Investigating a ‘Glasgow Effect’

Why do equally deprived UK cities experience different health outcomes?

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Preface

This report presents the results of the first of two phases of research aimed at gaining a better understanding of what lies behind the so-called 'Glasgow Effect', a term increasingly used in recent years to describe the poor health status of Glasgow *over and above* that attributable to the city's high levels of socio-economic deprivation.

This first stage of the research is entirely quantitative in nature, and explores the relationship between socio-economic circumstances and mortality in Glasgow and its two most similar and comparable post-industrial UK cities: Liverpool and Manchester. This work paves the way for the second stage of research which is currently underway: based on qualitative methodologies, it seeks to gain an in-depth understanding of why communities in Glasgow experience profoundly different mortality rates and other health outcomes compared to very similar communities in Liverpool and Manchester. We will report the results of this second phase of research in 2011.

Acknowledgements

Grateful thanks are due to a number of organisations and individuals. In particular we would like to thank the following for their help, time and efforts: Jamie Reid, ISD Scotland; Anna Wasielewska, NHS Manchester; John Pritchard, formerly of the SASI Research Group at the University of Sheffield; Richard Lawder, ISD Scotland; Paula Aucott and the University of Portsmouth's Great Britain Historical GIS Project; the General Register Office for Scotland (GRO(S)); the Office for National Statistics (ONS), especially Tony Hitching; the Department of Work & Pensions (DWP), in particular Andrew Bell and Gary Gifford; John Corkery of the National Programme on Substance Abuse Deaths in London; Martin Taulbut, NHS Health Scotland. Thanks are also due to those who provided helpful comments on this report, especially Carol Tannahill and Bruce Whyte of the Glasgow Centre for Population Health, and John Hacking of Manchester City Council.

Executive Summary

Executive Summary

The link between deprivation and health is well established. However, recent research has highlighted the existence of a 'Scottish Effect', a term used to describe the higher levels of mortality and poor health experienced in Scotland over and above that explained by socio-economic circumstances. Evidence of this 'excess' being concentrated in West Central Scotland has led to discussion of a more specific 'Glasgow Effect'. However, within the UK, Glasgow is not alone in experiencing relatively high levels of poor health and deprivation: Liverpool and Manchester are two other cities which also stand out in this regard and a more detailed comparison of these three cities might, therefore, throw light on the phenomenon. Also, previous analyses of this 'effect' were constrained by limitations of data and geography so it is important that these weaknesses are eliminated.

Given the above, this study had two, complementary, objectives:

1. To establish whether there is evidence of a 'Glasgow Effect', even when Glasgow is compared to its two most similar and comparable UK cities, and when based on a more robust and spatially sensitive measure of deprivation than has previously been available to researchers.
2. To develop data that facilitate the identification of comparable small areas within the three cities as a focus for a second, qualitative, piece of research: specifically, to identify communities in Glasgow which experience significantly different health outcomes compared to similarly deprived communities in Liverpool and Manchester.

The analyses were based on the creation of a three-city deprivation index. Thus, rates of 'income deprivation' (a measure very highly correlated with the main UK indices of multiple deprivation) were calculated for small areas (average population size: 1,600) in Glasgow, Liverpool and Manchester. All-cause and cause-specific standardised mortality ratios (SMRs) were calculated for Glasgow relative to Liverpool and Manchester, standardising for age, sex and income deprivation decile. In addition, historical census and mortality data were analysed.

The results show the deprivation profiles of Glasgow, Liverpool and Manchester to be almost identical. Despite this, premature deaths in Glasgow are more than 30% higher, with all deaths around 15% higher than in the other cities. This 'excess' mortality is 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 were directly related to alcohol and drugs. Analyses of historical data suggest it is unlikely that the deprivation profile of Glasgow has changed significantly relative to Liverpool and Manchester in recent decades; however, the mortality gap appears to have widened since the early 1970s, indicating that the 'effect' may be a relatively recent phenomenon.

These results emphasise that while deprivation is a fundamental determinant of health and, therefore, an important driver of mortality, it is only one part of a complex picture. As currently measured, deprivation does not explain the higher levels of mortality experienced by Glasgow in relation to two very similar UK cities. Additional explanations are required.

This research, in particular the creation of the small area based three-city deprivation measure, has allowed identification of communities in Glasgow which, although almost identical to similar sized areas in Liverpool and Manchester in terms of their socio-economic characteristics, have significantly poorer health outcomes. These are now the focus for the second, qualitative, phase of research.

Introduction

Introduction

The link between socio-economic circumstances and health is well established. However, the extent to which the poor health profile of Scotland – the nation with the highest mortality rates and lowest life expectancy in western Europe[1,2] – can be explained in terms of socio-economic factors is less clear. Historically, Scotland's unenviable position in being what the press has labelled 'The Sick Man of Europe' has been attributed almost exclusively to its relatively high levels of socio-economic deprivation, principally in comparison to England and Wales[3,4] . However, a number of publications over the past five years have highlighted a phenomenon speculatively entitled the 'Scottish Effect', a term used to describe the country's higher levels of morbidity and mortality *over and above* that explained by deprivation. For example, Mitchell and colleagues[5] showed Scots to have a 50% higher risk of being diagnosed with ischaemic heart disease compared to those in England, even once individual social circumstances (and other risk factors such as smoking, alcohol consumption) had been controlled for, while Hanlon *et al* showed that Scotland's excess mortality relative to England & Wales – that is, mortality which could not be explained by area-based measures of socio-economic deprivation – increased between 1981 and 2001 to around eight percent[6]. The latter analysis showed this 'Scottish Effect' to exist in all geographical regions of Scotland and at all levels of deprivation, but that it was most evident in the most deprived post industrial region of West Central Scotland, with Glasgow at the region's core. This led to talk of a 'Glasgow Effect', a notion reinforced by other recent research showing that mortality in the former industrial areas of West Central Scotland was higher, and was improving more slowly, than in the vast majority of other, similar, post-industrial regions of Europe, including those which currently experience worse socio-economic conditions[7].

Within a UK context, however, Glasgow is not alone in experiencing relatively high levels of poor health and deprivation. Liverpool and Manchester are two other cities which stand out in this regard, with high levels of poverty and the lowest life expectancy of all cities in England[8,9,10,11]. Our approach, therefore, has been to investigate this 'Scottish Effect' or 'Glasgow Effect' by looking in detail at the three cities of Liverpool, Manchester and Glasgow, cities which share similar histories of industrialisation and deindustrialisation, and which have high mortality associated with known problems of deprivation. Furthermore, we sought to improve on previous related analyses[6,9] by employing a more up to date and spatially sensitive measure of deprivation. These previous analyses were based on the Carstairs &

Morris deprivation index[4], calculated from census data. This measure is now out of date (the most recent data being for 2001), but crucially was also calculated for different-sized geographies north and south of the border: postcode sectors in Scotland and electoral wards in England. In 2001, postcode sectors in Glasgow had an average population size of around 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.

Given all the above, this research sought to answer the question "is there evidence of a so-called 'Glasgow Effect'":

1. even when based on comparisons with its two most similar and comparable UK cities?
2. and when based on a more robust and spatially sensitive measure of deprivation than that previously available to researchers?

In addition, the study aimed to lay the foundation for a second, qualitative, phase of research by creating a means of identifying communities in Glasgow which experience significantly different health outcomes compared to identically deprived communities in Liverpool and Manchester.

Summary of the methodologies used in the study

Defining the cities

In all the main analyses, Glasgow, Liverpool and Manchester were defined by their current local authority boundaries. The only exceptions to this were some of the historical census, population and mortality data sets discussed further below. In addition, analyses of the 'Breadline Britain' data set[11] (also discussed below) were based on 'data tracts' aggregated to 'best-fit' local authority areas.

Creating a measure of deprivation

A measure of 'income deprivation' was created for similarly-sized small areas in each city. Income deprivation is derived from Department of Work & Pensions (DWP) benefits data, and was used in the 2006 Scottish Index of Multiple Deprivation (SIMD)[12]. It is a measure of the proportion of the population in receipt of key income-related benefits in 2005, as well as children dependent on adult recipients of those benefits[i]. Scottish data were obtained from the SIMD website; identical data for Liverpool and Manchester were obtained from DWP. Importantly, this measure of deprivation was shown to be highly correlated with both the overall SIMD (R=0.98 for Glasgow areas) and, for Liverpool and Manchester, the English Index of Multiple Deprivation[13] (R=0.97). Thus, income deprivation was judged to be a good proxy for multiple deprivation, as measured across Scotland and England.

Further details are available in Appendix 1.

[i] The components of 'income deprivation', as defined by the 2006 SIMD, are: number of elderly in receipt of Guaranteed Pension Credit; number of working age adults in receipt of Income Support; number of adults in receipt of Job Seekers Allowance; number of children dependent on a recipient of Income Support; number of children dependent on a recipient of Job Seekers Allowance. The total number of these 'income deprived' are shown as a percentage of the total population in each small area.

Creating small areas of Glasgow, Liverpool and Manchester

For any analysis aimed at measuring, or controlling for, the effects of area-based deprivation, it is important that the spatial unit of analysis is as small as possible. For the purposes of this study, however, the unit also needed to be of a sufficient size to enable access to – and analysis of – up to date, detailed mortality and population data. For Liverpool and Manchester, the optimum geographical unit in these respects was the so-called 'Lower Super Output Area' (LSOA). This is an administrative geography used in England and Wales with an average population size of approximately 1,500 people, and at which – for England – Index of Multiple Deprivation data are published. The Liverpool local authority area 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.

In Scotland, LSOAs are not used. Instead, the smallest administrative geography at which deprivation, population and mortality data can be accessed is the so-called 'datazone'. With an average population size of around 750 people in Scotland, datazones are approximately half the size of the English LSOAs[ii]. Thus, to enable these analyses to be undertaken on a spatially comparable basis, GIS (Geographical Information System) software was used to merge pairs of neighbouring datazones in Glasgow with similar rates of income deprivation. In this way, Glasgow was broken down into 350 small areas of a similar size to LSOAs, with an average population size of 1,650.

Further details are again included within Appendix 1.

[ii] Datazone is also the geography at which Scottish Index of Multiple Deprivation data are published.

Undertaking mortality analyses

Mortality data for each small area[iii], 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)) for Glasgow, and for Liverpool and Manchester, from 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). 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 here.

The causes of death examined were: 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); 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[14]; 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[15].

[iii] i.e. LSOA for Liverpool and Manchester; merged datazone for Glasgow.

Analysing historical data

Historical census data were obtained from ISD Scotland for the period 1981-2001[iv], and from the University of Portsmouth and the Great Britain Historical GIS Project[16] for the period 1951-2001. Historical mortality and population data were obtained from the SASI Research Group at Sheffield University[17], from which age-standardised premature (<65 years) mortality rates were calculated. Data on households classed as 'core poor' for the period 1970-2000 were derived from SASI's 'Breadline Britain' dataset[11].

Note that the Portsmouth University data, and the mortality and population data from Sheffield, used city boundaries that are slightly different from the current local authority boundaries. Precise geographical definitions are available elsewhere[16,17].

Additional analyses

For comparative purposes, additional analyses of mortality and deprivation were undertaken for Glasgow in relation to four other major English cities: Birmingham, Bristol, Leeds and Sheffield. These were carried out for all-cause mortality only, and were based on identical methods and geographies to those outlined above.

Similarly, separate analyses to compare mortality and deprivation for Glasgow relative to the rest of Scotland were carried out. These were based on identical methodologies, but used single datazones (rather than the merged datazones described above) as the spatial level of analysis.

The results of these additional analyses are included in Appendices 2 and 3 respectively.

Finally, a range of census and survey data for each city were analysed to enable comparison of a number of potentially relevant indicators. These are presented in the 'Discussion' section of this report, with details of all sources cited in that section. Further details of sources and definitions are available from the authors on request.

