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OFFICE OF POPULATION CENSUSES AND SURVEYS

Mortality and Geography

A review in the mid-1980s England and Wales

Edited by M Britton

HMSO

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The Registrar General's decennial supplement for England and Wales

Edited by M Britton

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Foreword

Mortality and Geography is the latest in a series of decennial supplements spanning more than a century in which the office of the Registrar General of England and Wales reviews mortality in greater depth than is ordinarily possible in annual reports or other publications. Analyses of variations in death rates attributed to various diseases by area of residence have been one of the cornerstones of the system of vital statistics for England and Wales since 1838.

This volume deals with area mortality but in a more comprehensive manner than previously. It brings together not only the traditional analyses of mortality for administrative areas of England and Wales centred around the time of the 1981 Census, but also the outcome of relevant research undertaken using other data-sets like the OPCS Longitudinal Study and the linked infant mortality files. The volume also considers the mortality patterns of migrants, in particular immigrants from beyond the United Kingdom, and by place of birth as opposed to usual address.

The data-sets on which the analyses are based are extensive. The commentary is therefore limited to examples and pointers for further research. The mortality data at a local area level for a wide range of diseases, with statistics standardised by age and sex, are available on microfiche from OPCS (cost £10.00). The accompanying text provides guidance about the use of this material. In practice the material is useful for the review of a particular issue, or as shelf material for cross-checking particular findings as and when they arise.

We have tried to give an impression of the range of uses of geographic analyses of mortality by collaborating with our principle customers in the preparation of this volume. Many people have contributed, both from inside and outside OPCS. The main contributors are acknowledged in individual chapters.

Before his retirement from OPCS the late Michael Alderson laid the foundations, preparing a draft commentary on mortality in 1979–83 by place of residence. This is incorporated into the present volume as Chapters 1–4. He also prepared the additional data which are available on microfiche and guided the analyses by country of birth.

Professor Adelstein and Professor Gardner, from my Medical Advisory Committee Panel of Experts, have commented on the volume as a whole.

Since 1982 medical analyses of data from the OPCS Longitudinal Study have been supported by a programme grant from the Medical Research Council to the Social Statistics Research Unit at the City University.

Mrs G T Banks
Registrar General for England and Wales
December 1989

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Introduction

Analyses of the spatial variation in mortality for various diseases have been at the forefront of attempts to understand and promote the health of the resident population of England and Wales for a considerable length of time. This report, *Mortality and Geography* is the latest in a series of decennial supplements spanning more than a century in which the office of the Registrar General of England and Wales reviews mortality in greater depth than is ordinarily possible in annual reports or other publications. Analyses of variations in death rates attributed to various diseases by area of residence have been one of the cornerstones of the system of vital statistics for England and Wales since 1838.

This report adopts a new approach, compared with previous supplements, by moving away from just listing localities with high or low mortality for particular conditions. The traditional analyses and limited commentary are still there, but they are supplemented by a number of additional features. First, the commentary has been extended to cover a number of diseases where there is interest in their geographical distribution — for example, stomach cancer and lung cancer. Second, it now includes analyses of birthweight-specific infant mortality rates for regional and district health authorities. Third, various ways of examining geographical distributions — urban versus rural, coastal versus inland, high and low altitude, types of areas defined in terms of socio-economic variables collected in the 1971 Census — have been chosen for review. Some of the analysis uses data from the OPCS Longitudinal Study. Fourth, the significance of migration, principally within England and Wales, has been examined to help understand why some areas have higher mortality than others; also to investigate the possibility that environmental factors in early life, as reflected by place of birth, are an important determinant of some diseases. Finally, the mortality of children and adults born outside England and Wales has been compared with that for the indigenous population.

Unlike earlier supplements, many of the analyses in this report are based on different data-sets and hence different time periods throughout the 1970s and 1980s. For example, the traditional area mortality analyses relate to 1979–83 while those available from the Longitudinal Study relate predominantly to 1971–81. The report has attempted to bring together the latest research on mortality according to geographical factors in their broadest sense, using OPCS data-sets. This new, multi-source, approach will be adopted for other supplements on different topics over the next decade.

In practice, mortality statistics by area (and related characteristics like country of birth) are used by two main groups of people. The first, health and other public administrators, are primarily interested in differences between areas, such as health regions and districts. This interest arises from their responsibility for the provision and distribution of services and resources, the desire to relate expenditures to the 'need' for services, and a wish to compare performances between areas.

The second large group of users comprises epidemiologists and other researchers. Geographic patterns provide an important source of clues about the causes of disease. These users are often concerned with particular diseases, local variations in socio-economic circumstances, the distribution of industry and the local environment. At a broader level, international comparisons may examine mortality in relation to socio-economic development, differences in diet, culture and behaviour.

Geographic variation in mortality 1979–83 (Chapter 3)

The analysis for the period 1979–83 has confirmed the continuation of the familiar regional gradient in mortality from high in the North and West to low in the South and East for both males and females. If anything, the relative position of the North region may have worsened over recent decades. East Anglia continues to exhibit the lowest SMRs.

The same broad pattern is reflected at county and district level, although there is obviously a greater chance of finding an area in a low mortality zone with relatively high mortality and vice versa. For instance,in the South and East some Inner London boroughs and county districts outside London have above average levels of mortality. These are often associated with a large institutional population. Similarly in the North and West regions there are districts with either average or below average levels of mortality. Areas with significantly high mortality levels relative to the rest of the country turn out to be predominantly urban areas as would be expected from previous work in this field.

When analysed by cause of death the array of data to summarise is extensive and the results quoted are therefore somewhat selective. Nevertheless, the same broad geographical pattern appears to prevail for most diseases even though there are some notable exceptions. One is **hypertensive disease** for which the SMRs for both sexes are high for the West Midlands and Wales but low for the North, North West and Yorkshire and Humberside. Others for which the geographical gradient is reversed are **malignant malanoma of the skin, cancer of the prostate** for men, **breast cancer** for women and **leukaemia.**

At a more local level the overall impact of some twenty most common causes of death was assessed by counting the number of times a locality (a county, metropolitan district or London borough) featured with high mortality; males and females were counted separately. Except for Greater London, a line drawn from the Severn river to the Wash generally distinguished the more frequently listed from the rest. The frequently listed localities were clustered in inner urban areas including Greater London, South Wales, Greater Manchester, Merseyside, Tyneside, Teeside and, to a lesser extent,the West Midlands.

Geographic variation in mortality since 1920 for selected causes of death (Chapter 4)
The persistence over time of geographical differences in mortality due to selected causes has been examined. The selected causes are **stomach cancer**, **lung cancer**, **cardiovascular diseases**, **bronchitis** and **peptic ulcer**; each of these has attracted interest in the past. The areal unit of analysis is a county (or London borough in the case of lung cancer); and maps have been chosen as the main form of presentation.

For a number of social indicators (e.g. population growth, unemployment) a line stretching from the River Severn to the Wash (or the River Humber in some instances) tends to separate local areas with a high or low incidence. This is also the case for mortality for most causes of death, with mortality north of this line higher than average since at least the 1920s. The gradient is not identical for each of the sexes or time periods considered, but the general pattern persists.

For **stomach cancer** the north west of Wales has had consistently high levels of mortality, some 60 per cent more than the low levels in the extreme South East. For **lung cancer** London has a relatively high mortality level and the boroughs to the east of London are the ones most affected. However, while the differentials with the national level for these boroughs are not as great as in the late 1940s, the underlying mortality rates are now much higher. For **cardiovascular diseases**, **ischaemic heart disease** and **cerebrovascular disease** the findings conform to the general pattern. For the latter disease the high zone has become more extensive for males but not for females; and the low zone has become less extensive in the South and East, particularly for females, where it is restricted to Greater London and the four counties immediately to the west of London. For **bronchitis** the association of high relative mortality with residence in major urban centres features prominently in each period; the areas showing the highest levels include Durham, South Yorkshire, Nottinghamshire, Mid Glamorgan, Greater Manchester and Merseyside. Finally, for **peptic ulcer** the localities with high relative mortality levels are much more scattered than for the other diseases mentioned so far. For the 1979–83 period the data indicate that people, particularly males, within the major urban centres face the greater risk.

Geographic variation in infant mortality in relation to birthweight, 1983–85 (Chapter 5)
Geographical variations in infant mortality in terms of crude and birthweight-specific mortality rates have been examined using data taken from the OPCS linked infant mortality file for the three years 1983–85. The results show a clear geographic gradient in **neonatal** (less than 28 days after birth) mortality rates, with all the regional health authorities (RHAs) in the south of England and only Mersey in the north of England having rates below that for England and Wales as a whole. The rates for Yorkshire, West Midlands, Wales and Northern were noticeably above the national level. The highest neonatal rates were for children whose mothers were born in Pakistan and Bangladesh. The two RHAs with the highest crude neonatal mortality rates, Yorkshire and West Midlands, also had some of the highest rates in the individual birthweight categories.

For the **postneonatal period** (at least 28 days but less than one year) rates were higher than average again in Yorkshire, and also in North Western, Wessex and South East Thames. Differences in postneonatal mortality rates between northern and southern regions had already disappeared by the mid 1970s.

Health districts with exceptionally high infant mortality rates tended to have above average proportions of mothers born in the New Commonwealth and Pakistan, and above average proportions of fathers in Social Classes IV and V. Many health districts with exceptionally high or low crude rates did not have exceptional birthweight-specific rates; this implies that the underlying distribution of births by birthweight was the determining factor in these cases. This distribution of births by birthweight, in turn, reflects the socio-economic characteristics of the DHA populations, and the net outcome of the provision of health care in pregnancy. The role played by each of these factors is difficult to determine. Broadly similar conclusions are reached if the infant mortality rates from all causes excluding congenital malformations are examined. Many of the same DHAs were significantly above or below the national level as they were when congenital malformations are included. The analyses also confirm the existence of infant mortality gradients by social class and country of birth of mother within the specified birthweight groups. Babies weighing under 1500 grams at birth had higher risk of death in DHAs where there was a high proportion of fathers in Social Classes IV and V. It was also high where the proportion of mothers born in the New Commonwealth and Pakistan, was relatively low. This may be a reflection of ethnic difference in birthweight distribution. In the higher weight groups mortality was lower in DHAs with a low proportion of fathers in Social Classes IV and V, but similar for DHAs with average or higher proportions. For births over 2500 grams infant mortality rates were low for areas with low proportions of mothers born in the New Commonwealth and Pakistan. The same broad patterns as described above generally hold within most RHAs.

The influence of socio-economic and environmental factors on geographic variation in mortality (Chapter 6) Geographic differentials in mortality have also been analysed in a less traditional way, by classifying individuals according to the type of area they live in and their own socio-economic characteristics. Data for 1979–83 and from the LS for 1971–81 have been used.

For 1979–83 local authority districts have been aggregated according to (i) the proportion of households in each district whose head was classified to Social Class I or II, (ii) the proportion of households whose head was a tenant of a local authority, (iii) proximity to the coast and (iv) average altitude.

The results show a general pattern of relatively high mortality in areas with a low proportion of Social Class I or II households, for both sexes. The ranking of the regions also appears consistent within each social class grouping; for example, East Anglia generally shows the lowest SMRs and the North and North West regions the highest.

Similarly, local authority districts with a higher proportion of males and females in accommodation rented from the local authority had raised mortality. Again the ranking of the regions broadly remains for each tenure group. The analyses of mortality according to altitude and proximity to the coast were inconclusive.

The major part of the analysis concentrated on mortality in 1971–81 according to the type of area in which a person was living in 1971. Some 36 clusters in seven families of areas, derived from a classification of 1971 Census wards according to the demographic and socio-economic characteristics of the population in those wards, were used as the main geographic axis. The results show a clear distinction for both males and females between above average mortality in 'low status' clusters, as exemplified by urban council estate areas (SMRs of 115, 113 respectively), and areas of older settlement (SMRs 107, 105), and below average mortality in 'high status' clusters like rural areas (SMRs 90, 95), and areas of established high status and resorts (SMRs 88, 90).

Within the low status group, people living in 1971 in clusters typified by inner city areas with low quality older housing, overspill estates or inner city council estates had the highest mortality with levels at least 20 per cent above the national average. On the other hand, virtually all the clusters in high status areas were below the national level to almost the same extent.

When analysed further by grouped regions — the North and West, Central, and South and East — the mortality gradients still persist. For example, for areas of older settlements the SMR value ranged from 118 in the North and West regions to 97 in the South and East regions. More generally, within each grouped region the low status areas had the highest levels of mortality and the high status areas the lowest. Of interest is the finding for inner city council estate areas. Those in the South and East regions, many of which would be in Greater London, had raised mortality, however, those in the North and West regions had no clusters with below average mortality.

The above analyses of total mortality were repeated for the three main cause of death groups, **malignant neoplasms**, **circulatory disease** and **respiratory disease**. Generally the results are broadly the same. For those living in low status areas the levels of mortality were consistently high. Mortality was only found to be relatively high in the low status areas of the South and East regions for malignant neoplasms and respiratory diseases. On the other hand the mortality levels of those living in high status areas were consistently low for the Central and South and East regions. For those living in the North and West regions in areas of established high status, the mortality level for respiratory disease was well below the national level.

The extent to which the observed gradients across socio-economic clusters could be accounted for by individuals in different tenure groups, social classes and economic positions was examined. Clearly the clusters bear some relationship to these individual characteristics given the nature of their derivation (for example a high proportion of local authority tenants in urban council estate areas).

Differences in mortality levels between families of areas were still evident within each tenure group, but the extent of the differences were not as great as between tenure groups. Mortality levels up to 20 per cent above the national level were found to prevail for those who were not owner occupiers in urban council estate areas; while for owner occupiers in these areas the level was more consistent with the national average. Apart from rural areas the mortality gradient between owner occupiers and the rest was consistently around 20–30 per cent, and the patterns for males and females were broadly similar.

The corresponding analysis by social class shows that, for each family of areas, males in Social Classes I and II had consistently lower mortality levels than those in Social Classes IV and V. The extent of the gradient was around 25 per cent. These findings are very similar to those for tenure.

Mortality gradients between owner occupiers and non-owner occupiers, and between Social Classes I and II and Social Classes IV and V tended to prevail for all the families of areas for each main cause of death. **Respiratory disease** showed a much steeper gradient for most families, and **circulatory disease** and **malignant neoplasms** a flatter one.

The LS has also been used to show its potential for examining the effects of environmental indicators on mortality. Recent interest has centred around water hardness and nitrate levels. Most other studies have found negative associations between water hardness and mortality from cardiovascular diseases, and there has been speculation about the possibility of a positive

association between stomach cancer and nitrate levels. Stress should be placed on the word 'association' because there are many confounding factors of a socio-economic and climatic nature which make any causal link extremely difficult to determine. Environmental data obtained for the British Regional Heart Study for the period around 1971 have been added to the LS data-set containing mortality data for the 1971–81 decade.

Within grouped regions there was no consistent gradient for deaths from **cardiovascular disease** with water hardness, but within most hardness categories there was a gradient from the South and East to North and West. The gradients were most consistent for females in the two hardest water categories. These results are generally in accordance with the findings of earlier studies and suggest that grouped region would appear to have greater explanatory power than water hardness.

Similarly, the role of nitrates in the prevalence of **stomach cancer** has given rise to considerable speculation in recent years. In keeping with other studies the analyses do not offer any clear evidence of raised mortality from stomach cancer with increasing nitrate levels in the local water supply of the study members.

The influence of migration on geographic variation in mortality (Chapter 7)
Mortality levels during the 1971–81 decade have been analysed according to the distance moved between 1966 and 1971 within England and Wales, using data from the LS. The types of migrant considered are those who had moved within a local authority, between local authorities in the same county, between counties in the same region, between contiguous regions and between distant regions.

For the 1971–81 period migrants who had moved within a county had excess mortality of some 5 to 10 per cent over that expected. Migrants over a longer distance had lower than expected mortality, about 10 per cent. The greater the distance moved the lower the mortality level. The most striking observation, for both males and females by age, was the excess mortality among those aged 75 years and over who had moved within the same county, particularly between local authorities.

The hypothesis was examined that health selection is at work, with shorter distance migrants possibly moving because of ill-health and relatively good health being a precondition of longer distance moves. Comparing mortality levels for 1971–75 and 1976–81 for males, there was no strong evidence of a fall from the earlier to the later period for the shorter distance movers, or a rise for the longer distance movers. For females the position is similar but there is stronger evidence of a downward trend for shorter distance migrants.

The effect of migration status on the mortality differences between the socio-economic area clusters was also examined for males. The marked gradient between low and high status areas was still evident when analysed by distance moved in the 1966–71 period. However, the slightly higher level of mortality for migrants as a whole, and particularly local migrants, compared with non-migrants did not hold for all families. The levels for movers and non-movers in areas of established high status and resorts were similar (SMRs about 90), whereas for urban council estate areas the differential was as expected — SMRs of 125 for movers and 112 for non-movers. With the exception of those in urban council estate areas, migrants from outside the region had lower mortality levels than more local migrants.

The above analysis was repeated for the three main cause of death groups: **malignant neoplasms**, **circulatory diseases** and **respiratory diseases**. The same general patterns persist.

These analyses show, therefore, that while migrants tend to have slightly higher mortality than non-migrants on average, the actual level of mortality is also conditioned by the socio-economic character of the area of residence and the individuals concerned. In other words, mortality levels for migrants are by no means uniform across the country.

Mortality by place of birth (Chapter 8)
Place of birth is not routinely coded from the death certificates for statistical purposes. However, given the possibility that place of birth might be an important determinant of some adult diseases, a special exercise was conducted for the two million or so deaths occurring between April 1969 and December 1972. These have been analysed to investigate whether a person's risk of dying from **ischaemic heart disease**, **stroke**, **chronic bronchitis** and **stomach cancer** can be predicted by place of birth, independently of place of death. For the analysis the country was divided into 154 areas comprising the counties, large towns and London boroughs.

Because of the lack of suitable populations at risk, the analyses had to be based on the numbers of deaths from one cause as a proportion of deaths from all other causes for each place of birth/death, using an index akin to the proportional mortality ratio (PMR). It follows that the place of birth PMRs can give only a general description of the influence of place of birth. They describe the relative contribution of birthplace to differences in mortality in England and Wales, but not its absolute contribution to mortality from any cause.

In England and Wales there is a strong relation between geographical differences in mortality from cardiovascular disease and differences in reproductive mortality, maternal physique and birthweight seventy or more years ago. **Cardiovascular mortality** is higher in areas which formerly had higher maternal and neonatal mortality, and in which mothers had worse physique and babies had lower mean birthweight. The distribution of **ischaemic heart disease** is also related to the postnatal environment. The findings for 'migrants' (i.e. those in a different area at death to that at birth) are consistent with a major effect of the intra-uterine and early postnatal environments on the risk of ischaemic heart disease. The analyses show that people born in northern counties and industrial towns and South Wales, where death rates

from ischaemic heart disease are high, have an increased risk of the disease whether or not they move to other parts of the country.

Unlike ischaemic heart disease, the geographical distribution of **stroke** does not relate to the early postnatal environment. It is related to the intra-uterine environment, and pre-natal determinants of blood pressure levels may underlie this. The analyses for migrants give conclusions similar to those for ischaemic heart disease. In addition, a striking feature of the distribution for stroke is the low PMR values for many London boroughs. The low risk of stroke among people born in London goes with them when they move to other parts of the country.

Mortality from **chronic bronchitis** is concentrated in the cities and large towns of England and Wales. Its distribution corresponds closely to that of infant mortality from bronchitis and pneumonia in the early years of the century. This is one of several lines of evidence which point to a direct causal link between lower respiratory tract infection in early childhood and chronic bronchitis in adult life. The migrant analyses show that people born in the cities and large towns of England and Wales have an increased risk of chronic airways obstruction which will persist independently of subsequent migration to other parts of the country. This is in keeping with international studies of migrants.

Areas with high place of birth PMRs for **stomach cancer** are among those known to have high stomach cancer mortality rates. They include four counties in the north west of Wales, three county boroughs in the north east of England and two boroughs in south and east London. The analyses of migrants within England and Wales are consistent with the childhood environment having a major effect on stomach cancer risk, through mechanisms which are as yet unknown. Among migrants those born in areas of high stomach cancer mortality continue to have an increased risk, irrespective of where they migrate to.

Mortality among immigrants in England and Wales, 1979–83 (Chapter 9)

Significant differences between immigrant groups emerged in this study of immigrant mortality in England and Wales. The variation in mortality among men at ages 20–69 years ranged from a SMR of 65 for Italians and 70 among the Spanish/Portuguese to 128 among the Irish born. Scottish men also experienced a significant excess in mortality (SMR 118). A much smaller excess was apparent for Indian and African men. Males from Europe, USA, and the Caribbean and Old Commonwealths experienced lower mortality than the average levels prevalent in this country. These findings were generally similar for women. At ages 20–69 years female SMRs for 1979–83 ranged from 56 among the Spanish and Portuguese, 75 for the French and 78 for the Italians to 118 for the Scottish and 120 for the Irish. Mortality levels were higher than average also for African, Indian and Caribbean women, and lower than average for women from Europe, the Old Commonwealth, and USA.

Excess mortality among the Scottish and the Irish was greatest among young adults, particularly among men. SMRs for Scottish and Irish men at ages 20–49 were 135 and 147 respectively, compared with SMRs of 118 and 128 respectively at ages 20–69 years. A greater excess of mortality in young adults was observed also among Africans and Indians. Caribbean men and women also experienced a significantly greater excess at ages 20–29 years (SMRs 125 and 130 respectively), despite low 'all age' mortality in the men. In contrast, in general immigrant groups with low all age mortality showed similar or lower gradients at younger ages.

At ages 70 and over, only men born in Ireland and Scotland showed excess mortality in the 1979–83 period, with SMRs of 116 and 107 respectively. Mortality among elderly women was similar but it was also high for those born in Russia (SMR 112), America (108), India (107) and Poland (106) in contrast to the lower than expected rates for males.

The proportions of death attributed to different causes varied between the country of birth groups. Of significance was the low proportion of deaths attributed to cancer among the Indian population in both sexes, and the high proportion of deaths from cardiovascular diseases. These patterns were apparent also among young adults from the Indian subcontinent. The contribution of cancer was also low for Africans. Another significant feature was the comparatively high contribution of cerebrovascular disease and hypertension to mortality for Caribbean born immigrants.

Mortality of immigrants in 1970–72 and 1979–83 showed significant differences between groups in the rate of mortality decline. The greatest improvements were observed for African and Caribbean men and women, with mortality levels in these groups falling sharply over the period. Thus Africans moved from being the highest risk group in 1970–72 to levels lower than Scottish and Irish in 1979–83; the same was true of Caribbean women. In contrast, the high mortality among Scottish and Irish showed the least improvement over the decade, and by the 1980s these groups had the highest mortality of the groups examined. Scottish and Irish were also the only groups to show higher mortality in both sexes in the 1980s than the average levels for England and Wales during the 1970s. The mortality of Indian men also declined relatively slowly.

A striking contrast was the greater than average decline in mortality among groups for whom mortality levels were already low in the 1970s, most notably the French, but also among most groups from the Mediterranean, Canada, Australia, Italian, and Caribbean men and American women.

Variations in perinatal, neonatal, postneonatal and infant mortality by mother's country of birth, 1982–85 (Chapter 10)

Mortality levels and patterns among infants in immigrant groups in England and Wales varied considerably. Infant

mortality for immigrants from Pakistan, West Africa and the Caribbean was considerably higher than for the indigenous population in 1982–85. Indians, Bangladeshis and East Africans, on the other hand, had similar levels of infant mortality to the UK group.

Differences in levels of mortality between the country of birth groups were not the same for each period of infancy. The differences were generally larger in the perinatal period than in the postneonatal period, and not always in the same direction. Whereas all immigrant groups showed excess perinatal and neonatal mortality over the indigenous population, this was not the case with mortality after the first month of life. Postneonatal mortality was raised only for Caribbeans and Pakistanis; for other immigrant groups the rate was in fact lower than the level for the UK group. Thus Caribbeans and Pakistanis were the only immigrant groups to show excess mortality throughout infancy.

For Indians, Bangladeshis and East Africans excess mortality in the neonatal period was counterbalanced by lower mortality in the postneonatal period, resulting in levels of infant mortality which were similar to those for the indigenous population. For Pakistanis, West Africans and Caribbeans, overall infant mortality was raised well above the level for the UK group and, therefore, also above the rates for Indians, Bangladeshis and East Africans. At every stage of infancy, mortality for Pakistani infants was significantly higher than the rates prevailing not just for the UK group, but also for all other immigrant groups. This pattern was apparent throughout the 1975–85 decade.

Higher perinatal and neonatal mortality for immigrant infants reflected differences in both birthweight distribution and birthweight-specific mortality rates. The effect of birthweight distribution was strongest for Indians, Bangladeshis and East Africans, who had much higher proportions (43–48 per cent) of babies weighing under 3000 grams than the UK group (25 per cent); mortality at these low birthweights is much higher than for babies over 3000 grams. Other immigrant groups also had higher proportions of babies weighing under 3000 grams than the UK group, but not as high as for the above groups.

There were interesting differences in birthweight-specific mortality between some groups. At birthweights under 3000 grams, both perinatal and postneonatal mortality were lower for Indian, Bangladeshi and East African infants than for the UK group, even though overall perinatal mortality was significantly higher for these immigrant groups. However, Pakistani infants of similar birthweights had markedly higher perinatal and postneonatal rates compared with the UK group and other infants of Asian origin. Despite heavier birthweights, the mortality of Pakistani infants was considerably higher than for other Asian infants across all the variables examined in this analysis.

Immigrant groups reflected the pattern of social class differences in perinatal, postneonatal and overall infant mortality observed for the indigenous population, that is, with levels rising from Social Class I to V. Most immigrant groups showed larger social class differences in mortality than those observed for the UK group. Standardisation for social class had relatively little effect on inter-group differences in mortality. Differences in the social class composition of the various immigrant groups therefore explain a relatively small part of the observed inter-group variation in mortality.

Throughout infancy Asian infants, Pakistanis in particular, showed raised mortality from congenital anomalies. For Pakistanis this was combined with higher levels of mortality from conditions arising in the perinatal period and respiratory diseases. Sudden infant deaths and deaths from respiratory diseases occurred at a lower rate for most Asian infants. West African and Caribbean infants experienced relatively high mortality throughout infancy from perinatal conditions. The Caribbeans had a rate of sudden infant death roughly similar to the level for the UK group.

Immigrant groups generally reflected the overall regional differences in infant mortality, with mostly low rates in the four Thames regions and mostly high rates in Yorkshire and the West Midlands. Even so, differences were apparent in most regions, with generally low rates for Indians, Bangladeshis and East Africans, and high rates for Pakistanis. West African and Caribbean births were concentrated in the four Thames regions, where they generally showed raised mortality over all groups other than Pakistanis.

Differences in infant mortality were even more marked at the DHA level, with rates for immigrants (in DHAs with over 30 deaths) ranging from 9.6 to 19.0 per 1000 live births. The lowest immigrant rates were recorded in Leicestershire, and in some London boroughs with a high proportion of immigrant births; in these DHAs the differences between rates for the immigrant and indigenous populations were relatively small. In DHAs where immigrant rates were highest, differences between levels in the immigrant and indigenous populations were also the largest, with excess infant mortality of 40–80 per cent among immigrants.

The various immigrant groups were generally concentrated in specific DHAs. In DHAs with the highest immigrant infant mortality rates, the immigrant community was predominantly of Pakistani origin. In areas with low immigrant rates the predominant groups generally but not always were of Indian and East African origin. Infant mortality was also low in Tower Hamlets, where Bangladeshi births constituted over one third of all births. Similarly, immigrant infant mortality was low in City and Hackney, where the predominant immigrant community was of Afro-Caribbean origin. In DHAs which had a mix of both Indian and Pakistani births, infant mortality was consistently higher for Pakistani infants than for Indian infants.

1 Introduction

M Britton

Office of Population Censuses and Surveys

With acknowledgements to L Bulusu and M Alderson

1.1 Historical background

Since 1838 tables of mortality statistics by local area have been presented in the Registrar General's Annual Reports;[1] these have been supplemented by more detailed decennial analyses. Introducing the supplement to the Twenty-fifth Annual Report (1862),[2] the first decennial analysis to be presented as a separate supplement, William Farr pointed out that 'it had been compiled to show in detail from the consecutive records of 10 years the causes of death and the comparative salubrity of every part of England and Wales'. He went on to say: 'The determination of the law of mortality requires an extensive area of observation, both in space and time, to eliminate accidental perturbation'. With this in mind, Farr had already compiled tables of area mortality statistics for the seven years 1838 to 1844 using populations from the 1841 Census, and presented them in the Ninth Annual Report. The Sixteenth Annual Report presented further tables compiled from numbers of deaths in the decade 1841–50.

The first decennial supplement covered the period 1851–60 and included tabulations of deaths by sex and age for 23 selected causes; these were presented for 623 separate districts in the country. Similar decennial analyses were continued at 10-year intervals, based on numbers of deaths in a decade and populations derived from censuses taken at the two ends of the decade in question.

The last decennial supplement based on 10 years' deaths was that for 1931. This covered deaths in the period 1921–30 by sex and age for 205 causes of death, for 12 subdivisions of the country (four regions, each divided into (a) county boroughs, (b) other urban areas and (c) rural areas). Data for specific local authority districts were only presented for 16 causes of death. Part III of this decennial supplement, containing the Area tables, was not published until 1952.[3] It carried a note stating that 'in view of the small demand for decennial aggregates of statistics of births, marriages and deaths, and as an economy measure, no further volumes in this series are being prepared'.

However, the decennial supplement for 1951 was published in 1958. There was a separate volume entitled *Area Mortality* which provided tables by area, but only for the years 1950–53.[4] This was followed in due course by the decennial supplements for 1961 and 1971; the Area Mortality volumes covered the pericensal periods 1959–63 and 1969–73 respectively.[5, 6] The purpose of the 1961 Supplement was to 'examine the geographical patterns and variations in the statistics more closely than is possible in the annual data'. The availability and increasing use of computerised methods for producing microfiche provided an opportunity for the tables in the 1971 Supplement to be more extensive. However, caution was, and still is, necessary. The extent of cross-tabulation is not simply an issue of the number of tables or the table size that can be published. The desire to reflect detailed local variations in disease patterns has had to be balanced against random fluctuations due to small numbers of events and the robustness of the population figures used.

Table 1.1 sets out the extent of the tabulations on area mortality over the period 1851 to 1973 published in 11 decennial supplements.

1.2 Uses of geographic studies

In practice, mortality statistics by area (and related characteristics) are used by two main groups of people. The first, health and other public administrators, are primarily interested in differences between areas, such as health regions and districts. This interest arises from their responsibility for the provision and distribution of

Table 1.1 Tabulations of area mortality in the Decennial Supplements of the Registrar General for England and Wales, 1851–1973

Years	Causes of death	Areas*	Sex/age (+)	Standardised mortality ratios(†)
1851–1860	23	623 districts	Sex × Age (16)	
1861–1870	25	623 districts	Sex × Age (16)	
1871–1880	26	44 counties	Age (15)	
		630 districts		
1881–1890	24	44 counties	Sex × Age (15)	
		631 districts	Age (15)	
1891–1900	24	45 counties	Sex × Age (15)	
		631 districts	Age (15)	
1901–1910	24	55 counties	Sex × Age (17)	
		634 districts	Sex × Age (13)	
1911–1920	189	CB/UD/RD × 4 regions	Sex × Age (18)	Yes
	30	29 LBs; 82 CBs; UD, RD × county	Sex × Age (18)	
1921–1930	205	CB/UD/RD × regions	Sex	
	105	London/CB/UD/RD	Sex × Age (18)	
		London/CB/UD/RD	F × MS × Age (9)	
	16	61 counties (CB/UD/RD)	Sex × Age (4)	
1950–1953	12	29 LBs; 83 CBs; 62 ACs	Age (6)	Yes
	14	29 LBs; 83 CBs; 62 ACs	Age (6)	Yes
1959–1963	12	29 LBs; 83 CBs; 62 ACs	Age (6)	Yes
	16	29 LBs; 83 CBs; 62 ACs	Age (6)	Yes
1969–1973	100	33 LBs; 81 CBs; 59 ACs	Sex × Age (11)	Yes
	100	255 MBs; 525 UDs; 469 RDs	Sex × Age (11)	Yes

*AC = Administrative county
CB = County borough
LB = London borough
MB = Municipal borough
RD = Rural district
UD = Urban district
(+) Number of age-groups tabulated
(†) See Chapter 2 for definition

services and resources, the desire to relate expenditures to the 'need'[7] for services, and a wish to compare performances between areas.

The second large group of users of mortality statistics by area comprises epidemiologists and other researchers studying individual diseases. For these, geographic patterns provide an important source of clues about the causes of the diseases in question. These users are often concerned with local variations in socio-economic circumstances,[8] the distribution of industry[9] and the local environment.[10] At a broader level, international comparisons[11] may examine mortality in relation to socio-economic development, differences in diet, culture and behaviour.

The aims of geographical comparisons can be summarised as follows:

1) *Descriptive:* is there variation in the incidence, prevalence, survival, or mortality from disease?
2) *Hypothesis generation:* what might be the factors related to the observed distribution of disease?
3) *Hypothesis testing:* do specific aetiological factors influence the risk of a particular disease?
4) *The evaluation of medical care:* is a particular campaign controlling the disease?

The data used, methods applied and the presentation will depend upon the aim of the particular study. Thus, descriptive work and hypothesis generation are often best served by simple mapping, listing or tabulation (as in the traditional decennial supplements). Hypothesis testing, however, may be best aided by multivariate statistical analysis or collation studies. For example, for a number of conditions there is evidence that place of birth can influence the risk of disease, both for children and also during adult life. Such hypotheses can be explored by analysing disease by place of birth, rather than place of death (see Chapter 8). The infant mortality from bronchitis and pneumonia in 1921–25 was compared with adult mortality rates in 1959–78 for 212 local authority areas in England and Wales.[12] A close geographical relationship was found. Regression analysis of these data suggested that infection in early childhood had a greater influence than smoking in determining the geographical distribution of chronic bronchitis.

Classifications of small areas into similar socio-economic groups using census and other data have been increasingly used in the analysis of mortality, health-care planning and research. For example, the variation in age-adjusted mortality for some 36 area clusters based on aggregations of census wards has been analysed.[13] The wards were grouped on the basis of 40 socio-economic variables taken from the 1971 Census.[14] This type of analysis has permitted consideration of the association of socio-economic factors and mortality, and is developed more extensively in Chapter 6 of this report. In a different vein, the geographical variation of causes of 'unnecessary untimely mortality' at county level across England and Wales has been studied.[15] The philosophy behind such work is that if death from a particular disease is potentially preventable, then studies of area variation may indicate variation in effectiveness of health care.

Interpretation of the various methods of exploring area variation in mortality requires an understanding of the sources and limitations of the data used. These are described in the next chapter.

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c Starting with 1974 data, statistics on a single topic or a number of related topics have been published in separate annual volumes in DH series of OPCS publications.

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2 Sources of data and limitations

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2.1 Deaths

The analyses in this volume are based on deaths registered in England and Wales during recent years. Because of the nature of this report the periods to which the deaths relate are specified in each section of the analysis. Unless otherwise stated, deaths are assigned to an area according to the usual place of residence of the deceased at the time of death.

Generally speaking, deaths of visitors, that is, persons normally resident outside England and Wales, are included in the total for 'England and Wales and Elsewhere' for the calculation of standard rates. (The exceptions are those analyses based on linkage studies like the Longitudinal Study and infant mortality.) However, they are excluded from the counts of deaths for individual areas. During the five years 1979–83, there were 5,821 male and 3,597 female deaths of persons usually resident outside England and Wales. They account for about 0.4 per cent and 0.25 per cent respectively of total male and female deaths registered in England and Wales during the period. On the other hand, deaths of persons usually resident in England and Wales occurring abroad are not included in any of the analyses. Although such deaths may be noted by OPCS for death certification purposes, they are not included in regular mortality tables. The 1,500 or so deaths registered abroad annually, if included with the counts of deaths in England and Wales, would contribute about 0.3 per cent to the total number of deaths. However, some of these deaths relate to persons permanently settled abroad or resident there on long-term employment or business, and are, therefore, not relevant to the analysis of deaths in the population exposed to risk in England and Wales during the periods in question.

2.2 Populations at risk

One of the traditional reasons for preparing a decennial supplement is to use the more accurate and detailed population figures from the latest census as denominators in the calculation of mortality rates. The analyses in Chapters 3, 4 and 9 use the five-year periods 1979–83 with 1981 as the central year. Populations of areas, for persons aged one and over have been derived from the numbers of persons enumerated in England and Wales at the 1981 Census. Persons returned as resident in some part of England and Wales were assigned to their area of usual residence, irrespective of their place of enumeration. Visitors present at the census who were returned as usually resident outside England and Wales were included in the total population of England and Wales but not in the area of enumeration. These total populations have been used as the denominators for the calculation of standard rates, along with all deaths in each corresponding area of England and Wales as the numerators (see previous section). Persons resident in England and Wales but abroad on the night of the census, that is, outside England and Wales, have been excluded from the population at risk. This corresponds with the practice described earlier of excluding deaths of residents occurring abroad.

The population counts from the 1981 Census are not appropriate for the calculation of rates at ages under one year of age. Not only is there a known undercount of young children in the census,[1] but the number of births can vary considerably from one year to another. Thus, an estimate of the number of children under one year of age at one point in time is not necessarily a satisfactory estimate of the population at risk over a period of five years. Instead, numbers of live births registered in England and Wales have been used for the relevant period. They, too, have been assigned to an area in England and Wales, or to 'Outside England and Wales', according to the usual residence of the mother. This procedure applies not only to the analyses in Chapters 3, 4 and 9, but also to those in Chapter 5 and 10 dealing with infant mortality rates during the early 1980s. Again, births to mothers whose usual residence is stated to be outside England and Wales are included in the total for England and Wales. Births occurring abroad to mothers resident in England and Wales are not included, although these may be noted by OPCS for some purposes of certification.

It is interesting to note that a much larger number of births than deaths are registered abroad each year. At an average of around 16,000 they would contribute 2.5 per cent to the total number of births registered in England and Wales annually. Members of the armed forces stationed abroad, Crown servants on overseas posting, and other United Kingdom citizens working abroad form a substantial proportion of the parents involved. However, there would be some births registered to establish the right of United Kingdom citizenship for the child, even though the parents may have permanently settled abroad. It is unlikely that many of these children would enter the United Kingdom before their first birthday and any deaths among them would have little impact on the analysis of mortality by area. A linked mortality analysis shows that less than one per cent of deaths under one year of age are to those born outside England and Wales;[2] and these are likely to include many immigrants who would have no right of registration of a birth abroad with UK agencies.

It must be remembered that the figures for populations at risk derived from census data are not perfect; for example, the lower the level of area disaggregation used the greater the bias may be. Errors in the census may bias the results for particular areas, age-groups, household sizes, and other social groups in the population. Areas affected by high levels of migration may also be less robust than those for areas where natural increase (births minus deaths) is the main component of change. However, the likely error levels tend to be small compared with the random fluctuation that may occur in event rates for even moderately common health problems. No adjustment has been made for census underenumeration or response errors. Neither has any adjustment been made to the census-based population figures for the fact that census day was 5 April and not the mid-point of the year 1981. The mid-year population estimates for 1981 show a slight increase of just over 0.1 per cent overall compared with the census. There is a

smaller increase for females than males; and the data by age suggest increases in some age-groups and decreases in others, generally around one per cent or less. For most of Chapters 6 and 7 the Longitudinal Study (LS) has been used as the main source of data. For well over a decade OPCS has been linking information on registered deaths with census data for a one per cent sample of the population of England and Wales. The sample, all people born on one of four dates in each year, was initially selected from the 1971 Census. Linkage problems apart, the death information used in the study is the same as that described earlier, but the population (or persons) at risk used to calculate rates, etc. are derived somewhat differently from those described for the 1979–83 analyses. The following description of the derivation is based on that given in the first LS publication, which described the background to and technical aspects of the LS more fully.[3]

Death rates in the LS have been calculated by dividing the number of deaths at a particular age in a particular year by, what are usually termed, 'person-years at risk'. The concept of 'person-years at risk' is illustrated in Figure 2.1 for two individuals, one who survived to at least December 1975 and one who died in April 1974. The main two axes of the calculation are the year of death and the age at risk of death. Individuals in the LS will start at a point defined by their ages on 25 April 1971 (census day). As time passes, individuals contribute person-years at risk to different cells in the table. In any single calendar year the maximum of one person-year at risk contributed by an individual will be spread over two age-groups, in proportion to the time spent in each. Individuals contribute person-years at risk only for the period when they are believed to be alive and resident in England and Wales. Clearly the person-years at risk in 1971 will be closely related to the age-distribution at census whereas those for subsequent years are increasingly affected by the ageing of the subgroup and by its mortality and emigration rates, as measured by the LS. The LS report discusses in detail the way in which the death rates from the LS differ from those calculated using the more traditional unlinked approach.

2.3 Usual residence

In previous sections it has been stated that births, deaths and populations of an area are analysed by reference to usual residence. In most cases the usual residence is simply the place where a person lives, and if this is a private household no further questions usually arise. However, if the place is a non-private establishment, there are circumstances in which some other place is regarded as the usual residence. Sometimes a usual residence is not available; for example for vagrants, or unidentified bodies. It can also be difficult to determine the correct usual residence when a person has moved between a number of institutions preceding death.

Usual residence was introduced as a basis for allocation of deaths to areas in 1911. Before that, deaths were allocated to the registration districts in which they occurred and hence registered. Statistics were produced by registration district and the number of deaths in any district was influenced to some extent by the presence of hospitals. William Farr was well aware of the influence of large institutions on the mortality of local areas.[4] He pointed out that the mortality in those institutions was often high, and indicated how the mortality in specific workhouses could be transferred back to the locality from which the residents came. In 1909 the Registrar General pointed out that nearly one fifth of deaths in England and Wales occurred in public institutions and frequently the subjects had been admitted from outside the administrative authority in which the institution was located.[5]

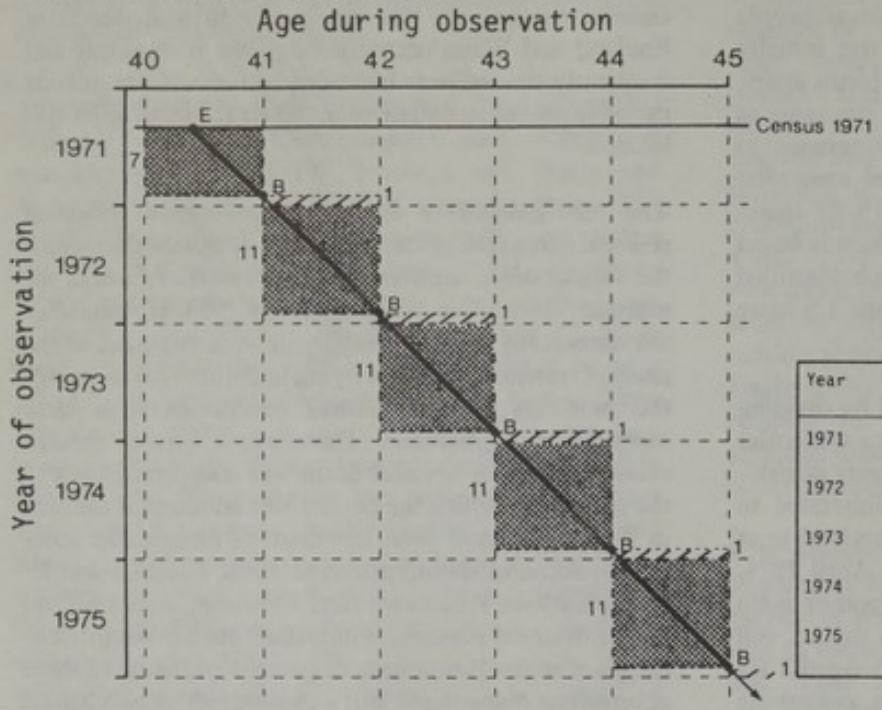
The reassignment of deaths to the original place of residence from the place (including institutions) in which the subject died, removed one source of distortion in the mortality data.[6] This was modified in 1953. Hospitals for the chronically sick or mentally ill were regarded as the place of residence for those dying in them. This increased the mortality rates for small authorities with large institutional populations. There was a further modification in 1958. A hospital death was transferred back to the place from which the patient was admitted if the stay in the hospital had been less than six months. In other words, accommodation provided under Parts III and IV of the National Assistance Act, 1948 (e.g. homes for old and/or disabled persons, blind, deaf, etc.) is regarded as the place of usual residence of persons enumerated there at census or dying there. But a chronic sick or psychiatric hospital is only treated as a place of residence of a person, if the person has been resident there for at least six months at the time of census or death. Deaths of persons in chronic sick wards of acute hospitals are assigned to their home address, or to the hospital address if no home address is available.

A recent analysis has compared the standardised mortality ratio (SMR) — see section 2.8 for definition — for local authority districts in 1981, with and without an adjustment for the mortality of the institutional population.[7] It was argued that the basic adjustment for age and sex distribution produced an SMR that adequately described the relative mortality for most areas. It was acknowledged that there were a few areas with a high proportion of institutional deaths, and that interpretation of the mortality of such localities required knowledge of the 'out-of-district' element in such institutional populations. Since 1983, the annual OPCS publications of area mortality (DH5 series) have not used a correction for institutional deaths.

The system of classifying a long-stay institution as the place of usual residence, and allocating the deaths occurring there to the area in which it is located, can contribute to raised mortality in that area, particularly if the residents are there for care of terminal illness. A recent example of such a distortion was found in the rural district of Stone in Staffordshire.[8] However, another investigation has examined the influence of 'out-of-locality' deaths and indicated that their loss has only a small effect and can be largely made good by local liaison with neighbouring districts.[9] Nevertheless, the loss of information about even a few deaths may compromise

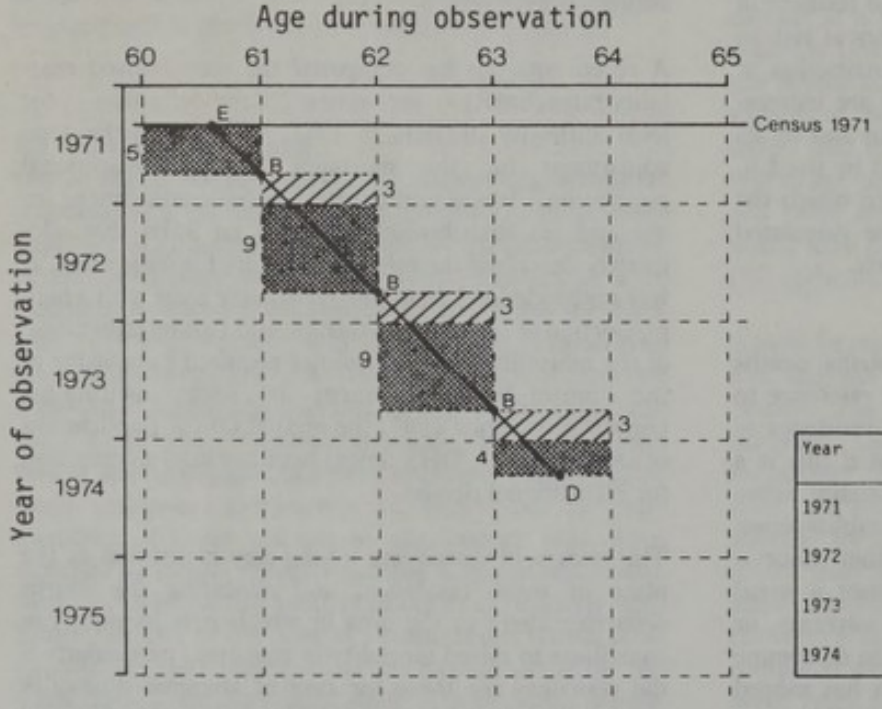
Figure 2.1 Illustrations of contribution to person-years-at-risk: OPCS Longitudinal Study

Person alive at end of 1975



Year	Age-group	Person-years-at-risk
1971	40	7 months
	41	1 month
1972	41	11 months
	42	1 month
1973	42	11 months
	43	1 month
1974	43	11 months
	44	1 month
1975	44	11 months
	45	1 month

Person who died (or embarked) 1971-75



Year	Age-group	Person-years-at-risk
1971	60	5 months
	61	3 months
1972	61	9 months
	62	3 months
1973	62	9 months
	63	3 months
1974	63	4 months

E-Entry date (25th April 1971) and age on entry

B-Birthdays

D-Date of death (embarkation) and age at death (embarkation)

Period at risk in younger age-group in each calendar year

Period at risk in older age-group in each calendar year

Reproduced from Chapter 2 of Fox, A J, Goldblatt, P O. *Longitudinal Study: Socio-economic mortality differentials, 1971-75*, Series LS No 1 HMSO (1982).

studies at sub-district level and the investigation of rare causes of death.

2.4 Cause of death

The International Classification of Diseases, Injuries and Causes of Death (ICD) 1977 (Ninth Revision)[10] has been used for all analyses in this report, except those based on the LS (Chapters 6 and 7) and place of birth (Chapter 8) which used the Eighth Revision because of the data periods involved. The use of two ICD classifications is unlikely to affect the conclusions reached. Where more than one cause of death is mentioned on the medical certificate, the underlying cause is determined in accordance with the international procedure. The ICD provides for grouping of causes into 3- and 4-digit categories and the aggregation of these into chapters and other groups. Appendix 3 lists the cause categories and various aggregated groups included in the microfiche tables (available from OPCS) and supporting analyses connected with Chapter 3. Appendix 2 gives some indication of the cause groups for which the analyses presented in other chapters are available, though for the analyses based on the LS the numbers of deaths involved may be relatively small.

Use of the ICD rules helps to achieve a degree of uniformity across the country in the certification and subsequent coding of the underlying cause of death for statistical analysis. However, there still are inaccuracies and inadequacies in the certification and coding of causes of death. The validity of area mortality indicators depends on the considerations frequently voiced about the general validity of the cause of death certified for death registration,[11] plus the need to consider whether there is any potential bias in the accuracy of cause details linked to different locations. The accuracy of the population figures, and the influence of migration also need to be borne in mind. For example, it has been found that in a substantial proportion of cases the pathologist's opinion after necropsy differs from that of the clinician in charge of the patient.[12] It has also been suggested that 'some patients remain for whom the most careful examination, investigation, and surveillance during life fail to provide a diagnosis, and exhaustive postmortem examination likewise fails to solve the mystery', and that 'in some circumstances the certified cause of death must be speculative and is usually misleading as well as inaccurate'.[13] Identification of a specific site of primary cancer is sometimes difficult to obtain, either because the certifying doctor failed to give the information and was unavailable to answer further enquiries, or it was not possible to determine the site due to the age and general condition of the patient. Competing causes present difficulty both to the certifier and the coder in the determination of the underlying cause. In Coroners' cases the situation is further complicated by considerations of law; the enquiries held by the Coroner are designed to serve purposes other than deriving a detailed ICD code for the underlying cause of death. These problems contribute to the general accuracy of the data.

Differences in availability of facilities for investigation of certain diseases and variation in certification practices in different areas may introduce bias. For instance, a marked increase in the number of deaths ascribed to mental disorder has been identified in north east Essex.[14] This was partly accounted for by a coding change which gave preference to a disease recorded in Part II of the certificate compared with a terminal condition in Part I. In 1981–83, 15 out of 76 certificates were from one doctor; and this increased to 47 out of 98 certificates for this cause in 1984. This indicated the effect that one doctor could have in a locality by use of terms rarely used by other doctors when certifying deaths.

Coding of cause of death was further affected by the industrial action of some of the registrars during 1981 and 1982. This resulted in a slight reduction in deaths coded to those categories which usually require more detailed information, for example specific sites of cancer. The effect of the industrial action was particularly relevant to the coding of the external cause for deaths involving accidents or violence. The supplementary information needed for detailed classification was not available from the quarterly copies. For example, for a road accident fatality, details such as the involvement of a motor vehicle, its type and whether the deceased was a driver, a passenger or a pedestrian, were not available. As a result, most of these deaths were coded to various 'not otherwise stated' categories. Deaths registered in 1982 were recoded after the industrial action was over, using the detailed information that was available from the draft entry forms submitted after a delay of several months; this recoding was not feasible for deaths in 1981. Consequently, the tables for external cause categories (see Appendix 3) have been based only on four years.

2.5 Birthweight information for infant deaths

Since 1975 OPCS has obtained birthweight information for live births through the co-operation of district medical officers. Birthweight information recorded on the birth notification form is passed to the local registrars of births and deaths who copy it onto the birth registration draft entry forms. These are subsequently returned to OPCS for statistical processing. OPCS refers back to the relevant district health authority (DHA) whenever a draft entry is received which has not recorded birthweight.

Initially the level of birthweight recording was very low, but it has improved consistently since 1975, and is now almost complete. In 1985, 99.9 per cent of all live births had a recorded birthweight. Thus, for the first time, it has become feasible to analyse birthweight-specific infant mortality rates for regional health authorities (RHAs) and DHAs. (See Chapters 5 and 10.)

Since 1975 0PCS has linked each infant death record to its corresponding birth records to obtain the additional information contained on the birth record including birthweight. The linked file also contains information about stillbirths. Fetal deaths, however, are not registrable under current registration practice if they are born before 28 weeks completed gestation, whereas all live births are registrable irrespective of gestation. Hence the

birthweight distribution of stillbirths is truncated at the lower end. Therefore, due to their lack of comparability with infant deaths in terms of birthweight, stillbirths are not included in the analyses.

Missing birthweights tend to occur among babies who died shortly after birth. Despite this, only 2.4 per cent of infant deaths in 1985 did not have a stated birthweight. Not surprisingly, high mortality rates are seen in the 'not stated' birthweight category. Some babies dying soon after birth are never weighed, so it is likely that the not stated category may include an excess of low birthweight babies compared with the population of live births as a whole.

2.6 Geography

The local government reorganisation of 1974 divided England and Wales into 54 counties, which were in turn subdivided into 403 districts (370 county districts and 33 London boroughs).[15] Most of the tables and analyses available in this report are for these areas and their aggregates. Chapters 6–8 are the main exception, being based, directly or indirectly, on the pre-1974 areas because of the data reference periods and classifications available.

2.6.1 Metropolitan counties and districts

Large concentrations of population were described in the past as conurbations. The 1974 reorganisation created six metropolitan counties, all in England, five of these comprising the areas of the old conurbations, plus a new metropolitan county of South Yorkshire, centred around Sheffield. These counties are divided into 36 metropolitan districts, mostly with populations of around 250,000 or more. Greater London continues to be treated statistically as a county, with 32 London boroughs and the City of London retaining their identities.

2.6.2 Non-metropolitan counties and districts

The remainder of England is divided into 39 counties, with 297 districts. Wales has 8 counties, divided into 37 districts. In general each non-metropolitan district has a population of between 60,000 and 100,000 persons. The reorganisation abolished a few of the smaller counties as well as restructuring others. The districts are large, both in terms of area and population, compared with the urban and rural districts of the past; many now include both urban and rural areas. Although the distinction between urban and rural areas is lost in the enlarged county districts, some of the larger urban units of the past county and municipal boroughs have retained their identity in the new districts.

2.6.3 Standard regions

England is divided into eight standard regions. Along with Wales, they form nine broad divisions of England and Wales and provide a North/South and East/West separation of areas for comparison. The regions are built up from complete counties. The composition of standard regions in terms of counties is shown at Appendix 1.

2.6.4 Comparison with old (pre-1974) local authority areas

Before the reorganisation of 1974, there were some 1,300 local authority areas. They varied considerably in the land area covered as well as in the population resident in them. While the urban areas (county and municipal boroughs and urban districts) were large or small centres of population, many rural districts covered large expanses of land with as few as 1,400 or as many as 109,000 persons in a single rural district, distributed over the area mainly in small villages. The old boundaries were such that some of the urban areas were located in the middle of the rural districts. Individual rural and urban areas, as formerly constituted, were generally too small to be suitable for analysis on their own. They were analysed in groups as aggregates of rural districts within a county, region, or England and Wales as a whole. The urban district totals for England and Wales were further grouped into density aggregates based on the population of the urban area. The new districts do not allow a comparable analysis of rural and urban areas. The new areas retain identification of most of the old county boroughs (CBs). Of the 83 CBs, 29 exist without change as new districts; many more have changed mainly by expansion of their boundaries to include surrounding urban settlements. Of the remainder, most are part of the new metropolitan districts and thus the new unit is not so different in character to the old CB. Therefore, it is possible to compare mortality data for most of the CBs from earlier decennial supplements with current data for the new areas. Although the 1974 reorganisation abolished some small counties and altered the boundaries of others, it is also feasible to relate mortality data (expressed as rates or ratios) for the remaining counties and regions built up from them, for the present and earlier reports.

2.6.5 Regional and district health authorities

An alternative division of England is provided by the boundaries of the 14 RHAs. Three of these, Northern, West Midlands and East Anglian, have boundaries coterminous with the standard regions North, West Midlands and East Anglia respectively. The North West standard region is split into two by North Western RHA and Mersey RHA. Three RHAs, Yorkshire, Trent and South Western, have slightly different boundaries from the corresponding standard regions. The major difference between standard regions and RHAs is to be found in the South East, which is divided into six RHAs. The four Thames RHAs are entirely contained within the South East, while Oxford RHA and Wessex RHA include parts of East Midlands and South West standard regions respectively.

The figures provided for RHAs in the microfiche tables (only) are made up of data for complete local authority areas — mostly whole counties and London boroughs, but also some county districts separate from their counties. As indicated above, these are different from the statutory RHAs, defined since 1982 as aggregates of their constituent DHAs. Furthermore, the boundaries of DHAs are not always coterminous with those of the local authorities. Where a local authority was divided by a DHA boundary and parts of it fell into two different RHAs, it was assigned in its entirety to the RHA containing the part with the larger share of the population. The composition of the RHAs in terms of

local authorities is shown at Appendix 1. This appendix also gives the composition of the statutory RHAs in terms of the constituent DHAs; these are used in Chapter 5.

2.6.6 Aggregates of small areas

The boundaries of the administrative areas and their aggregates used in this volume enclose within their limits different types of locality. Some districts contain sparsely populated villages as well as more densely inhabited urban settlements. Such boundaries do not usually identify separate communities which can be easily compared. Environmental features, such as chemical or other industries, may be located in one area, while people living in adjacent areas may be affected by pollution or other effects. The area affected by air-borne substances will be determined by wind speed and direction at different times.[16] For water-borne substances not only persons living in areas receiving the polluted water supply will be affected, but also, possibly, those in places far from the source of pollution who consume foodstuffs grown in the polluted water. Studies of such effects can rarely be based on mortality data classified to district level. Where an affected area can be identified, data at ward or postcode level often have to be aggregated. However, an observed excess mortality from any cause in one local authority district may well indicate a need for further examination of the mortality of adjacent areas.

The use of small areas can facilitate the consideration of differences in exposure to aetiological agents, but random variation due to small numbers of events can make it difficult to interpret observed differences in mortality. Though small areas may be more homogeneous, and thus more suitable for study, they are also more likely to be markedly affected by migration. The longer the latent interval between the exposure to a local environmental factor and resulting death, the greater the effect of dilution or distortion from migration. (Chapter 7 examines mortality differentials according to migration status and distance moved.).

The classification of small areas (e.g. wards) into grouped areas with like socio-economic or environmental characteristics is an alternative form of analysis which is used extensively in Chapters 6 and 7 with data from the LS.

The geographic framework used in a census permits analysis by area groupings based on enumeration districts. Such groupings include standard regions, conurbations, counties, London boroughs and county boroughs, wards, parliamentary constituencies etc.[17] During the 1970s, OPCS sponsored a series of analyses which aimed to group areas within Great Britain according to their socio-economic composition.[18] Thirty-six geographic clusters were derived by grouping census wards on the basis of 40 census variables. These 36 clusters were grouped into seven 'families' as follows:

FAMILY 1 Areas of young and growing population
FAMILY 2 Areas of older settlement
FAMILY 3 Rural areas
FAMILY 4 Urban council estates
FAMILY 5 Areas in Scotland suffering from acute social disadvantage
FAMILY 6 Areas of multi-occupancy students and immigrants
FAMILY 7 Areas of established high status and resorts

Readers should recognise the limitation of the titles given to these families (and clusters) and refer to the original analysis which described the characteristics of people in each cluster.[19] Chapter 6 gives a full listing of the titles for each cluster and family. Chapter 6 also contains analyses based on the LS data-set which show the potential for adding environmental variables (for example, water hardness) to the local area in which the sample members were resident in 1971.

2.7 Country of birth

2.7.1 Background

An alternative approach to mortality analysis by area of residence is an analysis by area of birth. Analysis by area of residence is based on the assumption that the person was exposed to the environment of that area and that the cause of death of that person was to some extent influenced by that environment in a broad sense. However, a large proportion of the population of an area comprises people not born in that area. These people would have been exposed to varying environments throughout their life, including that of their area of birth for at least a short time at the beginning of their lives. Thus, information on place of birth in mortality data, where available, provides us with an opportunity to study the effects of the environment in early life.

Such an analysis is particularly relevant to those born outside England and Wales. Apart from the environment of their country of birth, they would have experienced a different social and cultural background which would continue to have some effects even after migration to this country. Further, many of these 'migrants' would have come from widely varying ethnic groups, with differences in their genetic make-up that may predispose them to certain diseases while providing protection from others.

To facilitate such an analysis, the recording of country of birth of the deceased was introduced in 1969 for death registration and a question on country of birth was included in the 1971 Census. Mortality during the years 1970–72 was analysed for various immigrant groups by relating their deaths to the corresponding population of immigrants derived from the 1971 Census. Those born outside England and Wales were defined as 'immigrants'. Deaths in the nine years 1970–78 were also analysed by the method of proportional mortality.[20]

Country of birth is now recorded routinely at death registration and is available as part of the regular mortality statistics. The question on country of birth was asked again in the 1981 Census and resident population figures by country of birth were derived from it in the same manner as described in section 2.2 of this chapter. In Chapter 9, deaths in England and Wales for the five

years 1979–83 have been analysed by country of birth using the population figures derived from the 1981 Census.

2.7.2 Notes on selected countries and groups of countries

Present name of country is requested on census forms and at death registration. In coding for tabulations some countries were identified individually but others were grouped together into broad categories in different regions of the world. Commonwealth countries were grouped separately from the non-Commonwealth countries, generally referred to as 'foreign', in any region.

The 1971 Census Post-enumeration Survey indicated an error of about two per cent for a broad grouping of countries.[21] The Post-enumeration Survey for the 1981 Census did not examine this question. Linked data for 1971 and 1981 Censuses from the LS show varying levels of inconsistency for different countries of birth.[22] For some countries, the discrepancy is as high as eight per cent, but when a number of countries are grouped together the discrepancies tend to cancel out. Some of the discrepancies are of a similar nature to those between census records and death registrations, that is, the differences are for a specific country. The two most obvious examples are the countries of the Indian subcontinent and Northern Ireland and the Irish Republic. The LS also provides a comparison between the country of birth recorded at Census and that recorded at death.[23]

For the analysis in this volume, a number of countries or groups of countries have been selected mainly on the basis of numbers living in England and Wales or known raised mortality levels. Of the total population, 8.6 per cent were born outside England and Wales, a similar proportion to that in 1971. Relevant information about some of the main countries and groups of countries is given below.

Ireland and Scotland

Of the groups considered in this report, the Irish born provides the largest population number followed closely by those born in Scotland. It was found necessary to combine Northern Ireland and the Irish Republic into one common group, 'All Ireland', because in many cases of death registration Ireland was stated without specifying which part. The number living in England and Wales in 1981 and born in any part of Ireland was 1.6 per cent of the total population. This is slightly lower than the proportion in 1971. The number born in Scotland was also slightly down on 1971 and formed 1.5 per cent of the 1981 population.

Indian subcontinent

This group consists of four countries — Bangladesh, India, Pakistan and Sri Lanka. Although all four countries have been coded separately for the census as well as for deaths, there are problems in analysing them individually. The recording of any of these countries in a census by a living person as his or her place of birth is likely to be more accurate than at death registration when the surviving relative may be less specific. Analysis of post-census data suggests that India is recorded quite often at death when the country of birth stated at a census is one of the other three. This is quite likely for a White or European person born in the subcontinent.

On the other hand, there is also a possibility that a person who came to England or Wales from Pakistan would be assumed to have been born there by the surviving relatives even if he/she was born in that part of the subcontinent which is now India and migrated, perhaps as a small child, to Pakistan. He/she may or may not have stated India (the correct place) as his place of birth at a census. Treating the four countries together as a group avoids the discrepancy between the two sources of data.

The number of persons born in the Indian subcontinent and resident in England and Wales in 1981 was 634,000, 1.3 per cent of the total population. This number has increased by a third since 1971 when it was under one per cent of the population of England and Wales. In general, the White or European component of this population has an older age profile than the population of those native to the subcontinent. However, in this volume the data are not analysed by ethnic group and the possible heterogeneous nature of the country of birth groups has to be taken into account in interpreting the results. This is discussed again in Chapters 9 and 10.

African Commonwealth

This group consists of the Commonwealth countries on the African continent and the islands of Mauritius and Seychelles. The population resident in England and Wales and born in the African Commonwealth includes three broadly definable groups (1) African origin (2) Asian origin, mainly from the Indian subcontinent, and (3) British and other European origin. No attempt has been made to identify the Africans, Asians and Europeans separately for analysis in this volume — as was done in the analysis around the 1971 Census — even though differences between them are likely to be of relevance. Separate analysis of individual countries of birth are constrained by small numbers. Consequently, only the groups East and West African Commonwealth have been analysed.

The number of persons living in England and Wales born in the African Commonwealth increased from 164,000 (0.3 per cent) in 1971 to 283,000 (0.6 per cent) in 1981. Much of this increase was due to East African Asians, mainly British passport holders, but also refugees from Uganda holding Ugandan citizenship.

Caribbean Commonwealth

This group includes all the Commonwealth countries in the Caribbean region, both the islands and countries on the Central and South American mainland. Those born in the Caribbean Commonwealth include some of British or other European origin and some of Indian or other Asian origin; but most are of African and mixed origins. The numbers fell from 304,000 to 295,000 between 1971

and 1981. The fall can be be explained almost entirely by deaths as migration has contributed little during the decade.

Mediterranean Commonwealth
This group comprises of Cyprus, Malta and Gozo, and Gibraltar, and includes both British and those indigenous to these countries. Those born in Cyprus constitute two thirds of the total of 127,000 in the group in 1981.

Old Commonwealth
Australia, Canada and New Zealand are usually referred to collectively as the Old Commonwealth. Although shown separately in the tables, they have much in common. Analysis of 1971 Census data by parents' country of birth showed that a very large proportion of those born in one of these countries had one or both parents born in the British Isles. Also, some of these people may only be resident in England and Wales for short periods. The numbers in 1981 are similar to those in 1971 — approximately 139,000 persons. This would suggest that some of those enumerated in the 1971 Census have returned to their country of birth and been replaced by newcomers in 1981.

Europe, USSR, USA
There are two distinct groups of migrants from European countries. First those who came before and during the 1939-45 war, mainly from the USSR, Poland and Germany. The numbers of these migrants have been declining due to deaths. There is little or no new migration from the USSR and Poland. From Germany, however, there is migration to England and Wales of children and wives of British armed forces personnel, born in Germany. The second group of migrants are those who arrived more recently, born in France, Italy and Spain and Portugal. The overall number in 1981 of these migrants was 479,000; this was similar to that in 1971.

South Africa
The 1971 Census showed that many of those born in South Africa had one or both parents born in the British Isles. The numbers are only slightly higher in 1981, 51,000, compared with 1971.

2.8 Statistical notes

2.8.1 Death rates
For ages one and over, the rates have been calculated as the number of deaths in the age/sex specific disease group during the period 1979–83 divided by five times the resident population derived from the 1981 Census, and are expressed as rates per million population. For ages under one year, the rates have been calculated as the number of deaths in the relevant period and disease group divided by the number of live births in the same period for each sex, and expressed as either rates per million or per thousand live births.

2.8.2 Standardised mortality ratios
The standardised mortality ratio (SMR) is a measure of relative mortality in a study population compared to that in some standard population. The standardisation is for age and, if relevant, sex. This method of standardisation, commonly referred to as the indirect method, was first used by Farr in the Annual Report of the Registrar General for the year 1857.[24] The Annual Report for the year 1911, included an elaborate discussion of the need for such a method and its advantages;[25] and the method has been used more regularly in the Registrar General's publications ever since. The Decennial Supplement for 1921 also provides a comparison of the indirect and direct methods of standardisation.[26] The expression 'standardised mortality ratio' was introduced in the 1931 Decennial Supplement[27] and has come to be used extensively in recent years.

For most of the analyses shown in Chapters 3 and 4, the study population is that of a local area and the standard rates used are those for England and Wales as a whole. The SMR has been calculated as the ratio of the observed number of deaths in the area to the number expected if the age/sex specific death rates in the standard population (i.e. for England and Wales) applied to the population of the local area. The SMR is presented as a percentage, rounded to the nearest whole number. The observed number of deaths in a given area have been obtained from the numbers of deaths registered anywhere in England and Wales classified to the usual residence of the deceased (see sections 2.1 and 2.3). Similarly, the 'average' population of an area has been derived from the counts of persons enumerated in the 1981 Census in England and Wales who gave a usual residence in the area in question (see section 2.2).

SMRs have been calculated separately for males and females, and for specific ICD disease groups; the standardisation is therefore based on the age distribution of the population. Five-year age-groups have been used from ages 5 to 95 with 0, 1–4, and 95 and over, covering the remainder of the life span. Although, because of space considerations, data have been presented in 10 year age-groups in the published microfiche tables, the SMRs are actually based on calculation of the expected deaths in each of the 21 age-groups described above. The expected deaths have been obtained by multiplying the population (or births, for age 0) of the area by the standard death rate for each of the 21 age-groups, for each sex and disease group. The numbers of expected deaths so obtained are then summed over the age-range to produce the SMR (i.e. SMR = $O/E \times 100$ where O = observed and E = expected). It should be noted that as a consequence of the method of calculation SMRs obviously cannot be compared by sex or across disease groups.

Similar procedures apply for the calculation of SMRs presented in Chapters 6 and 7. In this instance the study population could be a type of area based on a socio-economic or environmental classification of areas and/or social groups (e.g. Social Classes I and II, owner occupiers, etc).

2.8.3 Statistical significance
The lowest level of area for which data are presented (county district) should yield a total number of deaths for

males or females which is sufficiently large for the resulting SMR to be a reliable guide to the mortality of the area. However, much of the analysis by cause and by age and sex relies on much smaller numbers of deaths. The tests of statistical significance described briefly below help to indicate the weight that can be attached to a particular rate or SMR. The tests depend on the number of deaths and the general rule is that the smaller the number of deaths on which a rate or SMR is based, the larger the range within which the true value might lie. Consequently, in a comparison of a local area death rate or SMR with that of England and Wales, only a large difference would tend to suggest a true difference. Even larger differences in the rates or SMRs would be required when two local areas are compared, each would be subject to variation.

The death rates and SMRs shown in this report are estimates of the true values of the measures of mortality they represent. They are subject to errors due to random variation in the observed number of deaths on which they are based, as well as to any errors in the population figures used in the calculation or biases in the method of study. Standard errors (se) of death rates or SMRs can be calculated by ignoring any errors in the population figures or biases and assuming that the observed number of deaths are distributed as a 'Poisson' variable.[28] Approximate limits can be obtained by using the normal distribution with observed numbers of deaths as mean and variance in place of the Poisson. The calculation of the standard error for the SMR can be formulated as follows:

$$\text{se (SMR)} = \frac{\text{SMR}}{\sqrt{\text{observed deaths}}}$$

Confidence limits provide an indication of the reliability of an estimated measure of mortality. However, in a study like this, it is often more appropriate to ask how the mortality of a local area compares with the average for the country as a whole. The SMR, or the ratio of local to national rate in any specified age-group, is the relative measure. The distribution for the observed number of deaths now has a mean equal to the expected number of deaths, since the underlying 'null hypothesis' here is that the level of mortality in the local area is the same as that in the country as a whole. An approximate test is to assume that SMRs have a Normal distribution and that the local SMR is greater or less than 100 if the difference between them is more than twice the standard error of the local SMR. In this instance the probability of the observed difference being due to chance is approximately five per cent. The number of standard errors chosen for the confidence limits can be varied according to how much additional protection is needed to avoid spurious results arising from multiple comparisons.

An alternative test of significance is given by:

$$\text{Chi - square} = \frac{(\text{Obs} - \text{Exp})^2}{\text{Exp}}$$

where Obs = Observed number of deaths in the local area

Exp = Expected number of deaths in the local area

and the table of chi-square values, with one degree of freedom, is used to obtain the probability. The same test can be written in a different form, using observed number of deaths and SMR, instead of expected number, to give.

$$\text{Chi - square} = \frac{\text{Obs}}{\text{SMR}} \times \frac{(\text{SMR} - 100)^2}{100}$$

where SMR = (Obs/Exp) × 100

With small numbers, at any chosen level of significance, the approximate test based on chi-square and the more exact test based on the Poisson probabilities will differ in outcome in borderline cases. The test based on chi-square imposes a symmetry and continuity on what is a non-symmetrical distribution based on discrete values of the numbers of deaths.

For parts of this report a number of slightly different methods of calculating the standard errors and confidence limits have been used depending upon the source of the analysis and whether they were calculated during the tabulation process or subsequently. In practice this makes little difference to the values obtained or conclusions reached particularly if the warnings about approximations are heeded.

However, in an analysis involving examination of data for large numbers of areas and causes the emphasis should not be on selecting individual significant values but on seeking broad patterns to form the basis for new hypotheses.

When a large number of areas and causes are examined, the use of tests like that described above to determine whether an area has significantly high (or low) mortality will always result in some areas being found to be significant due to chance alone. For example, if the SMRs, for some cause, for all 403 local authority areas in England and Wales are tested at the five per cent level of significance, then 20 areas can be expected to have SMRs significantly different from 100, even if there are no differences in the force of mortality between the areas. Setting the level of significance to a lower probability would reduce the number of spuriously high or low mortality areas detected in error — that is, reduce the 'false positives'. At the same time the number of 'false negatives' will increase.

The question of testing SMRs with reference to mortality by areas in the last decennial supplement was discussed by Gardner *et al*.[29] More general discussion of simultaneous performance of large number of tests can be found in Jones and Rushton,[30] and Miller.[31] Rosen *et al* have pointed out that detailed regional analyses of mortality suffer from (i) problems of small numbers; (ii) spurious

significant results from multiple comparisons; (iii) use of SMRs which place too great weight on results from older subjects; (iv) the ecological fallacy (the inability to assess relationships with individual behaviour, from associations at the population level); (v) the inappropriateness of administrative boundaries for studying biological associations; (vi) the effect of internal migration; and (vii) variation in local diagnostic criteria.[32] Shaper has also warned against the over-interpretation of geographical distributions of mortality.[33] He emphasized that there was need to go beyond the maps and mount analytic studies usually involving prospective studies of individuals. Pocock *et al* have stated that simple geographic associations need to be interpreted cautiously, and methods of simple regression could be used to allow for the effects of factors influencing mortality (as in Chapter 6, for example).[34] However, no matter what statistical methods are employed, the interpretation of geographical mortality studies remains difficult. Inevitably, there will be variables one would like to include in the study which cannot be measured at the local level; for example, data on diet and tobacco consumption are only available at a regional level in England and Wales.

Many commentators continue to worry that the presentation of statistics based on small numbers may be so subject to chance fluctuation that the pattern revealed is misleading. When some of the results are supported by previous evidence, it is still not clear if the unexpected findings point to genuine environmental variation, or are the result of statistical quirks thrown up by the technique. If the patterns do not suggest distortion by small numbers, difficulty in determining the population at risk, bias from migration, or variation in accuracy of cause of death, then a search for an explanation is required. Having considered these aspects, it is natural then to reflect on whether the observed geographical variation (if any) might be a pointer to aetiological factors, or factors affecting variation in survival. It is impossible from the material available to OPCS to determine whether high mortality for a given non-malignant condition is a reflection of high case-fatality in the patients concerned, some other factor leading to poor survival, or high incidence of the disease. As far as malignant disease is concerned it is possible, because of the existence of the national cancer registration system, to compare the geographical variation in the incidence of the disease, in five-year survival, and in mortality.

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3 Geographic variation in mortality, 1973–83

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With acknowledgements to L Bulusu and M Alderson

3.1 Introduction

In this chapter, the geographical patterns in mortality during the years 1979–83 are briefly summarised and compared with those found in the earlier decennial analyses for 1959–63 and 1969–73.[1] A comparison of SMRs for regions is followed by an examination of those for counties within regions and districts within counties. This analysis, based on all causes, is then supplemented by a summary analysis of specific causes, mostly at county, metropolitan district and London borough level. All the analyses for the 1979–83 period are based on the data provided on microfiche, details of which are given in Appendices 3 and 4.

3.2 Regional pattern of mortality: all causes

The mortality gradient from the North and West to the South and East continues to prevail. Table 3.1 presents SMRs for the eight English standard regions and Wales for the periods 1959–63, 1969–73 and 1979–83. The regions and Wales are presented in descending order of SMR values for the period 1979–83. The order for females is the same as that for males although the spread of the values is less. The order has remained virtually unchanged over the same three periods, except that North West region has moved from first to second place for males and is at the same level as the North region for females. Relative male mortality in the North region is now the highest, having been lower than the North West and Wales, and equal to Yorkshire and Humberside in 1959–63, and lower than the North West but equal to Wales in 1969–73. For females the North region was second to the North West in the earlier periods, but they are now equal first. Overall, it would appear that the relative position of the North region has slightly worsened over the period. In contrast, the South West region now has lower SMRs for both males and females than before. This has not affected its position as the second best region for males but has moved it from third to second best for females. East Anglia still has the lowest SMRs.

Table 3.1 SMRs in 1959–63, 1969–73 and 1979–83: all causes
Standard regions of England and Wales

Area (ranked according to SMR, values in 1979–83)	1959–63*	1969–73*	1979–83
Males			
North	107	109	112
North West	113	112	111
Wales	108	109	107
Yorkshire and Humberside	107	105	106
West Midlands	103	104	104
East Midlands	96	98	99
South East	94	93	94
South West	92	93	90
East Anglia	89	89	88
Females			
North	108	108	110
North West	111	109	110
Wales	105	105	105
Yorkshire and Humberside	106	104	105
West Midlands	103	102	104
East Midlands	99	100	101
South East	94	95	94
South West	96	96	93
East Anglia	94	93	92

* *Source: Area Mortality: Decennial Supplement, Series DS no. 4, HMSO, 1981*

Table 3.2 shows the same information for 1979–83 but for two broad age-groups, 15–64 and 65 and over. The spread of SMR values for the 15–64 age-group is greater, whilst that for ages 65 and over is smaller than for all ages. However, the ranking of the regions is virtually the same for these age-groups as for all ages, for both sexes.

3.3 Mortality at county and district level: all causes

Examination of the microfiche tables related to this volume indicates that the mortality pattern for males observed at regional level is reflected in the constituent counties. While there is some variation between counties within each region, the five counties with the highest SMRs are all in the high mortality zone of the North and North West regions and Wales. Other counties in these regions and Wales also have high SMRs generally. By contrast, in the South East, South West and East Anglia regions all the counties have an SMR less than 95 with the exception of Kent (96) and Greater London (99). When separated into Inner and Outer London, the latter has an SMR of 93 while Inner London is the only area in the south with an above average mortality (SMR=108). Also, there are no counties with an SMR less than 95 outside these three southern regions. Counties in Yorkshire and Humberside, East Midlands and West Midlands have SMRs in the middle range, with West Yorkshire having the highest SMR at 111, and North Yorkshire the lowest at 95.

The pattern is broadly similar for females. One exception is Inner London which has an SMR of only 100 for females. While the same counties as for males have the extreme values of SMRs, those with SMRs in the middle range do not always appear in the same rank order for males and females.

Table 3.3 shows the local authority districts with SMRs of 115 or more. This is the lowest geographical level for which mortality data is routinely available (a total of 403 authorities).

For males, 28 of the 33 districts listed are in the high mortality zone the North and North West regions and Wales. Of the remaining five, one is an Inner London borough — Tower Hamlets — one is Stoke-on-Trent in Staffordshire, and the other three are metropolitan districts in West Yorkshire. A similar picture emerges for females. There are 27 districts with SMRs of 115 or more. Of these, 22 are in the high mortality zone. The five outside this zone are in Staffordshire (two districts), Kent (one district), and West Yorkshire (two metropolitan districts). Although the districts with high SMRs do not appear in the same rank order for males and females, a district with a very high SMR for one sex tends to have a high SMR for the other as well.

More generally the microfiche tables show that there are few districts with SMRs significantly higher than 100 in the low mortality southern regions, for either sex. The

Table 3.2 SMRs by broad age-group and sex, all causes, 1979–83

Standard regions of England and Wales

Area (ranked according to SMR values for all ages)	Males			Females		
	All ages	15–64	65 and over	All ages	15–64	65 and over
North	112	116	110	110	116	109
North West	111	116	110	110	115	109
Wales	107	106	107	105	108	105
Yorkshire and Humberside	106	107	105	105	105	105
West Midlands	104	103	105	104	101	104
East Midlands	99	97	99	101	98	101
South East	94	91	95	94	92	94
South West	90	89	91	93	88	94
East Anglia	88	81	90	92	83	93

Table 3.3 Local authorities with all cause SMRs above 115: numbers of deaths, 1979–83

Local authority districts

Males				Females			
Area (ranked SMR)	Number of deaths	SMR	95 per cent confidence interval	Area (ranked SMR)	Number of deaths	SMR	95 per cent confidence interval
Manchester	16,000	125	123–127	Castle Morpeth	2,160	145	139–151
Salford	8,785	124	121–127	Burnley	3,515	123	119–127
Cynon Valley	2,456	123	118–128	Copeland	2,127	120	115–125
Merthyr Tydfil	2,177	122	117–127	Middlesbrough	4,139	119	115–123
Rhondda	3,065	122	118–126	Chester-le-Street	1,388	119	113–125
Knowsley	4,295	122	118–126	Wear Valley	2,237	119	114–124
Hartlepool	3,028	122	118–126	Merthyr Tydfil	2,073	119	114–124
Castle Morpeth	1,990	122	117–127	Cynon Valley	2,264	118	113–123
Burnley	3,308	121	117–125	Rhondda	3,016	118	114–122
Middlesbrough	4,383	121	118–124	Rhymney Valley	2,771	118	114–122
St Helens	5,935	121	118–124	Blackburn	5,108	118	115–121
Liverpool	17,198	120	118–122	Dartford	2,565	117	113–121
Tower Hamlets	5,122	120	117–123	Sedgefield	2,578	117	113–121
Gateshead	7,113	120	117–123	Oldham	7,157	117	114–120
Stoke-on-Trent	8,509	120	118–122	Salford	8,588	116	114–118
Afan	1,865	119	114–124	Knowsley	3,931	116	112–120
Arfon	1,717	118	113–123	St Helens	5,545	116	113–119
Wear Valley	2,308	118	113–123	Easington	2,915	116	112–120
Barrow-in-Furness	2,556	117	113–121	Halton	2,881	116	112–120
Blackburn	4,582	117	114–120	Hyndburn	2,852	116	112–120
Copeland	2,239	116	111–121	Lichfield	2,085	116	111–121
Bolton	8,315	116	114–118	Stoke-on-Trent	7,935	116	114–118
Wigan	9,177	116	114–118	West Lancashire	2,773	115	111–119
Oldham	6,918	115	112–118	Barrow-in-Furness	2,381	115	110–120
South Tyneside	5,430	115	112–118	Wigan	9,050	115	113–117
Sunderland	8,678	115	113–117	Bolton	8,463	115	113–117
Stockton-on-Tees	4,562	115	112–118	Ogwr	4,007	115	112–118
Langbaurgh	4,197	115	112–118				
Halton	3,088	115	111–119				
Easington	3,404	115	111–119				
Sedgefield	2,851	115	111–119				
Hyndburn	2,703	115	111–119				
Rhymney Valley MG	2,886	115	111–119				

exceptions are some of the London boroughs and Dartford in Kent. For females, Brentwood in Essex, Hastings in East Sussex, Swale in Kent, and North Cornwall have significantly high SMRs. With the exception of Hastings, these areas have a higher proportion of the population in institutions than the average for England and Wales.[2]

3.4 Regional pattern of mortality by cause

Diseases of the **circulatory system** account for about one half of the deaths in the 1979–83 period; examination of the microfiche tables suggests that the broad regional pattern seen for all causes also applies to this group of diseases. For individual causes in this group there is some variation in the ranking of the regions by SMR, but the broad pattern is maintained. One notable exception is **hypertensive disease,** for which the SMRs for both sexes are high for the West Midlands and Wales but low for the North, North West, and Yorkshire and Humberside regions.

Malignant neoplasms, as a group, are next in importance accounting for a quarter of all deaths. Mortality due to all malignant neoplasms is high in the North and

North West regions but Wales slips down to below West Midlands and Yorkshire and Humberside regions in rank order. This pattern is generally repeated for most sites, and, in view of the small numbers on which the SMRs are based, too much importance should not be attached to the rankings of the regions derived from the SMRs for individual cancers. However, it is worth noting that the pattern is virtually reversed for **malignant melanoma of the skin** for both sexes. It has been suggested that this type of cancer is associated with exposure to ultraviolet light,[3] which is likely to be greater with more hours and greater intensity of sunshine. A similar reversal of the geographic pattern is found for **cancer of the prostate** in males and **breast cancer in** females, with southern regions having higher SMRs. **Leukaemia** and **malignant neoplasms of the brain** also show a relative excess of deaths in the southern regions.

3.5 Mortality at county, metropolitan district and London borough level by cause

To probe these issues further, the microfiche data were examined for counties, metropolitan districts and the London boroughs (a total of 115 local authorities). This is at a higher level than the analysis in Table 3.3 because the number of deaths from some individual causes are likely to be too small in non-metropolitan districts. In order to select causes of death warranting further examination, the total number of deaths for persons was set out for each of the cause groups used on the microfiche. Excluding broad groups where component causes of death also featured, the commonest twenty causes of death were identified. The aggregates 'all causes of mortality', and 'all malignant neoplasms' were examined in addition to common sites of malignancy. One or two causes were added to this list even though they did not feature in the numerical ranking of the top causes, because of their innate interest as representing a chapter of the ICD. The list of selected causes are as follows:

All causes	**(ICD 001–999)**
Malignant neoplasms (ICD 140–208)	
— Stomach	(ICD 151)
— Colon	(ICD 153)
— Rectum, etc	(ICD 154)
— Pancreas	(ICD 157)
— Trachea, etc	(ICD 162)
— Female breast	(ICD 174)
— Prostate	(ICD 185)
— Bladder	(ICD 188)
— Lymphatic tissue, etc	(ICD 200–208)
Diabetes mellitus	(ICD 250)
Diseases of nervous system, etc	(ICD 320–389)
Hypertensive disease	(ICD 401–405)
Ischaemic heart disease	(ICD 410–414)
Other forms of heart disease	(ICD 420–429)
Cerebrovascular disease	(ICD 430–438)
Diseases of arteries, etc	(ICD 440–448)
Phlebitis, etc	(ICD 451–453)
Pneumonia	(ICD 480–486)
— Bronchopneumonia, organism unspecified	(ICD 485)
Chronic bronchitis	(ICD 491)
Chronic airways obstruction, not elsewhere classified	(ICD 496)
Ulcer of stomach and duodenum	(ICD 531–533)
Nephritis, etc	(ICD 580–589)
External causes of injury and poisoning	(ICD E800–E999)
— Transport accidents	(ICD E800–E848, E929–929.1)

For each of the causes examined, the SMR was ranked and the top twenty local authorities listed. This was done separately for males and females for each of the selected causes of death, other than cancer of the breast in females, and malignant neoplasms of the prostate in males. Tables 3.4–3.7 give the lists for all causes, malignant neoplasms, ischaemic heart disease and external causes respectively; the remainder can be found in Appendix 2. The tables show the top 20 local authorities ranked by SMR, the numbers of deaths on which this SMR is based, and the 95 per cent confidence interval. For many of the causes the numbers of deaths are in the hundreds or thousands. SMRs based on such numbers are relatively stable and not subject to appreciable chance fluctuation. However, for some causes where there were fewer deaths, rankings should be treated with caution. One check on the influence of chance is whether the same localities appear in both the male and female listings for a given cause of death. Other things being equal (such as the difference in aetiology of a given cause affecting men and women, or the survival, and validity of certification), one would anticipate that if there was a local factor operating this might lead to both male and female SMRs being high (or low). There are also obvious dangers in producing a ranking of this nature, as there will always be, by definition, 20 localities appearing at the top of the list. Care needs to be taken to assess the interpretation of these findings, by examining the standard error of the SMR, the consistency between the sexes, whether causes thought to have comparable aetiology both show comparable lists of localities, and whether the pattern of localities appearing on the list form any homogeneous grouping. The following comments highlight some of the factors evident in these tables.

