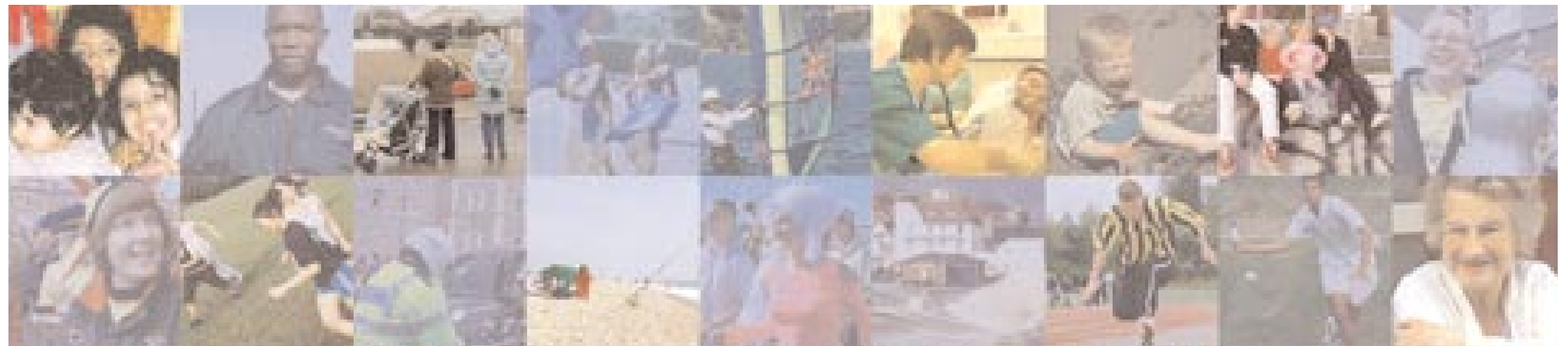


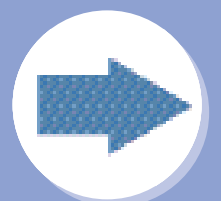
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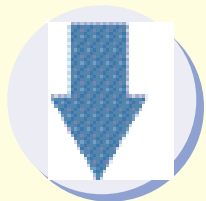
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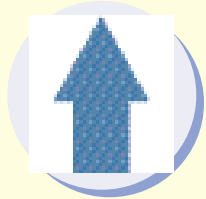
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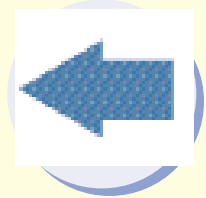
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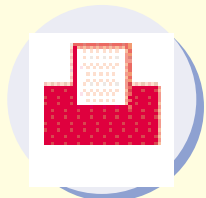
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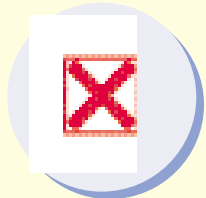
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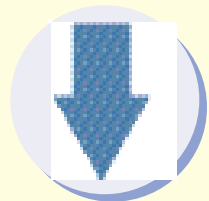
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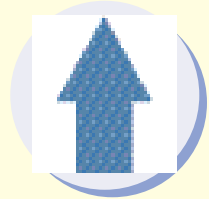
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# An atlas of coronary heart disease mortality, hospital admissions and coronary revascularisations in South East England

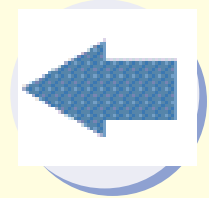
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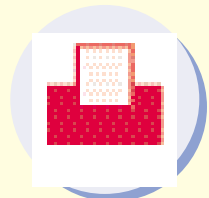
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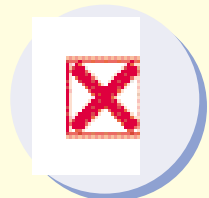
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Maps showing local authority boundaries in England and the South East Region can be found at the back of this atlas.

## Foreword

Matching services to need in healthcare is a difficult task, especially in an area such as coronary heart disease (CHD), which contributes substantially to differing life expectancies in different parts of England.

The *National Service Framework for CHD*, published in March 2000, recognised these inequalities. They were emphasised again in the *NHS Plan*, and are now emerging with new emphasis in the current consultation on choice, responsiveness and equity.

Thanks to the expertise and hard work of thousands of NHS staff, we have seen significant progress in improving CHD services over the last three years. Major achievements have included:

- substantial reductions in waiting lists for coronary bypass operations since the mid-1990s
- increased patient choice in terms of the time and place of surgery
- the announcement by the Government of thirteen major NHS building projects, at a cost of over £580 million, in areas where need is greatest
- more systematic treatment of patients with CHD in primary care, including a rapid increase in prescriptions for cholesterol-lowering and anti-hypertensive drugs
- more rapid institution of thrombolysis treatment after acute myocardial infarction (more than 75% of eligible patients now receive thrombolysis within 30 minutes of arrival at hospital).

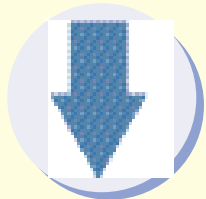
Two key initiatives are bearing down on waiting times for the diagnosis of CHD. First, over the past three years the NHS has built up a national network of rapid-access chest-pain clinics. These aim to provide patients with new chest pain with

a ‘one-stop’ diagnostic service within two weeks of referral by their GP; about 80% of patients were seen within fourteen days in the final quarter of 2002–03. Second, combined investment by the Department of Health and National Lottery of over £80 million is ensuring a national network of state-of-the-art angiography suites, providing patients with more rapid access to specialist CHD diagnosis.

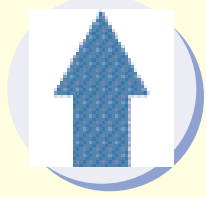
Many challenges remain. CHD remains most prevalent amongst the more deprived communities and the ethnic minorities, and the expansion plans currently in train have been skewed to help address this. Already, at Strategic Health Authority level, patients from areas with a high standardised mortality ratio (SMR) are more likely to receive coronary bypass surgery than those in areas where the SMR is low, but the data shown here indicate that there is still much to be done in improving equity of access at a local level. And for coronary angioplasty, the number of procedures per 100,000 population correlates closely with the number of cardiologists available rather than need, providing powerful messages for those planning the cardiac workforce for the years ahead.

This atlas provides further vital evidence on access to care, which will be useful to health communities in delivering better care to patients with CHD. It will also help cardiac networks as they strive to match services to need across both the South East and England as a whole.

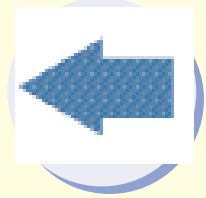
Dr Roger Boyle  
National Director for Heart Disease  
Department of Health  
London



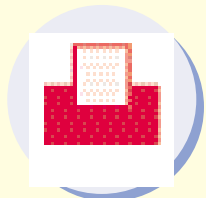
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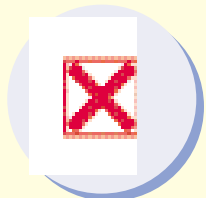
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## Executive summary

Coronary heart disease (CHD) continues to be a major killer in our communities. Its reduction is a primary focus of public health policy and of government efforts to redress imbalances in health and healthcare provision. This atlas was commissioned to support the implementation of the *Coronary Heart Disease National Service Framework*<sup>1</sup> (CHD NSF) by providing easily accessible, comparative information on CHD mortality and hospital care for CHD in local authorities across the South East Region of England. Maps and figures are presented for the whole of England, as well as the South East, to facilitate the comparison of populations within and outside the region.

The findings show a striking geographical pattern in CHD mortality rates, with particularly high rates in the large urban authorities in North East and North West England, some of the London boroughs and in urban authorities across central and southern England. Apart from a few urban authorities, the South East Region has predominately low CHD mortality rates. There is a strong correlation between mortality and socio-economic status, with high mortality rates found in local authorities with the highest social deprivation. As in other western developed countries, in England there was a huge rise in CHD incidence and mortality in the first two thirds of the 20th century, and there has been a decline in recent decades – later in England than in some other developed countries. As this atlas shows, there is a continuing downward trend in CHD mortality rates, with the biggest falls in the north of the country.

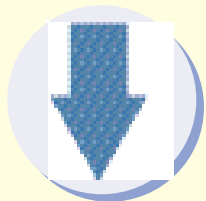
CHD hospital admission rates also show a clear (though less strong) geographical pattern, similar to that for CHD mortality, with areas of high CHD mortality having high rates of hospital admissions for CHD. In general, moreover, CHD hospital admission rates are higher in areas of high social deprivation, though there are some exceptions to this. Relative to other parts of England, the South East Region has predominately low mortality and hospital admission rates for CHD.

By contrast, the rates of coronary revascularisation by coronary artery bypass grafting (CABG) and percutaneous transluminal coronary angioplasty (PTCA) show an inconsistent geographical pattern. High rates of revascularisation are observed

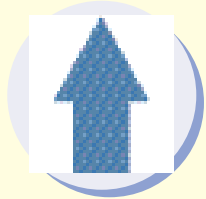
particularly in the London boroughs, parts of the South East Region and in the North East and North West, but otherwise high and low rates show no consistent pattern across the country, suggesting that the provision of coronary revascularisations at local level is not closely related to need, as measured by the observed rates of CHD mortality and hospital admissions. Furthermore, whilst CHD mortality rates and hospital admission rates are higher in areas of high social deprivation, there appears to be no relationship between the revascularisation rate and the socio-economic profile of an area.

The CHD NSF places great emphasis on equity of access to and provision of revascularisation. The reasons for the apparent discrepancies highlighted in this report are complex, requiring detailed investigation at a local level. Differences in access to revascularisation may be due to differences in availability of care, or local variations in what is construed as appropriate treatment. In particular, revascularisation procedures carried out privately are not included in the hospital episode statistics (HES) database, and currently there is no requirement for data on private revascularisation procedures to be collected. This could well distort analyses on equity of provision, as the most affluent areas may have high levels of private revascularisation, whilst the most deprived areas may have very low levels. Thus for a complete picture, data on coronary revascularisation procedures carried out in private hospitals would be required.

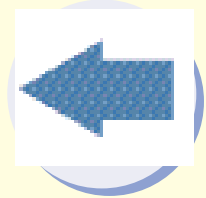
We hope that this atlas will provide insights into variations in need and provision in the South East Region and across England as a whole. There is considerable further potential for analysis of CHD data at the level of Primary Care Trusts (PCTs), at ward level, and within primary care. It would be valuable to update the analysis of trends every few years. With the acquisition of the HES dataset, public health observatories (PHOs) will be able to offer a systematic approach to examining geographical variations of hospital care and the provision of CHD-related procedures within the South East Region and across England.



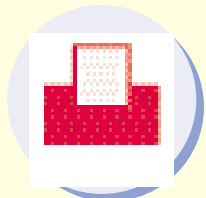
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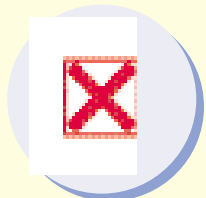
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## Introduction

The *NHS Plan*<sup>2</sup>, published in 2000, heralded significant changes in the NHS, with an increased emphasis on delivering high-quality healthcare services and on reducing health inequalities.

The Government has ambitious national targets for 2010, aimed at reducing the gap in mortality across social groups, and raising life expectancy in the most disadvantaged areas faster than elsewhere. CHD is a major killer, which takes a particularly high toll on more deprived communities. Accordingly, tackling CHD is central to the Government's strategy for reducing inequalities. *Tackling Health Inequalities: A Programme for Action*<sup>3</sup> sets out the programme of work required to be undertaken by government departments and local agencies over the next three years. For CHD, these actions include reducing smoking in manual social groups and preventing and managing other risks for CHD, such as poor diet, obesity, physical inactivity and hypertension. This programme is designed to be implemented via effective primary care and public health interventions – especially in the over-50s age group.

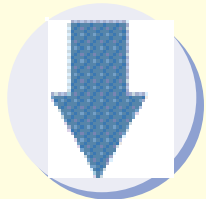
The Department of Health has introduced standards and identified key interventions for specific services and groups of patients through a series of NSFs. The CHD NSF<sup>1</sup>, published in 2000, set standards for the prevention, diagnosis and treatment of CHD. The standards, to be implemented over a ten-year period, are underpinned by a number of fundamental values and guiding principles relating to accessibility, efficiency, equity and quality of healthcare. The NSF also establishes a series of performance indicators against which progress is to be measured.

The *Coronary Heart Disease Information Strategy*,<sup>4</sup> published in 2001, identified a role for the nine regional PHOs in “co-ordinating the use of information

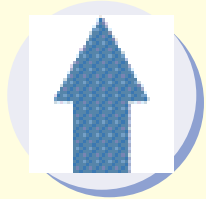
already available at local level ... to improve health surveillance”. Each PHO took a lead role on key policy areas, with the South East PHO (SEPHO) becoming the lead observatory for CHD.<sup>5</sup> The role of lead observatories, agreed by the Association of Public Health Observatories, is to provide a point of contact with national bodies for dissemination of information to other PHOs; to identify and signpost work undertaken in each PHO; and to signpost to other data sources, methods and expertise. As part of its lead role in CHD, SEPHO has undertaken national and regional projects, and is collating data on CHD prevention and treatment through its website: [www.sepho.org.uk](http://www.sepho.org.uk)

This atlas was commissioned by the South East Regional Office of the NHS Executive, to support the implementation of the CHD NSF in the South East Region by the development of easily accessible, comparative information on CHD mortality and HES for local authorities. Local organisations in the South East requested that this project include analyses for the whole of England, so that they could compare their populations with other authorities outside, as well as within, the South East Region. SEPHO undertook the work as a joint project with the British Heart Foundation Health Promotion Research Group, which has a nationwide interest in CHD information

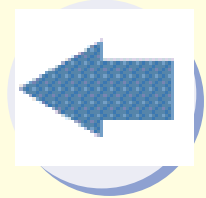
This project aimed to look particularly at geographical variations in the rates of mortality from CHD, hospital admissions for CHD, and coronary revascularisation procedures, and to examine the relationships between them. The print version of this atlas presents some of the key results, illustrated by a selection of maps and graphs. This extended version presents some of these findings in more detail.



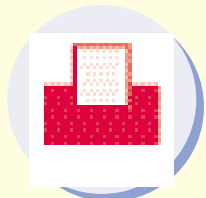
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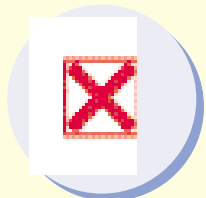
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## Methods

The following data sources were used in compiling this atlas:

- *The Compendium of Clinical and Health Indicators 2001*,<sup>6</sup> published by the National Centre for Health Outcomes Development, for data on CHD mortality
- The national HES database, collated by the Statistics Division, Department of Health, for statistics on hospital admissions and coronary revascularisations
- The Office of National Statistics' population and socio-economic statistics at local authority level in England.

The data were analysed by local authorities and are presented in two ways:

- maps and figures comparing authorities across England
- maps and figures comparing authorities across the South East Region.

The names and boundaries for local authorities in England and the South East are given in Maps 1a and 1b, which can be found at the back of this atlas.

### Mortality statistics

The CHD mortality statistics in this atlas are taken from the *Compendium of Clinical and Health Indicators 2001*,<sup>6</sup> which presents mortality data sourced from death registrations provided by the Office of National Statistics. Data provided in the compendium are for years up to and including 2000, and include trend data for eleven years. The mortality statistics examined are for deaths from CHD, where CHD is classified as the underlying cause of death.

Mortality rates for under 65-year-olds are directly age standardised to allow for differences in the age structure of populations between areas, and are presented per 100,000 population (see Appendix 1 for further details). The three-year average of rates is used in order to eliminate any random annual variations. Mortality for all ages is presented in the form of an indirectly standardised mortality ratio (SMR) in relation to England and Wales. The SMR for England and Wales is 100, thus SMRs greater than 100 indicate higher mortality than the national average; SMRs less than 100 indicate lower mortality than the national average (Appendix 1).

### Hospital episode statistics

The HES database contains the records of every hospital in-patient episode in England in any given year, each of which represents an individual patient stay in hospital under the care of an NHS consultant. Each episode is coded in various

fields, including diagnosis, procedures carried out, length of stay in hospital, age, sex and ethnic group. Thus, the database provides a valuable resource for analysing the provision of hospital care for CHD.

For the purposes of this atlas, the following statistics were commissioned from the national HES service at a local authority level over the three financial years ending 2000–2002:

- the number of episodes of in-patient care, termed 'finished consultant episodes' with a primary diagnosis of CHD (ICD10:<sup>a</sup> 120–125)
- the number of finished consultant episodes in which CABG (OPCS4:<sup>b</sup> K40–46) was undertaken
- the number of finished consultant episodes in which PTCA (OPCS4: K49–50) was performed.

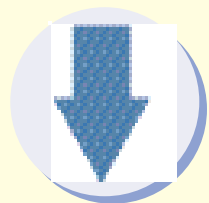
For ease of readability, we use the term 'hospital admissions' throughout the atlas rather than 'finished consultant episodes'.

The coronary revascularisation rates for CABG and PTCA – the two main revascularisation procedures used to treat CHD – were summed on the basis that this combined rate would best reflect overall provision for revascularisation in a geographical area. The revascularisation rates were then examined in order to determine how the total number of revascularisation procedures being carried out in the local authorities corresponded with the levels of CHD hospital admissions and CHD mortality rates. The relationships between CHD mortality, CHD admissions and coronary revascularisation rates by local authority were examined, as were their relationships to socio-economic factors.

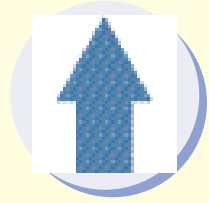
Directly age-standardised rates and 95% confidence intervals were calculated from the data, using the methods described in Appendix 1. The numbers and rates of admissions and procedures were computed for the geographical area of home residence of patients. Following the convention with HES analysis, all hospital admissions with a discharge date in the appropriate year were included in the analysis, though a few of these episodes would have commenced in the preceding year. Episodes involving a primary diagnosis of CHD only were included, in order to exclude patients who were admitted to hospital for a reason other than CHD but who nevertheless had a CHD code recorded. Coronary revascularisation rates were calculated from all hospital admissions where CABG or PTCA occurred in any one of the four available procedure fields.

<sup>a</sup>The international classification of disease and related health problems, 10th revision. An internationally agreed system for classifying diseases, published by the World Health Organisation.

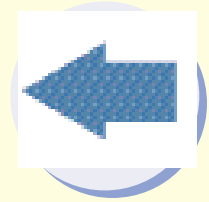
<sup>b</sup>Office of Population, Censuses and Surveys classification of surgical operations and procedures, 4th revision. A national system for classifying operations.



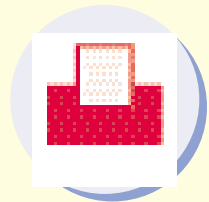
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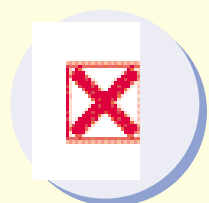
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### Socio-economic statistics

The socio-economic profiles of local authorities are represented in this atlas using the Index of Multiple Deprivation 2000 (IMD 2000).<sup>7</sup> This index was developed at the University of Oxford under a commission from the then Department of Environment, Transport and the Regions (DETR), and is now in the remit of The Office of the Deputy Prime Minister (ODPM). The IMD 2000 provides information at administrative ward level on socio-economic deprivation, based on a weighted combination of six separate domains: income; employment; health and disability; education, skills and training; geographical access to services; and housing.

An alternative means of presenting socio-economic profiles is via the proportion of households in social classes I-V within an area.<sup>8,9</sup> Social class, defined by the occupation of the head of household, ranges from social class I (professional) to social class V (unskilled), and the proportions of the population within each class vary for each local authority in England. The class distribution within England as a whole is 39% in social classes I and II, 42% in class III and 19% in classes IV and V. Social classes I and II combined form a larger proportion of the households in England than social classes IV and V. We therefore used the combined data from classes I and II in the preparation of maps and figures relating to social class.

### Mapping the data

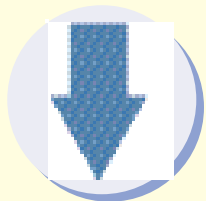
For many of the maps, the mortality, HES and socio-economic statistics were stratified into quintiles by ranking the rates for each local authority and then grouping these from the first quintile (the 20% of local authorities with the lowest rates) to the fifth quintile (the 20% of local authorities with the highest rates). Graduated colour has been used in the maps so that the range and pattern of the various rates is easily visualised for all the local authorities in England or in the South East. In general, darker colours represent higher rates.

Complementing these maps of the rates are maps of the statistical significance of differences between the rates for each local authority and for England as a whole. This shows whether differences between local authorities' rates and the national rates are statistically significant, and, in particular, it assists the interpretation of rates based on small numbers. The classification of local authority rates used in these maps is:

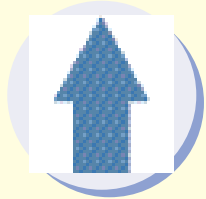
- significantly low and in the lowest tenth of local authorities
- significantly low but not in the lowest tenth of local authorities
- not significantly high or low
- significantly high but not in the highest tenth of local authorities
- significantly high and in the highest tenth of local authorities.

The divisions were calculated using the 95% confidence intervals of the rates for each local authority. The local authorities with significantly low rates were defined as those whose rates and 95% confidence intervals lay below the lower 95% confidence limit for England; these local authorities were further divided into two: those with significantly low rates within the lowest tenth in the country, and those with significantly low rates not within the lowest tenth. Likewise, the local authorities with significantly high rates were defined as those with rates and 95% confidence intervals lying above the upper 95% confidence limit for England; these were divided into those with significantly high rates within the highest tenth in the country, and those with significantly high rates not within the highest tenth. The middle category represents local authorities whose rates were not significantly high or low.

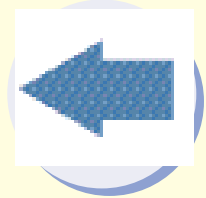
PCT boundaries and statistics were not available at the time of analysing the data, therefore maps have not been produced at PCT level in this atlas.



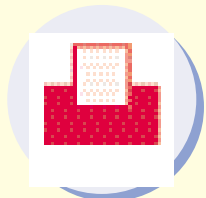
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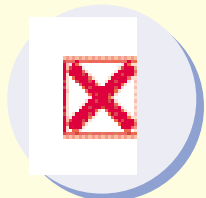
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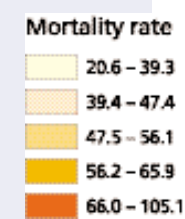
## CHD mortality

This atlas focuses on the statistical analysis and mapping of CHD mortality in people under 65 years of age. Mortality in the under-65 age group represents substantial premature loss of life, and CHD mortality rates in this age group show a particularly wide geographical variation. The average CHD mortality rate for men under 65 years of age in England is 54.9 per 100,000 men under 65; that for women is 14.4 per 100,000 women. Thus death rates in women are about four times lower than those in men. At a regional level, the South East has the lowest mortality rates for CHD in the under-65 age group of any region: 43.5 per 100,000 for men and 10.0 per 100,000 for women. In this report we have focused in particular on the findings in men under 65 years of age. This is because CHD mortality rates for men in this age

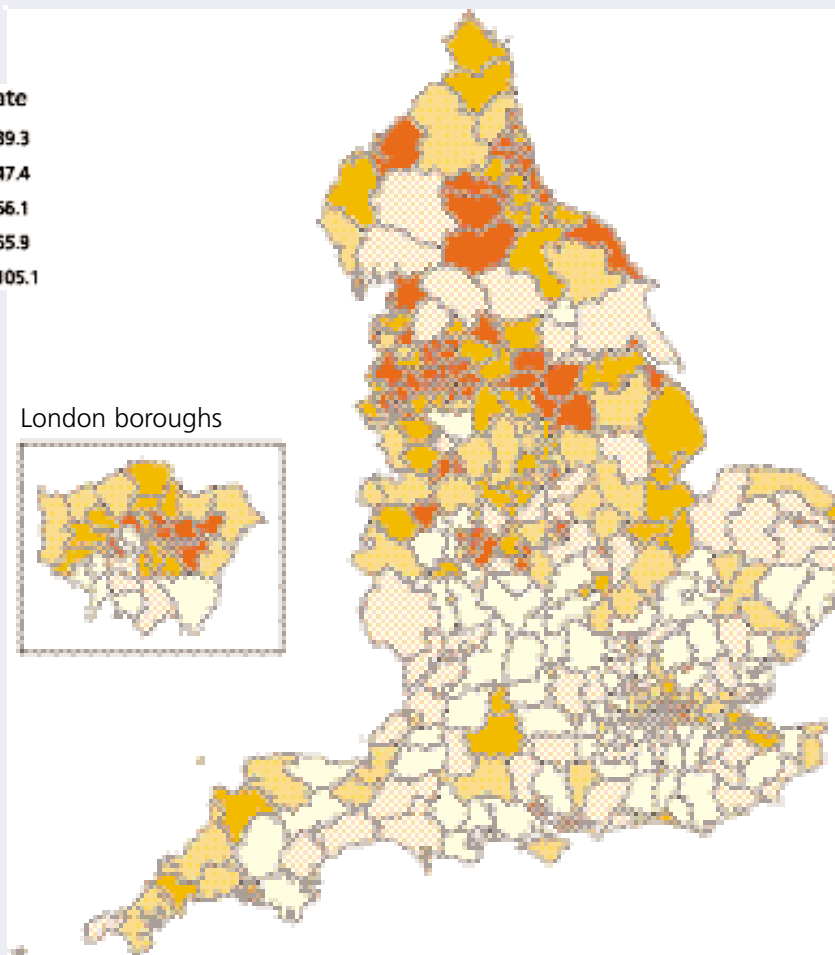
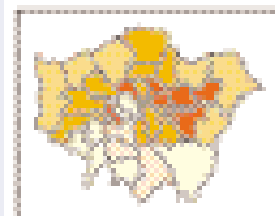
group show particularly striking geographical variation, and also show the strongest correlations with other variables such as socio-economic status.

Maps 2a and 2b show the geographical distribution of CHD mortality rates for men under 65 by local authority area in England and the South East, respectively. High CHD mortality rates are found predominantly in the large urban local authorities of the North East, North West, and Yorkshire and the Humber, in about half of the London boroughs, and in many of the small urban unitary authorities across central and southern England. Slough, Portsmouth and Lincoln are examples of small urban unitary authorities with high CHD mortality rates that are surrounded by rural local authorities with much lower CHD mortality rates.

**Map 2a** CHD mortality rates by quintile, men aged less than 65, 1998–2000, England

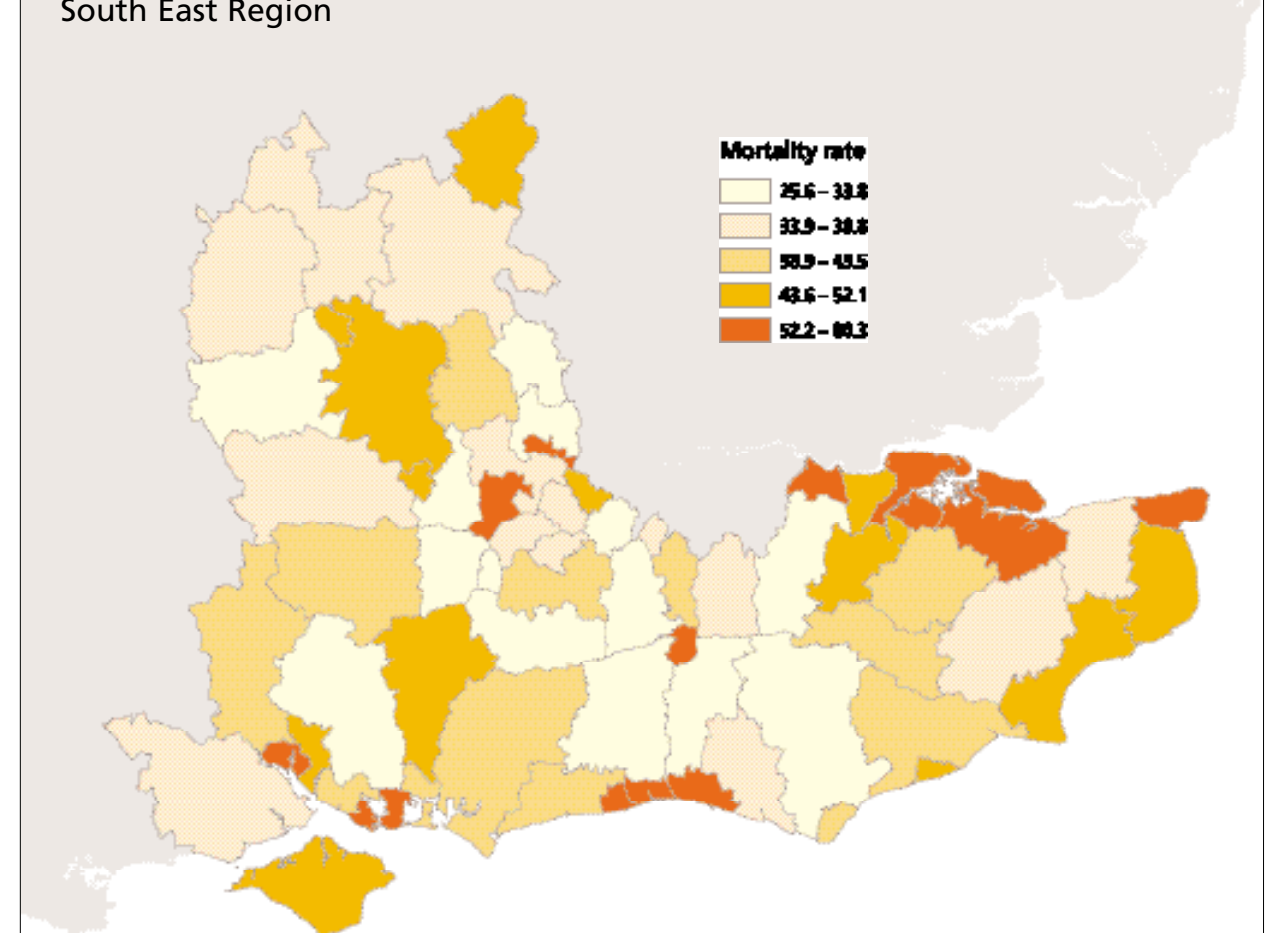
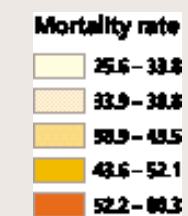


London boroughs

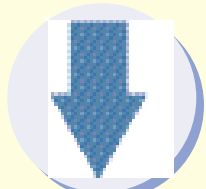


The map shows directly age-standardised mortality rates per 100,000, 1998–2000 averaged. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

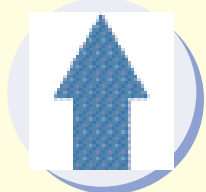
**Map 2b** CHD mortality rates by quintile, men aged less than 65, 1998–2000, South East Region



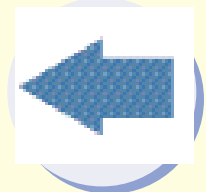
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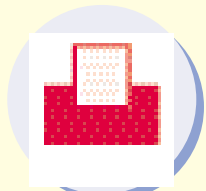
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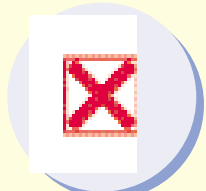
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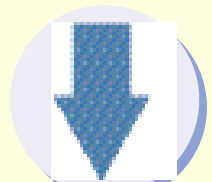
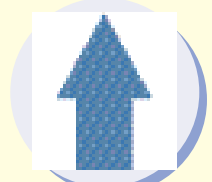
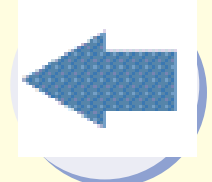

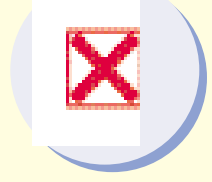
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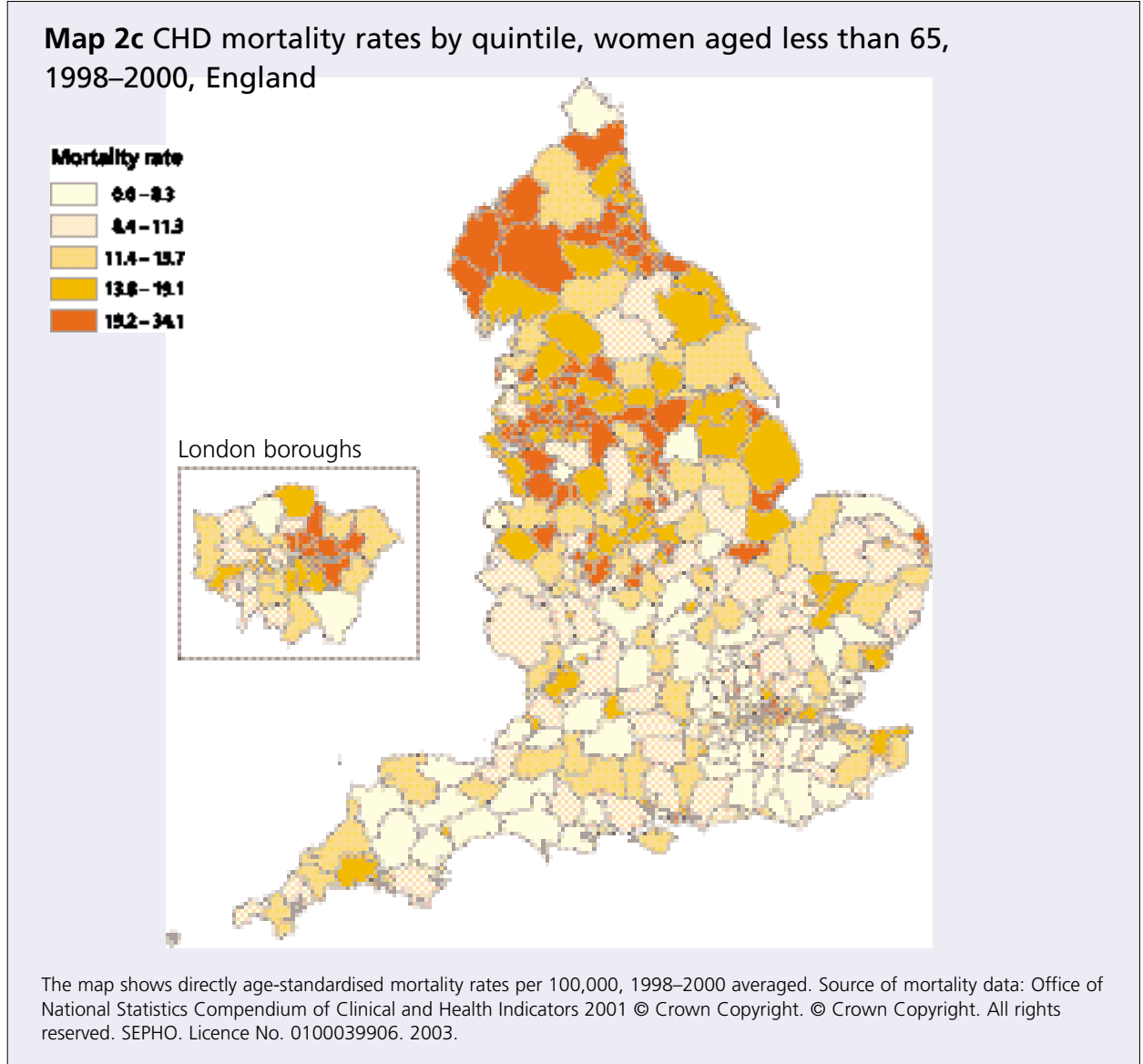


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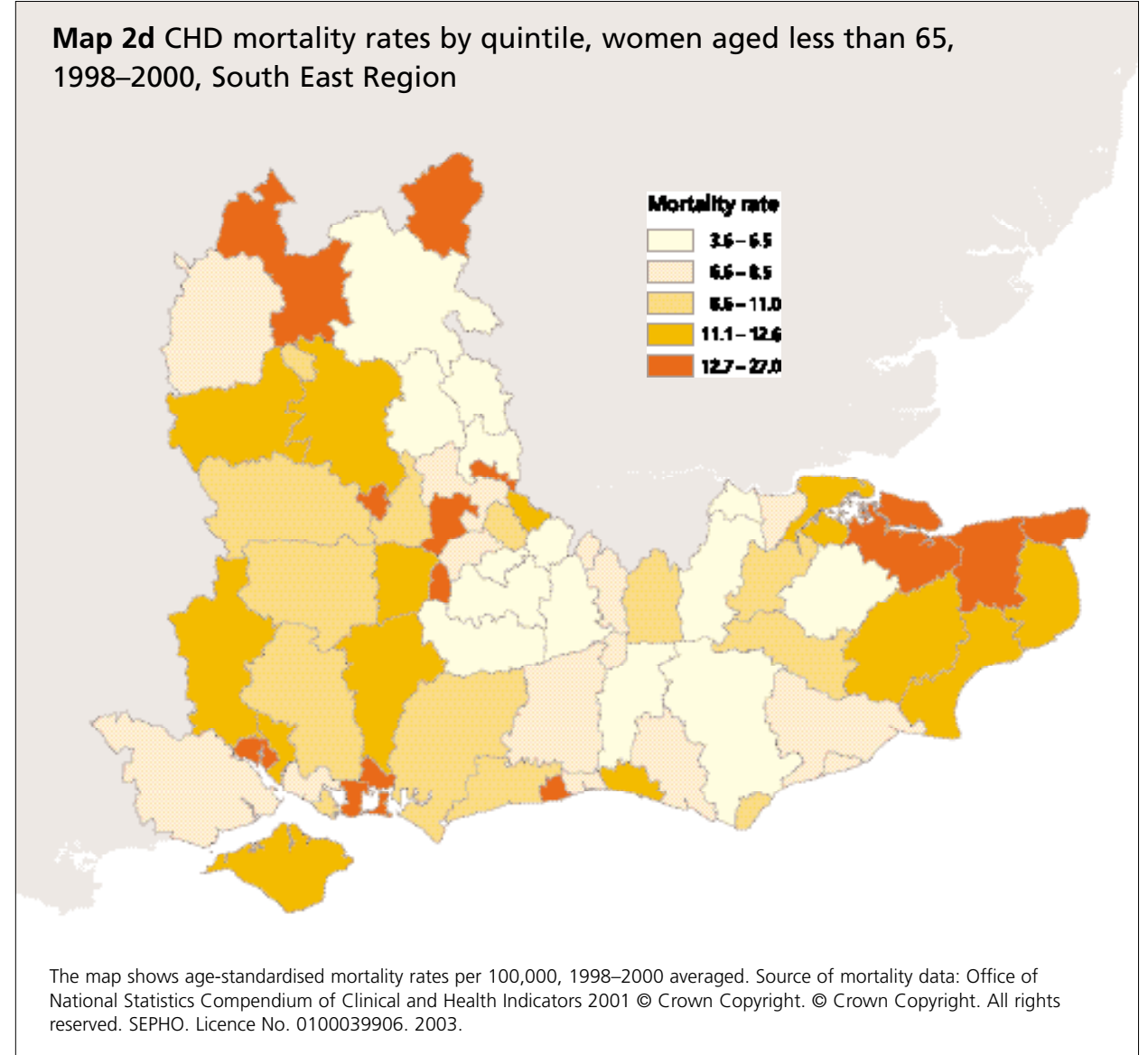


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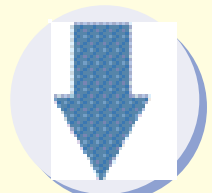
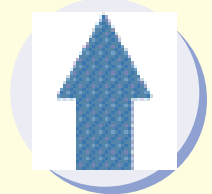
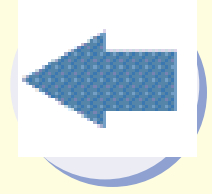
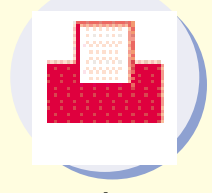
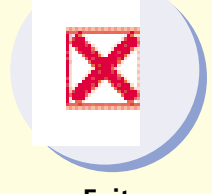
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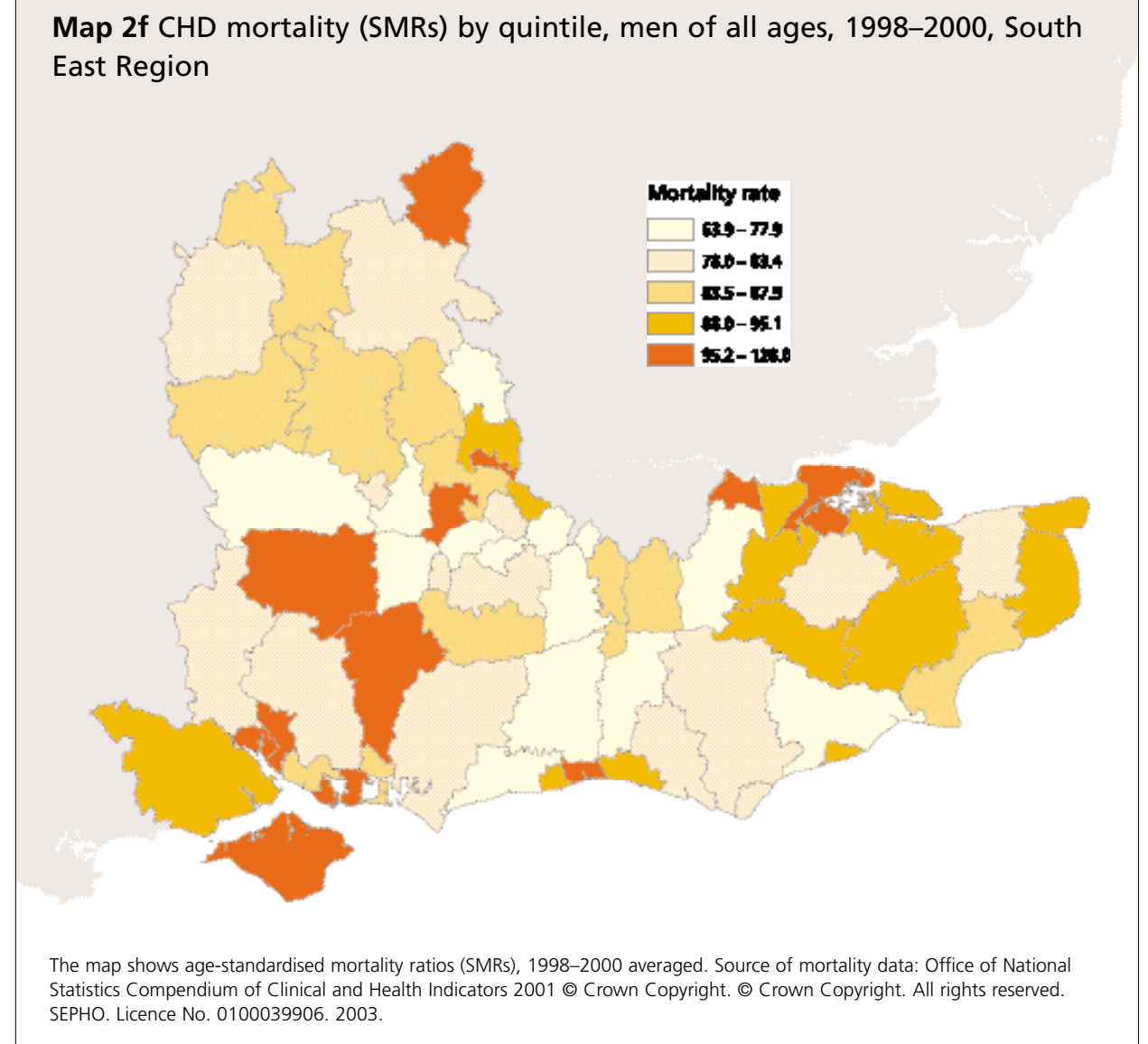
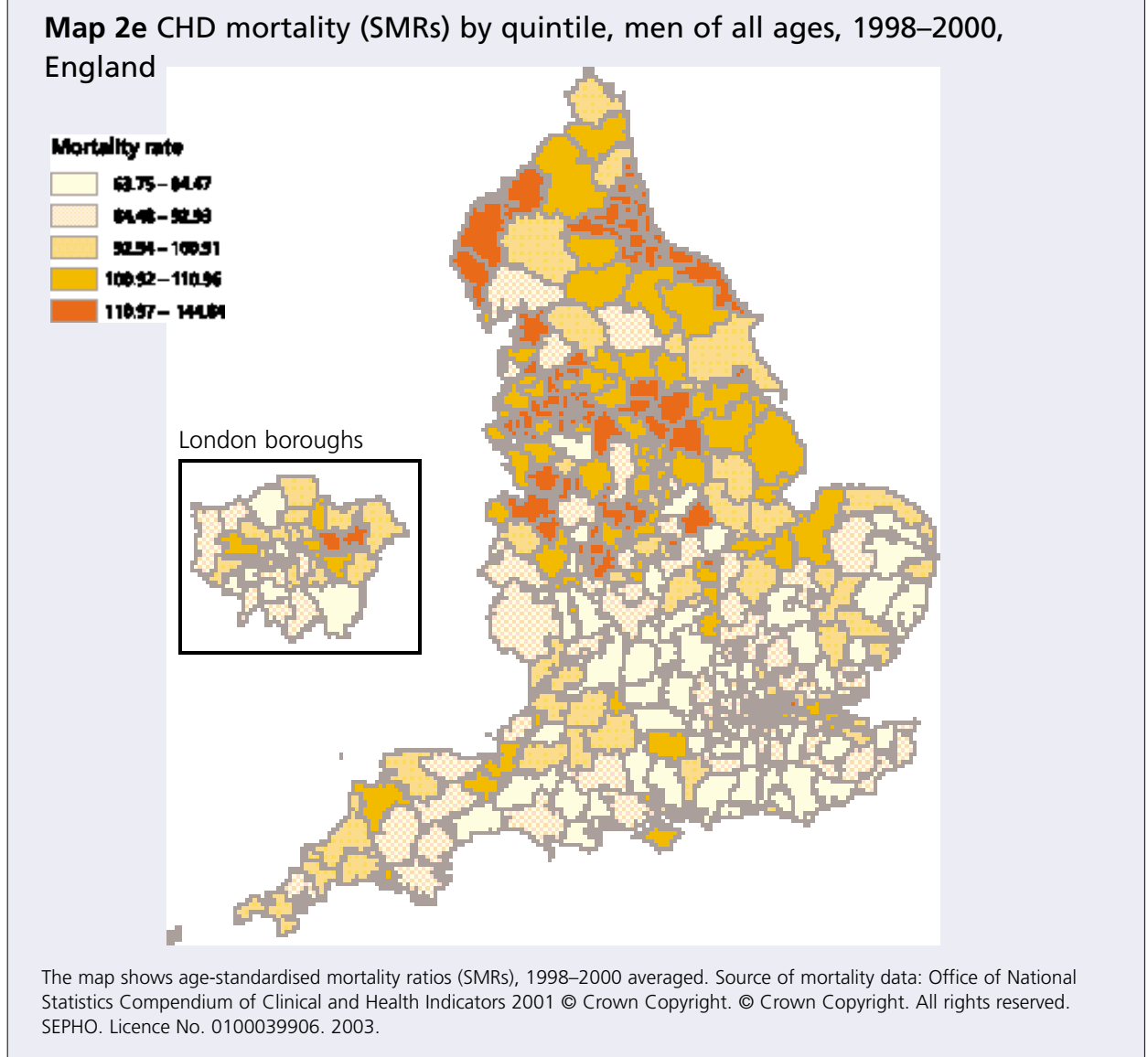


For men under 65, CHD mortality rates for local authorities in England range from 105 per 100,000 in Manchester to 26 per 100,000 in Chiltern. Thus, there is a four-fold difference between the highest and lowest rates. The equivalent rates for women are 35 per 100,000 in Manchester and 5 per 100,000 in Chiltern – a seven-fold difference (Map 2c). The map of CHD mortality rates for men under 65



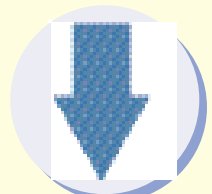
for the South East Region (Map 2b) shows a smaller range than that for England as a whole, from 80 per 100,000 in Slough to 26 per 100,000 in the adjacent local authority of Chiltern – an approximately three-fold difference between the highest and lowest rates. The range of rates for women in the South East varies from less than 4 per 100,000 in Woking to 27 per 100,000 in Slough (Map 2d).