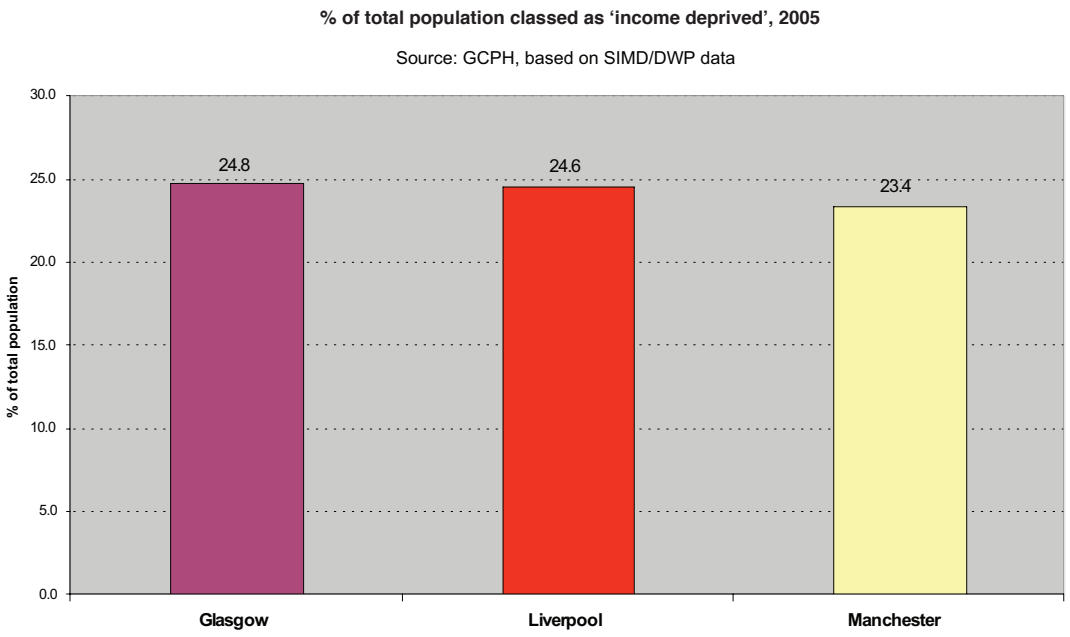
[iv] These data originated from GRO(S) and ONS, but were made available, with permission, by ISD Scotland

Results

How do the deprivation profiles of Glasgow, Liverpool and Manchester compare?

Figure 1 shows that overall levels of deprivation in Glasgow, Liverpool and Manchester in 2005 were almost identical, with almost a quarter of the total population in each classed as income deprived: 24.8%, 24.6% and 23.4% respectively.

Figure 1

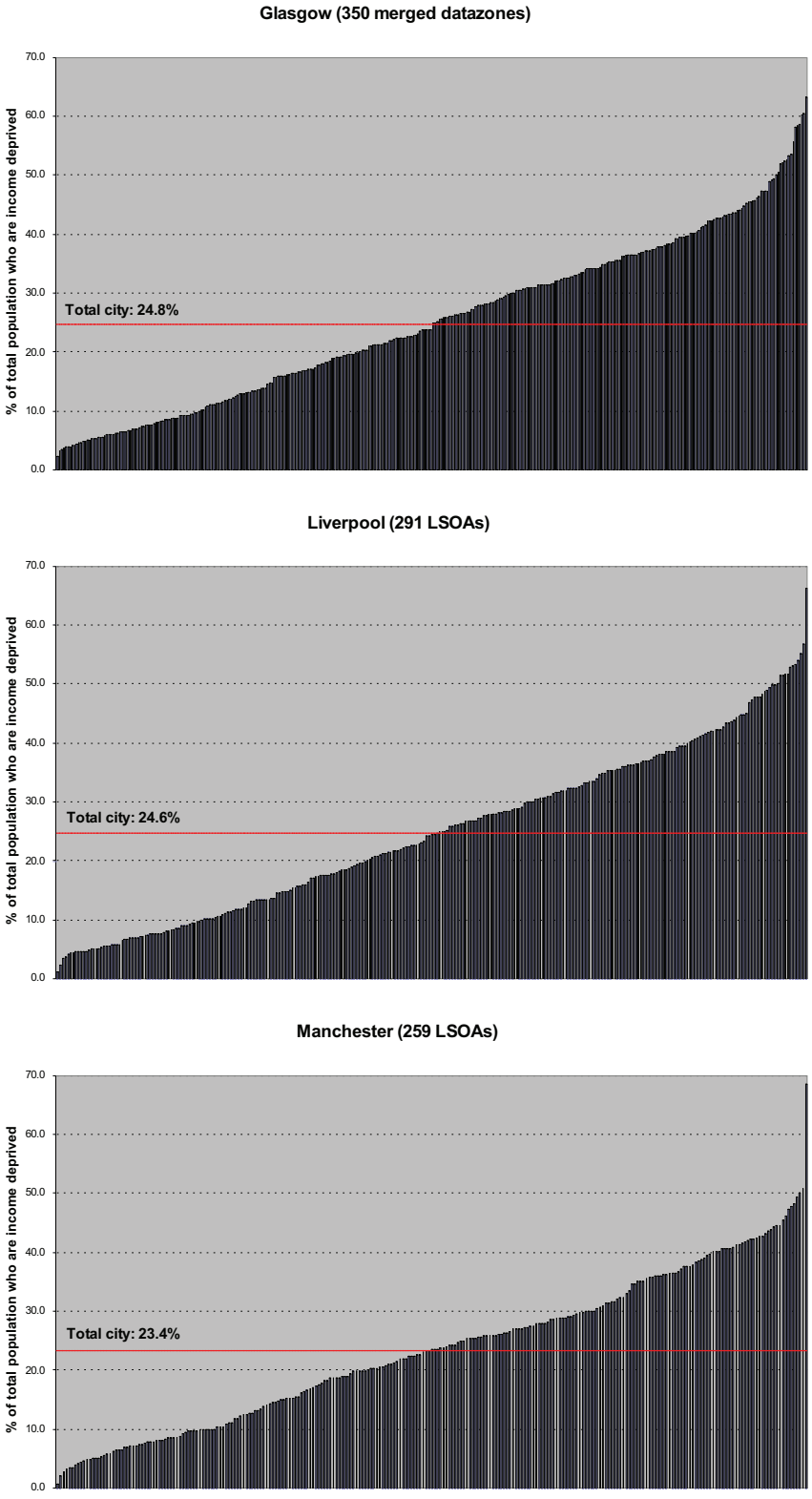


In addition, the *distribution* of deprivation across each city's small areas was also almost identical. This can be seen in Figure 2 which shows the proportion of the total population classed as 'income deprived' in each of the cities' small areas. In each city, it ranges from areas with less than 5% of the population classed as income deprived to areas with over 50% classed as such. Breaking these distributions down into ten equal groups (deciles) of areas in each city, analysis shows that the ratio of most deprived/least deprived decile in each city is virtually identical: 9.7 (Glasgow), 10.0 (Liverpool) and 10.1 (Manchester) respectively.

Thus, based on a measure of deprivation that is very highly correlated with the most sophisticated measures of multiple deprivation currently in use in the UK, Glasgow, Liverpool and Manchester are virtually identically deprived cities.

Figure 2

Distribution of 'income deprivation' across Glasgow, Liverpool and Manchester, showing the proportion of the total population in each of the cities' small areas classed as 'income deprived'



How does the overall mortality profile of Glasgow compare with that of Liverpool and Manchester?

Figures 3-5 compare the mortality profile of Glasgow with that of Liverpool and Manchester, standardising for age, sex and deprivation decile (although in fact, given the near identical deprivation profiles of each city, standardising for deprivation makes practically no difference to the results). The results are presented as standardised mortality ratios (SMRs)[v] for the whole population (Figure 3), and for males and females separately (Figures 4 and 5 respectively). These results show that despite their near identical deprivation profiles, all-cause mortality in Glasgow relative to Liverpool and Manchester combined was more than 30% higher in relation to deaths under 65 (SMR of 131.4 (95% confidence intervals: 128.6 – 134.1)). For all deaths, mortality in Glasgow was 14% higher (SMR: 114.4 (113.2 – 115.5)). 'Excess' mortality 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[vi]). 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 for comparisons of deaths among males.

[v] 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.

[vi] 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 3

Standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to Liverpool & Manchester, standardised by age, sex and deprivation decile

Calculated from various sources

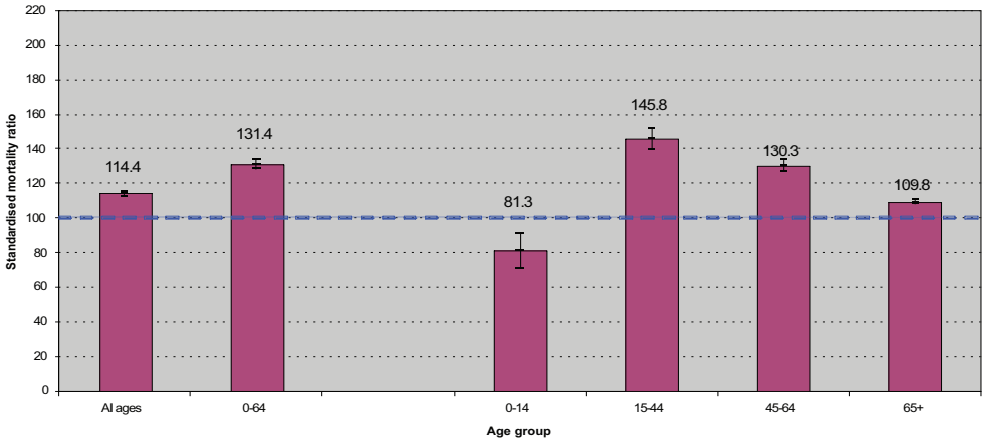


Figure 4

Males: standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to Liverpool & Manchester, standardised by age and deprivation decile

Calculated from various sources

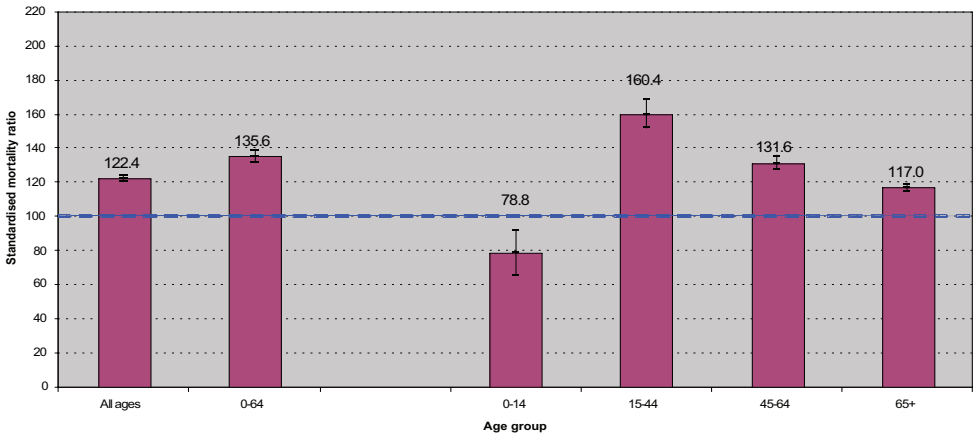
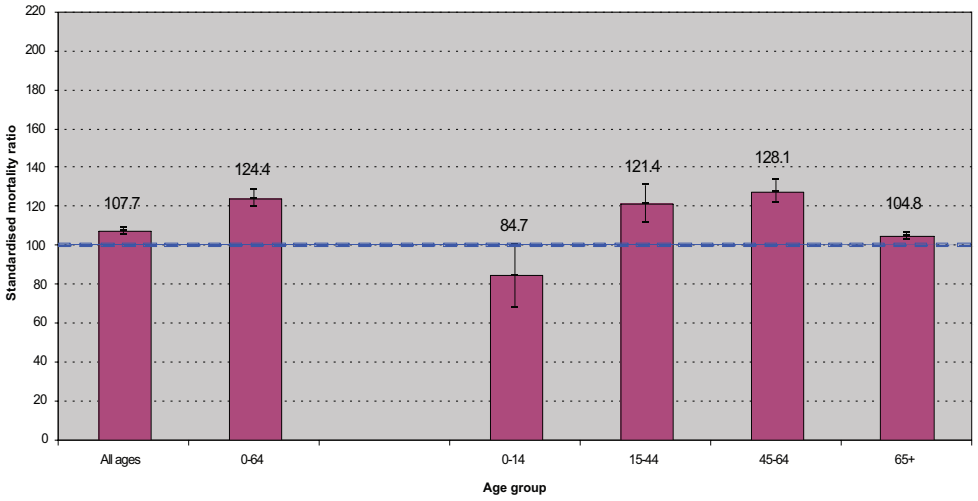


Figure 5

Females: standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to Liverpool & Manchester, standardised by age and deprivation decile

Calculated from various sources



How does mortality compare across the spectrum of deprivation?