For all causes (Table 3.4), 16 of the localities appear on both the male and female list. This table is the same as Table 3.3 except that districts in non-metropolitan counties are not shown separately. Thus for example Hartlepool, Middlesborough, Stockton-on-Tees and Langbaurgh are the component districts of the county of Cleveland.

For all malignant neoplasms there is again a very high proportion of localities (14 out of 20) in both the male and the female list (Table 3.5). An appreciable number of the localities appearing in Table 3.5 also appear in Table 3.4; this is partly a reflection of the relatively high contribution of deaths from neoplasms to all causes of death, and possibly an aetiology that is common for malignant disease and some other major causes of death. As regards lung cancer, the list consists predominantly of inner metropolitan districts; nine of the male and 13 of the female localities are from the Greater London area. The latter proportion is particularly high, and reflects smoking patterns of the women resident in these localities in comparison with smoking patterns elsewhere. There has been long-standing evidence of an urban-rural gradient in the risk of lung cancer; smoking contributes to such a gradient. There are some similarities in the localities appearing in the list for **bladder cancer** but not to such an extent for **pancreatic cancer** — though smoking is also associated with increased risk of both these cancers.

Table 3.4 The twenty local authorities with the highest mortality due to all causes (ICD 001–999): numbers of deaths and SMRs by sex, 1979–83

Counties, metropolitan districts and London boroughs

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
Manchester	16,000	125	123–127	Oldham	7,157	117	114–120
Salford	8,785	124	121–127	Mid Glamorgan	16,393	116	114–118
Knowsley	4,295	122	118–126	Salford	8,588	116	113–119
St Helens	5,935	121	118–124	St Helens	5,545	116	113–119
Liverpool	17,198	120	118–122	Knowsley	3,931	116	112–120
Gateshead	7,113	120	117–123	Wigan	9,050	115	113–117
Tower Hamlets	5,122	120	117–123	Bolton	8,463	115	113–117
Cleveland	16,170	118	116–120	Liverpool	18,377	114	112–116
Mid Glamorgan	17,090	116	114–118	Manchester	15,870	114	112–116
Wigan	9,177	116	114–118	Durham	18,214	113	111–115
Bolton	8,315	116	113–119	Cleveland	14,829	113	111–115
Sunderland	8,678	115	113–117	Kirklees	12,441	113	111–115
Oldham	6,918	115	112–118	Northumberland	9,546	113	111–115
South Tyneside	5,430	115	112–118	Wakefield	8,681	113	111–115
Rochdale	6,079	114	111–117	Tameside	6,907	113	110–116
Islington	5,014	114	111–117	Gateshead	6,620	113	110–116
Bradford	14,001	113	111–115	Rochdale	6,216	112	109–115
Kirklees	11,651	113	111–115	Lancashire	49,696	110	109–111
Wakefield	9,553	113	111–115	Bradford	15,129	110	108–112
Sandwell	9,766	112	110–114	Sunderland	8,212	110	108–112

Table 3.5 The twenty local authorities with the highest mortality due to malignant neoplasms (ICD 140–208): numbers of deaths and SMRs by sex, 1979–83

Counties, metropolitan districts and London boroughs

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
Liverpool	4,614	134	130–138	Hammersmith and Fulham	1,157	121	114–128
Knowsley	1,143	133	125–141	Liverpool	4,060	120	116–124
Newcastle-upon-Tyne	2,673	132	127–137	Barking and Dagenham	1,201	118	111–125
Salford	2,245	130	125–135	Tower Hamlets	1,003	116	109–123
Manchester	3,991	129	125–133	Newcastle-upon-Tyne	2,190	115	110–120
Islington	1,366	128	121–135	Southwark	1,579	113	107–119
Tower Hamlets	1,323	128	121–135	City of Westminster	1,347	113	107–119
South Tyneside	1,451	127	120–134	Manchester	3,240	111	107–115
Cleveland	4,172	126	122–130	Camden	1,255	111	105–117
Southwark	1,934	126	120–132	Knowsley	874	111	103–119
Gateshead	1,811	125	119–131	Cleveland	3,207	110	106–114
Newham	1,670	122	116–128	Kensington and Chelsea	885	110	103–117
Sunderland	2,182	120	115–125	North Tyneside	1,390	109	103–115
Barking and Dagenham	1,397	120	114–126	Newham	1,308	109	103–115
Hammersmith and Fulham	1,245	120	113–127	Wandsworth	1,829	108	103–113
North Tyneside	1,662	119	113–125	Salford	1,720	108	103–113
Lambeth	1,878	117	112–122	Hackney	1,167	108	102–114
Camden	1,357	115	109–121	Sefton	2,138	107	102–112
Wandsworth	2,011	114	109–119	Sunderland	1,752	107	102–112
Sandwell	2,422	113	108–118	Tameside	1,422	107	101–113

Very different is the picture for **female breast cancer** where there are a few rural counties listed that do not appear in the results for the other cancer sites; there are also an appreciable number of London boroughs, but not those in the eastern part of Inner London. For **prostate cancer,** the list includes a number of counties in the south west (West Sussex, Hampshire, Berkshire, Wiltshire, Somerset and Cornwall). This is a site of malignancy where the aetiology is not well understood. Association with rural areas has been reported before, and warrants further consideration.

Ischaemic heart disease is the commonest cause of death. It thus has a pattern that is similar to the all cause mortality, with identification of urban areas — many from metropolitan counties (Table 3.6). Seventeen of the districts appear on both lists; and the additional ones on the male and female lists are all contiguous with other localities mentioned on the two lists. There is also some similarity in the localities represented in the various components of **cardiovascular disease,** apart from the lists for other forms of heart disease, and diseases of the arteries (some of these results are based on small

Table 3.6 The twenty local authorities with the highest mortality due to ischaemic heart disease (ICD 410–414): numbers of deaths and SMRs by sex, 1979–83

Counties, metropolitan districts and London boroughs

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
Rochdale	2,187	133	127–139	Calderdale	2,069	143	137–149
Calderdale	2,279	130	125–135	Wigan	2,487	139	133–145
Wigan	3,139	129	124–134	Kirklees	3,429	137	132–142
Kirklees	4,021	126	122–130	Rochdale	1,702	137	130–144
Salford	2,734	124	119–129	Wakefield	2,329	135	129–141
Bury	1,839	123	117–129	Barnsley	1,696	135	128–142
Sunderland	2,846	122	117–127	Cleveland	3,860	132	128–136
Knowsley	1,329	122	115–129	Sunderland	2,225	132	126–138
Bradford	4,624	121	117–125	Bradford	4,012	129	125–133
Bolton	2,660	121	116–126	Salford	2,161	127	122–132
Gateshead	2,238	121	116–126	Oldham	1,777	127	121–133
Cleveland	5,082	120	117–123	Durham	4,627	126	122–130
Mid Glamorgan	5,450	119	116–123	Gateshead	1,698	126	120–132
Rotherham	2,429	119	114–124	Bury	1,491	126	119–133
Oldham	2,213	119	114–124	Knowsley	925	125	117–133
West Glamorgan	4,035	118	114–122	Mid Glamorgan	3,971	124	120–128
Durham	6,324	117	114–120	North Tyneside	1,643	123	117–129
Wakefield	3,053	117	113–121	South Tyneside	1,295	122	115–129
Barnsley	2,358	117	112–122	Rotherham	1,573	120	114–126
St Helens	1,759	116	110–122	Northumberland	2,294	119	114–124

Table 3.7 The twenty local authorities with the highest mortality due to external causes of injury and poisoning (ICD E800–E999): numbers of deaths and SMRs by sex, 1979–83

Counties, metropolitan districts and London boroughs

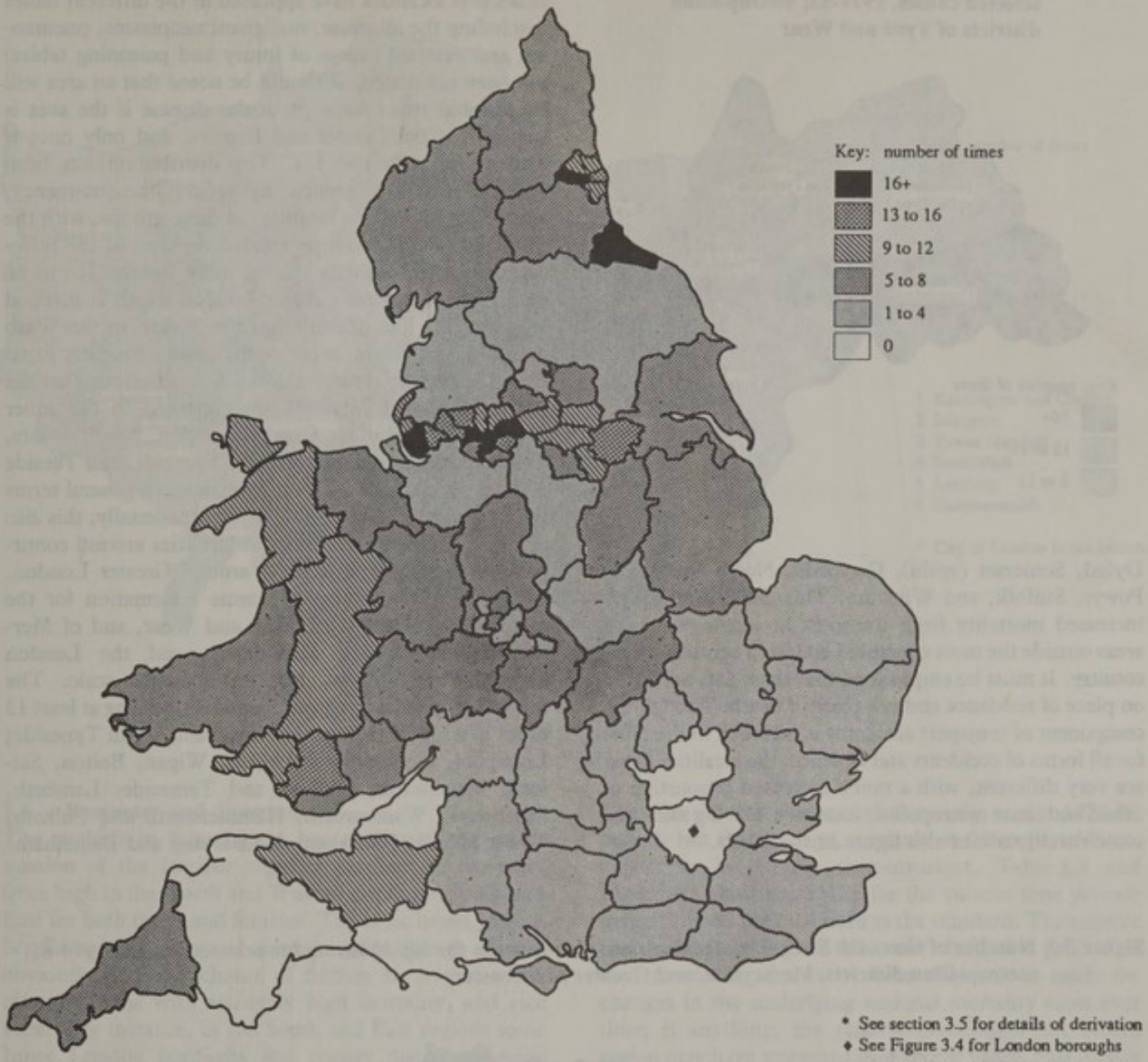
Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
City of Westminster	412	198	178–218	City of Westminster	286	178	157–199
Kensington and Chelsea	273	181	159–203	Kensington and Chelsea	199	170	146–194
Lambeth	483	164	149–179	Northumberland	391	160	144–176
Hammersmith and Fulham	289	162	143–181	Lambeth	332	157	140–174
Camden	313	158	140–176	Manchester	594	153	140–166
Islington	293	154	136–172	Camden	232	147	128–166
Tower Hamlets	268	154	135–173	Lancashire	1,814	146	139–153
Southwark	355	141	126–156	Leeds	886	146	136–156
Dyfed	545	138	126–150	Dyfed	415	144	130–158
Hackney	276	130	114–146	Islington	194	142	122–162
Manchester	666	126	116–136	Dudley	316	138	122–154
Salford	353	123	110–136	Salford	285	136	120–152
Leeds	990	120	112–128	Birmingham	1,113	134	126–142
Shropshire	526	120	110–130	Bolton	286	134	118–150
Liverpool	705	119	110–128	Hackney	203	134	115–153
Northamptonshire	726	117	108–126	Bradford	513	132	120–144
Lancashire	1,875	115	110–120	Southwark	246	129	113–145
Wandsworth	351	115	103–127	Liverpool	574	127	116–138
Warwickshire	638	114	105–123	Warwickshire	464	127	115–139
Gwynedd	307	114	101–127	Hammersmith and Fulham	164	123	104–142

numbers with an appreciable degree of chance fluctuation). There is also greater representation of some rural localities in some of these lists, which does raise the question of differences in certification practice as well as differences in prevailing exposure to aetiological factors.

For respiratory diseases the lists for **pneumonia** show predominantly inner urban areas and high concordance between the two sexes.

Chronic bronchitis is one of the causes that specific research studies (see Chapter 4) have associated with environmental pollution. Rather surprisingly however, there is appreciable divergence between the localities listed for males and females — with only nine localities appearing on both lists. A number of the other localities are contiguous, but there is greater scatter than for other causes. Though there are smaller numbers for deaths from chronic bronchitis, in general the increment of the

Figure 3.1 Number of times the SMR for a local authority appears in the top 20 listing for selected causes*, 1979-83; non-metropolitan counties and metropolitan districts



* See section 3.5 for details of derivation
♦ See Figure 3.4 for London boroughs

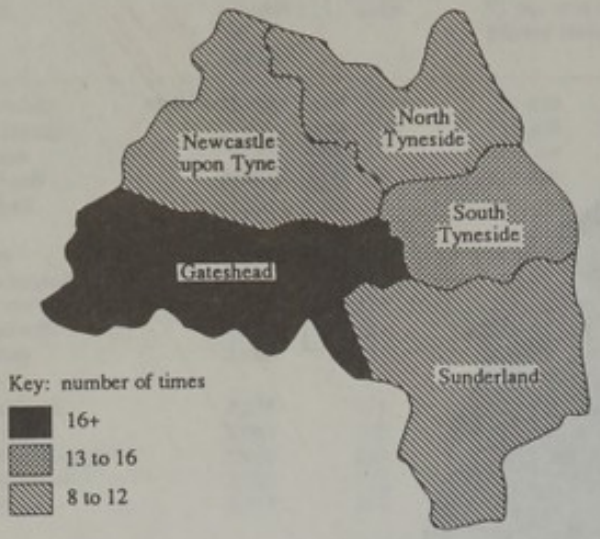
SMR above 100 is well over twice the standard error. There is much greater concordance between the two sexes for **chronic airways obstruction** — a term increasingly used in certification to represent an end stage of the condition that was referred to formerly as chronic bronchitis. The localities on this list are predominantly urban and inner urban districts.

For **peptic ulcer** there is again less marked concordance between the two sexes (with only 10 of the localities being on both lists). For males, all the localities are urban, whilst for females the one exception to this is Bedfordshire. The numbers of deaths are small and the standard errors large compared with the increment over 100 — these findings therefore need to be treated with some caution. This is indicative of the relatively low case fatality of this condition nowadays.

Nephritis — again the SMRs need to be treated with caution, particularly for the localities in the bottom half of the table. The localities are somewhat mixed, though the majority are inner urban. For males, Powys, Shropshire, and Cornwall appear, whilst for females Powys again appears and also Cheshire and Wirral. Because Powys is on both lists, and Cheshire and Wirral (which are contiguous) are on the female list, one needs to consider some underlying reason — though this may be differences in certification rather than confirmed differences in exposure to aetiological agents, or the results of end stage renal failure treatment.

There are two tables for deaths from **accidents and violence** — one from all causes (Table 3.7), and the other restricted to transport accidents (see Appendix 4). For transport accidents, the pattern of localities represented is very different from most other causes — in particular there are rural counties appearing on the list. For females they are: Shropshire, Somerset, Oxfordshire, Cambridgeshire, Clwyd, Lincolnshire and East Sussex. For males: Lincolnshire (again), Northamptonshire, Buckinghamshire, Shropshire (again), Norfolk, Cumbria, Cambridgeshire (again),

Figure 3.2 Number of times the SMR for a local authority appears in the top 20 listing for selected causes, 1979-83; metropolitan districts of Tyne and Wear

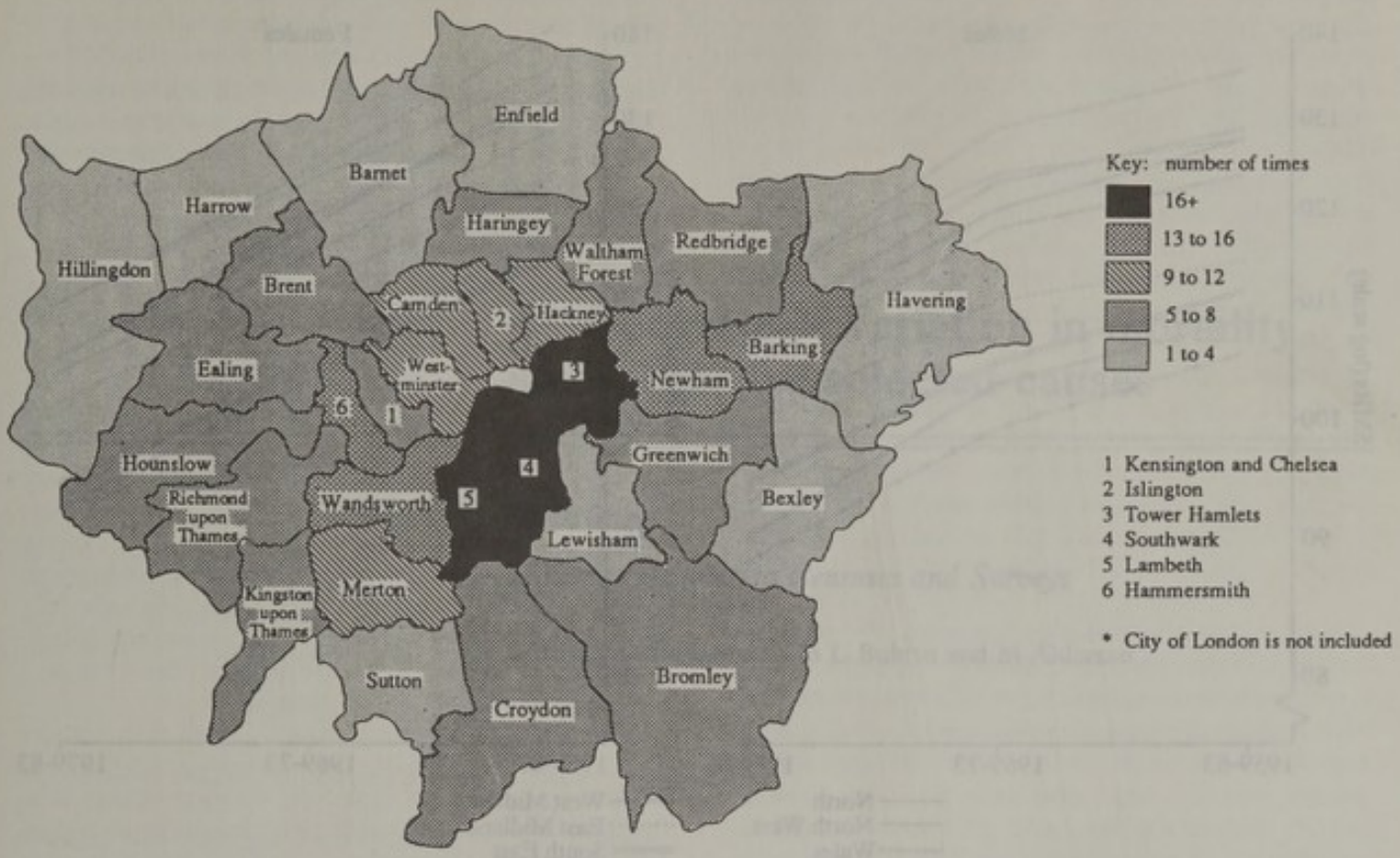


Dyfed, Somerset (again), Gwynedd, North Yorkshire, Powys, Suffolk, and Wiltshire. This demonstrates that increased mortality from transport accidents occurs in areas outside the most congested and built up areas of the country. It must be emphasised that these lists are based on place of residence and not place of death. Though the component of transport accidents is included in the table for all forms of accidents and violence, the localities listed are very different, with a much increased proportion of urban and inner metropolitan localities. Having said this, some rural localities also figure in these lists.

In an attempt to produce an overall view of the impact of the range of causes covered in this section, the number of times that localities have appeared in the different tables (excluding the all cause, malignant neoplasms, pneumonia and external causes of injury and poisoning tables) has been calculated. It should be noted that an area will be counted twice for a particular disease if the area is present for both males and females, and only once if present for only one sex. The distribution has been divided into six groups to reflect the frequency. Figure 3.1 shows the localities in these groups, with the frequently listed localities shaded darkly and the infrequently listed localities shaded more lightly. It can be seen that, except for Greater London which is mapped separately, a line drawn from the Severn to the Wash does in general terms separate the more frequently listed from the rest. Figures 3.1 and 3.4 also indicate that the frequently listed localities are clustered in the inner urban areas including Greater London, South Wales, Greater Manchester, Merseyside, Tyneside, and Teeside and, to a lesser extent, West Midlands. In general terms the more rural areas are only listed occasionally; this also applies to some of the periphal localities around conurbations — for example those around Greater London. Figures 3.2–3.4 present the same information for the metropolitan districts of Tyne and Wear, and of Merseyside and Greater Manchester, and the London boroughs respectively, but on a larger scale. The following areas feature prominently, appearing at least 13 times in a top 20 listing: Gateshead and South Tyneside; Liverpool, Knowsley, St Helens, Wigan, Bolton, Salford, Manchester, Oldham and Tameside; Lambeth, Southwark, Wandsworth, Hammersmith and Fulham, Tower Hamlets, Newham and Barking and Dagenham.

Figure 3.3 Number of times the SMR for a local authority appears in the top 20 listing for selected causes, 1979-83; metropolitan districts, Merseyside, and Greater Manchester

Figure 3.4 Number of times the SMR for a local authority appears in the top 20 listing for selected causes, 1979-83; London boroughs*



3.6 Summary and discussion

The analysis in this chapter has confirmed the continuation of the familiar regional gradient in mortality from high in the North and West to low in the South and East for both males and females. The same broad pattern is reflected at county and district level, although there is obviously a greater chance of finding an area in a low mortality zone with relatively high mortality, and vice versa. For instance, in the South and East regions some Inner London boroughs and county districts outside London have above average levels of mortality. Similarly in the North and West regions there are districts with either average or below average levels of mortality. The focus of this chapter has been on identifying those areas with significantly high mortality levels relative to the rest of the country; these turn out to be predominantly urban areas, as would be expected from previous work in this field.

When analysed by cause of death ,the array of data to summarise is extensive and the results quoted are therefore somewhat selective. Nevertheless, the same broad geographical pattern appears to prevail for most diseases even though there are some notable exceptions. One is **hypertensive disease** for which the SMRs for both sexes are high for the West Midlands and Wales but low for the North, North West, and Yorkshire and Humberside. Others for which the geographical gradient is reversed are **malignant melanoma of the skin, cancer of the prostate, breast cancer** for women and **leukaemia.**

The data in this chapter relate mostly to the 1979–83 period; but the findings, certainly at the regional level, appear to be largely time-invariant. Table 3.8 and Figure 3.5 show the SMRs for the various time periods using 1979–83 national rates as the standard. The relative positions of the regions have not changed a great deal over recent decades even when allowance is made for changes in the underlying national mortality rates over time; if anything, the relative position of the North region may have worsened over recent years. East Anglia continues to exhibit the lowest SMRs.

In many ways the use of local authority areas as the unit of analysis is out-dated. Results are presented in the microfiche tables for RHAs (derived from aggregations of local authorities), but a more appropriate entity for the main commentary and reference tables would have been DHAs given their more direct responsibilities for health care. This point is reflected in Chapter 5 which presents infant mortality rates for RHAs and DHAs. The use of local authorities as the main unit of analysis has not utilised the census information on local populations to full advantage. The census is a unique source which can provide very localised population information, say, for wards. For this volume, ward data would have been far more useful as a means of providing clues to the aetiology of specific diseases. The provision of more localised information as the basic reference data-set should be given serious consideration for a future volume on this subject.

Figure 3.5 All cause SMRs by sex and standard region, 1959-63, 1969-73 and 1979-83; England and Wales 1979-83 = 100

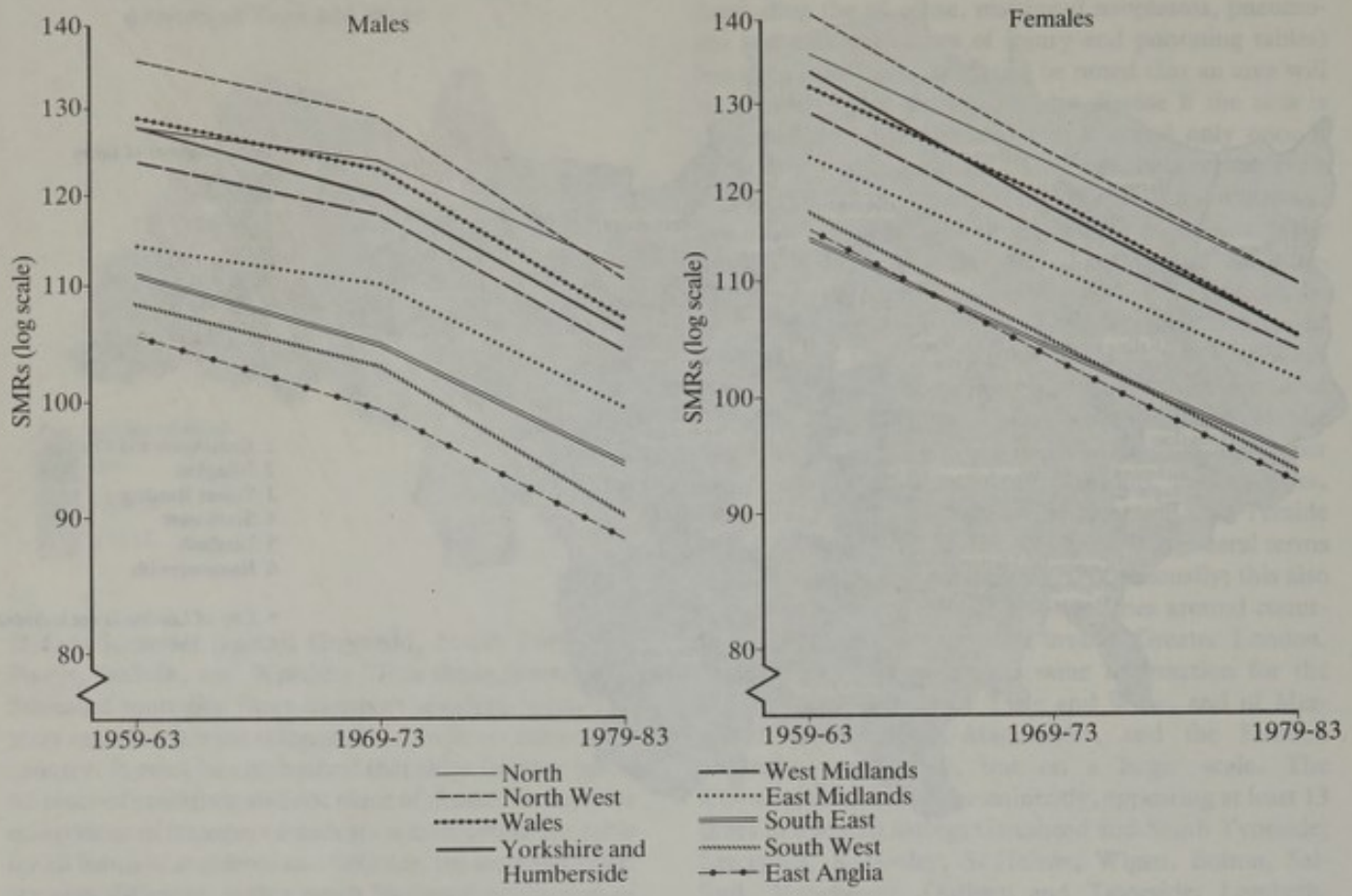


Table 3.8 SMRs in 1959–63, 1969–73 and 1979–83*: all causes
Standard regions of England and Wales

Area (ranked according to SMR values in 1979–83)	1959–63	1969–73	1979–83
Males			
England and Wales	**120**	**113**	**100**
North	128	124	112
North West	136	129	111
Wales	129	123	107
Yorkshire and Humberside	128	120	106
West Midlands	124	118	104
East Midlands	115	111	99
South East	112	105	94
South West	109	103	90
East Anglia	106	99	88
Females			
England and Wales	**125**	**112**	**100**
North	136	123	110
North West	141	124	110
Wales	132	119	105
Yorkshire and Humberside	134	118	105
West Midlands	129	115	104
East Midlands	124	112	101
South East	115	104	94
South West	118	105	93
East Anglia	116	103	92

* *Rates for 1979–83 for England and Wales used as the standard.*

Furthermore, with the postcoding of 1991 Census data and the introduction of database technology within OPCS it will be possible to provide the basic reference data at postcode level on a computer medium (e.g. diskette or CD-ROM) to enable the aggregations to be performed either way, and, indeed, for mortality measures for ad hoc areas to be derived. This will provide a more flexible output and will enable many long-term studies to be updated which at present cannot be done easily because of local government reorganisations and boundary changes. Often these changes create more difficulties than those involving the International Classification of Diseases.

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4 Geographic variation in mortality since 1920 for selected causes

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With acknowledgements to L Bulusu and M Alderson

4.1 Introduction

Some of the causes of death known to show marked geographical differences have been selected for special discussion in this chapter. Maps have been chosen as the means of presentation. The earliest period examined is 1921–30; other maps cover 1946–49 (for London boroughs), 1950–53, and 1979–83.

There have been some minor changes in the boundaries of the areas used for mapping over the time period covered. The boundaries used are the ones for which the mortality statistics were available in each period. Most of the maps are for England and Wales and the areas mapped are mainly old and new counties. **Lung cancer** has been examined for London boroughs in the old London County Council (LCC) area and in the present Greater London area, of which the Inner London boroughs correspond closely to the old boroughs. Maps for lung cancer mortality have been prepared for males only. For other causes, maps for both males and females have been prepared.

One point that affects the interpretation of the maps is the overall level of mortality for the cause being studied; it is important to emphasise that SMRs have been based on the prevailing mortality rates for the specific time period — for example, an SMR of 130 indicates that the locality has a rate 30 per cent above the national average for the years in question, after adjustment for the age structure of the population. Thus with increasing mortality rates, the same SMR value at a later date may indicate a quite different force of mortality in the locality. It is conceivable that an SMR of 70 in a locality for a time period when the rates were high may actually reflect a greater mortality than an SMR of 130 when the age-specific rates were low.

4.2 All causes mortality: 1921–30, 1950–53 and 1979–83

Figures 4.1(a)–(b) show the persistence of a North West/South East gradient in mortality, with generally higher rates north of a line joining the River Severn to the Wash, for both sexes. This division is not absolutely consistent, there being areas of 'average mortality (SMR 90–109) both north and south of this line. However, the localities with SMRs of 110 and above are all to the north and west of the line. This situation has persisted for each of the time periods 1921–30, 1950–53 and 1979–83. The results are not identical for each of the sexes and time periods, but the general pattern persists for all the causes discussed below.

4.3 Stomach cancer: 1921–30, 1950–53 and 1979–83

The maps for 1921–30 in Figures 4.2(a)–(b) show a clear excess mortality in the north west of Wales, with some extension of the high zone through to the north west of England and across to the north east. There is also a small pocket of excess mortality around the vicinity of the Wash. The pattern is similar in the 1950s, with an increase in the relative mortality in the north east. The picture is similar for both sexes. For the 1979–83 period there is a further extension of the high zone to include Staffordshire. There are areas of high mortality from this cancer throughout Wales, though the extent of this has altered over the three time periods shown. The south and east of the country have relatively low rates, particularly Sussex.

There is appreciable international variation in mortality from this cancer, with evidence from migrant studies suggesting that an environmental factor is of importance. In many countries, including the UK, the incidence (and mortality) has been declining since about the time of World War II. In the UK there has consistently been a stepwise gradient of mortality between the social classes; being lowest in Social Class I. Genetic studies, despite their limitations, suggest that gastric cancer is concentrated in some families.[1] There is also increased incidence in persons with blood group A, and ABH non-secretors. A deficiency of fresh food, vegetables and salads is also associated with increased risk, and though endogenous or exogenous nitrosamines have been proposed as relevant, this was on somewhat tenuous evidence.[2] Furthermore, associations with atmospheric pollution and dusty jobs such as coal mining have been reported.[3,4] However, while the causes are largely unknown, diet is thought to be the most likely factor to explain the geographical distribution.[5]

4.4 Lung cancer in London boroughs: 1946–49 and 1979–83

Figure 4.3 shows mortality from lung cancer for males in 1946–49 for the old London County Council area. Throughout London there is a higher SMR compared with the national figure, and a particularly high SMR in those boroughs clustered round the East End of London. Figure 4.3 also shows data for the whole of the Greater London area for males for 1979–83. The key used spans the whole range of SMRs and boundaries have altered somewhat, but again London has relatively high mortality from this cancer. It is the boroughs in the east of the inner area that are particularly affected. It should be noted, however, that while the SMRs are not as high as in the earlier period, they are based on much higher mortality rates than existed in the late 1940s.

It has been suggested that about 90 per cent of all deaths from lung cancer are attributable to smoking.[6] Atmospheric pollution has also been suggested;[7] and in a number of countries there is evidence that persons living in towns smoke more than rural dwellers. After adjusting for this, there appears to be about a twofold increase in lung cancer from rural to urban localities.[8] Recent work has suggested that persons given adequate intake of Vitamin A are at reduced risk of lung cancer; this effect was thought to be independent of smoking habits.[9]

4.5 Cardiovascular disease, ischaemic heart disease and cerebrovascular accident: 1921–30, 1950–53 and 1979–83

Comparisons over time are bedevilled by changes in the International Classification of Diseases. This creates particular difficulty for cardiovascular disease. Figures 4.4(a)–(b) show the distribution of mortality from heart disease in the period 1921–30 for both males and females.

Most noticeable are the relatively high rates in the west of Wales and the north west of England compared with the south and east. These Figures also show mortality from circulatory disease as a whole (i.e. heart and vasculature) for 1979–83. The distribution is not identical to that for 1921–30. There is a very similar picture in the south east of the country, but a further extension of the high risk zone through to the north of England.

Figures 4.5(c)–(d) relate to ischaemic heart disease. In 1921–30 and 1950–53 there was relatively high mortality from arteriosclerotic heart disease for both males and females in most parts of the north of England with generally low values again at least south of a line joining the Severn to the Wash. (A line from the Humber through North Wales might be more precise.) The high zones were not identical for males and females, particularly in the 1950s, though they covered the same general part of the country. In 1979–83 the picture is again broadly similar, but with an extension of the high rates in males through Staffordshire and into Wales, and the low zones over a more extensive part of the south east. The map for females is broadly similar to that for males.

Figures 4.6(a)–(b) cover geographical variation in cerebrovascular disease. For 1921–30 there was a very clear north west/south east dichotomy. For females the high zone extended more into the Midlands and there were areas with SMRs greater than 130. In 1979–83 the high zones for males have become more extensive, but not for females. The low zone in the south east of England is also less extensive for males and females; for women it is restricted to Greater London and four counties to the west of Greater London.

It has been suggested by epidemiologists that water hardness, rainfall, and temperature are independent factors influencing cardiovascular mortality in Great Britain, and are associated with regional variation.[10] Furthermore, smoking may double the risk of a cardiovascular event in an individual and living in a locality with soft water may only add an increment of about 10 per cent to the risk of such an event.[11] Regional variation in the prevalence of hypertension may also be associated with risk of cardiovascular disease including stroke;[12] and lack of exercise, family history, diet, obesity, diabetes, and blood lipid profile may also be related to ischaemic heart disease.[13] On the other hand, data or similar variables, including the use of oral contraceptives, have been reviewed and no clear link to any geographical association found.[14]

The distribution of mortality from cerebral thrombosis and cerebral haemorrhage in males in England and Wales was examined in the 1970s.[15] It was suggested that rising standards of living may have contributed to decreased mortality from stroke but that differences in standards of living were only one of the factors influencing the geographic distribution. Subsequently a negative correlation was noted between cerebrovascular mortality and consumption of fresh fruit or vegetables in England and Wales;[16] and it has been suggested that dietary sodium is an aetiological factor in essential hypertension and thus cerebrovascular disease.[17]

4.6 Bronchitis: 1921–30, 1950–53 and 1979–83

Figures 4.7(a)–(b) show the mortality from bronchitis for the three time periods. The range of SMR values is more varied across the country than for the other diseases considered so far. For the period 1921–30 there was relatively high mortality in the industrial areas of the north and the south of Wales. There were low rates in rural localities in mid-Wales, East Anglia, the far North West, and the south and west of England. A very similar picture is shown for both males and females. In 1950–53 the high zone for both males and females was in Lancashire. London also featured as a high risk zone. Other areas with heavy industry in South Wales, the Midlands, Yorkshire and Durham had high SMRs in males and/or females. Again there were low rates in the rural zones of England. For 1979–83 Figure 4.7 shows a shift in the high SMR values for males from Lancashire and Glamorgan to Gwent, the Midlands and Durham. The map for females for 1979–83 presents a broadly similar picture to that for 1950–53, with the highest mortality apparently restricted to the large urban areas of South Wales, West Midlands, Mersey and Manchester and South Yorkshire. Again the rural localities have low SMRs.

The aetiology of chronic bronchitis has been reviewed.[18] Findings from cross-sectional studies were consistent with a cause-and-effect influence of air pollution on respiratory symptoms, whilst prospective studies have confirmed that the symptoms change in individuals following a change in air pollution levels. It was also accepted that smoking led to both chronic hypersecretion and chronic air flow obstruction in those that were susceptible and continued to smoke.

4.7 Peptic ulcer: 1921–30, 1950–53 and 1979–83

The maps for 1921–30 (Figures 4.8(a)–(b)) show scattered localities with relatively high SMRs, and no consistent feature such as variation between urban and rural localities or within one part of the country. The maps for males and females also differ. For 1950–53 the distribution varies; it is not consistent between the sexes or with previous maps, though London showed more clearly high SMRs. For 1979–83 there appear to be scattered pockets of high and low risk, but again with no clear pattern, apart from the suggestion that major urban centres may now have relatively higher rates than other areas. There are high SMRs in the Midlands, especially for Nottinghamshire, and Cleveland (for males). The maps for males and females in 1979–83 are broadly similar.

A major review of this disease has emphasised the relationship between the change in the incidence, prevalence, and mortality of peptic ulcer; a rise and fall in the rates in many countries, and a change in the relative proportion of patients with gastric and duodenal ulcer.[19] Males are more at risk than females, especially for duodenal ulcer. Smoking apparently doubled the risk of peptic ulcer. High risk was also associated with a low residue diet, excess use of spices and consumption of

coffee. There appeared to be lower risk in those having a relatively high milk intake. There was weak evidence of an effect from alcohol intake, whilst other risk factors were consumption of certain medications, the presence of various other diseases, and a family history. It was noted, however, that there were few coherent features to the geographical distribution of the disease.

4.8 Summary and discussion

This chapter has examined the persistence over time of geographical differences in mortality due to selected causes: stomach cancer, lung cancer, cardiovascular diseases, bronchitis and peptic ulcer. The areal unit of analysis is a county (or London borough in the case of lung cancer), and the diseases are ones for which the mortality gradients have attracted interest in the past.

A line stretching from the River Severn to the Wash (or the River Humber in some instances) tends to separate local areas with a high or low mortality for most causes of death, with mortality north of this line higher than average since at least the 1920s. The gradient is not identical for each of the sexes or time periods used in this chapter, but the general pattern persists.

For **stomach cancer** the north west of Wales has had consistently high levels of mortality, some 60 per cent more than the low levels in the extreme South East (e.g. Sussex). For **lung cancer** London has a relatively high mortality level and the boroughs of east London are the ones most affected; however, while the differentials with the national level for these boroughs are not as great as in the late 1940s, the underlying mortality rates are now much higher. For **cardiovascular diseases, ischaemic heart disease** and **cerebrovascular disease** the findings conform to the general pattern. For the latter disease the high zone has become more extensive for males but not for females; and the low zone has become less extensive in the South and East, particularly for females, where it is restricted to Greater London and the four counties immediately to the west of London. For **bronchitis** the association of high relative mortality with residence in major urban centres features prominently in each period; the areas showing the highest levels include Durham, South Yorkshire, Nottinghamshire, Mid Glamorgan, Greater Manchester and Merseyside. Finally, for **peptic ulcer** the localities with high relative mortality levels are much more scattered than for the other diseases mentioned so far. For the 1979–83 period the data indicate that people, particularly males, within the major urban centres face the greater risk.

The traditional presentation of mortality data in the form of maps is a convenient and often satisfactory way of assessing the broad extent of these kinds of differentials. However, there are difficulties of interpretation which need to be recognised. Even allowing for the obvious problems associated with boundary changes over time and the SMRs being related to the national rates for the period in question, the extent of the differentials could be misleading. The choice of intervals to group the SMRs (as in Figures 4.1–4.8) could give a distorted picture. For example, an area with an SMR of 109 and confidence limits of 106–112, say, would go into the interval group 90–109 (as used in this chapter). But is the true value really any different from, say, 110 which would be placed in the group 110–129? Care needs to be taken, therefore, in the choice of the interval groups by close examination of the homogeneity of the SMRs and the standard errors attaching to them; and in the interpretation of the resulting map, particularly when subregional areas are plotted.

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Figures 4.1 to 4.8

Figure 4.1(a) Geographic variation in mortality of males: all causes, SMRs for 1921-30, 1950-53 and 1979-83; counties of England and Wales

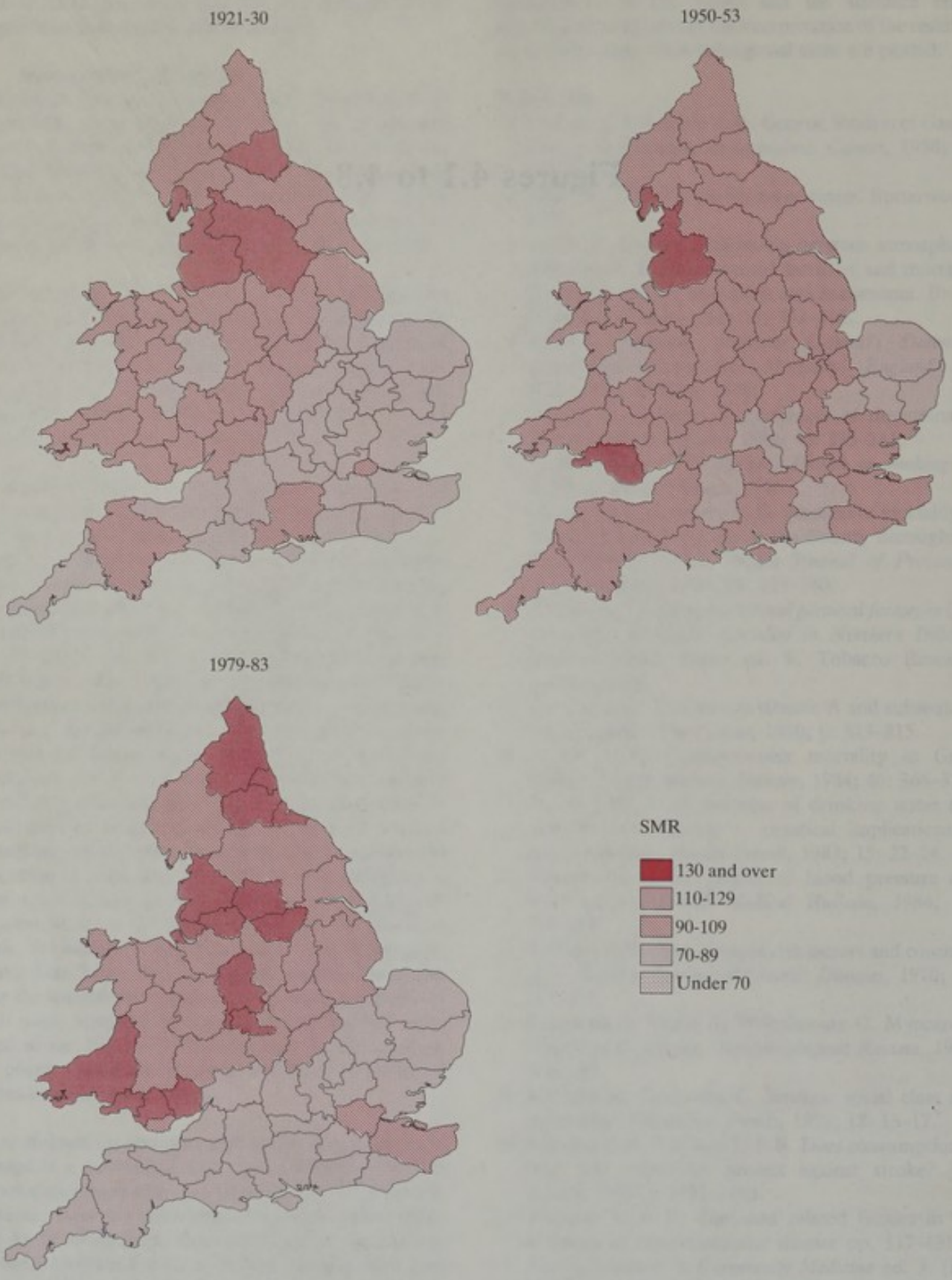


Figure 4.1(b) Geographic variation in mortality of females: all causes, SMRs for 1921-30, 1950-53 and 1979-83; counties of England and Wales

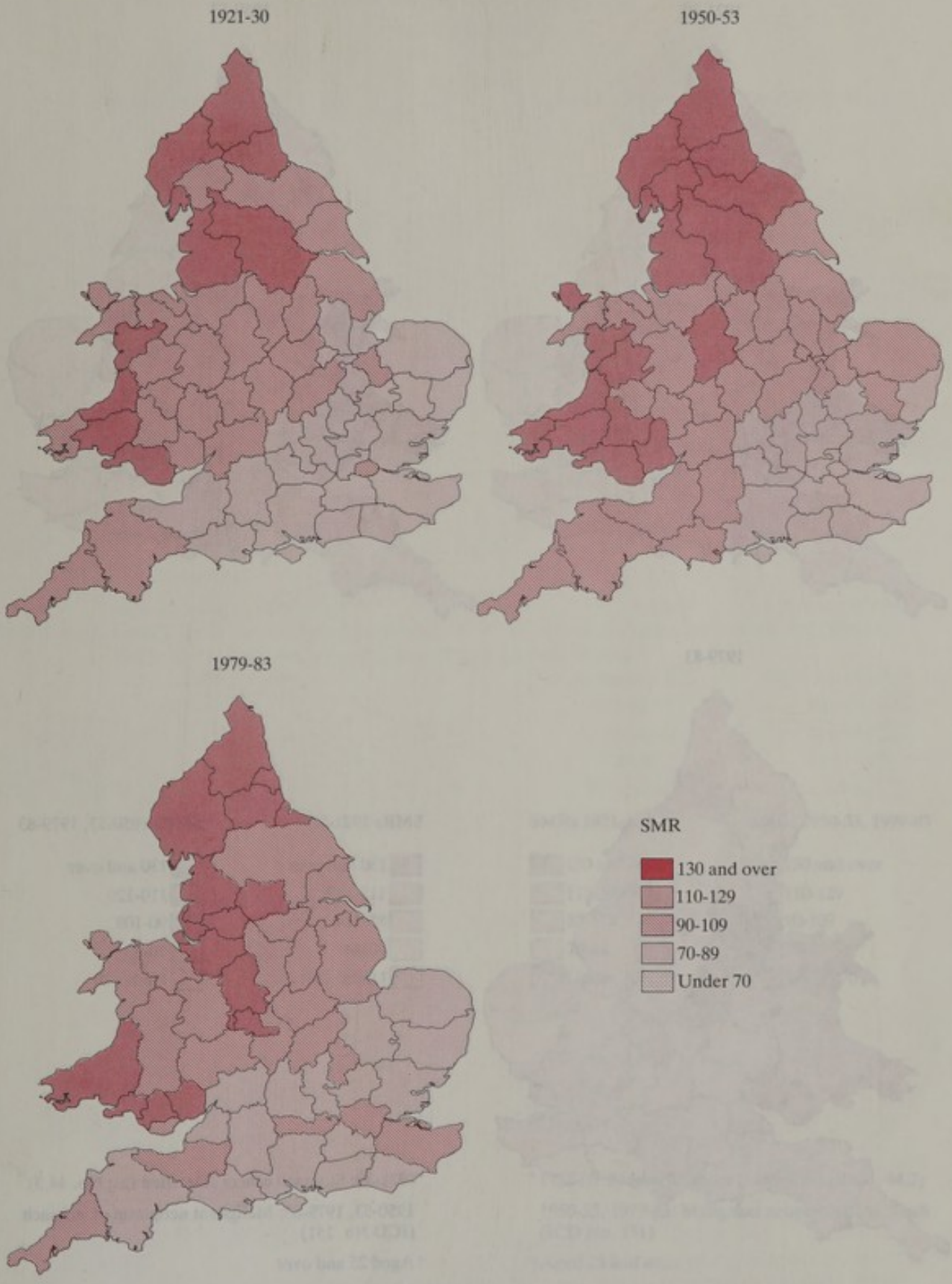
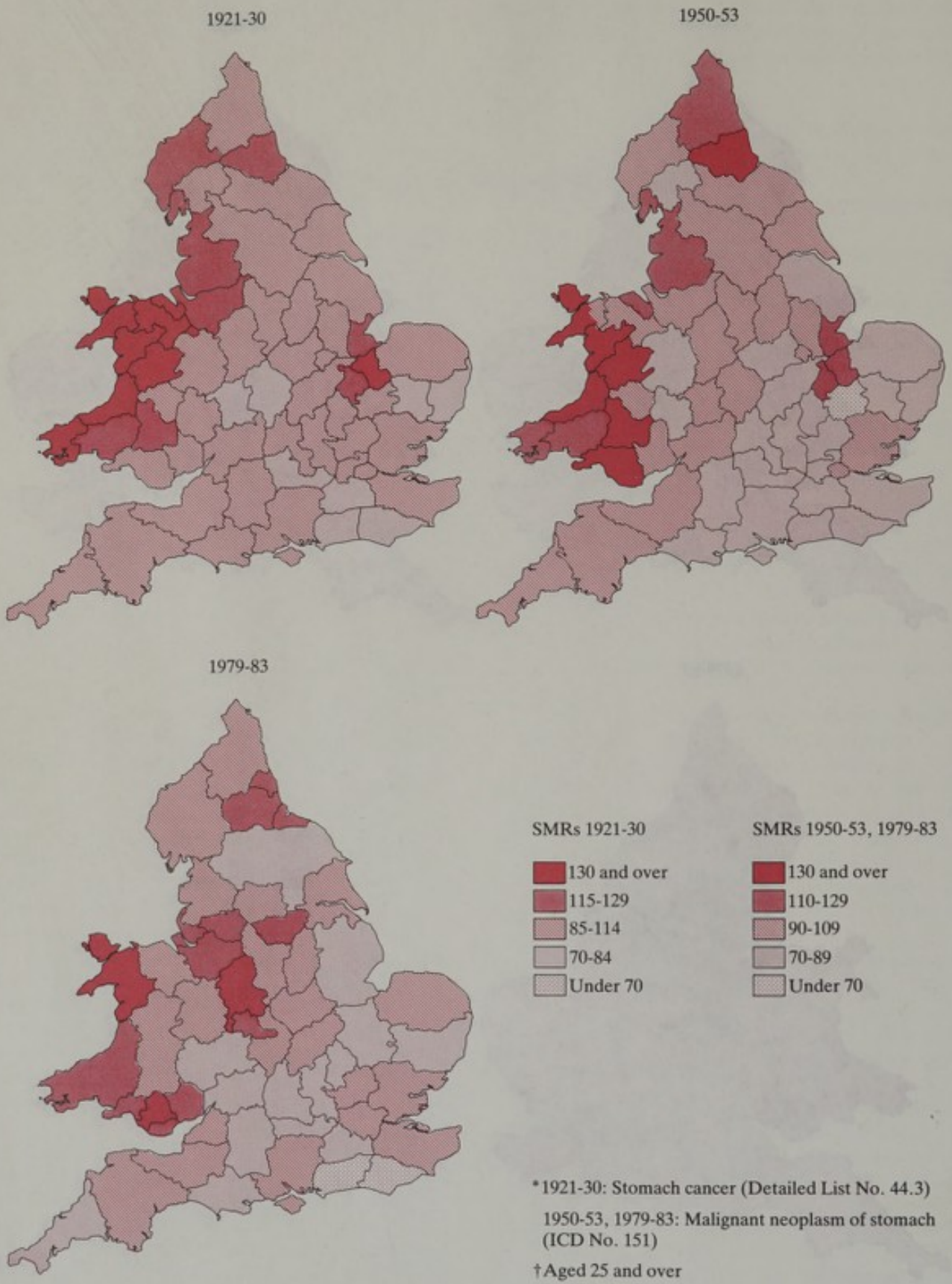


Figure 4.2(a) Geographic variation in mortality of males: stomach cancer*, SMRs for 1921-30, 1950-53† and 1979-83; counties of England and Wales

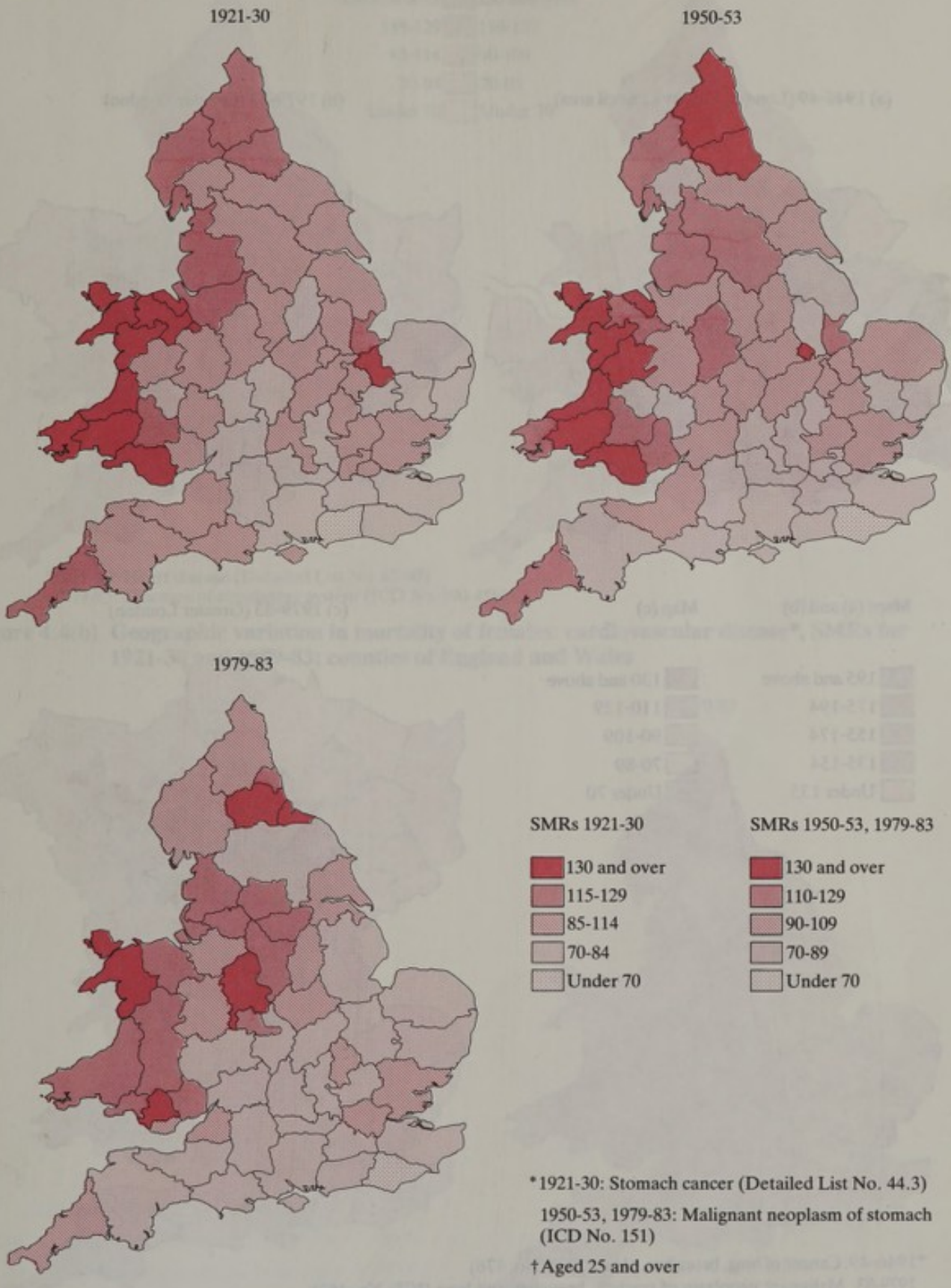


*1921-30: Stomach cancer (Detailed List No. 44.3)

1950-53, 1979-83: Malignant neoplasm of stomach (ICD No. 151)

†Aged 25 and over

Figure 4.2(b) Geographic variation in mortality of females: stomach cancer*, SMRs for 1921-30, 1950-53† and 1979-83; counties of England and Wales



*1921-30: Stomach cancer (Detailed List No. 44.3)

1950-53, 1979-83: Malignant neoplasm of stomach (ICD No. 151)

†Aged 25 and over

Figure 4.3 Geographic variation in mortality of males: lung cancer*; SMRs for 1946-49 and 1979-83; London boroughs

(a) 1946-49 (London County Council area)

(b) 1979-83 (Greater London)

Maps (a) and (b)

- 195 and above
- 175-194
- 155-174
- 135-154
- Under 135

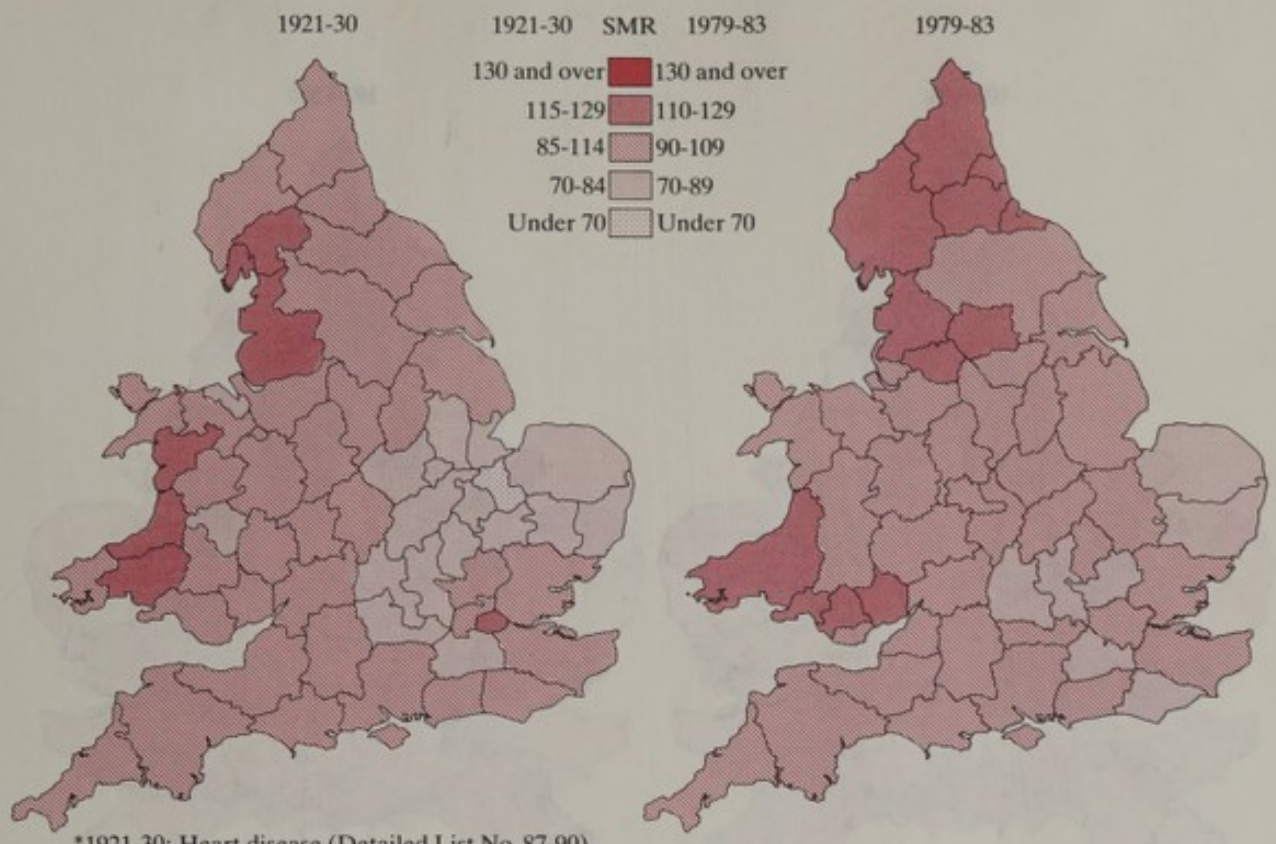
Map (c)

- 130 and above
- 110-129
- 90-109
- 70-89
- Under 70

(c) 1979-83 (Greater London)

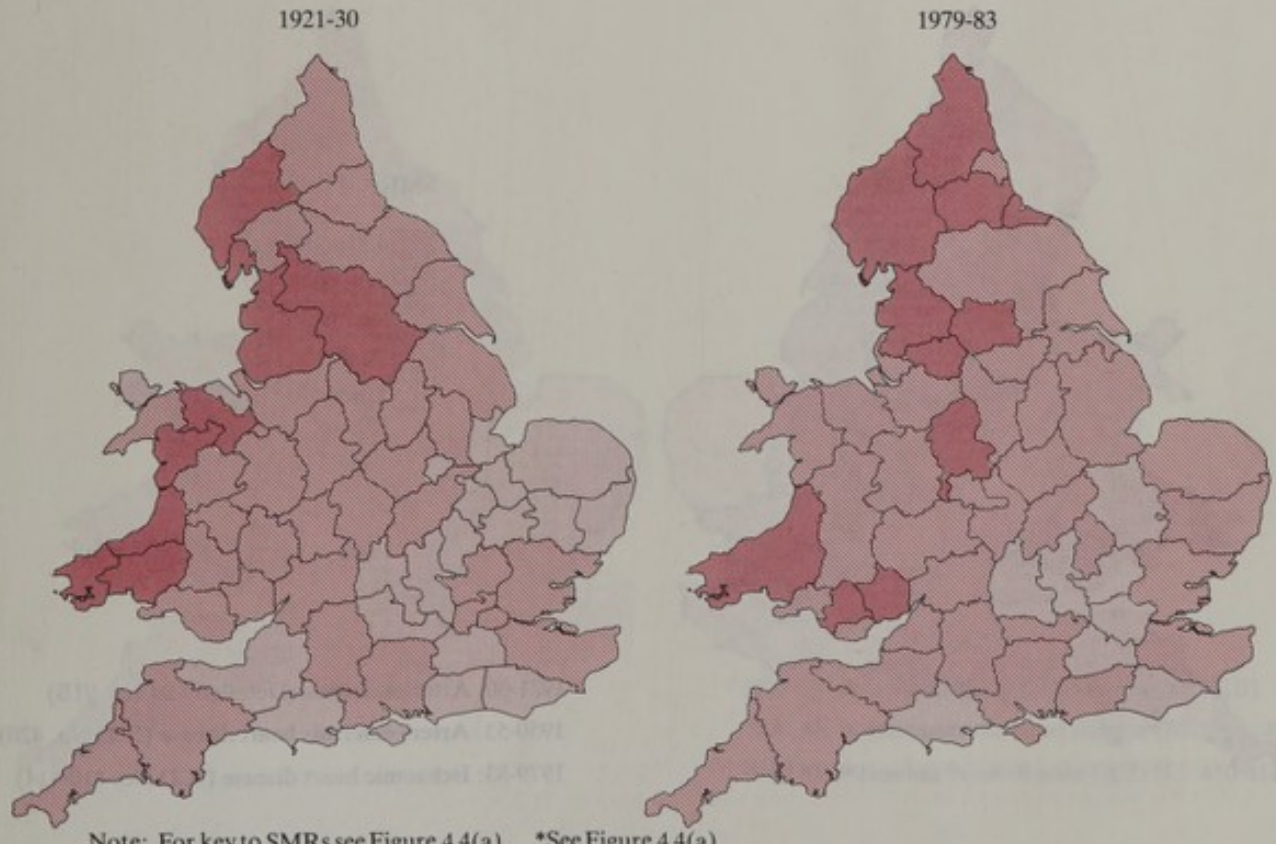
*1946-49: Cancer of lung, bronchus, pleura (ICD No. 476)
1979-83: Malignant neoplasm of trachea, bronchus and lung (ICD No. 162)

Figure 4.4(a) Geographic variation in mortality of males: cardiovascular disease*, SMRs for 1921-30 and 1979-83; counties of England and Wales



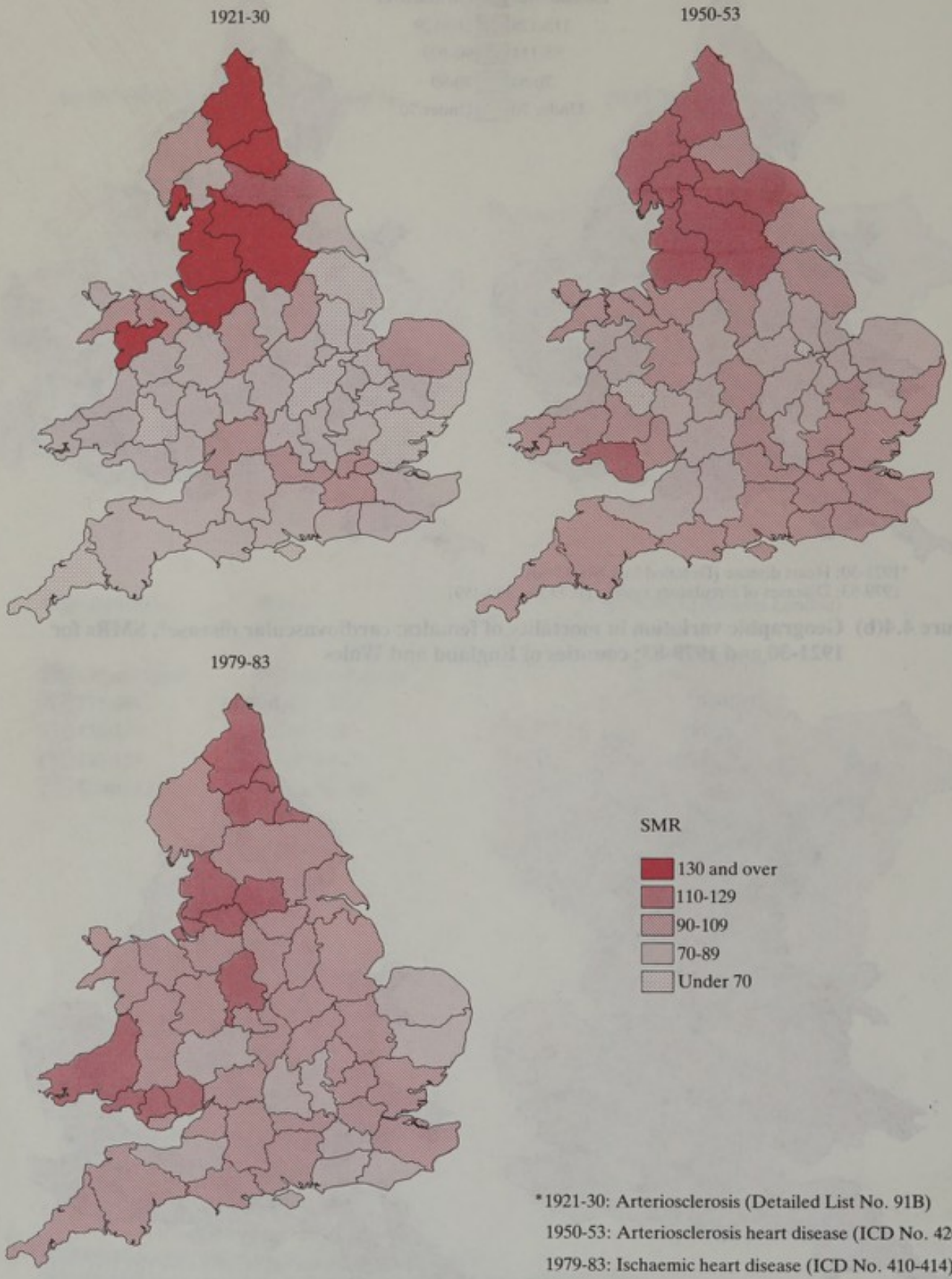
*1921-30: Heart disease (Detailed List No. 87-90)
1979-83: Diseases of circulatory system (ICD No. 390-459)

Figure 4.4(b) Geographic variation in mortality of females: cardiovascular disease*, SMRs for 1921-30 and 1979-83; counties of England and Wales



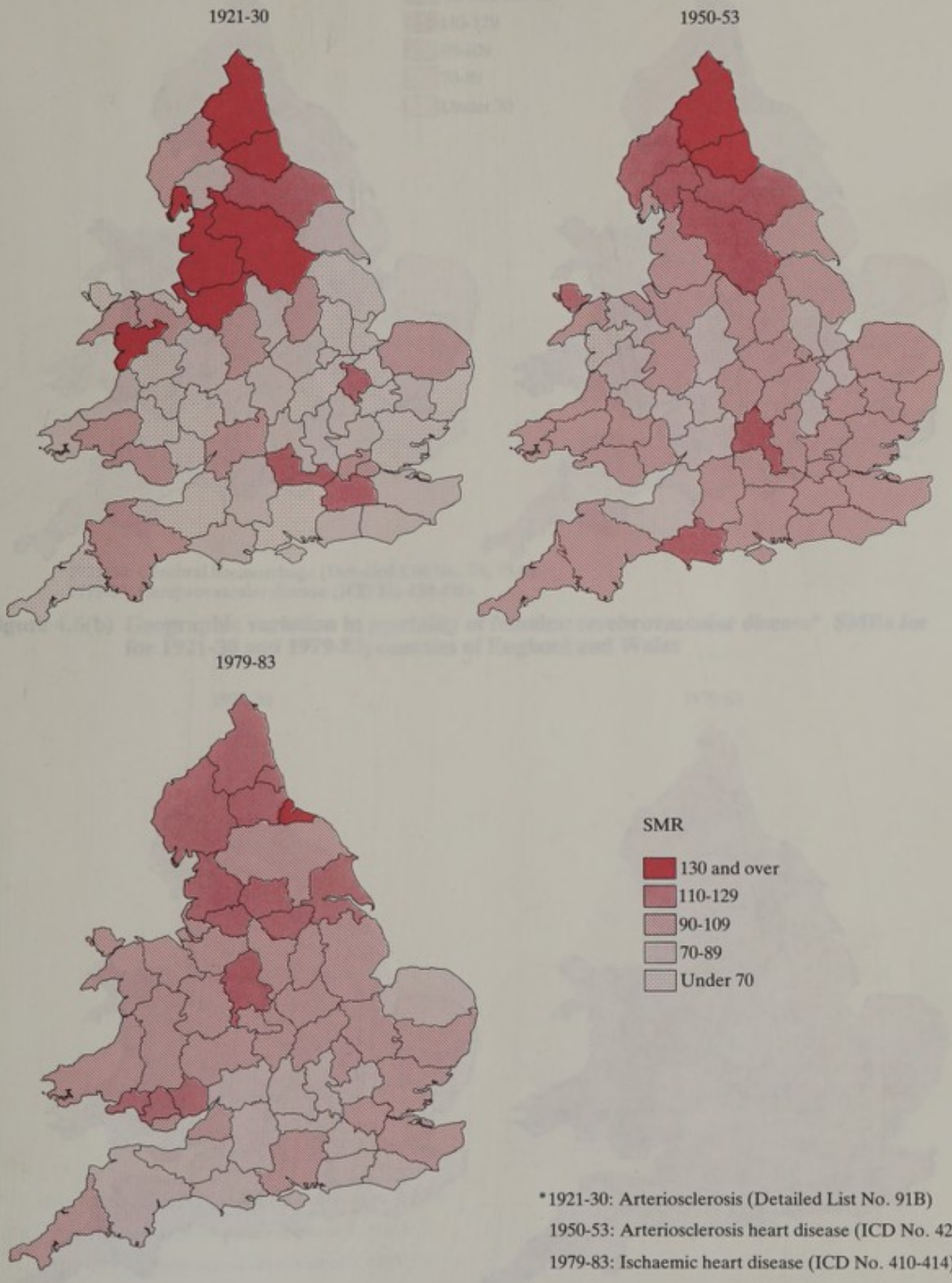
Note: For key to SMRs see Figure 4.4(a) *See Figure 4.4(a)

Figure 4.5(a) Geographic variation in mortality of males: ischaemic heart disease*, SMRs for 1921-30, 1950-53 and 1979-83; counties of England and Wales



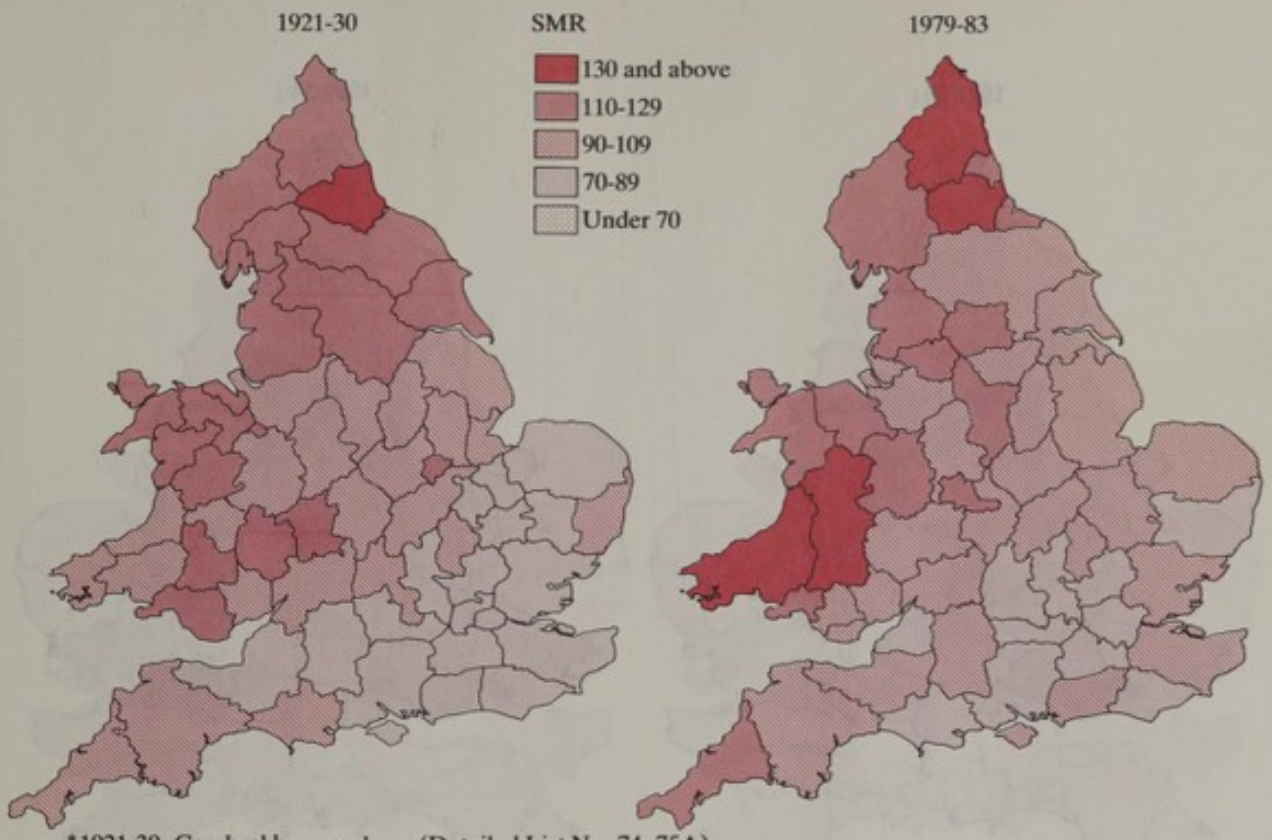
*1921-30: Arteriosclerosis (Detailed List No. 91B)
1950-53: Arteriosclerosis heart disease (ICD No. 420)
1979-83: Ischaemic heart disease (ICD No. 410-414)

Figure 4.5(b) Geographic variation in mortality of females: ischaemic heart disease*, SMRs for 1921-30, 1950-53 and 1979-83: counties of England and Wales



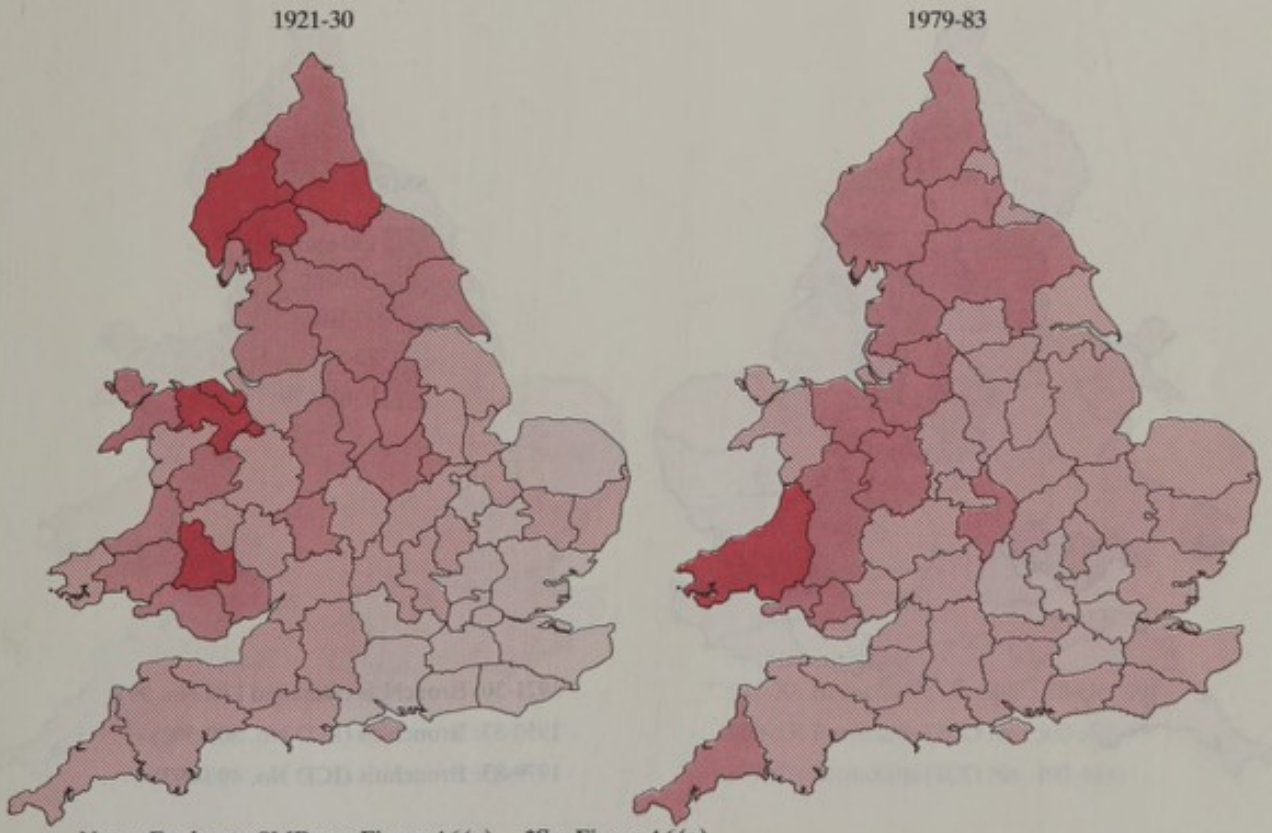
*1921-30: Arteriosclerosis (Detailed List No. 91B)
1950-53: Arteriosclerosis heart disease (ICD No. 420)
1979-83: Ischaemic heart disease (ICD No. 410-414)

Figure 4.6(a) Geographic variation in mortality of males: cerebrovascular disease*, SMRs for 1921-30 and 1979-83; counties of England and Wales



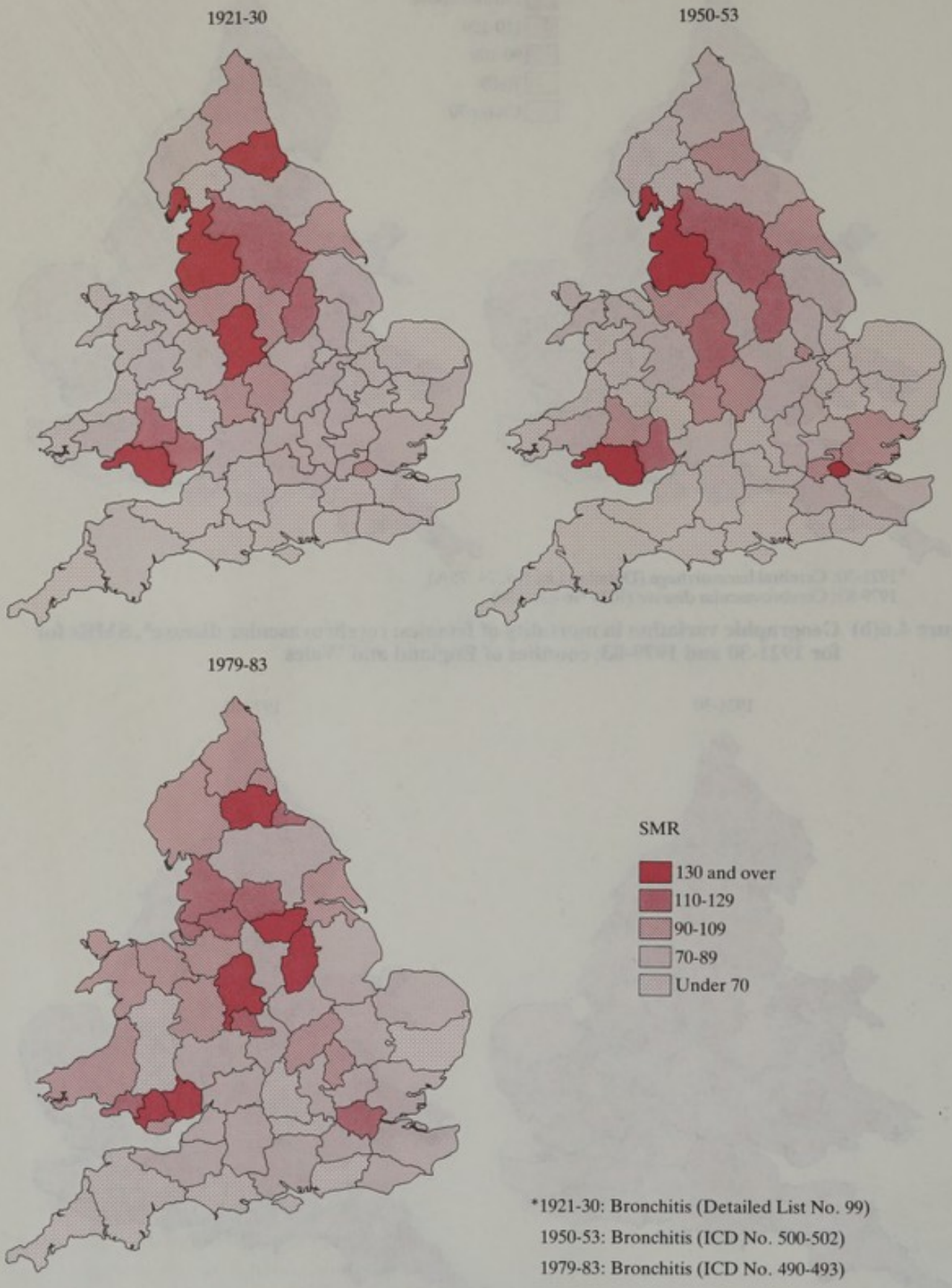
*1921-30: Cerebral haemorrhage (Detailed List No. 74, 75A)
1979-83: Cerebrovascular disease (ICD No 430-438)

Figure 4.6(b) Geographic variation in mortality of females: cerebrovascular disease*, SMRs for for 1921-30 and 1979-83; counties of England and Wales



