Liverpool: 4.5 (95% confidence intervals 2.4, 8.7), p<0.0001; Manchester: 4.5 (95% confidence intervals 2.4, 8.4), p<0.0001.

Figure 7.39

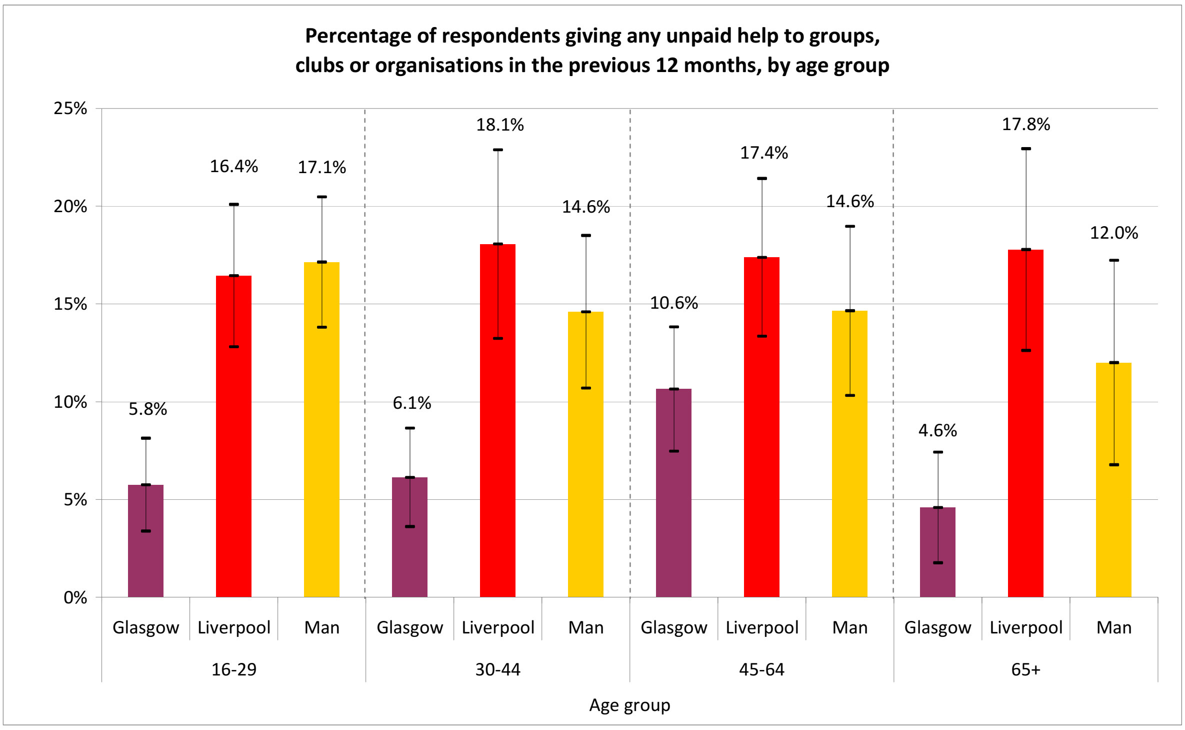


Figure 7.40

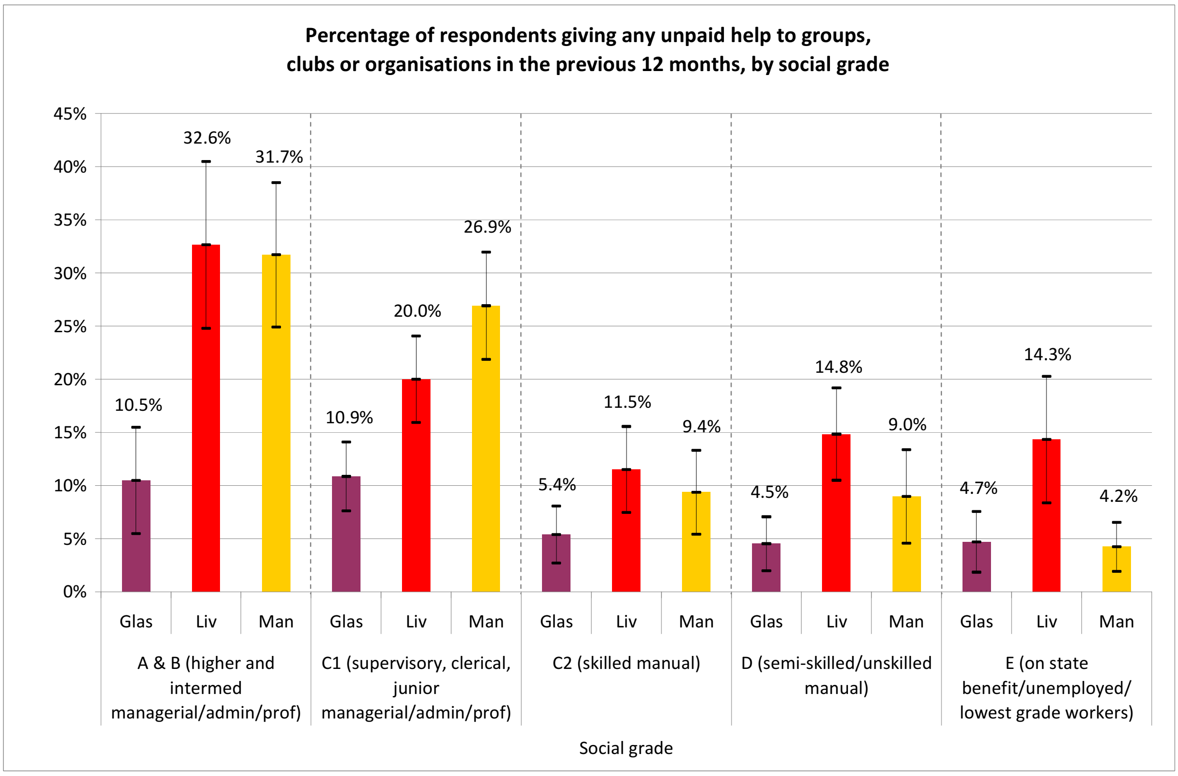


Table 7.8

Multivariate logistic regression analysis of the factors associated with having volunteered in last 12 months: odds ratios for Liverpool & Manchester relative to Glasgow for each social class (from models incorporating city*social class interaction term)

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
Social grade A/B (higher managerial/admin/prof; intermed managerial/admin/prof)	**24.81**	****	
Glasgow†			1.00
Liverpool	20.60	****	4.53 (2.36 to 8.69)
Manchester	21.79	****	4.47 (2.38 to 8.37)
Social grade C1(supervisory, clerical, junior managerial/admin/prof)	**26.18**	****	
Glasgow†			1.00
Liverpool	8.08	**	1.86 (1.21 to 2.86)
Manchester	25.97	****	3.04 (1.98 to 4.67)
Social grade C2 (skilled manual)	**4.69**		
Glasgow†			1.00
Liverpool	4.60	*	2.07 (1.06 to 4.03)
Manchester	2.31		1.73 (0.85 to 3.52)
Social grade D (semi-skilled/ unskilled manual)	**13.08**	**	
Glasgow†			1.00
Liverpool	12.59	***	3.46 (1.74 to 6.88)
Manchester	2.94		2.02 (0.90 to 4.50)
Social grade E (on state benefit/unemployed/lowest grade workers)	**13.46**	**	
Glasgow†			1.00
Liverpool	7.77	**	3.17 (1.41 to 7.13)
Manchester	0.09		0.88 (0.37 to 2.08)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Table 7.9

Multivariate logistic regression analysis of the factors associated with having volunteered in last 12 months: odds ratios for Liverpool & Manchester relative to Glasgow for each deprivation quintile (from models incorporating city*deprivation quintile interaction term)

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
Deprivation quintile 1 (most deprived)	**22.43**	********	
Glasgow†			1.00
Liverpool	10.14	**	2.92 (1.51 to 5.64)
Manchester	2.73		0.44 (0.16 to 1.17)
Deprivation quintile 2	**0.23**		
Glasgow†			1.00
Liverpool	0.19		0.86 (0.44 to 1.68)
Manchester	0.00		1.00 (0.52 to 1.93)
Deprivation quintile 3	**16.55**	*******	
Glasgow†			1.00
Liverpool	15.45	****	4.75 (2.18 to 10.32)
Manchester	13.68	***	4.38 (2.00 to 9.57)
Deprivation quintile 4	**3.41**		
Glasgow†			1.00
Liverpool	0.33		1.16 (0.70 to 1.95)
Manchester	3.12		1.58 (0.95 to 2.61)
Deprivation quintile 5 (least deprived)	**56.26**	********	
Glasgow†			1.00
Liverpool	42.07	****	6.83 (3.82 to 12.20)
Manchester	54.34	****	8.83 (4.95 to 15.77)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Finally, main effects models[clxx] based on the Glasgow-only sample showed that predictive factors in relation to the likelihood of having volunteered were: gender (females were more likely to volunteer than males), social class (those in higher 'social grades' being significantly more likely than those in lower grades), and health status (those in good health being more likely to volunteer than those in poor health) (Appendix VII)[clxxi].

As explained, *religious* social capital is also relevant to the concept of social participation. However, a significant caveat applies to these analyses in that the survey question asked about religious *affiliation* rather than *participation*[clxxii].

[clxx] i.e. as opposed to those shown in Tables 7.8 and 7.9 which are non-main effects models incorporating the city-social grade and city-deprivation quintile interaction terms respectively.
[clxxi] Deprivation quintile was not a significant predictor in the Glasgow-only model. As was the case with the modelling based on the whole sample (the results of which are presented in Table 7.7), individual social class, rather than area deprivation, was a better predictor of differences in likelihood of having volunteered.
[clxxii] The survey used the same wording of the question as that used in the Scottish census: 'What religion, religious denomination or body do you belong to?' (with a list of 12 possible answers provided). However, while the census question in 2012 was voluntary, that was not the case in the three-city survey.

This is an important distinction as the benefits of religious social capital relate to active participation, and not everyone affiliating themselves with a particular religion will attend regular religious services: the notion of religion as a 'badge' rather than necessarily a belief has been highlighted by some authors[658-661]. Nonetheless, in the context of social capital and its links to population health, it is still of potential interest that religious affiliation is significantly lower among the Glasgow sample compared with those in Liverpool and Manchester. Figure 7.41 shows that the percentage of the Glasgow respondents who stated they had no religious affiliation was 46%, compared to 33% in Manchester and 28% in Liverpool. As with volunteering, this difference between the Glasgow and English samples was seen in analyses by age (where a clear gradient was visible across all three cities, but with the percentage of respondents with no affiliation in Glasgow higher in every group), gender, area deprivation and social class (Figures 7.42-7.45).

Figure 7.41

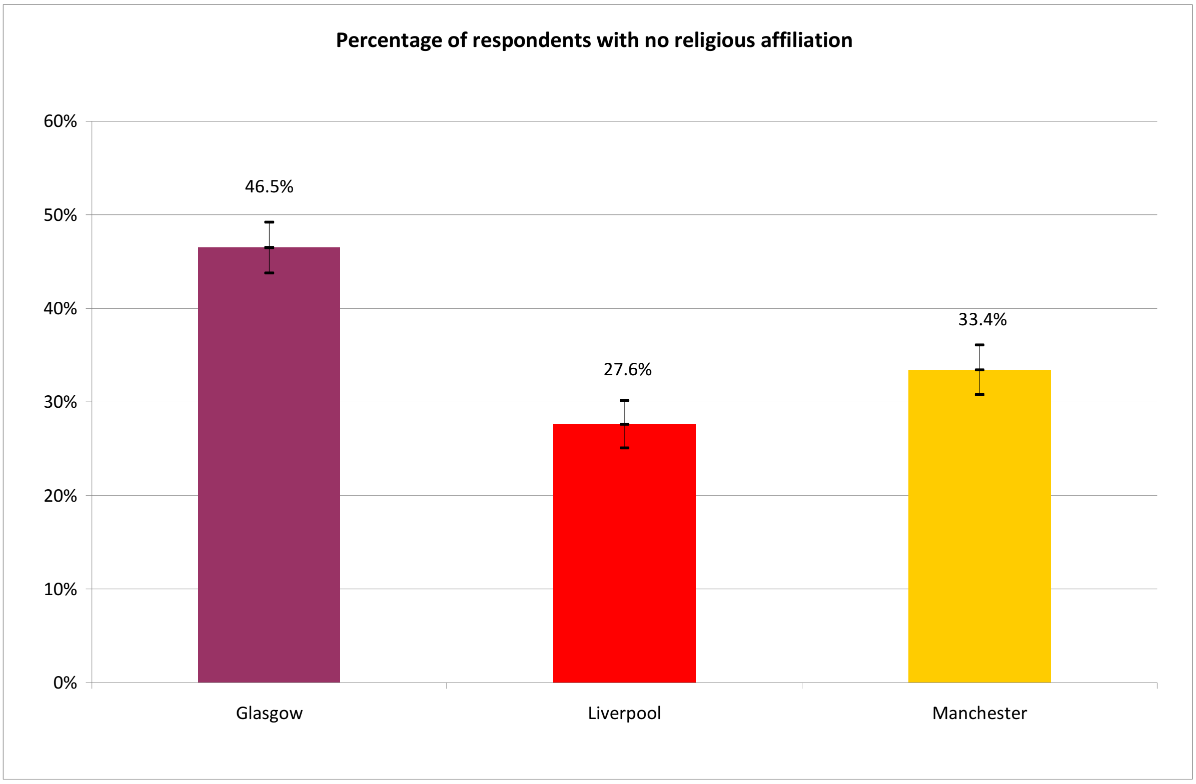


Figure 7.42

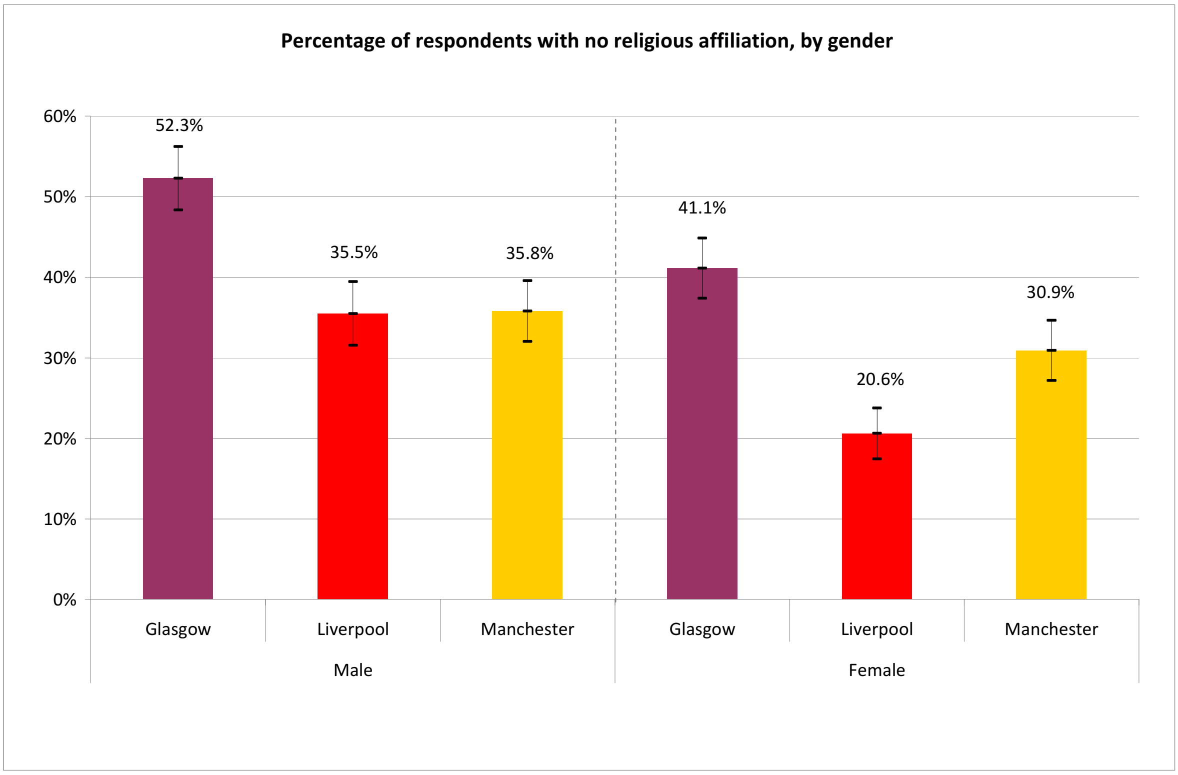


Figure 7.43

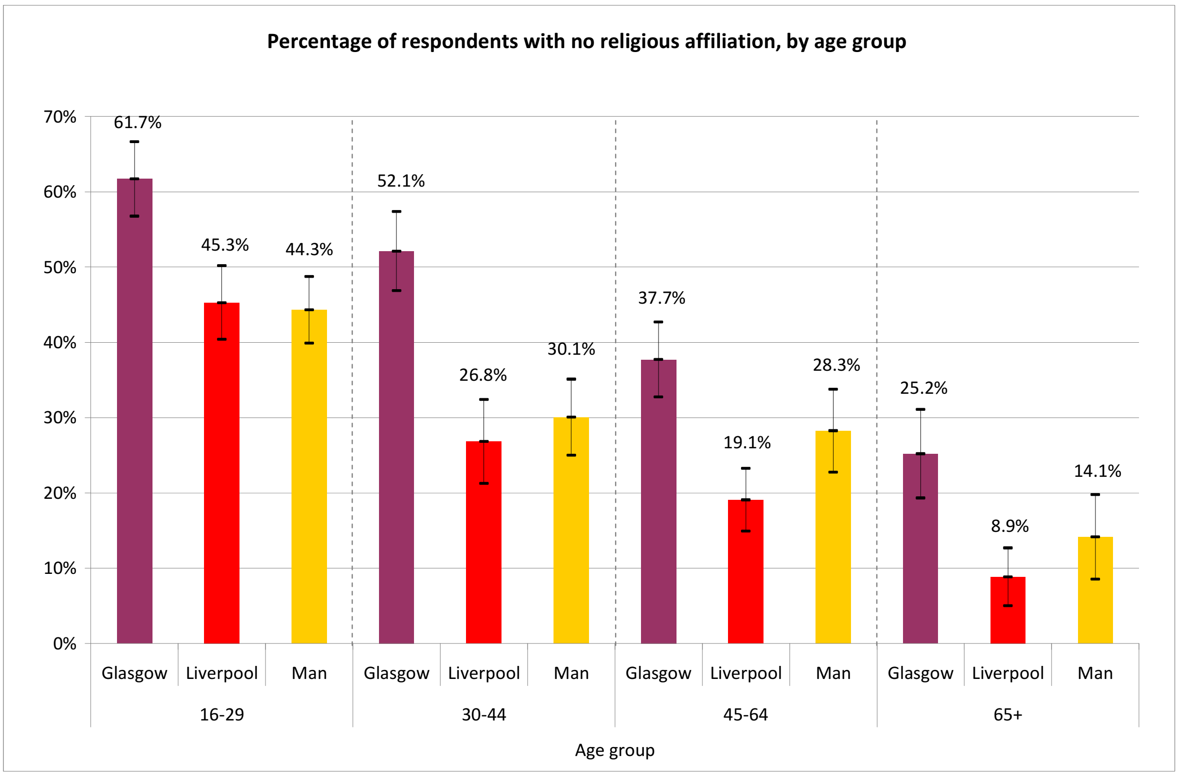


Figure 7.44

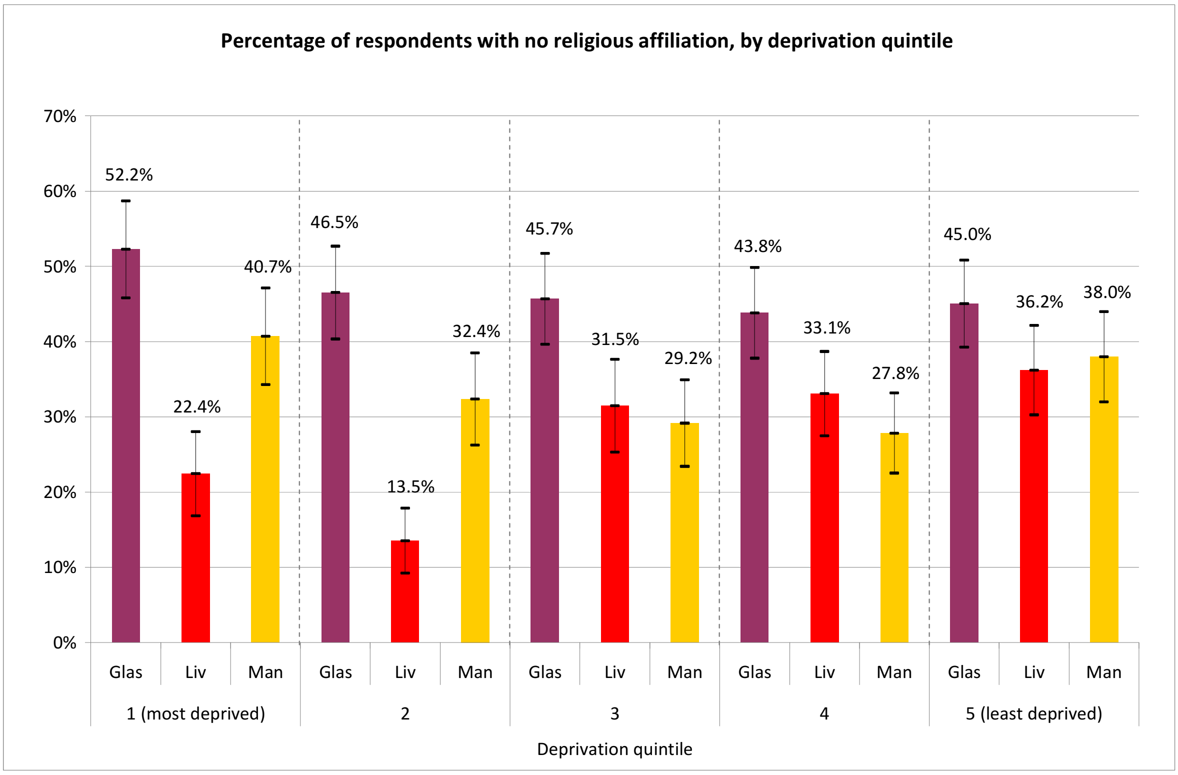
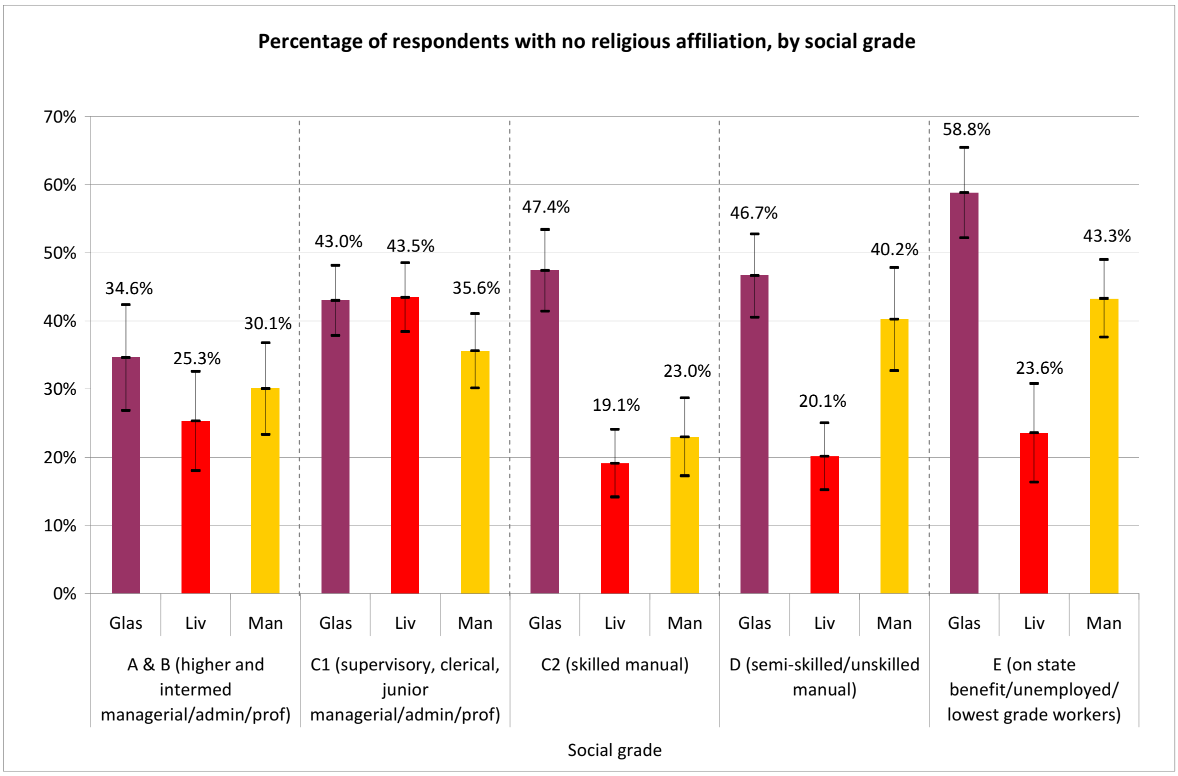


Figure 7.45



The statistical modelling analysis confirms that after adjustment for other factors in the model, people in Liverpool and Manchester were 62% and 40% respectively less likely to state they had no religious affiliation (odds ratio for Liverpool: 0.38 (95% confidence intervals 0.31, 0.46), p<0.0001; odds ratio for Manchester: 0.60 (95% confidence intervals 0.5, 0.72), p<0.0001). Other significant variables were gender, age, ethnicity, different measures of socio-economic status (social class, educational attainment, employment status) and marital status. These results are shown in Table 7.10.

Table 7.10

Multivariate logistic regression analysis of the factors associated with reporting no religious affiliation

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**104.20**	********	
Glasgow†			1.00
Liverpool	102.88	****	0.38 (0.31 to 0.46)
Manchester	28.28	****	0.60 (0.5 to 0.72)
Gender	**50.20**	********	
Male†			1.00
Female	50.20	****	0.56 (0.48 to 0.66)
Age group	**39.25**	********	
16-29†			1.00
30-44	12.92	***	0.66 (0.53 to 0.83)
45-64	33.94	****	0.46 (0.36 to 0.6)
65+	23.41	****	0.32 (0.21 to 0.51)
Ethnicity	**133.86**	********	
Not a member of ethnic minority group†			1.00
Member of ethnic minority group	133.86	****	0.19 (0.15 to 0.25)
Social grade	**15.23**	******	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	6.49	*	1.43 (1.09 to 1.88)
C2 (skilled manual)	1.42		1.20 (0.89 to 1.62)
D (semi-skilled/ unskilled manual)	7.04	**	1.52 (1.12 to 2.08)
E (on state benefit/ unemployed/ lowest grade workers)	11.27	***	1.83 (1.28 to 2.60)
Educational attainment	**35.21**	********	
No qualifications†			1.00
Some qualifications, but not degree level	5.04	*	0.79 (0.65 to 0.97)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	9.43	**	1.58 (1.18 to 2.12)
Employment status	**16.56**	******	
Employed (PT/FT)†			1.00
Unemployed	0.99		1.15 (0.87 to 1.53)
Ill/disabled	0.14		0.94 (0.67 to 1.32)
Retired	5.28	*	0.65 (0.45 to 0.94)
Looking after home/family	0.09		0.95 (0.69 to 1.31)
In education/training (PT/FT)	9.06	**	1.52 (1.16 to 2.00)
Marital status	**18.34**	*******	
Never married†			1.00
Married/civil partnership	16.96	****	0.65 (0.53 to 0.80)
Separated/divorced	0.41		0.91 (0.67 to 1.22)
Widowed/surviving partner	1.08		0.79 (0.51 to 1.23)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable
R^2 = 0.17 (Cox & Snell)

The differences between social classes shown in Figure 7.45 were quantified by the additional models incorporating the city-social class interaction term[clxxiii]. These confirmed that the greatest differences were between those in the lowest

[clxxiii] Note that social class, rather than area deprivation, was used. Although similar differences are seen between the cities (as shown in Figures 7.44 and 7.45), social class, not area deprivation, was significant in the final logistic regression model.

social class (social grade E), and also among those of social grade C2 (skilled manual workers)[clxxiv], as Figure 7.45 also shows.

Among the Glasgow-only sample, the characteristics of the sample that were significantly associated with likelihood of having no religious affiliation were similar to those seen in the model based on all three samples i.e. age, gender, social class, ethnicity and marital status (Appendix VII).

7.5.2.5 Reciprocity and trust

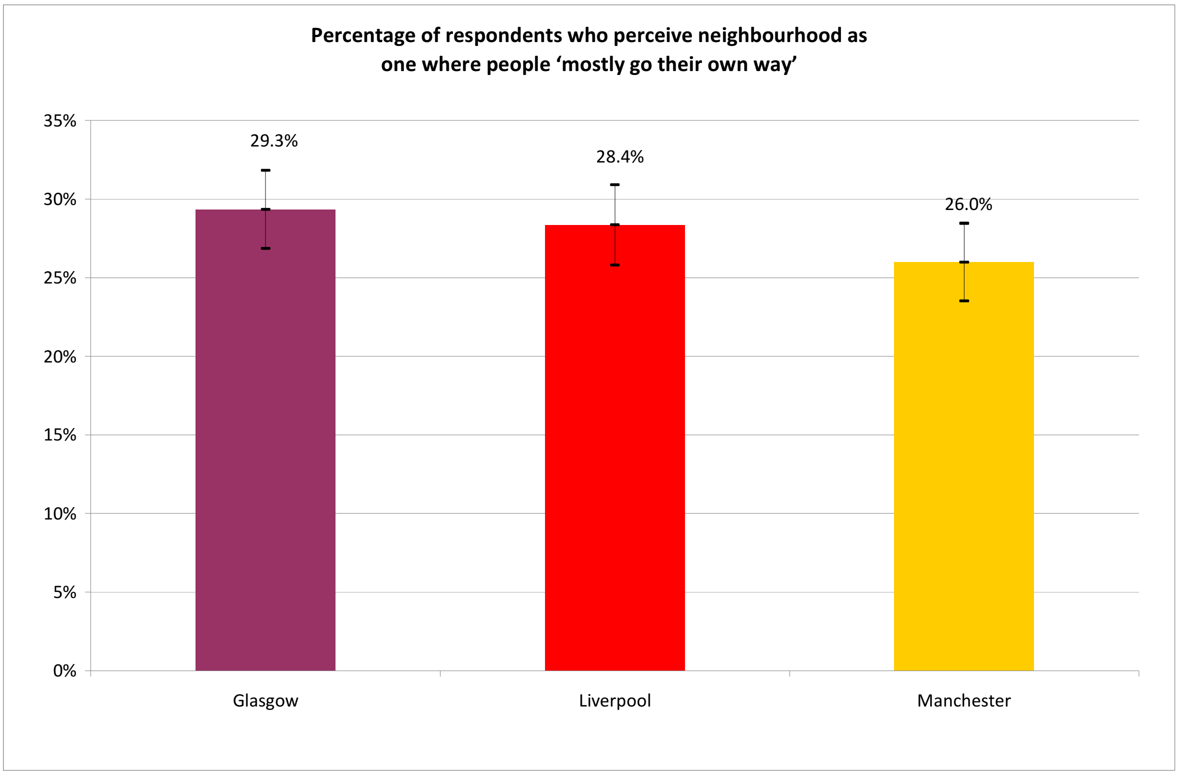
The fifth and final component, described in this section, concerns the notions of reciprocity and trust, using a number of different survey questions.

In relation to reciprocity – but also relevant to the more general heading of *views on the local area* – respondents were asked to describe their neighbourhood in terms of whether it was a place where ‘people do things together and try to help each other’ or instead whether it was one in which ‘people mostly go their own way’. There were no significant differences between the cities in terms of the numbers of respondents selecting the latter category, with between 26% and 29% believing this to be the case (Figure 7.46), and this is confirmed by the statistical modelling analyses (see Appendix VI). However, a significantly higher percentage of the Liverpool (30%) sample believed their neighbourhood to be one with high levels of reciprocity (i.e. where ‘people do things together and try to help each other’) compared with the Glasgow sample (22%), which in turn was significantly higher than the figure for Manchester (16%) (Figure 7.47). These differences between the cities were again confirmed by the statistical models: as Table 7.11 shows, compared with those in Glasgow, and adjusting for the various characteristics of the samples, those in Liverpool were 56% *more* likely to assess their neighbourhood in these terms, while Manchester respondents were 31% *less* likely to do so - odds ratios for Liverpool: 1.56 (95% confidence intervals 1.29, 1.88), $p<0.0001$; for Manchester: 0.69 (95% confidence intervals 0.56, 0.86), $p<0.01$. This perception varied by age and gender (older and female respondents were more likely than younger and male respondents to describe their neighbourhood in terms of this

[clxxiv] Social grade E (on state benefits/unemployed/lowest grade workers): Liverpool 0.17 (95% confidence intervals 0.10, 0.29), $p<0.0001$; Manchester 0.58 (95% confidence intervals 0.39, 0.86), $p<0.01$; social grade C1 (skilled manual workers): Liverpool 0.25 (95% confidence intervals 0.17, 0.39), $p<0.0001$; Manchester 0.35 (95% confidence intervals 0.23, 0.55), $p<0.0001$.

measure of reciprocity), with the modelling analyses showing that this positive view was also shared by those living in the less, rather than more, deprived areas[clxxv], those who were a member of a minority ethnic group and those who were likely to have lived in their city for a long time.

Figure 7.46



[clxxv] This was particularly true of the Liverpool and Manchester samples, but less so of those in Glasgow, where no clear gradient was evident. Furthermore, the additional model incorporating the city-deprivation quintile interaction (with the aim of quantifying the differences between the cities across the social spectrum) showed no clear pattern across the quintiles. The greatest difference between Glasgow and Liverpool was between those living in quintile 2: odds ratio for Liverpool compared to the reference category of Glasgow being 2.7 (95% confidence intervals 1.8, 4.2), $p<0.0001$ (data not shown).

Figure 7.47

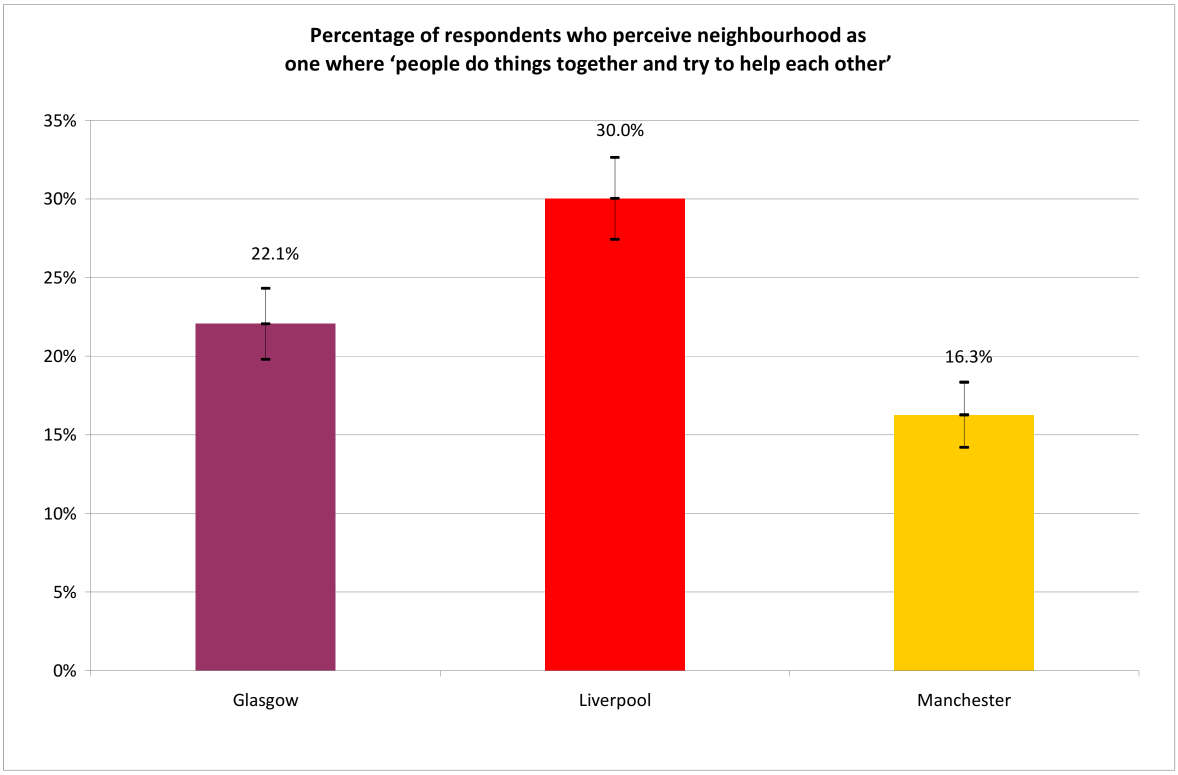

Percentage of respondents who perceive neighbourhood as one where 'people do things together and try to help each other'
35%
30%
25%
20%
15%
10%
5%
0%
22.1%
30.0%
16.3%
Glasgow
Liverpool
Manchester

Table 7.11

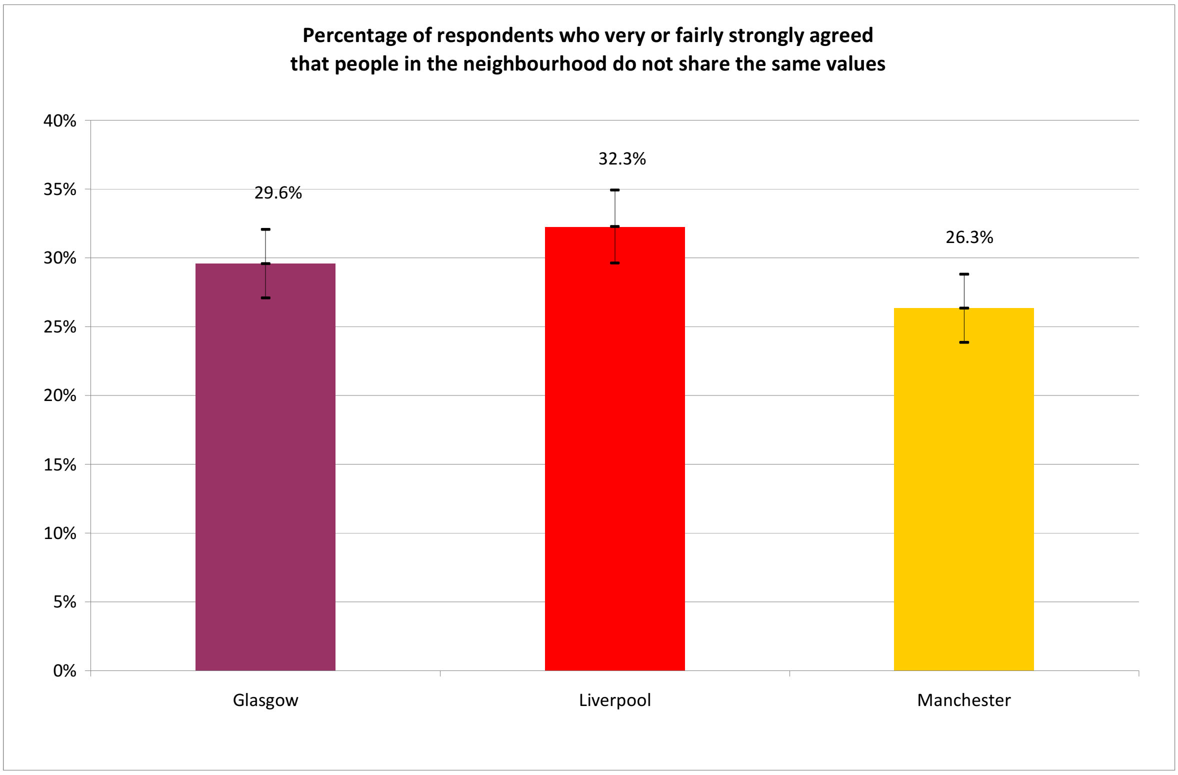
Multivariate logistic regression analysis of the factors associated with likelihood of perceiving the neighbourhood as one where 'people do things together and try to help each other'

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**53.73**	********	
Glasgow†			1.00
Liverpool	20.99	****	1.56 (1.29 to 1.88)
Manchester	10.59	**	0.69 (0.56 to 0.86)
Gender	**10.03**	******	
Male†			1.00
Female	10.03	**	1.32 (1.11 to 1.56)
Ethnicity	**32.94**	********	
Not a member of ethnic minority group†			1.00
Member of ethnic minority group	32.94	****	2.13 (1.65 to 2.76)
Deprivation quintile	**16.28**	******	
1 (Most deprived)†			1.00
2	3.20		1.29 (0.98 to 1.70)
3	4.78	*	1.37 (1.03 to 1.81)
4	8.11	**	1.50 (1.13 to 1.97)
5 (Least deprived)	15.38	****	1.75 (1.32 to 2.32)
Social grade	**12.97**	*****	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	1.29		0.85 (0.65 to 1.12)
C2 (skilled manual)	0.05		0.97 (0.73 to 1.29)
D (semi-skilled/ unskilled manual)	0.63		1.12 (0.84 to 1.50)
E (on state benefit/ unemployed/ lowest grade workers)	5.32	*	0.66 (0.46 to 0.94)
Employment status	**47.50**	********	
Employed (PT/FT)†			1.00
Unemployed	1.75		0.80 (0.58 to 1.11)
Ill/disabled	0.58		1.15 (0.80 to 1.65)
Retired	4.51	*	1.28 (1.02 to 1.61)
Looking after home/family	1.70		0.81 (0.59 to 1.11)
In education/training (PT/FT)	35.80	****	0.36 (0.26 to 0.50)
Length of residence	**8.56**	******	
Time in city not known†			1.00
Possibly long-term resident	8.56	**	1.33 (1.10 to 1.62)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable
R^2 = 0.06 (Cox & Snell)

Participants were also asked to what extent they agreed with the statement that people in their neighbourhood ‘do not share the same values’. As Figure 7.48 shows, a minority of respondents in each city thought this to be the case: 26%-32% of the three samples agreed ‘very’ or ‘fairly strongly’ with this statement, and the statistical modelling confirmed that there were no significant differences between the cities in this regard (Appendix VI).

Figure 7.48



Reciprocity was also assessed by a question which asked how likely it would be that a lost wallet or purse (containing the owner's address details) would be returned intact. As Figure 7.49 shows, the percentage of respondents believing that this would be a 'very likely' or 'quite likely' outcome was significantly lower in Glasgow (27%) compared with Liverpool (40%), although similar to the figure for Manchester (29%). Similar patterns were seen in the analyses by gender, age, and area type, with gradients evident in the latter two analyses (i.e. the numbers agreeing increasing with age, and higher in less deprived compared with more deprived areas) (data not shown). The modelling analyses confirmed that, adjusting for all other factors in the model, respondents in Liverpool were 73% more likely to agree than respondents in Glasgow that a lost wallet/purse would be returned intact (with no significant differences between Glasgow and Manchester participants) (Table 7.12).

Figure 7.49

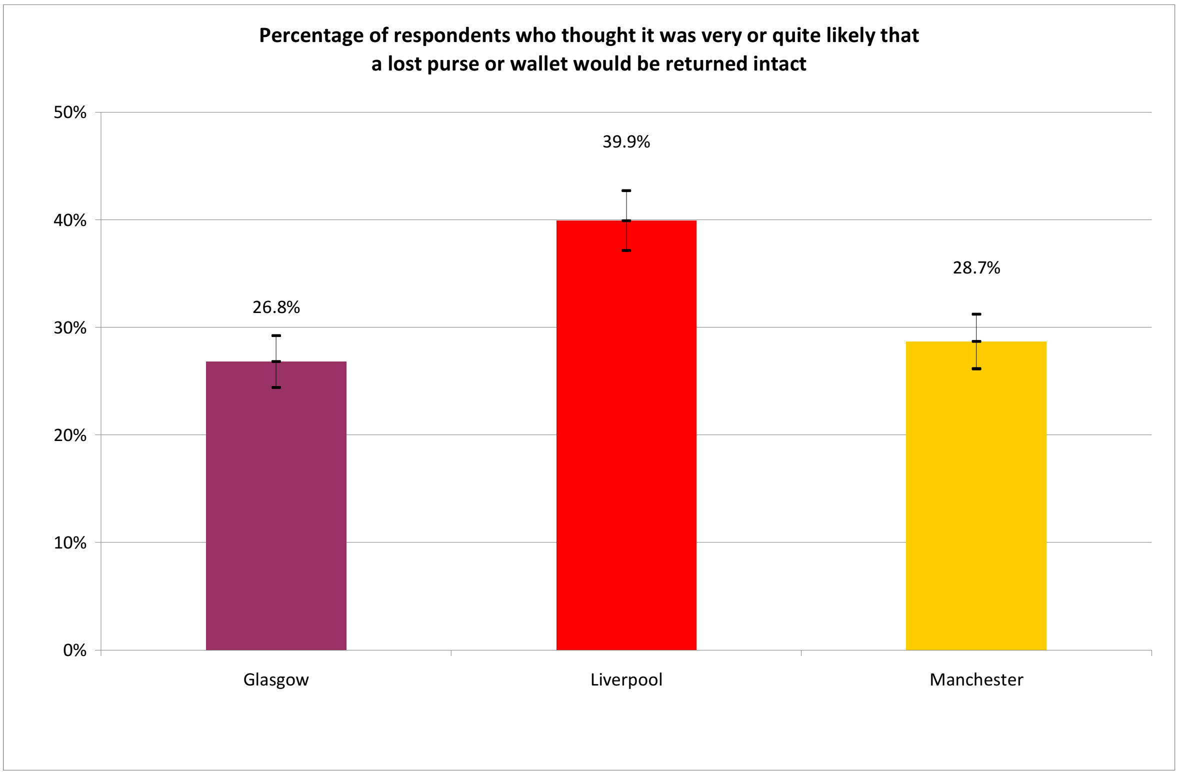

Percentage of respondents who thought it was very or quite likely that a lost purse or wallet would be returned intact
50%
40%
30%
20%
10%
0%
26.8%
39.9%
28.7%
Glasgow
Liverpool
Manchester

Table 7.12

Multivariate logistic regression analysis of the factors associated with the likelihood of reporting that it was very or quite likely that a lost wallet/purse would be returned intact

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**37.77**	********	
Glasgow†			1.00
Liverpool	35.75	****	1.73 (1.44 to 2.07)
Manchester	3.07		1.18 (0.98 to 1.43)
Gender	**5.36**	*****	
Male†			1.00
Female	5.36	*	1.19 (1.03 to 1.39)
Age group	**14.04**	******	
16-29†			1.00
30-44	3.46		0.80 (0.64 to 1.01)
45-64	1.65		1.20 (0.91 to 1.60)
65+	1.62		1.25 (0.89 to 1.76)
Social grade	**29.81**	********	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	14.50	***	0.63 (0.5 to 0.80)
C2 (skilled manual)	20.19	****	0.55 (0.42 to 0.71)
D (semi-skilled/ unskilled manual)	6.81	**	0.70 (0.54 to 0.92)
E (on state benefit/ unemployed/ lowest grade workers)	22.83	****	0.50 (0.37 to 0.66)
Deprivation quintile	**47.74**	********	
1 (Most deprived)†			1.00
2	0.34		1.08 (0.83 to 1.40)
3	2.35		1.22 (0.95 to 1.57)
4	14.92	***	1.63 (1.27 to 2.08)
5 (Least deprived)	32.77	****	2.09 (1.62 to 2.68)
Marital status	**13.92**	******	
Never married†			1.00
Married/civil partnership	4.24	*	1.23 (1.01 to 1.51)
Separated/divorced	3.01		0.76 (0.56 to 1.04)
Widowed/surviving partner	0.09		0.94 (0.64 to 1.38)
Longterm limiting illness (LLI)	**11.76**	******	
None†			1.00
Limited a little	0.62		1.11 (0.86 to 1.43)
Limited a lot	11.60	***	1.82 (1.29 to 2.56)
Self-assessed health	**7.80**	*****	
Good/very good†			1.00
Fair	5.51	*	0.76 (0.60 to 0.96)
Bad/very bad	5.16	*	0.65 (0.45 to 0.94)
Length of residence	**6.57**	*****	
Time in city not known†			1.00
Possibly long-term resident	6.57	*	1.31 (1.07 to 1.62)

Notes
1. Significance level: * = $p<0.05$; ** = $p<0.01$; *** = $p<0.001$; **** = $p<0.0001$
† - reference category of variable
$R^2 = 0.07$ (Cox & Snell)

Additional models were run incorporating the significant city-deprivation quintile interaction (as described in Chapter 4). This showed that the greatest difference in perception that a lost wallet/purse would be returned intact between

Glasgow and both English cities was among people living in the *least* deprived areas with odds ratios of 2.10 (95% confidence intervals 1.44, 2.96), $p<0.0001$ (Liverpool) and 2.00 (95% confidence intervals 1.38, 2.88), $p<0.0001$ (Manchester).

Respondents were also asked about whether they ever exchanged ‘small favours’ (such as leaving a key to let in a repair man, feeding pets or picking up items from a local shop) with those who lived near them. As with the question on the return of a lost wallet or purse, reciprocity in these terms was lower in Glasgow compared with Liverpool, but not compared with Manchester. As Figure 7.50 shows, 47% of respondents in Glasgow said they exchanged such favours with neighbours compared with 64% in Liverpool and 42% in Manchester (with a similar pattern seen across social classes and area deprivation (data not shown[clxxvi])). In addition, Figure 7.51 shows that among those who reported exchanging favours, the average number of people with whom they did so was, on average, higher in Liverpool (mean = 2.9) than in Glasgow (2.3) and Manchester (2.1).

[clxxvi] Additional models were run incorporating the significant city-social class interaction term (social class, rather than area deprivation, was significant in the final main effects model shown in Table 7.13). This showed that the likelihood of reporting the exchange of favours was significantly higher among the Liverpool sample compared to those in Glasgow in 4 out of 5 social classes, with the highest odds ratio in comparison of those of social class D (semi and unskilled manual workers) (data not shown).

Figure 7.50

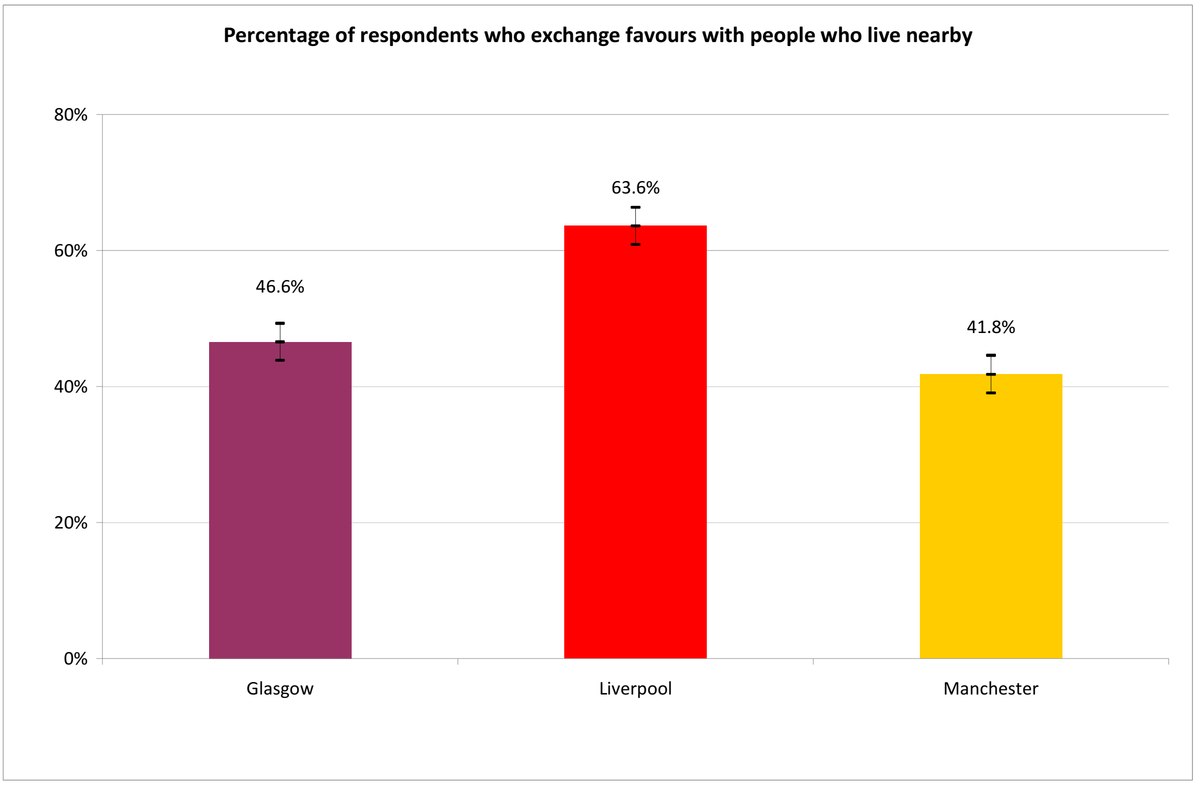
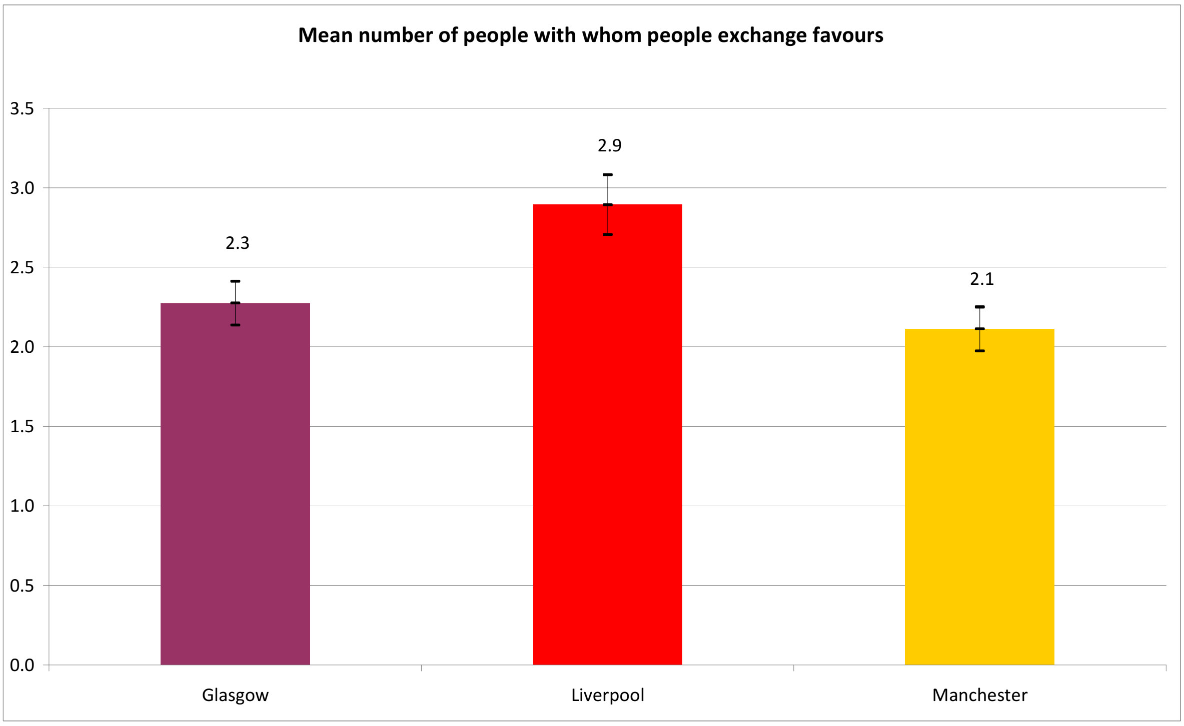


Figure 7.51



The multivariate logistic regression analysis confirmed, after adjustment for other factors in the model, the significant difference between respondents in

Glasgow and those in Liverpool (but not those in Manchester) in terms of the likelihood of reporting that they exchange such favours with people who live nearby: as shown in Table 7.13, the odds ratio for people resident in Liverpool compared to the reference category of residence in Glasgow was 2.10 (95% confidence intervals 1.76, 2.50), p<0.0001. Other significant predictor variables included social grade, educational attainment, gender and length of residence.

Table 7.13

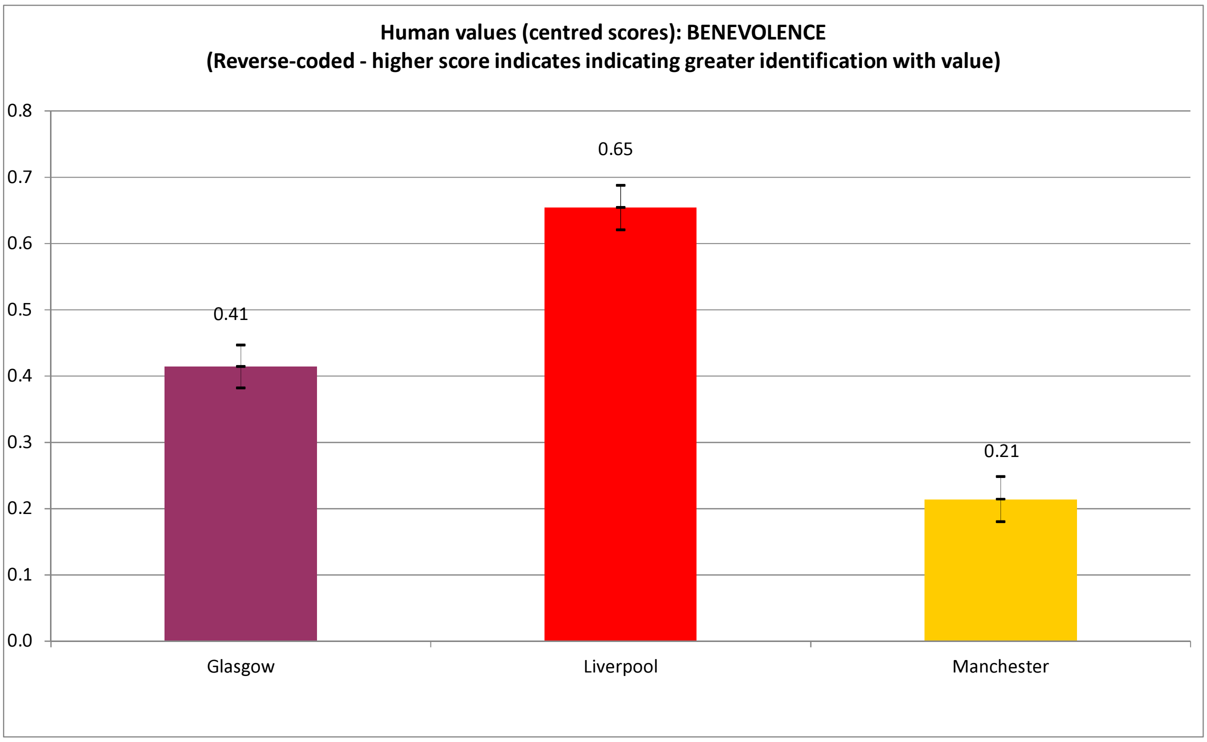
Multivariate logistic regression analysis of the factors associated with likelihood of reporting exchanging favours with people who live nearby

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**83.18**	********	
Glasgow†			1.00
Liverpool	69.18	****	2.10 (1.76 to 2.50)
Manchester	0.22		1.04 (0.88 to 1.24)
Gender	**9.49**	******	
Male†			1.00
Female	9.49	**	1.26 (1.09 to 1.47)
Age group	**8.52**	*****	
16-29†			1.00
30-44	4.93	*	1.27 (1.03 to 1.57)
45-64	0.01		0.98 (0.76 to 1.28)
65+	0.61		1.17 (0.78 to 1.76)
Social grade	**26.97**	********	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	0.86		0.89 (0.69 to 1.14)
C2 (skilled manual)	3.79		0.77 (0.58 to 1.00)
D (semi-skilled/ unskilled manual)	0.38		0.92 (0.69 to 1.21)
E (on state benefit/ unemployed/ lowest grade workers)	19.06	****	0.49 (0.36 to 0.67)
Educational attainment	**7.40**	*****	
No qualifications†			1.00
Some qualifications, but not degree level	1.98		1.14 (0.95 to 1.38)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	7.34	**	1.46 (1.11 to 1.93)
Employment status	**29.25**	********	
Employed (PT/FT)†			1.00
Unemployed	5.35	*	0.72 (0.55 to 0.95)
Ill/disabled	0.06		1.05 (0.72 to 1.52)
Retired	1.24		1.20 (0.87 to 1.67)
Looking after home/family	0.00		1.00 (0.75 to 1.32)
In education/training (PT/FT)	22.46	****	0.53 (0.41 to 0.69)
Longterm limiting illness (LLI)	**6.72**	*****	
None†			1.00
Limited a little	5.57	*	1.36 (1.05 to 1.75)
Limited a lot	3.48		1.39 (0.98 to 1.96)
Self-assessed health	**7.83**	*****	
Good/very good†			1.00
Fair	5.38	*	0.77 (0.62 to 0.96)
Bad/very bad	5.46	*	0.65 (0.45 to 0.93)
Length of residence	**55.43**	********	
Time in city not known†			1.00
Possibly long-term resident	55.43	****	2.12 (1.74 to 2.58)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable
R^2 = 0.12 (Cox & Snell)

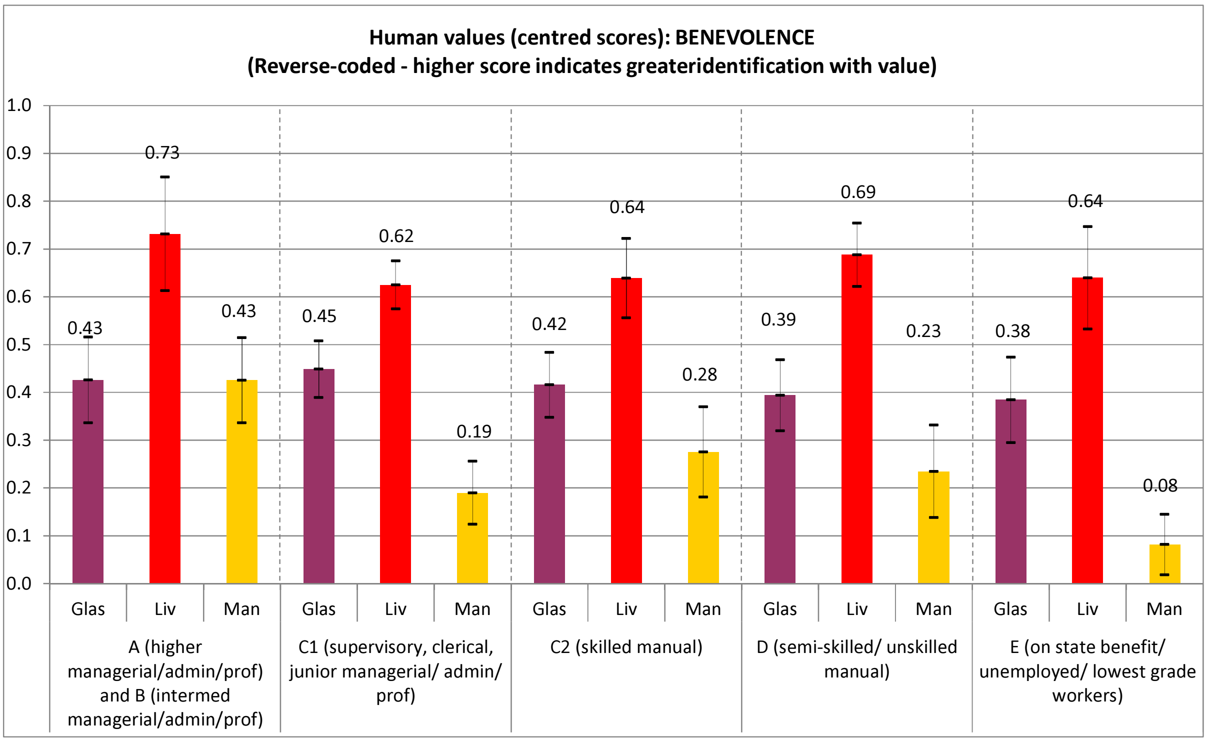
Aspects of reciprocity are included within the ‘benevolence’ value of Schwartz’s Human Values Scale described in Chapter 4. In this context, benevolence is based on two statements, in relation to which respondents are asked to rate the extent to which they are similar to the person described. The statements (using here the male version of the question[clxxvii]) are: *It is important to him to be loyal to his friends. He wants to devote himself to people close to him*; and *It's very important to him to help the people around him. He wants to care for their wellbeing*. Figure 7.52 shows that, as defined in these terms (and echoing the results from some of the other reciprocity-related measures), benevolence among the Glasgow sample was significantly lower than among those in Liverpool, but higher than among those in Manchester[clxxviii]. This difference was also apparent in comparisons of sub-groups of the samples, for example age, gender and – as shown in Figure 7.53 – social class[clxxix].