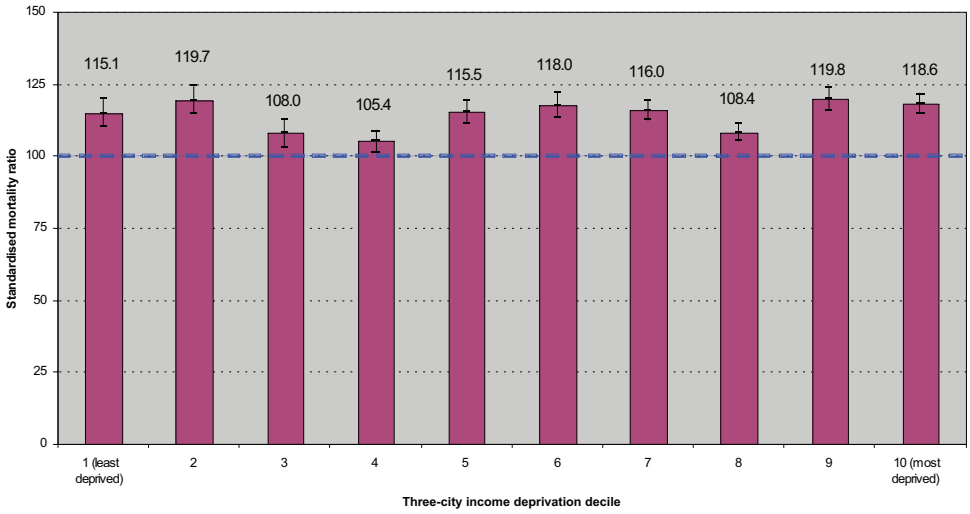
Figure 6 overleaf presents all-cause SMRs for Glasgow relative to Liverpool and Manchester, broken down by deprivation decile, for (a) all deaths, and (b) deaths for age <65 years. For all deaths, 'excess' mortality for Glasgow relative to Liverpool/Manchester can be seen across the whole population, with mortality around 18% higher in the most deprived decile (decile 10) (SMR: 118.6 (115.3 - 121.9)), but also 15% higher in the least deprived decile (decile 1) (SMR 115.1 (110.4 - 115.3)). For premature mortality (deaths <65 years), SMRs tend to be higher in the five more deprived deciles (6-10) compared to the less deprived (1-5). Similar results for males (Figure 7) and females (Figure 8) again reveal generally higher SMRs among males.

Figure 6

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.

Calculated from various sources

(a) All deaths



(b) Deaths <65 years

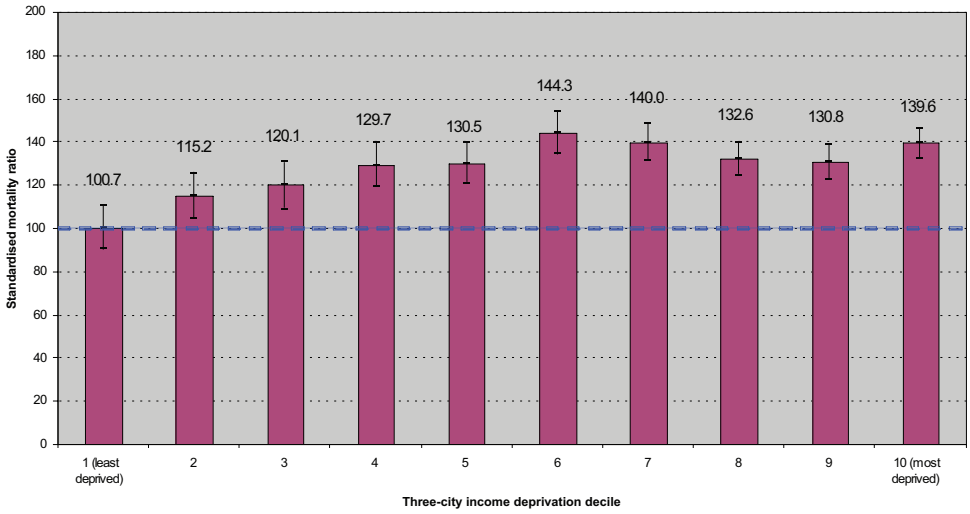
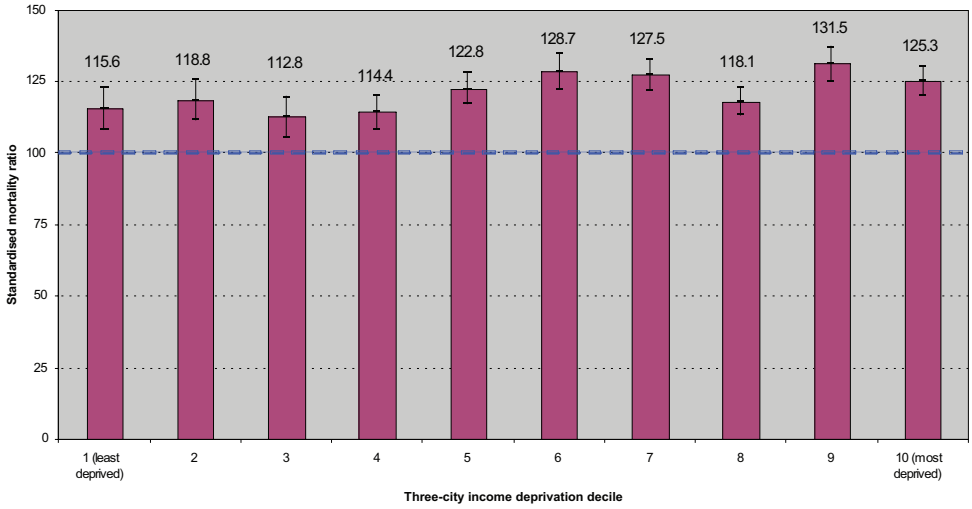


Figure 7

Males: 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.

Calculated from various sources

(a) All deaths



(b) Deaths <65 years

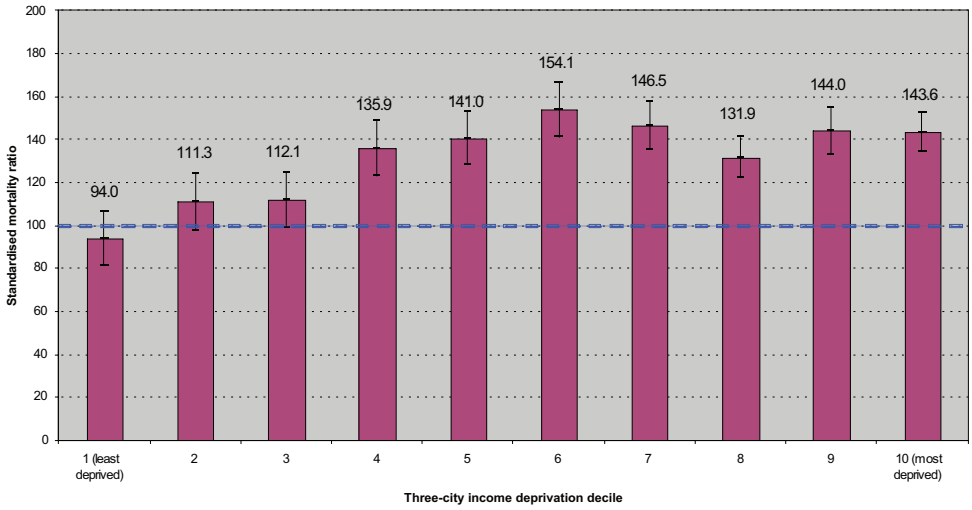
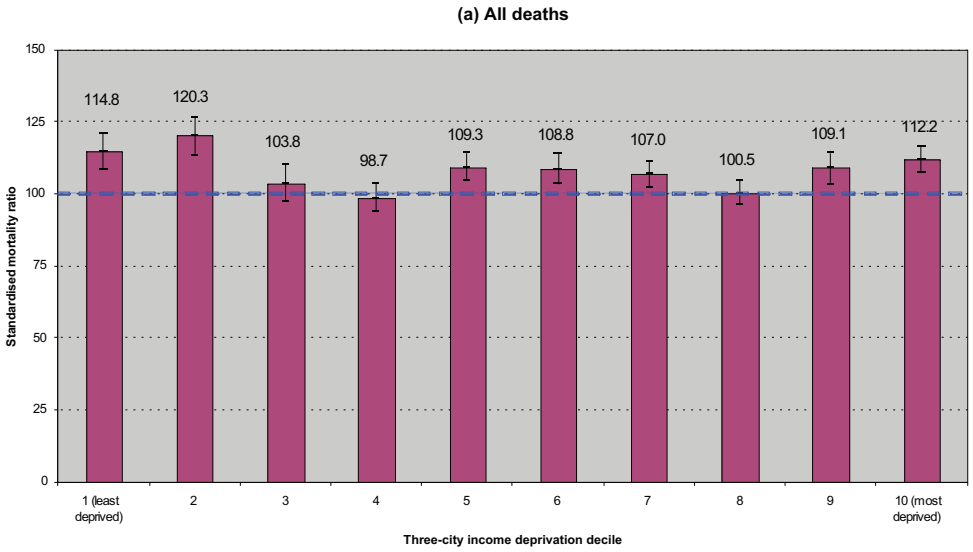
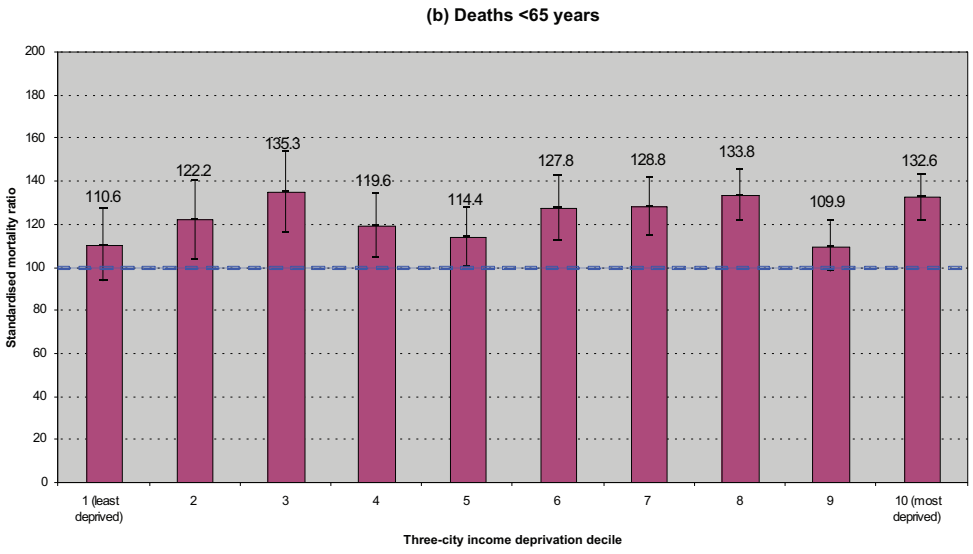


Figure 8

Females: 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.

Calculated from various sources





How does mortality compare for particular causes of death?

Figure 9 shows a similar set of SMRs, for all deaths, 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[vii], almost 70% higher for suicide, 2.3 times higher for alcohol-related causes, and almost 2.5 times higher for drug-related poisonings. Figures 10 and 11 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)).

[vii] 'External causes' is a grouping of ICD (International Classification of Diseases) 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).

Figure 9

All ages, both sexes: cause-specific standardised mortality ratios 2003-07, Glasgow relative to Liverpool & Manchester, standardised by age, sex and deprivation decile

Calculated from various sources

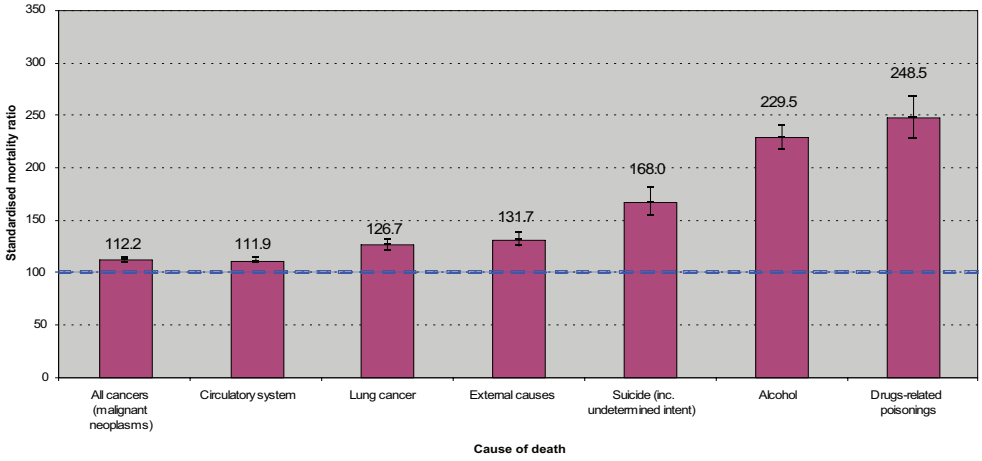


Figure 10

All ages, males: cause-specific standardised mortality ratios 2003-07, Glasgow relative to Liverpool & Manchester, standardised by age, sex and deprivation decile