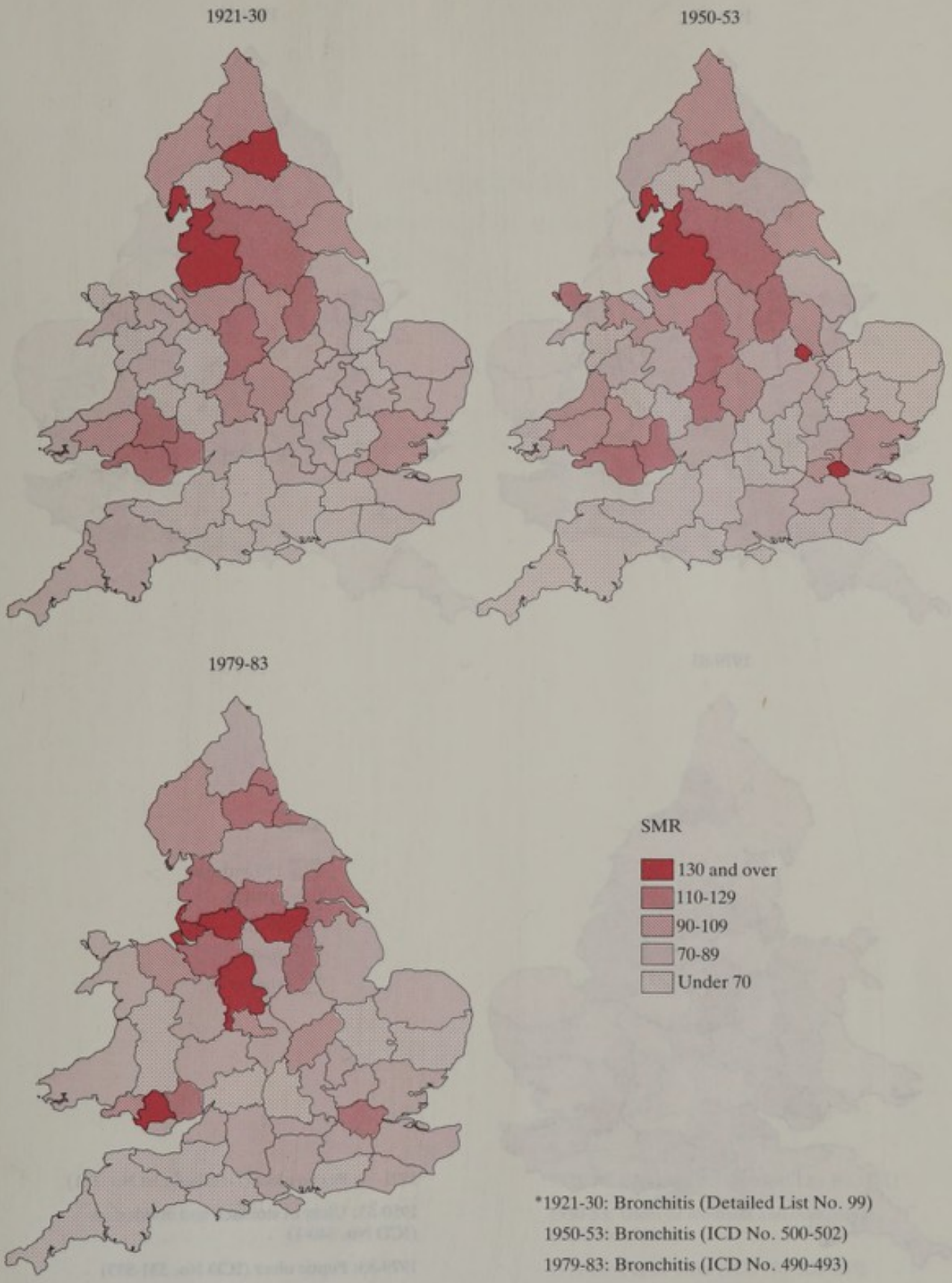
Note: For key to SMRs see Figure 4.6(a) *See Figure 4.6(a)

Figure 4.7(a) Geographic variation in mortality of males: bronchitis* for 1921-30, 1950-53 and 1979-83; counties of England and Wales



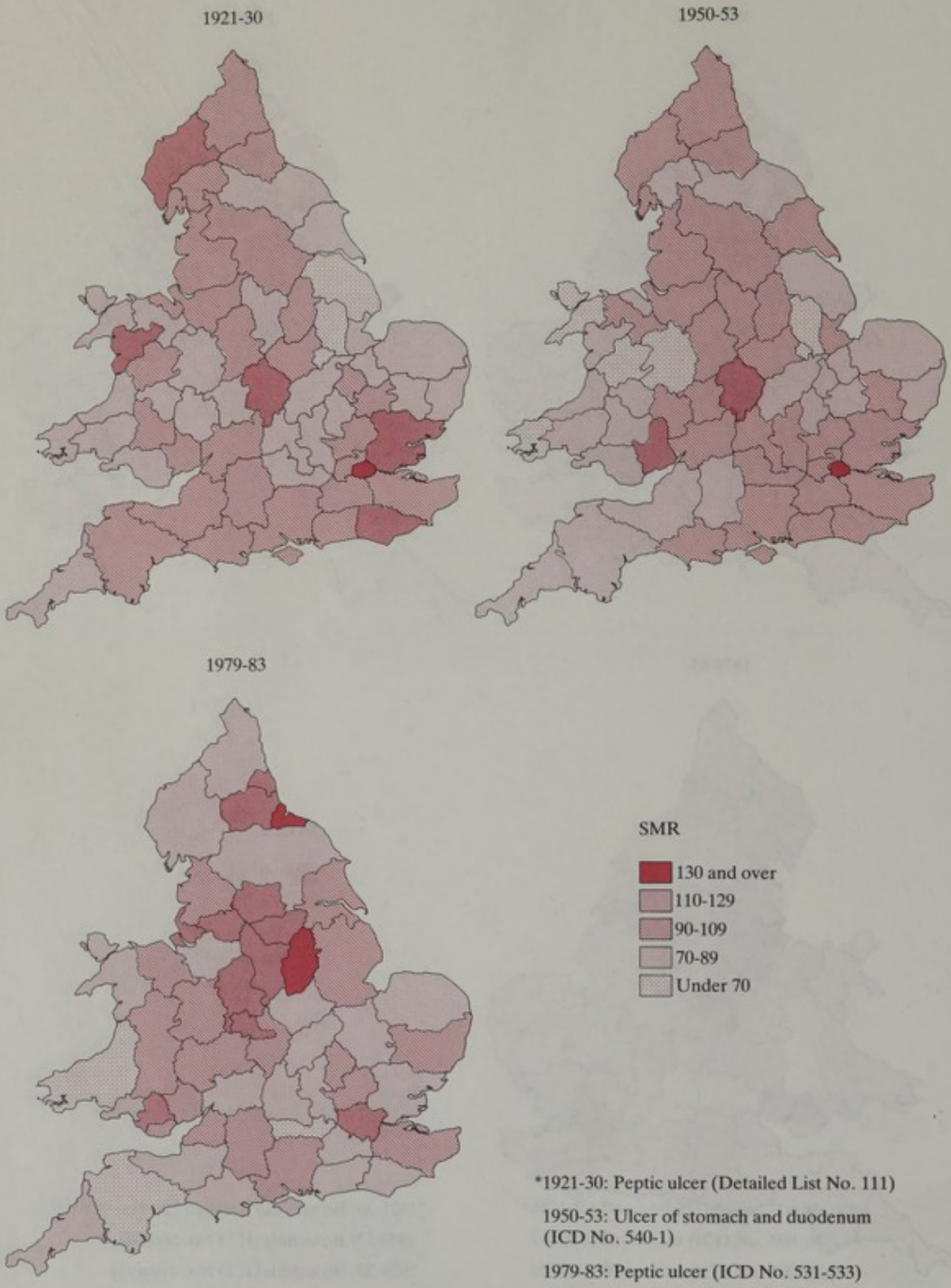
*1921-30: Bronchitis (Detailed List No. 99)
1950-53: Bronchitis (ICD No. 500-502)
1979-83: Bronchitis (ICD No. 490-493)

Figure 4.7(b) Geographic variation in mortality of females: bronchitis* for 1921-30, 1950-53 and 1979-83; counties of England and Wales



*1921-30: Bronchitis (Detailed List No. 99)
1950-53: Bronchitis (ICD No. 500-502)
1979-83: Bronchitis (ICD No. 490-493)

Figure 4.8(a) Geographic variation in mortality of males: peptic ulcer* for 1921-30, 1950-53 and 1979-83; counties of England and Wales

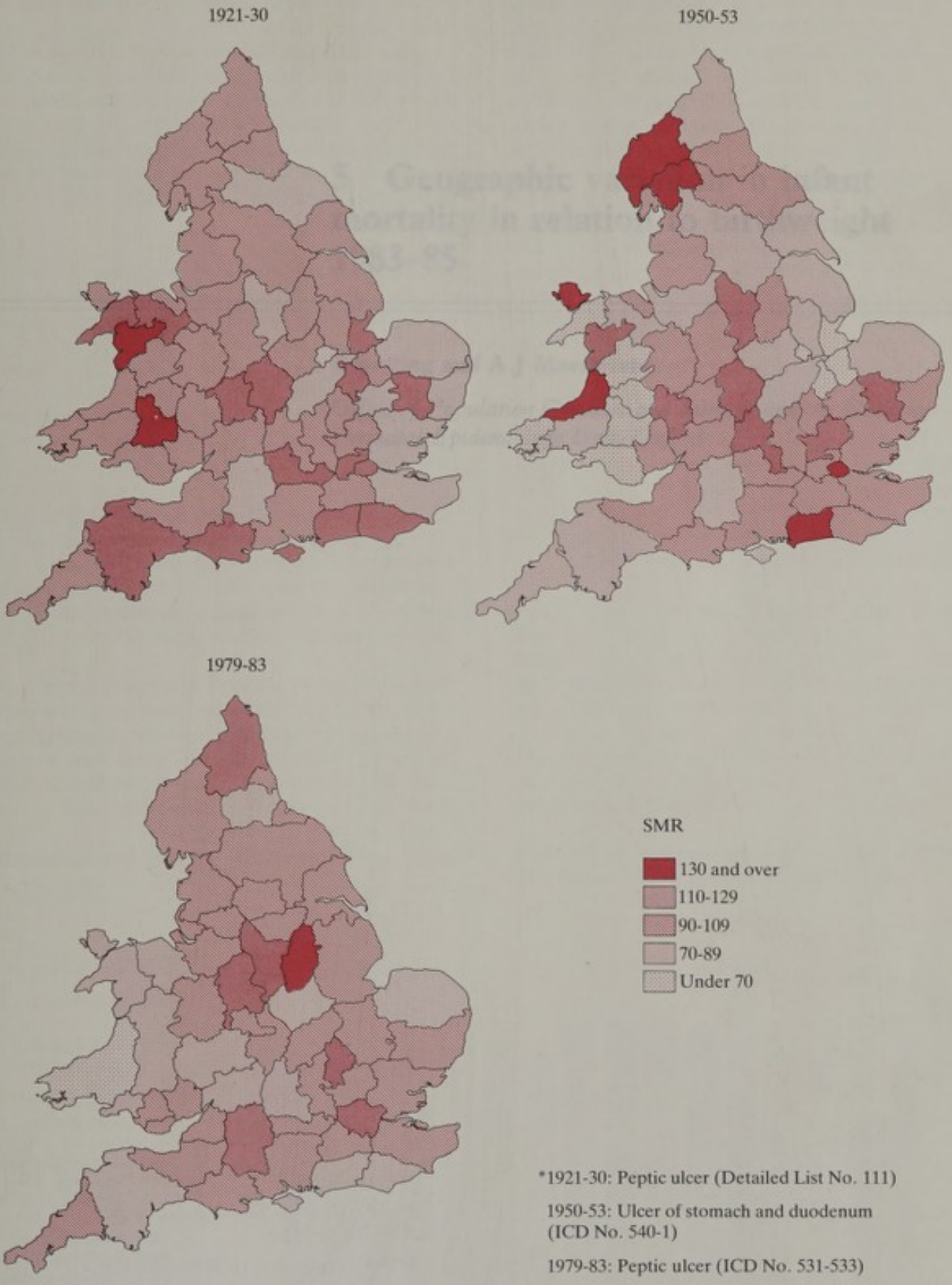


*1921-30: Peptic ulcer (Detailed List No. 111)

1950-53: Ulcer of stomach and duodenum (ICD No. 540-1)

1979-83: Peptic ulcer (ICD No. 531-533)

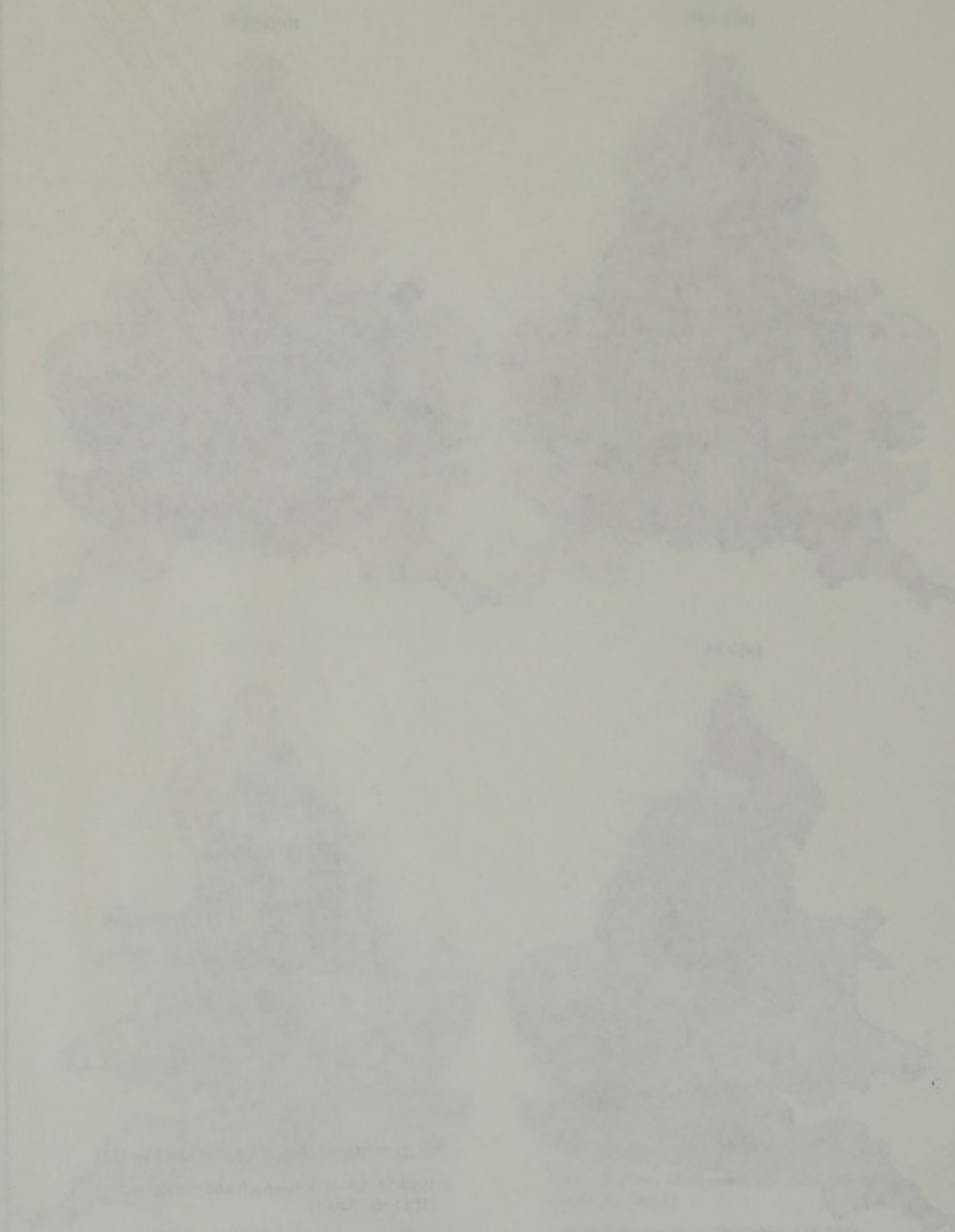
Figure 4.8(b) Geographic variation in mortality of females: peptic ulcer* for 1921-30, 1950-53 and 1979-83; counties of England and Wales



*1921-30: Peptic ulcer (Detailed List No. 111)

1950-53: Ulcer of stomach and duodenum (ICD No. 540-1)

1979-83: Peptic ulcer (ICD No. 531-533)



5 Geographic variation in infant mortality in relation to birthweight 1983–85

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5.1 Introduction

An infant's chance of survival is closely related to its birthweight. In 1985, over a quarter of all babies born live in England and Wales weighing under 1500 grams died in the first 28 days of life, compared with less than 2 in every thousand liveborn babies weighing 3000 grams or over. The 1946 National Birth Survey[1], the 1958 British Perinatal Mortality Survey[2], and the 1970 British Births Survey[3] all showed associations between low birthweight and a number of demographic and socio-economic factors. Since these special cohort studies, based on relatively small numbers, were carried out, birthweight data have become available routinely for nearly all births and infant deaths in England and Wales (see Chapter 2 for more background). This chapter analyses variations in birthweight-specific infant mortality (deaths within one year of live birth) by social class, age of mother and mother's country of birth, for regional health authorities (RHAs) and district health authorities (DHAs). Annual infant mortality rates at RHA or DHA level are frequently based on a small number of deaths so data for the period 1983–85 have been aggregated.

5.2 Variations between regional health authorities

An analysis of infant mortality rates shows considerable variation between RHAs. Figure 5.1 shows infant mortality rates for RHAs for 1983–85. The RHAs are ranked in decreasing order of neonatal mortality rates (deaths before 28 completed days after live birth).

There is a clear geographical pattern in neonatal mortality rates. All the RHAs in the south of England (Wessex, South East Thames, North East Thames, South Western, North West Thames, East Anglia, South West Thames, Oxford) have neonatal mortality rates below that of England and Wales. The rates for Yorkshire, West Midlands, Wales and Northern were noticeably above the national level. Only Mersey of the RHAs in the north and west had a neonatal rate below the national level. For the postneonatal period, rates were higher than average in Yorkshire, North Western, Wessex and South East Thames.

The extent to which higher infant mortality is associated with very low weight births (under 1500 grams), low weight births (under 2500 grams) or among babies weighing 2500 grams or more at birth is shown in Table 5.1 together with the regional distribution of live births. The two RHAs with the highest crude neonatal mortality rates, West Midlands and Yorkshire, also have some of the highest rates in the individual birthweight categories. In contrast, the RHAs with the lowest neonatal rates, East Anglia, North East Thames and Oxford, show a far less consistent pattern.

For the postneonatal period (at least 28 days but less than one year) the differences in mortality rates between northern and southern regions disappeared in the mid-1970s.[4] It is not surprising therefore that for the years 1983–85 the regional variation in crude and birthweight specific postneonatal mortality rates was much smaller than for neonatal mortality. Once again, however, Yorkshire is among the RHAs with the highest rates in all the individual birthweight categories.

5.3 Associations between socio-economic, ethnic and biological factors and infant mortality rates

A number of analyses for England and Wales as a whole[5] have shown the association of infant mortality with birthweight and other factors including father's social class and mother's age and country of birth.

When tabulated by mother's age, infant mortality rates within birthweight categories show the usual pattern with the highest rates for the youngest mothers, decreasing to a minimum at ages 30–34 and then increasing again. This reflects, in part, the selection factors, such as social class, which can influence the ages at which

Figure 5.1 Neonatal and postneonatal components of infant mortality rates for regional health authorities in England and Wales; 1983–5 combined

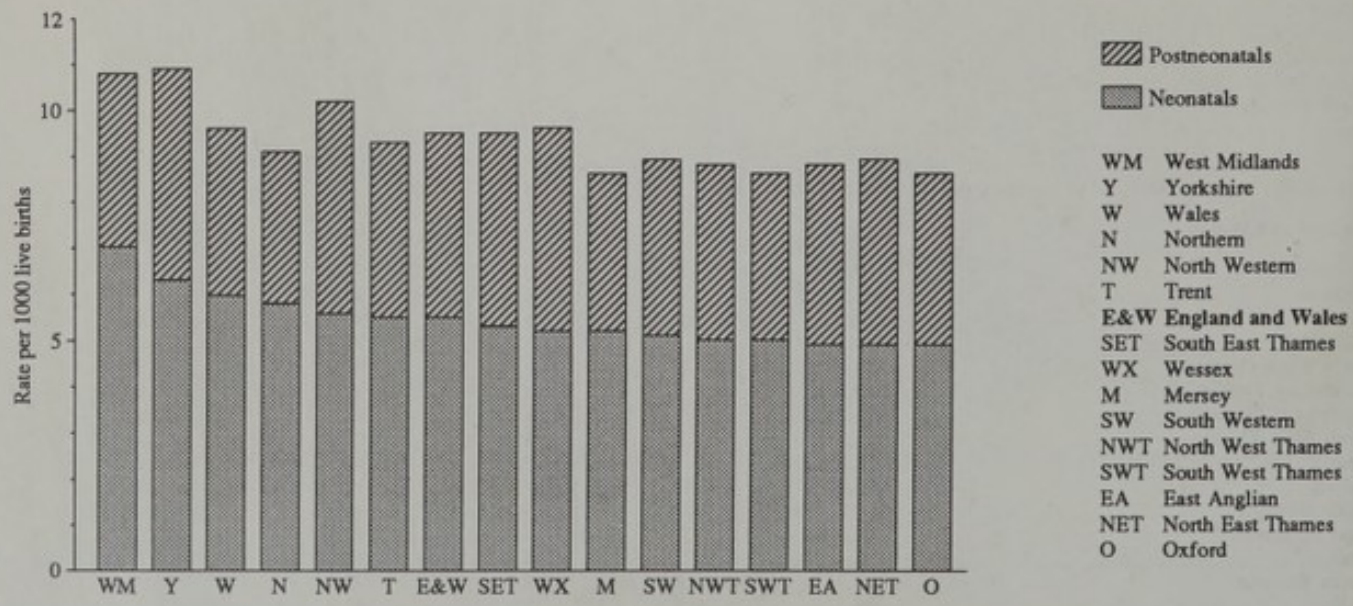


Table 5.1 Neonatal, postneonatal and infant mortality rates per 1,000 live births by birthweight, and percentage distribution by birthweight, 1983–5.

Regional Health Authorities of England and Wales

Area of usual residence	Birthweight group				
	Total	Less than 1,500g	1,500–2499g	2,500g and over	Not stated
Neonatal mortality					
England and Wales	**5.5**	**277.9**	**19.1**	**1.9**	**188.8**
Northern	5.8	297.6	20.7	2.0	233.3
Yorkshire	6.3	316.3	21.9	2.0	344.4
Trent	5.5	279.7	18.6	1.8	258.1
East Anglia	4.9	264.0	15.6	2.1	73.5
North West Thames	5.0	206.0	17.9	1.9	162.8
North East Thames	4.9	215.1	19.0	1.7	186.9
South East Thames	5.3	245.8	17.5	1.9	150.8
South West Thames	5.0	269.0	16.6	1.8	215.5
Wessex	5.2	286.9	17.3	1.9	306.9
Oxford	4.9	246.6	19.1	1.6	73.5
South Western	5.1	269.6	20.7	1.8	130.2
West Midlands	7.0	346.3	22.0	2.3	151.6
Mersey	5.2	286.6	16.9	1.6	298.9
North Western	5.6	284.8	16.6	1.8	232.9
Wales	6.0	329.0	22.8	1.7	303.9
Postneonatal mortality					
England and Wales	**4.0**	**37.8**	**10.7**	**3.2**	**27.1**
Northern	3.5	32.4	7.3	2.9	41.7
Yorkshire	4.6	42.4	13.2	3.6	55.6
Trent	3.8	33.4	11.3	3.0	104.8
East Anglia	3.9	43.4	11.5	3.2	–
North West Thames	3.8	40.3	8.7	3.1	17.4
North East Thames	4.0	41.9	12.0	3.1	14.0
South East Thames	4.2	42.7	10.0	3.4	23.0
South West Thames	3.6	29.2	9.9	3.1	8.6
Wessex	4.4	30.5	11.4	3.8	49.5
Oxford	3.7	33.5	13.3	2.9	8.2
South Western	3.8	25.8	10.8	3.2	17.8
West Midlands	3.8	40.5	10.4	3.0	28.6
Mersey	3.4	37.8	9.4	2.8	–
North Western	4.6	39.9	11.8	3.7	41.1
Wales	3.6	45.3	9.3	2.9	29.4
Infant mortality					
England and Wales	**9.5**	**315.7**	**29.9**	**5.1**	**215.9**
Northern	9.2	330.0	28.0	4.9	275.0
Yorkshire	10.9	358.7	35.1	5.6	400.0
Trent	9.3	313.0	29.9	4.8	362.9
East Anglia	8.8	307.4	27.1	5.3	73.5
North West Thames	8.8	246.3	26.7	5.0	180.2
North East Thames	9.0	257.0	31.0	4.8	200.9
South East Thames	9.5	288.5	27.5	5.2	173.8
South West Thames	8.6	298.2	26.5	4.8	224.1
Wessex	9.6	317.4	28.7	5.7	356.4
Oxford	8.6	280.0	32.4	4.5	81.6
South Western	8.9	295.4	31.5	5.0	147.9
West Midlands	10.8	386.8	32.4	5.2	180.2
Mersey	8.6	324.4	26.3	4.4	298.9
North Western	10.2	324.7	28.4	5.5	274.0
Wales	9.7	374.3	32.1	4.6	333.3
Live births: total number and percentage distribution by birthweight					
England and Wales	**1,921,255**	**0.9**	**5.9**	**93.1**	**0.1**
Northern	119,243	0.8	5.8	93.2	0.1
Yorkshire	141,201	0.9	6.3	92.8	0.1
Trent	173,568	0.9	6.0	93.0	0.1
East Anglia	71,247	0.8	5.2	93.9	0.1
North West Thames	139,271	1.0	6.0	92.9	0.1
North East Thames	153,128	0.9	6.2	92.8	0.1
South East Thames	135,553	0.9	5.7	93.1	0.2
South West Thames	105,963	0.8	5.3	93.8	0.1
Wessex	101,811	0.7	5.3	93.9	0.1
Oxford	95,829	0.8	5.6	93.3	0.3
South Western	109,276	0.8	5.3	93.8	0.2
West Midlands	207,301	0.9	6.1	92.8	0.2
Mersey	96,340	0.9	5.6	93.4	0.1
North Western	163,398	1.0	6.5	92.4	0.0
Wales	108,126	0.8	5.6	93.4	0.2

different groups of women give birth. The pattern is far more variable for individual RHAs. In part this reflects random variation arising from the small numbers of deaths in some birthweight categories. In addition, the differing maternal age structure of those giving birth in the RHAs can confound the analysis. One approach to this problem is to apply either direct or indirect standardisation to the birthweight. It has been shown, however, that these methods are likely to be biased when applied to birthweight because for some populations the lowest mortality rate occurs at a weight which is greater than mean birthweight. The effect of this is that standardisation is intrinsically biased against populations with heavier birthweights. Because of this, standardisation has not been used here.[6]

Another variable known to be associated with differences in birthweight is the mother's country of birth. It has been shown that there are differences in the birthweight distributions of babies born to mothers of different countries of birth, with the highest proportion of low birthweight live births being recorded for mothers born in Africa, India and Bangladesh.[7] These results have been confirmed in a number of local studies.[8–13] For example, an early study showed that babies born to women from the West Indies were on average of lower birthweight than those whose parents were born in Britain, even after adjusting for the mothers' heights and parities.[12] A further study showed that women of Asian ethnic origin in higher socio-economic groups tended to have babies of lower average birthweight than women of European ethnic origin. It also showed that babies born to Asian women in the higher socio-economic groups had lower mortality than those born to less affluent women of Asian ethnic origin.[13]

Country of birth is increasingly becoming a poor indicator of ethnic origin. For example, many women of Afro-Caribbean ethnic origin and an increasing proportion of women of Asian ethnic origin were born in England and Wales whilst some women born in India or Africa are of European descent. Nevertheless it is the only indicator available in routine registration data.

The House of Commons Social Services Committee reported in 1984 that it considered perinatal mortality (stillbirths plus deaths in the first week of life) among ethnic minority group babies to be a major outstanding problem.[14] Immigrants to England and Wales have tended to cluster in particular areas of the country. Therefore it is reasonable to expect that areas with a high proportion of women from the New Commonwealth and Pakistan will have different birthweight distributions to other areas. Depending on other characteristics of the populations concerned, this may affect infant mortality and associated comparisons between RHAs.

Over the period 1983–85 the highest neonatal mortality rates in England and Wales were among babies whose mothers were born in Pakistan or Bangladesh. These differences persisted across birthweight categories but not always when cross-tabulated by RHA of mother's residence. Again this reflects the small number of events in some categories and differences between the populations within each RHA. To examine this more closely, the data for 1983–85 have been analysed for individual DHAs.

5.4 Variations between district health authorities

Due to the relatively small numbers of deaths in each DHA, apparently large differences in mortality may occur by chance. This problem has become particularly acute since the 1982 reorganisation of the NHS, which resulted in many DHAs being smaller than the area health authorities on which NHS administration and many statistics were based from 1974 to 1981.

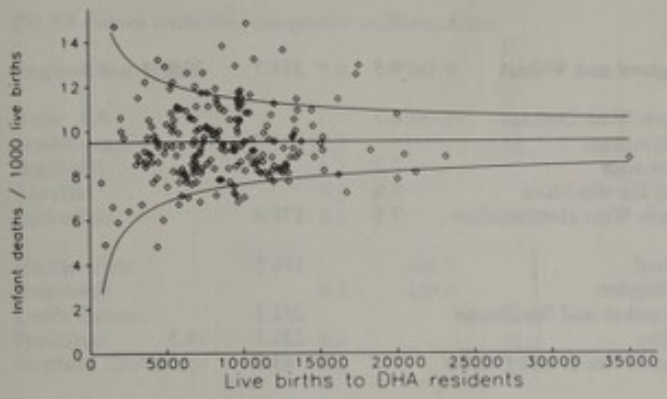
Crude infant mortality rates for DHAs range from 6.0 to 13.2 per 1,000 live births for the period 1983–85. This range is very much larger than that for RHAs which range from 8.6 to 10.9. This reflects both the greater variability arising from the much smaller numbers of deaths and the much more marked differences between the socio-economic characteristics of the populations of the DHAs. These can, in their turn, affect the birthweight distribution of live births in the DHA. It is also possible that there are local differences in the quality and accessibility of health care available in pregnancy and labour and the postnatal period. Analyses, which have included both socio-economic factors and indicators of the provision of health care, have found that the outcome of pregnancy in terms of mortality and the incidence of low birthweight is more closely associated statistically with provision of health care.[15–17]

A series of analyses in the 1970s standardised infant mortality rates to allow for differences in the birthweight distribution.[18–20] The aim was to derive standardised rates which, it was suggested, would reflect differences in the quality of medical care. In addition to the possibility that they are probably biased[6, 21] these standardised ratios obscure the way that DHAs may have relatively high mortality at one point in the birthweight distribution but not elsewhere. Differences in birthweight-specific mortality rates have practical implications for monitoring and planning maternity services. A higher mortality rate among very low weight births has very different implications from a higher rate among heavier babies when seeking ways to reduce mortality.

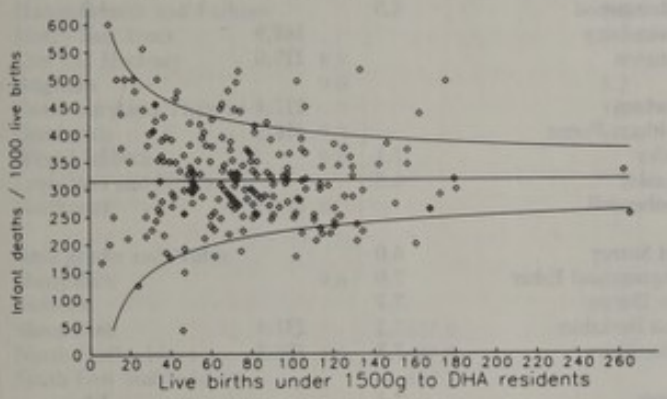
Infant mortality rates for babies weighing under 1500 grams, 1500–2499 grams and 2500 grams or more were examined separately for each DHA in England and each management unit in Wales (see Appendix 4 for detailed figures: for convenience, management units in Wales are referred to as DHAs in this analysis.) For each birthweight group ninety-five per cent confidence intervals (based on the normal approximation to the binomial distribution) were calculated by applying the England and Wales rates to the number of live births in each DHA. DHAs whose rates lay outside these confidence intervals, either above or below, have been identified. At this probability level, it would be expected that 5 per cent or 11 out of each set of 216 rates would lie outside the interval, if the difference were attributed to chance alone. The resulting data are shown in Figure 5.2 together with the England and Wales rate and the 95 per cent confidence intervals.

Figure 5.2 Infant mortality rates by birthweight, district health authorities and Welsh management units, 1983-85

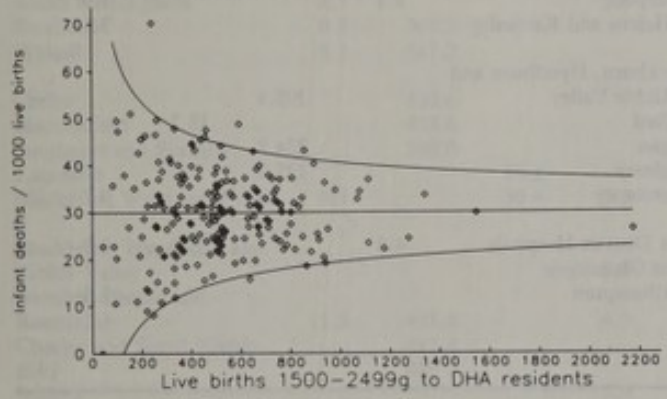
(a) All live births



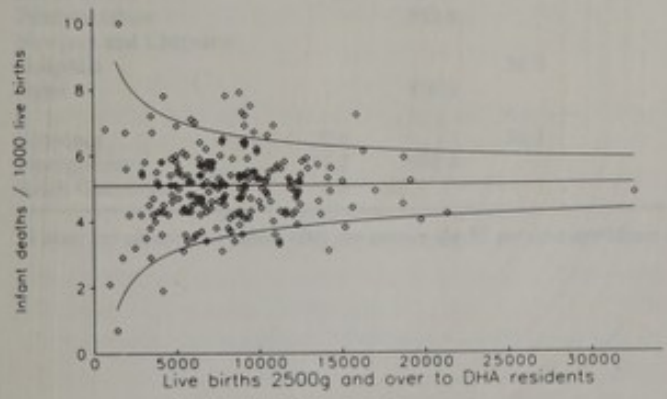
(b) All live births under 1500g



(c) All live births 1500-2499g



(d) All live births 2500g and over



For all babies irrespective of birthweight (Figure 5.2(a)), 22 DHAs had crude infant mortality rates which lay above the upper end of the confidence interval and 17 had rates which lay below the lower end. These are more than would be expected by chance. The areas concerned are listed in Table 5.2 with their infant mortality rates.

Inspection of other data for these districts showed that in 13 of the 22 DHAs with rates above the upper end of the interval, more than 10 per cent of mothers were born in the New Commonwealth or Pakistan. In the DHAs with rates below the lower end of the interval, the percentage of mothers born in the New Commonwealth or Pakistan did not exceed 8 per cent, and it only exceeded 5 per cent in 7 DHAs. Similarly, analyses by social class derived from the father's occupation show that 20 of the 22 DHAs with high infant mortality rates had 20 per cent or more of all fathers in Social Classes IV and V combined, whereas of the 17 DHAs with low rates only 4 DHAs had more than 20 per cent of fathers in these classes.

The analysis of birthweight by DHA was repeated for three specific birthweight groups and the results given in Figures 5.2(b)–(d) and Table 5.2. The analysis within birthweight groups shows, that for babies weighing under 1500 grams and those weighing 2500 grams or more, more DHAs than would be expected by chance had mortality rates which lay outside the 95 per cent confidence intervals. In the under 1500 grams group, 17 lay above the upper limit and 17 below the lower limit. The corresponding figures are 5 and 3 in the 1500–2499 grams group and 14 and 13 in the 2500 grams and over group. It is notable that of the 22 DHAs with high crude rates, only 16 have high mortality rates in one or more of the three birthweight groups. In the 17 DHAs with unusually low crude rates only 12 have any birthweight-specific mortality rate below the limit for the relevant birthweight category. In both cases it is the mortality rates for babies weighing 2500 grams or more which are more likely to be outside the relevant limit.

It has been shown elsewhere that the higher incidence of serious and potentially fatal congenital malformations is a major contributory factor to the higher perinatal and infant mortality rates in Wales and the North and West of England, and also among women born in Pakistan.[22] As a consequence, It has been suggested that deaths from all other causes apart from congenital malformations should be analysed separately from those attributed to congenital malformations. Birthweight specific mortality rates for all these other causes combined was calculated for each DHA and the process described above repeated (see Appendix 4 for more details). Table 5.2 (see part b) shows that 26 DHAs have infant mortality rates for all causes excluding congenital malformations above the 95 per cent upper limit, and 15 have rates below the lower limit. Once again this is more than would be expected by chance and many of the DHAs are the same as in the previous analysis. Compared with the analysis of all cause mortality rates, fewer of the 41 DHAs with outlying values for all birthweights combined have outlying values within any of the individual birthweight groups; this

Table 5.2 District health authorities with significantly high or low infant mortality rates,* by birthweight, 1983–85

Area	High rates of infant mortality				Area	Low rates of infant mortality			
	All birth weights	Less than 1,500g	1,500–2,499g	2,500g and over		All birth weights	Less than 1,500g	1,500–2,499g	2,500g and over
(a) All causes									
England and Wales	**9.5**	**315.7**	**29.8**	**5.1**	**England and Wales**	**9.5**	**315.7**	**29.8**	**5.1**
York		420.5			South West Durham	6.7			3.1
Scarborough	13.2		70.2	7.8	Nottingham		251.9		
Bradford	12.5			7.2	Doncaster	7.7			3.3
Airedale	12.6			7.1	East Hertfordshire	7.0			
Calderdale	11.7				North West Hertfordshire	7.5	177.4		
Huddersfield	11.9				Barnet		176.5		
Dewsbury	12.6	478.3			Hillingdon				3.4
Leeds Eastern			43.1		Hounslow and Spelthorne		222.2		
Pontefract	12.0		47.5		Ealing		228.1	18.5	
Barnsley		513.5			Hammersmith and Fulham		43.5		
Paddington and North Kensington	12.2				Victoria		186.7		
Brighton	11.8			6.9	West Essex	7.2			
Greenwich	12.9			7.9	Barking, Havering and Brentwood	8.0			3.8
Swindon	11.7			7.2	Bloomsbury		148.9		
Torby				7.0	Islington		219.0		
Shropshire		514.9			Newham		217.4		
Mid Staffordshire			48.7		Waltham Forest		218.5		
North Staffordshire	12.9	494.3			Bexley	7.1			3.1
South East Staffordshire	11.6	493.2			Bromley	6.8			
Central Birmingham	13.8			7.8	Camberwell		204.5		
East Birmingham	11.5	440.0			Mid Surrey	6.0		8.1	
South Birmingham				6.7	Kingston and Esher	7.0			
Coventry	11.4				East Dorset	7.7			
Sandwell	13.6	435.6			West Berkshire	7.2	231.4		
Walsall	13.2	448.6			Oxfordshire	7.8	198.8		
Crewe		444.4			Exeter	7.1			3.6
Macclesfield		465.1			Mid Staffordshire				3.4
Blackburn, Hydburn and Ribble valley				6.9	South Warwickshire	6.8			3.4
					Liverpool	8.1			4.0
Burnley, Pendle and Rossendale	14.8	495.1		7.5	St Helens and Knowsley				3.1
Chorley and South Ribble		446.2			Blackburn, Hyndburn and Ribble Valley		205.4		
Bolton				6.6	Salford			15.7	
Bury		454.5			Wigan		234.8		
Salford				7.3	Anglesey		125.0		
North Clwyd		477.3			Aberconwy				0.7
South Clwyd			46.0						
					East District Hospitals	4.8			1.9
Pembrokeshire		555.6			West Glamorgan				
Ogwr		500.0			Northampton				3.6
Rhymney	12.9								
Montgomery	14.7			10.0					
South Glamorgan	11.4								

Table 5.2 *Continued*

Area	High rates of infant mortality				Area	Low rates of infant mortality			
	All birth weights	Less than 1,500g	1,500–2,499g	2,500g and over		All birth weights	Less than 1,500g	1,500–2,499g	2,500g and over
(b) All causes excluding congenital malformations									
England and Wales	**7.0**	**281.9**	**17.4**	**3.6**	**England and Wales**	**7.0**	**281.9**	**17.4**	**3.6**
York		397.7			Leicestershire	5.8		11.0	
Scarborough	10.2		53.7	5.6	Sheffield		208.3		
Bradford	8.7			4.8	North Hertfordshire		166.7		
Airedale	9.3				East Hertfordshire	5.3			
Calderdale	9.1		29.6		South West Hertfordshire		173.9		
Huddersfield		403.5			Barnet		156.9		
Dewsbury	9.3	420.3			Hillingdon				2.1
Leeds Eastern			26.8		Hounslow and Spelthorne		192.6		
Pontefract	9.4		32.4		Hammersmith and Fulham		43.5		
Southern Derbyshire	8.2		25.1		Victoria		173.3		
Barnsley		486.5			North East Essex		171.1		
Paddington and North Kensington	9.6				Barking, Havering and Brentwood	5.7			2.6
Hammersmith and Fulham				5.6	Bloomsbury		106.4		
North East Essex				5.0	Waltham Forest		184.9		
City and Hackney	8.9				Dartford				2.2
Brighton	9.0			5.2					
Canterbury and Thanet				5.1	Bexley	5.2			2.1
Greenwich	9.9			6.1	Bromley	4.6			
West Lambeth	9.0				Camberwell		181.8		
Lewisham and North Southwark	8.5				Merton and Sutton	5.4			
					East Dorset	5.5			
Basingstoke and North Hampshire	9.6			5.4	West Berkshire	5.1			
Swindon				5.1	Northampton				2.4
Shropshire		477.6			Oxfordshire	5.7	192.5		
North Staffordshire	9.6	437.5			Exeter	5.2			
South East Staffordshire		424.7			Cheltenham and District		148.9		
Central Birmingham	9.6			5.3	Somerset	5.2			2.5
North Birmingham		409.8			Mid Staffordshire				2.2
South Birmingham	8.7			5.0	South Warwickshire	5.0			
Sandwell	9.8	368.1			St. Helens and Knowsley				2.3
Walsall	9.1	411.2			Blackburn, Hyndburn and Ribble Valley		160.7		
Crewe		430.6			South Manchester			5.7	
Macclesfield		418.6			Salford			3.1	
Southport and Formby		500.0			Wigan		181.8		
Lancaster			38.2		Pontypool & W. Gwent				
Blackpool, Wyre and Fylde	9.4		30.4	5.1	Hospitals	4.3	108.1		
					Anglesey	2.6	83.3		1.2
Blackburn, Hyndburn and Ribble Valley				5.3	East District Hospitals	3.4			1.0
Burnley, Pendle and Rossendale	11.3	485.4		4.9					
Chorley and South Ribble		415.4							
Bury		409.1							
Salford				5.9					
Trafford	9.0								
North Clwyd	9.2	454.5		5.2					
Pembrokeshire		555.6							
Newport and Chepstow Hospitals			36.0						
Ogwr		470.6							
Rhymney	10.4		38.8						
Montgomery	11.2	600.0							
South Glamorgan	8.6								

**Values are shown only where rates are outside the 95 per cent confidence intervals.*

occurred for 19 DHAs with high rates and 8 DHAs with low rates (compared with 16 and 12 respectively of the 39 DHA values in the all cause analysis).

Multiple births should also be excluded from comparisons between DHAs[18, 23] because of the variability of the numbers of deaths at DHA level, their tendency to be of low birthweight and their relatively high mortality rates. Although this has not been done here, it is one factor to be considered in future analyses.

In an attempt to interpret the above findings, the distributions of births by social class and by mother's country of birth, both of which are known to affect the birthweight distribution, have been examined to see to what extent these are unusual compared with the national picture. The number of births and deaths involved in these analyses are relatively small. Therefore, in order to obtain a more reliable picture, DHAs with similar proportions of mothers born in the New Commonwealth and Pakistan, of mothers aged under 20, and of fathers in Social Classes IV and V have been grouped together and birthweight-specific mortality rates calculated. These data are given in Table 5.3 for DHAs in England and Wales. The likelihood of social class, age of mother and country of birth being inter-correlated must always be borne in mind in interpreting the findings.

Table 5.3 shows a clear social class gradient in infant mortality in the under 1500 grams group. Rates were highest in DHAs where a high proportion of fathers were in Social Classes IV and V. In the higher weight groups the differences were small but generally followed the same pattern. These differences are also reflected by mother's age but the proportional differentials in the under 1500 grams group are much narrower.

Grouping districts by mother's country of birth shows a clear gradient in the under 1500 grams group, but with the lowest rate being for the areas with a high proportion of mothers born in the New Commonwealth and Pakistan. This is not unexpected since, as discussed earlier, babies born to such women are on average of lower birthweight than babies born to women born in England and Wales and therefore may carry a lower risk of mortality weight for weight. For the category of births weighing 2500 grams and over the gradient appears to be in the opposite direction, with the lowest rate being for the areas with a low proportion of mothers born in the New Commonwealth and Pakistan.

5.5 Summary and discussion

The analyses in this chapter are based on data taken from the OPCS linked infant mortality file for the three years 1983–85. They have been used to examine geographical variations in infant mortality in terms of crude and birthweight-specific mortality rates. The results show a clear geographic gradient in neonatal mortality rates, with all the RHAs in the south of England and only Mersey in the north of England having rates below that for England and Wales as a whole. The rates for Yorkshire, West Midlands, Northern RHAs and Wales were noticeably above the national level. The highest neonatal rates were for children whose mothers were born in Pakistan and Bangladesh. The two RHAs with the highest crude neonatal mortality rates, Yorkshire and West Midlands, also had some of the highest rates in the individual birthweight categories.

For the postneonatal period rates were higher than average again in Yorkshire, and also in North Western, Wessex and South East Thames. Any general differences in postneonatal mortality rates between northern and southern regions had already disappeared by the mid-1970s.

Health districts with exceptionally high infant mortality rates tended to have above average proportions of mothers born in the New Commonwealth and Pakistan, and fathers in a low social class group. Many health districts with exceptionally high or low crude rates did not have exceptional birthweight-specific rates; this implies that the underlying distribution of births by birthweight was the determining factor in these cases rather than poor quality health services. This distribution of births by birthweight is strongly associated with the socio-economic characteristics of the DHA populations. Broadly similar conclusions are reached if the infant mortality rates from all causes excluding congenital malformations are examined. Many of the same DHAs were significantly above or below the national level as when congenital malformations are included.

The analyses also confirm the existence of infant mortality gradients by social class and country of birth of mothers within the specified birthweight groups. Babies weighing under 1500 grams at birth had a higher risk of death in DHAs where there was a high proportion of fathers in Social Classes IV and V. It was also high where the proportion of mothers born in the New Commonwealth and Pakistan, was relatively low. This may be a reflection of ethnic differences in birth weight distributions. In the higher weight groups mortality was lower in DHAs with a low proportion of fathers in Social Classes IV and V, but similar for DHAs with average or higher proportions. For births over 2500 grams infant mortality rates were low for areas with low proportions of mothers born in the New Commonwealth and Pakistan. The same broad patterns as described above generally hold within most RHAs.

It is clear from the analyses in this chapter that the linkage of infant death and birth records for statistical purposes and the incorporation of birthweight information and the aggregation of data for a three year period have led to a better understanding of both socio-economic and geographical variations in infant mortality*. These three year aggregated files will be analysed for further years to enable these relationships to be explored more fully

* The more detailed tabulations upon which the analyses have been based are available from the Medical Statistics Unit on request.

Table 5.3 Infant mortality rates per 1,000 live births for DHAs classified by certain characteristics of parents of live births and percentage distribution by birthweight, 1983–85

Grouped district health authorities in England and Wales

DHAs grouped according to level of characteristic	Birthweight group				
	Total	Under 1,500g	1,500–2,499g	2,500g and over	Not stated
Infant mortality					
England and Wales	**9.5**	**315.7**	**29.9**	**5.1**	**215.9**
Proportion of fathers in Social Class IV and V					
Low (under 17 per cent)	8.7	280.4	27.3	4.9	205.6
Medium (17.00–25.99 per cent)	9.6	319.8	31.2	5.1	197.7
High (26 per cent or more)	10.2	342.9	30.0	5.2	266.0
Proportion of mothers aged under 20					
Low (under 7 per cent)	8.7	289.8	28.8	4.8	162.5
Medium (7.00–9.99 per cent)	9.6	320.9	31.4	5.1	230.7
High (10 per cent or more)	10.2	331.8	29.2	5.2	265.7
Proportion of mothers born in New Commonwealth and Pakistan					
Low (under 2 per cent)	9.2	336.2	31.2	4.8	259.9
Medium (2.00–7.99 per cent)	9.2	316.9	29.4	5.0	209.5
High (8 per cent or more)	10.2	298.6	29.4	5.4	197.7
Live births (total number and per cent distribution by birthweight)					
England and Wales	**1,921,255**	**0.9**	**5.9**	**93.1**	**0.1**
Proportion of fathers in Social Class IV and V					
Low (under 17 per cent)	531,164	0.8	5.6	93.5	0.1
Medium (17.00–25.99 per cent)	898,306	0.9	5.7	93.3	0.1
High (26 per cent or more)	491,785	0.9	6.4	92.6	0.1
Proportion of mothers aged under 20					
Low (under 7 per cent)	606,406	0.8	5.4	93.6	0.2
Medium (7.00–9.99 per cent)	694,943	0.8	5.6	93.4	0.1
High (10 per cent or more)	619,906	1.0	6.5	92.4	0.1
Proportion of mothers born in New Commonwealth and Pakistan					
Low (under 2 per cent)	503,240	0.8	5.6	93.5	0.1
Medium (2.00–7.99 per cent)	858,806	0.8	5.5	93.6	0.1
High (8 per cent or more)	559,209	1.0	6.7	92.2	0.1

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6 The influence of socio-economic and environmental factors on geographic variation in mortality

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6.1 Introduction

Chapters 3, 4 and 5 summarised recent geographic variation in mortality in England and Wales, and provided some specific examples by cause of death. Reference was made to various factors (including age and sex) that can influence the risk of mortality. Geographic variation was considered through the use of adminstrative areas such as local and district health authorities.

This chapter examines mortality in different areas of England and Wales in terms of the socio-economic characteristics of the areas concerned and the people living in them. Some findings of recent research into the effects of environmental factors are also given as a means of illustrating how such information can be incorporated into existing data-sets on mortality. Housing tenure, social class, proximity of residence to the coast, altitude and water hardness are some of the variables considered. An attempt is made to assess the extent to which the socio-economic status of each area and selected characteristics of individuals help to explain geographic mortality differentials. This is achieved in part by fitting regression models to the data to describe numbers of observed deaths in terms of expected deaths alone (the 'null' model) or in combination with selected socio-economic variables.

Some variables, such as social class, are surrogates for aspects of behaviour and differences in environment associated with different households. It is unlikely that any of these are direct causes of observed geographic variation in mortality. There are, also, interrelationships between the different factors, for example, between social class and housing tenure. Many other social and environmental factors with a geographic dimension could be examined — for example, water quality, atmospheric pollution and climate,[1,2] and at the personal level — dietary patterns, alcohol intake, smoking, and body build.[3–6] It is hoped that the detailed data available on microfiche and from other sources, for example, Longitudinal Study, will facilitate analysis of the interrelationships between the many social and environmental factors and specific causes of death. The following sections in this chapter give some examples.

Two approaches have been adopted for the analysis. **First,** local authority districts have been grouped according to their value for specific variables. These are a selection of 1981 Census variables[7] and other environmental variables. Thus for social class, the percentage of households where the head of household is in Social Class I or II has been used to separate the districts into five subgroups within each region and Wales. Standardised mortality ratios (SMRs — see Chapter 2 for derivation) have been calculated for the aggregated districts within each of these subgroups. A similar technique has been used for the other selected variables, though for some of them there is only a dichotomy of the material (for example, districts that were classified as either coastal or inland).

Second, linked data from the OPCS Longitudinal Study (LS) have been used to examine the relationship between mortality and socio-economic and environmental variables. The background to the LS is given in Chapter 2, and the methods used to analyse mortality differentials have been described in detail in published reports.[8,9,10] In short, deaths and person-years at risk of the sample population between the Censuses are split by sex, age at death (5-year age-groups), and then further subdivided by characteristics recorded in the 1971 Census. Deaths in a subgroup are then compared with the number expected, obtained by multiplying the person-years-at-risk by age-specific death rates for a standard group, usually the total LS population of the same sex. In this way death rates have been analysed prospectively according to 1971 Census variables.

6.2 Mortality in local authority districts with different socio-economic and environmental characteristics, 1979–83

6.2.1 Social class

One simple method of classifying areas in a socio-economic dimension is to group them according to the proportion of heads of households in Social Classes I and II at the time of the 1981 Census. This is done in Table 6.1. As can be seen for England and Wales as a whole, local authority districts with less than 15 per cent of heads of households in Social Classes I and III and had an all cause SMR of 115 for men. This decreased to 90 for high status districts where 30 per cent or more of heads of households were in Social Classes I and II. The pattern for women was similar but less extreme. Figure 6.1 shows the same general pattern for each region and for men and women. Thus for each region there was the expected gradient between districts with different social class profiles. Yet the differences in mortality between regions remain for each category of district. The high SMRs for the high status groups in the North are based on only two districts one of which has a high proportion of the population in institutions and a consistently high mortality.

6.2.2 Housing tenure

One of the questions in the 1981 Census on housing accommodation concerned tenure. Households were classified as either owner occupiers, privately renting or renting from a local authority. Tenure, one of the factors examined in the first report of the LS referred to earlier, showed appreciable variation in age-adjusted mortality. For this new analysis, local authorities within regions (and Wales) have been grouped according to the proportion of households where heads of households were tenants of the local authority.

Table 6.2 and Figure 6.2 present the results for males and females for mortality from all causes. It shows a gradient with raised mortality for regions with a higher proportion of households renting from the local authority. The gradient by tenure is generally maintained; some regions having high mortality in each of the categories and others low mortality. As with social class, the ranking of the regions remains. It does not appear, therefore, that regional differences in mortality are a simple reflection of housing tenure, or that tenure plays much part in 'explaining' regional variation.

Table 6.1 Mortality in 1979–83 for local authorities clustered according to the proportion of private households with the head in Social Class I or II

Standard regions of England and Wales

Area	SMRs for local authorities for which percentage of households with head in Social Class I or II is:					
	All	Under 15 per cent	15–19 per cent	20–24 per cent	25–29 per cent	30 per cent and over
Males						
England and Wales	**100**	**150**	**106**	**99**	**93**	**90**
North	112	116	114	105	94	112
Yorkshire and Humberside	106	110	108	107	94	92
East Midlands	99	106	103	98	94	91
East Anglia	88	–	90	89	87	84
South East	94	112	103	96	93	88
South West	90	–	98	90	88	85
West Midlands	104	116	108	103	99	95
North West	111	122	115	107	106	101
Wales	107	116	109	103	102	98
Females						
England and Wales	**100**	**110**	**104**	**99**	**95**	**95**
North	110	113	110	108	98	123
Yorkshire and Humberside	105	106	105	106	101	97
East Midlands	101	104	104	99	99	94
East Anglia	92	–	92	94	90	94
South East	94	104	97	95	92	92
South West	93	–	97	92	92	89
West Midlands	104	111	105	102	103	99
North West	110	114	114	107	108	105
Wales	105	112	108	99	103	102
Number of local authorities in each cell						
England and Wales	**403**	**38**	**71**	**107**	**80**	**107**
North	29	9	8	8	2	2
Yorkshire and Humberside	26	3	7	8	5	3
East Midlands	40	6	4	14	9	7
East Anglia	20	–	6	4	8	2
South East	131	5	11	28	28	59
South West	47	–	6	18	14	9
West Midlands	36	3	8	7	5	13
North West	37	5	10	11	5	6
Wales	37	7	11	9	4	6

Figure 6.1 Proportion of private households where head of household is in Social Class I or II, 1979–83

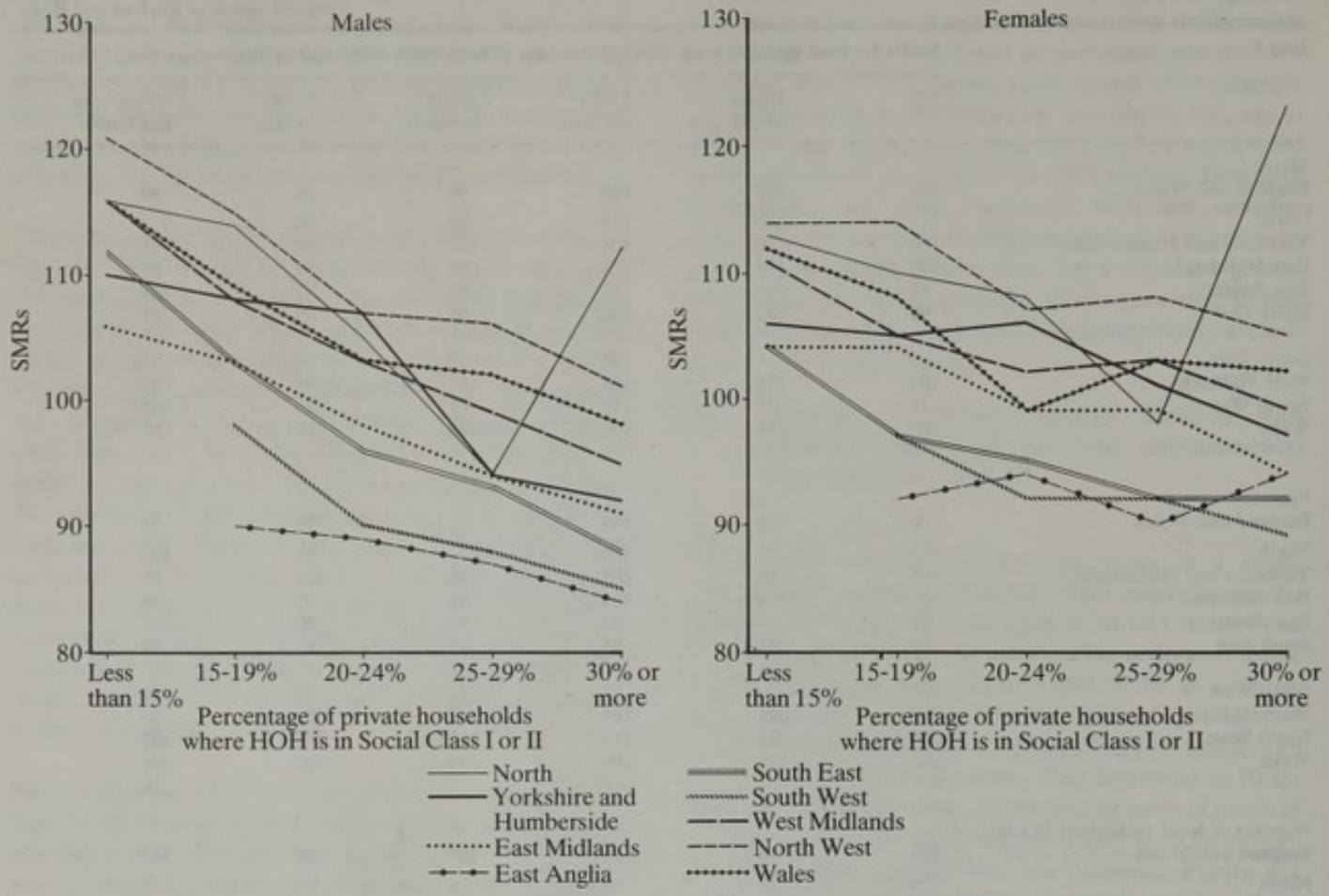


Figure 6.2 Proportion of private households in local authority accommodation, SMRs by standard region, 1979–83

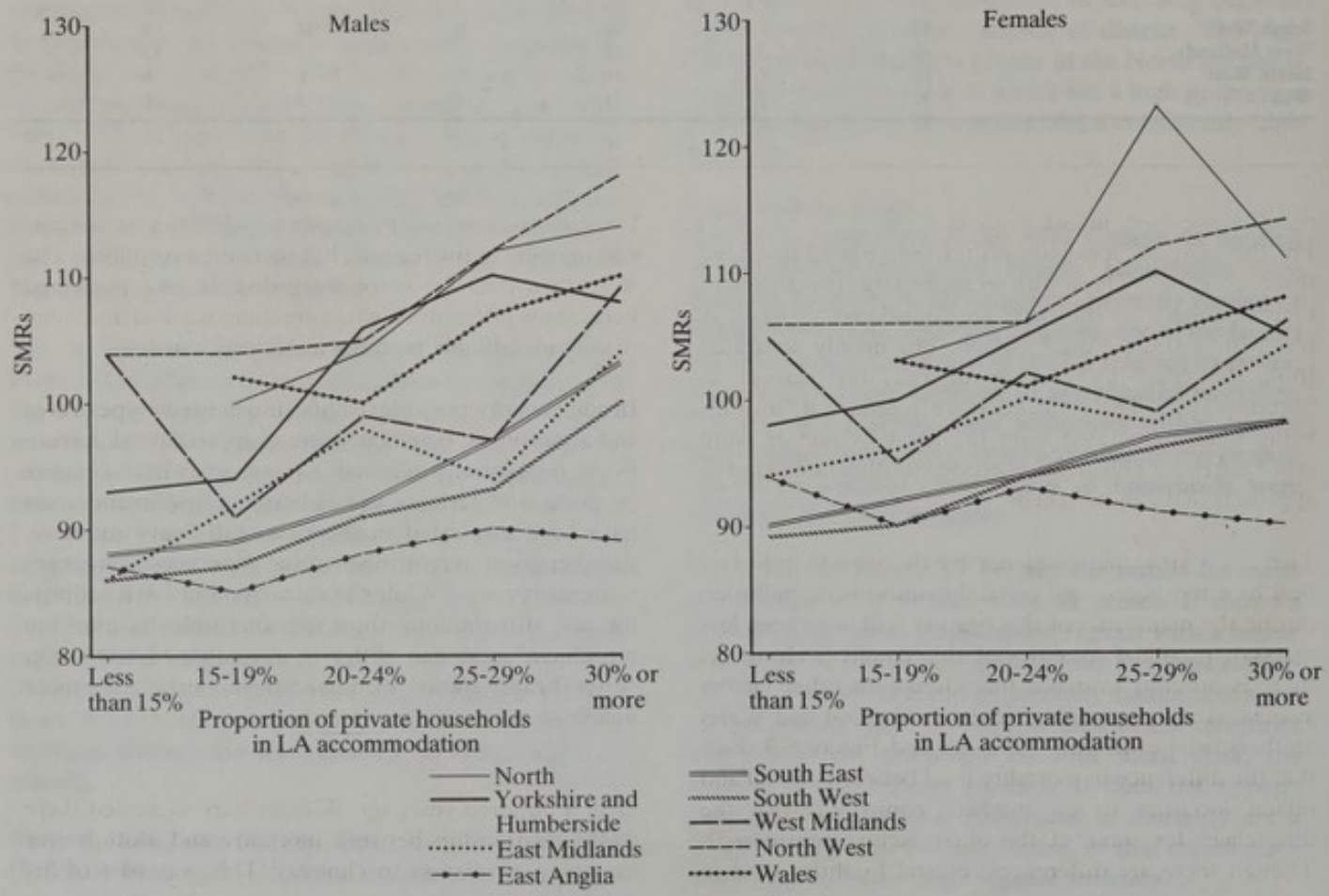


Table 6.2 Mortality in 1979–83 for local authorities clustered according to the proportion of private households living in local authority rented accommodation

Standard regions of England and Wales

Area	SMRs for local authorities for which percentage of households living in local authority rented accommodation is:					
	All	Under 15 per cent	15–19 per cent	20–24 per cent	25–29 per cent	30 per cent and over
Males						
England and Wales	**100**	**91**	**92**	**96**	**101**	**108**
North	112	–	100	104	112	114
Yorkshire and Humberside	106	93	94	106	110	108
East Midlands	99	86	92	98	94	104
East Anglia	88	87	85	88	90	89
South East	94	88	89	92	97	103
South West	90	86	87	91	93	100
West Midlands	104	104	91	99	97	109
North West	111	104	104	105	112	118
Wales	107	–	102	100	107	110
Females						
England and Wales	**100**	**93**	**95**	**98**	**101**	**105**
North	110	–	103	106	123	111
Yorkshire and Humberside	105	98	100	105	110	105
East Midlands	101	94	96	100	98	104
East Anglia	92	94	90	93	91	90
South East	94	90	92	94	97	98
South West	93	89	90	94	96	98
West Midlands	104	105	95	102	99	106
North West	110	106	106	106	112	114
Wales	105	–	103	101	105	108
Number of local authorities in each cell						
England and Wales	**403**	**38**	**72**	**112**	**65**	**116**
North	29	–	3	3	2	21
Yorkshire and Humberside	26	3	5	7	3	8
East Midlands	40	2	7	12	5	14
East Anglia	20	1	3	8	4	4
South East	131	21	26	36	18	30
South West	47	5	14	19	8	1
West Midlands	36	1	3	12	8	12
North West	37	5	6	7	7	12
Wales	37	–	5	8	10	14

6.2.3 Coastal and inland localities

For this analysis, local authorities were placed in one of three categories. Those with an appreciable proportion of their boundary on the coast are considered 'coastal'. A few with a short coastal stretch, but mainly separated from the coast by another district, are classed as 'intermediate'. The remainder are considered 'inland', being totally separated from the coast by one or more other districts. This index is crude but illustrates kind of approach that can be taken.

There is a view that residence by the seaside implies a healthy atmosphere, and certainly atmospheric pollution during the major part of this century will have been less marked in coastal localities of this country. However, there is no clear evidence that climate or other factors associated with coastal residence in England and Wales are beneficial to health. Table 6.3 and Figure 6.3 show that the difference in mortality level between coastal and inland localities is not marked (compared with the differences for some of the other factors considered). Though there are differences; coastal localities tend to have lower mortality in England and Wales as a whole and in many of the regions, but there are exceptions. The equivalent data for **respiratory disease** (not presented here) show differences which are more marked and more readily identifiable both for males and females.

In addition to a possible relationship between type of area and atmospheric pollution, there is appreciable difference in the occupations followed. Coastal areas have a higher proportion of farmers and fishermen, and inland areas have been associated in the past with heavy industry. Another point to remember is that some coastal areas are retirement zones. While the calculation of SMRs adjusts for age distribution, those persons able to move to retirement areas may differ in a number of ways (e.g. better health status, or financial support) from those unable to move.

6.2.4 Altitude

Over a hundred years ago William Farr suggested there was a relationship between mortality and altitude (for example, in relation to cholera)[11]This was part of his

search for natural laws governing mortality. For the present analysis, local authorities have been categorised into four levels of average altitude using a standard Ordnance Survey atlas.[12]

Table 6.3 Mortality in 1979–83 for local authorities clustered according to their proximity to the coast
Standard regions of England and Wales

Area	SMRs for local authorities classified as:			
	All	Coastal	Inter-mediate	Inland
Males				
England and Wales	**100**	**98**	**101**	**100**
North	112	112	110	112
Yorkshire and Humberside	106	103	94	107
East Midlands	99	94	—	99
East Anglia	88	88	92	88
South East	94	92	102	95
South West	90	91	90	90
West Midlands	104	—	—	104
North West	111	109	110	113
Wales	107	105	101	110
Females				
England and Wales	**100**	**98**	**102**	**101**
North	110	98	102	101
Yorkshire and Humberside	105	102	98	106
East Midlands	101	96	—	101
East Anglia	92	91	98	91
South East	94	92	98	95
South West	93	93	93	93
West Midlands	104	—	—	104
North West	110	107	109	112
Wales	105	103	112	109

Table 6.4 shows the all cause SMRs for groups of local authorities at different average altitudes. For both males and females there appears to be a mortality gradient with increasing altitude for the whole of England and Wales. However, this gradient is by no means consistently observed within regions.

6.3 Mortality by socio-economic cluster, 1971–81

In this section data from the LS are used to examine geographic mortality differentials in a less traditional fashion.[13, 14] Areas and characteristics of individual persons are derived from the 1971 Census. Individual characteristics considered are: area of usual residence (see below), housing tenure and social class 15. Types of areas are defined in terms of 1971 Census characteristics, rather than by existing administrative areas. Thirty-six geographic clusters were derived by grouping wards on the basis of 40 census variables. The titles given to these clusters and 'families' are:

FAMILY 1 Areas of young and growing population
1 New towns
2 Planned developments, smaller town
3 Very new council housing
4 Modern, low cost, owner occupier housing
5 Not owner occupied housing in areas of growth
6 Modern high status housing, young families
7 Military bases

Table 6.4 Mortality in 1979–83 for local authorities clustered according to their average altitude above sea level
Standard regions of England and Wales

Area	SMRs for local authorities whose average altitude above sea level (metres) is:				
	All	0–99	100–199	200–399	400 and over
Males					
England and Wales	**100**	**99**	**101**	**102**	**107**
North	112	115	112	102	106
Yorkshire and Humberside	106	106	91	107	109
East Midlands	99	99	97	98	104
East Anglia	88	88	—	—	—
South East	94	95	90	82	—
South West	90	91	91	90	86
West Midlands	104	103	105	94	—
North West	111	111	112	118	—
Wales	107	105	109	98	111
Females					
England and Wales	**100**	**99**	**102**	**103**	**107**
North	110	111	112	104	108
Yorkshire and Humberside	105	104	98	105	111
East Midlands	101	101	99	102	108
East Anglia	92	92	—	—	—
South East	94	94	93	83	—
South West	93	93	94	98	90
West Midlands	104	104	104	93	—
North West	110	109	113	118	—
Wales	105	104	109	98	108

FAMILY 2 Areas of older settlement
8 Edwardian development
9 Older industrial settlements with low stress
10 Market town
11 Inner areas with low guality older housing
12 Poor quality housing in areas of economic decline

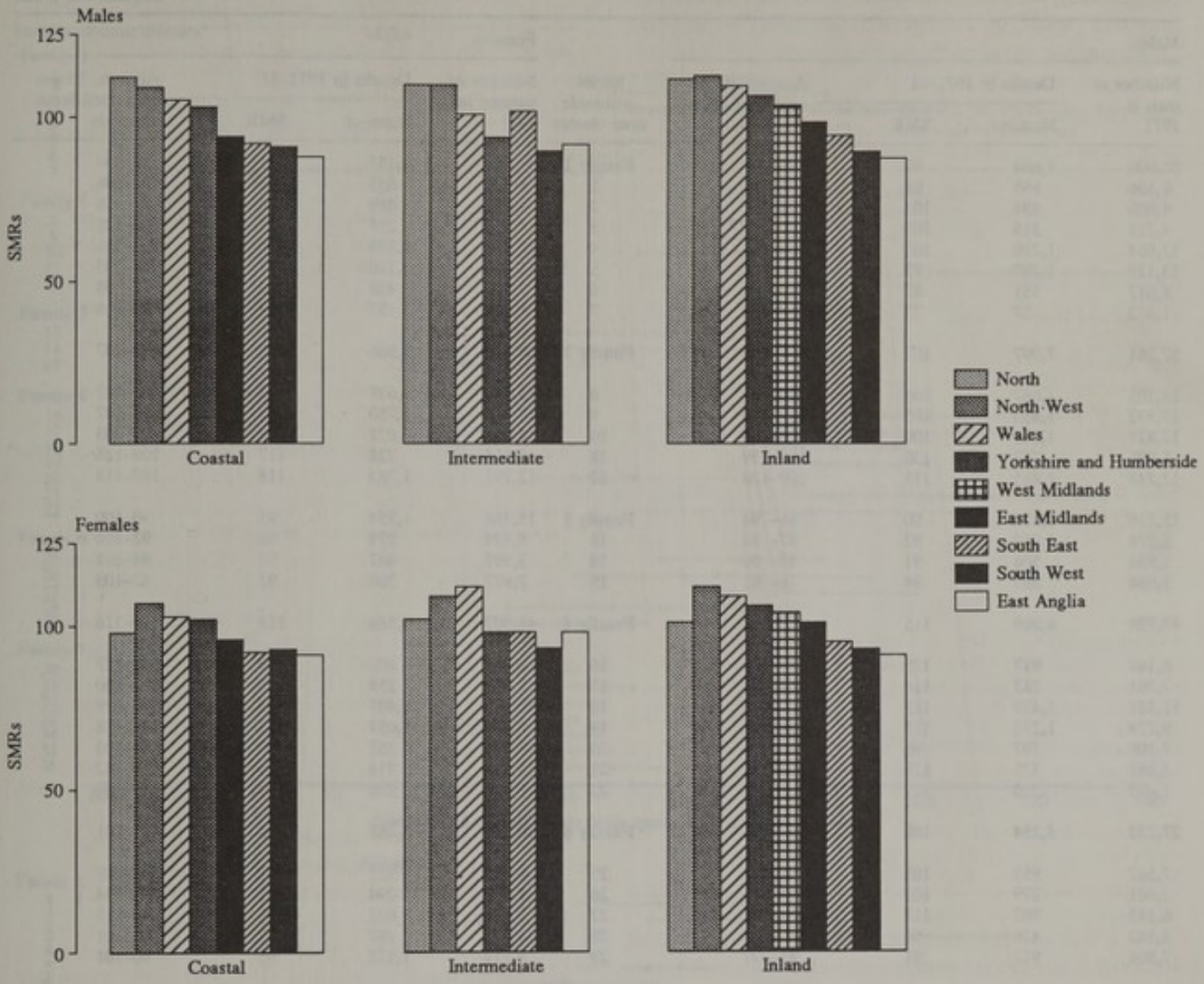
FAMILY 3 Rural areas
13 Villages with some non-agricultural employment
14 Rural areas with large land holdings
15 Rural areas with small land holdings

FAMILY 4 Urban council estates
16 Overspill estates
17 Local authority housing in Scotland and North East
18 Urban local authority estates with good job opportunities
19 Mining areas
20 Inter war local authority housing
21 Inner city council estates
22 Areas of local authority housing with single people

FAMILY 5 Areas in Scotland suffering from acute social disadvantage
23 Clydeside peripheral estates
24 Clydeside inner areas

FAMILY 6 Areas of multi-occupancy students and immigrants
25 Inner London
26 Multi-occupied inner London

Figure 6.3 SMRs by proximity to the coast, 1979-83, standard regions



27 Multi-occupied and immigrant areas
28 Student areas and high status Central London
29 High status rooming-house areas

FAMILY 7 Areas of established high status and resorts

30 Modern high status areas
31 Mock Tudor areas
32 Established high status suburban areas
33 Rural established high status areas
34 Very high status areas
35 Residential retirement
36 Seaside and retirement

Again the reader should recognize the inherent limitations of these titles and refer to the original paper which described the characteristics of people in each cluster.[16] It should also be noted that, because the LS is confined to people's 'usually' resident in England and Wales in 1971, Family 5 (areas in Scotland suffering from acute social disadvantages) has been excluded here.

The numbers of individuals included in each area cluster can be seen in Table 6.5. The final column of this table shows that the confidence interval around cluster SMRs is fairly broad and needs to be considered carefully in any analysis, even though more than 1,000 persons in the LS sample were usually resident in the smallest of the remaining 34 clusters in 1971.

Table 6.5 and Figure 6.4 present relative mortality levels of the 34 area clusters and six families for persons resident' in 1971. These show a clear distinction between high mortality in 'low-status' clusters and low mortality in 'high-status' clusters. With a few exceptions there are significantly higher levels of mortality for males in Family 2-type clusters (Areas of older settlement) and Family 4-type clusters (Urban council estates). Most notable are Clusters 11 (Inner areas with low quality, older housing), 16 (Overspill estates) and 21 (Inner city council estates) with substantially raised mortality levels. Other clusters with significantly high mortality are Clusters 4 (Modern low cost owner-occupier housing) and 27 (Multi-occupied and immigrant areas). On the other hand, clusters in Family 3 (Rural areas) and, with possibly one exception, in Family 7 (Areas of established high status and resorts) have consistently low mortality levels. Clusters 6 (Modern high status housing, young

Table 6.5 Mortality in 1971–81 by socio-economic area cluster of residence in 1971 and sex

England and Wales

Males					Females			
Number of men in 1971	Deaths in 1971–81		Approx. 95 per cent confidence intervals	Socio-economic area cluster	Number of women in 1971	Deaths in 1971–81		Approx. 95 per cent confidence intervals
	Number	SMR				Number	SMR	
52,900	4,684	99	96–102	**Family 1**	53,512	4,153	101	98–104
8,106	698	98	91–106	**1**	8,331	633	98	91–106
4,800	494	103	94–112	**2**	4,947	489	106	97–116
4,721	315	109	97–122	**3**	4,850	258	113	100–128
12,664	1,270	108	102–114	**4**	12,713	1,138	110	103–116
13,119	1,299	97	91–102	**5**	13,456	1,120	97	91–103
8,017	551	87	80– 95	**6**	7,950	458	90	82– 98
1,473	57	72	54– 93	**7**	1,265	57	89	68–116
57,261	7,997	107	105–109	**Family 2**	60,831	7,966	105	103–107
13,105	1,687	104	99–109	**8**	13,944	1,698	102	97–107
13,392	1,853	105	100–110	**9**	14,266	1,750	102	98–107
12,821	1,809	100	96–105	**10**	14,012	2,027	99	95–103
5,695	763	130	121–139	**11**	5,818	728	117	109–126
12,248	1,885	115	109–120	**12**	12,791	1,763	113	107–118
15,216	1,952	90	86– 94	**Family 3**	15,468	1,754	95	90–100
8,278	1,057	92	87– 98	**13**	8,494	979	98	92–104
3,904	506	91	83– 99	**14**	3,997	467	92	84–101
3,034	389	84	76– 92	**15**	2,977	308	92	82–103
40,736	4,969	115	112–118	**Family 4**	41,907	4,586	113	110–116
8,168	917	125	117–134	**16**	8,317	802	119	111–127
2,761	282	114	101–128	**17**	2,682	258	115	101–130
12,337	1,474	113	107–119	**18**	12,945	1,407	113	107–119
9,774	1,274	115	108–121	**19**	9,786	1,057	111	105–118
3,100	397	96	87–106	**20**	3,397	362	93	84–103
2,961	375	123	111–136	**21**	2,937	414	129	117–142
1,635	250	111	97–125	**22**	1,843	286	114	101–128
27,732	3,284	100	97–103	**Family 6**	29,230	3,486	98	95–101
7,537	955	105	98–112	**25**	8,005	951	101	95–108
2,601	279	103	91–116	**26**	2,655	294	102	91–114
6,183	707	112	104–120	**27**	5,854	622	103	95–112
3,545	426	94	85–103	**28**	4,002	497	92	85–101
7,866	917	91	85– 97	**29**	8,714	1,122	95	90–101
55,788	6,968	88	86– 90	**Family 7**	60,789	7,106	90	88– 92
13,364	1,308	86	82– 91	**30**	14,050	1,239	92	87– 97
13,393	1,505	92	87– 96	**31**	14,209	1,440	93	88– 98
10,599	1,239	87	82– 92	**32**	11,501	1,335	90	85– 95
4,620	558	83	77– 91	**33**	4,783	534	88	81– 96
4,551	513	85	78– 93	**34**	4,946	518	87	80– 95
6,510	1,250	89	84– 94	**35**	7,627	1,250	84	80– 89
2,751	595	94	86–102	**36**	3,673	790	97	90–104

Source: OPCS Longitudinal Study

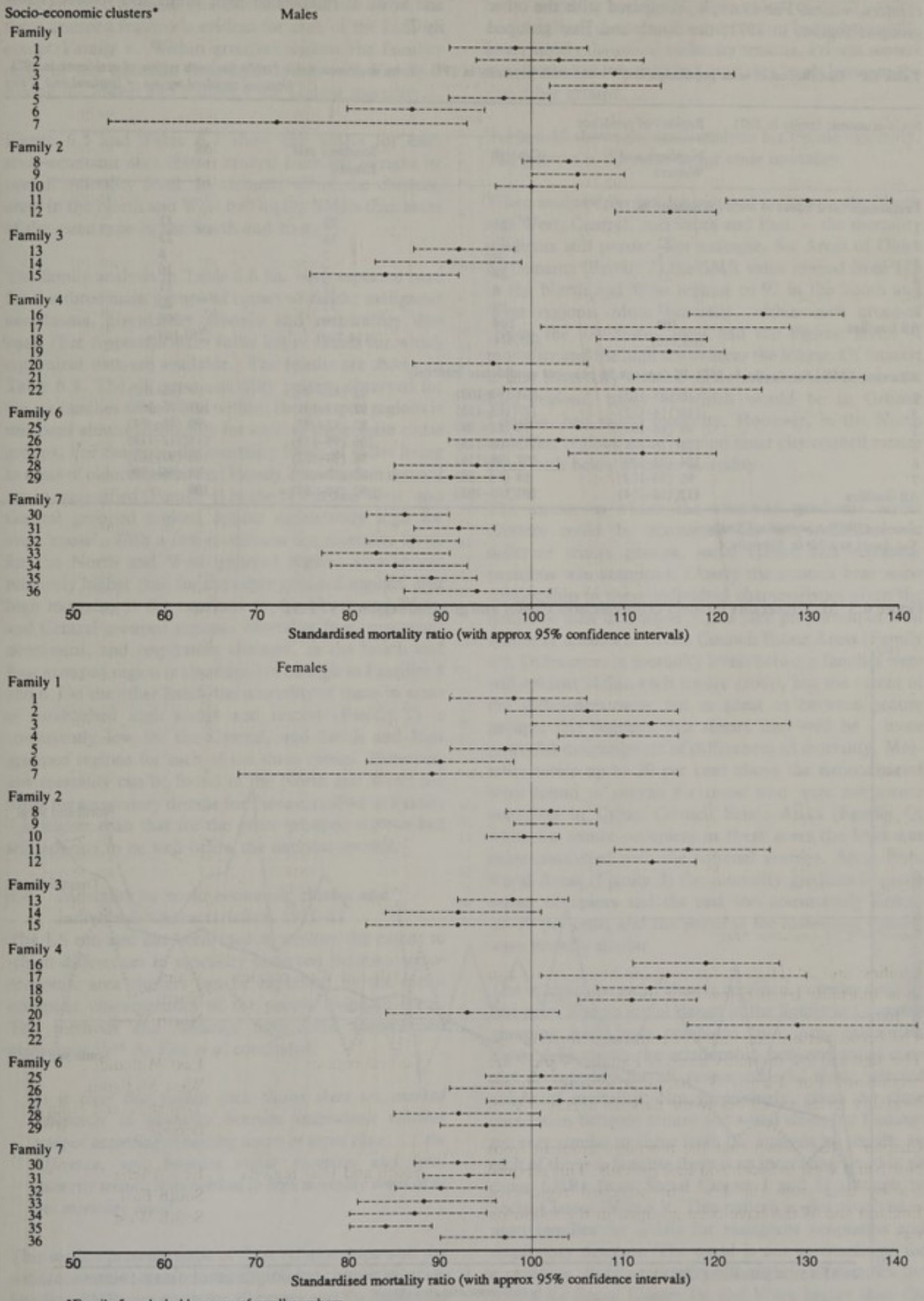
families) and 29 (High status rooming house areas) also show mortality levels below the national average.

The broad pattern for males is confirmed for females. The high and low mortality levels of Families 4 and 7 are prominent. For Family 3 (Rural areas), the cluster mortality levels are all below the national average.

Chapter 3 has shown that the mortality gradient from North and West to South and East prevails. This is borne out by data from the LS. The standard regions of England and Wales have been grouped in the following way:

North and West regions	Wales
	North
	North West
Central regions	East Midlands
	West Midlands
	Yorkshire and Humberside
South and East regions	East Anglia
	South East
	South West

Figure 6.4 Mortality in 1971-81 by socio-economic area cluster of residence in 1971 and sex, England and Wales



*Family 5 excluded because of small numbers

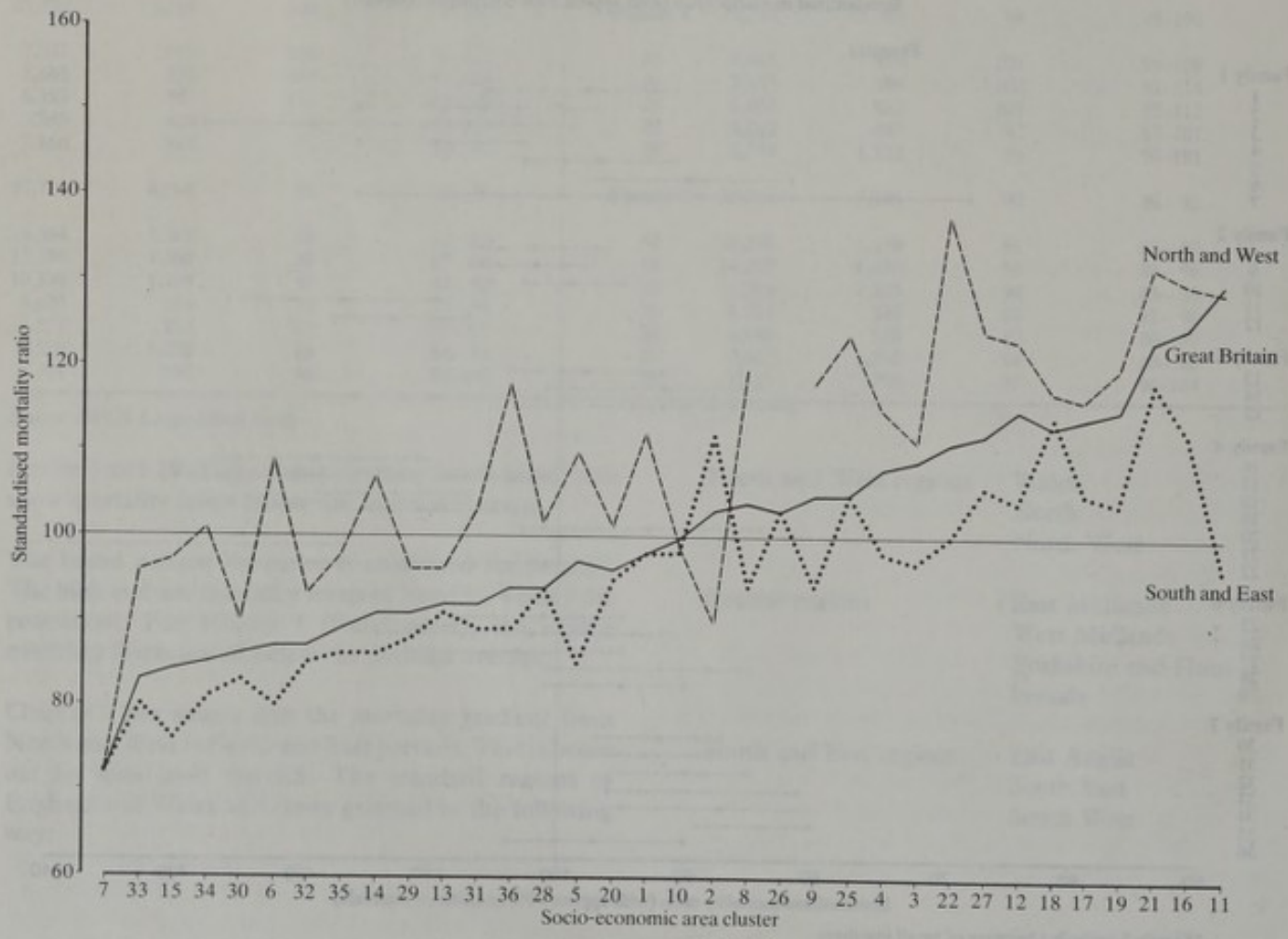
It can be seen from Table 6.6 that the composition of these grouped regions, in terms of the six families of clusters, varies. For example, compared with the other grouped regions in 1971, the South and East grouped region had over twice as many males living in areas of multi-occupancy students and immigrants (Family 6) and areas of established high status and resorts (Family 7).

Table 6.6 Distribution of male population in 1971 and male mortality in 1971–81, by socio-economic family for each region of residence in 1971
Grouped standard regions of England and Wales

Socio-economic family in 1971	Regions of residence			
	Northern and Western	Central	Southern and Eastern	All
Percentage (and base) of male population in 1971				
1	17	24	22	21
2	32	25	16	23
3	5	6	7	6
4	25	24	7	16
6	4	8	17	11
7	17	13	31	22
All families	**100**	**100**	**100**	**100**
	(65,910)	(69,474)	(114,780)	(250,164)
All cause SMRs for deaths in 1971–81 (approx 95 per cent confidence interval)				
1	110(103–117)	104 (99–109)	92 (88– 96)	99 (96–102)
2	118(114–122)	107(103–111)	97 (93–101)	107(105–109)
3	98 (88–108)	90 (82– 98)	87 (82– 92)	90 (86– 94)
4	121(116–126)	113(108–118)	106 (99–113)	115(112–118)
6	104 (92–129)	107 (98–116)	98 (94–102)	100 (97–103)
7	98 (93–103)	88 (83– 88)	85 (82– 88)	88 (86– 90)
All families	**112(110–114)**	**103(101–105)**	**92 (90– 94)**	**100**

Source: OPCS Longitudinal Study
See Annex to table in Appendix 4.