Figure 7.52



[clxxvii] For simplicity, the 'male' versions of the statements are shown here. Female respondents were obviously presented with a female version of the statements.
[clxxviii] Note that in Figure 7.52, as in all the analyses of Human Values Scale scores, the scores were adjusted to allow for scale use differences by individuals and groups, and were also reverse-coded to aid interpretation (see Chapter 4 for details).
[clxxix] Additional modelling including the significant city-social grade interaction term confirmed that the differences between Glasgow and Liverpool were fairly similar across all social classes, although slightly higher in comparisons of social grade A & B, and D, as Figure 7.53 also suggests.

Figure 7.53



As Table 7.14 shows, these city differences were confirmed by the modelling analyses, which also showed that the factors that significantly predicted differences in the benevolence score included: gender (higher among females), age (benevolence rising in line with increasing age), educational attainment (higher among those with degree level qualifications), social class (lower among those classed as 'unemployed, on state benefits or lowest grade workers'), and employment status (higher scores being associated with those who were sick or disabled). Among the Glasgow-only sample, however, only age and long-term limiting illness (LLI) were significant predictors, with older age groups and those with an illness that limited their daily activities 'a lot' being associated with a higher average benevolence score than the youngest age group and those with no LLI respectively (Appendix VII).

Table 7.14

Multivariate linear regression analysis of the factors associated with: Benevolence (centred score) (Human Values Scale)

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
City				
Glasgow†	0.24			
Liverpool	0.46	0.22 (0.17 to 0.27)	9.29	****
Manchester	0.07	-0.17 (-0.22 to -0.12)	-7.12	****
Gender				
Male†	0.24			
Female	0.34	0.10 (0.06 to 0.14)	4.82	****
Social grade				
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†	0.24			
C1(Supervisory, clerical, junior managerial/admin/prof)	0.21	-0.03 (-0.09 to 0.03)	-0.86	
C2 (Skilled manual)	0.23	0.00 (-0.07 to 0.06)	-0.13	
D (Semi-skilled/unskilled manual)	0.24	0.00 (-0.07 to 0.07)	0.06	
E (On state benefit/unemployed/lowest grade workers)	0.14	-0.09 (-0.17 to -0.01)	-2.28	*
Educational attainment				
No qualifications†	0.24			
Some qualifications, but not degree level	0.29	0.05 (0.00 to 0.10)	1.92	
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	0.41	0.18 (0.10 to 0.25)	4.83	****
Employment status				
Employed (PT & FT)†	0.24			
Unemployed	0.22	-0.02 (-0.09 to 0.06)	-0.43	
Ill/disabled	0.35	0.11 (0.01 to 0.21)	2.25	*
Retired	0.25	0.01 (-0.07 to 0.10)	0.25	
Looking after home/family	0.29	0.05 (-0.02 to 0.13)	1.39	
In education/training (PT/FT)	0.22	-0.02 (-0.09 to 0.05)	-0.48	
Marital status				
Never married†	0.24			
Married/civil partnership	0.19	-0.05 (-0.10 to 0.00)	-1.79	
Separated/divorced	0.15	-0.09 (-0.17 to -0.01)	-2.30	*
Widowed/surviving partner	0.14	-0.10 (-0.20 to -0.01)	-2.07	*
Longterm limiting illness (LLI)				
No LLI†	0.24			
Limited a little	0.31	0.07 (0.01 to 0.13)	2.18	*
Limited a lot	0.32	0.09 (0.01 to 0.16)	2.18	*
Age group				
16-29†	0.24			
30-44	0.31	0.08 (0.02 to 0.13)	2.55	*
45-64	0.43	0.19 (0.12 to 0.25)	5.61	****
65+	0.46	0.23 (0.12 to 0.33)	4.29	****

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

R^2 = 0.12; Adjusted R^2 = 0.12

There is an overlap between Schwartz's value of *benevolence* and his value of *universalism.* This has been highlighted by some commentators, who have suggested they may be part of the same, wider, construct[662]. Universalism can be seen as the opposite of individualism[clxxx], and the data presented above showing lower levels of volunteering in Glasgow (compared with both English cities), and less benevolence (compared with Liverpool) suggest Glaswegians may be more individualistic. If so, it would be of potential relevance: it has been argued that in today's society individualism impacts negatively on levels of social connectedness and support, 'impacting on everything from citizenship and social trust, cohesion and engagement, to the intimacy of friendships and the quality of family life'[663].

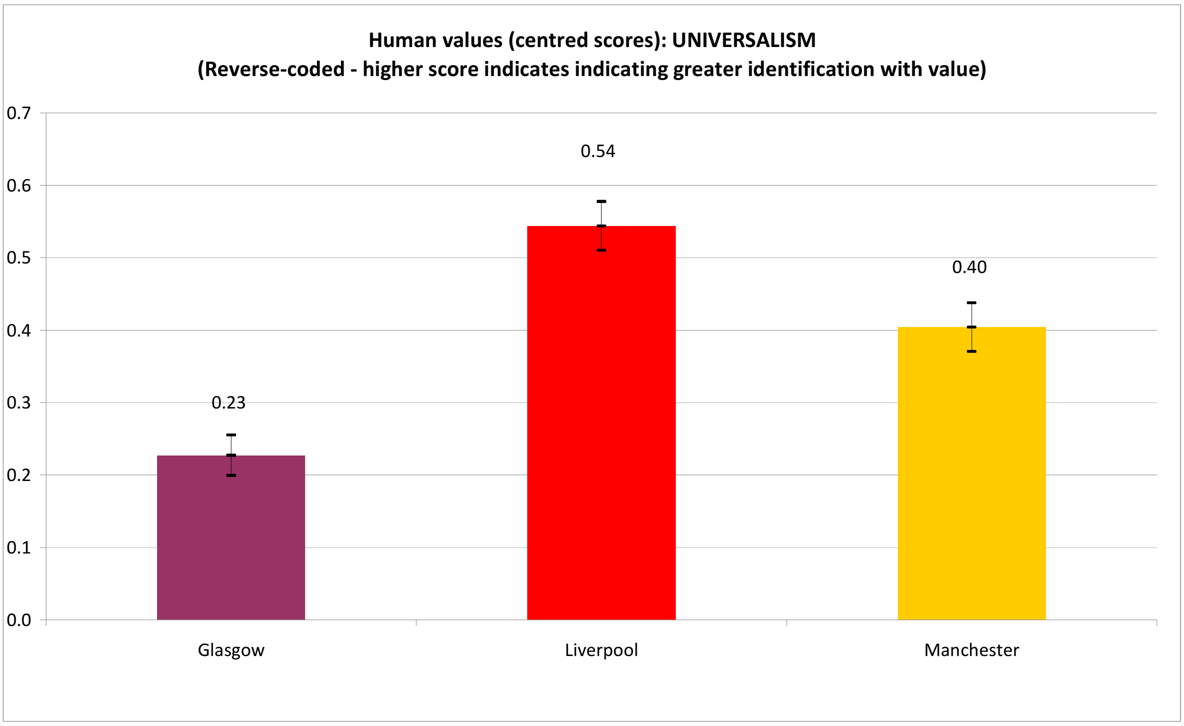
The *universalism* value of Schwartz's scale is derived from three statements, with respondents assessing the extent to which they identify with this type of person (again, using here the male version of the statements): 1) *He thinks it is important that every person in the world should be treated equally. He believes everyone should have equal opportunities in life*; 2) *It is important to him to listen to people who are different from him. Even when he disagrees with them, he still wants to understand them*; and 3) *He strongly believes that people should care for nature. Looking after the environment is important to him.*

Figure 7.54 shows that universalism, as defined by Schwartz's concept, is significantly less associated with respondents in Glasgow than those in the other two cities, suggesting that individualism may be more prevalent among the Glasgow sample. This is confirmed by the statistical modelling analyses (Table 7.15), which also show significant associations between universalism and: age (analysis by age is also presented in Figure 7.55 below), gender (more associated with females) and education (more associated with those with educational qualifications compared with those without). Although social class and the majority of deprivation quintiles were not significant in the final model (the variation in the outcome being better explained by the educational attainment variable in that particular model), analyses presented in Figure 7.56 show that the difference between Glasgow and the English cities was still evident in the

[clxxx] Individualism was another topic included in the survey under the heading of 'different individual values': however, it is clearly relevant to, and overlaps with, the social capital construct of reciprocity.

majority of social classes (all social classes in the case of the comparison with Liverpool)[clxxxi].

Figure 7.54



[clxxxi] In the additional modelling undertaken to quantify differences between social classes/deprivation quintiles, the city-social grade interaction term was not significant. However, the city-deprivation quintile term *was* significant, and confirmed that there were similar differences between the cities across the quintiles (data not shown).

Figure 7.55

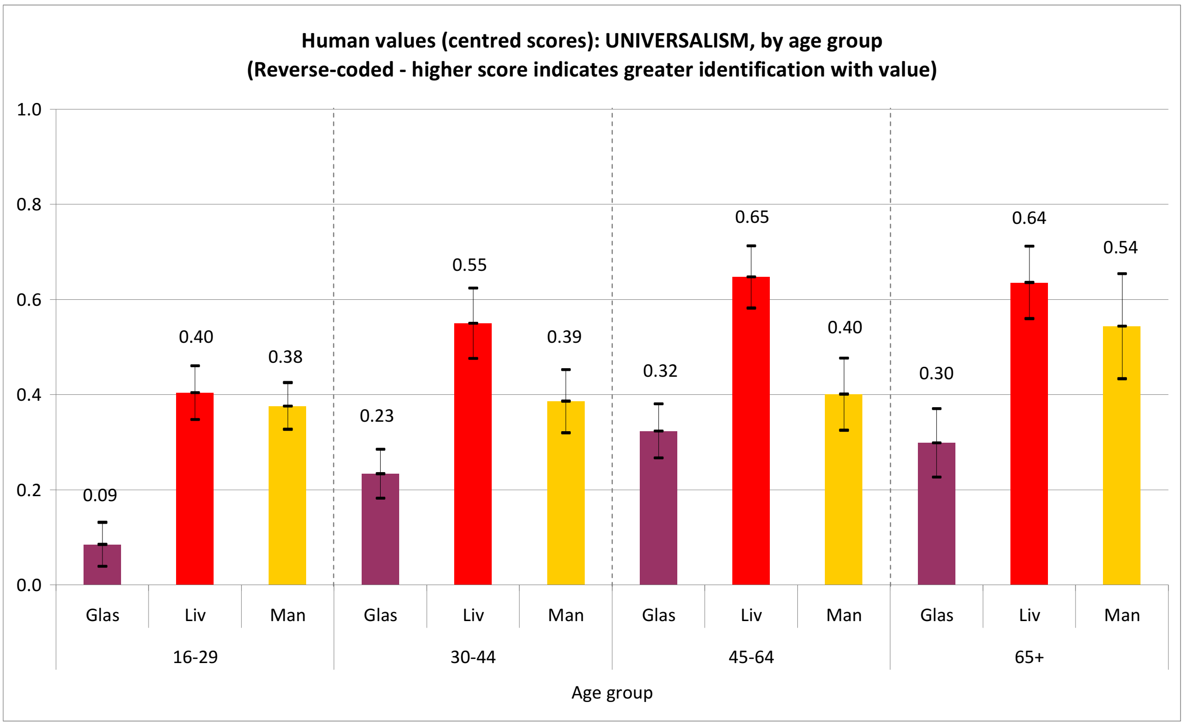

Human values (centred scores): UNIVERSALISM, by age group
(Reverse-coded - higher score indicates greater identification with value)
1.0
0.8
0.6
0.4
0.2
0.0
0.09
0.40
0.38
0.23
0.55
0.39
0.32
0.65
0.40
0.30
0.64
0.54
Glas
Liv
Man
Glas
Liv
Man
Glas
Liv
Man
Glas
Liv
Man
16-29
30-44
45-64
65+
Age group

Table 7.15

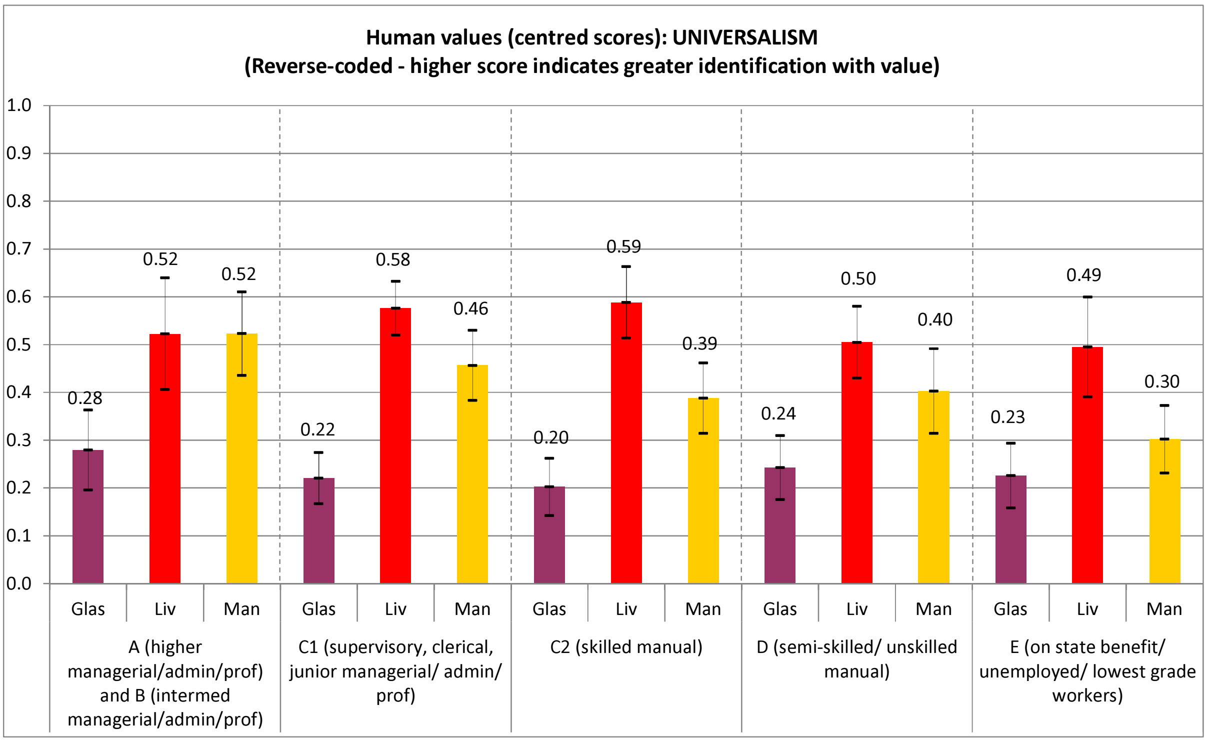
Multivariate linear regression analysis of the factors associated with: Universalism (centred score) (Human Values Scale)

Variable/category	**Adjusted Mean[1]**	**$\Delta\mu^2$ (95% conf. ints)**	***t* statistic**	**Significance[3]**
City				
Glasgow†	-0.06			
Liverpool	0.24	0.30 (0.25 to 0.34)	13.26	****
Manchester	0.14	0.20 (0.15 to 0.24)	8.84	****
Gender				
Male†	-0.06			
Female	0.02	0.07 (0.03 to 0.11)	3.74	***
Deprivation quintile				
1 (Most deprived)†	-0.06			
2	-0.02	0.04 (-0.02 to 0.10)	1.30	
3	0.01	0.06 (0.01 to 0.12)	2.13	*
4	-0.01	0.04 (-0.01 to 0.10)	1.47	
5 (Least deprived)	-0.05	0.00 (-0.06 to 0.06)	0.15	
Educational attainment				
No qualifications†	-0.06			
Some qualifications, but not degree level	0.03	0.09 (0.04 to 0.13)	3.70	***
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	0.17	0.23 (0.16 to 0.29)	6.89	****
Employment status				
Employed (PT & FT)†	-0.06			
Unemployed	-0.05	0.00 (-0.06 to 0.07)	0.15	
Ill/disabled	-0.05	0.00 (-0.08 to 0.09)	0.09	
Retired	0.08	0.13 (0.05 to 0.21)	3.23	**
Looking after home/family	-0.03	0.03 (-0.04 to 0.10)	0.79	
In education/training (PT/FT)	-0.03	0.02 (-0.04 to 0.09)	0.68	
Longterm limiting illness (LLI)				
No LLI†	-0.06			
Limited a little	0.05	0.10 (0.04 to 0.16)	3.33	***
Limited a lot	0.05	0.11 (0.03 to 0.18)	2.81	**
Age group				
16-29†	-0.06			
30-44	0.04	0.10 (0.05 to 0.15)	3.75	***
45-64	0.10	0.15 (0.10 to 0.21)	5.43	****
65+	0.05	0.10 (0.01 to 0.19)	2.16	*

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

R^2 = 0.09; Adjusted R^2 = 0.09

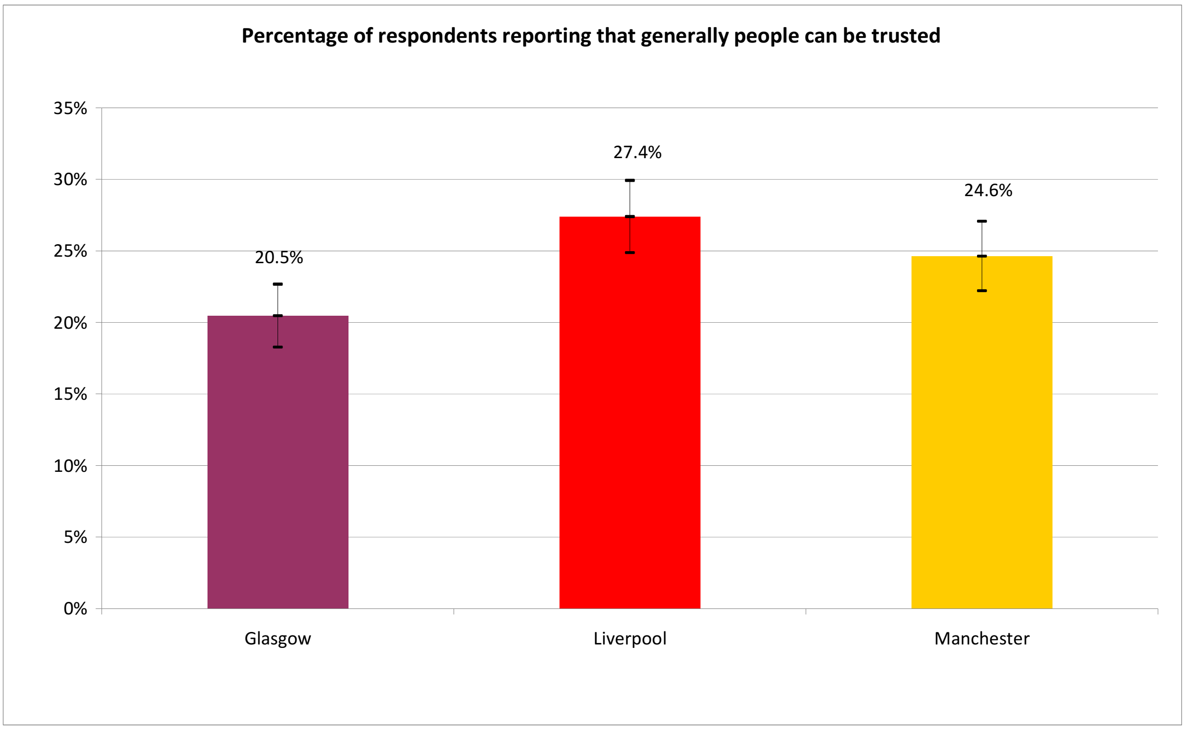
Figure 7.56



There is an obvious overlap between the notion of reciprocity, as measured by questions such as that relating to the return of a wallet, and the notion of trust. Two additional questions were asked specifically about trust. First, respondents were asked whether they believed that 'generally speaking' most people can be trusted, or whether they believed that you can't be too careful in dealing with people. Figure 7.57 shows that a significantly lower percentage of respondents in Glasgow (20.5%) compared with those in Liverpool (27%) and Manchester (25%) believed that most people could be trusted. The statistical modelling analyses confirmed the significant differences between the cities[clxxxii], and similar differences were seen for both genders, in most age groups (especially the youngest) and in most area types (data not shown)[clxxxiii]. The results of the multivariate logistic regression analysis are presented in Table 7.16.

[clxxxii] As Table 7.16 shows, respondents in Liverpool were approximately 37% (1.37 (1.14-1.66), p<0.01) more likely to state that 'most people can be trusted' compared to respondents in Glasgow; those in Manchester were approximately 32% (1.32 (1.09-1.59), p<0.01) more likely.
[clxxxiii] The difference between cities across different neighbourhood types (deprived, non-deprived) was explored further by the additional modelling which included significant city-deprivation quintile interaction term. The greatest difference between the Glasgow and Liverpool samples were seen in comparisons of those living in deprivation quintile 2 (odds ratio for Liverpool compared to Glasgow: 2.2 (95% confidence intervals 1.4, 3.5, p<0.01)), while the greatest difference between the Glasgow and Manchester samples were in comparison of those

Figure 7.57



living in the least deprived areas (quintile 5) (odds ratio for Manchester compared to Glasgow: 2.0 (95% confidence intervals 1.4, 2.9, p<0.0001)).

Table 7.16

Multivariate logistic regression analysis of the factors associated with the likelihood of reporting that generally people can be trusted

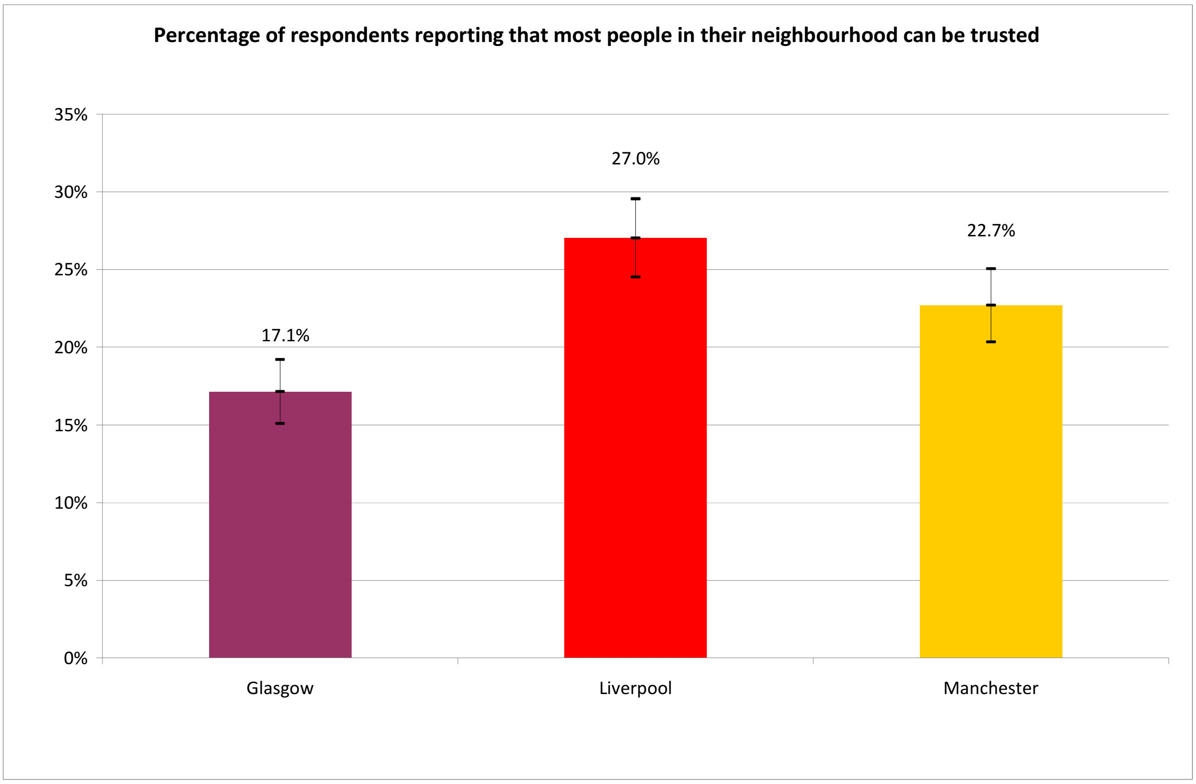
Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**12.52**	******	
Glasgow†			1.00
Liverpool	10.82	**	1.37 (1.14 to 1.66)
Manchester	7.92	**	1.32 (1.09 to 1.59)
Deprivation quintile	**11.54**	*****	
1 (Most deprived)†			1.00
2	0.50		1.10 (0.84 to 1.44)
3	4.88	*	1.34 (1.03 to 1.74)
4	5.65	*	1.36 (1.06 to 1.76)
5 (Least deprived)	8.38	**	1.46 (1.13 to 1.89)
Educational attainment	**50.55**	********	
No qualifications†			1.00
Some qualifications, but not degree level	16.98	****	1.49 (1.23 to 1.81)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	50.54	****	2.49 (1.94 to 3.20)
Longterm limiting illness (LLI)	**6.25**	*****	
None†			1.00
Limited a little	4.18	*	1.28 (1.01 to 1.61)
Limited a lot	3.23		1.29 (0.98 to 1.70)
Length of residence	**11.93**	*******	
Time in city not known†			1.00
Possibly long-term resident	11.93	***	1.34 (1.14 to 1.58)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable
R^2 = 0.03 (Cox & Snell)

In the Glasgow-only modelling, higher levels of trust were significantly associated with educational attainment (as also seen above, those with degree level qualifications were more likely to state that most people could be trusted than those with no qualifications) and with marital status (those who were married or in a civil partnership were much more likely to be classed as trusting in this regard than those who were single) (Appendix VII).

The second question related to the more specific notion of trust in people in the neighbourhood. As Figure 7.58 shows, levels of such trust were again significantly lower in Glasgow (only 17% of respondents stated that ‘most people in their neighbourhood could be trusted’) compared with the two English cities (27% and 23% for Liverpool and Manchester respectively). These differences between the cities were also clearly evident in the modelling analyses, with the fully-adjusted model showing that Liverpool and Manchester respondents were, respectively, 71% and 45% more likely to believe that most people in the neighbourhood could be trusted: the odds ratio for Liverpool was 1.71 (95% confidence intervals 1.40, 2.09), p<0.0001, and for Manchester it was 1.45 (95% confidence intervals 1.18, 1.78), p<0.001 (Table 7.17). Figures 7.59 to 7.61 show that the differences between the cities were also true when analysed by gender, age and area type. The last of these suggests the greatest difference between Glasgow and both English cities are between those living in the *least* deprived areas (quintile 5). The additional modelling incorporating the significant city-deprivation quintile interaction term confirmed this was the case: the odds ratios for the Liverpool and Manchester samples in this quintile compared to those in Glasgow were, respectively, 2.46 (95% confidence intervals 1.67, 3.62), p<0.0001, and 1.95 (95% confidence intervals 1.31, 2.90), p<0.01(data not shown)[clxxxiv].

Figure 7.58



[clxxxiv] This compares to, for example, odds ratios of 2.11 (95% confidence intervals 1.26, 3.53), p<0.01, for Liverpool for quintile 1 (Manchester n/s) (data not shown).

Figure 7.59

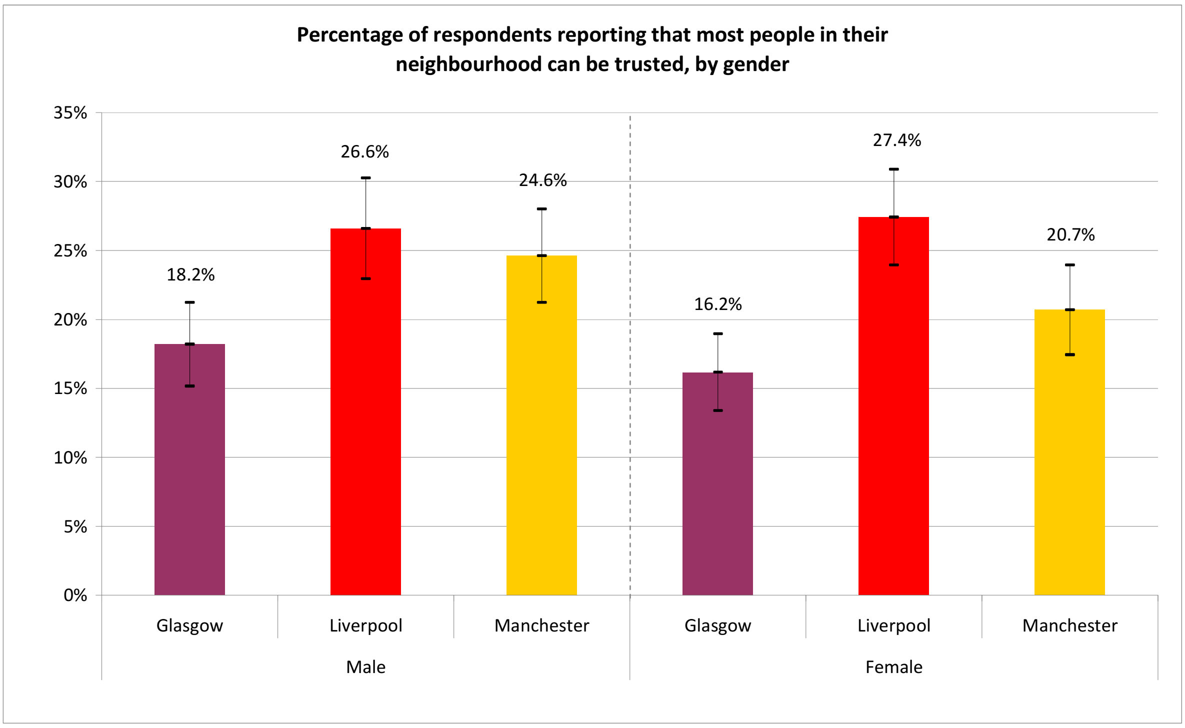


Figure 7.60

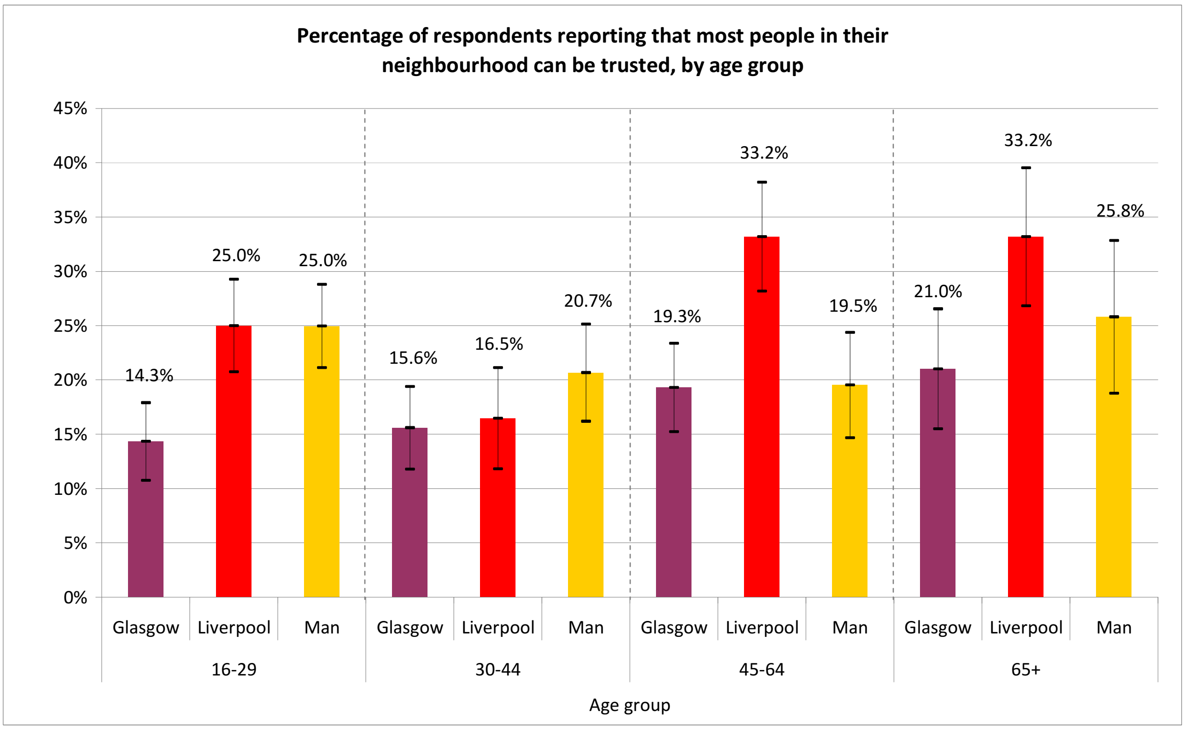
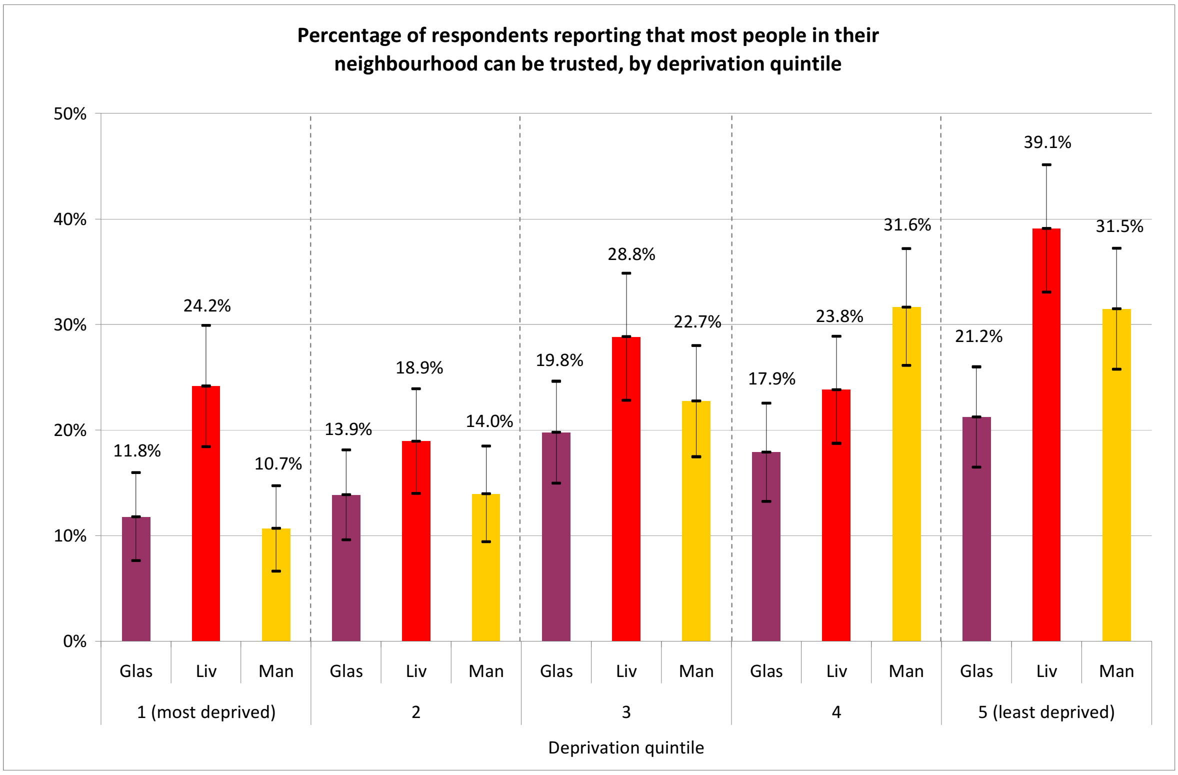


Figure 7.61



Percentage of respondents reporting that most people in their neighbourhood can be trusted, by deprivation quintile
50%
40%
30%
20%
10%
0%
11.8%
24.2%
10.7%
13.9%
18.9%
14.0%
19.8%
28.8%
22.7%
17.9%
23.8%
31.6%
21.2%
39.1%
31.5%
Glas
Liv
Man
1 (most deprived)
2
3
4
5 (least deprived)
Deprivation quintile

Table 7.17

Multivariate logistic regression analysis of the factors associated with the likelihood of reporting that most people in the neighbourhood can be trusted

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**28.44**	********	
Glasgow†			1.00
Liverpool	27.80	****	1.71 (1.40 to 2.09)
Manchester	12.36	***	1.45 (1.18 to 1.78)
Deprivation quintile	**38.82**	********	
1 (Most deprived)†			1.00
2	0.02		1.02 (0.76 to 1.38)
3	10.91	***	1.61 (1.21 to 2.13)
4	9.59	**	1.55 (1.18 to 2.05)
5 (Least deprived)	25.86	****	2.04 (1.55 to 2.69)
Educational attainment	**34.23**	********	
No qualifications†			1.00
Some qualifications, but not degree level	2.56		1.19 (0.96 to 1.47)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	29.54	****	2.14 (1.63 to 2.82)
Employment status	**23.11**	*******	
Employed (PT/FT)†			1.00
Unemployed	2.41		0.78 (0.58 to 1.07)
Ill/disabled	0.91		0.82 (0.54 to 1.24)
Retired	6.83	**	1.41 (1.09 to 1.83)
Looking after home/family	4.73	*	0.69 (0.49 to 0.96)
In education/training (PT/FT)	0.00		1.00 (0.78 to 1.30)
Longterm limiting illness (LLI)	**7.72**	*****	
None†			1.00
Limited a little	7.61	**	1.47 (1.12 to 1.93)
Limited a lot	1.96		1.31 (0.90 to 1.91)
Length of residence	**9.81**	******	
Time in city not known†			1.00
Possibly long-term resident	9.81	**	1.36 (1.12 to 1.66)

Notes
1. Significance level: * = $p<0.05$; ** = $p<0.01$; *** = $p<0.001$; **** = $p<0.0001$
† - reference category of variable
$R^2 = 0.05$ (Cox & Snell)

The Glasgow-only statistical modelling showed that factors associated with the likelihood of stating that people in their neighbourhood could be trusted included respondents' social class (those in socioeconomic groups D/E were less likely to report trust than those in A and B) and employment status (those in employment/training and looking after home and family, were less likely to report such trust) (Appendix VII).

7.5.3 Summary and conclusions

As a partial summary of the results presented within the previous section, Table 7.18 presents a high-level, non-statistical, overview of the city-level comparisons of social capital. For ease of interpretation, this uses deliberately simplistic comparative terms ('worse', 'better' or 'no difference') to summarise the main results. These terms are based on the statistical 'significance' of the results, being mindful of the debate around the latter term (alluded to in Chapter 3).

Table 7.18 High level summary of city-level social capital comparisons.

Topic	Measure	Glasgow compared to Liverpool	Glasgow compared to Manchester
Views on the local area	Reporting at least one 'very big' or 'fairly big' neighbourhood problem	Better	Better
Civic participation	Having taken action to solve a problem in last 12 months	No difference	No difference
	Perception of ability to influence decisions affecting local area	No difference	No difference
	Perception of ability to influence decisions affecting city	Better	Better
	Perception of ability to influence decisions affecting UK	Better	Better
Social networks and support	Frequency of speaking with neighbours	Better	Better
	Frequency of telephone contact with friends	No difference	No difference
	Frequency of telephone contact with relatives	No difference	Better
	Frequency of meeting up with friends	Worse	No difference
	Frequency of meeting up with relatives	No difference	Better
	Frequency of social media contact with friends	Worse	Worse
	Frequency of social media contact with relatives	Worse	Worse
	Having no-one to ask for help (shopping/advice/support/to borrow money)	Worse	Better
Social participation	Having volunteered in last 12 months	Worse	Worse
	Religious affiliation (as possible proxy for religious participation)	Worse	Worse
Reciprocity	Perception of neighbourhood one where 'people do things together and try to help each other'	Worse	Better
	Perception of neighbourhood seen as one where 'people mostly go their own way'	No difference	No difference
	Agreeing (very/fairly strongly) that 'people in this neighbourhood do not share the same values'	No difference	No difference

Topic	Measure	Glasgow compared to Liverpool	Glasgow compared to Manchester
	Perception (very or quite likely) that a lost purse or wallet would be returned intact	Worse	No difference
	Exchanging favours with people who live nearby	Worse	No difference
	Benevolence	Worse	Better
	Universalism	Worse	Worse
Trust	Belief that most people can be trusted	Worse	Worse
	Belief that most people in neighbourhood can be trusted	Worse	Worse

The data collected within the three-city survey suggest that there are some significant differences between the cities in relation to some (but not all) aspects of social capital. While the profile of the Glasgow respondents was either favourable in comparison with, or similar to, the English cities in relation to issues such as views on the neighbourhood, civic participation (albeit very low levels were recorded across all three cities) and social networks and support, it appeared to have significantly lower levels of social participation (in terms of volunteering, and a proxy for religious attendance) and trust compared to both Liverpool and Manchester, and lower levels of reciprocity, compared to Liverpool alone. It is of additional interest that some of these differences (e.g. volunteering, neighbourhood trust, some measures of reciprocity (e.g. perception regarding the return of a lost wallet or purse)) were greatest among those of higher, rather than lower, socio-economic status.

The implications of these results are considered in the next chapter of the thesis.

7.6 Different individual values: psychological outlook (optimism)

It has been hypothesised that different individual values among Glasgow's population might influence health behaviour and lifestyle choices, ultimately impacting on outcomes such as morbidity and mortality. One particular aspect of this hypothesis is examined within this thesis: optimism, as a measure of psychological outlook.

7.6.1 Background

A number of studies have highlighted the health benefits of an optimistic outlook[664-667] and, more generally, of 'positive psychological wellbeing'[668,669]. For example, a 2012 review suggested that such a positive psychological outlook 'protects consistently against cardiovascular disease (CVD), independently of traditional risk factors... [being] positively associated with restorative health behaviours… and inversely associated with deteriorative health behaviours'[670]. In the same review, optimism in particular was highlighted as a factor in reducing risk of CVD, and a separate 'meta-analytic' review in 2009 of optimism and physical health (including studies of mortality, CVD, cancer outcomes and immune function) concluded that 'optimism is a significant predictor of positive physical health outcomes'[671].

There are different ways of measuring optimism, and different survey scales have been developed. However, the most commonly used[671] is probably the Life Orientation Test, or its shorter, revised version, the Life Orientation Test (Revised) (LOT-R)[553]. Both have been independently assessed as good measures of optimism, the shorter, revised version especially so[553,672-674], having been described as a 'highly reliable and valid measure of generalised optimism' and 'the best measure of optimism'[672]. Although there have been criticisms, for example in relation to it being a general, 'context-free' measure (whereas context-specific measures may be more appropriate in some settings)[672,675], and in terms of whether it captures just one dimension of psychological outlook (optimism alone) or two dimensions (optimism and its opposite, pessimism)[676], its advantages have generally been perceived to outweigh its disadvantages (and in relation to the latter criticism, studies in 2006 and 2012 concluded that the LOT-R accurately captures both dimensions, optimism and pessimism[673,677]).

Consequently, therefore, the LOT-R was used to measure optimism in the three-city survey. The question this sought to answer was: is there any evidence of lower levels of optimism among Glasgow's population which might have a negative effect on its health and wellbeing?

7.6.2 Results

As explained in Chapter 4, the LOT-R scale is made up of ten statements against which respondents' level of agreement (from 'strongly disagree' to 'strongly agree') is recorded. However, of the ten statements, four are 'dummy' statements (or 'fillers') and are excluded from the overall score. The minimum score that can be calculated is 0 (representing extreme pessimism) and the maximum is 24 (representing extreme optimism)[clxxxv].

Figures 7.62-7.65 show average LOT-R scores by city alone (Figure 7.62), city and gender (Figure 7.63), city and age group (Figure 7.64) and city and social grade (Figure 7.65). These show that at the city level, levels of optimism among Glasgow and Liverpool respondents were identical, and significantly higher than among respondents in Manchester. Generally the same pattern is evident among the samples' sub-groups (age, gender and so on). An interesting u-shape distribution is evident in the analysis by age, echoing other analyses of optimism and other psychological aspects (e.g. happiness) across the life-course[678]. A clear social gradient can be seen in Figure 7.65.

[clxxxv] The six statements included in the total LOT-R score are: in uncertain times, I usually expect the best; if something can go wrong for me it will; I'm always optimistic about my future; I hardly ever expect things to go my way; and I rarely count on good things happening to me; overall, I expect more good things to happen to me than bad. In calculating the total score for each question, a negatively-worded statement (e.g. if something can go wrong for me it will) was reverse-coded (i.e. strongly agree coded as 0 rather than 4).

Figure 7.62

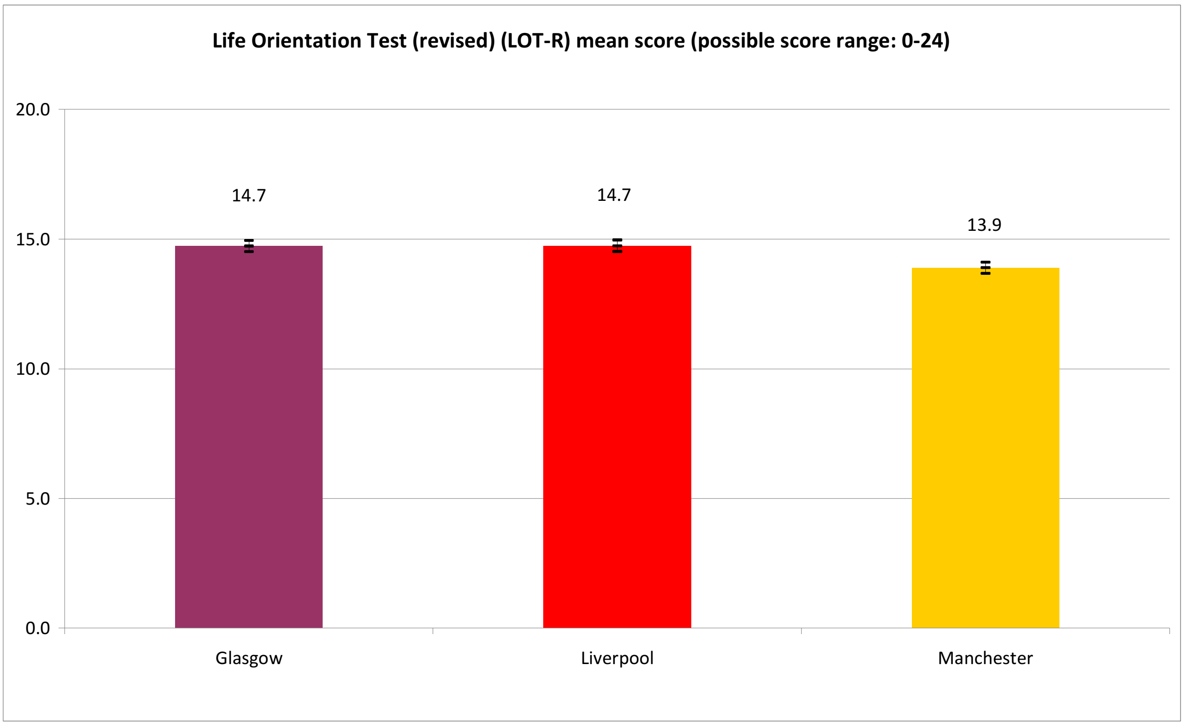


Figure 7.63

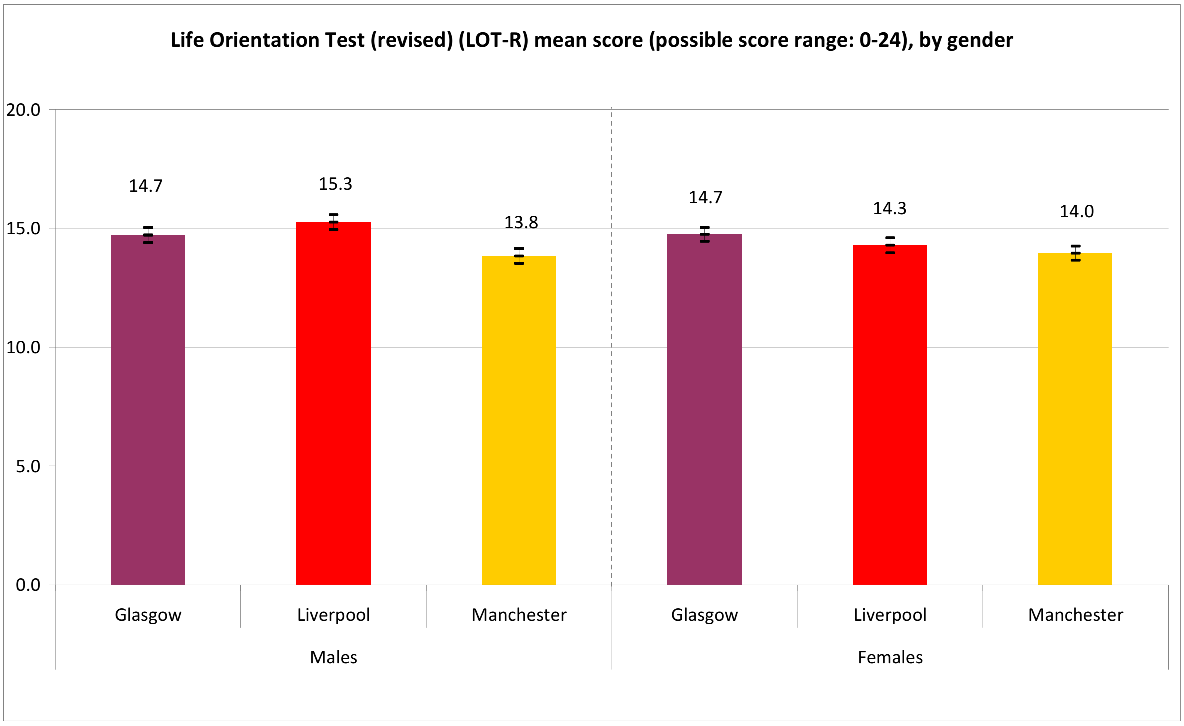


Figure 7.64

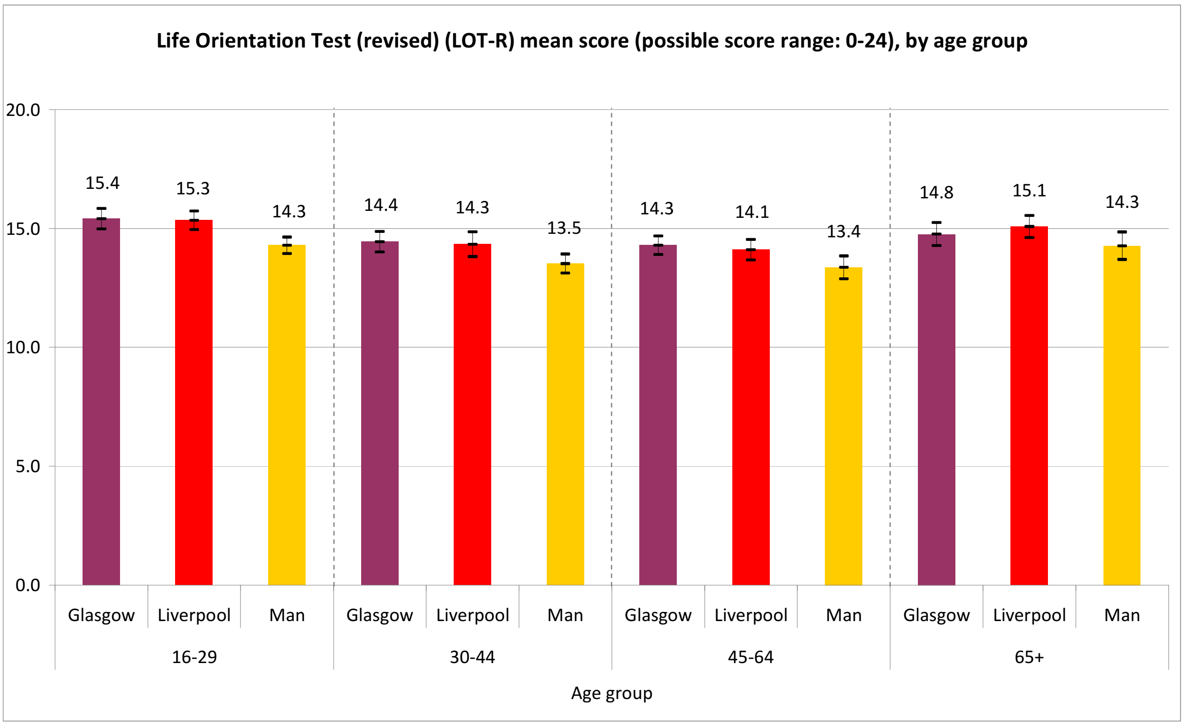
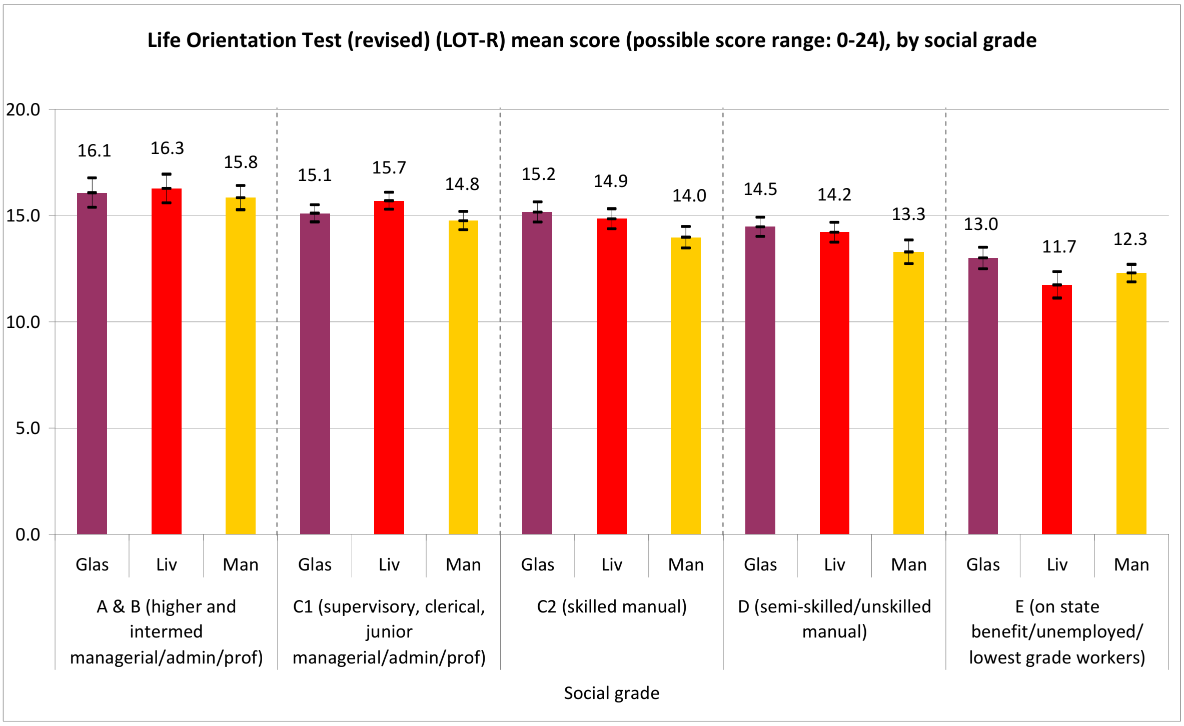


Figure 7.65



The statistical modelling analyses confirmed that the higher optimism score among the Glasgow and Liverpool samples compared to that in Manchester remained significant after adjustment for other factors in the model. As Table 7.19 shows, the Manchester sample was associated with a score 0.86 lower than the fully adjusted mean score for the Glasgow sample (regression coefficient: -0.86 (95% confidence intervals -1.15, -0.57), $p<0.0001$); the mean score for the Liverpool sample was not statistically different to that of Glasgow's sample. The modelling analyses also showed expected associations between levels of optimism and some of the independent variables included in the models: for example, higher optimism among those living in less deprived areas (compared with those in the most deprived areas) and among those with higher educational qualifications (compared with those with none), and lower optimism among those of low social grade compared with those of highest, those not working (through unemployment, being sick, or looking after home and family) compared with those who were working, and those in poor health compared with those in good health. Similar associations were evident in the modelling analyses of the Glasgow-only sample (Appendix VII).

Table 7.19

Multivariate linear regression analysis of the factors associated with Life Orientation Test (Revised) score

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
City				
Glasgow†	14.43			
Liverpool	14.28	-0.15 (-0.44 to 0.13)	-1.05	
Manchester	13.57	-0.86 (-1.15 to -0.57)	-5.84	****
Social grade				
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†	14.43			
C1(Supervisory, clerical, junior managerial/admin/prof)	14.28	-0.15 (-0.52 to 0.22)	-0.79	
C2 (Skilled manual)	14.44	0.00 (-0.40 to 0.41)	0.01	
D (Semi-skilled/unskilled manual)	14.12	-0.32 (-0.74 to 0.11)	-1.46	
E (On state benefit/unemployed/lowest grade workers)	13.66	-0.78 (-1.27 to -0.28)	-3.06	**
Deprivation quintile				
1 (Most deprived)†	14.43			
2	14.88	0.45 (0.07 to 0.83)	2.30	*
3	15.49	1.06 (0.67 to 1.45)	5.38	****
4	14.83	0.39 (0.01 to 0.78)	1.99	*
5 (Least deprived)	15.41	0.97 (0.58 to 1.37)	4.81	****
Educational attainment				
No qualifications†	14.43			
Some qualifications, but not degree level	15.06	0.63 (0.33 to 0.93)	4.06	****
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	16.21	1.77 (1.32 to 2.22)	7.76	****
Employment status				
Employed (PT & FT)†	14.43			
Unemployed	13.25	-1.18 (-1.64 to -0.72)	-5.01	****
Ill/disabled	13.00	-1.43 (-2.03 to -0.84)	-4.72	****
Retired	14.74	0.31 (-0.22 to 0.83)	1.14	
Looking after home/family	13.84	-0.59 (-1.05 to -0.13)	-2.52	*
In education/training (PT/FT)	14.81	0.38 (-0.06 to 0.82)	1.68	
Marital status				
Never married†	14.43			
Married/civil partnership	14.91	0.48 (0.15 to 0.81)	2.88	**
Separated/divorced	14.67	0.23 (-0.24 to 0.71)	0.97	
Widowed/surviving partner	15.14	0.71 (0.12 to 1.30)	2.34	*
Self-assessed health				
Good/very good†	14.43			
Fair	13.36	-1.08 (-1.41 to -0.75)	-6.40	****
Bad/very bad	12.31	-2.12 (-2.62 to -1.63)	-8.36	****
Age group				
16-29†	14.43			
30-44	13.86	-0.57 (-0.93 to -0.21)	-3.11	**
45-64	13.84	-0.59 (-1.00 to -0.18)	-2.84	**
65+	14.37	-0.07 (-0.70 to 0.57)	-0.20	

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

R^2 = 0.17; Adjusted R^2 = 0.16

7.6.3 Summary and conclusions

This section has sought to assess whether, based on the data collected in the three-city survey, there appears to be any evidence for Glasgow's population being characterised by having lower levels of optimism than those living in Liverpool and Manchester. This was not the case: the mean LOT-R score among the Glasgow sample was very similar to that of the Liverpool sample, and higher than that of Manchester.