Calculated from various sources

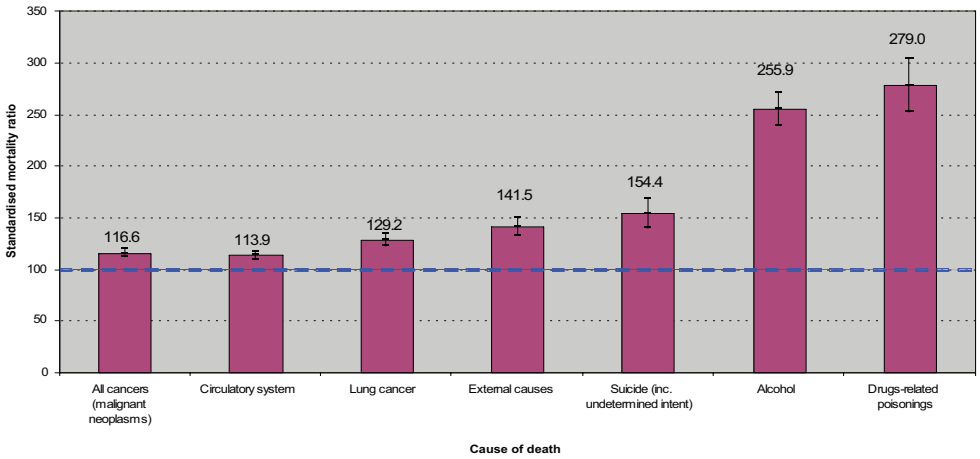
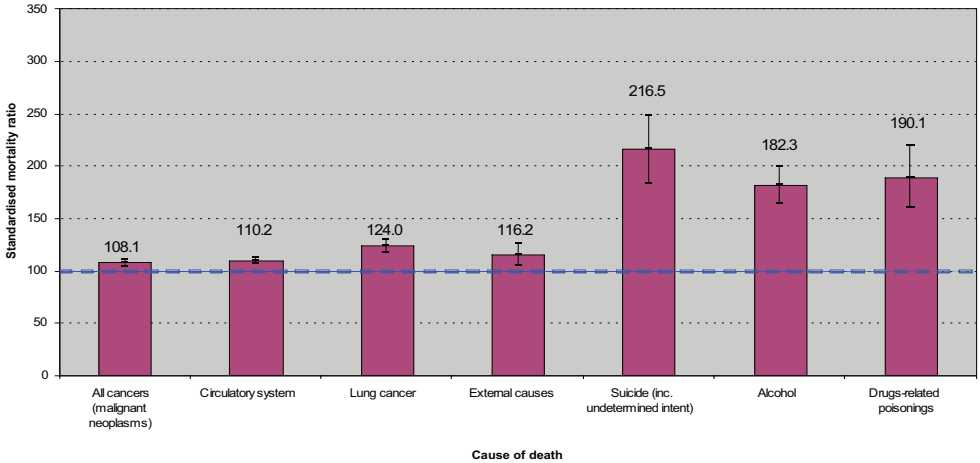


Figure 11

All ages, females: cause specific standardised mortality ratios 2003-07, Glasgow relative to Liverpool & Manchester, standardised by age, sex and deprivation decile

Calculated from various sources



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, 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. Analysis by age, sex and cause shows 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, 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 1.

Table 1

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

	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**

[viii] 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%.

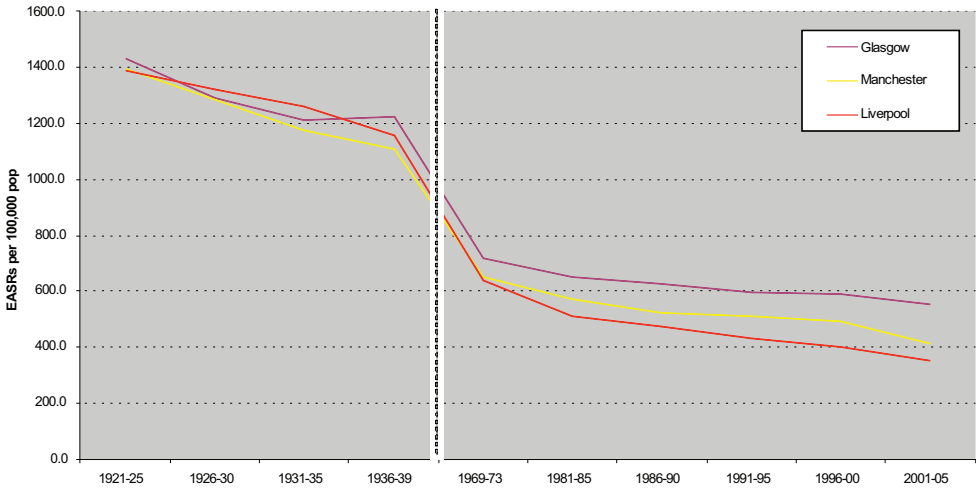
Has Glasgow always had higher levels of mortality than Liverpool and Manchester?

Data obtained from the University of Sheffield have allowed us to calculate historical mortality trends for the three cities. Figure 12 shows age-standardised premature mortality rates (age < 65) among males 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 problematic, the data suggest that the current situation (higher male mortality rates in Glasgow compared to Liverpool and Manchester) has not always been the case. 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) can be seen in the years for which data are available in the latter part of the 20th Century. This might suggest that the 'excess' – the Glasgow Effect – is a relatively recent phenomenon.

Figure 12

Deaths < 65, males: European age-standardised mortality rates (EASRs) per 100,000 population, 1921/25 - 2001/05, Glasgow, Liverpool and Manchester

Source: calculated from SASI Research Group Death and Population Data, 1921-2005



Data for females (not shown here) 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 tended to be higher than those of the other two cities.

Additional analyses

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. The results are presented in full in Appendices 2 and 3. Overall, however, they reinforce the overall finding of this report that deprivation does not explain all of Glasgow's excess levels of mortality.

The implications of all the above findings are discussed in more detail in the next section of the report.

Discussion

Main findings

The main finding of this study is that despite displaying levels and patterns of deprivation that are almost identical to those of Liverpool and Manchester, Glasgow has a profoundly different mortality profile: premature deaths are more than 30% higher, and all deaths around 15% higher. Importantly, these higher levels of mortality are seen across virtually the whole population: all ages (except the very young), both males and females, in deprived and non-deprived neighbourhoods. Indeed it is notable that overall levels of mortality in Glasgow's more affluent suburbs (i.e. the least deprived decile) are still around 15% higher than in equivalent areas of Liverpool and Manchester. A slightly different picture emerges for premature mortality, however, with relatively higher mortality in the more deprived areas (particularly among males), and with around a half of all 'excess' deaths directly related to alcohol and drugs.

Thus, while deprivation is a fundamental determinant of health and, therefore, an important driver of mortality, it does not explain the higher levels of mortality experienced by Glasgow in relation to two very similar UK cities.

How do we explain this? As discussed in the next section of the report, it is hoped that the second phase of research will shed light on some of the potential explanations for these findings. However, in this section we additionally ask – and attempt to answer – some of the more obvious questions that these analyses pose.

1. Do the results merely reflect limitations in the way we measure 'deprivation'?

The strength of this study is that it has removed important weaknesses from previous analyses. By employing smaller and equivalent geographies and using a contemporary measure of deprivation that correlates strongly with the best available measurements of multiple deprivation in Scotland and England, the analyses have been undertaken at a much finer spatial level than was previously possible, and the weaknesses of previous work highlighted in the introduction have been addressed. A weakness remains, however, in that it is still possible that the results are simply a reflection that true 'deprivation' cannot be adequately captured by indicators derived from routine data sources. The measures employed in the analyses are still only *indicators* of deprivation, derived from benefits systems and other databases. As such, therefore, they cannot fully capture all aspects of true social and economic deprivation experienced by individuals in the population. Is it possible that any 'additional', unmeasured, aspects associated with deprivation are more prevalent in Glasgow than in Liverpool and Manchester?

2. Have the deprivation profiles of Glasgow, Liverpool and Manchester changed in recent decades?

This is an important question, and we cannot be certain that there has not been a change in the deprivation profiles of the three cities, impacting across the life course in a manner that is not detected by cross sectional analyses. Current levels of mortality (at least for some, if not all, causes of death) are likely to 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.

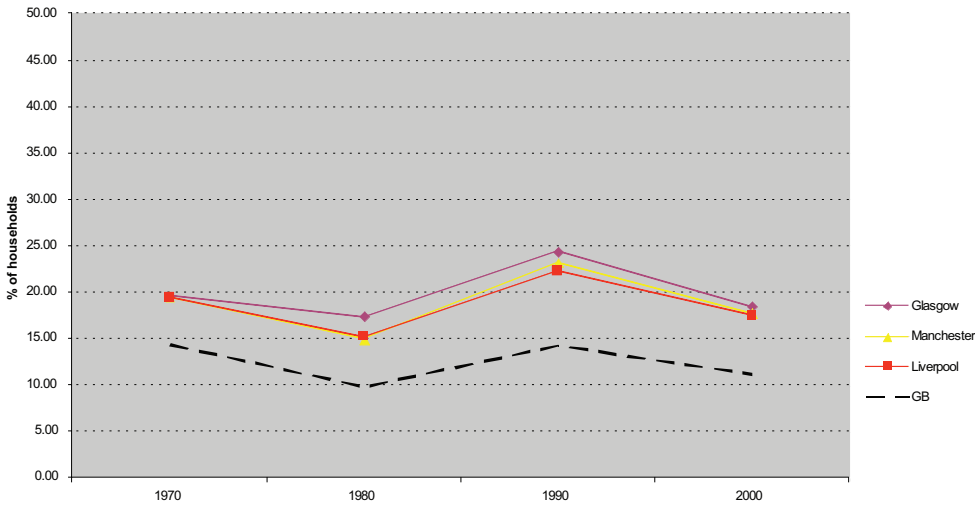
That said, examination of a range of historical data sources suggests that, at an overall city level at least, this is unlikely to be the case. For example, Figure 13 shows that the proportion of households in each city which were classed as 'core poor' by Sheffield University's 'Breadline Britain' data set[11] 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 in 1980 and 1990, the differences between the cities over the whole period were slight.

Figure 13

Percentage of household classed as 'core poor', 1970-2000

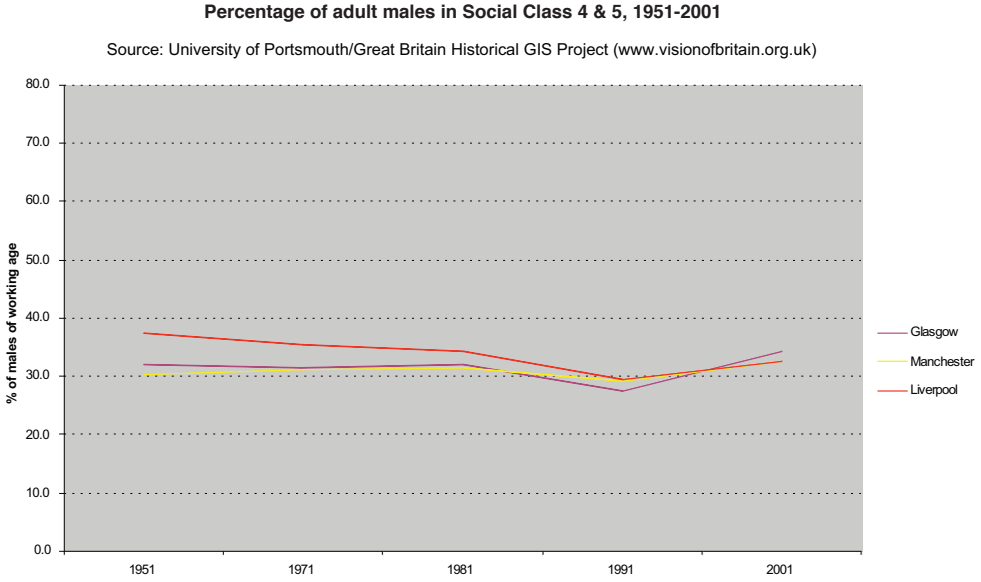
Source: Breadline Britian data (Dorling et al, 2007)



Going back further, analyses of historical census data[16] also suggest there has been little change over time: for example Figure 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 with male unemployment, this indicator has been commonly used as a component of deprivation indices[4,18]) also shows no relative improvement in Glasgow's position over this time period (Figure 15).

Figure 14

Figure 15



Analysis of other relevant census data (car ownership and overcrowding) for a more limited time period (1981-2001) shows relative improvement in Glasgow for levels of overcrowding only, and only in comparison with Manchester (an even higher percentage change was recorded for Liverpool). Taken together, therefore, all these data suggest that it is unlikely that any significant change in relative deprivation status between the three cities has taken place which might account easily for the mortality trends reported here.