Figure 6.5 Male mortality by socio-economic area cluster and grouped region, 1971-81



Source: Population Trends 40, summer 1985[14]

Table 6.6 also shows mortality for males over the 1971–81 period for each of the family clusters within the three grouped regions. The mortality gradient across the three grouped regions is evident for each of the families except Family 6. Within grouped regions the families more or less maintain their rank order, with Family 7 having the lowest and Family 4 the highest mortality.

Figure 6.5 and Table 6.7 show the SMRs for each socio-economic area cluster ranked from left to right by overall mortality level. In virtually all of the clusters, areas in the North and West had higher SMRs than areas of the same type in the South and East.

The family analysis in Table 6.6 has been repeated here for the three main groups of causes of death: **malignant neoplasms, circulatory disease** and **respiratory disease.** (See Appendix 4 for fuller list of causes for which equivalent data are available.) The results are shown in Table 6.8. The all cause mortality pattern observed for the six families across, and within, the grouped regions is mirrored almost identically for each of these main cause groups. For example, the mortality levels of males living in areas of older settlements (Family 2) and urban council estate areas sified (Family 4) in the North and West, and Central grouped regions appear consistently high for each 'cause'. With a few exceptions the mortality levels for the North and West grouped regions also appear relatively higher than for the other grouped regions. But high mortality is not confined to the North and West, and Central grouped regions. Mortality from malignant neoplasms, and respiratory diseases, in the South and East grouped region is also found to be high in Families 4 and 6. On the other hand, the mortality of those in areas of established high status and resorts (Family 7) is consistently low for the Central, and South and East grouped regions for each of the three causes. However, low mortality can be found in the North and West; the SMR for respiratory disease for those classified to Family 7 is higher than that for the other grouped regions but still appears to be well below the national average.

6.4 Mortality by socio-economic cluster and individuals characteristics, 1971–81

The LS can and has been used to explore the extent to which differences in mortality observed between socio-economic area clusters can be explained by the socio-economic characteristics of the people living in them. The methods and findings have been summarised previously.[13,14] As Fox *et al* concluded:

> '*It is clear that within each cluster there are marked differences in mortality between individuals whether grouped according to housing tenure or social class . . . the difference, say, between owner occupiers and local authority tenants is as marked in high mortality areas as in low mortality areas*'.

This section presents some of these relationships with the socio-economic area clusters grouped into their six families. SMRs are given for all causes and for malignant neoplasms, circulatory and respiratory diseases.

Table 6.9 shows the relationships between tenure and socio-economic family of residence. As can be seen for all cause mortality and the separate causes of death, within each family of clusters, owner occupiers had substantially lower SMRs than local authority tenants. Private renters usually, but not always, had mortality levels between the two other groups.

Table 6.10 shows the same analysis for female mortality. The pattern is the same as for male mortality.

When analysed further by grouped regions — the North and West, Central, and South and East — the mortality gradients still persist. For example, for Areas of Older Settlements (Family 2) the SMR value ranged from 118 in the North and West regions to 97 in the South and West regions. More generally, within each grouped region the low status areas had the highest levels of mortality and the high status areas the lowest. Of interest is that inner city council estate areas in the South and East regions, many of which would be in Greater London, had raised mortality. However, in the North and West regions there were no inner city council estates areas with below average mortality.

The extent to which the observed gradients across clusters could be accounted for by individuals in different tenure groups, social classes and economic positions was examined. Clearly the clusters bear some relationship to these individual characteristics given the nature of their derivation (e.g. a high proportion of local authority tenants in Urban Council Estate Areas (Family 4)). Differences in mortality levels between families were still evident within each tenure group, but the extent of the differences were not as great as between tenure groups; this suggests that tenure may well be a more powerful discriminator of differences in mortality. Mortality levels up to 20 per cent above the national level were found to prevail for those who were not owner occupiers in Urban Council Estate Areas (Family 4); while for owner occupiers in these areas the level was more consistent with the national average. Apart from Rural Areas (Family 3) the mortality gradient between owner occupiers and the rest was consistently around 20–30 per cent; and the patterns for males and females were broadly similar.

The analysis by social class is confined to males aged 15 and over. The six social classes in the Registrar General's grouping have been combined into three categories. Table 6.11 shows the relationship between social class and area family for all causes and the three selected causes of mortality. Not surprisingly, given the close correlation between tenure and social class, the findings are very similar to those from the analysis by tenure. In each of the area families there is an increasing trend in all cause SMRs from Social Classes I and II through to Social Classes IV and V. This pattern is also observed in most families for SMRs for malignant neoplasms and respiratory diseases. The trend is not so consistent for circulatory disease mortality although in all families the SMRs for Social Classes IV and V are higher than the SMRs for Social Classes I and II.

Table 6.7 SMRs for socio-economic ward clusters with grouped regions in 1971–81 (males)

Grouped standard regions of England and Wales SMR (approx 95 per cent confidence interval)

Socio-economic ward cluster of residence in 1971	Regions of residence			
	Northern and Western	Central	Southern and Eastern	All
Percentage (and base) of male population in 1971				
Family 1	110(103–117)	104 (99–109)	92 (88– 96)	99 (96–102)
1	112 (92–135)	90 (74–108)	98 (89–107)	98 (91–106)
2	90 (71–113)	87 (70–107)	112(100–124)	103 (94–112)
3	111 (89–137)	131(106–160)	97 (81–115)	109 (97–122)
4	115(104–127)	108(100–117)	98 (87–111)	108(102–114)
5	110 (97–124)	108 (98–118)	85 (78– 92)	97 (91–102)
6	109 (90–131)	89 (75–105)	80 (71– 90)	87 (80– 95)
7	72 (26–157)	70 (34–129)	72 (52– 98)	72 (54– 93)
Family 2	118(114–122)	107(103–111)	97 (93–101)	107(105–109)
8	120(110–131)	105 (96–115)	94 (87–101)	104 (99–109)
9	118(110–127)	100 (93–107)	94 (84–104)	105(100–110)
10	99 (91–109)	108 (97–120)	98 (92–104)	100 (96–105)
11	129(119–141)	136(118–156)	96 (63–141)	130(121–139
12	123(116–132)	109(101–118)	104 (94–115)	115(109–120)
Family 3	98 (88–108)	90 (82– 98)	87 (82– 92)	90 (86– 94)
13	96 (83–111)	93 (82–106)	91 (84– 98)	92 (87– 98)
14	107 (82–137)	94 (80–110)	86 (77– 97)	91 (83– 99)
15	97 (83–113)	74 (59– 92)	76 (64– 90)	84 (76– 92)
Family 4	121(116–126)	113(108–118)	106 (99–113)	115(112–118)
16	130(119–143)	125(111–141)	112 (96–131)	125(117–134)
17	116 (99–135)	115 (91–143)	105 (76–141)	114(101–128)
18	117(107–129)	111(104–119)	114 (97–132)	113(107–119)
19	120(110–130)	111(102–120)	104 (77–137)	115(108–121)
20	101 (85–121)	90 (66–119)	95 (83–108)	96 (87–106)
21	132(112–154)	114 (86–148)	118(100–138)	123(111–136)
22	138(104–179)	119 (89–157)	100 (85–118)	111 (97–125)
Family 6	104 (92–116)	107 (98–116)	98 (94–102)	100 (97–103)
25	124 (79–187)	93 (58–140)	105 (98–112)	105 (98–112)
26	— —	119 (3–663)	103 (91–116)	103 (91–116)
27	124 (98–154)	113(102–125)	106 (92–121)	112(104–120)
28	102 (66–149)	84 (42–150)	94 (85–104)	94 (85–103)
29	96 (83–111)	96 (81–112)	88 (81– 95)	91 (85– 97)
Family 7	98 (93–103)	88 (83– 93)	85 (82– 88)	88 (86– 90)
30	90 (80–101)	93 (83–105)	83 (77– 89)	86 (82– 91)
31	103 (92–115)	89 (79– 99)	89 (84– 96)	92 (87– 96)
32	93 (82–105)	86 (73–100)	85 (79– 91)	87 (82– 92)
33	96 (77–118)	85 (70–103)	80 (72– 89)	83 (77– 91)
34	101 (85–120)	78 (61– 99)	81 (72– 90)	85 (78– 93)
35	98 (87–111)	83 (63–108)	86 (81– 92)	89 (84– 94)
36	118 (98–141)	88 (55–133)	89 (81– 98)	94 (86–102)

Table 6.8 Male population in 1971–81 by socio-economic area family of residence in 1971 by selected causes

Grouped standard regions of England and Wales SMR (approx 95 per cent confidence interval)

Socio-economic area family of residence in 1971	Regions of residence			
	Northern and Western	Central	Southern and Eastern	All
Malignant neoplasms (ICD 8th Revision 140–209)				
1	111 (97–125)	95 (85–105)	93 (85–101)	97 (91–103)
2	109(101–117)	104 (95–113)	98 (90–106)	104 (99–109)
3	89 (70–108)	92 (75–109)	83 (72– 94)	86 (78– 94)
4	126(115–137)	112(102–122)	119(104–134)	119(112–126)
6	122 (96–148)	91 (75–107)	108 (99–117)	106 (99–113)
7	94 (83–105)	85 (74– 96)	88 (83– 93)	88 (84– 92)
All families	**110(105–115)**	**100 (95–105)**	**93 (90– 96)**	**100**
Circulatory diseases (ICD 8th Revision 390–458)				
1	111(101–121)	105 (97–113)	93 (87– 99)	100 (96–104)
2	122(116–128)	106(100–112)	92 (87– 97)	108(105–111)
3	106 (92–120)	88 (77– 99)	91 (83– 99)	93 (87– 99)
4	116(109–123)	110(103–117)	96 (87–105)	109(105–113)
6	99 (83–115)	110 (98–122)	90 (85– 95)	94 (89– 99)
7	103 (96–110)	92 (84–100)	88 (84– 92)	92 (89– 95)
All families	**113(110–116)**	**104(101–107)**	**91 (89– 93)**	**100**
Respiratory diseases (ICD 8th Revision 460–519)				
1	109 (91–127)	115(100–130)	93 (82–104)	103 (95–111)
2	123(112–134)	115(103–127)	96 (86–106)	112(106–118)
3	93 (69–117)	85 (65–105)	74 (62– 86)	80 (70– 90)
4	138(123–153)	125(111–139)	127(107–147)	130(121–139)
6	96 (67–125)	119 (95–143)	105 (94–116)	107 (98–116)
7	87 (75– 99)	80 (67– 93)	72 (66– 78)	76 (71– 81)
All families	**114(108–120)**	**110(104–116)**	**88 (84– 92)**	**100**

Source: OPCS Longitudinal Study
See Annex to table in Appendix 4.

Table 6.9 Male mortality 1971–81 by socio-economic area family of residence and tenure in 1971 for all causes, malignant neoplasms, circulatory diseases and respiratory diseases

England and Wales SMR (approx 95 per cent confidence interval)

Socio-economic area family of residence in 1971	Tenure in 1971			
	Owner occupier	Private renter	Local authority tenant	All tenures*
All causes				
1	87(83– 91)	100 (92–108)	113(108–118)	99 (96–102)
2	95(92– 98)	118(113–123)	118(113–123)	107(105–109)
3	85(80– 90)	95 (86–104)	94 (84–104)	90 (86– 94)
4	100(94–106)	119(110–128)	117(113–121)	115(112–118)
6	87(82– 92)	100 (94–106)	113(104–122)	100 (97–103)
7	81(79– 83)	97 (91–103)	102 (95–109)	88 (86– 90)
All families	**88(87– 89)**	**106(103–109)**	**113(111–115)**	**100**
Malignant neoplasms (ICD 8th Revision 140–209)				
1	85 (77– 93)	107 (90–124)	113(102–124)	97 (91–103)
2	89 (83– 95)	117(106–128)	122(111–133)	104 (99–109)
3	80 (69– 91)	85 (68–102)	99 (78–120)	86 (78– 94)
4	89 (78–100)	128(108–148)	128(119–137)	119(112–126)
6	85 (75– 95)	106 (94–118)	139(120–158)	106 (99–113)
7	83 (78– 88)	98 (86–110)	105 (91–119)	88 (84– 92)
All families	**85 (82– 88)**	**108(102–114)**	**121(116–126)**	**100**
Circulatory diseases (ICD 8th Revision 390–458)				
1	93 (87– 99)	94 (83–105)	110(102–118)	100 (96–104)
2	100 (96–104)	115(107–123)	113(106–120)	108(105–111)
3	92 (84–100)	104 (91–117)	85 (72– 98)	93 (87– 99)
4	106 (97–115)	104 (92–116)	110(104–116)	109(105–113)
6	91 (84– 98)	93 (85–101)	94 (83–105)	94 (89– 99)
7	85 (82– 88)	99 (91–107)	103 (93–113)	92 (89– 95)
All families	**93 (91– 95)**	**103 (99–107)**	**107(104–110)**	**100**
Respiratory diseases (ICD 8th Revision 460–519)				
1	75 (66– 84)	109 (88–130)	132(116–148)	103 (95–111)
2	87 (80– 94)	129(115–143)	133(118–148)	112(106–118)
3	78 (65– 91)	69 (50– 88)	88 (64–112)	80 (70– 90)
4	106 (90–122)	137(111–163)	135(123–147)	130(121–139)
6	81 (68– 94)	114 (98–130)	114 (92–136)	107 (98–116)
7	65 (60– 70)	81 (68– 94)	106 (88–124)	76 (71– 81)
All families	**77 (73– 81)**	**108(101–115)**	**126(119–133)**	**100**

Source: OPCS Longitudinal Study.
** Includes those in non-private households and 'not stated' tenures.*
See Annex to table in Appendix 4.

Table 6.10 Female mortality 1971–81 by socio-economic area family of residence and tenure in 1971 for all causes, malignant neoplasms, circulatory diseases and respiratory diseases

England and Wales SMR (approx 95 per cent confidence interval)

Socio-economic area family of residence in 1971	Tenure in 1971			
	Owner occupier	Private renter	Local authority tenant	All tenures*
All causes				
1	86 (82– 90)	108 (99–117)	108(102–114)	101 (98–104)
2	95 (92– 98)	108(103–113)	105(100–110)	105(103–107)
3	91 (85– 97)	97 (88–106)	98 (87–109)	95 (90–101)
4	101 (95–107)	111(102–120)	111(107–115)	113(110–116)
6	87 (82– 92)	95 (90–100)	106 (98–114)	98 (95–101)
7	82 (79– 85)	91 (86– 96)	97 (90–104)	90 (88– 92)
All families	**88 (86– 90)**	**101 (98–104)**	**106(104–108)**	**100**
Malignant neoplasms (ICD 8th Revision 140–209)				
1	96 (87–105)	91 (73–109)	107 (95–119)	100 (93–107)
2	95 (88–102)	103 (92–114)	106 (95–117)	101 (96–106)
3	102 (88–116)	102 (81–123)	98 (75–121)	102 (92–112)
4	95 (82–108)	106 (86–126)	107 (98–116)	105 (98–112)
6	89 (78–100)	105 (92–118)	121(102–140)	103 (95–111)
7	93 (87– 99)	99 (86–112)	93 (79–107)	95 (90–100)
All families	**94 (90– 98)**	**102 (96–108)**	**106(101–111)**	**100**
Circulatory diseases (ICD 8th Revision 390–458)				
1	86 (80– 92)	111 (98–124)	113(105–121)	103 (99–107)
2	97 (93–101)	111(104–118)	102 (95–109)	106(103–109)
3	88 (80– 95)	99 (86–112)	128(109–147)	94 (88–100)
4	108 (99–117)	107 (95–119)	114(108–120)	115(110–120)
6	83 (76– 90)	86 (79– 93)	89 (79– 99)	90 (86– 94)
7	82 (79– 85)	92 (85– 99)	98 (89–107)	91 (88– 94)
All families	**89 (87– 91)**	**100 (96–104)**	**107(104–110)**	**100**
Respiratory diseases (ICD 8th Revision 460–519)				
1	77 (66– 88)	105 (80–130)	103 (88–118)	103 (94–112)
2	84 (76– 92)	99 (86–112)	110 (96–124)	100 (94–106)
3	86 (70–102)	90 (66–114)	97 (68–126)	90 (78–102)
4	87 (71–103)	119 (93–145)	131(116–146)	124(114–134)
6	87 (73–101)	112 (97–127)	145(119–171)	114(104–124)
7	71 (65– 77)	80 (67– 93)	92 (74–110)	83 (77– 89)
All families	**79 (75– 83)**	**107(100–114)**	**115(108–122)**	**100**

Source: OPCS Longitudinal Study.

** Includes those in non-private households and 'not stated' tenures.*

See Annex to table in Appendix 4.

Table 6.11 Male mortality 1971–81 by socio-economic family and social class in 1971 for all causes, malignant neoplasms, circulatory diseases and respiratory diseases

England and Wales SMR (approx 95 per cent confidence interval)

Socio-economic area family of residence in 1971	Social class in 1971			
	I and II	IIIN and IIIM	IV and V	All males aged 15 and over*
All causes				
1	83 (77– 89)	95 (91– 99)	104 (98–110)	96 (93– 99)
2	90 (84– 96)	102 (98–106)	110(106–114)	103(101–105)
3	81 (74– 88)	86 (78– 94)	94 (86–102)	87 (83– 91)
4	91 (81–101)	110(105–115)	117(111–123)	110(107–113)
6	81 (74– 88)	97 (92–102)	106 (99–113)	96 (93–100)
7	75 (72– 78)	87 (84– 90)	93 (88– 98)	84 (82– 86)
All families	**81 (79– 83)**	**98 (96–100)**	**106(104–108)**	**96 (95– 97)**
Malignant neoplasms (ICD 8th Revision 140–209)				
1	85 (72– 98)	99 (90–108)	101 (90–112)	97 (91–103)
2	92 (80–104)	100 (93–107)	112(103–121)	103 (98–108)
3	76 (62– 90)	79 (64– 94)	96 (80–112)	84 (75– 93)
4	70 (53– 87)	116(106–126)	132(120–144)	117(110–124)
6	97 (81–113)	99 (88–110)	106 (92–120)	101 (93–109)
7	76 (69– 83)	85 (78– 92)	106 (95–117)	86 (81– 91)
All families	**82 (77– 87)**	**98 (94–102)**	**111(106–116)**	**98 (95–101)**
Circulatory diseases (ICD 8th Revision 390–458)				
1	88 (79– 97)	98 (92–104)	106 (98–114)	98 (94–102)
2	96 (88–104)	106(101–111)	106(100–112)	105(101–109)
3	88 (78– 98)	96 (84–108)	91 (81–101)	91 (85– 97)
4	98 (84–112)	109(102–116)	103 (96–110)	105(100–110)
6	79 (69– 89)	96 (88–104)	97 (88–106)	92 (87– 97)
7	81 (76– 86)	94 (89– 99)	89 (82– 96)	88 (85– 91)
All families	**86 (83– 89)**	**101 (98–104)**	**100 (97–103)**	**97 (95– 99)**
Respiratory diseases (ICD 8th Revision 460–519)				
1	71 (55– 87)	92 (80–104)	109 (94–124)	94 (86–102)
2	64 (52– 76)	101 (92–110)	122(110–134)	102 (96–108)
3	66 (51– 81)	64 (46– 82)	91 (72–110)	74 (64– 84)
4	82 (57–107)	113(100–126)	140(124–156)	120(111–129)
6	54 (39– 69)	105 (90–120)	121(102–140)	99 (89–109)
7	52 (45– 59)	78 (70– 86)	83 (71– 95)	70 (65– 75)
All families	**60 (55– 65)**	**94 (89– 99)**	**113(107–119)**	**92 (89– 95)**

Source: OPCS Longitudinal Study.
** Economically active or retired males, but excluding those in Armed Forces and with inadequately described occupations.*
See Annex to table in Appendix 4.

(See Appendix 4 for a detailed list of the causes for which equivalent results are available).

6.5 Mortality and environment, 1971–81

By comparison with socio-economic analyses, interest in the relationship between water quality and mortality (in particular, that between water hardness and cardiovascular mortality) is relatively recent.[17,18] Most studies looking into this relationship have found varying negative associations between water hardness and cardiovascular mortality. Not surprisingly, convincing evidence that the association is causal is lacking; and several other factors, including socio-economic and climatic, confound the association.

Shaper *et al* in their Regional Heart Study (RHS) examined regional variations in cardiovascular mortality (and morbidity) in Great Britain and assessed the role of environmental, socio-economic and personal risk factors, with some emphasis on the possible effects of water quality.[19] Phase I of the study related mortality in men and women aged 35–74 in the period 1969–73 in 253 towns in Britain to environmental and socio-economic data. After considering a wide range of socio-economic indicators derived from the 1971 Census and water quality variables for the period 1969–73, together with more limited measures of climate, air pollution and blood group distribution, it was concluded that five variables were of importance; water hardness, rainfall, maximum temperature, percentage of manual workers, and level of car ownership. These variables jointly explained over 75 per cent of the variance in cardiovascular mortality.

Phases II and III of the study are now exploring risk factors at the individual level rather than through noting correlations between the chacteristics of areas and their mortality levels. Prospective methods of the LS are supplementing the cross-sectional approach of Phase I, and are helping to avoid the pitfalls of the ecological fallacy — that is, interpreting correlations between the

characteristics of areas and their mortality levels as evidence that these same characteristics form risk factors for individuals.

This section summarises the results of adding environmental data from the RHS to the LS, analysing mortality in the period 1971–81 by both census and environmental variables.[20] The environmental variables considered are water hardness (calcium carbonate levels) and water nitrates and relate to the time around the 1971 Census. Thus each relevant individual in the LS sample has been assigned the values of the environmental variables for the area in which he/she was resident in 1971. Water hardness data, for example, describe average hardness in the areas in which LS members are resident, but not necessarily of the water supply of individuals' households.

6.5.1 Water hardness

A first attempt to add environmental data to the LS in this way involved a study of mortality in the period 1971–75 for those resident in selected county boroughs where water data had been measured in 1961.[21,22] The main findings of this preliminary study were:

(i) water hardness correlates strongly with grouped region (North and West; Central; South and East), soft water predominating in the North and West and hard water in the South and East;

(ii) for all **circulatory diseases,** and for the sub-set **ischaemic heart disease,** there is some suggestion of increasing mortality rates from South East to North West, within most water hardness categories, for both males and females, although sampling variation makes the picture less than clear; and

(iii) *within regions* there is no consistent gradient with water hardness, although sampling variation obscures what maybe a rise, or at least no further fall, in the hardest water category;

(iv) except in the case of male ischaemic heart disease mortality, region alone accounts for a substantial proportion of the variation in mortality rates. Water hardness explains only a little more of the variation when added to region. For male ischaemic heart disease, the role of the two factors is reversed.

This analysis has been updated for mortality during 1971–81, incorporating more recent information on water hardness.

Data on water hardness in the period 1969–73 was collected for the RHS for more than 200 (pre-1974 classification) urban areas in England and Wales, mostly with populations of 50,000 or more. These data, as well as some socio-economic and climatic characteristics of the area, were added to the basic LS data record. Fifty-eight per cent of male LS sample members and 59 per cent of the females were resident in RHS areas of known water hardness.

As expected, the pattern of mortality between 1971 and 1981 according to grouped region and water hardness in 1969–73 is not greatly different from that for 1971–75 based on 1961 water hardness data. Table 6.12 shows that there is a strong relationship between grouped region of residence and total hardness of water supply as measured in the individuals' much smaller areas of residence. For example, 85 per cent of male LS sample members living in areas of hardness of 250 parts per million (ppm) or more lived in the South and East grouped region, while 53 per cent of those in areas of hardness of less than 90 ppm lived in the North and West. The distribution for females is very similar.

Table 6.12 Percentage distribution of population resident in Regional Heart Study areas by grouped region and hardness of water, 1969–73

England and Wales

Total hardness of water (parts per million*)	Grouped regions			All regions
	South and East	Central	North and West	
Males	%	%	%	%
Under 90	6	41	53	100
90–169	18	33	49	100
170–249	57	39	4	100
250 and over	85	13	2	100
All areas of known hardness	**47**	**29**	**25**	**100**
Females				
Under 90	7	40	53	100
90–169	19	32	49	100
170–249	59	37	4	100
250 and over	86	13	2	100
All areas of known hardness	**48**	**28**	**24**	**100**

Source: OPCS Longitudinal Study.
**Calcium carbonate equivalent.*

Tables 6.13 and 6.14 show mortality from **cardiovascular diseases** and **ischaemic heart disease** respectively, for males, by grouped region and water hardness. Table 6.15 and 6.16 give the corresponding results for females. These are the disease groupings for which there is the strongest existing evidence of an association with water hardness. The definitions of disease classes used in the analyses presented here are those used in the RHS, and differ slightly from the conventional categories. (A full list of disease categories for which results are available is given in Appendix 4). It should be noted that the RHS areas have an overall level of mortality similar to that for all England and Wales.

In each of the four tables the figures for 'all regions' by water hardness show the familiar pattern; steady decreases in the SMRs as hardness increases. The SMRs for 'all areas of known hardness' by grouped region again show a familiar and consistent pattern with about the same range of variations. For all four tables there is a steady increase in SMR values from the South and East to the North and West grouped regions. However, within each grouped region there is no consistent gradient with water hardness. Within most hardness categories, there is a gradient in SMR from the South and East to North and West grouped regions.

Table 6.13 Male mortality from cardiovascular diseases (ICD 8th Revision 400–458) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971

SMR (approx 95 per cent confidence interval)

Total hardness of water (parts per million*)	Grouped regions			All regions
	South and East	Central	North and West	
Under 90	106 (92–122)	105 (99–112)	115(109–122)	111(106–115)
90–169	89 (78–101)	110(100–121)	106 (98–115)	104 (98–110)
170–249	92 (85– 98)	108 (99–118)	116 (88–148)	98 (93–103)
250 and over	90 (86– 93)	110 (99–121)	113 (86–143)	93 (89– 96)
All areas of known hardness	**91 (88– 94)**	**108(103–112)**	**112(108–117)**	**100 (98–103)**

Source: OPCS Longitudinal Study
** Calcium carbonate equivalent.*
See Annex to table in Appendix 4.

Table 6.14 Male mortality from ischaemic heart diseases (ICD 8th Revision 400–429) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971

SMR (approx 95 per cent confidence interval)

Total hardness of water (parts per million*)	Grouped regions			All regions
	South and East	Central	North and West	
Under 90	102 (85–120)	104 (96–112)	119(111–126)	111(106–117)
90–169	80 (68– 94)	109 (97–121)	104 (95–115)	101 (94–108)
170–249	94 (86–101)	104 (94–115)	119 (86–158)	98 (92–104)
250 and over	92 (88– 96)	109 (97–122)	101 (72–136)	94 (90– 98)
All areas of known hardness	**92 (88– 96)**	**106(101–111)**	**114(108–120)**	**101 (98–104)**

Source: OPCS Longitudinal Study
** Calcium carbonate equivalent.*
See Annex to table in Appendix 4.

Table 6.15 Female mortality from cardiovascular diseases (ICD 8th Revision 400–458) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971

SMR (approx 95 per cent confidence interval)

Total hardness of water (parts per million*)	Grouped regions			All regions
	South and East	Central	North and West	
Under 90	98 (84–112)	107(100–114)	110(104–116)	108(103–112)
90–169	101 (90–113)	109 (99–120)	113(104–121)	109(103–115)
170–249	89 (83– 95)	104 (95–114)	129(100–162)	95 (90–100)
250 and over	89 (85– 92)	104 (93–116)	124 (98–153)	91 (88– 94)
All areas of known hardness	**90 (87– 93)**	**106(102–111)**	**112(107–116)**	**99 (97–101)**

Source: OPCS Longitudinal Study
** Calcium carbonate equivalent.*
See Annex to table in Appendix 4.

Table 6.16 Female mortality from ischaemic heart diseases (ICD 8th Revision 400–429) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971

SMR (approx 95 per cent confidence interval)

Total hardness of water (parts per million*)	Grouped regions			All regions
	South and East	Central	North and West	
Under 90	103(85–122)	104(96–113)	112(105–120)	108(103–114)
90–169	86(72–100)	102(89–115)	117(106–129)	105 (98–113)
170–249	89(81– 97)	104(91–116)	122 (86–165)	94 (88–101)
250 and over	93(88– 98)	106(92–121)	128 (94–168)	95 (91–100)
All areas of known hardness	**92(88– 96)**	**104(98–110)**	**115(109–121)**	**100 (98–103)**

Source: OPCS Longitudinal Study
** Calcium carbonate equivalent.*
See Annex to table in Appendix 4.

In view of the presence of regional gradients in the SMR within many water hardness groups, but the relative absence of hardness gradients within grouped regions, it may be anticipated that 'grouped region' will have better explanatory power than water hardness. The explanatory power of the region and water hardness variables, both separately and jointly, has been explored further by use of regression models.[23, 24] These are based on the assumption that the observed deaths 0_k, $k = 1, \ldots K$ in the K subgroups of interest are independent Poisson variables whose means satisfy

$$\log E(0_k;\beta) = \log(E_k) + \beta'.x_k \quad k = 1, \ldots, K$$

where the Kth subgroup is characterised by a vector of qualitative co-variables x_k, $k = 1, \ldots, K$; E_k is the number of expected deaths in the subgroup and β is a vector of parameters to be estimated.

For both sexes and both diseases, Table 6.17 shows that the addition of a (grouped) region variable to the null model explains a substantial proportion of the variation in the pattern of mortality by region and hardness. Indeed, the fit of the model in which region is the only explanatory variable is reasonably good in each case. Addition of a hardness term does not substantially improve the fit of the model in any of the four cases, although some improvement is to be seen in the case of ischaemic heart disease in males, for which the fit of the 'region only' model was poorest. In contrast, for neither sex and neither disease group does addition of 'hardness' alone to the null model explain a substantial proportion of the variation. These results are similar to those from the aforementioned study of deaths in 1971–75 except for the case of male ischaemic heart disease, for which hardness had more explanatory power than region.

Table 6.17 Scaled deviances in regression models for observed deaths by grouped region and hardness of water

Model	Deaths from:		Degrees of freedom of model
	Cardiovascular disease	Ischaemic heart disease	
Males			
Null model	83.6	58.8	11
Region alone	9.0	10.9	9
Hardness alone	39.0	30.4	8
Region and hardness	7.0	6.9	6
Females			
Null model	88.0	46.8	11
Region alone	9.6	4.6	9
Hardness alone	33.4	27.7	8
Region and hardness	6.1	3.6	6

6.5.2 *Water nitrate*

Another example of the way in which environmental variables can be introduced into existing data-sets on mortality (or morbidity) relates to water nitrates. The role of ingested nitrates in the development of gastric cancer has been the subject of considerable speculation in recent years.[25-34]

The possible mechanisms by which ingested nitrate might be involved in stomach cancer have been dicussed elsewhere.[25] If dietary nitrate is involved then it is possible that nitrate from drinking water may contribute. The process of carcinogenesis may, however, be influenced by the style of life of the individual, including the consumption of specific foods such as fresh fruit and vegetables, which may have protective effect. It is therefore relevant to examine the possible combined effects of nitrate exposure and life-style.

Data from the LS can be used to explore these issues. For the LS sample members the relationship between stomach cancer mortality and the level of nitrate in the water supply of their locality have been explored inthe light of socio-demographic variables used as proxy measures for the quality of diet. Water quality data are available for more than 200 (pre-1974 classification) urban areas, mostly with populations of 50,000 or more, from Phase I of the RHS. A water nitrate level was derived by taking the mean concentration of nitrate in water supplied to the area from each source and then weighting this figure according to the proportion of the population's requirements that were served by each source. Local authorities were then categorised according to whether their nitrate concentrations were: less than 1.5, 1.5–2.4, 2.5–4.4, or 4.5 mg N/l (mg/l of nitrate nitrogen) and over. The ranges of nitrate level adopted are such that relatively large proportions of both the populations at risk and observed deaths fall in the two extreme groups. This may dilute any evidence of the existence of enhanced risk at high levels of water nitrate or of a trend in mortality rates with nitrate levels. The method of calculating mortality levels has been described briefly at the beginning of this chapter and in more detail in Chapter 2.

The analyses presented are based on a comparison of **stomach cancer** mortality levels among LS sample members in 1971–81, according to housing tenure in 1971 and the average water nitrate levels during 1969–73 of the local authority areas in which they lived at the 1971 Census. It should be noted, however, that the numbers of deaths upon which the analyses are based are relatively small compared with those presented earlier in this chapter; the results, therefore, cannot be regarded as conclusive and careful attention should be paid to the confidence intervals relevant to each SMR. The explanatory power of the water nitrate and tenure variables has been explored further by use of regression models as described for the analysis by hardness of water.

Fifty-three per cent of male LS sample members and 54 per cent of the females were resident in RHS areas with known levels of nitrate in their water supply. Table 6.18 shows mortality in the 1971–81 decade from malignant neoplasms of the stomach for males in the LS sample resident in private households in RHS areas at the 1971 Census, by water nitrate level and housing tenure. The equivalent information for females is shown in Table 6.19.

Table 6.18 Male mortality from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents of Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971

SMR (approx 95 per cent confidence interval)*

Nitrate in drinking water (mgN/l)	Housing tenure			All private households with known tenure
	Owner occupied	Privately rented	Local authority	
Less than 1.5	91(69–116)	149(104–202)	132 (99–170)	114(97–134)
1.5–2.4	85(41–143)	68 (12–170)	98 (34–195)	85(51–127)
2.5–4.4	104(72–141)	88 (41–152)	114 (73–162)	105(82–131)
4.5 and over	86(66–108)	83 (56–115)	134(101–172)	98(83–114)
All areas with known nitrate level	**91(78–106)**	**104 (82–128)**	**127(107–149)**	**104(94–115)**

Source: OPCS Longitudinal Study
** based on age-specific death rates in all males in the LS sample resident in private households.*
See Annex to table in Appendix 4.

Table 6.19 Female mortality from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents of Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971

SMR (approx 95 per cent confidence interval)*

Nitrate in drinking water (mgN/l)	Housing tenure			All private households with known tenure
	Owner occupied	Privately rented	Local authority	
Less than 1.5	117(87–151)	136(89–193)	144(104–192)	130(107–154)
1.5–2.4	79(30–149)	32 (0–129)	114 (29–257)	77 (39–129)
2.5–4.4	83(50–124)	84(35–154)	75 (37–127)	81 (57–109)
4.5 and over	96(70–126)	88(57–127)	135 (96–181)	105 (86–125)
All areas with known nitrate level	**100(83–118)**	**100(76–127)**	**126(102–153)**	**108 (95–121)**

Source: OPCS Longitudinal Study
** based on age-specific death rates in all females in the LS sample resident in private households.*
See Annex to table in Appendix 4.

For males the number of deaths from stomach cancer observed in residents of private households in all RHS areas with known nitrate levels is similar to that expected on the basis of rates in all private households in England and Wales. For females there is a suggestion of a higher rate than expected. Thus, for females any extrapolation of the results from this study to the entire population in private households must be undertaken with care.

In keeping with the results of other studies in Britain, Tables 6.18 and 6.19 do not offer evidence of an upward trend in stomach cancer mortality with increasing nitrate levels.[35] On the contrary relatively high SMR values in the *lowest* nitrate groups are apparent for both males and females.

For each tenure category and both sexes, the SMR in the lowest nitrate category is generally higher than the SMRs in at least some of, and in nearly every case all of, the corresponding higher nitrate level categories.

Table 6.20 Scaled deviances in regression models for observed deaths by tenure and water nitrate level

Model	Deaths from stomach cancer		Degrees of freedom of model
	Males	Females	
Null model	17.7	15.4	11
Tenure alone	8.9	12.0	9
Nitrate level alone	15.0	6.4	8
Tenure and nitrate level	6.5	3.2	6

The apparent raised mortality at low nitrate levels deserves further analysis. Known geographical gradients of stomach cancer mortality (see Chapter 4) suggest that these are negatively correlated with nitrate levels. The distribution of water nitrate levels in RHS areas indicate a strong North West/South East gradient in nitrate level, with the lowest levels in the North West regions where stomach cancer mortality rates are known to be high, presumably for reasons other than the nitrate levels experienced there.

To clarify this relationship the analyses in Tables 6.18 and 6.19 have been repeated for those RHS areas in the South and East grouped region which includes the majority of the population resident in high nitrate areas. The nitrate categories used have been redefined to provide a more even division of the observation; the two small central categories have been combined and a category of the highest nitrates levels (6.0 mg N/l and over) is identified separately. The results of these analyses are shown in Tables 6.21–6.22; again care should be taken in their interpretation given the small number of deaths and hence the wide confidence intervals. While Table 6.21 offers no evidence of a gradient, in male stomach cancer mortality with nitrate level, the corresponding data for females does. The main finding is of an excess in mortality for local authority tenants in the highest nitrate category remains for both males and females. This result is consistent with the hypothesis that high levels of nitrate in water only

constitute a risk factor for raised levels of stomach cancer when present with socio-economic, and perhaps specifically dietary, disadvantage.

6.6 Summary and discussion

Chapters 3, 4 and 5 used administrative areas and their aggregates as the main geographic dimension of analysis. This follows the practice of previous supplements on area mortality. This chapter has examined geographic differentials in mortality in a less traditional way, by classifying individuals according to the type of area they live in and their own socio-economic characteristics. It utilises data for 1979–83 area mortality and mortality between 1971–81 taken from the LS.

For the 1979–83 period local authority districts have been aggregated according to (i) the proportion of households in each district whose head was classified to Social Class I or II, (ii) the proportion of households whose head was a tenant of a local authority, (iii) their proximity to the coast and (iv) their average altitude.

The results show a general pattern of relatively high mortality in areas with a low proportion of Social Class I or II households, for both sexes. The ranking of the regions also appears consistent within each social class grouping; for example, East Anglia shows the lowest SMRs for all groupings, and the North and North West regions the highest.

Similarly, districts with a higher proportion of males and females in accommodation rented from the local authority had raised mortality; conversely those with high proportions of owner occupiers had lower mortality. Again the ranking of the regions appears broadly consistent for each tenure group.

There was no clear evidence of a relation between low mortality and proximity to the coast, except possibly for respiratory diseases. The analysis of mortality according to altitude was also inconclusive.

None of the above findings are really unexpected. Nevertheless, the analyses show the potential for other extraneous variables to be integrated with the 1979–83 mortality data. There is a problem, however, with this form of analysis. It is frequently referred to as the ecological fallacy. It concerns the false labelling of all individuals in an area with the predominant or stated characteristics of that area for example, not all people living in areas with high proportions of households in local authority housing will be local authority tenants. The scale of the problem can be compounded by the size and obviously the homogeneity of the local areas used in the analysis. Information at the individual level, not always available, is required to avoid this problem.

The major part of Chapter 6 has concentrated on the analysis of LS mortality in the 1971–81 decade according to the type of area in which a person was living in 1971. Some thirty-six clusters in seven families of areas, derived from a classification of 1971 Census wards according to the demographic and socio-economic characteristics of the population in those wards, have been used as the main geographic axis. The titles attributed to these clusters and families are given in section 6.3. The analyses show a clear distinction for both males and females between above average mortality in 'low status' clusters, as exemplified by Urban Council Estate Areas (Family 4), and Areas of Older Settlement (Family 2), and below average mortality in 'high status' clusters like Rural Areas (Family 3), and Areas of Established High Status and Resorts (Family 7). The summary table below shows the extent of the differences in SMR values.

Type of area	SMR (approx. 95% confidence limits) Males	Females
Low status		
Urban council estates (Family 4)	115 (112–118)	113 (110–116)
Areas of older settlements (Family 2)	107 (105–109)	105 (103–107)
High status		
Rural areas (Family 3)	90 (86–94)	95 (90–100)
Areas of established high status and resorts (Family 7)	88 (86–90)	90 (88–92)

Within the low status group, people living in 1971 in clusters typified by inner city areas with low quality older housing, overspill estates or inner city council estates had the highest mortality with levels at least 20 per cent above the national average. On the other hand, virtually all the clusters in high status areas were below the national level.

The corresponding analysis by social class shows that, for each family, males in Social Classes I and II had consistently lower mortality levels than those in Social Classes IV and V. The extent of the gradient was around 25 per cent. These findings are very similar to those for tenure.

Mortality gradients between owner occupiers and non-owner occupiers, and between Social Classes I and II and Social Classes IV and V tended to prevail for all the families for each main cause of death. Respiratory disease showed a much steeper gradient for most families, and circulatory disease and malignant neoplasms a flatter one.

The LS data-set has also been used to show its potential for examining the effects of environmental indicators on mortality. Recent interest has centred around water hardness and nitrate levels. Most other studies have found negative associations between water hardness and mortality from cardiovascular diseases, and there has been speculation about the possibility of a positive association between stomach cancer and nitrate levels. Stress should be placed on the word 'association' because there are many confounding factors of a socio-economic and climatic nature which make any causal link extremely difficult to determine. The last two sections of this chapter have considered the results of adding environmental data taken from the Regional Heart Study for the period around 1971 to the LS data-set containing mortality data for the 1971–81 decade.

Table 6.21 Male mortality from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents of Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971 in South and East Regions only

SMR (approx 95 per cent confidence interval)*

Nitrate in drinking water (mgN/l)	Housing tenure			All private households with known tenure
	Owner occupied	Privately rented	Local authority	
Less than 1.5	78(20–177)	71(0–286)	—	62(19–131)
1.5–4.4	93(60–134)	56(14–127)	102 (52–169)	90(64–120)
4.5–5.9	83(53–120)	99(51–161)	88 (43–149)	88(65–115)
6.0 and over	74(48–106)	63(34–102)	146(101–199)	92(72–115)
All areas with known nitrate level	**82(65–102)**	**73(50–101)**	**117 (88–150)**	**89(76–103)**

Source: OPCS Longitudinal Study
** based on age-specific death rates in all males in the LS sample resident in private households.*
See Annex to table in Appendix 4.

Table 6.22 Female mortality from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents of Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971 in South and East Regions only

SMR (approx 95 per cent confidence interval)*

Nitrate in drinking water (mgN/l)	Housing tenure			All private households with known tenure
	Owner occupied	Privately rented	Local authority	
Less than 1.5	29 (0–118)	63 (0–250)	—	34 (3– 99)
1.5–4.4	68(36–111)	100(35–198)	93(36–177)	80(52–114)
4.5–5.9	75(41–118)	69(27–130)	102(46–182)	79(53–110)
6.0 and over	108(70–155)	88(48–139)	143(91–207)	112(86–142)
All areas with known nitrate level	**83(62–106)**	**83(55–116)**	**118(83–158)**	**92(76–109)**

Source: OPCS Longitudinal Study
** based on age-specific death rates in all females in the LS sample resident in private households.*
See Annex to table in Appendix 4.

The results show a strong correlation between grouped region of residence and hardness of water supply in the individual's area of residence. Some 85 per cent of those included in the analyses lived in the South and East regions in areas of hardness of 250 parts per million (ppm), whereas just over 50 per cent of those in the North and West regions lived in areas with less than 90 ppm. For both males and females, and for deaths from cardiovascular disease and ischaemic heart disease, the SMR values showed a steady decrease as the hardness of the water supply increased. The extreme categories of water hardness showed SMRs of around 90 and 110 with a slightly narrower range for female ischaemic heart disease. Within grouped region there was no consistent gradient with water hardness, but within most hardness categories there was a gradient from the South and East to North and West. The gradients were most consistent for females in the two hardest water categories. These results are generally in accordance with the findings of earlier studies and suggest that grouped region would appear to have greater explanatory power than water hardness.

The role of nitrates in the prevalence of stomach cancer has given rise to considerable speculation in recent years. Again the LS data-set can be used, by incorporating information from the RHS on the level of nitrate in the local water supply of the study members. In keeping with other studies the most striking features were the relatively high SMRs in the low nitrate groups. It was apparent from LS data that this was an artefact of the regional distribution of nitrate levels in water, confirming that nitrates are not the principal cause of stomach cancer in this country. However when attention is focused on the region with the highest water nitrate levels (the South and East) and when tenure is added to the analyses, interactions between nitrate levels and housing tenure appear to be of some importance. These relationships deserve further analysis.

The significance of these studies involving environmental factors is somewhat weakened by the absence of household, as distinct from area, level water hardness and water quality data. For example, only a single measure of water nitrate level, as opposed to a history of each individual's water nitrate consumption, was available; and there may be a considerable latent period between exposure to this component and the onset of stomach cancer and subsequent mortality.

Finally there is another point to be made concerning the latent period of a disease. All the analyses in this chapter have been based on the characteristics of individuals or areas measured at one point in time, usually around 1971. In Chapter 7 it is stated that at least 50 per cent of people migrate at some point during their lifetime. It is of direct relevance to know how long the individuals concerned were exposed to the environmental factor in

question or were a member of a particular social group. Movements between areas of different water hardness or quality and social mobility will have all conspired to confound the underlying relationships. Clearly more profile information is required. The use of the LS to examine mortality differentials according to characteristics measured in both the 1971 and 1981 Censuses should provide a useful start.

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7 The influence of migration on geographic variation in mortality

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7.1 Introduction

Population movements have long been implicated in the spread of communicable diseases; for instance, seasonal movements of North African peoples are known to be associated with prevalence of malaria.[1] The role of population mobility in the distribution and aetiology of non-communicable diseases is less clear. Studies of the health of migrant population groups in comparison with their non-migrant counterparts have been central to the investigation of the respective roles of 'genetic' and/or environmental risk factors for diseases; studies of heart disease and stomach cancer in Japanese immigrants to Hawaii and California are good examples.[2, 3]

Differences in mortality between areas cannot be attributed wholly to adverse or favourable conditions in those areas. The population exposed to risk in a given area during the period of study contains a proportion who have lived in other places for varying periods. The proportion of migrants in the population, their age and sex composition and life-time migration profile varies considerably from area to area. A question on usual address five years earlier was included in the 1971 Census. Answers to this question, in conjunction with the usual address at the time of the Census, provided data on migration during the five years preceding the 1971 Census. For England and Wales overall, five years before the Census, 20 per cent of the population had lived in a different local authority area to the one they were resident in at the time of the Census. The proportions were similar for both sexes but they were higher at the younger ages, the highest being 42 per cent for males aged 25–29 and females aged 20–29. Even at older ages, 10 per cent or more had moved residence across local authority boundaries during the previous five years.[4] Even if it is assumed that not everyone moves and some move frequently, it would be reasonable to suggest that at least 50 per cent of people move sometime during their life. This is confirmed by an analysis of deaths in England and Wales in 1969–72 by places of birth and death (see Chapter 8), which shows that on average more than one half of those resident in an area at the time of death were born elsewhere. Such individuals would have been exposed to the environment of at least one locality different to the one in which they spent their last days.

Over recent centuries the migration of working people and their families from villages to towns and from smaller towns to larger towns and cities seeking work and economic advancement is well known.[5] More recently, the reverse has been occurring, in part through the creation of New Towns which at first were populated by young workers and families migrating from densely populated inner city areas.[6] Also, around retirement age some people move to the supposedly better climate of the south coast towns of England.[7]

The effect of migration into London from the surrounding countryside on mortality of the two areas was studied by Farr[8] and Welton.[9] Farr suggested

> *'the bulk of the immigrants to towns from the country are probably in good health but a certain number of sick resort to the town hospitals: upon the other hand, of the emigrants, some are consumptive, seeking health in the country and abroad, or returning home to die; but the emigrants are less numerous in the aggregate than the immigrants, and so have less effect on the mortality'.*

Welton saw the task of interpreting the mortality differentials between the two areas against a similar background of three kinds of migration — healthy persons migrating to towns; former migrants to towns losing their health in towns and returning to rural areas; and long standing town dwellers moving to the countryside on becoming ill. Both studies were limited by the fact that deaths were assigned to the area in which they occurred.

A system of assigning a death to the area of usual residence of the deceased was introduced in 1911; it removed the distortion created by deaths of patients in hospitals outside the area of their residence and of others temporarily in an area. Recognising that it did not correct for the effects of migration, particularly of those returning from towns to countryside, Stevenson commented: 'Unfortunately, this misstatement of mortality cannot be fully corrected by any means at present available, for although deaths are now transferred to the area of residence there is no ground for transfer in these cases as the town residence is given up before death'.[10]

Hill[11] examined the migration types suggested by Welton. He observed that:

> *'Not only is it the stronger element that tends to migrate, the weaker element that tends to remain at home, but that this stronger element secures a higher economic position in the towns, while the weaker element in the country is subjected to worse housing conditions and to a lower diet.'*

The interpretation of data on health following migration is complex.[12] Some migration may be necessitated by ill health, or be made possible by good health; there may be health consequences resulting from the migration, for example, through stress related to social and cultural changes entailed by the migration.[13] These kinds of issues are important to bear in mind in any description of the health of migrant groups and hence the effect of migration on the health of the population of origin and destination.[14] The process whereby health, itself, influences migration is referred to in this chapter as selection.

Theoretical and empirical developments in studies of migration are also important.[15] Many familiar socio-demographic variables, such as age, sex, housing tenure and occupation are associated with differing propensities to migrate.[16, 17] To some extent these variations may reflect the predictions of models of migration based on variations in the labour market or a particular stage in the life-cycle of migrants. Whatever the explanation internal migration can contribute substantially to changes in the size and/or structure of the populations of sub-areas of the country whether defined in geographical or socio-demographic terms.[18, 19]

Although interest in relationships between health and migration has been the object of attention since the late nineteenth century, there have been relatively few large-scale studies which have allowed a broad investigation of these relationships (as opposed to concentration on specific disease groups or groups of migrants).[20, 21, 22] Analyses of deaths in the period 1971–75 by migration and other 1971 Census variables were presented in the first report of the OPCS Longitudinal Study (LS).[23] The main findings were that short distance migrants (that is, those moving within a county) had high mortality, probably reflecting previous ill health which led to the move, to seek support from relatives or institutions. Long distance migrants had low mortality rates presumably reflecting their relatively healthy status. However, this longer distance migration was not found to make a major contribution to regional mortality gradients except for young men.

In this chapter some of these analyses are extended and updated to cover mortality in the 1971–81 decade. The background to the LS is given in Chapter 2, and the methods used to analyse mortality differentials have been described in the afore-mentioned report.[24] In short, deaths and person years at risk for the LS sample members between the 1971 and 1981 Censuses have been disaggregated by sex and five-year age-group, and then further subdivided by answers to the 1971 Census question on usual address five years prior to the 1971 Census. The number of deaths in a particular subgroup has been compared with the number expected, obtained by multiplying the person-years at risk by the age-specific death rates for the entire LS sample population of the same sex. The types of five-year migrant considered in this chapter are: those within a local authority; those between local authorities within a county; those between counties in the same region; those between contiguous regions; those between distant regions; and those from outside England and Wales These types reflect the *net* distance moved over the 1966–71 period and can be used with other census variables (e.g. economic position, age, social class, and so on) to examine mortality differentials. (It should be remembered that this categorisation is only a proxy for net distance moved. It is quite possible that in some instances a move between regions is a shorter distance than between local authorities.) In addition the mortality of migrants is assessed in relation to the type of area to which the migration is made. For this purpose the 36 geographic clusters of wards based on forty 1971 Census variables have been used (see Chapter 6 for more details). The contribution of migration to mortality patterns and levels of these areas is considered.

One aspect relevant to this volume which is *not* updated from the first LS report concerns the impact of migration upon regional differentials. This is because the necessary analyses from the LS are not readily available for the period 1971–81. The LS report compared region of residence in 1966 and 1971 in an attempt to examine the Hill and Welton-type hypotheses about health related migration. Of particular interest was the question of whether the apparently high mortality levels for the North and West shown by cross-sectional data were just a product of selection effects — that is, for example, the South and East grouped regions being continually replenished by healthy migrants from the North and West regions, leaving behind in the latter a relatively unhealthy population. The report concluded that selection effects could not be very large; however, the data showed evidence of regional gradients by both region of origin and destination. The data suggest that migration helped to widen regional differences because those moving out of high mortality areas had lower mortality than those moving in; and those moving between 'healthy' regions had even lower mortality levels than those moving from areas of high mortality. However, those who had lived in the North and West in either 1966 or 1971 and had migrated between these dates had raised mortality from circulatory diseases but not from the other causes of death examined.

7.2 Mortality during 1971-81 by distance of migration, 1966–71

7.2.1 Distance moved

As mentioned briefly in the previous section, mortality in 1971–75 by a proxy for distance of migration between 1966 and 1971 was analysed in Chapter 9 of the first LS report. Migrants within a county had an excess of mortality over that expected on the basis of death rates for all LS sample members. Longer distance migrants had lower than expected mortality; the greater the distance the lower the mortality. These results suggested a health selection mechanism, with short distance migrants appearing to move because of ill health, perhaps to gain or institutional support; on the other hand, good health appeared to be a precondition of longer distance migration. Further support for these selection hypotheses was provided by the observed patterns of mortality during the period 1971–75. Mortality in the high risk (local migrant) group was less raised in 1973–75 than in 1971–72, as would be expected if the initial excess was due to selection of a poor health subgroup; the impact of initial poor health in a cohort wears off with time.[25] This effect might be expected to continue when mortality over the ten years 1971–81 is analysed.

The percentage distribution of the LS sample by age-group and extent of migration for both males and females is shown in Figure 7.1. The distributions are fairly similar. Overall, more than half had the same address at the 1971 Census as five years before. Most of those who had changed address had made a relatively local or short distance move. Perhaps the most noticeable feature is the peak of migration for all distances between ages 20 and 30, corresponding to the main marriage and childbearing periods. However, because mortality rates at these ages are considerably lower than at older ages it is not possible to undertake detailed analyses of the relationship between migration and mortality using the LS sample. The numbers are too small. This is obviously more fruitful at older ages when mortality rates are much higher and analyses can be tied in with apparent increases, albeit small ones, in the rate of migration around retirement age and after age 80 years.

Figure 7.1 Percentage distribution at each age by distance moved in the 5 years before the 1971 Census, England and Wales

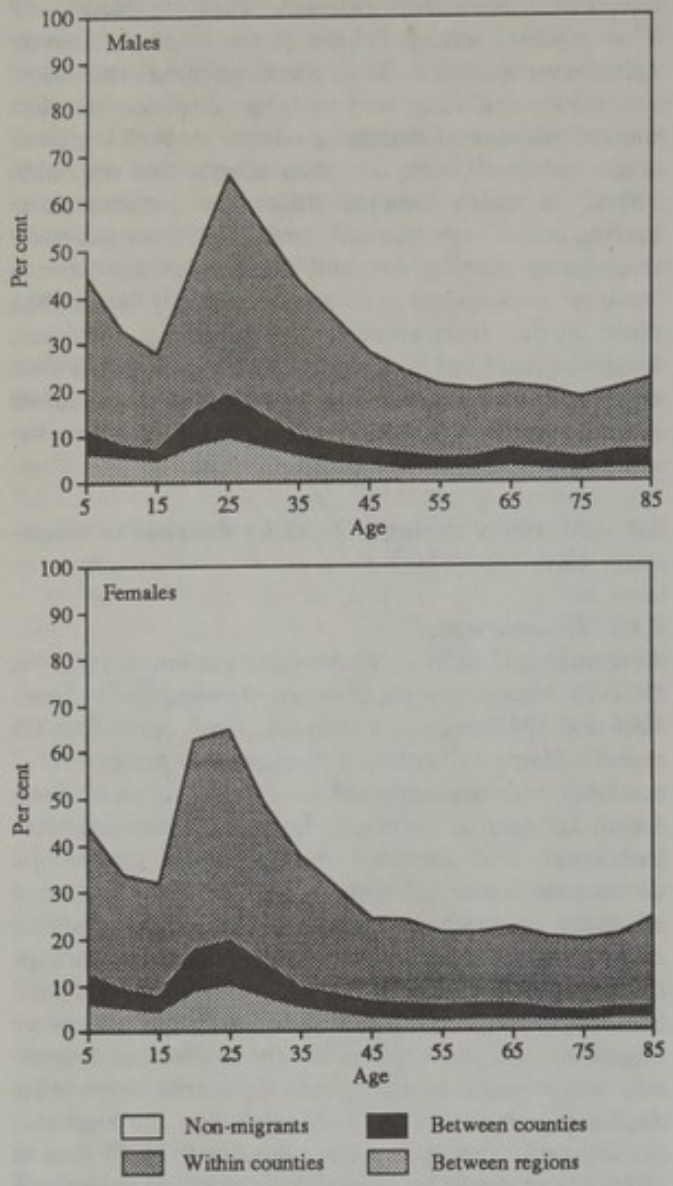


Table 7.1 shows mortality in the 1971–81 decade from all causes according to the distance of migration between 1966 and 1971 for males and females aged five years and over in 1971. The pattern of mortality is similar to that for the 1971–75 period. Mortality in the largest group — non-migrants — is found to be slightly below that for all LS sample members, while that for the five-year migrants is slightly above the expected level. Short distance migrants experienced mortality rates between 5 and 10 per cent the expected levels. There was little difference between people whose move was within the same local authority or between local authorities in the same county. The mortality of migrants between counties and regions was generally about 10 per cent below the expected level. For migrants coming from outside the UK the level was even lower — 21 and 25 per cent for males and females respectively. (It should be noted that not all of those classed as migrants from outside the UK were new immigrants to this country; many UK citizens returning from abroad.[26] Chapter 9 of this report considers the mortality of those born outside England and Wales in some detail.)

On the whole the same broad patterns of mortality by distance of migration are seen for each of the age-groups presented in Table 7.2. For both males and females the most striking observation is the significant excess mortality among those aged 75 years and over moving within a county, particularly between local authorities. This is also evident for those aged 45–74 moving within the same local authority. SMRs for men and women aged 75 years and over moving between local authorities within a county appear to be some 10 percentage points higher than the already high SMRs of those moving more locally.

The SMRs of both men and women who moved between counties or between regions are around or below 100 (Table 7.2 and Figure 7.2). The variability between age-groups is greater for females than for men. However, for both sexes, the SMRs for people who migrated from outside Enqland and Wales are extremely variable between age-groups. They are based on small numbers of deaths and no conclusions can be drawn about migrants of different ages.

Further analysis by cause of death group (**malignant neoplasms, circulatory diseases** and **respiratory diseases**) indicates that the broad mortality pattern of migrants prevails, with local movers having higher mortality than both non-movers and longer distance migrants (Table 7.3 and Figure 7.3). (Appendix 4 gives a list of more detailed causes for which these results are available.) However, for respiratory diseases the mortality gradient for males and females between short and longer distance migration is somewhat steeper than for the other grouped causes. For instance, the SMR values range from around 115–120 for males who moved within or between local authorities to around 70–80 for those who moved between regions, and possibly even lower for those migrants who came or returned from beyond the UK. These compare with 105–110 and 90 respectively for circulatory diseases.

7.2.2 Selection effects in relation to members of non-private households and economic position

The hypotheses that raised mortality in a cohort of short distance migrants and reduced mortality in long distance migrants both result from health selection can be investigated by examination of time trends in the SMR values. If these hypotheses are true then one would expect a downward (i.e. improving health) trend of mortality in the initially poor risk local migrant group and an upward trend in the initially good risk distant migrant group.[27]

In Table 7.4, mortality (SMR) for the two five-year periods 1971–75 and 1976–81 is shown by distance moved for males and for females. It should be noted that the data are not disaggregated by period of migration; thus those dying in, say, 1973 might have migrated at any time in the five-year period before the 1971 Census. The effect of this will be to reduce the clarity with which

Table 7.1 Mortality in 1971–81 of people aged 5 years and over in 1971 and migration in the five years before the 1971 Census, by sex and distance moved*

England and Wales

Distance moved 1966–71	Males				Females			
	Number in 1971	Deaths in 1971–81			Number in 1971	Deaths in 1971–81		
		Observed	SMR	Approx 95 percent confidence interval		Observed	SMR	Approx 95 percent confidence interval
Non mover	**138,466**	**22,507**	**99**	**98–100**	**148,889**	**21,600**	**98**	**97–99**
Mover	**86,517**	**6,837**	**102**	**99–104**	**88,781**	**6,729**	**103**	**100–105**
Within same county	59,915	5,130	107	104–110	61,585	5,204	107	104–110
Within the same local authority	41,240	3,771	108	105–112	42,296	3,873	107	104–111
Between local authorities	18,675	1,359	104	99–110	19,289	1,331	109	103–115
Between counties in the same region	9,620	771	90	84–96	10,144	695	90	83–97
Between regions	11,223	760	89	83–95	11,237	689	91	84–98
Between contiguous regions	6,993	513	88	81–96	7,135	428	85	77–94
Between distant regions	4,230	247	91	80–103	4,102	261	102	90–115
From outside England and Wales	5,759	176	82	70–94	5,815	141	84	70–98
Within UK	1,060	46	94	69–125	972	44	115	83–154
Beyond UK	4,699	130	79	66–93	4,843	97	75	61–92

Source: OPCS Longitudinal Study
** Table does not include some 4,658 males and 4,652 females for whom address five years prior to the 1971 Census was not stated*

Table 7.2 Mortality in 1971–81 of people aged 5 years and over in 1971 and migration in the five years before the 1971 Census: SMRs by sex, selected age group at death and distance moved*

England and Wales SMR (approx. 95 per cent confidence intervals)

Distance moved	Age				
	15–44	45–64	65–74	75–84	85 and over
Males					
Non mover	**101(93–109)**	**100 (97–103)**	**100 (97–102)**	**98 (95–100)**	**97 (93–101)**
Mover	**99(91–107)**	**99 (94–104)**	**100 (96–104)**	**106(101–111)**	**112(103–121)**
Within same county	101(91–111)	103 (98–108)	106(101–111)	112(106–118)	120(109–131)
Within same local authority	100(88–112)	107(101–114)	108(102–115)	109(102–116)	116(104–130)
Between local authorities	102(85–119)	93 (83–103)	101 (91–111)	121(108–135)	130(109–154)
Between counties in same region	86(63–109)	90 (78–104)	88 (77– 99)	98 (85–112)	80 (61–103)
Between regions	86(65–107)	87 (74–100)	82 (71– 93)	95 (81–109)	109 (84–134)
Between contiguous regions	91(64–118)	88 (73–105)	77 (65– 90)	95 (80–112)	104 (80–137)
Between distant regions	77(46–108)	84 (65–107)	94 (74–118)	94 (71–121)	120 (76–180)
From outside England and Wales	126(92–160)	82 (61–103)	66 (43– 89)	61 (35– 87)	—
Within UK	171(80–262)	107 (60–176)	47 (15–110)	79 (38–145)	—
Beyond UK	116(80–152)	77 (56–102)	71 (47–103)	51 (27– 90)	—
Females					
Non mover	**106(95–117)**	**100 (96–103)**	**99 (96–102)**	**97 (95– 99)**	**97 (95–100)**
Mover	**91(81–101)**	**98 (92–104)**	**101 (96–106)**	**107(102–112)**	**104 (99–109)**
Within same county	91(79–103)	106 (99–113)	108(102–114)	110(105–115)	108(102–114)
Within same local authority	95(79–111)	111(103–120)	109(102–116)	107(101–112)	105 (98–112)
Between local authorities	84(64–104)	93 (81–107)	107 (95–120)	121(109–133)	115(103–127)
Between counties in same region	104(72–136)	77 (63– 95)	80 (68– 93)	101 (89–114)	92 (78–109)
Between regions	102(73–131)	79 (63– 95)	76 (63– 89)	98 (85–111)	101 (85–117)
Between contiguous regions	95(59–131)	69 (52– 89)	66 (53– 82)	95 (80–111)	101 (83–123)
Between distant regions	112(62–162)	98 (71–131)	100 (75–130)	106 (84–132)	100 (76–128)
From outside England and Wales	59(30– 89)	74 (48–100)	118 (78–158)	103 (69–137)	67 (36– 98)
Within UK	—	81 (33–167)	126 (57–238)	161 (94–258)	128 (59–243)
Beyond UK	66(32–100)	72 (47–105)	115 (75–170)	79 (49–123)	47 (22– 86)

Source: OPCS Longitudinal Study
** Table does not include some 4,658 males and 4,652 females for whom address five years prior to the 1971 Census was not stated.*
See Annex to table in Appendix 4.

Figure 7.2 Mortality in 1971-81 of people aged 5 years and over in 1971 and migration in the five years before the 1971 Census, SMRs by sex, selected age group at death and distance moved

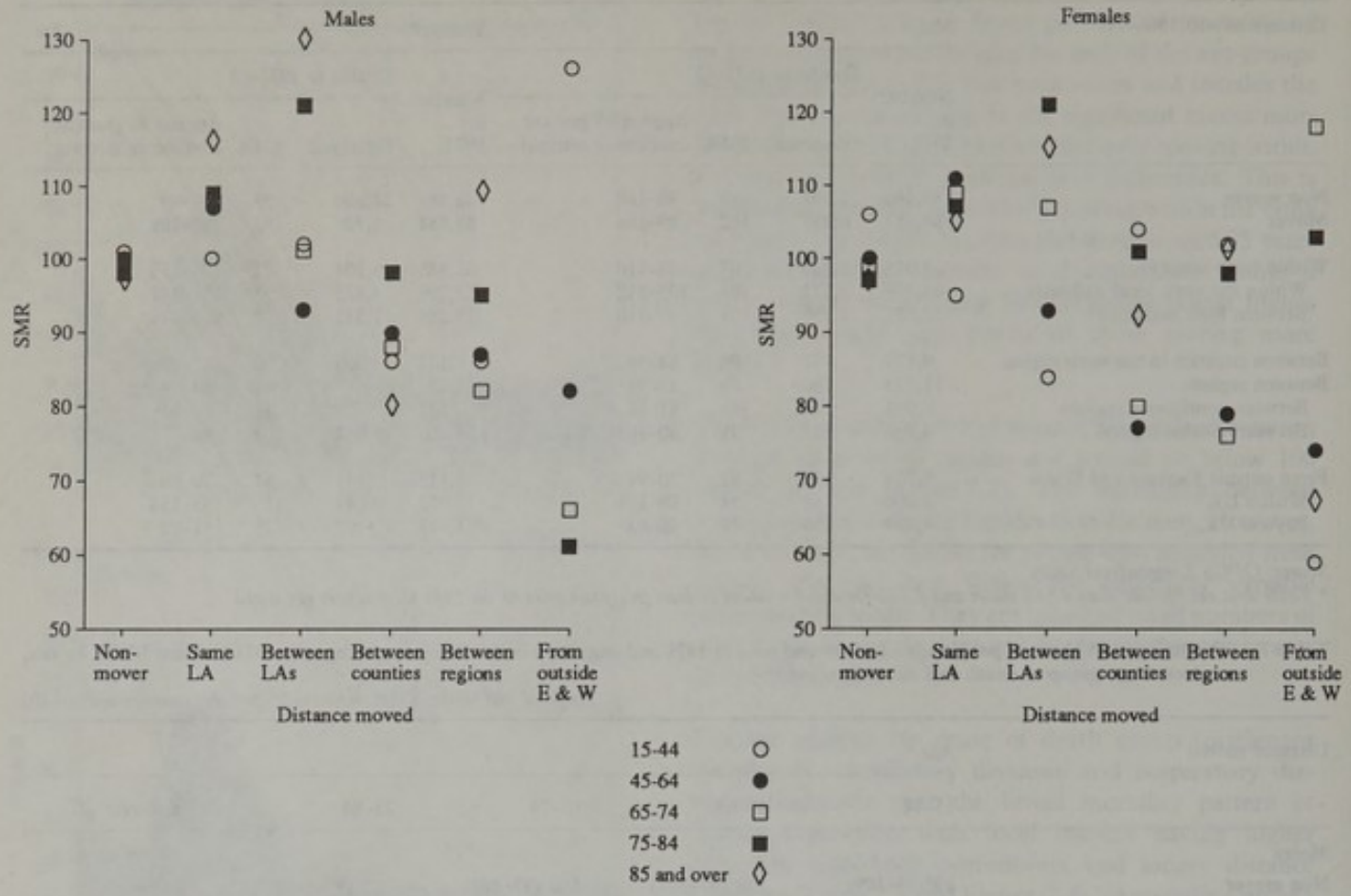


Figure 7.3 Mortality in 1971-81 of people aged 5 years and over in 1971 and migration in the five years before the 1971 Census, SMRs by sex and distance moved, for selected causes

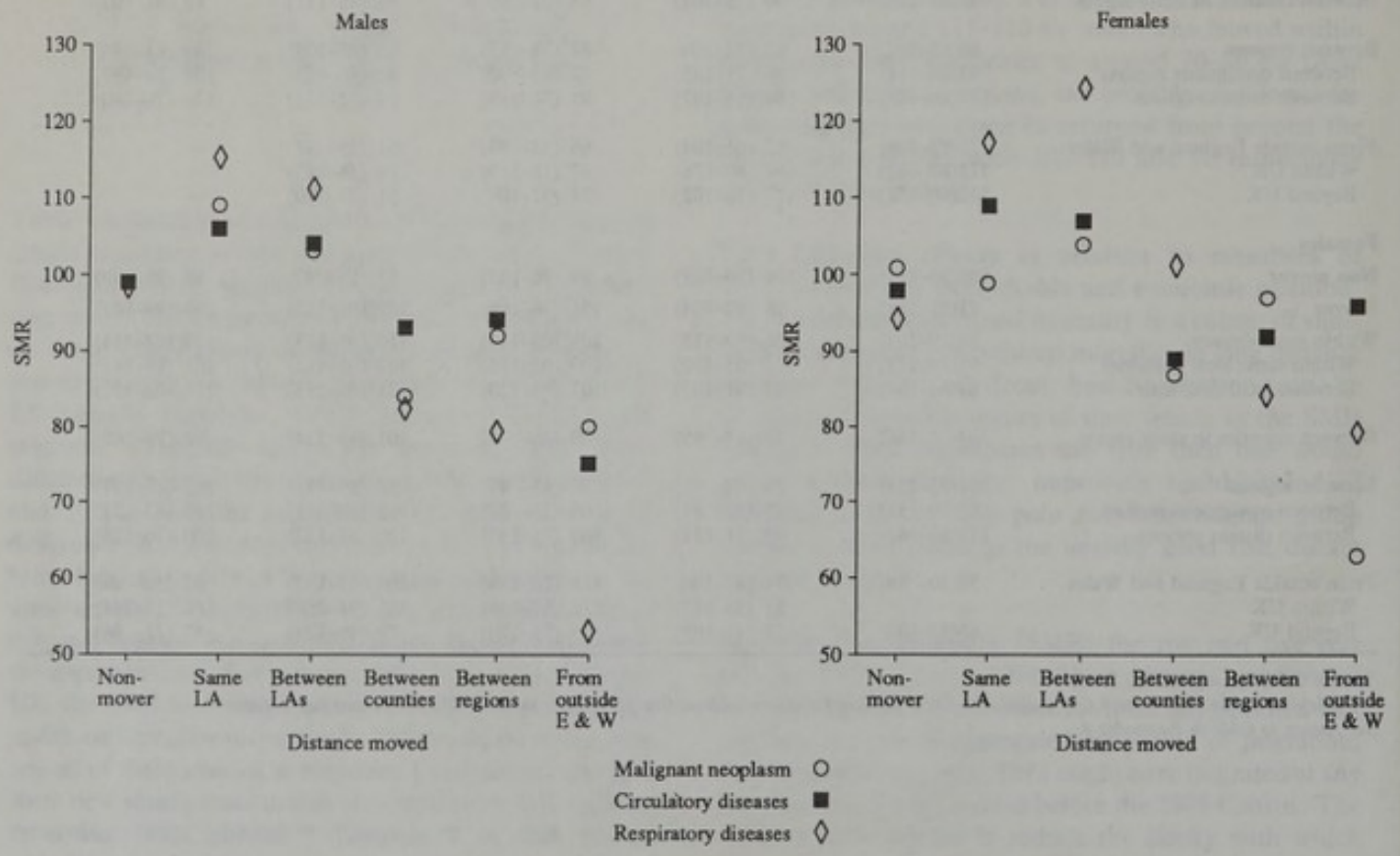


Table 7.3 Mortality in 1971–81 of people aged 5 years and over in 1971 and migration in the five years before the 1971 Census: SMRs by sex, and distance moved, for selected causes*

England and Wales SMR (approx. 95 per cent confidence intervals)

Distance moved	Cause of death		
	Malignant Neoplasm (ICD 140–209)	Circulatory disease (ICD 390–458)	Respiratory diseases (ICD 460–519)
Males			
Non mover	**99 (97–102)**	**99 (98–101)**	**98 (96–101)**
Mover	**102 (97–107)**	**101 (98–105)**	**104 (97–110)**
Within same county	107(101–113)	105(101–109)	114(106–122)
Within same local authority	109(102–117)	106(101–111)	115(106–125)
Between local authorities	103 (92–115)	104 (96–112)	111 (96–127)
Between counties in same region	84 (71– 97)	93 (84–103)	82 (67– 99)
Between regions	92 (78–106)	94 (85–103)	79 (63– 95)
Between contiguous regions	93 (77–111)	90 (79–101)	81 (63–102)
Between distant regions	90 (68–117)	103 (86–122)	74 (49–107)
From outside England and Wales	80 (55–105)	75 (58– 92)	53 (29– 77)
Within UK	99 (49–177)	65 (36–108)	78 (25–182)
Beyond UK	74 (50–107)	78 (60–101)	44 (19– 87)
Females			
Non mover	**101 (98–104)**	**98 (96–100)**	**94 (91– 98)**
Mover	**97 (92–102)**	**104(101–108)**	**112(105–119)**
Within same county	100 (94–106)	108(104–112)	119(110–128)
Within same local authority	99 (92–106)	109(104–114)	117(107–127)
Between local authorities	104 (93–117)	107 (99–115)	124(108–143)
Between counties in same region	87 (74–103)	89 (80– 99)	101 (82–122)
Between regions	97 (82–112)	92 (82–102)	84 (65–103)
Between contiguous regions	89 (72–109)	90 (79–102)	70 (51– 93)
Between distant regions	113 (87–145)	97 (81–115)	111 (78–153)
From outside England and Wales	63 (39– 87)	96 (73–119)	79 (38–120)
Within UK	85 (37–168)	127 (81–191)	108 (35–253)
Beyond UK	57 (35– 88)	87 (64–115)	70 (33–128)

Source: OPCS Longitudinal Study
** Table does not include some 4,658 males and 4,652 females for whom address five years prior to the 1971 Census was not stated.*
See Annex to table in Appendix 4.

Table 7.4 Mortality in 1971–75 and 1976–81 of people aged 5 years and over in 1971 and migration in the five years prior to the 1971 Census: SMRs by sex, and distance moved*

England and Wales SMR (approx. 95 per cent confidence intervals)

Distance migration 1966–71	Males		Females	
	1971–75	1976–81	1971–75	1976–81
Non mover	**99 (97–101)**	**99 (98–101)**	**96 (94– 98)**	**100 (98–102)**
Mover	**102 (98–106)**	**102 (99–105)**	**106(103–110)**	**100 (97–103)**
Within same county	107(103–111)	107(103–111)	112(108–116)	104(100–108)
Within same local authority	106(101–111)	110(105–114)	110(105–115)	104(100–109)
Between local authorities	108 (99–116)	102 (94–109)	116(108–125)	102 (94–110)
Between counties in same region	90 (81–100)	90 (81– 98)	92 (82–103)	88 (80– 98)
Between regions	90 (80–100)	89 (80– 98)	93 (83–103)	89 (80– 98)
Between contiguous regions	93 (82–106)	84 (75– 95)	88 (76–101)	83 (72– 94)
Between distant regions	83 (67–100)	98 (82–115)	102 (84–121)	102 (86–121)
From outside England and Wales	90 (70–110)	76 (61– 91)	74 (54– 94)	93 (73–113)
Within UK	106 (66–160)	85 (54–126)	115 (72–174)	115 (72–174)
Beyond UK	85 (64–110)	75 (59– 94)	60 (41– 84)	88 (68–112)

Source: OPCS Longitudinal Study
** Table does not include some 4,658 males and 4,652 females for whom address five years prior to the 1971 Census was not stated.*
See Annex to table in Appendix 4.

mortality trends by calendar period reflect trends by time since migration. Although this problem could be largely alleviated by consideration of migrants who moved one year prior to the 1971 Census, the reduced numbers of deaths lead to the likelihood of markedly increased sampling variations.

For males moving within local authorities there is no evidence of a fall in SMR from the earlier to the later period; in fact there may well have been a small rise. For males moving between counties within regions (for which the previously reported results were anomalous, or at least unexpected)[28] no trend is apparent. Those who moved between distant regions show the possibility of a rise in the SMR from an initial low level, as expected, but the reverse may be true of migrants between contiguous regions in England and Wales. For females the trends are similar to those for males, although there is evidence of a clearer downward trend in both groups of local migrants, in accordance with the ill-health selection hypothesis. In contrast there is very little in the way of clear trends in the longer distance migrant groups; if anything, the data suggest small declines in SMR values between the two periods. On the whole, the results in Table 7.4 constitute less support for the selection hypothesis in males than the commentary on the results for 1971–75 suggested.

The above analyses are subject to what is termed the ecological fallacy; not all local migrants are 'unhealthy' nor longer distance migrants 'healthy'. It is helpful to understanding the data, therefore, to extend these analyses, sample numbers permitting, to include individual and/or household characteristics. For example, in the report on mortality in the 1971–75 period it was demonstrated that raised mortality among short distance movers was associated with people obtaining support from relatives or institutions.[29] No analysis was actually presented of mortality in 1971–75 by distance moved and type of household. About 10 per cent of deaths in the 1971–81 period were to LS sample members in non-private households in 1971, even though they only accounted for 4 per cent of the initial sample population. Table 7.5 shows that the mortality levels during 1971–81 for members of non-private households in 1971 were markedly high for both migrants and non-migrants, with the levels (particularly for the latter group) in 1976–81 being generally lower than five years earlier. While the data for migrants in non-private households do not reflect when the move took place or whether it was a move from a non-private or private household, they do support the possibility of significant selection effects due to ill-health.

Tables 7.6 and 7.7 present similar data to those in Table 7.2 for males and females respectively, but disaggregated by the economic position in 1971 of the individuals concerned.

Mortality is markedly raised in almost every subgroup of the **sick** presented in the tables, usually by a factor of at least 2 compared with the rates for the 'all economic positions' category. Very high mortality ratios are to be seen for migrants of this subgroup moving within a region during the 1971–75 period; but these ratios have tended to fall sharply in the corresponding 1976–81 results, although they are still well in excess of unity.

Table 7.5 Mortality in 1971–81 of persons aged 5 years and over in 1971 and migration in the five years before the 1971 Census: SMRs by sex, distance moved, type of household in 1971 and period of death*

England and Wales SMR (approx. 95 per cent confidence intervals)

Distance moved 1966–71*	Males			Females		
	1971–75	1976–81	1971–81	1971–75	1976–81	1971–81
Member of private household						
Non mover	**96 (94– 98)**	**91 (89– 93)**	**99 (97–100)**	**99 (97–101)**	**97 (96– 99)**	**95 (94– 97)**
Mover	**95 (92– 99)**	**93 (89– 97)**	**100 (96–103)**	**97 (93–100)**	**98 (95–100)**	**95 (92– 97)**
Within same county	99 (95–104)	97 (92–101)	105(101–109)	100 (96–104)	103(100–106)	99 (96–102)
Within same local authority	101 (96–107)	98 (93–103)	108(103–113)	102 (98–107)	105(101–109)	100 (97–104)
Between local authorities	94 (85–102)	93 (84–102)	98 (90–105)	93 (85–101)	96 (90–102)	93 (87– 99)
Between counties in same region	83 (74– 93)	79 (69– 89)	87 (78– 95)	86 (77– 95)	85 (79– 92)	83 (76– 90)
Between regions	87 (77– 97)	87 (77– 98)	88 (79– 97)	87 (77– 96)	87 (81– 94)	87 (80– 94)
Members of non-private household						
Non mover	**212(194–230)**	**137(122–154)**	**178(166–191)**	**233(217–249)**	**139(125–155)**	**196(185–207)**
Mover	**191(172–210)**	**158(137–180)**	**179(165–193)**	**203(189–218)**	**152(135–171)**	**187(175–198)**
Within same county						
Within same local authority	190(162–222)	175(139–218)	186(164–211)	215(194–238)	149(124–178)	195(178–213)
Between local authorities	218(184–256)	188(143–242)	210(182–241)	206(181–233)	184(150–223)	199(179–221)
Between counties in same region	198(143–266)	166(110–240)	184(144–232)	200(157–251)	131 (88–188)	175(143–212)
Between regions	130 (91–181)	100 (68–141)	114 (88–145)	148(109–197)	128 (86–183)	140(110–175)

Source: OPCS Longitudinal Study

** The category of migrants from outside England and Wales has been omitted because of the very small numbers involved; however the relevant numbers have been included in the 'mover' category. Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

See Annex to table in Appendix 4.

Table 7.6 Mortality in 1971–81 of males aged 5 years and over in 1971 and migration in the five years before the 1971 Census: SMRs for selected age groups at death, distance moved and economic position in 1971

England and Wales SMR (approx. 95 per cent confidence intervals)

Distance moved 1966–71*	Economic position in 1971	Mortality 1971–81: age at death					Mortality in 1971–75: all aged 15 and over	Mortality 1976–81: all ages 15 and over
		15–44	45–64	65–74	75 and over	All ages 15 and over		
Non mover	All	101 (93– 109)	100 (97–103)	100 (97–102)	98 (95–100)	99 (98–100)	99 (97–101)	99 (98–101)
	Employed	87 (78– 96)	91 (88– 93)	84 (82– 87)	81 (76– 86)	87 (85– 89)	82 (79– 85)	91 (88– 93)
	Retired	–	180(145–221)	116(113–121)	101 (98–103)	105(103–107)	105(102–108)	105(102–108)
	Sick	794(606–1022)	316(292–343)	194(178–211)	137(104–177)	243(229–257)	286(265–309)	207(190–224)
	Other	107 (92– 124)	128(110–146)	105 (92–119)	109 (84–140)	112(103–121)	109 (96–124)	113(103– 25)
Mover	All	99 (91– 107)	99 (95–104)	100 (95–104)	108(103–113)	102(100–104)	102 (98–106)	102 (98–105)
	Employed	89 (81– 98)	87 (83– 91)	77 (72– 82)	74 (63– 86)	83 (80– 86)	77 (72– 82)	88 (84– 92)
	Retired	–	161(117–216)	116(109–124)	111(107–116)	113(109–118)	114(108–119)	112(106–118)
	Sick	757(521–1062)	322(282–366)	205(177–236)	222(142–330)	266(242–290)	300(264–339)	236(206–269)
	Other	115 (96– 137)	132(108–159)	93 (73–116)	98 (60–151)	112(100–125)	100 (82–121)	118(103–135)
Within a county	All	101 (91– 111)	103 (98–108)	106(101–111)	114(108–120)	107(104–110)	107(103–111)	107(103–111)
	Employed	89 (79– 99)	90 (85– 95)	81 (75– 87)	79 (66– 92)	86 (82– 90)	78 (72– 84)	92 (87– 97)
	Retired	–	176(107–245)	130(120–140)	118(112–124)	121(117–127)	121(114–128)	121(113–129)
	Sick	794(488–1000)	327(280–374)	200(167–233)	253(143–363)	268(241–295)	239(204–274)	239(204–274)
	Other	122 (96– 148)	155(120–190)	108 (78–138)	129 (62–196)	128(111–145)	118 (91–145)	133(111–155)
Between counties in a region	All	90 (66– 114)	90 (77–103)	88 (77– 99)	93 (83–104)	90 (84– 96)	90 (81–100)	91 (81– 98)
	Employed	76 (55– 102)	79 (66– 92)	64 (51– 80)	51 (28– 86)	72 (64– 81)	68 (56– 83)	74 (64– 86)
	Retired	–	173 (79–329)	101 (85–118)	98 (86–111)	100 (90–110)	94 (81–108)	105 (91–120)
	Sick	–	379(237–573)	226(136–353)	–	308(227–408)	419(286–591)	202(115–328)
	Other	102 (51– 183)	96 (44–181)	76 (36–139)	–	87 (60–123)	93 (50–159)	83 (50–130)
Between regions	All	86 (65– 107)	86 (73– 99)	82 (71– 93)	98 (86–100)	89 (83– 95)	90 (80–100)	89 (80– 98)
	Employed	81 (61– 107)	79 (67– 93)	64 (49– 82)	72 (40–123)	75 (67– 84)	77 (63– 93)	74 (64– 86)
	Retired	–	147 (63–289)	86 (72–102)	100 (88–113)	96 (86–106)	97 (84–111)	93 (80–108)
	Sick	–	206(116–340)	217(136–329)	–	197(139–271)	192(110–312)	202(127–306)
	Other	100 (56– 164)	106 (58–178)	70 (38–117)	–	91 (67–121)	53 (25– 97)	114 (80–158)

Source: OPCS Longitudinal Study.

**The category of migrants from outside England and Wales has been omitted because of the very small numbers involved; however the relevant numbers have been included in the 'mover' category. Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

See Annex to table in Appendix 4.

Table 7.7 Mortality in 1971–81 of females aged 5 years and over in 1971 and migration in the five years before the 1971 Census: SMRs for selected age groups at death, distance moved and economic position in 1971

England and Wales SMR (approx. 95 per cent confidence intervals)

Distance moved 1966–71*	Economic position in 1971	Mortality 1971–81: age at death					Mortality in 1971–75: all aged 15 and over	Mortality 1976–81: all ages 15 and over
		15–44	45–64	65–74	75 and over	All ages 15 and over		
Non mover	All	108 (97– 119)	101 (96– 106)	100 (98–102)	97 (96– 99)	99 (98– 100)	96 (94– 98)	100 (98–102)
	Employed	105 (89– 121)	81 (76– 87)	75 (71– 79)	68 (61– 77)	77 (75– 80)	70 (66– 75)	83 (79– 87)
	Retired	–	188(140– 248)	114(109–118)	101 (99–103)	104(102– 106)	104(101–107)	103(100–106)
	Sick	794(528–1148)	457(389– 533)	272(238–309)	164(138–193)	267(245– 290)	291(260–326)	244(215–275)
	Other	98 (84– 113)	109(102– 117)	101 (98–105)	96 (93– 99)	99 (97– 101)	96 (93– 99)	101 (99–104)
Mover	All	91 (81– 101)	98 (90– 106)	100 (95–105)	106(103–110)	103(100– 106)	106(103–110)	100 (97–103)
	Employed	82 (69– 98)	84 (75– 94)	73 (65– 81)	73 (56– 94)	78 (73– 84)	69 (62– 78)	85 (78– 93)
	Retired	–	132 (75– 214)	120(112–129)	111(106–115)	113(109– 117)	117(111–112)	108(103–113)
	Sick	1028(644–1556)	340(252– 450)	279(221–348)	182(139–233)	269(234– 308)	336(282–398)	197(154–247)
	Other	89 (76– 103)	102 (90– 159)	92 (85– 89)	97 (92–103)	95 (92– 100)	97 (91–103)	94 (89–100)
Within a county	All	91 (79– 103)	107 (98– 116)	108(102–114)	109(105–113)	107(104– 110)	112(108–116)	104(100–108)
	Employed	78 (61– 95)	91 (80– 102)	72 (63– 81)	72 (52– 92)	79 (73– 85)	70 (61– 79)	87 (79– 95)
	Retired	–	146 (65– 227)	134(123–145)	114(109–119)	118(113– 123)	123(116–130)	112(106–118)
	Sick	1000(400–1200)	342(234– 450)	276(209–343)	209(146–272)	285(241– 329)	363(293–433)	204(150–258)
	Other	91 (74– 108)	116(100– 132)	100 (91–109)	99 (92–106)	101 (96– 106)	102 (95–109)	99 (92–106)
Between counties in a region	All	104 (72– 136)	76 (56– 96)	79 (68– 90)	97 (88–108)	90 (83– 97)	92 (82–103)	88 (80– 98)
	Employed	107 (64– 167)	54 (33– 83)	68 (46– 96)	88 (32–192)	70 (56– 88)	64 (43– 93)	76 (56–100)
	Retired	–	–	90 (73–110)	100 (88–113)	97 (87– 107)	94 (81–109)	99 (85–114)
	Sick	–	619(227–1347)	366(147–755)	171 (78–324)	310(203– 454)	472(284–737)	160 (65–331)
	Other	86 (53– 133)	87 (57– 127)	68 (52– 86)	90 (74–108)	82 (71– 93)	86 (71–104)	78 (65– 94)
Between regions	All	102 (73– 131)	66 (48– 84)	81 (69– 93)	99 (89–109)	90 (83– 97)	93 (83–103)	89 (80– 98)
	Employed	108 (68– 164)	64 (41– 96)	91 (62–130)	–	84 (67– 105)	81 (55–115)	88 (65–116)
	Retired	–	–	85 (68–105)	101 (89–114)	96 (86– 107)	100 (86–116)	92 (79–107)
	Sick	–	–	340(111–794)	87 (32–189)	162 (92–2262)	136 (59–268)	197 (85–388)
	Other	90 (58– 134)	63 (41– 94)	69 (54– 88)	97 (81–116)	83 (72– 94)	83 (68–101)	82 (69– 98)

Source: OPCS Longitudinal Study.