7.7 Analyses of self-assessed health

As seen earlier in the chapter (Figure 7.16), descriptive analyses showed levels of self-assessed health to be broadly similar across the three cities. The percentages of respondents reporting 'bad' or 'very bad' health in Glasgow, Liverpool and Manchester were 9.6%, 8.5% and 5.9% respectively, while the percentages reporting 'good' or 'very good' health were 73%, 72% and 75%, with the equivalent figures for those reporting 'fair' health being 17%, 19% and 20%. In more detailed analyses of the data on bad/very bad SAH by means of multivariate logistic regression (as described in Chapter 4[clxxxvi]), residents in Manchester were shown to be approximately 33% less likely to report such poor health compared to those in Glasgow after adjustment for other factors in the model; however, there was no significant difference between the Glasgow and Liverpool samples[clxxxvii]. When the various social capital measures shown to differ between the cities were added to the models (e.g. volunteering, neighbourhood trust, exchanging of favours), only volunteering was significantly associated with SAH status. In the fully adjusted model, those who had volunteered in the previous 12 months were approximately 46% less likely to report bad or very bad

[clxxxvi] As a reminder, the aims of this were: 1) to quantify differences between the cities in SAH; 2) to establish whether any differences between the samples in the main topics of interest (social capital, SoC and optimism) modified any observed variation in SAH. In the first of these models the same set of predictor variables (shown in Table 4.2 in Chapter 4) that were used in all the main effects models were included, with two exceptions: the health status questions were omitted, while smoking status was included. In subsequent models additional predictor variables were included relating to social capital (as binary variables), SoC and optimism (LOT-R) (both the latter as continuous variables). NB Although there appears to be a certain circularity here, given that SAH was included as a *predictor* variable in the models examining outcomes of social capital, SoC and LOT-R, as Chapter 4 also explained, those same models were re-run *without* SAH (and without the other health related variable, long-term limiting illness (LLI)), and this made virtually no difference to the results.

[clxxxvii] Odds ratios: Manchester 0.67 (95% confidence intervals 0.48, 0.94), $p<0.05$; Liverpool 0.74 (95% confidence intervals 0.54, 1.02), n/s. See Appendix VIII for full results.

health than those who had not volunteered (odds ratio: 0.54 (95% confidence intervals 0.32, 0.89, $p<0.05$)). However, the inclusion of volunteering and the other social capital variables did not alter the value of the odds ratios (ORs), or significance levels, associated with the city variable in the models to any great extent.

The addition of SoC to the model showed that, after adjustment for other factors, a one unit increase in SoC was associated with an approximately 3% lower likelihood of reporting bad or very bad health (odds ratio: 0.97 (95% confidence intervals 0.96, 0.98, $p<0.0001$)). As SoC was shown to be lower in the Liverpool and Manchester samples compared to the Glasgow sample, adjustment for SoC in the model altered the odds ratios and significance levels for the cities, with slightly lower odds resulting for both. The LOT-R measure of optimism was also significantly associated with the likelihood of reporting bad/very bad health: in the fully adjusted model a one unit increase in LOT-R was associated with approximately 13% lower likelihood of reporting such health status (odds ratio: 0.87 (95% confidence intervals 0.84, 0.91, $p<0.0001$)). As LOT-R was shown to be lower in the Manchester sample compared to the Glasgow sample, this adjustment for LOT-R in the model lowered the odds ratio and associated significance level for the former sample[clxxxviii].

These results are shown in Appendix VIII.

The results of all the analyses presented in this chapter are discussed in the final chapter of the thesis.

[clxxxviii] In other words, levels of bad/very self-assessed health would be relatively higher among the Glasgow sample were it not for its higher levels of SoC (compared to both the Liverpool and Manchester samples) and LOT-R (compared to the Manchester sample alone).

Chapter 8. Discussion

This final chapter of the thesis has four aims:

1. to summarise and discuss the first set of results (the analyses of deprivation and mortality in the three cities), including the strengths and weaknesses of the approach taken, and to ensure that all the relevant research questions have been adequately answered;
2. to provide an overview of the main theories that have been put forward to explain those results, and other results showing excess mortality in Scotland compared to elsewhere in the UK: the aim here is to provide a brief summary in order to provide further context for the discussion of the survey analyses;
3. to summarise and discuss the second set of results which relate to three of those specific hypotheses, again including the strengths and weaknesses associated with the research, and the research questions to which it relates;
4. to present the conclusions and implications of all the research undertaken.

Chapter 2 (literature review) sought to place this thesis in the context of previous relevant research. Thus, in seeking to achieve the four aims above, explicit reference will be made to a number of the topics discussed within that earlier part of the thesis.

8.1 Analyses of mortality and deprivation

8.1.1 Summary of main findings

The first set of analyses sought to answer six separate research questions relating to the current and historical deprivation and mortality profiles of Glasgow compared (principally) to Liverpool and Manchester[clxxxix].

[clxxxix] As a reminder, these questions were: 1) How comparable are the deprivation profiles of Glasgow, Liverpool and Manchester? 2) Controlling for differences in area-based deprivation, how do the health (mortality) profiles of the three cities compare? 3) If there is evidence of higher mortality in Glasgow, is this restricted to certain sections of the population, or is it a city-wide effect? 4) Are there particular differences between the cities in relation to particular causes of death? 5) What do historic trends in deprivation and mortality show? 6) To what extent does the employed measure of deprivation explain differences in mortality between Glasgow and the rest of Scotland, and between Glasgow and other large English cities?

The main findings of those analyses were that, using recent measures, Glasgow, Liverpool and Manchester share remarkably similar levels and patterns of deprivation; despite this, however, Glasgow has a profoundly different mortality profile compared to the two English cities. After adjusting for any remaining differences in income deprivation, premature deaths in Glasgow in 2003-07 were shown to be more than 30% higher, with deaths at all ages deaths almost 15% higher. This excess mortality was evident across almost the whole population: all ages (except the very young), both males and females, and in deprived and non-deprived neighbourhoods. Indeed it was notable that overall levels of mortality in Glasgow's more affluent suburbs (i.e. the least deprived decile) were still around 15% higher than in equivalent areas of Liverpool and Manchester. However, a potentially important distinction was noted between deaths at all ages and premature deaths (under 65 years): while for the former the excess was fairly evenly distributed across deprivation deciles, in the latter case the excess was much higher in comparisons of the more, rather than less, deprived areas (particularly among men). Half of the excess deaths at all ages were attributable to cancers and diseases of the circulatory system (with approximately 20% the result of alcohol related conditions), while for premature deaths half of the excess was instead attributable to alcohol and drugs. While at the city level there have been no noticeable variations in levels of poverty between the cities over the previous six decades (at least as measured by the majority of indicators derived from census and survey data – overcrowding (discussed further below) being a notable exception), Glasgow's relatively higher rates of premature mortality appear to have emerged in the latter half of the 20th Century, with the relative gap shown to be widening over time. Additional analyses showed that the excess is evident in comparisons with other English cities.

8.1.2 Strengths and weaknesses

A number of weaknesses associated with these analyses must be acknowledged, all of which relate to issues discussed in Chapter 2. First, the analyses were based on an area-based measure of deprivation: as previously discussed, many authors argue for the need for both area *and* individual measures in analyses of this type. Second, the size of neighbourhood, with an average population size of approximately 1,500 people was not optimal, and is twice the size of geographical unit at which analyses of deprivation are currently undertaken in Scotland: this thereby places the research at more risk from issues such as ecological fallacy. Third, the definitions of the neighbourhoods (both the English LSOAs and the merged Scottish datazones) were not based on qualitative observational methodologies, as some authors have argued should be the case.

With regard to the first of these points, however, individual measures of poverty or income linked to mortality and covering the whole population of the three cities were not available: thus the best available measures and methodology were employed. Furthermore, and as also discussed in Chapter 2, similar levels of excess mortality have been shown for Scottish populations relative to English populations when based on both area *and* individual measures. In terms of the size of neighbourhood, while that weakness must be accepted, at the same time it can be argued that the geographical spatial units employed in the analyses are in fact a core strength: by basing the analyses on smaller and equivalently sized units, and using a contemporary measure of deprivation that correlates strongly with the best available measurements of multiple deprivation in both Scotland and England, the analyses were undertaken at a much finer spatial level than was previously possible, thereby addressing the weaknesses of previous work (e.g. by Hanlon *et al*[404], and Reid[445]) highlighted in Chapter 2. Furthermore, these analyses represent the first time that a core component of recent British indices of multiple deprivation have been employed across Scottish and English settings in this way. Finally, it was clearly not feasible to generate new, observational-based definitions of neighbourhoods across all three cities: even if it had been possible, it would have impacted on the availability of deprivation data, given that the latter are calculated for standard administrative geographies such as datazones or LSOAs. It is also of potential interest to note that one study in Glasgow which sought to create such ‘bespoke’ neighbourhood boundaries in fact produced very similar socio-economic profiles to those based on existing administrative geographies[679].

8.1.3 Implications and relevance to other research

Overall, the findings strengthen the evidence base for Scottish excess mortality discussed in Chapter 2, and more broadly add to the existing research literature highlighting variation in mortality between similarly disadvantaged places. It is difficult to compare the level of excess mortality in this study with that shown in other research as different studies have tended to use different age groups in their analyses. However the 15% excess for all ages shown for Glasgow is identical to that shown by Connolly *et al* for Scottish born residents of Northern Ireland compared to those born locally[454], but higher than that shown for Reid for residents of Glasgow compared to those of other British cities (8%)[445]. It is also higher than the excess seen for all Scotland compared to England & Wales by Hanlon *et al*[404] and in some of the analyses by Popham *et al*[453] (both approximately 8%), although it is identical to the excess shown in other work by Popham[450].

The fact that the data suggest that the excess is increasing over time is a major concern, and confirms results of other analyses comparing Scotland with other parts of the UK[404,453].

The considerably higher relative mortality in Glasgow relating to alcohol and drugs is also noteworthy, and reflects increasing trends in both seen in Scotland in recent decades. It is worth pointing out that since publication of these analyses in 2010, alcohol related deaths in Scotland have decreased[680], but with reductions also seen in Liverpool and Manchester, the relative difference between the cities since 2007 is likely to be similar[681,682]. Drugs related mortality is much higher in Scotland than in England, and as mentioned in Chapter 2, one study suggested that one third of the Scottish excess compared to England & Wales was accounted for by the higher levels of drugs misuse[447]. Both these issues are being explored further in ongoing research[cxc].

The high SMRs for suicide – especially among females – are also striking. Although there have been shown to be differences in recording of suicide between Scotland and England[683-685], the use of additional ICD codes for ‘undetermined intent’ maximises the comparability of the data and suggests that this difference is not artefactual[686-688]. In a 2003 paper, Dorling and Gunnell modelled the impact of social and economic factors[cxci] on suicide rates across Britain[689]. They found that in the vast majority of places (parliamentary constituencies) levels of

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[cxc] See www.gcph.co.uk for more details.
[cxci] Described as indicators of ‘social isolation’, these were: the percentage of internal migrants, the percentage not in employment and the percentage who were single.

suicide could be predicted by these ecological variables. However, there were a small number of areas which had significantly lower than expected rates, and areas which had higher than expected rates. The latter included deprived constituencies in Glasgow (and other areas elsewhere in Scotland[cxcii]), while the former included areas in and around Liverpool. The authors speculated – in reference to Durkheim's work discussed briefly elsewhere in this thesis - that protective factors relating to religion and social integration might be operating in Liverpool. This clearly links to some of the findings of the three-city survey and thus is discussed later in the chapter.

Before discussing those survey findings in more detail, the next section considers other potential explanations for Glasgow's excess mortality in relation to the two English cities: first, in relation to what was discussed in Chapter 2 around the principal determinants of health; and second, in relation to the many other theories that have been proposed to explain excess mortality in both Glasgow and Scotland.

8.2 Potential explanations of excess mortality in Glasgow (and Scotland)

8.2.1 The determinants of health and health inequalities

In seeking explanations for Glasgow's strikingly different mortality profile compared to two such similarly deprived English cities, it is worth returning to the discussion within Chapter 2 of what determines good or bad health in populations, and how we understand differences in health and its determinants between places i.e. the drivers of health inequalities.

In terms of the latter, Chapter 2 discussed the importance of socio-economic factors in explaining differences in health status. The link between deprivation and poor health is profound, proven and beyond dispute. With deprivation levels in the three cities seemingly so similar and yet mortality in Glasgow so much higher, it begs the obvious question of whether or not an accurate measure of socio-economic deprivation has been used in the analyses. On the one hand, a strength of the analyses, as stated above, is that they have arguably used a

[cxcii] Aside from three Glasgow constituencies (Shettleston, Springburn and Anniesland) and Central Fife, another six Scottish constituencies were listed, all northern, more remote areas (e.g. Inverness East, Nairn & Lochaber, Ross, Skye & Inverness West, Caithness, Sutherland & Easter Ross).

better measure of area deprivation (particularly regards the spatial level at which it was measured) than was available in previous analyses while, as also stated, excess mortality has been shown for Scotland irrespective of the measure (e.g. area based or individual) or geographical unit chosen. Furthermore, the excess for Glasgow relative to Liverpool and Manchester was shown in comparisons of non-deprived, as well as deprived, populations. On the other hand, the analyses also showed that for premature mortality, the excess was greater in comparisons of more, rather than less, deprived areas: clearly, therefore, it is still possible that the results are simply a reflection that true ‘deprivation’ cannot be adequately captured by indicators derived from benefits systems and other administrative data sources. This is an issue that lies at the heart of this thesis, and I will return to it later in the chapter.

Given the importance of the economic drivers of health inequalities, another obvious question is whether levels of poverty and deprivation in the cities have changed in recent decades. Similar levels of current deprivation may mask relatively higher levels of poverty in Glasgow historically which may have impacted across the life course in a manner that is not detected by cross sectional analyses. However, as Chapter 6 also showed, historical analyses of unemployment, social class, ‘core poverty’ and ‘breadline poverty’ do not appear to support this hypothesis. Nor do the data on levels of deindustrialisation (obviously closely linked with unemployment and poverty) experienced by the cities (presented in Chapter 5). That said, those comparisons were made at the level of entire cities and, as stated in Chapter 6, it is possible that changes in the *distribution* of deprivation within each city may have occurred over time: that is, although the distribution of poverty currently appears to be very similar in the cities, there may previously have been greater concentrations and different patterns of poverty in Glasgow compared to the English cities. The analysis of the historical distribution of unemployment presented in Chapter 6, showing similar profiles in Glasgow and Liverpool, does not support that suggestion. However, other analysis showed levels of overcrowding to have been much higher in the Scottish city, an issue highlighted by a number of other authors[690-692] [cxciii]. Furthermore, more detailed analyses of

[cxciii] The cited analyses are of housing data from the 1980s. Analyses presented in Chapter 6 showed that although overcrowding was considerably higher in Glasgow than in Liverpool and

1971 census data by Holtermann[693] suggested that Clydeside, and Glasgow in particular, had much more of its proportional 'fair share' of deprived neighbourhoods compared to relevant parts of North West England. For example, she showed that Merseyside contained 2.7% of all census enumeration districts (EDs) in Britain, but had 9.0% of the 'most deprived' EDs in terms of levels of male unemployment (that is, more than three times the figure that might be expected had unemployment been equally distributed across Britain at the time), and 5.3% of the 'most deprived' EDs measured by lack of access to a bath or shower[cxciv]. Clydeside, however, had 4.3% of all EDs in Britain, but 23.1% of the most deprived according to unemployment and 16.9% of the most deprived according to access to a bath/shower. Furthermore, analysis of 'multiply deprived' EDs (defined as the worst 15% of EDs in Britain for a combination of overcrowding, lacking amenities and unemployment) showed that almost 600 of these areas were in Glasgow (occupied by 19% of the city's population), compared to 93 in Manchester (housing 7% of the population) and 60 in Liverpool (5% of residents).

These latter figures are undoubtedly influenced especially by the higher levels of overcrowding seen across all Glasgow at the time. They are also likely to be inflated to an extent by differences in the size of the spatial unit (EDs) employed in the analysis: as described in Chapter 6, these were approximately 25% smaller in Glasgow at the time[cxcv]. Nevertheless Holtermann's analyses suggest that although overall levels of poverty (as measured by unemployment or low social class) may have been similar in Glasgow, Liverpool and Manchester, there may have been a greater concentration of small deprived neighbourhoods in and around Glasgow compared to the two English cities. More generally, higher levels of overcrowding (and access to some household amenities) may suggest different historical characteristics of deprivation that are not captured

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Manchester in this decade, Glasgow's profile in relation to housing amenities was *not* worse than that of the English cities. Pacione (cited above[691]) concludes that Glasgow's much worse levels of overcrowding was attributable to a 'mismatch between household size and house type' in the newer council stock (thus, also reflecting the relatively good level of basic amenities).

[cxciv] This was the 5% of all EDs in Britain with the highest rates for these indicators.

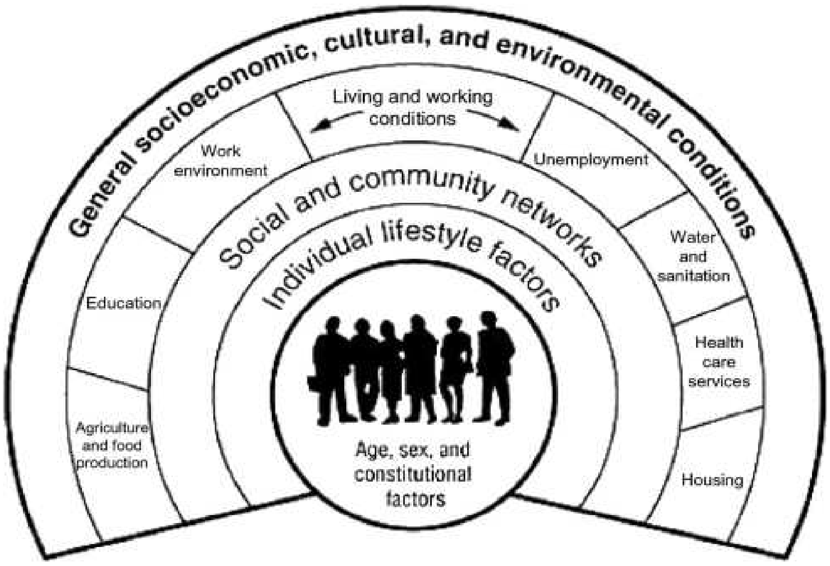
[cxcv] In other words, if, for example, there were two cities of the same population size and an identical number of people classed as living in multiply deprived circumstances in each, but the size of the EDs was, on average, smaller in one city than the other, then potentially the same number of people could be distributed across more EDs, resulting in a higher number EDs being selected as being multiply deprived. Thus, the latter figure would be artificially inflated because of the difference in population size of the EDs between the cities.

by indicators such as unemployment, income or social class. Historical factors, alongside the nature of deprivation, therefore, might be important and these are both themes which will be returned to later in the chapter.

Chapter 2 also discussed different models of health, for example those of Evans & Stoddart and Dahlgren & Whitehead. It may be instructive to return to such models in seeking to understand reasons for differences in the mortality profiles of the cities.

The lowest level of Dahlgren & Whitehead's model (reproduced below in Figure 8.1) is comprised of 'age, sex and constitutional factors', and another obvious question relating to the analyses presented in Chapter 6 is whether there are important differences in the compositions of the populations in the three cities that might explain the different mortality profiles.

Figure 8.1 Dahlgren & Whitehead's model of the principal determinants of health (originally presented in Chapter 2)



The age structure of the population in Manchester differs slightly from that of the other two cities, having a higher percentage of its population in the younger age groups (e.g. 15-44 years), and a lower percentage in its older age group (e.g. 65+ years)[cxcvi]. However, given that the mortality analyses were adjusted for age

[cxcvi] The population data used in the analyses (from 2005) showed the percentage of the population aged 15-44 years was 47% and 46% in Glasgow and Liverpool, but 53% in Manchester. The equivalent figures for those aged 65+ years was 15% (both Glasgow and Liverpool) and 12%. The percentage of those aged 0-14 was similar in all three cities (16-17%), but the percentage aged 45-64 years was slightly different (21%, 22% and 18% for Glasgow, Liverpool and Manchester respectively).

(and gender), this is unlikely to have impacted on the results. More pertinently, the ethnic make-up of Manchester is considerably different to that of Glasgow: in 2001 19% of Manchester's population was classed as being of an ethnic minority, compared to only 5.5% in Glasgow (and 5.7% in Liverpool). By the 2011 census, those figures had increased to 33%, 12% and 11% respectively[cxcvii] This is potentially important: first, because of the evidence of differing health behaviours and outcomes among certain ethnic groups[694-698]; and second, because – as mentioned in Chapter 2 – Tunstall and others have suggested that higher numbers of ethnic minority groups may be an explanatory factor for lower than expected mortality among some more deprived UK populations[471]. That said, however, the fact that Liverpool's ethnic composition is very similar to that of Glasgow, and the fact that the mortality analyses for Glasgow compared to Liverpool alone produced very similar results to those undertaken for both cities (as seen in Chapter 6 and in more detail in Appendix II), suggests that this different ethnic mix is unlikely to provide the full explanation for the difference in mortality rates between the cities. However, that is not to say that the issue is not relevant for Manchester, and this will also be returned to later in the chapter.

The second layer in Dahlgren & Whitehead's model is individual lifestyle factors. Their relationship to Glasgow's excess mortality is a complex issue. On the one hand the vast majority of health behaviours are socially patterned and, given the very similar deprivation profiles of the three cities, one would not expect there to be important differences between the three cities in such risk factors. This suggestion is supported by published data for relevant time periods from the Scottish Health Survey[cxcviii] and the Health Survey for England which show very little differences in prevalence levels of, for example, healthy eating[cxcix], binge drinking[cc] and smoking[cci, 699, 700]. On the other hand, as shown in Chapter 6 and

[cxcvii] Note these figures are for all ages, and so differ slightly to those shown in Chapter 7 which were for ages 16 years and above.
[cxcviii] Note that this is for the Greater Glasgow area, rather than Glasgow City local authority area. Figures for the city may differ slightly from those for the larger area.
[cxcix] Healthy eating defined as the proportion of the adult population aged 16+ eating five or more portions of fruit and vegetables per day. The figure in all three cities (Greater Glasgow (2003), Liverpool (2003-05) and Manchester (2003-05)) was 21%.
[cc] Binge drinking defined as the proportion of the adult population aged 16+ having consumed 8+ units (men) or 6+ units (women) on heaviest drinking day in the previous 7 days. Figures for Greater Glasgow (2003), Liverpool (2003-05) and Manchester (2003-05)) were: 25%, 27% and 28% respectively.

discussed further above, mortality is significantly higher in Glasgow for a number of causes directly associated with adverse health behaviours e.g. lung cancer, alcohol-related causes and drug-related poisonings. This may suggest an 'extreme' behavioural risk profile among some elements of the Glasgow population which would not be identified from routine health surveys. However, more fundamentally, it also begs the question: why? With alcohol, drugs misuse and tobacco associated with coping mechanisms for those living in difficult circumstances[701-703], and the socio-economic profiles of the cities seemingly so similar, why is mortality related to these causes so much higher in Glasgow? This partly relates to the need to understand what Marmot and others have referred to as 'the causes of the causes'[42,704-706], the upstream, rather than downstream, drivers of poor health (again, as was discussed in Chapter 2). However, more specifically, it is also relevant to the discussion of whether routine indicators of socio-economic status truly capture the essence of living in disadvantaged circumstances in Scotland.

The third layer of Dahlgren & Whitehead's model is social and community networks. This links to the idea of social capital, data for which were presented in the last chapter and are thus discussed later in the chapter. It also arguably overlaps with aspects of the next layer – living and working conditions – and with what Evans & Stoddart referred to in their own model of health as the 'social environment'. It is possible to look at some aspects of the social environment for the cities from routine data. Such comparisons generally confirm how notably similar the cities are, for example in relation to levels of educational attainment, numbers of lone parent households, or rates of teenage pregnancy. The figures for all three cities compare poorly with national figures (reflecting the much higher levels of deprivation in the cities compared to Scotland as a whole and England as a whole), but there are few differences between them. Where there are differences, Glasgow's profile actually tends to be better than the English cities – for example in having a lower teenage pregnancy rate than Manchester

[cci] Adult smoking prevalence: Greater Glasgow (2003) – 35%; Liverpool (2003-05) – 34%; Manchester (2003-05) – 34%. Figure 7.7 in Chapter 7 also showed more recent city level data, both from the three-city survey, and from other national surveys, showing very similar adult smoking prevalence rates in the cities.

and a higher percentage of adults with degree level qualifications compared to Liverpool[ccii].

The similarity of the cities in terms of these indicators of the 'social environment' is no surprise. By definition, these issues are socially patterned and the analyses presented within this thesis have shown how similar the cities are in those terms. Less is known about the cities in relation to other components of Dahlgren & Whitehead's model, for example the work environment, housing conditions (other than overcrowding), and general cultural factors[cciii]. These, therefore, can be added to, and considered alongside, some of the many other potential explanations for Glasgow's (and Scotland's) excess mortality that have been suggested. This is the focus of the next section of the chapter, a section which provides answers to research question 7, i.e. *what explanations have been proposed to explain any additional poor health seen in Glasgow?*

8.2.2 Other proposed explanations for Scottish excess mortality

As described in Chapter 4, work undertaken by McCartney *et al* (published as a report and journal paper in 2011 and 2012 respectively[538,539]) sought to summarise and assess the principal hypotheses that had been proposed to explain Scotland's and Glasgow's excess levels of mortality. No fewer than 17 explanations were addressed, with a synthesis of the most likely causes, and potential causal pathways, attempted. Since publication, further theories have been proposed. This section briefly reviews these many theories on an individual basis, mindful of the fact highlighted by McCartney that 'causal pathways are likely to be complex, and that underlying causes may be compounded or alleviated by a range of other factors'[539]. There is a clear need to be aware of

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[ccii] All three cities have high percentages of the working age population with **no educational qualifications**: in 2006-08 the figures were 20%, 22% and 19% for Glasgow, Liverpool and Manchester respectively. The equivalent figures for Scotland and England were both 13%[566]. In 2001 the percentages of all households with children which were **lone parent households** in Glasgow, Liverpool and Manchester respectively were 40%, 39% and 40%. The equivalent figure for Scotland was 24.5% and for England 22%[322,707]. **Teenage pregnancy rates** (defined as the number of pregnancies under 18 years of age per 1,000 females aged 15-17) in 2005-07 in Scotland and England were 41.8 and 41.2 respectively. The equivalent figures for Glasgow, Liverpool and Manchester were 54.1, 46.9 and 70.0[708,709]. The percentage of the working age population with **higher level educational qualifications** (defined as NVQ4 and above) in Glasgow in 2006-08 was at 32%, considerably higher than in Liverpool (21%), and very similar to the figure for Manchester: 30%. The national figures were similar: 33% for Scotland and 28% for England[566].
[cciii] All of these topics are the focus of ongoing research by GCPH and NHS Health Scotland.

this likely multifactorial element in seeking to achieve a better understanding of potential causes, links between them, and the extent to which they may impact on different sections of the population.

It is important to note that the intention here is not to provide an in-depth analysis of the many proposed theories, the existence of supporting evidence (or lack of), nor a discussion of causality (all factors included within McCartney *et al*'s publications). These factors will be touched on, but the main purpose is simply to provide a brief overview of the considerable amount of theorising that has taken place in relation to the issue of Scottish excess mortality; and, in doing so, to establish the context and rationale for the collection of new data described in the previous chapter, the analyses of which are then discussed in the following section of this final chapter.

Note also that McCartney *et al*'s work considered evidence relating principally to excess mortality in Scotland compared to the rest of Great Britain, whereas the focus of this thesis is instead three specific British cities. However, as discussed in Chapter 2, for a number of reasons it appears unlikely that the main causes of Scotland's and Glasgow's excess levels of mortality differ, albeit that there may be some city-specific characteristics may be important. This is another point which will be returned to at the end of the chapter.

Table 8.1 overleaf summarises the 17 explanations considered in the above publications. Echoing the hierarchical nature of Dahlgren & Whitehead's model of health determinants (and other models of health), the theories were categorised under the headings of 'upstream', 'midstream' and 'downstream'. Two further headings were also included: artefactual and genetic. Each category is briefly described and discussed below.

Table 8.1 Summary of hypotheses described by McCartney *et al*.

Artefact	Upstream	Midstream	Downstream	Other
• Deprivation (measurement of) • Migration	• Greater income inequalities • Greater levels of deindustrialisation • Political attack • Climatic differences	• Lower social capital • Different spatial patterning of deprivation • Sectarianism • Culture of limited social mobility • Anomie – or a culture of 'boundlessness and alienation' • Family, gender relations and parenting differences • Health service supply or demand • Different culture of substance misuse	• Health behaviours • Different individual values	• Genetic differences

8.2.2.1 Artefactual explanations

Two sub-headings are included here: the inadequate measurement of **deprivation**, and the impact of **migration**. The former has been discussed above, and is further discussed later in the chapter. With regards to migration, as discussed in Chapter 2, there is evidence that selective migration can impact on spatial inequalities in health, and could therefore be a potentially important explanatory factor i.e. that population health may be adversely affected by the loss of healthier people migrating elsewhere. However, as Chapter 2 also discussed, in a Scottish context, research has shown that Glasgow's poor health status relative to the rest of Scotland has not been significantly affected by selective migration[268]. Furthermore, Scottish migrants elsewhere in the UK display a mortality pattern very similar to that of the non-emigrating population and retain their higher mortality rates compared to native residents: this has been shown for migrants to England & Wales[450,453], and to Northern Ireland[454]. It is possible that particular aspects of migration and population movement may be pertinent to the comparisons of the three cities: for example, it is likely that in the post-war period Glasgow lost a higher percentage of its better educated and skilled population to the New Towns than was the case in Liverpool, and certainly compared to Manchester[cciv], while in the English cities some peripheral estates, housing some of the more disadvantaged population, were built outside the city boundaries, whereas all of Glasgow's were contained within the city limits. That said, however, the analyses presented in Chapter 6 show that irrespective of any such potential effect, for similar levels of deprivation *within* the cities, mortality is still significantly higher in Glasgow. It seems unlikely, therefore, that migration plays a major part in the explanation.

8.2.2.2 'Upstream' explanations

Greater income inequalities: as also discussed in Chapter 2, there is considerable evidence that more unequal societies are associated with a range of adverse health and social outcomes and, although Wilkinson *et al* have argued that the relevant mechanisms operate only at the level of whole countries (and U.S states), others have suggested that they may also function at more local levels[278]. However,

[cciv] This is the subject of ongoing research.

as was shown in the earlier chapter, income inequalities are larger in England than in Scotland, and regional estimates of income inequality suggest levels are slightly higher in North West England (including Liverpool and Manchester) compared to West Central Scotland (which includes Glasgow). Chapter 2 also showed (albeit with a number of associated caveats) that among those in employment, within-city levels of income inequality were very similar in the three cities (and similar to Britain as a whole), and were not highest in Glasgow. Adding this to the data presented in Chapter 6 showing the similar distribution of deprivation across Glasgow, Liverpool and Manchester, presents a more complete picture, one suggesting that it is unlikely that Glasgow is a relatively more unequal city in terms of income.

(There is a second, related, point to note in relation to income inequality and Scottish excess mortality. Chapter 2 discussed the importance of income inequalities as a driver of health inequalities (the 'neo-materialist' view of the causes of health inequalities). What is apparent in Scotland, compared to other parts of the UK, is that despite exhibiting similar (or lower) levels of income inequality, Scotland experiences much wider health (mortality) inequalities. This is driven by Scotland's high levels of excess mortality, particularly in relation to rates of premature death among its poorest population. The analyses presented in Chapter 6 demonstrate that this is also very much the case for Glasgow compared to Liverpool and Manchester).

Data included within this thesis (but not analysed prior to the publication of McCartney *et al*'s work) have also shown that it does not appear to be the case that **levels of deindustrialisation** experienced in Glasgow were greater than those experienced in the two English cities. As shown in Chapter 5, levels of deindustrialisation (at least as measured by historical census data) were identical.

The impact of neoliberal policies on the health of populations was mentioned in Chapter 2 in the discussion of the importance of the political economy. It has been hypothesised (under the heading of **'political attack'**[40]) that the adoption of neoliberal policies in the UK from 1979 onwards had a particularly negative effect on the health of Scotland's and Glasgow's population, much more so than was the case in other parts of the UK. This, it has been argued by others, is because

Scotland was more vulnerable to the effects of neoliberalism for a number of reasons.

First, Scotland and Glasgow were more vulnerable to the damaging effects of the Thatcher government's housing policy, which was seen as part of a broader attack on 'municipal socialism'. This saw the best council housing sold off at discounted prices to better-off tenants, while the remaining stock, in need of repair despite rapidly increasing rents, was left for poorer (and increasingly stigmatised) tenants, many dependent on housing benefit. Levels of council housing in the 1980s were much higher in Scotland compared to England, and in Glasgow compared to English cities[40].

Second, it has been argued that West Central Scotland, and Glasgow in particular, was particularly affected by the sense of political alienation and disempowerment that was common to all of the UK's deindustrialising cities at the time, where voters were typically hostile to neoliberal Conservatism. As mentioned in Chapter 5, it is argued that this was enhanced by the fact that local government in 1980s Glasgow was, despite its Labour majority, highly acquiescent to the policies of the post-1979 Conservative Government, and was also willing to adapt neoliberal policy measures to its own particular circumstances[615]. This was quite different to Liverpool and Manchester, where local government response was arguably more hostile[581,582,597,710,711].

Third, it has been argued that as Glasgow was part of a nation which experienced a more general 'democratic deficit' in the 1980s and 1990s (i.e. in terms of Conservative polices being implemented in Scotland, a country whose electorate had overwhelmingly rejected the party in elections), this generated a distinct reaction in terms of national political culture which might reasonably be expected to intensify the sense of political alienation and disempowerment in comparison to the English cities[40].

With no empirical data to compare perceptions of these political factors among the populations of the three cities, this topic was one of seven included in the three city survey (but not presented within this thesis). However, the results were inconclusive, possibly reflecting the difficulty of asking survey participants in 2011 about the perceived effects of 1980s policies and highlighting the need, therefore, for a different methodological approach[ccv].

The final ‘upstream’ hypothesis is that there is a **difference in climate** which contributes to higher levels of mortality in Scotland. The two main aspects of this discussed by McCartney were: that less sunlight in Scotland leads to greater levels of Vitamin D deficiency (which has been linked to various morbidities and mortality[171,712]), and that colder winters results in higher mortality rates compared to those living in England.

For a variety of reasons the Vitamin D deficiency appears unlikely to play a major role in the emergence of Glasgow’s excess mortality. First, although Glasgow does receive less sunlight than Liverpool and Manchester, the city receives slightly more than Belfast, another similar post-industrial city in the UK[ccvi] [713]. Despite this, very similar levels of excess mortality (27% higher for premature deaths, 18% higher for deaths at all ages) have been shown for Glasgow relative to the Northern Irish city in a study which replicated the methodology used in Chapter 6[714]. Second, as has been shown, the excess levels of premature mortality are driven by higher numbers of deaths from causes related to alcohol, drugs, suicide and violence (the latter included within the ‘external causes’ category), most of which are clearly not directly attributable to vitamin D deficiency. Third, a systematic review of the link between vitamin D deficiency and all-cause deaths was recently undertaken, and although this suggested that there was an independent association between the two (despite quite limited and, in cases, problematic evidence[ccvii]), it related mainly to deaths among older age groups. As the previous chapter (and other analyses) have shown, excess mortality in Glasgow and Scotland is highest among those of working age. Furthermore, a more recent (2014) systematic review which

[ccv] Participants were asked a series of questions covering perception of, and engagement with, current local and national governments, and (for respondents who lived through the 1980s) perceptions of the experiences and effects of the 1980s, and trust in 1980s political institutions and politicians. Although some, limited, evidence of more negative perceptions of the 1980s did emerge from the Glasgow sample, overall the data were inconclusive.
[ccvi] Met Office data show that the average annual number of hours of sunshine for weather stations located close to Glasgow, Liverpool, Manchester and Belfast respectively between 1981 and 2010 was 1,265, 1,566, 1,373 and 1,247.
[ccvii] Very few studies were identified which examined premature mortality (deaths <65 years). Furthermore, a number of the studies did not adjust for potential confounders such as SES, increasing the risk of residual confounding in the relationship between vitamin D deficiency and mortality.

examined a wider set of health outcomes and broader set of studies suggested that low levels of Vitamin D may in fact be a symptom of disease, rather than a cause[ccviii] [715].

For similar age and cause of death related reasons, higher winter-related mortality appears unlikely to be a major contributory factor: analyses of additional winter deaths[ccix] in both Scotland and England show that the majority relate to people aged over 75 years[716,717]. Furthermore, additional winter mortality figures in Glasgow over the period 2003/04 to 2006/07 were similar to those which took place in Liverpool (although higher than in Manchester)[ccx].

8.2.2.3 'Midstream' explanations

Eight separate hypotheses were classified as 'midstream' explanations. The first, that **social capital** may be lower in Glasgow, is discussed in the next section of this chapter as one of the three theories presented in Chapter 7.

The second is that there may be important differences in the **spatial patterning of deprivation** (i.e. the way in which deprived and affluent areas are distributed across the cities) between Glasgow and the two English cities, and which may, through particular causal pathways, adversely affect the health of Glasgow's population. As mentioned briefly in Chapter 2, important influences of different patterning of deprivation within a Scottish context have been noted by Sridharan and colleagues[242]. However, new research published in 2013 showed that, although there were differences between Glasgow, Liverpool and Manchester in this regard – principally that deprived areas are more dispersed across Glasgow, and rather

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[ccviii] The authors reviewed, and compared, both prospective cohort studies and randomised trials. The majority of the former showed strong associations between low vitamin D and a range of health outcomes including mortality; the latter did not. The authors concluded that 'the discrepancy between observational and intervention studies suggests that low 25(OH)D is a marker of ill-health. Inflammatory processes involved in disease occurrence and clinical course would reduce 25(OH)D which would explain why low Vitamin D status is reported in a wide range of disorders'.

[ccix] This is defined as the 'difference between the number of deaths in the four 'winter' months (December to March) and the average of the numbers of deaths in the two four-month periods which precede winter (August to November) and follow winter (April to July)'[716]. Note also that the majority of such deaths tends to be associated with respiratory and circulatory diseases.

[ccx] Published data for Scottish[716] and English[717] local authority areas for these years show that the average annual number of higher winter deaths in Glasgow, Liverpool and Manchester in 2011/12 were approximately 323, 250 and 168. Expressed as crude rates per 100,000 population the figures are 55.9, 57.2 and 37.8.

more concentrated within larger areas in the English cities – these did not impact on differences in neighbourhood levels of mortality[718].

Third, it has been hypothesised that **religious sectarianism** in Scotland, and more specifically Glasgow and West Central Scotland, may play a part. In other words, that there is a pervading culture of sectarianism in Glasgow which may impact on the health of its population in a number of ways. These include: impeding the social mobility of sections of the population; detrimentally affecting, through psychosocial processes, the health and well-being of those discriminated against; through the effects of violence from sectarian attacks; and through the uneasy social relations between population subgroups. However, as mentioned above, the analyses of deprivation and mortality for Glasgow, Liverpool and Manchester were replicated for Glasgow and Belfast, and showed remarkably similar results[714]. It can be argued, therefore, that if religious sectarianism were indeed impacting significantly on population health in Glasgow, one would expect to see a more striking manifestation of that effect in Belfast, given the latter city's more profound history of such religious division[ccxi].

Lower levels of social mobility in Glasgow has also been proposed as an explanation for relatively poorer health in Glasgow (given that health status is known to increase across the social gradient). It has been suggested that this is influenced by cultural factors, being brought about by both a lack of self-confidence (the roots of which lie in the influence of Scottish Calvinism), and also a culture of 'social-control' which discourages people from being seen to do better than their peers[528,721]. A culture of limited social mobility was another hypothesis for which new data were collected in the survey, but which are not presented in this thesis. Those data suggested that it was highly unlikely that such obstacles (lack of self-confidence, and social control) were impeding social mobility in

[ccxi] Numerous studies have shown the extent of the religious divide in the Northern Irish city, the considerably poorer socio-economic and health profile of its Catholic population relative to the rest of the population, and the impact of years of conflict on the city's residents. As French pointed out, even since the Good Friday Agreement of 1998, 'sectarian violence [between the Protestant and Catholic communities] remains a problem for many at home and in the workplace, taking the form of attacks on people and property; less violent forms of aggression such as verbal abuse, harassment, visual displays and graffiti also continue to be significant'[719]. Glasgow's sectarianism problem seems almost insignificant in comparison. Indeed, Bruce *et al*. have described it as 'much exaggerated', and that 'in the matter of religious conflict, the history of Scotland is much closer to that of the United States or Australia then it is to that of Northern Ireland'[720].

Glasgow[ccxii]. However, as with the 'political attack' questions, a different methodological approach (in this case longitudinal analyses of occupation and social class across generations of the three cities' populations) is required to investigate this hypothesis more completely[ccxiii].

A fifth 'midstream' explanation relates to the concept of **anomie** or **a culture of boundlessness and alienation**. Described briefly in Chapter 2, anomie is a concept first proposed by Durkheim[722,723] in the late 19th Century to describe a breakdown or lack of social values or norms that can occur particularly at times of economic instability and social change, and which can result in greater risk-taking and self-destructive behaviours (e.g. alcohol misuse, drugs misuse, suicide). When considered as an explanation for Scotland's excess mortality in McCartney *et al*'s 2011 report, this concept was described in terms of the more general heading of a 'culture of boundlessness and alienation' to distinguish it from the 'underclass' theory[724-727] with which anomie has become associated – and which has been attacked for 'demonising' the poor[728]. This is another hypothesis for which new data were collected in the three-city survey. While those data did not support the thesis[ccxiv], the extent to which such a cross-sectional population survey can access a population characterised as alienated, and/or accurately identify such a trait in terms of the survey tools available to researchers, is open to question. Thus, a different methodological approach is again required.

Family, gender relations and parenting differences make up a sixth midstream hypothesis. The suggestion here is that family breakdown, acrimony between partners and/or dysfunctional parenting are more prevalent in Scotland (and

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[ccxii] The measures included within the survey principally captured respondents' *motivations* and *aspirations* for success (and thereby, social mobility), and found nothing to suggest there was less importance attached to these by Glaswegians of all social classes than elsewhere (indeed, for some measures the opposite was true). Clearly, however, successful social mobility depends on more than simple motivation: many obstacles might stand in the way that would not be apparent from a cross-sectional survey.

[ccxiii] Note that this work is being planned, using the 1958 National Child Development Study (NCDS).

[ccxiv] A number of questions within the Sense of Coherence scale (discussed in Chapter 7 and further below) were directly relevant to this hypothesis, as indeed is the entire scale itself and, especially, the questions that make up the 'meaningfulness' sub-scale . Glasgow respondents were associated with higher, not lower, scores than those in the two English cities. The conformity value of Schwartz's Human Values scale (the latter was also discussed in Chapter 7) was also relevant to this hypothesis: anomie relates to a breakdown or lack of social values or norms, while the conformity value captures respondents' perceptions of the importance of such social norms. However, conformity was shown to be significantly more, rather than less, associated with the Glasgow sample than with those in Liverpool and Manchester.

Glasgow), and ultimately have a negative influence on population health. Certainly there is considerable evidence linking adverse early years experiences to negative adult health and wellbeing related outcomes[729-731]. However, despite having been proposed by some as a potential explanation for Scottish excess mortality[528,732-734], McCartney *et al* found very little evidence to support the suggestion that such characteristics of parenting, upbringing or relationships were likely to be different in Scotland compared to other parts of the UK. Furthermore, a report published in 2013 considered in detail the issue of early years environment, based on analyses of a number of well-known UK longitudinal cohort studies[735]. The study found virtually no relevant evidence of differences in early years experiences between children born between 1946 and 2000. This was true of comparative analyses of cohort members in Scotland and England, and more specifically (where sample sizes allowed), in so-called 'city regions' of Glasgow and the Clyde Valley, Merseyside and Greater Manchester. In addition, some limited questions on early years experiences (rating of happiness of childhood, and rating of childhood relationship with parents) were included within the three-city survey: these also provided no evidence of more negative early years experiences on the part of the Scottish sample. An acknowledged, and potentially important, weakness of both those approaches, however, is that populations most at risk of experiencing such circumstances may not be represented in such population surveys.

Penultimately, differences in **health service** supply (i.e. quality and accessibility) or demand have also been proposed as a potential contributory factor. McCartney *et al* found no evidence to suggest this was the case, pointing out that the quality of primary care is relatively high in Scotland, and the specific causes of death which have most driven the excess in premature mortality in Glasgow compared to Liverpool and Manchester (alcohol, drugs, suicide, violence) are not considered to be amenable to health care. That said, given the higher prevalence of alcohol and drugs misuse in Glasgow, it is possible that there may be relevant differences between addictions services and social services that may be important. However, there is an absence of evidence that this is the case; furthermore, as discussed above, this relates more to proximal, rather than underlying, explanations, and it is the latter that is the focus of this study.

Finally, that there is a **different culture of substance misuse** in Scotland has also been suggested. This relates not to high levels of such use (which, in the case of alcohol and drugs, we already know is the case) but rather the way in which substances (not just alcohol and drugs, but also tobacco) are consumed is different (e.g. inhalation of more toxins per cigarette), and/or that culture associated with their use differs (e.g. a different identity of drugs misuse, as portrayed in the film Trainspotting) and which somehow exacerbates the negative effects. This was deemed theoretically plausible, but there was no evidence to support or refute it.

8.2.2.4 'Downstream' explanations

Two downstream explanations were proposed. The first, that the Scottish and Glasgow populations are associated with worse **health behaviours** compared to other populations within England & Wales, has been discussed above. The second is that these same Scottish populations are characterised by **different individual 'values':** these would influence health behaviours and choices and, therefore, ultimately health outcomes. As discussed in Chapter 4, this hypothesis embraces a number of overlapping concepts relating to: psychological outlook (including optimism); hedonism; time and risk 'preferences'; individualism and materialism.

Analyses of optimism (as measured by the Life Orientation Test (Revised) (LOT-R)) were presented in the previous chapter, and are therefore discussed later in this chapter. The survey also collected data relating to the other aspects of individual values listed above. Aside from individualism (which, as the previous chapter showed, reinforced some of the social capital findings) and, arguably, materialism[ccxv], there was no evidence that Glasgow's population was more associated with such 'values' that might have adverse impacts on health[ccxvi]

[ccxv] Questions from Schwartz's Human Values scale (part of the 'power' value) were relevant to the issue of materialism. An additional, materialism-specific, question was also developed and added to the survey. Analyses of these questions all suggested that Glasgow respondents were more associated with materialistic values than those in Liverpool, but not compared to those in Manchester. However, the 'achievement' value of Schwartz's scale was more associated with the Glasgow sample than both English sets of respondents, and Kasser[736] has argued that this value is also indicative of more materialistic values.

[ccxvi] In terms of **psychological outlook** – and aside from optimism and aspirations (discussed above) – **self-efficacy** (a concept which overlaps with the notions of aspiration and optimism) among respondents from Glasgow was not lower compared to the two English samples: the mean Generalised Self-Efficacy scores were similar in Glasgow and Liverpool, and higher than that of the Manchester sample. In addition, analysis of the **meaningfulness** component of the Sense of

8.2.2.5 Genetics

Finally, a hypothesis that the genetic make-up of Scotland's population predisposes it to negative health behaviours, or makes it especially vulnerable to the effects of such behaviours, has also been proposed. This was deemed an unlikely explanation[ccxvii].

8.2.2.6 Synthesising the hypotheses

Since publication of the work summarised above, yet more hypotheses have been suggested. Notably, these have also included Antonovsky's Sense of Coherence: as mentioned in Chapter 7, this has been put forward as a plausible 'downstream' explanation in a number of Scottish Government documents[535,536].

The work by McCartney assessed each of the 17 hypotheses separately in terms of the Bradford-Hill criteria for causation in observational epidemiology[737]. On this basis the research deemed certain hypotheses plausible, and some - like genetics, migration, sectarianism – as less plausible. A synthesis was also attempted, looking at the divergence of mortality rates in Scotland from those of elsewhere in Western Europe (including, of course, England & Wales) since the 1950s (as mentioned in Chapter 2 of this thesis). The reasons for an initial divergence were not clarified; an explanation for the divergence from the early 1980s onwards – mirroring the divergence of male premature mortality rates in Glasgow from those of Liverpool and Manchester shown in Chapter 6 (Figure 6.17) – focused on the political attack thesis with the suggestion that the implementation of neoliberal policies from 1979 onwards in the UK impacted upon the Scottish population disproportionately, with an outcome of 'an intensifying climate of conflict, injustice and disempowerment' resulting in, among other things, higher levels of adverse health behaviours.

Coherence scale (presented in Chapter 7), which assesses respondents' perceptions of the extent to which their lives have meaning and purpose, showed this to be higher, not lower, among Glasgow respondents compared with those in the English cities. Highly related to the concept of psychological outlook, there was no evidence of a greater culture of **hedonism** among respondents from Glasgow. Similarly, there was no evidence of present-orientated '**time preferences**' (reflecting less 'investment' in future health status) in Glasgow.

[ccxvii] This related both to the wide range of causes of death associated with excess mortality in Scotland (it was suggested that a genetic component would be more likely to explain specific causes rather than the broad spectrum shown in various analyses), and to the fact that the temporal divergence in mortality rates between Scotland and elsewhere in the UK has taken place over too short a period of time to be explained by changes in the gene pool.

On one level, this is an attractive explanation. On another, however, an acknowledged lack of supporting evidence around many aspects of this causal chain makes it less clear how this account could explain the phenomenon being investigated. The lack of evidence extends to the arguments that Glasgow was more vulnerable to the negative effects of neoliberal policies than Liverpool and Manchester, and this remains unclear given the similarity of their social, economic and political histories described briefly in Chapter 5.

The three-city survey described in this thesis was an attempt to collect new evidence for some of the theories outlined above which were regarded as more plausible but which lacked any supporting data. As described in Chapter 4, data were collected for a number of different hypotheses. Some have been described briefly in the section above; three were the focus of the last chapter of the thesis. The next section discusses the analyses of the latter data in more detail.

8.3 Analyses of survey data for Glasgow, Liverpool and Manchester

The analyses presented in Chapter 7 sought to answer two of the ten research questions outlined at the beginning of the thesis, namely:

- what can new population survey data tell us in regard to some of the more plausible hypotheses that have been put forward to explain Scotland's and Glasgow's 'excess' mortality?
- using new survey data, and appropriate statistical methodologies, can we show significant differences between the three cities for any of these newly measured factors (and while controlling for a range of area-based and individual characteristics)?

This section briefly summarises the main results and implications of those analyses, as well as discussing (in section 8.3.4) the overall strengths and weaknesses of the approach taken with the three-city survey.

8.3.1 Sense of Coherence (SoC)

8.3.1.1 Summary of main findings and implications

Contrary to the what had been hypothesised, SoC, as measured by Antonovsky's SOC-13 scale, was found to be significantly higher, not lower, in Glasgow compared to Liverpool and Manchester. It was shown to be higher in comparisons of age group, gender, social class and area deprivation, and within statistical modelling after adjustment for these and other relevant factors.

The analyses also confirmed previously noted associations between SoC and various measures of SES[738-741], as well as marital status[742]. They additionally provided further evidence for SoC as an independent predictor of differences in general health status[556]. Of course they also present a paradox: given the proven link between SoC and health, why should SoC be relatively 'better' in a population associated with relatively 'worse' mortality? Different interpretations are possible. First, it may suggest weaknesses in the extent to which the SOC-13 scale fully captures the concept of SoC, being perhaps vulnerable to cultural influences in self-reporting in the same way some measures of self-reported health status have been shown to be[293-297]. Although, as stated, the measure has been judged 'cross-culturally applicable', other recent research has suggested the manner in which SoC operates within different cultures is not entirely clear and requires further research[743]. Second, it may suggest the survey samples are flawed and unrepresentative; more specifically, as population surveys may not reach those at the greatest risk of early death, it could be that, among those omitted, a different SoC profile could apply. However, as discussed in Chapter 7, the survey samples have in fact been shown to be broadly representative of all three cities; furthermore, mortality is higher in Glasgow compared to the English cities across the whole social spectrum, and in the survey SoC was also shown to be higher in comparisons of all social classes. This, therefore, seems an unlikely explanation.

8.3.1.2 Comparison with other studies

How do the data presented here compare with other studies? This is the first time that SoC has been measured in these UK cities, and it is difficult, and potentially misleading, to compare SoC scores between different surveys, given the different population characteristics, socioeconomic conditions, sampling methodologies, sample sizes and response rates that may apply. With those caveats in mind, however, it is still potentially useful to know how the scores obtained in this study compare with those reported elsewhere.

A series of systematic reviews of the SoC scale was undertaken by Eriksson and Lindström between 2005 and 2007[554-556]. From 127 studies published between 1992 and 2003, the mean score for the 13-item SoC scale (SOC-13) ranged from 35.4 to 77.6. Very low scores were obtained from particular sub-groups of populations, for example 35.4 from a group of Norwegian substance abusers[744], 53.3 for unemployed people with schizophrenia in Sweden[745] and 59.9 for American single parents of disabled children[746]. There have been relatively few studies of the general population, and of those, many were small in size, and the scores range considerably: for example, from 59.0 in the Canadian general population in 1999[747] to 70.8 in the Swedish population in 2002[748]. It is difficult to assess, therefore, whether the scores obtained in this study for residents of Glasgow (67.6), Liverpool (63.1) and Manchester (59.3) are high or low compared to other populations. That said, one recent study in Glasgow[749] measured SoC among deprived and affluent groups in the city, and found similar results: the SOC-13 score was 59.6 for the deprived group and 70.3 for the affluent group, which are not significantly different from the scores of 61.9 (95% confidence interval: 59.9-63.4) and 72.2 (69.9-74.4) for the lowest and highest socioeconomic groups in the Glasgow sample here.

8.3.2 Optimism

8.3.2.1 Summary of main findings and implications

Levels of optimism (as measured by the LOT-R survey tool) were not lower in the Glasgow sample compared to those in Liverpool and Manchester. As is the case with SoC, despite the cross-sectional nature of the data, this suggests that this is an implausible explanation for Glasgow's higher levels of mortality compared to the English cities.

This implausibility is strengthened when the results are examined in the context of other findings. Optimism is a key component of the wider 'psychological outlook' hypothesis discussed above, which included suggestions that Glaswegians were more hedonistic, were less associated with ambition to succeed (lower aspirations) and were less 'future-oriented' than those in the two comparator cities. None of the results from the survey analyses undertaken supported these suggestions.

As with SoC, analyses confirmed the relationship between LOT-R and SES, as well self-assessed health. The analyses also beg the same questions relating to the proven relationship between LOT-R and health outcomes, the similar or, in the case of the comparison with Manchester, relatively higher scores associated with the Glasgow sample, and whole population level differences in mortality between the cities. Some of the same issues raised above (e.g. potential cultural influences in self-reporting of LOT-R) are also relevant to this discussion. I return to this briefly later in the chapter in considering the broader strengths and weaknesses of the survey analyses.

8.3.2.2 Comparison with other studies

To the author's knowledge, no directly relevant (e.g. population-level data for Scotland/England, or for the three cities) LOT-R data are available for comparison. However, LOT-R is a frequently used measure and in terms of wider context, some studies have shown similar, or slightly lower, levels of optimism compared to the three city samples (for example, a mean score of 14.3 among US college students[672]), while others have shown slightly higher scores (for example, 15.1 among patients having just undergone bypass surgery[672]). However, there are no data with which the scores obtained in the survey can be verified, nor placed in the context of scores for other, more relevant, populations.

8.3.3 Social capital

8.3.3.1 Summary of main findings and implications

The survey data suggested that there are some significant differences between Glasgow and Liverpool and Manchester in relation to some (but not all) aspects of social capital. Notably the Glasgow respondents were characterised by lower levels of social participation (in terms of volunteering and, more contentiously, lower levels of religious affiliation) and trust compared to both Liverpool and Manchester, and lower levels of reciprocity compared to Liverpool alone. Some of these differences (e.g. volunteering, neighbourhood trust, aspects of reciprocity) were greatest among those of higher, rather than lower, socio-economic status.

At one level, these differences in social capital are of interest simply because they represent one of the very few data sets with relevance to population health that show Glasgow to be at a potential disadvantage compared to the other cities. As outlined earlier in this chapter (and elsewhere in this thesis), other data have shown remarkable similarities between the cities – particularly between Glasgow and Liverpool – in relation to (for example): income inequalities; adult poverty; child poverty; deprivation; educational attainment; other indicators of the so-called 'social environment' (e.g. lone parent households, teenage pregnancies); many health behaviours (e.g. smoking, diet, obesity); histories of deindustrialisation; population decline; and more. Other data collected in the 3-city survey also confirmed this trait with, for example, very similar levels of optimism, self-efficacy[ccxviii], and childhood experiences, particularly among the Glasgow and Liverpool samples. Thus, where clear differences become apparent, they are of potential interest: and very clear and consistent differences emerge from the analyses of some aspects of social capital.

How might differences in these concepts impact on different levels of health and wellbeing in the populations? The research literature suggests a number of potential causal mechanisms. Some commentators have argued that at the city or state level (as opposed to the neighbourhood level), greater social capital impacts on health via political processes: it is argued that social participation (e.g. in voluntary groups, churches) nurtures skills that can lead to political engagement and activity, and greater political activity across the social gradient results in government policies more beneficial for the least advantaged members of society[228,752-755]: 'who participates in politics matters for political outcomes, and in turn the resulting policies have an important influence on the opportunities available to the poor to lead a healthy life'[228]. However, the 'beneficial' policies

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[ccxviii] Self-efficacy was measured by the Generalised Self-Efficacy (GSE) scale. It has been defined as 'the belief that one can perform a novel or difficult task, or cope with adversity – in various domains of human functioning': it links, therefore, to the notions of optimism (reflecting an 'optimistic self-belief'), aspirations, and social mobility[672,750,751].

described here relate primarily to better government provision of social support: this is less relevant to comparisons of UK cities as welfare policies in the UK are not devolved to local governments[ccxix]. Nonetheless, this is arguably still of potential interest given other evidence from the three-city survey of a more 'politicised' Liverpool sample (in terms of, for example, having been more engaged in anti-government demonstrations in the 1980s[ccxx]), alongside the particular brand of ('Militant') local politics that was evident in Liverpool in that decade. On the other hand, however, the survey also suggested that there were high levels of powerlessness (in terms of belief in being able to bring about change) across all three cities (i.e. including Liverpool), and it is also known from other data sources that political engagement, as measured by voter turnout, is comparably low in all three cities in relation to elsewhere in the UK[ccxxi].

Arguably more relevantly, however, at the neighbourhood level, three mechanisms have been suggested by means of which social capital could potentially impact on the health of populations[756]: social and psychological support processes (i.e. greater social support in times of need, and 'psychosocial processes… providing affective support and acting as [a] source of self-esteem and mutual respect'); more positive health behaviours (i.e. influenced both by informal social control (preventing damaging behaviours such as alcohol and drug abuse), and by an increased likelihood of healthy behaviours such as physical activity being adopted); and provision of access to services and amenities (i.e. based on evidence that

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[ccxix] Kawachi (who is quoted here) cites evidence of greater political engagement correlating with greater care of members of society through more generous social security systems. In contrast, and related to this, 'the lower the levels of trust between citizens, the more hostile the social policies geared toward the poor'[228]. However, evidence is from national and US state governments which have control over welfare legislation, and not from UK local governments which do not.

[ccxx] Respondents were asked whether or not in the 1980s they had attended any public demonstrations about government policies (with demonstrations defined as 'public rallies, meetings, strike actions or other similar events'). In Glasgow and Manchester, only 5% of respondents who had lived through the 1980s reported that they had attended demonstrations of this type. However, the equivalent figure for Liverpool was 14%. Other analyses showed the Liverpool sample to have stronger (more negative) views on the current UK government. For example, 50% agreed or strongly agreed that the UK Government was 'undermining' their city: the equivalent figures for Glasgow and Manchester respectively were 30% and 28%.

[ccxxi] For example, Electoral Commission data show that voter turnout in 2005 Westminster elections was 50% in Glasgow and 48% in both Liverpool and Manchester. These figures compare with 61% for both Scotland and England. These figures are based on Electoral Commission data for the following constituencies: Glasgow Central; Glasgow East; Glasgow North; Glasgow North East; Glasgow North West; Glasgow South; Glasgow South West; Liverpool Garston; Liverpool Riverside; Liverpool Walton; Liverpool Wavertree; Liverpool West Derby; Manchester Blackley; Manchester Central; Manchester Gorton; Manchester Withington.

more socially cohesive communities can safeguard relevant services (e.g. that might be threatened from budget cuts) through effective local action)).