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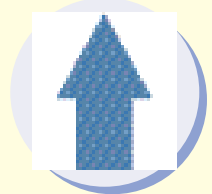


Maps 2e-2h present CHD mortality ratios (SMRs) for men and women of all ages in England and the South East, and these show that the geographic pattern of areas with high and low mortality is similar to the maps of the under 65 mortality rates. The wider the range of SMRs, the greater the variation between the best and worst local authorities in relation to the SMR for England and Wales of 100 (SMRs of below

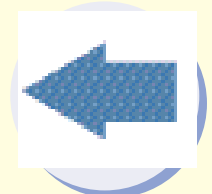
100 correspond to lower than average mortality and SMRs of above 100 reflect higher than average mortality). All age CHD SMRs for local authorities in England range from 64 to 145 for men, and 70 to 164 for women. The range is much smaller for local authorities in the South East, which has SMRs for men of between 64 and 128, and for women of between 66 and 118.



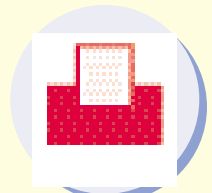
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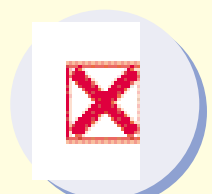
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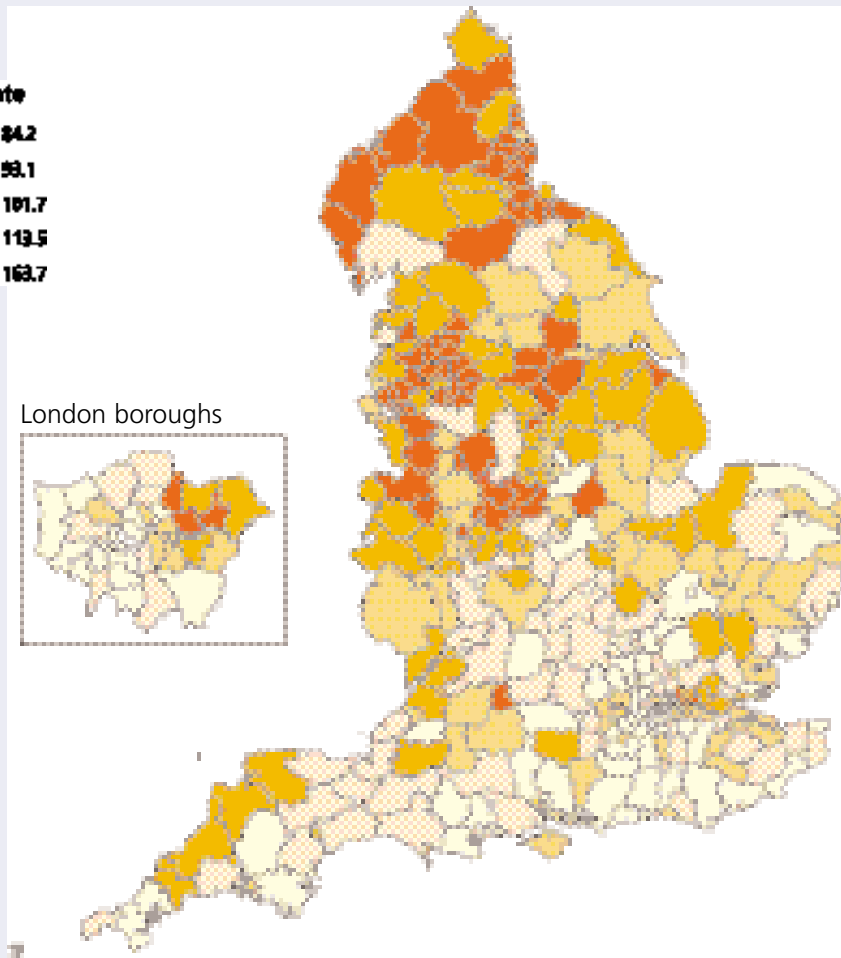
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**Map 2g** CHD mortality (SMRs) by quintile, women of all ages, 1998–2000, England

**Mortality rate**  
 69.9–84.2  
 84.3–99.1  
 99.2–101.7  
 101.8–113.5  
 113.6–163.7

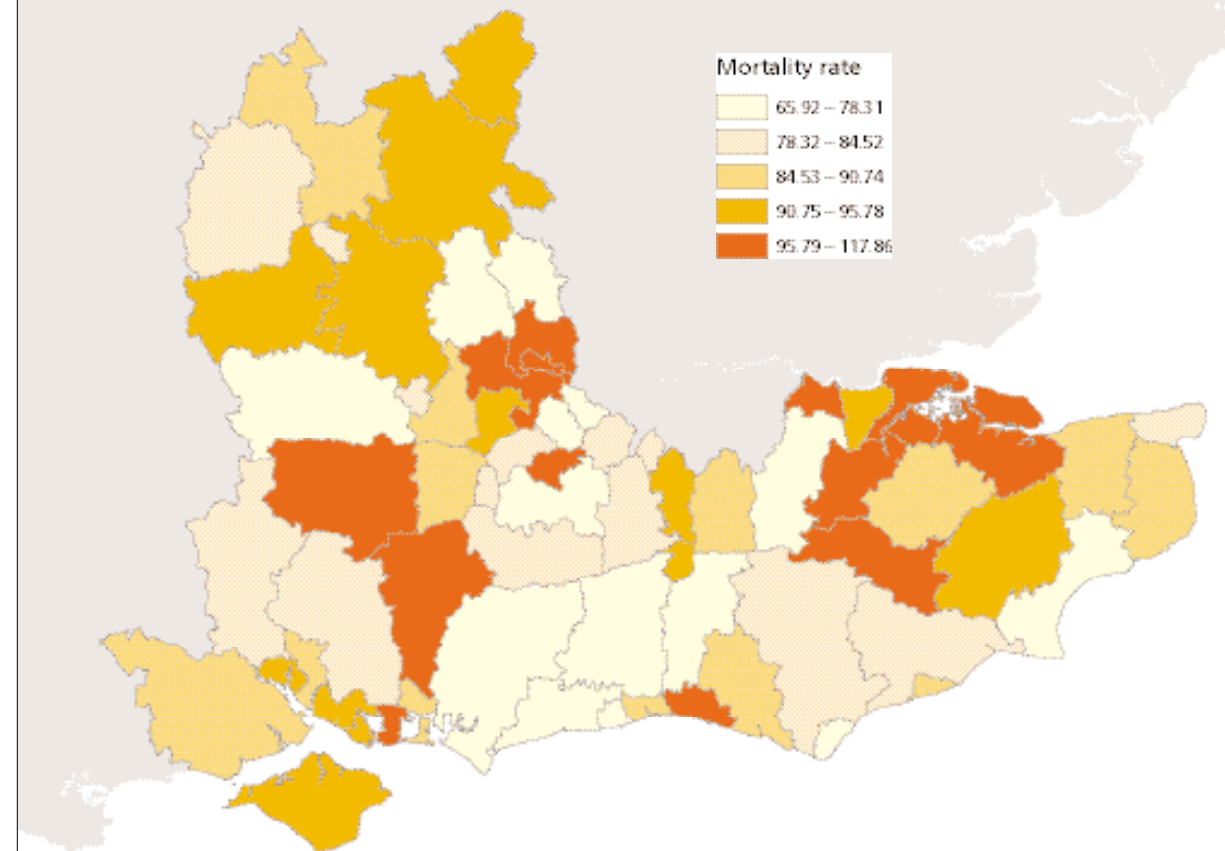


London boroughs

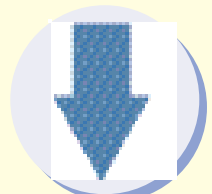
The map shows age-standardised mortality ratios (SMRs), 1998–2000 averaged. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

**Map 2h** CHD mortality (SMRs) by quintile, women of all ages, 1998–2000, South East Region

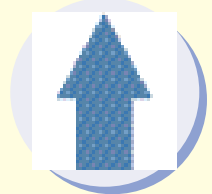
**Mortality rate**  
 65.92–78.31  
 78.32–84.52  
 84.53–90.74  
 90.75–95.78  
 95.79–117.86



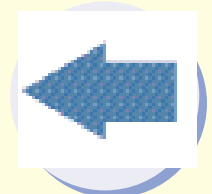
The map shows age-standardised mortality ratios (SMRs), 1998–2000 averaged. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.



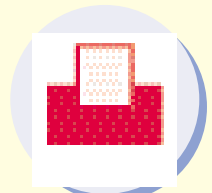
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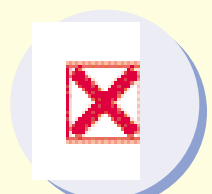
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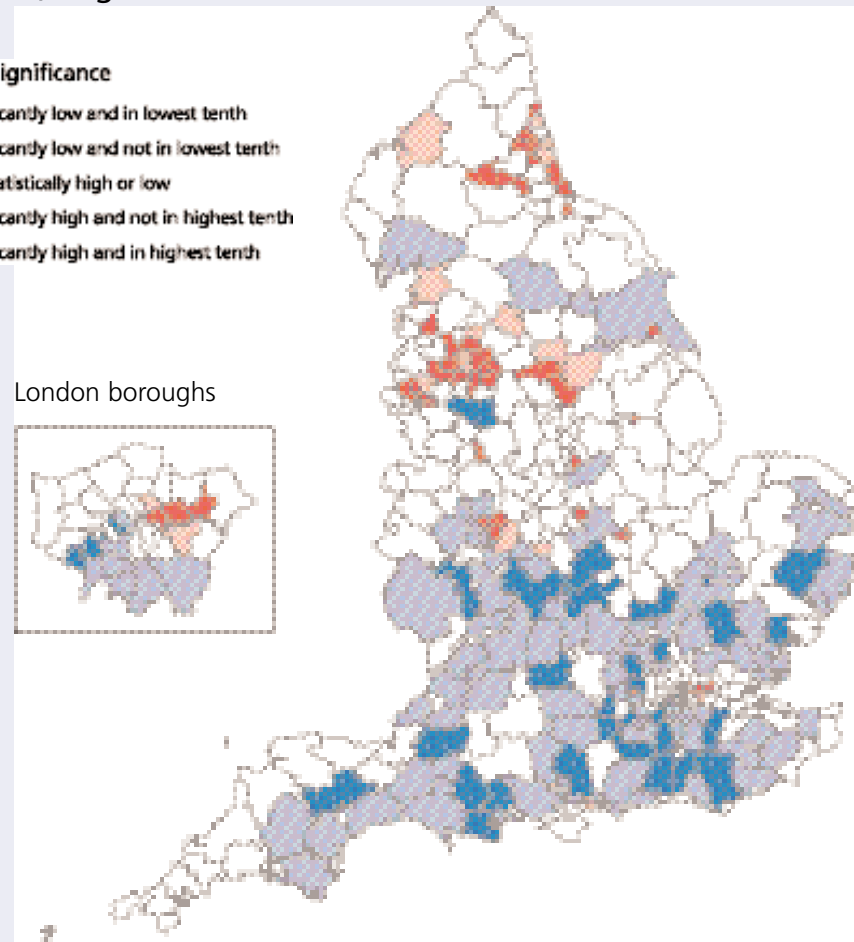


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**Map 3a** Statistical significance of CHD mortality rates, men aged less than 65, 1998–2000, England

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth



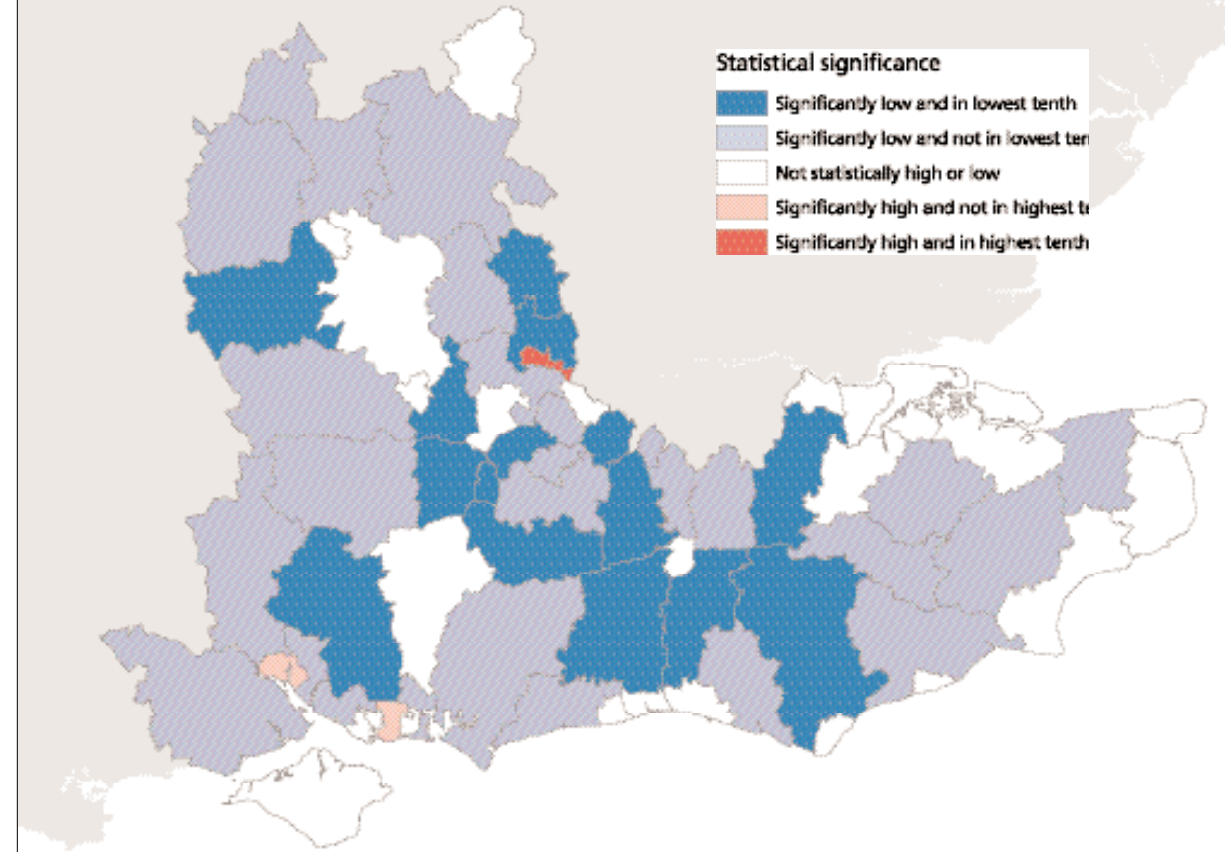
London boroughs

The map shows the statistical significance of directly age-standardised mortality rates per 100,000, 1998–2000 averaged. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

**Map 3b** Statistical significance of CHD mortality rates, men aged less than 65, 1998–2000, South East Region

**Statistical significance**

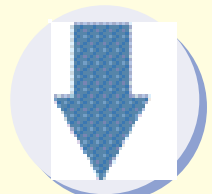
- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth



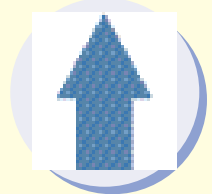
The map shows the statistical significance of directly age-standardised mortality rates per 100,000, 1998–2000 averaged. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

The patterns of the under 65 CHD mortality rates for men and women are confirmed in Maps 3a - 3d, which show the statistical significance of the rates for each local authority in England and the South East, respectively, in relation to the average for England. The local authorities with significantly low rates are concentrated in the south for both men and women. Although

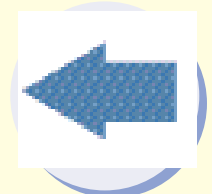
the South East generally has the lowest CHD mortality rates in England, it contains three local authorities with significantly high rates for men - Slough, Southampton and Portsmouth (Map 3b) and one for women - Slough. Slough has a rate within the highest decile in the country for both men and women.



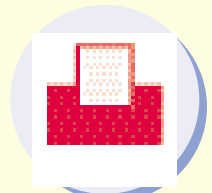
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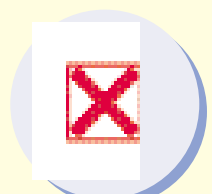
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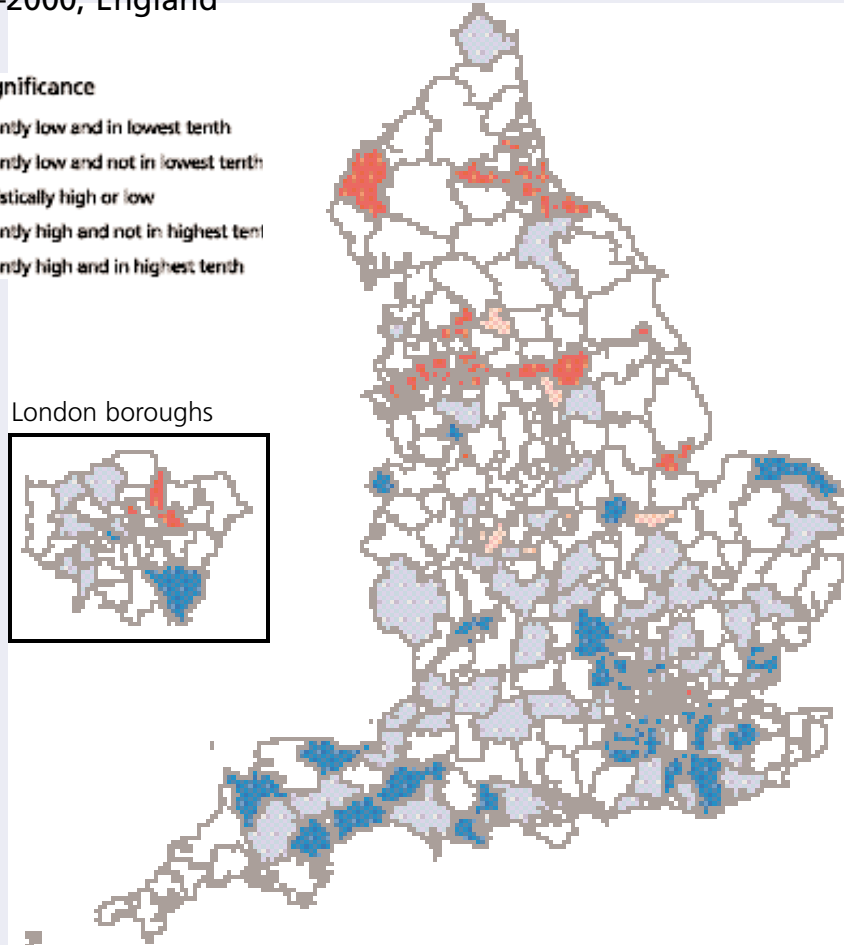
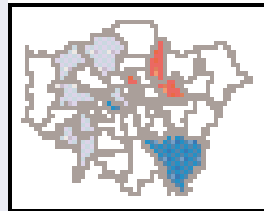
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**Map 3c** Statistical significance of CHD mortality rates, women aged less than 65, 1998–2000, England

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth

London boroughs

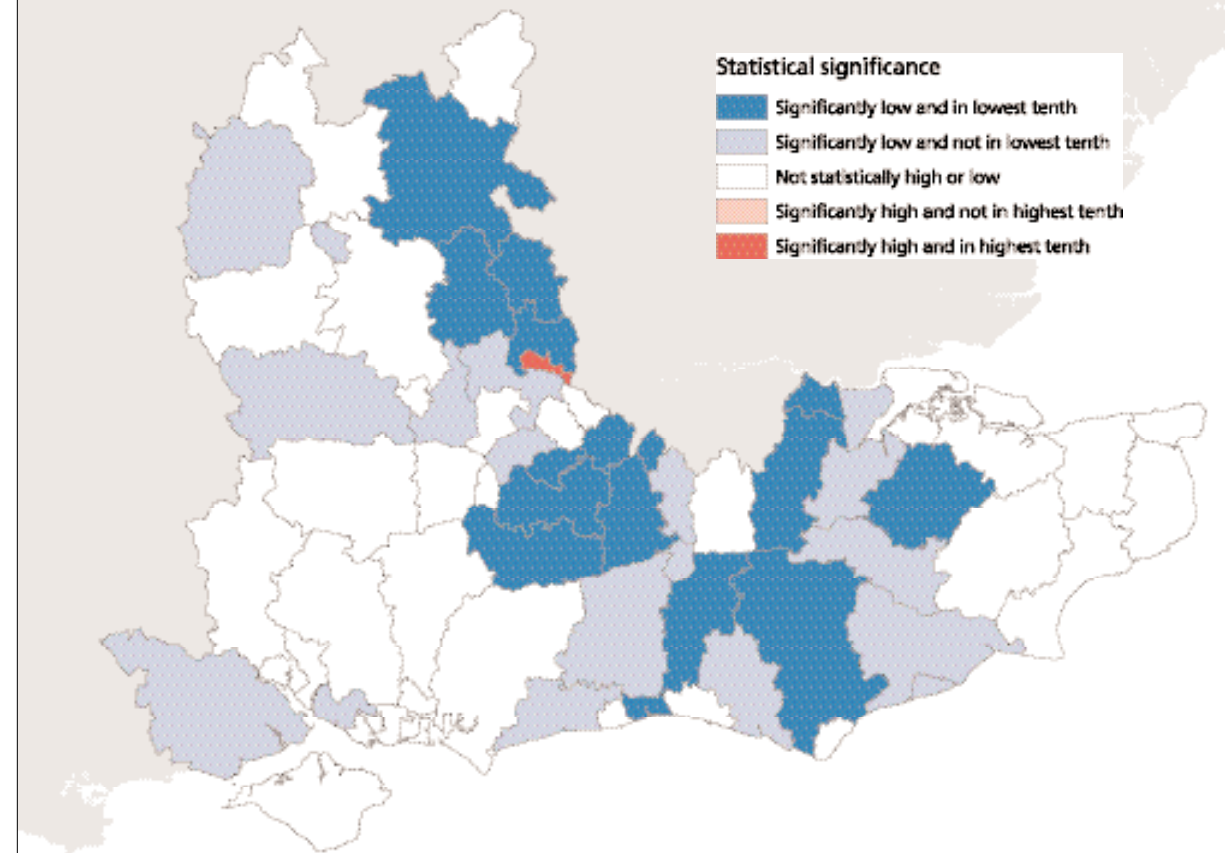


The map shows the statistical significance of directly age-standardised mortality rates per 100,000, 1998–2000 averaged.  
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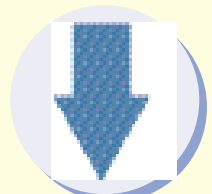
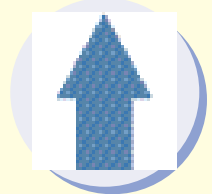
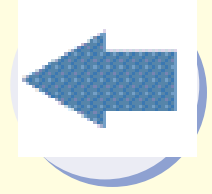
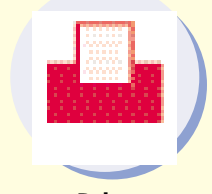
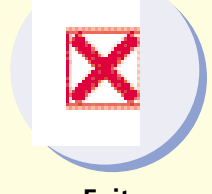
**Map 3d** Statistical significance of CHD mortality rates, women aged less than 65, 1998–2000, South East Region

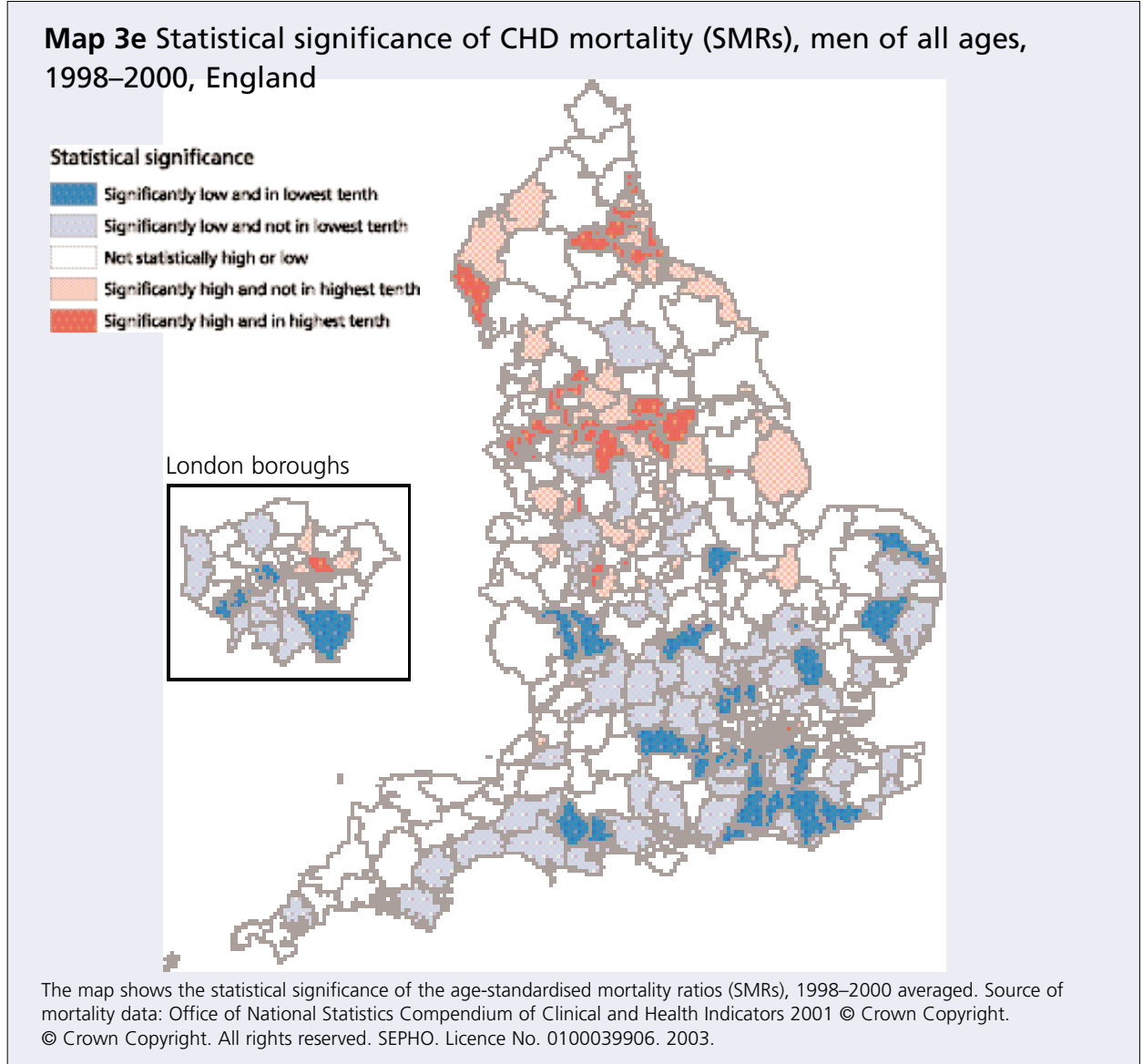
**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth

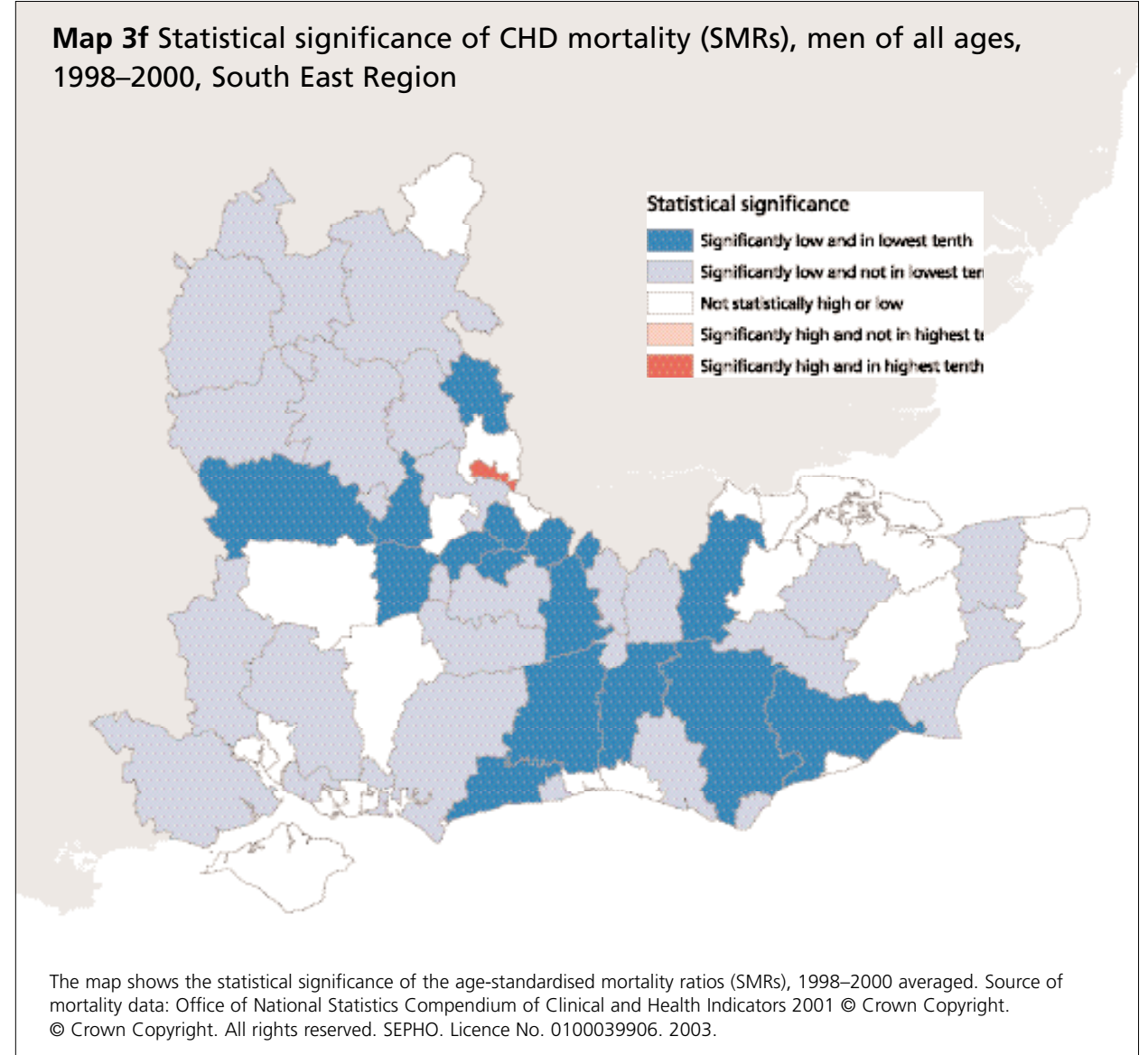


The map shows the statistical significance of directly age-standardised mortality rates per 100,000, 1998–2000 averaged.  
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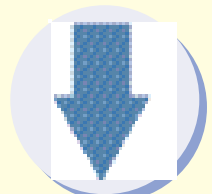
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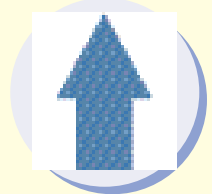
The maps of statistical significance of the all age CHD mortality ratios (SMRs) for local authorities in England and the South East (Maps 3e-3h) also confirm the pattern of significantly low rates being predominantly located in the south for men and women. However, there are minor exceptions to this, with a few of the London boroughs and Slough in the South East region showing significantly high SMRs for both men and women.



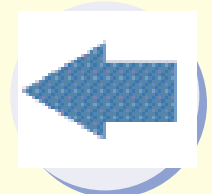
The mortality rates for men under 65 by local authority in the South East Region are presented in Figure 1a. This confirms the picture shown in Maps 2a, 2b and 3a, that the majority of the local authorities in the South East Region have CHD mortality rates below the national average. Mortality rates for women in this age group, comparing local authorities across the region, are also predominately below the national average (Figure 1b).