3. Are income inequalities in Glasgow greater than in Liverpool and Manchester?

There is an increasing body of evidence suggesting that large areas with higher levels of income inequality experience correspondingly poorer health outcomes at equivalent levels of average wealth[19,20,21]. In short, socio-economic inequalities have an independent impact on mortality levels within populations. Although this effect has been discovered through analyses at the level of countries and U.S. states, it is at least possible that an equivalent effect may apply at a city level. The data presented in this paper on the distribution of area-based levels of income deprivation across the three cities suggest that this is unlikely to be the case. However, these data do not capture the full picture of the distribution and concentration of absolute levels of income in the three cities and it is possible, therefore, that significant differences exist. Further research would be required to establish whether or not differences in patterns of income inequality play a part in the 'Glasgow Effect'.

4. Does Glasgow's population exhibit significantly worse health behaviours than those of Liverpool and Manchester?

This is a complex issue. On the one hand the vast majority of health behaviours are socially patterned and thus, given the strikingly similar deprivation profiles of the three cities, one would not expect there to be important differences in such risk factors. For health behaviours such as smoking (Figure 16), binge drinking (Figure 17) and healthy eating (Figure 18) this expectation would appear to be backed up by national survey data[22,23,24] which show only small differences in prevalence levels of these measures. In addition, survey based measures of obesity levels (Figure 19) are also very similar in each of the cities. (Note, however, that in the case of binge drinking, healthy eating and obesity, the comparison area is Greater Glasgow, rather than Glasgow City: figures for the city may differ slightly from those for the larger area).

Figure 16

Adult (16+) smoking prevalence

Source: Scottish Household Survey 2003-05;
English Health Profiles (using Health Survey for England data 2003-05)

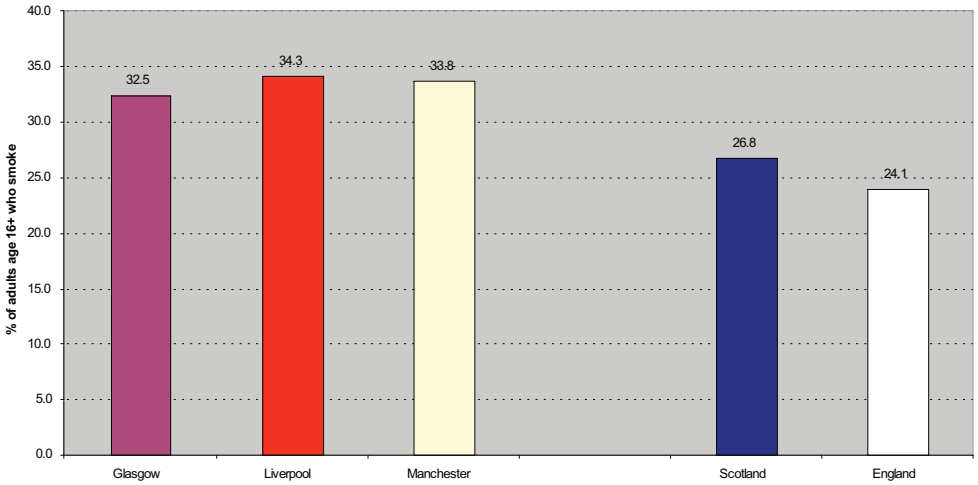


Figure 17

Binge-drinking: % of adults (16+) consuming 8+ units (men) or 6+ units (women) on heaviest drinking day in the previous week

Source: Scottish Health Survey 2003;
English Health Profiles (using Health Survey for England data 2003-05)

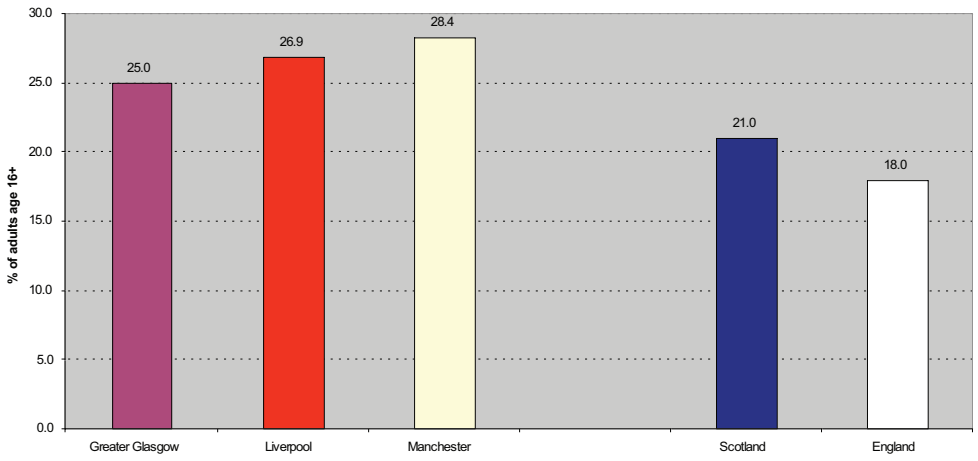


Figure 18

Healthy eating: % of adults (16+) eating 5+ portions of fruit and vegetables per day

Source: Scottish Health Survey 2003;
English Health Profiles (using Health Survey for England data 2003-05)

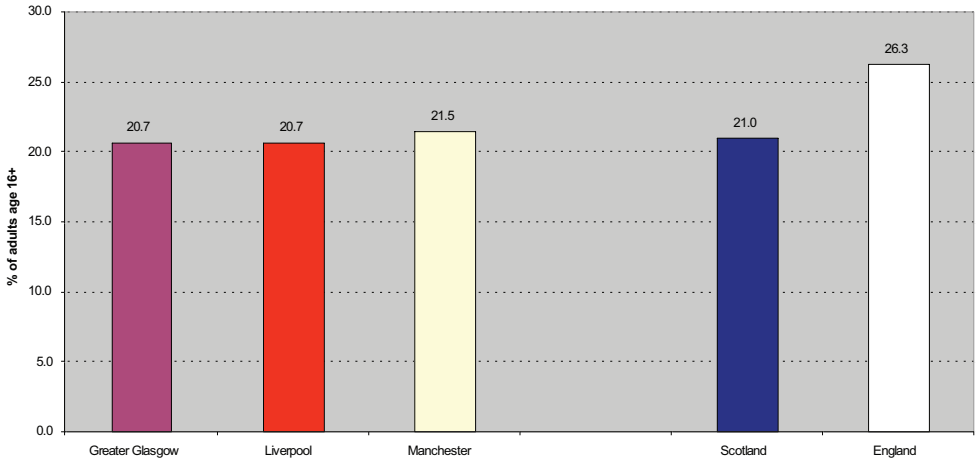
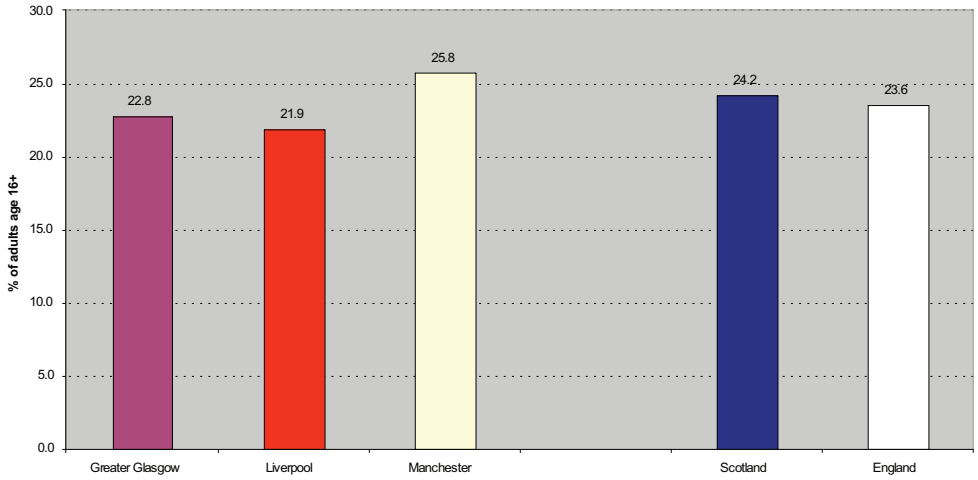


Figure 19

Adults (16+) classed as obese (BMI>30)

Source: Scottish Health Survey 2003;
English Health Profiles (using Health Survey for England data 2003-05)



On the other hand, 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 and prevalence data. Certainly, it has been suggested previously that drug abuse, in particular, may contribute a significant amount of the excess mortality seen for Scotland as a whole relative to England[25]. However, a more detailed exploration specifically in relation to Glasgow, Liverpool and Manchester would be required to quantify the impact of drugs – and indeed other adverse health behaviours – on the analyses reported here.

5. Are the results affected by migration?

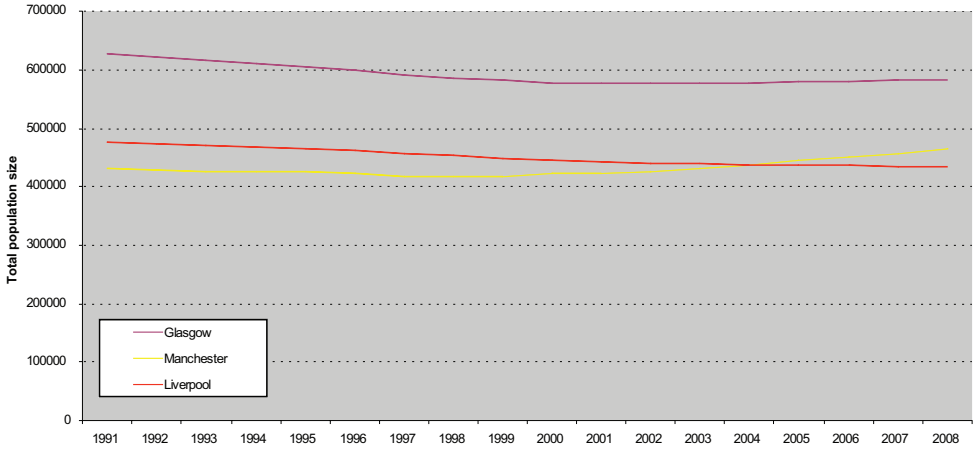
Figure 20 shows the size of the total population in each city between 1991 and 2008. Although the trends in Glasgow and Liverpool appear very similar, the pattern for Manchester is slightly different. Manchester experienced a ten percent increase in total population size between 2000 and 2008, whereas in Glasgow the equivalent increase was only one percent, and in Liverpool the population *size decreased* by 2.5%. Although not shown here, further analyses of these data show that in Manchester this increase in population size was particularly high among the working age population (defined here as males aged 16-64 and females aged 16-59): the numbers in this group increased by around 20% between 2000 and 2008, compared to eight per cent and three per cent increases in Glasgow and Liverpool respectively. However, without further detailed research, it is difficult to quantify what the impact of these differences might be on levels of population health in each city.

Differences in the age structures of the population are discussed further in the next section.