A number of similar, and overlapping, potential pathways have been proposed to explain the apparent links between religious attendance and better health outcomes (including lower mortality): greater social networks, support and integration; less association with damaging lifestyle factors (alcohol, drugs, violence, risky sexual behaviour and so on) through 'social regulation'; and, more specific to religious social capital than other forms, increased psychological resources and coping mechanisms[653,656,757-762]. Linking these forms of social capital further is the fact that religious participation has also been shown to encourage volunteering, itself a component of social participation with known links to better health outcomes[653]. Indeed, a recent (2013) systematic review[763] of the association between volunteering and health suggested benefits in terms of outcomes related to depression, life satisfaction, and wellbeing, with some links to lower all-cause mortality. There is also recent international evidence of lower suicide rates among those of Roman Catholic faith compared to Protestants[764] (something of course also shown historically by Durkheim[723]), and in showing lower than expected rates of suicide in and around Liverpool in their own study (cited earlier), Dorling and Gunnell speculated that this may have been influenced by high numbers of 'practising or believing' Catholics resident in the areas. Unlike their Scottish equivalents, the English questions on religion in the 2001 and 2011 censuses did not differentiate between different Christian religions: thus, it was difficult to assess the validity of the authors' speculation. However, the three-city survey did allow such differentiation and indeed showed that the percentage of the Liverpool sample describing themselves as Catholic was indeed much higher than in Glasgow (and Manchester): 29% compared to 18% (and 12%). Interestingly, the greatest difference was between those living in the most deprived parts of the cities (i.e. quintile 1) where the figures were 41% compared to 20% (and 8% for Manchester) respectively[ccxxii]. This is potentially relevant given that suicide rates tend to be highest in areas of high deprivation[765,766]. That said, however, and as stated earlier,

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[ccxxii] There was a very clear social gradient in Liverpool, ranging from 41% of those in living in the most deprived areas (quintile 1) stating they were Roman Catholic down to 21% in the least deprived quintile (quintile 5).There was no such gradient evident in analyses of the data for Glasgow and Manchester.

there is a considerable weakness in the use of a question based on religious *affiliation*, as opposed to *participation*, in the survey: clearly the one does not necessarily entail the other, as a number of commentators have pointed out[658-661]. Indeed, analysis of the census question on religious affiliation in relation to suicide in Northern Ireland showed no significant association[767].

Aside from these noted differences between the populations in terms of trust, reciprocity and social participation, other results from the analyses of social capital measures are worthy of further comment. The fact that significantly fewer respondents in Glasgow reported ‘problems’ (e.g. vandalism, graffiti, rubbish lying about) in their neighbourhood compared with those in Liverpool and Manchester, a finding generally true of all neighbourhood types (deprived and non-deprived), is of interest, and shows a distinction between the physical and social environments (or perceptions of them) in the cities. It is also important to note the low levels of civic participation evident across all three cities, and (as mentioned above) perceived powerlessness in relation to bringing about change in the neighbourhood and city.

Interpretation of the meaning of the differences in social capital is difficult for two particular reasons. First, it has been suggested that differences in aspects of social capital (including trust and reciprocity) are characteristic of more unequal societies[36,113,224,229]. However, as already discussed, all available data suggests that levels of income inequalities in Glasgow, Liverpool and Manchester (and surrounding areas) are very similar. Second, the fact that some, but not all, aspects of social capital differ begs a number of questions in relation to whether what have been shown are differences between a community construct of overall social capital, or instead differences in selected attributes of individuals. As mentioned in the previous chapter, a topic of much debate in the social capital literature is whether it is an individual or collective attribute. For writers like Portes, for example, its value is very much individual[214], whereas for others like Kawachi and colleagues its value is very much in both: ‘the novel contribution of social capital… lies in its collective dimension, i.e. its potential to account for group-level influences on individual health’[225]. The evidence from the three-city survey does not shed light on this difficult distinction.

8.3.3.2 Comparison with other studies

Social capital has not previously been measured comparably across these three cities. More generally, there are few available data for elsewhere in the UK with which the results of these survey analyses can be compared. In relation to **views on the local area**, the Scottish Household Survey (SHoS)[768] includes a number of relevant questions. They are worded quite differently, however, and are not, therefore, comparable: they ask about whether or not issues (such as graffiti) are 'common' rather than (as the ONS questions put it) being 'problems', which represents a different perception. Some of the same ONS questions are included in the Health Survey for England[769], but city-level measures cannot be obtained from that survey. Similarly, in relation to **civic participation**, there are no other data that offer meaningful comparisons for any of the three cities. The NHS Greater Glasgow Health & Wellbeing (GGHWB)[770] Survey used to ask a question about whether participants had taken any action to solve a local problem, but the question related to the previous three years, rather than (in the case of the ONS question used in the three-city survey) the previous 12 months. Nonetheless, the GGHWB data do at least confirm the general low levels of participation in the city: for example data from the 2002 survey show that for the wider Greater Glasgow area (rather than City of Glasgow local authority area), and over a three year period, only 11% of respondents said they had taken any such action[771]. There are no directly comparable measures of **social networks and support** for the three cities, and the same is generally true of measures of **social participation**. The SHoS does include a detailed question on volunteering, but it includes a much broader set of categories from which to choose compared to the ONS question. As a result, analyses of SHoS data for Glasgow show a higher total percentage of volunteers than that recorded in this three-city survey. However, it seems likely that had that broader set of categories been used for this (three-city) survey, the same relative differences between the cities would have been observed. Indeed, SHoS data for 2008 show volunteering rates for Glasgow to be significantly lower than those of the other main Scottish cities[772]. Comparative data on religious affiliation are available from the census and they confirm the significantly lower rates of affiliation in Glasgow compared to the two English cities[ccxxiii]. Finally, in relation to **reciprocity and trust**, the same question on the likelihood of the return of a lost wallet or purse is included within the General Lifestyle Survey (GLS). This cannot provide city-level data, but comparisons between those national data and the three-city survey suggests that reciprocity (as measured by this question) is likely to be much lower in all three cities than across Great Britain as a whole given that there is a deprivation gradient associated with these kind of measures and Glasgow, Liverpool and Manchester are the three most deprived cities in the UK[ccxxiv]. The GLS was previously known as the General Household Survey (GHS) and one of the few comparative analyses of social capital between Scotland and England was published in 2005 by Bell and Blanchflower using GHS data from 2000-01[773]. These showed very little difference between Scotland and England on most measures: however, the questions analysed were different to those included within the three-city survey[ccxxv]. The British Social Attitudes Survey (BSAS)[624] asks the same ONS question about whether people in general can be trusted, and again comparisons between this data source and the three-city survey suggest levels of trust are low in the three cities compared to the rest of great Britain (as, again, would be expected)[ccxxvi]. Chapter 7 also included analyses of Schwartz's Human Values Scale for the specific values of *benevolence* and *individualism*. No city-level data of this scale are available for comparison. As stated in Chapter 4, however, Schwartz's scale is used within the European Social Survey (ESS), from which

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[ccxxiii] In 2011, the percentage of the adult population in the three cities who answered the religion question to state they had with no religious affiliation was 32% (Glasgow), 19% (Liverpool) and 28% (Manchester). These figures are lower than those reported in the three-city survey: however, as the census question was voluntary, the two data sets are not entirely comparable.

[ccxxiv] As shown in Chapter 7, the percentages of respondents believing it was quite/very likely that their lost wallet/purse would be returned intact were 27%, 40% and 29% in Glasgow, Liverpool and Manchester. In the 2004/5 General Lifestyle Survey the equivalent figure for Great Britain was 67%.

[ccxxv] The GHS measures analysed were: neighbourliness score; local facilities score; network of friends; family network ; not civically engaged. There were no significant differences between Scotland and England in analyses of the first three; Scotland had marginally higher scores than England for the latter two measures.

[ccxxvi] The 2010 BSAS suggested 45% of people across Britain thought 'most people could be trusted' compared with 20.5%, 27.4% and 24.6% in Glasgow, Liverpool and Manchester in this three-city survey. However, that particular BSAS question was only asked of less than 1,100 people across the whole of Great Britain, and this small sample size again highlights the danger of making comparisons between different surveys. The question was also asked in the 2009 Scottish Social Attitudes Survey, and again the national (Scottish) figure was considerably higher than that obtained for Glasgow in the three-city survey, with 45% of men and 58% of women saying that 'most people can be trusted'. However, analysis by area deprivation showed that the figures ranged from 65% in the least deprived fifth of the Scottish population to 31% in the most deprived[774]. The 2009 SSAS had a sample size of less than 1,500[775].

comparisons of scores with the UK and other countries are possible[776]. Reflecting, to a degree, the results shown in Chapter 7, comparisons of scores between Glasgow (from the three-city survey) and the UK (from the ESS), suggest that *universalism* and *benevolence* appeared less associated with the Glasgow sample compared with the UK as a whole[ccxxvii]. Further comparisons can be made with other European countries, although with those data available only at country (rather than city) level, the relevance of such comparisons is questionable.

More generally, other analyses of English survey data have suggested that Liverpool exhibits higher levels of some aspects of social capital that might be expected given its socioeconomic profile[777]. This appears to be reinforced by some of the results presented in the thesis.

8.3.4 Analyses of self-assessed health

Modelling analyses showed that there was very little difference between the Glasgow and Liverpool samples in terms of the percentages classifying their own health as bad or very bad. Similar results can be seen in analyses of census data: as reported in the previous chapter, the 2011 census showed that the percentages of the total populations of Glasgow, Liverpool and Manchester reporting that their health were 'bad' or 'very bad' was 9%, 9% and 7% respectively[564,565], almost identical to the figures for those age 16+ years obtained from the three-city survey[ccxxviii]. This is despite the fact that mortality is considerably higher in the Scottish city and reflects the discussion in Chapter 2 concerning the difficulties of interpreting differences in SAH between UK populations. These difficulties of interpretation extend to the fact that although levels of bad/very bad SAH were lower in Manchester than Glasgow, this difference was not attenuated by the addition of social capital related variables into the models, factors that have been shown in other literature to be associated with a range of health outcomes. To a

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[ccxxvii] As mentioned in Chapter 4, the human values data presented in Chapter 7 were reverse-coded to enhance ease of interpretation i.e. so that higher scores indicated a greater level of association with the value. Published country level data from the ESS have not been reverse-coded, and thus a higher level of association is indicated by a *lower* score. Mean scores for the UK from 2010 for the values of universalism and benevolence were -0.50 and -0.85 respectively. The equivalent non-reverse-coded scores for Glasgow from the three city survey were considerably higher, indicating less association with the values: -0.23 and -0.41.

[ccxxviii] As explained previously, 2011 census data on self-assessed health for the same 16+ years age group were not available for all three cities at the time of writing (only data for all ages were available).

degree, however, this may be explained by the fact that, as described above, the greatest differences in many of the aspects of social capital were seen in comparison of respondents of high SES, among whom the percentages reporting bad/very bad health were similarly low[ccxxix]. The models also confirmed the associations between SoC and LOT-R and self-reported measures of health that have been shown in other studies[738-741,778]. As stated earlier in the thesis, this additional modelling of SAH was undertaken for reasons of comprehensiveness of analysis, and the findings are only of limited interest and relevance to the subject matter of the thesis.

8.3.5 Strengths and weaknesses

As discussed above, the analyses presented in Chapter 7 have identified some potentially important and relevant differences between Glasgow and the two English cities, while at the same time suggesting that two other suggested explanations for excess mortality in Glasgow appear less likely. However, there are a number of important caveats and weaknesses associated with the collection and analyses of these data which have to be acknowledged.

First, the analyses have been based on cross-sectional survey data collected in 2011: these data do not, therefore, allow any measure of impact, or otherwise, on individuals' subsequent health outcomes. Current mortality rates in all three cities have been determined by complex interactions of different factors over decades: to quantify the potential impact of the measures recorded in this survey would require a much larger study to have been established many years ago. Current cross-sectional data drawn from survey samples cannot, therefore, be applied to contemporary whole population level mortality trends. This complexity is highlighted by some of the results presented in this thesis: as discussed above, measures of both optimism and SoC, which have been shown to be significantly associated with health outcomes, were found to be lower in Manchester compared with Glasgow, despite mortality rates being considerably higher in the Scottish city. SoC was also lower in Liverpool, another city with lower mortality rates than Glasgow. Although, for interest, statistical models were run to examine health

[ccxxix] For example, among those living in the least deprived areas of Glasgow and Manchester, only 5.6% (CIs 2.9%, 8.3%) and 3.7% (CIs 1.4%, 6.1%) of the Glasgow and Manchester samples respectively reported bad or very bad health.

related outcomes, as the latter were self-assessed measures of health, and not mortality, the results are of limited relevance to the thesis for reasons explained previously.

Second, any population survey, especially one based on such a sample size and with an overall 55% response rate, is unlikely to be *entirely* representative of its target population: we have to be aware that it is probable that not all sections of society are represented within the collected data. Furthermore, Chapter 7 showed that there are some important differences between the socioeconomic profiles of the samples compared to those produced by other data sources including the 2011 census; and Manchester's sample was particularly problematic in this respect, being over-represented by the unemployed and some economically inactive groups of that city's population. Indeed, an additional potential weakness is that the latter discrepancies could not be corrected for by means of further weighting for socio-economic factors as 2011 census data at the required geographical level (output areas) were not available at the time of undertaking the analyses (and remain unavailable for Scotland at the time of writing).

Equally, however, the considerable strengths of this work should not be overlooked. A population survey of this type arguably offers the most practical means by which to capture and compare data relating to the hypotheses under investigation for the total populations of three large post-industrial cities. The response rate is better than that achieved in many other local[779,780], regional[781-783] and even national[623,784] surveys, and this relatively high rate was obtained across all neighbourhood types (deprived and non-deprived) in all three cities. Comparisons with other data sources show that for many characteristics, the survey samples *are* highly representative, while all the analyses that were undertaken entailed a multivariate regression modelling component, ensuring that any reported differences between the cities were independent of the characteristics of the survey samples. Furthermore, as mentioned in Chapter 2, recent analyses of Scottish and English health survey data, based on samples with similar response rates to the three-city survey, show very clear evidence of 'excess' mortality among Scottish, compared to English, respondents, levels of which are on a par with those seen in analyses of 'total' population registries[456]. Thus, populations at risk of higher rates of mortality have been shown to be included within, not excluded from, these types of surveys, emphasising the usefulness and appropriateness of this type of data collection exercise.

Other strengths include the fact that all the questions analysed within this thesis were based on previously validated survey scales or question-sets, and the rigorous statistical modelling analyses was additionally strengthened through comparison with the results of multilevel modelling for a number of key models – and which produced near identical results to those from non-multilevel models. Finally, an important strength is that the analyses have, for the first time, enabled examination of evidence relevant to a number of theories that have been proposed to explain excess mortality in Glasgow, including one suggested within national government documents.

8.4 Conclusions and implications

This thesis has presented the results of a range of new epidemiological analyses, comparing the populations of Glasgow, Liverpool and Manchester in relation to mortality, poverty and other measures potentially relevant to health. What are their implications in terms of advancing our understanding of the reasons for Glasgow's higher levels of mortality?

To be clear, the analyses presented within the thesis do not provide the much sought after solution to the conundrum of Glasgow's excess mortality. However, alongside existing knowledge of the key determinants of health and health inequalities, they perhaps provide some pertinent clues as to the identity of some contributory factors, as well as suggesting that some other factors may be less relevant.

In assessing these clues, it is difficult to avoid indulging in further speculation. There has been no shortage of such conjecture in recent times. Aside from the many theories discussed above in section 8.2.2, the author of this thesis has been the recipient of an extraordinary number of communications proposing potential explanatory theories. These hypotheses have ranged from land contamination and abortion rates, rainfall and water quality, through to a lack of vegetables (specifically, runner beans) and the existence of a general 'curse' on the city. Even

The Economist magazine, writing about Glasgow's excess mortality in 2012, unhelpfully suggested that it was 'as if a malign vapour rises from the Clyde at night and settles in the lungs of sleeping Glaswegians'[785]. It is not useful to add to this level of speculation, and it is not the role of this thesis to do so. However, there is a contrast to be made between non-evidence based supposition, and more nuanced judgements based on the provision of new data and knowledge. This final section of the thesis will concentrate on the latter and seek to avoid the former.

Note that work of this nature does not lead to a set of conclusions and recommendations which can be easily set out in succinct bullet points. However, for the sake of completeness, and to provide a very brief synopsis of the complex issues discussed in this thesis, a set of summary conclusions and recommendations are presented at the end of the chapter in Box 8.1 in Box 8.2 respectively.

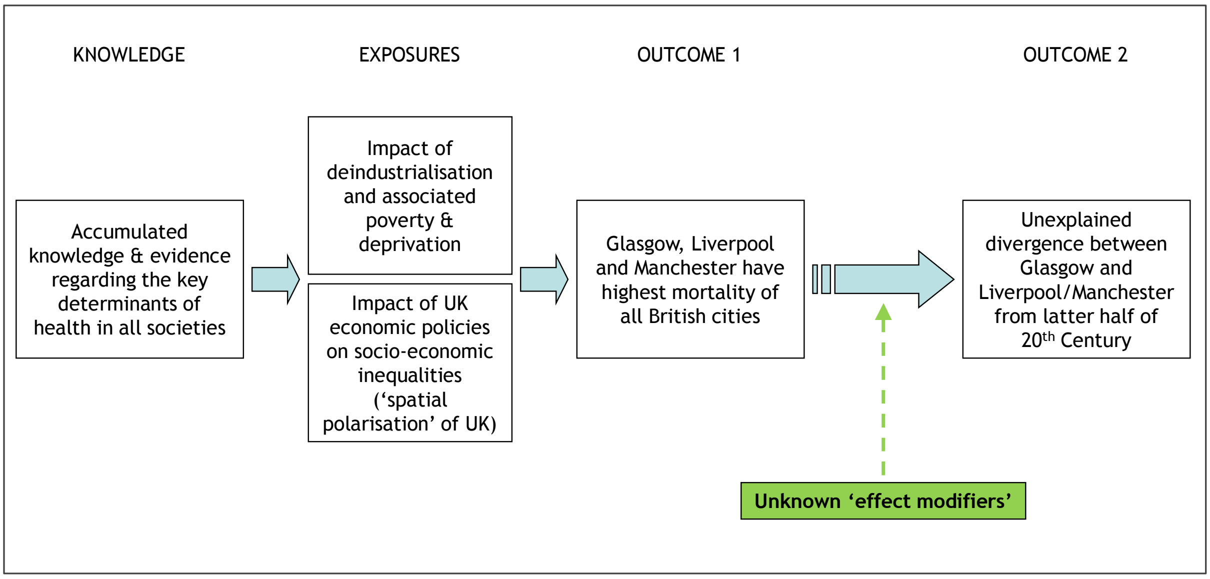
From the entirety of the material presented within this thesis, several lessons have emerged. First, excess mortality in Scotland and Glasgow is a deeply complex phenomenon. It has been observed across most age groups, males and females, all social classes and relating to different causes of death. The explanation, therefore, will be equally complex and multifactorial. Indeed, if this were not the case, given the amount of research already undertaken, the causes would surely have already been identified.

Second, there are a number of previously suggested explanations that now, on the evidence accumulated by means of the three-city survey, appear rather implausible. The 'individual values' of the city's population and the notion of Sense of Coherence can surely be included within that list.

Third, as emphasised previously in this chapter, our understanding of the main determinants of health across all societies is well developed. Socio-ecological models of health determinants such as those of Dahlgren & Whitehead and Evans & Stoddart (and many other variations of the same theme) have been derived from, and applied to, a great many diverse epidemiological studies in a variety of settings and across different time periods. They are based on an accumulation of knowledge, evidence and observation; there is a universality of their meaning, relevance and application. It is therefore extraordinarily unlikely that explanations for differences in health between Glasgow and other UK cities will lie beyond this existing knowledge. It is possible that the causes will relate to less obvious facets of, or more complex interactions between, the principal recognised determinants of population heath, but they will still surely lie with those main determinants.

Fourth, alongside – and intertwining with – existing knowledge, history is also important. Chapter 2 emphasised that of all the determinants of health and health inequalities, the most important are socio-economic: that chapter, as well as Chapter 5, described elements of the socio-economic history of the UK, and Glasgow, Liverpool and Manchester in particular. This included the widening of income inequalities in Britain and the 'spatial polarisation of the UK' that took place over the last two decades of the 20th Century (and continues still in the first two decades of the 21st Century), whereby disadvantaged areas (including large parts of Glasgow, Liverpool and Manchester) became relatively more disadvantaged in contrast to other areas which became 'disproportionately wealthier'[79]. The histories of Glasgow, Liverpool and Manchester in terms of continuing and accelerating deindustrialisation, the associated levels of poverty and deprivation, their relative decline within that context of widening inequalities in recent decades, are central to our understanding of the changes in the cities' population health status. This combination of knowledge, history and their interaction with the unknown drivers of additional mortality is represented in Figure 8.2.

Figure 8.2 The context for excess mortality in Glasgow



In epidemiology, if a statistical relationship between an 'exposure' (e.g. a risk factor such as smoking) and an outcome (e.g. lung cancer) differs because of, and according to the values of, a third variable, the latter is known as an 'effect modifier'[786]. Thus, Figure 8.2 shows that we know why, in general terms, Glasgow, Liverpool and Manchester have the poorest health of any British cities ('outcome 1' above): their 'exposures' are deindustrialisation and poverty in tandem with, and related to, the effects of UK economic policy. The second 'outcome' is a divergence between Glasgow and the two English cities, an outcome quantified in terms of the standardised mortality ratios and mortality time trends which were presented in Chapter 6. The unknown 'effect modifiers' that have influenced the divergence between Glasgow and the two English cities are what lies at the heart of this thesis. Although they remain unknown, some clues as to their identity have perhaps emerged from some of the material contained within this thesis.

The first potential clue lies in the results of the analyses presented in Chapter 6 showing differences in the levels of excess mortality between deaths at all ages and those occurring under 65 years of age (premature deaths). As summarised earlier in this chapter, for deaths at all ages the excess was smaller, and fairly consistent across different area types (deprived and non-deprived neighbourhoods); for premature deaths the excess was higher, and higher still in comparison of those living in the more deprived areas. A similar pattern for premature mortality has been shown in national analyses (Scotland vs. England) based on social class rather than area deprivation (Figure 2.11 in Chapter 2). This might suggest that the 'excess' mortality may be explained by two different sets of phenomena, albeit with overlapping elements: one affecting the whole social spectrum, and another more specifically impacting on mortality among Glasgow's more deprived population in a particular way. Linking this once more to what is known about the determinants of health and the importance of socio-economic factors within that understanding, this might suggest that the reality, the so-called 'lived experience', of living in materially and socially disadvantaged circumstances in Glasgow and Scotland is not truly captured by routine indicators of poverty and deprivation. The analyses of cause of death presented in Chapter 6 support this: the excess levels of premature mortality are driven to a large degree by deaths from alcohol, drugs and suicide. These might be described as the 'diseases of despair' associated with people living with, and attempting (or failing) to cope with, difficult circumstances.

This, however, is not a clear-cut explanation. As stated above, there are similar levels of poverty across the cities. This has been shown using a wide range of different measures, and based on a variety of different definitions and sources. Furthermore, the profiles of the cities in relation to other social factors linked to poverty (e.g. education, lone parenthood, teenage pregnancy) are also very similar. Thus there is considerable evidence that suggests that the cities do not differ in terms of levels of deprivation. However, the weight of other evidence suggests that there are likely to be additional, unmeasured, aspects associated with living in deprivation that are more prevalent among the Glasgow population compared to those living in the English cities.

Related to this, the analyses of overcrowding (in particular the historical analyses) suggest that there may have been (and still are), differences in the conditions in which the populations of the cities have lived which are not identified from data relating to income, unemployment or social class alone.

Further potential clues are provided by analyses of the survey data presented in Chapter 7 (together with knowledge of other research). It seems plausible that some protective factors may be at work in the two English cities in comparison with Glasgow. For example, aspects of social capital may be protective for Liverpool in particular, given the significantly higher levels of social participation, trust and reciprocity evidenced for the city, and the previously amassed knowledge of the benefits of these factors for population health. This may extend to the more politicised nature of the Liverpool sample, as well as even to the suggestion, from Gunnell and Dorling[689], that religious social capital may play a part in this.

Some elements of social capital (trust, social participation) may also be protective for Manchester residents relative to those of Glasgow, as might the city's greater ethnic mix (as discussed earlier in the chapter).

The social capital analyses also showed that some of these differences between Glasgow and the two English cities (in particular Liverpool) (e.g. volunteering, neighbourhood trust, aspects of reciprocity) were greatest in comparison of those of higher, rather than lower, socio-economic status. Thus it is possible that any protective element of social capital may apply particularly to those living the least deprived areas of the English cities. Part of the explanation for the excess seen for deaths at all ages, and equally affecting those living in less deprived circumstances, may therefore relate to differences in social capital – alongside a range of various other factors. These latter additional ‘effect modifiers’ are likely to be interactions of factors either not yet investigated, or possibly too intangible to be identified from previous research. These might include cultural differences (for example, relating to other three-city survey evidence of more materialistic values in the Glasgow population[ccxxx]), cultural influences on diet[ccxxxi], and socio-cultural influences on some of the other main determinants of health.

The role of history – highlighted as important for population health by a number of authors[789-791] – may also offer additional clues. This thesis has already touched on aspects of history (e.g. the experience of deindustrialisation, the widening inequalities in the UK over the course of the late 20th Century in the UK, different housing conditions in terms of overcrowding), and other historical factors may play a part in explaining some aspects of Glasgow’s divergence, as illustrated in Figure 8.2. The experience of Glasgow in the latter half of the 20th Century and early part of the 21st Century, described very briefly in Chapter 5 but brought to life more vividly and more insightfully in a number of personal accounts[792,793] and social histories of the city[577,590] , that of slum clearances on a massive scale, the creation of large peripheral housing estates, the uprooting of sections of the population and the dismantling of existing social networks and communities, the poor quality of houses built, was, as Chapter 5 made clear, an experience shared by Liverpool and Manchester (as well as other UK cities). However, although this has never been quantified, it seems likely that the scale of this change was larger in Glasgow than in the two English cities, thereby impacting on greater numbers of people (both in absolute terms, and proportionately relative to the size of the cities and their

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[ccxxx] The issue of materialism may be relevant, given the association between materialism and measures of life-dissatisfaction, depression, anxiety, and alienation[663,736,787].
[ccxxxi] As one small example, there is some evidence that salt consumption (which is linked to variations in blood pressure) is higher in Scotland than in England & Wales[788].

populations) [794-796] [ccxxxii]. This may also be relevant to some of the differences in social capital presented in Chapter 7, although without any comparative historical measures of social capital, it is impossible to be sure.

This historical element could perhaps link to, and overlap with, other potentially influential factors, including some discussed in section 8.2 above. For example, alongside other actions of local government (including its response to national UK economic policies) it might form part of the explanation as to why Glasgow may have been more susceptible to the negative impact of those UK economic policies compared to cities such as Liverpool and Manchester: the city may therefore have experienced cumulative corrosive effects on the health and wellbeing of its population. A city already reeling from the effects of a greater dose of one negative series of events may have then been more greatly affected by the next. However, although a number of aspects associated with this suggestion are the focus for ongoing research, this remains utterly speculative; and as with other speculation regarding the causes of Scotland's and Glasgow's excess mortality, it is fraught with difficulties and unanswered questions. For example, to what extent would such historical influences explain higher mortality in subsequent generations? Furthermore, as explained in Chapter 2, excess mortality is seen in all parts of Scotland compared to England & Wales, not just Glasgow: thus, explanations relating solely to Glasgow are clearly limited in this regard. That said, it is clear that the explanation for excess mortality will be multi-factorial, and in terms of city-specific (rather than whole country) comparisons, what has been outlined above may be a plausible explanation for some aspects of the excess, as is what has been hinted at by some of the new analyses undertaken and presented within this thesis.

However, what remains beyond doubt and speculation is the scale of Glasgow's (and Scotland's) 'excess' mortality, the impact it has on individuals and communities alike in terms of shortened and wasted lives, and the urgent need, therefore, to understand and address this situation. Chapter 2 included reference

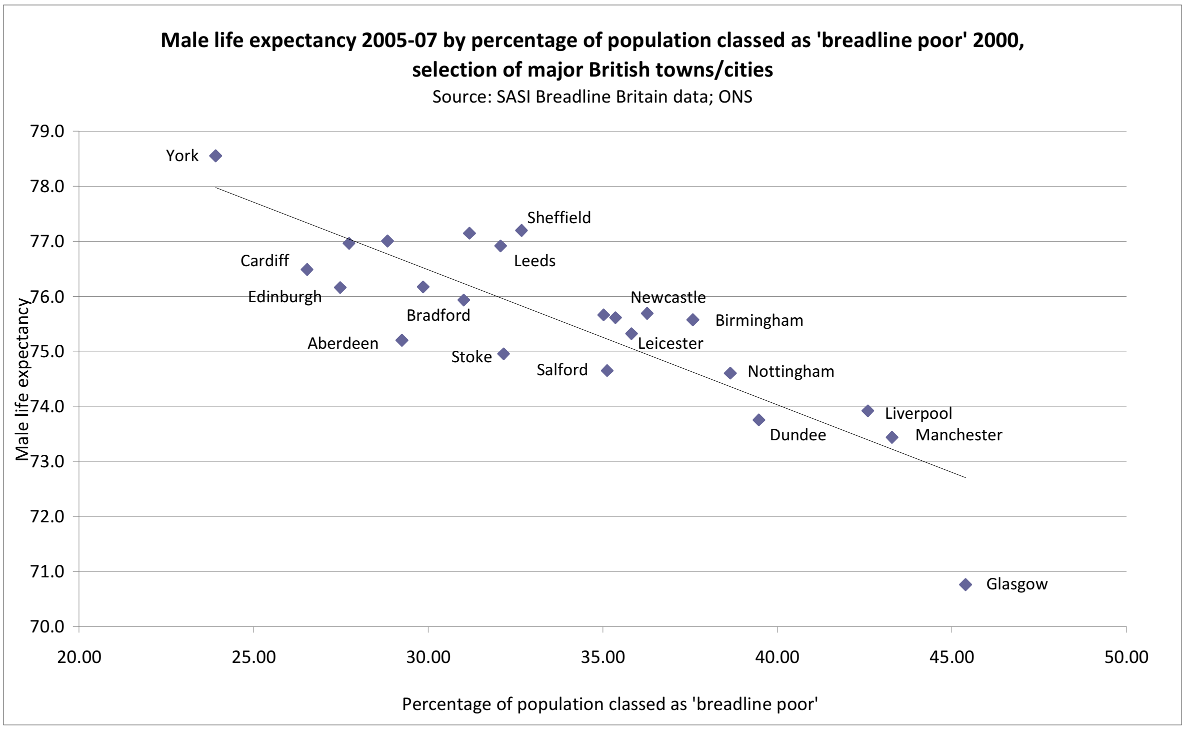
[ccxxxii] As mentioned in Chapter 5, this is the subject of ongoing research, early indications of which seem to confirm experts' and researchers' views (cited above) that this scale of change was indeed greater in terms of: demolitions between the mid-1950s and mid 1980s; movement of population to peripheral estates; movement of population (and of different types of population) to New Towns.

to the report by the WHO's Commission on Social Determinants of Health[42]. In relation to the social gradient in health across all countries, the authors stated: 'It does not have to be this way and it is not right that it should be like this… Social injustice is killing people on a grand scale'. In a country (Scotland) and especially a city (Glasgow) where people of all classes die younger than in other parts of the UK, and in particular where people living in the most disadvantaged circumstances die considerably younger than their peers down south, this quotation seems strikingly relevant. It does not have to be this way and it should not be this way.

Linking this further to the work of the WHO commission, it is important to stress, however, that seeking an understanding of the excess must be alongside, not in place of, efforts to reduce poverty and deprivation, the fundamental drivers of poor health in any society (a point emphasised throughout this thesis). The final chart (Figure 8.3) emphasises this point by presenting male life expectancy in the mid-2000s[797] for some of the major UK towns and cities alongside the percentage of population of each that was classed as 'Breadline poor' in 2000 in the study by Dorling *et al.* discussed earlier in the thesis. Although a number of caveats apply to combining these data[ccxxxiii], they helpfully demonstrate two key points. First, despite the cities having very similar levels of (this measure of) poverty – 45% of the population in Glasgow, 43% in both Liverpool and Manchester – Glasgow has considerably lower life expectancy: it is an 'outlier' in this respect, and this is another illustration of the excess levels of mortality in the city described within this thesis. Second, even if Glasgow had the same life expectancy as those two English cities, it would still be considerably lower than that of any other UK city (e.g. York, Cardiff, Edinburgh): this is because of the fundamental link between poverty and poor health, a link that should not be forgotten in seeking to understand the causes of excess mortality in Scotland and Glasgow.

[ccxxxiii] As was done with some of the analyses of these data in Chapter 6, the 'Breadline poor' data at census tract level (defined in Chapters 2 and 4) were aggregated to 'best-fit' local authority areas. Thus, the exact boundaries of these areas will not exactly match those at which the ONS data for life expectancy have been calculated. However, differences will be minimal. Note also that, for simplicity, London is not included in the Figure, as that city is obviously made up of a number of different local authority areas.

Figure 8.3


Male life expectancy 2005-07 by percentage of population classed as 'breadline poor' 2000, selection of major British towns/cities
Source: SASI Breadline Britain data; ONS
Male life expectancy
79.0
78.0
77.0
76.0
75.0
74.0
73.0
72.0
71.0
70.0
York
Sheffield
Cardiff
Leeds
Edinburgh
Newcastle
Bradford
Birmingham
Aberdeen
Leicester
Stoke
Salford
Nottingham
Liverpool
Dundee
Manchester
Glasgow
20.00
25.00
30.00
35.00
40.00
45.00
50.00
Percentage of population classed as 'breadline poor'

Box 8.1 Summary of conclusions

- Glasgow, Liverpool and Manchester are three cities which share similar histories and appear to share very similar current socio-economic profiles.
- Despite this, and despite the known link between deprivation and population health, the mortality profile of Glasgow is quite different to that of the two English cities. After statistical adjustment for any remaining differences in income deprivation, premature deaths (<65 years) in the period 2003-07 were 30% higher in Glasgow compared to Liverpool and Manchester, with deaths at all ages almost 15% higher.
- As currently measured, therefore, socio-economic deprivation does not appear to explain the differences in mortality between the cities. There is a high level of ‘excess’ mortality in Glasgow compared to the English cities.
- This excess is seen across virtually the whole population: all adult age groups, both genders, and among those living in deprived and non-deprived neighbourhoods. However, there is a difference between the excess observed for deaths at all ages, and that observed for premature deaths. For the former, the near 15% higher mortality was fairly evenly distributed across deprivation deciles, with the greatest contribution (in terms of causes of death) being from cancers and diseases of the circulatory system; in the latter case the excess was much higher in comparisons of those living in the more, rather than less, deprived areas (particularly men), and was driven in particular by deaths from alcohol, drugs and suicide.
- Importantly, the excess appears to be increasing over time.
- Many theories have been proposed to explain the excess. On the basis of analyses included within this thesis, it seems highly unlikely that two of these – relating to Sense of Coherence and ‘individual values’ (in particular, optimism) – play a part. However, it is possible that differences in aspects of social capital (a third potential explanation examined within this research) may play a part in explaining some of the excess, particularly that observed in comparison of *less* deprived populations.
- More generally, it is clear that excess mortality in Scotland and, in particular, Glasgow is a deeply complex phenomenon. The causes will be

equally complex and multifactorial. However, given the wealth of research into, and knowledge of, health inequalities across the globe, it is highly unlikely that the causes lie beyond current understanding of the main determinants of health and health inequalities.

- Given the fundamental link between deprivation and mortality, it seems likely that the nature of socio-economic deprivation experienced by sections of Glasgow's population is not fully captured by the measures employed within this research (nor by those used in the many other studies which have demonstrated excess levels of mortality among Scottish populations). More speculatively, the role of history may be important in seeking to identify the potentially different, unmeasured, facets of deprivation experienced by people in Glasgow compared to those in Liverpool and Manchester. It is also possible that protective factors (relating to, for example, ethnicity and social capital) may be at work in the two comparator English cities. However, given that excess mortality has been shown for all parts of Scotland compared to England & Wales, and not just Glasgow, this is not in any way a complete explanation.

Box 8.2 Recommendations

- Given the high levels of excess mortality that have been observed and, importantly, the fact that the excess appears to be increasing over time, it is paramount that research into this phenomenon continues: an understanding of its causes is desperately required.
- That research should focus, in part, on the potentially unidentified aspects of the experience of living in deprivation in Glasgow compared to Liverpool and Manchester.
- Other elements of future research (all potentially overlapping) should include: historical influences, the 'political economy' (including the role of local government), and causal mechanisms relating to social capital and its influence on health in the three cities. Potentially complex interactions

between the main determinants of health, and their development over time, should also be studied.

- Given this need for further research, there are as yet no clear, specific, implications for policy makers that emerge from the analyses undertaken to date. Nonetheless, given the level of excess mortality that has been shown, there is a need for those in policy circles to be aware of developments in this area, and to be informed by existing and future evidence, rather than by speculation.
- It is of utmost importance that further research into excess mortality must be carried out alongside, and not in place of, increased efforts to reduce poverty and deprivation, the fundamental drivers of poor health in Glasgow – and in any society.

Appendices

Appendix I: contributions of individuals to the work presented in the thesis

Components of work	Relevant research questions	Contributions
Literature review	n/a	All undertaken solely by the author
Creation (and comparisons) of a small-area deprivation measure for Glasgow, Liverpool and Manchester	1. How comparable are the deprivation profiles of Glasgow, Liverpool and Manchester?	All undertaken solely by the author (using data supplied by organisations listed in Chapter 4).
Analyses of deprivation and mortality data for Glasgow, Liverpool and Manchester.	2. Controlling for differences in area-based deprivation, how do the health (mortality) profiles of the three cities compare? 3. If there is evidence of higher mortality in Glasgow, is this restricted to certain sections of the population, or is it a city-wide effect? 4. Are there particular differences between the cities in relation to particular causes of death?	All undertaken solely by the author (using data supplied by organisations listed in Chapter 4).
Historical trends in deprivation and mortality	5. At the city level, what do historic trends in deprivation and mortality show?	All undertaken solely by the author (using data supplied by organisations listed in Chapter 4).
Comparisons with elsewhere in Scotland, and with other English cities	6. To what extent does the employed measure of deprivation explain differences in mortality between Glasgow and the rest of Scotland, and between Glasgow and other large English cities?	All undertaken solely by the author (using data supplied by organisations listed in Chapter 4).
Summarising the potential explanations for ‘excess’ poor health in Glasgow	7. What explanations have been proposed to explain any additional poor health seen in Glasgow?	The summary presented in Chapter 8 was written solely by the author, but, as stated, referred to material originally summarised in publications by McCartney *et al*[538,539] (of which

Components of work	Relevant research questions	Contributions
		the author of this thesis was also a co-author).
Collecting and analysing new data from a survey of the populations of Glasgow, Liverpool and Manchester.	8. What can new population survey data tell us in regard to some of the more plausible hypotheses that have been put forward to explain Scotland's and Glasgow's 'excess' mortality? 9. Using new survey data, and appropriate statistical methodologies, can we show significant differences between the three cities for any of these newly measured factors (and while controlling for a range of area-based and individual characteristics)?	This entailed a number of different components, as listed in Chapter 4: • **Questionnaire design**: a review of existing survey questions and scales relating to the hypotheses of interest was initially led by Ruth McLaughlin of GCPH, alongside the author of this thesis, Gerry McCartney of NHS Health Scotland (NHSHS), Phil Hanlon of Glasgow University and Carol Tannahill (also GCPH). The initial questionnaire which emerged from this review was then modified following further discussion with the above group, as well as with Sarah McCullough (NHSHS) and Russell Jones (GCPH), both of whom were involved in the commissioning of the survey (discussed below). • To expand knowledge of the survey scales chosen to measure the particular hypotheses, **additional literature searches** were undertaken: these were carried out solely by the author (and are described in Chapter 4). • **Ethical approval** for the survey was obtained solely by the author. • The **commissioning of the survey** was undertaken by a group comprising of the author of this thesis, Gerry McCartney, Sarah

Components of work	Relevant research questions	Contributions
		McCullough, Russell Jones as well as Catherine Ferrell, of the MRC/CSO Social and Public Health Sciences Unit at Glasgow University. • The **data collection** for the survey was undertaken by AECOM Social and Market Research, as described in Chapter 4. • The **analyses of all the survey data** was undertaken solely by the author. However, statistical advice was provided by Duncan Buchanan, ISD Scotland, and the additional multilevel modelling (shown in Appendix IX) was undertaken with assistance from Maria Gannon and Mark Livingston at the Department of Urban Studies, University of Glasgow. Note also that, as stated, the tabulated data presented in Appendix V are taken from analyses presented with the AECOM report cited earlier[557] rather than from the author's own analyses.

Appendix II: individual city mortality comparisons

Standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to Liverpool & Manchester (combined and separately).

Standardised by five-year age band, sex and 3-city income deprivation decile.

		SMRs (95% confidence intervals)		
Gender	Age	Liverpool & Manchester combined	Liverpool only	Manchester only
Males & Females	**All ages**	114.4 (113.2, 115.5)	112.6 (111.4, 113.7)	115.7 (114.5, 116.9)
	0-64 years	131.4 (128.6, 134.1)	136.0 (133.1, 138.8)	125.8 (123.2, 128.5)
Males	**All ages**	122.4 (120.6, 124.2)	123.0 (121.2, 124.9)	120.7 (119.0, 122.5)
	0-64 years	135.6 (132.0, 139.1)	142.6 (138.9, 146.3)	127.8 (124.4, 131.1)
Females	**All ages**	107.7 (106.1, 109.2)	104.2 (102.7, 105.7)	111.4 (109.8, 113.0)
	0-64 years	124.4 (120.0, 128.8)	125.4 (121.0, 129.8)	122.5 (118.1, 126.8)

Appendix III: cause specific SMRs for deaths at age 0-64 years

Standardised mortality ratios for particular causes of death, 2003-07, Glasgow relative to Liverpool & Manchester for ages 0-64 years: standardised by five-year age band, sex and 3-city income deprivation decile.

Figure AIII.1: males and females

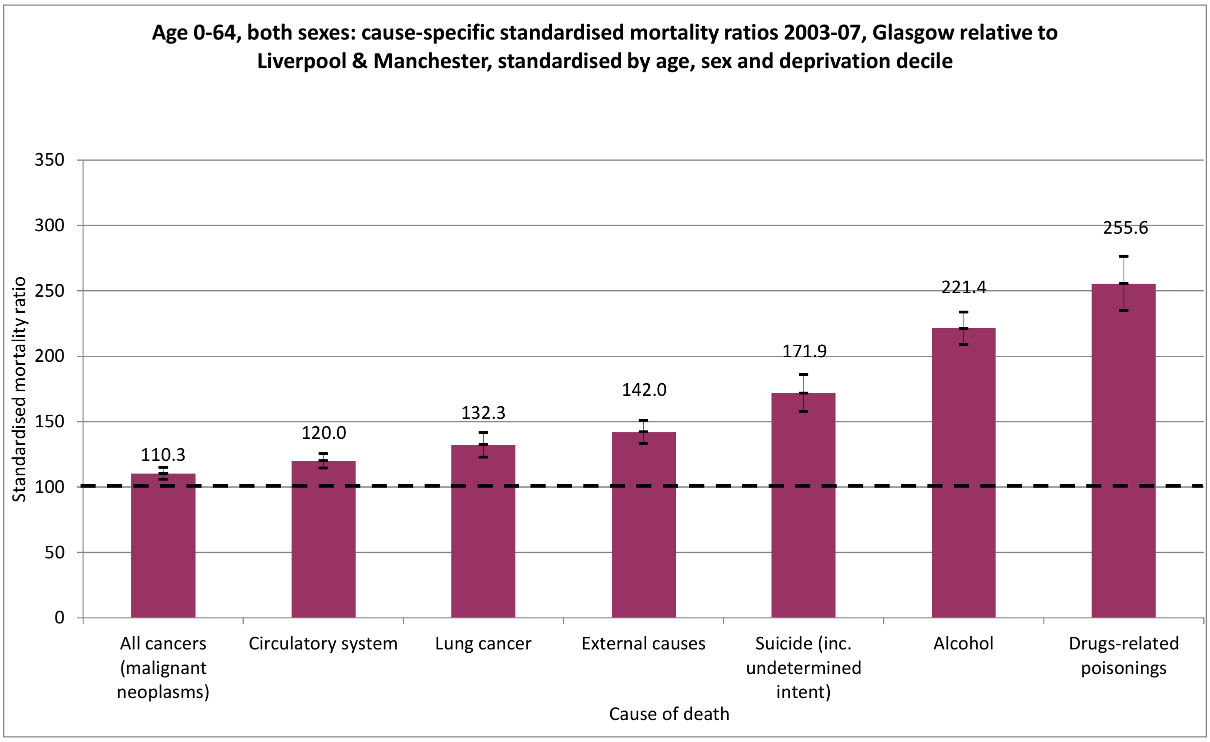


Figure AIII.2: males only

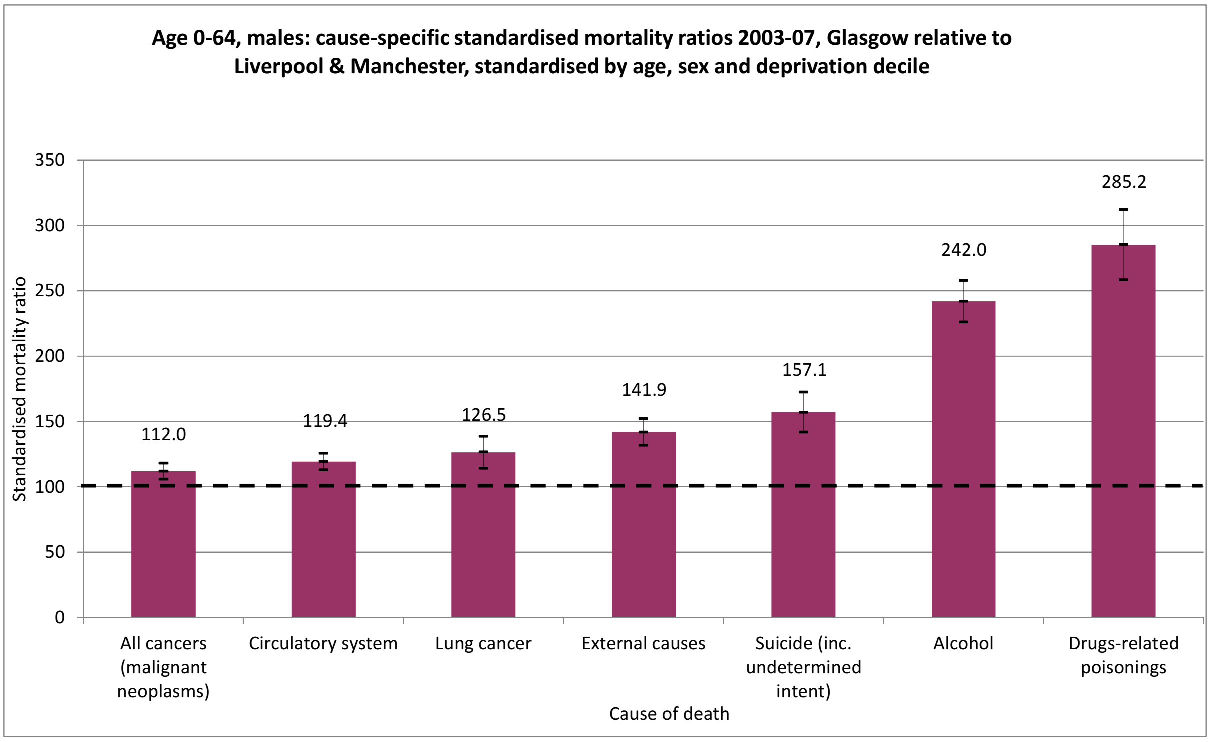
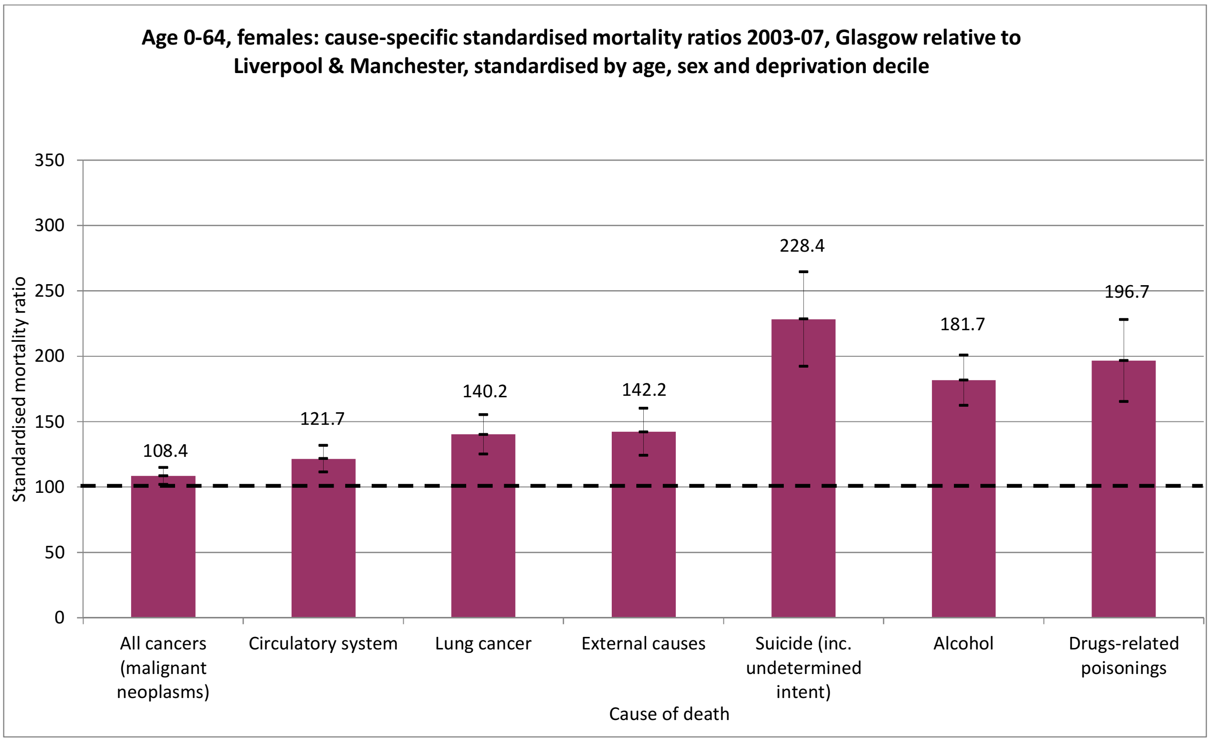


Figure AIII.3: females only



Appendix IV: survey representativeness - additional comparisons with census and other survey data

Chapter 7 provided an overview of the representativeness of the three survey samples, drawn from comparisons with census and other survey data. This very brief Appendix provides details of additional comparisons not presented within that chapter. These relate to: age; gender; educational attainment; and marital status.

With regard to **age and gender**, as stated in Chapter 7, the survey samples under-represent the young (especially in Manchester) and over-represent the elderly; however, these are corrected through the application of the survey weighting. Figures AIV.1, AIV.3 and AIV.5 show the *unweighted* age and gender breakdown of the three samples compared to published population estimates from ONS (Office for National Statistics) for 2010. Figures AIV.2, AIV.4 and AIV.6 show the same comparisons, but based on the *weighted* survey data.

Figure AIV.1

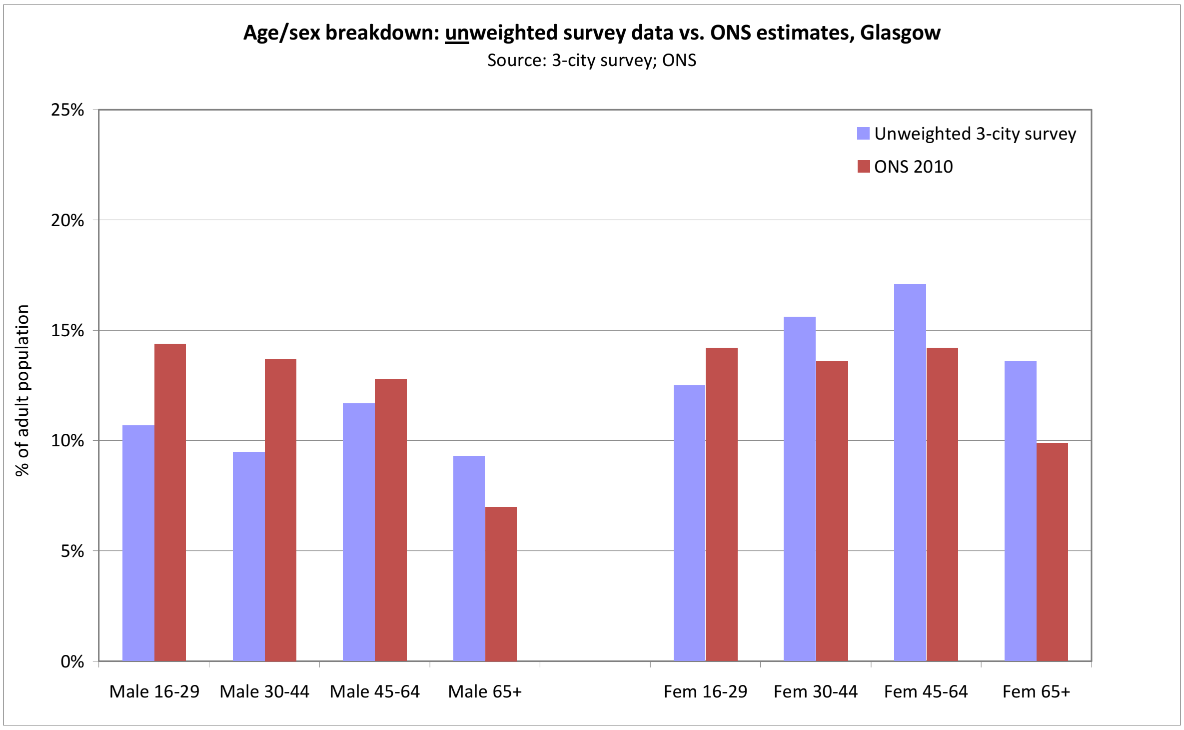


Figure AIV.2

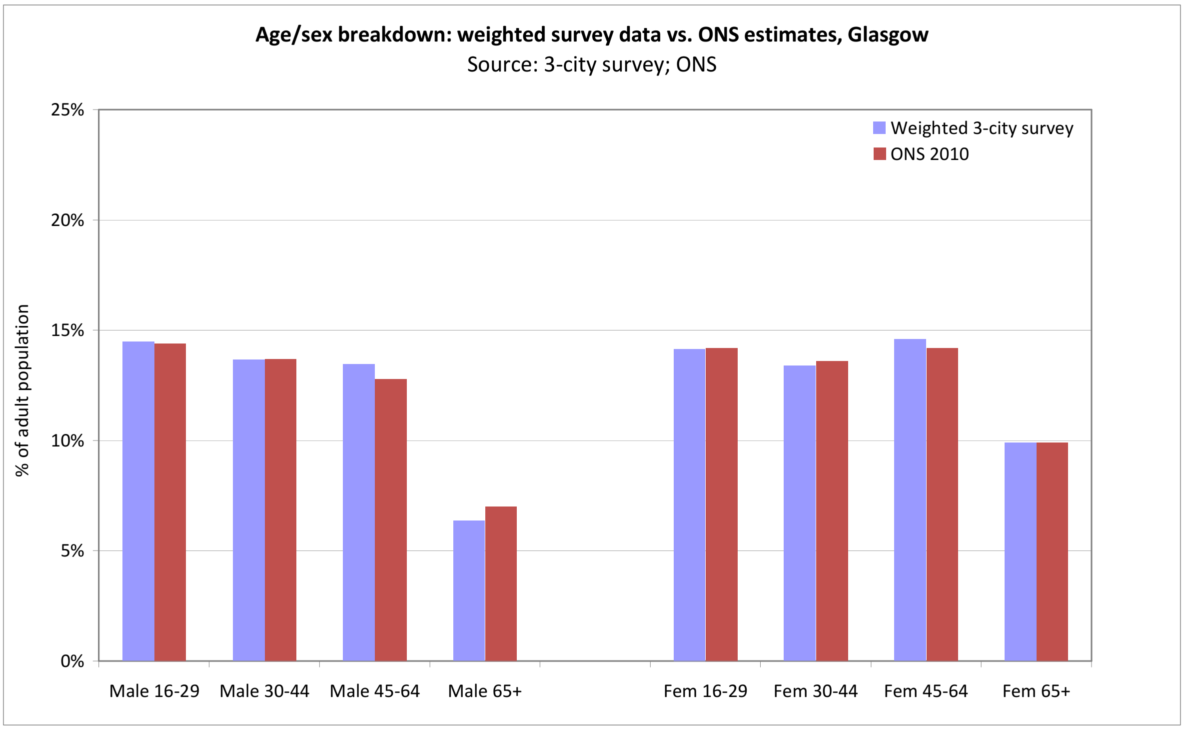


Figure AIV.3

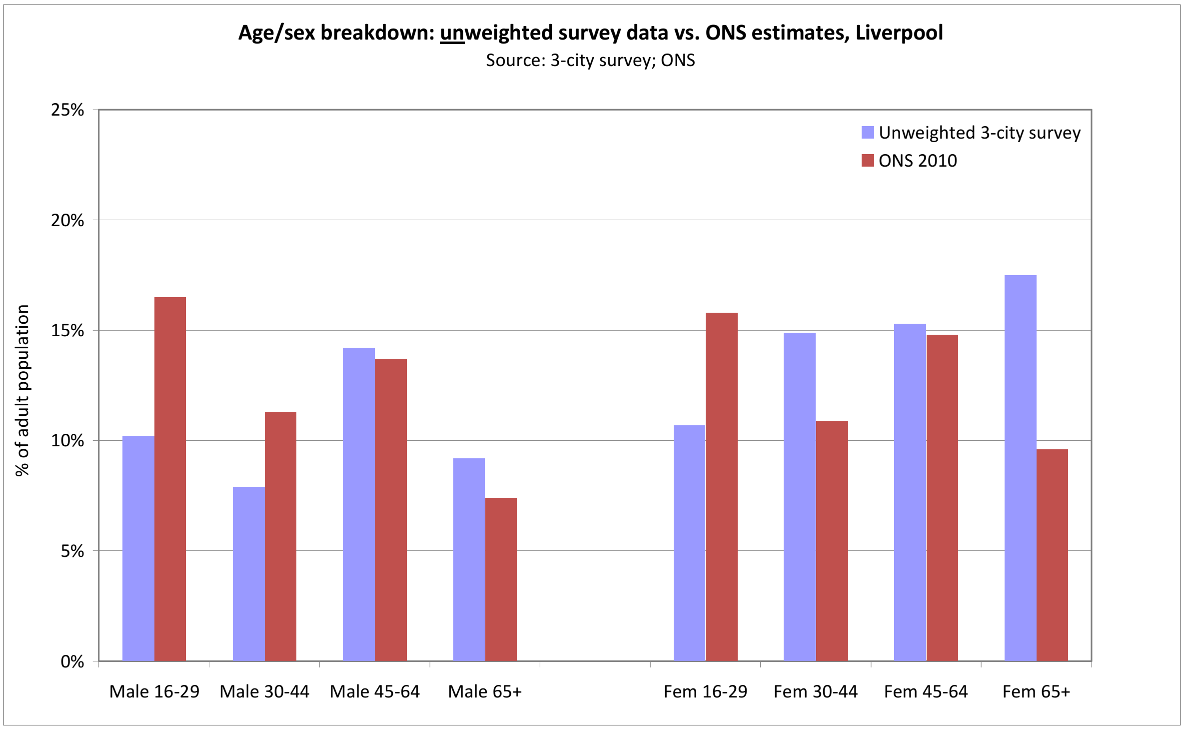


Figure AIV.4

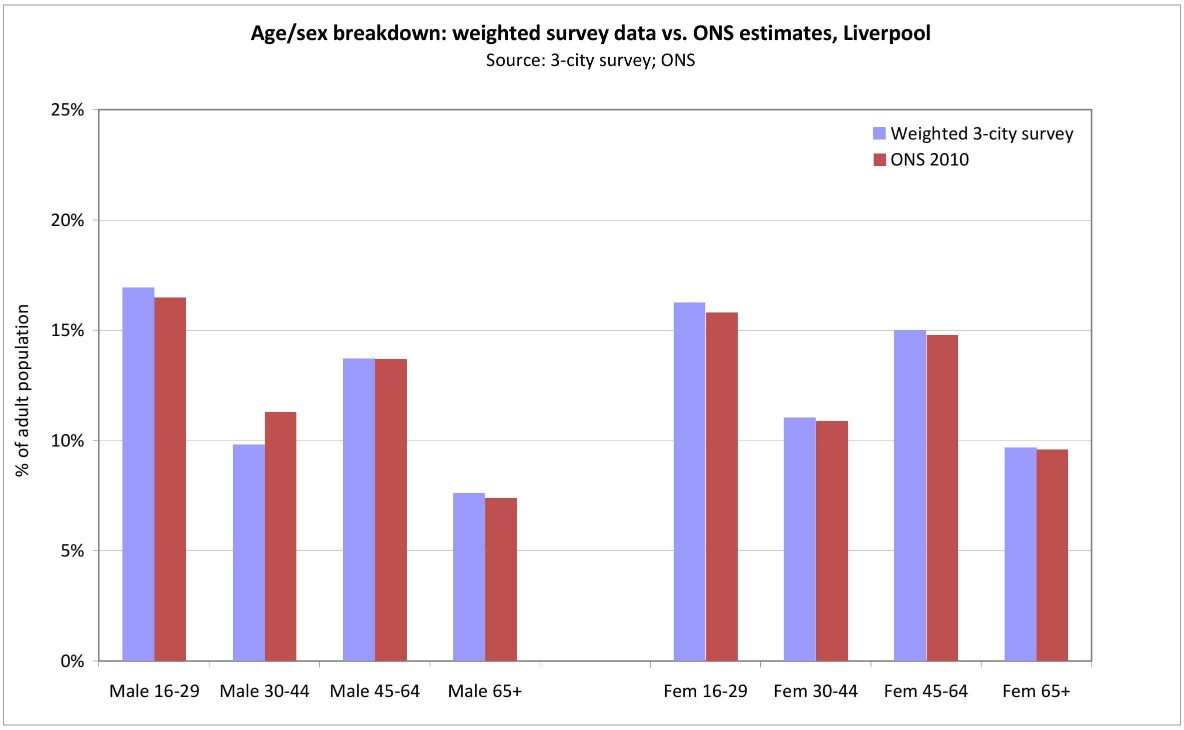


Figure AIV.5

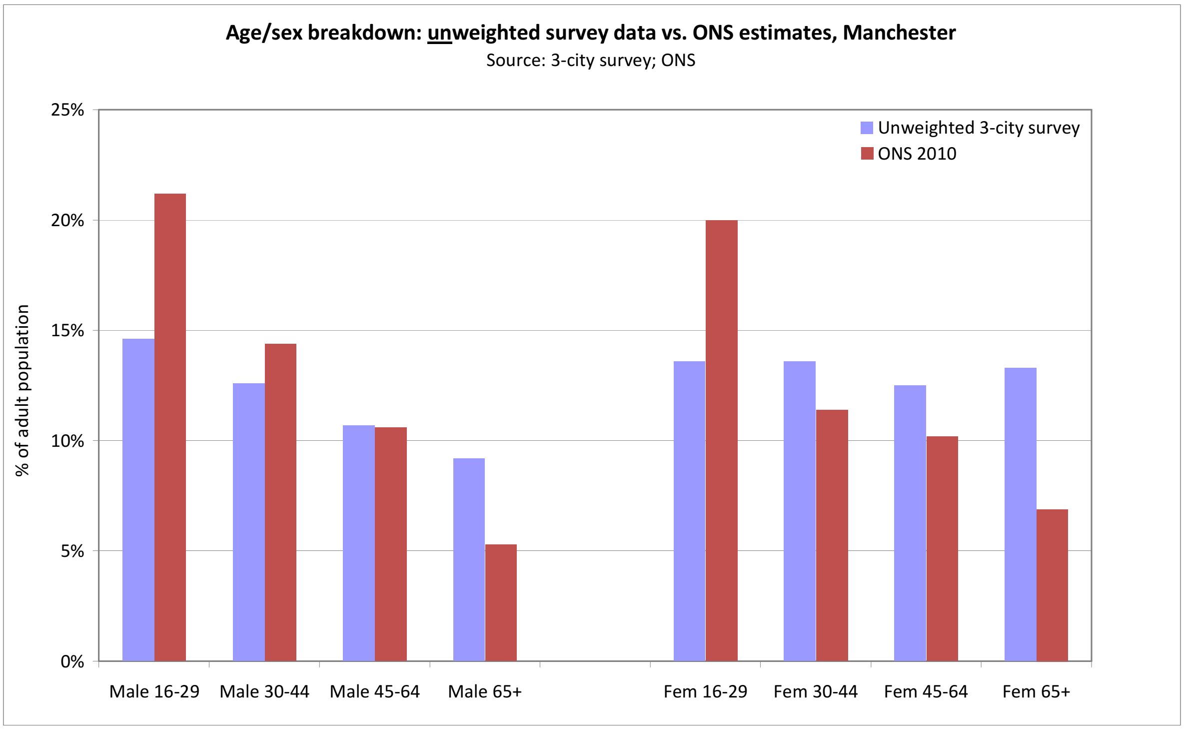
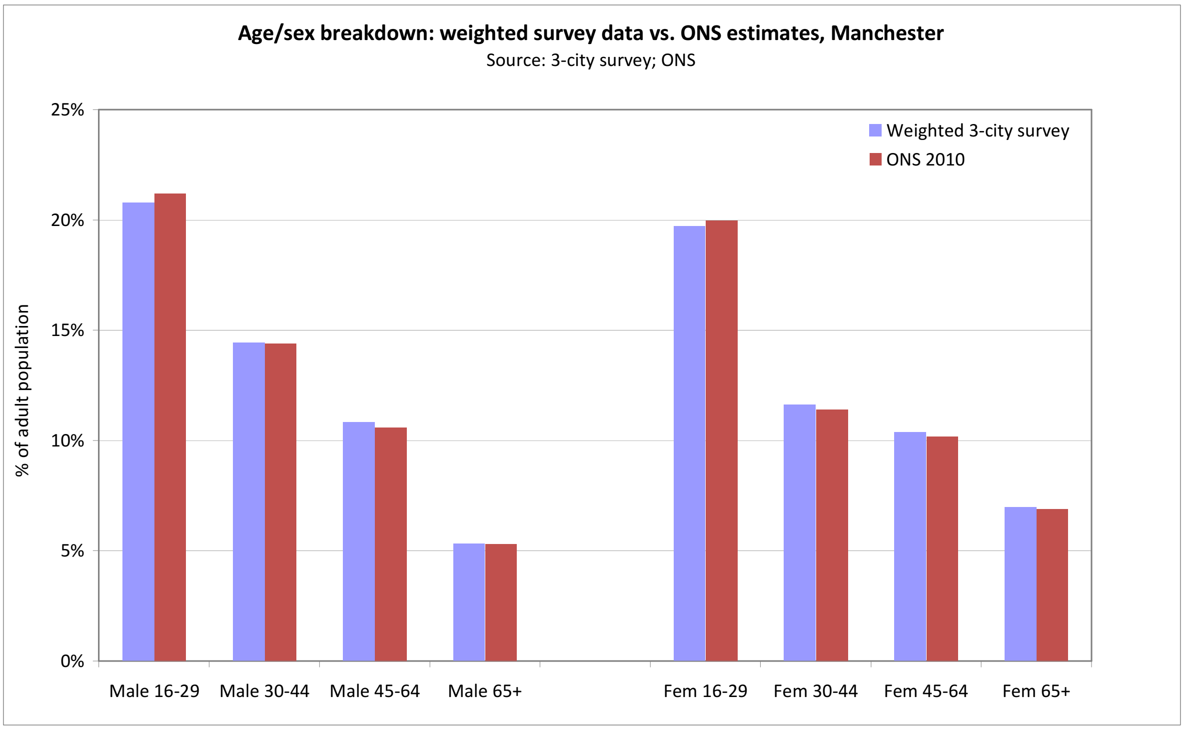


Figure AIV.6



In relation to e**ducational attainment**, Chapter 7 reported that in comparison to the 2011 census, the 3-city survey seems to under-sample those with degree level qualifications, particularly in Glasgow and Manchester, but less so in Liverpool: this is shown here in Figure AIV.7. At the other end of educational spectrum, there were very similar percentages of the survey sample with no educational qualifications in Glasgow and Liverpool compared to the APS, but not in Manchester: this was shown in Figure 7.8 in the main report, and is reproduced here for comparison as Figure AIV.8.