**The category of migrants from outside England and Wales has been omitted because of the very small numbers involved; however the relevant numbers have been included in the 'mover' category. Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

See Annex to table in Appendix 4.

This adds evidence to a possible explanation of local or short distance migration and subsequent raised mortality in terms of ill health selection. Mortality ratios are also raised in the relatively small numbers of "sick" who moved between regions, but the SMRs for the two periods suggest no major change in level.

Selection effects are also evident for those who were **employed** in 1971. Mortality levels in 1976–81 were generally higher than for 1971–75 for both non-movers and movers, particularly within a county. These findings support the contention that the 'healthy' are initially selected through the employed category (as defined, by the 1971 Census) and become progressively sick or otherwise as time progresses. However, while mortality levels for the employed were mostly well below the average level, the differential was not so great for those moving within a county as compared with longer distances — for example, SMRs of 86 and 75 respectively for males. The lowest level of mortality for the employed was for those persons moving beyond a county.

On the other hand, the mortality levels of males who were **retired** in 1971 hardly changed between the two periods of death; but for females there is some indication of a fall for those moving locally. Levels of mortality for the retired, not unsurprisingly because of age effects, are somewhat higher than for the employed. Both males and females who were retired, and had moved within a county prior to the 1971 Census, had mortality some 20 per cent in excess of those moving longer distances who had broadly average mortality.

Tables 7.6 and 7.7 also show the effect of age and economic position on the mortality differentials according to distance moved. In each age-group the SMRs are generally below the national average for the employed; and this differential appears to widen with increasing age, particularly for males. The relatively high mortality ratio for those who were retired or sick in 1971 and died before age 65 is apparent, presumably because a high proportion of retired persons was already 'unhealthy'. At older ages the influence of the retired category comes more into play. There is a marked contrast between the mortality levels of retired, elderly movers within a county, movers further afield, and non-movers. For the age-group 65–74 (males) the SMRs for retired movers and non-movers are similar, but for the latter group there is a differential according to distance moved. Those moving within a county had an SMR of 130 during the 1971–81 decade compared with 101 for those moving within the region and 86 for those moving between regions. For those aged 75 and over a similar pattern is evident. In general for each age and migrant group the differences in mortality levels by economic position are similar. The implication of this finding is that the composition of a local population in terms of economic position would tend to have stronger explanatory power than distance moved in accounting for that area's mortality level.

7.3 Mortality during 1971–81 by distance of migration 1966–71 between wards clustered socio-economically.

It has already been mentioned in section 7.1 that the extent to which mortality following recent, possibly health-related, migration could account for regional differences in mortality would appear to be small, being discernible only among some sub-groups of the young.[30] A similar question can be posed in respect of migration to areas defined by their socio-economic characteristics, in particular, such areas as retirement areas and New Towns. Whilst the latter are fairly easily identified as areas of recent rapid population growth, the former are more difficult to characterise succinctly.[31]

An alternative approach is provided by the classification of areas at census ward level into clusters with similar socio-economic characteristics. These clusters are the same as those described and used in sections 6.3 and 6.4 of the previous chapter. Forty measures of socio-economic characteristics of wards, derived from 1971 Census data, were used in a cluster analysis to form groups of wards with similar socio-economic profiles.[30] Included in the forty measures were the proportion of persons in private households who were aged 65 or over, and the proportion of households no longer resident in the same place as five years before. However, no direct measure of migration of the elderly was included.

Table 7.8 presents the distribution of males in the LS sample by the cluster (socio-economic) to which their ward of residence in 1971 is allocated, and by distance moved in 1966–71. (Tabulations for females are not readily available.) The titles given to these clusters and families are given in Chapter 6 (as with analyses in Chapter 6, readers should recognise the limitations of the summary titles and refer to the original paper which describes the characteristics of the people in each cluster more fully[32]). Although there is some correspondence in Table 7.8 between cluster category and migration — for example, a high percentage of migrants from outside the region to planned development areas (Cluster 2), military bases (Cluster 7), overspill estates (Cluster 16) and student areas (Cluster 28) — many expected correlations are absent — for example, the migration percentages are not especially high in New Towns (Cluster 1), or retirement areas (Clusters 35, 36). Readers should also note that the data for Clusters 23 and 24 have been omitted from the remaining analyses in this chapter because of the very small numbers involved for England and Wales; however, they have been included in the 'all families' category.

SMRs of males by socio-economic cluster of residence in 1971 and distance of migration in the five years leading up to the 1971 Census are set out in Table 7.9. Numbers of deaths at this level of detail, and when analysed by cause of death, are generally very small for those categories involving migration beyond a local authority; therefore Figure 7.2 presents the same information at the 'family' level.

The data in Table 7.9 show considerable variation by cluster and family. As noted in Chapter 6, 'high status'

Table 7.8 Percentage distribution of males by distance moved in 1966–71 and ward cluster of residence in 1971

England and Wales

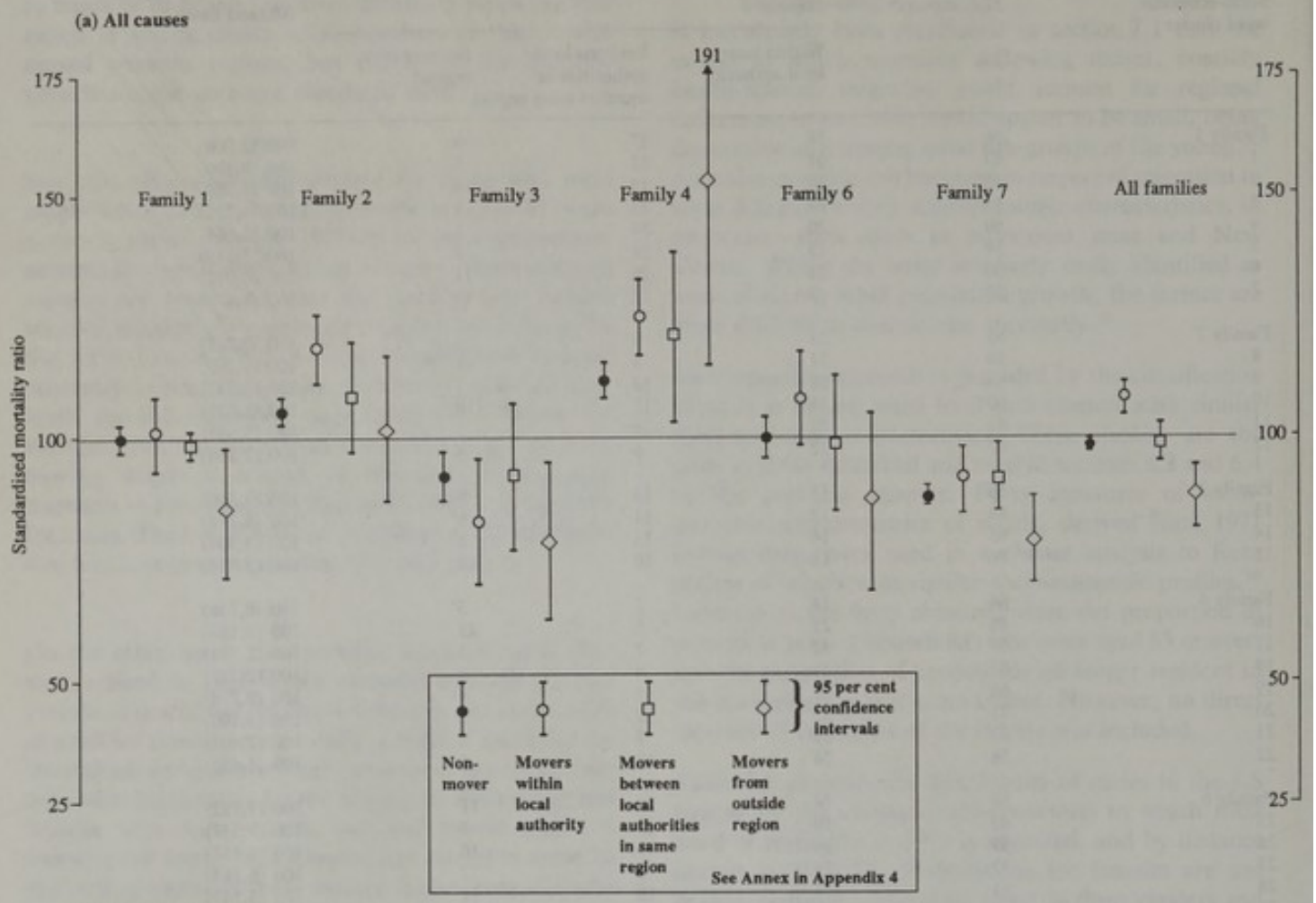
Socio-economic ward cluster	Non movers*	Movers			All (and base)
		Within same local authority	Between local authorities or counties same region	From outside region†	
Family 1	56	18	17	9	100(52,900)
1	63	21	11	5	100 (8,106)
2	53	20	14	13	100 (4,800)
3	44	24	23	9	100 (4,721)
4	60	20	14	5	100(12,664)
5	59	15	18	8	100(13,119)
6	50	13	26	11	100 (8,017)
7	30	9	12	49	100 (1,473)
Family 2	65	21	9	6	100(57,261)
8	66	21	8	4	100(13,105)
9	66	18	10	5	100(13,392)
10	60	18	12	10	100(12,821)
11	61	28	6	5	100 (5,695)
12	67	22	6	4	100(12,248)
Family 3	65	13	13	9	100(15,216)
13	64	13	14	9	100 (8,278)
14	65	14	13	8	100 (3,904)
15	76	13	10	8	100 (3,034)
Family 4	66	24	7	3	100(40,736)
16	68	25	5	23	100 (8,168)
17	57	32	7	3	100 (2,761)
18	67	24	6	3	100(12,337)
19	68	22	7	3	100 (9,774)
20	71	17	10	3	100 (3,100)
21	57	33	7	3	100 (2,961)
22	58	24	12	7	100 (1,635)
Family 6	58	19	12	11	100(27,732)
25	62	19	12	7	100 (7,537)
26	59	16	15	10	100 (2,601)
27	57	25	6	12	100 (6,183)
28	51	14	18	18	100 (3,545)
29	58	18	13	11	100 (7,866)
Family 7	60	14	17	9	100(55,788)
30	56	13	20	10	100(13,364)
31	65	15	15	5	100(13,393)
32	63	16	14	7	100(10,599)
33	61	11	18	10	100 (4,620)
34	57	12	20	11	100 (4,551)
35	57	15	18	10	100 (6,510)
36	56	20	14	10	100 (2,751)

Source: OPCS Longitudinal Study.

** Includes males aged 0–4 years in 1971 and the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

† Including migrants from outside England and Wales.

Figure 7.4 Male mortality (SMRs) in 1971-81 by socio-economic area of residence in 1971 and distance moved 1966-71, England and Wales



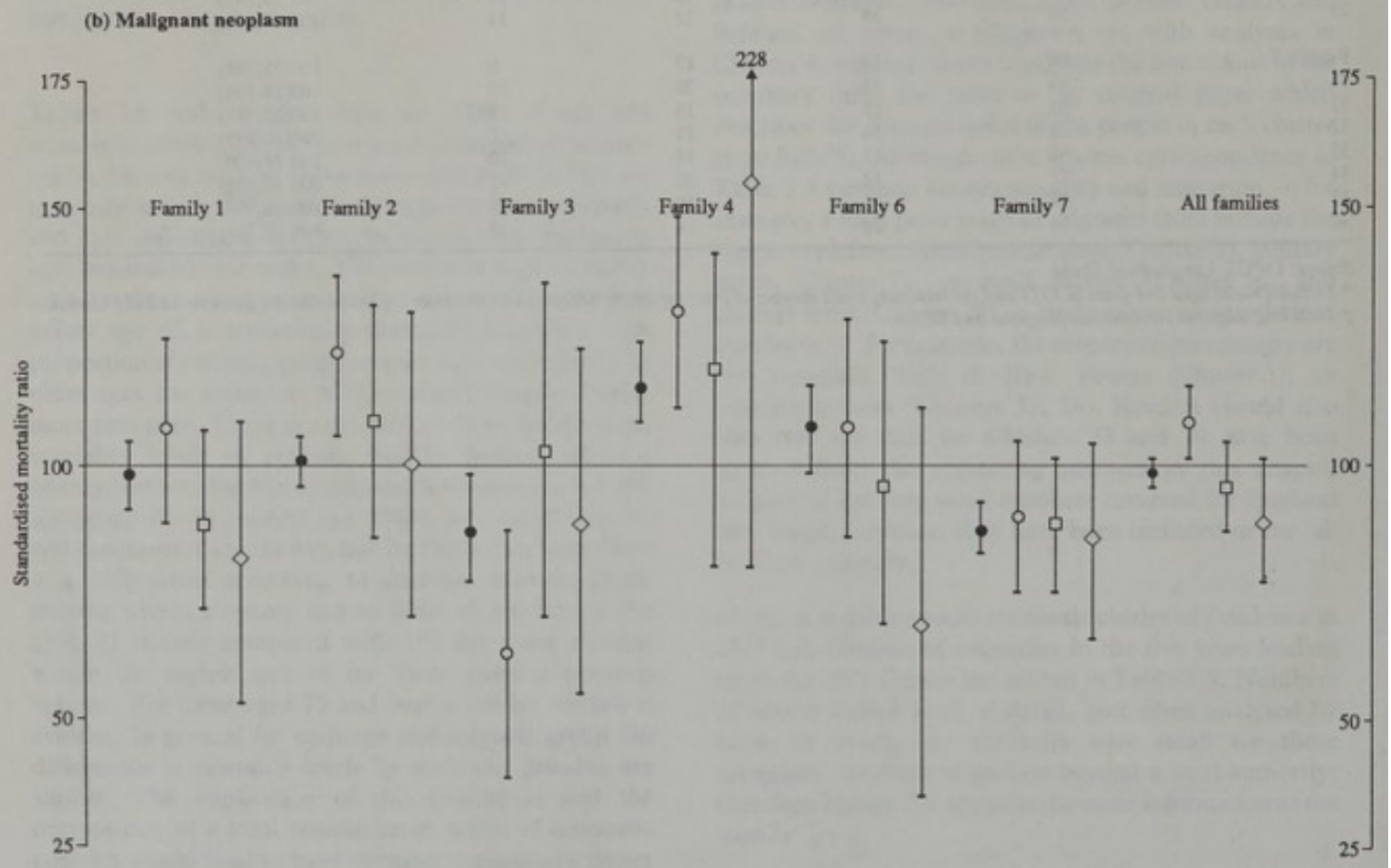
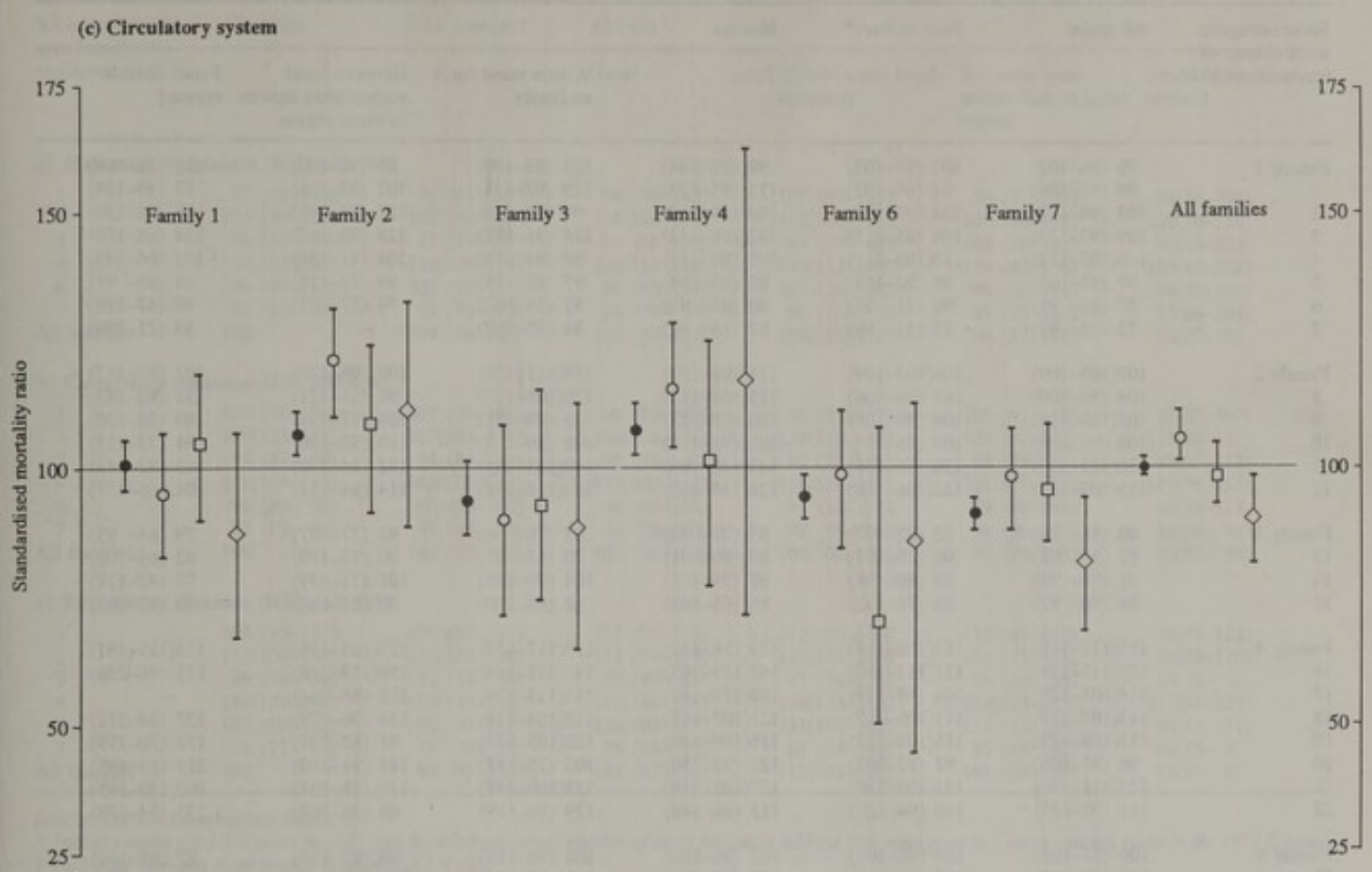


Figure 7.4 *continued*



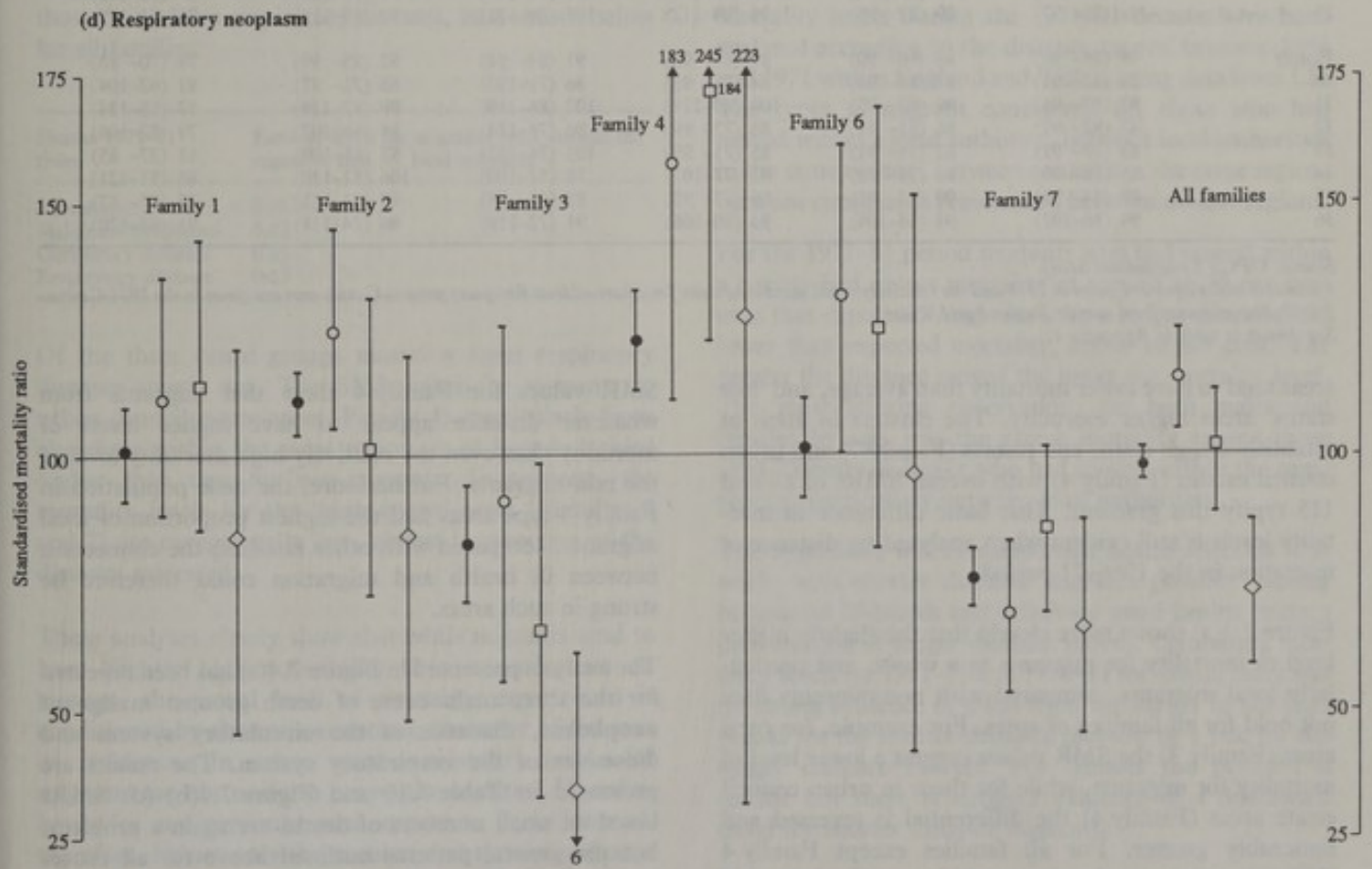


Table 7.9 Male mortality in 1971–81 SMRs for socio-economic ward cluster of residence in 1971 and distance moved 1966–71

England and Wales SMR (approx. 95 per cent confidence interval)

Socio-economic ward cluster of residence in 1971	All males	Non movers*	Movers			
			Total	Within same local authority	Between local authorities/counties in same region	From outside region†
Family 1	99 (96–102)	100 (97–103)	98 (92–104)	101 (93–109)	99 (96–102)	85 (72– 98)
1	98 (91–106)	94 (86–102)	112 (95–129)	119 (97–141)	105 (91–106)	87 (40–134)
2	103 (94–112)	104 (93–115)	100 (83–117)	98 (77–124)	112 (83–149)	88 (58–130)
3	109 (97–122)	100 (85–115)	122(101–143)	118 (91–151)	129 (98–167)	114 (68–178)
4	108(102–114)	110(103–117)	101 (88–114)	99 (84–116)	104 (81–130)	101 (66–149)
5	97 (91–102)	98 (92–104)	93 (82–104)	97 (81–115)	99 (83–118)	69 (49– 93)
6	87 (80– 95)	90 (81– 99)	80 (67– 93)	81 (59–107)	74 (57– 93)	99 (67–139)
7	72 (54– 93)	75 (51– 99)	67 (36– 98)	81 (35–159)	—	53 (21–109)
Family 2	107(105–109)	106(103–109)	114(108–120)	119(112–126)	109 (98–120)	102 (87–117)
8	104 (99–109)	101 (96–106)	115(102–128)	120(105–137)	96 (75–121)	131 (92–182)
9	105(100–110)	104 (99–109)	110 (98–122)	115 (99–131)	109 (87–131)	89 (58–120)
10	100 (96–105)	100 (95–105)	102 (92–112)	102 (89–116)	110 (92–130)	91 (73–113)
11	130(121–139)	126(116–136)	143(120–166)	140(115–165)	152 (84–220)	163 (82–245)
12	115(109–120)	122(106–118)	128(114–142)	134(118–152)	114 (84–151)	104 (66–157)
Family 3	90 (86– 94)	92 (87– 97)	85 (77– 93)	83 (70– 96)	92 (77–107)	79 (63– 95)
13	92 (87– 98)	96 (89–103)	80 (69– 91)	70 (55– 87)	90 (73–110)	82 (63–106)
14	91 (83– 99)	89 (80– 98)	97 (79–115)	104 (79–135)	101 (71–139)	78 (47–121)
15	84 (76– 92)	83 (74– 92)	85 (65–105)	92 (63–130)	90 (57–136)	70 (42–109)
Family 4	115(112–118)	112(108–116)	125(118–132)	125(117–133)	121(103–139)	153(115–191)
16	125(117–134)	121(112–130)	143(123–163)	141(121–164)	159(113–218)	115 (46–236)
17	114(101–128)	104 (89–119)	139(110–168)	143(113–179)	158 (86–264)	—
18	113(107–119)	111(105–117)	121(107–135)	118(104–134)	133 (96–179)	137 (84–212)
19	115(108–121)	115(108–122)	115(100–130)	120(103–138)	91 (62–128)	122 (70–199)
20	96 (87–106)	92 (82–102)	121 (92–150)	105 (75–141)	141 (91–210)	227 (83–495)
21	123(111–136)	121(106–136)	127(105–149)	123(100–148)	124 (69–204)	302(130–595)
22	111 (97–125)	110 (94–126)	113 (86–140)	129 (96–169)	69 (36–204)	1,235 (54–278)
Family 6	100 (97–103)	100 (96–104)	102 (94–110)	108 (98–118)	99 (85–113)	87 (69–105)
25	105 (98–112)	104 (96–112)	110 (94–126)	111 (92–132)	108 (82–140)	110 (66–172)
26	103 (91–116)	108 (94–122)	87 (64–110)	88 (59–125)	77 (46–122)	120 (48–248)
27	112(104–120)	113(103–123)	110 (93–127)	118 (98–141)	129 (78–202)	76 (48–113)
28	94 (85–103)	93 (82–104)	98 (80–116)	101 (75–132)	99 (74–130)	87 (51–140)
29	91 (85– 97)	89 (82– 96)	98 (84–112)	107 (89–128)	92 (69–119)	78 (51–115)
Family 7	88 (86– 90)	88 (86– 90)	89 (85– 93)	91 (84– 98)	92 (85– 99)	79 (70– 88)
30	86 (82– 91)	87 (81– 93)	84 (75– 93)	86 (71–103)	83 (71– 97)	81 (62–104)
31	92 (87– 96)	90 (85– 95)	100 (89–111)	102 (86–119)	99 (82–118)	97 (68–134)
32	87 (82– 92)	86 (81– 91)	88 (77– 99)	96 (78–114)	84 (66–102)	79 (52–106)
33	83 (77– 91)	83 (75– 91)	85 (71– 99)	103 (74–132)	87 (65–109)	61 (37– 85)
34	85 (78– 93)	83 (74– 92)	92 (77–107)	76 (52–100)	106 (82–130)	86 (51–121)
35	89 (84– 94)	90 (84– 96)	86 (77– 95)	82 (66– 98)	97 (83–111)	72 (57– 87)
36	94 (86–102)	94 (84–104)	93 (80–106)	91 (72–110)	96 (74–118)	91 (62–120)

Source: OPCS Longitudinal Study.

** Includes males aged 0–4 years in 1971 and the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

† Including migrants from outside England and Wales.

See Annex to table in Appendix 4.

areas tend to have lower mortality than average, and 'low status' areas higher mortality. The clusters in areas of established high status and resorts (Family 7) and urban council estates (Family 4) with overall SMRs of 88 and 115 typify this gradient. This basic difference in mortality levels is still evident when analysed by distance of migration in the 1966–71 period.

Figure 7.4(a) shows more clearly that the slightly higher level of mortality for migrants as a whole, and particularly local migrants, compared with non-migrants does not hold for all families of areas. For example, for rural areas (Family 3) the SMR values suggest a lower level of mortality for migrants, while for those in urban council estate areas (Family 4) the differential is reversed and noticeably greater. For all families except Family 4 (Urban council estates) migrants from outside the region have lower mortality levels than local migrants. The SMR values for Family 4 show that migrants from whatever distance appear to have higher levels of mortality than even the relatively high mortality level of the non-migrants. Furthermore, the male population in Family 4-type areas had the highest proportion of local migrants, compared with other families; the connection between ill health and migration could therefore be strong in such areas.

The analysis presented in Figure 7.4(a) has been repeated for the three main cause of death groups: **malignant neoplasms, diseases of the circulatory system** and **dieseases of the respiratory system.** The results are presented in Table 7.10 and Figure 7.4(b)–(d) SMRs based on small numbers of deaths are again a problem, but the general patterns outlined above for all causes appear to hold for the three separate cause groups. However, the mortality differential between local and

Table 7.10 Male mortality in 1971–81: SMRs for socio-economic family of residence in 1971 and distance moved 1966–71, for selected causes
England and Wales SMR (approx. 95 per cent confidence interval)

Socio-economic area family of residence in 1971	All males	Non movers*	Movers			
			Total	Within same local authority	Between local authorities in same region	From outside region†
a) Malignant neoplasms (ICD 140–209)						
1	97 (91–103)	98 (91–105)	96 (84–108)	107 (89–125)	89 (71–107)	81(54–108)
2	104 (99–109)	101 (96–106)	116(104–128)	122(106–138)	109 (86–132)	100(70–130)
3	86 (78– 94)	87 (77– 97)	83 (66–100)	63 (39– 87)	103 (70–136)	89(55–123)
4	119(112–126)	116(108–124)	130(114–146)	130(112–148)	119 (82–156)	155(82–228)
6	106 (99–113)	108 (99–117)	98 (83–113)	107 (86–128)	96 (68–124)	68(35–101)
7	88 (84– 92)	88 (83– 93)	88 (79– 97)	90 (75–105)	88 (75–101)	85(66–104)
All families	100	99 (96–102)	102 (97–107)	109(102–116)	96 (87–105)	89(77–101)
b) Circulatory diseases (ICD 390–458)						
1	100 (96–104)	101 (96–106)	98 (90–106)	95 (83–107)	105 (91–119)	87(67–107)
2	108(105–111)	107(103–111)	116(108–124)	121(110–132)	108 (92–124)	111(89–133)
3	93 (87– 99)	94 (87–101)	91 (79–103)	90 (71–109)	95 (74–116)	89(65–113)
4	109(105–113)	108(103–113)	113(103–123)	116(104–128)	101 (77–125)	117(71–163)
6	94 (89– 99)	95 (90–100)	94 (84–104)	98 (84–112)	89 (70–108)	86(59–113)
7	92 (89– 95)	91 (88– 94)	94 (88–100)	98 (88–108)	96 (86–106)	81(68– 94)
All families	100	100 (98–102)	101 (98–104)	106(101–111)	99 (93–105)	90(82– 98)
c) Respiratory diseases (ICD 460–519)						
1	103 (95–111)	101 (92–110)	108 (91–125)	112 (88–136)	114 (86–143)	84(46–122)
2	112(106–118)	111(104–118)	114 (99–129)	125(105–145)	102 (73–131)	84(48–120)
3	80 (70– 90)	83 (72– 94)	68 (49– 87)	91 (56–126)	66 (33– 99)	34 (6– 62)
4	130(121–139)	123(113–133)	161(138–184)	158(133–183)	184(123–245)	127(31–223)
6	107 (98–116)	102 (92–112)	124(101–147)	131(100–162)	125 (81–169)	96(41–151)
7	76 (71– 81)	76 (70– 82)	75 (65– 85)	68 (53– 83)	85 (68–102)	66(45– 87)
All families	100	98 (95–101)	104 (97–111)	115(105–125)	101 (89–113)	73(59– 87)

Source: OPCS Longitudinal Study.
** Includes males aged 0–4 years in 1971 and the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*
† Including migrants from outside England and Wales.
See Annex to table in Appendix 4.

longer distance migrants appears to be much wider for those dying from respiratory diseases, as is shown below for all families:

Deaths 1971–81 from	Ratio of SMR for migrants from outside the region to that for local migrants
All causes	0.81
Malignant neoplasms	0.82
Circulatory diseases	0.85
Respiratory diseases	0.63

Of the three cause groups mortality from respiratory diseases stands out. The SMR value for migrants to urban council estate areas (Family 4), particularly from elsewhere within the same region, is at least one third higher than that for non-migrants. In contrast, the mortality levels for the 'high status' areas (Families 3 and 7) are exceptionally low, almost irrespective of the distance migrated.

These analyses clearly show that while migrants tend to have slightly higher mortality than non-migrants on average, the actual level of mortality experienced is conditioned by the socio-economic character of the area of residence. In other words, mortality levels for migrants are not uniform across the country. Mortality levels for any particular area appear to be influenced, therefore, by not only the number and type of migrants but also the socioeconomic condition of the individuals concerned and their environment.

7.4 Summary

Mortality levels during the 1971–81 decade have been analysed according to the distance moved between 1966 and 1971 within England and Wales, using data from LS. The types of migrant considered are those who had moved within a local authority, between local authorities in the same county, between counties in the same region, between contiguous regions and between distant regions.

For the 1971–81 period migrants who had moved within a county had excess mortality of some 5 to 10 per cent over that expected. Migrants over a longer distance had lower than expected mortality, about 10 per cent. The greater the distance moved the lower the mortality level. The most striking observation, for both males and females by age, was the excess mortality among those aged 75 years and over who had moved within the same county, particularly between local authorities.

The hypothesis was examined that health selection is at work, with shorter distance migrants possibly moving because of ill-health and relatively good health being a precondition of longer distance moves. Comparing mortality levels for 1971–75 and 1976–81 for males, there was no strong evidence of a fall from the earlier to the later period for the shorter distance movers, or a rise for the longer distance movers. For females the position is similar but there is stronger evidence of a downward trend for shorter distance migrants.

The effect of migration status on the mortality differences between the socio-economic area clusters was also

examined for males. The marked gradient between low and high status areas was still evident when analysed by distance moved in the 1966–71 period. However, the slightly higher level of mortality for migrants as a whole, and particularly local migrants, compared with non-migrants did not hold for all families. The levels for movers and non-movers in Areas of Established High Status and Resorts were similar (SMRs about 90), whereas for Urban Council Estate Areas the differential was as expected — SMRs of 125 for movers and 112 for non-movers. With the exception of those in Urban Council Estate Areas, migrants from outside the region had lower mortality levels than more local migrants.

The above analysis was repeated for the three main cause of death groups: **malignant neoplasms, circulatory diseases** and **respiratory diseases**. The same general patterns persist.

These analyses show, therefore, that while migrants tend to have slightly higher mortality than non-migrants on average, the actual level of mortality is also conditioned by the socio-economic character of the area of residence and the individuals concerned. In other words, mortality levels for migrants are by no means uniform across the country.

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8 Mortality by place of birth

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8.1 Introduction

There is increasing evidence that the environment in intra-uterine and early post-natal life has an effect on the risk of adult chronic disease.[1,2] This evidence comes mainly from epidemiological studies. Processes which could link early environment with adult health are not well understood, but may include long-term consequences of fetal growth retardation, an effect of infant feeding in programming metabolism, and persisting responses to infection.

At the beginning of this century there were large variations in the early-life environment from place to place in England and Wales. These were documented in a series of government reports into maternal and child health and mortality.[3,4,5,6] Large changes in children's housing, exposure to infection, nutrition and parental care were brought about partly by the Industrial Revolution. Industrial towns which grew up around coal-mining areas became densely populated, houses were overcrowded, and hygiene and sanitation were poor. High fertility in some communities, especially mining towns, compounded domestic overcrowding. In textile and pottery towns mothers returned to work soon after their babies' birth, and infants were bottle-fed and placed in the care of untrained minders. Fetal growth in industrial towns and northern counties, dependent as it was on the health and physique of the mothers, contrasted with that in the richer agricultural counties in the south and east. Such differences in the environment were reflected in child mortality. In 1921–25, for example, infant mortality ranged from 44 per 1,000 in rural West Sussex to 114 in Burnley.

If the environment in early life is an important determinant of patterns of adult disease, a person's risk of disease will be predicted by place of birth within England and Wales. This can be explored by using the place of birth information recorded on death certificates. Examination of patterns of death in life-time migrants, as distinct from people who spent their lives in one place, allows, at least in theory, separation of the effects of the environment in early life and those encountered later on.

Four leading causes of death are analysed in this chapter: ischaemic heart disease, stroke, chronic bronchitis and stomach cancer. Mortality from these serves as a useful indicator of incidence, and numbers of deaths are sufficient to allow detailed geographical analysis. For each of them there is strong evidence for the importance of the early-life environment.[7,8,9,10] This evidence comes from studying the geography of the diseases, from retrospective studies of the childhoods of patients, and from prospective studies of risk factors in children and young adults.

8.2 Method of analysis

Place of birth within England and Wales is recorded on death certificates, but not routinely coded for analysis. However, for a trial period from April 1969 to December 1972 OPCS coded the place of birth. There were 1,907,999 deaths in England and Wales among people who were also born there. For each death seven items of information were made available: (i) place of birth; (ii) place of usual residence at time of death; (iii) sex; (iv) age at death in years; (v) year of death; (vi) underlying cause of death (coded to the Eighth Revision of the International Classification of Diseases (ICD)); and (vii) occupation (for 1970–72 only).

Place of birth and death were coded to 80 county boroughs (CBs, large towns), 15 London boroughs (LBs), and 59 administrative counties (ACs, counties excluding the county boroughs) which together comprised England and Wales.[7] (See Chapter 2 for a brief history of changes in area boundaries.) Montgomeryshire AC and Radnorshire AC were combined and places of birth in Rutlandshire AC were coded as occurring in Leicestershire AC. Some places of birth were given as 'London' without specifying the borough, and were analysed separately. Analyses of places of birth and death were therefore based on 153 areas.

The analyses were undertaken for the sexes separately and in combination; and ages at death were grouped into ten year bands, from 0 to 9 up to 90 and over. Year of death was ignored because the data spanned less than four years. As mentioned already, the four causes of death analysed were (i) **ischaemic heart disease** (ICD 410–414), (ii) **stroke** (ICD 431–438), (iii) **chronic bronchitis** (ICD 490–492) and (iv) **stomach cancer** (ICD 151). Occupation was used in conjunction with the Registrar General's 1970 Classification of Occupations to obtain an indication of social class at death.

The place where each individual lived was known only at birth and death. There was no other information on moves, either in number, timing or location. There was no denominator to calculate death rates for those who were born in one area and died in another, and therefore the proportion of all deaths that were due to each cause had to be used. To explore how these proportions varied according to birthplace and place of death a statistical model was employed. Strata (k) of potentially confounding variables (age, sex and social class) for each place of birth (i) and place of death (j) were formed for which the proportion of deaths that were due to a cause (p_{ijk}, derived as r_{ijk} out of n_{ijk}) could be calculated.

A log-linear regression model with a Poisson error structure was used.

where $\log(p_{ijk}) = \beta_i + \delta_j + \sigma_k + \text{error}$,
β_i = place of birth effect for place i,
δ_j = place of death effect for place j,
σ_k = stratum effect for combination k,

Specifically, for the maximum likelihood estimates,

$$\exp(\beta_i) = \frac{\Sigma_{j,k}\, r_{ijk}}{\Sigma_{j,k}\, n_{ijk} \exp(\delta_j + \sigma_k)} = \frac{O_i}{E_i}$$

The numerator is the number of deaths observed among those born in place i (O_i). The denominator is the number of deaths expected among those born in place i (E_i), allowing for place of death ($\exp(\delta_j)$) and stratum ($\exp(\sigma_k)$) effects. Thus $\exp(\beta_i)$ is in the form of an

indirectly standardised index, such as the proportional mortality ratio (PMR), and hereinafter it is referred to as the *place of birth PMR*. An equivalent result applies for both 'place of death PMRs' and the stratum effects. (A PMR is normally defined as the percentage ratio of the number of deaths observed from a particular cause in the group studied to the number expected from the age-specific proportions of total deaths attributed to that cause for England and Wales.) In order to specify a unique model solution it was necessary to ensure that the sums of observed and expected deaths over all places of birth and over all places of death were identical. This strengthened the analogy with the familiar PMR. This approach is similar to those described by Mantel and Stark[11] and Osborn.[12]

Intuitively the model can be described in the following way. For each disease and place two numbers were derived, based on proportions of deaths, representing the effect on the disease of either birth or death in that place. A number summarising the combined effect of the age, sex and social class distribution on death from that cause was also derived. When these three numbers were multiplied together they estimated the proportion of deaths in that place that were due to that cause. For example, in the analysis of stomach cancer in Caernarvonshire AC, numbers of 1.439 for the effect of place of birth, and 1.081 for the place of death were derived. For 60–69 year old men of all social classes the third number was 0.0332. The product of these three numbers, $1.439 \times 1.081 \times 0.0332 = 0.0516$, estimated the proportion of deaths due to stomach cancer among men aged 60 to 69 who were born and died in Caernarvonshire AC. The numbers 1.439 and 1.081 were chosen so that, when combined with data on all migrants who were either born in the county or moved there before death, they gave a proportion of deaths due to stomach cancer as close as possible to the observed value. In this particular example the estimated proportion of 0.0516 may be compared with the observed value of 0.0519 (29 out of 559 deaths). These numbers are referred to as the 'place of birth PMR' and the 'place of death PMR'. Their average value is 1.000.

To calculate confidence intervals for the PMRs, the denominator was regarded as fixed, and the numerator was taken to be an observation from a Poisson distribution. To test the importance of the place of birth PMRs, the goodness of fit of the full model was compared with that for the submodels in which no β_i terms appeared. Likelihood ratio statistics (deviances and measures based upon the chi-square criterion of

$$\sum \frac{(O_i - E_i)^2}{E_i}$$

were used; and where these could be compared they gave similar results.

The strength of the effect of place of birth or place of death on risk of death from the disease may not be represented accurately by the size of the PMR. PMRs are based upon proportions of deaths from one cause in relation to all other causes. A high value may reflect deficits of deaths from other causes rather than a high risk associated with the place of birth or death. This is the fundamental disadvantage of proportional data analysis. Also, the range of values taken by the PMRs is not immediately comparable across diseases which occur with different frequency. Stomach cancer, which caused fewer deaths than the other three diseases, will tend to have a greater spread of PMRs.

8.3 Place of birth and place of death effects

8.3.1 Proportional mortality ratios by place of birth

Table 8.1 gives the numbers of deaths by age and sex that occurred from April 1969 to December 1972 according to selected diseases. The results of the statistical modelling are given in detail in Appendix 4; this lists, for each disease and each of the 153 areas, the place of birth PMR, the place of death PMR, 95 per cent confidence intervals for these statistics, and their rank positions. Tables 8.2 to 8.5 are summaries of these statistics. They list areas whose place of birth PMRs are in the top and bottom tenth of the distributions and are significantly different from unity using a test at the five per cent level (i.e. the confidence interval does not contain unity). For each disease there is a considerable spread in the PMRs, particularly for stomach cancer.

Table 8.1 Numbers of deaths by sex and age-group for selected causes, 1969–72

Persons born in England and Wales

Sex and age-group	Selected cause of death				
	Ischaemic heart disease	Stroke	Bronchitis	Stomach cancer	All causes
Males					
0–9	7	53	176	1	36,773
10–19	11	37	26	1	7,375
20–29	188	71	26	20	9,977
30–39	2,084	214	132	157	11,741
40–49	14,535	1,386	1,024	944	40,170
50–59	41,853	6,036	6,145	3,522	113,756
60–69	88,227	22,956	22,926	9,018	269,516
70–79	83,202	36,704	27,647	7,892	292,329
80–89	39,719	26,662	12,174	2,834	164,364
90 and over	5,371	4,111	1,223	180	25,522
All ages	**275,197**	**98,230**	**71,499**	**24,569**	**971,523**
Females					
0–9	7	35	123	0	26,640
10–19	1	33	18	0	3,311
20–29	43	48	22	25	4,965
30–39	346	202	93	109	8,137
40–49	2,214	1,155	526	476	27,627
50–59	9,371	4,690	1,876	1,485	67,089
60–69	36,085	18,828	4,795	4,159	156,703
70–79	72,518	52,295	7,847	6,637	284,513
80–89	64,904	61,440	6,507	4,642	285,073
90 and over	14,141	14,609	1,401	571	72,418
All ages	**199,630**	**153,335**	**23,208**	**18,104**	**936,476**

8.3.2 Effect of social class adjustment

The results in Tables 8.2 to 8.5 (and in Appendix 4) are not adjusted for social class. However, this may be

Table 8.2 Areas with place of birth PMRs for ischaemic heart disease in the top tenth and bottom tenth of the distribution and statistically significantly different from unity, 1969–72

Area	PMR	Area	PMR
Huddersfield CB	1.12	Somerset AC	0.94
Westmorland AC	1.11	Nottingham CB	0.94
Cumberland AC	1.10	Wight, Isle of AC	0.93
Dewsbury CB	1.09	East Sussex AC	0.93
Carmarthenshire AC	1.08	Caernarvonshire AC	0.93
Cardiganshire AC	1.08	West Sussex AC	0.92
Northumberland AC	1.08	Great Yarmouth CB	0.92
Preston CB	1.08	Bournemouth CB	0.90
Halifax CB	1.08	Anglesey AC	0.89
Yorkshire W Riding AC	1.06		
Bradford CB	1.06		

Table 8.3 Areas with place of birth PMRs for stroke in the top tenth and bottom tenth of the distribution and statistically significantly different from unity, 1969–72

Area	PMR	Area	PMR
Anglesey AC	1.19	Hackney LB	0.92
Southport CB	1.13	Southwark LB	0.92
Lincs (Kesteven) AC	1.12	Burnley CB	0.92
Preston CB	1.11	Camden LB	0.91
Cambridgeshire AC	1.10	Birkenhead CB	0.91
Wigan CB	1.09	Dudley CB	0.91
Blackburn CB	1.09	Newham LB	0.90
Northamptonshire AC	1.09	Hammersmith LB	0.90
Denbighshire AC	1.07	Westminster LB	0.90
Yorkshire N Riding AC	1.07	Lewisham LB	0.89
		Tower Hamlets LB	0.89
		Grimsby CB	0.88
		Bootle CB	0.86

Table 8.4 Areas with place of birth PMRs for chronic bronchitis in the top tenth and bottom tenth of the distribution and statistically significantly different from unity, 1969–72

Area	PMR	Area	PMR
Hastings CB	1.24	Norfolk AC	0.87
Grimsby CB	1.19	Bradford CB	0.87
Monmouthshire AC	1.17	Yorkshire E Riding AC	0.87
Birkenhead CB	1.17	Lincs (Kesteven) AC	0.86
Glamorganshire AC	1.17	Halifax CB	0.85
Stockport CB	1.15	Essex AC	0.85
St Helens CB	1.15	Norwich CB	0.83
Wigan CB	1.14		
Westminster LB	1.13		
Cardiff CB	1.13		
Warley CB	1.12		

Table 8.5 Areas with place of birth PMRs for stomach cancer in the top tenth and bottom tenth of the distribution and statistically significantly different from unity, 1969–72

Area	PMR	Area	PMR
Caernarvonshire AC	1.44	Lincs (Lindsey) AC	0.81
Hartlepool CB	1.32	Gloucestershire AC	0.81
Merionethshire AC	1.31	Buckinghamshire AC	0.81
Anglesey AC	1.29	Leicestershire AC	0.79
Southwark LB	1.25	Bury CB	0.78
Denbighshire AC	1.21	East Sussex AC	0.77
Tower Hamlets LB	1.20	Wiltshire AC	0.77
Gateshead CB	1.20	Reading CB	0.73
Cumberland AC	1.20	Blackpool CB	0.72
Newcastle on Tyne CB	1.19	Hertfordshire AC	0.71
Kingston upon Hull CB	1.19	Oxford CB	0.67
Swansea CB	1.18	Southport CB	0.64

estimated from the final occupation for men dying between 1970 and 1972. The effect of social class on place of birth and place of death PMRs was explored by considering stomach cancer, which has a steep social class gradient. Table 8.6 gives place of birth PMRs with and without adjustment for social class for men in the eight areas with the highest PMRs. The largest difference between adjusted and unadjusted values was 0.01. Therefore the social class distribution of migrants did not vary sufficiently from place to place to disturb the geographical pattern of mortality. Consequently unadjusted ratios and data for women and the year 1969 have been used in the analyses.

Table 8.6 The eight largest place of birth PMRs for stomach cancer in men, with and without adjustment for social class, 1969–72

Area	With adjustment	Without adjustment
Caernarvonshire AC	1.43	1.43
Cumberland AC	1.38	1.38
Merionethshire AC	1.37	1.37
Pembrokeshire AC	1.29	1.28
Denbighshire AC	1.29	1.30
Gateshead CB	1.28	1.28
Southwark LB	1.26	1.26
Tower Hamlets LB	1.22	1.23

8.3.3 Comparison of static and migrant populations

Deaths among people born or dying in an area may be divided into those among the static population (born and died in the area), among immigrants (born in another area) and emigrants (died in another area). Table 8.7 shows PMRs for stomach cancer, calculated in the conventional way for the areas with the highest place of birth PMR and place of death PMR. Expected numbers for the static population, for immigrants and emigrants were derived from the national proportions of stomach cancer deaths in each age-sex group.

Table 8.7 Observed and expected deaths and PMRs for stomach cancer for Caernarvonshire AC and Exeter CB, 1969–72

Caernarvonshire AC				Exeter CB		
Obs	Exp	PMR		Obs	Exp	PMR
132	84	1.57	**Static**	34	31	1.11
76	66	1.16	**Immigrant**	70	55	1.27
85	57	1.48	**Emigrant**	27	35	0.77

In Caernarvonshire AC, which had the highest place of birth PMR, mortality in immigrants was below that in the static population and emigrants. This is consistent with birth in Caernarvonshire increasing disease risk. In Exeter CB, which had the highest place of death PMR, mortality in emigrants was below that in the static population and immigrants. This does not suggest that birth in Exeter increases disease risk. The weakness of this analysis compared with statistical modelling is that it fails to take account of the level of risk associated with both the destination of emigrants and the origin of immigrants. For example, did immigrants in Caernarvonshire AC come from other parts of north Wales and bring with them the slight excess risk represented by the PMR 1.16?

8.3.4 Comparison of place of birth PMRs with standardised mortality ratios (SMRs)

The relation between place of birth PMRs, place of death PMRs and SMRs was examined. To obtain stable estimates SMRs were calculated for the 11 years 1968–78, covering the period of the Eighth Revision of the ICD. Table 8.8 gives correlation coefficients summarising the relationships.

Table 8.8 Correlation coefficients for SMRs, 1968–78 (all ages, both sexes) and PMRs for place of birth and death, selected causes of death, 1969–72

Selected cause of death	Correlation coefficients for:	
	Place of birth PMRs	Place of death PMRs
Ischaemic heart disease	0.63	0.46
Stroke	0.56	0.85
Chronic bronchitis	0.38	0.93
Stomach cancer	0.69	0.54

For all four causes of death the geographical distribution of place of birth PMRs correlates positively with the distribution of SMRs, though the correlation for chronic bronchitis is the weakest. There are also positive correlations between the place of death PMRs and SMRs. The correlation for chronic bronchitis is the strongest. A relation between place of death PMRs and SMRs would be expected since both depend on place of usual residence at the time of death. The unexpectedly weak relation for ischaemic heart disease may be explained by the denominator used to calculate PMRs, as previously described. For example, a number of southern areas have high place of death PMRs for ischaemic heart disease, but low SMRs. These include Bournemouth CB, West Sussex AC and Eastbourne CB (see Appendix 4). Their high PMRs are due to death rates from all causes combined being, in relation to the national average, even lower than those for ischaemic heart disease.

8.3.5 Size of the PMR variations

Table 8.9 gives chi-square statistics which assess the variability in the place of birth and place of death PMRs. Chi-square values were calculated for place of birth and place of death PMRs independently and in relation to each other. The 'joint' chi-square statistic was derived by sharing the variation between place of birth and place of death as suggested by the data, and was calculated using $\Sigma(O-E)^2/E$ for the maximum likelihood estimates. For the 'conditional' statistic all possible variation was conceded to the other set of PMRs by comparing deviances from the submodel.

All the values in Table 8.9 are strongly significant. For each disease there are place of birth effects which are independent of place of death effects. For stomach cancer the place of birth chi-squares are larger than those for place of death. This suggests that place of birth has a greater effect than place of death on this disease risk. For the other three diseases place of death chi-squares are larger than those for place of birth. These large values depend on the wide variation in PMRs, conventionally calculated. The distribution of these PMRs is closely related to the distribution of place of death PMRs. The correlations for the three diseases are 0.88 for ischaemic heart disease, 0.93 for stroke, and 0.96 for bronchitis. It is therefore not possible to use these data to estimate the relative importance of place of birth and place of death effects.

Table 8.9 Chi-square statistics used to assess strength of PMR variations for selected causes of death 1969–72*

	Ischaemic heart disease	Stroke	Chronic bronchitis	Stomach cancer
Place of birth				
Independent	1,547	2,077	2,242	768
Joint	587	567	522	620
Conditional	320	372	327	402
Place of death				
Independent	2,560	4,104	4,443	599
Joint	2,025	3,295	3,958	331
Conditional	1,333	2,399	2,528	233

* *All chi-square statistics here have 152 degrees of freedom. Values exceeding 189 are statistically significant at 5 per cent level.*

8.4 Summary and discussion

This analysis of around two million people, half of whom migrated from one part of England and Wales to another, shows that a person's risk of dying from ischaemic heart disease, stroke, chronic bronchitis and stomach cancer can be predicted by place of birth, independently of place of death. For the analysis the country was divided into 154 areas, comprising the counties, large towns and London boroughs: the data did not allow more detailed geography.

It was necessary to base the analysis on the numbers of deaths from one cause as a proportion of deaths from all other causes. The range of values of the place of birth and death PMRs for each disease (Tables 8.2 to 8.5) is influenced by the total number of deaths from that cause, as has already been described. Furthermore, within each place the values for one cause depend on the values for all other causes. It follows that place of birth PMRs can give only a general description of the influence of place of birth. The distributions of place of birth and place of death PMRs correlate with those for SMRs. There are, however, anomalies. For example, Burnley CB has a low place of birth effect for stroke (Table 8.3), but an SMR of 120. Because mortality ratios from other leading causes are even higher, the proportion of deaths due to stroke is below average.

The place of birth PMRs describe the relative contribution of birthplace to differences in mortality in England and Wales; they do not describe its absolute contribution to mortality from any cause. Since the place where each individual lived was known only at birth and death, the age at which the place of birth acts in the genesis of each disease cannot be determined.

It could be argued that the place of birth effects on death from the four diseases reflect genetic variations in susceptibility between different places in England and Wales. The large changes in incidence of each of the diseases during this century, however, point to domi-

nance of the environment in determining their distribution. The large movements of population before and during the Industrial Revolution make it unlikely that industrial towns where high mortality is concentrated are characterised by differing gene frequencies.

Geographical studies suggest that, although adult influences are important, the environment in early life has a major effect on risk of cardiovascular disease, that is ischaemic heart disease and stroke.[13] In England and Wales there is a strong relation between geographical differences in mortality from cardiovascular disease and differences in reproductive mortality, maternal physique and birthweight seventy or more years ago. Cardiovascular mortality is higher in areas which formerly had higher maternal and neonatal mortality, and in which mothers had worse physique and babies had lower mean birthweight.[14] These areas are now characterised by shorter stature among adults.[15] These geographical associations point to a relation between an adverse intra-uterine environment and the risk of cardiovascular disease.[16] It has been suggested that this relation may be partly determined by blood pressure, which in a national sample of adults aged 36 years was inversely related to birthweight.[17] A number of mechanisms could theoretically link adverse intra-uterine environment, reduced fetal growth and higher blood pressure.[18,19] The distribution of **ischaemic heart disease** is also related to the postnatal environment, as indicated by post-neonatal mortality.[20]

The findings for migrants (see Table 8.2) are consistent with a major effect of the intra-uterine and early post-natal environments on the risk of ischaemic heart disease. The analyses show that people born in northern counties and industrial towns and South Wales, where death rates from ischaemic heart disease are high, have an increased risk of the disease whether or not they move to other parts of the country.

Unlike ischaemic heart disease, the geographical distribution of **stroke** does not relate to the early post-natal environment. It is related to the intra-uterine environment and pre-natal determinants of blood pressure levels may underlie this.[21] The analyses for migrants give conclusions similar to those for ischaemic heart disease. In addition a striking feature of the distribution for stroke is the low PMRs for many London boroughs. The low risk of stroke among people born in London goes with them when they move to other parts of the country (see Table 8.3).

Mortality from **chronic bronchitis** is concentrated in the cities and large towns of England and Wales. Its distribution corresponds closely to that of infant mortality from bronchitis and pneumonia in the early years of the century.[22] This is one of several lines of evidence which point to a direct causal link between lower respiratory tract infection in early childhood and chronic bronchitis in adult life. Other evidence comes from follow-up studies which show that after bronchiolitis, bronchitis or pneumonia, abnormalities of pulmonary function may persist through childhood.[23–26] In a national sample of young adults there was a strong association between the occurrence of one or more respiratory infections before two years of age and the prevalence of cough during the day, or at night during the winter at the age of 25 years.[27]

The place of birth PMRs for chronic bronchitis correlate less closely with the distribution of SMRs than those for the other three diseases. This can be attributed to the close similarity of the distribution of place of birth and place of death PMRs, and to the almost coincident distributions of place of death PMRs and PMRs conventionally calculated (r=0.96). This is shown in two ways. A ranking of places according to place of birth effects, before allowance for place of death, is similar to a ranking by SMRs. In Table 8.9 the large chi-square value for place of birth is greatly reduced after allowance for place of death.

The migrant analyses show that people born in the cities and large towns of England and Wales have an increased risk of chronic airways obstruction which will persist independently of subsequent migration to other parts of the country. This is in keeping with international studies of migrants. Among men who migrated to the United States the prevalence of chronic bronchitis, after allowing for smoking habits, was higher among those born in urban areas.[28]

Areas with high place of birth PMRs for **stomach cancer** (Table 8.5) are among those known to have high stomach cancer mortality rates.[29] They include four counties in the north-west of Wales (Caernarvonshire, Anglesey, Merionethshire and Denbighshire), three county boroughs in the north-east of England (Hartlepool, Gateshead and Newcastle upon Tyne) and two boroughs in south and east London (Southwark and Tower Hamlets). Studies of people who have moved from one country to another and two recent case-control studies have shown a higher risk of disease in people who spent their childhood in areas of higher incidence.[30]

The analyses of migrants within England and Wales are consistent with the childhood environment having a major effect on stomach cancer risk, through mechanisms which are as yet unknown. Among migrants those born in areas of high stomach cancer mortality continue to have an increased risk, irrespective of where they migrate to.

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9 Mortality among immigrants in England and Wales, 1979–83

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9.1 Introduction

Reports of ethnic differences in patterns of mortality have been widely published.[1–5] Such analyses serve not only to highlight the differences that prevail among various communities, but also aid in the understanding of the aetiology of diseases. Ethnic group is not recorded on death certificates or in the census so in England and Wales country of birth is commonly used as a proxy for ethnic group. Immigrant ethnic group status so defined thus applies only to the first generation of immigrants. In England and Wales the first analysis of immigrant mortality was published in 1984, and covered primarily deaths in the three years (1970–72) surrounding the 1971 Census.[6]

In this chapter deaths during 1979–83, years centring on the 1981 Census, are analysed by country of birth of the deceased. Standardised mortality ratios (SMRs) by country of birth have been computed for ages 20–69 and 70 and over using England and Wales five-year age-group, sex and cause specific rates of 1979–83 as the standard. Age-specific mortality ratios and mortality among young adults (20–49 years) are also examined for differences between the country of birth groups. Ninety-five per cent confidence intervals have been calculated where appropriate. For more background to the general methodology see Chapter 2.

The issues relating to analyses of immigrant mortality based on country of birth as against ethnic origin are addressed in the discussion, and have been dealt with elsewhere.[6,7] The introduction to Chapter 10 also discusses this issue in respect of females. For brevity and convenience, the country of birth groups are referred to here as the 'ethnic' groups originating in the home country. Those born in the Indian subcontinent countries of India, Pakistan, Bangladesh and Sri Lanka are referred to as *Indians*. Similarly, immigrants from the African and Caribbean Commonwealths are referred to as *Africans* and *Caribbeans* respectively. Chapter 2 provides more detailed background notes for the major country of birth groupings employed in this chapter.

Differences in mortality between 1970–72 and 1979–83 have also been examined by country of birth, by calculating SMRs for the two periods using the age and sex-specific mortality rates for England and Wales for 1979–83 as the standard. This permits mortality differentials to be examined between the two time periods and across the country of birth groups. The percentage changes between these SMRs (for 1970–72 and 1979–83) have been calculated, and the shifts tested for statistical significance at the 5 per cent level.

The material presented in sections 9.3–9.5 relates primarily to mortality from all causes. In order to examine the relative contributions of the major causes of death to overall mortality, percentage distributions of deaths by age, sex and cause are presented in section 9.6. This section also analyses circulatory diseases, malignant neoplasms and accidents and violence in more detail.

9.2 Immigrant populations in England and Wales

9.2.1 Background

The level and source of immigration into England and Wales has varied over time.[8] During the first half of the twentieth century immigration into this country was predominantly of European origin. It also included people of British extraction returning home from the colonies. Whereas some of the immigration during this period was labour-oriented, most of it was refugee migration. In the years before the First World War political persecution in Eastern Europe caused Jews from Poland and Russia to emigrate to this country. A second wave of Jewish immigration occurred in the 1930s, this time the result of persecution in Germany, Austria, and other parts of German-controlled Europe.

The major growth in Britain's Polish population occurred with the Second World War, when members of the Polish government and armed forces moved to Britain. Their families, Polish prisoners of war, and other Polish groups also settled in this country. The military origins of this settlement explain the predominantly male composition of the Polish born population in this country.[9]

Irish immigration goes back two centuries, prompted by population and economic pressures in Ireland and reinforced by employment opportunities offered by this country. The most recent waves of Irish immigration occurred in the 1930s and the 1950s. Another community with a long-standing history of migration into Britain are the Italians; their numbers grew after the Second World War when Italian prisoners of war stayed on in this country, and economic opportunities attracted others from Italy.[10] Other European groups displaced by the war also settled here during the 1940s.

Immigration since 1950 has been radically different in character and origin. Post-war reconstruction and economic revival led to labour shortages in the western industrialised economies, resulting in widespread importation of labour from developing countries into Europe and America. In Britain these labour shortages led to immigration from the West Indies in the 1950s and the 1960s;[11] and from the Indian subcontinent in the 1960s and 1970s. This movement was prompted by economic rather than political motives. This is reflected in the age and sex structure of some of the populations, especially those from the Indian subcontinent where young adult males predominated.[12] Post-war economic expansion of the British economy led also to immigration from Ireland, Italy, and the Mediterranean Commonwealth, particularly Cyprus. The only sizeable migration of a political nature since the 1950s has been of East African Asians from Uganda and Kenya, and to a much lesser extent of Vietnamese more recently.

9.2.2 Age and sex structure

The 1981 Census population by age, sex and country of birth is presented in Table 9.1 for males and Table 9.2 for females. Irish and Scottish were the largest immigrant groups, their populations numbering just under 800,000 each in 1981. Persons born in the Indian subcontinent

Table 9.1 Male enumerated population at 1981 Census by age and country of birth

England and Wales

Country of birth	Total	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80 and over
Scotland	382,127	15,495	35,487	59,981	75,125	58,048	59,587	50,878	22,124	5,402
All Ireland	377,726	6,069	14,668	40,632	72,791	79,213	78,088	58,983	22,558	4,724
Indian subcontinent	341,295	17,371	36,192	77,455	63,085	72,022	44,935	20,076	8,460	1,699
Caribbean Commonwealth	144,577	1,357	5,781	28,629	22,601	43,467	29,950	10,688	1,822	282
African Commonwealth	150,034	6,918	29,599	54,886	33,383	16,389	6,356	1,863	527	113
Mediterranean Commonwealth	65,099	2,926	8,991	15,574	12,347	11,509	7,497	4,079	1,823	353
Australia	25,826	4,144	5,951	5,111	3,551	1,769	2,607	1,810	571	312
Canada	25,580	1,899	3,830	4,020	2,832	1,811	4,465	5,238	1,251	234
New Zealand	12,246	1,388	1,570	3,907	2,074	991	1,120	751	348	97
France	11,909	811	1,432	2,746	1,949	1,240	1,927	1,102	497	205
Germany (East and West)	66,862	13,325	17,816	11,524	7,862	2,737	7,774	3,573	1,740	511
Italy	45,375	775	2,012	7,919	10,497	11,498	8,233	3,260	792	389
Poland	55,240	166	263	700	1,138	2,505	23,046	18,559	7,013	1,850
Spain and Portugal	24,380	1,023	2,274	3,861	7,128	5,553	2,863	1,207	367	104
USSR	22,423	86	113	121	358	566	10,606	6,407	3,195	971
S Africa	22,884	3,187	2,704	3,721	4,248	2,652	2,370	2,005	1,684	313
USA	55,594	6,853	9,811	14,138	11,336	5,241	4,269	2,551	1,021	374
All countries of birth*	**873,366**	**3,169,602**	**4,083,025**	**3,520,599**	**3,406,507**	**2,755,775**	**2,793,656**	**2,324,655**	**1,441,457**	**378,090**

**Including people born in England and Wales*

Table 9.2 Female enumerated population at 1981 Census by age and country of birth

England and Wales

Country of birth	Total	0–9	10–19	20–29	30–39	40–49	50–59	60–69	70–79	80 and over
Scotland	374,521	14,640	32,401	58,161	69,338	50,584	59,572	48,556	28,035	13,082
All Ireland	416,953	5,916	13,872	46,963	79,119	81,964	80,907	65,207	30,844	12,161
Indian subcontinent	292,740	14,050	28,239	74,423	62,601	49,928	31,446	18,443	10,125	3,485
Caribbean Commonwealth	150,652	1,282	6,112	36,202	32,507	41,350	22,623	7,537	2,319	720
African Commonwealth	133,419	6,771	28,983	51,160	27,528	12,190	4,413	1,564	622	188
Mediterranean Commonwealth	61,995	2,783	8,812	14,694	11,704	10,100	6,939	3,990	2,237	736
Australia	31,719	3,926	5,855	7,138	4,988	2,276	3,258	2,356	1,099	823
Canada	28,366	1,830	3,770	4,924	3,804	2,071	4,666	5,186	1,660	455
New Zealand	14,774	1,319	1,696	5,515	2,511	1,081	1,061	792	546	253
France	25,241	847	1,821	5,887	4,758	3,008	3,928	1,903	1,423	1,666
Germany (East and West)	103,633	12,664	17,495	14,306	11,758	10,614	22,986	7,784	4,090	1,936
Italy	47,425	731	1,958	5,727	7,175	12,916	12,768	3,745	1,575	830
Poland	33,338	149	266	2,219	3,132	4,457	10,437	5,805	4,814	2,059
Spain and Portugal	31,145	1,016	2,397	5,007	7,450	7,394	4,824	1,931	819	307
USSR	12,169	83	93	170	538	834	3,590	2,625	2,582	1,654
S Africa	27,977	3,004	2,590	4,111	4,962	3,269	3,343	3,097	2,825	776
USA	49,644	6,596	8,234	11,815	10,277	3,702	3,679	2,600	1,726	1,015
All countries of birth*	**25,281,327**	**3,005,806**	**3,892,567**	**3,465,916**	**3,391,578**	**2,737,903**	**2,905,041**	**2,720,058**	**2,164,758**	**997,700**

**Including people born in England and Wales*

followed with about 634,000, then African and Caribbean born at just under 300,000 each. The largest European group were the German born, about 170,000. The second largest European group were the Italians, enumerated at 93,000 in the 1981 Census. The Polish and Russian born numbered 89,000 and 35,000 respectively. There were about 127,000 persons born in the Mediterranean Commonwealth comprising Cyprus, Malta and Gozo, and Gibraltar. The American born numbered 105,000, and the Canadian born were about half that number.

The percentage distributions of these populations by age (0–19, 20–49, 50–69, and 70 and over) and sex are given in Table 9.3. The age-sex distributions varied significantly between the groups, and are a function both of the date of migration and the underlying reasons for migration. The immigrant populations with the largest proportions of young were born in Germany and Australia, the proportions aged 0–19 among Americans being similar to those of England and Wales. In contrast, immigrants from the Indian subcontinent, the Caribbean and African Commonwealths, the Mediterranean Commonwealth, Italy, Spain and Portugal belong primarily to the working ages 20–49; 60 per cent or more of their populations were in this age-group compared with around 40 per cent for residents of England and Wales as a whole. Migration from Africa was comparatively recent; this is reflected in the younger age structure of this group compared with Indians and Caribbeans, with only about 5 per cent over the age of 50. Since migration from Eastern Europe has been negligible since the 1940s,

Table 9.3 Percentage distribution of 1981 Census enumerated population by age and sex, and sex-ratio by country of birth

England and Wales

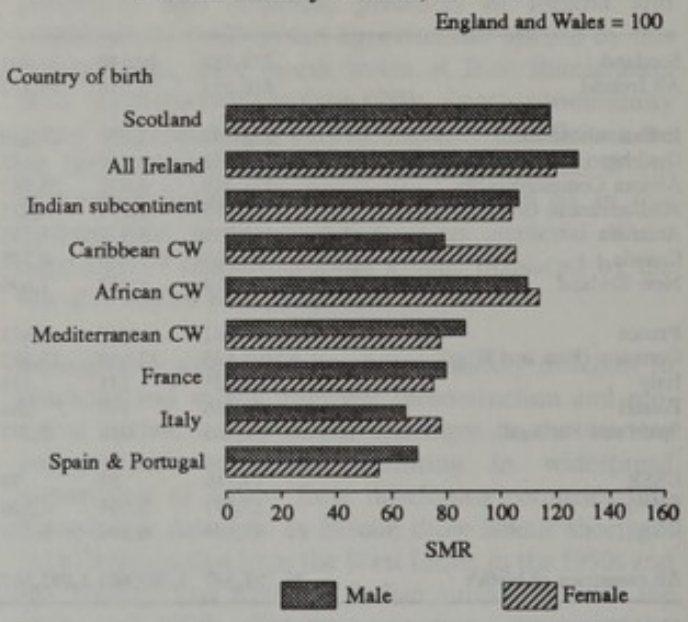
Country of birth	Males				Females				Sex ratio
	0–19	20–49	50–69	70 and over	0–19	20–49	50–69	70 and over	F/M
Scotland	13.3	50.5	28.9	7.2	12.6	47.5	28.9	11.0	0.98
All Ireland	5.5	51.0	36.3	7.2	4.7	49.9	35.0	10.3	1.10
Indian subcontinent	15.7	62.3	19.0	3.0	14.4	63.9	17.0	4.6	0.86
Caribbean Commonwealth	4.9	65.5	28.1	1.5	4.9	73.1	20.0	2.0	1.04
African Commonwealth	24.3	69.8	5.5	0.4	26.8	68.1	4.5	0.6	0.89
Mediterranean Commonwealth	18.3	60.6	17.8	3.3	18.7	58.9	17.6	4.8	0.95
Australia	39.1	40.4	17.1	3.4	30.8	45.4	17.7	6.1	1.23
Canada	22.4	33.9	37.9	5.8	19.7	38.1	34.7	7.5	1.11
New Zealand	24.2	56.9	15.3	3.6	20.4	61.6	12.5	5.4	1.21
France	18.8	49.8	25.4	5.9	10.6	54.1	23.1	12.2	2.12
Germany (East and West)	46.6	33.1	17.0	3.4	29.1	35.4	29.7	5.8	1.55
Italy	6.1	65.9	25.3	2.6	5.7	54.4	34.8	5.1	1.05
Poland	0.8	7.9	75.3	16.0	1.2	29.4	48.7	20.6	0.60
Spain and Portugal	13.5	67.9	16.7	1.9	11.0	63.7	21.7	3.6	1.28
USSR	0.9	4.7	75.9	18.6	1.4	12.7	51.1	34.8	0.54
S Africa	25.7	46.4	19.1	8.7	20.0	44.1	23.0	12.9	1.22
USA	30.0	55.2	12.3	2.5	29.9	52.0	12.6	5.5	0.89
All countries of birth*	**30.4**	**40.6**	**21.4**	**7.6**	**27.3**	**38.0**	**22.3**	**12.5**	**1.06**

**Including people born in England and Wales*

Polish and Russian born immigrants resident in this country constitute relatively elderly populations, with the highest proportions aged 50 years and over of all the groups examined. More than 90 per cent of Polish and Russian males were over the age of 50. The proportions were lower for females but still markedly higher than for the population of England and Wales as a whole.

Table 9.3 also shows the overall sex ratios of the different country of birth groups, ranging from 2.12 females per male among the French born to 0.54 among the Russians, compared with 1.06 for England and Wales. This wide variation reflects the different circumstances governing the migration of the various groups. For instance, the low female:male ratio in immigrants from the Indian subcontinent (0.86) reflects male labour migration, whereas the low ratio in the Polish (0.60) reflects the war-time circumstances which conditioned their migration.

Figure 9.1 All cause mortality (SMRs, ages 20-69) by sex and country of birth, 1979-83



9.3 Age-adjusted mortality

Overall mortality varied between the different country of birth groups (Table 9.4 and Figure 9.1). There were significantly high levels at ages 20–69 years in males from Ireland (SMR 128), followed by men from Scotland (SMR 118), the African Commonwealth (SMR 109), and the Indian subcontinent (SMR 106). Mortality was significantly lower than expected for men born in the USA (SMR 89), Germany (SMR 87), the Mediterranean Commonwealth (SMR 87), Australia (SMR 85), New Zealand (SMR 84), France (SMR 80), and the Caribbean Commonwealth (SMR 79). The lowest levels were observed for Italian men (SMR 65) and Spanish and Portuguese men (SMR 70).

The findings are broadly similar among women, with the highest mortality at ages 20–69 years among the Irish (SMR 120) followed by women from Scotland (SMR 118), the African Commonwealth (SMR 114), and the Indian subcontinent (SMR 105). A difference was apparent between Caribbean men and women, with a small excess for females (SMR 105) in contrast to the significantly low ratio observed for men (SMR 79). Deaths were significantly lower than expected among women from the Mediterranean Commonwealth, Australia, Canada, Germany, and the USA, being lowest for Spanish and Portuguese (SMR 56), French (SMR 75), and Italian (SMR 78) women.

9.3.1 Mortality among young adults

Country of birth groups that experienced raised mortality at 20–69 years showed an even greater excess at 20–49 years (Tables 9.5 and Figure 9.2). Among men the Irish experienced a 47 per cent excess and the Scots a 35 per

Table 9.4 Mortality at ages 20–69 from all causes by sex and country of birth, 1979–83

England and Wales=100

Country of birth	Males			Females		
	Observed deaths	SMR	Approx. 95 per cent confidence interval	Observed deaths	SMR	Approx. 95 per cent confidence interval
Scotland	14,478	118	116–120	7,628	118	115–121
All Ireland	18,961	128	126–130	10,403	120	118–122
Indian subcontinent	7,566	106	104–108	3,427	105	102–109
Caribbean Commonwealth	3,190	79	76– 82	1,944	105	100–110
African Commonwealth	1,394	109	103–115	652	114	105–123
Meditteranean Commonwealth	1,144	87	82– 92	541	78	72– 85
Australia	403	85	77– 94	280	83	74– 93
Canada	1,051	96	90–102	510	85	78– 93
New Zealand	178	84	72– 97	119	96	80–115
France	244	80	70– 91	246	75	66– 85
Germany (East and West)	966	87	82– 93	1,356	93	88– 98
Italy	759	65	60– 70	657	78	72– 84
Poland	4,123	99	96–102	819	97	90–104
Spain and Portugal	327	70	63– 78	226	56	49– 64
USSR	1,552	96	91–101	312	95	85–106
Republic of S. Africa	500	97	89–106	383	94	84–104
USA	720	89	83– 96	351	85	76–94
All countries of birth*	**577,674**	**100**		**348,525**	**100**	

**Including people born in England and Wales*

Table 9.5 Mortality at ages 20–49 from all causes by sex and country of birth, 1979–83

England and Wales=100

Country of birth	Males			Females		
	Observed deaths	SMR	Approx. 95 per cent confidence interval	Observed deaths	SMR	Approx. 95 per cent confidence interval
Scotland	2,275	135	130–141	1,151	122	115–129
All Ireland	2,914	147	142–152	1,632	123	117–129
Indian subcontinent	2,134	111	106–116	879	94	88–100
Caribbean Commonwealth	908	90	84– 96	746	114	106–122
African Commonwealth	793	115	107–123	421	127	115–140
Meditteranean Commonwealth	254	76	67– 86	124	68	57– 81
Australia	65	90	69–115	50	87	65–115
Canada	71	105	82–132	43	88	64–119
New Zealand	41	92	66–125	29	91	61–131
France	30	68	46– 97	51	81	60–107
Germany (East and West)	144	105	89–124	190	101	87–116
Italy	195	67	58– 77	144	77	65– 91
Poland	56	103	78–134	64	96	74–123
Spain and Portugal	103	67	55– 81	68	56	43– 71
USSR	9	74	34–140	14	120	66–201
Republic of S. Africa	96	112	91–137	69	109	85–138
USA	178	83	71– 96	86	85	68–105
All countries of birth*	**82,206**	**100**		**50,237**	**100**	

**Including people born in England and Wales*

cent excess at these younger ages over the levels in England and Wales during this period. Young Indian and African men also experienced a significant excess, with SMRs of 111 and 115 respectively. Male age-specific mortality by country of birth is presented in Table 9.6 and for selected countries in Figure 9.3. Excess mortality among the Irish peaked at 30–39 years, with a 62 per cent excess. Indians on the other hand did not show an excess at 20–29 years. Caribbean mortality, though not raised overall for young adult males, was significantly high (SMR 125) at ages 20–29 years (Figure 9.3).

Among women aged 20–49, the Irish (SMR 123) and the Scottish (SMR 122) again showed a greater excess of mortality at younger ages (Table 9.5 and Figure 9.2). Women born in the Caribbean (SMR 114) and Africa (SMR 127) also had a greater excess of mortality at younger ages. Female age-specific mortality ratios by

Figure 9.2 All cause mortality (SMRs, ages 20-49) by sex and country of birth, 1979-83

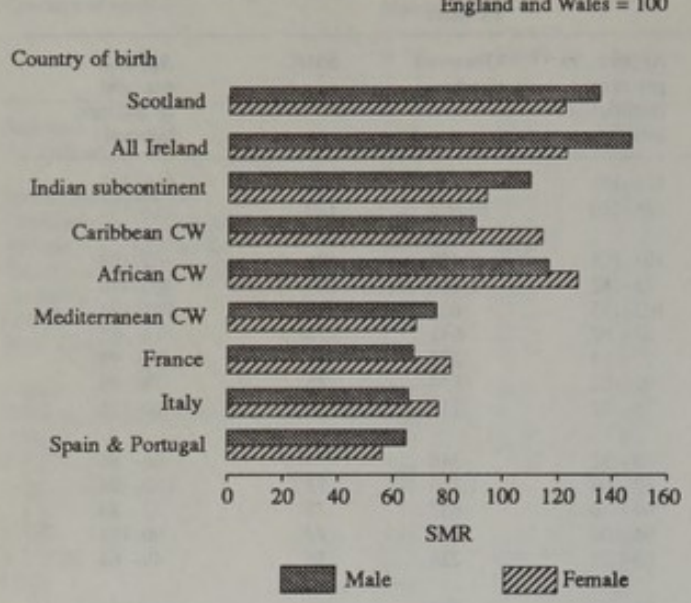


Table 9.6 Male age-specific (20–69 years) mortality ratios for all causes by country of birth, 1979–83

England and Wales=100

Country of birth	Age-group				
	20–29	30–39	40–49	50–59	60–69
Scotland	128	134	137	122	112
All Ireland	145	162	143	132	122
Indian subcontinent	72	116	120	107	103
Caribbean Commonwealth	125	100	82	71	81
African Commonwealth	95	109	137	103	103
Mediterranean Commonwealth	63	61	87	89	91
Australia	112	75	84	85	84
Canada	136	95	93	91	97
New Zealand	100	87	86	94	74
France	67	46	80	84	80
Germany (East and West)	119	94	100	74	94
Italy	72	79	62	68	62
Poland	196	118	95	97	99
Spain and Portugal	107	80	54	64	77
USSR	379	88	54	95	98
Republic of S. Africa	142	93	113	91	95
USA	110	53	87	90	92
All countries of birth*	**100**	**100**	**100**	**100**	**100**

**Includes people born in England and Wales*

country of birth are presented in Table 9.7 and for selected countries in Figure 9.4. For the Irish and the Scots mortality peaked at ages 30–39, with an excess of 29 per cent and 25 per cent respectively. The excess in mortality increased with decreasing age in African and Caribbean women, reaching a significant excess of 54 per cent and 29 per cent respectively at ages 20–29. Indian women were an exception in that they showed significantly higher mortality at 20–69 years but not at 20–49 years, although an excess was apparent at ages 20–29.

In general, country of birth groups with low mortality at 20–69 years had low mortality at 20–49 years (Tables 9.4

Table 9.7 Female age-specific (20–69 years) mortality ratios for all causes by country of birth, 1979–83

England and Wales=100

Country of birth	Age-group				
	20–29	30–39	40–49	50–59	60–69
Scotland	101	123	125	117	118
All Ireland	110	124	124	121	118
Indian subcontinent	109	90	92	97	118
Caribbean Commonwealth	129	118	110	102	97
African Commonwealth	154	121	112	97	94
Mediterranean Commonwealth	62	83	63	72	90
Australia	69	92	93	70	89
Canada	93	51	107	88	83
New Zealand	73	65	131	72	111
France	102	75	77	71	77
Germany (East and West)	119	109	94	91	92
Italy	95	106	70	74	84
Poland	65	117	93	90	103
Spain and Portugal	79	51	55	46	66
USSR	286	177	99	88	97
Republic of S. Africa	155	116	95	84	94
USA	67	92	88	94	81
All countries of birth*	**100**	**100**	**100**	**100**	**100**

**Includes people born in England and Wales*

and 9.5). Some of them showed even lower rates at these younger ages, notably immigrants from the Mediterranean Commonwealth (with SMRs of 76 for men and 68 for women), and men from Spain and Portugal (SMR 67), France (SMR 68) and America (SMR 83). Germans and South Africans were exceptions, with ratios raised in young adults; this excess was attributable to the very young, namely those aged 20–29 years. A further observation was the higher than expected mortality in male Australians, Canadians and Americans in the youngest age-group examined (20–29), though none of these reached statistical significance (Table 9.6).

9.3.2 Mortality among the elderly

At ages 70 years and over only men born in Ireland (SMR 116) and Scotland (SMR 107) showed excess mortality in the 1979–83 period. For other groups mortality among elderly males was lower than expected (Table 9.8). Age-specific mortality is shown in Tables 9.9 and 9.10 for males and females respectively. There was significantly lower mortality than expected among men aged 70 and over from the African Commonwealth (SMR 76), the Caribbean Commonwealth (SMR 78), Italy (SMR 82), the Mediterranean Commonwealth (SMR 86), Spain and Portugal (SMR 86), the Indian subcontinent (SMR 90), the Old Commonwealth (SMR 91), Germany (SMR 91), and Poland (SMR 96). The excess mortality for Irish and Scottish men was apparent in all age-groups over 70 years; similarly, the country of birth groups with low overall SMRs at 70 and over showed low age-specific mortality ratios in most age-groups over 70 years.