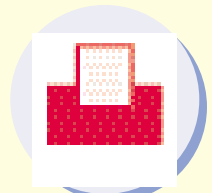
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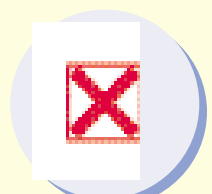
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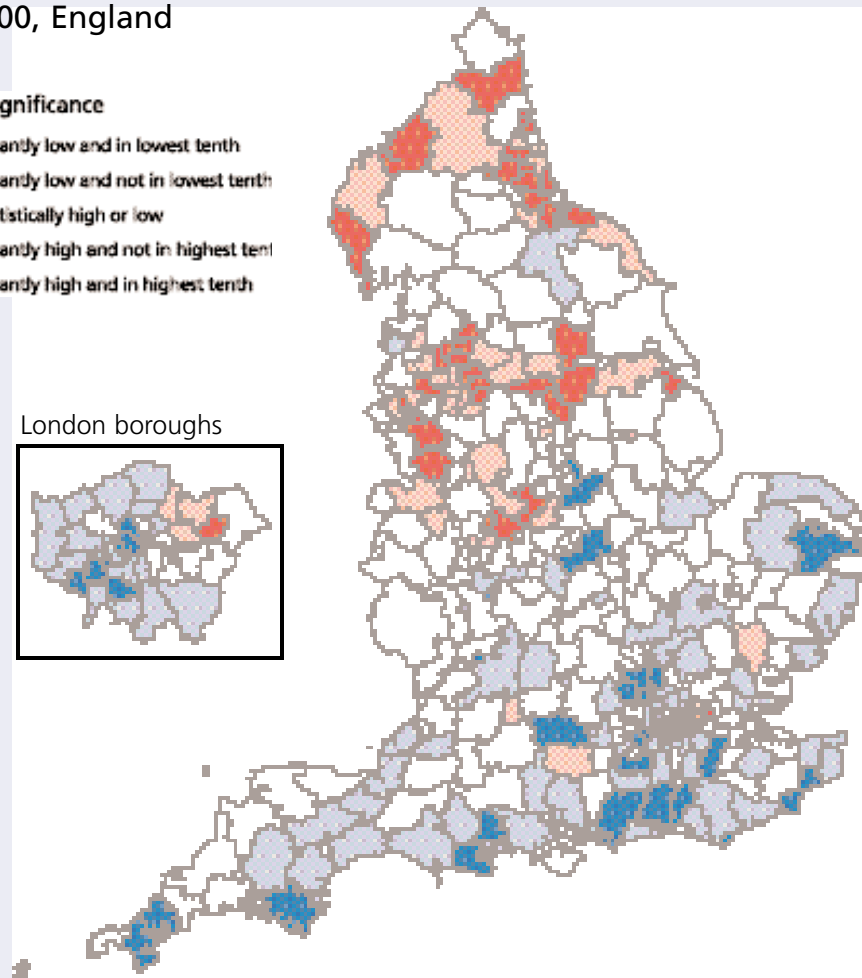


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**Map 3g** Statistical significance of CHD mortality (SMRs), women of all ages, 1998–2000, England

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth

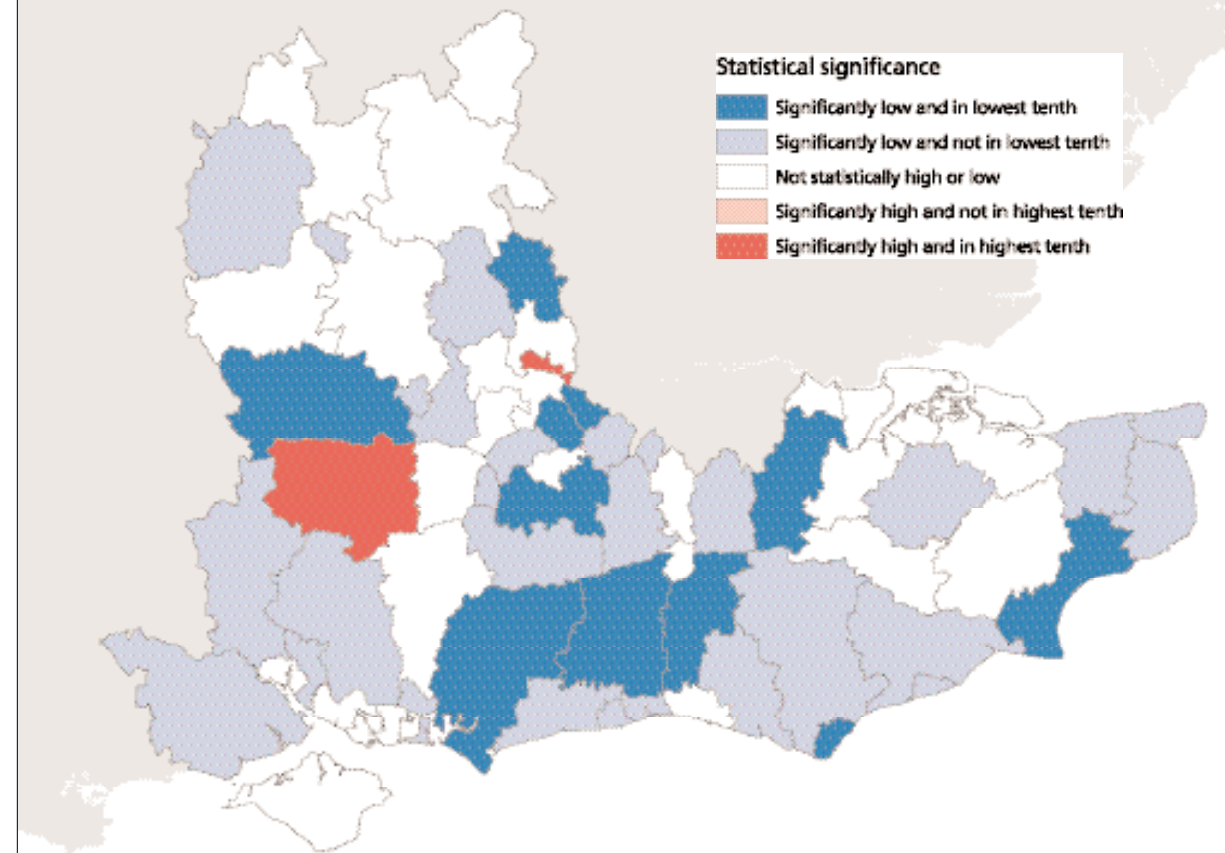


The map shows the statistical significance of the age-standardised mortality ratios (SMRs), 1998–2000 averaged. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

**Map 3h** Statistical significance of CHD mortality (SMRs), women of all ages, 1998–2000, South East Region

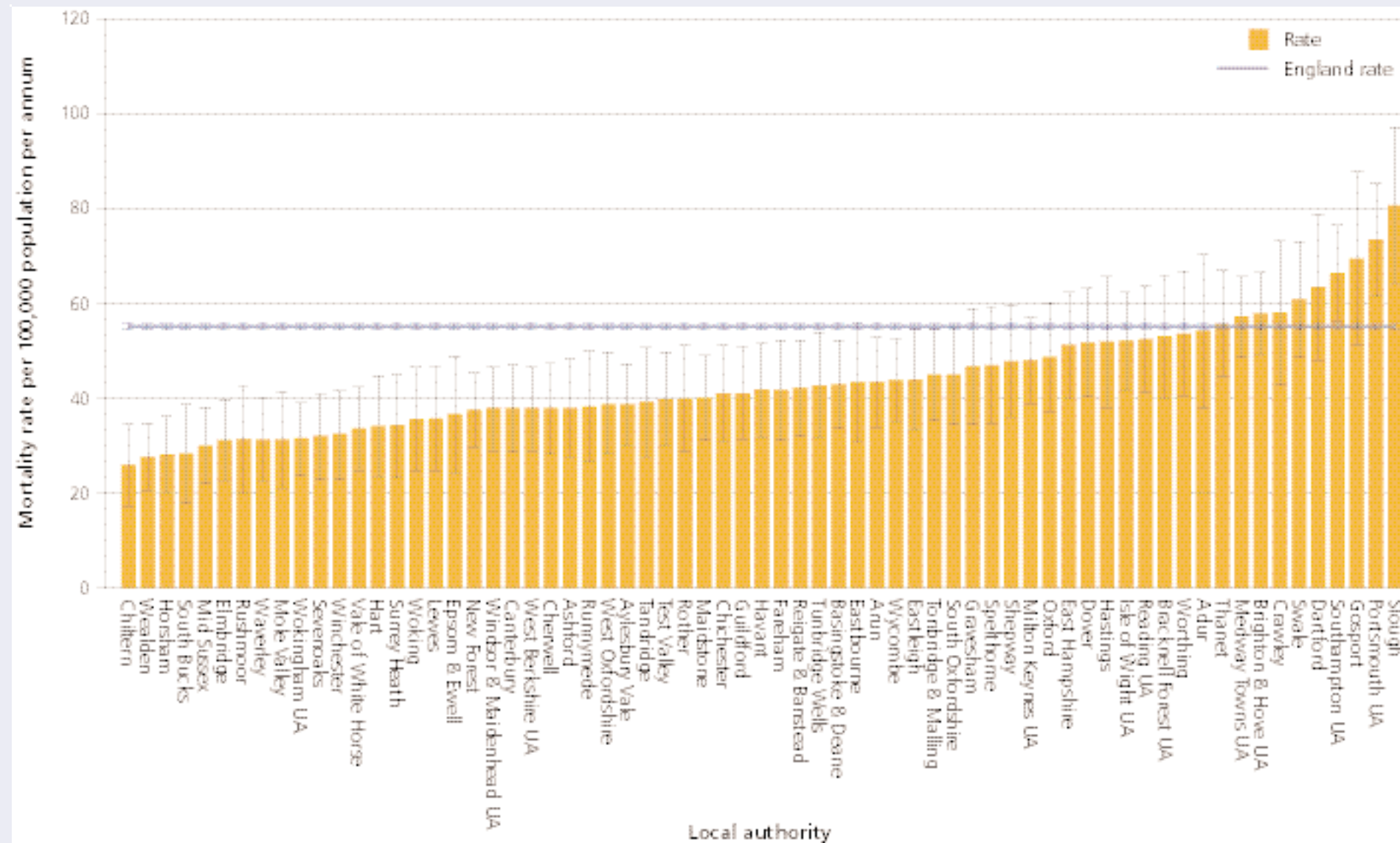
**Statistical significance**

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- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth



The map shows the statistical significance of the age-standardised mortality ratios (SMRs), 1998–2000 averaged. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

Figure 1a CHD mortality rates, 1998–2000, for men aged less than 65; South East Region



Data are directly age-standardised mortality rates, 1998–2000 averaged, with 95% confidence intervals. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

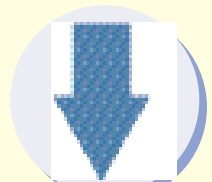
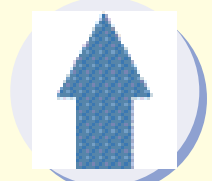
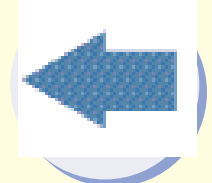

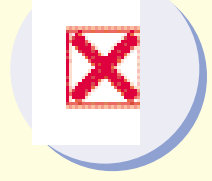
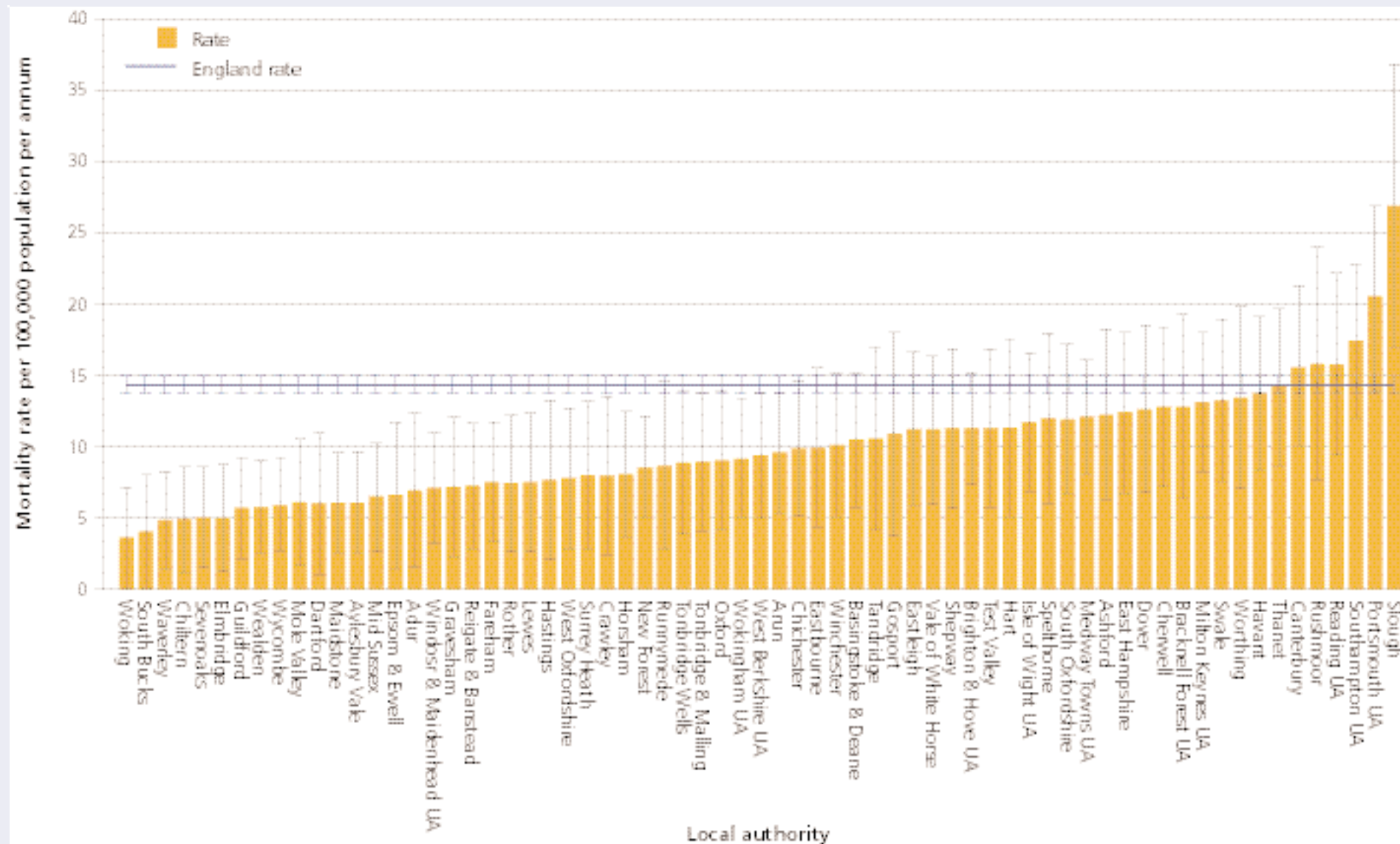
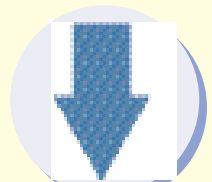
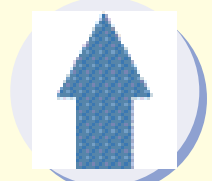
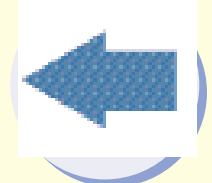

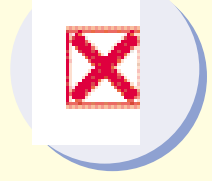
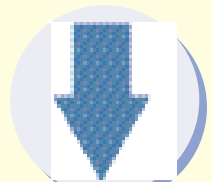
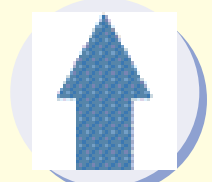
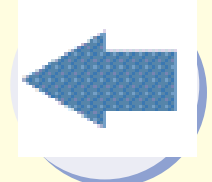

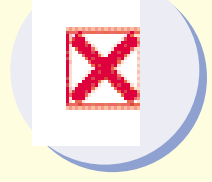
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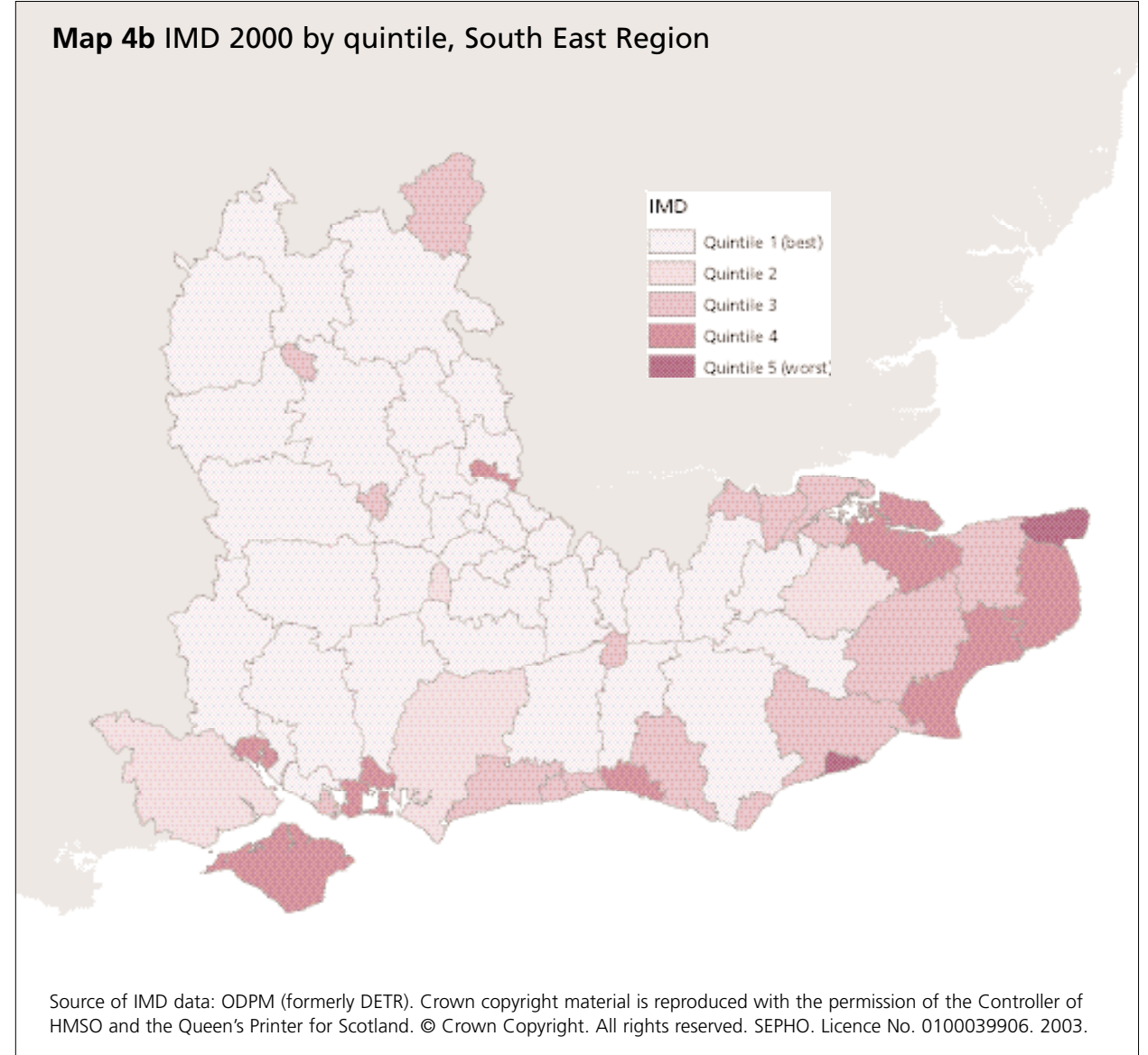
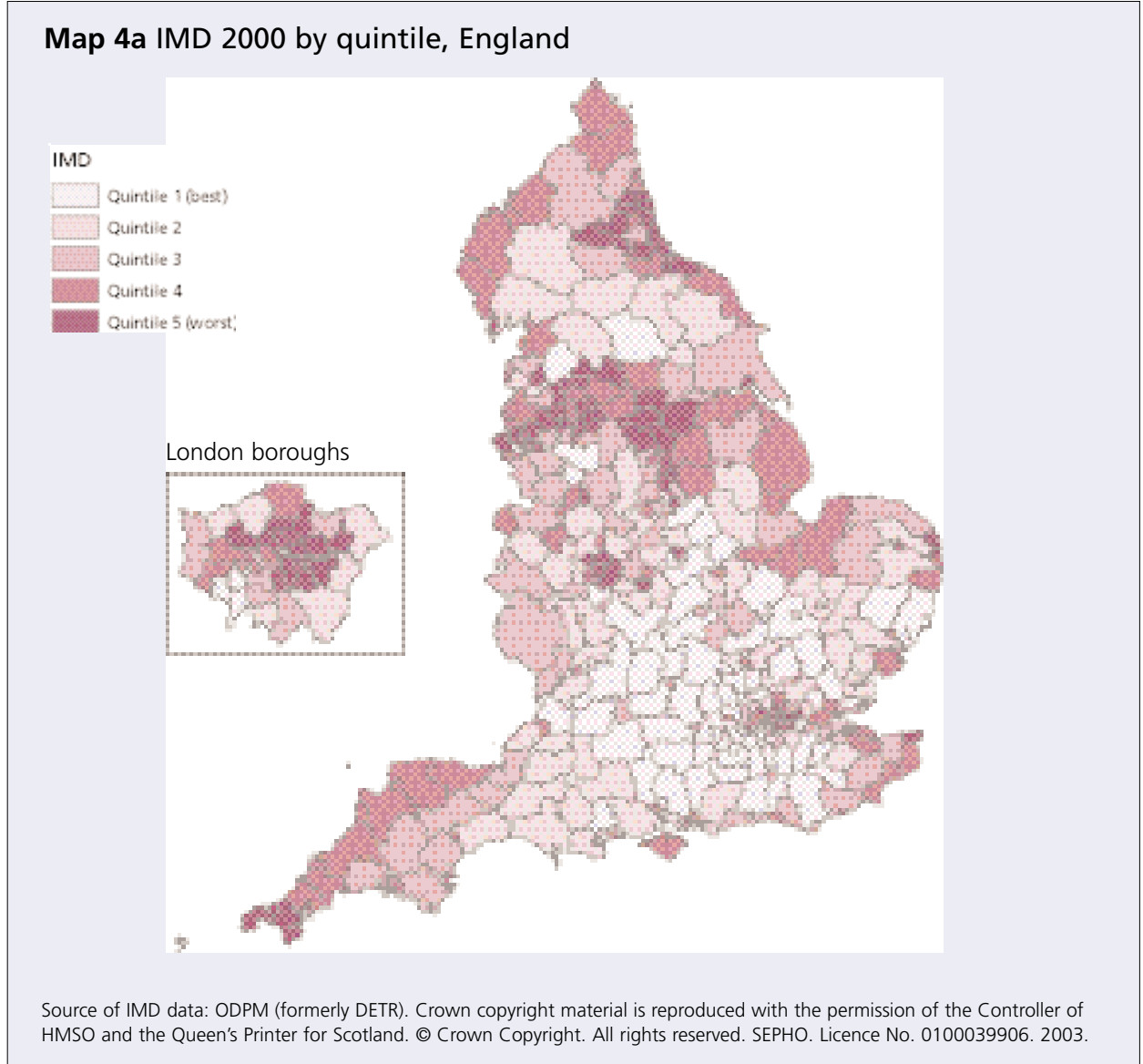
Figure 1b CHD mortality rates, 1998–2000, for women aged less than 65; South East Region



Data are directly age-standardised mortality rates, 1998–2000 averaged, with 95% confidence intervals. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

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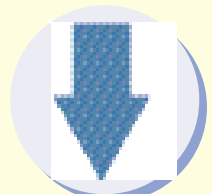
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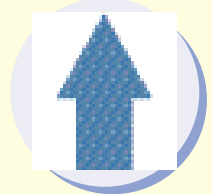
**CHD mortality and socio-economic variables**

It is well established that there are strong and persistent relationships between geographical variations in CHD mortality and socio-economic characteristics.<sup>10,11</sup> Thus the maps showing the geographical distribution of IMD scores for local authorities in England and the South East (Maps 4a and 4b) appear very similar to

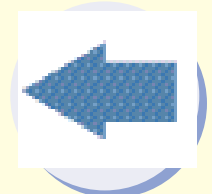
those for CHD mortality rates (Maps 2a and 2b). IMD 2000 scores range from 4 in Hart (the least deprived local authority in England) to 61 in Tower Hamlets (the most deprived local authority). Local authorities in the South East Region are predominately in the least-deprived IMD 2000 quintiles for England, with IMD scores ranging from 4 in Hart to 39 in Hastings.



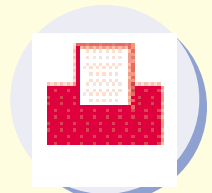
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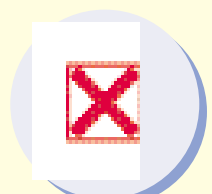
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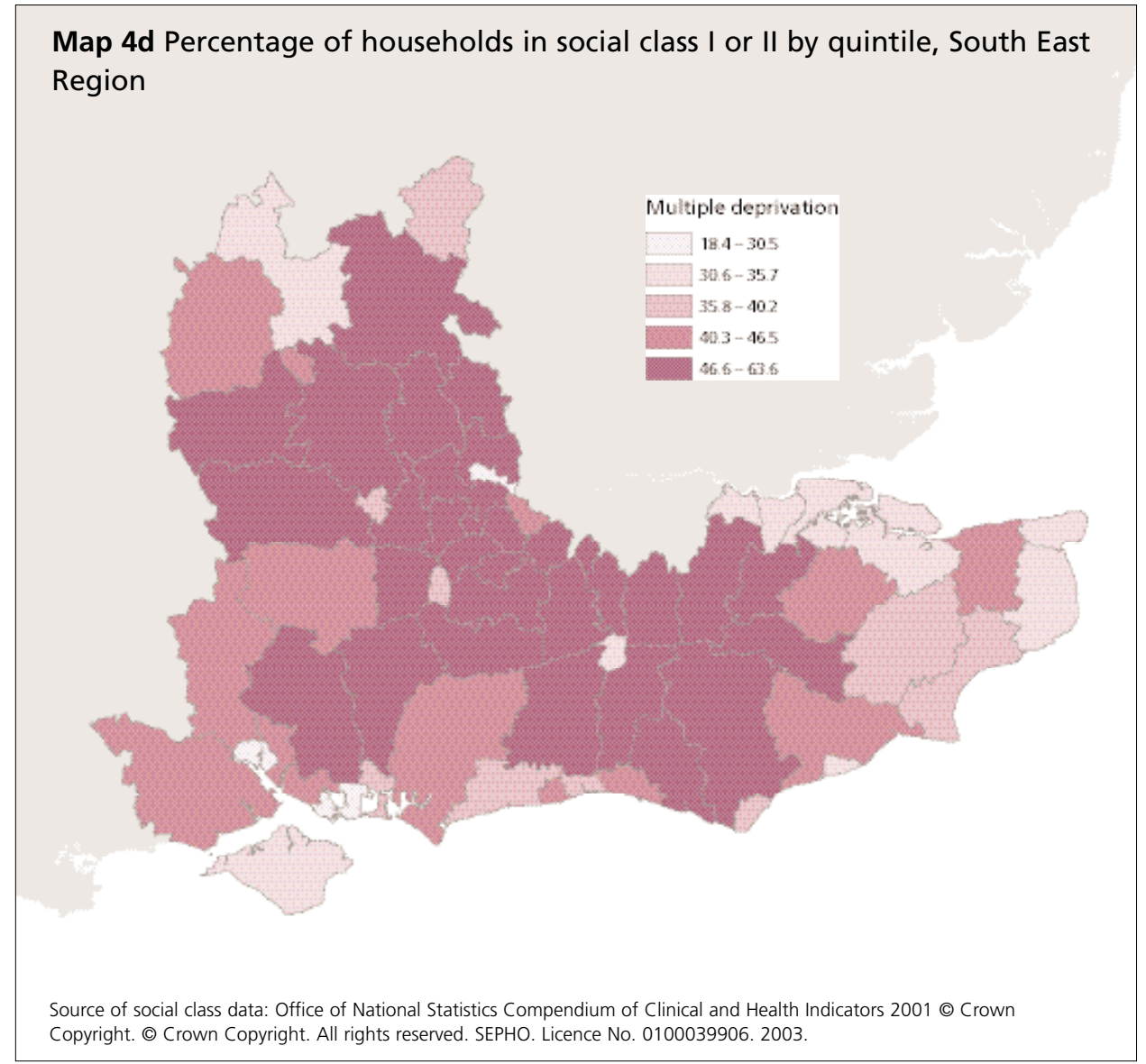
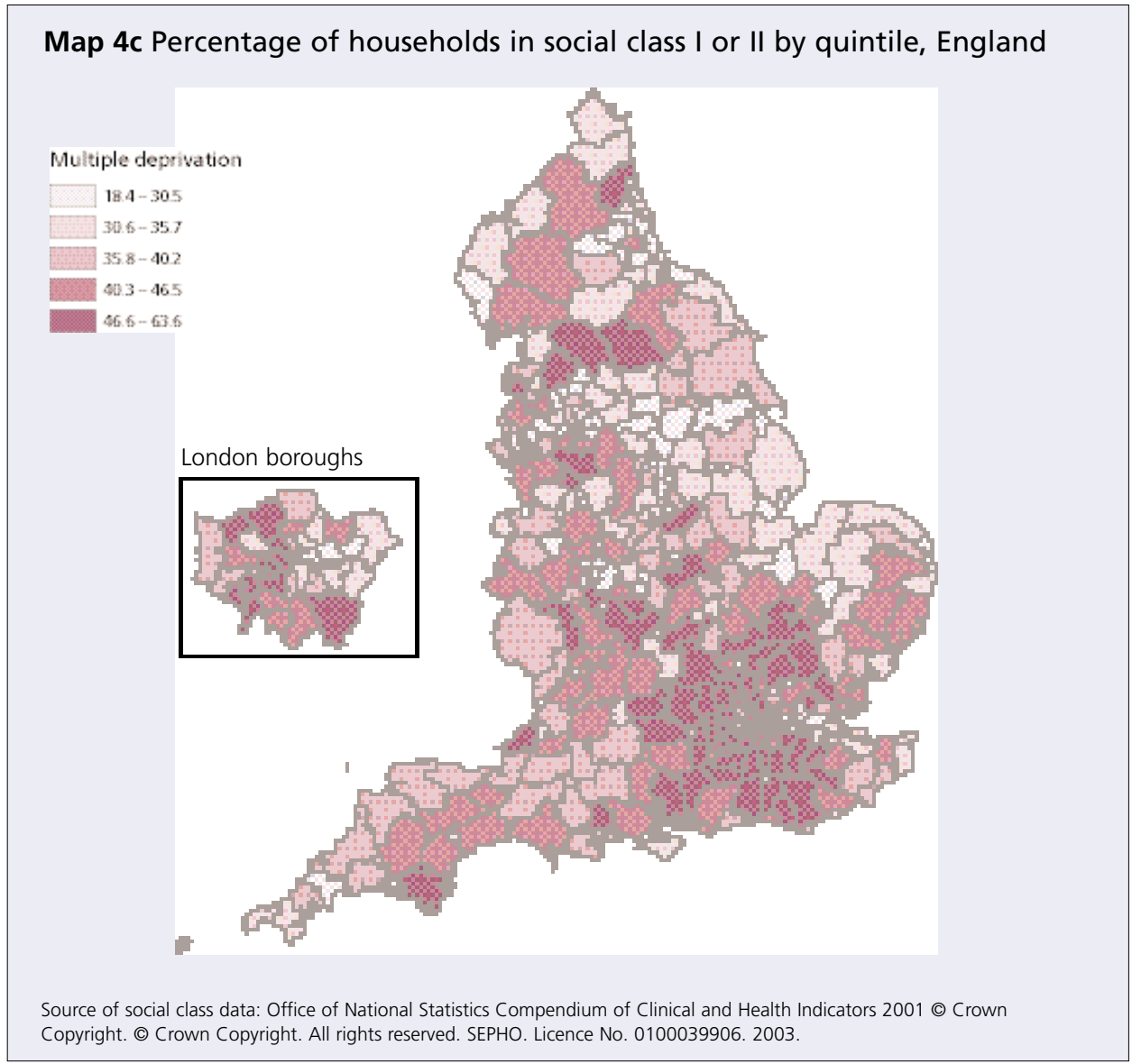
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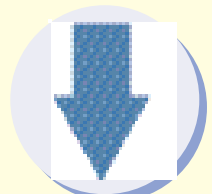
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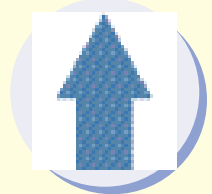
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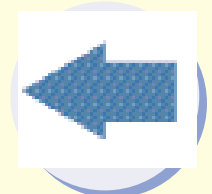
The spatial patterns of the percentage of class I and II households by local authority in England and the South East are presented in Maps 4c and 4d, respectively. These show that areas with the highest deprivation, according to the IMD 2000, also have the lowest percentage of households in social classes I and II.



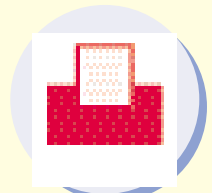
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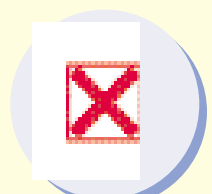
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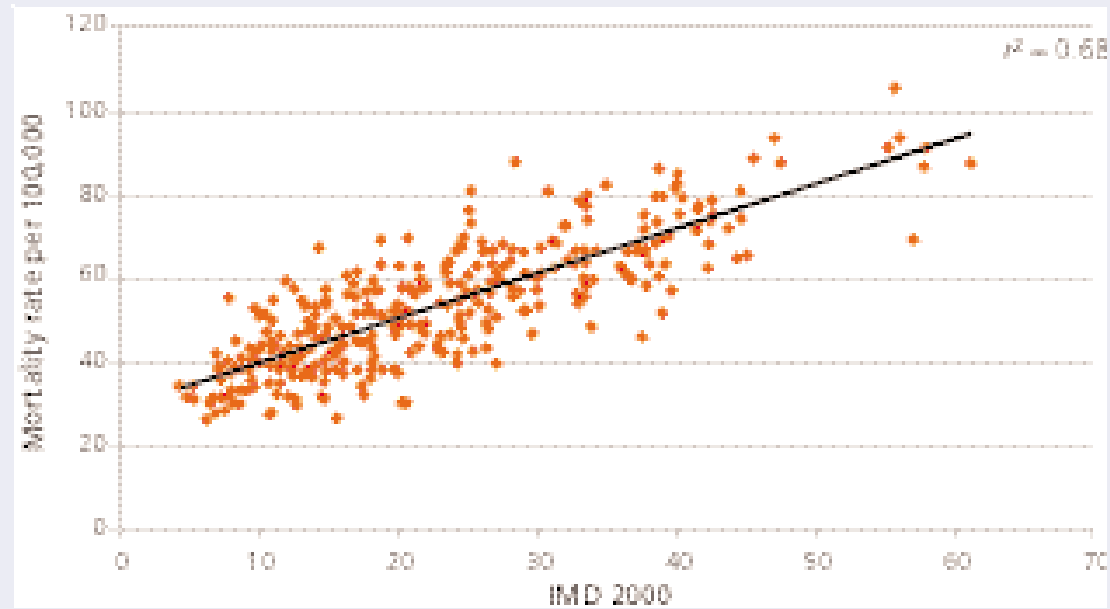


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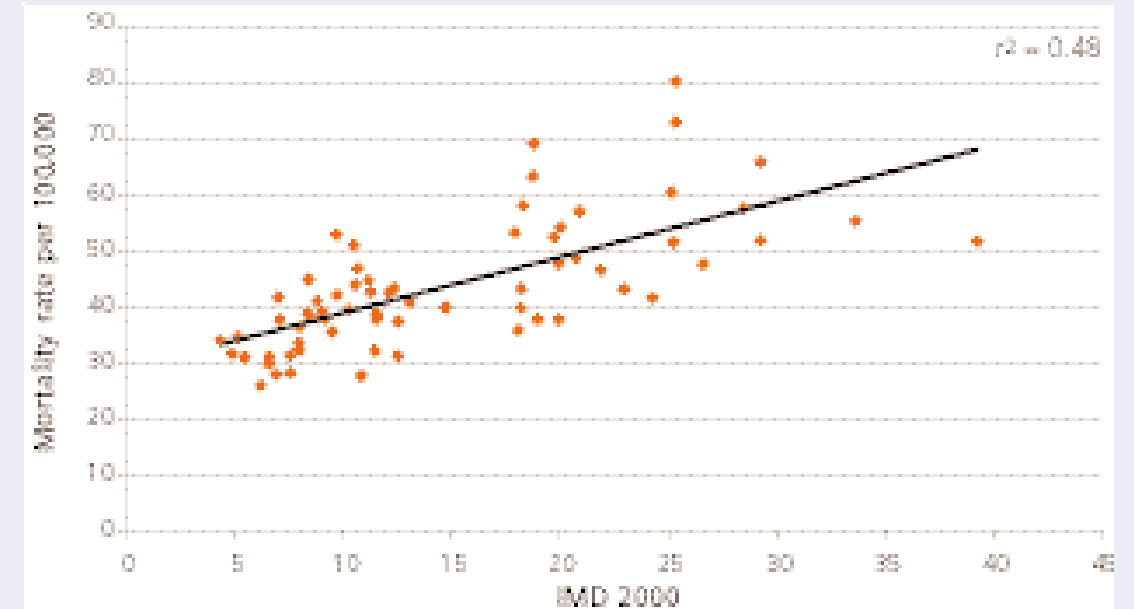
**Figure 2a** CHD mortality rates, 1998–2000, for men aged less than 65, against socio-economic status; England



Data are directly age-standardised mortality rates, 1998–2000 averaged, against socio-economic status (IMD 2000). Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

Linear regression analysis confirms a close correlation between CHD mortality rates for men under 65 and IMD score for local authorities in England: CHD mortality increases linearly with increasing IMD score (Figure 2a;  $r^2 = 0.68$ ). Similarly, there is a close correlation between CHD mortality for men under 65 and

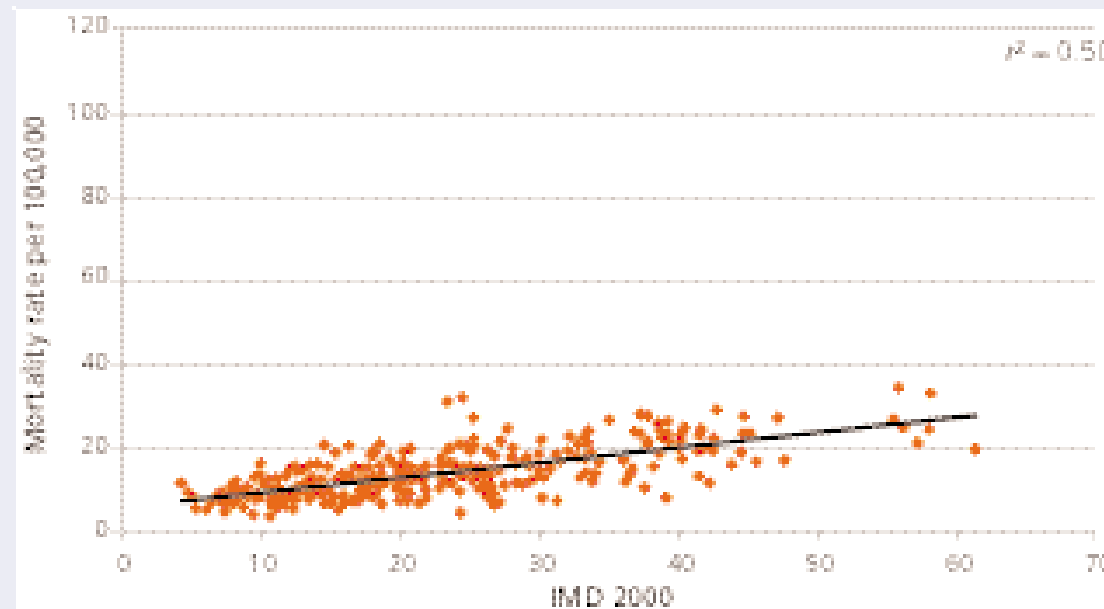
**Figure 2b** CHD mortality rates, 1998–2000, for men aged less than 65, against socio-economic status; South East Region



Data are directly age-standardised mortality rates, 1998–2000 averaged, against socio-economic status (IMD 2000). Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

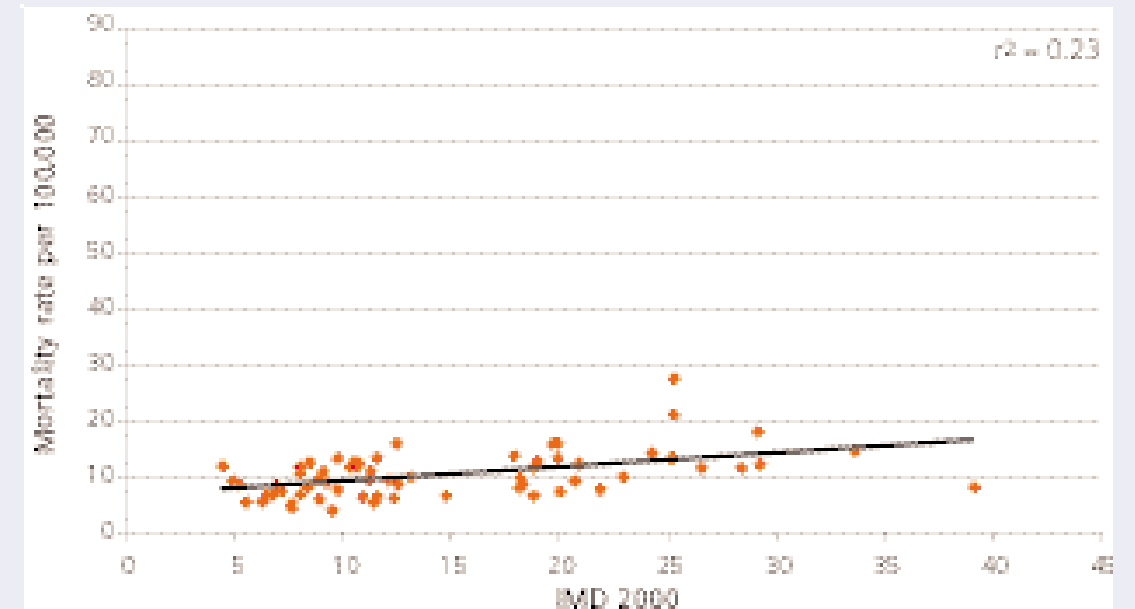
the IMD 2000 for the local authorities in the South East Region (Figure 2b,  $r^2 = 0.48$ ), though both the mortality rates and IMD scores are lower than those for England as a whole. Mortality rates for women under 65, analysed by local authority, also show close correlations with the IMD score (Figures 2c and 2d).

**Figure 2c** CHD mortality rates, 1998–2000, for women aged less than 65, against socio-economic status; England



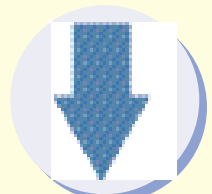
Data are directly age-standardised mortality rates, 1998–2000 averaged, against socio-economic status (IMD 2000). Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

**Figure 2d** CHD mortality rates, 1998–2000, for women aged less than 65, against socio-economic status; South East Region

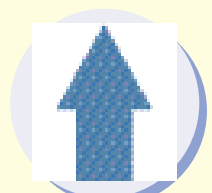


Data are directly age-standardised mortality rates, 1998–2000 averaged, against socio-economic status (IMD 2000). Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown copyright material is reproduced with the permission of the Controller of HMSO and the Queen's Printer for Scotland.

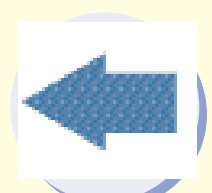
There is also a close but converse correlation between CHD under 65 mortality rates and the percentage of heads of household within social classes I and II by local authority in England and the South East (Figures 2e–2h): mortality rates increase with decreasing percentages of households in class I and II. The Figures show good correlations between these variables for both men and women in England as a whole ( $r^2 = 0.60$  for men,  $r^2 = 0.44$  for women), and in the South East ( $r^2 = 0.63$  for men,  $r^2 = 0.37$  for women).



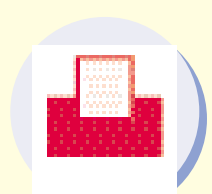
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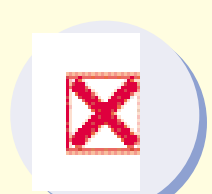
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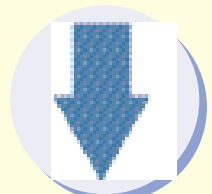
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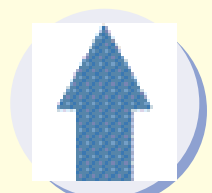
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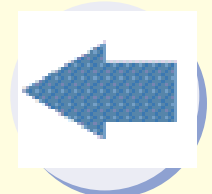
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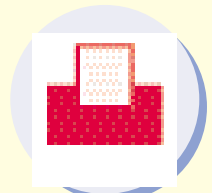
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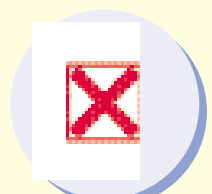
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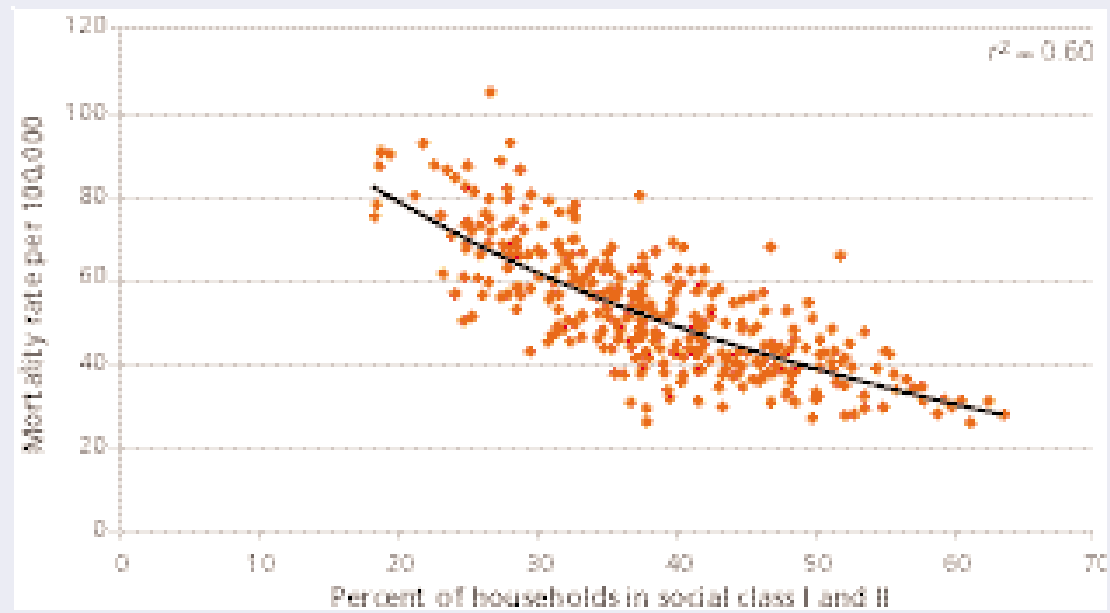


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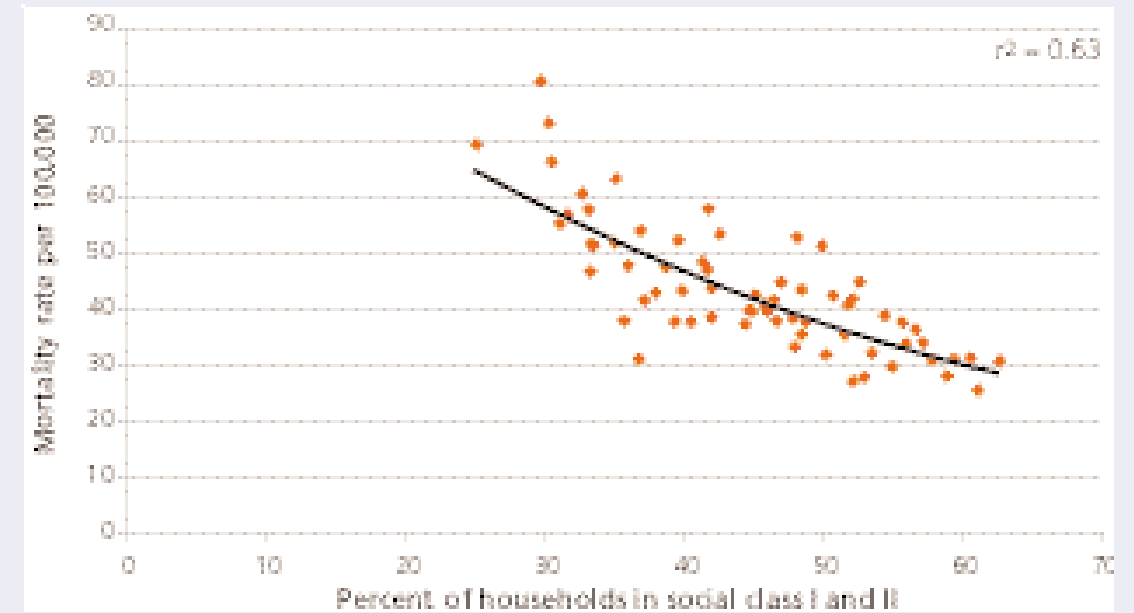
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**Figure 2e** CHD mortality rates, 1998–2000, for men aged less than 65, against percent of households in social class I and II; England

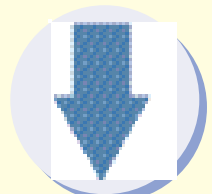


Data are directly age-standardised mortality rates, 1998–2000 averaged, against percent of households in social class I and II. Source of mortality and social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

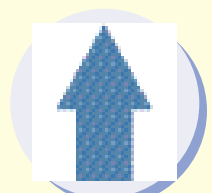
**Figure 2f** CHD mortality rates, 1998–2000, for men aged less than 65, against percent of households in social class I and II; South East Region



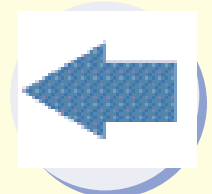
Data are directly age-standardised mortality rates, 1998–2000 averaged, against percent of households in social class I and II. Source of mortality and social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.