Figure 20

Total population trends 1991-2008, Glasgow, Liverpool and Manchester

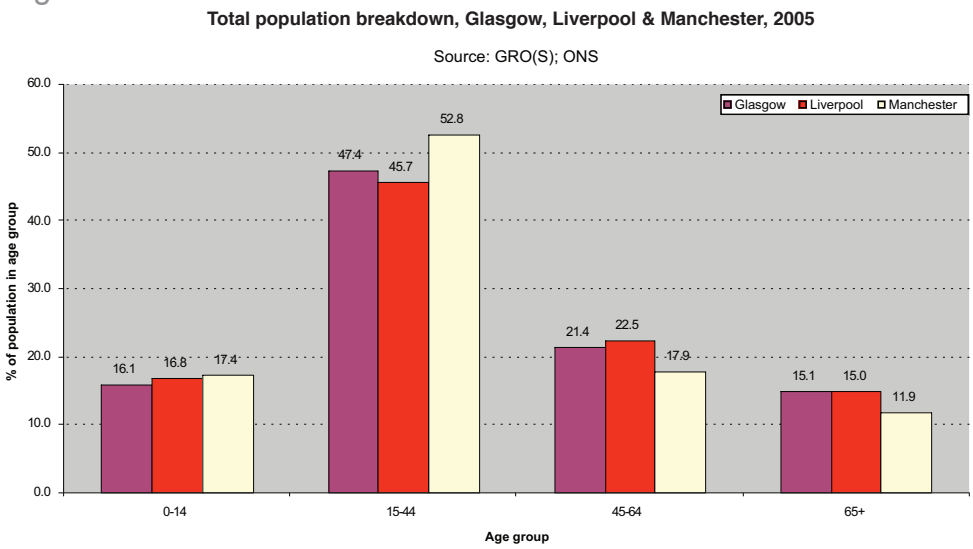
Source: GRO(S); ONS



6. Are there differences in the population compositions of the cities?

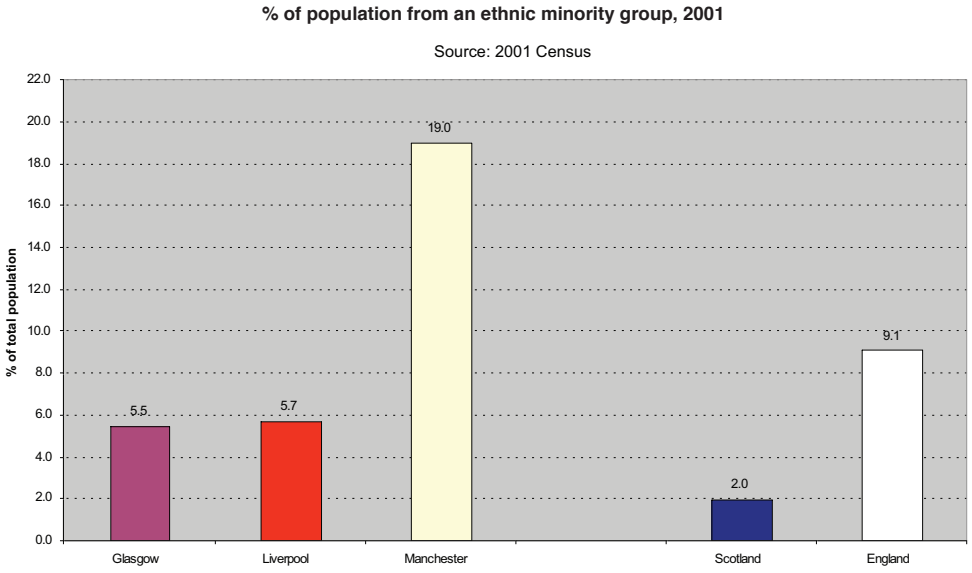
We can examine other routine administrative and survey data sources for clues to any other important differences between Glasgow, Liverpool and Manchester. For example, Figure 21 shows the age breakdown for each city's population. Separate figures for males and females (not shown here) are very similar. This suggests that Manchester differs from the other two cities in having slightly higher proportions of its population in the younger age groups. However, this is very unlikely to impact on the results presented in this report for two reasons: first, all the mortality analyses are standardised by age – in other words, they specifically take into account any differences in the populations of the cities; second, although we have only presented the results of analyses for Liverpool and Manchester combined, a very similar set of results were obtained based on data for Liverpool only (and as Figure 21 shows, Liverpool has a very similar age composition to Glasgow).

Figure 21



More pertinently, Figure 22 shows the proportion of each city's population classed as being in an ethnic minority group at the last (2001) census. The ethnic make-up of Manchester (with more than three times Glasgow's proportion of people in an ethnic minority in 2001) is important, given the evidence of differing health behaviours and outcomes among certain ethnic groups[26,27,28,29,30]. However, the fact that Liverpool's ethnic composition is very close to that of Glasgow, and the fact that the mortality analyses in relation to Liverpool alone were very similar to those presented in this report for both English cities, suggests that this different ethnic mix is unlikely to provide the explanation for the principal findings of the study.

Figure 22



7. Are there other differences in the 'social environment' of the cities?

The term 'social environment' covers an array of important, often overlapping, topics which can impact on health including ethnicity (discussed above), educational attainment, home circumstances, social capital and many more. There is a small number of comparable data sets which we can use to analyse some of these issues for the three cities.

For example, **educational attainment** has been shown to be an important determinant of adult health status[31,32,33,34,35]. Previous international comparisons have suggested that a relatively high proportion of Glasgow's adult population have no educational qualifications compared to other urban areas in the UK and mainland Europe[36]. Similarly, the 2001 census showed Glasgow's figure in this regard to be the second highest of all council areas in Scotland[37]. However, as illustrated in Figure 23, the most recent comparable data from the Annual Population Survey[38] show that the percentage of Glasgow's working age population with no qualifications is very similar to the figures for Liverpool and Manchester (20%, 22% and 19% respectively). At the other end of the educational spectrum, however, other research has shown that the West of Scotland compares well in terms of *higher* levels of attainment (e.g. tertiary level qualifications) in relation to a wide array of UK and European regions (including Merseyside and Greater Manchester)[7,36]. This is echoed by the data presented in Figure 24, which show that the proportion of the working age population with higher level qualifications in Glasgow is, at 32%, considerably higher than in Liverpool (21%), and indeed is higher than England as a whole (28%). The equivalent figure for Manchester, however, is very similar to that of Glasgow: 30%.

Figure 23

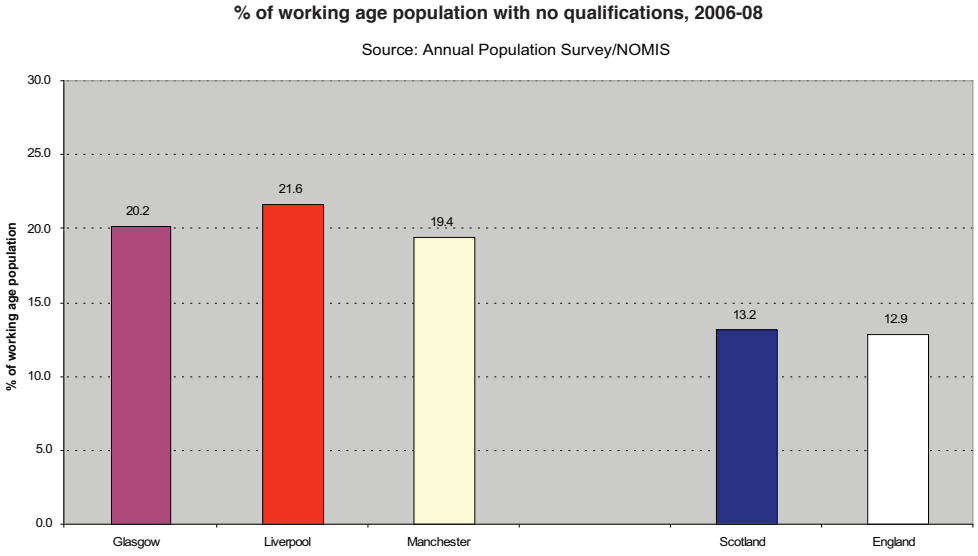
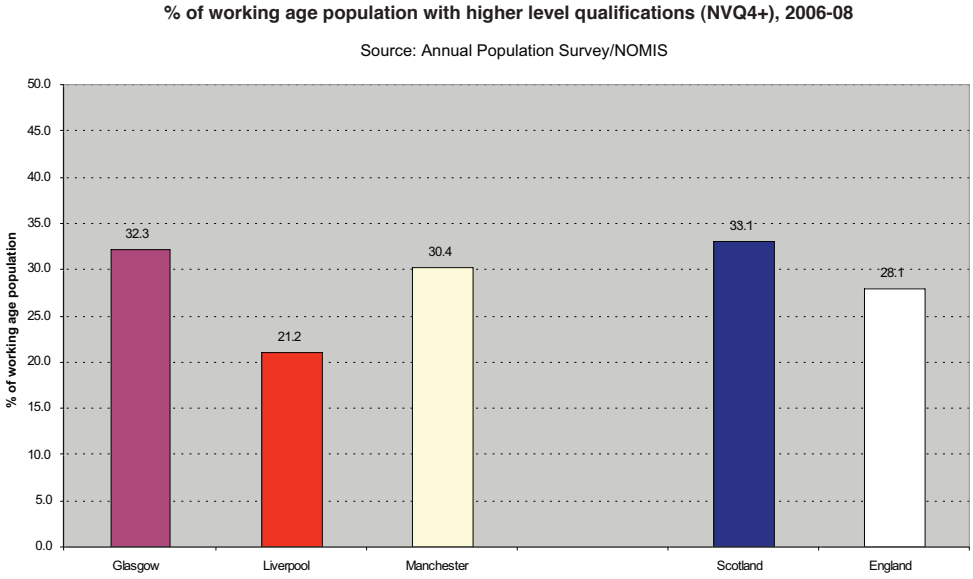


Figure 24



What of 'vulnerable' populations such as **lone parents**? At the last census, rates of lone parent households (as a proportion of all households with children) in Glasgow were the highest in Scotland[39]. However, Figure 25 shows that the rates for Liverpool and Manchester were, at around 40%, almost identical to Glasgow's. Rates of **teenage pregnancy** (shown to be highly correlated with lone parenting rates in Glasgow[40]) are also known to be high in Glasgow; however, as Figure 26 shows, although rates in Liverpool are slightly lower, they are considerably higher in Manchester.

Figure 25

Lone parent households with dependent children, 2001

Source: 2001 Census

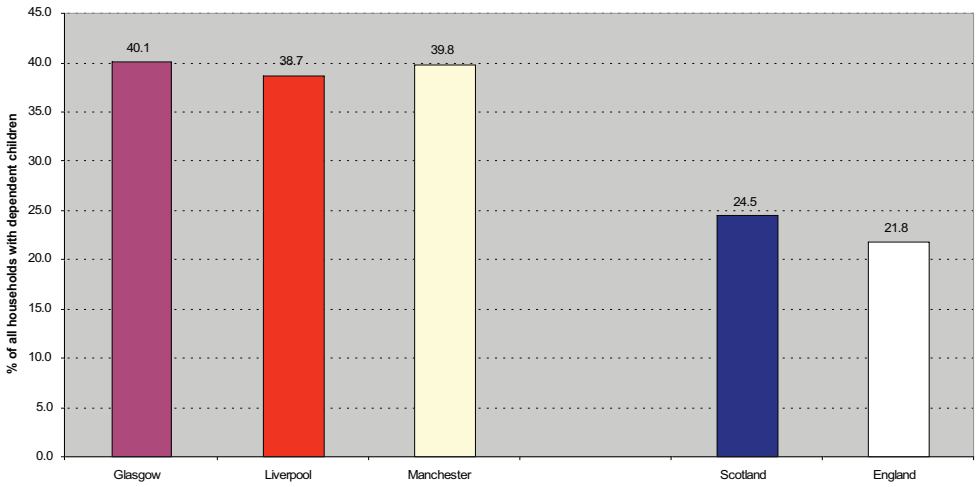
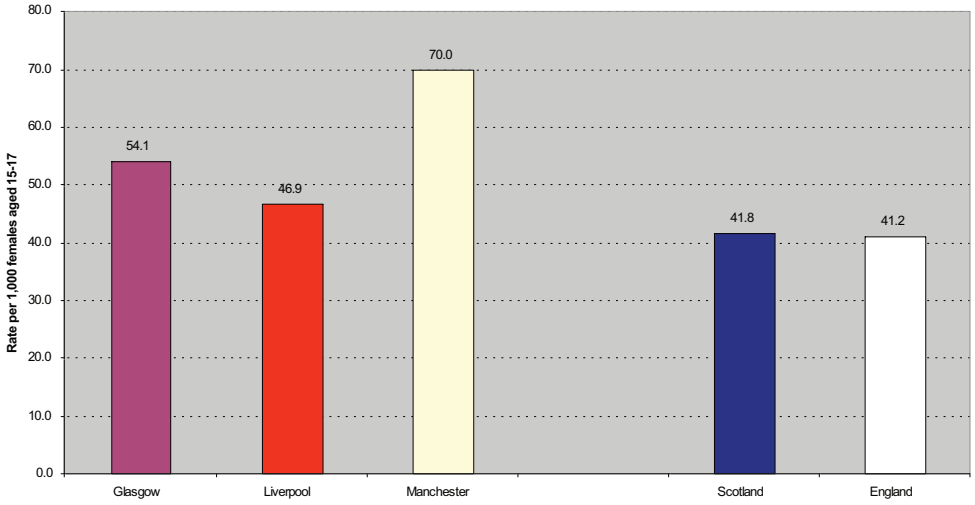


Figure 26

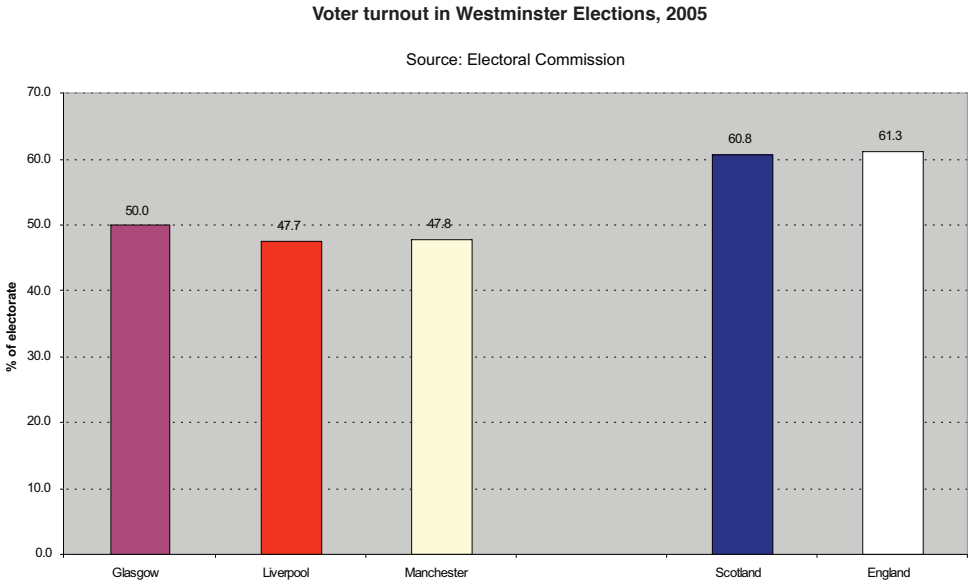
Teenage pregnancy rate (<18 years), 2005-07