Mortality among elderly (70 plus) women was highest for those from Ireland (SMR 115) and Scotland (SMR 111), patterns similar to those seen for elderly men from these countries (Table 9.8). Mortality was significantly high also for elderly women born in Russia (SMR 112), America (SMR 108), India (SMR 107) and Poland (SMR

Figure 9.3 Male all cause mortality: age specific ratios by country of birth, 1979-83

(England and Wales = 100)

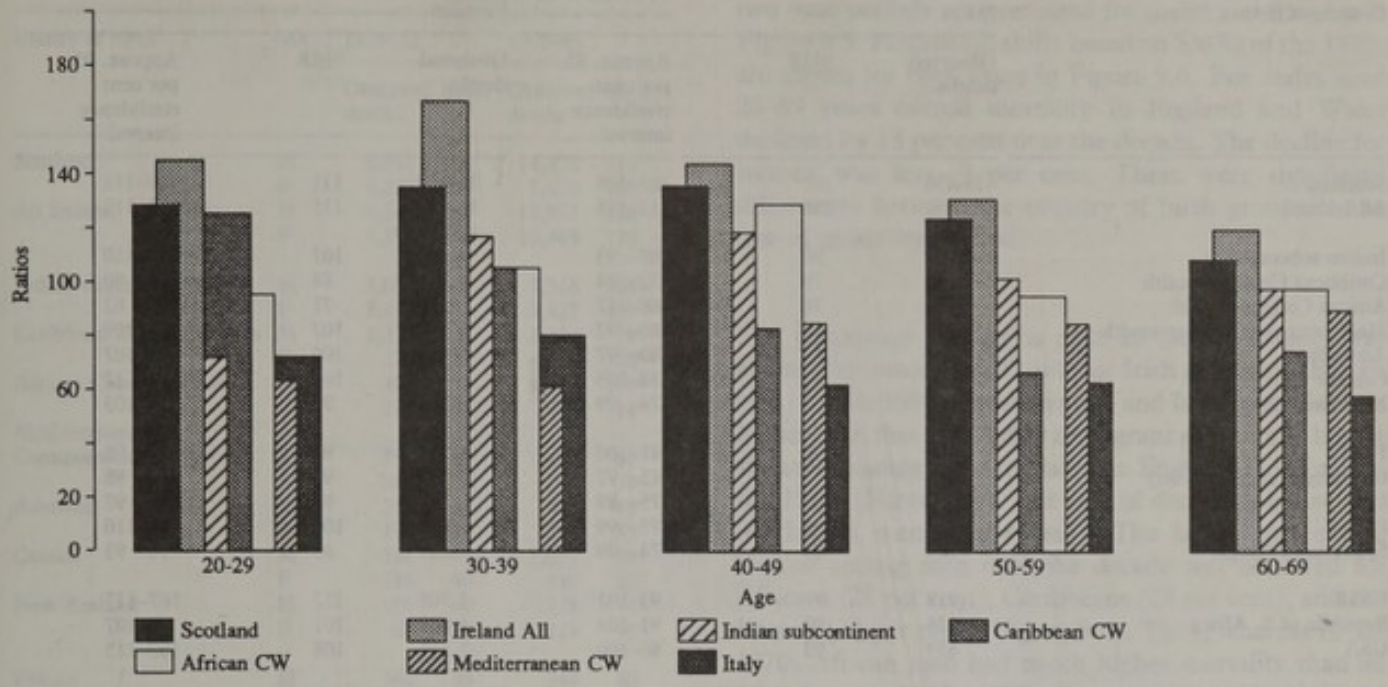
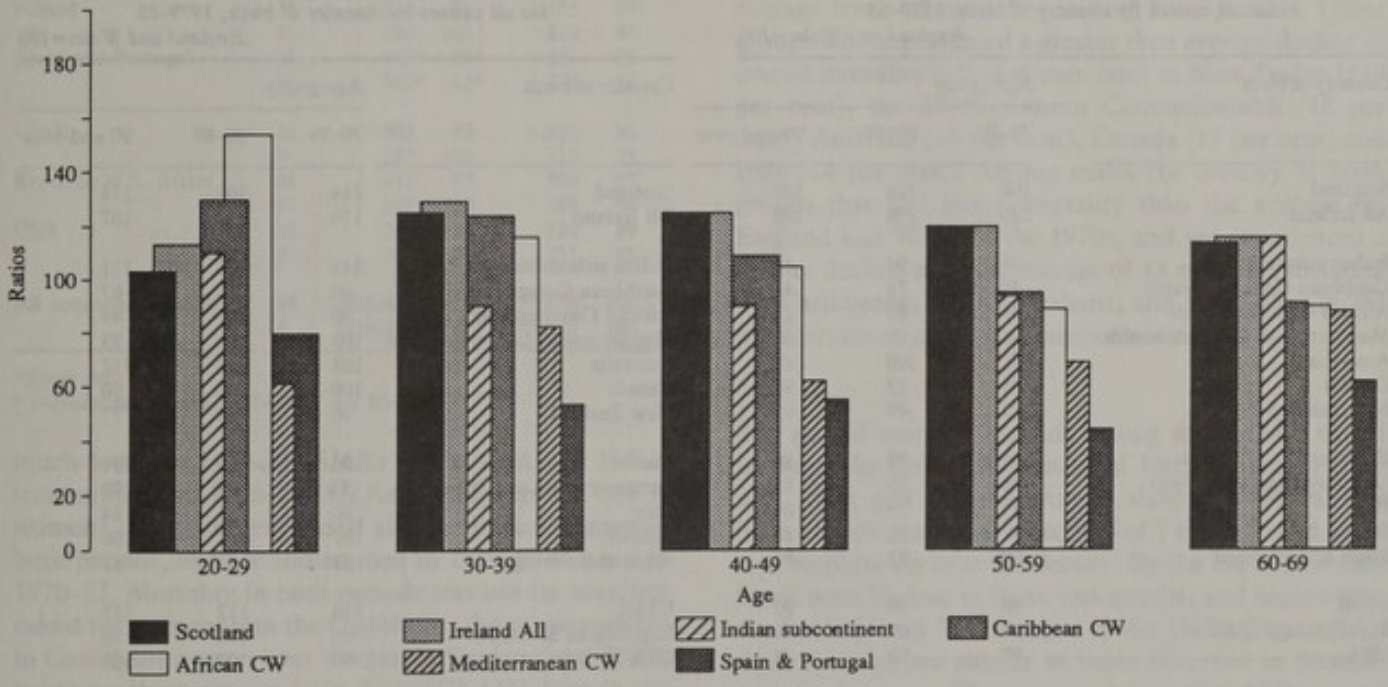


Figure 9.4 Female all cause mortality: age specific ratios by country of birth, 1979-83

(England and Wales = 100)



106), in contrast to the lower than expected rates for elderly men from these countries. Women from these countries showed raised age-specific mortality ratios at most ages over 70 years (Table 9.10). Women aged 70 and over born in France, Germany, Italy, and Spain and Portugal experienced lower than expected mortality, but the lowest levels were for African and Caribbean women (SMRs 71 and 84 respectively), a pattern observed also in men from these countries.

9.4 Comparisons with mortality in 1970–72

The patterns observed in this analysis of immigrant mortality for 1979–83 are broadly similar to those reported for 1970–72 (Table 9.11). The SMRs presented in Table 9.11 cannot be compared directly across the time period, as they have been standardised separately using mortality rates prevalent in England and Wales in the respective periods. The SMRs relate to ages 20–69, as this age-group is likely to be more representative of the ethnic groups originating from the home countries.

In both periods Scottish, Irish and African men and women aged 20–69 years experienced higher than average levels of mortality — Africans having the highest levels of mortality in 1970–72 and the Irish in 1979–83. The excess for Africans relative to other groups was

Table 9.8 Mortality at ages 70 and over from all causes by sex and country of birth, 1979–83

England and Wales=100

Country of birth	Males			Females		
	Observed deaths	SMR	Approx. 95 per cent confidence interval	Observed deaths	SMR	Approx. 95 per cent confidence interval
Scotland	13,436	107	105–109	15,630	111	109–113
All Ireland	13,768	116	114–118	15,828	115	113–117
Indian subcontinent	4,067	90	87– 93	4,518	107	104–110
Caribbean Commonwealth	673	78	72– 84	784	84	78– 90
African Commonwealth	220	76	66– 87	173	71	61– 82
Mediterranean Commonwealth	809	86	80– 92	922	102	96–109
Australia	440	88	80– 97	806	100	93–107
Canada	599	95	88–103	656	104	96–112
New Zealand	182	86	74– 99	261	91	80–103
France	332	90	81–100	1,291	93	88– 98
Germany (East and West)	986	91	85– 97	1,937	94	90– 98
Italy	525	82	75– 89	765	90	84– 97
Poland	3,830	96	93– 99	2,384	106	102–110
Spain and Portugal	189	86	74– 99	299	83	74– 93
USSR	1,918	97	93–101	1,768	112	107–117
Republic of S. Africa	836	97	91–104	1,060	101	95–107
USA	659	93	86–100	1,115	108	102–115
All countries of birth*	**842,972**	**100**		**1,082,478**	**100**	

**Includes people born in England and Wales*

Table 9.9 Male age-specific (70 years and over) mortality ratios for all causes by country of birth, 1979–83

England and Wales=100

Country of birth	Age-group		
	70–79	80–89	90 and over
Scotland	108	106	107
All Ireland	120	108	102
Indian subcontinent	89	94	86
Caribbean Commonwealth	78	78	82
African Commonwealth	79	92	24
Mediterranean Commonwealth	86	90	64
Australia	72	100	95
Canada	101	82	94
New Zealand	77	99	92
France	86	98	80
Germany (East and West)	90	95	85
Italy	85	79	86
Poland	97	95	86
Spain and Portugal	90	81	81
USSR	96	99	93
Republic of S. Africa	97	99	81
USA	97	92	78
All countries of birth*	**100**	**100**	**100**

**Includes people born in England and Wales*

Table 9.10 Female age-specific (70 years and over) mortality ratios for all causes by country of birth, 1979–83

England and Wales=100

Country of birth	Age-group		
	70–79	80–89	90 and over
Scotland	114	108	114
All Ireland	120	113	107
Indian subcontinent	111	103	111
Caribbean Commonwealth	86	88	67
African Commonwealth	80	66	49
Mediterranean Commonwealth	105	108	73
Australia	101	94	112
Canada	100	103	90
New Zealand	96	93	77
France	96	89	101
Germany (East and West)	93	93	99
Italy	86	95	84
Poland	107	105	106
Spain and Portugal	83	88	67
USSR	110	112	117
Republic of S. Africa	96	108	96
USA	94	107	139
All countries of birth*	**100**	**100**	**100**

**Includes people born in England and Wales*

Table 9.11 Mortality at ages 20–69 from all causes by sex and country of birth, 1970–72 and 1979–83

England and Wales=100

Coutry of birth	Sex	1970–72		1979–83	
		Observed deaths	SMR	Observed deaths	SMR
Scotland	M	8,561	112	14,478	118
	F	4,229	107	7,628	118
All Ireland	M	10,547	121	18,961	128
	F	5,590	116	10,403	120
Indian subcontinent	M	3,007	99	7,566	106
	F	1,442	111	3,427	105
Caribbean Commonwealth	M	1,326	95	3,190	79
	F	878	131	1,944	105
African Commonwealth	M	467	133	1,394	109
	F	207	144	652	114
Mediterranean Commonwealth	M	594	92	1,144	87
	F	300	92	541	78
Australia	M	235	88	403	85
	F	196	93	280	83
Canada	M	536	99	1,051	96
	F	285	99	510	85
New Zealand	M	109	90	178	84
	F	68	86	119	96
France	M	168	95	244	80
	F	177	88	246	75
Germany (East and West)	M	513	82	966	87
	F	699	98	1,356	93
Italy	M	345	66	759	65
	F	273	73	657	78
Poland	M	2,246	96	4,123	99
	F	580	101	819	97
Spain and Portugal	M	162*	85*	327	70
	F	102*	62*	226	56
USSR	M	905	92	1,552	96
	F	297	105	312	95
Republic of S. Africa	M	411	97	500	97
	F	299	100	383	94
USA	M	529	86	720	89
	F	301	91	351	85
All countries of birth†	**M**	**405,446**	**100**	**577,674**	**100**
	F	**238,076**	**100**	**348,525**	**100**

**Spain only.*
† *Includes people born in England and Wales.*

much lower in 1979–83 (SMRs 109 in men and 114 in women) than in 1970–72 (SMRs 133 in men and 144 in women). Mortality was raised also for Indian women in both periods, and for Indian men in 1979–83 but not in 1970–72. Mortality in both periods was low for men but raised for women from the Caribbean, the relative excess in Caribbean women over women in England and Wales being much greater in 1970–72 (SMR 131) than in the period covering 1979–83 (SMR 105).

In both periods mortality levels were generally low for men and women from the Mediterranean and Old Commonwealths, USA, and Europe, being generally the lowest for Italian and Spanish immigrants.

9.5 Trends in mortality

Trends in mortality between 1970–72 and 1979–83 were examined for men and women separately, using the age and sex-specific rates prevalent in England and Wales during 1979–83 as the standard. This adjustment permits direct comparisons in mortality between the two time periods and across the country of birth groups. The results are presented in Table 9.12 for males and in Table 9.13 for females. Absolute shifts in SMRs between the two time periods are presented for males and females in Figure 9.5. Percentage shifts based on SMRs of the 1970s are shown for both sexes in Figure 9.6. For males aged 20–69 years overall mortality in England and Wales declined by 13 per cent over the decade. The decline for women was less, 9 per cent. There were significant differences between the country of birth groups in the rate of mortality decline.

The percentage decline in male all-cause mortality was among the lowest (8 per cent) for Irish and Scottish born men. By the 1980s, male Scottish and Irish mortality was higher than that of all other immigrant groups and higher than the average levels prevalent in England and Wales in the 1970s (Figure 9.5). The rate of decline was low also for Indian men (7 per cent). The largest percentage decline among men over the decade was observed for Africans (28 per cent), Caribbeans (28 per cent), and the French (27 per cent) (Figure 9.6). Thus, whereas in the 1970s African men had much higher mortality than all other groups, by the 1980s they experienced levels lower than the Scots and the Irish (Table 9.12). Caribbean and French men, who also showed the greatest declines in mortality over the decade, experienced lower than average levels of mortality in both time periods. Other groups who experienced a greater than average decline in overall mortality included men born in New Zealand (19 per cent), the Mediterranean Commonwealth (18 per cent), Australia (16 per cent), Canada (15 per cent) and Italy (14 per cent). Among males the country of birth groups that had lower mortality than the average for England and Wales in the 1970s, and yet experienced a greater decline than the average of 13 per cent, included the Caribbeans, French, Italians, and those born in the Mediterranean and Old Commonwealths.

The rate of mortality decline among women also varied between the different country of birth groups (Figure 9.6). Irish and Scottish women showed comparatively little improvement, with declines of 7 per cent and 1 per cent respectively over the decade. By the 1980s mortality levels were highest in these two groups, and higher than the England and Wales values in the 1970s (Figure 9.5); these findings are similar to those observed in Scottish and Irish men. Women born in the African and Caribbean Commonwealths experienced the highest levels of mortality in the 1970s, but showed the greatest improvement over the period (Table 9.13). This improvement was also found among males from these countries. Women born in the Indian subcontinent showed a decline of 15 per cent. The mortality of African, Caribbean and Indian women in the 1980s was lower than that for Scottish and Irish women. Among women the country of birth groups that experienced lower mortality than the value for England and Wales in the 1970s, and yet experienced a greater than average decline over the decade, included those born in America, France, Australia, Canada, and the Mediterranean Commonwealth.

Figure 9.5 Comparison of all-cause SMRs between 1970-72 and 1979-83 by country of birth (England and Wales 1979-83 = 100)

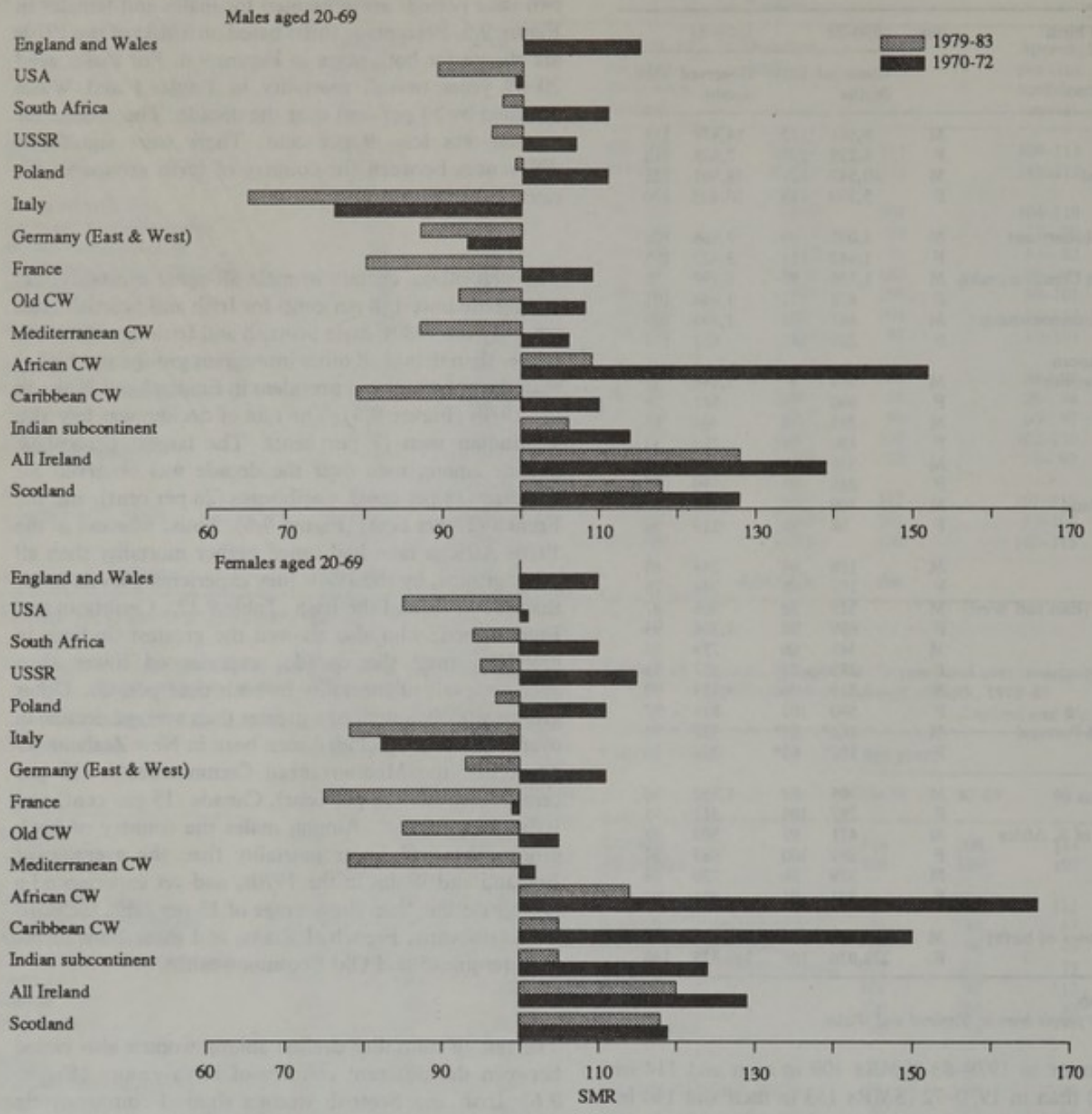


Table 9.12 Trends in male mortality at ages 20–69 from all causes by country of birth 1970–72 and 1979–83

England and Wales=100

Country of birth	1970–72		1979–83		Percentage change in SMR
	Observed deaths	SMR+	Observed deaths	SMR+	
Scotland	8,561	128	14,478	118	− 8*
All Ireland	10,547	139	18,961	128	− 8*
Indian subcontinent	3,007	114	7,566	106	− 7*
Caribbean Commonwealth	1,326	110	3,190	79	−28*
African Commonwealth	467	152	1,394	109	−28*
Meditterranean Commonwealth	594	106	1,144	87	−18*
Australia	235	101	403	85	−16*
Canada	536	113	1,051	96	−15*
New Zealand	109	104	178	84	−19
Old Commonwealth	880	108	1,632	92	−15*
France	168	109	244	80	−27*
Germany (East and West)	513	95	966	87	− 8
Italy	345	76	759	65	−14*
Poland	2,246	111	4,123	99	−11*
USSR	905	107	1,552	96	−10*
Republic of S. Africa	411	111	500	97	−13*
USA	529	99	720	89	−10*
All countries of birth**	**405,446**	**115**	**577,674**	**100**	**−13***

**Significant at 5 per cent level.*
+ SMRs with England and Wales rates for 1979–83 as standard.
***Includes people born in England and Wales.*

Figure 9.6 Percentage change in all cause SMRs between 1970-72 and 1979-83 by country of birth and sex, ages 20-69

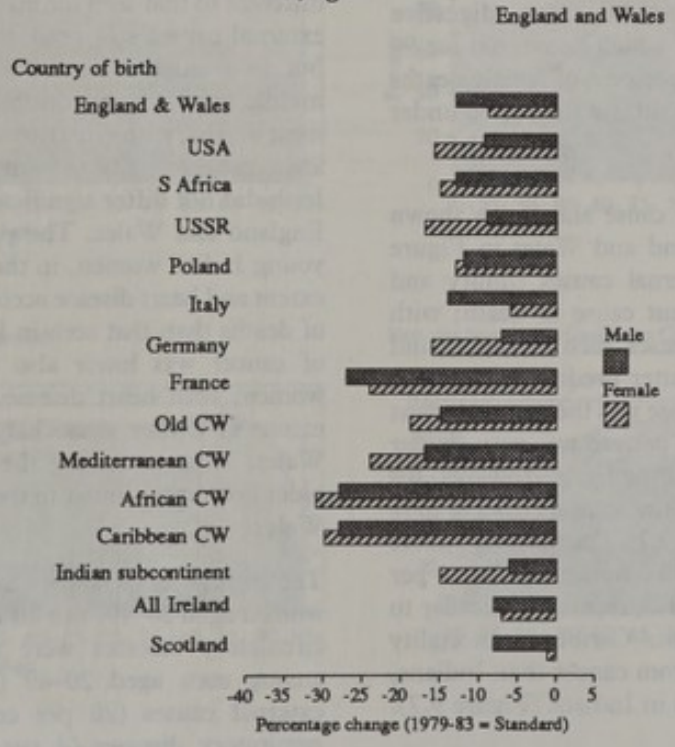


Table 9.13 Trends in female mortality at ages 20–69 from all causes by country of birth 1970–72 and 1979–83

England and Wales=100

Country of birth	1970–72		1979–83		Percentage change in SMR
	Observed deaths	SMR+	Observed deaths	SMR+	
Scotland	4,229	119	7,628	118	− 1
All Ireland	5,590	129	10,403	120	− 7*
Indian subcontinent	1,442	124	3,427	105	−15*
Caribbean Commonwealth	878	150	1,944	105	−30*
African Commonwealth	207	166	652	114	−31*
Meditterranean Commonwealth	300	102	541	78	−24*
Australia	196	104	280	83	−20*
Canada	285	108	510	85	−21*
New Zealand	68	95	119	96	1
Old Commonwealth	549	105	909	85	−19*
France	177	99	246	75	−24*
Germany (East and West)	699	111	1,356	93	−16*
Italy	273	83	657	78	− 6
Poland	580	111	819	97	−13*
USSR	297	115	312	95	−17*
Republic of S. Africa	299	110	383	94	−15*
USA	301	101	351	85	−16*
All countries of birth**	**238,076**	**110**	**348,525**	**100**	− 9*

**Significant at 5 per cent level.*
+ SMRs with England and Wales rates for 1979–83 as standard.
***Includes people born in England and Wales.*

9.6 Cause-specific mortality

9.6.1 Major causes

The percentage distribution of deaths in the 1979–83 period by cause, sex and five-year age-group has been computed for selected country of birth groups, to examine the load from major causes of death in the different age bands. The major causes are **neoplasms, circulatory diseases, respiratory diseases, digestive diseases,** and **external causes,** which accounted for 94 per cent of male deaths and 92 per cent of female deaths at all ages in England and Wales during the period under consideration.

The percentage distribution by cause and age is shown for all males resident in England and Wales in Figure 9.7. In the younger ages external causes (injury and poisoning) were the predominant cause of death; with age this shifted to chronic diseases such as cancer and circulatory diseases, with the latter predominating with increasing age. Respiratory disease was the second largest cause for the very elderly. This pattern was very similar for the Scottish (Figure 9.7) and the Irish. However, for those born in the Indian subcontinent heart disease took its toll at an earlier aged (Figure 9.7). Deaths attributable to cancer were low among Indians, not exceeding 20 per cent at any age. The pattern for Africans was similar to that seen for the Indian born. Caribbean mortality showed a higher contribution from cancer than Indians, and less heart disease than seen in Indians (Figure 9.7).

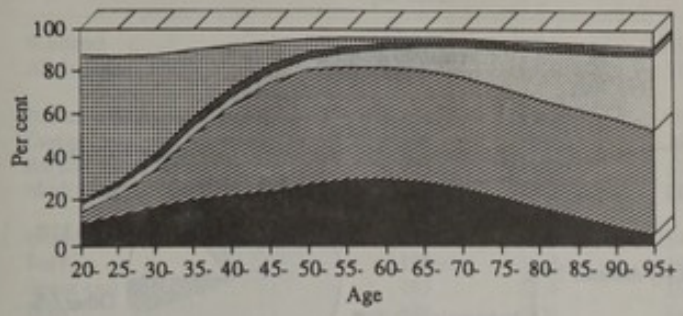
The numbers of deaths in the various age-groups constrained the examination of patterns for immigrants from many countries. Among the additional countries examined, the features of interest were the low proportion of deaths from circulatory diseases for middle aged Italians and Spanish and Portuguese, and the high external cause mortality among young Germans. There were sufficient deaths among elderly Russian and Polish males for examination; the age-specific proportions by cause in these groups were generally similar to those for England and Wales.

The pattern among women in England and Wales was different to that seen for males (Figure 9.7). Deaths from external causes still predominated at the younger ages, but to a much lesser extent compared with males. In middle aged women deaths from cancer accounted for most deaths, with circulatory disease predominating after about 60 years. The patterns among the Scottish and the Irish did not differ significantly from those prevalent in England and Wales. The pattern differed however, for young Indian women, in that cancer featured to a lesser extent and heart disease accounted for a larger proportion of deaths than that seen in England and Wales. The toll of cancer was lower also for African and Caribbean women, with heart disease predominating to a greater extent at earlier ages than that seen in England and Wales. Patterns among the Russians and the Polish at older ages were similar to those prevalent in England and Wales.

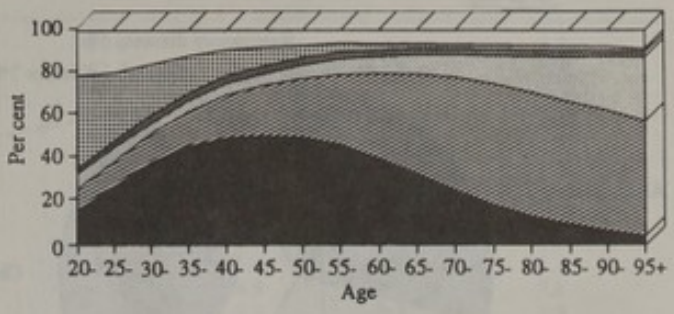
Tables 9.14–9.17 show a similar analysis for men and women aged 20–49. For all England and Wales residents circulatory diseases were the major cause of deaths among men aged 20–49 (34 per cent), followed by external causes (28 per cent), cancer (21 per cent), respiratory diseases (4 per cent), and diseases of the digestive system (3 per cent) (Figure 9.8). The countries of birth included are those with more than 100 deaths in this age-group. The percentage of the deaths to men attributable to circulatory diseases was highest in Indians (51 per cent), followed by those born in the Mediterranean Commonwealth (40 per cent) (Table 9.14). The

Figure 9.7 Distribution of deaths in each age-group by cause of death according to country of birth and sex, 1979-83

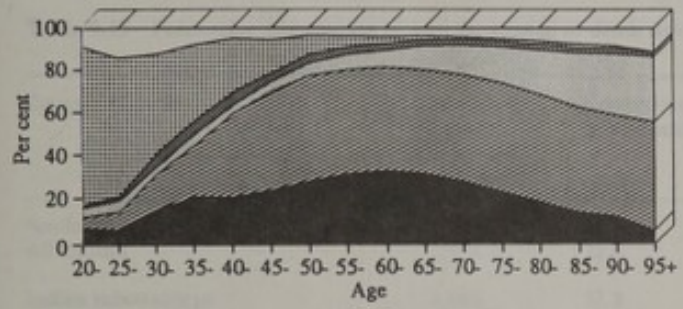
All males resident in England and Wales



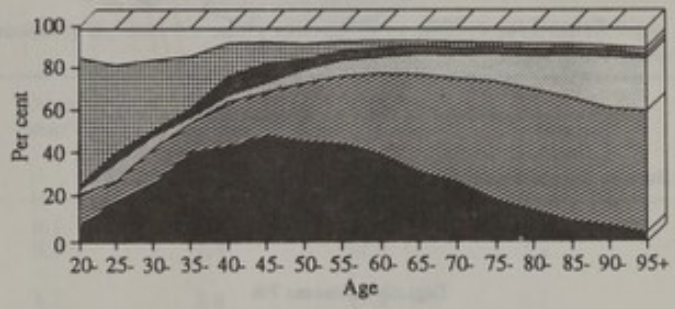
All females resident in England and Wales



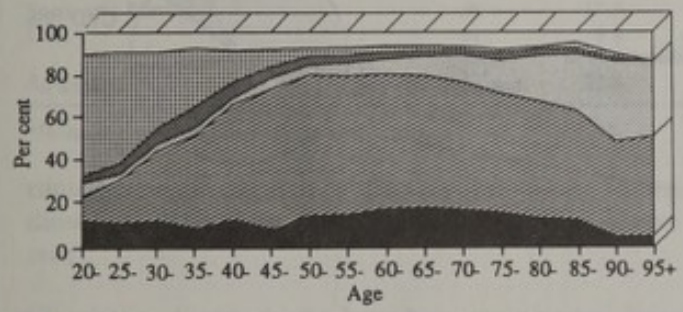
Males born in Scotland



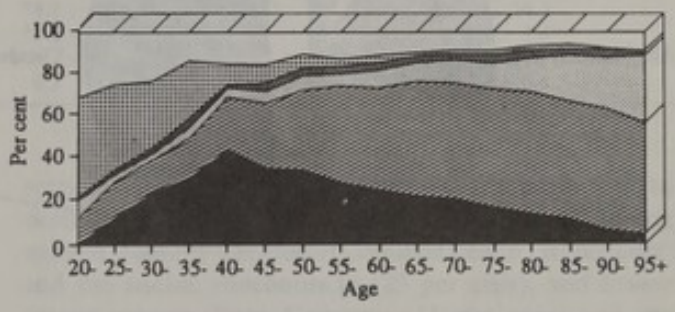
Females born in Scotland



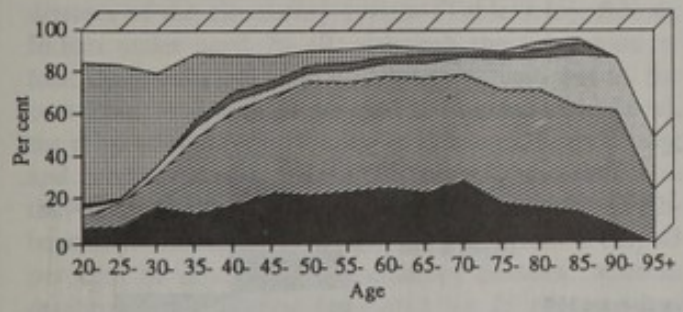
Males born in the Indian subcontinent



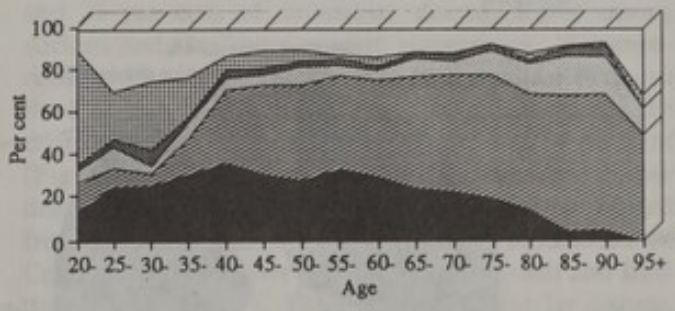
Females born in the Indian subcontinent



Males born in the Caribbean Commonwealth



Females born in the Caribbean Commonwealth



All neoplasms
Circulatory diseases
Respiratory diseases
Digestive diseases
External causes
Other

Figure 9.8 Distribution of deaths by cause according to country of birth: males aged 20-49, 1979-83

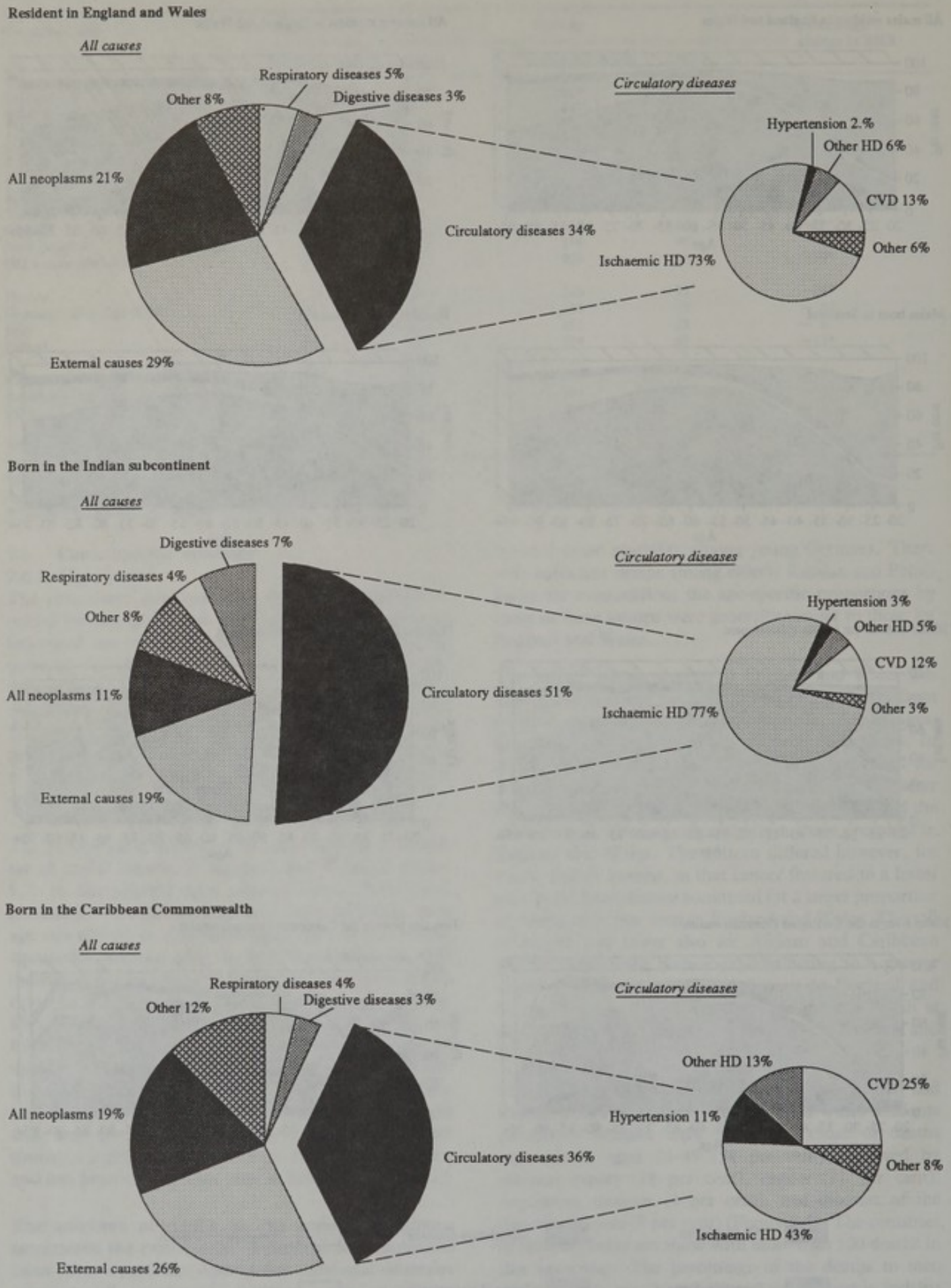


Table 9.14 Percentage distribution of cause of death for males aged 20–49 by country of birth, 1979–83

England and Wales

Country of birth	All causes (Base=100 per cent)	All neoplasms	External causes	Circulatory diseases	Respiratory diseases	Digestive diseases	Other
Scotland	2,275	20.4	31.7	31.8	4.3	4.8	7.0
All Ireland	2,914	19.4	31.2	32.7	4.4	4.8	7.7
Indian subcontinent	2,134	11.2	19.4	50.7	4.0	6.5	8.1
Caribbean Commonwealth	908	19.2	25.7	35.8	4.1	2.9	12.4
African Commonwealth	793	11.7	31.4	34.6	6.4	5.4	10.5
Mediterranean Commonwealth	254	23.2	21.3	40.2	2.8	2.8	9.8
Germany (East and West)	144	14.6	54.9	18.8	1.4	2.1	8.3
Italy	195	26.2	26.2	30.8	1.0	4.1	11.8
Spain and Portugal	103	22.3	35.0	27.2	4.9	2.9	7.8
USA	178	18.0	44.9	23.0	3.9	2.8	7.3
All countries of birth*	**82,206**	**21.3**	**28.5**	**34.1**	**4.5**	**3.3**	**8.3**

**Includes people born in England and Wales.*

Table 9.15 Percentage distribution of specific causes of death from circulatory diseases for males aged 20–49 by country of birth, 1979–83

England and Wales

Country of birth	Circulatory disease (Base=100 per cent)	Cerebrovascular diseases	Other forms of heart disease	Hypertensive disease	Ischaemic heart disease	Other circulatory diseases
Scotland	724	12.7	6.1	0.7	75.4	5.1
All Ireland	952	12.6	5.3	2.1	74.7	5.4
Indian subcontinent	1,083	12.3	4.7	2.6	77.3	3.1
Caribbean Commonwealth	325	25.2	12.9	10.5	43.1	8.3
African Commonwealth	274	15.3	12.0	4.4	64.2	4.0
Mediterranean Commonwealth	102	15.7	2.0	2.0	78.4	2.0
Germany (East and West)	27	3.7	7.4	7.4	74.1	7.4
Italy	60	6.7	6.7	0.0	71.7	15.0
Spain and Portugal	28	17.9	14.3	0.0	53.6	14.3
USA	41	9.8	12.2	0.0	70.7	7.3
All countries of birth*	**28,043**	**12.8**	**6.2**	**2.0**	**73.4**	**5.6**

**Includes people born in England and Wales.*

contribution of circulatory diseases was lowest among those born in Germany (19 per cent) and the USA (23 per cent).

Circulatory disease deaths have been examined in more detail. Among Scottish and Irish men aged 20–49, ischaemic heart disease accounted for 75 per cent and cerebrovascular disease for 13 per cent of deaths from diseases of the circulatory system (Table 9.15). Among Indian males aged 20–49, although the proportion of total deaths attributed to circulatory disease was 51 per cent (compared with 34 per cent in England and Wales), the proportionate contribution of ischaemic heart disease and cerebrovascular disease (Figure 9.8) was similar to that in England and Wales. In contrast, among Caribbean males ischaemic heart disease contributed to only 43 per cent of deaths from circulatory diseases, whereas cerebrovascular disease accounted for 25 per cent and hypertension for 10 per cent, the largest proportions for these conditions seen in any country of birth group.

In England and Wales the contribution of circulatory diseases to deaths among women at ages 20–49 was lower (19 per cent) than that of cancer (45 per cent); deaths from external causes, respiratory and digestive diseases contributed 16 per cent, 5 per cent and 4 per cent respectively (Table 9.16, Figure 9.9). The proportion of deaths due to circulatory diseases was highest among women from the Caribbean Commonwealth (30 per cent) and the Indian subcontinent (23 per cent), and lowest among women from Germany (11 per cent) and the Mediterranean Commonwealth (15 per cent).

Ischaemic heart disease accounted for only 13 per cent and 21 per cent of circulatory disease deaths among African and Caribbean women respectively, in comparison with most groups where it accounted for over one third of such deaths (Table 9.17). In Indian women the contribution of ischaemic heart disease was 34 per cent (Figure 9.9). The proportion of circulatory disease deaths attributable to cerebrovascular disease ranged from 22 per cent in women born in the Mediterranean Commonwealth to over 40 per cent in Scottish and Irish women (Table 9.17). Although cerebrovascular disease, as a proportion of all circulatory disease, was similar in Caribbean women to that in England and Wales, circulatory disease itself caused 30 per cent of deaths in Caribbean women (Figure 9.9) in contrast to 19 per cent among women in England and Wales. The proportion of circulatory disease mortality attributable to hypertension was highest in women born in the Caribbean (12 per cent).

Figure 9.9 Distribution of deaths by cause according to country of birth: females aged 20-49, 1979-83

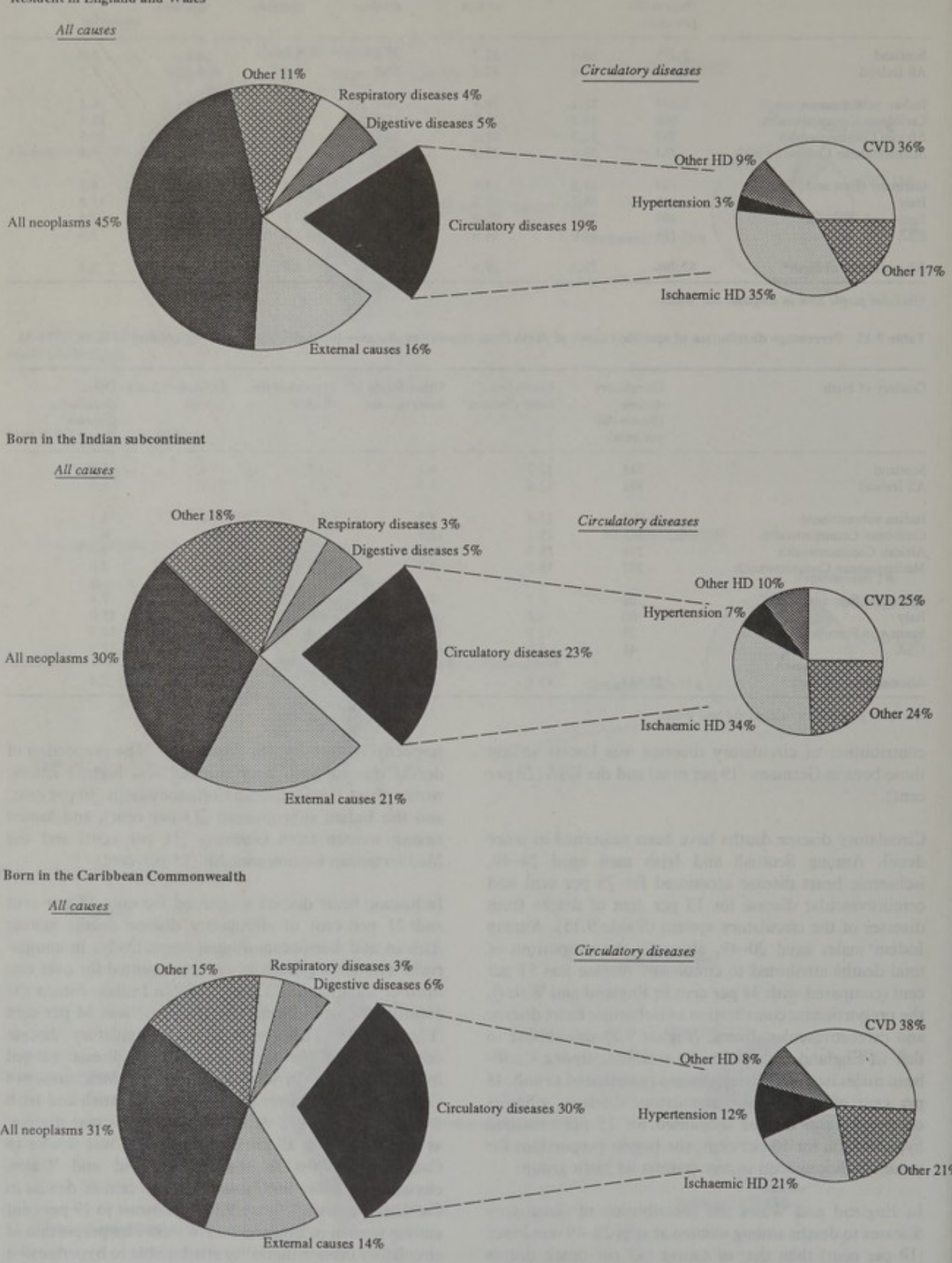


Table 9.16 Percentage distribution of cause of death for females aged 20–49 by country of birth, 1979–83

England and Wales

Country of birth	All causes (Base=100 per cent)	All neoplasms	External causes	Circulatory diseases	Respiratory diseases	Digestive diseases	Other
Scotland	1,151	41.5	20.4	17.9	4.3	6.6	9.2
All Ireland	1,632	40.6	20.4	19.4	5.3	5.6	8.8
Indian subcontinent	879	30.1	20.4	23.2	5.0	3.1	18.2
Caribbean Commonwealth	746	31.1	14.3	30.4	6.0	3.4	14.7
African Commonwealth	421	25.9	24.7	22.1	5.5	1.4	20.4
Mediterranean Commonwealth	124	53.2	17.7	14.5	4.8	1.6	8.1
Germany (East and West)	190	45.3	23.7	11.1	5.3	3.7	11.1
Italy	144	44.4	16.7	18.8	3.5	3.5	13.2
All countries of birth*	**50,237**	**45.0**	**16.2**	**18.8**	**5.4**	**3.6**	**11.0**

**Includes people born in England and Wales.*

Table 9.17 Percentage distribution of specific causes of death from circulatory diseases for females aged 20–49 by country of birth, 1979–83

England and Wales

Country of birth	Circulatory disease (Base=100 per cent)	Cerebrovascular diseases	Other forms of heart disease	Hypertensive disease	Ischaemic heart disease	Other circulatory diseases
Scotland	206	40.3	5.3	2.4	39.3	12.6
All Ireland	316	40.5	6.0	1.6	37.7	14.2
Indian subcontinent	204	24.5	10.3	7.4	33.8	24.0
Caribbean Commonwealth	227	37.9	8.8	11.9	20.7	20.7
African Commonwealth	93	32.3	22.6	2.2	12.9	30.1
Mediterranean Commonwealth	18	22.2	22.2	0.0	38.9	16.7
Germany (East and West)	21	28.6	4.8	9.5	38.1	19.0
Italy	27	33.3	14.8	3.7	37.0	11.1
All countries of birth*	**9,440**	**35.6**	**9.2**	**2.7**	**35.0**	**17.5**

**Includes people born in England and Wales.*

Among men the proportion of deaths at ages 20–49 attributable to neoplasms was highest among those born in Italy (26 per cent), the Mediterranean Commonwealth (23 per cent) and Spain and Portugal (22 per cent), and lowest among Indians (11 per cent) and Africans (12 per cent) (Table 9.14). Among women the proportion of deaths at ages 20–49 due to neoplasms was again lowest among Africans (26 per cent), Indians (30 per cent) and Caribbeans (31 per cent) in comparison with other immigrant groups (Table 9.16).

Deaths from external causes contributed 29 per cent and 16 per cent of deaths at ages 20–49 among men and women respectively in England and Wales. With some exceptions, the contribution of external causes to all deaths was higher for immigrants for both sexes than the average for England and Wales. Deaths from external causes accounted for more than half the deaths to men aged 20–49 born in Germany (55 per cent) and for 45 per cent of the deaths to men born in the USA. The proportion was low for men born in the Indian subcontinent (19 per cent). Among females deaths from external causes were highest proportionately for the Africans (25 per cent) and lowest for the Caribbeans (14 per cent).

9.7 Summary and discussion

The foregoing analysis has been based on the country of birth as opposed to the ethnic origin of the deceased for reasons outlined earlier. The two are not necessarily the same, and vary in the degree to which they are representative of each other for any given group. For instance, those classified as born in the Indian subcontinent or the African Commonwealth include expatriates of British extraction, particularly among the older age-groups,[13] making country of birth a less reliable substitute for ethnicity at older ages. The younger the age-group the more accurate is country of birth as a proxy for ethnic origin for persons born in the Indian subcontinent. The African born also include immigrants of Indian extraction. The German born include children born to members of the British armed forces in Germany, and people born in the Mediterranean Commonwealth include people of British origin.

Immigrants from South Africa and the Old Commonwealth (Australia, Canada, New Zealand) on the other hand are largely of British extraction, and could represent a mixture of different generations who have migrated back to Britain; some born to recent expatriates from Britain and others of older generations. From the Eastern Bloc, the Polish and the Russians are the two largest immigrant groups resident in this country, most of them having migrated in the 1940s or earlier.[15] Europeans other than Germans and those from the Mediterranean Commonwealth are likely by and large to represent the ethnic stocks of their respective countries. Country of birth and ethnicity are probably largely synonymous also for the Scottish and the Irish.

In the absence of suitable population denominators on the ethnic origin of people born outside England and Wales, analysis by country of birth is the best approximation for population-based estimates of mortality among foreign-born ethnic groups in this country. Ethnic differences in mortality have previously been examined for immigrants born in the Indian subcontinent and the African Commonwealth, using names on death certificates as indicators of ethnicity.[15] A further study examined mortality among immigrants from the Indian subcontinent by region of origin and religious affiliation, again on the basis of names on death certificates.[16] Such analyses unavoidably relied on proportional mortality (PMR) analysis, given the unavailability of estimates of the ethnic populations at risk. (The methodological issues relating to PMRs are discussed in detail elsewhere.)[17] Further research is underway to explore such differences using the material relating to this study.

The results presented in this chapter have not been given separately for immigrants from the individual countries of the Indian subcontinent. This is because the available evidence suggests that there could be discrepancies between the census and death registration in the recording of country of birth for those born in the Indian subcontinent. The problem arises because in reporting country of birth, at the time of death registration, India is sometimes referred to in the context of undivided, pre-partition India. An investigation relating to death records and the 1971 census showed that deaths among persons born in Pakistan had been underestimated by nearly 30 per cent as a result of such discrepancies.[18] This analysis is therefore restricted to aggregated data for the Indian subcontinent. The same sort of inconsistency was reported with respect to mortality data for persons born in Northern Ireland and the Irish Republic, these two countries are therefore analysed together.

A further consequence of analysing immigrant mortality by country of birth of the deceased is that it does not include mortality among children born in this country to immigrants. These constitute significant proportions in some groups who migrated to this country several decades ago (for example the Russians and the Polish). Second generation immigrants constitute sizeable proportions even among more recent migrants. About half the West Indian population living in Great Britain, and one third of the Indian/Pakistani/Bangladeshi population, is UK born.[19] Sizeable proportions of these ethnic groups are therefore not represented in this analysis.

A similar problem occurs with the long-standing migration of the Scottish and Irish. The Irish make up one of the largest immigrant groups from any European country, as measured by first generation immigrants.[20] If the second generation of these immigrants is included the Irish become the largest immigrant group from Europe. The 1971 Census provides the most detailed information on immigrant status in the UK. It included questions on where parents were born, thus providing some data on what might be called the 'degree of Irishness'. Around two and one quarter million persons were found to be 'Irish', of which well over one half were born in the UK to Irish born parents.

Migrant studies have often shown that immigrant groups take on the morbidity and mortality patterns of the host community over time. Perhaps the best known studies have been of Japanese immigrants to the USA, to Hawaii and California in particular.[21] Applied to the Irish, one might expect that those who have been born in England and Wales of Irish parents and those who have been resident longest to have mortality ratios more similar to those of the host community. The OPCS Longitudinal Study (LS) (see Chapter 2 for background) has recently been used to test such hypotheses using mortality data for 1971–81.[22] The results of this analysis do not support the hypothesis and show raised SMRs for Irish born residents, but also similarly high SMRs for persons born of Irish born parents.

High SMRs observed apply to persons born outside Ireland with either one or two Irish born parents. These results suggest that the 'degree of Irishness' has little effect on the observed raised mortality. Furthermore, this analysis does not support the contention that the overall raised mortality levels in the second generation result solely from social class differences.

Significant differences between immigrant groups emerged in our study of immigrant mortality in England and Wales. The variation in mortality among men at ages 20–69 years was almost twofold, ranging from an SMR of 65 for Italians to 128 among the Irish born. Scottish men also experienced a significant excess in mortality (SMR 118). A much smaller excess was apparent for Indian and African men. Males from Europe, USA, and the Caribbean and Old Commonwealths experienced lower mortality than the average levels in this country.

These findings were generally similar for women. At ages 20–69 years female SMRs for 1979–83 ranged from 56 among the Spanish and Portuguese, 75 for the French and 78 for the Italians to 118 for the Scottish and 120 for the Irish. Mortality levels were higher than average also for African, Indian and Caribbean women, and lower than average for women from Europe, the Old Commonwealth, and USA.

Excess mortality among the Scottish and the Irish was greatest among young adults, particularly among men. SMRs for Scottish and Irish men at ages 20–49 were 135 and 147 respectively, compared with SMRs of 118 and 128 respectively at ages 20–69 years. A greater excess of mortality in young adults was observed also among Africans and Indians. Caribbean men and women also experienced a significantly greater excess at ages 20–29 years (SMRs 125 and 129 respectively), despite low 'all-age' mortality in the men. In contrast, immigrant groups with low all-age mortality generally showed similar or lower gradients at younger ages.

The proportions attributed to the different causes of death varied between the country of birth groups. Of significance was the low proportion of deaths attributed

to cancer among the Indian population in both sexes, and the high proportion of deaths from circulatory diseases. These patterns were apparent also among young adults from the Indian subcontinent. The contribution of cancer was also low for Africans. Another significant feature was the comparatively high contribution of cerebrovascular disease and hypertension to mortality for Caribbean born immigrants.

Mortality was lowest for immigrants from Italy, Spain and Portugal, and France, and highest for Scottish and Irish born immigrants, with Indians and Africans showing moderate excesses. The Scottish and the Irish were the only groups to experience raised mortality also among the elderly in both sexes. Mortality for West Europeans and American immigrants was generally and significantly lower than the average levels prevalent in this country.

Mortality of immigrants in 1970–72 and 1979–83 showed significant differences between groups in the rate of mortality decline. The greatest improvements were observed for African and Caribbean men and women, with mortality levels in these groups falling sharply over the period. Thus Africans moved from being the highest risk group in 1970–72 to levels lower than Scottish and Irish in 1979–83; the same was true of Caribbean women. In contrast, the high mortality among Scottish and Irish showed the least improvement over the decade, and by the 1980s these groups had the highest mortality of the groups examined. The Scottish and Irish were also the only groups to show higher mortality in both sexes in the 1980s than the average levels for England and Wales during the 1970s. The mortality of Indian men also declined relatively slowly.

In contrast was the greater than average decline in mortality among groups for whom mortality levels were already low in the 1970s, most notably the French, but also among most groups from the Mediterranean, Canada, Australia, Italian and Caribbean men and American women.

The findings in this chapter substantiate the mortality differentials previously observed in England and Wales among various immigrant groups. More importantly, they show a differential rate of decline among the various groups, notably the relatively small decline among Scottish and Irish, in contrast to the substantial reduction in mortality among Africans and Caribbeans (who experienced high levels in the 1970s) and persons born in the Mediterranean Commonwealth or France (who experienced low levels in the 1970s). Premature death as seen by the excess mortality in younger age-groups is a cause for concern, the levels being high for Scottish, Irish, African, and Caribbean immigrants.

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10 Variations in perinatal, neonatal, postneonatal and infant mortality in England and Wales by mother's country of birth, 1982–85

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10.1 Introductions

Chapter 5 examined geographical variations in infant mortality rates in terms of crude and birthweight specific mortality rates. One finding was that, in aggregate, health districts with exceptionally high infant mortality rates had above average proportions of mothers born in the New Commonwealth and Pakistan. This chapter considers this finding in more detail.

In a report from the Social Services Committee, the incidence of perinatal mortality among ethnic minority babies was considered to be a major outstanding problem.[1] Other studies reported high rates of perinatal mortality for immigrant infants.[2–5] Some studies specifically highlighted higher perinatal rates for Pakistani and Caribbean infants.[6–8] High rates of congenital malformations among Asian infants generally and Pakistani infants in particular have been reported.[9–15] On the other hand, ethnic differences in levels and causes of postneonatal mortality in this country were not analysed until recently.[16] Nor has there been a systematic study of patterns of mortality in infants of different ethnic groups. This chapter shows that the patterns of mortality through infancy are far from uniform in the different ethnic groups; they differ according to the period of infancy under consideration.

Since 1975 OPCS has linked death records of infants dying under one year of age with corresponding birth records, thereby providing information on a variety of social and biological factors relating to deceased infants and their families. (See Chapter 2 for more details.) Information on age of mother, number of previous children born within marriage (parity), parents' country of birth, and birthweight is available from the birth records. Death records provide information on cause of death and parents occupation from which social class is derived.

Data from these linked files have been used to analyse variations in perinatal, neonatal, postneonatal and infant mortality in England and Wales by mother's country of birth. Annual data for the years 1982–85 inclusive have been aggregated to provide a large enough data set. The groups studied are mothers born in the UK, Eire, India, Bangladesh, East Africa, West Africa, the Caribbean, and Pakistan. Differences by regional health authority and district health authority of residence, and trends during the decade 1975–85 using three-year moving averages, were also examined.

Since information on ethnic origin is not recorded at birth or death registration, it has to be inferred. Country of birth is generally taken to be a reasonably good substitute for ethnicity for women in the childbearing ages.[17] Women of British origin born overseas belong mainly to older generations, so it is reasonable to assume that immigrant mothers born in the Indian subcontinent are of Asian origin, and those born in the Caribbean or West Africa are of West Indian or African origin. Immigrant mothers from the East African Commonwealth are an exception, since they are predominantly of Asian origin.[18] In this chapter immigrant mothers from the Indian subcontinent are referred to as Asians.

Identification of a child's ethnicity by mother's country of birth, although the only practical method in present circumstances, results in the classification of second-generation immigrant mothers as UK born rather than foreign born. Although their numbers in general are not large enough as yet to affect the rates for the UK born significantly, the growing numbers of UK born, ethnic minority mothers will result in an increasingly greater omission of these births. This method of classification will therefore become increasingly inadequate as a means of examining all ethnic minority births in this country. This is not as yet a serious difficulty in the case of immigrant mothers of Asian origin, since the majority of them entered this country in the 1970s and 1980s as young adults. Only a small proportion of Asian women born in this country had therefore reached the age of 20 by the mid-1980s. However, the majority of Asian women now entering the childbearing ages are UK born; consequently their births as a proportion of all Asian births will rise rapidly.[17] On the other hand, most immigration from the Caribbean occurred in the 1950s and 1960s. UK born Caribbean mothers therefore account for a sizeable proportion of all births to those of Caribbean origin. The following analysis therefore covers Asian births in this country fairly comprehensively, but for Caribbeans it refers only to births among first generation immigrant mothers, a smaller proportion of all births to Carribbean women.

10.2 Variation by period of infancy, age and parity

More than one half of deaths in the first year of life occur in the four weeks after birth (neonatal deaths), when the cause of death is generally related to antenatal and obstetric factors. Postneonatal mortality, on the other hand, relates more to social and environmental factors. In order to gain a better understanding of country of birth differences in overall infant mortality, it is therefore important to examine mortality in the different periods of infancy. Infant mortality is usually studied in terms of perinatal, neonatal and postneonatal deaths, the first two of which are not mutually exclusive.

All the associated rates refer to deaths in a calendar year as a proportion of births in the corresponding calendar year, and are defined as follows:

Infant mortality	deaths to infants under one year of age per 1,000 live births;
Perinatal mortality	stillbirths and deaths in the first week of life per 1,000 total (live and still) births;
Neonatal mortality	deaths in the first 28 days of life per 1,000 live births;
Postneonatal mortality	deaths at ages over 28 days and under one year per 1,000 live births.

Infant mortality in the 1982–85 period was highest for infants of Pakistani born mothers (16.6 per 1000 live births), followed by those with mothers born in the

Caribbean (12.9), West Africa (11.0), Eire (10.1), India (10.0), and the UK (9.7). These figures are shown in Table 10.1 and Figure 10.1. (See also Annex to Figure 10.1 in Appendix 2.) Infants of mothers born in Bangladesh and East Africa had slightly lower mortality (9.3) than infants of UK born mothers. The mortality of Pakistani infants was significantly higher than for other infants of Asian origin.

Infant mortality rates in England and Wales as a whole show wide variations by mother's age. The relationship is a U-shaped one, so for example, in 1985 the rate for infants born to teenage mothers was 14 per 1,000, fell to 8 for infants of mothers aged 25–34 and rose to 9 per 1000 for infants of older mothers. Figure 10.2 (and Annex in Appendix 2) shows that most of the country of birth groups followed a similar pattern. (The values for births to mothers under 20 and 40 or more are based on small numbers in several of the groups.) The values for births of infants to mothers born in Pakistan and the Caribbean were generally higher than the other groups. Rates for Pakistani infants were the highest in every age-group,

Table 10.1 Infant mortality rates by parity and mother's country of birth*, 1982–85

England and Wales per 1,000 livebirths

Mother's country of birth	All live births	All live births within marriage	Parity †				All live births outside marriage
			0	1	2	3 or more	
United Kingdom	9.7(21,515)	8.9(16,296)	8.3(6,142)	8.6(5,927)	10.0(2,783)	11.7(1,444)	13.2(5,219)
Eire	10.1 (269)	9.0 (199)	8.3 (54)	8.1 (59)	7.5 (34)	14.0 (52)	14.9 (70)
India	10.1 (459)	10.1 (457)	9.1 (130)	10.2 (159)	9.2 (81)	13.4 (87)	2.9 (2)
Bangladesh	9.3 (145)	9.2 (144)	13.9 (35)	9.6 (26)	6.7 (18)	8.5 (65)	14.5 (1)
East Africa	9.3 (255)	9.3 (247)	9.2 (100)	9.1 (95)	10.5 (41)	7.8 (11)	10.7 (8)
West Africa	11.0 (128)	10.6 (103)	13.3 (40)	11.7 (34)	6.2 (12)	9.3 (17)	12.6 (25)
Caribbean	12.9 (274)	13.0 (139)	17.2 (55)	11.9 (44)	10.9 (24)	9.9 (16)	12.7 (135)
Pakistan	16.6 (892)	16.5 (882)	14.8 (156)	18.1 (199)	18.0 (193)	15.7 (334)	26.0 (10)

* *Obeserved deaths are given in parentheses.*
† *Number of previous live and stillborn children within marriage only.*

Figure 10.1 Infant, perinatal, neonatal and postneonatal mortality rates by mother's country of birth, 1982-85, England and Wales

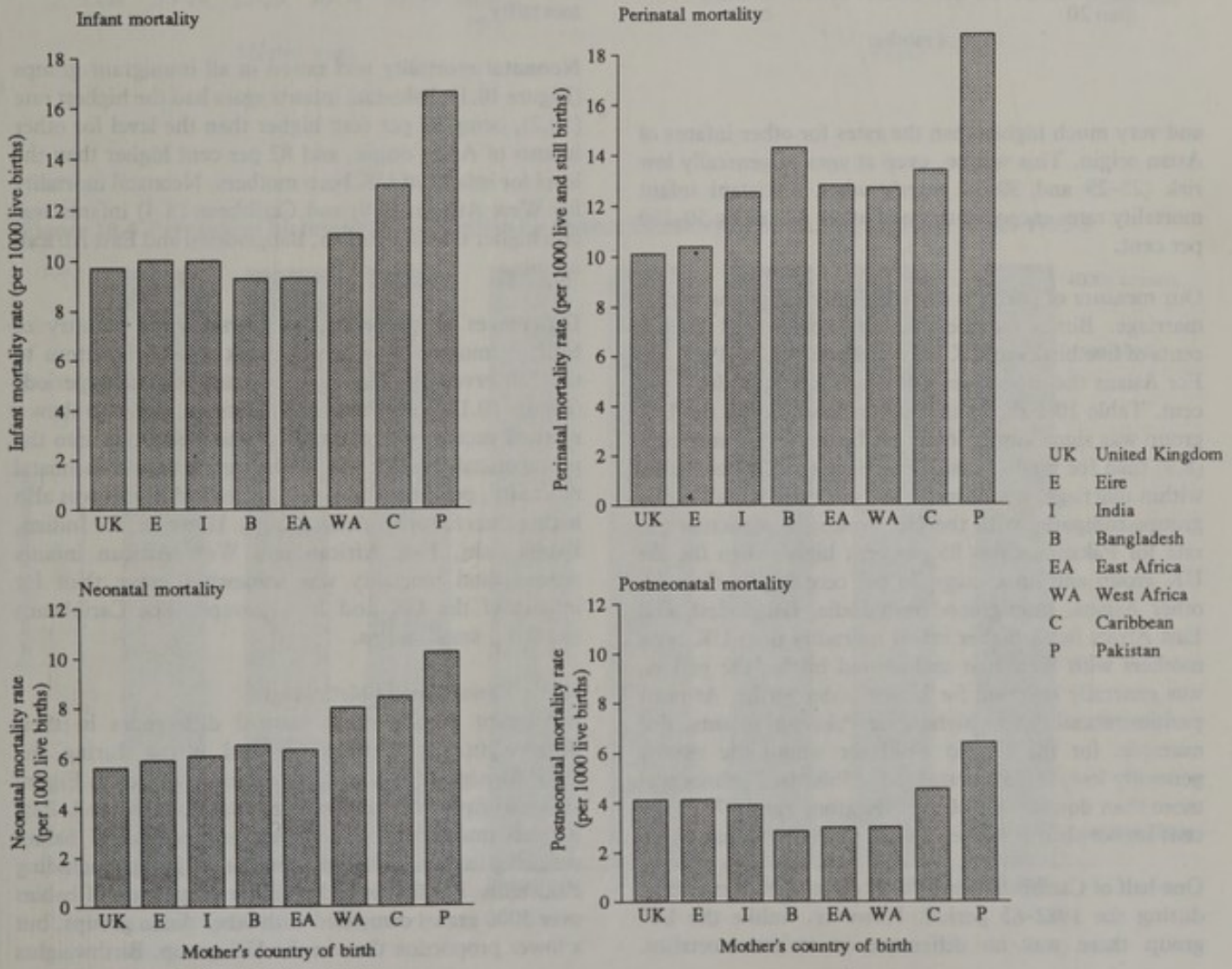
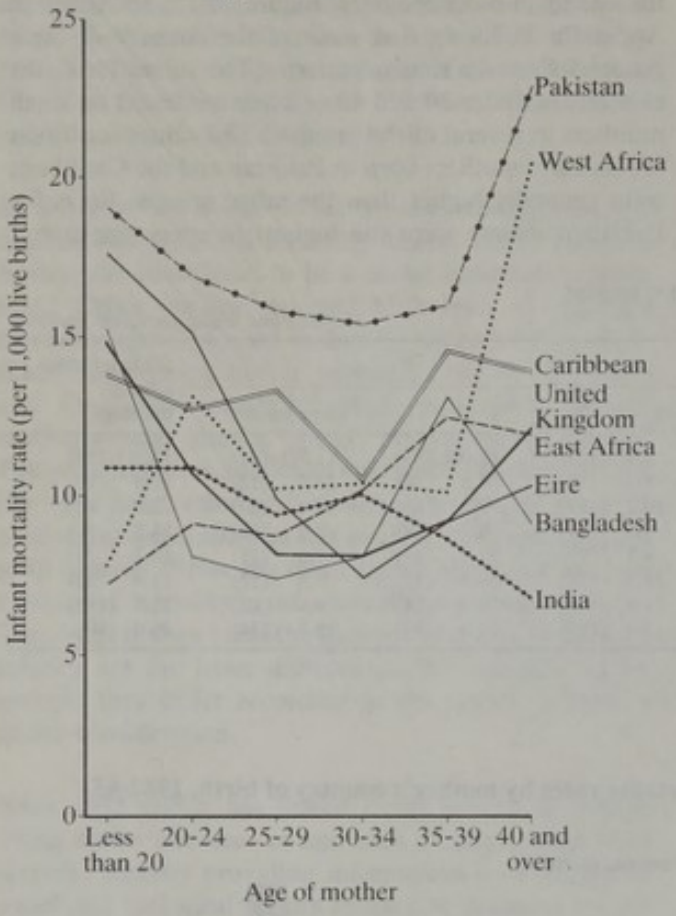


Figure 10.2 Infant mortality rates by mother's age and country of birth, 1982-85, England and Wales



and very much higher than the rates for other infants of Asian origin. This was so, even at ages of generally low risk (25–29 and 30–34 years), when Pakistani infant mortality rates exceeded those of other Asians by 50–100 per cent.

Our measure of parity is available only for births within marriage. Births outside marriage constituted 18 per cents of live births to UK born mothers during 1982–85. For Asians the proportion was much lower, under 2 per cent. Table 10.1 shows that infant mortality in the UK group was significantly lower for births within marriage (8.9) than for births outside marriage (13.2). For births within marriage, infant mortality was raised in all Asian groups compared with the UK group; in particular the rate for Pakistanis was 85 per cent higher than for the UK group and on average 70 per cent higher than for other Asians. Immigrants from India, Bangladesh and East Africa faced higher infant mortality than UK born mothers with their first and second births; the pattern was generally reversed for higher order births. At most parities mortality was highest for Pakistani infants. For example, for the second child for whom the risk is generally low, infant mortality for Pakistani infants was more than double that of the UK group, and 77–99 per cent higher than for other Asians of the same parity.

One half of Caribbean births took place outside marriage during the 1982–85 period. However, unlike the UK group there was no difference in infant mortality. Compared with the UK group, Caribbean parity-specific infant mortality rates for births within marriage were raised at all parities except 3 and over.

Perinatal mortality rates for the different country of birth groups during the 1982–85 period are shown in Figure 10.1. Perinatal mortality was raised in all immigrant groups, being highest for Pakistani infants (18.8 compared with 10.1 in the UK group). Other Asian groups, West Africans and Caribbeans showed smaller excesses.

Excess perinatal mortality in Asian groups was also apparent at most maternal ages (increasing with age) and parities. At every maternal age and parity perinatal mortality was highest for Pakistani infants; these rates were considerably higher than for other immigrants from the Indian subcontinent (Figure 10.3). (See also Annex to Figure 10.3 in Appendix.2.)

Even in low risk groups, such as mothers aged 25–29 years or those having their second birth, perinatal mortality for Pakistanis was double that for the UK group and more than 40 per cent higher than for Indians and Bangladeshis.

About 80 per cent of the neonatal deaths in 1982–85 occurred in the first week of life. The patterns are therefore very similar to those found for perinatal mortality.

Neonatal mortality was raised in all immigrant groups (Figure 10.1). Pakistani infants again had the highest rate (10.2), being 60 per cent higher than the level for other infants of Asian origin, and 82 per cent higher than the level for infants of UK born mothers. Neonatal mortality for West African (8.0) and Caribbean (8.4) infants was also higher than for Indian, Bangladeshi and East African infants.

Differences in **postneonatal mortality** by country of birth of mother show a somewhat different pattern to that observed for the perinatal and neonatal periods (Figure 10.1). Only Pakistani infants continued to show a marked excess in mortality over the UK group into the postneonatal period. As with perinatal and neonatal mortality, postneonatal mortality for Pakistanis was also higher than for other Asian groups. However, for Indian, Bangladeshi, East African and West African infants postneonatal mortality was somewhat lower than for infants of the UK and Irish groups. The Caribbeans showed a small excess.

10.3 Variations by birthweight

Immigrant groups show marked differences in their birthweight distributions of total births during the 1982–85 period (Figure 10.4). (See also Annex to Figure 10.4 in Appendix 2.) Indian, Bangladeshi and East African immigrants had higher proportions of babies weighing under 3000 grams than other groups including Pakistanis. Pakistanis had a higher proportion of babies over 3000 grams compared with other Asian groups, but a lower proportion than in the UK group. Birthweights

Figure 10.3 Perinatal mortality rates by age and parity for mothers born in UK and the Indian subcontinent, 1982-85, England and Wales

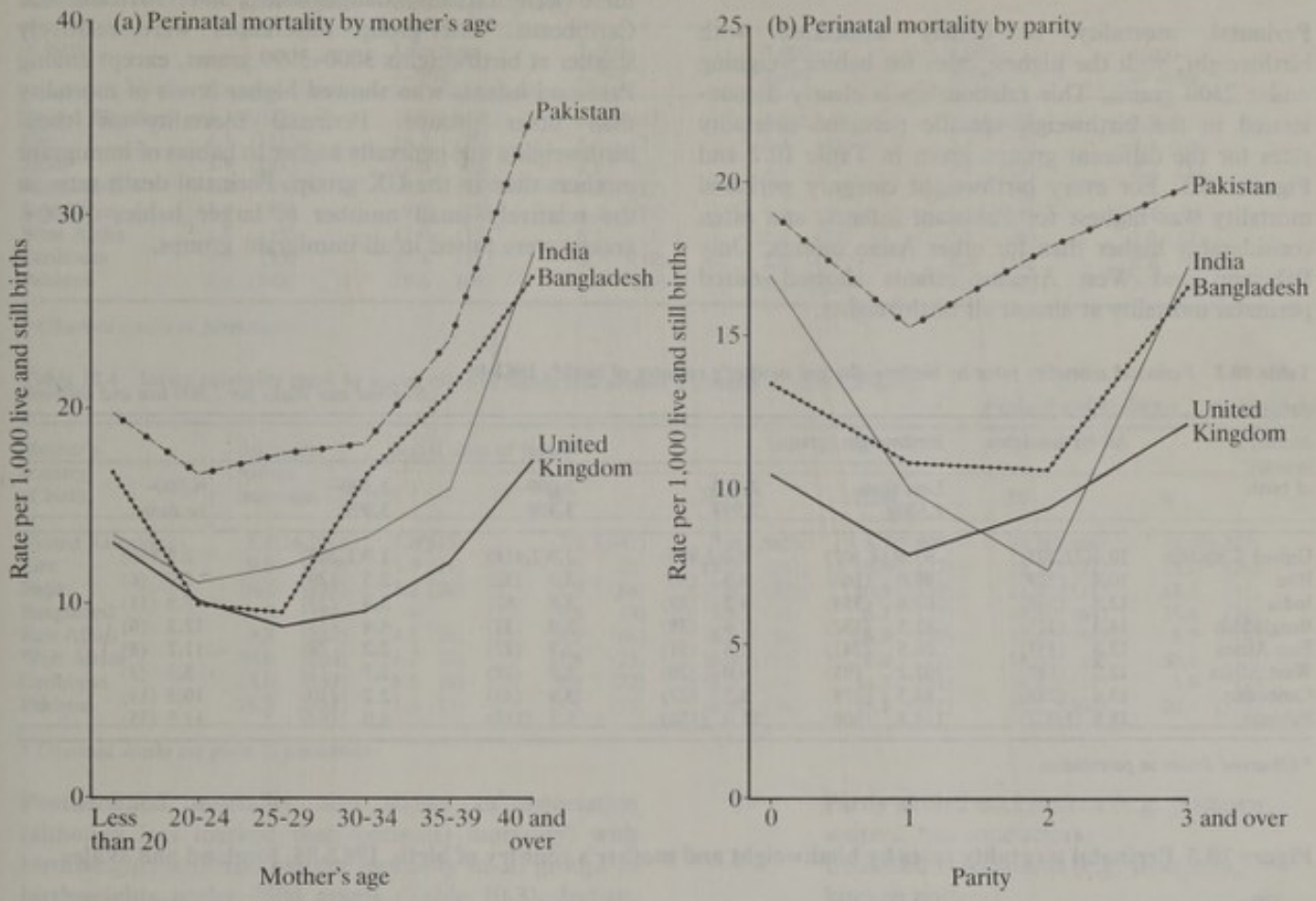
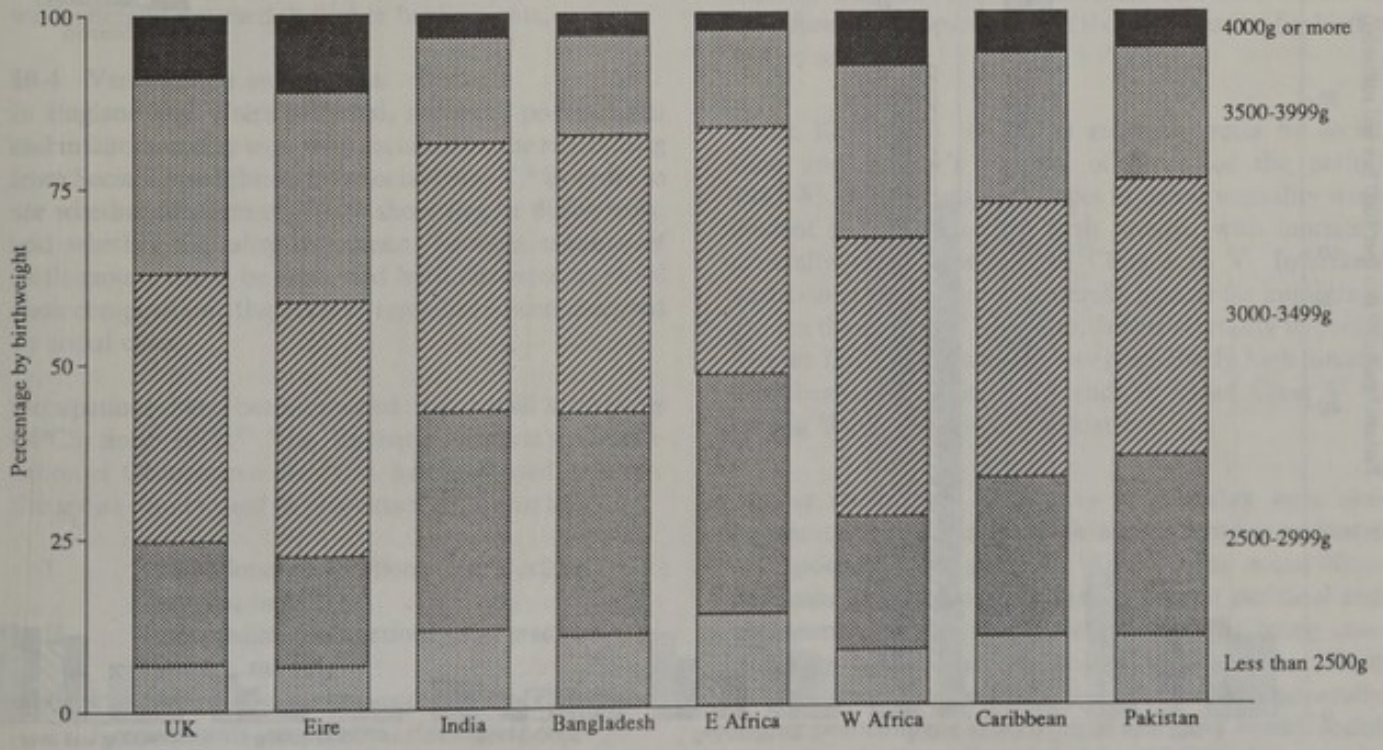


Figure 10.4 Percentage birthweight distribution by mother's country of birth, England and Wales 1982-5



for West African and Caribbean infants were lower than in the UK group, but higher than in Asian groups.

Perinatal mortality is closely associated with birthweight, with the highest rates for babies weighing under 2500 grams. This relationship is clearly demonstrated in the birthweight-specific perinatal mortality rates for the different groups given in Table 10.2 and Figure 10.5. For every birthweight category perinatal mortality was highest for Pakistani infants, and often considerably higher than for other Asian infants. Only Pakistani and West African infants showed raised perinatal mortality at almost all birthweights.

At birthweights under 3000 grams several immigrant groups had lower perinatal rates than the UK group; these were Indians, Bangladeshis, East Africans and Caribbeans. Inter-group differences were relatively smaller at birthweights 3000–3999 grams, except among Pakistani infants who showed higher levels of mortality than other groups. Perinatal mortality at these birthweights was generally higher in babies of immigrant mothers than in the UK group. Perinatal death rates in the relatively small number of larger babies (4000+ grams) were raised in all immigrant groups.

Table 10.2 Perinatal mortality rates by birthweight and mother's country of birth*, 1982–85

England and Wales per 1,000 live and stillbirths

Mother's country of birth	All birthweights	Birthweight (grams)				
		Less than 2,500g	2,500–2,999	3,000–3,499	3,500–3,999	4,000– or more
United Kingdom	10.1(22,503)	93.8(14,107)	7.4(2,899)	2.9(2,418)	1.9(1,203)	2.8(550)
Eire	10.4 (279)	98.0 (166)	8.5 (36)	3.3 (32)	2.5 (20)	2.0 (6)
India	12.5 (576)	67.6 (353)	6.2 (89)	3.8 (67)	3.3 (23)	7.3 (11)
Bangladesh	14.3 (225)	81.5 (132)	7.6 (38)	5.0 (31)	4.4 (10)	12.2 (6)
East Africa	12.8 (351)	66.5 (241)	5.4 (51)	2.7 (27)	2.2 (8)	11.2 (8)
West Africa	12.7 (149)	102.2 (95)	9.0 (20)	3.9 (18)	1.7 (5)	3.3 (3)
Caribbean	13.4 (288)	84.3 (178)	5.5 (27)	3.9 (33)	2.2 (10)	10.3 (13)
Pakistan	18.8 (1,022)	114.8 (600)	11.0 (156)	5.1 (110)	6.0 (63)	12.5 (35)

* *Observed deaths in parentheses.*

Figure 10.5 Perinatal mortality rates by birthweight and mother's country of birth, 1982-85, England and Wales

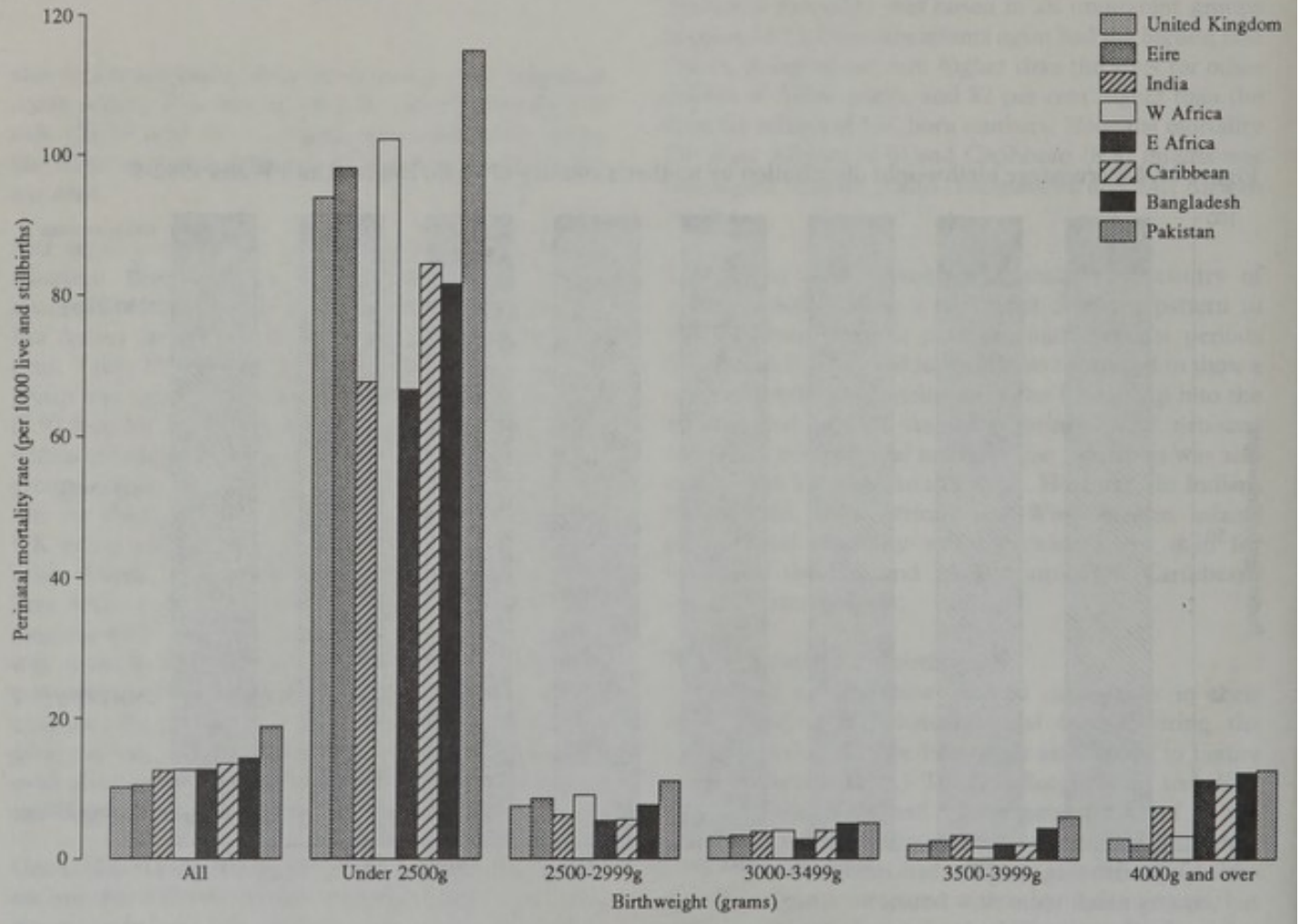


Table 10.3 Postneonatal mortality rates by birthweight and mother's country of birth*, 1982–85

England and Wales per 1,000 livebirths

Mother's country of birth	All birthweights	Birthweight (grams)				
		Less than 2,500g	2,500–2,999	3,000–3,499	3,500–3,999	4,000– or more
United Kingdom	4.1(9,077)	14.4(2,049)	5.2(2,042)	3.3(2,767)	2.5(1,573)	2.2(442)
Eire	4.1 (111)	16.2 (26)	5.5 (23)	3.4 (33)	2.1 (17)	3.4 (10)
India	3.9 (181)	12.6 (63)	3.0 (43)	3.1 (54)	2.4 (17)	0.7 (1)
Bangladesh	2.8 (44)	9.7 (15)	3.4 (17)	0.8 (5)	1.3 (3)	–
East Africa	3.0 (83)	9.2 (32)	2.2 (21)	1.9 (19)	2.2 (8)	1.4 (1)
West Africa	3.0 (35)	17.0 (15)	0.5 (1)	2.4 (11)	2.1 (6)	2.2 (2)
Caribbean	4.5 (95)	15.8 (32)	3.7 (18)	2.9 (24)	3.3 (15)	0.8 (1)
Pakistan	6.4 (343)	19.6 (96)	6.3 (89)	5.3 (112)	3.3 (34)	3.3 (9)

* *Observed deaths in parentheses.*

Table 10.4 Infant mortality rates by social class of father and mother's country of birth*,1982–85

England and Wales per 1,000 livebirths

Mother's country of birth	All births within marriage	Social class of father					
		I	II	IIIN	IIIM	IV	V
United Kingdom	8.9(16,296)	7.0(915)	7.5(3,047)	7.8(1,565)	8.7(5,809)	10.7(2,696)	12.5(1,327)
Eire	9.0 (199)	5.9 (11)	5.5 (28)	11.7 (26)	10.0 (77)	12.5 (27)	13.1 (20)
India	10.1 (457)	5.2 (20)	8.7 (66)	7.6 (32)	10.5 (150)	11.1 (118)	13.3 (41)
Bangladesh	9.2 (144)	–	9.6 (9)	9.6 (15)	6.1 (27)	10.0 (64)	15.6 (26)
East Africa	9.3 (247)	4.8 (16)	8.9 (66)	8.6 (36)	8.9 (59)	12.6 (56)	8.7 (4)
West Africa	10.6 (103)	4.7 (8)	11.6 (23)	10.6 (10)	8.0 (7)	14.5 (9)	30.0 (3)
Caribbean	13.0 (139)	8.5 (8)	9.8 (22)	15.2 (16)	14.7 (61)	14.6 (18)	5.0 (2)
Pakistan	16.5 (882)	7.3 (11)	13.1 (73)	18.4 (54)	15.8 (261)	16.8 (304)	20.4 (126)

* *Observed deaths are given in parentheses*

Postneonatal mortality also shows an association (although less marked than perinatal mortality) with birthweight, with the highest mortality in all groups at birthweights under 2500 grams (Table 10.3). Indian, Bangladeshi and East African babies had lower postneonatal mortality than the UK group at every birthweight, but Pakistani infants again showed markedly higher rates than the UK and other Asian groups throughout. Caribbeans and West Africans had higher postneonatal mortality at birthweights under 2500 grams; this pattern was generally reversed at higher birthweights.

10.4 Variation by social class

In England and Wales perinatal, neonatal, postneonatal and infant mortality vary with social class, the rates rising from Social Class I through to Social Class V.[1] In order to see whether immigrant groups show similar differences, and whether mortality differences between country of birth groups could be explained by differences in social class composition, the various rates have been analysed by social class.

Occupations have been grouped into social classes by OPCS since 1911.[19] The Registrar General's Classification of Occupations for 1980, has been used to derive the social classes used in this report.[20] These are:

- I Professional occupations (e.g. doctors, dentists, barristers)
- II Intermediate occupations (e.g. teachers, farmers, nurses)
- IIIN Skilled non-manual occupations (e.g. shop assistants, secretaries, clerks)
- IIIM Skilled manual occupations (e.g. bakers, mechanics, vehicle drivers)
- IV Partly skilled occupations (e.g. postmen, waiters, bus conductors)
- V Unskilled occupations (e.g. labourers, kitchen porters)

Social class, based on father's occupation and economic status, is given here for births within marriage only. This is because some births outside marriage are registered by the mother alone, and these are classified to the social class of mother. The classification for these births is therefore not comparable with the classification for births within marriage.

Table 10.4 shows the **infant mortality** rates by social class and mother's country of birth for the period 1982–85. Social class differences in infant mortality were evident in all country of birth groups, with mortality generally rising from Social Class I to V. Interclass variation in mortality was generally greater for immigrant groups than for the UK group. Infant mortality in Social Classes IIIN, IIIM and IV was particularly high among Caribbeans and Pakistanis, and in Social Class V in among West Africans and Pakistanis.

Similar social class differences in mortality were also apparent in most country of birth groups in the **perinatal** and **postneonatal** periods. Within each social class Pakistani infants generally had the highest perinatal and postneonatal rates, their levels throughout being considerably higher than those for other Asians. West African and Caribbean infants also showed generally higher perinatal and postneonatal mortality in each social class than Indians, Bangladeshis and East Africans. In each social class Indian, Bangladeshi and East African

infants had higher perinatal mortality than the UK group, but later in infancy the pattern was generally reversed.