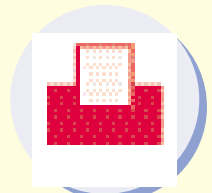
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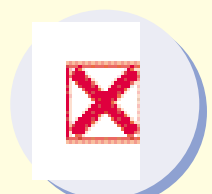
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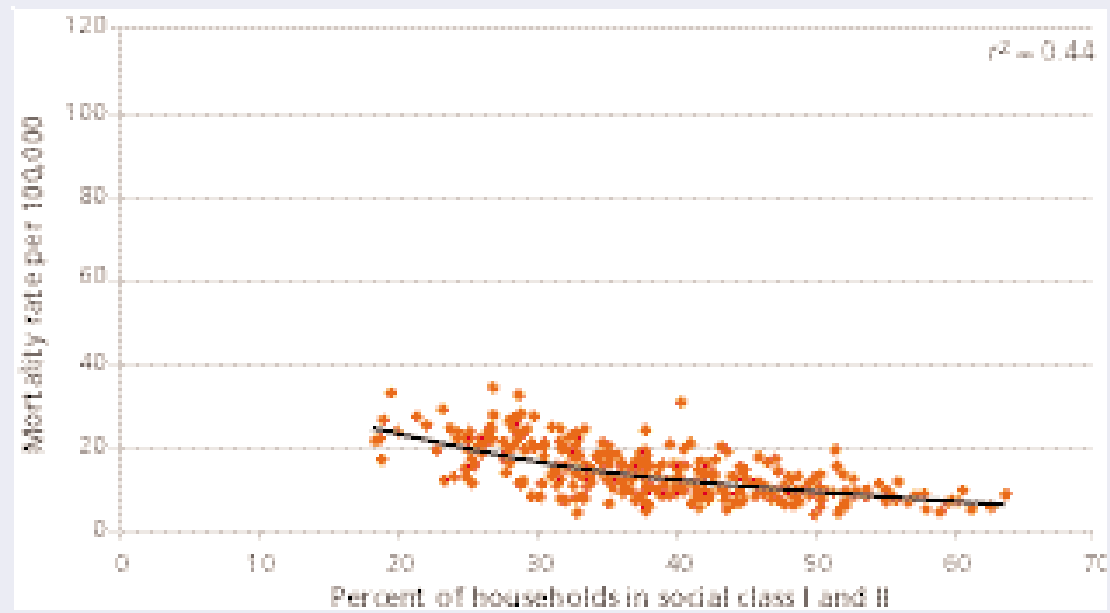


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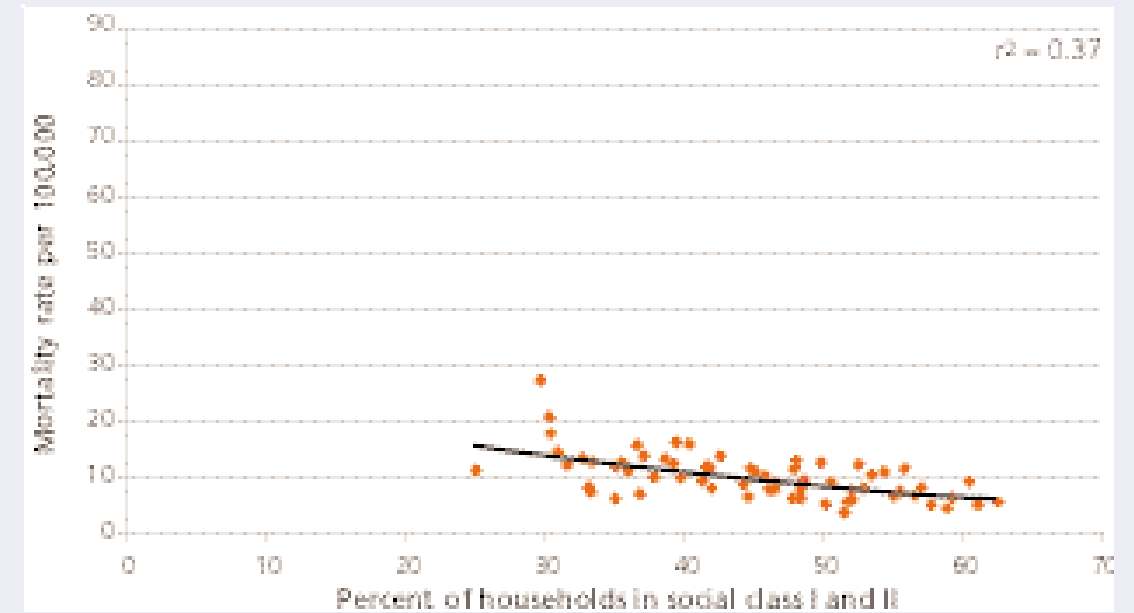
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**Figure 2g** CHD mortality rates, 1998–2000, for women aged less than 65, against percent of households in social class I and II; England



Data are directly age-standardised mortality rates, 1998–2000 averaged, against percent of households in social class I and II. Source of mortality and social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

**Figure 2h** CHD mortality rates, 1998–2000, for women aged less than 65, against percent of households in social class I and II; South East Region



Data are directly age-standardised mortality rates, 1998–2000 averaged, against percent of households in social class I and II. Source of mortality and social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

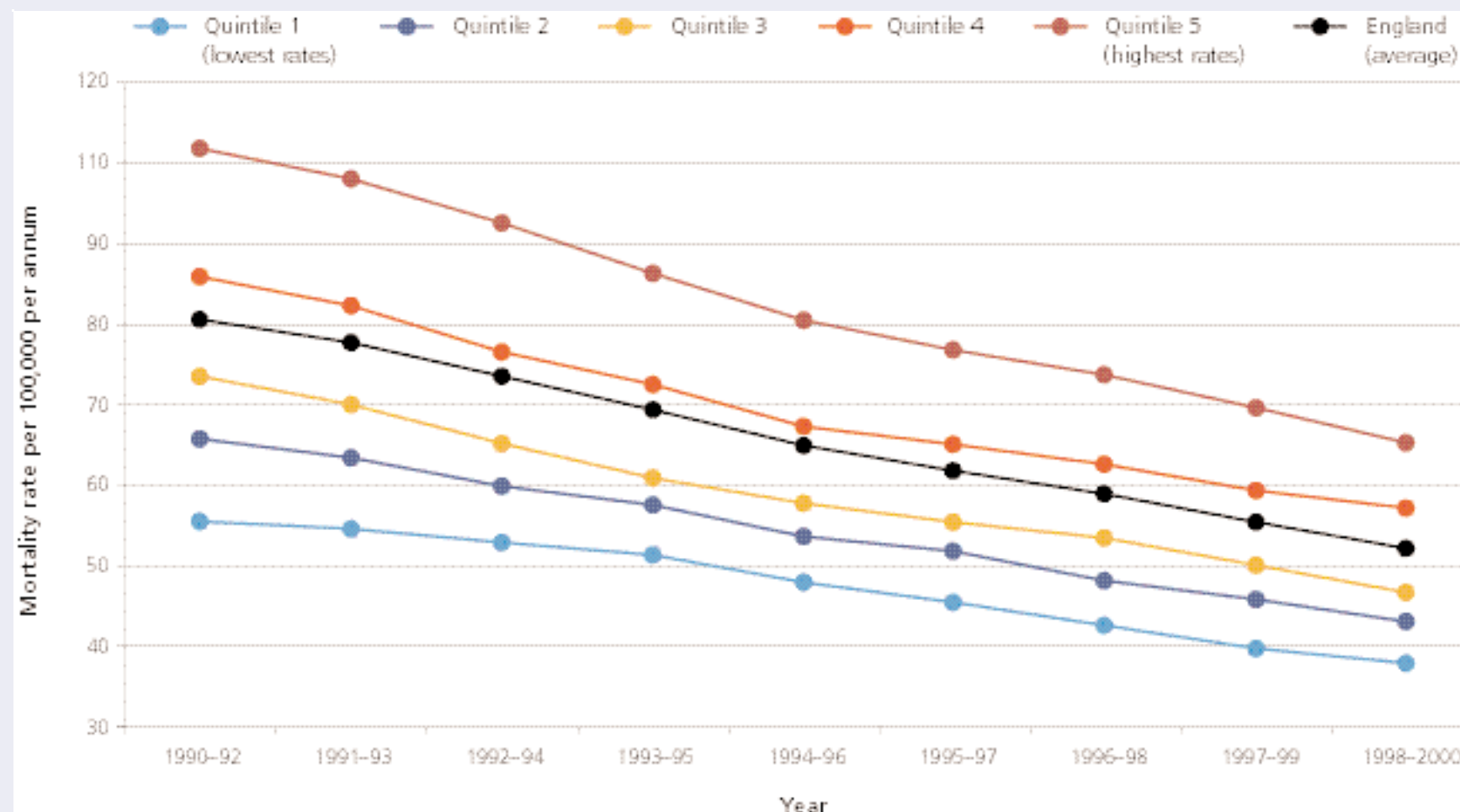
### Trends in CHD mortality

CHD remains a leading cause of mortality in England. However, an annual reduction in rates that was established in the 1980s has continued throughout the last decade (Figure 3a).

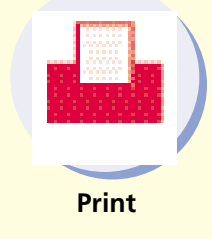
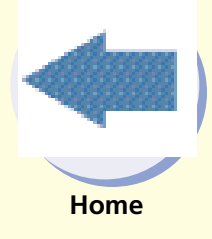
Figure 3a shows that CHD mortality for men under 65 for England as a whole fell by 32 per 100,000 between 1991 and 1999, from 87 per 100,000 to 55 per 100,000 (three-year averages). At local authority level, however, a more varied picture emerges of these changes in CHD mortality rates over time. For example, in Easington, County Durham, which had the highest CHD mortality rate for men under 65 in 1991, the rate reduced by 46 per 100,000 (from 137 to 91 per 100,000) between 1991 and 1999. For South Cambridgeshire, which had the lowest CHD

mortality rate in 1991, the rate reduced by 5 per 100,000 (from 39 to 34 per 100,000) over the same period. In general, there was a clear trend towards the greatest falls in CHD mortality occurring in the local authority areas with the highest mortality rates. Overall, CHD mortality rates for men under 65 fell by 20 per 100,000 (from 59 to 39 per 100,000) for local authorities in the lowest quintile of rates in 1991, and by 40 per 100,000 (from 111 to 71 per 100,000) for local authorities in the highest quintile of rates. The reduction in rates for women over the same period was 10 per 100,000 (from 24 to 14 per 100,000), reflecting the much lower CHD mortality rates in women, again with the greatest falls occurring in the local authorities with the highest mortality rates (Figure 3b).

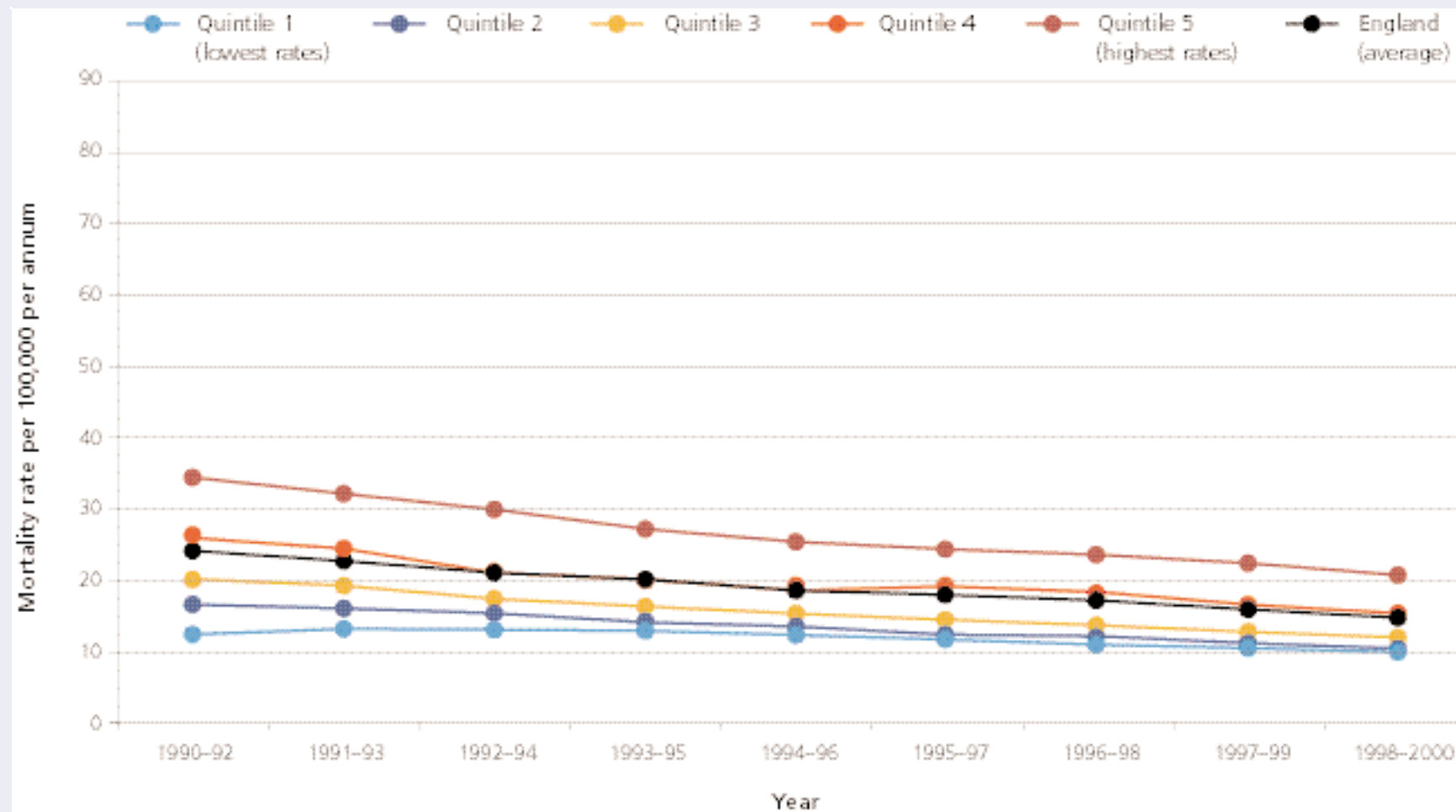
Figure 3a Trends in CHD mortality, 1990 to 2000, for men aged less than 65, by local authority quintiles of rates; England



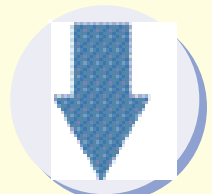
Data are three-year averages for directly age-standardised mortality rates from 1990-1992 to 1998-2000. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.



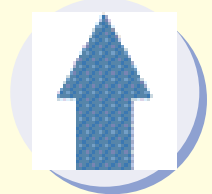
**Figure 3b** Trends in CHD mortality, 1990 to 2000, for women aged less than 65, by local authority quintiles of rates; England



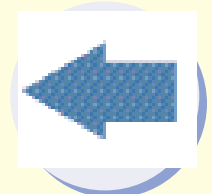
Data are three-year averages for directly age-standardised mortality rates from 1990-1992 to 1998-2000. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.



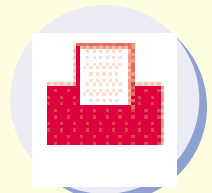
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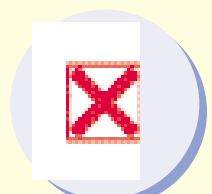
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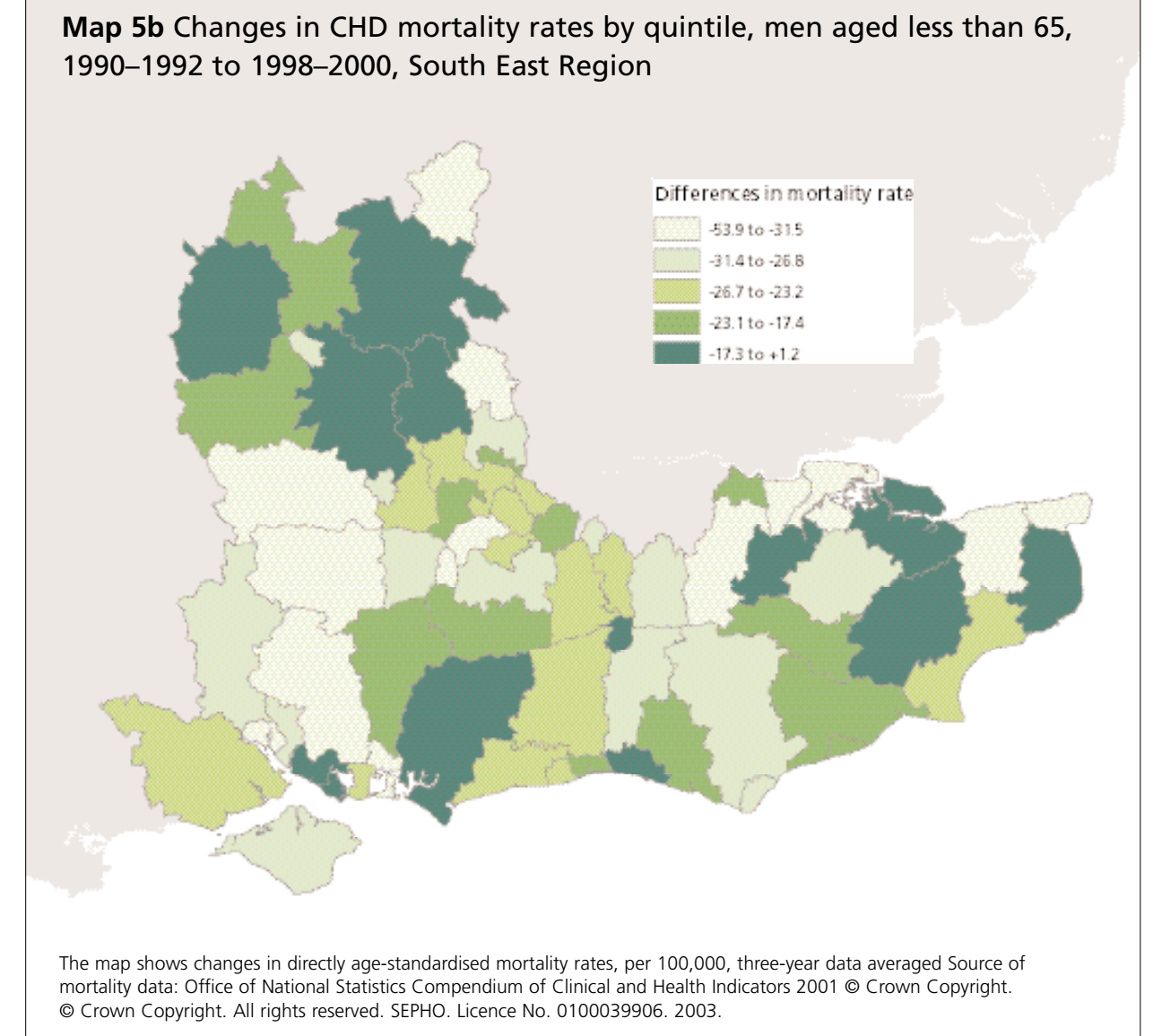
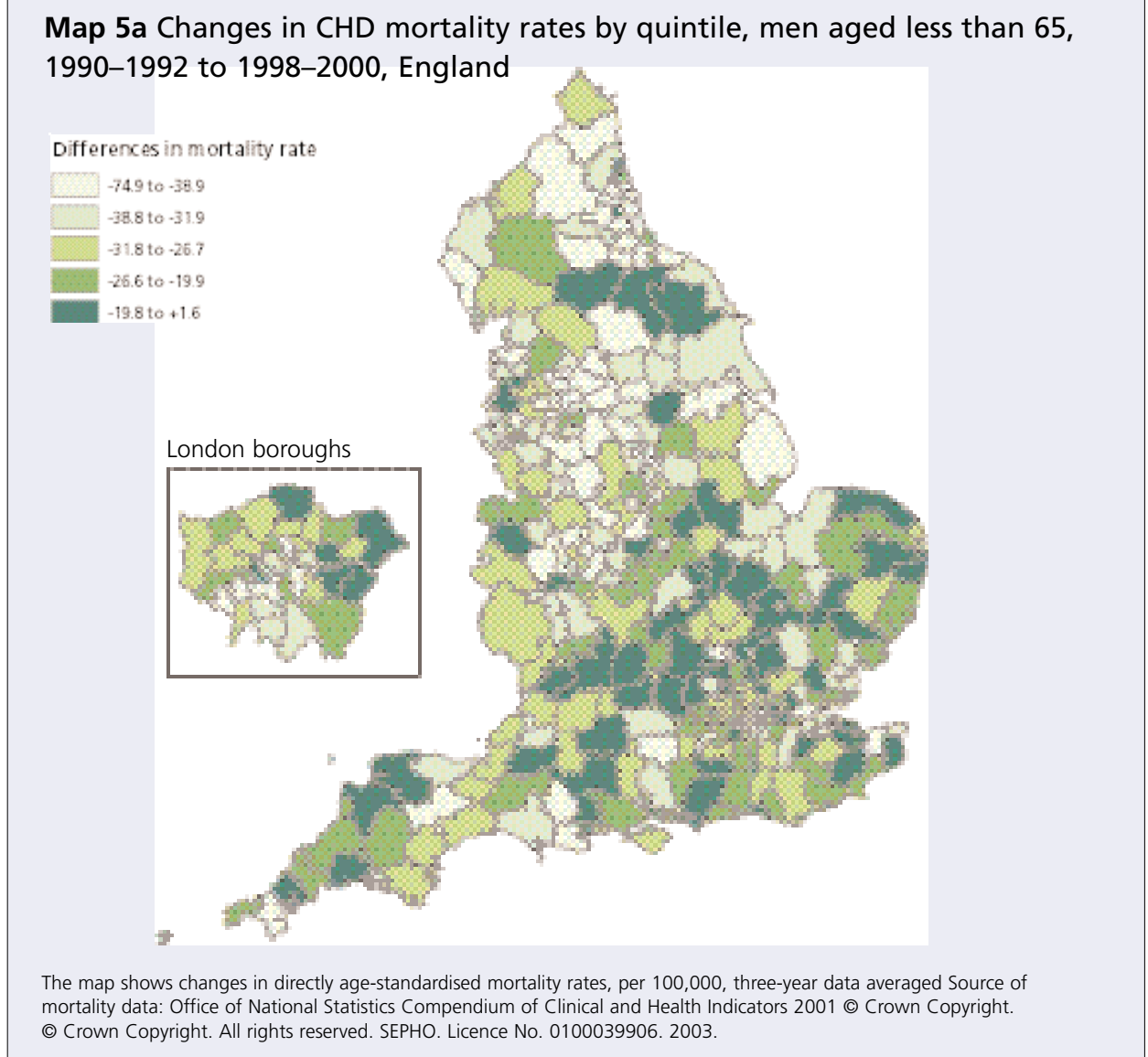
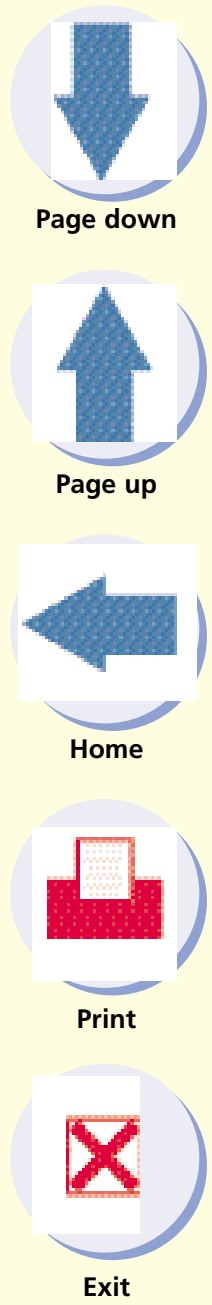
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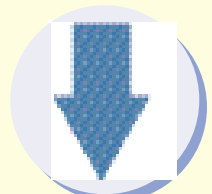


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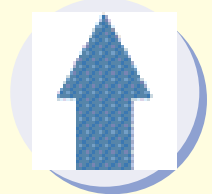


Maps 5a – 5d illustrate the geographical distribution of these changes in CHD mortality rates for men and women under 65 between 1991 and 1999. Smaller reductions in rates appear to occur predominantly in the south, where overall rates were (and still are) lower, and greater reductions in rates appear to occur predominantly in the north, where rates were (and still are) higher. This is confirmed in Figure 4a which analyses the average CHD mortality rates for men under 65 for selected government office regions. For the South East, which was the region with the lowest CHD mortality rates for men under 65 in 1991, these rates fell by 25 per 100,000 (from 69 to 44 per 100,000). For the North East, which was the region with the highest male mortality rates in 1991, the corresponding fall was 44 per 100,000 (from 115 to 71 per 100,000). Figure 4b shows the corresponding data for women under 65, and the same positions apply to the selected regions in relation to CHD

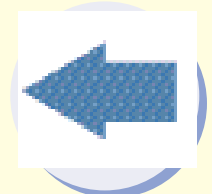
mortality for women. Not all local authorities experienced a reduction in rates over this period: four local authorities experienced an increase in rates for men and 19 local authorities experienced an increase in rates for women. A variable pattern is seen among local authorities in the South East Region (Map 5b), with a reduction in CHD mortality rates for men under 65 of 33 per 100,000 (from 99 to 66 per 100,000) in Southampton, the local authority which had the highest rates in 1991, and an increase of 1 per 100,000 (from 43 to 44 per 100,000) for South Oxfordshire, which had the lowest rates in 1991. For women under 65 (Map 5d) though CHD mortality rates show a decrease of up to 16 per 100,000 in one local authority, five local authorities in the South East show a minor increase in rates between 1991 and 1999.



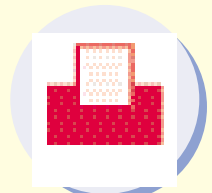
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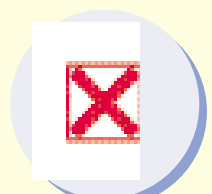
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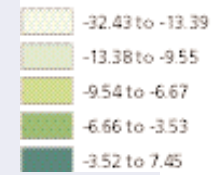
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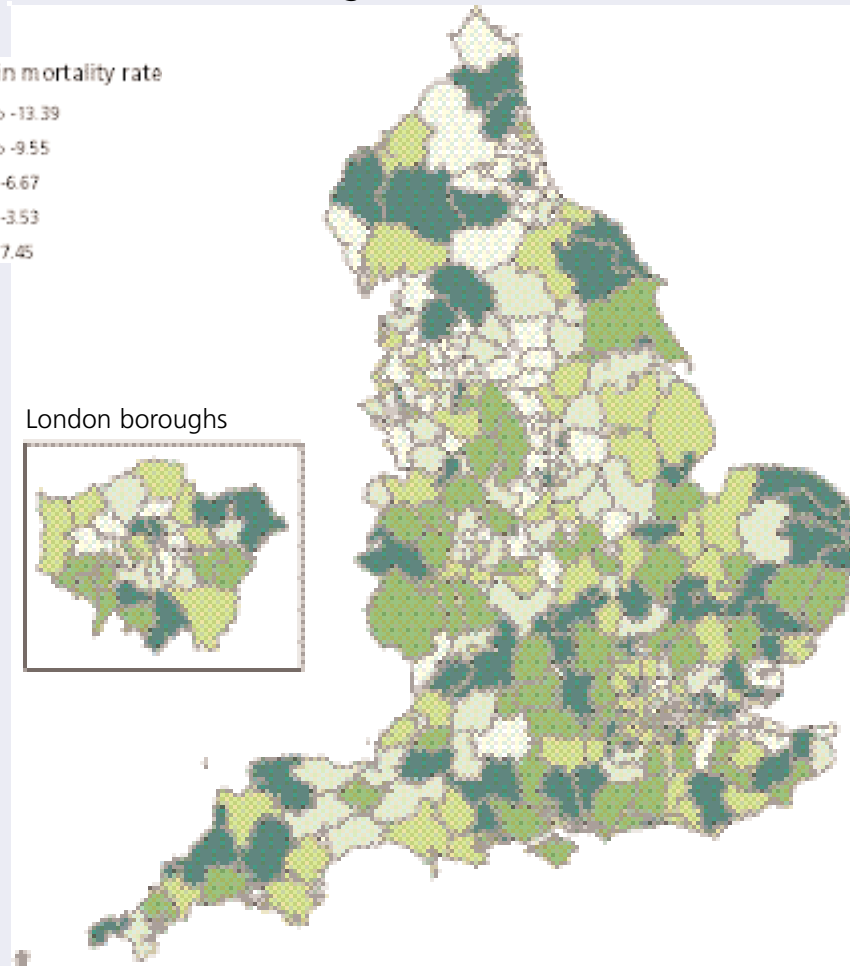
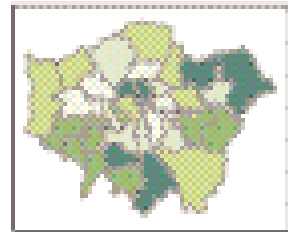
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**Map 5c** Changes in CHD mortality rates by quintile, women aged less than 65, 1990–1992 to 1998–2000, England

Differences in mortality rate



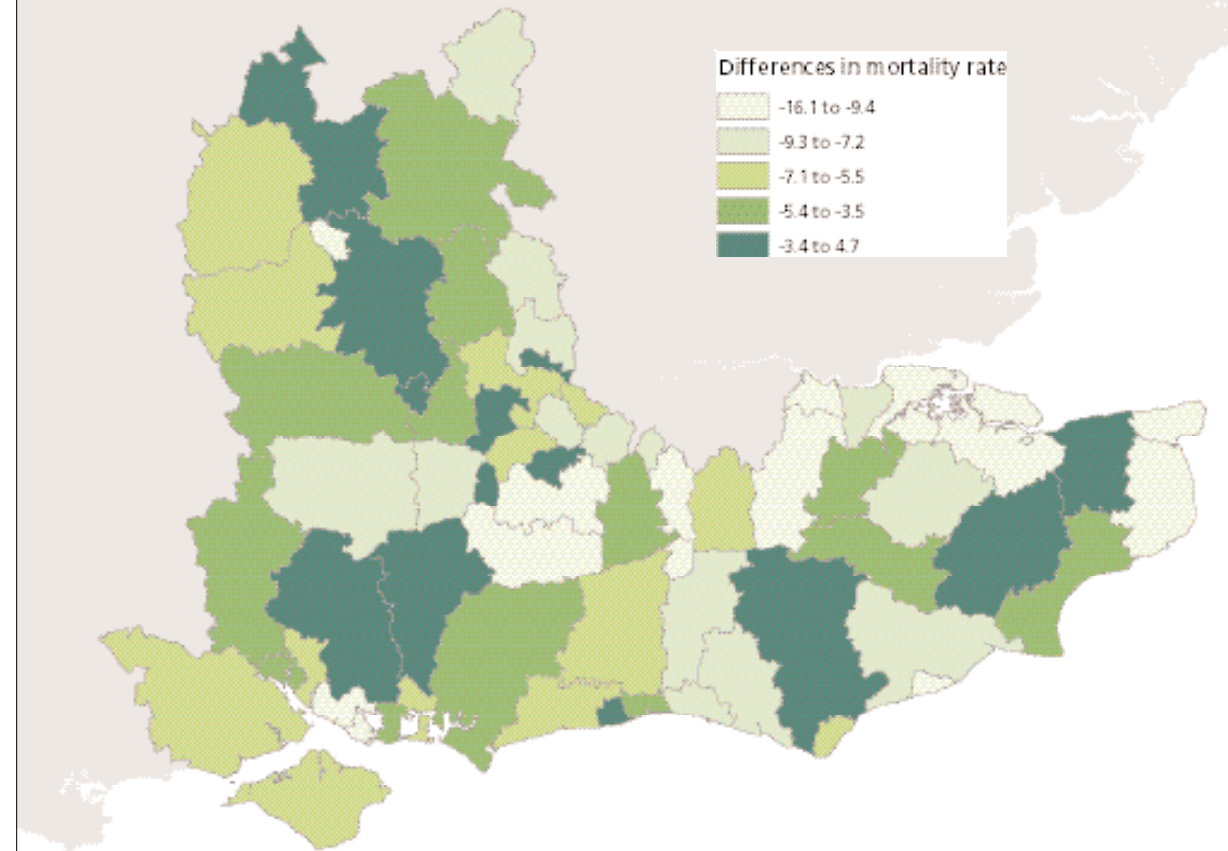
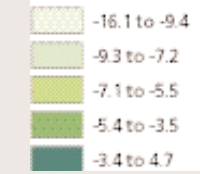
London boroughs



The map shows changes in directly age-standardised mortality rates, per 100,000, three-year data averaged Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

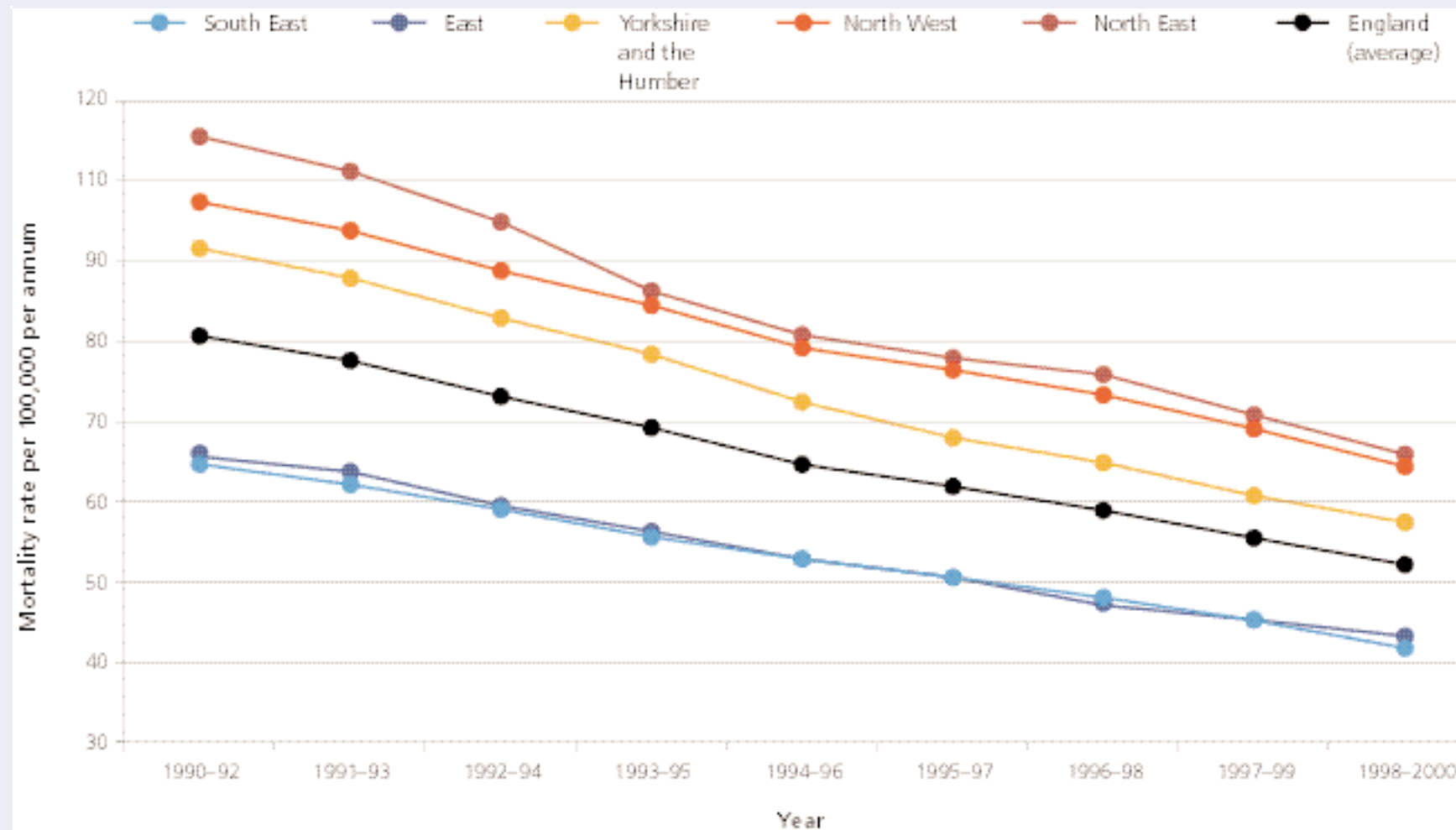
**Map 5d** Changes in CHD mortality rates by quintile, women aged less than 65, 1990–1992 to 1998–2000, South East Region

Differences in mortality rate

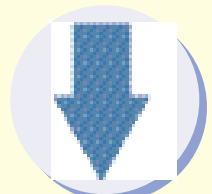


The map shows changes in directly age-standardised mortality rates, per 100,000, three-year data averaged Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

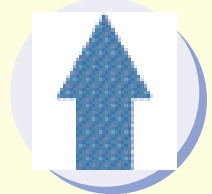
Figure 4a Trends in CHD mortality, 1990 to 2000, for men aged less than 65, by government office region; England



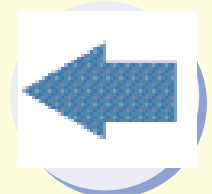
Data are three-year averages for directly age-standardised mortality rates from 1990-1992 to 1998-2000. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.



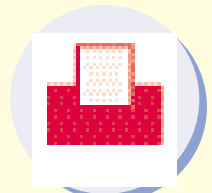
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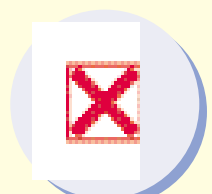
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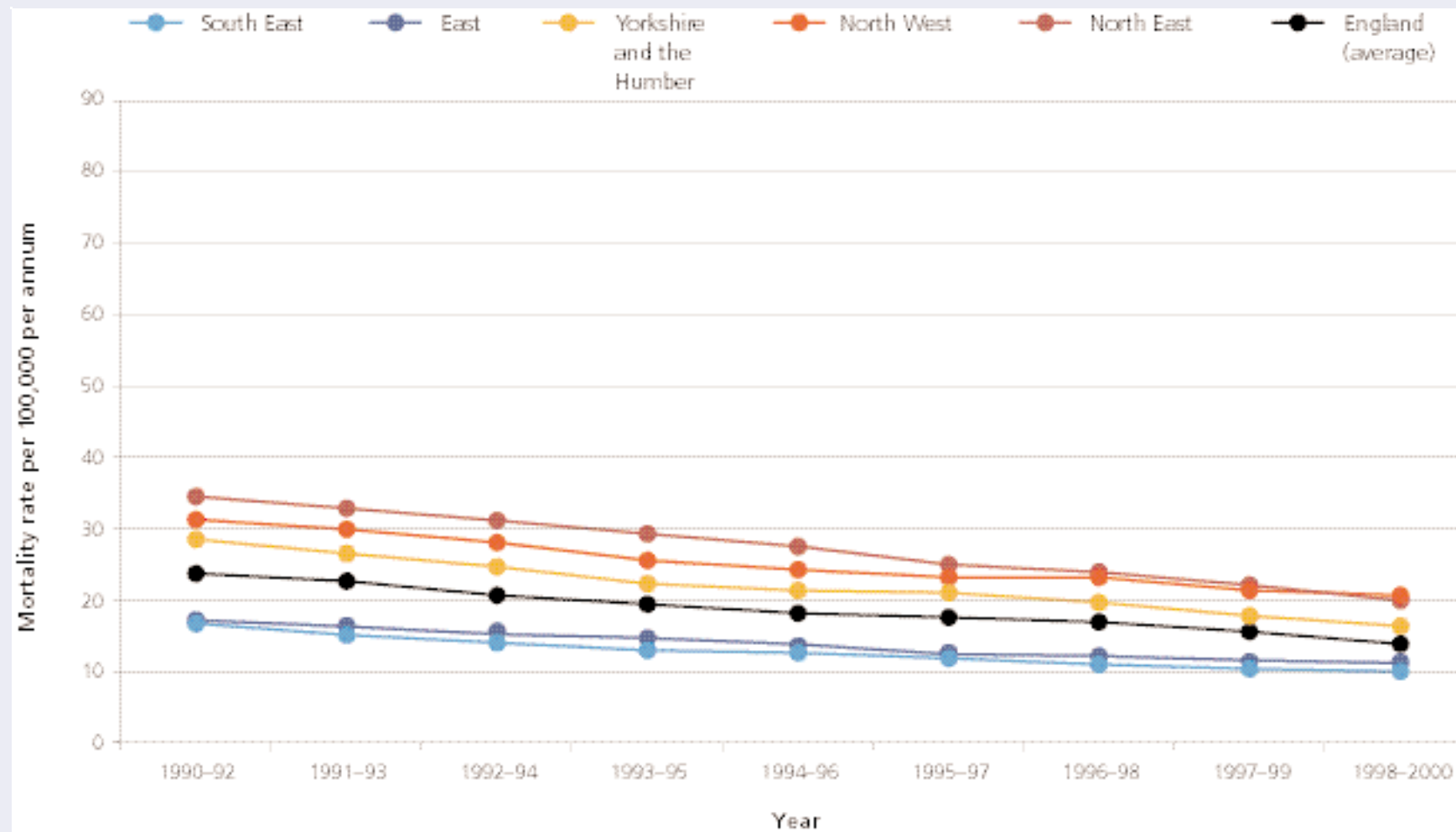


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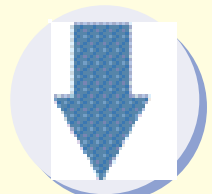


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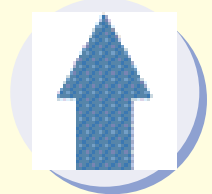
**Figure 4b** Trends in CHD mortality, 1990 to 2000, for women aged less than 65, by government office region; England



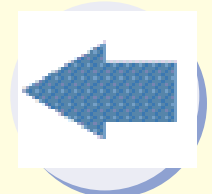
Data are three-year averages for directly age-standardised mortality rates from 1990-1992 to 1998-2000. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.