Figure AIV.7

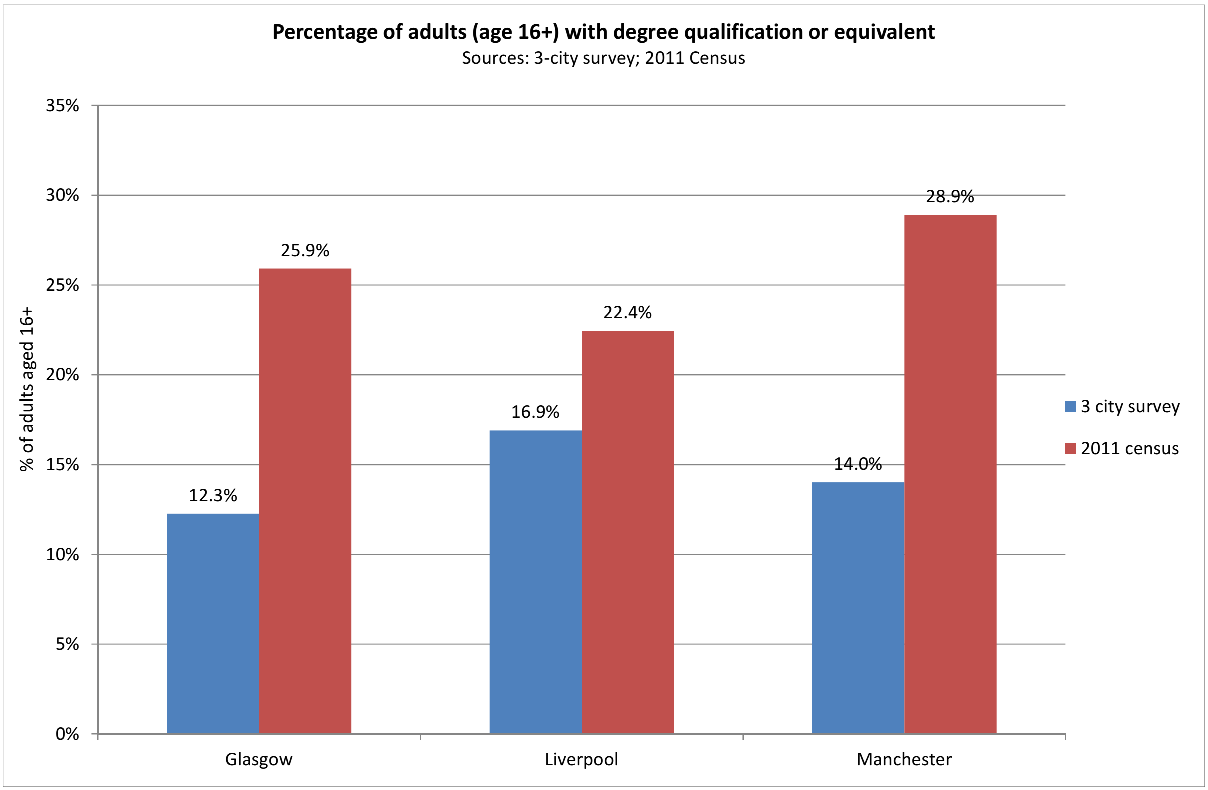
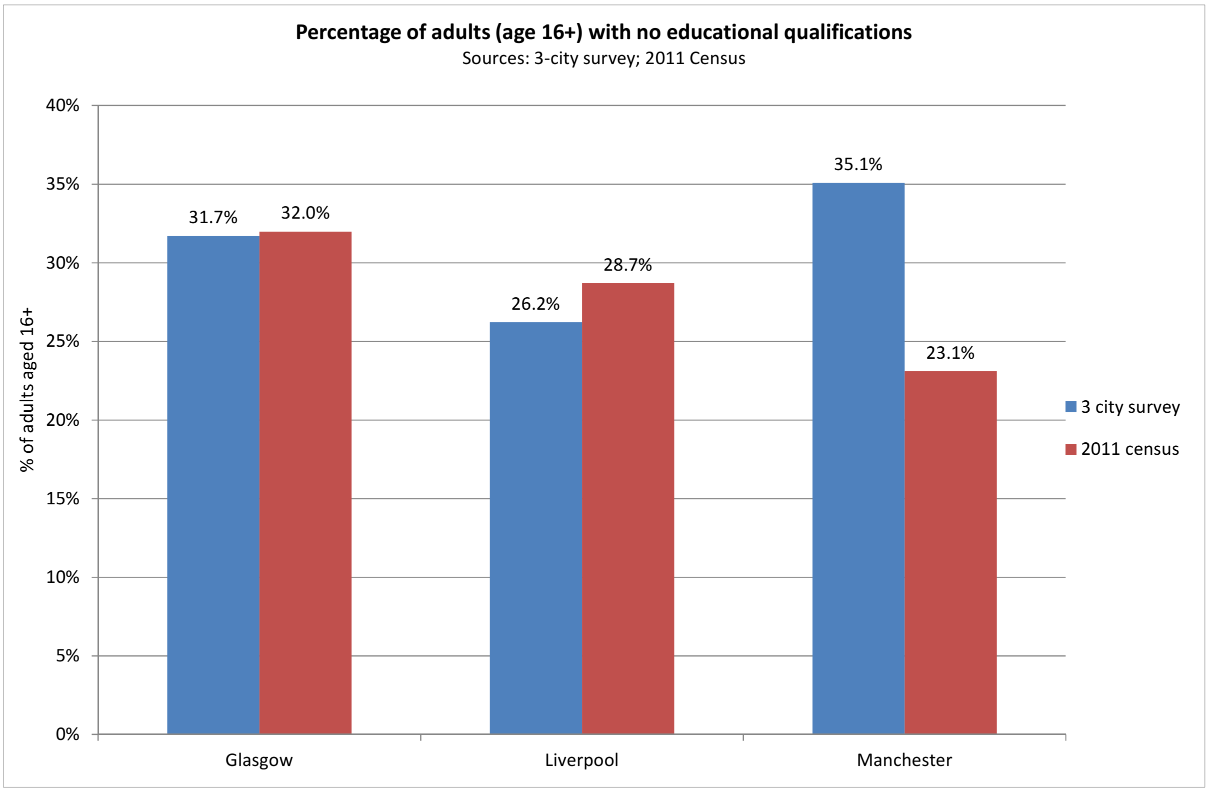
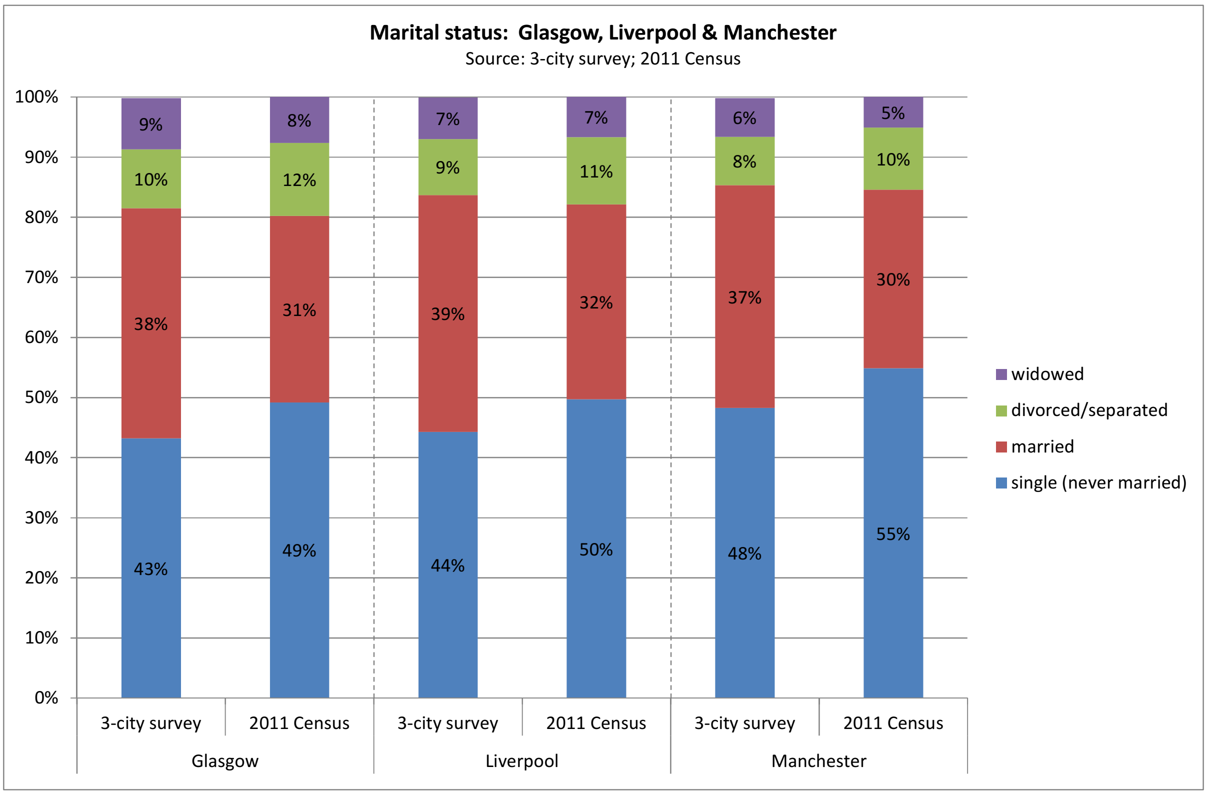


Figure AIV.8



Finally, Figure AIV.9 compares the **marital status** breakdown of the three samples with 2011 census data. This suggests that the samples are reasonably representative in this regard.

Figure AIV.9



Chapter 7 discusses in more detail the overall assessment of representativeness of the samples.

Appendix V: extract from survey questionnaire & descriptive statistics by city

This Appendix includes descriptive analyses by city, presented as (where appropriate) tabulated data – e.g. frequency percentages – and charts for the majority of the questions discussed in the thesis.

These are presented alongside extracts from the relevant sections of the questionnaire.

The original questionnaire had nine sections, as listed below. The same section names (A, B etc.) are used within this appendix.

A. Social capital
B. Political effects
C. Human Values Scale
D. Time preferences
E. Life Orientation Test (Revised)
F. Sense of Coherence
G. Generalised Self-Efficacy Scale
H. Various (self-assessed health, smoking, self-esteem, childhood)
I. Socio-economic & demographics

Note: as stated in Appendix I, all tabulated data within this appendix have been taken directly from the AECOM report referenced earlier in the thesis. However, the corresponding charts are from the author's own analyses.

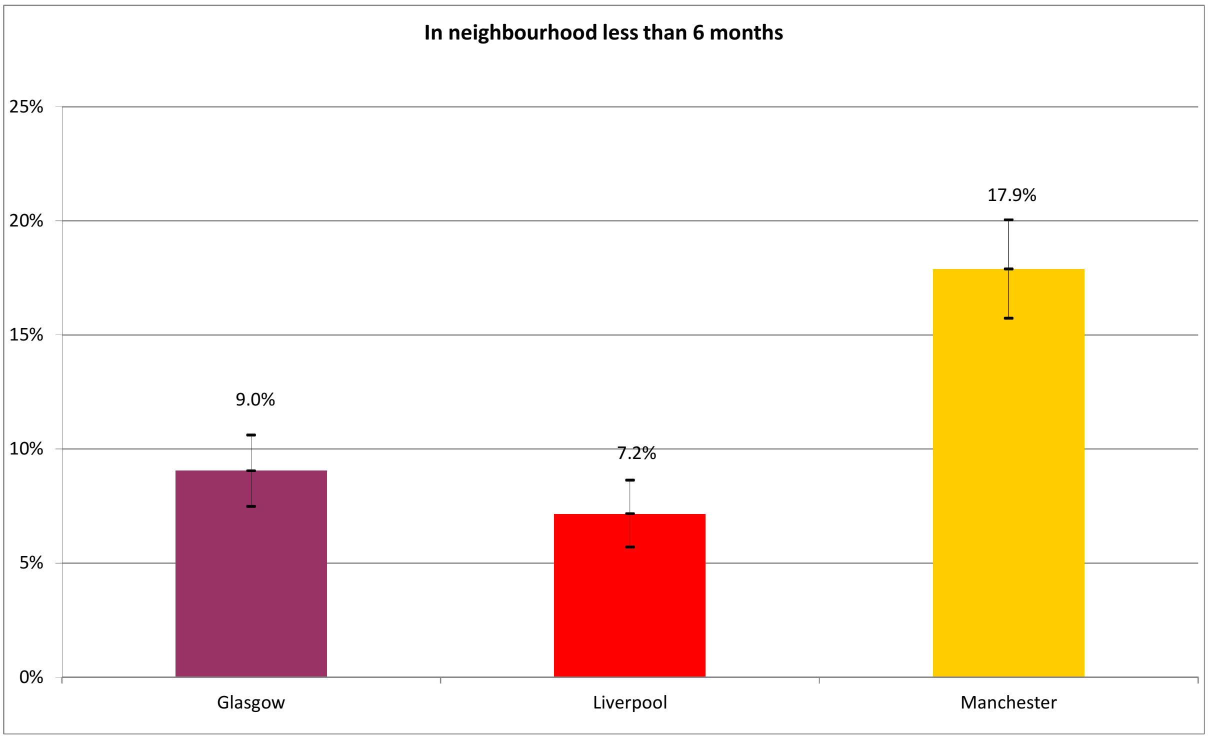
All the presented data are weighted. Note that there may be slight differences between figures presented in the tables and those in the charts due to rounding of the weighted data.

Section A: Social Capital

These first questions are about how you feel about living in your neighbourhood and your relationships with other people.

A1. How long have you lived in this neighbourhood?

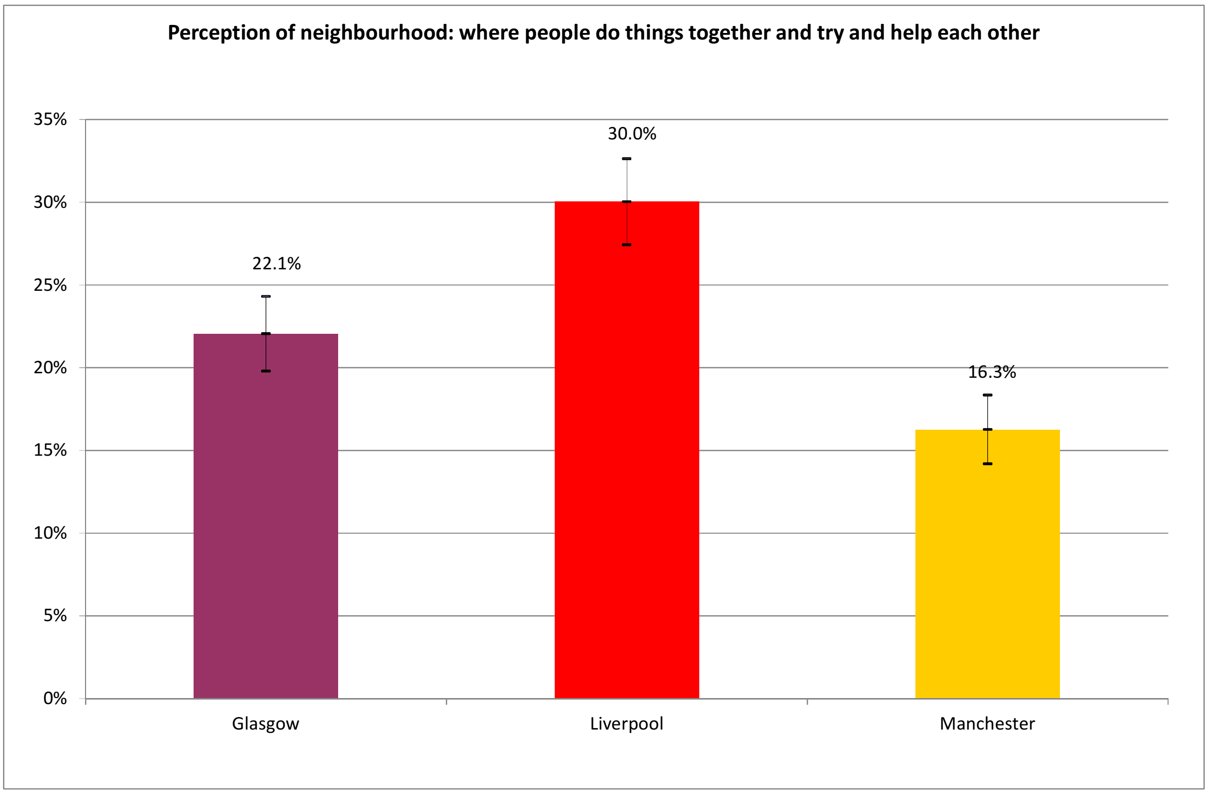
	Total	Glasgow	Liverpool	Manchester
Under 6 months	11.4%	9.0%	7.2%	17.9%
6 months or more but less than 12 months	8.2%	7.3%	5.5%	11.5%
One year or more but less than 5 years	18.1%	19.5%	16.5%	17.8%
Over 5 years	62.4%	64.1%	70.9%	52.8%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)

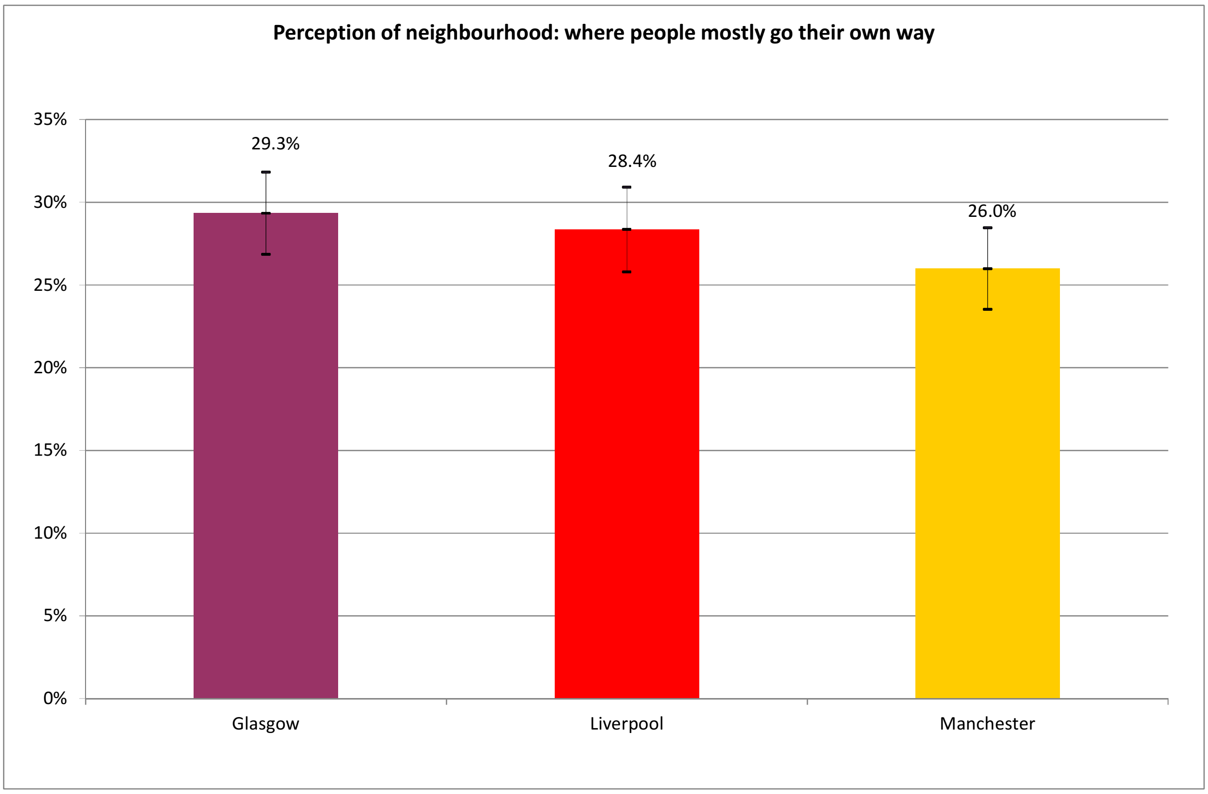


Now I'd like to ask you a few questions about your immediate neighbourhood, by which I mean your street or block.

A2. In general, what kind of neighbourhood would you say you live in - would you say it is a neighbourhood in which people do things together and try to help each other, or one in which people mostly go their own way? (Unprompted)

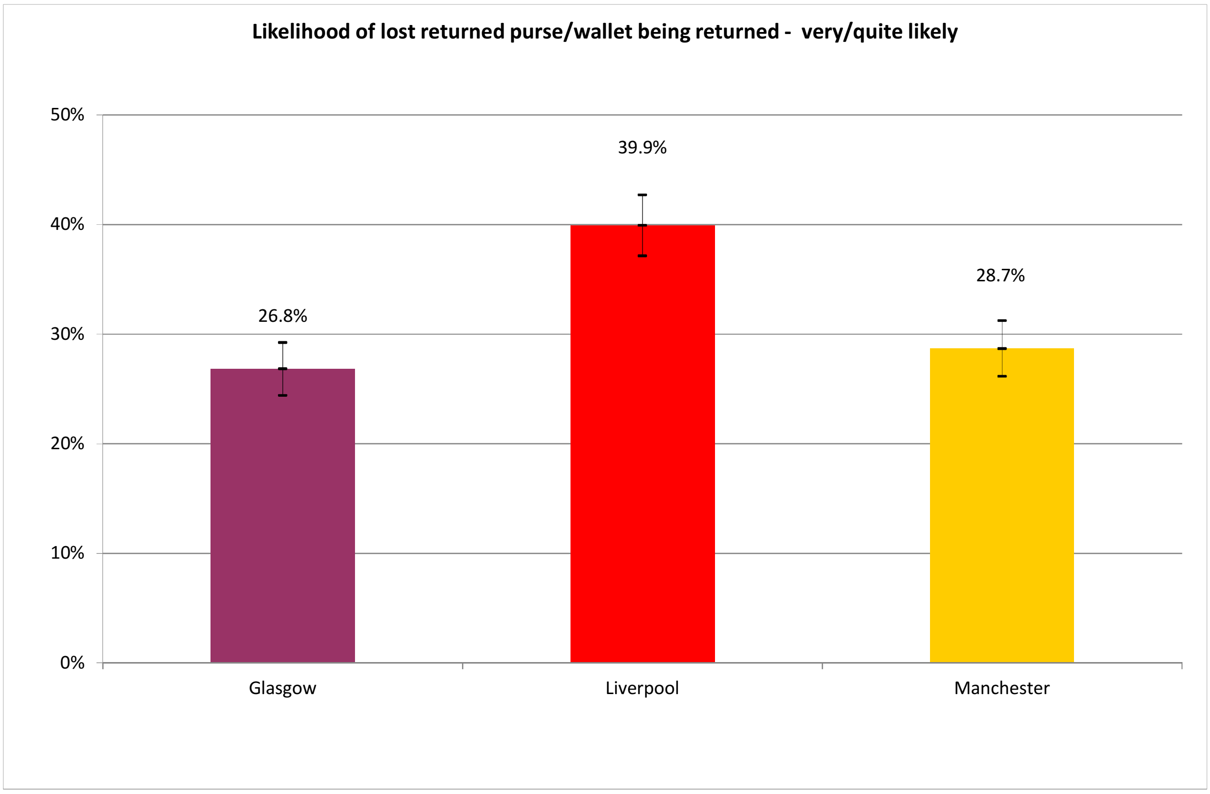
	Total	Glasgow	Liverpool	Manchester
Help each other	22.5%	22.1%	30.0%	16.3%
Go their own way	28.0%	29.3%	28.4%	26.0%
Mixture	41.7%	38.8%	36.6%	49.9%
Don't know (spontaneous)	7.8%	9.8%	5.0%	7.9%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)




Perception of neighbourhood: where people mostly go their own way
35%
30%
25%
20%
15%
10%
5%
0%
29.3%
28.4%
26.0%
Glasgow
Liverpool
Manchester

A3. Suppose you lost your (purse/wallet) containing your address details, and it was found in the street by someone living in this neighbourhood. How likely is it that it would be returned to you with nothing missing? Is that very likely, quite likely, not very likely or not at all likely?

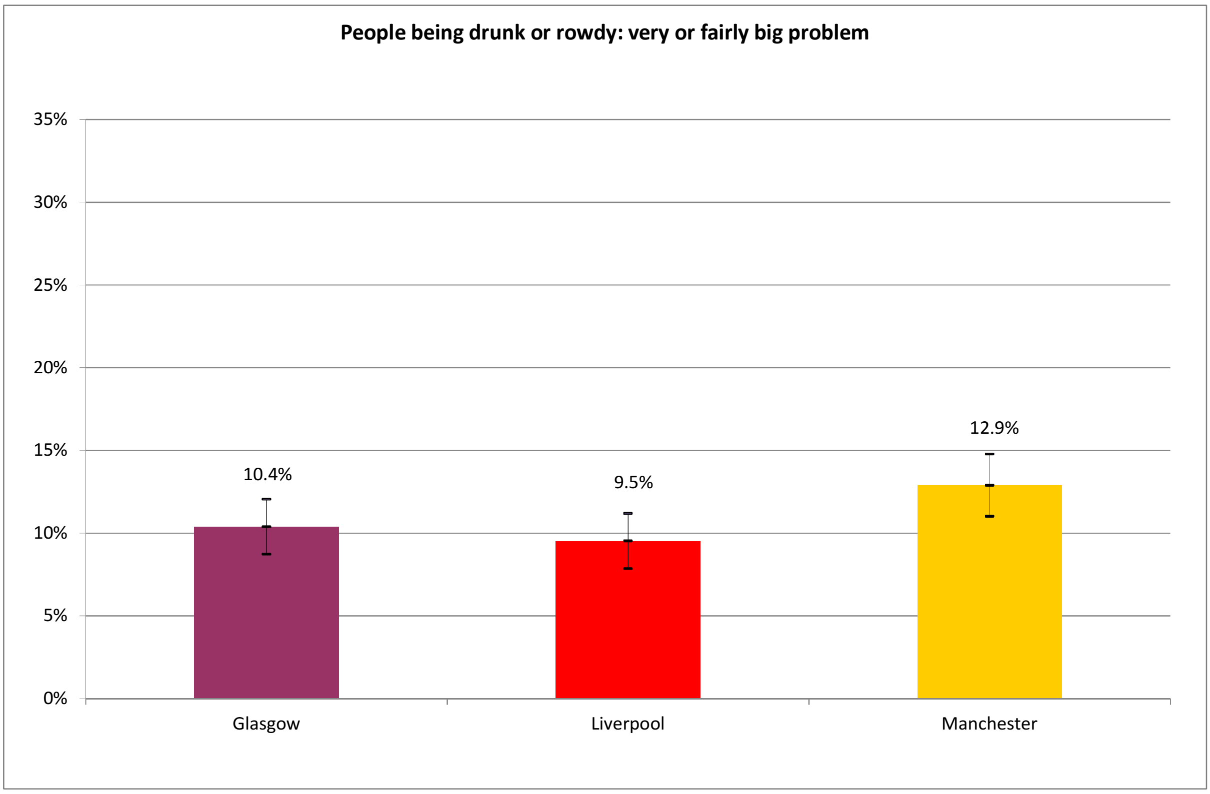
	Total	**Glasgow**	**Liverpool**	**Manchester**
Very likely	7.5%	5.7%	13.7%	4.3%
Quite likely	23.6%	21.2%	26.2%	24.4%
Not very likely	20.3%	18.5%	16.2%	26.1%
Not at all likely	33.1%	31.9%	31.9%	35.6%
Don't know (spontaneous)	15.4%	22.8%	11.9%	9.6%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



Still thinking about your street or block, I am going to read out a list of problems which people face in their neighbourhood. For each one can you tell me how much of a problem it is?

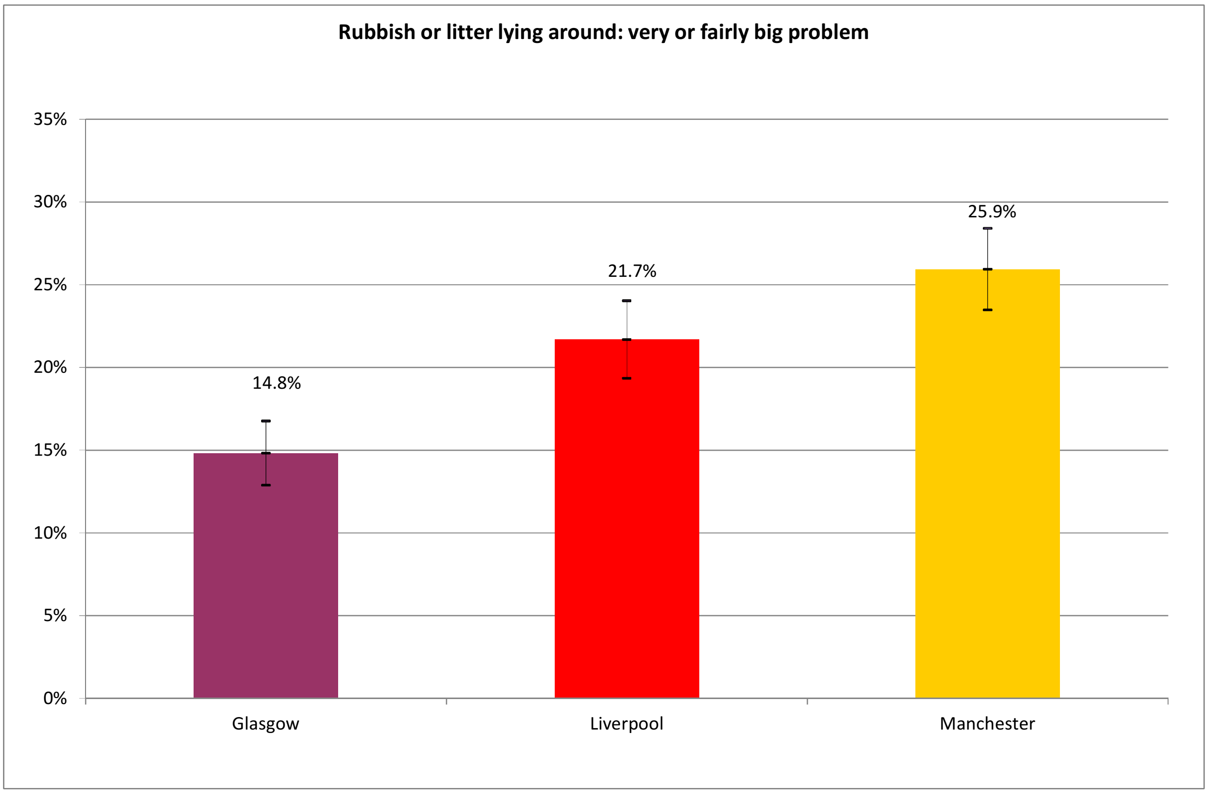
A4.1 How much of a problem are people being drunk or rowdy in public places?

	Total	Glasgow	Liverpool	Manchester
Very big problem	2.6%	2.8%	3.2%	1.9%
Fairly big problem	8.3%	7.6%	6.3%	11.0%
Not a very big problem	22.4%	22.7%	21.3%	23.1%
Not a problem at all	55.7%	55.3%	61.5%	51.1%
It happens, but it's not a problem	9.2%	9.4%	7.0%	11.0%
Don't know (spontaneous)	1.7%	2.2%	0.7%	1.9%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)


People being drunk or rowdy: very or fairly big problem
35%
30%
25%
20%
15%
10%
5%
0%
10.4%
9.5%
12.9%
Glasgow
Liverpool
Manchester

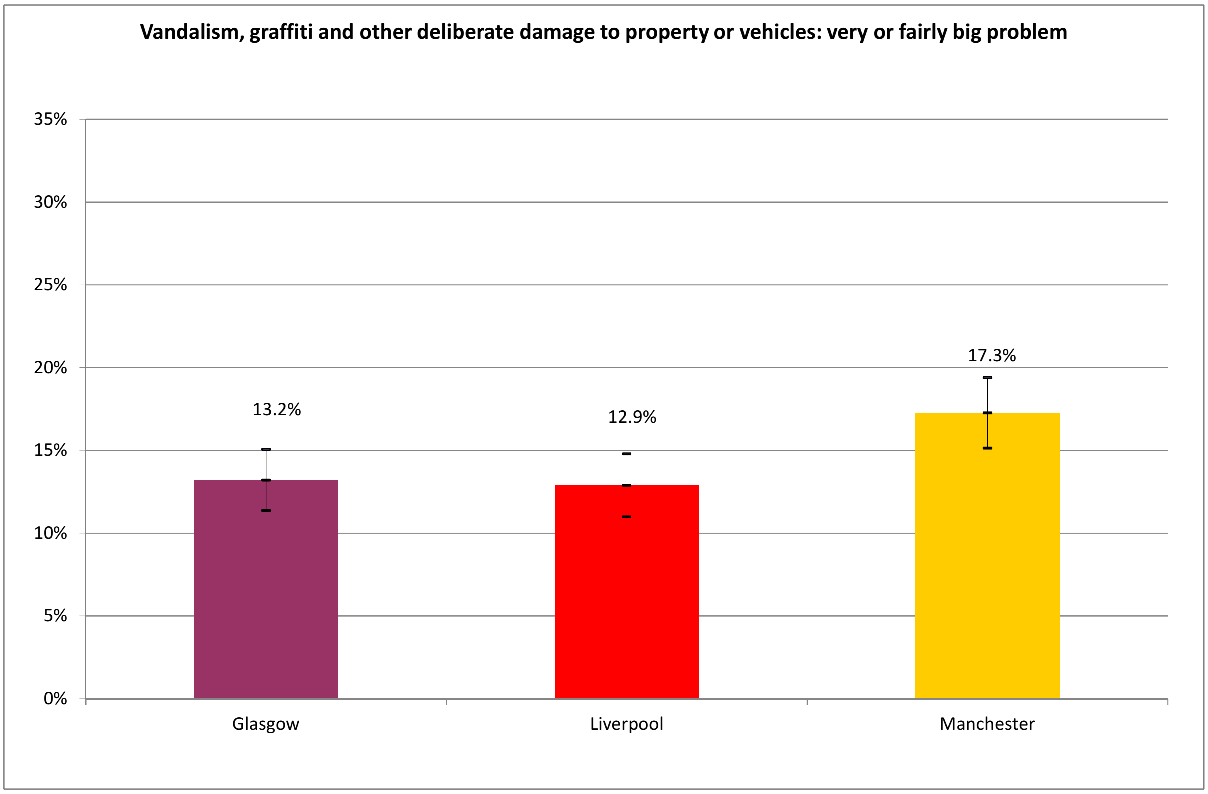
A4.2. How much of a problem is rubbish or litter lying around?

	Total	Glasgow	Liverpool	Manchester
Very big problem	5.3%	4.3%	6.4%	5.6%
Fairly big problem	15.1%	10.5%	15.3%	20.3%
Not a very big problem	22.6%	22.5%	23.9%	21.7%
Not a problem at all	50.0%	56.1%	51.1%	41.6%
It happens, but it's not a problem	5.9%	5.1%	3.2%	9.4%
Don't know (spontaneous)	1.1%	1.5%	0.2%	1.4%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



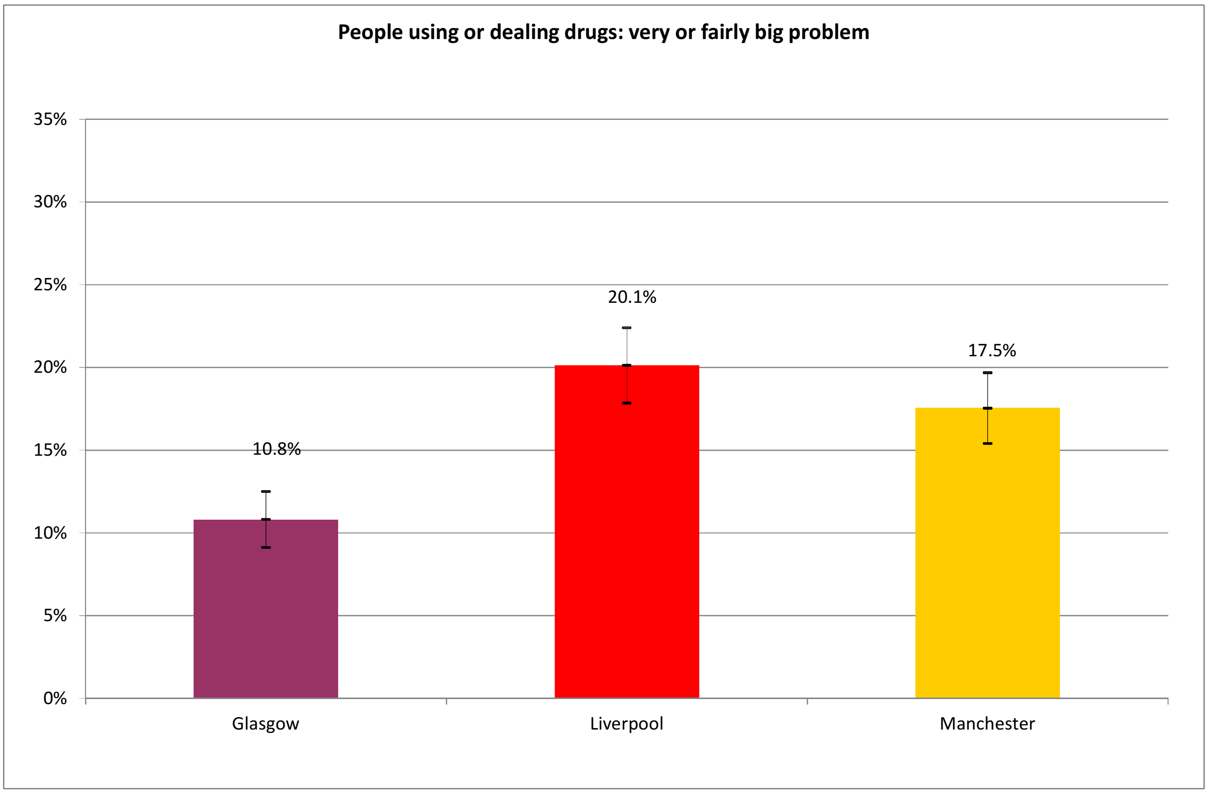
A4.3. How much of a problem are vandalism, graffiti and other deliberate damage to property or vehicles?

	Total	Glasgow	Liverpool	Manchester
Very big problem	3.0%	2.9%	3.4%	2.8%
Fairly big problem	11.4%	10.3%	9.5%	14.4%
Not a very big problem	19.8%	22.0%	15.8%	20.6%
Not a problem at all	58.3%	58.0%	66.0%	51.8%
It happens, but it's not a problem	6.0%	5.2%	4.2%	8.7%
Don't know (spontaneous)	1.5%	1.7%	1.2%	1.6%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



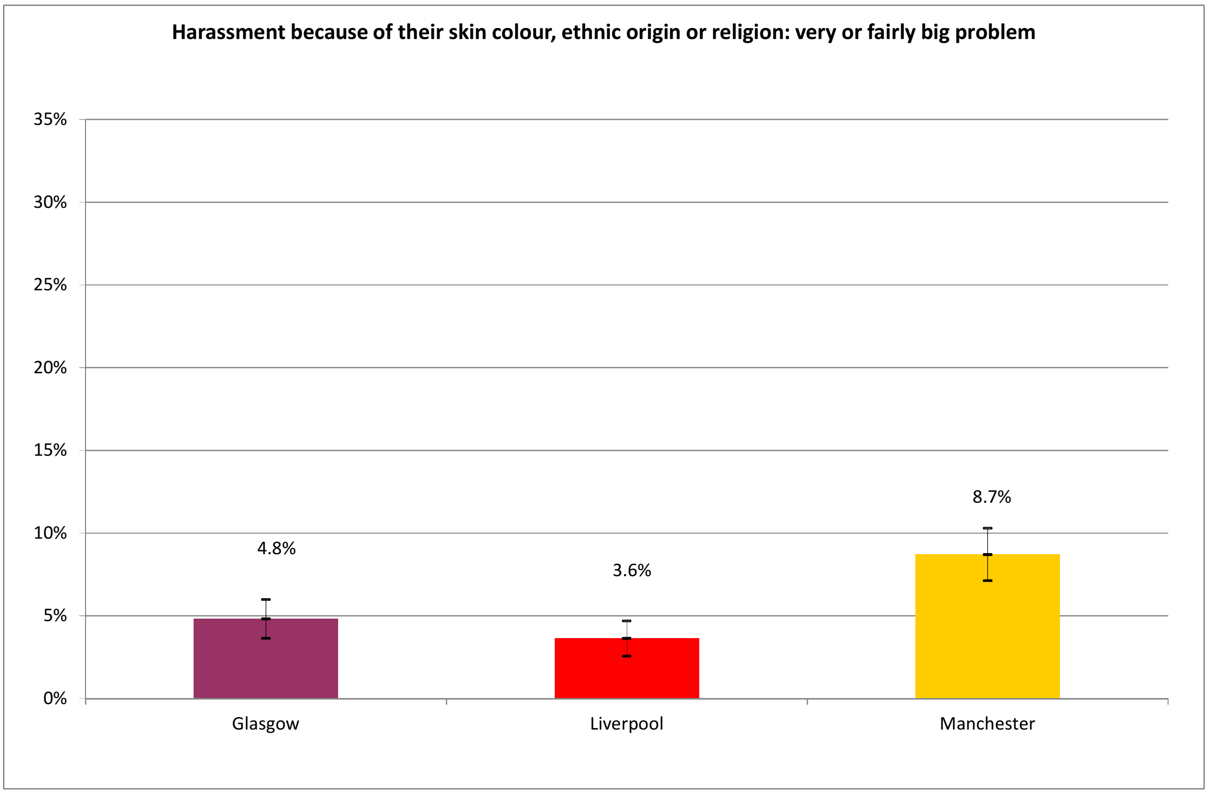
A4.4. How much of a problem are people using or dealing drugs?

	Total	Glasgow	Liverpool	Manchester
Very big problem	5.3%	4.4%	7.7%	4.2%
Fairly big problem	10.4%	6.4%	12.5%	13.3%
Not a very big problem	14.9%	16.6%	11.6%	15.6%
Not a problem at all	51.4%	54.3%	48.9%	50.0%
It happens, but it's not a problem	9.1%	6.5%	9.8%	11.6%
Don't know (spontaneous)	9.0%	11.7%	9.6%	5.2%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



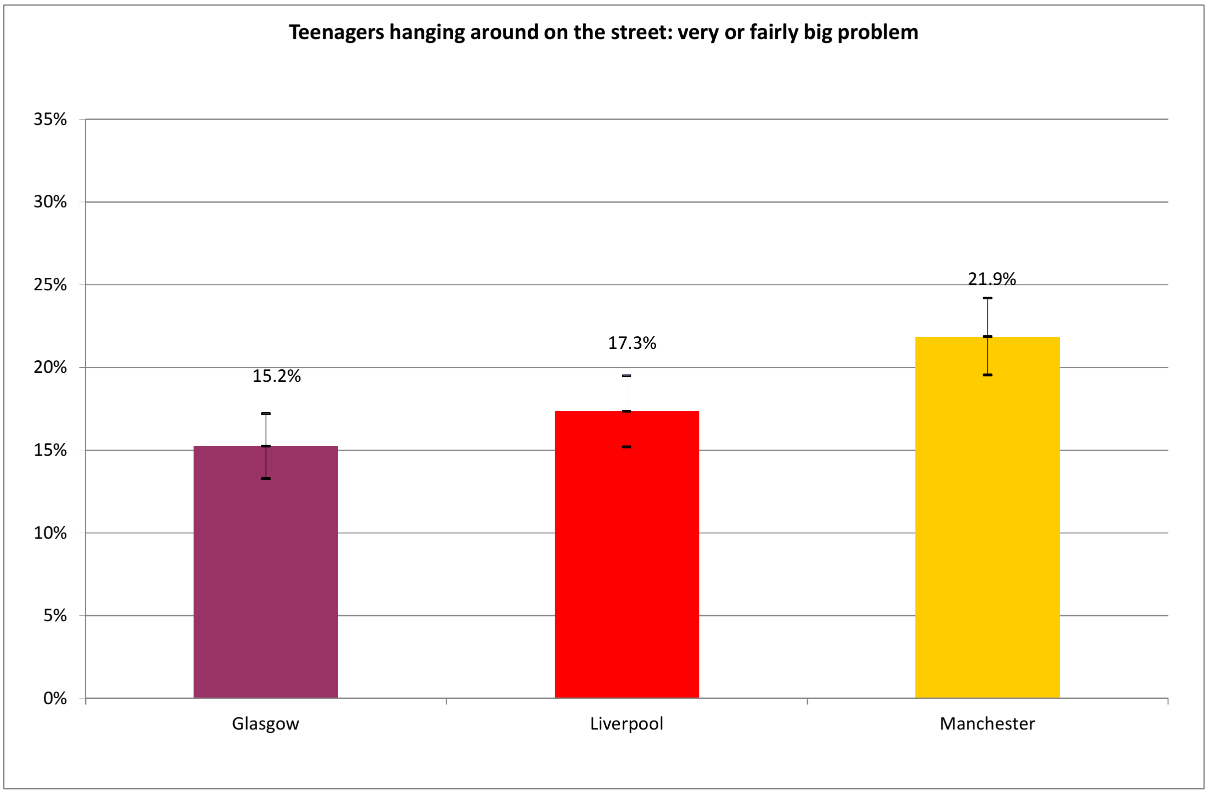
A4.5. How much of a problem is people being attacked or harassed because of their skin colour, ethnic origin or religion?

	Total	Glasgow	Liverpool	Manchester
Very big problem	1.1%	1.1%	0.7%	1.3%
Fairly big problem	4.7%	3.7%	2.9%	7.4%
Not a very big problem	12.9%	14.2%	8.9%	15.0%
Not a problem at all	68.0%	65.8%	77.2%	62.6%
It happens, but it’s not a problem	6.5%	5.5%	4.2%	9.9%
Don’t know (spontaneous)	6.8%	9.8%	6.1%	3.8%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



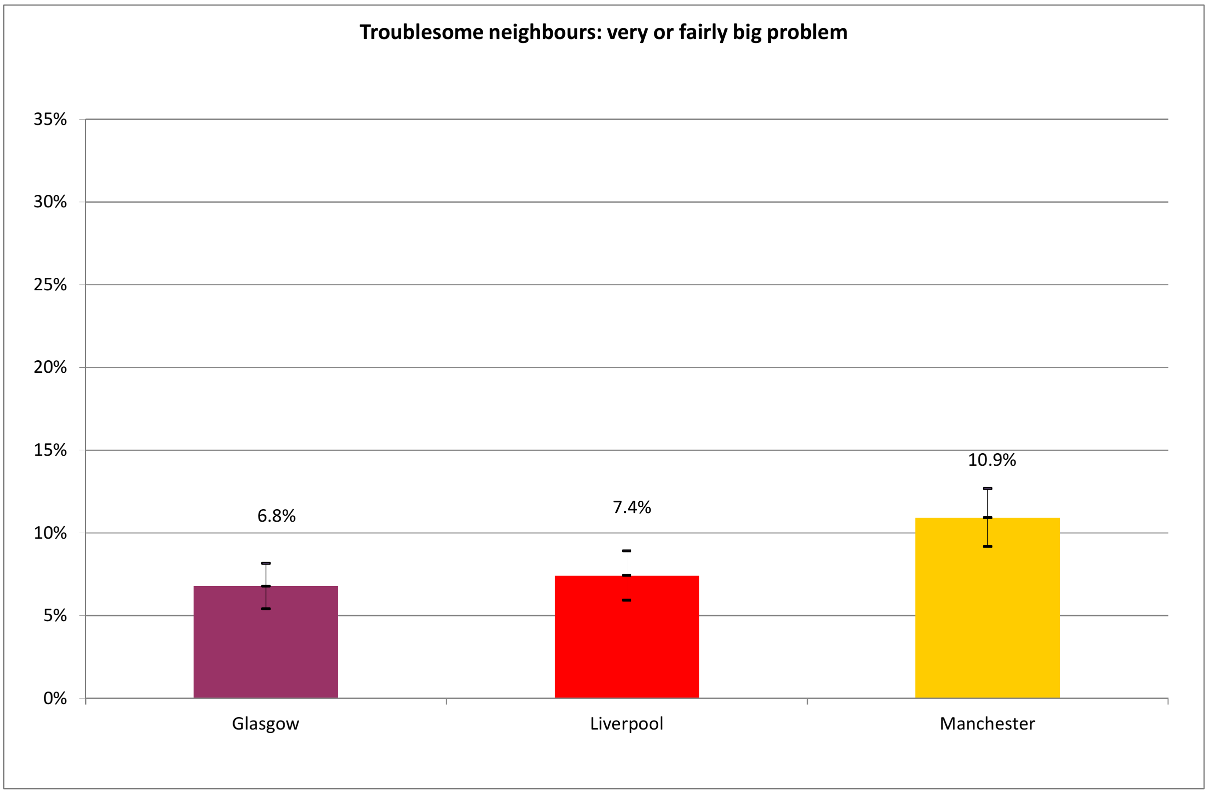
A4.6. How much of a problem are teenagers hanging around on the street?

	Total	Glasgow	Liverpool	Manchester
Very big problem	4.8%	4.4%	5.6%	4.4%
Fairly big problem	13.2%	10.9%	11.7%	17.4%
Not a very big problem	21.5%	25.4%	20.6%	17.4%
Not a problem at all	50.9%	50.6%	56.5%	46.4%
It happens, but it’s not a problem	8.2%	6.9%	4.7%	12.8%
Don’t know (spontaneous)	1.4%	1.9%	0.8%	1.5%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)

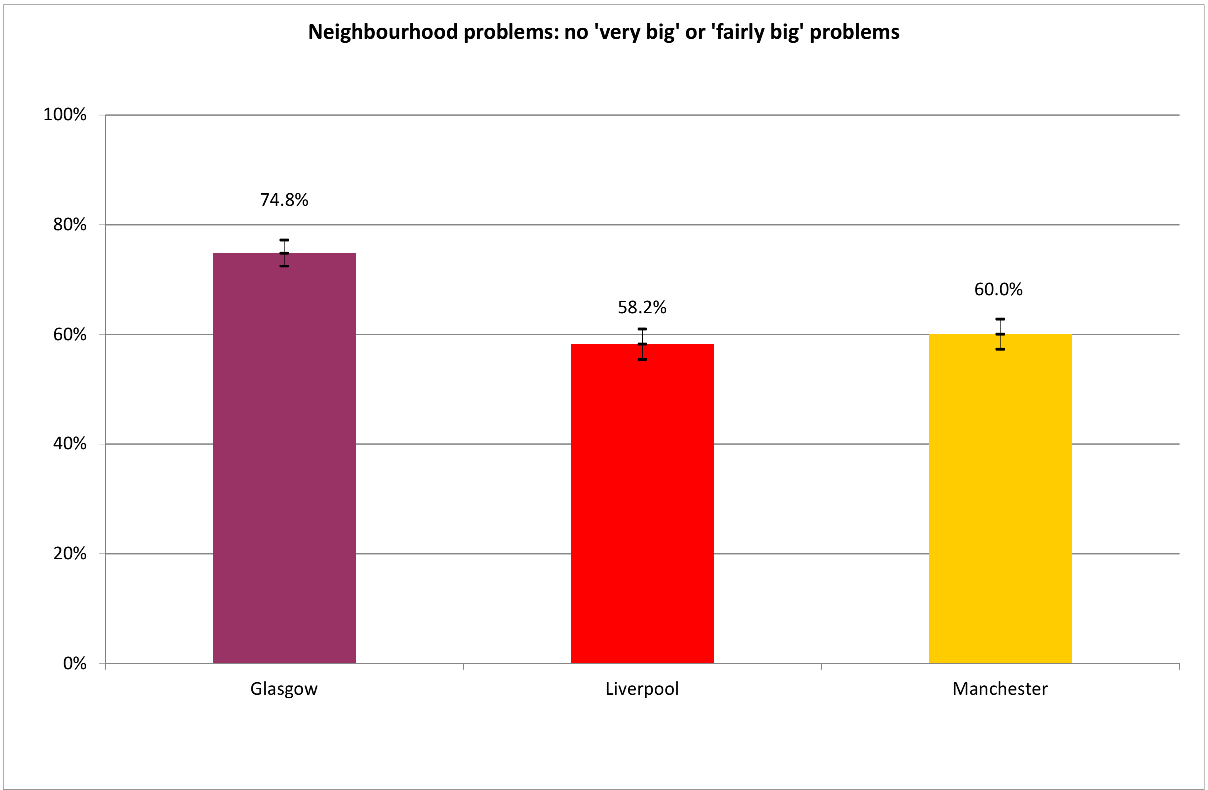


A4.7. How much of a problem are troublesome neighbours?

	Total	Glasgow	Liverpool	Manchester
Very big problem	2.1%	1.4%	3.3%	1.9%
Fairly big problem	6.2%	5.4%	4.1%	9.0%
Not a very big problem	13.7%	15.2%	9.7%	15.6%
Not a problem at all	70.7%	70.5%	78.8%	63.5%
It happens, but it's not a problem	5.6%	4.8%	4.1%	7.9%
Don't know (spontaneous)	1.7%	2.6%	0%	2.0%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



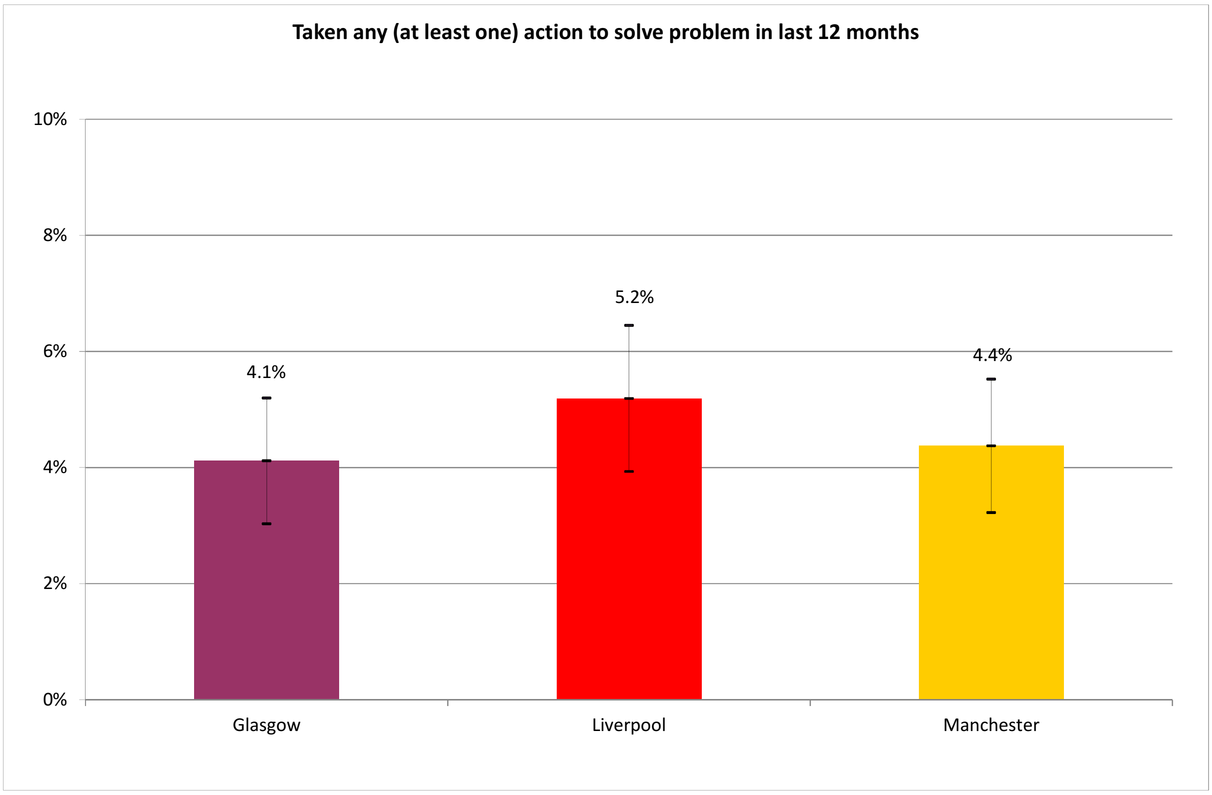
Summary of responses to questions A4.1-A4.7:



A5. In the last 12 months have you taken any of the following actions in an attempt to solve a problem affecting people in your local area?