Figure 10.6 shows perinatal, postneonatal and infant mortality ratios for the different ethnic groups, standardised for social class (The rates of England and Wales were used as the standard.) Standardisation has little effect on the direction and magnitude of mortality differences between the groups. All immigrant groups still show excess perinatal mortality, with markedly raised levels for Caribbean and Pakistani infants. In the postneonatal period only Pakistani infants showed excess mortality; for Bangladeshi and African infants postneonatal mortality was lower than in the UK group, whereas remaining groups show only marginal differences. Infant mortality was significantly higher for Caribbeans and Pakistanis even after standardisation for social class.

10.5 Variation by cause of death

Here the main causes of infant mortality are presented, and comments made on the salient features for the component stages of infancy. Deaths from congenital anomalies are examined in greater detail than other causes, since they are major causes of death in some immigrant groups. There are notable differences between the groups in causes of infant death (see Figure 10.7) and in the relative contribution of selected conditions to infant mortality. (See also Annex to Figure 10.7 in Appendix 2.)

10.5.1 Congenital anomalies

Figure 10.7 shows that **infant mortality** from congenital anomalies (ICD 740–759) during the 1982–85 period occurred at a higher rate for mothers from the Indian subcontinent compared with the UK or Afro-Caribbean groups. Pakistani infants in particular showed a markedly high mortality rate from congenital malformations (6.8 per 1,000 live births compared with 2.5 for the UK group), more than double the raised rate for Indians, Bangladeshis and East Africans. Asian groups showed excess mortality from congenital anomalies at all stages of infancy (Table 10.5). **Perinatal** and **postneonatal mortality** attributable to congenital anomalies was again highest for Pakistani infants. Their rates were almost three times those for the UK group, and around double those for other immigrant groups.

Table 10.5 Perinatal and postneonatal mortality from congenital anomalies, 1982–85

England and Wales

Mother's country of birth	Mortality from congenital anomalies*	
	Perinatal†	Postneonatal**
United Kingdom	1.9(4,192)	0.7(1,664)
Eire	2.2 (60)	0.9 (23)
India	2.7 (126)	1.0 (48)
Bangladesh	3.5 (56)	1.0 (16)
East Africa	2.3 (64)	0.9 (25)
West Africa	1.6 (19)	0.9 (11)
Caribbean	2.1 (44)	0.8 (18)
Pakistan	5.7 (309)	2.0 (106)

** Observed deaths in parentheses.*
† Rate per 1,000 total births.
*** Rate per 1,000 live births.*

10.5.2 Perinatal conditions

West African and Caribbean infants showed excess **infant mortality** from perinatal conditions (ICD 760–779) over the UK group (Figure 10.7). The excess was smaller for East African and Pakistani infants. For Indian and Bangladeshi infants rates were similar to that for

Figure 10.6 Perinatal, postneonatal and infant mortality ratios standardised for social class (UK born = 100), by mother's country of birth, 1982-85, England and Wales

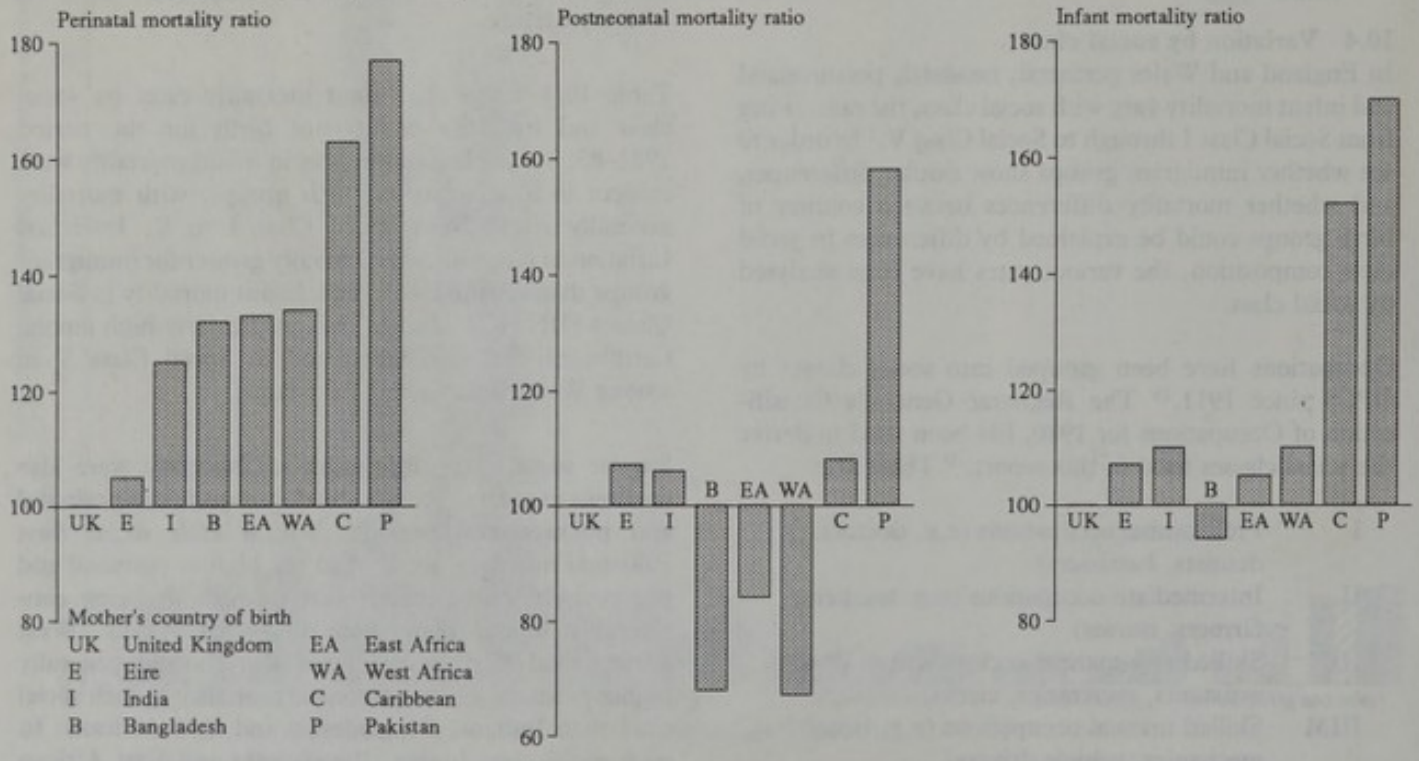
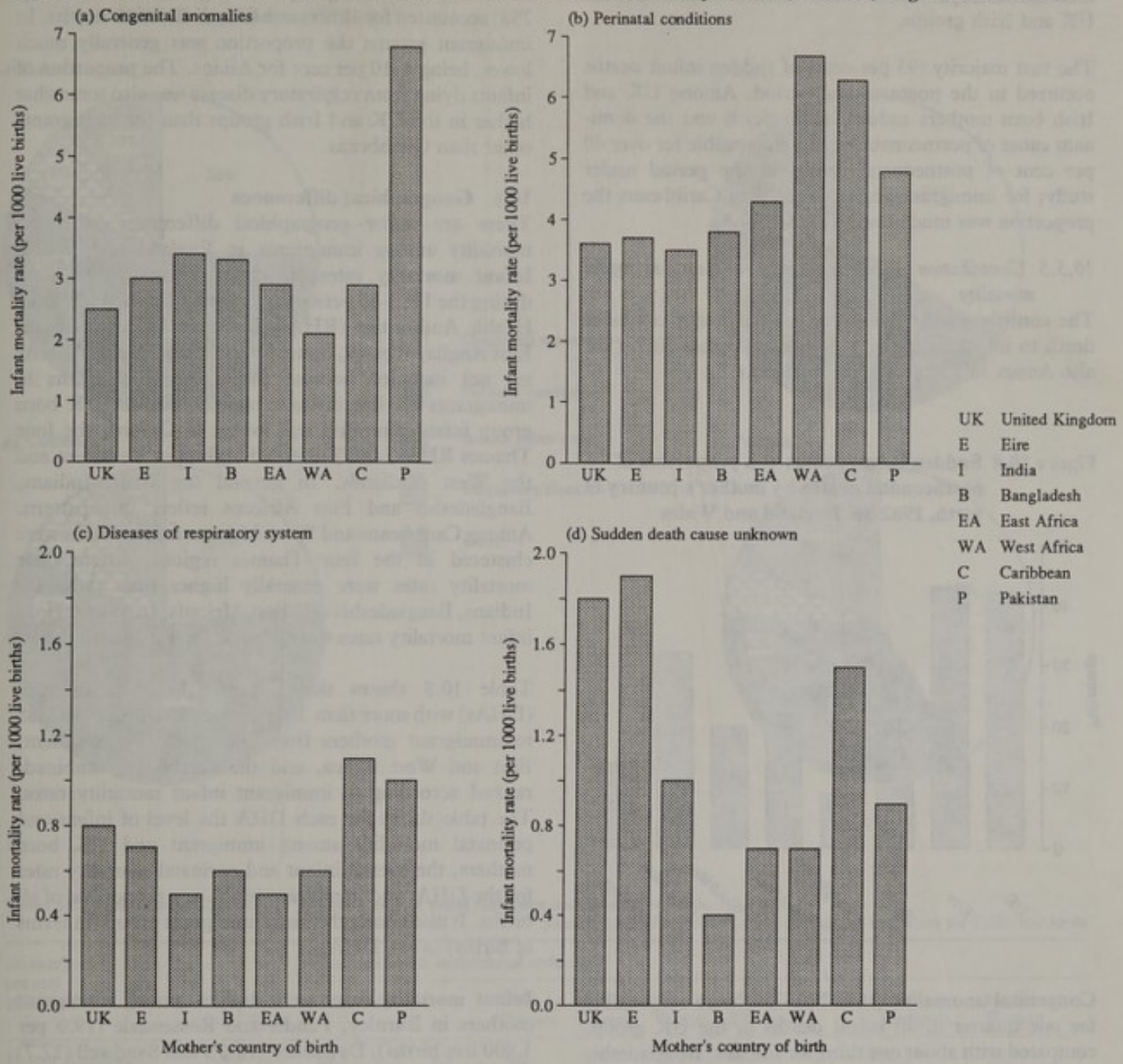


Figure 10.7 Infant mortality by main causes of death and mother's country of birth, 1982-85, England and Wales



the UK group. In the **perinatal** period, however, all immigrant groups (except Eire) showed higher mortality from perinatal conditions (Table 10.6). The excess was greatest for West African, Caribbean and Pakistani infants.

Table 10.6 Perinatal mortality from perinatal conditions and respiratory distress syndrome by mother's country of birth, 1982–85

England and Wales per 1,000 live and stillbirths

Mother's country of birth	Perinatal conditions* (ICD 760–779)	Respiratory distress syndrome* (ICD 769)
United Kingdom	8.0(17,883)	0.8(1,818)
Eire	8.0 (216)	0.7 (19)
India	9.5 (437)	0.6 (26)
Bangladesh	10.3 (163)	0.6 (10)
East Africa	10.3 (282)	0.7 (18)
West Africa	11.0 (129)	0.9 (11)
Caribbean	11.2 (241)	1.1 (24)
Pakistan	12.6 (688)	0.7 (40)

* *Observed deaths are given in parentheses.*

10.5.3 Respiratory diseases

Compared with the UK and Irish groups, infant deaths from diseases of the respiratory system (ICD 460–519) occurred at a slightly lower rate for Indian, Bangladeshi and African infants, but at a slightly higher rate for Caribbeans and Pakistanis (Figure 10.7). Most deaths attributable to this cause occurred in the **postneonatal** period. **Perinatal mortality** from respiratory distress syndrome (ICD 769) also occurred at a slightly lower rate in Asians but was higher for Caribbeans (Table 10.6).

10.5.4 Sudden death from unknown causes

Virtually all sudden deaths from unknown causes (ICD 798) were classified to sudden infant death syndrome (ICD 798.0). Sudden infant death occurred at a much lower rate (0.4 – 1.0 per 1,000 live births) in Asian groups compared with the UK group (1.8 per 1,000 live births) (Figure 10.7). West Africans also had a low rate of sudden infant death. Only for Caribbeans did the

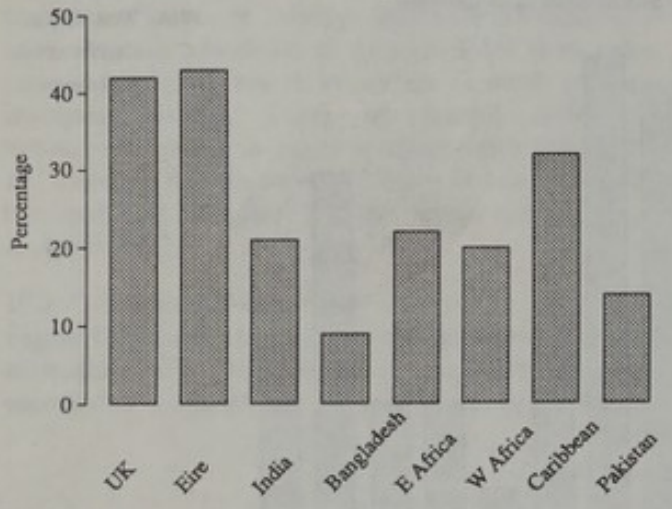
incidence of sudden infant death come close to that of the UK and Irish groups.

The vast majority (95 per cent) of sudden infant deaths occurred in the **postneonatal** period. Among UK and Irish born mothers sudden infant death was the dominant cause of postneonatal death, responsible for over 40 per cent of postneonatal deaths in the period under study; for immigrant groups other than Caribbeans the proportion was much lower (Figure 10.8).

10.5.5 Contribution of selected causes of death to infant mortality

The contribution of these selected but major causes of death to infant mortality is shown in Figure 10.9. (See also Annex to Figure 10.9 in Appendix 2.)

Figure 10.8 Sudden infant deaths as a proportion of postneonatal deaths by mother's country of birth, 1982-85, England and Wales



Congenital anomalies (ICD 740–759) were responsible for one quarter of all infant deaths to the UK group, compared with about one third for Indians, Bangladeshis and East Africans. The proportion was even higher in Pakistanis, with 41 per cent of infant deaths being caused by congenital defects, the dominant cause of infant death in this group. In West Africans and Caribbeans congenital anomalies were responsible for a lower proportion (about one fifth) of infant deaths compared with other groups.

Conditions arising in the perinatal period (ICD 760–779) were responsible for about 37 per cent of all infant deaths in the UK and Irish groups, compared with 61 per cent for West Africans and 49 per cent for Caribbeans. For Indians perinatal conditions were responsible for about as many infant deaths as congenital anomalies (34–35 per cent). For East Africans and Bangladeshis perinatal conditions were a somewhat more common cause of infant death than congenital anomalies. For West Africans and Caribbeans perinatal conditions accounted for a much larger proportion of infant deaths than congenital anomalies; the reverse was true of Pakistanis.

In the UK and Irish groups **sudden infant deaths** (ICD 798) accounted for almost one fifth of all infant deaths. In immigrant groups the proportion was generally much lower, being 4–10 per cent for Asians. The proportion of infants dying from respiratory disease was also somewhat higher in the UK and Irish groups than for immigrants other than Caribbeans.

10.6 Geographical differences

There are major geographical differences in infant mortality among immigrants in England and Wales. **Infant mortality** rates by mother's country of birth during the 1982–85 period are given for selected Regional Health Authorities (RHAs) in Table 10.7. Northern, East Anglia, Wessex, South Western and Mersey RHAs are not included because the numbers of births to immigrants are low in these regions. For the UK born group infant mortality was lowest in Oxford, the four Thames RHAs, and Trent and highest in Yorkshire and the West Midlands. In general the Irish, Indians, Bangladeshis and East Africans reflect this pattern. Among Caribbeans and West Africans infant deaths were clustered in the four Thames regions, where their mortality rates were generally higher than those for Indians, Bangladeshis and East Africans. In most regions infant mortality rates were highest for Pakistani infants.

Table 10.8 shows those district health authorities (DHAs) with more than 30 infant deaths during 1982–85 to immigrant mothers from the Indian subcontinent, East and West Africa, and the Caribbean combined, ranked according to immigrant infant mortality rates. The table shows for each DHA the level of infant and perinatal mortality among immigrant and UK born mothers, the overall infant and perinatal mortality rates for the DHA, and immigrant births as a proportion of all births. It also shows the main immigrant group (in terms of births) in the DHA.

Infant mortality rates were highest among immigrant mothers in Burnley, Pendle and Rossendale (19.0 per 1,000 live births), Dewsbury (18.6), and Sandwell (17.7) DHAs, where they exceeded the average infant mortality rate of 9.8 for England and Wales as a whole during 1982–85 by 80–94 per cent. Immigrant rates in these DHAs were also higher than the corresponding DHA rates for UK born mothers by 44, 69 and 36 per cent respectively. Of these DHAs only Dewsbury and Sandwell had a relatively high proportion of immigrant births (23 and 19 per cent respectively), but this was still much lower than the proportion in Birmingham and some London boroughs. Infant mortality for immigrant mothers was also high in Bradford (16.9), South Bedfordshire (16.3), and Oldham (16.3), being higher by 50, 83 and 66 per cent respectively than that for UK born mothers residing in these areas. Generally, in DHAs with high immigrant infant mortality rates, the immigrant community was predominantly of Pakistani origin.

At the other extreme was Leicestershire, second only to Bradford in numbers of immigrant births (6,650 and 6,879 respectively during the period under study), but with the lowest immigrant infant mortality rate of the

Figure 10.9 Percentage contribution of the main causes of death to infant mortality by mother's country of birth, 1982-85 England and Wales

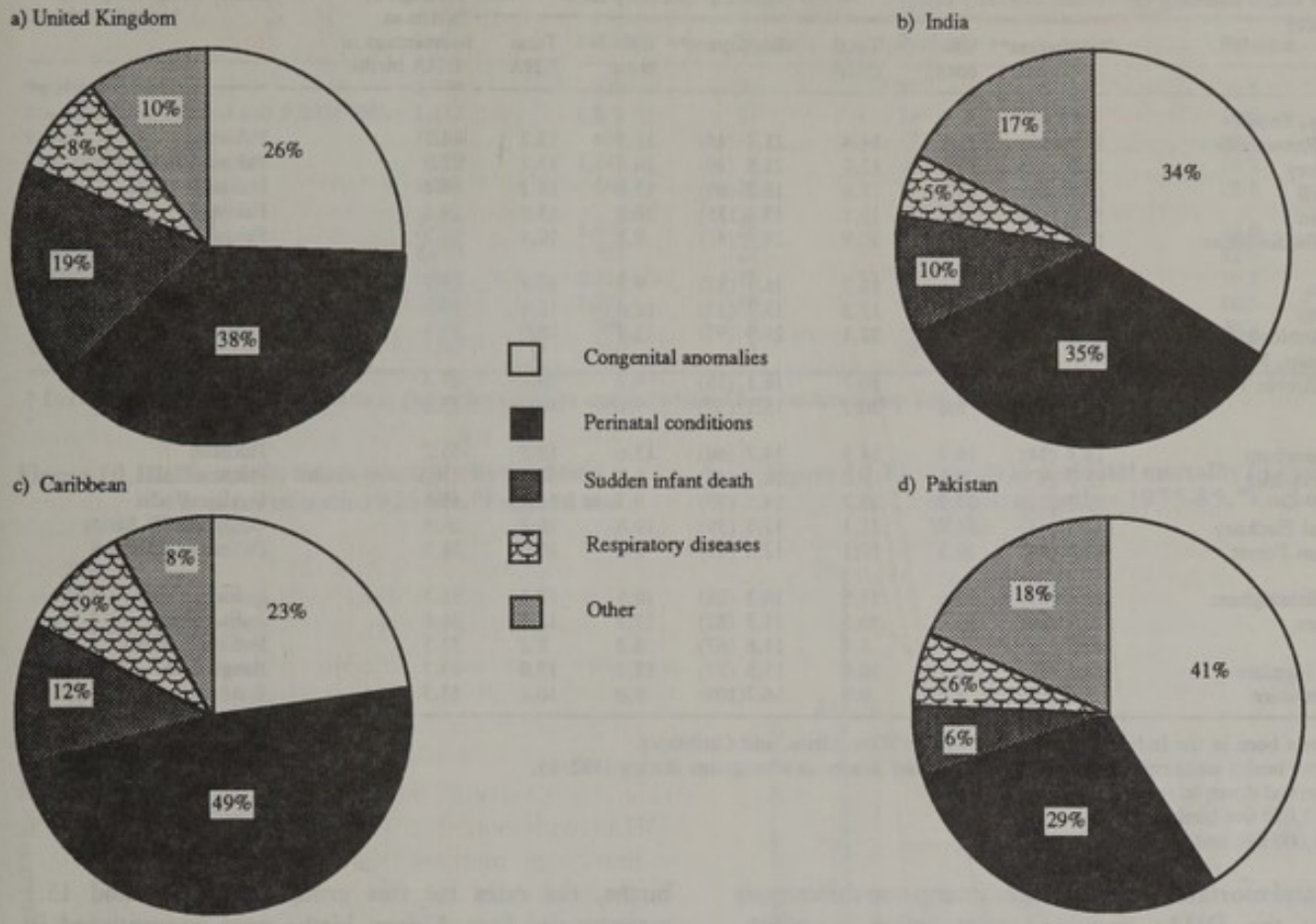


Table 10.7 Infant mortality rates by mother's area of usual residence and country of birth, 1982–85

Selected regional health authorities in England and Wales per 1,000 live births

Mother's country of birth	England and Wales	Regional health authority of residence*								
		Yorkshire	Trent	NW Thames	NE Thames	SE Thames	SW Thames	Oxford	West Midlands	North Western
United Kingdom	9.7	10.5	9.5	9.2	9.4	9.5	9.2	8.7	10.7	10.3
Eire	10.1	13.1	11.7	8.9	7.8	9.6	8.0	12.6	12.9	10.8
	(269)	(13)	(13)	(48)	(32)	(23)	(16)	(17)	(38)	(30)
India	10.0	13.2	8.2	9.1	9.7	10.5	7.0	6.7	11.5	11.5
	(459)	(37)	(35)	(87)	(54)	(25)	(13)	(12)	(125)	(47)
Bangladesh	9.3	13.5	5.3	9.7	9.4	8.9	7.0	2.7	9.2	12.7
	(145)	(11)	(2)	(15)	(61)	(6)	(3)	(1)	(20)	(18)
East Africa	9.3	10.8	8.5	7.9	10.2	9.3	9.1	8.0	12.2	8.8
	(255)	(10)	(30)	(65)	(33)	(15)	(20)	(9)	(35)	(15)
West Africa	11.0	10.4	—	9.3	14.6	8.7	12.4	—	21.5	11.9
	(128)	(2)	—	(20)	(49)	(25)	(15)	—	(6)	(4)
Caribbean	12.9	8.1	15.6	12.9	12.8	11.1	15.8	11.4	12.4	8.1
	(274)	(4)	(13)	(48)	(61)	(43)	(31)	(11)	(34)	(5)
Pakistan	16.6	17.9	20.1	16.5	13.0	17.9	5.5	17.4	16.1	17.4
	(892)	(195)	(69)	(73)	(60)	(11)	(8)	(58)	(195)	(171)

* *Observed deaths are given in parentheses.*

DHAs examined here (9.6 compared with Bradford's 16.9). The main immigrant groups in Leicestershire are of Indian and East African origin.

Immigrant infant mortality rates were low (10.1–10.6) also in the London boroughs of Tower Hamlets, Ealing and Newham, where they compared relatively closely with the corresponding DHA rates for UK born mothers, and with the national average. Immigrant births constituted 32–44 per cent of births in these boroughs. But immigrant infant mortality rates were higher (12.0–12.3) in the London boroughs of Waltham Forest, City and Hackney, and Brent. In Central and West Birmingham City and Hackney, Newham and Tower Hamlets the infant mortality rates were lower for immigrants than for the UK born.

Table 10.8 Infant and perinatal mortality rates for immigrant* and UK-born mothers by area of usual residence, 1982–85
Selected district health authorities in England and Wales

District health authority of residence†	Infant mortality rate††			Perinatal mortality rate¢			Immigrant births as percentage of DHA births	Main immigrant group
	Immigrant**	UK born	Total DHA	Immigrant**	UK born	Total DHA		
Burnley, Pendle and Rossendale	19.0 (38)	13.2	14.4	21.7 (44)	11.5	13.2	14.7	Pakistan
Dewsbury	18.6 (42)	11.0	12.7	21.5 (49)	10.6	13.1	22.9	Pakistan/India
Sandwell	17.7 (58)	13.0	13.9	18.2 (60)	15.8	16.2	19.4	Indian/Pakistan
Bradford	16.9(116)	11.3	13.1	19.4(135)	10.8	13.5	29.8	Pakistan
South Bedfordshire	16.3 (46)	8.9	10.9	14.4 (41)	9.2	10.4	16.0	Pakistan
Oldham	16.3 (33)	9.8	10.7	16.1 (33)	9.2	10.3	15.7	Pakistan
Coventry	14.5 (36)	11.6	12.3	13.2 (33)	12.0	12.4	13.8	India
East Birmingham	14.0 (61)	11.2	12.1	21.9 (97)	12.8	16.0	33.1	Pakistan
Blackburn, Hyndburn and Ribble Valley	13.9 (47)	9.7	10.7	16.1 (55)	9.2	10.8	21.4	Pakistan/India
Bolton	13.7 (31)	9.4	10.2	13.1 (30)	9.7	10.4	15.0	India/Pakistan
C Birmingham	13.3 (54)	14.9	14.5	14.7 (60)	13.6	13.5	35.2	Pakistan
East Berkshire	12.7 (37)	8.3	9.0	16.3 (48)	8.9	10.4	15.0	Pakistan/India
Brent	12.3 (78)	10.9	10.7	14.5 (93)	9.3	10.8	41.1	E Africa/India
City and Hackney	12.3 (43)	12.7	11.1	11.1 (39)	10.6	10.2	26.4	Caribbean/W Africa
Waltham Forest	12.0 (40)	10.3	10.1	12.9 (43)	8.9	10.0	26.0	Pakistan/Caribbean
West Birmingham	11.3 (69)	11.6	11.5	14.3 (88)	10.5	12.1	38.3	India/Pakistan
Newham	10.6 (60)	10.8	10.5	14.3 (82)	11.5	12.4	36.6	India/Pakistan
Ealing	10.5 (58)	7.7	8.4	11.6 (67)	6.2	8.2	32.5	India/E Africa
Tower Hamlets	10.1 (50)	12.1	10.6	15.3 (77)	11.1	13.0	43.7	Bangladesh
Leicestershire	9.6 (64)	8.9	9.0	16.2(109)	9.0	10.1	15.3	E Africa/India

* Mothers born in the Indian subcontinent, East or West Africa, and Caribbean.
† District health authorities with more than 30 infant deaths to immigrants during 1982–85.
** Observed death in parentheses.
†† Per 1,000 live births.
¢ Per 1,000 live and stillbirths.

Perinatal mortality showed larger intergroup differences among the DHAs examined than infant mortality. Perinatal rates for immigrants in most of the DHAs listed in Table 10.8 were well above the average of 10.3 for England and Wales, and much higher than the corresponding DHA rates for the UK born. The highest perinatal rates for immigrants were in East Birmingham (21.9), Burnley, Pendle and Rossendale (21.7), Dewsbury (21.5), Bradford (19.4), and Sandwell (18.2). Perinatal rates for immigrants were high also in other DHAs, Leicestershire (16.2), Tower Hamlets (15.3), and Newham (14.3). The equivalent rates for the UK born group in Sandwell (15.8), Central Birmingham (13.6) and East Birmingham (12.8) were noticeably higher than the national average. In none of the districts did immigrants have lower perinatal mortality rates than the UK born.

Births to the various immigrant groups were unevenly concentrated in specific DHAs. The largest number of Indian births occurred in Ealing, Leicestershire and West Birmingham, where the Indian infant mortality rates were 10.0, 8.9 and 10.5 respectively. The largest number of Pakistani births occurred in Bradford, Central and East Birmingham, where the Pakistani infant mortality rates were 18.5, 13.6 and 15.3 respectively. Bangladeshi births were concentrated in Tower Hamlets, where their infant mortality rate was 9.9. Caribbean births were most numerous in Camberwell, Brent, Lewisham and North Southwark, and City and Hackney, where their infant mortality rates were 10.8, 9.8, 6.5 and 10.5 respectively; however in Haringey and West Lambeth, which also had large numbers of Caribbean births, the rates for this group were 15.3 and 15.1 respectively. East African births were concentrated in Leicestershire, Brent, Harrow and Ealing DHAs, where their infant mortality rates were in the range 7.0–9.8.

The excess mortality of Pakistani infants compared with other groups was apparent within DHAs. Table 10.9 shows DHAs with more than 650 live births to Indian born mothers and to Pakistani born mothers during 1982–85. The mortality of Pakistani infants was considerably higher than that of Indian infants even in those DHAs with a mixed composition of immigrants. At the extreme was Brent and South Derbyshire where the Pakistani rate was several times greater than the Indian infant mortality rate.

10.7 Trends since 1975

Figure 10.10 shows trends in **infant mortality rates** during the period 1975–85 in terms of three-year moving averages. The country of birth groups India and Bangladesh, and East and West Africa, have been aggregated as data for earlier years were not available separately. Infant mortality fell in all groups over the decade. By the mid-1980s the excess mortality for Indian, Bangladeshi and African infants seen during the 1970s had virtually disappeared. Infant mortality among West Indians and Pakistanis declined at almost the same rate as in the UK group; their excess over the UK group (72 per cent in Pakistanis and 35 per cent in Caribbeans) therefore remained virtually unchanged over the 10 year period.

Trends in **perinatal mortality** during 1975–85 (Figure 10.11) show a significant narrowing of differentials. By the mid-1980s immigrant groups still showed excess

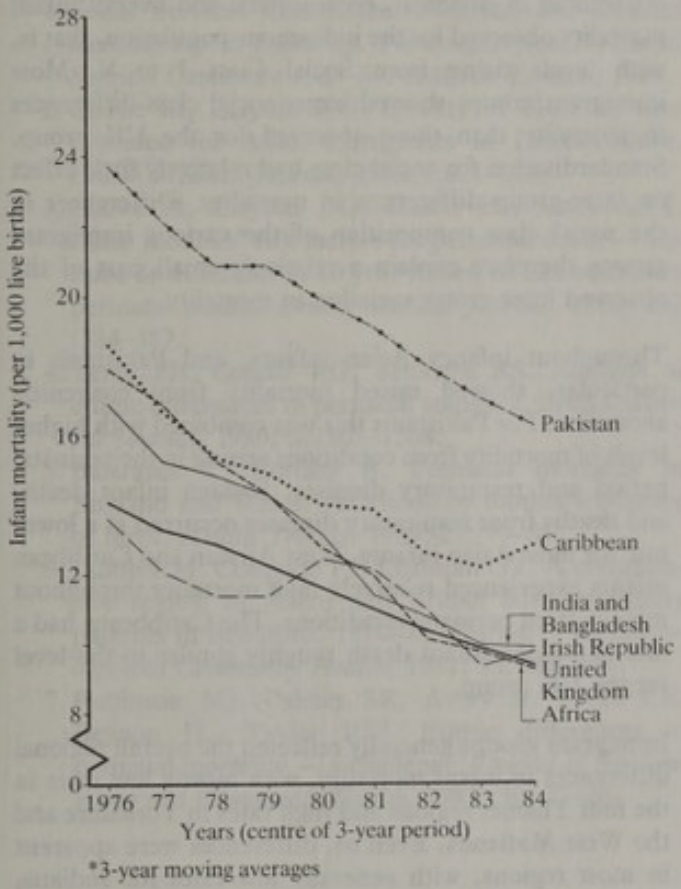
Table 10.9 Infant mortality by immigrant group and mother's area of usual residence 1982–85

Selected district health authorities in England and Wales

District health authority*	Live births		Infant deaths		Infant mortality rate	
	Indian	Pakistan	Indian	Pakistan	Indian	Pakistan
Sandwell	1,719	830	27	17	15.7	20.5
Blackburn, Hyndburn and Ribble Valley	1,112	1,878	12	33	10.8	17.6
Bolton	1,164	659	12	13	10.3	19.7
East Berkshire	979	1,345	8	24	8.2	17.8
Brent	1,845	660	22	19	11.9	28.8
West Birmingham	2,473	1,640	26	23	10.5	14.0
Newham	2,083	1,412	22	17	10.6	12.0
Dewsbury	814	1,312	15	26	18.4	19.8
Bradford	901	5,289	10	98	11.1	18.5
Walsall	867	786	8	16	9.2	20.4
Southern Derbyshire	747	704	5	19	6.7	27.0

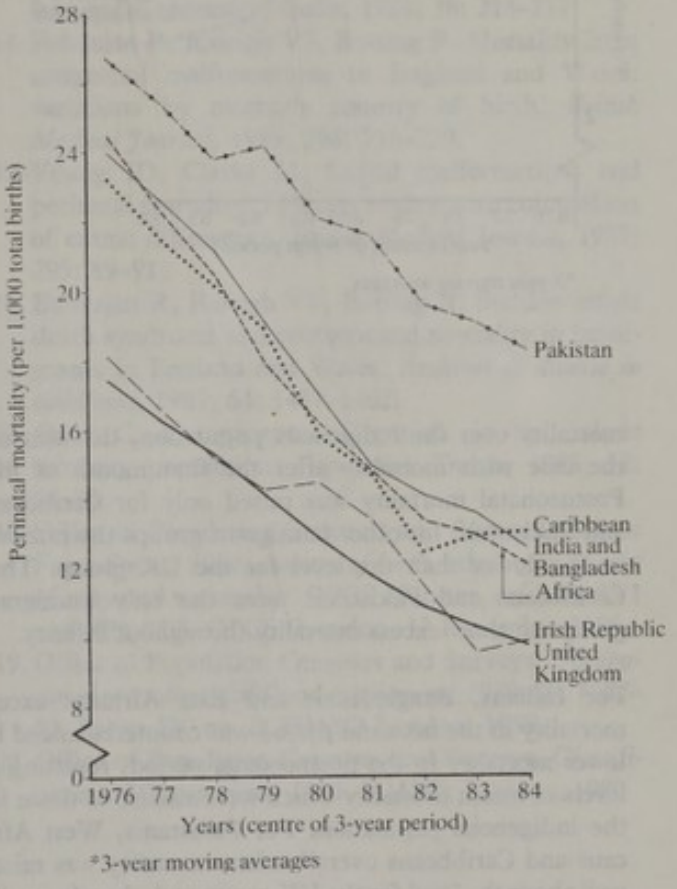
** DHAs with more than 650 live births to Indian born mothers and to Pakistani born mothers during 1982–85.*

Figure 10.10 Trends in infant mortality by mother's country of birth 1975-85, *England and Wales



*3-year moving averages

Figure 10.11 Trends in perinatal mortality by country of birth of mother 1975-85, *England and Wales



*3-year moving averages

mortality over the UK group, but by a smaller margin than in the 1970s. The only exception was the Pakistani group, who showed a declining trend but the smallest percentage improvement of all groups.

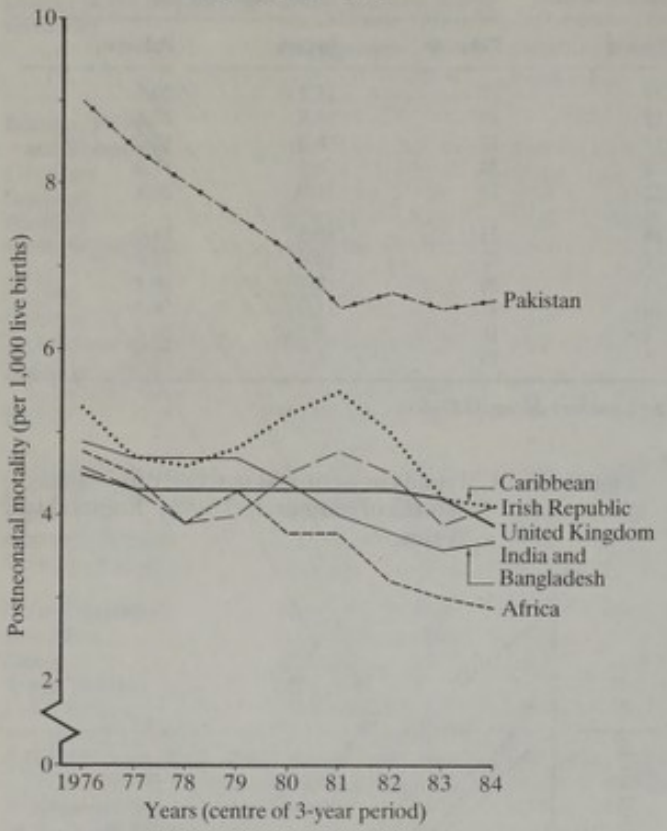
Postneonatal mortality in the UK group showed very little change during 1975–85 (Figure 10.12). But the decline in postneonatal rates among Indian, Bangladeshi and African infants transformed the excess mortality in these groups in the 1970s into a deficit by the mid-1980s. The highest levels throughout were observed for Pakistani infants; their postneonatal rates showed a consistent decline up to the early 1980s, but little change in subsequent years. Mortality changes for Caribbeans were not consistent but the overall trend was downwards.

10.8 Summary and discussion

Mortality levels and patterns among infants in immigrant groups in England and Wales varied considerably during 1982–85. Infant mortality for immigrants from Pakistan, West Africa and the Caribbean was considerably higher than for the indigenous population. Indians, Bangladeshis and East Africans, on the other hand, had similar levels of infant mortality to the UK group.

Differences in levels of mortality between the country of birth groups showed considerable variation according to period of infancy. The differences were generally larger in the perinatal period than in the postneonatal period, and not always in the same direction. Whereas all immigrant groups showed excess perinatal and neonatal

Figure 10.12 Trends in postneonatal mortality by mother's country of birth, 1975-85, *England and Wales



*3-year moving averages

mortality over the indigenous population, this was not the case with mortality after the first month of life. Postneonatal mortality was raised only for Caribbeans and Pakistanis; for other immigrant groups the rate was in fact lower than the level for the UK group. Thus Caribbeans and Pakistanis were the only immigrant groups to show excess mortality throughout infancy.

For Indians, Bangladeshis and East Africans excess mortality in the neonatal period was counterbalanced by lower mortality in the postneonatal period, resulting in levels of infant mortality which were similar to those for the indigenous population. For Pakistanis, West Africans and Caribbeans overall infant mortality was raised well above the level for the UK group and, therefore, also above the rates for Indians, Bangladeshis and East Africans. At every stage of infancy, mortality for Pakistani infants was significantly higher than the rates prevailing not just for the UK group, but also for all other immigrant groups. This pattern was apparent throughout the 1975–85 decade.

Higher perinatal and neonatal mortality for immigrant infants reflected differences in both birthweight distribution and birthweight-specific mortality rates. The effect of birthweight distribution was strongest for Indians, Bangladeshis and East Africans, who had much higher proportions (43–48 per cent) of babies weighing under 3000 grams than the UK group (25 per cent); mortality at these low birthweights is much higher than for babies over 3000 grams. Other immigrant groups also had higher proportions of babies weighing under 3000 grams than the UK group, but not as high as for the above groups (Figure 10.4).

There were interesting differences in birthweight-specific mortality between some groups. At birthweights under 3000 grams both perinatal and postneonatal mortality were lower for Indian, Bangladeshi and East African infants than for the UK group, even though overall perinatal mortality was significantly higher for these immigrant groups. However, Pakistani infants of similar birthweights had markedly higher perinatal and postneonatal rates compared with the UK group and other infants of Asian origin. Despite heavier birthweights, the mortality of Pakistani infants was considerably higher than for other Asian infants across all the variables examined in this analysis.

Immigrant groups reflected the pattern of social class differences in perinatal, postneonatal and overall infant mortality observed for the indigenous population, that is, with levels rising from Social Class I to V. Most immigrant groups showed larger social class differences in mortality than those observed for the UK group. Standardisation for social class had relatively little effect on inter-group differences in mortality. Differences in the social class composition of the various immigrant groups therefore explain a relatively small part of the observed inter-group variation in mortality.

Throughout infancy Asian infants, and Pakistanis in particular, showed raised mortality from congenital anomalies. For Pakistanis this was combined with higher levels of mortality from conditions arising in the perinatal period and respiratory diseases. Sudden infant deaths and deaths from respiratory diseases occurred at a lower rate for most Asian infants. West African and Caribbean infants experienced relatively high mortality throughout infancy from perinatal conditions. The Caribbeans had a rate of sudden infant death roughly similar to the level for the UK group.

Immigrant groups generally reflected the overall regional differences in infant mortality, with mostly low rates in the four Thames regions and high rates in Yorkshire and the West Midlands. Even so, differences were apparent in most regions, with generally low rates for Indians, Bangladeshis and East Africans, and high rates for Pakistanis. West African and Caribbean births were concentrated in the four Thames regions, where they generally showed raised mortality over all groups other than Pakistanis.

Differences in infant mortality were even more marked at the DHA level, with rates for immigrants (in DHAs with over 30 deaths) ranging from 9.6 to 19.0 per 1,000 live births. The lowest immigrant rates were recorded in Leicestershire, and in some London boroughs with a high proportion of immigrant births; in these DHAs the differences between rates for the immigrant and indigenous populations were relatively small. In DHAs where immigrant rates were highest, differences between levels in the immigrant and indigenous populations were also

the largest, with excess infant mortality of 40–80 per cent among immigrants.

The various immigrant groups were generally concentrated in specific DHAs. In DHAs with the highest immigrant infant mortality rates, the immigrant community was predominantly of Pakistani origin. In areas with low immigrant rates the predominant groups generally but not always were of Indian and East African origin. Infant mortality was also low in Tower Hamlets, where Bangladeshi births constituted over one third of all births. Similarly, immigrant infant mortality was low in City and Hackney, where the predominant immigrant community was of Afro-Caribbean origin. In DHAs which had a mix of both Indian and Pakistani births, infant mortality was consistently higher for Pakistani infants than for Indian infants.

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Appendix 1 Composition of geographic areas

(a) Standard regions, metropolitan and non-metropolitan counties and districts

ENGLAND

NORTH REGION

Tyne and Wear*
- Gateshead
- Newcastle upon Tyne
- North Tyneside
- South Tyneside
- Sunderland

Cleveland
- Hartlepool
- Langbaurgh
- Middlesbrough
- Stockton-on-Tees

Cumbria
- Allerdale
- Barrow-in-Furness
- Carlisle
- Copeland
- Eden
- South Lakeland

Durham
- Chester-le-Street
- Darlington
- Derventside
- Durham
- Easington
- Sedgefield
- Teeside
- Wear Valley

Northumberland
- Alnwick
- Berwick-upon-Tweed
- Blyth Valley
- Castle Morpeth
- Tynedale
- Wansbeck

YORKSHIRE AND HUMBERSIDE REGION

South Yorkshire*
- Barnsley
- Doncaster
- Rotherham
- Sheffield

West Yorkshire*
- Bradford
- Calderdale
- Kirklees
- Leeds
- Wakefield

Humberside
- Beverley
- Boothferry
- Cleethorpes
- Glanford
- Great Grimsby
- Holderness
- Kingston-upon-Hull
- North Wolds
- Scunthorpe

North Yorkshire
- Craven
- Hambleton
- Harrogate
- Richmondshire
- Ryedale
- Scarborough
- Selby
- York

EAST MIDLANDS REGION

Derbyshire
- Amber Valley
- Bolsover
- Chesterfield
- Derby
- Erewash
- High Peak
- North East Derbyshire
- South Derbyshire
- West Derbyshire

Leicestershire
- Blaby
- Charnwood
- Harnborough
- Hinckley and Bosworth
- Leicester
- Melton
- North West Leicestershire
- Oadby and Wigston
- Rutland

Lincolnshire
- Boston
- East Lindsey
- Lincoln
- North Kesteven
- South Holland
- South Kesteven
- West Lindsey

Northamptonshire
- Corby
- Daventry
- East Northamptonshire
- Kettering
- Northampton
- South Northamptonshire
- Wellingborough

Nottinghamshire
- Ashfield
- Bassetlaw
- Broxtowe
- Gedling
- Mansfield
- Newark
- Nottingham
- Rushcliffe

EAST ANGLIA REGION

Cambridgeshire
- Cambridge
- East Cambridgeshire
- Fenland
- Huntingdon
- Peterborough
- South Cambridgeshire

Norfolk
- Breckland
- Broadland
- Great Yarmouth
- North Norfolk
- Norwich
- South Norfolk
- West Norfolk

Suffolk
- Babergh
- Forest Heath
- Ipswich
- Mid Suffolk
- St Edmundsbury
- Suffolk Coastal
- Waveney

SOUTH EAST REGION

Greater London
- City of London
- Barking and Dagenham LB
- Barnet LB
- Bexley LB
- Brent LB
- Bromley LB
- Camden LB
- Croydon LB
- Ealing LB
- Enfield LB
- Greenwich LB
- Hackney LB
- Hammersmith and Fulham LB

**Metropolitan county*

Haringey LB
Harrow LB
Havering LB
Hillingdon LB
Hounslow LB
Islington LB
Kensington and Chelsea LB
Kingston upon Thames LB
Lambeth LB
Lewisham LB
Merton LB
Newham LB
Redbridge LB
Richmond upon Thames LB
Southwark LB
Sutton LB
Tower Hamlets LB
Waltham Forest LB
Wandsworth LB
Westminster, City of

Bedfordshire
Luton
Mid-Bedfordshire
North Bedfordshire
South Bedfordshire

Berkshire
Bracknell
Newbury
Reading
Slough
Windsor and Maidenhead
Wokingham

Buckinghamshire
Aylesbury Vale
South Buckinghamshire
Chiltern
Milton Keynes
Wycombe

East Sussex
Brighton
Eastbourne
Hastings
Hove
Lewes
Rother
Wealden

Essex
Basildon
Braintree
Brentwood
Castle Point
Chelmsford
Colchester
Epping Forest
Harlow
Maldon
Rochford
Southend-on-Sea
Tendring
Thurrock
Uttlesford

Hampshire
Basingstoke and Deane
East Hampshire
Eastleigh
Fareham
Gosport
Hart
Havant
New Forest
Portsmouth
Rushmoor
Southampton
Test Valley
Winchester

Hertfordshire
Broxbourne
Dacorum
East Hertfordshire
Hertsmere
North Hertfordshire
St Albans
Stevenage
Three Rivers
Watford
Welwyn Hatfield

Isle of Wight
Medina
South Wight

Kent
Ashford
Canterbury
Dartford
Dover
Gillingham
Gravesham
Maidstone
Rochester upon Medway
Sevenoaks
Shepway
Swale
Thanet
Tonbridge and Malling
Tunbridge Wells

Oxfordshire
Cherwell
Oxford
South Oxfordshire
Vale of White Horse
West Oxfordshire

Surrey
Elmbridge
Epsom and Ewell
Guildford
Mole Valley
Reigate and Banstead
Runnymede
Spelthorne
Surrey Heath
Tandridge
Waverley
Woking

West Sussex
Adur
Arun
Chichester
Crawley
Horsham
Mid-Sussex
Worthing

SOUTH WEST REGION

Avon
Bath
Bristol
Kingswood
Northavon
Wansdyke
Woodspring

Cornwall and Isles of Scilly
Caradon
Carrick
Kerrier
North Cornwall
Penwith
Restormel
Isles of Scilly

Devon
East Devon
Exeter
Mid Devon
North Devon
Plymouth
South Hams
Teignbridge
Torbay
Torridge
West Devon

Dorset
Bournemouth
Christchurch
North Dorset
Poole
Purbeck
West Dorset
Weymouth and Portland
Wimborne

Gloucestershire
Cheltenham
Cotswold
Forest of Dean
Stroud
Tewkesbury

Somerset
Mendip
Sedgemoor
Taunton Deane
West Somerset
Yeovil

Wiltshire
Kennet
North Wiltshire
Salisbury
Thamesdown
West Wiltshire

WEST MIDLANDS REGION

West Midlands*
Birmingham
Dudley
Sandwell
Solihull
Walsall
Wolverhampton

**Metropolitan county*

(a) Standard regions, metropolitan and non-metropolitan counties and districts *(continued)*

Hereford and Worcester
- Bromsgrove
- Hereford
- Leominster
- Malvern Hills
- Redditch
- South Herefordshire
- Worcester
- Wychavon
- Wyre Forest

Shropshire
- Bridgnorth
- North Shropshire
- Oswestry
- Shresbury and Atcham
- South Shropshire
- The Wrekin

Staffordshire
- Cannock Chase
- East Staffordshire
- Lichfield
- Newcastle-under-Lyme
- South Staffordshire
- Stafford
- Staffordshire Moorlands
- Stoke-on-Trent
- Tamworth

Warwickshire
- North Warwickshire
- Nuneaton
- Rugby
- Stratford-on-Avon
- Warwick

NORTH WEST REGION

Greater Manchester*
- Bolton
- Bury
- Manchester
- Oldham
- Rochdale
- Salford
- Stockport
- Tameside
- Trafford
- Wigan

Merseyside*
- Knowsley
- Liverpool
- St Helens
- Sefton
- Wirral

Cheshire
- Chester
- Congleton
- Crewe and Nantwich
- Ellesmere Port and Neston
- Halton
- Macclesfield
- Vale Royal
- Warrington

Lancashire
- Blackburn
- Blackpool
- Burnley
- Chorley
- Fylde
- Hyndburn
- Lancaster
- Pendle
- Preston
- Ribble Valley
- Rossendale
- South Ribble
- West Lancashire
- Wyre

WALES

Clwyd
- Alyn and Deeside
- Colwyn
- Delyn
- Glyndwr
- Rhuddlan
- Wrexham Maelor

Dyfed
- Carmarthen
- Ceredigion
- Dinefwr
- Llanelli
- Preseli
- South Pembrokeshire

Gwent
- Blaenau Gwent
- Islwyn
- Monmouth
- Newport
- Torfaen

Gwynedd
- Aberconwy
- Arfon
- Dwyfor
- Meirionnydd
- Ynys Mon-Isle of Anglesey

Mid Glamorgan
- Cynon Valley
- Merthyr Tydfil
- Ogwr
- Rhondda
- Rhymney Valley
- Taff Ely

Powys
- Brecknock
- Montgomery
- Radnor

South Glamorgan
- Cardiff
- Vale of Glamorgan

West Glamorgan
- Afan
- Lliw Valley
- Neath
- Swansea

**Metropolitan county*

(b) Regional health authorities (defined in terms of metropolitan and non-metropolitan districts and London boroughs)

NORTHERN

Metropolitan districts
- Gateshead
- Newcastle-upon-Tyne
- North Tyneside
- South Tyneside
- Sunderland

Non-metropolitan districts
- Allerdale
- Alnwick
- Barrow-in-Furness
- Berwick upon Tweed
- Blyth Valley

- Carlisle
- Castle Morpeth
- Chester-le-Street
- Copeland
- Darlington

- Derwentside
- Durham
- Easington
- Eden
- Hartlepool

- Langbaurgh
- Middlesborough
- Sedgefield
- South Lakeland
- Stockton-on-Tees

- Teesdale
- Tynedale
- Wansbeck
- Wear Valley

YORKSHIRE

Metropolitan districts
- Bradford
- Calderdale
- Kirklees
- Leeds
- Wakefield

Non-metropolitan districts
- Beverley
- Boothferry
- Cleethorpes
- Craven
- East Yorkshire

- Glanford
- Great Grimsby
- Hambleton
- Harrogate
- Holderness

- Kingston upon Hull
- Richmondshire
- Ryedale
- Scarborough

- Scunthorpe
- Selby
- York

TRENT

Metropolitan districts
- Barnsley
- Doncaster
- Rotherham
- Sheffield

Non-metropolitan districts
- Amber Valley
- Ashfield
- Bassetlaw
- Blaby
- Bolsover

- Boston
- Broxtowe
- Charnwood
- Chesterfield
- Derby

- East Lindsey
- Erewash
- Gedling
- Harborough
- High Peak (part)

- Hinckley and Bosworth
- Leicester
- Lincoln
- Mansfield
- Melton

- NE Derbyshire
- Newark
- North Kesteven
- Nottingham
- NW Leicestershire

- Oadby and Wigston
- Rushcliffe
- Rutland
- South Derbyshire
- South Holland

- South Kesteven
- West Derbyshire
- West Lindsey

EAST ANGLIAN

Non-metropolitan districts
- Babergh
- Breckland
- Broadland
- Cambridge
- East Cambridgeshire

- Fenland
- Forest Heath
- Great Yarmouth
- Huntingdon
- Ipswich

- King's Lynn and W Norfolk
- Mid Suffolk
- North Norfolk
- Norwich
- Peterborough
- South Cambridgeshire
- South Norfolk
- St Edmundsbury
- Suffolk Coastal
- Waveney

NW THAMES

Metropolitan districts
- Barnet LB
- Brent LB
- Ealing LB
- Hammersmith and Fulham LB
- Harrow LB

- Hillingdon LB
- Hounslow LB
- Kensington and Chelsea LB
- Westminster LB (part)

Non-metropolitan districts
- Broxbourne
- Dacorum
- East Herts
- Hertsmere
- Luton

- Mid Bedfordshire
- North Bedfordshire
- North Hertfordshire
- South Bedfordshire
- Spelthorne

- St Albans
- Stevenage
- Three Rivers
- Watford
- Welwyn Hatfield

NE THAMES

Metropolitan districts
- Barking and Dagenham LB
- Camden LB
- City of London
- Enfield LB
- Hackney LB

- Haringey LB
- Havering LB
- Islington LB
- Newham LB
- Redbridge LB

- Tower Hamlets LB
- Waltham Forest LB
- Westminster LB (part)

Non-metropolitan districts
- Basildon
- Braintree
- Brentwood
- Castle Point
- Chelmsford

- Colchester
- Epping Forest
- Harlow

(b) Regional health authorities (defined in terms of metropolitan and non-metropolitan districts and London boroughs) *(continued)*

Maldon
Rochford
Southend-on-Sea

Tendring
Thurrock
Uttlesford

SE THAMES

Metropolitan districts
Bexley LB
Bromley LB
Greenwich LB
Lambeth LB
Lewisham LB
Southwark LB

Non-metropolitan districts
Ashford
Brighton
Canterbury
Dartford
Dover

Eastbourne
Gillingham
Gravesham
Hastings
Hove

Lewes
Maidstone
Rochester upon Medway
Rother
Sevenoaks

Shepway
Swale
Thanet
Tonbridge and Malling
Tunbridge Wells
Wealden

WESSEX

Non-metropolitan districts
Basingstoke and Deane
Bath
Bournemouth
Christchurch
East Hampshire

Eastleigh
Fareham
Gosport
Hart (part)
Havant

Kennet
Medina
Mendip (part)
New Forest
North Dorset

North Wiltshhire
Poole
Portsmouth
Purbeck
Salisbury

Southampton
South Wight
Test Valley
Thamesdown
Wansdyke (part)

West Dorset
West Wiltshire
Weymouth and Portland
Wimborne
Winchester

SOUTH WEST THAMES

Metropolitan districts
Croydon LB
Kingston Upon Thames LB
Merton LB
Richmond Upon Thames LB
Sutton LB
Wandsworth LB

Non-metropolitan districts
Adur
Arun
Chichester
Crawley
Elmbridge

Epsom and Ewell
Guildford
Hart (part)
Horsham
Mid Sussex

Mole Valley
Reigate and Banstead
Runnymede
Rushmoor
Surrey Heath

Tandridge
Waverley
Woking
Worthing

SOUTH WESTERN

Non-metropolitan districts
Bristol
Caradon
Carrick
Cheltenham
Cotswold

East Devon
Exeter
Forest of Dean
Gloucester
Isles of Scilly

Kerrier
Kingswood
Mendip (part)
Mid Devon
Northavon
North Cornwall
North Devon
Penwith
Plymouth
Restormel

Sedgemoor
South Hams
Stroud
Taunton Deane
Teignbridge

Tewkesbury
Torbay
Torridge
Wansdyke (part)
West Devon

West Somerset
Woodspring
Yeovil

OXFORD

Non-metropolitan districts
Aylesbury Vale
Bracknell
Cherwell
Chiltern
Corby

Daventry
East Northants
Kettering
Milton Keynes
Newbury

Northampton
Oxford
Reading
Slough
South Buckinghamshire

South Northants
South Oxfordshire
Vale of White Horse
Wellingborough
West Oxfordshire

Windsor and Maidenhead
Wokingham
Wycombe

WEST MIDLANDS

Metropolitan districts
Birmingham
Coventry
Dudley
Sandwell
Solihull
Walsall
Wolverhampton

Non-metropolitan districts
Bridgnorth
Bromsgrove
Cannock Chase
East Staffordshire
Hereford

(b) Regional health authorities (defined in terms of metropolitan and non-metropolitan districts and London boroughs) *(continued)*

Leominster
Lichfield
Malvern Hills
Newcastle-under-Lyme
North Shropshire

North Warwickshire
Nuneaton and Bedworth
Oswestry
Redditch
Rugby

Shrewsbury and Atcham
South Herefordshire
South Shropshire
South Staffordshire
Staffs Moorlands

Stafford
Stoke-on-Trent
Stratford-on-Avon
Tamworth
The Wrekin

Warwick
Worcester
Wychavon
Wyre Forest

MERSEY

Metropolitan districts

Knowsley
Liverpool
Sefton
St. Helens
Wirral

Non-metropolitan districts

Chester
Congleton
Crewe and Nantwich
Ellesmere Port and Neston
Halton
Macclesfield
Vale Royal
Warrington

NORTH WESTERN

Metropolitan districts

Bolton
Bury
Manchester
Oldham
Rochdale

Salford
Stockport
Tameside
Trafford
Wigan

Non-metropolitan districts

Blackburn
Blackpool
Burnley
Chorley
Fylde

High Peak (part)
Hyndburn
Lancaster
Pendle
Preston

Ribble Valley
Rossendale
South Ribble
West Lancashire
Wyre

WALES

Non-metropolitan districts

Aberconwy
Afan
Alyn and Deeside
Arfon
Blaenau Gwent

Brecknock
Cardiff
Carmarthen
Ceredigion
Colwyn

Cynon Valley
Delyn
Dinefwr
Dwyfor
Glyndwr

Islwyn
Llanelli
Lliw Valley
Meirionnydd
Merthyr Tydfil

Monmouth
Montgomery
Neath
Newport
Ogwr

Preseli
Radnor
Rhondda
Rhuddlan
Rhymney Valley

South Pembrokeshire
Swansea
Taff-Ely
Torfaen
Vale of Glamorgan

Wrexham Maelor
Ynys Mon

(c) Regional health authorities (defined in terms of district health authorities)

ENGLAND

NORTHERN
Hartlepool
North Tees
South Tees
East Cumbria
South Cumbria

West Cumbria
Darlington
Durham
North West Durham
South West Durham

Northumberland
Gateshead
Newcastle
North Tyneside
South Tyneside
Sunderland

YORKSHIRE
Hull
East Yorkshire
Grimsby
Scunthorpe
Northallerton

York
Scarborough
Harrogate
Bradford
Airedale

Calderdale
Huddersfield
Dewsbury
Leeds Western
Leeds Eastern

Wakefield
Pontefract

TRENT
North Derbyshire
Southern Derbyshire
Leicestershire
North Lincolnshire
South Lincolnshire

Bassetlaw
Central Nottinghamshire
Nottingham
Barnsley
Doncaster

Rotherham
Sheffield

EAST ANGLIAN
Cambridge
Peterborough
West Suffolk
East Suffolk
Norwich

Great Yarmouth and Waveney
West Norfolk and Wisbech
Huntingdon

NORTH WEST THAMES
North Bedfordshire
South Bedfordshire
North Hertfordshire
East Hertfordshire
North West Hertfordshire

South West Hertfordshire
Barnet
Harrow
Hillingdon
Hounslow and Spelthorne

Ealing
Brent
Paddington and North Kensington
Kensington
Riverside

NORTH EAST THAMES
Basildon and Thurrock
Mid Essex
North East Essex
West Essex
Southend

Barking, Havering and Brentwood
Hampstead
Bloomsbury
Islington
City and Hackney

Newham
Tower Hamlets
Enfield
Haringey
Redbridge
Waltham Forest

SOUTH EAST THAMES
Brighton
Eastbourne
Hastings
South East Kent
Canterbury and Thanet

Dartford and Gravesham
Maidstone
Medway
Tunbridge Wells
Bexley

Greenwich
Bromley
West Lambeth
Camberwell
Lewisham and North Southwark

SOUTH WEST THAMES
North West Surrey
North Surrey and North East Hampshire
South West Surrey
Mid Surrey
East Surrey

Chichester
Mid Downs
Worthing
Croydon
Kingston and Esher

Richmond, Twickenham and Roehampton
Wandsworth
Merton and Sutton

WESSEX
East Dorset
West Dorset
Portsmouth and South East Hampshire
Southampton and South West Hampshire
Winchester

Basingstoke and North Hampshire
Salisbury
Swindon
Bath
Isle of Wight

OXFORD
East Berkshire
West Berkshire
Aylesbury Vale
Wycombe
Milton Keynes

Kettering
Northampton
Oxfordshire

SOUTH WESTERN
Bristol and Weston
Frenchay
Southmead
Cornwall and Isles of Scilly
Exeter

North Devon
Plymouth
Torbay
Cheltenham and District
Gloucester
Somerset

WEST MIDLANDS
Bromsgrove and Redditch
Herefordshire
Kidderminster and District
Worcester and District
Shropshire

Mid Staffordshire
North Staffordshire
South East Staffordshire
Rugby
North Warwickshire

South Warwickshire
Central Birmingham
East Birmingham
North Birmingham
South Birmingham

West Birmingham
Coventry
Dudley
Sandwell
Solihull

Walsall
Wolverhampton

MERSEY
Chester
Crewe
Halton
Macclesfield
Warrington

Liverpool
St Helens and Knowsley
Southport and Formby
South Sefton
Wirral

(c) Regional health authorities (defined in terms of district health authorities) *(continued)*

NORTH WESTERN

Lancaster
Blackpool, Wyre and Fylde
Preston
Blackburn, Hyndburn and Ribble Valley
Burnley, Pendle and Rossendale

West Lancashire
Chorley and South Ribble
Bolton
Bury
North Manchester

Central Manchester
South Manchester
Oldham
Rochdale
Salford

Stockport
Tameside and Glossop
Trafford
Wigan

WALES

District Health Authorities and Management Units (Wales)

CLWYD

North Clwyd
South Clwyd

EAST DYFED

Ceredigion
Carmarthen-Dinefwr
Llanelli-Dinefwr

PEMBROKESHIRE

GWENT

North Gwent Hospitals
Pontypool and West Gwent Hospitals
Newport and Chepstow Hospitals

GWYNEDD

Anglesey
Meirionnydd
Aberconwy
Arfon
Dwyfor

MID GLAMORGAN

Ogwr
Taff-Ely
Rhondda
Merthyr-Cynon
Rhymney

POWYS

Montgomery
Brecknock and Radnor

SOUTH GLAMORGAN

WEST GLAMORGAN

East District Hospitals
North and West District Hospitals

Appendix 2 Supplementary material for Chapters 3, 5–10

This appendix contains additional tables and figures relevant to the analysis presented in the various chapters. The material is orderd by chapter and is preceded by a contents list. Reference is also made where relevant to the availability of microfiche and tables from OPCS in respect of the different data-sets used in this volume. Appendix 3 gives further information about the availability of additional mortality data for the period 1979–83.

Chapter 3 Geographic variation in mortality, 1979–83

Contents

Table 3A The twenty local authorities with the highest mortality due to selected causes: numbers of deaths and SMRs by sex, 1979–83
Counties, metropolitan districts and London boroughs

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
i) Malignant neoplasm of stomach (ICD 151)							
Knowsley	117	153	125–181	Walsall	151	159	133–185
Walsall	216	148	128–168	Tower Hamlets	97	154	123–185
Sunderland	227	138	126–156	Gwynedd	189	150	128–172
Staffordshire	782	135	125–145	Sunderland	172	150	127–173
Mid Glamorgan	436	135	122–148	Barking and Dagenham	105	144	116–172
Salford	209	133	115–151	Cleveland	283	142	125–159
Southwark	185	132	113–151	Liverpool	339	139	124–154
Tameside	175	132	112–152	Mid Glamorgan	300	137	121–153
Gwynedd	219	131	113–149	Staffordshire	499	134	122–146
Barking and Dagenham	138	130	108–152	Sheffield	355	134	120–148
Cleveland	385	129	116–142	Tameside	125	132	108–156
South Glamorgan	302	129	114–144	Salford	150	131	110–152
Wigan	222	129	112–146	Durham	324	130	116–144
Gwent	357	129	115–143	Gwent	234	129	112–146
Rotherham	182	127	108–146	Manchester	269	126	111–141
Newham	157	127	107–147	Rochdale	106	126	102–150
Liverpool	396	126	113–139	Dudley	146	125	104–146
Bolton	196	126	108–144	Gateshead	115	125	102–148
Tower Hamlets	117	125	102–148	West Glamorgan	207	124	107–141
West Glamorgan	298	123	109–137	Stockport	158	124	104–144
ii) Malignant neoplasm of colon (ICD 153)							
Knowsley	81	152	118–186	Tameside	164	128	108–148
Manchester	254	130	114–146	Bolton	187	123	105–141
North Tyneside	114	129	105–153	Staffordshire	608	120	110–130
Richmond-upon-Thames	101	127	102–152	Newcastle-upon-Tyne	223	119	103–135
City of Westminster	101	124	99–149	Liverpool	382	116	104–128
South Tyneside	90	124	98–150	Wirral	255	114	100–128
Sefton	159	122	103–141	Sefton	223	114	99–129
Gateshead	111	122	99–145	Trafford	149	114	95–133
West Glamorgan	202	120	103–137	Richmond-upon-Thames	131	112	92–132
Rotherham	119	119	97–141	Hounslow	127	111	91–131
Liverpool	257	117	102–132	Isle of Wight	110	111	90–132
Wirral	176	117	99–135	West Glamorgan	247	110	96–124
Doncaster	142	117	97–137	Croydon	206	110	95–125
Powys	69	117	89–145	Lincolnshire	352	109	97–121
Salford	126	116	95–137	Cumbria	328	109	97–121
St Helens	86	115	90–140	Gwynedd	184	109	93–125
Lambeth	116	114	93–135	Dudley	172	109	92–126
Clwyd	214	113	98–128	Gateshead	135	109	90–128
Wolverhampton	121	113	92–134	North Tyneside	133	109	90–128
Cleveland	233	112	97–127	Knowsley	78	109	84–134
iii) Malignant neoplasm of rectum, rectosigmoid junction and anus (ICD 154)							
Barnsley	116	157	128–186	Tameside	81	135	105–165
Cleveland	239	154	134–174	Cleveland	172	134	114–154
Salford	123	152	125–179	Bolton	93	130	103–157
Wigan	129	144	119–169	Sunderland	93	127	101–153
Gateshead	95	140	111–169	Solihull	54	126	92–160
Sandwell	137	137	114–160	Rotherham	72	124	95–153
Rotherham	101	135	108–162	Dudley	89	119	94–144
Walsall	99	131	105–157	Nottingham	303	118	104–132
Coventry	131	130	107–153	Bury	59	118	87–149
Newcastle-upon-Tyne	125	130	107–153	Sefton	108	117	94–140
West Glamorgan	162	129	109–149	Wandsworth	93	116	92–140
Liverpool	208	128	110–146	Liverpool	178	115	98–132
Bolton	102	127	102–152	Lincolnshire	175	115	98–132
Manchester	184	126	107–145	Staffordshire	271	114	100–128
Nottingham	392	124	111–137	Newcastle-upon-Tyne	99	113	90–136
Doncaster, Dudley	112	124	101–147	Leeds	230	112	97–127
				Camden	60	112	83–141
Powys	54	124	90–158	Humberside	254	111	97–125
Southwark	89	123	97–149	Sheffield	186	111	95–127
South Tyneside	66	122	92–152	Manchester	150	111	93–129

Source: Microfiche

Table 3A — *continued*

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
iv) Malignant neoplasm of pancreas (ICD 157)							
Sefton	125	141	116–166	North Tyneside	72	123	94–152
Hammersmith & Fulham	56	125	92–158	St Helens	59	123	91–155
Manchester	167	123	104–142	Bexley	69	122	93–151
Merton	67	122	92–152	Sefton	111	120	97–143
Mid Glamorgan	188	121	103–139	Wakefield	92	119	94–144
Walsall	86	121	95–147	Redbridge	83	119	93–145
Oldham	76	120	92–148	Newcastle-upon-Tyne	104	117	94–140
South Tyneside	60	120	89–151	Bromley	102	116	93–139
Kensington and Chelsea	41	120	83–157	West Glamorgan	125	115	94–136
Southwark	80	119	92–146	Merton	64	115	86–144
Greenwich	76	119	92–146	Coventry	89	114	90–138
St Helens	61	119	89–149	Hammersmith and Fulham	51	114	88–146
Bury	60	119	88–150	South Glamorgan	124	113	93–133
Wakefield	105	118	95–141	Stockport	92	113	89–137
Gwynedd	93	118	94–142	Doncaster	78	113	87–139
Cleveland	169	117	99–135	Brent	72	113	86–140
Havering	79	116	90–142	Staffordshire	273	112	98–126
Coventry	108	115	93–137	Newham	62	112	84–140
Newcastle-upon-Tyne	101	115	92–138	Hackney	56	112	82–142
Wandsworth	88	115	90–140	Tower Hamlets	45	112	79–145
v) Malignant neoplasm of trachea, bronchus and lung (ICD 162)							
Islington	644	157	145–169	Hammersmith and Fulham	259	194	170–218
Knowsley	518	157	143–171	Knowsley	196	173	148–198
Liverpool	2,045	154	147–161	Liverpool	820	172	160–184
Southwark	906	153	143–163	City of Westminster	283	171	151–191
Newcastle-upon-Tyne	1,164	150	141–159	Newcastle-upon-Tyne	442	165	149–181
Salford	993	149	140–158	Southwark	319	162	144–180
Tower Hamlets	580	146	134–158	Cleveland	619	151	139–163
Gateshead	808	145	135–155	Newham	253	150	131–169
Cleveland	1,799	142	135–149	Kensington and Chelsea	164	150	127–173
Manchester	1,689	141	134–148	South Tyneside	214	147	127–167
Sunderland	977	141	132–150	Manchester	603	146	134–158
Barking and Dagenham	635	141	130–152	Wandsworth	335	143	127–159
South Tyneside	613	139	128–150	Lambeth	296	143	126–160
Newham	727	138	128–148	Islington	196	143	123–163
North Tyneside	728	136	126–146	Haringey	229	139	121–157
Lambeth	821	133	124–142	Barking and Dagenham	201	139	119–159
Lewisham	845	132	123–141	Tower Hamlets	168	138	117–159
Hammersmith and Fulham	523	132	120–144	North Tyneside	250	137	120–154
Greenwich	727	129	119–139	Camden	212	136	117–155
Sandwell	1,052	127	119–135	Merton	221	134	116–152
vi) Malignant neoplasm of prostrate (ICD 185)							
Hounslow	131	131	108–154	City of Westminster	278	117	103–131
Kingston-upon-Thames	93	122	97–147	Camden	260	116	102–130
Cornwall and Scilly Isles	347	121	108–134	Bromley	456	115	104–126
City of Westminster	114	118	96–140	Richmond-upon-Thames	266	114	100–128
Kensington and Chelsea	71	118	90–146	Barking and Dagenham	234	114	99–129
Calderdale	119	117	96–138	Solihull	240	113	98–128
Barking and Dagenham	100	117	94–140	Redbridge	340	112	100–124
Somerset	321	116	103–129	Walsall	333	112	100–124
Wiltshire	313	115	102–128	Wolverhampton	334	111	99–123
Ealing	159	115	97–133	Sutton	259	111	97–125
Solihull	89	115	91–139	Birmingham	1,357	110	104–116
Gwynedd	163	114	96–132	Clwyd	573	110	101–119
Stockport	156	114	96–132	Wandsworth	369	109	98–120
Newham	112	114	92–136	Greenwich	289	109	96–122
Camden	102	114	91–137	Southwark	304	108	96–120
Berkshire	325	113	100–126	Essex	1,921	107	102–112
Waltham Forest	139	113	94–132	Somerset	623	107	98–116
Hampshire	835	112	104–120	Warwickshire	583	107	98–116
Lambeth	132	112	93–131	Enfield	369	107	96–118
West Sussex	533	111	101–121	Bexley	276	107	94–120

Source: Microfiche

Table 3A — *continued*

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
viii) Malignant neoplasm of bladder (ICD 188)							
Cleveland	212	155	134–176	Kingston-upon-Thames	31	154	99–209
Knowsley	51	149	107–191	Wigan	55	151	110–192
Salford	101	139	111–167	Liverpool	106	144	116–172
Newham	80	139	108–170	Sefton	62	142	106–178
Hammersmith and Fulham	59	131	97–165	Lambeth	45	139	98–180
Islington				Wakefield	49	138	99–177
				Southwark	42	138	95–181
Sutton	70	130	99–161	Tameside	39	138	94–182
Sefton	112	128	104–152	Coventry	48	135	96–174
Hounslow	74	128	98–158	Wolverhampton	41	135	93–177
Wandsworth	97	127	101–153				
Liverpool	184	125	107–143	Barking and Dagenham	29	132	83–181
				Bromley	53	128	93–163
Kirklees	132	125	103–147	Sandwell	50	127	91–163
Bolton	90	124	98–150	Croydon	52	125	90–160
Southwark	81	124	96–152	Merton	33	125	81–169
Oldham	75	123	95–151				
Kingston-upon-Thames	53	122	88–156	Leeds	121	124	101–147
				Gateshead	34	124	81–167
Manchester	160	121	102–140	Northamptonshire	78	123	95–151
Lambeth	82	120	93–147	Rochdale	31	123	79–167
Tower Hamlets	52	120	87–153	Sunderland	42	122	84–160
Newcastle-upon-Tyne	104	119	96–142				
ix) Malignant neoplasm of lymphatic and haematopoietic tissue (ICD 200–208)							
Hammersmith and Fulham	81	130	101–159	Hammersmith and Fulham	82	141	110–172
City of Westminster	96	127	101–153	Tower Hamlets	67	128	97–159
Wandsworth	132	124	102–146	Brent	108	127	103–151
Merton	93	124	98–150	Enfield	125	121	99–143
Doncaster	141	120	100–140	Bromley	138	120	100–140
Waltham Forest	113	118	96–140	Hackney	79	120	93–147
Northamptonshire	255	117	102–132	Oxfordshire	205	119	102–136
Kensington and Chelsea	57	117	86–148	Gloucestershire	224	118	102–134
Surrey	505	116	106–126	Buckinghamshire	203	118	101–135
Newcastle-upon-Tyne	138	114	95–133	Newham	86	118	93–143
Redbridge	114	114	93–135	Barnet	140	117	97–137
Greenwich	101	114	91–137	Harrow	90	117	92–142
Harrow	97	113	90–136	Wiltshire	208	115	99–131
West Sussex	369	112	100–124	Somerset	201	115	99–131
Hereford and Worcester	291	111	98–124	Merton	82	115	90–140
Buckinghamshire	2,321	110	96–124	North Yorkshire	309	114	101–127
Barnet	142	110	92–128	Cambridgeshire	222	114	99–129
Lambeth	108	110	89–131	Havering	92	114	90–138
Tower Hamlets	68	110	83–137	Lambeth	102	113	91–135
Oxfordshire	228	109	95–123	City of Westminster	80	112	87–137
x) Diabetes mellitus (ICD 250)							
Coventry	99	165	132–198	Hackney	79	165	128–202
Greenwich	63	152	114–190	Tower Hamlets	63	165	123–207
Bury	48	145	103–187	Coventry	118	164	134–194
Cornwall & Scilly Isles	146	140	117–163	St Helens	72	161	123–199
Kirklees	97	138	110–166	Sandwell	127	160	132–188
Gwent	119	137	112–162	Gwent	159	144	121–167
Warwickshire	122	136	111–161	Northumberland	112	141	114–168
Ealing	73	136	104–168	Durham	204	134	115–153
Hackney	46	135	95–175	Gateshead	75	134	103–165
Gwynedd	70	134	102–166	Cornwall & Scilly Isles	180	132	112–152
Sandwell	79	133	103–163	Mid Glamorgan	176	132	112–152
Wolverhampton	63	132	99–165	Newham	69	132	100–164
Lincolnshire	152	126	106–146	Lincolnshire	187	128	109–147
Tameside	51	125	90–160	Dudley	91	128	101–155
Birmingham	239	124	108–140	Greenwich	73	128	98–158
Bolton	59	122	90–154	Somerset	164	126	106–146
Tower Hamlets	35	121	80–162	Warwickshire	140	126	105–147
Kent	364	119	107–131	South Tyneside	55	126	92–160
Knowsley	28	119	74–164	Powys	40	126	86–166
Essex	341	117	104–130	Tameside	71	123	94–152

Source: Microfiche

Table 3A — *continued*

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
xi) Diseases of the nervous system and sense organs (ICD 320–389)							
Croydon	163	158	133–183	Havering	139	176	146–206
Sheffield	283	145	128–162	Croydon	200	168	144–192
Walsall	111	138	112–164	Rotherham	117	148	121–175
Salford	112	135	109–161	Wandsworth	156	147	123–171
Barnsley	103	134	108–160	Bury	93	140	111–169
St Helens	79	134	104–164	Birmingham	500	135	123–147
South Tyneside	74	134	103–165	Cumbria	244	131	144–148
Rotherham	105	133	107–159	Liverpool	258	127	111–143
Stockport	120	128	105–151	Leeds	342	126	112–140
Birmingham	428	127	115–139	Haringey	94	124	98–150
Havering	96	127	101–153	Northumberland	135	123	102–144
Manchester	190	126	108–144	Essex	651	122	112–132
Newcastle-upon-Tyne	121	123	101–145	Wakefield	125	122	100–144
Humberside	354	122	109–135	St Helens	77	122	94–150
Cumbria	211	122	105–139	Somerset	214	121	104–138
Tower Hamlets	61	122	91–153	Sheffield	260	120	105–135
Leeds	287	120	106–134	Humberside	352	115	103–127
Gateshead	84	119	93–145	Calderdale	90	114	90–138
Wakefield	118	117	95–139	Enfield	118	113	92–134
Haringey	77	117	90–144	Bolton	107	112	90–134
xii) Hypertensive disease (ICD 401–405)							
Sandwell	161	217	183–251	Sandwell	161	184	155–213
Southwark	105	195	157–233	Bexley	104	177	142–212
Waltham Forest	109	190	154–226	Waltham Forest	127	171	141–201
Hereford and Worcester	204	185	163–207	Southwark	119	170	139–201
Lambeth	101	178	143–213	Shropshire	166	161	136–186
Powys	56	171	125–217	Newham	91	155	123–187
Islington	63	169	126–212	Mid Glamorgan	224	153	133–173
Mid Glamorgan	208	167	144–190	Hereford and Worcester	270	151	133–169
Barking and Dagenham	67	164	124–204	Northamptonshire	220	150	130–170
Shropshire	146	162	135–189	Gwynedd	131	150	124–176
City of Westminster	72	158	121–195	Oldham	96	150	111–189
Somerset	192	153	131–175	Lambeth	111	147	119–175
St Helens	63	153	114–192	Gateshead	90	146	115–177
Oldham	75	148	114–182	Kent	682	142	131–153
Gateshead	74	146	112–180	South Glamorgan	166	141	112–163
Kingston-upon-Thames	51	143	103–183	Walsall	83	132	103–161
South Glamorgan	130	142	117–167	Kingston-upon-Thames	60	129	96–162
Redbridge	83	139	108–170	Hillingdon	80	127	99–155
Hackney	58	138	102–174	Redbridge	94	125	99–151
Richmond-upon-Thames	60	135	100–170	Powys	44	122	85–159
xiii) Other forms of heart disease (ICD 420–429)							
Manchester	937	207	193–221	St Helens	470	165	150–180
Doncaster	586	206	189–223	Sandwell	800	164	152–176
St Helens	316	185	164–206	Hounslow	570	161	148–174
Sandwell	430	145	131–159	Sefton	867	141	131–151
Hammersmith and Fulham	235	144	125–163	West Sussex	2,684	140	135–145
Hounslow	285	138	122–154	Doncaster	559	138	126–150
Wolverhampton	334	136	121–151	Oldham	496	135	123–147
Leicestershire	1,160	134	126–142	Hammersmith and Fulham	413	134	121–147
Liverpool	635	127	117–137	Powys	296	134	118–150
Northumberland	425	126	114–136	Liverpool	1,314	130	123–137
Tameside	261	124	109–139	Rochdale	437	130	118–142
Oldham	259	124	109–139	Manchester	1,108	127	119–135
Croydon	389	121	109–133	Wolverhampton	498	127	116–138
Coventry	378	121	109–133	Mid Glamorgan	1,042	125	117–133
Ealing	354	120	107–133	Northumberland	627	125	115–135
Wandsworth	334	119	106–132	Leicestershire	1,745	123	117–129
Cheshire	1,046	118	111–125	Wigan	560	122	112–132
Wigan	331	118	105–131	Tameside	433	120	108–132
South Tyneside	200	118	101–135	Hereford & Worcester	1,303	119	112–126
Richmond-upon-Thames	239	117	102–132	Gloucestershire	1,174	119	112–126

Source: Microfiche

Table 3A — *continued*

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
xiv) Cerebrovascular disease (ICD 430–438)							
Oldham	811	151	140–162	Dyfed	2,125	137	131–143
Bolton	917	142	133–151	Bolton	1,432	131	124–138
Dyfed	1,312	132	125–139	Oldham	1,181	130	122–138
Powys	483	132	120–144	Durham	3,024	128	123–133
Durham	2,079	131	125–137	Powys	658	126	116–136
Bradford	1,463	130	123–137	Bradford	2,564	123	118–128
Northumberland	1,104	130	122–138	Clwyd	2,337	123	118–128
Sunderland	867	129	120–138	Lancashire	8,392	122	119–125
Wigan	891	126	118–134	Cumbria	2,632	120	115–125
Rochdale	599	126	116–136	Northumberland	1,500	120	114–126
Cumbria	1,741	125	119–131	Wigan	1,378	120	114–126
Kirklees	1,176	125	118–132	Stockport	1,494	119	113–125
Dudley	866	124	116–132	Tameside	1,061	118	111–125
Tameside	662	123	113–133	Cornwall & Scilly Isles	2,612	117	112–122
Lancashire	4,897	122	119–125	Kirklees	1,923	117	112–122
Gateshead	653	122	112–132	Sunderland	1,286	117	110–124
Manchester	1,393	120	114–126	Mid Glamorgan	2,384	115	110–120
Wolverhampton	749	120	111–129	Trafford	1,084	115	108–122
Sandwell	919	119	111–127	Warwickshire	2,036	114	109–119
North Tyneside	610	118	108–128	Rochdale	934	114	107–121
xv) Diseases of arteries, arterioles and capillaries (ICD 440–448)							
Doncaster	399	192	173–211	Doncaster	443	236	214–251
Dyfed	415	143	129–157	Bolton	393	192	173–211
Trafford	202	126	108–144	Dyfed	521	177	161–193
Bolton	232	123	107–139	Durham	676	154	142–166
Warwickshire	415	120	108–132	Oldham	252	148	129–167
Kent	1,474	118	112–124	St Helens	193	147	126–168
Lancashire	1,376	118	112–124	Gateshead	231	145	126–164
Gwynedd	250	117	102–132	Stockport	345	144	128–160
Clwyd	397	116	104–128	Trafford	245	136	119–153
St Helens	146	116	97–135	Sheffield	661	134	124–144
Salford	213	115	99–131	Lancashire	1,750	133	127–139
Hillingdon	197	115	99–131	Gwynedd	325	133	118–148
Lewisham	209	113	97–129	Clwyd	491	132	120–144
Hereford and Worcester	545	112	102–122	Warwickshire	454	132	120–144
Hampshire	1,246	110	104–116	Haringey	241	132	115–149
South Glamorgan	322	110	98–122	Derbyshire	919	129	120–138
Lincolnshire	531	109	100–118	Hounslow	204	125	107–143
Wirral	290	109	96–122	Staffordshire	813	124	115–133
Greenwich	178	109	93–125	North Yorkshire	806	123	114–132
Surrey	877	107	100–114	Somerset	532	123	112–134
xvi) Phlebitis, thrombophlebitis, venous embolism and thrombosis (ICD 451–453)							
Mid Glamorgan	190	258	221–295	Lambeth	150	220	184–256
Barnsley	67	205	155–255	Brent	122	200	164–236
Camden	49	196	140–252	Southwark	123	194	159–229
Doncaster	76	191	147–235	Barnsley	98	186	148–224
Lewisham	58	167	123–211	Islington	80	180	140–220
Hillingdon	51	156	112–200	Walsall	102	176	141–211
Sheffield	133	155	128–182	Kingston-upon-Thames	71	169	129–209
Wandsworth	58	155	114–196	Hillingdon	97	168	134–202
Ealing	61	154	115–193	Waltham Forest	111	166	134–198
Salford	55	154	112–196	Doncaster	106	163	131–195
Southwark	49	153	109–197	Nottinghamshire	399	161	145–177
Stockport	60	152	113–191	Northamptonshire	201	152	131–173
Walsall	50	151	108–194	Wandsworth	120	150	123–177
Brent	50	146	105–187	Merton	82	149	116–182
Nottinghamshire	202	144	124–164	Sheffield	242	148	129–167
Lambeth	48	143	102–184	Salford	103	146	117–175
Merton	38	142	96–188	Oldham	84	144	113–175
Haringey	38	139	94–184	Leeds	281	139	122–156
Lincolnshire	121	136	111–161	Barnet	127	138	114–162
City of Westminster	36	133	89–177	Ealing	100	136	109–163

Source: Microfiche

Table 3A — *continued*

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
xvii) Pneumonia (ICD 480–486)							
Wolverhampton	855	172	160–184	Knowsley	540	163	149–177
St Helens	562	163	149–177	Wolverhampton	1,102	158	148–168
Tower Hamlets	468	154	140–168	St Helens	793	157	146–168
Walsall	669	153	141–165	Walsall	929	151	141–161
Liverpool	1,578	151	143–159	Waltham Forest	1,189	146	138–154
Southwark	681	148	137–159	Ealing	1,293	142	134–150
Knowsley	326	147	131–163	Tower Hamlets	664	140	129–151
Lambeth	720	145	134–156	Mid Glamorgan	2,063	139	133–145
Waltham Forest	754	144	134–154	Wandsworth	1,440	139	132–146
Mid Glamorgan	1,435	138	131–145	West Glamorgan	1,535	135	128–142
Birmingham	2,781	136	131–141	Southwark	1,038	133	125–141
Newham	549	136	124–148	Barking and Dagenham	676	131	121–141
West Glamorgan	1,077	135	127–143	Cleveland	1,785	130	124–136
Wandsworth	783	135	125–145	Newham	819	130	121–139
Islington	421	135	122–148	Birmingham	4,018	127	123–131
Cleveland	1,280	134	127–141	Lambeth	1,085	127	119–135
Sunderland	712	133	123–143	Wakefield	981	124	116–132
Hackney	474	130	118–142	Hackney	727	122	113–131
Salford	649	129	119–139	Bury	712	122	113–131
Tameside	547	129	118–140	Liverpool	2,180	121	116–126
xiii) Bronchopneumonia, organism unspecified (ICD 485)							
St Helens	527	171	156–186	Knowsley	510	168	153–183
Knowsley	302	155	137–173	St Helens	763	163	151–175
Liverpool	1,423	152	144–160	Waltham Forest	1,128	149	140–158
Southwark	615	150	138–162	Walsall	839	148	138–158
Tower Hamlets	404	150	135–165	Ealing	1,213	143	135–151
Waltham Forest	695	148	137–159	Mid Glamorgan	1,939	141	135–147
Walsall	566	146	134–158	West Glamorgan	1,479	141	134–148
Lambeth	634	143	132–154	Wolverhampton	902	140	131–149
West Glamorgan	995	140	131–149	Tower Hamlets	617	140	129–151
Birmingham	2,520	138	133–143	Wandsworth	1,331	137	129–145
Sunderland	655	137	126–148	Southwark	971	134	125–143
Mid Glamorgan	1,257	136	128–144	Cleveland	1,689	133	127–139
Newham	486	136	124–148	Newham	764	130	121–139
Cleveland	1,149	135	127–143	Barking and Dagenham	627	130	120–149
Wakefield	727	135	125–145	Birmingham	3,798	129	125–133
Tameside	503	133	121–145	Lambeth	1,025	129	121–137
Islington	368	132	118–146	Wakefield	931	127	119–135
Bury	414	131	118–144	Barnet	1,336	123	116–130
Wandsworth	672	129	119–139	Liverpool	2,040	122	117–127
Salford	572	128	117–139	Bromley	1,200	122	115–129
xix) Chronic bronchitis (ICD 491)							
Barnsley	664	254	234–274	Barnsley	220	269	233–305
Wakefield	718	214	198–230	Oldham	225	248	215–281
Mid Glamorgan	1,071	184	173–195	Wandsworth	303	242	214–270
Walsall	442	174	157–191	Tameside	216	239	206–272
Oldham	412	172	155–189	Wakefield	233	206	179–233
Tower Hamlets	288	170	150–190	Merton	173	201	170–232
Doncaster	537	169	154–184	Knowsley	99	201	161–241
Rotherham	436	168	152–184	Manchester	391	190	171–209
Wandsworth	508	166	151–181	Croydon	260	190	166–214
Southwark	425	166	150–182	Bexley	146	175	146–204
Staffordshire	1,178	165	157–173	Brent	158	167	140–194
Manchester	839	162	151–173	Lambeth	177	166	141–191
Sandwell	547	159	145–173	Salford	176	160	136–184
Islington	273	155	136–174	South Tyneside	111	160	130–190
Gwent	763	149	138–160	Southwark	158	159	134–184
Haringey	320	145	129–161	Kirklees	246	153	133–173
Tameside	339	142	127–157	Sutton	129	153	126–180
Wigan	442	141	128–154	Tower Hamlets	94	153	121–185
Lambeth	380	141	127–155	Liverpool	359	151	135–167
St Helens	271	141	124–158	Harrow	137	151	125–177

Source: Microfiche

Table 3A — *continued*

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
xx) Chronic airways obstruction, not elsewhere classified (ICD 496)							
Camden	150	218	182–254	Manchester	177	244	207–281
Tower Hamlets	124	215	176–254	Salford	92	234	185–283
Salford	201	207	178–236	Hammersmith and Fulham	54	227	165–289
Hammersmith and Fulham	124	205	168–242	Tower Hamlets	45	211	148–274
Hackney	139	203	169–237	Wigan	86	206	162–250
Manchester	353	201	180–222	Newcastle-upon-Tyne	96	204	162–246
Islington	117	196	160–232	Knowsley	37	204	137–271
Knowsley	86	194	152–236	Camden	56	198	145–251
Newham	136	178	147–209	North Tyneside	58	187	138–236
Newcastle-upon-Tyne	195	167	143–191	Tameside	60	185	137–233
Haringey	121	163	133–193	Gateshead	58	183	135–231
Rochdale	114	159	129–189	Islington	44	183	128–238
Liverpool	307	157	139–175	Bolton	70	182	138–226
Wigan	164	155	131–179	Cleveland	124	181	148–214
Cleveland	227	154	134–174	Liverpool	150	180	151–209
North Tyneside	118	151	123–179	Hackney	43	162	113–211
Derbyshire	561	148	136–160	Northumberland	71	159	121–197
Southwark	128	148	122–174	South Tyneside	39	158	107–209
Gateshead	117	146	119–173	Brent	52	155	112–198
Berkshire	322	144	128–160	Rochdale	42	147	102–192
xxi) Ulcer of stomach and duodenum (ICD 531–533)							
Camden	73	198	152–244	Barking & Dagenham	63	170	127–213
Oldham	77	177	137–217	Islington	58	157	116–198
Tower Hamlets	53	171	124–218	Nottinghamshire	295	144	127–161
Southwark	77	166	128–204	Southwark	76	143	110–176
Islington	51	159	114–204	Hammersmith and Fulham	53	142	103–181
City of Westminster	59	148	109–187	Brent	70	140	107–173
Doncaster	85	146	114–178	Tower Hamlets	44	134	94–174
Hackney	53	145	105–185	Manchester	141	129	107–151
Manchester	135	144	119–169	Calderdale	64	128	96–160
Lambeth	71	144	110–178	Knowsley	32	128	83–173
Barking and Dagenham	51	144	104–184	Lewisham	75	127	98–156
Hammersmith and Fulham	46	142	100–184	Walsall	59	127	94–160
Salford	73	141	108–174	Hackney	52	127	92–162
Rotherham	67	141	107–175	Kingston-upon-Thames	44	125	87–163
Newham	57	139	102–176	Trafford	61	124	92–156
Gateshead	60	138	102–174	Barnsley	51	121	87–155
Wandsworth	74	134	103–165	South Tyneside	44	121	85–157
Walsall	63	133	99–167	Kensington and Chelsea	38	120	81–159
South Tyneside	46	132	93–171	Bedfordshire	103	119	96–142
Cleveland	129	131	108–154	Doncaster	63	119	89–149
xxii) Nephritis, nephrotic syndrome and nephrosis (ICD 580–589)							
Powys	53	181	131–231	Havering	80	158	123–193
Oldham	73	174	133–215	Cleveland	170	153	130–176
Calderdale	69	165	125–205	St Helens	62	152	113–191
Bury	52	150	108–192	Newham	73	149	114–184
Newham	59	148	109–187	Oldham	78	148	114–182
Kirklees	107	144	116–172	Barking and Dagenham	61	148	110–186
Barking and Dagenham	49	143	102–184	Mid Glamorgan	175	143	121–165
Haringey	57	142	104–180	Knowsley	39	139	94–184
Cleveland	133	139	115–163	Calderdale	77	138	107–169
Knowsley	32	139	90–188	Humberside	280	137	121–153
Sefton	84	134	105–163	Kirklees	131	137	113–161
Tower Hamlets	40	134	92–176	Solihull	50	137	98–176
Lambeth	64	132	99–165	Powys	41	136	94–178
Humberside	230	128	111–145	Cheshire	275	134	118–150
Shropshire	101	128	103–153	Wirral	129	134	110–158
Salford	63	126	94–158	South Glamorgan	131	133	110–156
Cornwall and Scilly Isles	146	125	104–145	Gateshead	67	133	101–165
Bolton	64	125	94–156	Rochdale	63	132	99–165
Wigan	69	123	93–153	Bury	59	130	96–164
Dudley	68	123	93–153	Wigan	86	128	100–156

Source: Microfiche

Table 3A — *continued*

Males				Females			
Area	Number of deaths	SMR	95 per cent confidence interval	Area	Number of deaths	SMR	95 per cent confidence interval
xxiii) Transport accidents (including late effects) (ICD E800–E848, E929.0–E929.1)							
Lincolnshire	283	148	130–166	Gateshead	44	152	106–198
Northamptonshire	264	148	130–166	Barnsley	44	150	105–195
Buckinghamshire	262	137	120–154	Hounslow	40	148	101–195
Shropshire	173	136	115–127	Leeds	140	143	119–167
Norfolk	311	132	117–147	Shropshire	67	137	104–170
Doncaster	133	132	109–155	Somerset	80	133	103–163
Warwickshire	212	131	113–149	Newham	37	131	88–174
Cumbria	207	127	109–145	Hackney	33	131	85–177
Cambridgeshire	249	125	109–141	Islington	28	126	78–174
Dyfed	137	124	103–145	Oxfordshire	83	124	97–151
Somerset	175	121	103–139	Calderdale	34	124	81–167
Gwynedd	89	119	94-144	Waltham Forest	38	123	83–163
Leeds	278	116	102–130	Camden	30	123	78–168
North Yorkshire	266	116	102–130	Cambridgeshire	91	122	96–148
Powys	44	116	81–151	Clwyd	67	122	92–152
Humberside	334	115	102–128	Lincolnshire	89	121	95–147
Richmond-upon-Thames	61	115	86–144	Liverpool	87	119	93–145
Nottinghamshire	382	113	101–125	Salford	41	119	82–156
Suffolk	230	113	98–128	East Sussex	132	118	97–139
Wiltshire	203	113	97–129	Tower Hamlets	23	118	69–167

Source: Microfiche

Chapter 5 Geographic variation in infant mortality in relation to birthweight, 1983–85

Contents

(An equivalent table for all infant deaths apart from congenital malformations is available on request from Medical Statistics Unit, OPCS.)