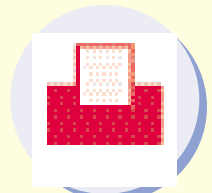
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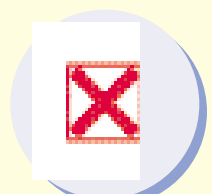
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## CHD admissions

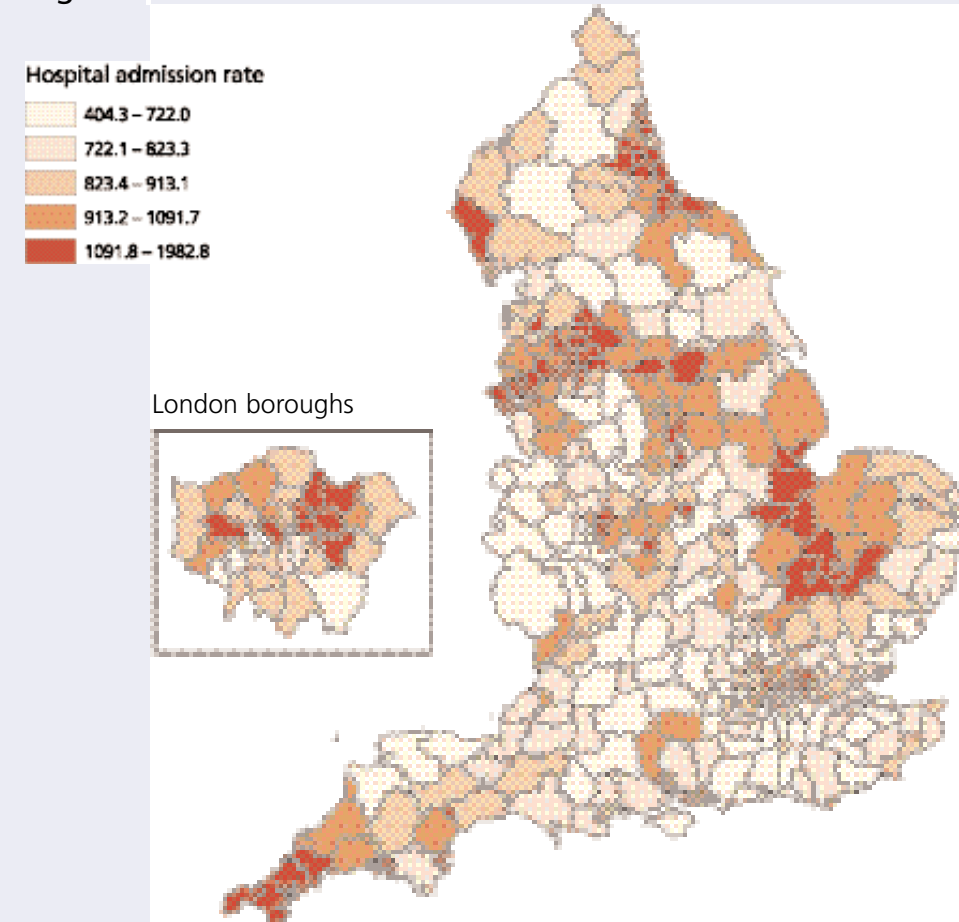
Table 1 (see next page) gives the numbers of hospital episodes involving primary diagnoses of CHD and acute myocardial infarction over 1999–2002. The total number of admissions rose for both men and women over this period, with the number of CHD admissions for men, for example, rising from 231,329 in 1999–2000 to 245,939 in 2001–2002.

Maps 6a and 6b show the geographical distribution of the CHD hospital admission rates for men by local authority in England and the South East, respectively. The rates for England as a whole range from a low of 404 per 100,000 in the Malvern Hills, to a high of 1983 per 100,000 in Tower Hamlets – a five-fold

difference between the lowest and the highest. The range in the South East Region is less stark: rates range from 511 per 100,000 in Mole Valley to 1285 per 100,000 in Slough (Map 6b).

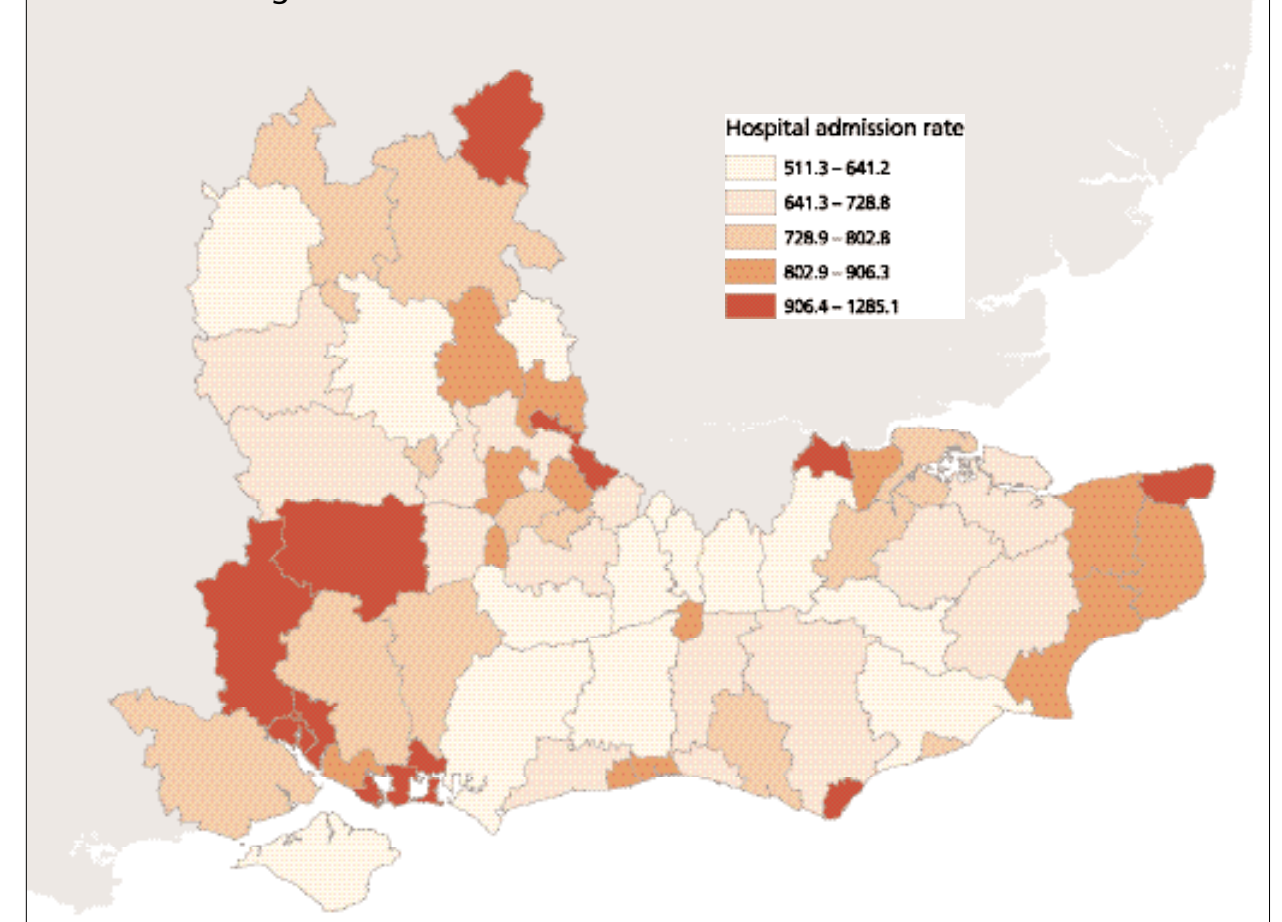
Maps 6c and 6d show the corresponding CHD hospital admission rates for women in England and the South East, respectively. These conform to the same geographic pattern found for men, though with much lower rates, ranging from a low of 168 per 100,000 in West Oxfordshire to a high of 993 per 100,000 in Knowsley.

**Map 6a** CHD hospital admission rates by quintile, men of all ages, 2002, England

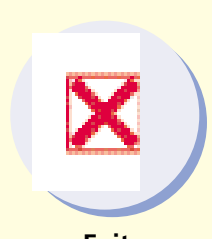
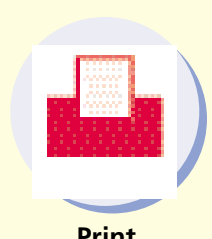


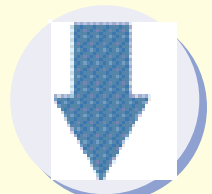
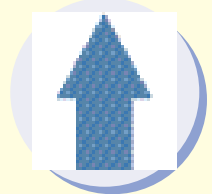
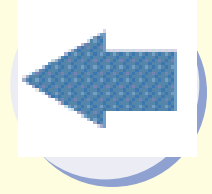
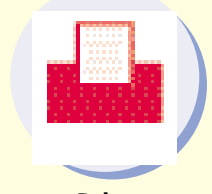
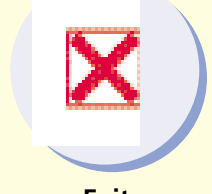
The map shows directly age-standardised CHD hospital admission rates, per 100,000, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

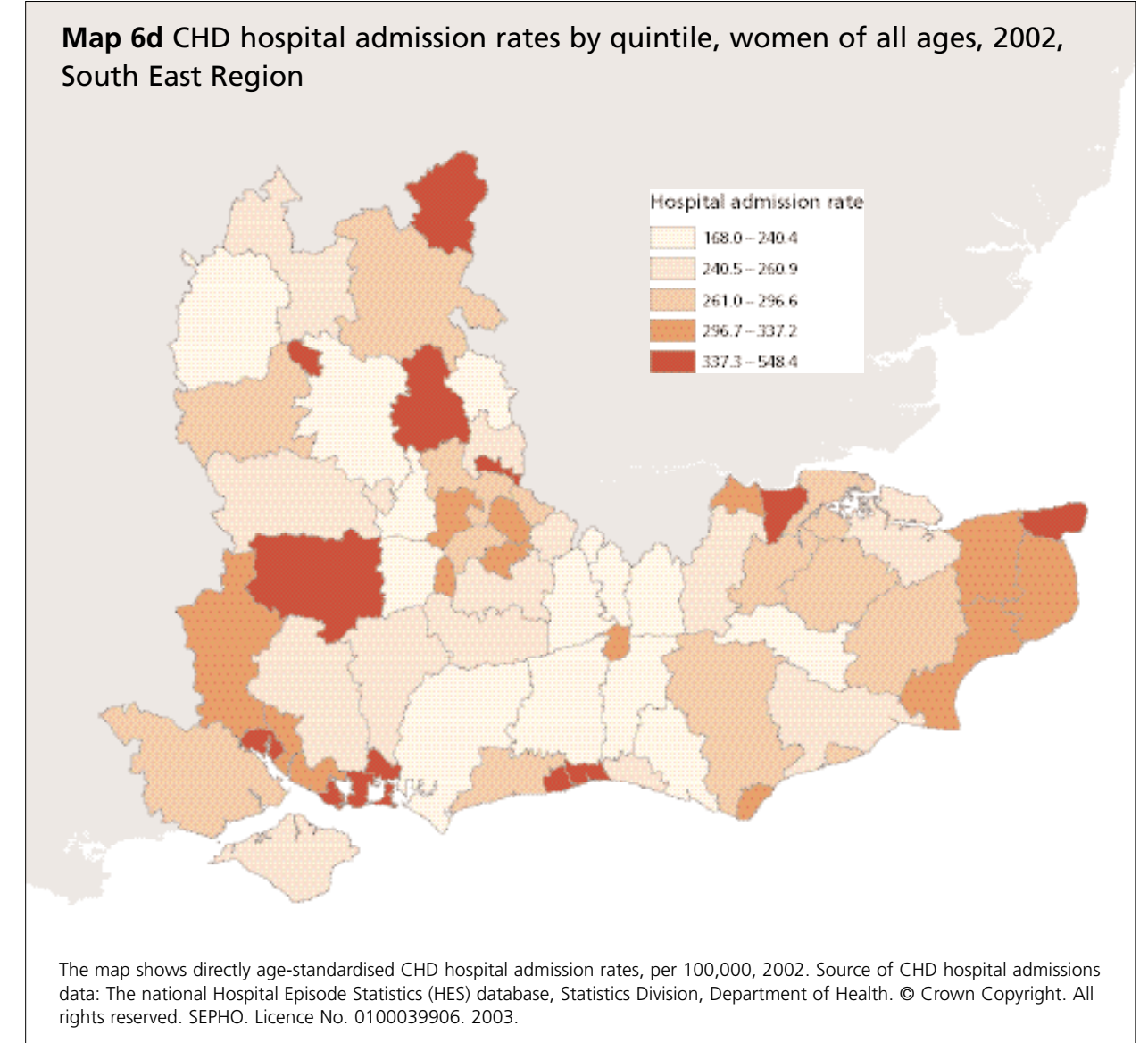
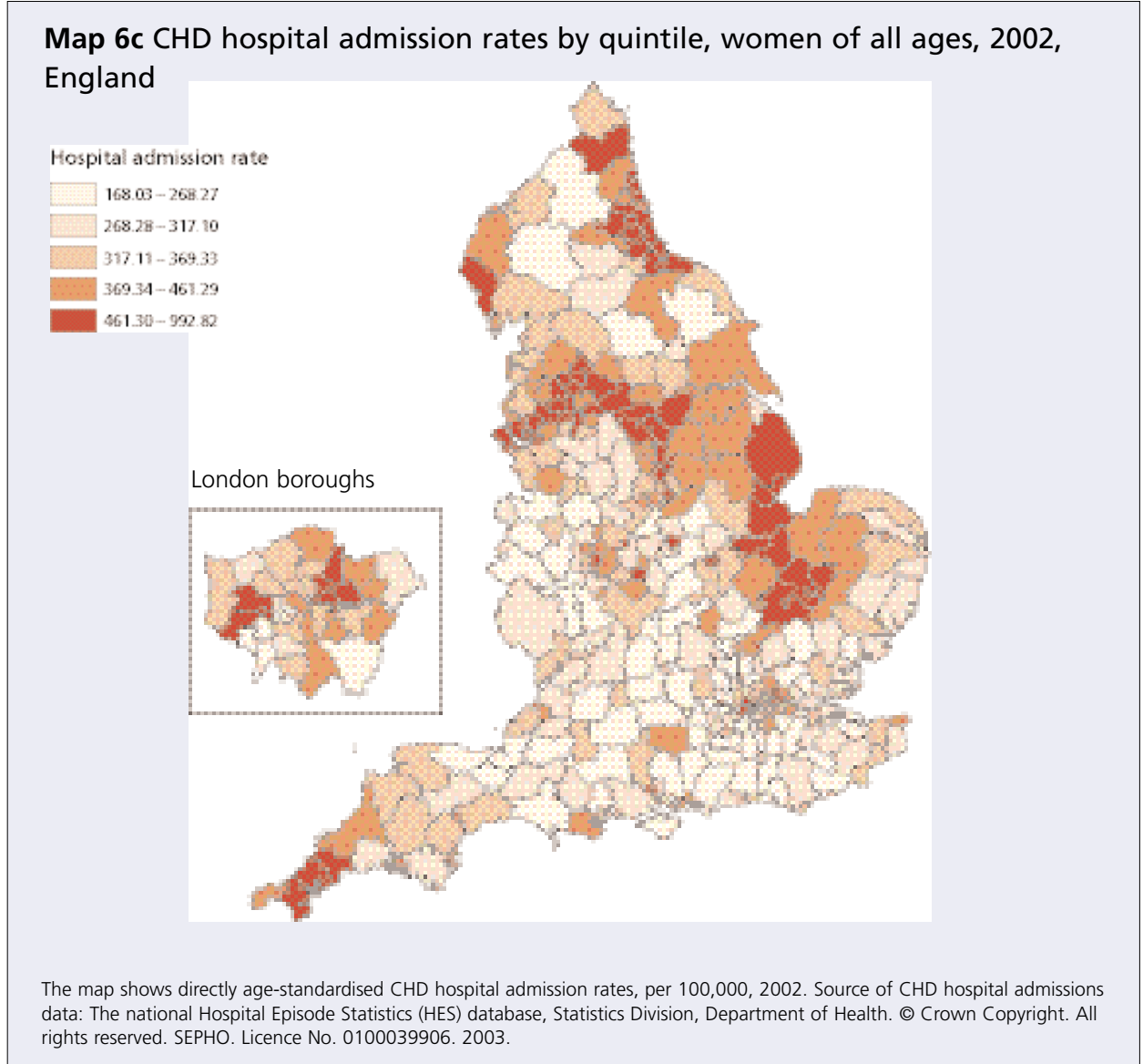
**Map 6b** CHD hospital admission rates by quintile, men of all ages, 2002, South East Region



The map shows directly age-standardised CHD hospital admission rates, per 100,000, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.



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**Table 1** Hospital admissions for CHD, 2000 to 2002, England

	2000			2001			2002		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
<b>CHD</b>	231,329	129,140	360,469	239,659	133,353	373,102	245,939	136,086	382,025
<b>Acute myocardial infarction</b>	56,266	33,647	89,913	57,327	34,167	91,494	59,401	36,225	95,626

Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health.

High CHD hospital admission rates for men and women are found predominantly in the areas of high male and female CHD mortality rates. However, there are some exceptions to this; for example, high male and female CHD hospital admission rates are also found in the local authorities in and around Cambridge, which have low male and female CHD mortality rates. CHD admission rates do not always correlate very closely with CHD mortality rates because whereas mortality statistics can be assumed to identify all deaths certified with CHD as the underlying cause, hospital admission statistics only identify the people with symptoms or signs of CHD who have had a hospital admission in that particular year, and clinical thresholds for admission of people with CHD to hospital vary geographically. Another explanation of why admission rates may not invariably correlate closely

with mortality rates is the differential use of private hospital care across the country.

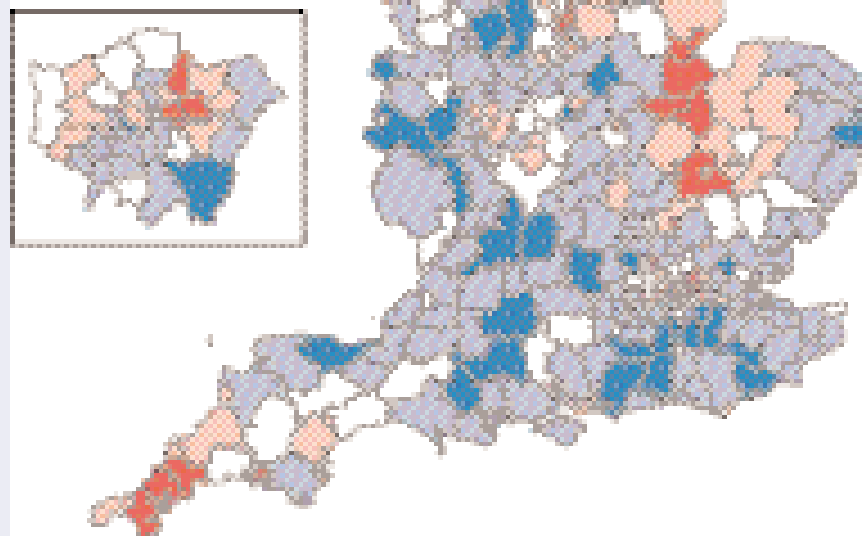
The patterns shown in Maps 6a -6d are confirmed by maps of statistical significance of the CHD hospital admission rates for men and women in relation to the average for England (Maps 7a - 7d). Map 7b shows that the rates of CHD hospital admissions are predominantly significantly low in the South East Region, as would be expected in light of the predominantly low male CHD mortality rates that occur in the region. The three local authorities in the South East Region with significantly high CHD mortality rates - Slough, Southampton and Portsmouth - have correspondingly significantly high rates of male CHD hospital admissions. CHD hospital admission rates among women in local authorities in the South East are also predominantly significantly low in relation to the average for England.

**Map 7a** Statistical significance of CHD hospital admission rates, men of all ages, 2002, England

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth

London boroughs

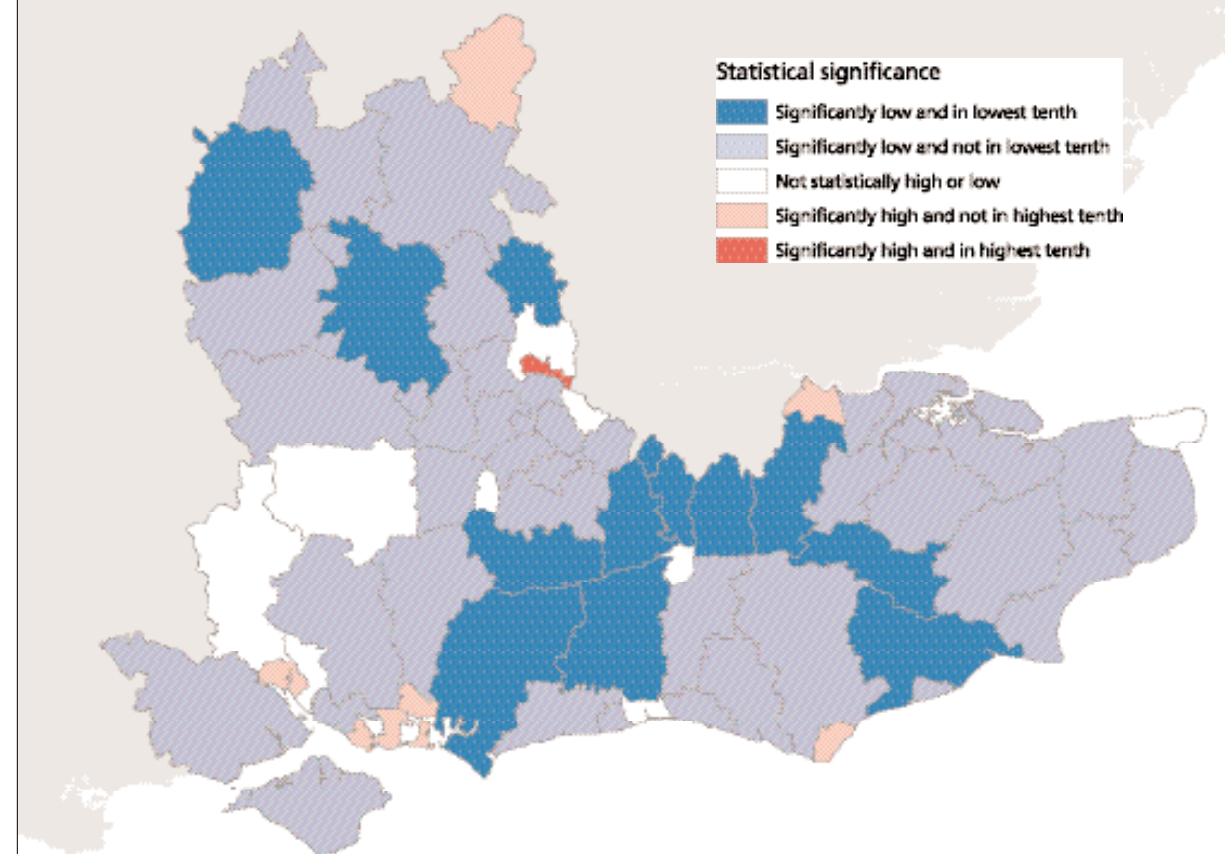


The map shows the statistical significance of directly age-standardised CHD hospital admission rates, 2002 Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

**Map 7b** Statistical significance of CHD hospital admission rates, men of all ages, 2002, South East Region

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth



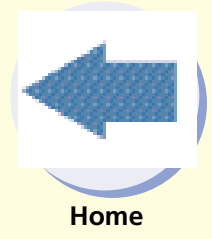
The map shows the statistical significance of directly age-standardised CHD hospital admission rates, 2002 Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.



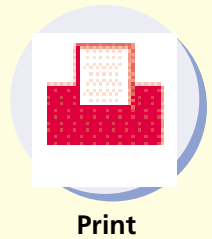
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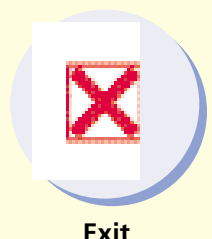
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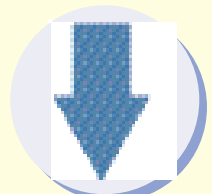
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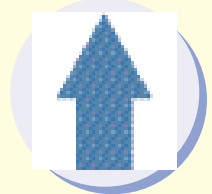
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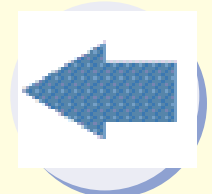
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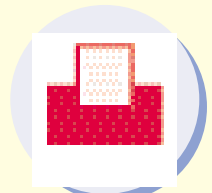
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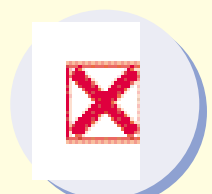
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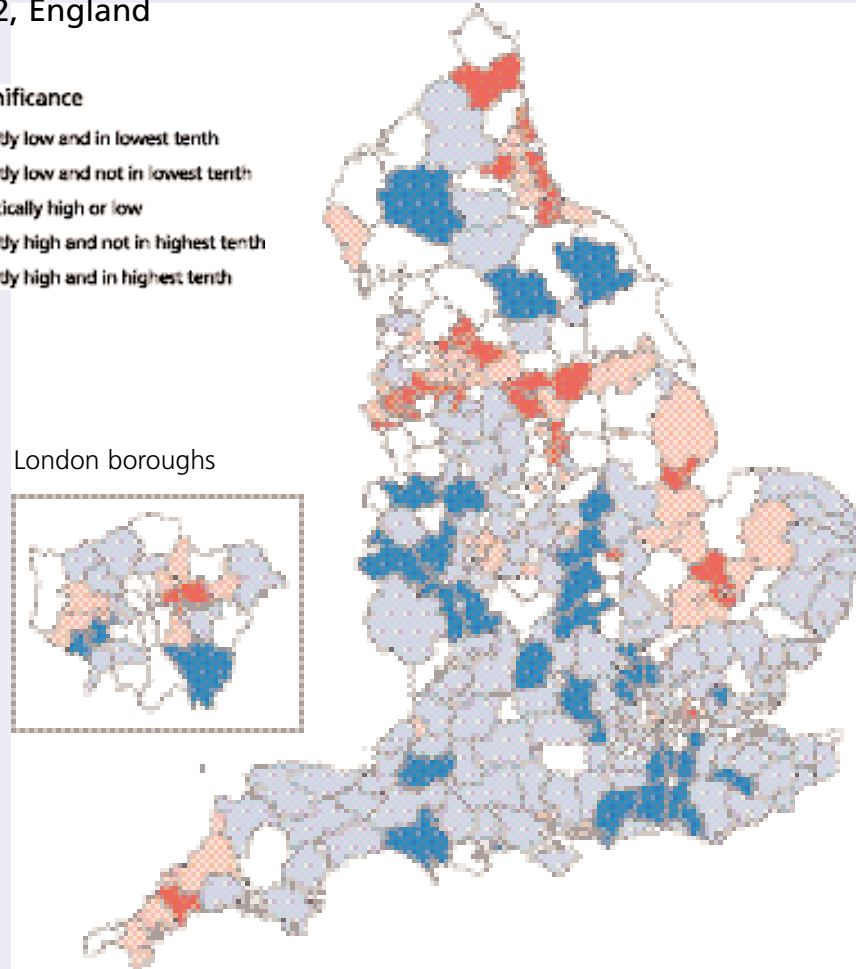
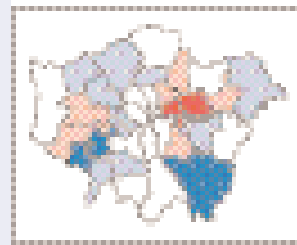
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**Map 7c** Statistical significance of CHD hospital admission rates, women of all ages, 2002, England

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth

London boroughs

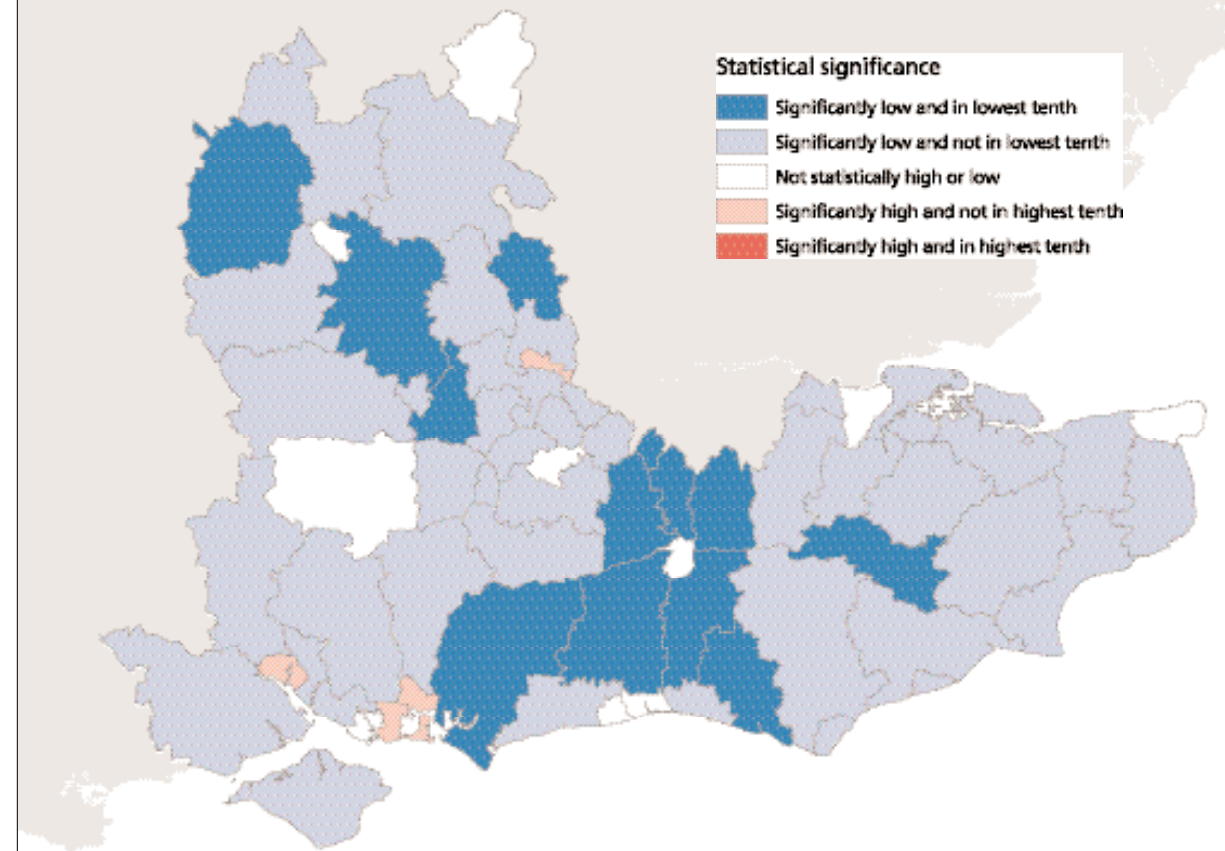


The map shows the statistical significance of directly age-standardised CHD hospital admission rates, 2002 Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

**Map 7d** Statistical significance of CHD hospital admission rates, women of all ages, 2002, South East Region

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth



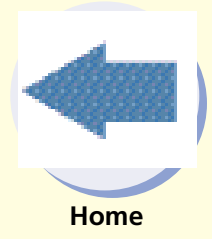
The map shows the statistical significance of directly age-standardised CHD hospital admission rates, 2002 Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.



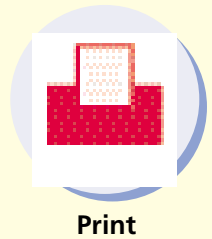
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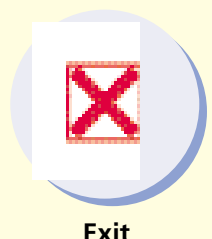
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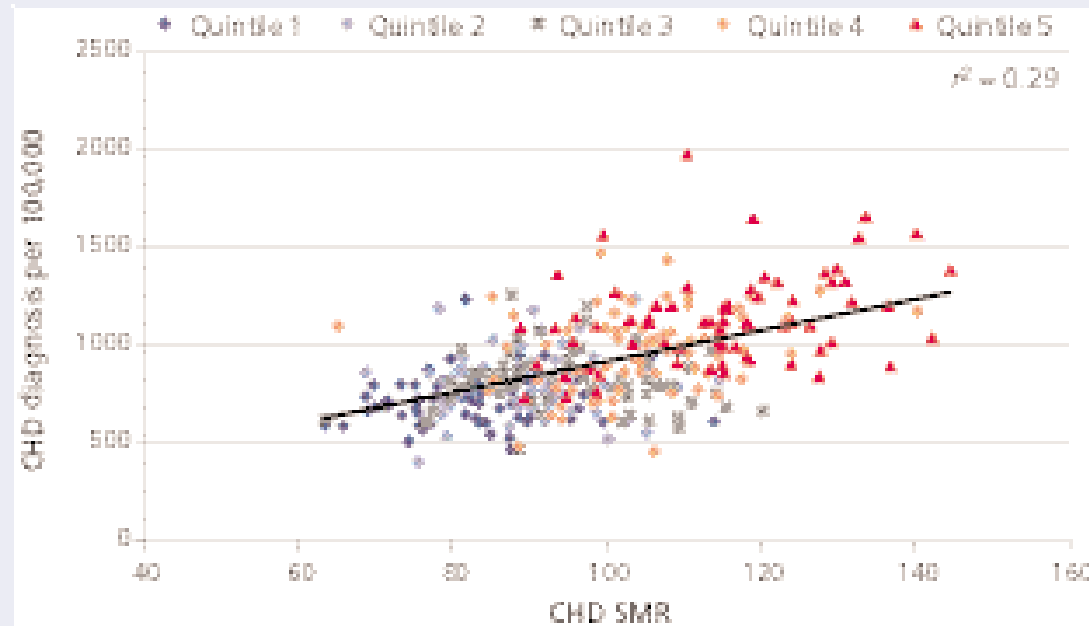


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**Figure 5a** CHD hospital admission rates, 2002, against CHD mortality (SMRs), 1998–2000, for men of all ages by local authority (IMD quintiles); England

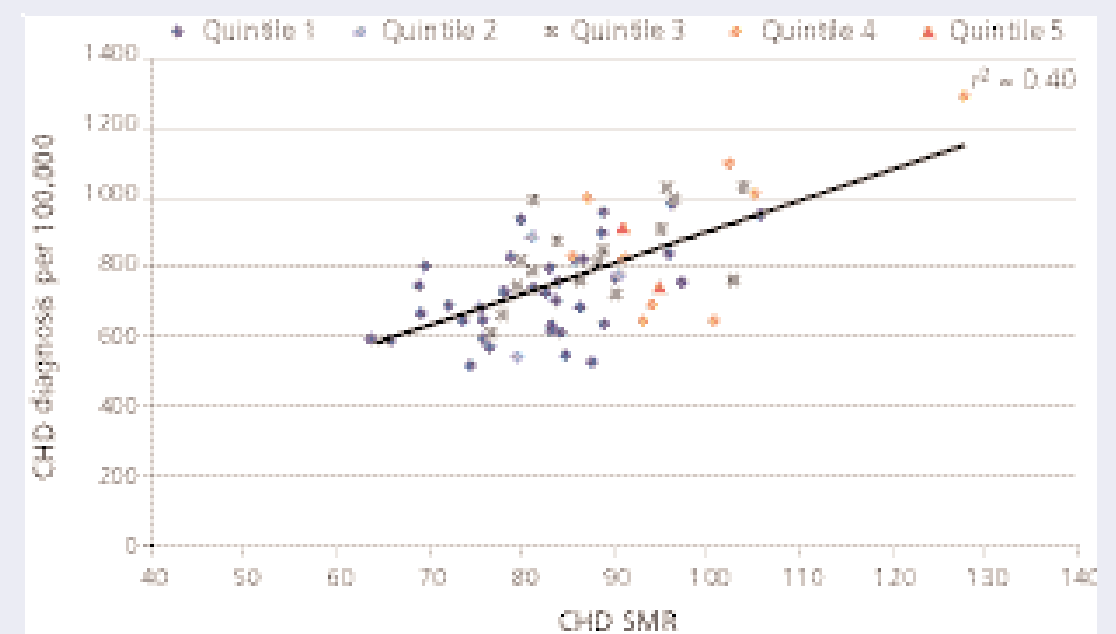


Data are directly age-standardised CHD hospital admission rates for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, by local authority (IMD quintiles). Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

**CHD admission and socio-economic variables**

Figures 5a and 5b confirm a close correlation between male CHD mortality and CHD hospital admission rates by local authority in both England ( $r^2 = 0.29$ ) and the South East ( $r^2 = 0.40$ ). In these figures, the local authority data have also been classified by IMD 2000 quintiles. This shows that local authorities in quintiles 1 and

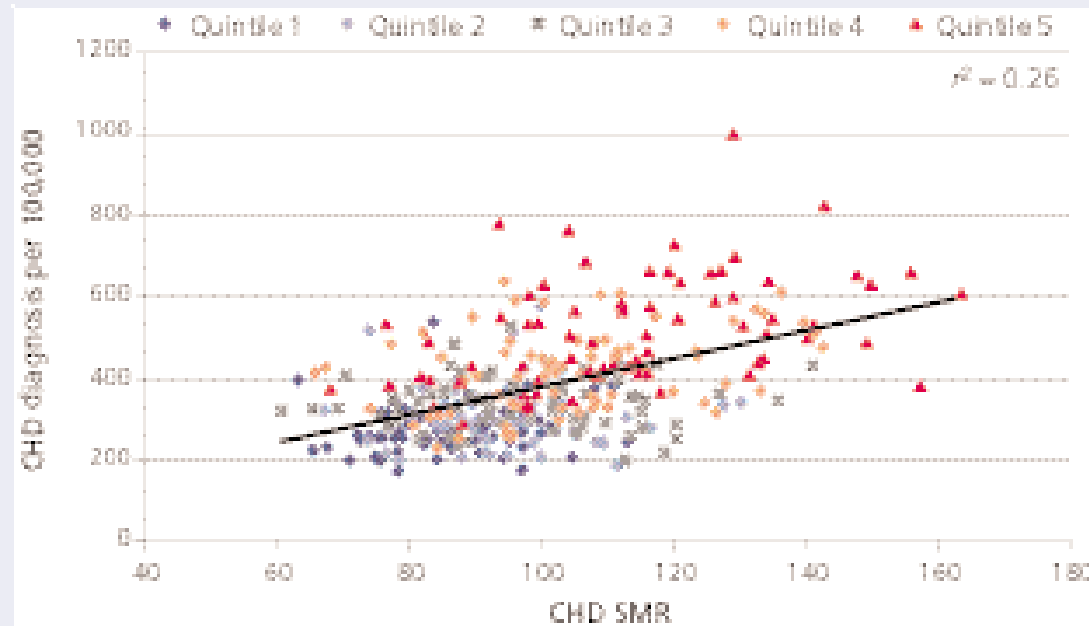
**Figure 5b** CHD hospital admission rates, 2002, against CHD mortality (SMRs), 1998–2000, for men of all ages by local authority (IMD quintiles); South East Region



Data are directly age-standardised CHD hospital admission rates for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, by local authority (IMD quintiles). Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

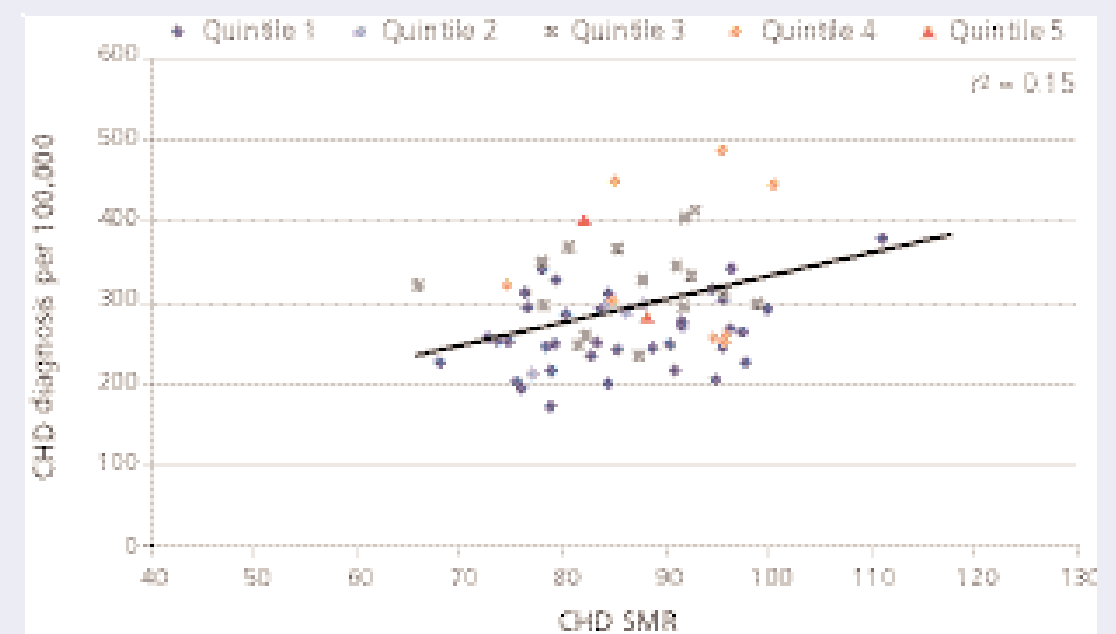
2, with the lowest deprivation, also have the lowest male CHD mortality and hospital admission rates. Conversely, those local authorities with the highest deprivation, in quintiles 4 and 5, also have the highest male CHD mortality and hospital admission rates. Thus, there is a clear relationship of increasing male CHD mortality and hospital admission rates with increasing IMD 2000 score.

**Figure 5c** CHD hospital admission rates, 2002, against CHD mortality (SMRs), 1998–2000, for women of all ages by local authority (IMD quintiles); England



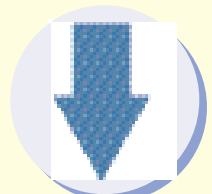
Data are directly age-standardised CHD hospital admission rates for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, by local authority (IMD quintiles). Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

**Figure 5d** CHD hospital admission rates, 2002, against CHD mortality (SMRs), 1998–2000, for women of all ages by local authority (IMD quintiles); South East Region

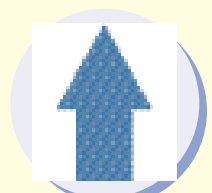


Data are directly age-standardised CHD hospital admission rates for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, by local authority (IMD quintiles). Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

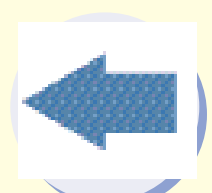
Figures 5c and 5d show the corresponding data for women in England and the South East, respectively. These again confirm a close correlation between female CHD mortality and CHD hospital admission rates by local authority in England ( $r^2 = 0.26$ ), though this correlation is weaker for the South East ( $r^2 = 0.15$ ).