Source: ISD Scotland; English Health Profiles



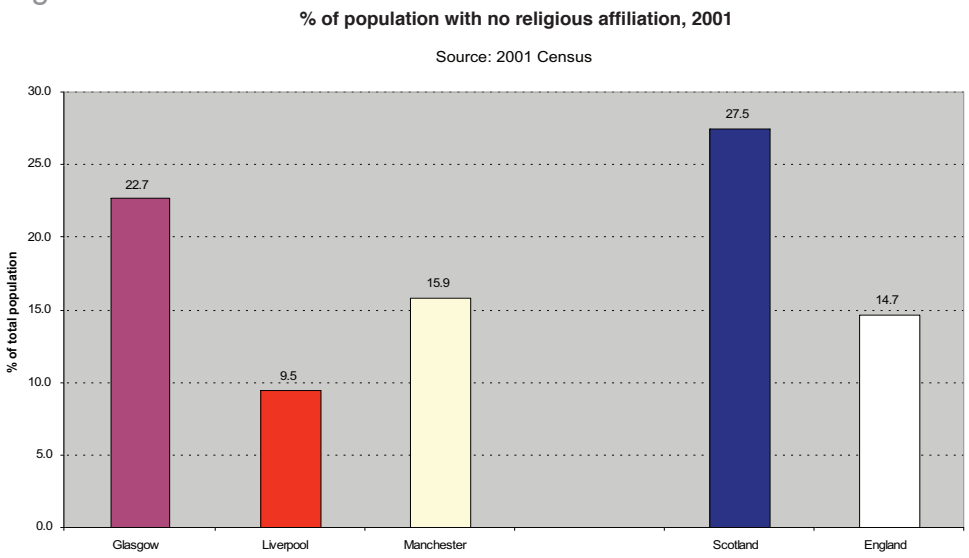
In recent years an increasing amount of research has pointed to the importance of **'social capital'** and social networks in relation to health status[41,42,43,44,45]. With particular relevance to a post-industrial landscape, Stuckler and colleagues showed that the negative effects of mass privatisation (and associated employment loss) on mortality in post-Communist Eastern Europe were mitigated to a large degree by high levels of social capital among the population[46]. Unfortunately, we lack comparable, high quality indicators of social capital for the three cities of Glasgow, Liverpool and Manchester. For illustration, however, we present here two proxy measures: voter turnout and religious affiliation. The former shows a similarly low level of participation among voters across all the three cities at the last UK General Election (Figure 27)[ix], while the latter suggests considerably lower levels of religious affiliation in Glasgow compared to Manchester and, especially, Liverpool (Figure 28).

Figure 27



[ix] Based on Electoral Commission figures 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.

Figure 28



Clearly, however, a more detailed and focused enquiry into the levels of social capital (and their potential influence on health) in each city would be required to shed light on real differences that are not detected by the variables presented here.

In summary, with the exception perhaps of the last Figure, the 'social environment' related indicators presented here show very little difference between Glasgow, Liverpool and Manchester (at least at the overall city level).

8. Other hypotheses

A whole range of speculative hypotheses to explain the 'Glasgow Effect' can be (and, in cases, have been) put forward. One such hypothesis currently under investigation is that it may be driven by elements of 'societal breakdown' among sections of the city's population. The data on alcohol, drugs and suicide mortality show significant differences in levels of self-harming behaviours in Glasgow compared to Liverpool and Manchester that may reflect fundamental societal differences among sections of the population. Could it point to evidence of a type of 'anomie', a breakdown of social and moral 'norms', such as that proposed in the 19th Century by the French sociologist Emile Durkheim?[47,48] Durkheim coined the term in relation to less regulated and less integrated societies in which previous social norms no longer apply and thus no longer control the behaviour of individuals. As a result, 'anomie' leads to increasing levels of crime and 'deviant behaviour'. Durkheim focused on suicide as one manifestation of a more generalised set of self-destructive behaviours. Could there be evidence of such a phenomenon among elements of Glasgow's population? Although an interesting and important question, it must be seen as speculative until further research has been conducted.

Other hypotheses that have been suggested include: cultural differences; genetic factors; the effects of migration; a greater 'vulnerability' on the part of the Glasgow population; the role of families and family breakdown; differences in outcomes from regeneration activities in the cities; differing legacies and benefits from cultural and sports-led regeneration (e.g. 'City of Culture' activities in Liverpool and Glasgow; the Commonwealth Games in Manchester); differences in the spatial patterning of deprivation across the three cities. Vitamin D has even been suggested as a contributory factor to the overall 'Scottish Effect'[49]. Some or none of these theories may play a part. The important point is that something over and above currently measured socio-economic deprivation appears to have an important role. This is likely to have implications not only for Scotland, given that other research has suggested similar effects may be visible in other deprived parts of the UK[6,50,51]. In the case of Glasgow, Liverpool and Manchester, this will now be investigated in detail through qualitative research, based on comparisons of equally deprived areas in the three cities (and made possible by the development of the three-city deprivation measure described in this paper).

Conclusions and next steps

Conclusions and next steps

The important link between socio-economic circumstances and health is well established, and it is important to note that this research adds to the evidence that deprivation is an important driver of mortality: Glasgow, Liverpool and Manchester are the most deprived cities in the UK – and also the cities with the lowest life expectancy. However, this study has shown that Glasgow experiences significant levels of 'excess' mortality, even when compared with two cities with almost identical profiles of deprivation. Thus, while deprivation is a fundamental determinant of health, these results suggest it is one part of a complex picture.

This (quantitative) study has laid the foundation for a second (qualitative) phase of research, aimed at gaining an understanding of what lies behind this so-called 'Glasgow Effect'. The creation of the three-city small area based deprivation measure allows us to identify communities in Glasgow which experience significantly different health outcomes compared to identically deprived/non-deprived communities in Liverpool and Manchester. Work is underway to ensure that these 'matching' areas are as similar and comparable as possible. Once finalised, we hope that the employment of ethnographic and other research methodologies will enable us to identify key differences between the communities that might help us better understand the differing influences on health. We hope to report the results of this second phase of research in 2011.

Appendix 1: Creation of a three-city deprivation index

Introduction

For the purposes of this study, it is unfortunate that 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.

Spatial scale

As outlined in the 'methods' section of this report, for the two English cities the geographical unit of analysis (and the smallest geography for which the required deprivation, mortality and population data could all be obtained) was 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 also the geography at which the (English) Index of Multiple Deprivation data are published). 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.

In Scotland, LSOAs are not used. Instead, the equivalent small area administrative geography (and the geography at which the Scottish Index of Multiple Deprivation 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, GIS software[x] was used to merge pairs of neighbouring datazones in Glasgow with similar rates of income deprivation. In this way the 694 datazones of Glasgow were transformed into 351 'merged' areas.

Figures A1 and A2 show the city broken down into these two sets of areas.

[x] GIS: Geographical Information System

Figure A1

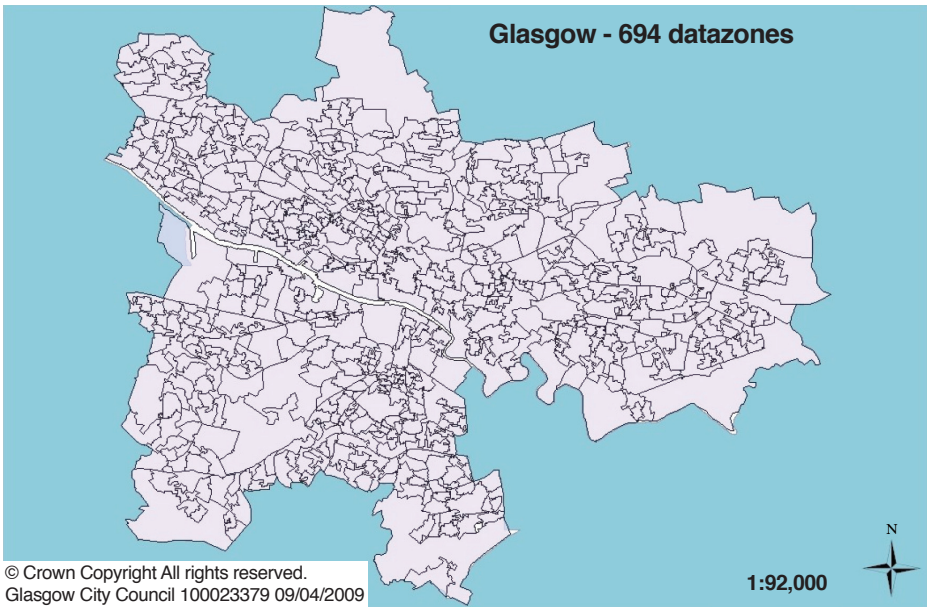
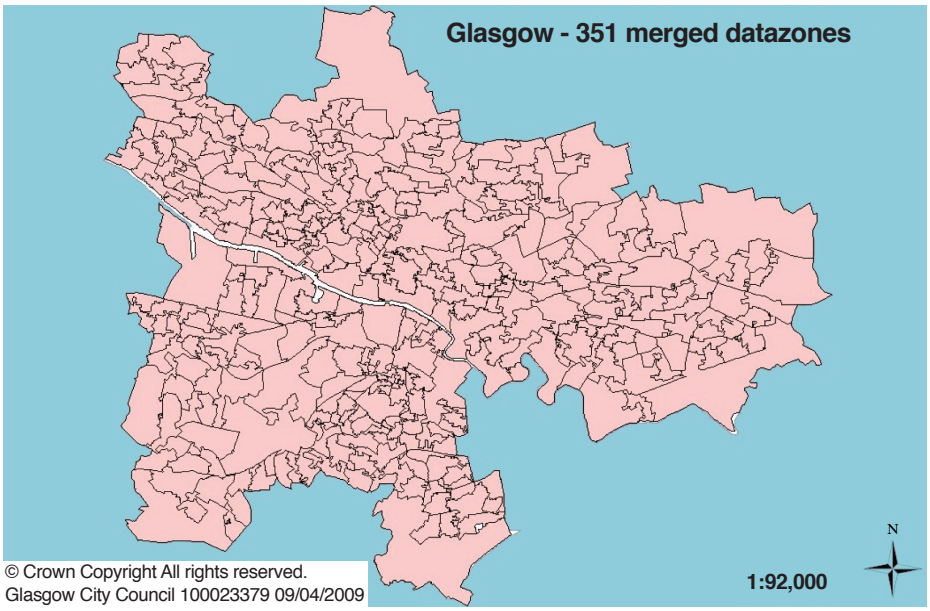


Figure A2



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 A3, A4 and A5 below.