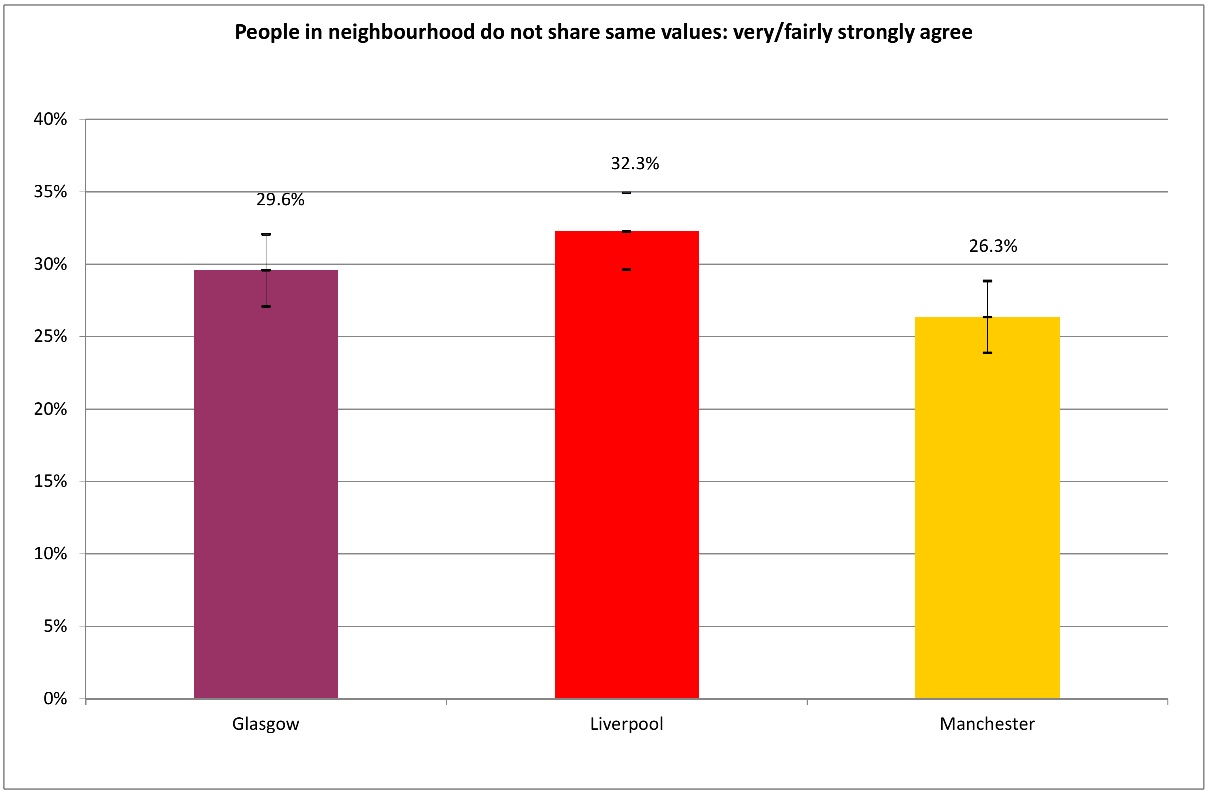
	Total	Glasgow	Liverpool	Manchester
Contacted a local radio station, television station or newspaper	0.2%	0.1%	0.1%	0.3%
Contacted the appropriate organisation to deal with the problem, such as the council	1.9%	1.3%	2.0%	2.7%
Contacted a local councillor or MP	1.4%	1.2%	2.2%	0.8%
Attended a public meeting or neighbourhood forum to discuss local issues	0.8%	0.8%	0.8%	0.8%
Attended a tenants' or local	0.7%	0.7%	0.8%	0.6%

residents' group				
Attended a protest meeting or joined an action group	0.5%	0.8%	0.1%	0.4%
Helped organise a petition on a local issue	0.6%	0.6%	1.0%	0.4%
No local problems	9.7%	8.0%	9.9%	11.6%
None of these	85.3%	87.8%	84.9%	82.8%
Don't know (spontaneous)	1.4%	1.0%	1.1%	2.3%
(Weighted base)	(3694)	(1291)	(1193)	(1215)
(Unweighted base)	(3701)	(1289)	(1202)	(1210)



A6. To what extent do you agree with the following statement: People in this neighbourhood do not share the same values.

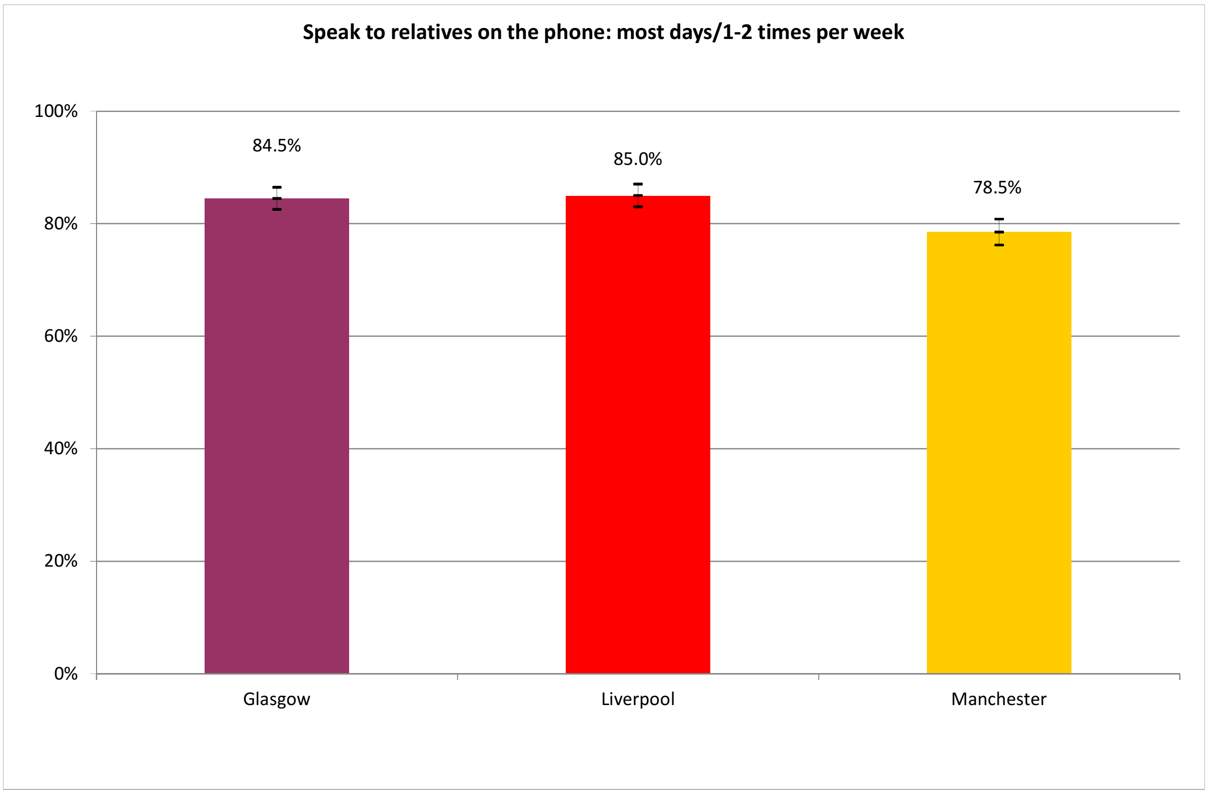
	Total	Glasgow	Liverpool	Manchester
Very strongly	6.9%	5.2%	9.9%	6.4%
Fairly strongly	22.4%	24.4%	22.4%	20.0%
Not very strongly	29.7%	20.6%	24.4%	45.3%
Not at all strongly	21.7%	19.6%	30.0%	16.9%
Don't know (spontaneous)	19.3%	30.3%	13.3%	11.5%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



The next few questions are about how often you *personally* contact your relatives, friends and neighbours. Not counting the people you live with, how often do you do any of the following?

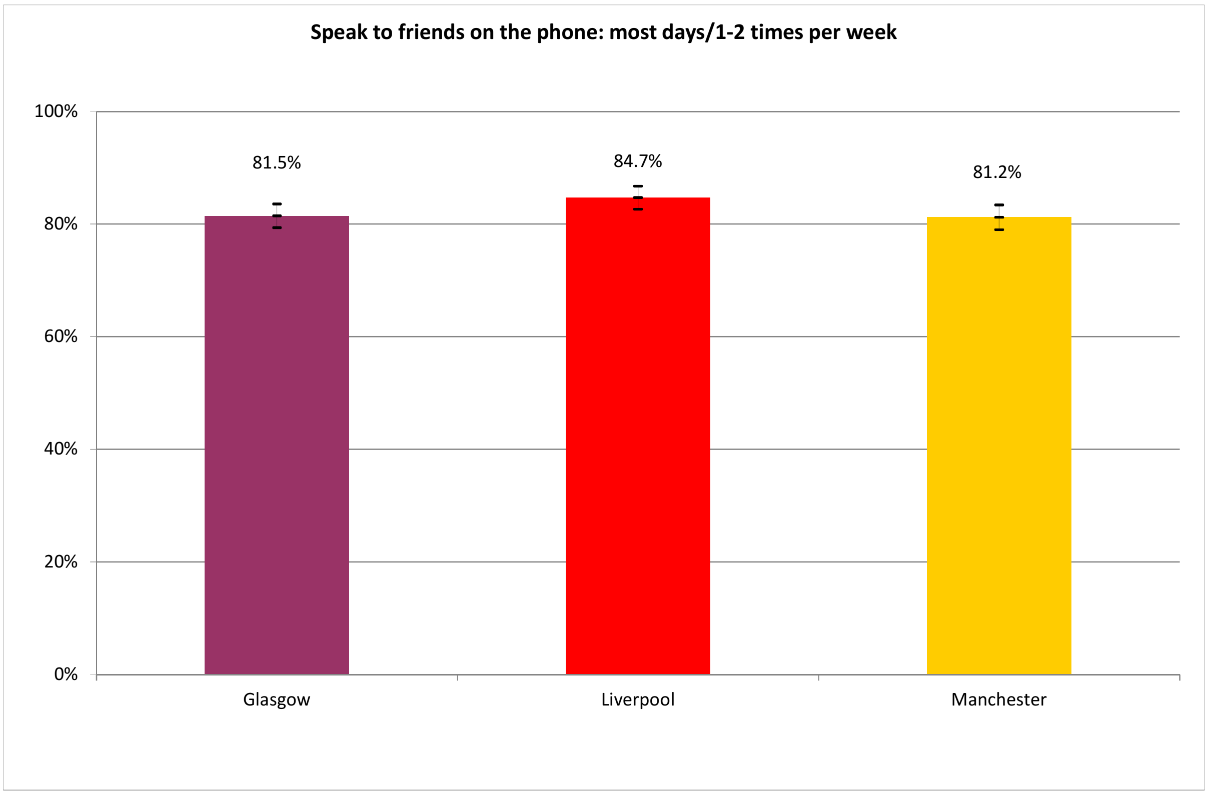
A7.1. Speak to relatives on the phone

	Total	**Glasgow**	**Liverpool**	**Manchester**
On most days	45.1%	49.6%	57.7%	28.4%
Once or twice a week	37.6%	34.8%	27.3%	50.1%
Once or twice a month	9.1%	8.5%	5.9%	12.5%
Less often than once a month	5.6%	5.2%	6.4%	5.5%
Never	2.3%	1.6%	2.7%	2.7%
Don't know (spontaneous)	0.4%	0.3%	0.1%	0.8%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)


Speak to relatives on the phone: most days/1-2 times per week
100%
80%
60%
40%
20%
0%
84.5%
85.0%
78.5%
Glasgow
Liverpool
Manchester

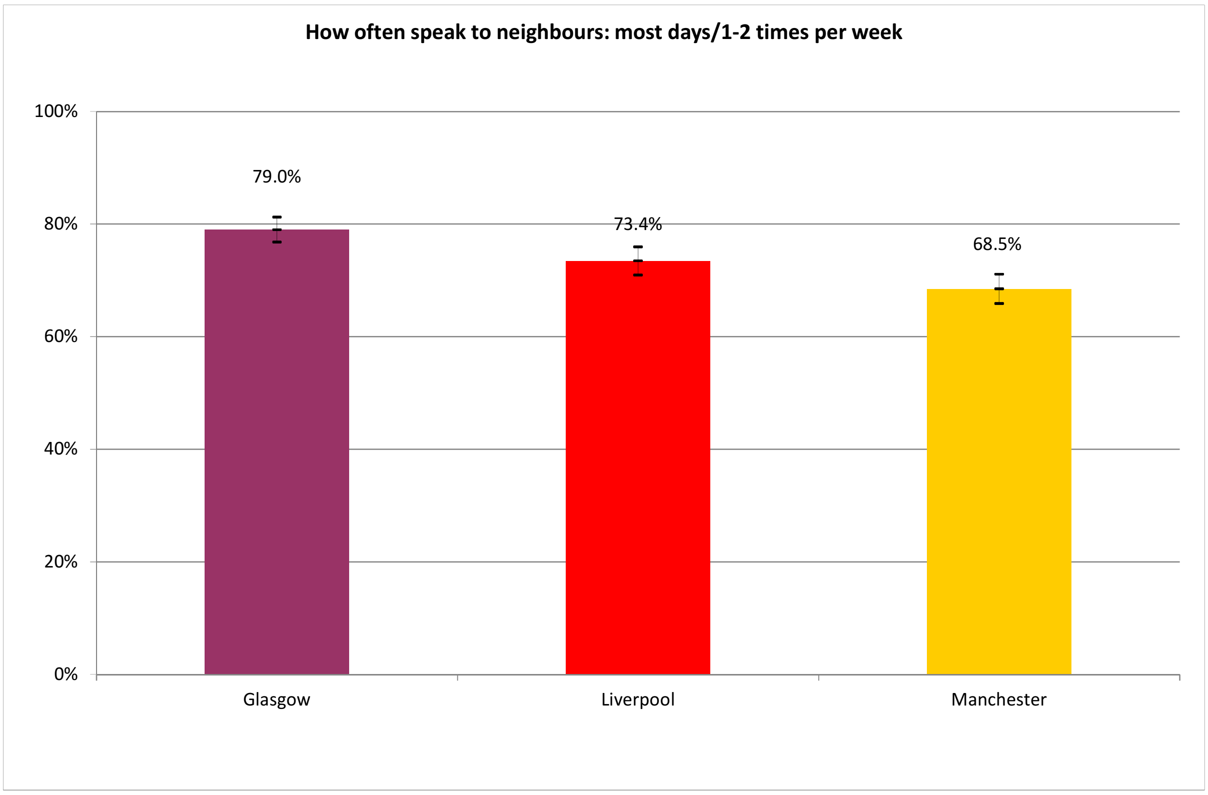
A7.2. Speak to friends on the phone

	Total	Glasgow	Liverpool	Manchester
On most days	44.8%	43.9%	52.9%	38.7%
Once or twice a week	37.5%	37.5%	31.8%	42.5%
Once or twice a month	9.1%	10.0%	5.2%	11.3%
Less often than once a month	5.9%	6.7%	6.3%	4.7%
Never	2.4%	1.5%	3.8%	2.3%
Don't know (spontaneous)	0.3%	0.3%	0.1%	0.5%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



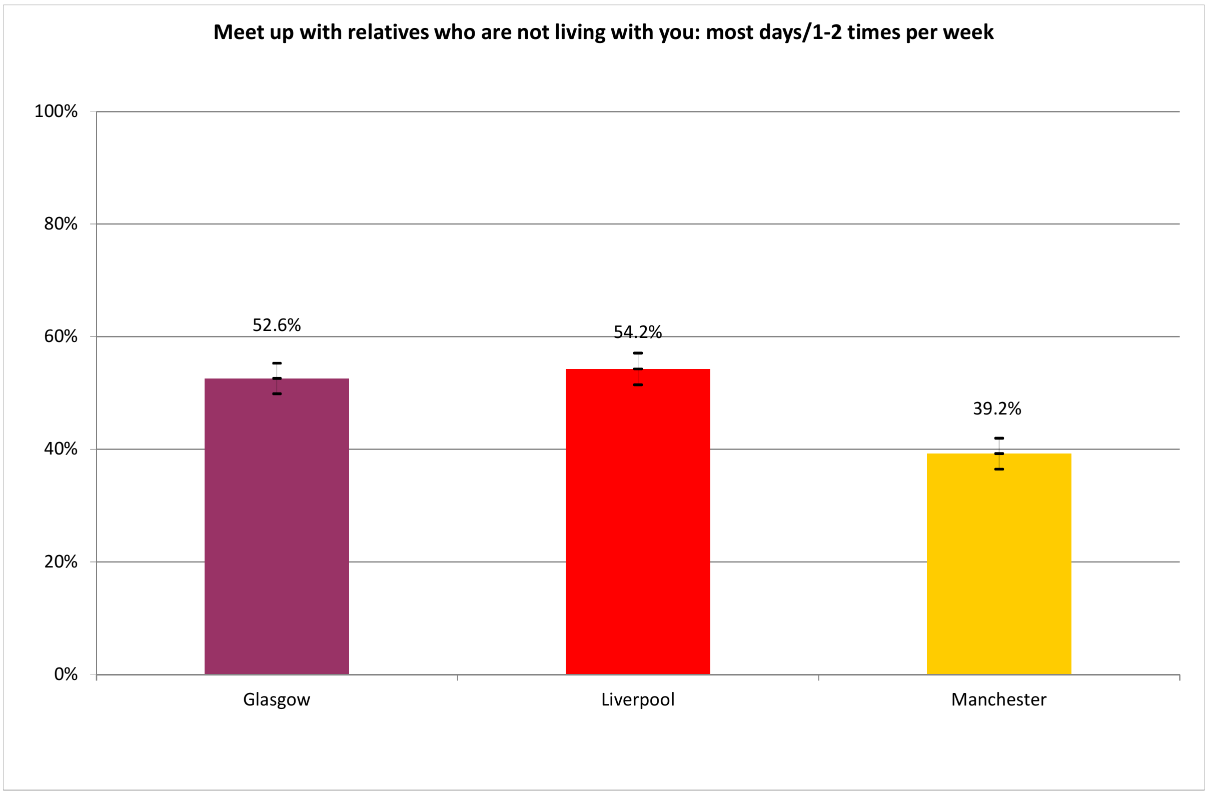
A7.3. Speak to neighbours

	Total	Glasgow	Liverpool	Manchester
On most days	35.9%	39.8%	38.9%	28.5%
Once or twice a week	38.1%	39.2%	34.6%	40.0%
Once or twice a month	12.7%	9.2%	11.0%	18.5%
Less often than once a month	8.4%	8.6%	8.2%	8.2%
Never	4.6%	2.8%	7.3%	4.3%
Don’t know (spontaneous)	0.3%	0.4%	0.1%	0.5%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



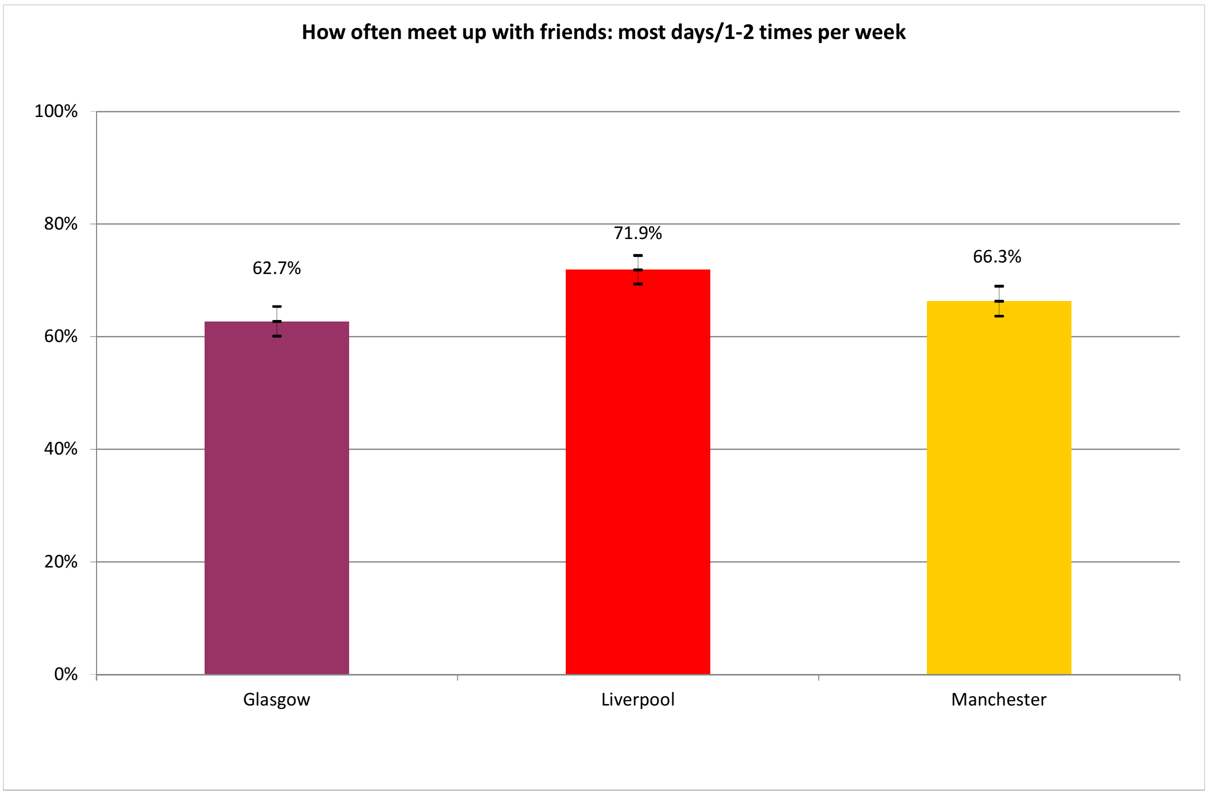
A7.4. How often do you meet up with relatives who are not living with you?

	Total	Glasgow	Liverpool	Manchester
On most days	15.8%	16.7%	20.4%	10.7%
Once or twice a week	32.9%	35.9%	33.8%	28.5%
Once or twice a month	25.6%	24.4%	18.3%	33.5%
Less often than once a month	22.2%	20.2%	24.0%	23.0%
Never	3.2%	2.3%	3.4%	4.1%
Don't know (spontaneous)	0.3%	0.6%	0%	0.3%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



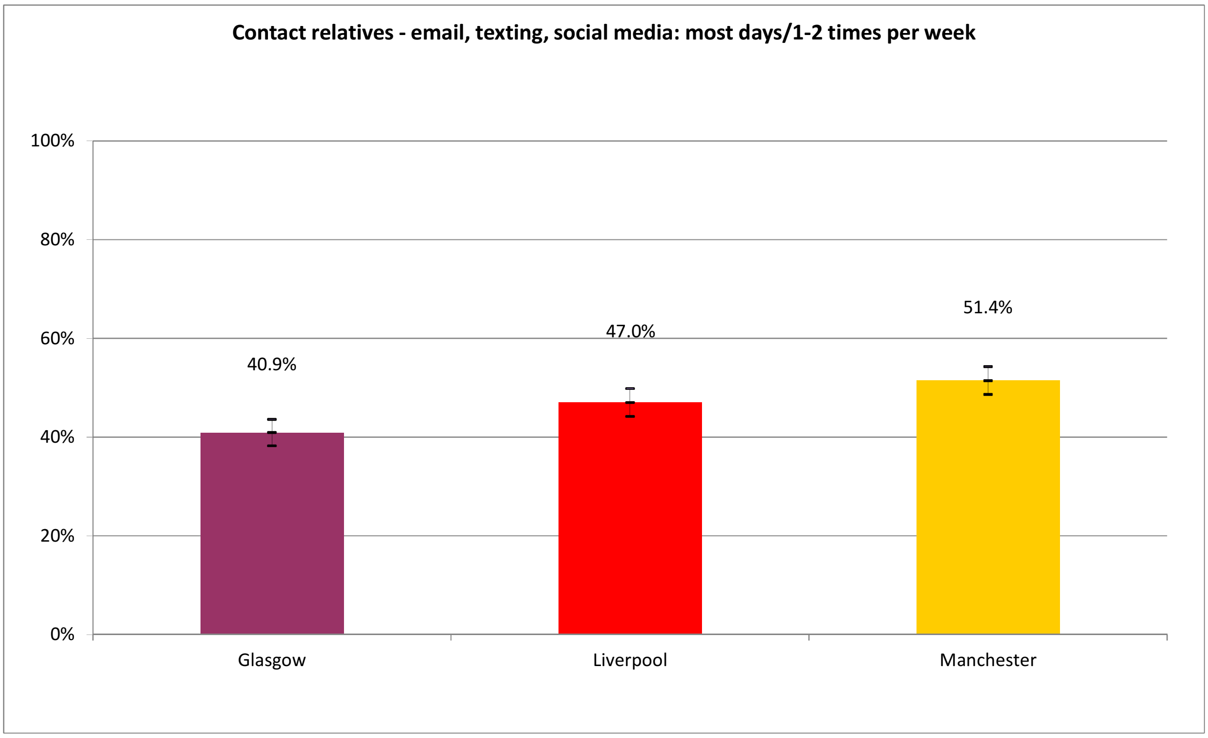
A7.5 How often do you meet up with friends?

	Total	Glasgow	Liverpool	Manchester
On most days	25.3%	19.7%	32.1%	26.0%
Once or twice a week	41.2%	43.0%	39.7%	40.3%
Once or twice a month	19.8%	21.1%	15.1%	22.2%
Less often than once a month	10.7%	13.0%	8.9%	9.4%
Never	2.8%	2.7%	4.1%	1.8%
Don't know (spontaneous)	0.3%	0.5%	0%	0.3%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



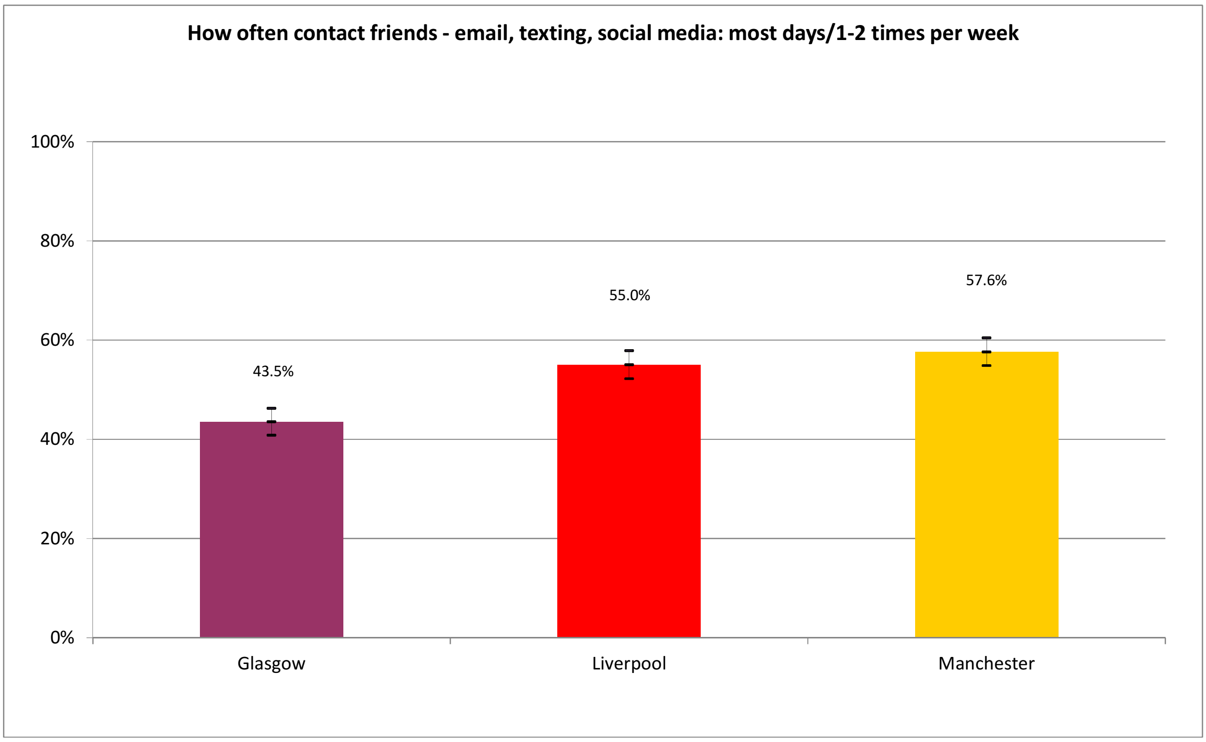
A7.6. How often do you contact relatives using any of the following? Email, text or social networking sites (for example Facebook or Twitter)?

	Total	Glasgow	Liverpool	Manchester
On most days	26.0%	23.6%	30.6%	24.9%
Once or twice a week	20.0%	17.3%	16.3%	26.5%
Once or twice a month	7.8%	5.1%	8.7%	10.2%
Less often than once a month	6.5%	8.6%	3.6%	6.5%
Never	39.4%	45.2%	40.3%	31.5%
Don't know (spontaneous)	0.3%	0.2%	0.4%	0.3%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



A7.7. How often do you contact friends using any of the following? Email, text or social networking sites (for example Facebook or Twitter)?

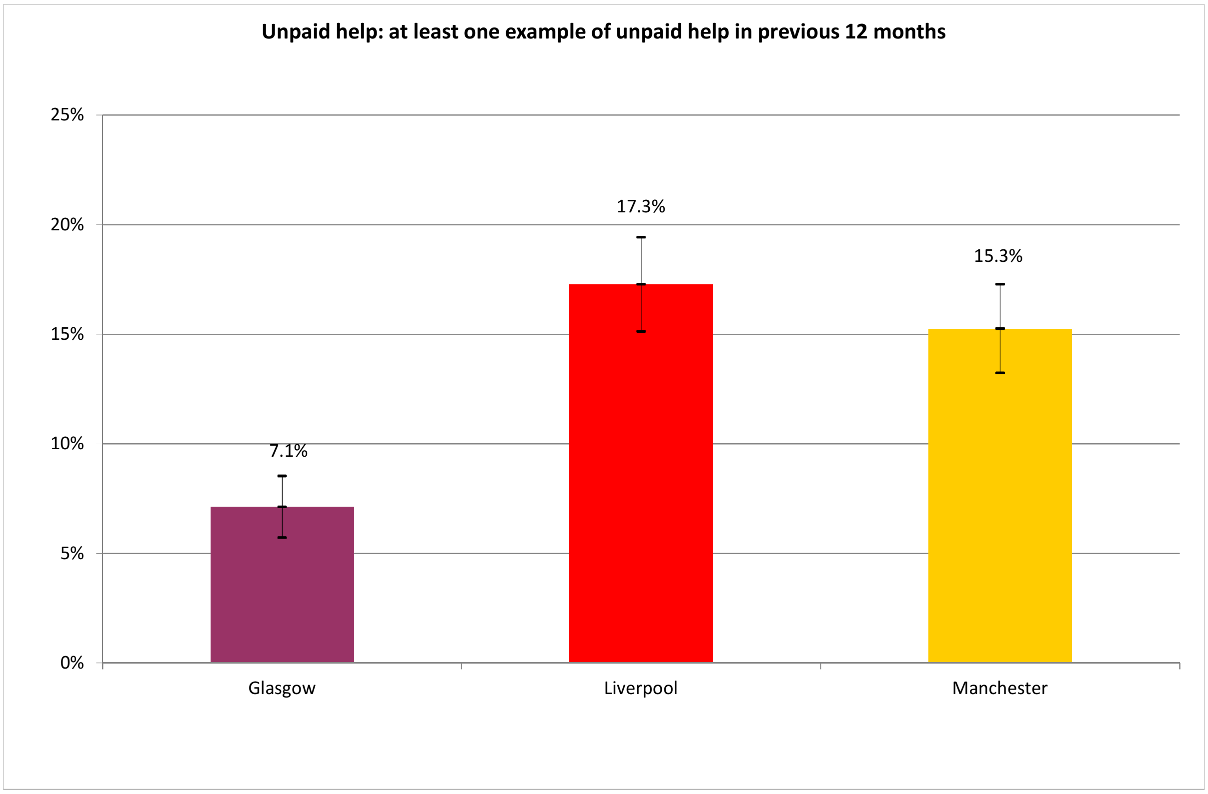
	Total	Glasgow	Liverpool	Manchester
On most days	34.3%	26.7%	42.9%	35.8%
Once or twice a week	17.1%	16.8%	12.1%	21.8%
Once or twice a month	4.2%	3.3%	3.2%	6.2%
Less often than once a month	5.5%	9.0%	2.9%	3.6%
Never	38.6%	44.0%	38.4%	32.2%
Don’t know (spontaneous)	0.3%	0.2%	0.4%	0.3%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



A8. During the last 12 months have you given any unpaid help to any groups, clubs or organisations in any of these ways?

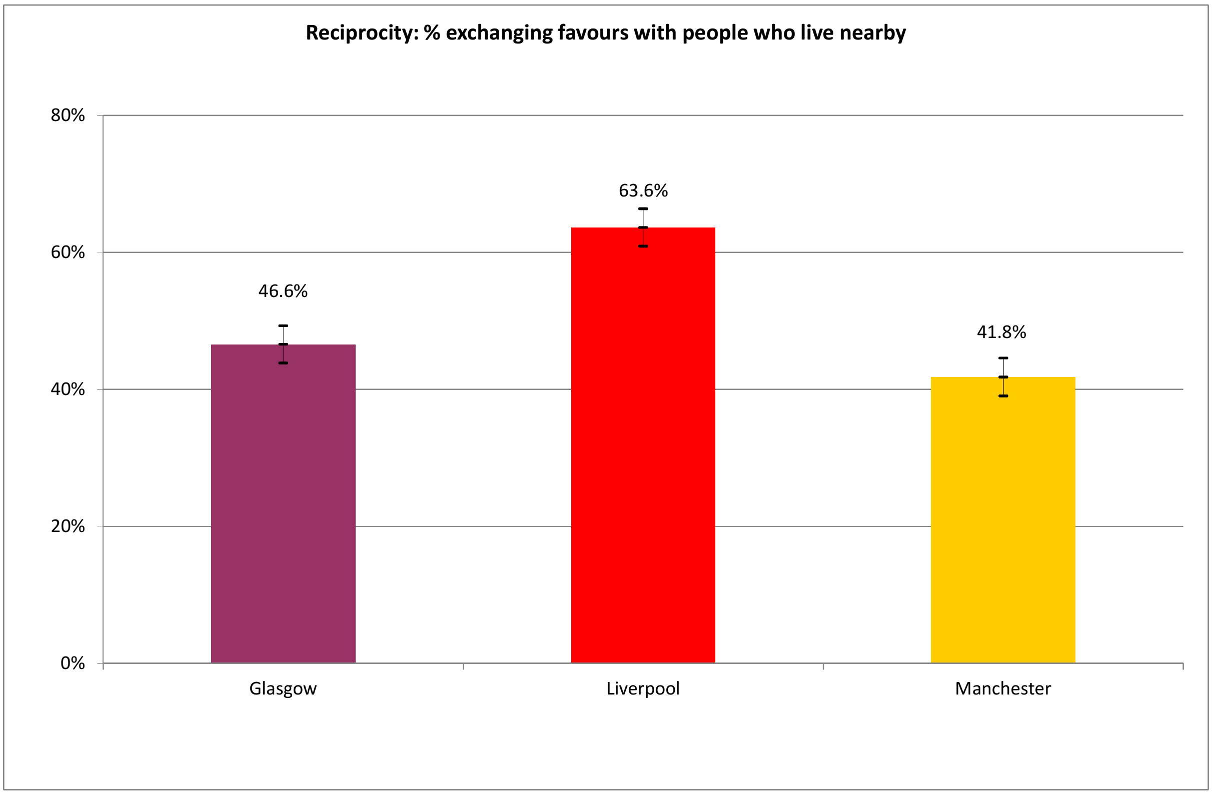
	Total	Glasgow	Liverpool	Manchester
Raising or handling money/taking part in sponsored events	4.5%	2.3%	5.3%	6.6%
Leading the group/ member of a committee	2.0%	1.5%	2.2%	2.5%
Organising or helping to run an activity or event	3.1%	1.9%	5.0%	2.9%
Visiting people	1.9%	0.8%	2.3%	2.7%
Befriending or mentoring people	1.1%	0.4%	1.0%	1.9%
Giving advice/information/ counselling	1.8%	0.8%	2.8%	2.3%
Secretarial, admin or clerical work	0.6%	0.5%	0.7%	0.5%
Providing transport/driving	0.5%	0.5%	0.5%	0.7%
Representing	0.5%	0.4%	0.5%	0.6%
Campaigning	1.0%	0.5%	0.9%	1.5%
Other practical help (e.g. helping out at school, religious group, shopping)	2.8%	1.1%	5.1%	2.8%
Any other help (write in)	1.5%	1.3%	3.1%	0.4%
None of the above	87.1%	92.1%	83.3%	84.3%
Don't know (spontaneous)	0.5%	1.0%	0.1%	0.4%
(Weighted base)	(3689)	(1291)	(1189)	(1213)

(Unweighted base)	(3696)	(1289)	(1199)	(1208)



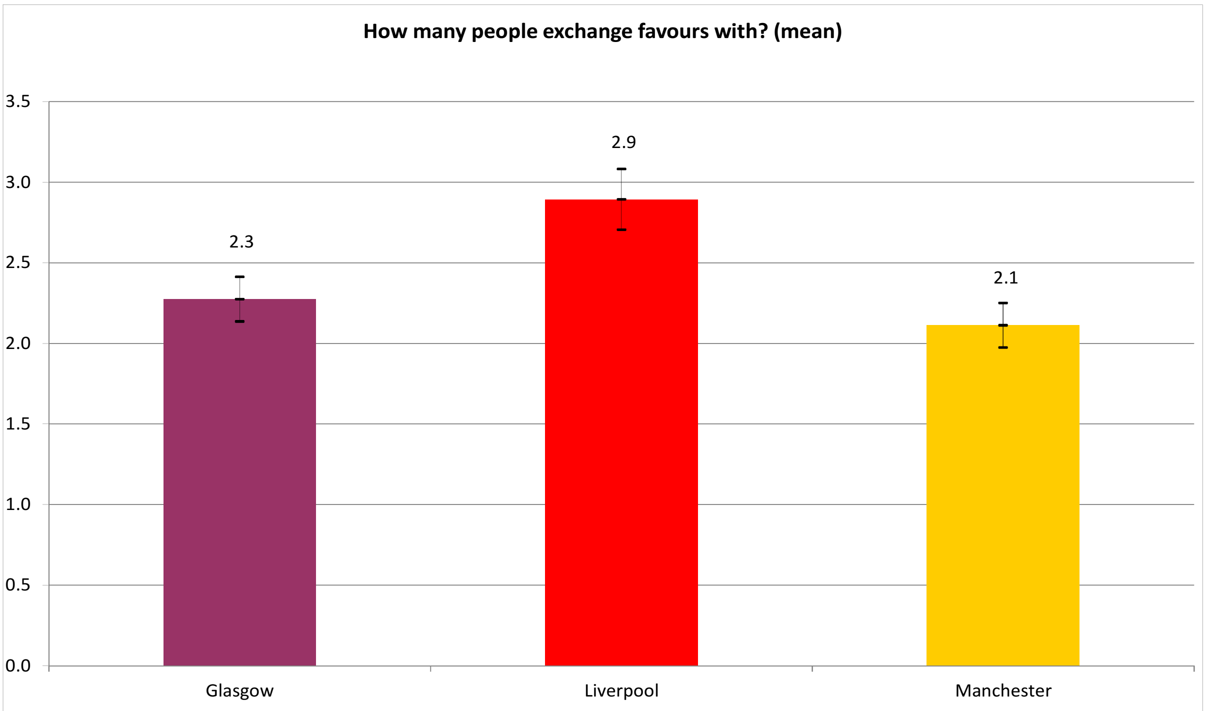
A9.1. Do you ever exchange small favours with the people who live near you? I'm thinking about things like leaving a key to let in a repair man, feeding pets while you are away or picking up things from the shop for each other.

	Total	Glasgow	Liverpool	Manchester
Yes	49.9%	46.6%	63.6%	41.8%
No	50.1%	53.4%	36.4%	58.2%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3696)	(1289)	(1202)	(1211)



A9.2. IF YES: How many people do you exchange favours with?

	Total	Glasgow	Liverpool	Manchester
One	26.4%	31.2%	20.4%	29.7%
Two	40.9%	39.5%	37.7%	47.2%
Three	16.8%	16.3%	19.3%	13.5%
Four	8.0%	7.7%	9.4%	6.1%
Five or more	8.0%	5.3%	13.2%	3.5%
Mean[ccxxxiv]	2.5	2.3	2.9	2.1
Median	2	2	2	2
(Weighted base)	(1865)	(598)	(759)	(508)
(Unweighted base)	(1919)	(592)	(796)	(531)

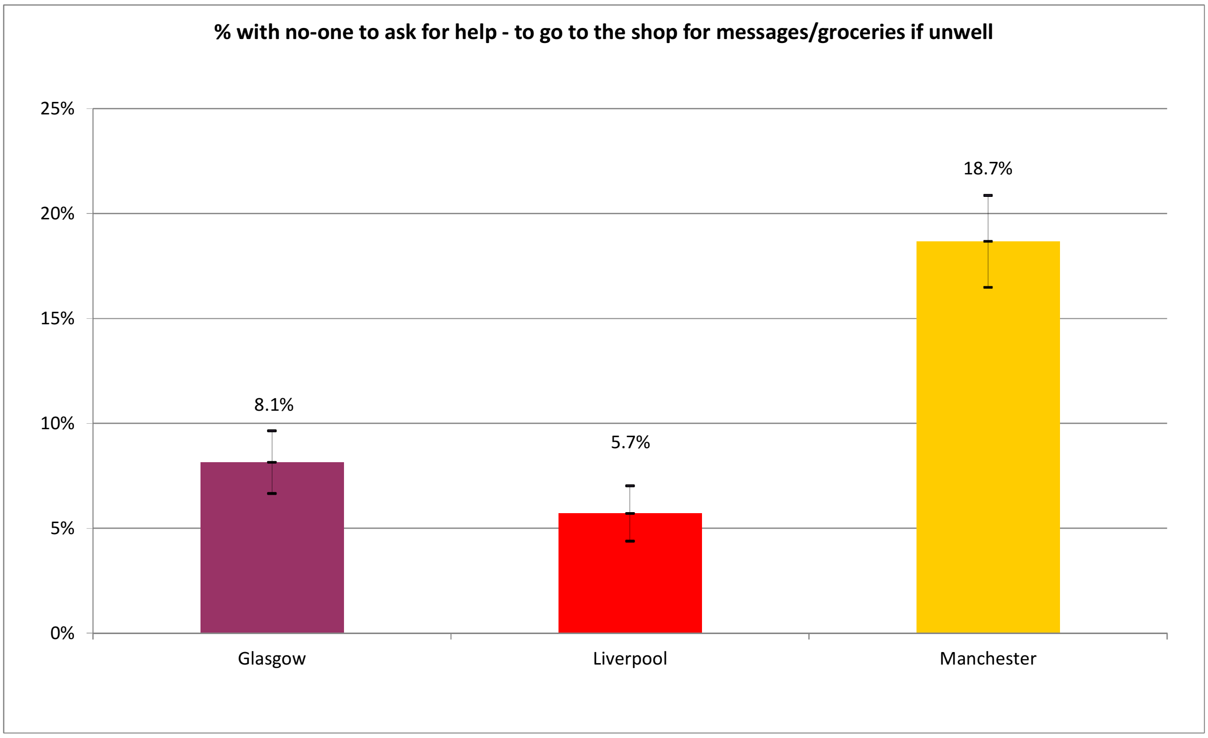


[ccxxxiv] Excludes a very small number (n=3) of cases with values greater than 30.

A10. Still thinking about your relatives, friends and neighbours outside your home, can you tell me around how many people could you ask for the following kinds of help?

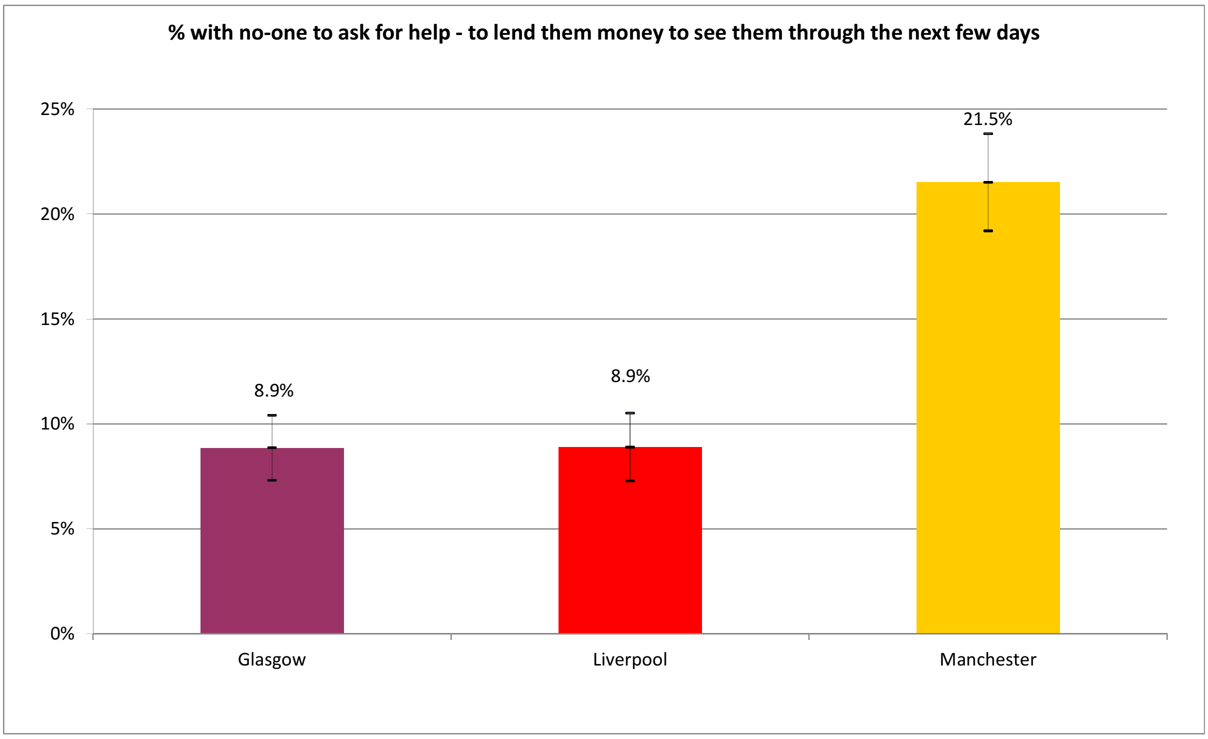
To go to the shop for messages/groceries if you are unwell

	Total	Glasgow	Liverpool	Manchester
None	10.8%	8.1%	5.7%	18.7%
One or two	48.2%	52.9%	51.3%	39.7%
More than two	27.5%	23.4%	38.0%	23.3%
Would not ask	12.2%	14.6%	3.7%	17.0%
Don't know (spontaneous)	1.2%	1.0%	1.2%	1.4%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



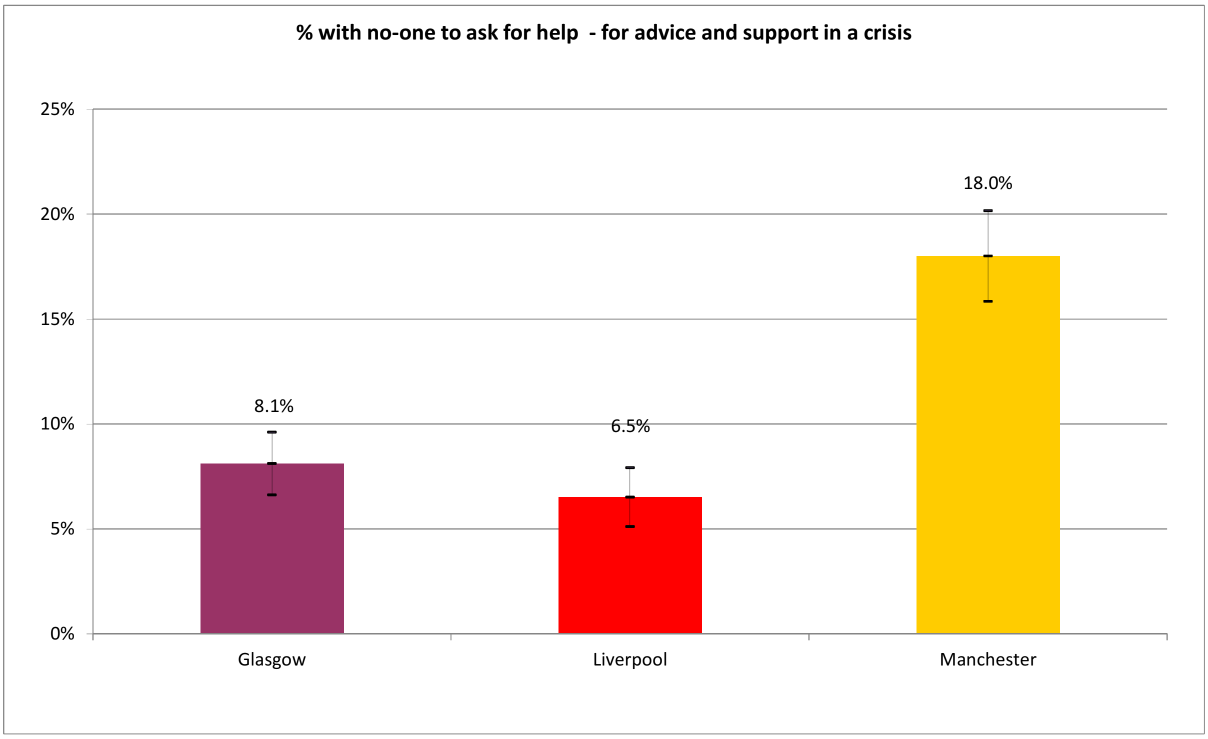
To lend you money to see you through the next few days

	Total	Glasgow	Liverpool	Manchester
None	13.0%	8.9%	8.9%	21.5%
One or two	34.9%	42.3%	37.5%	23.8%
More than two	19.5%	16.5%	26.3%	17.0%
Would not ask	30.4%	31.1%	23.3%	35.8%
Don't know (spontaneous)	2.3%	1.2%	4.1%	1.9%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)

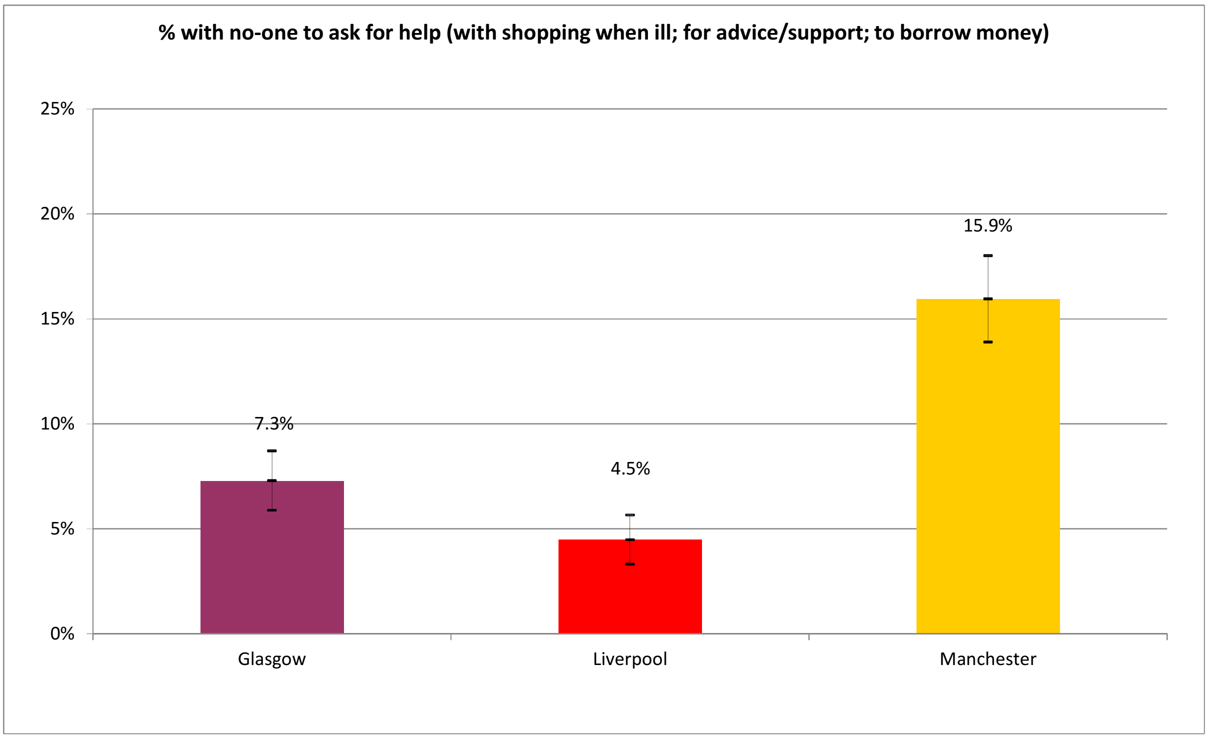


To give you advice and support in a crisis

	Total	Glasgow	Liverpool	Manchester
None	10.8%	8.1%	6.5%	18.0%
One or two	43.4%	51.0%	46.8%	31.2%
More than two	29.3%	23.6%	38.0%	28.3%
Would not ask	14.6%	16.5%	6.3%	19.7%
Don't know (spontaneous)	1.9%	0.8%	2.4%	2.8%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)

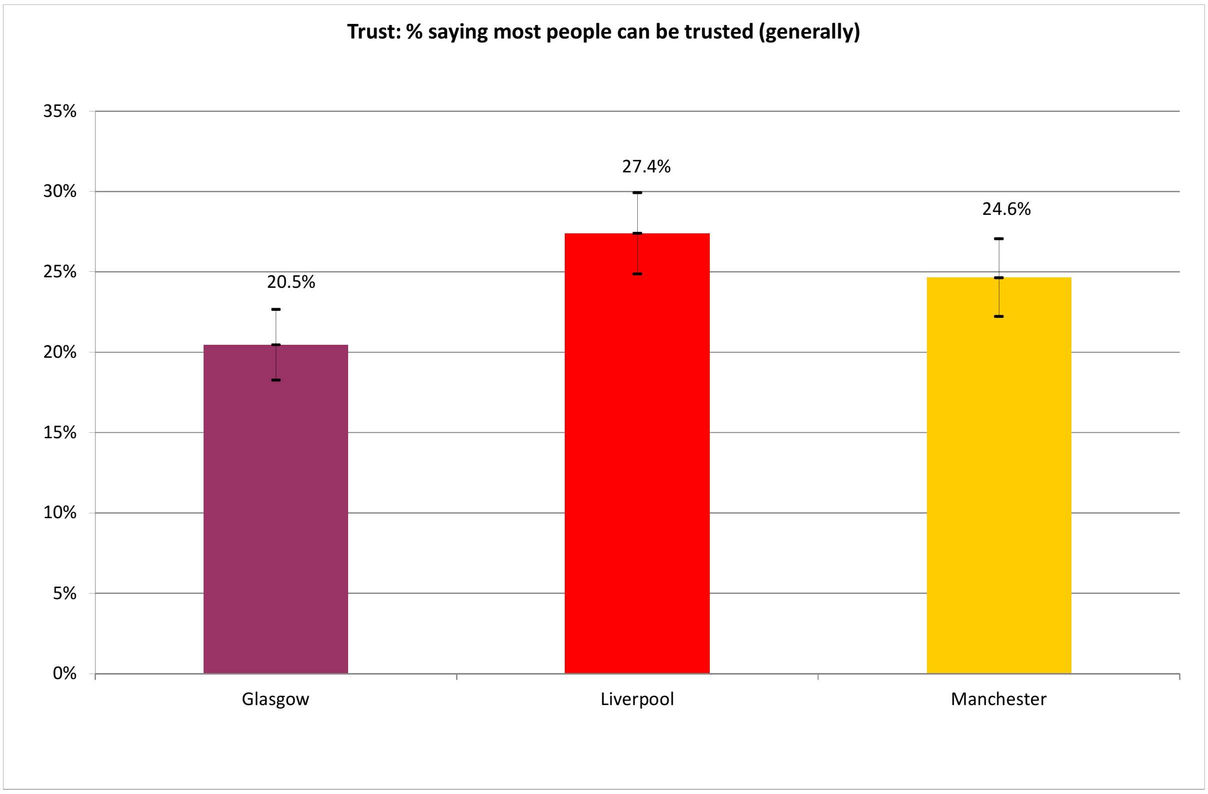


Summary of above three responses:



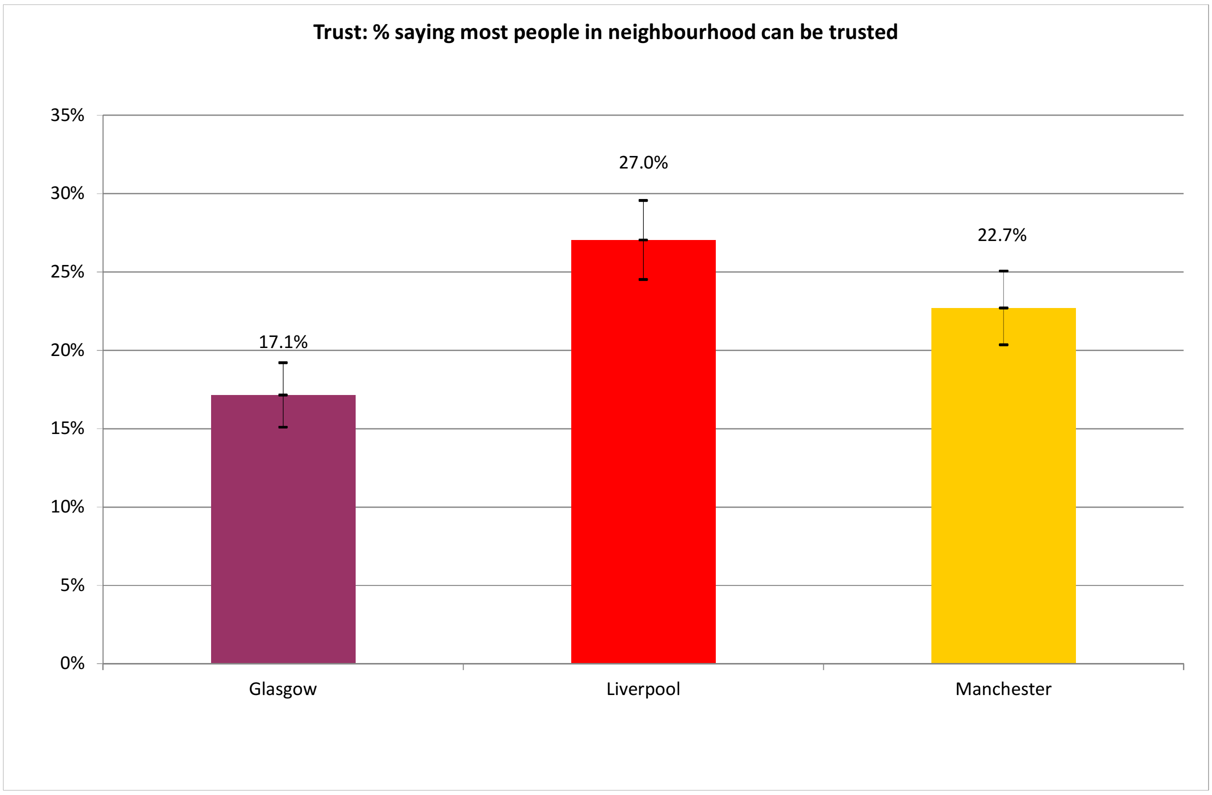
A11. Another topic we are interested in is trust. Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? (Unprompted)

	Total	Glasgow	Liverpool	Manchester
Most people can be trusted	23.8%	20.5%	27.4%	24.6%
Can't be too careful in dealing with people	35.6%	43.8%	26.9%	33.5%
It depends on people/circumstances	36.8%	31.7%	44.0%	36.4%
Don't know (spontaneous)	3.8%	4.0%	1.7%	5.5%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



A12. Would you say that………..