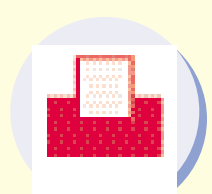
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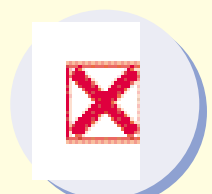
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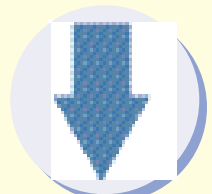
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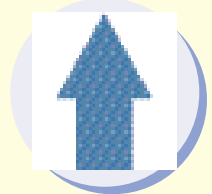
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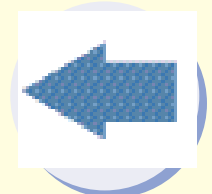
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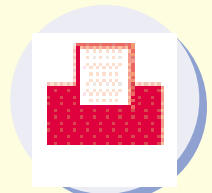
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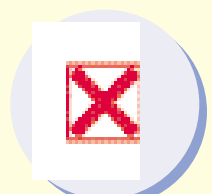
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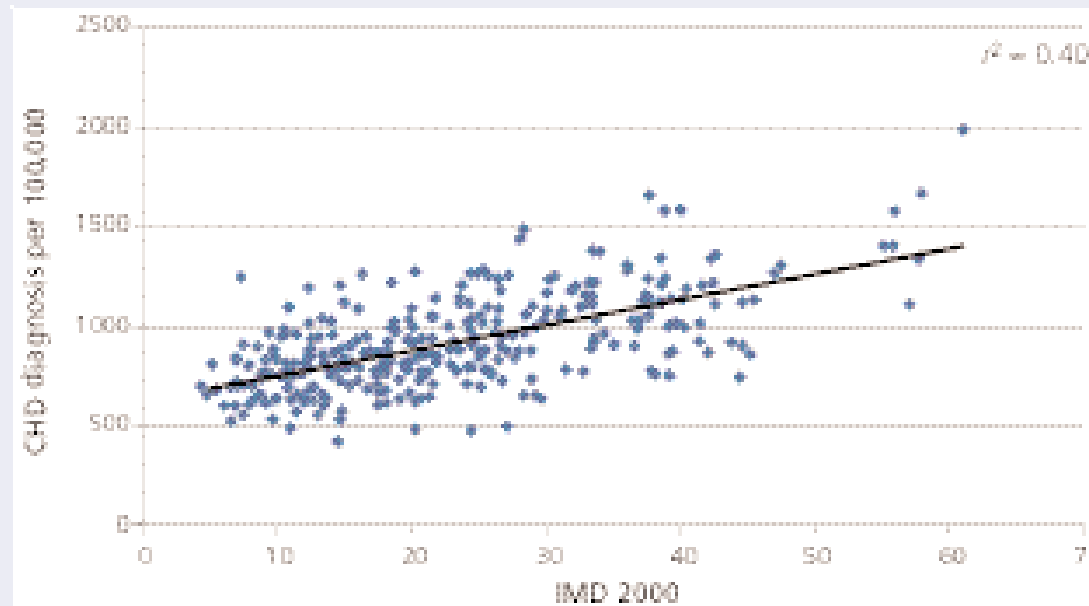


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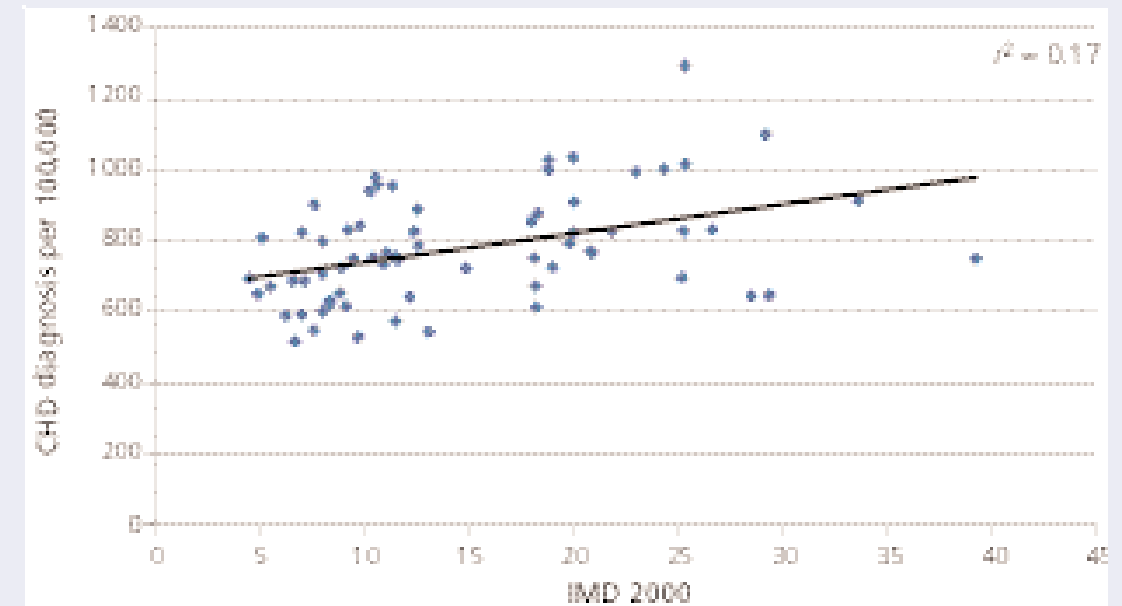
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**Figure 6a** CHD hospital admission rates, 2002, for men of all ages, against socio-economic status by local authority; England



Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

**Figure 6b** CHD hospital admission rates, 2002, for men of all ages against socio-economic status by local authority; South East Region

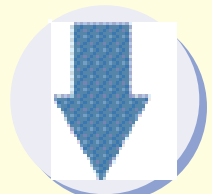


Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

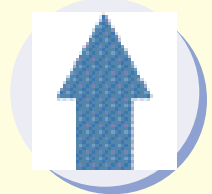
Figures 6a-6d show the correlations between CHD hospital admission rates and socio-economic status, as indicated by IMD 2000 score. The analysis confirms a strong correlation between these variables in men and women of all ages for local authorities in England (Figure 6a;  $r^2 = 0.40$  and Figure 6c;  $r^2 = 0.51$ , respectively). However, this correlation is weaker for men and women in local authorities in the South East Region (Figure 6b,  $r^2 = 0.17$  and Figure 6d,  $r^2 = 0.29$ , respectively). The reasons for these differences between England and the South East may be complex,

and would require detailed investigation at a local level involving the statistics of private sector hospital care, which are currently unavailable.

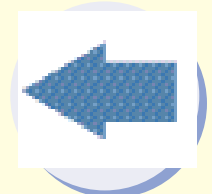
An analysis of the rates of hospital CHD admission in relation to the social class of the head of household by local authority (for social classes I and II) again showed good correlations for England as a whole and the South East Region for both men (Figure 6e;  $r^2 = 0.34$  and Figure 6f;  $r^2 = 0.38$ , respectively) and women (Figure 6g;  $r^2 = 0.44$  and Figure 6h;  $r^2 = 0.41$ , respectively).



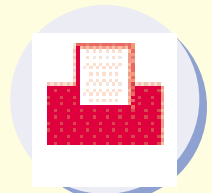
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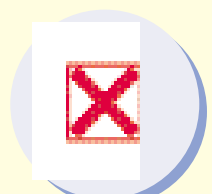
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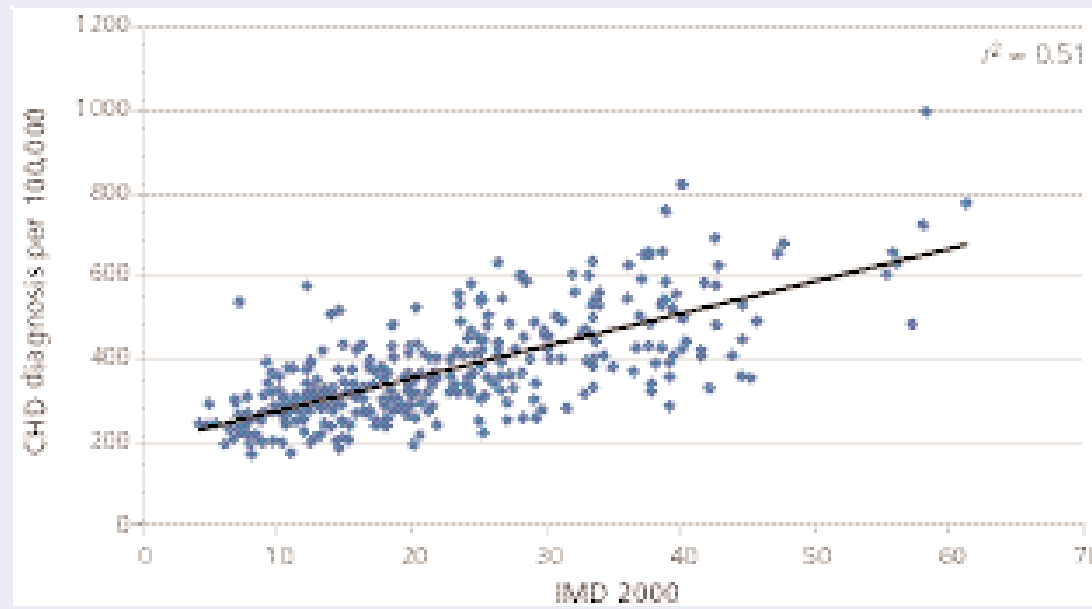


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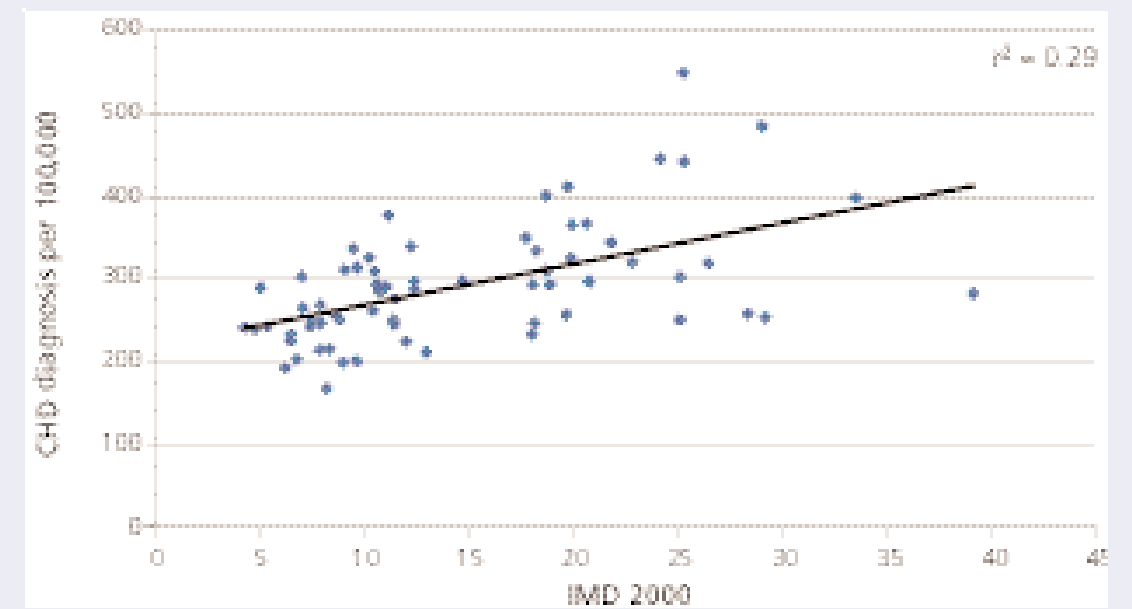
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**Figure 6c** CHD hospital admission rates, 2002, for women of all ages, against socio-economic status by local authority; England

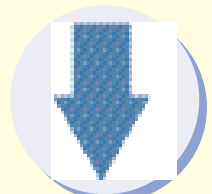


Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

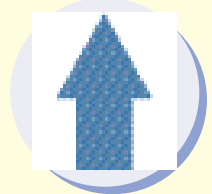
**Figure 6d** CHD hospital admission rates, 2002, for women of all ages against socio-economic status, by local authority; South East Region



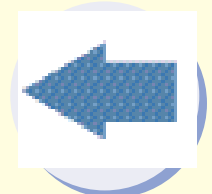
Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.



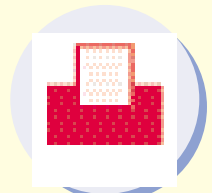
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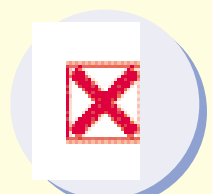
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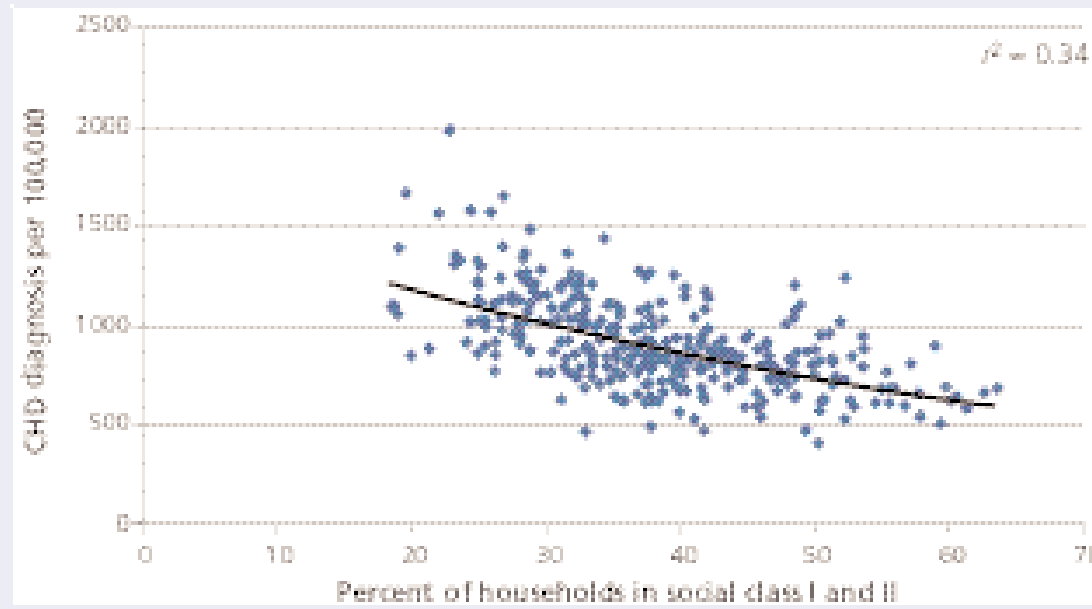


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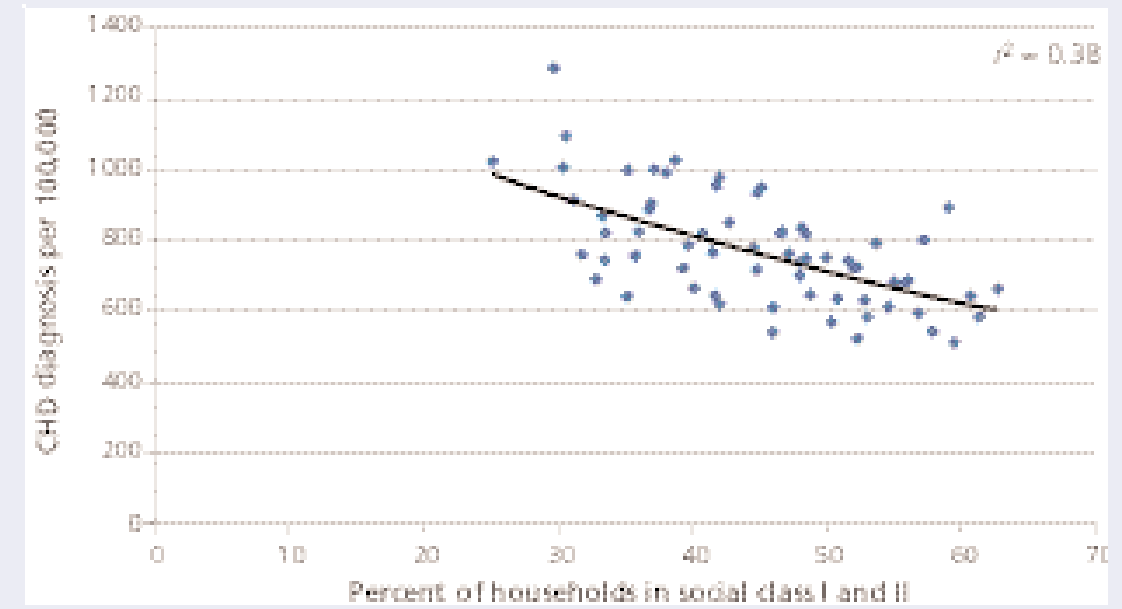
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**Figure 6e** CHD hospital admission rates, 2002, for men of all ages, against percent of households in social classes I and II; England

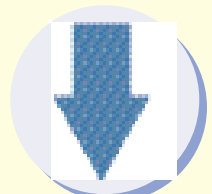


Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright

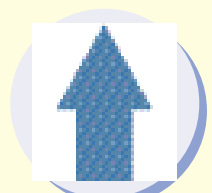
**Figure 6f** CHD hospital admission rates, 2002, for men of all ages, against percent of households in social classes I and II; South East Region



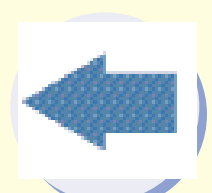
Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright



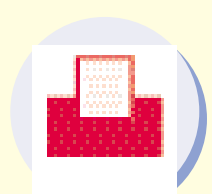
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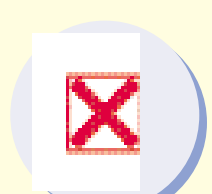
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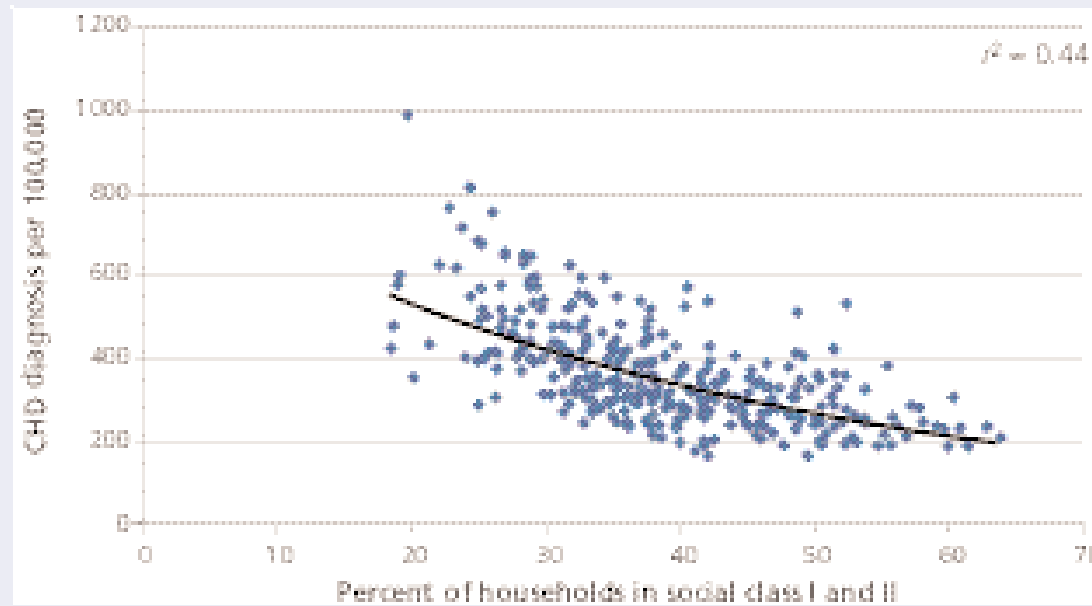


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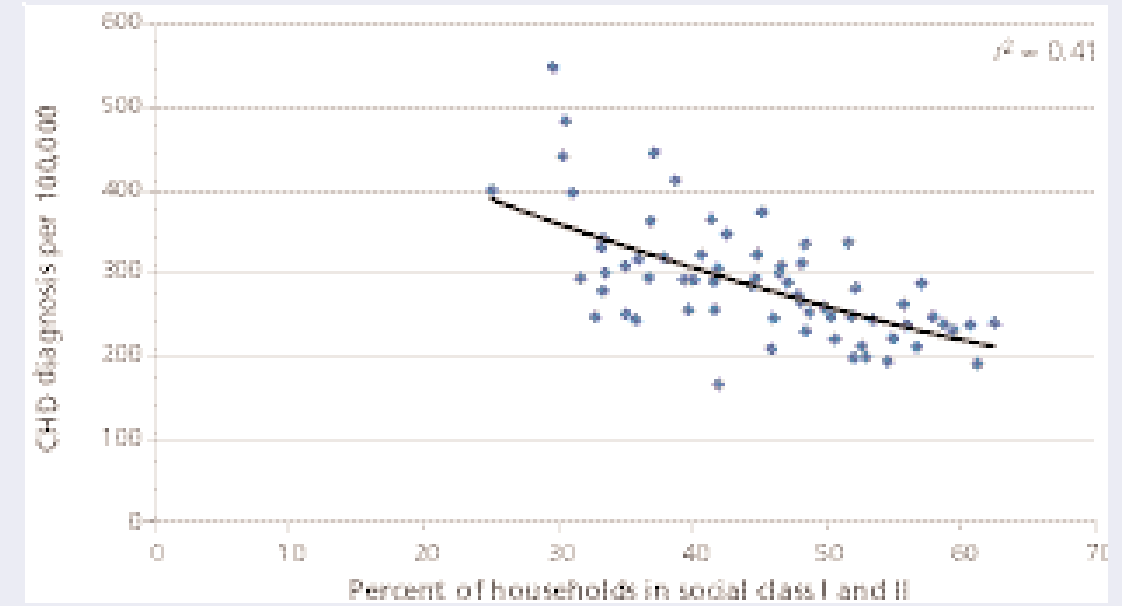
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**Figure 6g** CHD hospital admission rates, 2002, for women of all ages, against percent of households in social classes I and II; England



Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright

**Figure 6h** CHD hospital admission rates, 2002, for women of all ages, against percent of households in social classes I and II; South East Region



Data are directly age-standardised CHD hospital admission rates, 2002. Source of CHD hospital admissions data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright

## Coronary revascularisation procedures

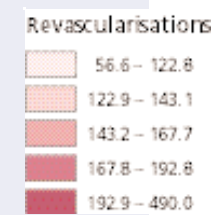
Table 2 (see next page) shows the total number of coronary revascularisation procedures carried out over 1999–2002 in England. The number of CABG procedures rose slightly over this three-year period, from 24,844 to 26,048 (4.8%), whilst the number of PTCA procedures rose markedly, from 24,273 to 32,099 (32%). The lower proportion of revascularisations carried out in women in comparison with men is consistent with the lower burden of heart disease in women.

Maps 8a and 8b give the coronary revascularisation rates for men of all ages by local authority in England and the South East Region, respectively. Map 8a shows a greater than six-fold difference between the lowest and highest coronary revascularisation rates in men by local authority, which vary from 57 per 100,000 on

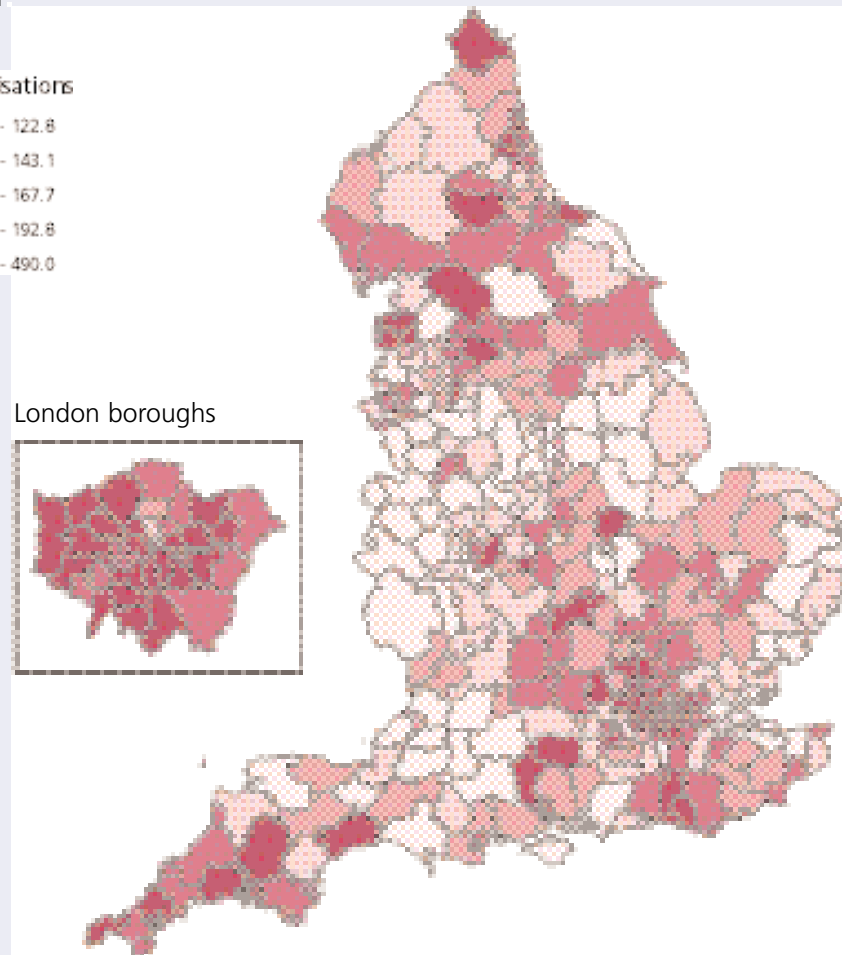
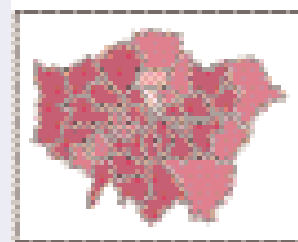
the Isle of Wight to 342 per 100,000 in Watford. High rates of revascularisation are observed particularly in the London boroughs, parts of the South East Region and in the North East and North West Regions, whilst low rates are concentrated in the Midlands; rates are otherwise fairly evenly spread. Similarly, the map of coronary revascularisation rates in men by local authority in the South East Region (Map 8b) shows an almost five-fold difference in the rates, from 57 per 100,000 in the Isle of Wight to 264 per 100,000 in Slough.

Maps 8c and 8d show the corresponding data for revascularisation rates in women in England and the South East, respectively. A similar geographic pattern to that for men is observed, though the rates for women are lower, ranging from 20.9 per 100,000 in the Isle of Wight to 280 per 100,000 in the City of London.

**Map 8a** Coronary revascularisation rates by quintile, men of all ages, 2002, England

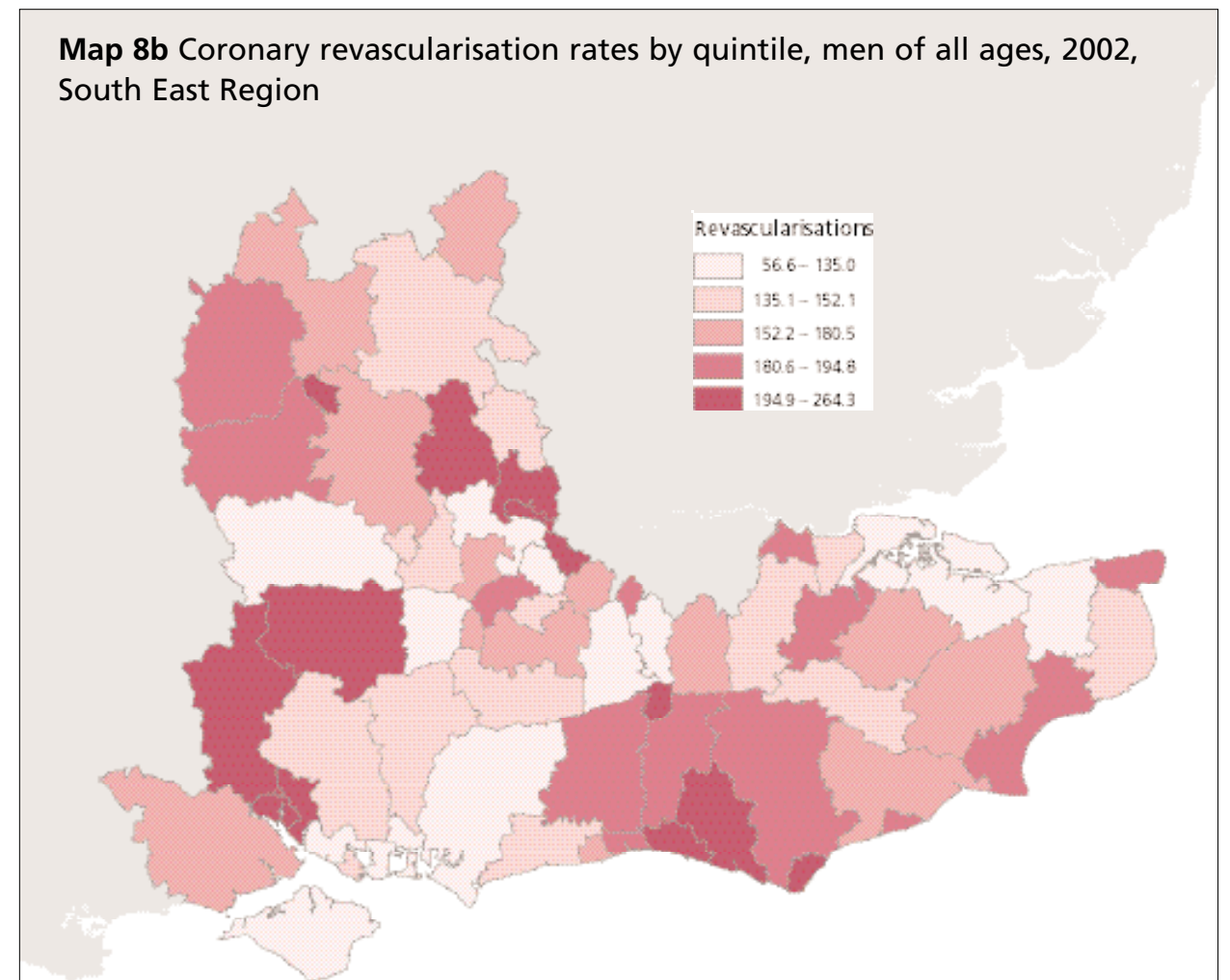
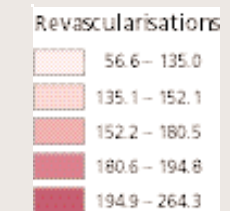


London boroughs



The map shows directly age-standardised CHD coronary revascularisation rates, per 100,000, 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

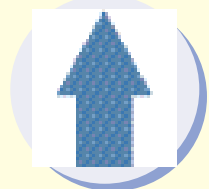
**Map 8b** Coronary revascularisation rates by quintile, men of all ages, 2002, South East Region



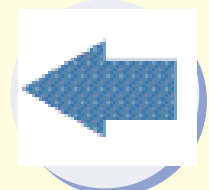
The map shows directly age-standardised CHD coronary revascularisation rates, per 100,000, 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.



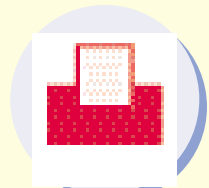
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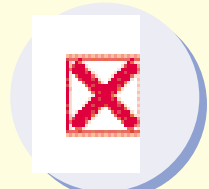
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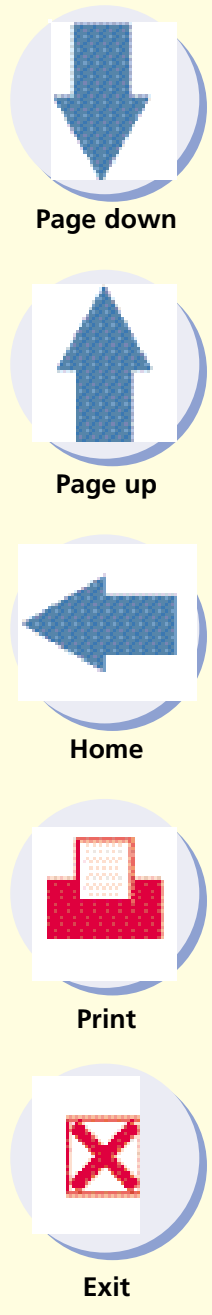
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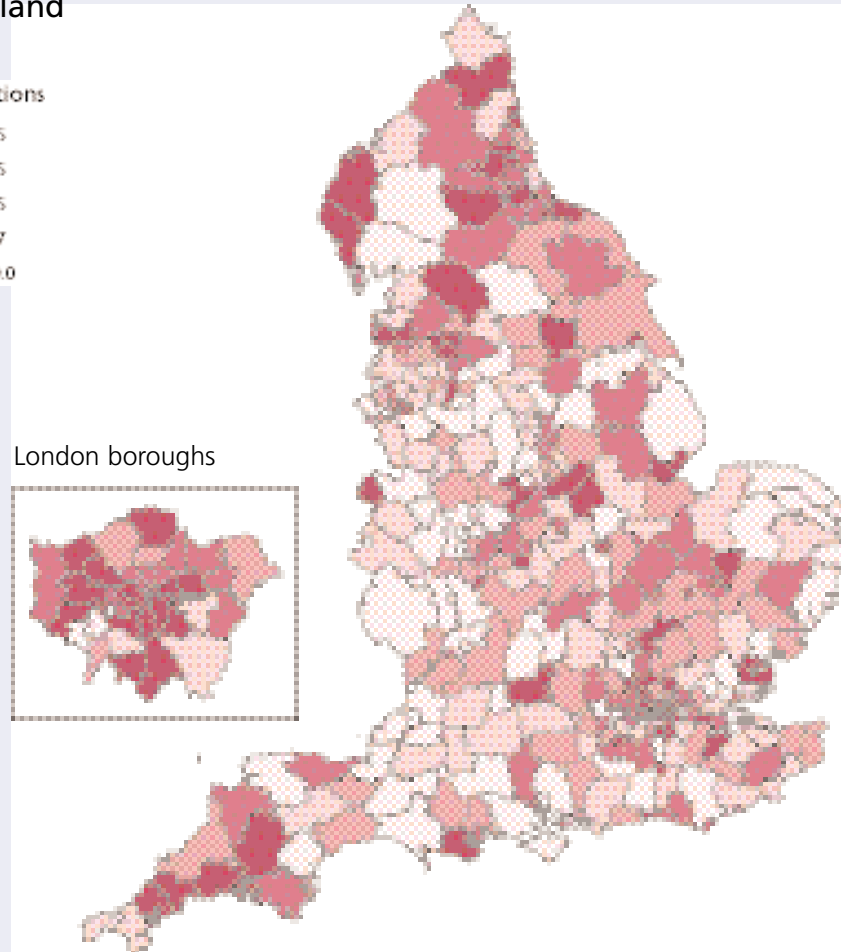
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**Map 8c** Coronary revascularisation rates by quintile, women of all ages, 2002, England

Revascularisations

- 20.9 – 42.5
- 42.6 – 50.6
- 50.7 – 57.6
- 57.7 – 67.7
- 67.8 – 280.0



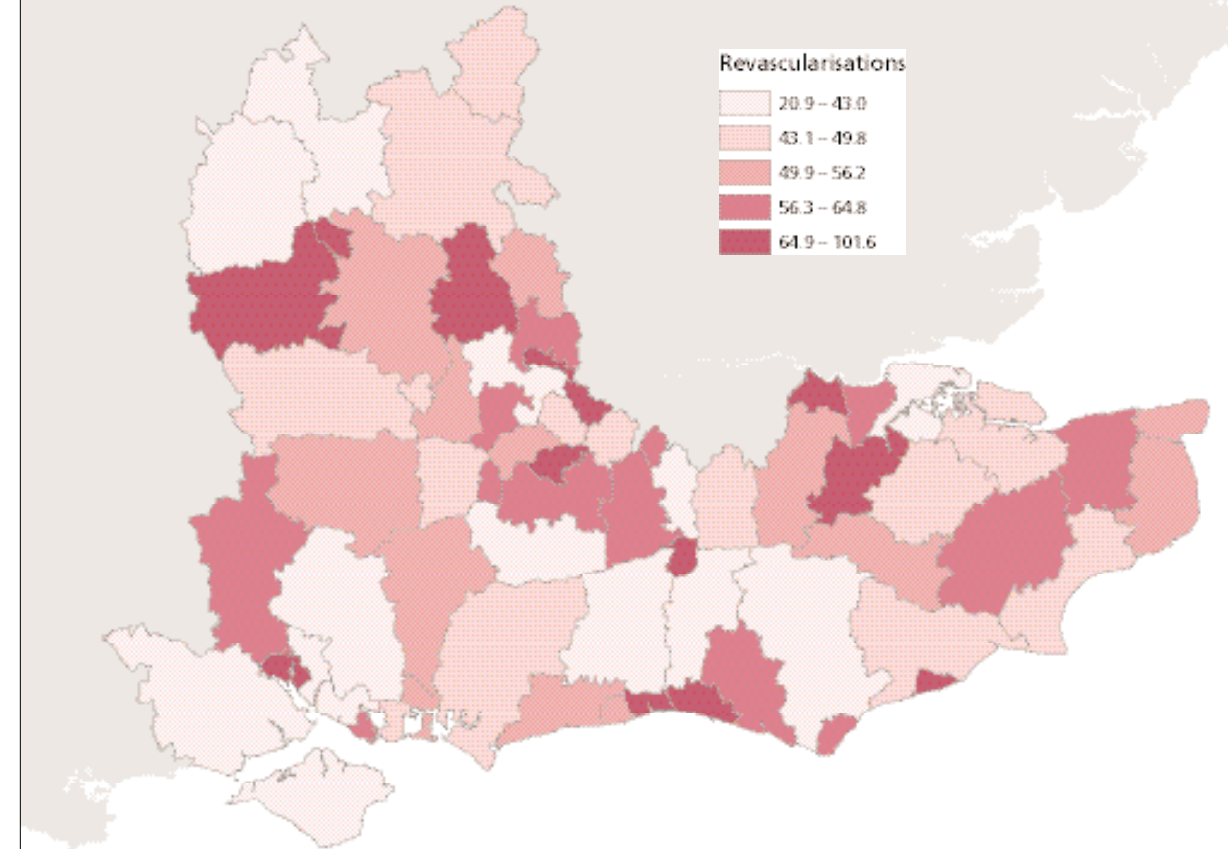
London boroughs

The map shows directly age-standardised CHD coronary revascularisation rates, per 100,000, 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

**Map 8d** Coronary revascularisation rates by quintile, women of all ages, 2002, South East Region

Revascularisations

- 20.9 – 43.0
- 43.1 – 49.8
- 49.9 – 56.2
- 56.3 – 64.8
- 64.9 – 101.6

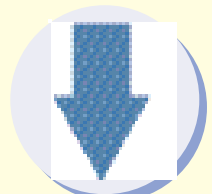
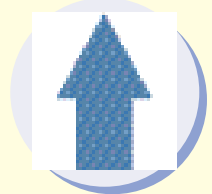
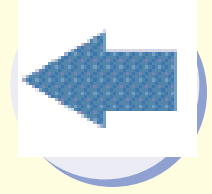
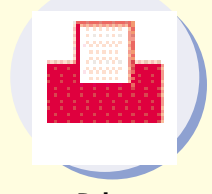
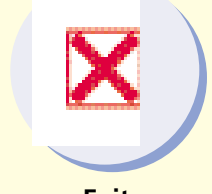


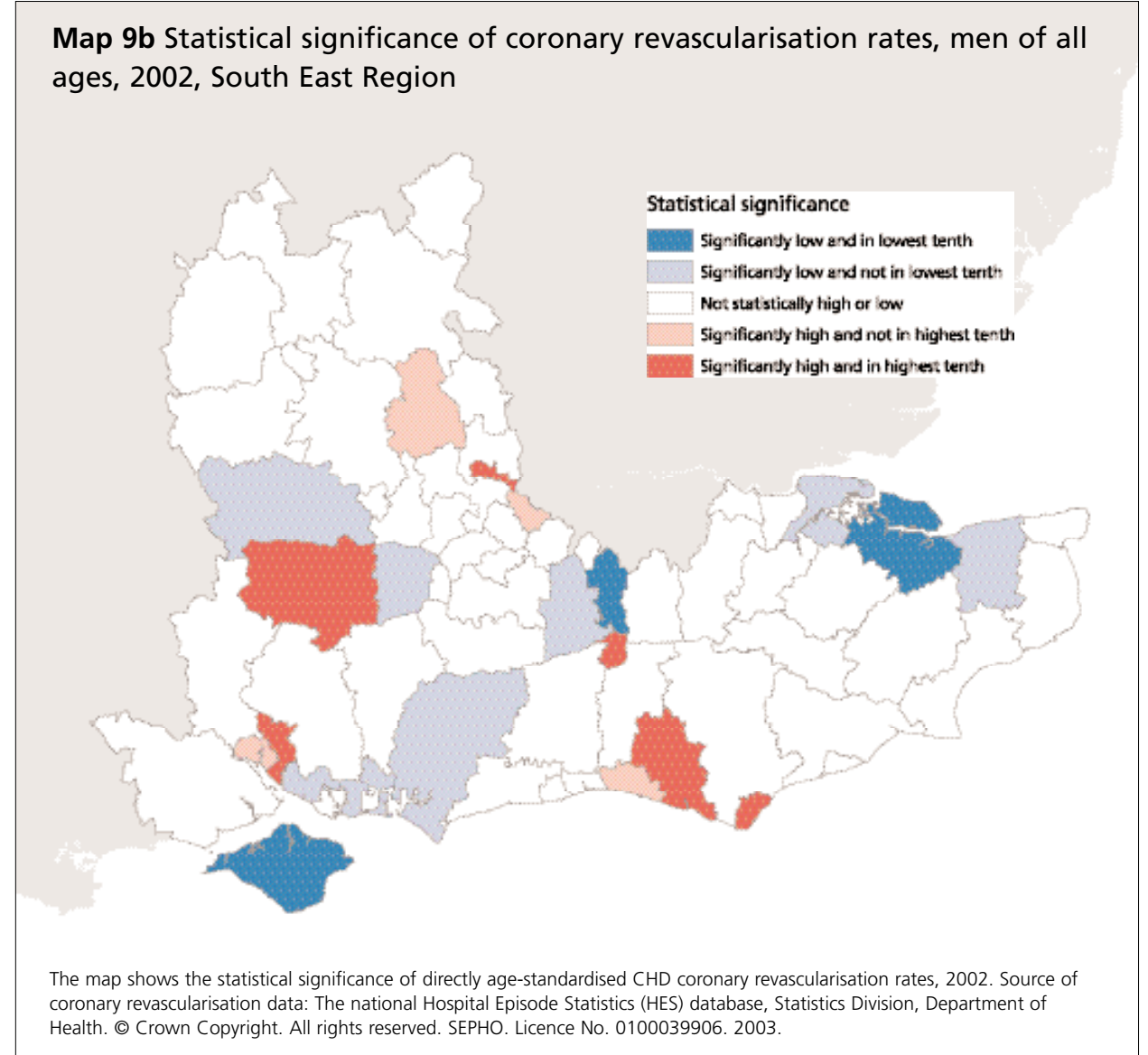
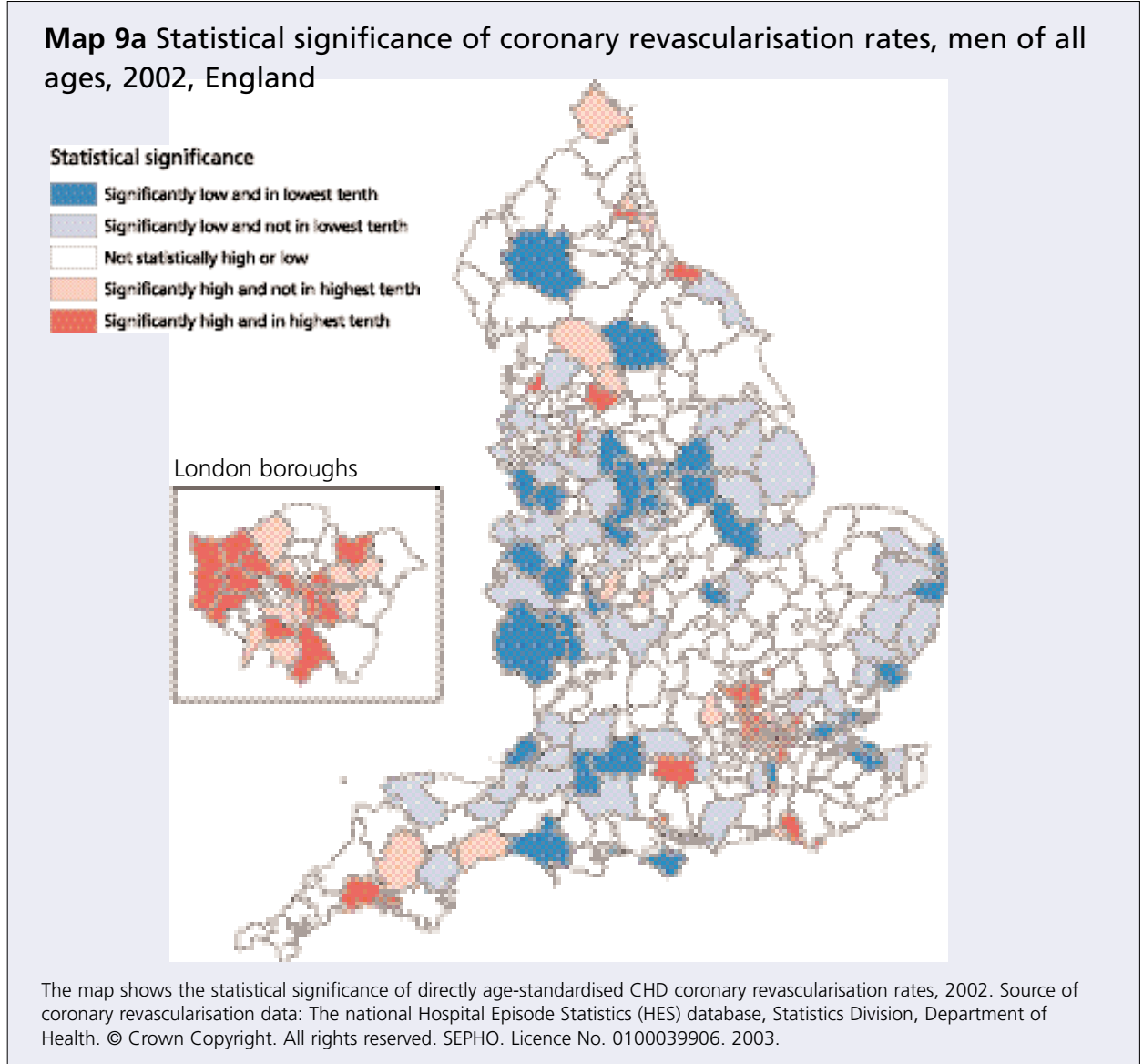
The map shows directly age-standardised CHD coronary revascularisation rates, per 100,000, 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

**Table 2** Coronary revascularisations 2000 to 2002, England

	2000			2001			2002		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
<b>CABG</b>	18,335	6,509	24,844	19,101	6,762	25,863	19,268	6,780	26,048
<b>PTCA</b>	16,816	7,457	24,273	19,112	8,507	27,619	22,614	9,485	32,099
<b>CABG + PTCA</b>	35,151	13,966	49,117	38,213	15,269	53,482	41,882	16,265	58,147

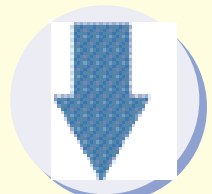
Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health.