Figure A3

Glasgow merged DZs: population distribution

Source: GCPH, based on GRO(S)/SIMD data

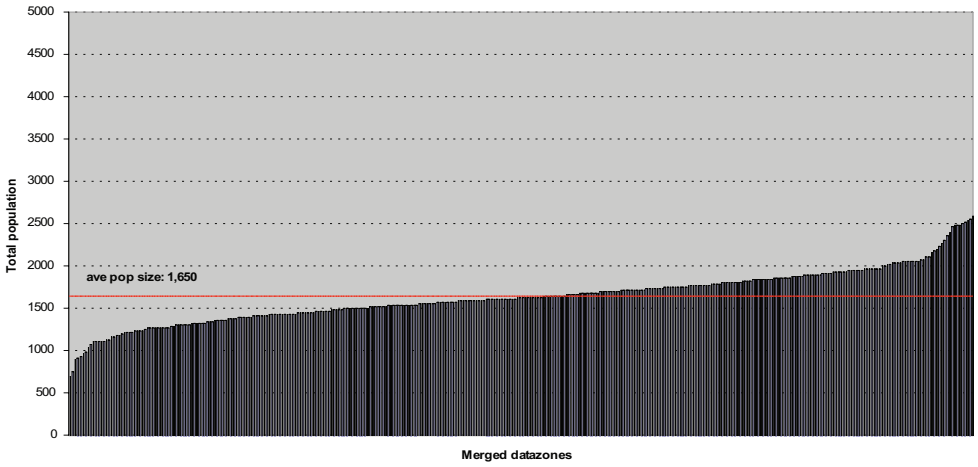


Figure A4

Liverpool LSOAs: population distribution

Source: ONS

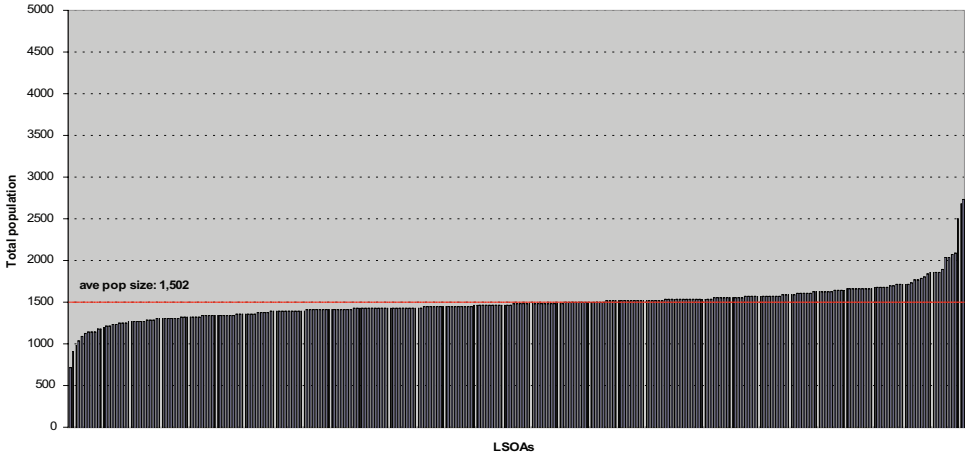
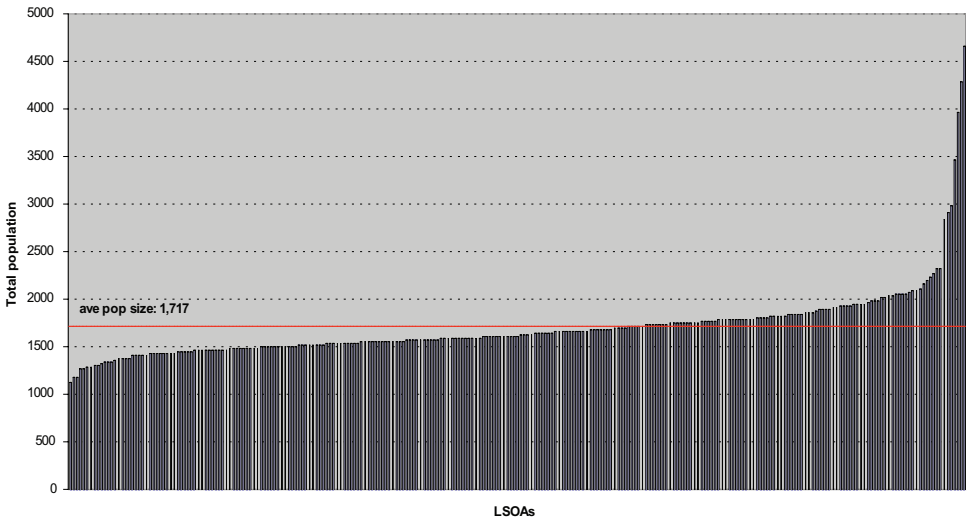


Figure A5

Manchester LSOAs: population distribution

Source: ONS



Income deprivation

As outlined in the main part of this report, the deprivation measure used in all the analyses was 'income deprivation'. This measure is derived from Department of Work & Pensions (DWP) benefits data, and was used in the 2006 Scottish Index of Multiple Deprivation (SIMD)[12]. It is a measure of the proportion 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[13] (R=0.97). These correlations are shown in Figures A6 and A7 below. Thus, income deprivation was judged to be a good proxy for multiple deprivation, as measured across Scotland and England.

Figure A6

Scatterplot of overall 2006 SIMD score and 'income deprivation' score
Glasgow City only

Source: 2006 SIMD

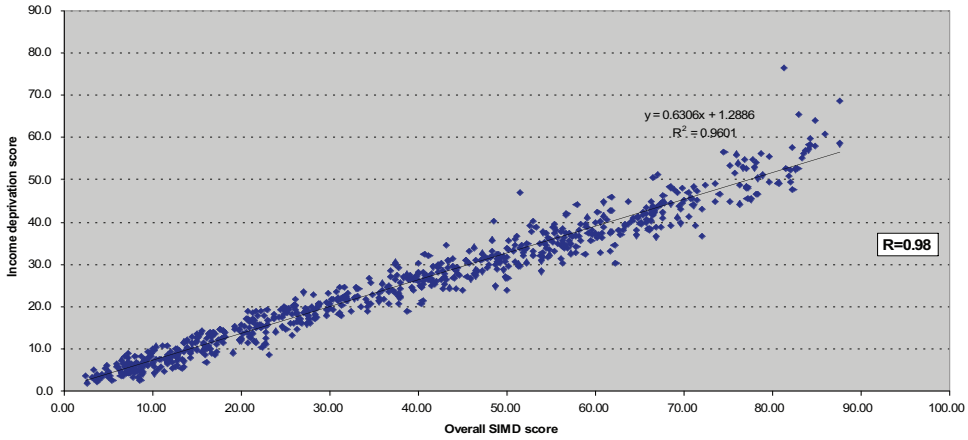
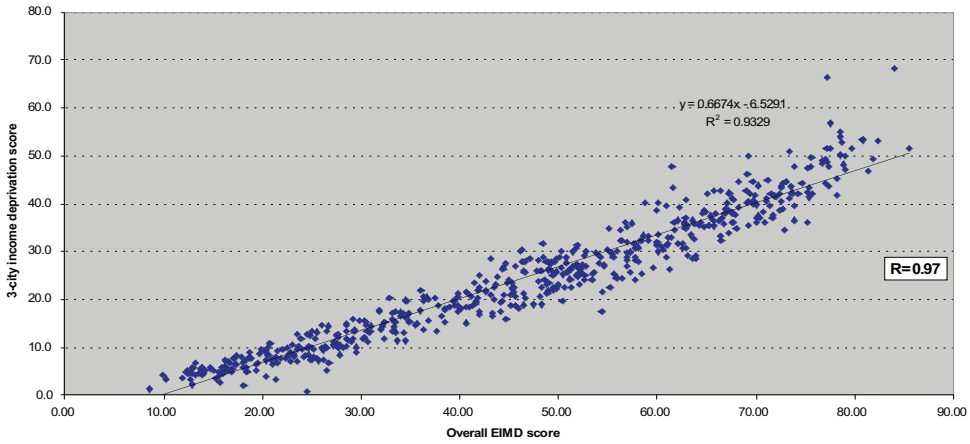


Figure A7

Scatterplot of overall 2007 EIMD score and 3-city 'income deprivation' score
Liverpool and Manchester

Source: 2007 EIMD, DWP



Appendix 2: Comparative analysis of deprivation and mortality for Glasgow and four other major English cities

Introduction

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

Methods

Birmingham, Leeds, Sheffield and Bristol were chosen as the comparator cities. Aside from Liverpool and Manchester, these are four of the largest English cities outside London[52]. From previous analyses they were known to differ considerably in terms of their overall levels of deprivation[9], and thus to provide a more varied basis for analysis than the almost identically 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 before, 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. 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.

Results

Figure A8 shows the overall levels of deprivation in each of the five cities included in the analyses. Leeds is the least deprived of these four English cities (12% of the total population being classed as income deprived), and Birmingham the most deprived (21%). All four cities, however, are less deprived in this respect than Glasgow[xi].

Figure A8

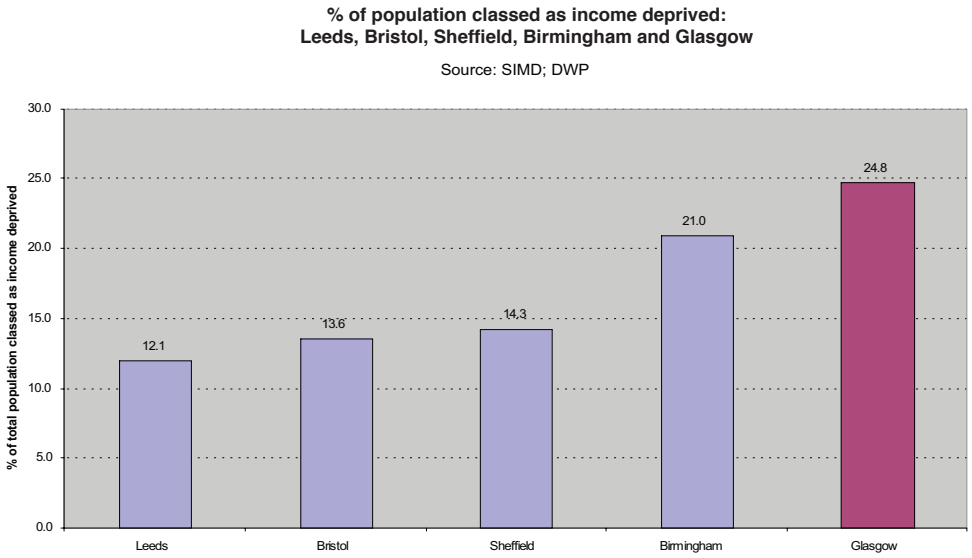


Table A1 presents the all-cause SMRs for Glasgow relative to the other four cities, standardising for (a) age and sex only, and (b) age, sex and deprivation decile. This shows that overall mortality in Glasgow is around 40% higher than Birmingham, Leeds, Sheffield and Bristol (combined) – SMR of 141.0. When Glasgow's higher levels of deprivation are taken into account, the 'excess' falls to around 25% (SMR: 125.4). In all cases, SMRs are higher among males, and especially high in relation to deaths under the age of 65.

[xi] 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.

Table A1

Standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to Birmingham, Bristol, Leeds and Sheffield

Standardised by age, sex and 5-city income deprivation decile

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

Thus, deprivation (as currently measured) explains some of the higher mortality seen in Glasgow compared to these four other English cities; however, as found in the Liverpool and Manchester comparisons, a large excess remains even when deprivation is accounted for in the calculations.

Appendix 3: Comparative analysis of deprivation and mortality for Glasgow in relation to Scotland

Introduction

Given the results of the deprivation and mortality analyses presented in the main sections of this report (and in Appendix 2), for comparison it was of interest to know whether a 'Glasgow Effect' existed in relation to Scotland, and not just to other English cities. Previous analyses suggested that Glasgow's higher rates of all-cause mortality in relation to elsewhere in Scotland were in fact explained by its higher levels of deprivation[53,xii]. However, those analyses were based on different statistical methodologies, on a different measure of deprivation (Carstairs & Morris) calculated at a considerably larger spatial scale[xiii], 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).

Methods

Identical methodologies were employed as those described elsewhere in this report – 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.

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

[xii] Note, however, that 'excess' levels of mortality were recorded for some specific causes of death. Further details are available from the report referenced above.

[xiii] See brief discussion of this issue in the introduction to the main report.

Results

Table A2 shows that based on these analyses, overall levels of mortality in Glasgow City are around 23% higher than all Scotland (SMR: 123.1). When deprivation decile is included in the standardisation, the excess reduces to around 10%. As before, this excess is higher for males (15%), and higher for premature mortality (just under 20%).

Table A2

Standardised mortality ratios (all-cause deaths 2003-07), Glasgow relative to all Scotland

Standardised by age, sex and national income deprivation decile

	a) Standardised by age and sex only	*b) Standardised by age, sex and deprivation*
All ages	**SMR (95% confidence intervals)**	**SMR (95% confidence intervals)**
Males & females	**123.1** (121.8 to 124.4)	**110.2** (109.0 to 111.3)
Males only	**133.5** (131.5 to 135.5)	**114.7** (113.0 to 116.4)
Females only	**114.6** (113.0 to 116.3)	**106.2** (104.7 to 107.7)
0-64	**SMR (95% confidence intervals)**	**SMR (95% confidence intervals)**
Males & females	**153.0** (149.8 to 156.2)	**119.5** (117.0 to 122.0)
Males only	**158.2** (154.1 to 162.4)	**121.6** (118.5 to 124.8)
Females only	**144.3** (139.2 to 149.3)	**115.9** (111.8 to 120)

Glasgow's overall levels of mortality, therefore, are significantly higher than that of Scotland as a whole, even once the effects of deprivation (as measured on an extremely small spatial scale) are taken into account. A 'Glasgow Effect' would appear to exist north of the border, as well as in relation to other English cities.

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