	Total	Glasgow	Liverpool	Manchester
Most of the people in your neighbourhood can be trusted	21.8%	17.1%	27.0%	22.7%
Some can be trusted	32.8%	37.3%	32.8%	27.5%
A few can be trusted	28.6%	28.8%	29.1%	28.0%
Or that no-one can be trusted?	11.2%	10.0%	6.2%	17.2%
Just moved here (spontaneous)	2.1%	2.3%	1.5%	2.5%
Don't know (spontaneous)	3.4%	4.5%	3.3%	2.1%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)

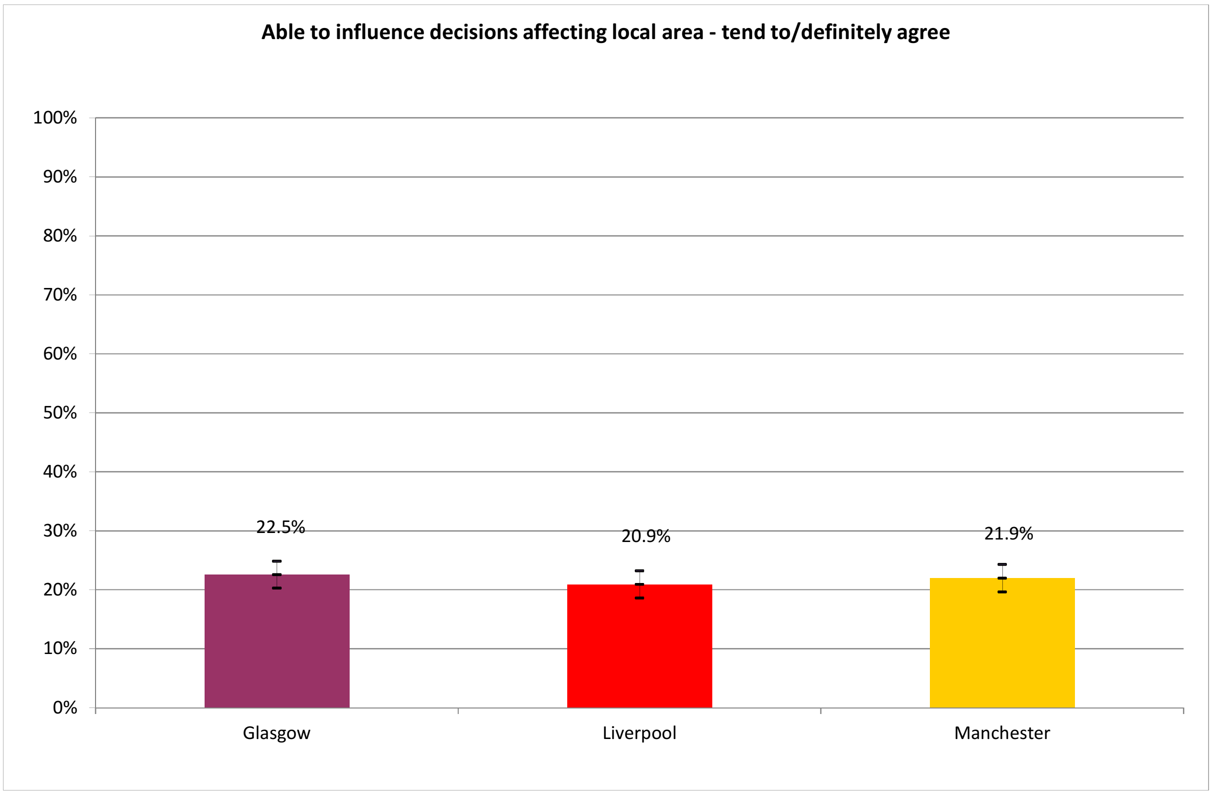


SECTION B: Political effects (selected questions only)

B2 Now thinking about whether you feel you are able to influence political decisions and local affairs, please say whether you agree or disagree with the following statements:

I am able to influence decisions affecting my local area

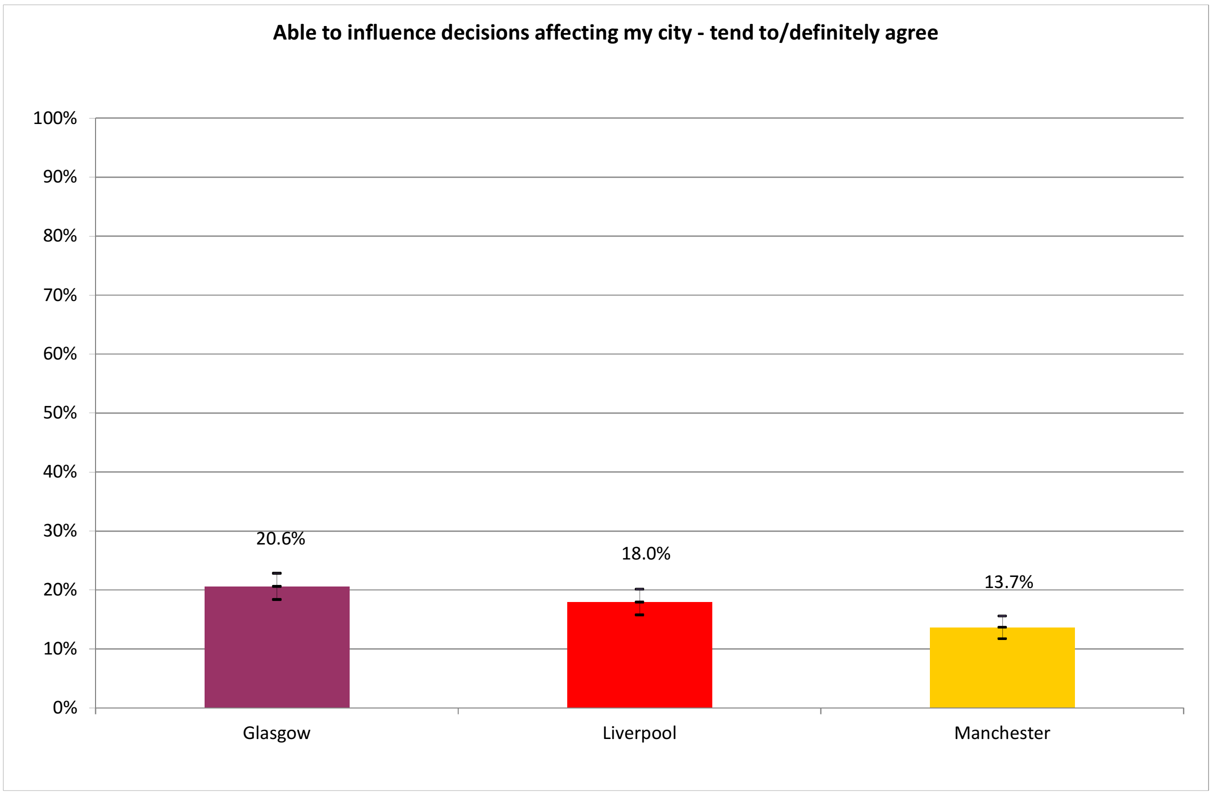
	Total	**Glasgow**	**Liverpool**	**Manchester**
Definitely Agree	1.6%	1.6%	1.2%	1.9%
Tend to Agree	20.3%	20.9%	19.7%	20.1%
Tend to Disagree	26.6%	25.3%	28.5%	26.5%
Definitely Disagree	42.2%	38.0%	42.1%	47.2%
Don't know	9.3%	14.2%	8.4%	4.3%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



Able to influence decisions affecting local area - tend to/definitely agree
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
22.5%
20.9%
21.9%
Glasgow
Liverpool
Manchester

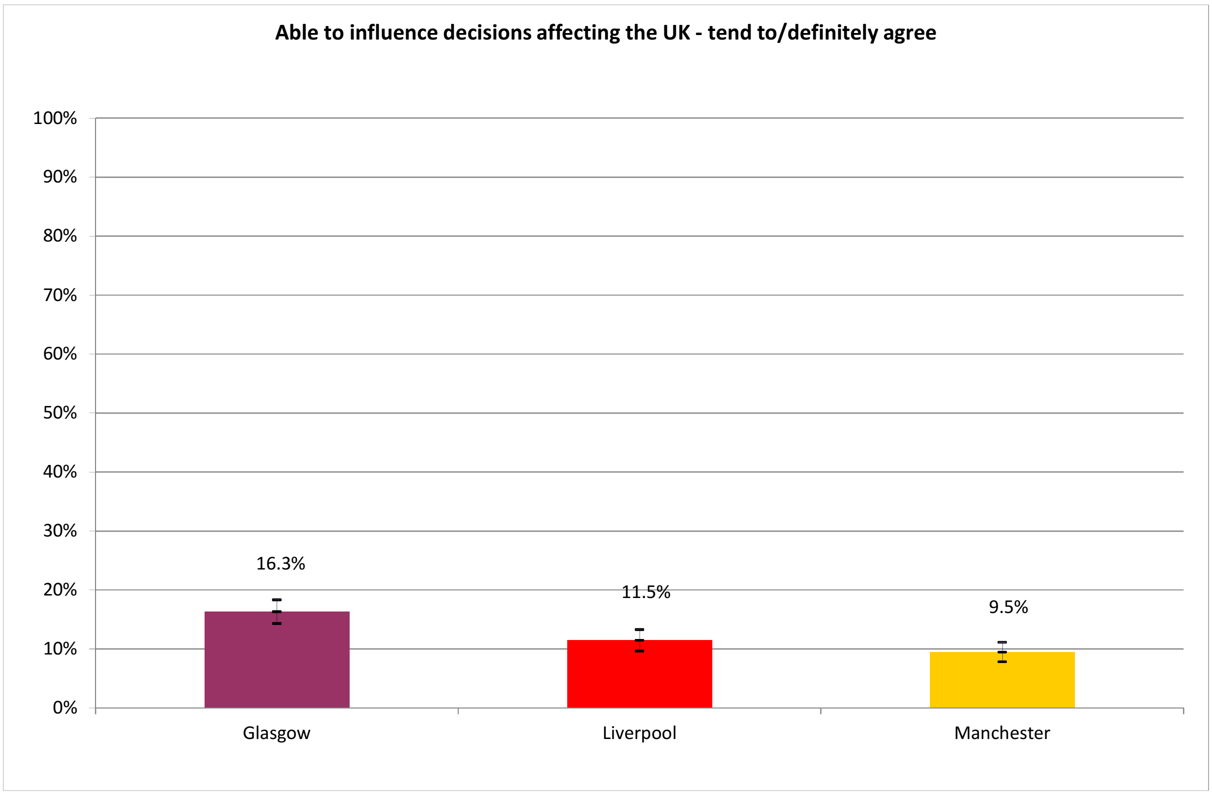
I am able to influence decisions affecting my city

	Total	Glasgow	Liverpool	Manchester
Definitely Agree	1.2%	1.8%	1.0%	0.7%
Tend to Agree	16.4%	18.8%	17.0%	12.9%
Tend to Disagree	29.3%	26.7%	28.5%	33.1%
Definitely Disagree	43.8%	38.7%	45.5%	48.6%
Don't know	9.3%	14.0%	8.1%	4.7%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



I am able to influence decisions affecting the United Kingdom

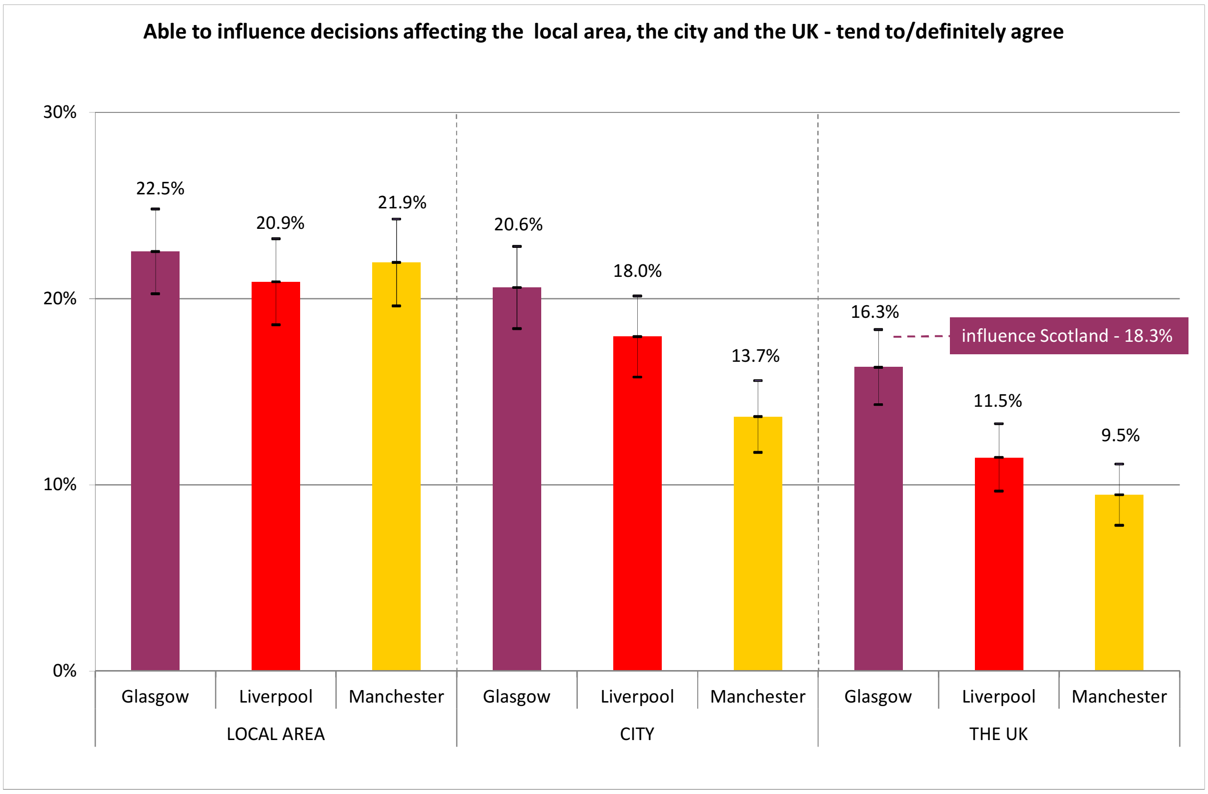
	Total	Glasgow	Liverpool	Manchester
Definitely Agree	0.7%	1.0%	0.5%	0.4%
Tend to Agree	12.0%	15.3%	10.9%	9.1%
Tend to Disagree	28.6%	28.1%	26.6%	31.0%
Definitely Disagree	49.4%	41.5%	54.2%	54.5%
Don't know	9.3%	14.0%	7.7%	5.0%
(Weighted base)	(3694)	(1291)	(1193)	(1216)
(Unweighted base)	(3702)	(1289)	(1202)	(1211)



I am able to influence decisions affecting Scotland

	Glasgow
Definitely Agree	1.4%
Tend to Agree	16.9%
Tend to Disagree	27.7%
Definitely Disagree	40.0%
Don't know	13.9%
(Weighted base)	(1291)
(Unweighted base)	(1289)

Summary of responses:



SECTION C: Human values (selected questions only)

As stated in the main part of the thesis, the Human Values Scale consists of 21 questions, from which scores for 10 'values' are derived. Respondents are asked to assess the extent to which they identify with the person described (with answers ranging from 1 ('very much like me') to 6 ('not at all like me')).

Data for two such values are presented in the thesis. The 'benevolence' value is derived from answers to these two statements:

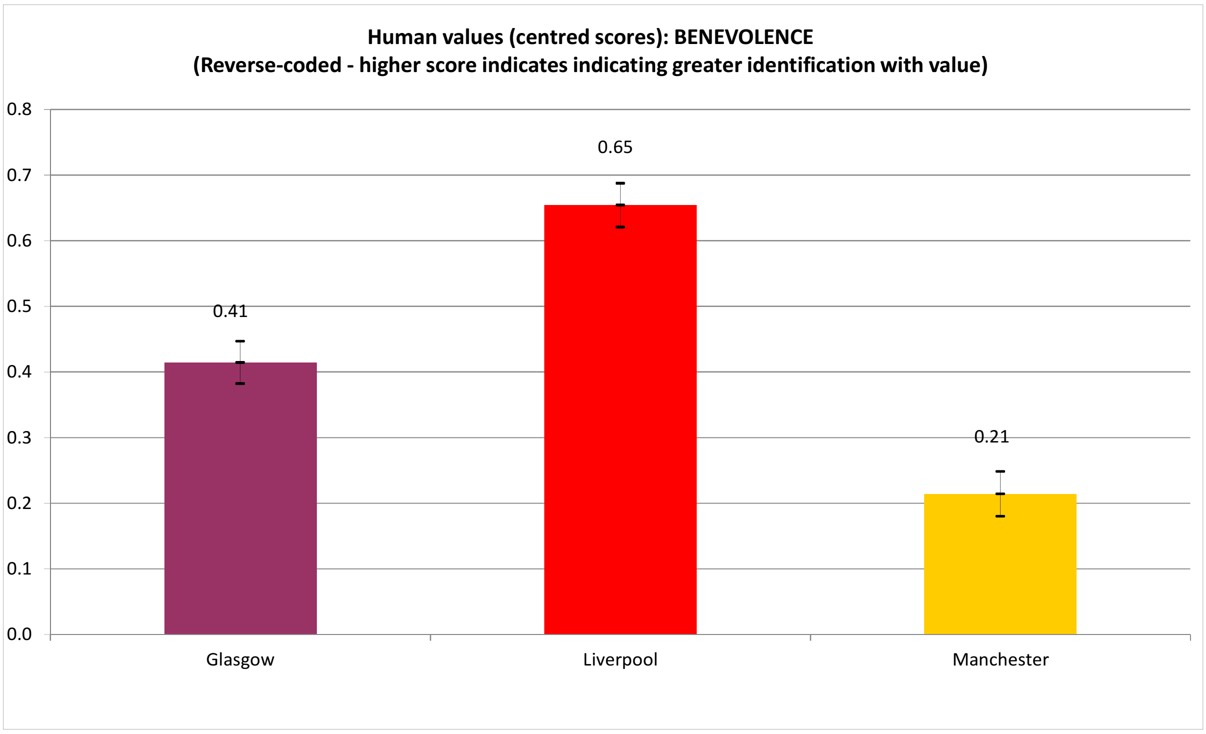
1. *It is important to him/her to be loyal to his/her friends. He/she wants to devote himself/herself to people close to him/her;*
2. *It's very important to him/her to help the people around him/her. He/she wants to care for their well-being.*

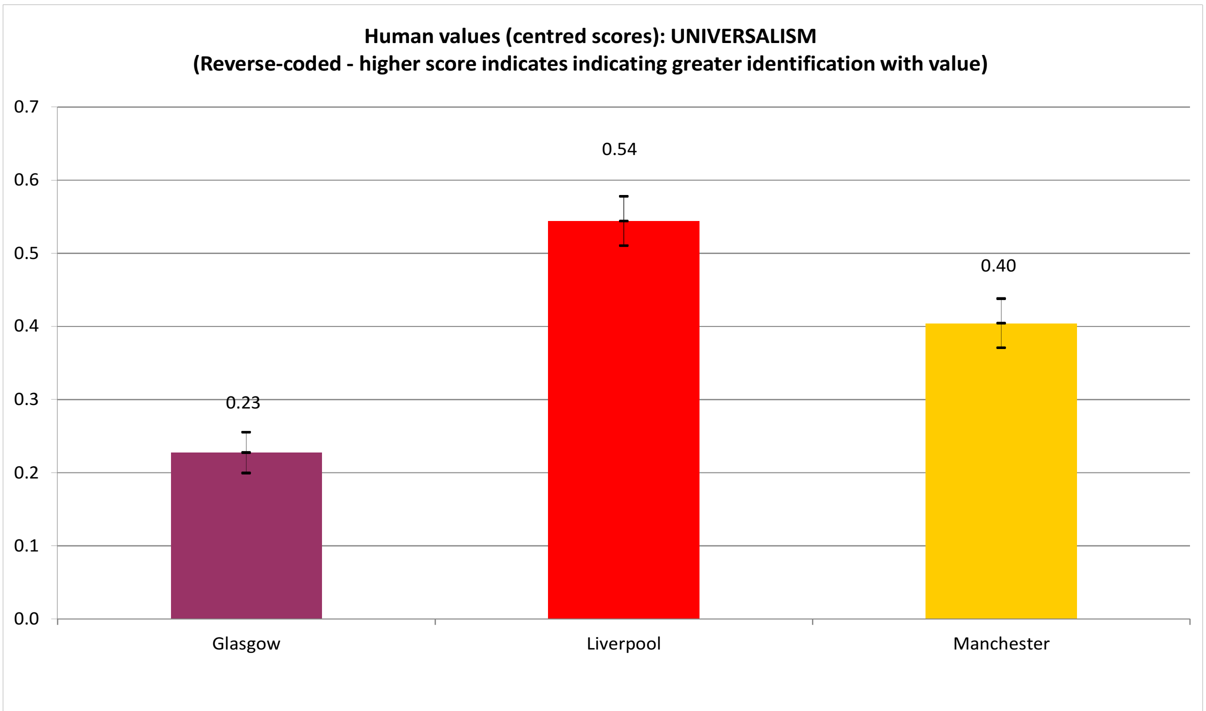
The 'universalism' value is derived from responses to three statements:

1. *He thinks it is important that every person in the world should be treated equally. He believes everyone should have equal opportunities in life*;
2. *It is important to him to listen to people who are different from him. Even when he disagrees with them, he still wants to understand them*;
3. *He strongly believes that people should care for nature. Looking after the environment is important to him.*

As stated in Chapter 4, scores are reverse-coded to aid interpretation i.e. so that the higher the score, the more associated with the value a participant's answer is. Scores are also adjusted to allow for scale use differences by individuals and groups.

Thus, the figures below show the adjusted, reverse-coded, mean scores by city for the two values presented within the thesis.


Human values (centred scores): BENEVOLENCE
(Reverse-coded - higher score indicates indicating greater identification with value)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.41
0.65
0.21
Glasgow
Liverpool
Manchester


Human values (centred scores): UNIVERSALISM
(Reverse-coded - higher score indicates indicating greater identification with value)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.23
0.54
0.40
Glasgow
Liverpool
Manchester

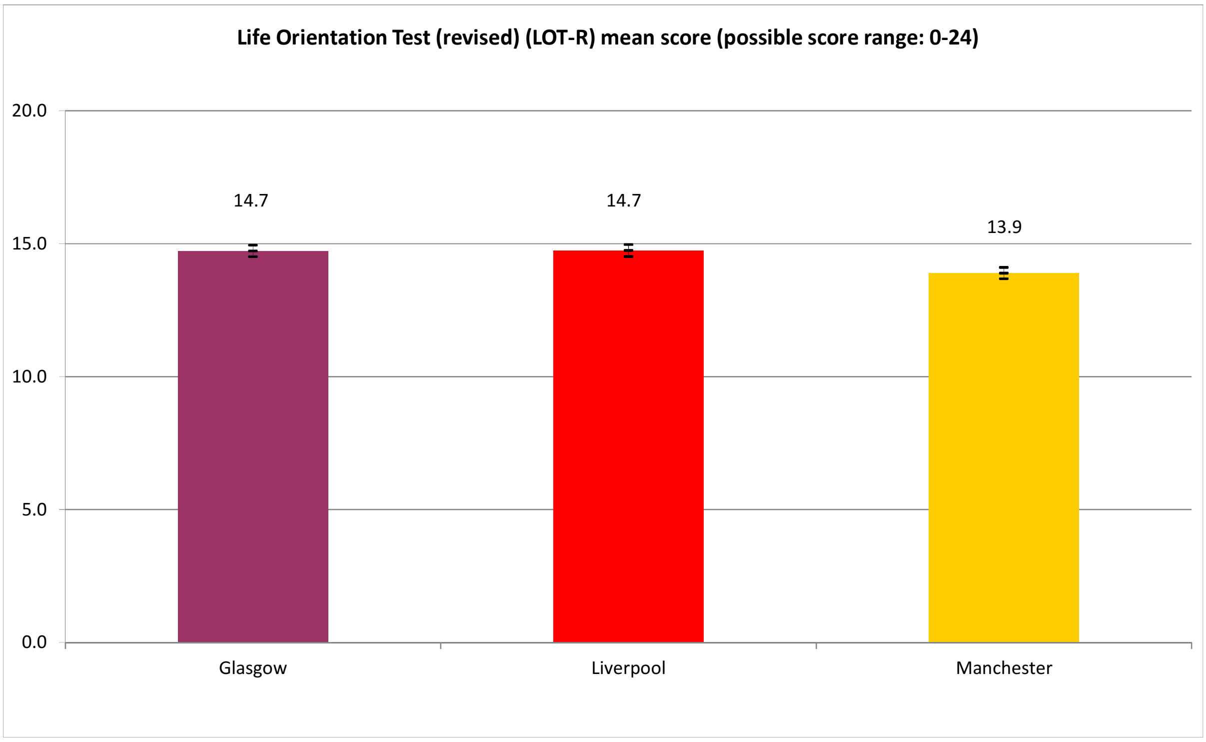
SECTION E: Life Orientation Test (Revised)

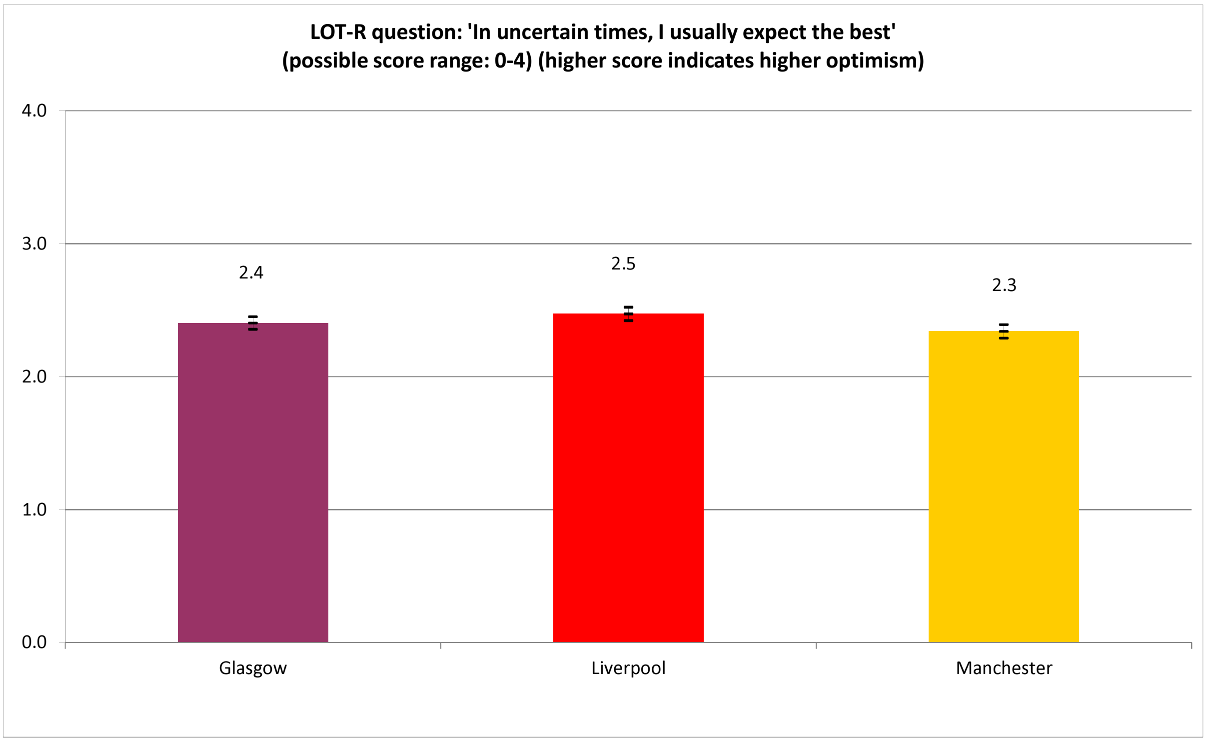
The LOT-R scale is made up of ten statements against which respondents' level of agreement (from 'strongly disagree' to 'strongly agree') is recorded. However, of the ten statements, four are 'dummy' statements (or 'fillers') and are excluded from the overall score. The minimum score that can be calculated is 0 (representing extreme pessimism) and the maximum is 24 (representing extreme optimism). The six statements included in the total LOT-R score are:

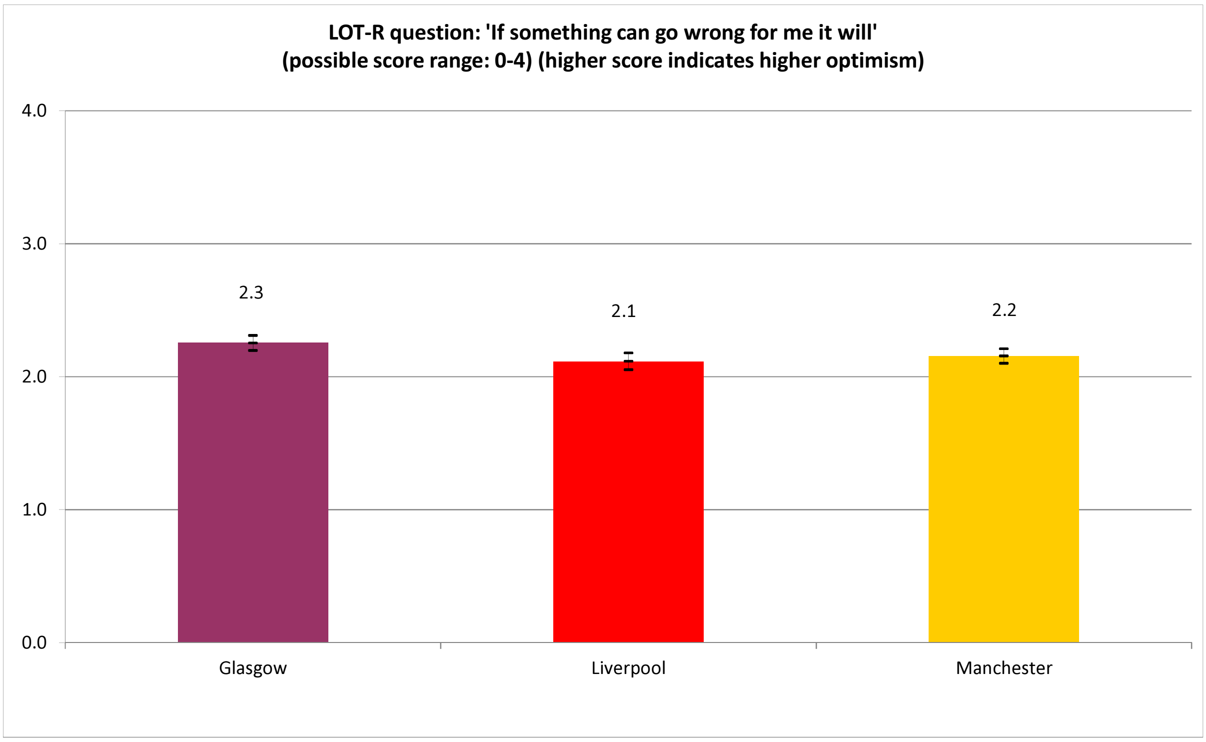
- in uncertain times, I usually expect the best;
- if something can go wrong for me it will;
- I'm always optimistic about my future;
- I hardly ever expect things to go my way;
- I rarely count on good things happening to me;
- overall, I expect more good things to happen to me than bad.

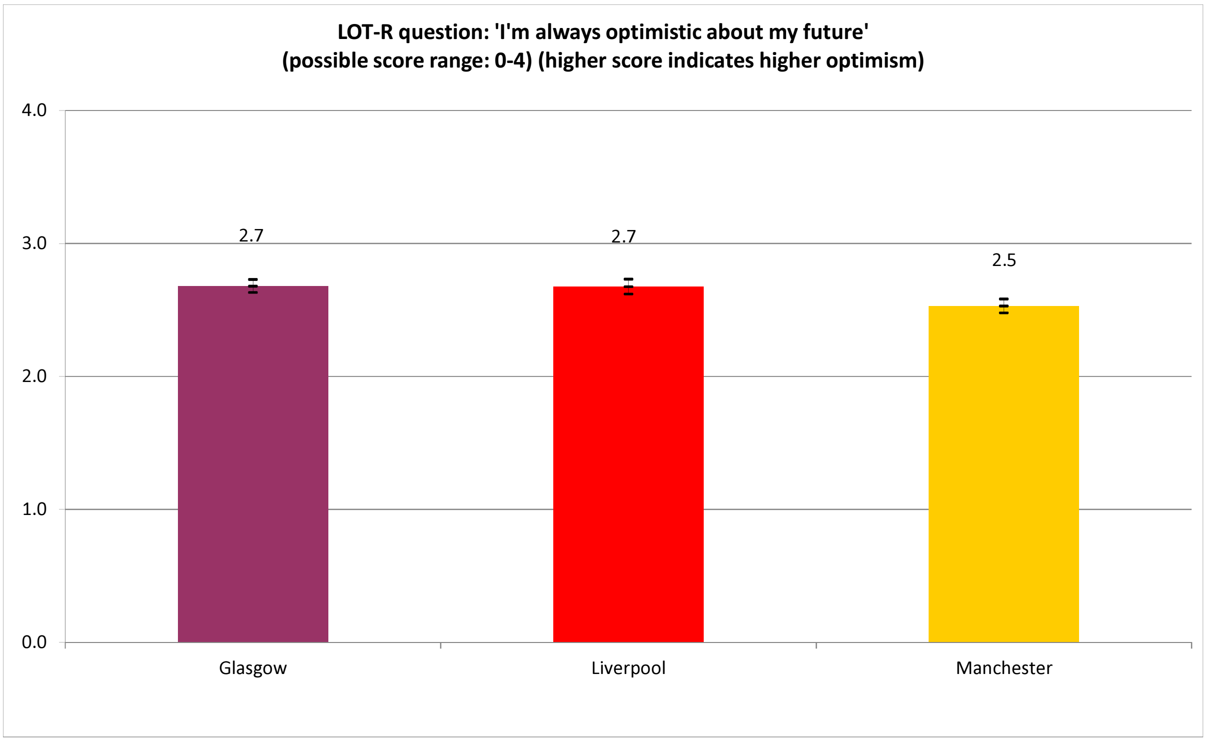
In calculating the total score for each question, a negatively-worded statement (e.g. 'if something can go wrong for me it will') is reverse-coded (i.e. 'strongly agree' is coded as 0 rather than 4).

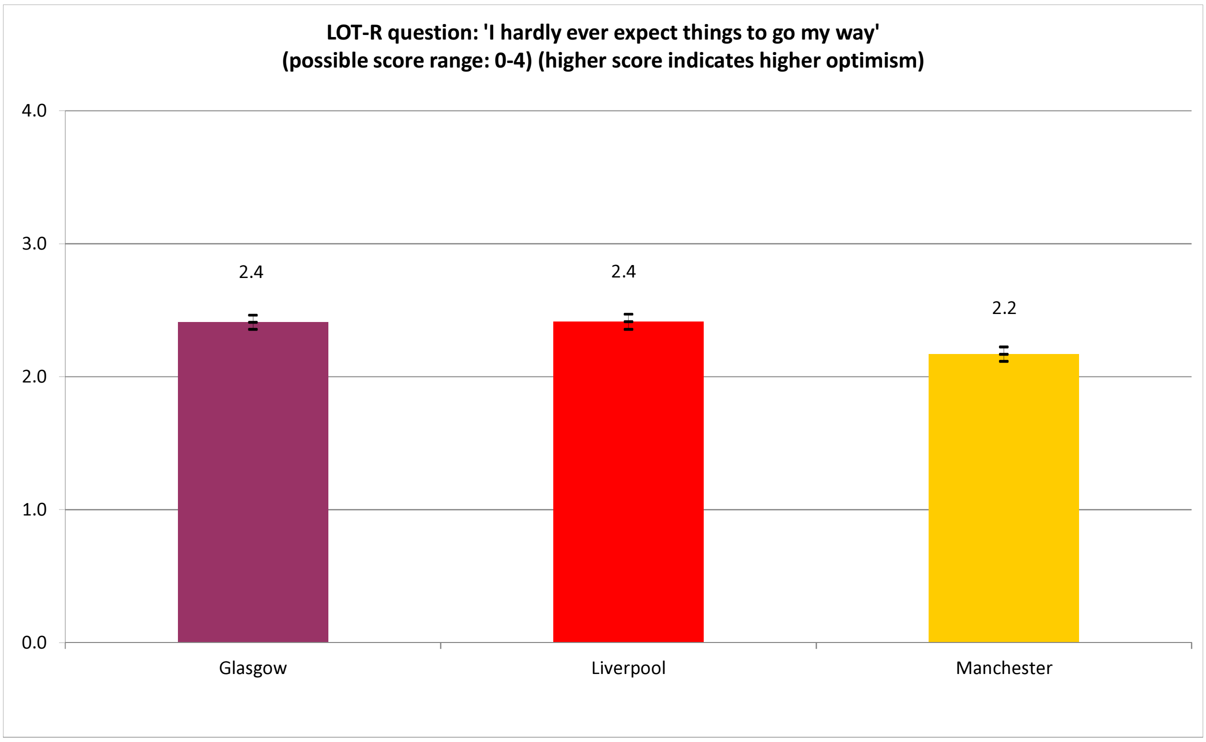
The figures below present the overall mean score by city, followed by mean scores for the six individual questions.

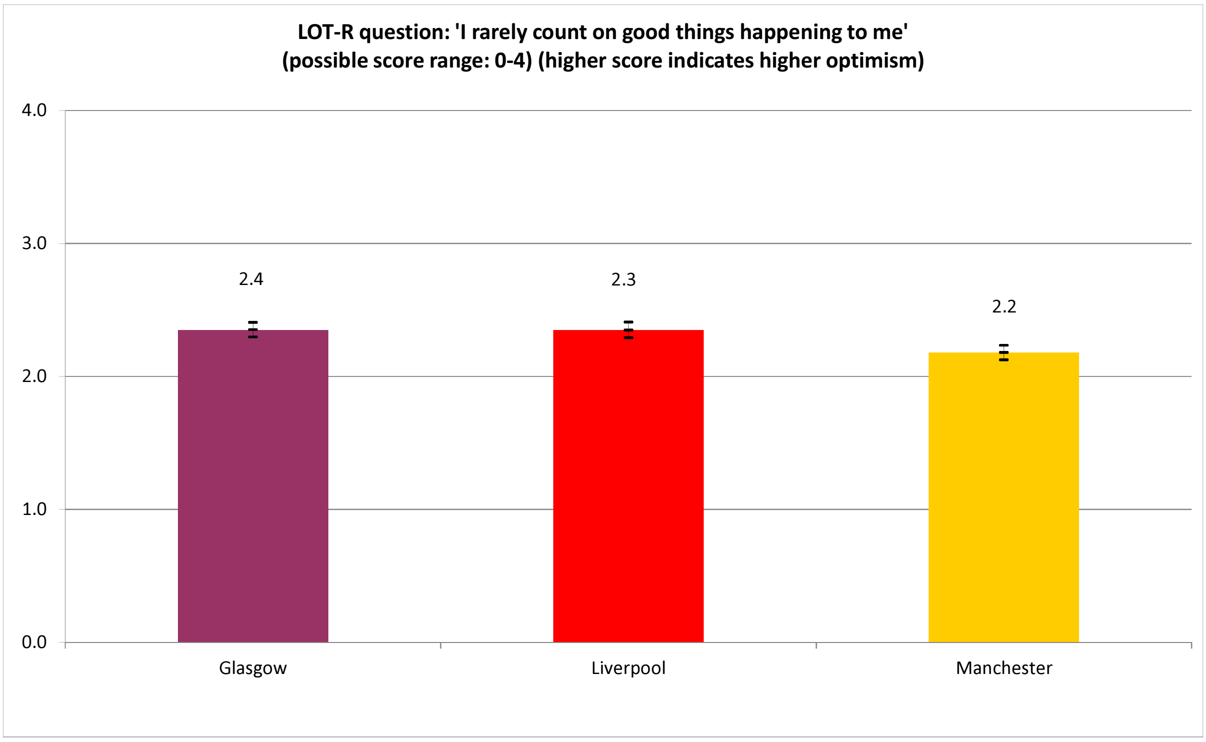

Life Orientation Test (revised) (LOT-R) mean score (possible score range: 0-24)
20.0
15.0
10.0
5.0
0.0
14.7
14.7
13.9
Glasgow
Liverpool
Manchester

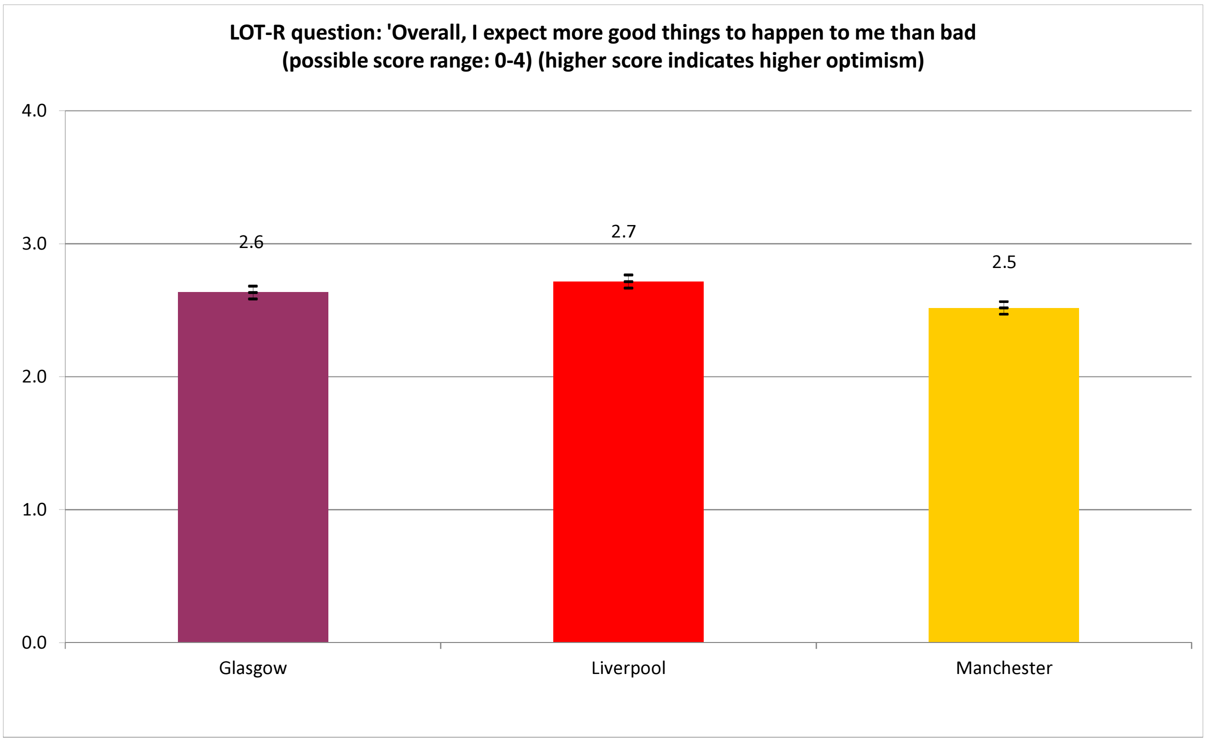

LOT-R question: 'In uncertain times, I usually expect the best'
(possible score range: 0-4) (higher score indicates higher optimism)
4.0
3.0
2.0
1.0
0.0
2.4
2.5
2.3
Glasgow
Liverpool
Manchester


LOT-R question: 'If something can go wrong for me it will'
(possible score range: 0-4) (higher score indicates higher optimism)
4.0
3.0
2.0
1.0
0.0
2.3
2.1
2.2
Glasgow
Liverpool
Manchester


LOT-R question: 'I'm always optimistic about my future'
(possible score range: 0-4) (higher score indicates higher optimism)
4.0
3.0
2.0
1.0
0.0
2.7
2.7
2.5
Glasgow
Liverpool
Manchester


LOT-R question: 'I hardly ever expect things to go my way'
(possible score range: 0-4) (higher score indicates higher optimism)
4.0
3.0
2.0
1.0
0.0
2.4
2.4
2.2
Glasgow
Liverpool
Manchester


LOT-R question: 'I rarely count on good things happening to me'
(possible score range: 0-4) (higher score indicates higher optimism)
4.0
3.0
2.0
1.0
0.0
2.4
2.3
2.2
Glasgow
Liverpool
Manchester


LOT-R question: 'Overall, I expect more good things to happen to me than bad
(possible score range: 0-4) (higher score indicates higher optimism)
4.0
3.0
2.0
1.0
0.0
2.6
2.7
2.5
Glasgow
Liverpool
Manchester

SECTION F: Sense of Coherence

As stated elsewhere in the thesis, Sense of Coherence (SoC) is measured by the summed total from 13 questions within the SoC-13 scale (shown below). 5 of the 13 questions are reverse-coded to ensure that a higher overall score is associated with a greater SoC. The overall scale is made up of three components: comprehensibility; manageability; and meaningfulness.

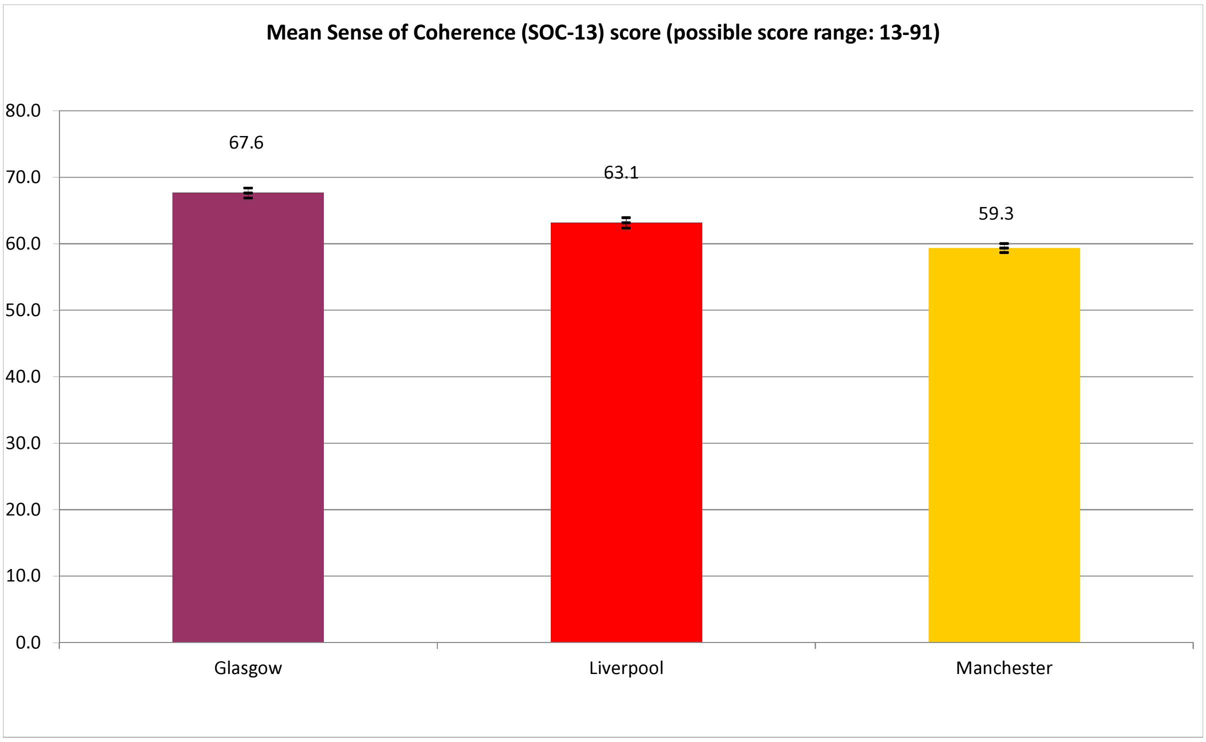
Sense of Coherence questions[ccxxxv]:

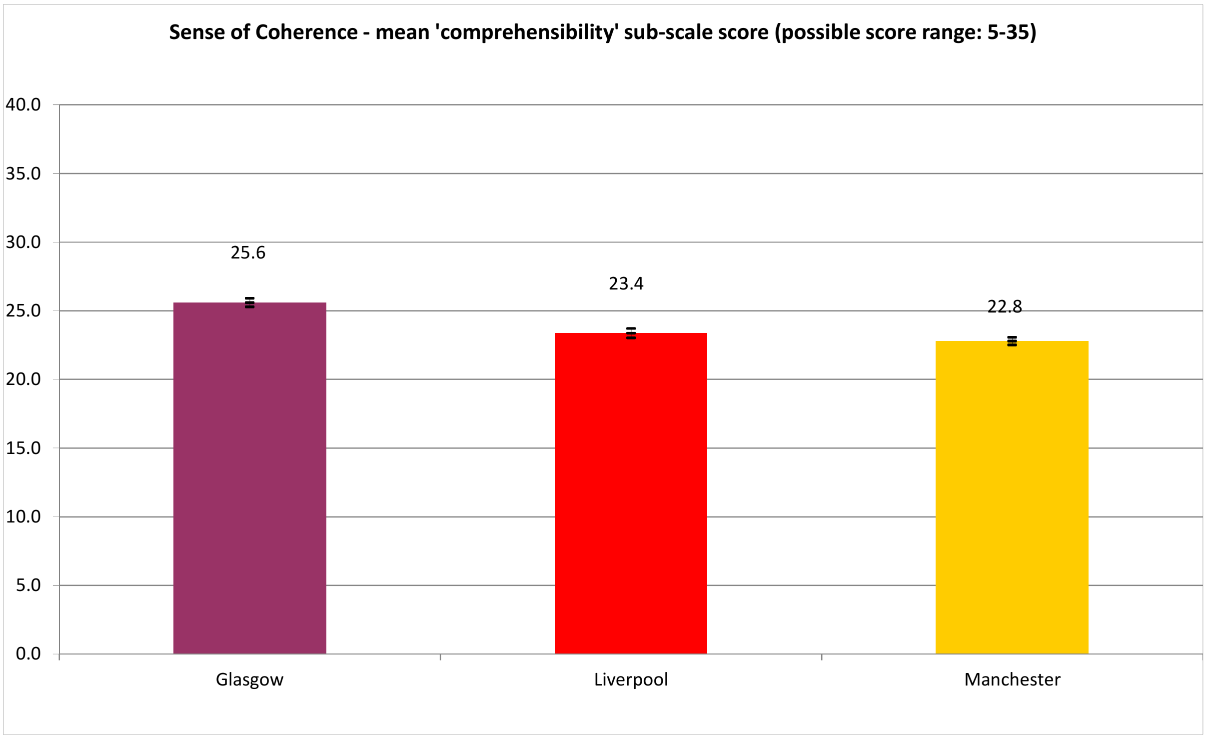
1.	Do you have the feeling that you don't really care about what goes on around you?	**Very seldom or never**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very often**
2.	Has it happened in the past that you were surprised by the behaviour of people whom you thought you knew well?	**Never happened**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Always happened**
3.	Has it happened that people whom you counted on disappointed you?	**Never happened**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Always happened**
4.	Until now your life has had:	**No clear goals or purpose at all**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very clear goals and purpose**
5.	Do you have the feeling that you're being treated unfairly?	**Very often**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very seldom or never**
6.	Do you ever have the feeling that you are in an unfamiliar situation and don't know what to do?	**Very often**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very seldom or never**

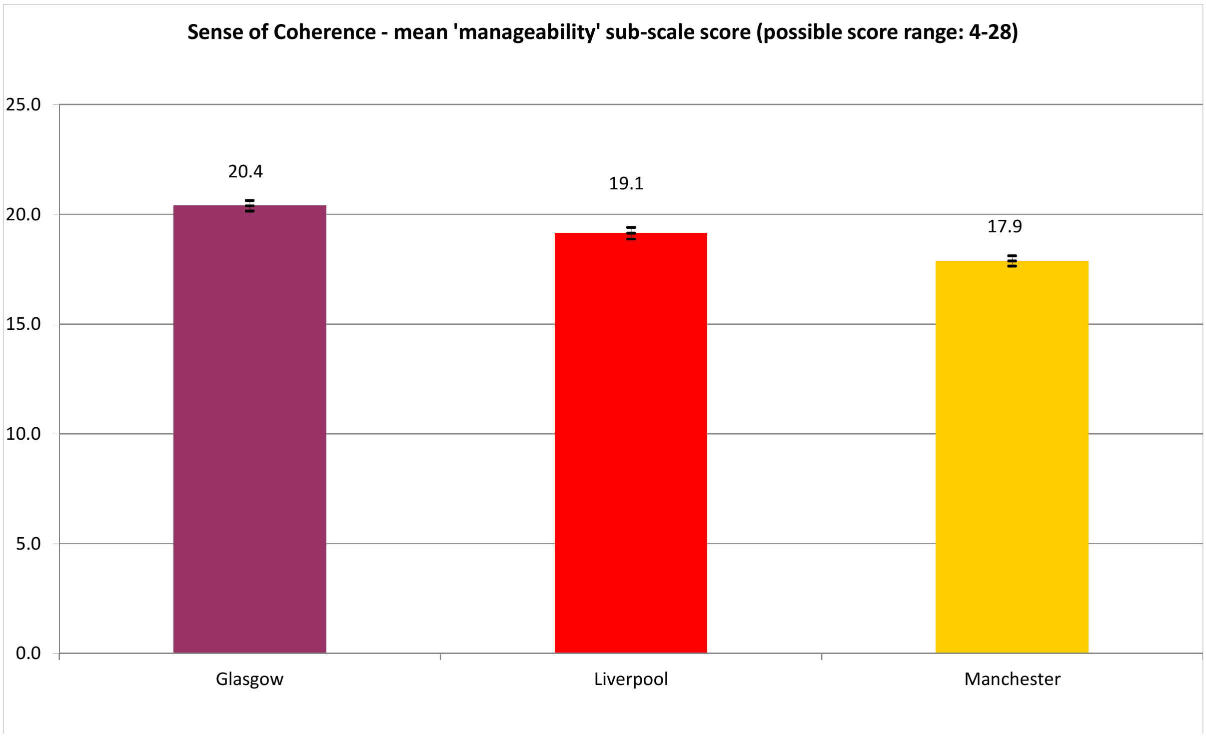
[ccxxxv] These are introduced in the questionnaire thus: *Here is a series of questions on various aspects of life. Each question has seven possible answers. Please tick the box which expresses your answer, with numbers 1 and 7 being the extreme answers. If the words beside 1 are right for you tick 1, if the words beside 7 are right for you tick 7. If you feel differently tick the number which best expresses your feeling.*

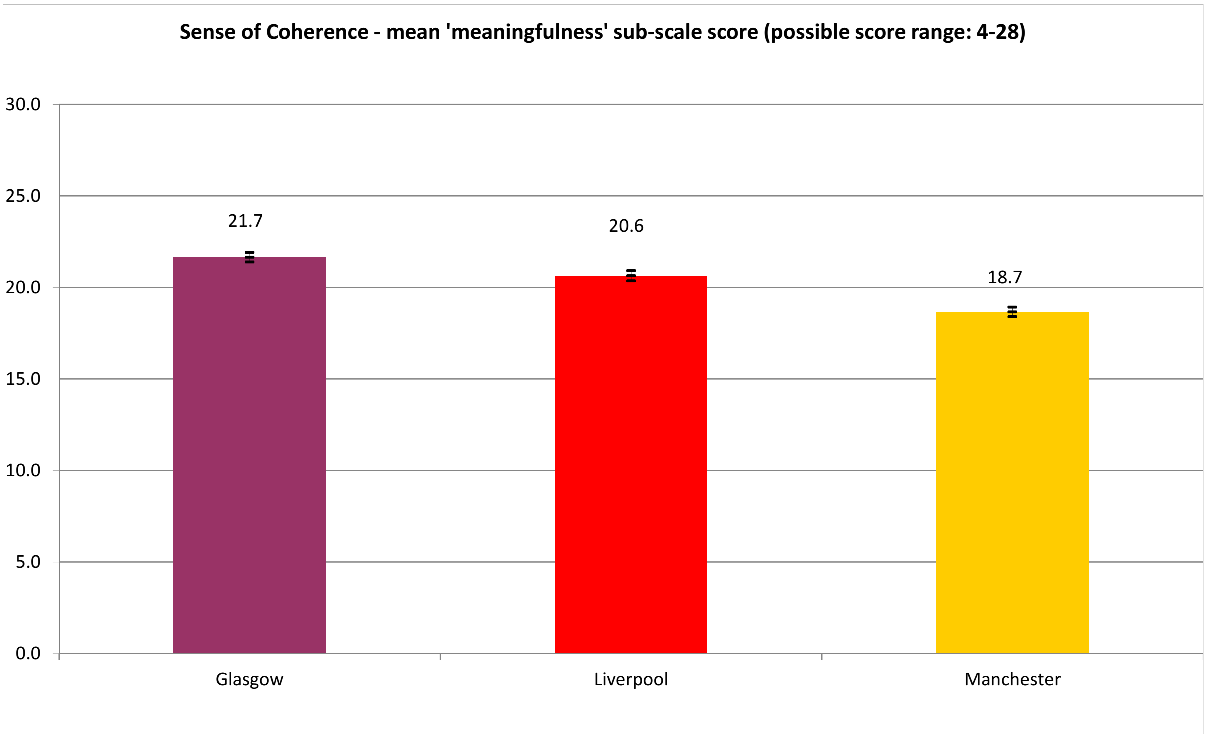
7.	Doing the things you do every day is:	**A source of deep pleasure and satisfaction**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**A source of pain and boredom**
8.	Do you have very mixed-up feelings and ideas?	**Very often**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very seldom or never**
9.	Does it happen that you have feelings inside you that you would rather not feel?	**Very often**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very seldom or never**
10.	Many people – even those with a strong character – sometimes feel like losers in certain situations. How often have you felt this way in the past?	**Very seldom or never**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very often**
11	When something happened, have you generally found that:	**You over estimated or under estimated its importance**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**You saw things in the right proportions**
12	How often do you have the feeling that there's little meaning in the things you do in your daily life?	**Very often**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very seldom or never**
13.	How often do you have the feeling that you're not sure you can keep under control?	**Very often**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Very seldom or never**

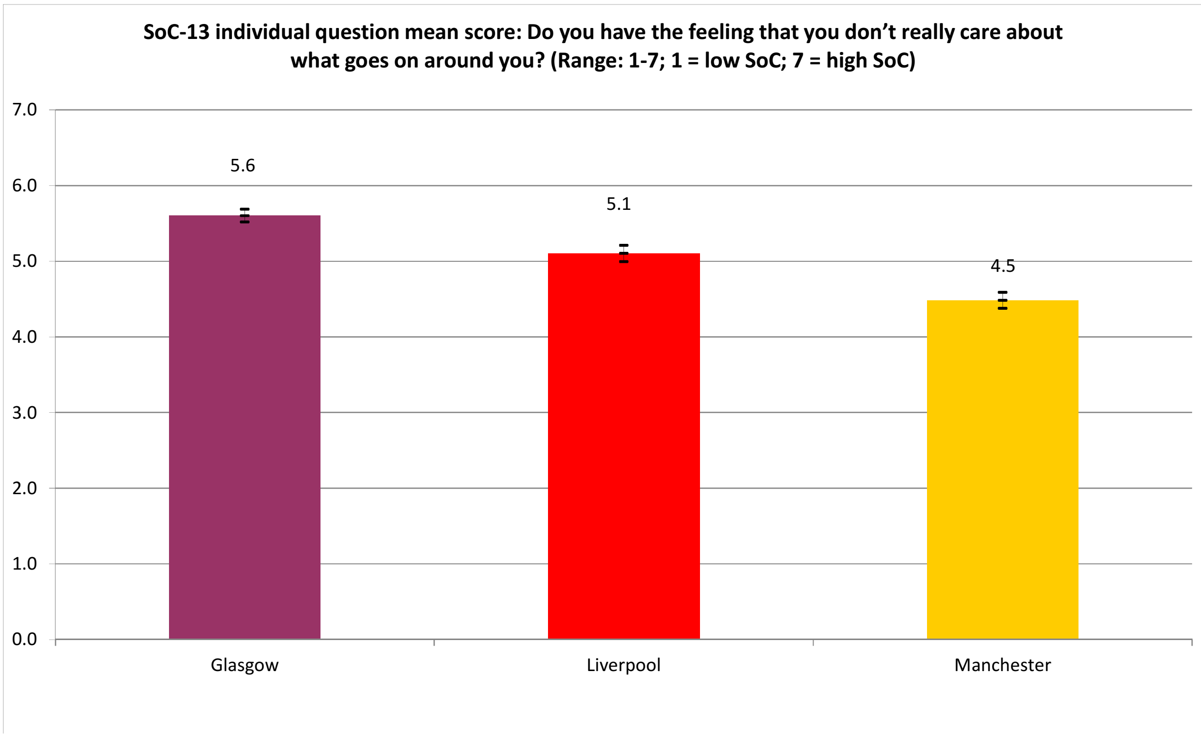
The figures below show the mean total scores for each city, followed by average scores for the three components, and for each of the 13 individual questions.