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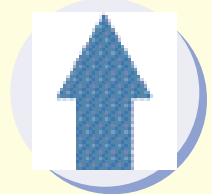


Of particular interest, the distribution of these revascularisation rates shows no clear relationship to either CHD mortality or hospital admission rates. Thus although high rates of revascularisation are observed in the North East and North West, which have predominantly high rates of CHD mortality and hospital admission, high revascularisation rates are also a feature in London and the South East, parts of which have low rates of CHD mortality and hospital admission. The unbalanced pattern of high coronary revascularisation rates in men and women in many local authorities in London and the South East that have low CHD mortality rates may also be compounded by potentially higher levels of revascularisation procedures being carried out privately in these areas.

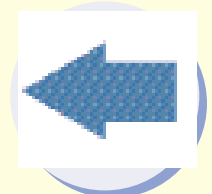
These variable patterns are confirmed by maps showing the statistical significance of the coronary revascularisation rates in men and women for local authorities in England and the South East in relation to the average for England (Maps 9a -9d). Map 9b shows, for example, that significantly high revascularisation rates for men are found in Slough and Southampton, which also have significantly high CHD mortality rates. However, in Portsmouth, the revascularisation rate is significantly low, despite this local authority having a significantly high male CHD mortality rate.



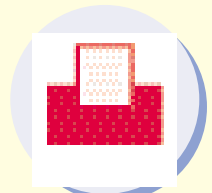
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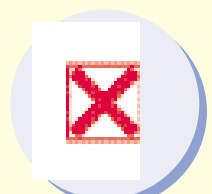
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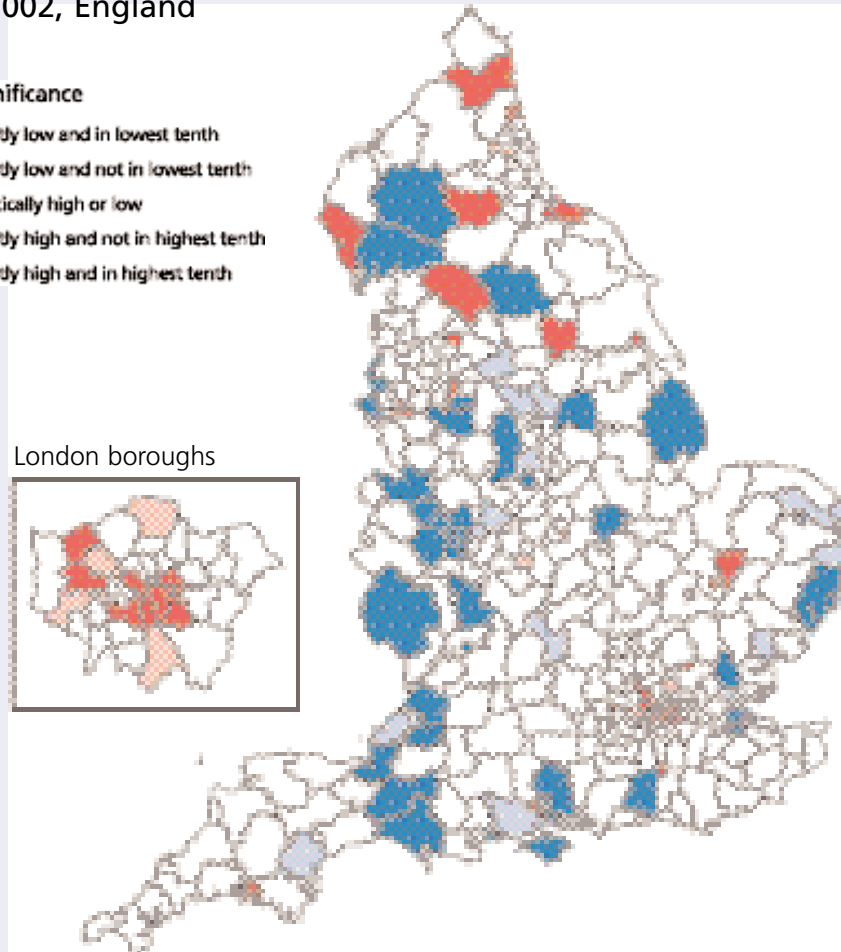
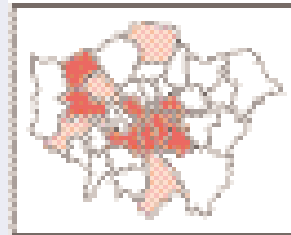
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**Map 9c** Statistical significance of coronary revascularisation rates, women of all ages, 2002, England

**Statistical significance**

- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth

London boroughs

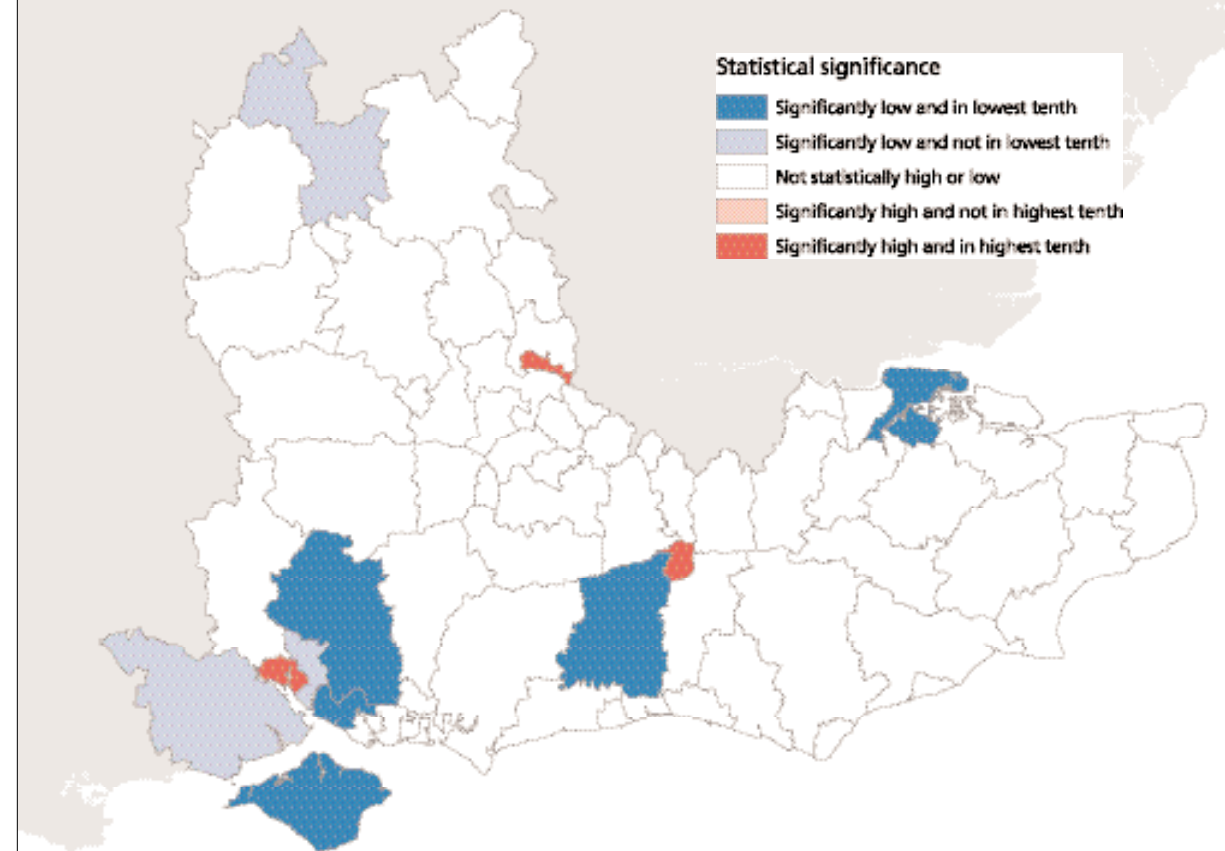


The map shows the statistical significance of directly age-standardised CHD coronary revascularisation rates, 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.

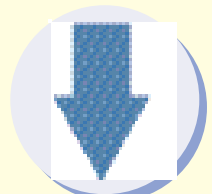
**Map 9d** Statistical significance of coronary revascularisation rates, women of all ages, 2002, South East Region

**Statistical significance**

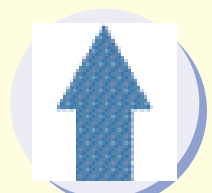
- Significantly low and in lowest tenth
- Significantly low and not in lowest tenth
- Not statistically high or low
- Significantly high and not in highest tenth
- Significantly high and in highest tenth



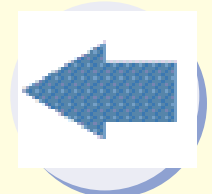
The map shows the statistical significance of directly age-standardised CHD coronary revascularisation rates, 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. © Crown Copyright. All rights reserved. SEPHO. Licence No. 0100039906. 2003.



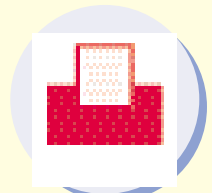
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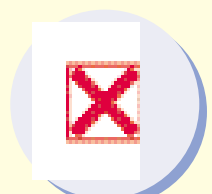
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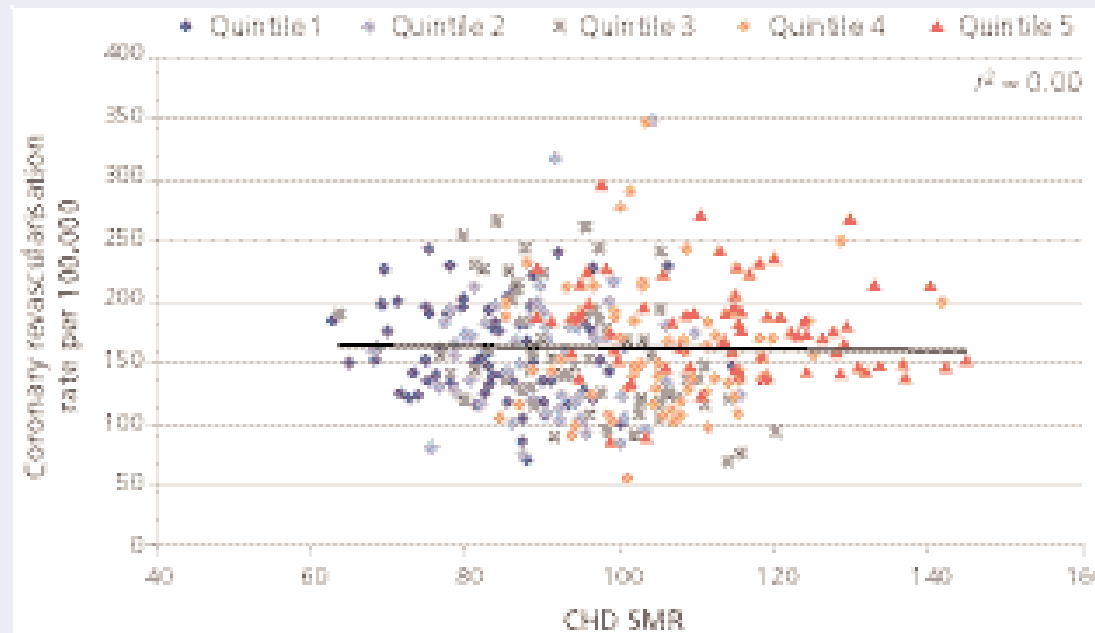


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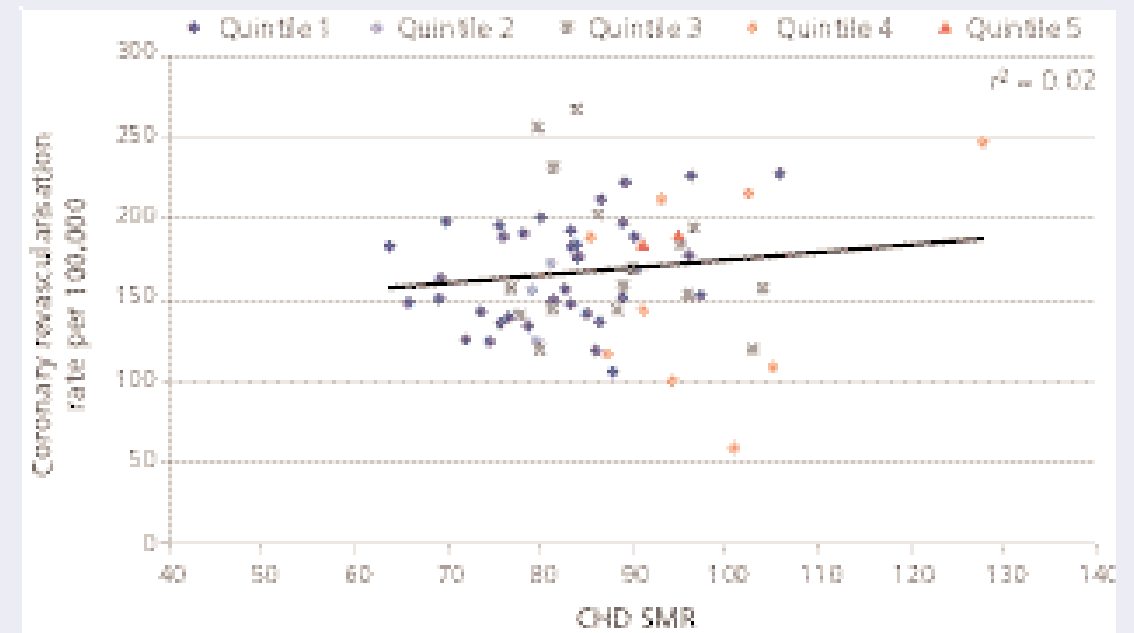
**Figure 7a** Coronary revascularisation rates, 2002, against CHD mortality (SMRs), 1998–2000, for men of all ages by local authority (IMD quintiles); England



Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, for local authorities by IMD 2000 quintiles. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

Figures 7a and 7b confirm a lack of correlation between coronary revascularisation rates in men and male CHD mortality (SMR) for local authorities in England ( $r^2 = 0.00$ ) and the South East ( $r^2 = 0.02$ ). Thus, higher rates of coronary revascularisation procedures in men are not necessarily found in the areas of highest male mortality. Nor is it the case that an inverse care law is operating, with areas of highest CHD mortality receiving the lowest levels of service provision. It appears

**Figure 7b** Coronary revascularisation rates, 2002, against CHD mortality (SMRs), 1998–2000, for men of all ages by local authority (IMD quintiles); South East Region

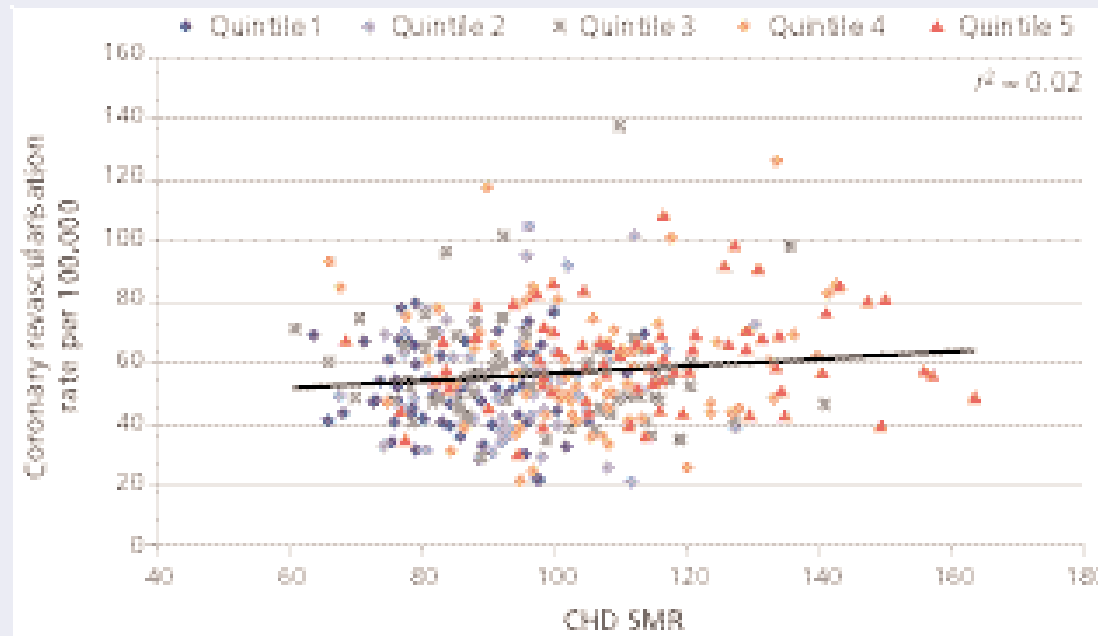


Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, for local authorities by IMD 2000 quintiles. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

simply that there is no correlation between these two variables at local authority level.

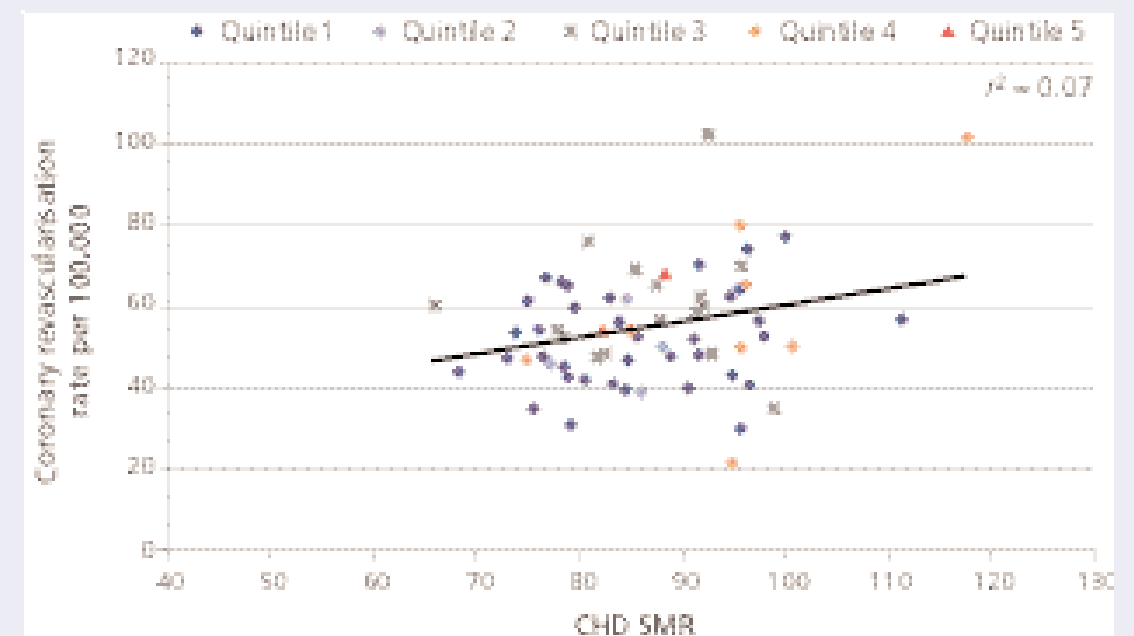
Figures 7c and 7d show the corresponding data for women in England and the South East, respectively. Again, no correlation is observed between coronary revascularisation rates and CHD mortality (SMR) for local authorities in England ( $r^2 = 0.02$ ) or the South East ( $r^2 = 0.07$ ).

**Figure 7c** Coronary revascularisation rates, 2002, against CHD mortality (SMRs), 1998–2000, for women of all ages by local authority (IMD quintiles); England

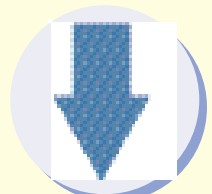


Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, for local authorities by IMD 2000 quintiles. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

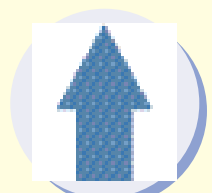
**Figure 7d** Coronary revascularisation rates, 2002, against CHD mortality (SMRs), 1998–2000, for women of all ages by local authority (IMD quintiles); South East Region



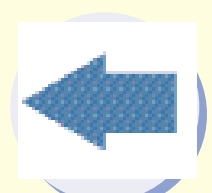
Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) for 2002, and standardised mortality ratios (SMRs), 1998–2000 averaged, for local authorities by IMD 2000 quintiles. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of mortality data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.



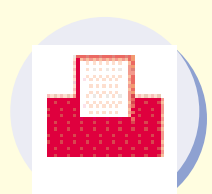
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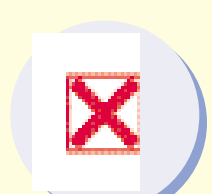
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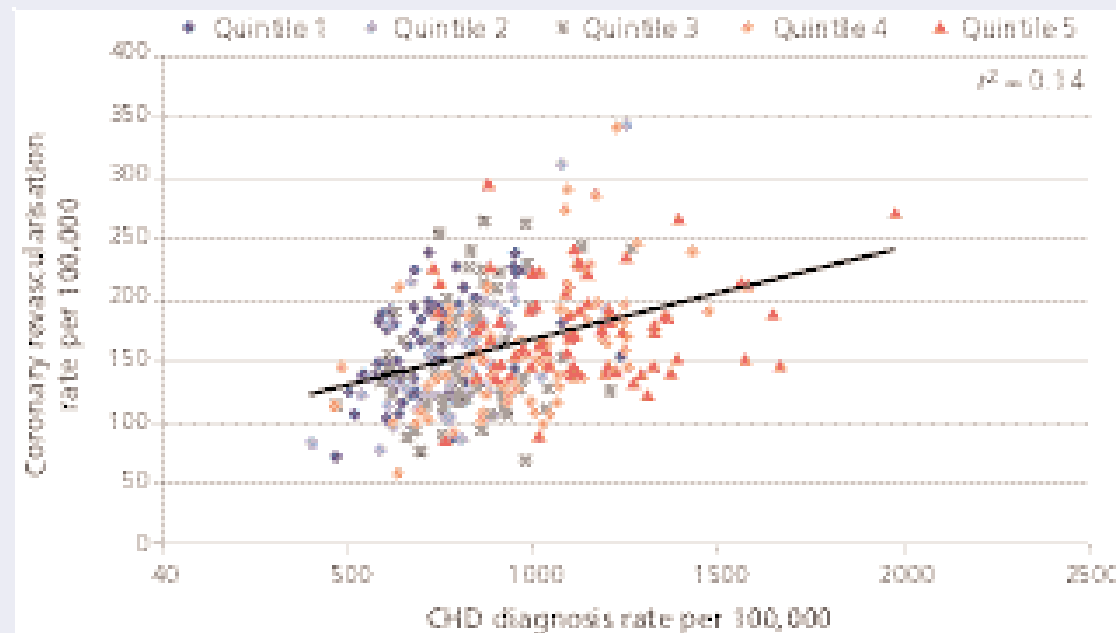


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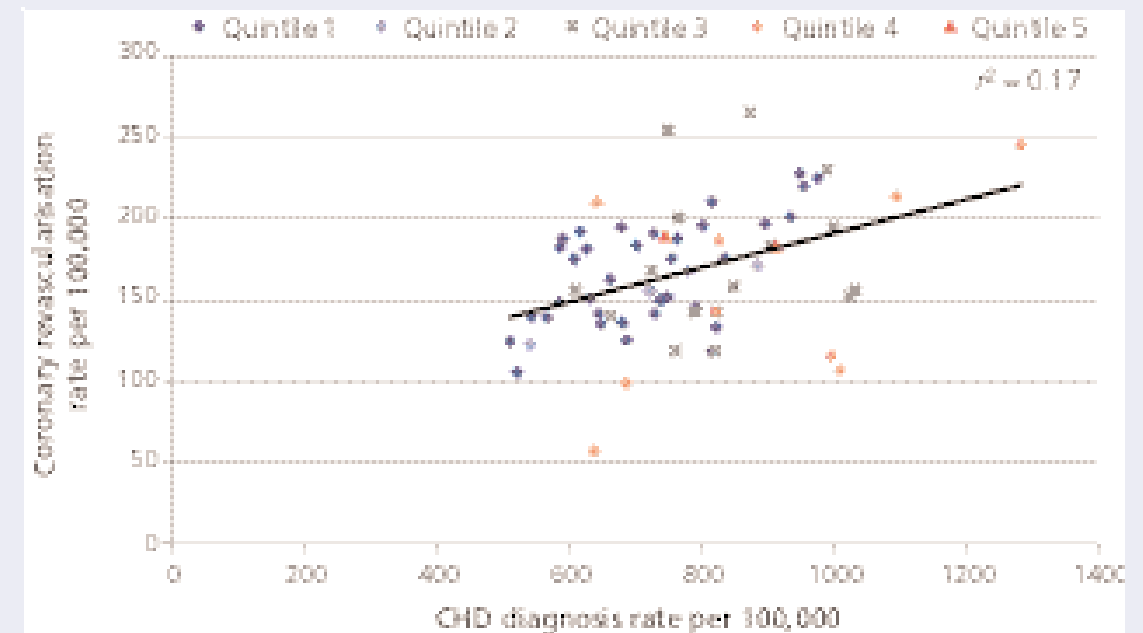
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**Figure 8a** Coronary revascularisation rates, 2002, against CHD hospital admission rates, 2002, for men of all ages by local authority (IMD quintiles); England



Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) and CHD hospital admission rates by IMD quintile, 2002. Source of CHD hospital admission and coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

**Figure 8b** Coronary revascularisation rates, 2002, against CHD hospital admission rates, 2002, for men of all ages by local authority (IMD quintiles); South East Region



Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) and CHD hospital admission rates by IMD quintile, 2002. Source of CHD hospital admission and coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

Figures 8a and 8b show a weak correlation between coronary revascularisation rates in men and CHD hospital admission rates for England ( $r^2 = 0.14$ ) as a whole and the South East Region ( $r^2 = 0.17$ ). Thus, coronary revascularisation rates may be high in areas where CHD hospital admission rates are high or low, and conversely may be low in areas where CHD hospital admission rates are either low or high.

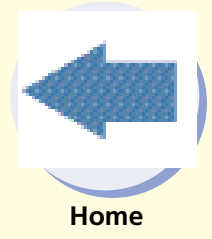
Figures 8c and 8d show the corresponding data for women in England and the South East, respectively. Again, the picture is similar to that for men, with a weak correlation between coronary revascularisation rates and CHD hospital admission rates for England as a whole ( $r^2 = 0.13$ ) and the South East Region ( $r^2 = 0.22$ ).



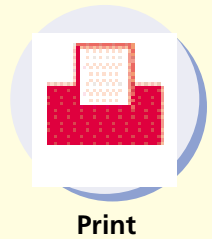
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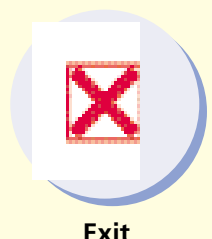
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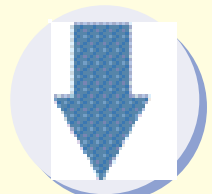
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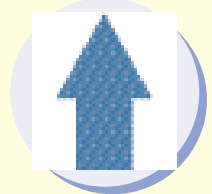
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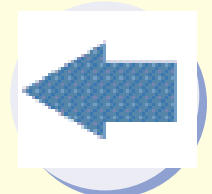
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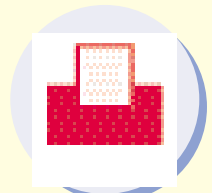
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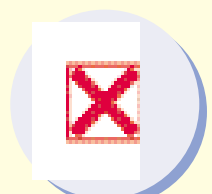
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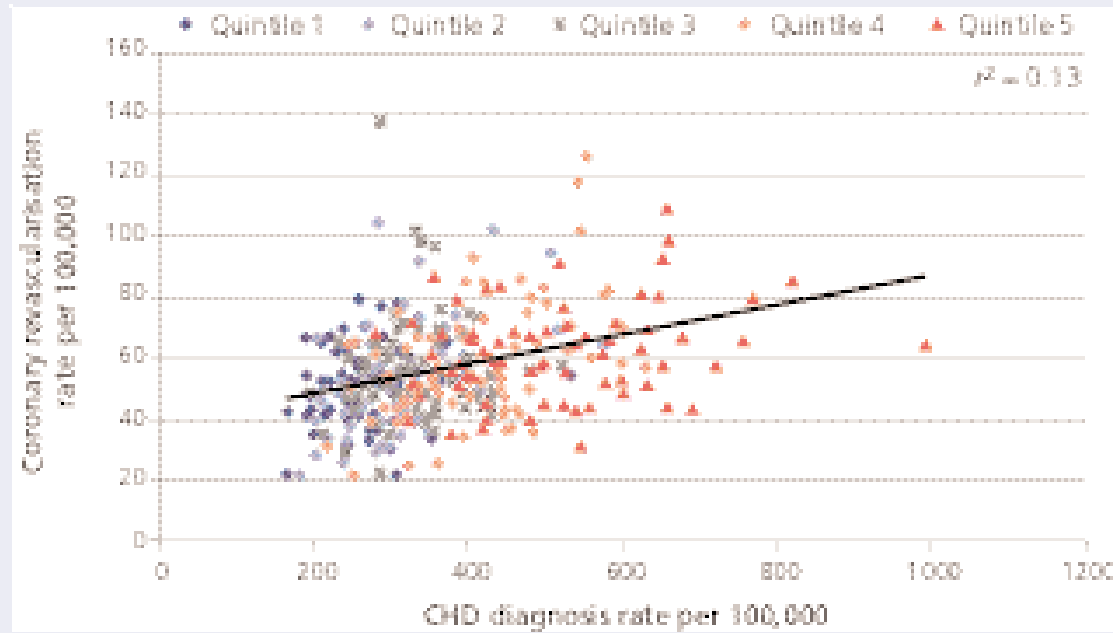


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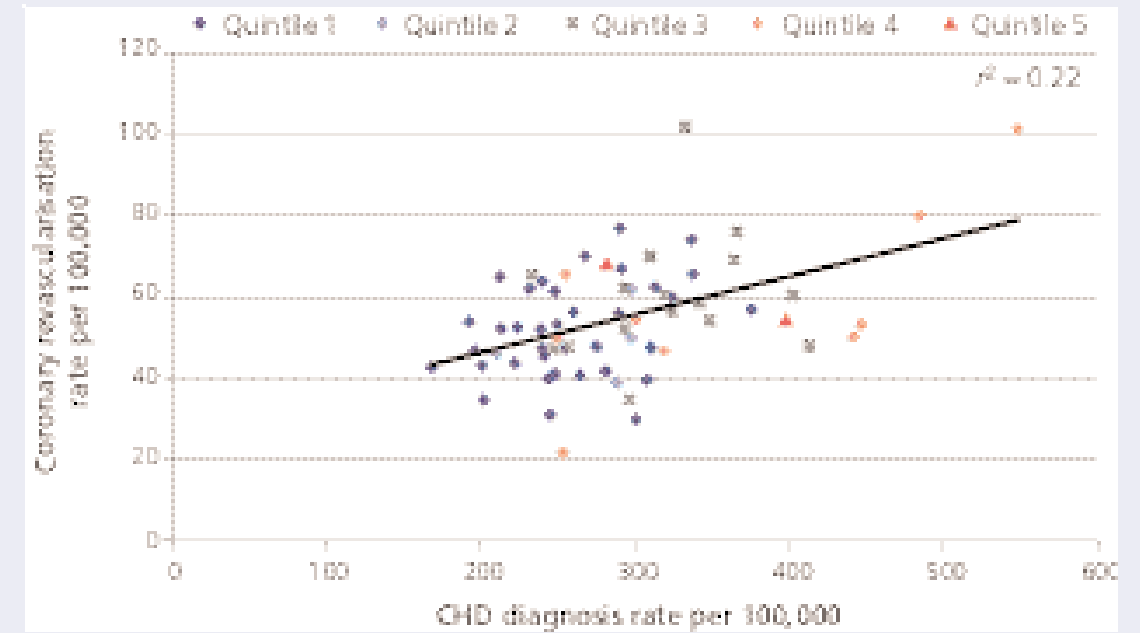
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**Figure 8c** Coronary revascularisation rates, 2002, against CHD hospital admission rates, 2002, for women of all ages by local authority (IMD quintiles); England

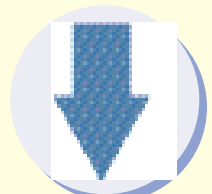


Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) and CHD hospital admission rates by IMD quintile, 2002. Source of CHD hospital admission and coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

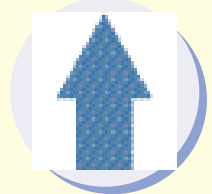
**Figure 8d** Coronary revascularisation rates, 2002, against CHD hospital admission rates, 2002, for women of all ages by local authority (IMD quintiles); South East Region



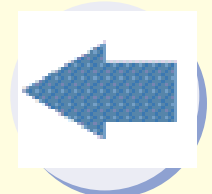
Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA) and CHD hospital admission rates by IMD quintile, 2002. Source of CHD hospital admission and coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.



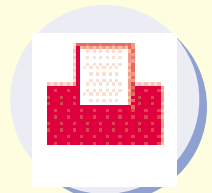
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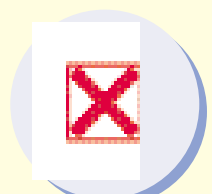
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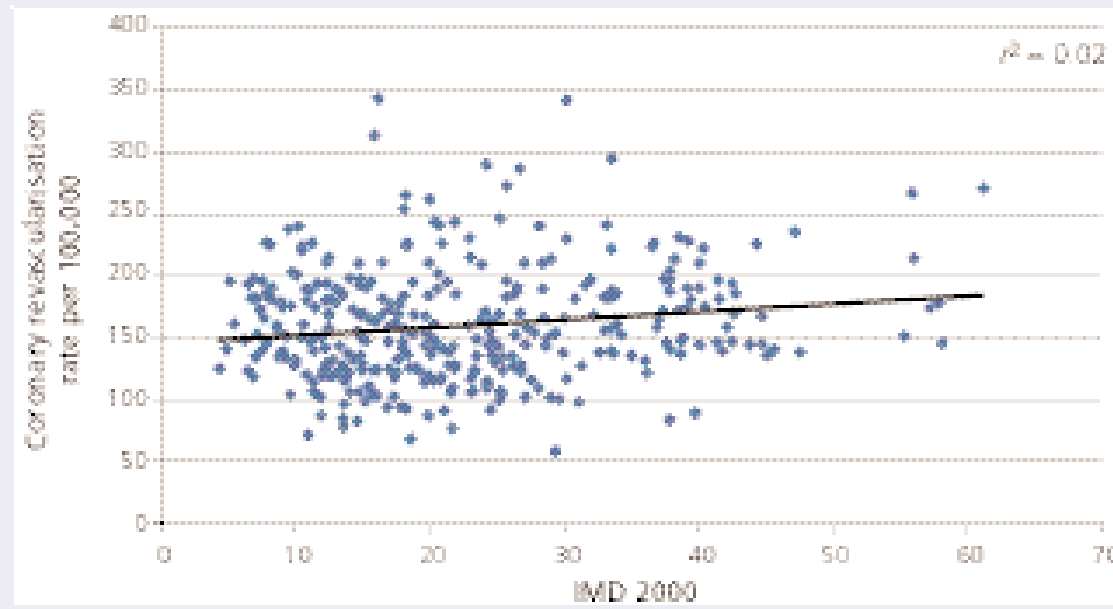


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**Figure 9a** Coronary revascularisation rates, 2002, for men of all ages, against socio-economic status by local authority; England

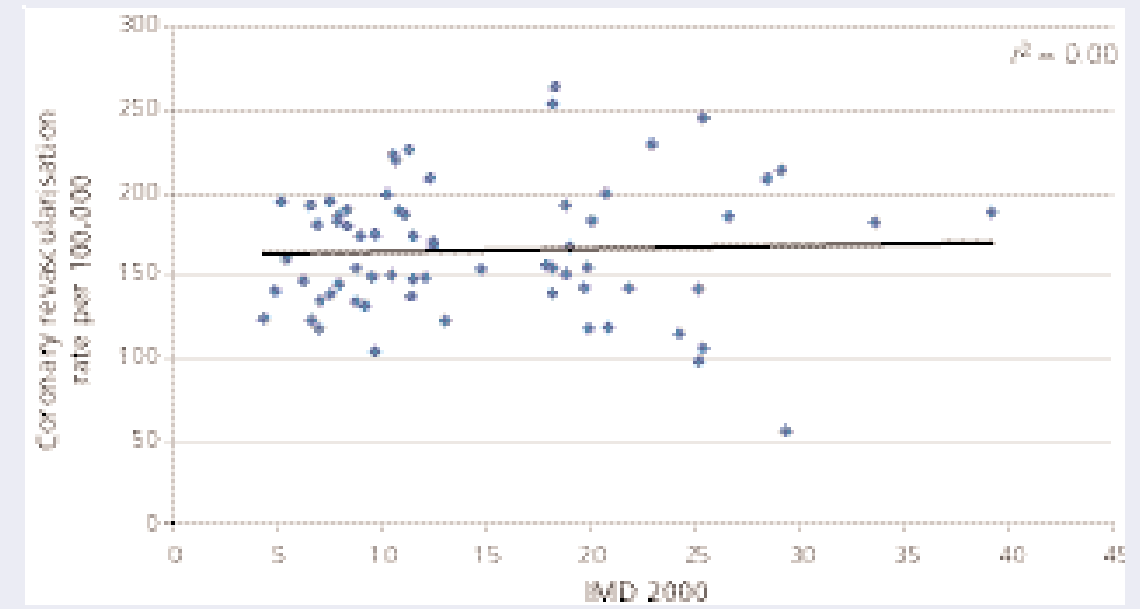


Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

**Revascularisation rates and socio-economic variables**

Figures 7a – 7d show local authorities classified according to their IMD 2000 quintile in England and the South East. These show a transition linking increasing deprivation with increasing CHD mortality, as quintiles of low deprivation give way to quintiles of high deprivation along the horizontal axis. However, there is no such pattern to link deprivation with rates of coronary revascularisation along the vertical axis.