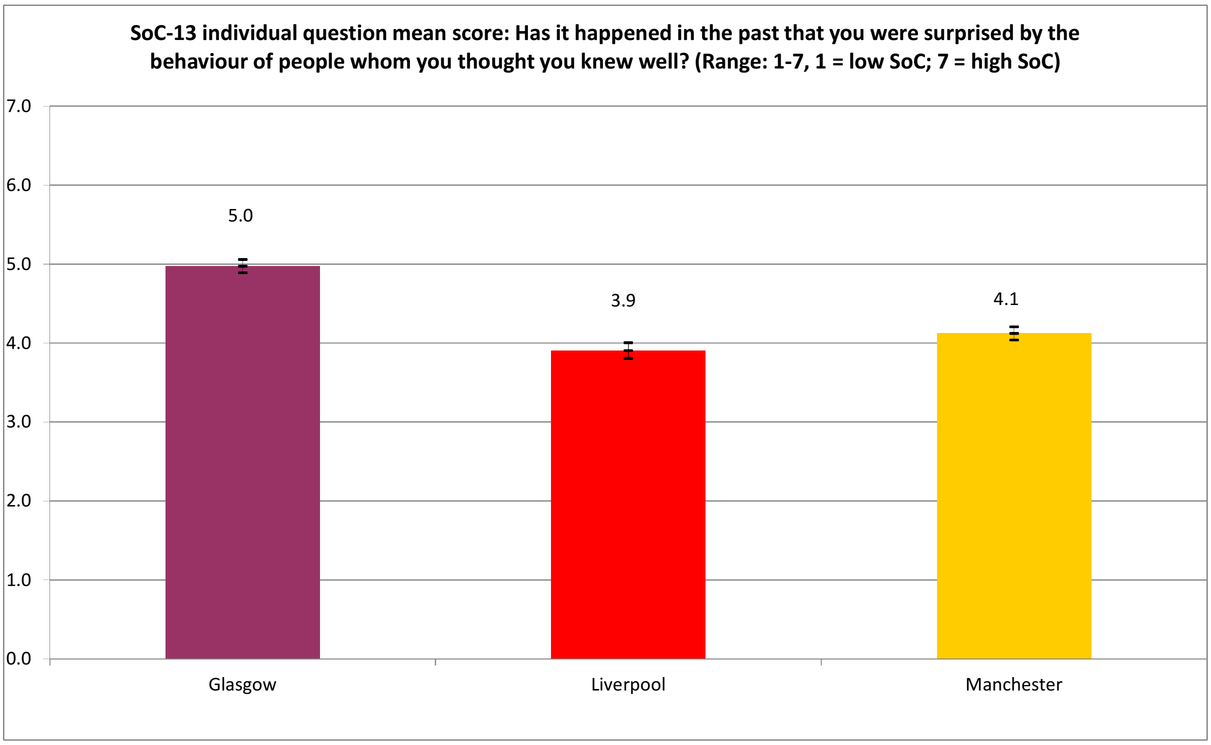

Mean Sense of Coherence (SOC-13) score (possible score range: 13-91)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
67.6
63.1
59.3
Glasgow
Liverpool
Manchester

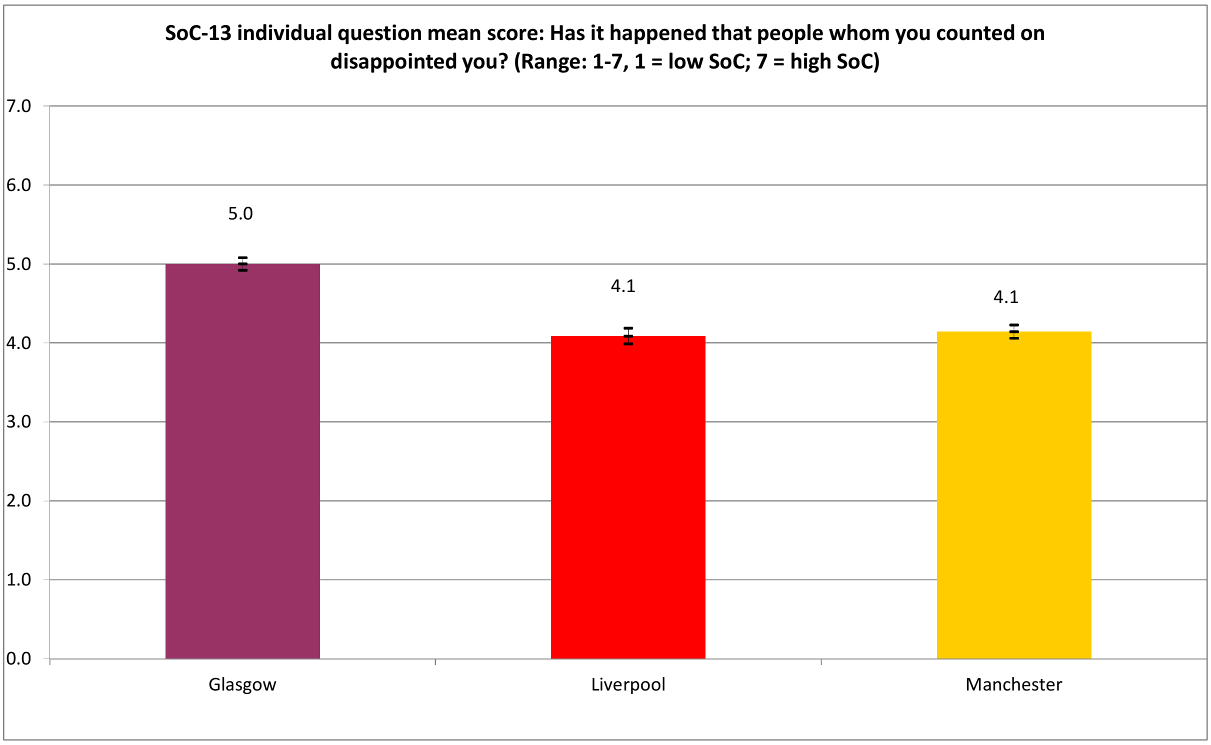

Sense of Coherence - mean 'comprehensibility' sub-scale score (possible score range: 5-35)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
25.6
23.4
22.8
Glasgow
Liverpool
Manchester

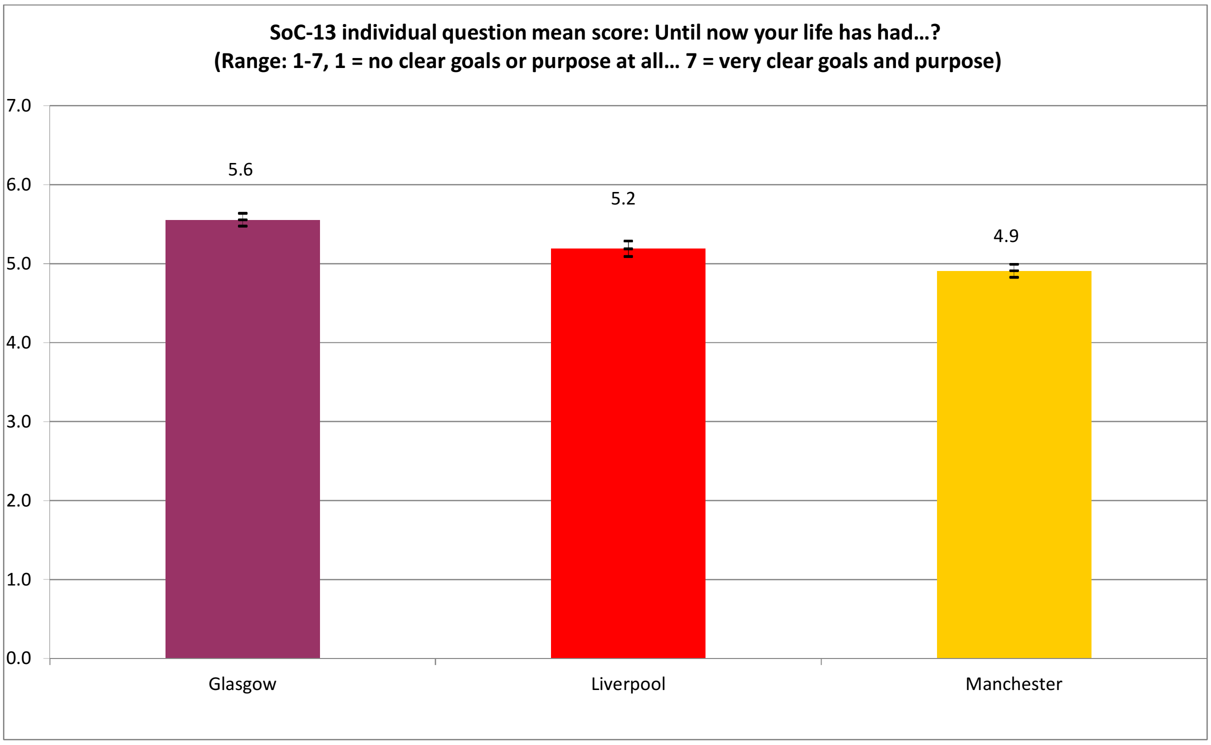

Sense of Coherence - mean 'manageability' sub-scale score (possible score range: 4-28)
25.0
20.0
15.0
10.0
5.0
0.0
20.4
19.1
17.9
Glasgow
Liverpool
Manchester

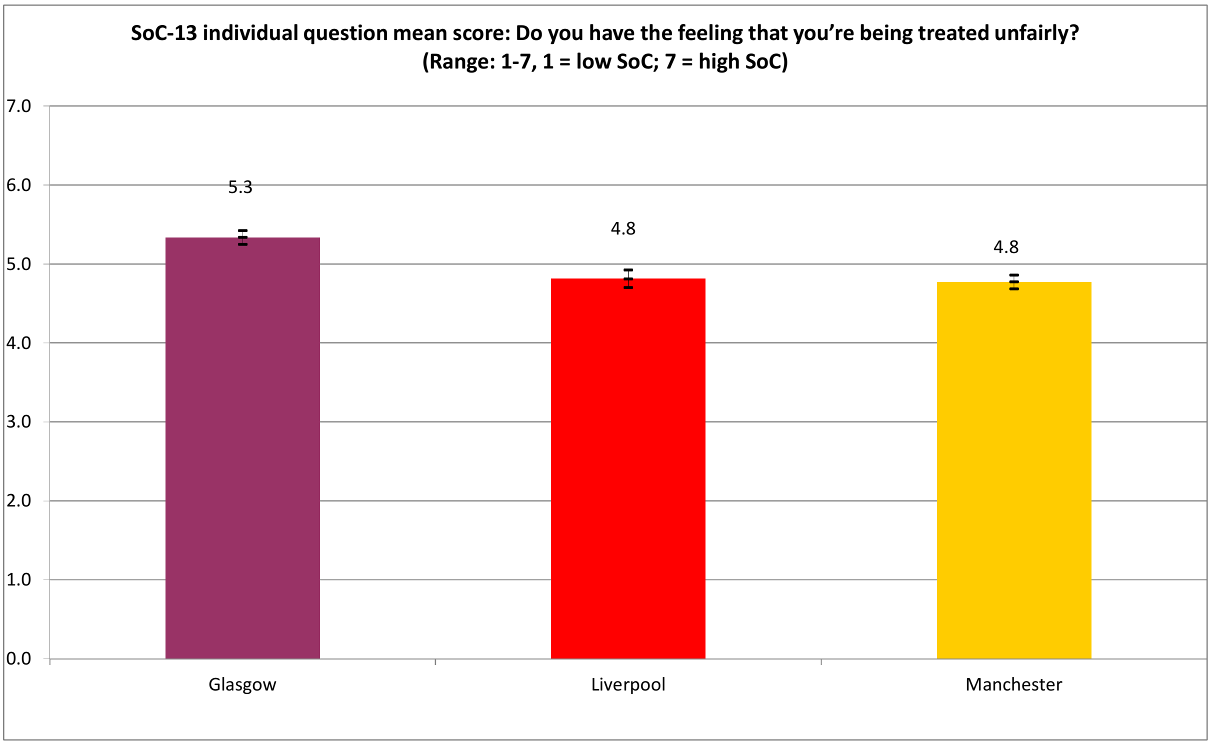

Sense of Coherence - mean 'meaningfulness' sub-scale score (possible score range: 4-28)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
21.7
20.6
18.7
Glasgow
Liverpool
Manchester

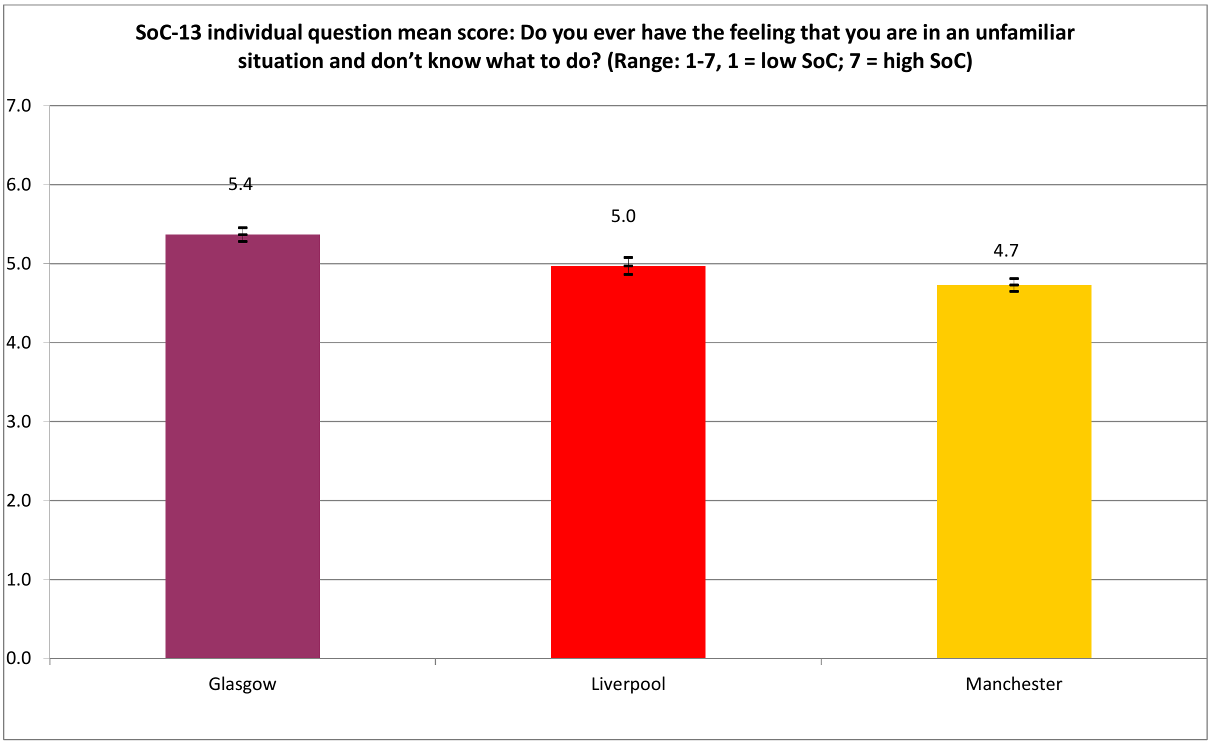

SoC-13 individual question mean score: Do you have the feeling that you don't really care about what goes on around you? (Range: 1-7; 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.6
5.1
4.5
Glasgow
Liverpool
Manchester

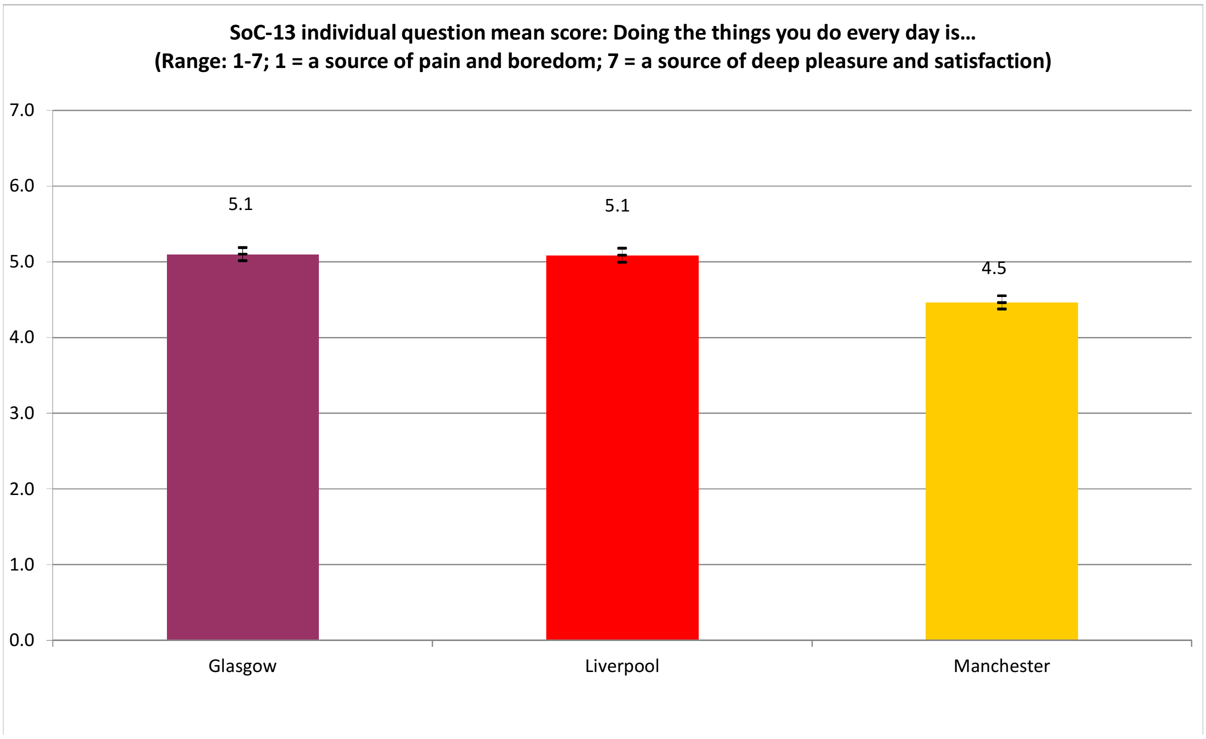

SoC-13 individual question mean score: Has it happened in the past that you were surprised by the behaviour of people whom you thought you knew well? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.0
3.9
4.1
Glasgow
Liverpool
Manchester

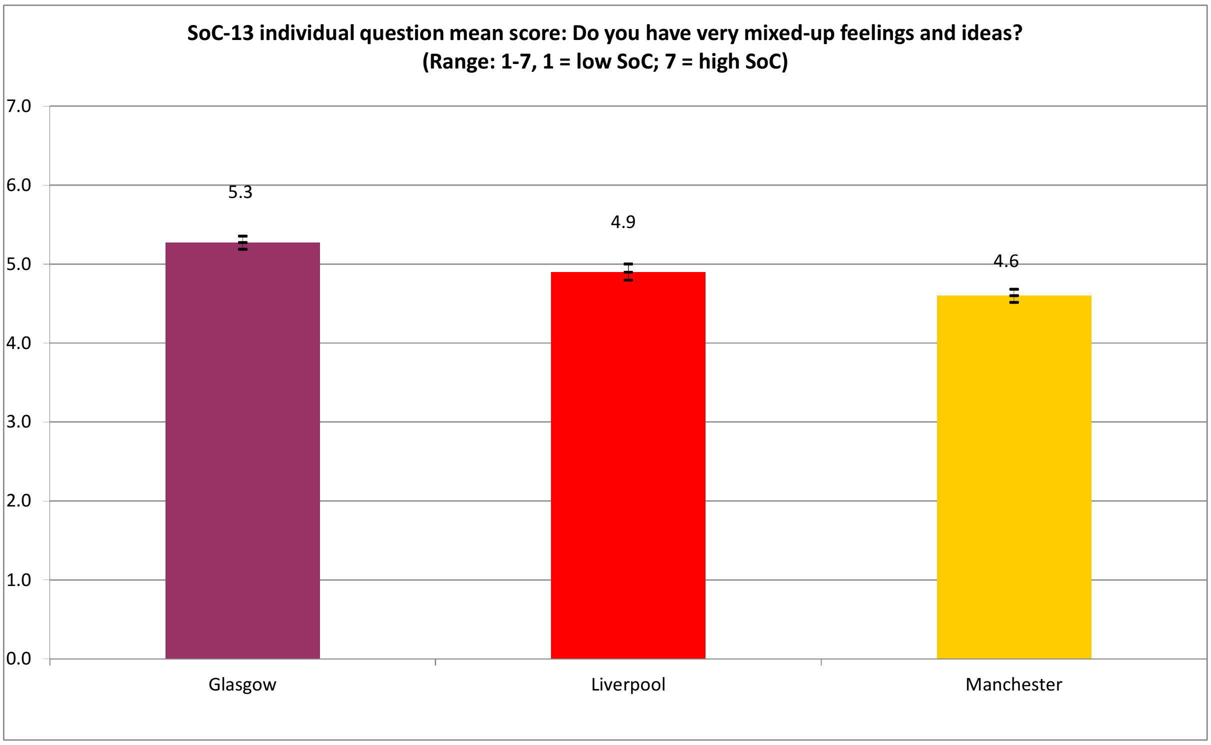

SoC-13 individual question mean score: Has it happened that people whom you counted on disappointed you? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.0
4.1
4.1
Glasgow
Liverpool
Manchester

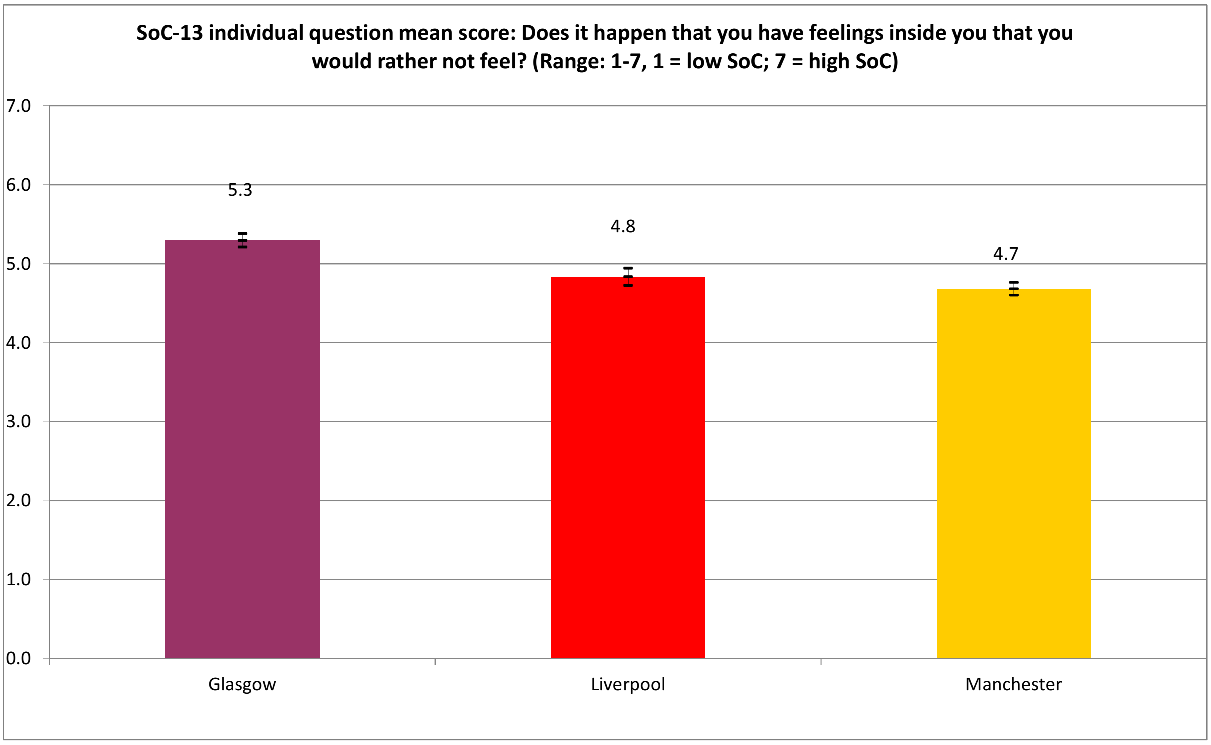

SoC-13 individual question mean score: Until now your life has had…?
(Range: 1-7, 1 = no clear goals or purpose at all… 7 = very clear goals and purpose)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.6
5.2
4.9
Glasgow
Liverpool
Manchester

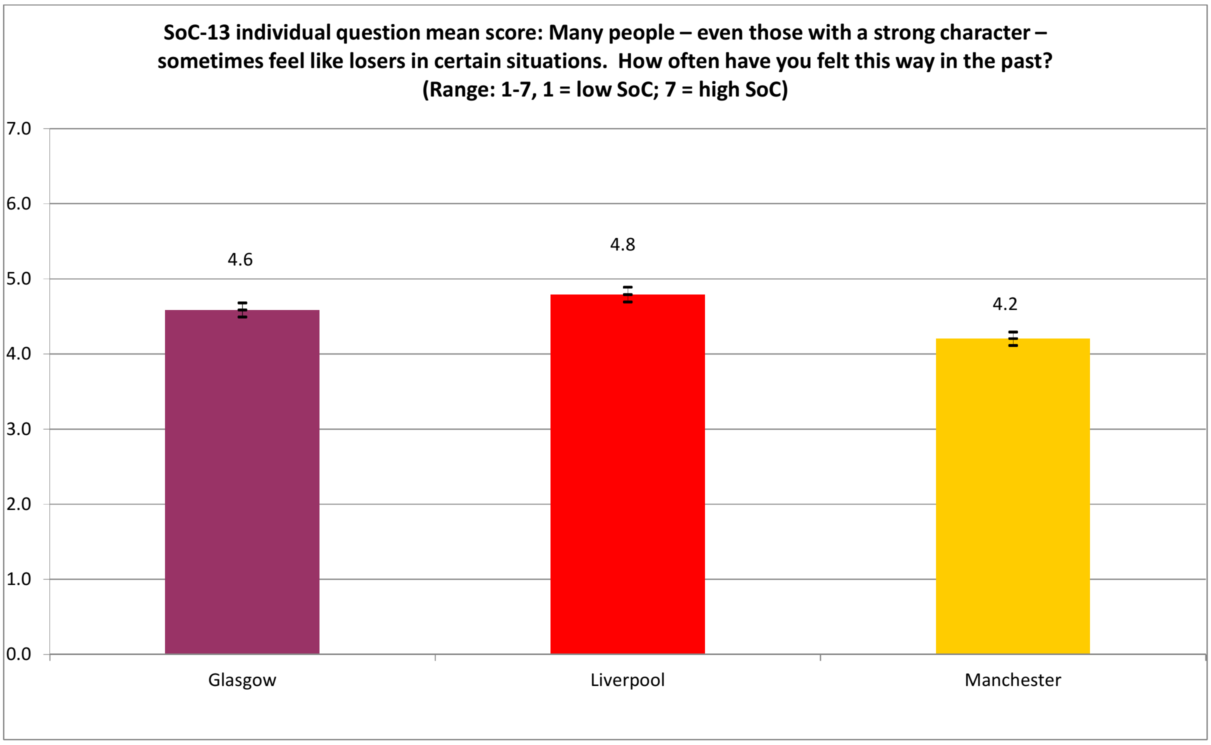

SoC-13 individual question mean score: Do you have the feeling that you're being treated unfairly? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.3
4.8
4.8
Glasgow
Liverpool
Manchester

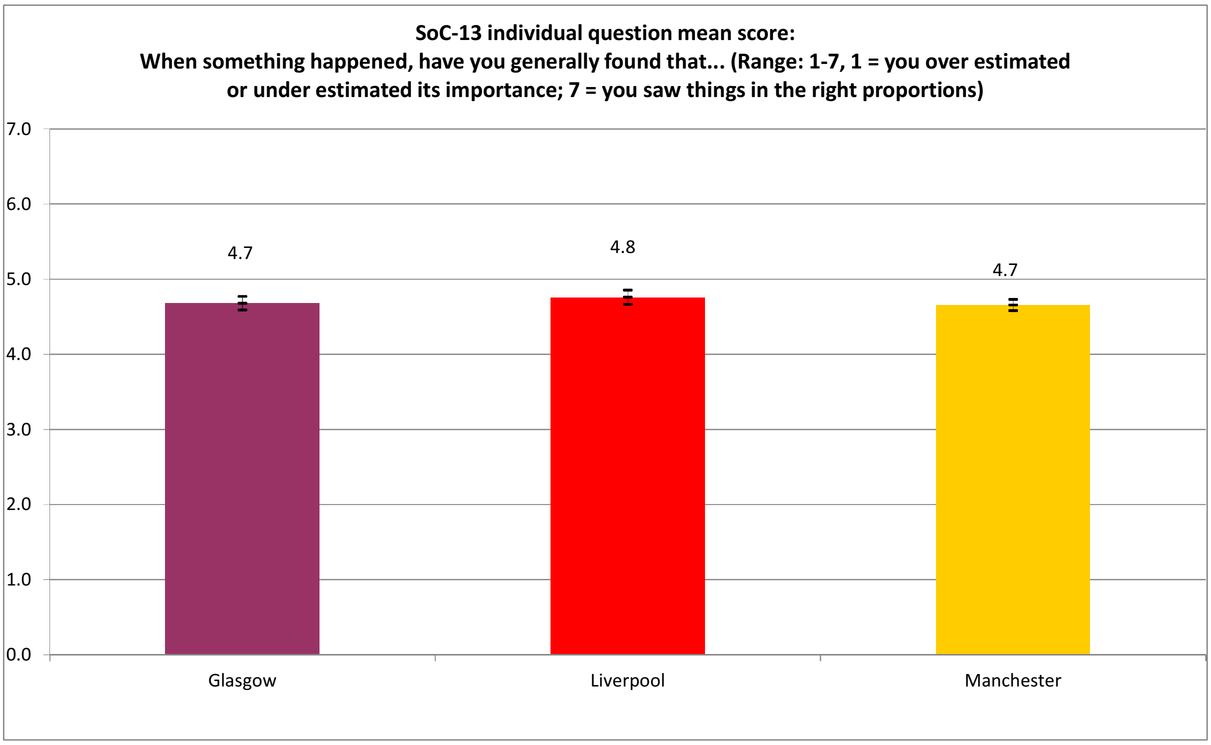

SoC-13 individual question mean score: Do you ever have the feeling that you are in an unfamiliar situation and don't know what to do? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.4
5.0
4.7
Glasgow
Liverpool
Manchester

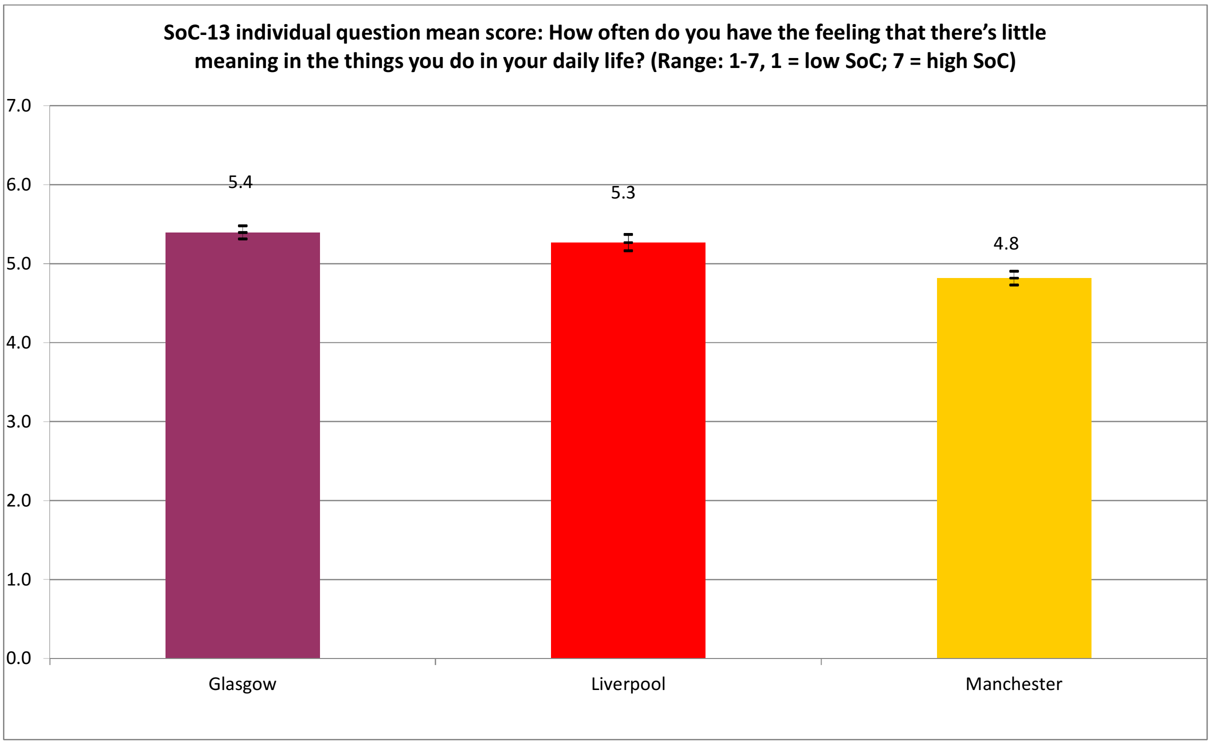

SoC-13 individual question mean score: Doing the things you do every day is...
(Range: 1-7; 1 = a source of pain and boredom; 7 = a source of deep pleasure and satisfaction)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.1
5.1
4.5
Glasgow
Liverpool
Manchester

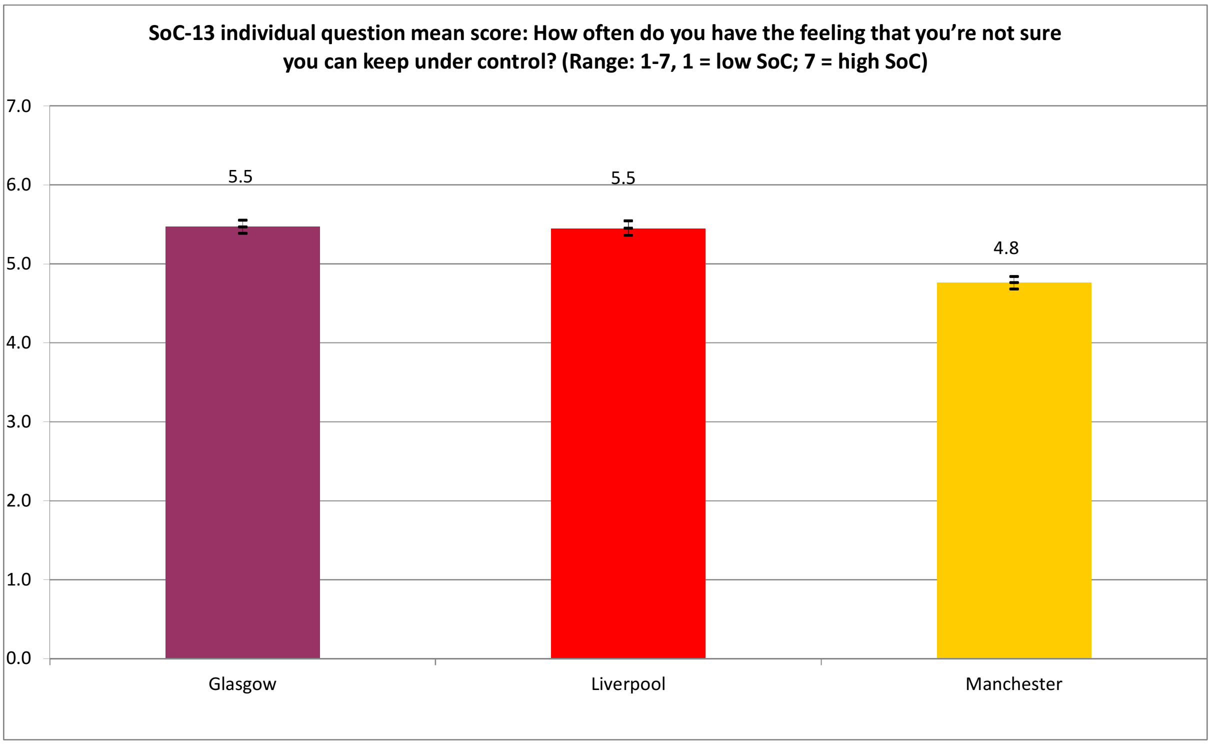

SoC-13 individual question mean score: Do you have very mixed-up feelings and ideas?
(Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.3
4.9
4.6
Glasgow
Liverpool
Manchester


SoC-13 individual question mean score: Does it happen that you have feelings inside you that you would rather not feel? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.3
4.8
4.7
Glasgow
Liverpool
Manchester


SoC-13 individual question mean score: Many people – even those with a strong character – sometimes feel like losers in certain situations. How often have you felt this way in the past? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
4.6
4.8
4.2
Glasgow
Liverpool
Manchester


SoC-13 individual question mean score:
When something happened, have you generally found that... (Range: 1-7, 1 = you over estimated or under estimated its importance; 7 = you saw things in the right proportions)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
4.7
4.8
4.7
Glasgow
Liverpool
Manchester


SoC-13 individual question mean score: How often do you have the feeling that there's little meaning in the things you do in your daily life? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.4
5.3
4.8
Glasgow
Liverpool
Manchester


SoC-13 individual question mean score: How often do you have the feeling that you're not sure you can keep under control? (Range: 1-7, 1 = low SoC; 7 = high SoC)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
5.5
5.5
4.8
Glasgow
Liverpool
Manchester

Appendix VI: results of social capital models not presented in Chapter 7

Note: as stated in Chapter 4, only significant variables were included in the final models.

Table AVI.1

Multivariate logistic regression analysis of the factors associated with whether taken action to solve a problem in last 12 months

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
Age group	**16.22**	**	
16-29†			1.00
30-44	15.46	****	3.02 (1.74 to 5.23)
45-64	11.13	***	2.80 (1.53 to 5.11)
65+	10.22	**	3.06 (1.54 to 6.07)
Social grade	**12.20**	*	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	4.95	*	0.61 (0.39 to 0.94)
C2 (skilled manual)	5.98	*	0.53 (0.32 to 0.88)
D (semi-skilled/ unskilled manual)	8.56	**	0.43 (0.24 to 0.75)
E (on state benefit/ unemployed/ lowest grade workers)	8.11	**	0.40 (0.22 to 0.75)
Educational attainment	**8.13**	*	
No qualifications†			1.00
Some qualifications, but not degree level	2.43		1.41 (0.92 to 2.16)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	8.00	**	2.22 (1.28 to 3.85)
Length of residence	**9.98**	**	
Time in city not known†			1.00
Possibly long-term resident	9.98	**	2.13 (1.33 to 3.41)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Table AVI.2

Multivariate logistic regression analysis of the factors associated with perception of ability to influence decisions affecting local area (definitely/tend to agree)

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
Deprivation quintile	**26.17**	****	
1 (Most deprived)†			1.00
2	11.02	***	1.60 (1.21 to 2.11)
3	0.50		1.11 (0.83 to 1.48)
4	14.28	***	1.68 (1.28 to 2.20)
5 (Least deprived)	13.84	***	1.68 (1.28 to 2.20)
Educational attainment	**66.85**	****	
No qualifications†			1.00
Some qualifications, but not degree level	6.02	*	1.27 (1.05 to 1.54)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	61.56	****	2.69 (2.10 to 3.44)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Table AVI.3

Multivariate logistic regression analysis of the factors associated with perception of ability to influence decisions affecting city (definitely/tend to agree)

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**19.94**	********	
Glasgow†			1.00
Liverpool	4.28	*	0.81 (0.66 to 0.99)
Manchester	19.92	****	0.61 (0.49 to 0.76)
Deprivation quintile	**19.93**	*******	
1 (Most deprived)†			1.00
2	12.37	***	1.69 (1.26 to 2.26)
3	0.02		0.98 (0.72 to 1.34)
4	3.40		1.32 (0.98 to 1.76)
5 (Least deprived)	4.17	*	1.36 (1.01 to 1.82)
Educational attainment	**47.65**	********	
No qualifications†			1.00
Some qualifications, but not degree level	9.47	**	1.40 (1.13 to 1.73)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	46.65	****	2.59 (1.97 to 3.40)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Table AVI.4

Multivariate logistic regression analysis of the factors associated with perception of ability to influence decisions affecting UK (definitely/tend to agree)

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
City	**27.92**	********	
Glasgow†			1.00
Liverpool	10.93	***	0.67 (0.53 to 0.85)
Manchester	25.76	****	0.53 (0.41 to 0.68)
Deprivation quintile	**20.40**	*******	
1 (Most deprived)†			1.00
2	16.72	****	2.02 (1.44 to 2.83)
3	3.04		1.37 (0.96 to 1.94)
4	1.06		1.20 (0.85 to 1.71)
5 (Least deprived)	2.84		1.35 (0.95 to 1.92)
Educational attainment	**7.91**	*****	
No qualifications†			1.00
Some qualifications, but not degree level	1.33		1.16 (0.90 to 1.48)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	7.65	**	1.59 (1.15 to 2.21)
Longterm limiting illness (LLI)	**9.80**	******	
None†			1.00
Limited a little	8.17	**	0.58 (0.40 to 0.84)
Limited a lot	2.65		0.71 (0.47 to 1.07)
Length of residence	**4.55**	*****	
Time in city not known†			1.00
Possibly long-term resident	4.55	*	0.80 (0.65 to 0.98)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Table AVI.5

Multivariate logistic regression analysis of the factors associated with of likelihood of perceiving the neighbourhood as one where 'people mostly go their own way'

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
Age group	**12.58**	**	
16-29†			1.00
30-44	0.46		0.93 (0.76 to 1.14)
45-64	7.25	**	1.40 (1.10 to 1.79)
65+	0.92		1.16 (0.86 to 1.55)
Deprivation quintile	**32.57**	****	
1 (Most deprived)†			1.00
2	4.65	*	0.78 (0.62 to 0.98)
3	1.22		0.88 (0.70 to 1.10)
4	10.62	**	0.68 (0.54 to 0.86)
5 (Least deprived)	27.70	****	0.52 (0.41 to 0.66)
Educational attainment	**8.82**	*	
No qualifications†			1.00
Some qualifications, but not degree level	0.05		1.02 (0.86 to 1.21)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	6.20	*	0.71 (0.55 to 0.93)
Length of residence	**17.19**	****	
Time in city not known†			1.00
Possibly long-term resident	17.19	****	0.65 (0.53 to 0.80)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Table AVI.6

Multivariate logistic regression analysis of the factors associated with likelihood of perceiving neighbourhood as one where 'people do not share same values' (very/fairly strongly agree)

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
Educational attainment	**6.84**	*	
No qualifications†			1.00
Some qualifications, but not degree level	4.36	*	0.84 (0.72 to 0.99)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	0.21		1.05 (0.84 to 1.32)
Length of residence	**26.81**	****	
Time in city not known†			1.00
Possibly long-term resident	26.81	****	1.48 (1.28 to 1.72)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Appendix VII: selected regression models for Glasgow sample only

As stated in Chapter 4, a series of additional models was run for the Glasgow sample only. This was to show which characteristics of the sample were significantly associated with differences in the outcomes (survey questions) within a specifically Glasgow context.

This appendix only includes the results of those models described in the report.

Table AVII.1: Sense of Coherence

Multivariate linear regression analysis of the factors associated with: **Sense of Coherence (SoC) (Glasgow respondents only)**

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
Length of residence				
Time in city not known†	72.56			
Possibly long-term resident	69.10	-3.47 (-5.00 to -1.93)	-4.42	****
Deprivation quintile				
1 (Most deprived)†	72.56			
5 (Least deprived)	75.14	2.58 (0.87 to 4.29)	2.96	**
Employment status				
Employed (pt & ft)†	72.56			
Unemployed	63.94	-8.62 (-10.85 to -6.40)	-7.60	****
Ill/disabled	61.73	-10.83 (-13.88 to -7.79)	-6.98	****
Looking after home/family	67.74	-4.83 (-7.41 to -2.24)	-3.66	***
Self-assessed health				
Good/very good†	72.56			
Fair	67.34	-5.22 (-7.22 to -3.22)	-5.13	****
Bad/very bad	67.75	-4.82 (-7.48 to -2.15)	-3.54	***
Socio-economic group				
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†	72.56			
D (Semi-skilled/unskilled manual)	70.54	-2.02 (-3.77 to -0.28)	-2.28	*
Age group				
16-29†	72.56			
65+	75.51	2.95 (0.86 to 5.04)	2.77	**

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Tables AVII.2 – AVII.7: selected social capital related models

Table AVII.2

Multivariate logistic regression analysis of the factors associated with: **no-one to ask for help (shopping/advice/support/to borrow money) (Glasgow respondents only)**

Variable/category	Wald statistic	Significance[1]	Odds ratio (95% conf. ints.)
Employment status	**24.49**	*******	
Employed (PT/FT)†			1.00
Unemployed	4.78	*	2.21 (1.09 to 4.51)
Ill/disabled	2.04		1.95 (0.78 to 4.89)
Retired	0.59		1.37 (0.61 to 3.05)
Looking after home/family	17.39	****	4.26 (2.16 to 8.43)
In education/training (PT/FT)	15.18	****	3.70 (1.92 to 7.16)
Longterm limiting illness (LLI)	**7.68**	*****	
None†			1.00
Limited a little	0.94		1.44 (0.69 to 2.98)
Limited a lot	7.67	**	2.92 (1.37 to 6.22)
Length of residence	**5.84**	*****	
Time in city not known†			1.00
Possibly long-term resident	5.84	*	0.53 (0.32 to 0.89)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Table AVII.3

Multivariate logistic regression analysis of the factors associated with: volunteered in last 12 months trusted (Glasgow respondents only)

Variable/category	**Wald statistic**	**Significance[1]**	**Odds ratio (95% conf. ints.)**
Gender	**8.38**	**	
Male†			1.00
Female	8.38	**	2.06 (1.26 to 3.35)
Age group	**10.13**	*	
16-29†			1.00
30-44	0.37		1.22 (0.64 to 2.33)
45-64	6.61	*	2.19 (1.20 to 3.97)
65+	0.06		0.90 (0.38 to 2.13)
Socio-economic group	**14.29**	**	
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00
C1 (supervisory, clerical, junior managerial/ admin/ prof)	0.31		1.20 (0.63 to 2.31)
C2 (skilled manual)	1.29		0.64 (0.29 to 1.39)
D (semi-skilled/ unskilled manual)	4.54	*	0.41 (0.18 to 0.93)
E (on state benefit/ unemployed/ lowest grade workers)	3.80		0.41 (0.17 to 1.01)
Longterm limiting illness (LLI)	**10.04**	**	
None†			1.00
Limited a little	9.55	**	2.89 (1.47 to 5.65)
Limited a lot	2.32		2.29 (0.79 to 6.64)
Self-assessed health	**6.61**	*	
Good/very good†			1.00
Fair	0.79		0.74 (0.37 to 1.45)
Bad/very bad	6.54	*	0.16 (0.04 to 0.65)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Table AVII.4

Multivariate logistic regression analysis of the factors associated with: no religious affiliation (Glasgow respondents only)

Variable/category	**Wald statistic**	**Significance[1]**	**Odds ratio**	**(95% conf. ints.)**
Gender	**11.99**	*******		
Male†			1.00	
Female	11.99	***	0.65	(0.50 to 0.83)
Age group	**44.79**	********		
16-29†			1.00	
30-44	1.73		0.79	(0.56 to 1.12)
45-64	19.06	****	0.43	(0.29 to 0.63)
65+	36.19	****	0.19	(0.11 to 0.33)
Ethnicity	**38.07**	********		
Not a member of ethnic minority group†			1.00	
Member of ethnic minority group	38.07	****	0.18	(0.10 to 0.31)
Socio-economic group	**14.61**	******		
A (higher managerial/admin/prof) and B (intermed managerial/admin/pro			1.00	
C1 (supervisory, clerical, junior managerial/ admin/ prof)	0.66		1.20	(0.78 to 1.84)
C2 (skilled manual)	3.30		1.52	(0.97 to 2.39)
D (semi-skilled/ unskilled manual)	4.95	*	1.68	(1.06 to 2.67)
E (on state benefit/ unemployed/ lowest grade workers)	10.25	**	2.21	(1.36 to 3.58)
Marital status	**14.37**	******		
Never married†			1.00	
Married/civil partnership	10.29	**	0.59	(0.43 to 0.81)
Separated/divorced	1.71		0.74	(0.47 to 1.16)
Widowed/surviving partner	0.41		1.22	(0.66 to 2.27)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Table AVII.5

Multivariate logistic regression analysis of the factors associated with: belief that most people can be trusted (Glasgow respondents only)

Variable/category	**Wald statistic**	**Significance[1]**	**Odds ratio**	**(95% conf. ints.)**
Marital status	**13.84**	******		
Never married†			1.00	
Married/civil partnership	12.91	***	1.76	(1.29 to 2.39)
Separated/divorced	4.92	*	1.71	(1.06 to 2.74)
Widowed/surviving partner	1.63		1.43	(0.83 to 2.48)
Educational attainment	**10.82**	******		
No qualifications†			1.00	
Some qualifications, but not degree level	0.01		0.98	(0.71 to 1.36)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	7.84	**	1.86	(1.20 to 2.87)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Table AVII.6

Multivariate logistic regression analysis of the factors associated with: **belief that most people in neighbourhood can be trusted (Glasgow respondents only)**

Variable/category	Wald statistic	Significance[1]	Odds ratio	(95% conf. ints.)
Socio-economic group	**10.33**	*		
A (higher managerial/admin/prof) and B (intermed managerial/admin/prof)†			1.00	
C1 (supervisory, clerical, junior managerial/ admin/ prof)	0.01		0.97	(0.60 to 1.58)
C2 (skilled manual)	1.67		0.70	(0.41 to 1.2)
D (semi-skilled/ unskilled manual)	5.06	*	0.51	(0.28 to 0.92)
E (on state benefit/ unemployed/ lowest grade workers)	4.54	*	0.44	(0.21 to 0.94)
Educational attainment	**11.48**	**		
No qualifications†			1.00	
Some qualifications, but not degree level	4.51	*	0.64	(0.43 to 0.97)
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	0.52		1.23	(0.70 to 2.18)
Employment status	**14.03**	*		
Employed (PT/FT)†			1.00	
Unemployed	2.55		0.57	(0.29 to 1.13)
Ill/disabled	2.37		0.52	(0.23 to 1.20)
Retired	0.03		1.04	(0.67 to 1.62)
Looking after home/family	4.05	*	0.48	(0.24 to 0.98)
In education/training (PT/FT)	7.10	**	0.46	(0.26 to 0.81)
Self-assessed health	**10.43**	**		
Good/very good†			1.00	
Fair	3.45		0.63	(0.38 to 1.03)
Bad/very bad	4.33	*	1.80	(1.04 to 3.14)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Table AVII.7

Multivariate linear regression analysis of the factors associated with: **benevolence (human values scale) (Glasgow respondents only)**

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$	(95% conf. ints)	*t* statistic	Significance[3]
Age group					
16-29†	0.35				
45-64	0.48	0.13	(0.05 to 0.20)	3.28	**
65+	0.46	0.11	(0.01 to 0.20)	2.26	*
Longterm limiting illness (LLI)					
No LLI†	0.35				
Limited a lot	0.50	0.15	(0.03 to 0.27)	2.46	*

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Table AVII.8: Life Orientation Test (Revised) (LOT-R)

Multivariate linear regression analysis of the factors associated with: Life Orientation Test (Revised) (Glasgow respondents only)

Variable/category	Adjusted Mean[1]	$\Delta\mu^2$ (95% conf. ints)	*t* statistic	Significance[3]
Length of residence				
Time in city not known†	16.11			
Possibly long-term resident	15.37	-0.74 (-1.17 to -0.30)	-3.32	***
Deprivation quintile				
1 (Most deprived)†	16.11			
4	15.39	-0.72 (-1.23 to -0.22)	-2.80	**
Educational attainment				
No qualifications†	16.11			
1st degree and above (includes NVQ/SVQ Level 5 or equivalent)	17.05	0.94 (0.30 to 1.57)	2.91	**
Employment status				
Employed (pt & ft)†	16.11			
Unemployed	13.78	-2.33 (-2.97 to -1.69)	-7.14	****
Ill/disabled	13.55	-2.56 (-3.43 to -1.69)	-5.75	****
Looking after home/family	14.48	-1.63 (-2.38 to -0.87)	-4.23	****
Self-assessed health				
Good/very good†	16.11			
Fair	15.23	-0.89 (-1.46 to -0.31)	-3.03	**
Bad/very bad	14.27	-1.84 (-2.62 to -1.07)	-4.68	****

Notes
1. Mean predicted by full fitted model
2. Difference in mean compared to reference category after adjustment for other factors in the model
3. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† Reference category of variable

Appendix VIII: self-assessed health (logistic regression modelling analyses)

As stated in Chapter 4, a series of logistic regression models was run with self-assessed health (SAH) as the dependent variable. The reasons for, and methodology associated with, undertaking these additional analyses were also explained in that chapter.

Table AVIII.1 shows the results of the first model, exploring the factors associated with the likelihood of reporting ‘bad’ or ‘very bad’ health status.

Table AVIII.1

Multivariate logistic regression analysis of the factors associated with likelihood of reporting 'bad' or 'very bad' self-reported health

Variable/category	Wald statistic	Significance[1]	Odds ratio	(95% conf. ints.)
City	**6.15**	*****		
Glasgow†				
Liverpool	3.41		0.74	(0.54 to 1.02)
Manchester	5.23	*	0.67	(0.48 to 0.94)
Age group	**25.92**	********		
16-29†				
30-44	6.23	*	2.21	(1.19 to 4.1)
45-64	22.18	****	4.16	(2.3 to 7.52)
65+	15.56	****	4.08	(2.03 to 8.2)
Employment status	**271.34**	********		
Employed (PT/FT)†				
Unemployed	0.74		1.35	(0.68 to 2.66)
Ill/disabled	216.75	****	27.70	(17.8 to 43.09)
Retired	38.94	****	5.06	(3.04 to 8.42)
Looking after home/family	8.94	**	2.52	(1.37 to 4.61)
In education/training (PT/FT)	0.06		0.86	(0.28 to 2.68)
Smoking status	**17.99**	*******		
Never/hardly ever smoked†				
Ex-smoker	12.98	***	1.93	(1.35 to 2.75)
Occasional smoker	5.67	*	2.34	(1.16 to 4.71)
Regular smoker	9.67	**	1.69	(1.21 to 2.35)

Notes
1. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
† - reference category of variable

Table AVIII.2 summarises the results of the additional set of models which explored the effects of the addition of selected social capital variables, as well as the Sense of Coherence (SoC) and Life Orientation Test (Revised) (LOT-R) variables, to the models. The SoC and LOT-R variables were included as continuous variables. The social capital variables were included as binary variables, as shown in the footnotes to the table.

Table AVIII.2 Multivariate logistic regression analysis: odds ratios for Liverpool and Manchester, compared to Glasgow, for reporting bad or very bad health, after adjustment for characteristics of the samples and additional variables (selected measures of social capital, Sense of Coherence, Life Orientation Test (Revised)).

Model	City	% of sample[a]	Odds ratio (fully adjusted)	(95% conf. ints.)	Sig[b]
1 (no additional variables - see Table AVIII.1 above)					
	Glasgow†	9.6			
	Liverpool	8.5	0.74	(0.54, 1.02)	
	Manchester	5.9	0.67	(0.48, 0.94)	*
2 (+ social support: having no-one, ask for help (shopping/advice/support/to borrow money)[c])					
	Glasgow†	9.6			
	Liverpool	8.5	0.75	(0.54, 1.03)	
	Manchester	5.9	0.66	(0.47, 0.93)	*
3 (+ social participation: having volunteered in last 12 months[d])					
	Glasgow†	9.6			
	Liverpool	8.5	0.77	(0.56, 1.06)	
	Manchester	5.9	0.69	(0.49, 0.97)	*
4 (+ reciprocity: neighbourhood one where 'people do things together and try to help each other'[e])					
	Glasgow†	9.6			
	Liverpool	8.5	0.77	(0.56, 1.06)	
	Manchester	5.9	0.69	(0.49, 0.98)	*
5 (+ reciprocity: perception (very or quite likely) that a lost purse or wallet would be returned intact[f])					
	Glasgow†	9.6			
	Liverpool	8.5	0.77	(0.56, 1.06)	
	Manchester	5.9	0.69	(0.49, 0.97)	*

Model	City	% of sample[a]	Odds ratio (fully adjusted)	(95% conf. ints.)	Sig[b]
6 (+ reciprocity: exchanging favours with people who live nearby[g])					
	Glasgow†	9.6			
	Liverpool	8.5	0.79	(0.57, 1.09)	
	Manchester	5.9	0.69	(0.49, 0.97)	*
7 (+ trust: belief that most people can be trusted[h])					
	Glasgow†	9.6			
	Liverpool	8.5	0.77	(0.56, 1.06)	
	Manchester	5.9	0.69	(0.49, 0.97)	*
8 (+ trust: belief that most people in neighbourhood can be trusted[i])					
	Glasgow†	9.6			
	Liverpool	8.5	0.75	(0.54, 1.04)	
	Manchester	5.9	0.69	(0.49, 0.97)	*
9 (+ Sense of Coherence (SoC)[j])					
	Glasgow†	9.6			
	Liverpool	8.5	0.67	(0.48, 0.93)	*
	Manchester	5.9	0.53	(0.38, 0.76)	***
9 (+ Life Orientation Test (Revised) (LOT-R)[k])					
	Glasgow†	9.6			
	Liverpool	8.5	0.73	(0.53, 1.01)	
	Manchester	5.9	0.60	(0.43, 0.86)	**

Notes to Table AVIII.2

Only significant (p<0.05 variables included in final models)

† Reference category of variable

a. Weighted figures
b. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001
c. Social support variable - coded as summary binary variable: 1 = no-one to ask for help for any option; 0 = at least one person to ask for help for at least one option. Odds ratio: 1.34 (95% confidence intervals 0.76, 2.0), n/s.
d. Social participation (volunteering) - coded as summary binary variable: 1 = at least one example of unpaid help recorded; 0 = no example recorded. Odds ratio: 0.54 (95% confidence intervals 0.32, 0.89), p<0.05.
e. Reciprocity variable (neighbourhood one where 'people do things together and try to help each other') - coded as summary binary variable: 1 = 'help each other' selected; 0 = 'help each other' not selected. Odds ratio: 1.05 (95% confidence intervals 0.77, 1.43), n/s.
f. Reciprocity variable (perception (very or quite likely) that a lost purse or wallet would be returned intact) - coded as summary binary variable: 1 = 'very likely or 'quite likely' selected; 0 = other answers. Odds ratio: 1.04 (95% confidence intervals 0.77, 1.40), n/s.

g. Reciprocity variable (exchanging favours with people who live nearby) - coded as summary binary variable: 1 = yes; 0 = no. Odds ratio: 0.88 (95% confidence intervals 0.67, 1.17), n/s.
h. Trust variable (belief that most people can be trusted) - coded as summary binary variable: 1 = 'most people can be trusted' selected; 0 = other answers. Odds ratio: 1.07 (95% confidence intervals 0.78, 1.43), n/s.
i. Trust variable (belief that most people in neighbourhood can be trusted) - coded as summary binary variable: 1 = 'most of the people in your neighbourhood can be trusted' selected; 0 = other answers. Odds ratio: 1.28 (95% confidence intervals 0.92, 1.75), n/s.
j. Sense of Coherence - odds ratio: 0.97 (95% confidence intervals 0.96, 0.98, $p<0.0001$).
k. Life Orientation Test (Revised) (LOT-R) - odds ratio: 0.87 (95% confidence intervals 0.84, 0.91, $p<0.0001$).

All these results were discussed in Chapter 7.

Appendix IX: comparison of multilevel and non-multilevel modelling results

As stated in Chapter 4, a number of regression models, using both linear regression and logistic regression, were re-run as multi-level models. The reasons for, and methodology associated with, undertaking these additional analyses were also explained in that chapter.

This appendix compares the results of both types of modelling analysis. Two examples of logistic regression and two examples of linear regression are presented. In both cases, the same sets of independent variables were included.

Table AIX.1 (logistic regression) and AIX.2 (linear regression) summarise the results of the two types of the models in terms of the principal statistics of interest: the odds ratios/regression coefficients (and associated significance levels) for the cities. As stated in Chapter 4, there was generally very little difference between the two sets of results.

Table AIX.1 Multivariate logistic regression analysis: odds ratios for Liverpool and Manchester, compared to Glasgow, for two outcomes of interest, after adjustment for characteristics of the samples: comparison of multilevel modelling (MLM) and non-MLM results

Model	City	Non-MLM results		MLM results	
		Fully adjusted odds ratio (95% conf. ints.)	Sig[a]	Fully adjusted odds ratio (95% conf. ints.)	Sig[a]
1. Analysis of the factors associated with having volunteered in the last 12 months					
	Glasgow†				
	Liverpool	2.60 (1.98, 3.41)	****	2.24 (1.57, 3.21)	****
	Manchester	2.52 (1.92, 3.33)	****	1.94 (1.33, 2.81)	***
2. Analysis of the factors associated with likelihood of reporting exchanging favours with people who live nearby					
	Glasgow†				
	Liverpool	2.10 (1.76, 2.50)	****	2.10 (1.65, 2.67)	****
	Manchester	1.04 (0.88, 1.24)		0.98 (0.77, 1.25)	

Notes:

† Reference category of variable

a. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001

Table AIX.2 Multivariate linear regression analysis: coefficients for Liverpool and Manchester, compared to Glasgow, for two outcomes of interest, after adjustment for characteristics of the samples: comparison of multilevel modelling (MLM) and non-MLM results

Model	City	Non-MLM results		MLM results	
		Fully adjusted odds ratio (95% conf. ints.)	Sig[a]	Fully adjusted odds ratio (95% conf. ints.)	Sig[a]
1. Analysis of the factors associated with Sense of Coherence (SoC) score					
	Glasgow†				
	Liverpool	-4.93 (-5.90, -3.97)	****	-4.93 (-6.35, -3.50)	****
	Manchester	-8.07 (-9.04, -7.10)	****	-8.15 (-9.51, -6.78)	****
2. Analysis of the factors associated with Life Orientation Test (Revised) score					
	Glasgow†				
	Liverpool	-0.15 (-0.44, 0.13)		-0.29 (-0.69, 0.11)	
	Manchester	-0.86 (-1.15, -0.57)	****	-0.83 (-1.25, -0.41)	****

Notes:

† Reference category of variable

a. Significance level: * = p<0.05; ** = p<0.01; *** = p<0.001; **** = p<0.0001

Appendix X: ethical approval letter

University of Glasgow | Faculty of Medicine

David Walsh
Glasgow Centre for Population, House 6,
94 Elmbank Street
Glasgow,
G2 4DL

21 April 2011

Dear David Walsh,

Medical Faculty Ethics Committee

Project Title: Investigating the 'Glasgow Effect' – three cities population survey

Project No.: zFM06910

The Faculty Ethics Committee has reviewed your application and has agreed that there is no objection on ethical grounds to the proposed study. They are happy therefore to approve the project, subject to the following conditions

- The research should be carried out only on the sites, and/or with the groups defined in the application.
- Any proposed changes in the protocol should be submitted for reassessment, except when it is necessary to change the protocol to eliminate hazard to the subjects or where the change involves only the administrative aspects of the project. The Ethics Committee should be informed of any such changes.
- If the study does not start within three years of the date of this letter, the project should be resubmitted.
- You should submit a short end of study report to the Ethics Committee within 3 months of completion.

Yours sincerely

pp. Dr David Shaw
Faculty Ethics Officer

Dr D Shaw
Lecturer in Ethics & Ethics Officer

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