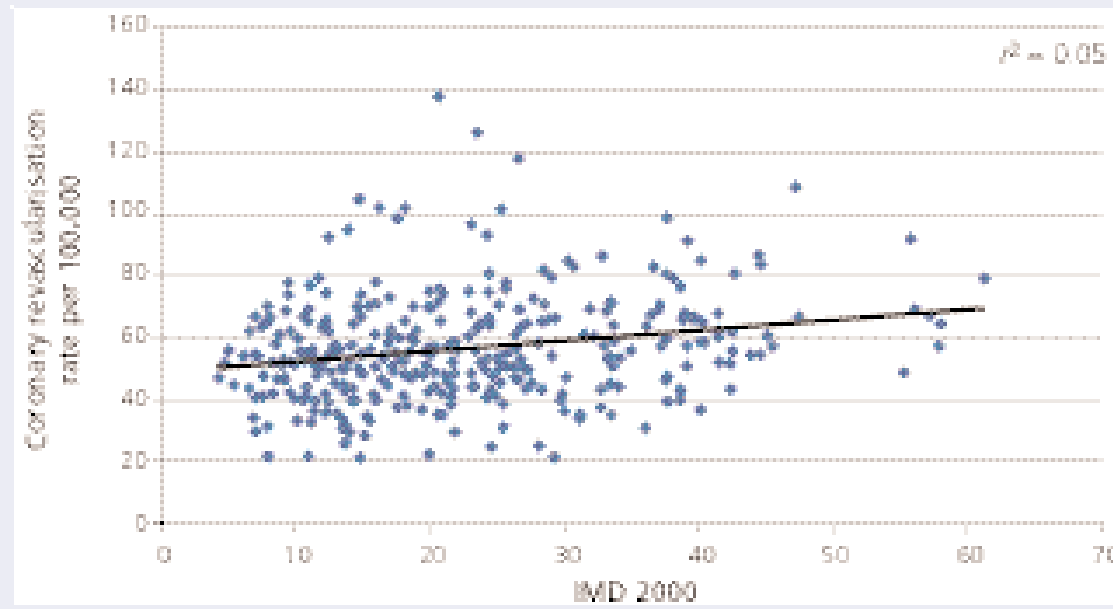
**Figure 9b** Coronary revascularisation rates, 2002, for men of all ages, against socio-economic status by local authority; South East Region



Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

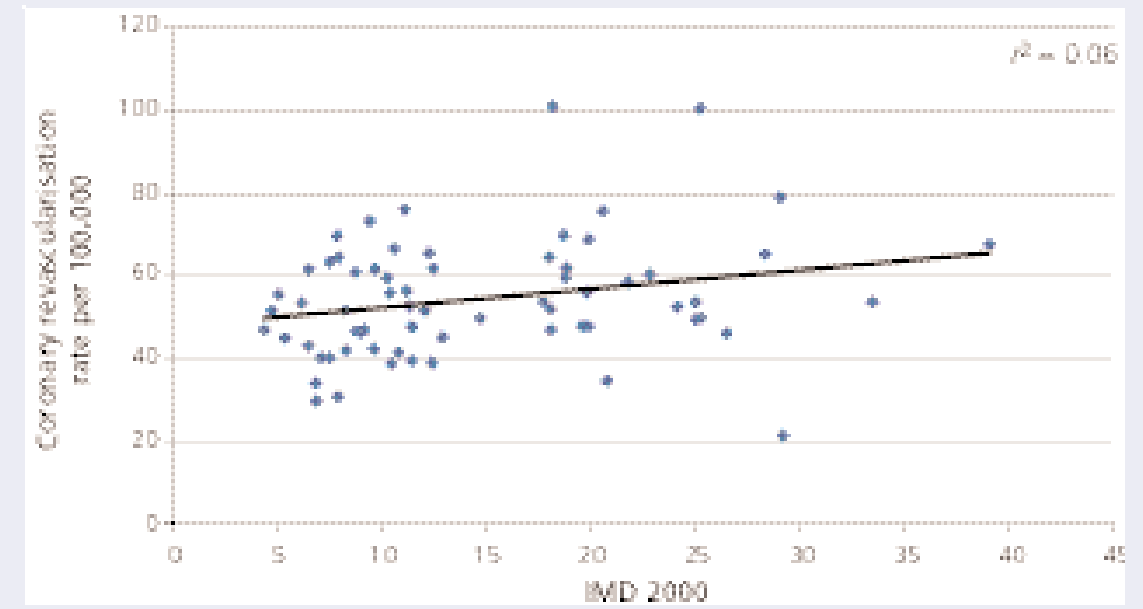
This lack of correlation is confirmed in Figures 9a and 9b, which show no correlation between coronary revascularisation rates in men and IMD 2000 scores for local authorities either in England as a whole ( $r^2 = 0.02$ ) or the South East Region ( $r^2 = 0.00$ ). Figures 9c and 9d present the corresponding data for women in England and the South East, which likewise show no correlation between coronary revascularisation rates and IMD 2000 scores for local authorities either in England as a whole ( $r^2 = 0.05$ ) or the South East Region ( $r^2 = 0.03$ ).

**Figure 9c** Coronary revascularisation rates, 2002, for women of all ages, against socio-economic status by local authority; England



Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

**Figure 9d** Coronary revascularisation rates, 2002, for women of all ages, against socio-economic status by local authority; South East Region

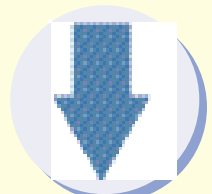


Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of IMD data: ODPM (formerly DETR). Crown Copyright material is reproduced with the permission of the Controller of HMSO and the Queen's printer for Scotland.

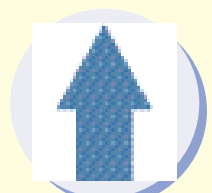
Similarly, there is no correlation between male and female coronary revascularisation rates and social class, as represented by the percentage of heads of household in classes I and II by local authority in England and the South East (Figures 9e—9h).

The reasons for this lack of correlation between revascularisation rates and established proxies of need are likely to be complex, requiring detailed investigation at a local level. They may include differences in the availability of care within the NHS, and local variations in what is construed as appropriate treatment. In particular, revascularisations carried out in the private sector would also be required for a complete picture, and this information is not currently available, nor is it required to be collected.

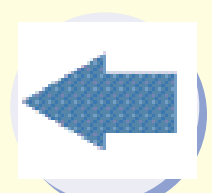
CABG and PTCA are proven to be effective in reducing CHD mortality and morbidity, and in improving the quality of life of those with CHD.<sup>1</sup> The CHD NSF places great emphasis on equity of access to and provision of revascularisation. CHD mortality and hospital admissions are well correlated with indices of socio-economic deprivation, as shown by the maps and figures in this atlas. Thus the findings shown here regarding the lack of correlation between these incidences and the numbers of CABG and PTCA procedures carried out raise concerns about the level of care for people with CHD in the more socially deprived areas of the South East and of England as a whole, who may not be receiving the most appropriate treatment.



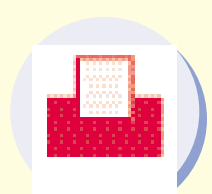
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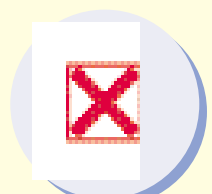
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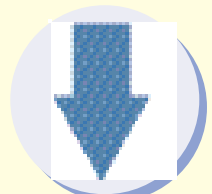
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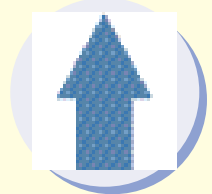
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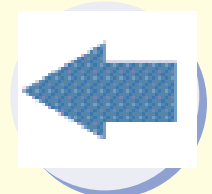
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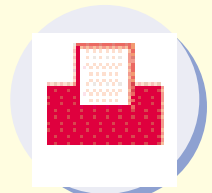
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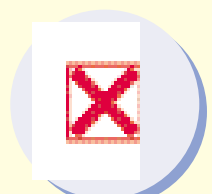
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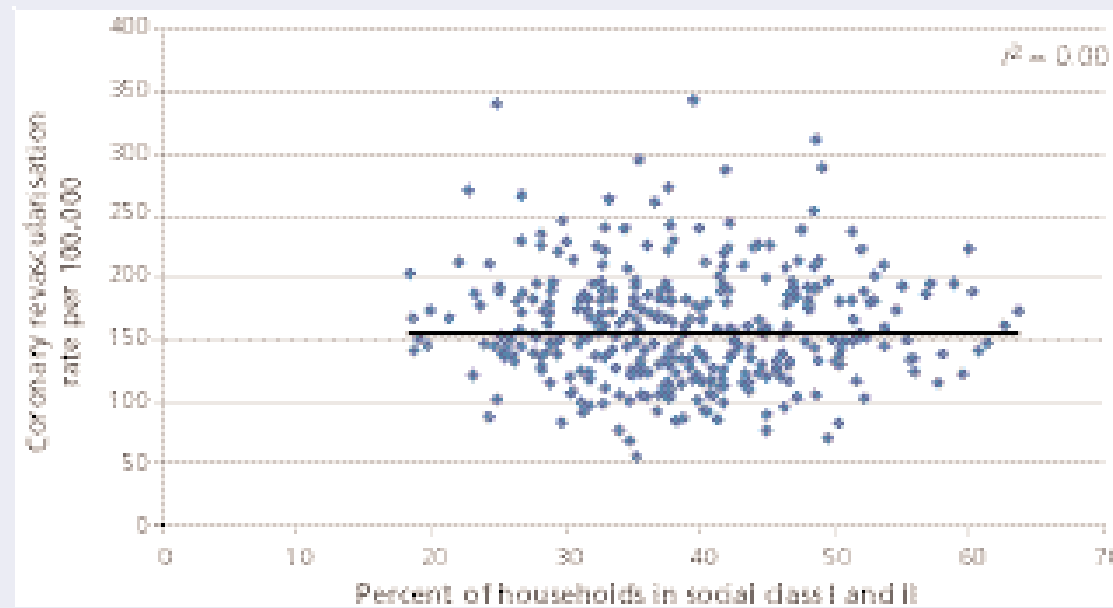


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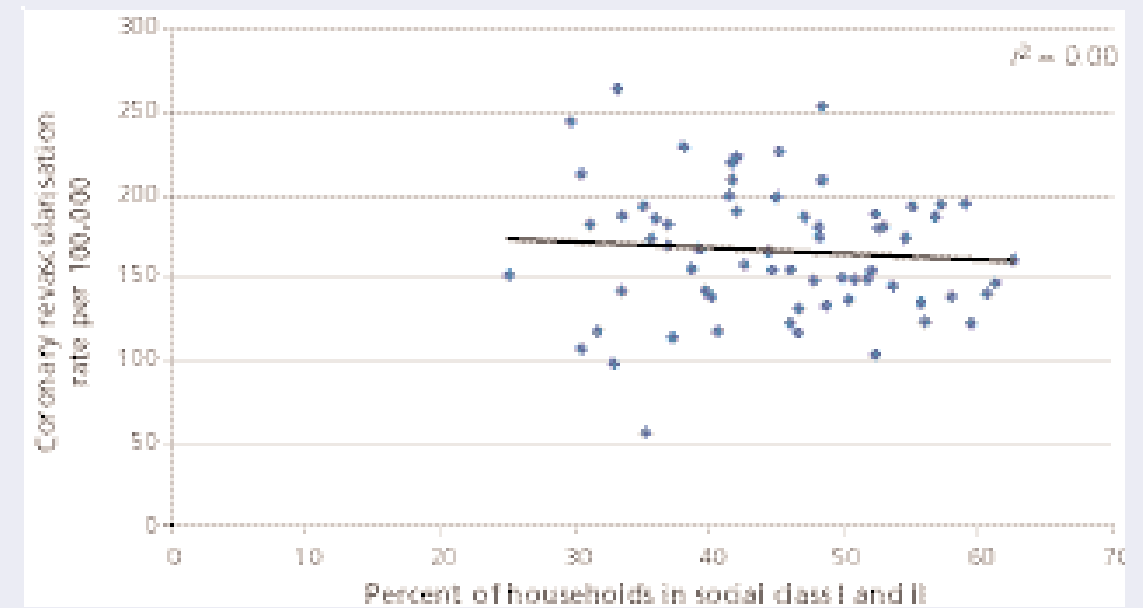
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**Figure 9e** Coronary revascularisation rates, 2002, for men of all ages, against percent of households in social classes I and II by local authority; England

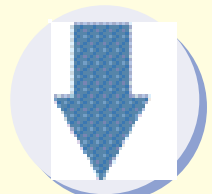


Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

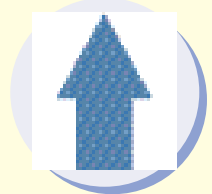
**Figure 9f** Coronary revascularisation rates, 2002, for men of all ages, against percent of households in social classes I and II by local authority; South East Region



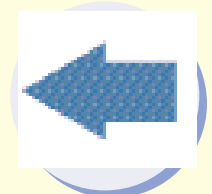
Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.



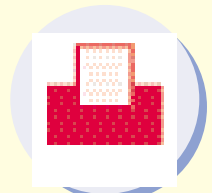
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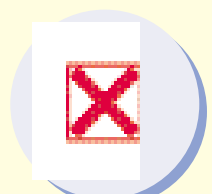
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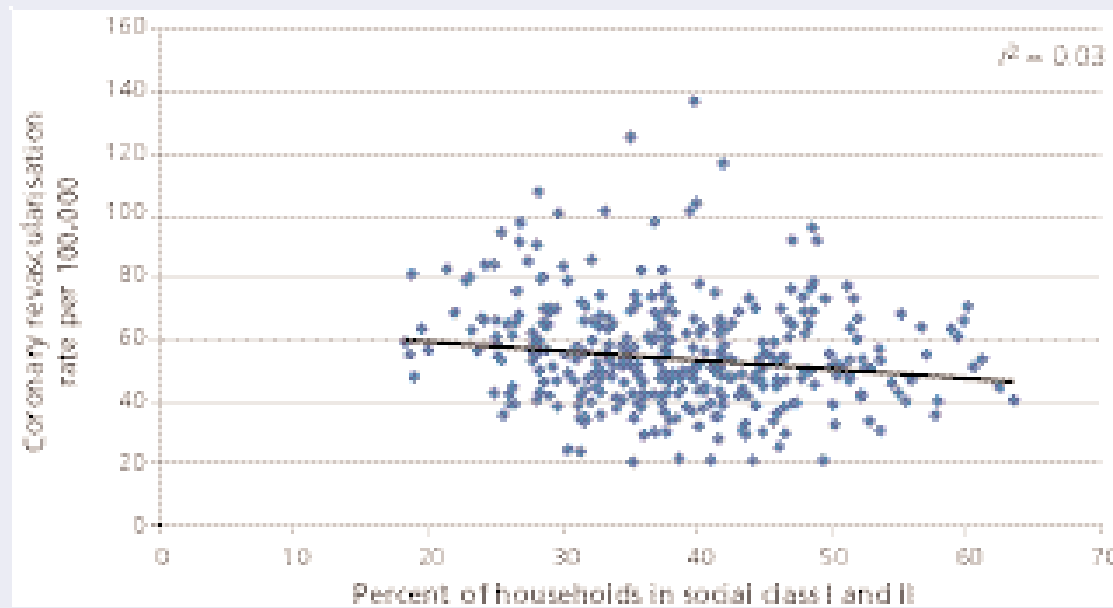


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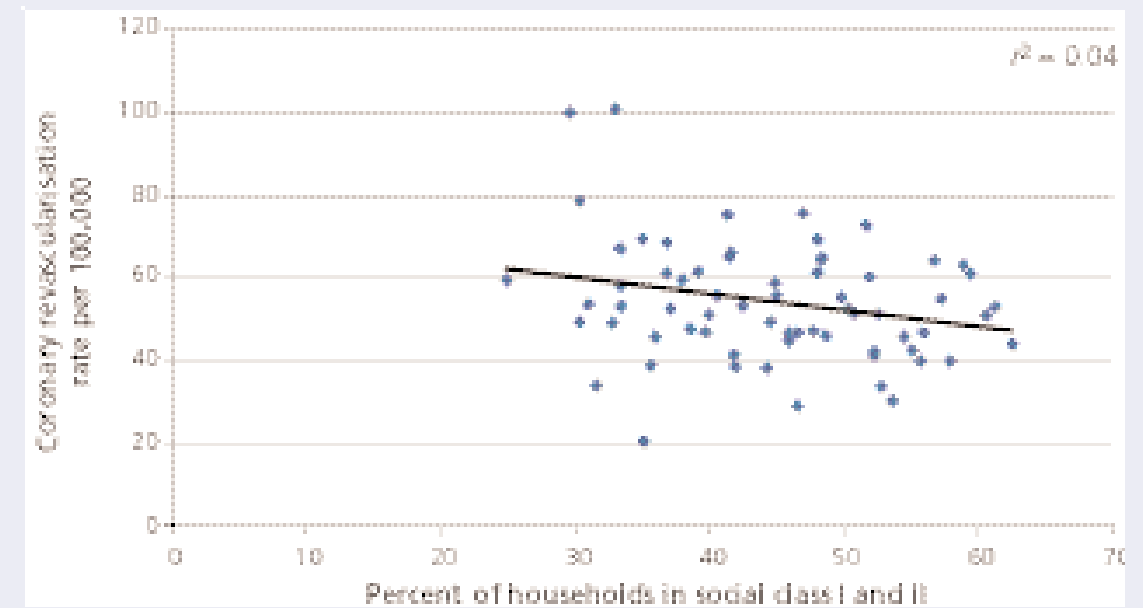
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**Figure 9g** Coronary revascularisation rates, 2002, for women of all ages, against percent of households in social classes I and II by local authority; England



Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

**Figure 9h** Coronary revascularisation rates, 2002, for women of all ages, against percent of households in social classes I and II by local authority; South East Region



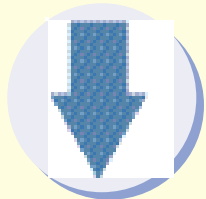
Data are directly age-standardised CHD coronary revascularisation rates (CABG + PTCA), 2002. Source of coronary revascularisation data: The national Hospital Episode Statistics (HES) database, Statistics Division, Department of Health. Source of social class data: Office of National Statistics Compendium of Clinical and Health Indicators 2001 © Crown Copyright.

## Next steps

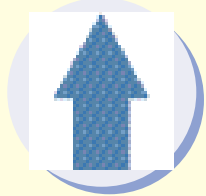
This atlas addresses geographical and socio-economic variations in mortality, hospital admissions and revascularisation procedures for CHD. Further analyses will be undertaken over 2003–2007, to build on this work and support local organisations in tackling heart disease. SEPHO's work programme will include:

- Assessing the feasibility of acquiring data from private hospitals, in order to assess the number of private hospital admissions and surgery, and the impacts on the data of access by different geographical and socio-economic groups
- Undertaking analyses for populations covered by PCTs, to complement the analyses at local authority level presented in this atlas
- Undertaking further trend analyses in future years to assess changes over time
- Undertaking analyses at ward level (the problem of small numbers will be overcome by aggregating the data from a number of years, or by grouping it into quintiles by IMD 2000 scores)
- Undertaking analyses using data from primary care
- Assessing the feasibility of mapping preventive initiatives in relation to smoking, diet and nutrition, obesity and physical activity
- Assessing innovative ways of displaying comparative data.

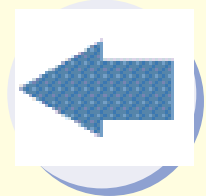
We hope that these initiatives will further advance local organisations' understanding of the burden of CHD, and its prevention and treatment. Hopefully this will help in targeting action to reduce heart disease in local communities, and in improving the access and experience of people receiving treatment for CHD.



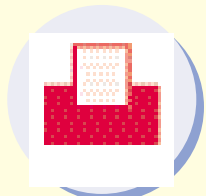
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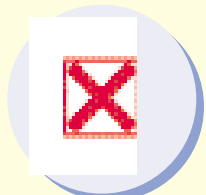
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## Appendix I: Statistical methods

Age standardisation facilitates comparisons across geographical areas by controlling for differences in the age structure of local populations. There are two methods of age standardisation: direct and indirect.

The directly age-standardised mortality rate for CHD is the number of deaths that would occur in a standard population (per 100,000) if that population had the age-specific rates of a given local authority area. Directly age-standardised mortality rates in this atlas are standardised to the European Standard Population.<sup>6</sup> Directly standardised rates can be compared across areas and time periods.

The indirectly standardised mortality ratio (SMR) is the ratio of observed to expected deaths in an area. The expected deaths are derived by applying the age, sex and cause-specific death rates for England and Wales to the corresponding age and sex-specific resident populations of an area. This gives the number of deaths that would be expected in an area if it conformed to the age, sex and cause-specific death rates of England and Wales. The SMR for an area is obtained by dividing the number of sex and cause-specific observed deaths in the area by the number expected, and is expressed as a ratio relative to 100. In this method of calculation, the SMR for England and Wales is defined as 100. SMRs greater than 100 indicate higher mortality than the national average; SMRs less than 100 indicate lower mortality than the national average.

Both the directly age-standardised mortality rates and the SMRs presented in this atlas represent the three-year average of these figures, in order to eliminate any random annual variations.

### Confidence intervals

Confidence intervals are used to indicate the statistical validity of data based on means or average; 95% confidence intervals – which indicate a 5% (1 in 20) chance that the true value lies outside the confidence interval – are commonly used, and

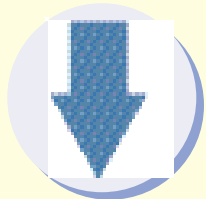
these have been applied to all mortality and HES data examined in this atlas. Confidence intervals are particularly important in demonstrating the effect of small numbers on the validity of data. In general, data sets with smaller numbers (e.g. local authorities with small populations in this atlas) will tend to have wider confidence intervals; for data sets with large numbers the confidence intervals will be relatively narrow.

### Linear regression and correlation coefficients

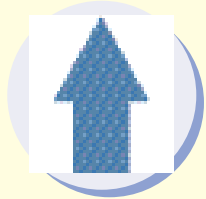
Linear regression is used to model the relationship between two variables by fitting a linear equation to observed data. An observed relationship does not necessarily imply that one variable causes the other, only that there is some association between the two.

The strength of the linear association between two variables is quantified by the correlation coefficient ( $r$ ), which always takes a value between  $-1$  (perfect negative correlation) and  $+1$  (perfect positive correlation). A positive correlation indicates that increasing values in one variable correspond to increasing values in the other, whilst a negative correlation indicates that increasing values in one variable correspond to decreasing values in the other. A correlation value close to 0 indicates no association between the variables.

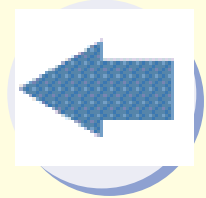
The square of the correlation coefficient,  $r^2$ , also known as the coefficient of determination, is used in this atlas to indicate the correlation between variables, rather than using the correlation coefficient per se. The  $r^2$  value represents the fraction of the variation in one variable that may be explained by the other variable. Values of  $r^2$  of between 0.6 and 1 are regarded as very strong, between 0.4 and 0.6 as strong, between 0.2 and 0.4 as moderate, and below 0.2 as weak. When  $r^2 = 0$  there is no correlation. These are rather arbitrary limits, and the context of the results should also be considered.



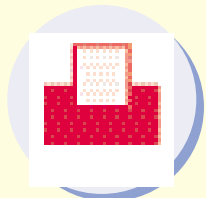
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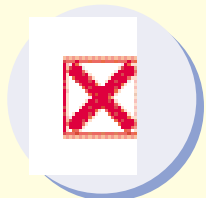
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## Appendix II: List of maps and figures

Figures and maps whose numbers are given in **bold** appear in the printed version of this atlas.

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- 2b** CHD mortality rates by quintile, men aged less than 65, 1998–2000, South East Region
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- 7c Statistical significance of CHD hospital admission rates, women of all ages, 2002, England
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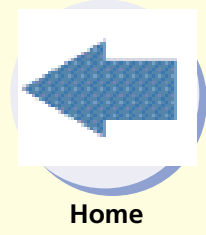
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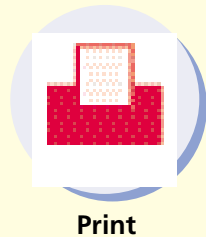
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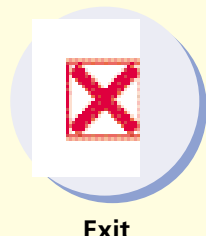
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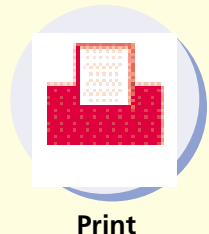
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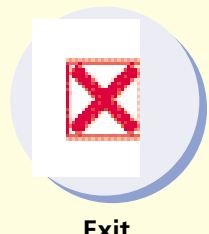
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**6a** CHD hospital admission rates, 2002, for men of all ages, against socio-economic status by local authority; England

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**6e** CHD hospital admission rates, 2002, for men of all ages, against percent of households in social classes I and II; England

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**6g** CHD hospital admission rates, 2002, for women of all ages, against percent of households in social classes I and II; England

**6h** CHD hospital admission rates, 2002, for women of all ages, against percent of households in social classes I and II; South East Region

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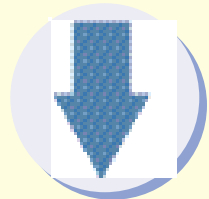
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**7b** Coronary revascularisation rates, 2002, against CHD mortality (SMRs), 1998–2000, for men of all ages by local authority (IMD quintiles); South East Region

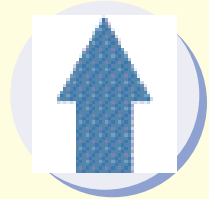
**7c** Coronary revascularisation rates, 2002, against CHD mortality (SMRs), 1998–2000, for women of all ages by local authority (IMD quintiles); England

**7d** Coronary revascularisation rates, 2002, against CHD mortality (SMRs), 1998–2000, for women of all ages by local authority (IMD quintiles); South East Region

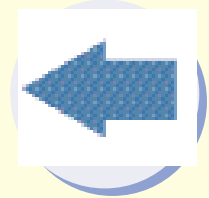
**8a** Coronary revascularisation rates, 2002, against CHD hospital admission rates, 2002, for men of all ages by local authority (IMD quintiles); England



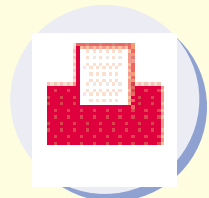
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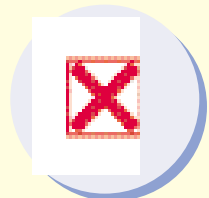
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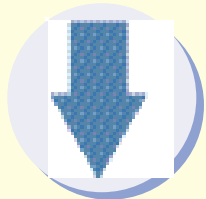
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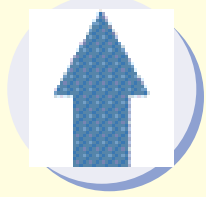
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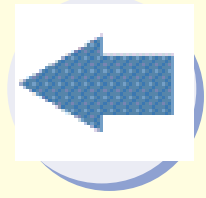
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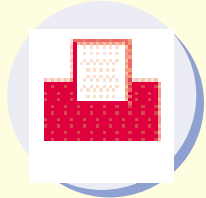
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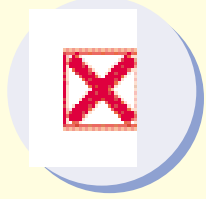
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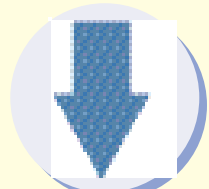
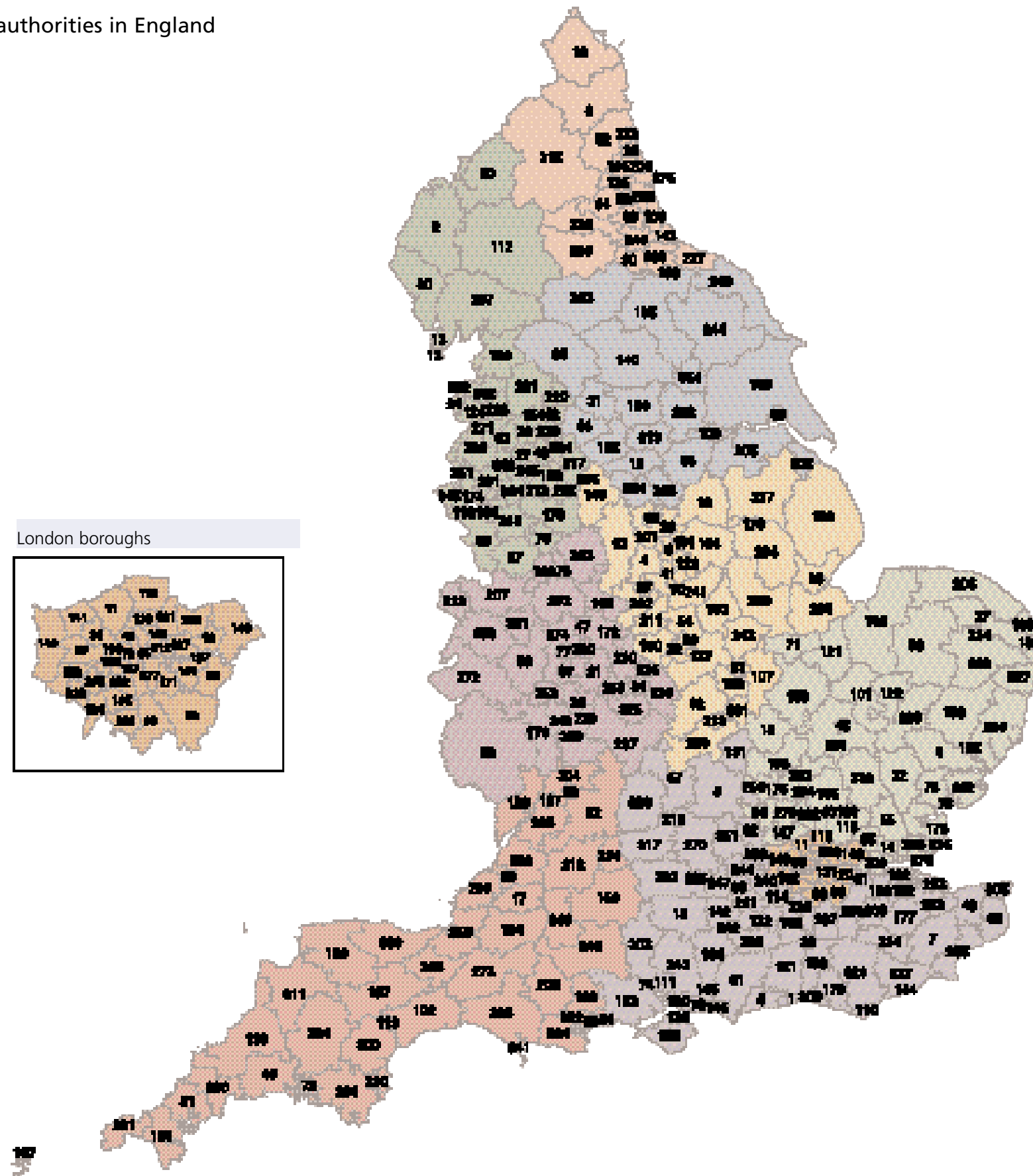
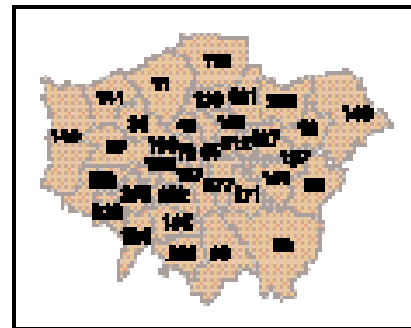
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Bridgnorth District	36	Doncaster District	95	Huntingdonshire District	153	Northampton District	213	South Ribble District	271	Wellingborough District	331
Broadland District	37	Dover District	96	Huntingdonshire District	153	Norwich District	214	South Shropshire District	272	Welwyn Hatfield District	332
Bromley London Borough	38	Dudley District	97	Huntingdonshire District	153	Nuneaton and Bedworth District	215	South Somerset District	273	West Berkshire	333
Bromsgrove District	39	Durham District	98	Huntingdonshire District	153	Oadby and Wigston District	216	South Staffordshire District	274	West Devon District	334
Broxbourne District	40	Ealing London Borough	99	Huntingdonshire District	153	Oldham District	217	South Tyneside District	275	West Dorset District	335
Broxton District	41	Easington District	100	Huntingdonshire District	153	Oxford District	219	Southend-on-Sea	276	West Lancashire District	336
Burnley District	42	East Cambridgeshire District	101	Huntingdonshire District	153	Pendle District	220	Southwark London Borough	277	West Lindsey District	337
Bury District	43	East Devon District	102	Huntingdonshire District	153	Penwith District	221	Spelthorne District	278	West Oxfordshire District	338
Calderdale District	44	East Dorset District	103	Huntingdonshire District	153	Poole	222	St. Albans District	279	West Somerset District	339
Camden London Borough	45	East Hampshire District	104	Huntingdonshire District	153	Preston District	223	St. Edmundsbury District	280	West Wiltshire District	340
Canterbury District	46	East Hertfordshire District	105	Huntingdonshire District	153	Purbeck District	224	Stafford District	282	Weymouth and Portland District	341
Caradon District	49	East Lindsey District	106	Huntingdonshire District	153	Reading	225	Staffordshire Moorlands District	283	Wigan District	342
Carlisle District	50	East Northamptonshire District	107	Huntingdonshire District	153	Redbridge London Borough	226	Staffordshire Moorlands District	283	Wincanter District	343
Carrick District	51	East Riding of Yorkshire	108	Huntingdonshire District	153	Redcar and Cleveland	227	Staffordshire Moorlands District	283	Windsor and Maidenhead	344
Castle Morpeth District	52	East Staffordshire District	109	Huntingdonshire District	153	Redditch District	228	Staffordshire Moorlands District	283	Wirral District	345
Castle Point District	53	East Staffs London Borough	110	Huntingdonshire District	153	Reigate and Banstead District	229	Staffordshire Moorlands District	283	Woking District	346
Charnwood District	54	Eastleigh District	111	Huntingdonshire District	153	Restormel District	230	Staffordshire Moorlands District	283	Wokingham	347
Chelmsford District	55	Eden District	112	Huntingdonshire District	153	Ribble Valley District	231	Staffordshire Moorlands District	283	Worcester District	348
Cheltenham District	56	Ellesmere Port and Neston District	113	Huntingdonshire District	153	Richmond upon Thames London Borough	232	Staffordshire Moorlands District	283	Worthing District	349
Cherwell District	57	Elmbridge District	114	Huntingdonshire District	153	Richmondshire District	233	Staffordshire Moorlands District	283	Wychavon District	350
Chester District	58	Enfield London Borough	115	Huntingdonshire District	153	Rochdale District	234	Staffordshire Moorlands District	283	Wycombe District	351
Chesterfield District	59	Epping Forest District	116	Huntingdonshire District	153	Rochford District	235	Staffordshire Moorlands District	283	Wyre District	352
Chester-le-Street District	60	Epsom and Ewell District	117	Huntingdonshire District	153			Staffordshire Moorlands District	283	Wyre Forest District	353
Chichester District	61	Erewash District	118	Huntingdonshire District	153			Staffordshire Moorlands District	283	York	354
		Exeter District	119	Huntingdonshire District	153			Staffordshire Moorlands District	283		
		Fareham District	120	Huntingdonshire District	153			Staffordshire Moorlands District	283		

Map 1a Boundaries of local authorities in England

Government office regions

- North East
- North West
- Yorkshire and the Humber
- East Midlands
- West Midlands
- East of England
- London
- South East
- South West

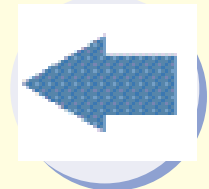
London boroughs



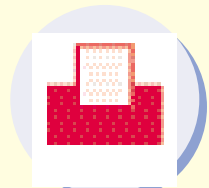
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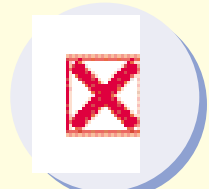
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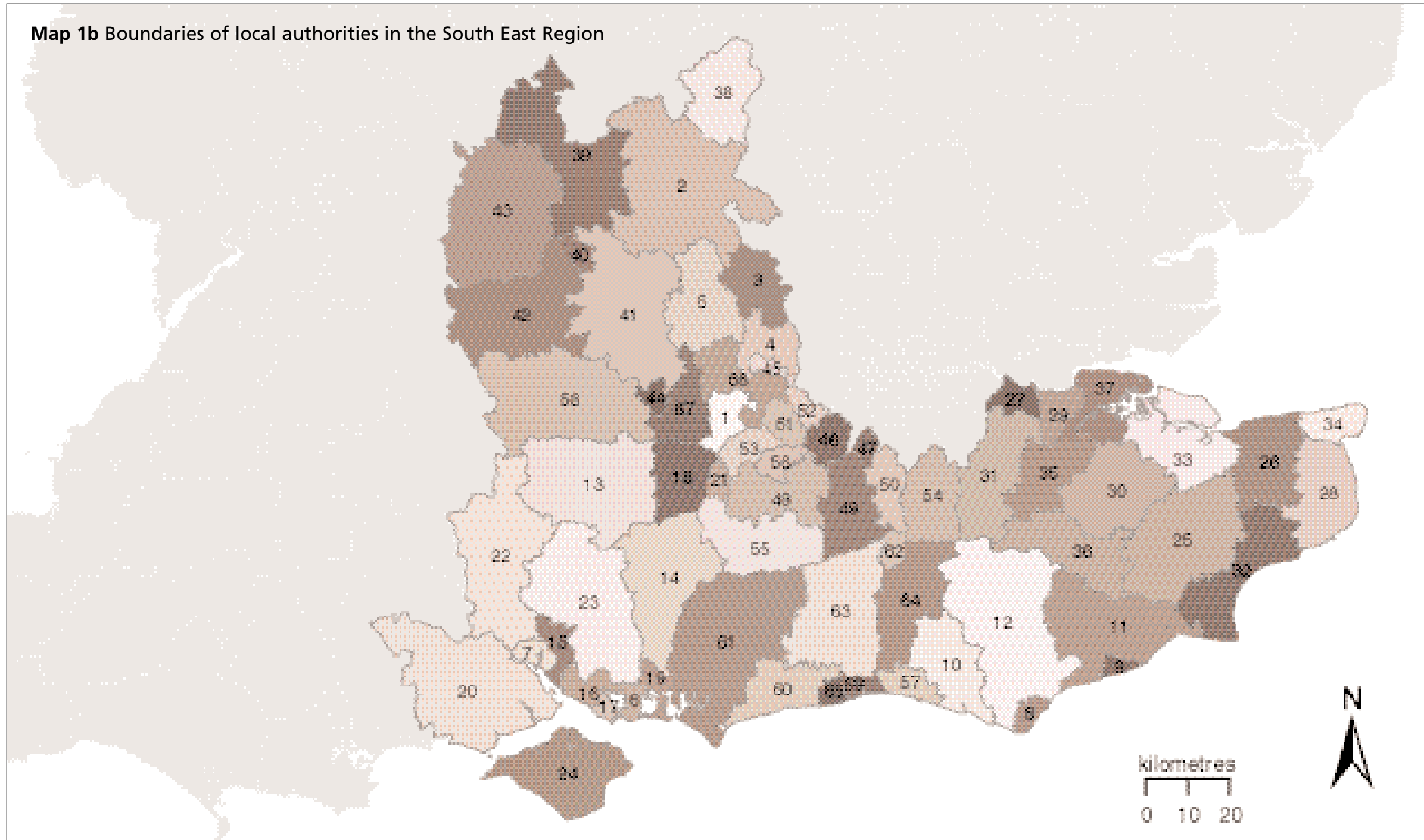


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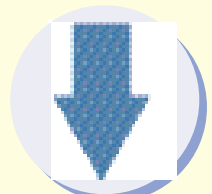


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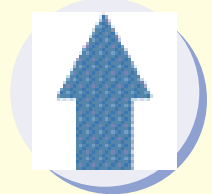
Map 1b Boundaries of local authorities in the South East Region



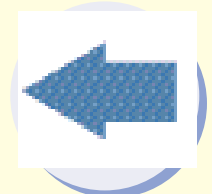
1 Bracknell Forest	10 Lewes	20 New Forest	30 Maidstone	39 Cherwell	49 Mole Valley	59 Adur
2 Aylesbury Vale	11 Rother	21 Rushmoor	31 Sevenoaks	40 Oxford	50 Reigate and Banstead	60 Arun
3 Chiltern	12 Wealdon	22 Test Valley	32 Shepway	41 South Oxfordshire	51 Runnymede	61 Chichester
4 South Buckinghamshire	13 Basingstoke and Dean	23 Winchester	33 Swale	42 Vale of White Horse	52 Spelthorne	62 Crawley
5 Wycombe	14 East Hampshire	24 Isle of Wight	34 Thanet	43 West Oxfordshire	53 Surrey Heath	63 Horsham
6 Portsmouth	15 Eastleigh	25 Ashford	35 Tonbridge and Malling	44 Reading	54 Tandridge	64 Mid Sussex
7 Southampton	16 Fareham	26 Canterbury	36 Tunbridge Wells	45 Slough	55 Waverley	65 Worthing
8 Eastbourne	17 Gosport	27 Dartford	37 Medway Towns	46 Elmbridge	56 Woking	66 Windsor and Maidenhead
9 Hastings	18 Hart	28 Dover	38 Milton Keynes	47 Epsom and Ewell	57 Brighton and Hove	67 Wokingham
	19 Havant	29 Gravesham		48 Guildford	58 West Berkshire	



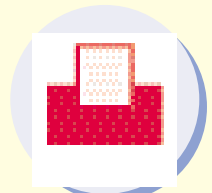
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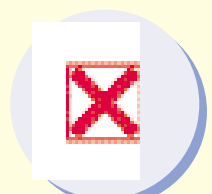
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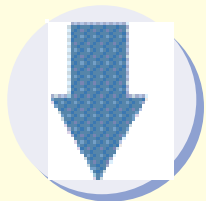
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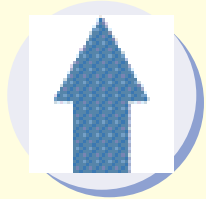
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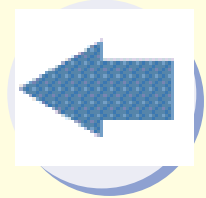
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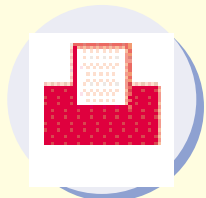
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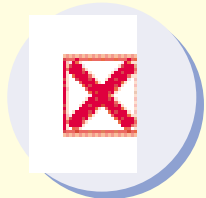
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**An atlas of coronary heart disease mortality, hospital admissions  
and coronary revascularisations in South East England**

South East Public Health Observatory

November 2003

An extended version of this atlas can be found online at the  
South East Public Health Observatory website: [www.sepho.org.uk](http://www.sepho.org.uk)  
and the British Heart Foundation Health Promotion Research Group  
website: [www.heartstats.org](http://www.heartstats.org)