Table 5A Infant mortality rates and numbers of livebirths by birthweight, 1983–85

Regional and district health authorities in England. Management Units in Wales

Area	Infant mortality rates[1]					Number of live births				
	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated
England and Wales										
Northern										
Hartlepool	10.5	432.4	27.0	4.7	250.0	3,906	37	259	3,606	4
North Tees	10.1	328.6	21.7	5.8	600.0	7,813	70	507	7,231	5
South Tees	10.5	356.6	28.3	5.4	666.7	13,363	129	706	12,519	9
East Cumbria	8.3	257.1	40.0	4.3	81.1	6,059	35	350	5,637	37
South Cumbria	8.9	242.4	33.6	5.4	555.6	5,700	33	268	5,390	9
West Cumbria	10.8	418.2	20.7	5.8	—	5,356	55	290	5,011	—
Darlington	9.5	394.7	32.3	4.3	1,000.0	4,503	38	279	4,185	1
Durham	9.1	414.6	26.2	3.7	333.3	8,902	82	534	8,280	6
North West Durham	8.9	214.3	35.1	5.4	—	3,152	28	171	2,953	—
South West Durham	6.7	255.3	28.8	3.1	0.0	5,828	47	347	5,430	4
Northumberland	9.1	300.0	28.6	5.3	272.7	10,756	80	629	10,036	11
Gateshead	10.1	392.9	28.2	5.7	500.0	7,703	56	497	7,148	2
Newcastle	9.1	275.5	26.9	5.3	83.3	10,628	98	633	9,885	12
North Tyneside	7.7	225.8	23.8	4.2	200.0	6,984	62	462	6,450	10
South Tyneside	8.1	350.0	22.4	4.4	666.7	5,906	40	357	5,506	3
Sunderland	9.2	336.7	31.0	5.0	428.6	12,684	98	677	11,902	7
Yorkshire										
Hull	8.8	305.1	31.1	4.5	0.0	13,449	118	836	12,493	2
East Yorks	10.2	424.2	40.7	5.6	2.0	5,481	33	270	5,177	1
Grimsby	9.6	326.9	18.8	4.7	500.0	6,883	52	425	6,384	22
Scunthorpe	9.5	342.1	24.0	4.9	333.3	7,462	76	417	6,966	3
Northallerton	9.7	400.0	42.6	4.2	1,000.0	3,813	30	188	3,593	2
York	10.9	420.5	31.7	5.4	0.0	8,838	88	441	8,308	1
Scarborough	13.2	277.8	70.2	7.8	0.0	4,532	36	242	4,253	1
Harrogate	7.7	264.7	20.7	4.3	500.0	4,155	34	193	3,924	4
Bradford	12.5	343.9	33.5	7.2	272.7	17,408	157	1,342	15,898	11
Airedale	12.6	393.9	28.9	7.1	—	6,433	66	450	5,917	—
Calderdale	11.7	328.8	39.5	5.6	545.5	7,723	73	506	7,133	11
Huddersfield	11.9	403.5	44.1	6.0	500.0	8,265	57	522	7,674	12
Dewsbury	12.6	478.3	33.3	6.2	0.0	7,457	69	570	6,817	1
Leeds Western	9.7	381.0	29.9	3.9	0.0	13,249	147	803	12,292	7
Leeds Eastern	10.9	284.6	43.1	5.8	111.1	13,584	130	858	12,587	9
Wakefield	10.5	420.0	30.6	5.0	500.0	5,542	50	327	5,163	2
Pontefract	12.0	379.3	47.5	5.9	1,000.0	6,927	58	463	6,405	1
Trent										
North Derbyshire	8.2	252.3	32.9	4.3	250.0	12,430	111	700	11,615	4
Southern Derbyshire	10.7	316.7	36.8	5.9	625.0	20,044	180	1,115	18,741	8
Leicestershire	8.7	330.8	26.2	4.8	156.3	35,051	263	2,176	32,580	32
North Lincolnshire	9.2	269.7	26.7	4.7	400.0	9,419	89	524	8,786	20
South Lincolnshire	11.0	385.7	38.7	6.3	200.0	9,776	70	542	9,154	10
Bassetlaw	9.1	314.3	31.3	4.5	0.0	3,608	35	224	3,348	1
Central Nottinghamshire	8.7	325.3	31.6	4.4	250.0	10,911	83	664	10,156	8
Nottingham	8.8	251.9	29.7	4.2	166.7	23,192	266	1,549	21,365	12
Barnsley	11.0	513.5	30.4	4.5	750.0	8,577	74	559	7,940	4
Doncaster	7.7	339.1	25.2	3.3	0.0	12,013	115	675	11,222	1
Rotherham	10.8	371.4	37.2	4.7	428.6	10,228	105	618	9,498	7
Sheffield	9.1	261.9	23.3	4.9	823.5	18,319	168	1,115	17,019	17

Table 5A — *continued*

Area	Infant mortality rates[1]					Number of live births				
	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated
East Anglian										
Cambridge	8.4	274.0	32.6	4.8	166.7	9,579	73	491	9,009	6
Peterborough	8.3	307.7	24.6	4.6	52.6	8,172	65	488	7,600	19
West Suffolk	9.7	323.9	15.5	6.5	0.0	8,349	71	453	7,823	2
East Suffolk	8.2	263.9	30.8	5.6	0.0	11,923	72	519	11,329	3
Norwich	9.4	296.3	31.5	5.3	111.1	15,076	135	762	14,161	18
Great Yarmouth and Waveney	10.5	377.0	38.0	5.4	0.0	6,867	61	368	5,425	13
West Norfolk and Wisbech	8.1	297.9	22.9	4.8	0.0	6,193	47	350	5,792	4
Huntingdon	7.5	379.3	13.4	4.6	333.3	5,088	29	298	4,758	3
North West Thames										
North Bedfordshire	9.3	343.3	34.3	5.5	250.0	9,902	67	496	9,335	4
South Bedfordshire	9.8	341.5	28.4	5.2	333.3	13,312	123	705	12,472	12
North Hertfordshire	9.7	233.3	44.6	5.8	0.0	7,509	60	404	7,044	1
East Hertfordshire	7.0	282.1	16.4	4.3	0.0	10,095	78	487	9,522	8
North West Hertfordshire	7.5	177.4	34.0	4.7	333.3	9,464	62	471	8,925	6
South West Hertfordshire	7.8	217.4	21.0	4.7	166.7	8,461	69	525	7,849	18
Barnet	8.1	176.5	31.4	4.9	285.7	11,172	102	637	10,426	7
Harrow	8.5	281.7	24.6	4.4	500.0	7,675	71	528	7,074	2
Hillingdon	7.7	287.4	30.0	3.4	0.0	9,147	87	534	8,523	3
Hounslow and Spelthorne	9.5	222.2	23.7	5.7	200.0	12,052	135	760	11,142	15
Ealing	8.5	228.1	18.5	5.3	210.5	12,805	114	865	11,807	19
Brent	10.2	261.9	24.0	4.8	153.8	11,601	168	916	10,504	13
Paddington and North Kensington	12.2	289.2	24.1	6.0	142.9	5,493	83	374	5,008	28
Hammersmith and Fulham	9.0	43.5	31.4	6.7	125.0	3,885	46	255	3,576	8
Victoria	7.6	186.7	27.5	3.6	142.9	6,698	75	400	6,195	28
North East Thames										
Basildon and Thurrock	8.4	307.7	35.1	4.3	500.0	12,054	91	656	11,305	2
Mid Essex	8.2	300.0	36.7	5.2	142.9	10.991	50	545	10,389	7
North East Essex	8.6	223.7	23.9	5.9	333.3	9,894	76	502	9,313	3
West Essex	7.2	250.0	21.0	4.2	333.3	9,424	76	476	8,866	6
Southend	8.1	350.0	33.3	4.0	178.6	11,480	80	511	10,861	28
Barking, Havering and Brentwood	8.0	250.0	40.2	3.8	208.3	16,239	126	896	15,195	24
Hampstead	8.4	184.2	46.3	3.8	166.7	3,687	38	216	3,427	6
Bloomsbury	9.3	148.9	27.6	5.8	100.0	4,514	47	326	4,121	20
Islington	10.1	219.0	28.9	5.1	250.0	7,233	105	484	6,636	8
City and Hackney	11.2	317.8	34.0	5.4	266.7	9,978	107	735	9,121	15
Newham	9.6	217.4	26.3	5.5	200.0	11,724	115	952	10,642	15
Tower Hamlets	9.2	271.4	26.8	4.7	217.4	8,624	70	672	7,859	23
Enfield	8.2	278.8	19.7	4.1	120.0	10,170	104	659	9,382	25
Haringey	10.5	244.4	34.5	5.9	83.3	9,173	90	666	8,405	12
Redbridge	9.9	285.7	35.7	5.1	384.6	8,305	70	504	7,718	13
Waltham Forest	10.1	218.5	31.2	5.4	285.7	9,638	119	673	8,839	7
South East Thames										
Brighton	11.8	329.5	33.2	6.9	571.4	9,874	88	633	9,146	7
Eastbourne	7.7	255.3	15.0	5.2	111.1	6,330	47	333	5,941	9
Hastings	9.3	290.3	33.6	5.9	76.9	5,040	31	268	4,728	13
South East Kent	8.3	327.3	27.5	4.2	142.9	9,089	55	472	8,506	56
Canterbury and Thanet	10.4	324.3	31.1	6.4	148.1	9,790	74	483	9,206	27
Dartford and Gravesham	7.8	271.6	24.8	3.8	444.4	8,623	81	404	8,129	9
Maidstone	8.6	361.7	37.5	3.7	171.4	6,946	47	347	6,517	35
Medway	10.2	285.7	27.4	5.7	157.3	14,592	126	803	13,574	89
Tunbridge Wells	7.9	351.4	29.9	4.5	0.0	6,339	37	335	5,959	8
Bexley	7.1	289.9	31.5	3.1	500.0	8,282	69	444	7,767	2
Greenwich	12.9	298.2	24.3	7.9	500.0	9,554	114	576	8,854	10
Bromley	6.8	281.3	21.8	4.1	0.0	9,707	64	504	9,134	5
West Lambeth	11.7	281.6	35.4	5.6	142.9	7,359	103	508	6,741	7
Camberwell	9.6	204.5	25.4	5.5	250.0	10,575	132	786	9,649	8
Lewisham and North Southwark	10.0	289.0	21.5	5.2	100.0	13,453	173	884	12,376	20
South West Thames										
North West Surrey	8.1	294.1	21.7	5.2	0.0	7,289	51	368	6,862	8
West Surrey and NE Hampshire	8.5	333.3	25.9	4.6	117.6	10,662	81	540	10,007	34
South West Surrey	7.7	388.9	31.0	3.6	400.0	5,867	36	290	5,536	5
Mid Surrey	6.0	225.8	8.1	4.2	200.0	4,798	31	247	4,515	5
East Surrey	9.3	285.7	37.0	5.4	500.0	6,039	42	270	5,721	6

Table 5A — *continued*

Area	Infant mortality rates[1]					Number of live births				
	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated
Chichester	9.0	406.3	28.6	5.1	333.3	4,906	32	210	4,661	3
Mid Downs	8.8	298.5	29.9	5.5	125.0	10,406	67	569	9,762	8
Worthing	9.4	294.1	21.1	6.4	166.7	6,831	51	331	6,443	6
Croydon	8.8	239.7	32.1	4.7	750.0	13,126	121	748	12,249	8
Kingston and Esher	7.0	301.9	18.1	3.5	285.7	6,434	53	332	6,042	7
Richmond, Twickenham & Roehampton	9.8	349.4	27.7	5.0	166.7	8,027	83	397	7,541	6
Wandsworth	9.4	243.2	19.7	5.1	250.0	8,717	111	610	7,988	8
Merton and Sutton	8.4	322.9	32.5	4.2	166.7	12,861	96	738	12,015	12
Wessex										
East Dorset	7.7	253.0	23.3	4.9	250.0	12,990	83	686	12,209	12
West Dorset	11.0	326.5	38.7	6.0	416.7	5,978	49	284	5,633	12
Portsmouth and SE Hampshire	8.9	217.5	22.1	5.2	390.2	20,516	151	1,179	19,145	41
Southampton and SW Hampshire	9.1	307.0	37.2	4.9	1,000.0	15,220	114	807	14,296	3
Winchester	9.2	380.0	18.5	5.8	1,000.0	7,289	50	379	6,859	1
Basingstoke and N Hampshire	11.4	371.4	31.2	6.4	312.5	8,312	70	449	7,777	16
Salisbury	9.6	454.5	13.7	5.8	0.0	4,372	33	219	4,116	4
Swindon	11.7	371.8	38.2	7.2	0.0	9,749	78	497	9,171	3
Bath	9.0	254.9	28.0	5.9	250.0	13,708	102	715	12,883	8
Isle of Wight	12.2	478.3	51.0	7.2	1,000.0	3,677	23	157	3,496	1
Oxford										
East Berkshire	8.8	338.5	31.9	4.2	200.0	14,675	130	815	13,720	10
West Berkshire	7.2	231.4	20.3	4.4	78.1	16,764	121	935	15,644	64
Aylesbury Vale	8.2	250.0	10.8	4.7	500.0	5,496	60	279	5,151	6
Wycombe	9.1	296.3	34.0	5.0	0.0	9,511	81	559	8,868	3
Milton Keynes	11.1	352.1	45.4	5.1	1,000.0	7,777	71	41	7,261	4
Kettering	10.5	402.4	36.6	5.1	200.0	9,823	82	573	9,158	10
Northampton	7.9	247.5	42.9	3.6	83.3	11,726	101	653	10,960	12
Oxfordshire	7.8	198.8	34.3	4.5	22.1	20,057	161	1,080	18,680	136
South Western										
Bristol and Weston	9.2	323.1	22.0	4.8	66.7	13,295	130	819	12,301	45
Frenchay	10.0	256.1	39.1	4.8	264.7	8,507	82	435	7,956	34
Southmead	10.0	333.3	35.5	5.3	156.3	8,075	66	394	7,583	32
Cornwall and Isles of Scilly	9.7	364.5	36.9	5.6	0.0	15,234	107	759	14,359	9
Exeter	7.1	246.9	29.3	3.6	111.1	9,579	81	512	8,977	9
North Devon	8.6	268.3	13.2	5.5	0.0	4,088	41	228	3,818	1
Plymouth	8.1	270.3	29.1	5.2	500.0	12,632	74	654	11,902	2
Torbay	10.6	274.5	36.1	7.0	0.0	6,580	51	360	6,161	8
Cheltenham and District	8.4	191.5	31.0	5.7	100.0	6,983	47	387	6,539	10
Gloucester	8.6	362.5	30.1	4.6	250.0	11,328	80	531	10,705	12
Somerset	8.1	266.0	39.1	4.3	285.7	12,975	94	665	12,209	7
West Midlands										
Bromsgrove and Redditch	8.5	258.1	33.3	4.6	0.0	6,696	62	360	6,260	14
Herefordshire	11.9	390.2	36.4	6.9	444.4	5,315	41	220	5,045	9
Kidderminster and District	8.6	406.3	45.5	2.9	0.0	3,700	32	198	3,444	26
Worcester and District	8.7	333.3	39.8	3.8	140.0	7,932	51	402	7,422	57
Shropshire	10.9	514.9	30.1	4.6	375.0	14,506	134	765	13,599	8
Mid Staffordshire	8.8	363.6	48.7	3.4	200.0	11,904	99	595	11,200	10
North Staffordshire	12.9	494.3	32.7	6.1	384.6	17,575	176	1,071	16,315	13
South East Staffordshire	11.6	493.2	36.3	6.1	583.3	10,508	73	524	9,899	12
Rugby	8.5	250.0	26.8	4.2	600.0	3,057	28	149	2,875	5
North Warwickshire	8.8	292.7	37.2	4.7	444.4	6,826	41	376	6,400	9
South Warwickshire	6.8	348.8	31.5	3.4	0.0	7,214	43	349	6,818	4
Central Birmingham	13.8	361.7	33.6	7.8	428.6	8,714	94	625	7,988	7
East Birmingham	11.5	440.0	37.8	5.4	416.7	9,917	75	714	9,116	12
North Birmingham	11.1	426.2	41.4	4.3	125.0	5,749	61	314	5,358	16
South Birmingham	10.8	314.3	24.4	6.7	0.0	10,451	105	616	9,720	10
West Birmingham	11.2	342.7	25.3	5.6	83.3	12,064	143	910	10,987	24
Coventry	11.4	373.0	24.7	4.9	188.0	13,529	126	850	12,420	133
Dudley	8.9	252.7	26.7	5.3	300.0	11,318	91	712	10,505	10
Sandwell	13.6	435.6	36.2	5.8	0.0	12,656	163	939	11,549	5
Solihull	8.1	313.7	24.5	4.7	0.0	6,808	51	368	6,387	2

Table 5A — *continued*

Area	Infant mortality rates[1]					Number of live births				
	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated
Walsall	13.2	448.6	37.1	6.2	89.6	10,780	107	728	9,878	67
Wolverhampton	9.5	299.1	22.9	5.0	0.0	10,082	107	786	9,187	2
Mersey										
Chester	8.3	285.7	11.9	5.7	0.0	6,831	56	335	6,438	2
Crewe	9.1	444.4	24.0	4.3	800.0	9,406	72	499	8,830	5
Halton	8.0	340.0	26.4	4.3	0.0	6,232	50	303	5,876	3
Macclesfield	9.9	465.1	40.6	4.4	333.3	5,855	43	320	5,489	3
Warrington	8.9	210.5	44.4	4.6	222.2	6,978	57	405	6,507	9
Liverpool	8.1	298.3	24.3	4.0	266.7	21,249	181	1,277	19,761	30
St Helens and Knowsley	8.2	369.4	19.1	3.1	500.0	15,301	157	942	14,192	10
Southport and Formby	8.7	500.0	11.0	5.8	0.0	3,320	18	181	3,110	11
South Sefton	8.3	246.2	25.3	4.3	454.5	7,333	65	435	6,822	11
Wirral	9.5	264.5	34.9	5.6	333.3	13,835	121	745	12,966	3
North Western										
Lancaster	8.6	175.0	49.6	4.5	0.0	4,527	40	262	4,224	1
Blackpool, Wyre and Fylde	11.4	322.2	41.7	6.4	125.0	9,679	90	527	9,054	8
Preston	10.0	333.3	30.9	5.1	1,000.0	5,416	45	421	4,949	1
Blackburn, Hyndburn and Ribble Valley	10.7	205.4	33.0	6.9	333.3	11,861	112	848	10,898	3
Burnley, Pendle and Rossendale	14.8	495.1	39.9	7.5	600.0	10,290	103	677	9,505	5
West Lancashire	7.9	307.7	15.2	3.6	0.0	4,444	52	264	4,126	2
Chorley and South Ribble	10.2	446.2	37.3	4.6	—	7,646	65	429	7,152	—
Bolton	9.9	282.4	22.0	6.6	500.0	11,393	85	773	10,531	4
Bury	10.0	454.5	21.8	4.7	333.3	7,001	66	367	6,565	3
North Manchester	10.6	367.1	23.1	4.8	0.0	6,628	79	519	6,027	3
Central Manchester	10.9	298.7	31.0	5.2	0.0	6,354	77	516	5,756	5
South Manchester	9.0	305.6	22.9	4.5	333.3	7,239	72	524	6,640	3
Oldham	9.9	285.7	30.0	5.3	0.0	9,703	91	767	8,838	7
Rochdale	10.5	326.5	26.9	5.4	750.0	9,587	98	670	8,815	4
Salford	11.2	316.3	15.7	7.3	181.8	9,738	98	637	8,992	11
Stockport	8.5	309.3	19.1	5.0	0.0	10,874	97	577	10,196	4
Tameside and Glossop	9.5	328.8	34.4	5.3	0.0	10,164	73	668	9,421	2
Trafford	11.2	390.5	25.5	5.2	0.0	8,379	105	510	7,761	3
Wigan	8.3	234.8	24.4	4.2	1,250.0	12,475	132	739	11,600	4
Wales										
District Health Authorities & Management Units (Wales)										
Clwyd										
North Clywd	11.0	477.3	32.3	6.1	0.0	5,751	44	279	5,427	1
South Clywd	9.4	350.0	46.0	4.1	352.9	8,763	60	457	8,229	17
East Dyfed										
Ceredigion	5.9	250.0	10.6	2.9	250.0	1,855	12	94	1,741	8
Carmarthen-Dinefwr	9.7	375.0	49.5	4.2	200.0	2,273	16	101	2,146	10
Llanelli-Dinefwr	6.7	350.0	24.8	3.5	0.0	3,414	20	202	3,187	5
Pembrokeshire	10.2	555.6	17.2	5.2	750.0	4,108	27	232	3,845	4
Gwent										
North Gwent Hospitals	9.8	454.5	20.6	5.1	250.0	4,272	33	291	3,944	4
Pontypool and W Gwent Hospitals	7.1	216.2	47.8	3.4	0.0	6,025	37	335	5,649	4
Newport and Chepstow Hospitals	11.1	315.1	43.2	5.4	333.3	7,008	73	417	6,512	6
Gwynedd										
Anglesey	6.4	125.0	37.9	3.2	1,000.0	2,653	24	132	2,496	1
Meirionnydd	4.9	200.0	22.7	2.1	0.0	1,011	10	44	955	2
Aberconwy	6.6	500.0	22.7	0.7	0.0	1,522	14	88	1,418	2
Arfon	10.6	210.5	47.2	6.7	0.0	2,069	19	106	1,942	2
Dwyfor	7.7	166.7		6.8	0.0	780	6	41	732	1
Mid Glamorgan										
Ogwr	10.3	500.0	27.1	4.8	333.3	5,068	34	258	4,761	15
Taff-Ely	8.9	361.1	22.1	4.0	666.7	4,046	36	272	3,735	3
Rhondda	11.5	444.4	26.7	5.5	500.0	3,219	27	262	2,926	4
Merthyr Cynon	9.3	352.9	20.5	5.5	333.3	5,455	34	341	5,068	12
Rhymney	12.9	351.9	46.5	5.4	571.4	4,979	54	258	4,653	14

Table 5A — *continued*

Area	Infant mortality rates[1]					Number of live births				
	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated	All birth-weights	Less than 1500g	1500g–2499g	2500g and over	Not stated
Powys										
Montgomery	14.7	600.0	35.7	10.0	0.0	1,701	10	84	1,604	3
Brecknock and Radnor	10.0	437.5	20.2	5.6	0.0	2,097	16	99	1,974	8
South Glamorgan	11.4	380.2	34.6	5.2	421.9	16,219	121	982	15,052	64
West Glamorgan										
East District Hospitals	4.8	500.0	9.0	1.9	—	4,406	22	221	4,163	—
North and District Hospitals	9.4	388.9	35.8	3.9	142.9	9,432	90	503	8,825	14

Source: Infant mortality linked files
[1] *Deaths within one year of live births per 1,000 live births*

Chapter 6 The influence of socio-economic and environmental factors on geographic variation in mortality

Contents

List 6A — List of causes for which the area cluster analyses are available.

List 6B — List of causes for which results of the analysis by grouped region and hardness of water are available.

Annex to Tables 6.6 and 6.7 **Number of male deaths in LS sample 1971–81 by socio-economic area cluster and grouped region of residence in 1971**

England and Wales

Socio-economic area cluster of residence in 1971	Grouped region of residence in 1971			
	Northern and Western	Central	Southern and Eastern	All
Family 1	1,037	1,528	2,119	4,684
1	108	115	475	698
2	77	88	329	494
3	87	94	134	315
4	392	613	265	1,270
5	254	468	577	1,299
6	113	140	298	551
7	6	10	41	57
Family 2	3,132	2,415	2,450	7,997
8	508	462	717	1,687
9	708	809	336	1,853
10	464	351	994	1,809
11	533	204	26	763
12	919	589	377	1,885
Family 3	417	476	1,059	1,952
13	186	239	632	1,057
14	61	158	287	506
15	170	79	140	389
Family 4	2,016	2,002	951	4,969
16	470	281	166	917
17	159	80	43	282
18	454	853	167	1,474
19	589	635	50	1,274
20	127	47	223	397
21	161	55	159	375
22	56	51	143	250
Family 6	320	604	2,360	3,284
25	23	22	910	955
26	0	1	278	279
27	78	415	214	707
28	26	11	389	426
29	193	155	569	917
Family 7	1,459	1,039	4,470	6,968
30	274	284	750	1,308
31	306	329	870	1,505
32	262	166	811	1,239
33	90	110	358	558
34	136	70	307	513
35	271	58	921	1,250
36	120	22	453	595

Source: OPCS Longitudinal Study.

Annex to Table 6.8 Number of male deaths in LS sample in 1971–81 by socio-economic area family and grouped region of residence in 1971, for selected causes

England and Wales

Socio-economic family of residence in 1971	Grouped region of residence in 1971			
	Northern and Western	Central	Southern and Eastern	All
Malignant neoplasms (ICD 140–209)				
1	249	333	502	1,084
2	673	548	568	1,789
3	86	111	225	422
4	498	477	252	1,227
6	88	122	600	810
7	319	233	1,034	1,586
All families	**1,924**	**1,824**	**3,181**	**6,929**
Circulatory diseases (ICD 390–458)				
1	524	771	1,066	2,361
2	1,640	1,217	1,239	4,096
3	230	238	564	1,032
4	967	988	434	2,389
6	153	315	1,098	1,566
7	778	553	2,361	3,692
All families	**4,303**	**4,083**	**6,765**	**15,151**
Respiratory diseases (ICD 460–519)				
1	144	238	311	693
2	493	398	381	1,272
3	62	70	143	275
4	330	318	167	815
6	44	98	383	525
7	202	144	596	942
All families	**1,278**	**1,266**	**1,982**	**4,526**

Source: OPCS Longitudinal Study.

Annex 1 to Table 6.9 Number of male deaths in LS sample in 1971–81 by socio-economic area cluster of residence and tenure in 1971
England and Wales

Socio-economic area cluster of residence in 1971	Tenure in 1971				
	Owner occupier	Local authority tennant	Private renter	Other	All tenure*
Family 1	2,118	1,776	613	177	4,684
1	188	429	52	29	698
2	188	197	65	44	494
3	59	235	15	6	315
4	563	466	215	26	1,270
5	741	332	177	49	1,299
6	357	103	72	19	551
7	22	14	17	4	57
Family 2	3,788	1,959	1,875	375	7,997
8	749	586	280	72	1,687
9	1,000	488	322	43	1,853
10	896	368	383	162	1,809
11	208	164	357	34	763
12	935	353	533	64	1,885
Family 3	1,024	387	482	59	1,952
13	596	217	212	32	1,057
14	215	117	156	18	506
15	213	53	114	9	389
Family 4	1,158	2,973	668	170	4,969
16	101	741	45	30	917
17	49	201	25	7	282
18	463	831	142	38	1,474
19	395	554	307	18	1,274
20	83	279	24	11	397
21	23	259	58	35	375
22	44	108	67	31	250
Family 6	1,169	705	1,182	228	3,284
25	225	338	346	46	955
26	74	53	143	9	279
27	313	136	225	33	707
28	103	56	199	68	426
29	454	122	269	72	917
Family 7	4,511	891	1,142	424	6,968
30	836	227	164	81	1,308
31	965	259	219	62	1,505
32	838	162	172	67	1,239
33	303	80	144	31	558
34	351	57	67	38	513
35	916	92	182	60	1,250
36	302	14	194	85	595

Source: OPCS Longitudinal Study.
** Includes those in non-private households and 'not stated' tenures.*

Annex 1 to Table 6.10 Number of female deaths in LS sample in 1971–81 by socio-economic area cluster of residence and tenure in 1971

England and Wales

Socio-economic area cluster of residence in 1971	Tenure in 1971				
	Owner occupier	Local authority Tenant	Private renter	Other	All Tenures*
Family 1	1,772	1,531	558	292	4,153
1	194	341	48	50	633
2	157	187	81	64	489
3	53	189	8	8	258
4	473	424	187	54	1,138
5	605	280	161	74	1,120
6	268	95	56	39	458
7	22	15	17	3	57
Family 2	3,634	1,796	1,938	598	7,966
8	756	525	300	117	1,698
9	887	433	348	82	1,750
10	947	338	440	302	2,027
11	208	163	334	23	728
12	836	337	516	74	1,763
Family 3	899	345	435	75	1,754
13	520	216	199	44	979
14	216	87	140	24	467
15	163	42	96	7	308
Family 4	1,025	2,751	591	219	4,586
16	74	651	33	44	802
17	52	172	17	17	258
18	398	302	141	66	1,407
19	322	471	232	32	1,057
20	82	237	30	13	362
21	32	300	58	24	414
22	65	118	80	23	286
Family 6	1,180	695	1,286	325	3,486
25	229	275	389	58	951
26	63	72	138	21	294
27	266	131	183	42	622
28	106	68	260	63	497
29	516	149	316	141	1,122
Family 7	4,278	812	1,240	776	7,106
30	726	198	167	148	1,239
31	906	230	209	95	1,440
32	848	157	215	115	1,335
33	282	71	127	54	534
34	346	29	79	64	518
35	847	100	179	124	1,250
36	323	27	264	176	790

Source: OPCS Longitudinal Study.

** Include those in non-private households and 'not stated' tenures.*

Annex 1 to Table 6.11 Number of male deaths in LS sample in 1971–81 by socio-economic area cluster of residence and social class in 1971*
England and Wales

Socio-economic area cluster of residence in 1971	Social class in 1971			
	I & II	IIIN & IIIM	IV & V	All males aged 15 and over*
Family 1	695	1,909	1,375	3,979
1	68	292	238	598
2	79	173	145	397
3	25	128	105	258
4	149	564	386	1,099
5	229	531	355	1,115
6	130	212	128	470
7	15	9	18	42
Family 2	1,033	3,299	2,471	6,803
8	240	710	500	1,450
9	233	827	552	1,612
10	361	668	462	1,491
11	42	300	299	641
12	157	794	658	1,609
Family 3	577	474	607	1,658
13	291	296	306	893
14	131	110	195	436
15	155	68	106	329
Family 4	359	2,211	1,680	4,250
16	43	364	352	759
17	23	129	91	243
18	114	659	527	1,300
19	86	663	347	1,096
20	49	170	116	335
21	17	126	161	304
22	27	100	86	213
Family 6	508	1,262	946	2,716
25	102	380	301	783
26	32	109	85	226
27	60	263	253	576
28	115	137	96	348
29	199	373	211	783
Family 7	1,970	2,531	1,377	5,878
30	357	476	252	1,085
31	302	635	336	1,273
32	376	487	196	1,059
33	163	132	163	458
34	206	158	77	441
35	395	446	246	1,087
36	171	197	107	475

Source: OPCS Longitudinal Study (LS).
** Economically active or retired males, but excluding those in Armed Forces and with inadequately described occupations.*

Annex 2 to Table 6.9 Number of male deaths in LS sample in 1971–81 by socio-economic area family of residence and tenure in 1971, for selected causes

England and Wales

Socio-economic family of residence in 1971	Tenure in 1971				
	Owner occupier	Local authority tenant	Private renter	Other*	All tenures*
Malignant neoplasms (ICD 140–209)					
1	486	428	152	18	1,084
2	821	484	426	58	1,789
3	216	93	99	14	422
4	242	788	169	28	1,227
6	265	208	289	48	810
7	1,059	218	254	55	1,586
All families	**3,090**	**2,229**	**1,389**	**221**	**6,929**
Circulatory diseases (ICD 390–458)					
1	1,124	858	292	87	2,361
2	2,043	952	929	172	4,096
3	566	177	266	23	1,032
4	618	1,401	296	74	2,389
6	617	299	558	92	1,566
7	2,429	453	598	212	3,692
All families	**7,397**	**4,153**	**2,941**	**660**	**15,151**
Respiratory diseases (ICD 460–519)					
1	261	283	103	46	693
2	539	323	321	89	1,272
3	152	56	54	13	275
4	179	481	115	40	815
6	161	105	205	54	525
7	566	134	157	85	942
All families	**1,858**	**1,385**	**956**	**327**	**4,526**

Source: OPCS Longitudinal Study.
**Includes those in non-private households and 'not stated' tenures.*

Annex 2 to Table 6.10 Number of female deaths in LS sample in 1971–81 by socio-economic area family of residence and tenure in 1971, for selected causes

England and Wales

Socio-economic family of residence in 1971	Tenure in 1971				
	Owner occupier	Local authority tenant	Private renter	Other*	All tenures*
Malignant neoplasms (ICD 140–209)					
1	441	346	98	22	907
2	735	377	348	57	1,517
3	204	71	92	12	379
4	211	571	116	27	925
6	242	161	267	37	707
7	977	167	247	73	1,464
All families	**2,810**	**1,696**	**1,169**	**228**	**5,903**
Circulatory diseases (ICD 390–458)					
1	907	807	303	147	2,164
2	1,990	919	1,083	353	4,345
3	466	175	238	49	928
4	567	1,439	303	131	2,440
6	597	309	634	185	1,725
7	2,289	431	688	451	3,859
All families	**6,816**	**4,097**	**3,252**	**1,317**	**15,482**
Respiratory diseases (ICD 460–519)					
1	203	182	72	81	538
2	435	249	246	111	1,041
3	114	46	55	10	225
4	114	316	83	135	648
6	161	128	214	63	566
7	502	101	155	147	905
All families	**1,529**	**1,026**	**826**	**547**	**3,928**

Source: OPCS Longitudinal Study.
** Includes those in non-private households and 'not stated' tenures.*

Annex 2 to Table 6.11 **Number of male deaths in LS sample in 1971–81 by socio-economic area family of residence and social class in 1971, for selected causes. 1979–83**

England and Wales

Socio-economic family of residence in 1971	Social class in 1971			
	I and II	IIIN and IIIM	IV and V	All males aged 15 and over*
Malignant neoplasms (ICD 140–209)				
1	174	480	318	972
2	246	762	593	1,601
3	124	104	143	371
4	68	569	463	1,100
6	144	308	230	682
7	468	571	365	1,404
All families	**1,225**	**2,779**	**2,114**	**6,118**
Circulatory diseases (ICD 390–458)				
1	370	987	708	2,065
2	568	1,749	1,221	3,538
3	323	271	304	898
4	197	1,119	758	2,074
6	253	637	441	1,331
7	1,099	1,390	680	3,169
All families	**2,810**	**6,159**	**4,119**	**13,088**
Respiratory diseases (ICD 460–519)				
1	79	251	211	541
2	111	481	417	1,009
3	75	52	93	220
4	44	318	294	656
6	50	199	156	405
7	208	348	195	751
All families	**567**	**1,650**	**1,367**	**3,584**

Source: OPCS Longitudinal Study.

** Economically active or retired males, but excluding those in Armed Forces and with inadequately described occupations.*

Annex to Table 6.13 **Number of male deaths in LS sample from cardiovascular diseases (ICD 8th Revision 400–458) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971**

Total hardness of water (parts per million)	Grouped regions			All regions
	South and East	Central	North and West	
Under 90	200	975	1,371	2,546
90–169	234	428	633	1,295
170–249	802	521	60	1,383
250 and over	2,375	413	62	2,850
All areas of known hardness	**3,611**	**2,337**	**2,126**	**8,074**

Source: OPCS Longitudinal Study.

Annex to Table 6.14 **Number of male deaths in LS sample from ischaemic heart disease (ICD 8th Revision 450–429) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971.**

Total hardness of water (parts per million)	Grouped regions			All regions
	South and East	Central	North and West	
Under 90	136	698	1,017	1,851
90–169	150	307	450	907
170–249	583	363	44	990
250 and over	1,753	298	40	2,091
All areas of known hardness	2,622	1,666	1,551	5,839

Source: OPCS Longitudinal Study.

Annex to Table 6.15 **Number of female deaths in LS sample from cardiovascular diseases (ICD 8th Revision 400–458) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971**

Total hardness of water (parts per million)*	Grouped regions			All regions
	South and East	Central	North and West	
Less than 90	199	1,022	1,400	2,621
90–169	303	422	706	1,431
170–249	889	462	68	1,419
250 and over	2,493	352	80	2,925
All areas of known hardness	**3,884**	**2,258**	**2,254**	**8,396**

Source: OPCS Longitudinal Study
** Calcium carbonate.*

Annex to Table 6.16 **Number of female deaths in LS sample from ischaemic heart diseases (ICD 8th Revision 450–429) in 1971–81 for those resident in Regional Heart Study areas by water hardness 1969–73 and grouped region of residence in 1971**

Total hardness of water (parts per million)*	Grouped regions			All regions
	South and East	Central	North and West	
Less than 90	123	587	847	1,557
90–169	150	232	432	814
170–249	523	271	38	832
250 and over	1,540	210	49	1,799
All areas of known hardness	**2,336**	**1,300**	**1,366**	**5,002**

Source: OPCS Longitudinal Study
**Calcium carbonate.*

Annex to Table 6.18 **Number of male deaths in LS sample from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents in Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971**

Nitrate in drinking water (mgN/l)	Housing tenure in 1971			All private households with known tenure
	Owner occupied	Local authority	Privately rented	
Less than 1.5	61	55	37	153
1.5–2.4	11	6	3	20
2.5–4.4	37	26	10	73
4.5 and over	66	57	32	155
All areas with known nitrate level	**175**	**144**	**82**	**401**

Source: OPCS Longitudinal Study.

Annex to Table 6.19 **Number of female deaths in LS sample from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents of Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971**

Nitrate in drinking water (mgN/l)	Housing tenure in 1971			All private households with known tenure
	Owner occupied	Local authority	Privately rented	
Less than 1.5	53	43	27	123
1.5–2.4	7	4	1	12
2.5–4.4	20	11	8	39
4.5 and over	48	40	26	114
All areas with known nitrate level	**128**	**98**	**62**	**288**

Source: OPCS Longitudinal Study.

Annex to Table 6.21 **Number of male deaths in LS sample from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents in Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971 in South and East Regions only.**

Nitrate in drinking water (mgN/l)	Housing tenure in 1971			All private households with known tenure
	Owner occupied	Local authority	Privately rented	
Less than 1.5	4	0	1	5
1.5–4.4	25	12	4	41
4.5–5.9	25	11	13	49
6.0 and over	27	35	14	76
All areas with known nitrate level	**81**	**58**	**32**	**171**

Source: OPCS Longitudinal Study.

Annex to Table 6.22 **Number of female deaths in LS sample from malignant neoplasms of the stomach (ICD 8th Revision 151) in 1971–81 for residents in Regional Heart Study areas in private households by level of water nitrate 1969–73 and housing tenure in 1971 in South and East Regions only.**

Nitrate in drinking water (mgN/l)	Housing tenure in 1971			All private households with known tenure
	Owner occupied	Local authority	Privately rented	
Less than 1.5	1	0	1	2
1.5–4.4	13	7	6	26
4.5–5.9	15	9	7	31
6.0 and over	26	24	15	65
All areas with known nitrate level	**55**	**40**	**29**	**124**

Source: OPCS Longitudinal Study.

List 6A Causes for which the area cluster analyses are available

ICD (8th Revision) Code	
000–999	All causes
140–209	Malignant neoplasms
162	Malignant neoplasms of trachea, bronchus, lung
174	Malignant neoplasms of female breast
390–458	Diseases of circulatory system
410–414	Ischaemic heart disease
430–438	Cerebrovascular disease
460–519	Diseases of respiratory system
460–486	Acute respiratory infections, influenza, pneumonia
490–493	Bronchitis, emphysema, asthma
520–577	Diseases of digestive system
800–999	Accidents, poisonings, violence
850–877, 942, 950–959, 980–989,	Suicide, injury, poisonings

List 6B Causes for which results of the analysis by grouped region and hardness of water are available

ICD (8th Revision) Code	
000–999	All causes
400–458	RHS cardiovascular disease
000–399 459–999	RHS non cardiovascular disease
400–429	RHS Ischaemic heart disease
140–209	All malignant neoplasms
151	Malignant neoplasms of stomach
152	Malignant neoplasms of intestines, rectum
162	Malignant neoplasms of trachea, bronchus, lung
174	Malignant neoplasms of breast
390–458	Diseases of circulatory system
400–404	Hypertensive disease
410–414	Ischaemic heart disease
420–429	Other heart disease
430–438	Cerebrovascular disease
460–519	Diseases of respiratory system
460–486	Acute respiratory infections, influenza, pneumonia
490–493	Bronchitis, emphysema, asthma
520–577	Diseases of digestive system
800–999	Accidents, poisonings, violence
850–877, 942, 950–959, 980–989,	Suicide, injury, poisonings

Chapter 7 The influence of migration on geographic variation in mortality

Contents

Annex to Table 7.2 Number of deaths in the LS sample in 1971–81 of people migrating in the five years before the 1971 Census, by sex, selected age group and distance moved

England and Wales

Distance moved	Age at death				
	15–44	45–64	65–74	75–84	85 and over
Males					
Non mover*	601	5,456	7,786	6,405	2,219
Mover	590	1,852	2,111	1,650	582
Within same county	409	1,418	1,597	1,224	446
Within same local authority	270	1,049	1,197	916	312
Between local authorities	139	369	400	308	134
Between counties in same region	58	186	257	209	58
Between regions	68	187	225	195	75
Between contiguous regions	44	121	152	136	52
Between distant regions	24	66	73	59	23
From outside England and Wales	55	61	32	22	3
Within UK	14	15	5	10	1
Beyond UK	41	46	27	12	2
Females					
Non mover*	361	3,335	5,167	7,772	4,950
Mover	324	1,070	1,487	2,254	1,553
Within same county	217	843	1,151	1,742	1,221
Within same local authority	148	633	875	1,313	880
Between local authorities	69	210	276	429	341
Between counties in same region	43	94	161	244	150
Between regions	48	100	141	231	163
Between contiguous regions	28	56	86	152	101
Between distant regions	20	44	55	79	62
From outside England and Wales	16	33	34	37	19
Within UK	1	7	9	17	9
Beyond UK	15	26	25	20	10

Source: OPCS Longitudinal Study.
**Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

Annex to Table 7.3 Number of deaths in the LS sample in 1971–81 of people aged over five years migrating in the five years before the 1971 Census, by sex, selected age group and distance moved for selected causes

England and Wales

Distance moved	Cause of death		
	Malignant neoplasm (ICD 140–209)	Circulatory diseases (ICD 390–458)	Respiratory diseases (ICD 460–519)
Males			
Non mover*	5,228	11,577	3,433
Mover	1,596	3,359	970
Within same county	1,209	2,494	760
Within same local authority	893	1,835	567
Between local authorities	316	659	193
Between counties in same region	166	397	102
Between regions	181	394	95
Between contiguous regions	124	258	68
Between distant regions	57	136	27
From outside England and Wales	40	74	13
Within UK	11	15	5
Beyond UK	29	59	8
Females			
Non mover*	4,458	11,595	2,817
Mover	1,349	3,509	965
Within same county	1,015	2,724	767
Within same local authorities	737	2,062	566
Between local authorities	278	662	201
Between counties in same region	145	356	101
Between regions	161	358	82
Between contiguous regions	98	232	45
Between distant regions	63	126	37
From outside England and Wales	28	71	15
Within UK	8	23	5
Beyond UK	20	48	10

Source: OPCS Longitudinal Study.
**Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

Table 7.4 Number of deaths in LS sample in 1971–75 and 1976–81, of people migrating in the five years prior to the 1971 Census, by sex and distance moved

England and Wales

Distance migration 1966–71	Males		Females	
	1971–75	1976–81	1971–75	1976–81
Non mover*	10,438	12,069	9,863	11,737
Mover	3,107	3,730	3,273	3,456
Within same county	2,340	2,790	2,568	2,636
Within same local authority	1,700	2,071	1,880	1,993
Between local authorities	640	719	688	643
Between counties in same region	346	425	326	369
Between regions	343	417	324	365
Between contiguous regions	243	270	202	226
Between distant regions	100	147	122	139
From outside England and Wales	78	98	55	86
Within UK	22	24	22	22
Beyond UK	56	74	33	64

Source: OPCS Longitudinal Study
** Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to census was not given in the 1971 Census.*

Annex to Table 7.5 Number of deaths in the LS sample in 1971–81 of persons aged five and over migrating in the five years before the 1971 Census, by sex, distance moved, type of household in 1971 and period of death

England and Wales

Distance moved 1966–71*	Males			Females		
	1971–75	1976–81	1971–81	1971–75	1976–81	1971–81
Member of private household						
Non mover	9,907	11,778	21,685	9,017	11,397	20,414
Mover	2,716	3,518	6,234	2,507	3,164	5,671
Within same county	2,035	2,649	4,684	1,931	2,409	4,340
Within same local authority	1,540	1,989	3,529	1,497	1,871	3,368
Between local authorities	495	660	1,155	434	538	972
Between counties in same region	303	397	700	251	340	591
Between regions	308	385	693	277	335	612
Members of non-private household						
Non mover	531	291	822	846	340	1,186
Mover	391	212	603	766	292	1,058
Within same county	305	141	446	637	227	864
Within same local authority	160	82	242	383	122	505
Between local authorities	145	59	204	254	105	359
Between counties in same region	43	28	71	75	29	104
Between regions	35	32	67	47	30	77

Source: OPCS Longitudinal Study.

** The category of migrants from outside England and Wales has been omitted because of the very small numbers involved; however, the relevant numbers have been included in the 'mover' category. Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

Annex to Table 7.6 Number of deaths in the LS sample in 1971–81 of males aged five and over migrating in the five years before the 1971 Census, by age at death, distance moved and economic position in 1971

England and Wales

Distance moved 1966–71*	Economic position in 1971	Mortality 1971–81: age at death					Mortality 1971–75: all ages 15 and over	Mortality 1976–81: all ages 15 and over
		15–44	45–64	65–74	75 and over	All ages 15 and over		
Non-mover	All	629	5,565	7,947	8,830	22,971	10,681	12,290
	Employed	387	4,668	3,867	982	9,904	3,737	6,167
	Retired	1	91	3,327	7,727	11,146	6,004	5,142
	Sick	60	603	528	58	1,249	683	566
	Other	181	203	225	63	672	257	415
Mover	All	590	1,852	2,111	2,232	6,785	3,079	3,706
	Employed	432	1,470	818	172	2,892	1,037	1,855
	Retired	0	44	1,022	2,016	3,082	1,676	1,406
	Sick	33	234	194	214	485	258	227
	Other	125	104	77	20	326	1,089	218
Within a county	All	409	1,418	1,597	1,670	5,094	2,320	2,774
	Employed	295	1,123	663	144	2,225	784	1,441
	Retired	0	26	733	1,490	2,249	1,250	999
	Sick	27	191	150	21	389	207	182
	Other	87	78	51	15	231	79	152
Between counties in a region	All	58	186	257	267	768	344	424
	Employed	43	146	80	14	283	103	180
	Retired	0	9	148	248	405	196	209
	Sick	4	22	19	3	48	32	16
	Other	11	9	10	2	32	13	19
Between Regions	All	68	187	225	270	750	338	412
	Employed	52	150	63	14	279	109	170
	Retired	0	8	126	253	387	203	184
	Sick	1	15	22	0	38	16	22
	Other	15	14	14	3	46	10	36

Source: OPCS Longitudinal Study.

** The category of migrants from outside England and Wales has been omitted because of the very small numbers involved; however the relevant numbers have been included in the 'mover' category. Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

Annex to Table 7.7 Number of deaths in the LS sample in 1971–81 of females aged 15 and over migrating in the five years before the 1971 Census, by age at death, distance moved and economic position in 1971

England and Wales

Distance moved 1966–71*	Economic position in 1971	Mortality 1971–81: age at death					Mortality 1971–75: all ages 15 and over	Mortality 1976–81: all ages 15 and over
		15–44	45–59	60–74	75 and over	All ages 15 and over		
Non-mover	All	386	1,892	6,829	13,204	22,311	10,295	12,016
	Employed	172	882	1,388	305	2,747	981	1,766
	Retired	3	50	2,294	7,869	10,216	5,085	5,131
	Sick	28	160	237	142	567	307	260
	Other	183	800	2,910	4,888	8,781	3,922	4,859
Mover	All	324	645	1,912	3,807	6,688	3,250	3,438
	Employed	125	313	332	63	833	294	539
	Retired	0	16	832	2,561	3,409	1,788	1,621
	Sick	22	49	79	61	211	137	74
	Other	177	267	669	1,122	2,235	1,031	1,204
Within a county	All	217	511	1,483	2,963	5,174	2,551	2,623
	Employed	80	258	266	52	656	229	427
	Retired	0	13	632	2,005	2,650	1,425	1,225
	Sick	16	40	67	44	167	109	58
	Other	121	200	518	862	1,701	788	913
Between counties in a region	All	43	55	200	394	692	324	368
	Employed	19	21	31	6	77	28	49
	Retired	0	1	97	265	363	170	193
	Sick	4	6	7	9	26	19	7
	Other	20	27	65	114	226	107	119
Between Regions	All	48	52	189	394	683	321	362
	Employed	22	23	31	4	80	31	49
	Retired	0	1	87	262	350	175	175
	Sick	2	3	5	6	16	8	8
	Other	24	25	66	122	237	107	130

Source: OPCS Longitudinal Study.

**The category of migrants from outside England and Wales has been omitted because of the very small numbers involved; however, the relevant numbers have been included in the 'mover' category. Figures for 'non-movers' include the relatively small number of cases for whom address five years prior to Census was not given in the 1971 Census.*

Annex to Table 7.9 and Figure 7.2 Number of male deaths in LS sample in 1971–81 by socio-economic area cluster of residence in 1971 and extent of migration 1966–71

England and Wales

Socio-economic cluster of residence in 1971	All males	Non movers*	Movers			
			Total	Within same local authority	Between local authorities/counties in same region	From outside region
Family 1	4,684	3,495	1,189	586	439	164
1	698	516	182	116	52	14
2	494	349	145	71	48	26
3	315	174	141	64	58	19
4	1,270	1,022	248	149	73	26
5	1,299	993	306	132	134	40
6	551	403	148	46	70	32
7	57	38	19	8	4	7
Family 2	7,997	6,410	1,587	1,021	370	196
8	1,687	1,356	331	223	72	36
9	1,853	1,515	338	209	95	34
10	1,809	1,374	435	213	135	87
11	763	603	160	124	20	16
12	1,885	1,562	323	252	48	23
Family 3	1,952	1,536	416	163	154	99
13	1,057	827	230	75	94	61
14	506	394	112	56	37	19
15	389	315	74	32	23	19
Family 4	4,969	3,845	1,124	879	179	66
16	917	703	214	168	39	7
17	282	189	93	77	14	2
18	1,474	1,169	305	242	43	20
19	1,274	1,033	241	193	32	16
20	397	325	72	42	24	6
21	375	246	129	106	15	8
22	250	180	70	51	12	7
Family 5	37	29	8	4	4	0
23	30	21	7	4	3	0
24	7	6	1	0	1	0
Family 6	3,284	2,546	738	446	199	93
25	955	754	201	126	56	19
26	279	224	55	30	18	7
27	707	545	162	119	19	24
28	426	306	120	52	51	17
29	917	717	200	119	55	26
Family 7	6,968	5,181	1,787	680	790	317
30	1,308	968	340	117	160	63
31	1,505	1,197	308	149	123	36
32	1,239	995	244	118	92	34
33	558	420	138	51	61	26
34	513	370	143	41	78	24
35	1,250	848	402	110	197	95
36	595	383	212	94	79	39

Source: OPCS Longitudinal Study.

**Includes those aged 0–4 years in 1971, and the relatively small number of cases for whom address five years prior to census was not given in the 1971 Census.*

Annex 1 to Table 7.10 and Figure 7.3 Number of male deaths in LS sample in 1971–81 by socio-economic family of residence in 1971 and extent of migration 1966–71, for selected causes

England and Wales

Socio-economic family of residence in 1971	All males	Non movers*	Movers			
			Total	Within same local authority	Between local authorities in same region	From outside region
Malignant neoplasms (ICD 140–209)						
1	1,084	809	275	146	93	36
2	1,789	1,412	377	245	87	45
3	422	327	95	28	40	27
4	1,227	950	277	218	41	18
5	11	8	3	1	2	0
6	810	641	169	106	46	17
7	1,586	1,185	401	153	171	77
All families	6,929	5,332	1,597	897	480	220
Circulatory diseases (ICD 390–458)						
1	2,361	1,793	568	268	222	78
2	4,096	3,304	792	509	180	103
3	1,032	809	223	88	79	56
4	2,389	1,890	499	401	72	26
5	15	14	1	1	0	0
6	1,566	1,237	329	200	87	42
7	3,692	2,762	930	366	401	163
All families	15,151	11,809	3,342	1,833	1,041	468
Respiratory diseases (ICD 460–519)						
1	693	522	171	87	64	20
2	1,272	1,052	220	150	48	22
3	275	236	49	27	16	6
4	815	618	197	154	36	7
5	4	3	1	1	0	0
6	525	407	118	73	33	12
7	942	721	221	77	104	40
All Families	4,526	3,529	997	569	301	107

*Source: OPCS Longitudinal Study**

** Include those aged 0–4 years in 1971, and the relatively small number of cases for whom address five years prior to census was not given in the 1971 Census.*

Chapter 8 Mortality by place of birth

Contents

Table 8A Place of birth and place of death PMRs with ranking for mortality due to selected causes, 1969–72

Administration areas of England and Wales

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
i) Ischaemic heart disease (ICD 8th Revision 410–414)						
Bedfordshire AC	0.95	(0.91–0.99)	138	0.98	(0.95–1.02)	89
Reading CB	0.98	(0.92–1.04)	93	0.97	(0.91–1.03)	101
Berkshire AC	1.02	(0.98–1.06)	38	0.97	(0.94–1.00)	99
Buckingshire AC	1.00	(0.97–1.04)	59	1.01	(0.98–1.04)	71
Cambridgeshire AC	0.97	(0.94–1.01)	108	0.96	(0.93–1.00)	102
Birkenhead CB	0.96	(0.92–1.01)	127	0.93	(0.88–0.98)	118
Chester CB	1.00	(0.93–1.08)	57	0.88	(0.80–0.96)	142
Stockport CB	1.04	(0.98–1.10)	26	0.89	(0.84–0.93)	136
Wallasey CB	1.00	(0.92–1.08)	65	0.97	(0.91–1.03)	100
Cheshire AC	0.99	(0.97–1.01)	78	0.98	(0.96–1.00)	90
Cornwall AC	1.00	(0.97–1.03)	68	1.14	(1.11–1.18)	8
Carlisle CB	1.02	(0.94–1.09)	43	1.06	(0.99–1.14)	29
Cumberland AC	1.10	(1.06–1.13)	3	1.11	(1.07–1.15)	9
Derby CB	1.02	(0.97–1.06)	44	1.08	(1.04–1.13)	19
Derbyshire AC	1.02	(1.00–1.04)	42	1.00	(0.98–1.03)	73
Exeter CB	0.95	(0.88–1.02)	139	1.10	(1.03–1.17)	13
Plymouth CB	0.99	(0.95–1.03)	82	1.06	(1.02–1.11)	28
Devon AC	0.96	(0.94–0.99)	130	1.05	(1.03–1.08)	37
Dorset AC	0.96	(0.93–1.00)	125	1.05	(1.02–1.09)	36
Darlington CB	1.02	(0.95–1.09)	41	1.02	(0.95–1.08)	60
Gateshead CB	1.02	(0.98–1.07)	34	1.00	(0.94–1.06)	74
Hartlepool CB	0.99	(0.93–1.05)	80	1.04	(0.97–1.11)	41
South Shields CB	1.05	(1.00–1.10)	18	0.92	(0.87–0.98)	121
Sunderland CB	1.05	(1.01–1.09)	19	1.04	(1.00–1.09)	39
Durham AC	1.05	(1.03–1.07)	23	1.01	(0.99–1.04)	62
Southend CB	0.97	(0.88–1.07)	112	1.07	(1.03–1.12)	21
Essex AC	1.00	(0.98–1.02)	66	0.96	(0.95–0.97)	106
Bristol CB	1.00	(0.97–1.03)	61	1.06	(1.03–1.09)	27
Gloucester CB	0.99	(0.91–1.06)	83	0.87	(0.80–0.93)	144
Gloucestershire AC	1.00	(0.97–1.03)	64	1.06	(1.03–1.09)	34
City of London	0.92	(0.80–1.04)	150	0.86	(0.50–1.33)	147
Camden LB	0.98	(0.94–1.02)	101	0.90	(0.85–0.95)	133
Croydon LB	0.99	(0.94–1.04)	81	0.87	(0.83–0.90)	145
Greenwich LB	1.01	(0.98–1.05)	47	0.99	(0.94–1.03)	87
Hackney LB	0.95	(0.92–0.99)	136	0.91	(0.87–0.96)	126
Hammersmith LB	0.98	(0.94–1.02)	104	0.91	(0.87–0.96)	125
Islington LB	0.98	(0.95–1.01)	105	0.82	(0.78–0.86)	153
Kensington Chelsea LB	0.99	(0.94–1.03)	90	0.89	(0.83–0.95)	135
Lambeth LB	1.00	(0.97–1.04)	58	0.88	(0.84–0.92)	138
Lewisham LB	0.99	(0.95–1.03)	73	0.94	(0.90–0.98)	114
Newham LB	1.01	(0.98–1.04)	48	0.91	(0.87–0.95)	128
Southwark LB	1.01	(0.98–1.03)	52	0.85	(0.81–0.88)	151
Tower Hamlets LB	0.99	(0.97–1.02)	74	0.86	(0.81–0.90)	149
Wandsworth LB	0.97	(0.94–1.00)	117	0.96	(0.93–1.00)	105
Westminster LB	0.98	(0.95–1.02)	97	0.93	(0.88–0.98)	119
London NOS	0.97	(0.96–0.99)	114			
Bournemouth CB	0.90	(0.82–0.98)	152	1.15	(1.10–1.19)	7
Portsmouth CB	0.98	(0.94–1.02)	92	1.03	(0.99–1.07)	49
Southampton CB	0.98	(0.94–1.03)	98	1.07	(1.02–1.12)	22
Hampshire AC	0.96	(0.93–0.99)	129	1.04	(1.01–1.06)	43
Herefordshire AC	0.99	(0.94–1.04)	79	0.88	(0.83–0.93)	139

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Hertfordshire AC	0.95	(0.92–0.98)	137	0.95	(0.92–0.97)	112
Huntingdonshire AC	1.02	(0.96–1.07)	45	0.96	(0.91–1.01)	104
Canterbury CB	0.97	(0.86–1.08)	124	1.07	(0.96–1.19)	23
Kent AC	0.99	(0.97–1.00)	86	1.00	(0.98–1.01)	77
Barrow CB	1.00	(0.94–1.07)	56	1.22	(1.14–1.31)	1
Blackburn CB	1.05	(1.00–1.10)	21	0.92	(0.87–0.97)	122
Blackpool CB	0.97	(0.89–1.06)	111	1.03	(0.99–1.07)	54
Bolton CB	1.04	(0.99–1.08)	28	0.90	(0.86–0.95)	131
Bootle CB	1.00	(0.92–1.08)	69	0.95	(0.88–1.03)	111
Burnley CB	1.06	(1.00–1.11)	16	0.88	(0.82–0.94)	140
Bury CB	1.07	(1.00–1.14)	10	1.04	(0.96–1.11)	42
Liverpool CB	0.99	(0.97–1.01)	85	0.93	(0.91–0.96)	116
Manchester CB	1.01	(0.99–1.03)	50	0.96	(0.93–0.98)	110
Oldham CB	0.96	(0.92–1.01)	131	0.95	(0.89–1.00)	113
Preston CB	1.08	(1.03–1.13)	8	0.96	(0.90–1.01)	108
Rochdale CB	0.95	(0.89–1.00)	140	1.06	(1.00–1.13)	25
St Helens CB	0.98	(0.93–1.04)	91	0.88	(0.82–0.93)	143
Salford CB	1.03	(0.99–1.07)	31	0.89	(0.84–0.94)	134
Southport CB	0.93	(0.86–1.01)	147	1.09	(1.03–1.15)	16
Warrington CB	1.02	(0.97–1.09)	35	0.92	(0.86–0.99)	123
Wigan CB	0.98	(0.93–1.03)	103	0.99	(0.93–1.05)	85
Lancashire AC	1.02	(1.01–1.04)	37	1.03	(1.02–1.04)	50
Leicester CB	0.99	(0.95–1.03)	76	0.86	(0.83–0.90)	148
Leicestershire AC	0.99	(0.96–1.02)	77	0.91	(0.88–0.94)	129
Lincs (Holland) AC	0.98	(0.92–1.04)	100	0.97	(0.91–1.04)	96
Lincoln CB	0.97	(0.91–1.04)	110	1.16	(1.09–1.24)	5
Lincs (Kesteven) AC	1.02	(0.97–1.08)	39	1.01	(0.95–1.06)	70
Grimsby CB	0.97	(0.91–1.04)	109	1.02	(0.96–1.09)	56
Lincs (Lindsey) AC	1.01	(0.97–1.04)	55	0.99	(0.96–1.03)	82
Middlesex AC	0.99	(0.97–1.01)	72	1.01	(0.99–1.02)	67
Great Yarmouth CB	0.92	(0.85–0.99)	151	1.07	(0.99–1.15)	24
Norwich CB	1.04	(0.99–1.09)	27	0.96	(0.91–1.02)	103
Norfolk AC	0.98	(0.95–1.01)	95	1.01	(0.98–1.04)	64
Northampton CB	0.97	(0.92–1.03)	116	1.06	(1.00–1.11)	31
Northamptonshire AC	1.02	(0.98–1.05)	46	1.00	(0.96–1.04)	78
Newcastle on Tyne CB	1.00	(0.97–1.03)	60	0.93	(0.89–0.97)	117
Tynemouth CB	1.05	(0.98–1.12)	17	0.99	(0.92–1.06)	83
Northumberland AC	1.08	(1.05–1.11)	7	1.05	(1.03–1.08)	38
Nottingham CB	0.94	(0.91–0.98)	143	0.84	(0.81–0.88)	152
Nottinghamshire AC	0.98	(0.95–1.01)	96	0.97	(0.95–1.00)	95
Oxford CB	0.98	(0.91–1.05)	99	1.07	(1.00–1.14)	20
Oxfordshire AC	1.02	(0.97–1.07)	40	1.01	(0.96–1.06)	66
Rutland AC	..	..	..	0.88	(0.76–1.02)	137
Shropshire AC	0.96	(0.93–1.00)	126	1.00	(0.96–1.04)	75
Bath CB	0.97	(0.90–1.04)	123	1.00	(0.94–1.07)	72
Somerset AC	0.94	(0.92–0.97)	142	1.00	(0.97–1.02)	79
Burton upon Trent CB	1.05	(0.97–1.12)	25	0.99	(0.91–1.08)	81
Dudley CB	0.97	(0.93–1.02)	113	0.88	(0.83–0.93)	141
Stoke upon Trent CB	1.01	(0.98–1.04)	49	0.94	(0.90–0.97)	115
Walsall CB	1.01	(0.96–1.05)	54	0.91	(0.87–0.96)	127
West Bromwich CB	0.99	(0.94–1.03)	89	0.86	(0.82–0.91)	146
Wolverhampton CB	0.96	(0.92–1.00)	132	0.90	(0.86–0.94)	132
Staffordshire AC	1.00	(0.97–1.02)	67	1.02	(1.00–1.05)	55
Ipswich CB	0.97	(0.91–1.04)	115	1.01	(0.95–1.07)	65
Suffolk East AC	0.98	(0.95–1.02)	94	1.02	(0.98–1.06)	58
Suffolk West AC	0.99	(0.94–1.05)	71	0.93	(0.88–0.98)	120
Surrey AC	0.97	(0.94–0.99)	120	0.99	(0.97–1.01)	86
Brighton CB	0.97	(0.92–1.02)	118	0.97	(0.93–1.02)	97
Eastbourne CB	0.97	(0.88–1.06)	121	1.09	(1.03–1.16)	15
Hastings CB	0.93	(0.86–1.01)	144	0.98	(0.92–1.04)	93
Sussex East AC	0.93	(0.90–0.97)	146	1.06	(1.03–1.09)	32
Sussex West AC	0.92	(0.88–0.96)	149	1.10	(1.07–1.13)	11
Birmingham CB	1.00	(0.98–1.02)	62	0.92	(0.90–0.94)	124
Coventry CB	1.00	(0.95–1.06)	63	1.10	(1.06–1.14)	14
Warwickshire AC	0.98	(0.94–1.01)	107	0.98	(0.95–1.00)	94

.. Figures not available.

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Westmorland AC	1.11	(1.04–1.19)	2	1.03	(0.96–1.10)	53
Wight Isle of AC	0.93	(0.87–0.99)	145	0.98	(0.93–1.04)	88
Wiltshire AC	0.98	(0.95–1.01)	102	1.03	(1.00–1.06)	52
Warley CB	0.98	(0.93–1.03)	106	0.98	(0.93–1.03)	91
Worcester CB	1.03	(0.95–1.11)	32	0.85	(0.78–0.92)	150
Worcestershire AC	0.99	(0.96–1.03)	75	0.96	(0.93–0.99)	109
Kingston upon Hull CB	1.01	(0.97–1.04)	53	1.03	(1.00–1.07)	44
Yorkshire E Riding AC	1.05	(1.00–1.09)	22	1.15	(1.11–1.19)	6
Middlesbrough CB	0.96	(0.92–0.99)	135	1.11	(1.08–1.15)	10
Yorkshire N Riding AC	0.99	(0.95–1.02)	84	1.21	(1.17–1.25)	3
Barnsley CB	0.96	(0.90–1.02)	128	0.96	(0.89–1.03)	107
Bradford CB	1.06	(1.02–1.09)	13	1.06	(1.02–1.09)	33
Dewsbury CB	1.09	(1.02–1.17)	4	1.03	(0.95–1.11)	48
Doncaster CB	1.06	(0.98–1.14)	15	0.91	(0.85–0.97)	130
Halifax CB	1.08	(1.02–1.13)	9	1.21	(1.15–1.28)	2
Huddersfield CB	1.12	(1.06–1.17)	1	1.06	(1.01–1.11)	30
Leeds CB	1.03	(1.00–1.06)	29	1.02	(0.99–1.05)	57
Rotherham CB	0.96	(0.90–1.02)	134	1.01	(0.94–1.08)	69
Sheffield CB	0.99	(0.97–1.02)	70	1.00	(0.97–1.03)	76
Wakefield CB	1.06	(0.99–1.13)	14	0.97	(0.91–1.04)	98
York CB	0.97	(0.91–1.02)	122	1.01	(0.95–1.07)	68
Yorkshire W Riding AC	1.06	(1.05–1.08)	11	1.02	(1.00–1.03)	59
Anglesey AC	0.89	(0.82–0.96)	153	1.03	(0.95–1.11)	51
Brecknockshire AC	1.06	(0.99–1.13)	12	1.17	(1.09–1.26)	4
Caernarvonshire AC	0.93	(0.88–0.98)	148	1.03	(0.98–1.08)	45
Cardiganshire AC	1.08	(1.01–1.16)	6	0.98	(0.91–1.05)	92
Carmarthenshire AC	1.08	(1.04–1.13)	5	1.01	(0.97–1.06)	61
Denbighshire AC	0.96	(0.92–1.00)	133	0.99	(0.95–1.04)	80
Flintshire AC	0.99	(0.93–1.04)	88	1.01	(0.97–1.06)	63
Cardiff CB	1.01	(0.97–1.05)	51	1.08	(1.04–1.12)	18
Merthyr Tydfil CB	1.05	(0.99–1.11)	20	1.03	(0.96–1.11)	46
Swansea CB	1.05	(1.00–1.09)	24	1.04	(1.00–1.09)	40
Glamorganshire AC	1.02	(1.00–1.05)	36	1.06	(1.03–1.08)	35
Merionethshire AC	0.95	(0.87–1.02)	141	0.99	(0.90–1.08)	84
Newport CB	0.97	(0.91–1.03)	119	1.06	(1.00–1.13)	26
Monmouthshire AC	1.03	(1.00–1.06)	33	1.09	(1.06–1.12)	17
Montgomery, Radnor AC	0.99	(0.93–1.05)	87	1.03	(0.96–1.11)	47
Pembrokeshire AC	1.03	(0.98–1.08)	30	1.10	(1.04–1.16)	12
ii) Cerebrovascular disease (ICD 8th Revision 431–438)*						
Bedfordshire AC	1.02	(0.96–1.07)	64	1.14	(1.09–1.19)	19
Reading CB	0.98	(0.90–1.07)	100	0.97	(0.89–1.05)	97
Berkshire AC	0.96	(0.91–1.01)	123	0.95	(0.91–1.00)	104
Buckinghamshire AC	0.98	(0.93–1.03)	108	0.86	(0.82–0.90)	131
Cambridgeshire AC	1.10	(1.04–1.15)	6	0.94	(0.89–0.98)	110
Birkenhead CB	0.91	(0.85–0.98)	144	0.96	(0.88–1.03)	103
Chester CB	0.93	(0.83–1.02)	138	0.91	(0.80–1.02)	120
Stockport CB	1.01	(0.94–1.09)	69	1.18	(1.10–1.25)	12
Wallasey CB	1.04	(0.92–1.17)	35	0.89	(0.81–0.97)	123
Cheshire AC	1.05	(1.02–1.08)	27	1.14	(1.11–1.17)	20
Cornwall AC	1.06	(1.02–1.10)	22	1.09	(1.05–1.13)	32
Carlisle CB	1.02	(0.92–1.12)	61	1.04	(0.94–1.15)	57
Cumberland AC	1.05	(1.01–1.10)	26	1.11	(1.06–1.17)	27
Derby CB	1.05	(0.98–1.13)	25	0.79	(0.74–0.85)	139
Derbyshire AC	1.06	(1.03–1.09)	18	1.04	(1.00–1.07)	59
Exeter CB	1.01	(0.91–1.12)	67	0.79	(0.71–0.86)	141
Plymouth CB	1.06	(1.00–1.12)	19	0.94	(0.89–0.99)	107
Devon AC	1.00	(0.96–1.03)	82	1.01	(0.98–1.05)	72
Dorset AC	1.01	(0.96–1.06)	76	0.99	(0.94–1.03)	86
Darlington CB	0.96	(0.87–1.06)	118	1.17	(1.07–1.27)	13
Gateshead CB	0.98	(0.91–1.04)	107	1.02	(0.94–1.12)	67
Hartlepool CB	1.00	(0.93–1.08)	81	1.33	(1.23–1.44)	2

* Excluding subarachnoid haemorrhage.

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
South Shields CB	0.95	(0.88–1.01)	129	1.03	(0.95–1.12)	63
Sunderland CB	0.99	(0.94–1.05)	88	0.96	(0.91–1.02)	100
Durham AC	1.00	(0.97–1.02)	84	1.16	(1.12–1.19)	17
Southend CB	0.91	(0.79–1.04)	143	1.48	(1.41–1.55)	1
Essex AC	0.98	(0.95–1.01)	102	0.98	(0.96–1.00)	92
Bristol CB	0.97	(0.93–1.01)	112	0.99	(0.95–1.03)	84
Gloucester CB	1.02	(0.92–1.13)	53	0.94	(0.85–1.03)	109
Gloucestershire AC	1.02	(0.98–1.06)	63	0.98	(0.94–1.02)	89
City of London	0.85	(0.70–1.00)	153	0.78	(0.30–1.48)	143
Camden LB	0.91	(0.86–0.96)	142	0.70	(0.64–0.76)	151
Croydon LB	0.95	(0.89–1.02)	124	1.12	(1.07–1.18)	22
Greenwich LB	0.98	(0.93–1.03)	106	0.84	(0.79–0.90)	133
Hackney LB	0.92	(0.88–0.96)	139	0.77	(0.71–0.82)	145
Hammersmith LB	0.90	(0.85–0.96)	147	0.69	(0.63–0.75)	152
Islington LB	0.97	(0.92–1.01)	117	0.69	(0.64–0.75)	153
Kensington Chelsea LB	0.98	(0.92–1.04)	109	0.79	(0.72–0.86)	140
Lambeth LB	0.95	(0.90–0.99)	128	0.75	(0.70–0.80)	148
Lewisham LB	0.89	(0.84–0.95)	149	0.93	(0.88–0.99)	112
Newham LB	0.90	(0.86–0.95)	146	0.75	(0.70–0.80)	147
Southwark LB	0.92	(0.88–0.95)	140	0.73	(0.69–0.78)	150
Tower Hamlets LB	0.89	(0.86–0.92)	150	0.77	(0.71–0.84)	144
Wandsworth LB	0.94	(0.89–0.99)	132	0.80	(0.75–0.84)	138
Westminster LB	0.90	(0.85–0.95)	148	0.76	(0.70–0.82)	146
London NOS	0.97	(0.95–0.99)	113			
Bournemouth CB	0.98	(0.87–1.11)	99	1.06	(1.00–1.12)	50
Portsmouth CB	1.03	(0.97–1.09)	43	0.92	(0.86–0.97)	114
Southampton CB	0.96	(0.90–1.03)	119	0.78	(0.73–0.84)	142
Hampshire AC	1.01	(0.97–1.05)	73	1.02	(0.99–1.05)	70
Herefordshire AC	1.01	(0.95–1.08)	68	1.08	(1.00–1.16)	36
Hertfordshire AC	1.02	(0.98–1.07)	52	1.03	(1.00–1.07)	62
Huntingdonshire AC	1.03	(0.96–1.11)	42	0.99	(0.93–1.06)	78
Canterbury CB	1.09	(0.93–1.26)	9	0.88	(0.75–1.02)	125
Kent AC	0.98	(0.96–1.01)	101	0.98	(0.96–1.00)	93
Barrow CB	1.06	(0.96–1.17)	20	0.83	(0.74–0.93)	134
Blackburn CB	1.09	(1.02–1.16)	10	0.74	(0.68–0.80)	149
Blackpool CB	1.02	(0.89–1.16)	60	1.00	(0.95–1.06)	74
Bolton CB	0.99	(0.94–1.05)	89	1.07	(1.01–1.14)	37
Bootle CB	0.86	(0.76–0.97)	152	0.87	(0.76–0.98)	128
Burnley CB	0.92	(0.85–0.99)	141	1.03	(0.95–1.12)	64
Bury CB	1.10	(1.00–1.20)	5	0.98	(0.89–1.08)	90
Liverpool CB	0.93	(0.90–0.96)	137	0.86	(0.83–0.90)	130
Manchester CB	0.99	(0.96–1.02)	94	0.99	(0.96–1.03)	79
Oldham CB	1.01	(0.95–1.08)	65	1.07	(1.00–1.15)	39
Preston CB	1.11	(1.04–1.18)	4	0.93	(0.86–1.01)	111
Rochdale CB	1.04	(0.95–1.13)	36	0.84	(0.77–0.92)	132
St Helens CB	1.02	(0.95–1.10)	50	0.90	(0.82–0.97)	122
Salford CB –	0.96	(0.91–1.01)	122	0.94	(0.87–1.01)	108
Southport CB	1.13	(1.01–1.25)	2	1.02	(0.95–1.10)	68
Warrington CB	0.99	(0.91–1.07)	92	1.05	(0.95–1.15)	53
Wigan CB	1.09	(1.02–1.16)	7	0.97	(0.89–1.06)	96
Lancashire AC	1.05	(1.03–1.07)	28	1.01	(1.00–1.03)	71
Leicester CB	1.02	(0.97–1.07)	58	1.06	(1.01–1.11)	49
Leicestershire AC	1.07	(1.02–1.11)	16	1.03	(0.99–1.07)	65
Lincs (Holland)AC	1.04	(0.96–1.12)	38	1.04	(0.96–1.13)	54
Lincoln CB	1.04	(0.94–1.14)	39	0.91	(0.82–1.00)	119
Lincs (Kesteven) AC	1.12	(1.04–1.20)	3	0.97	(0.90–1.04)	98
Grimsby CB	0.88	(0.80–0.96)	151	1.05	(0.96–1.15)	52
Lincs (Lindsey) AC	1.04	(1.00–1.09)	31	1.12	(1.07–1.17)	25
Middlesex AC	0.95	(0.92–0.98)	126	0.82	(0.80–0.84)	136
Great Yarmouth CB	1.00	(0.90–1.10)	87	0.91	(0.82–1.02)	116
Norwich CB	1.02	(0.95–1.09)	59	1.04	(0.97–1.12)	56
Norfolk AC	1.06	(1.03–1.10)	17	0.99	(0.95–1.02)	88
Northampton CB	1.01	(0.94–1.09)	70	1.06	(0.99–1.14)	47
Northamptonshire AC	1.09	(1.03–1.14)	11	0.87	(0.83–0.92)	126

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Newcastle on Tyne CB	0.94	(0.90–0.99)	131	0.95	(0.90–1.01)	105
Tynemouth CB	0.98	(0.88–1.07)	110	0.99	(0.89–1.10)	77
Northumberland AC	1.03	(0.99–1.07)	45	1.15	(1.11–1.20)	18
Nottingham CB	1.02	(0.97–1.07)	56	0.92	(0.87–0.96)	115
Nottinghamshire AC	1.02	(0.98–1.06)	57	0.99	(0.95–1.03)	81
Oxford CB	0.98	(0.89–1.08)	103	0.89	(0.81–0.97)	124
Oxfordshire AC	1.03	(0.97–1.09)	44	0.91	(0.85–0.97)	117
Rutland AC				0.97	(0.80–1.16)	94
Shropshire AC	1.02	(0.98–1.06)	62	1.16	(1.11–1.21)	16
Bath CB	0.94	(0.85–1.03)	134	0.96	(0.88–1.05)	101
Somerset AC	1.01	(0.97–1.05)	75	1.07	(1.04–1.11)	38
Burton upon Trent CB	0.95	(0.86–1.05)	125	1.09	(0.97–1.22)	31
Dudley CB	0.91	(0.86–0.96)	145	1.27	(1.19–1.35)	4
Stoke upon Trent CB	1.00	(0.95–1.05)	83	0.99	(0.94–1.05)	80
Walsall CB	1.01	(0.95–1.07)	77	0.99	(0.92–1.05)	85
West Bromwich CB	0.99	(0.93–1.05)	93	0.99	(0.92–1.06)	82
Wolverhampton CB	1.00	(0.95–1.06)	80	1.12	(1.06–1.18)	26
Staffordshire AC	1.03	(0.99–1.06)	47	1.08	(1.05–1.12)	35
Ipswich CB	1.08	(0.98–1.18)	12	0.80	(0.73–0.88)	137
Suffolk East AC	1.02	(0.97–1.07)	55	1.03	(0.98–1.08)	66
Suffolk West AC	0.98	(0.92–1.05)	105	1.12	(1.05–1.20)	24
Surrey AC	0.98	(0.95–1.02)	104	0.91	(0.88–0.93)	118
Brighton CB	1.04	(0.97–1.11)	40	0.99	(0.93–1.05)	83
Eastbourne CB	0.93	(0.82–1.05)	136	1.31	(1.22–1.40)	3
Hastings CB	0.94	(0.85–1.04)	130	1.11	(1.03–1.19)	28
Sussex East AC	1.03	(0.98–1.08)	48	1.07	(1.03–1.10)	44
Sussex West AC	1.01	(0.95–1.07)	72	1.10	(1.06–1.14)	30
Birmingham CB	0.99	(0.96–1.01)	95	1.00	(0.98–1.03)	73
Coventry CB	1.04	(0.96–1.13)	32	0.87	(0.81–0.92)	129
Warwickshire AC	1.04	(0.99–1.09)	34	0.99	(0.95–1.02)	87
Westmorland AC	1.06	(0.97–1.15)	21	1.07	(0.97–1.17)	41
Wight, Isle of AC	1.00	(0.92–1.08)	85	1.19	(1.11–1.27)	9
Wiltshire AC	1.04	(1.00–1.08)	37	0.96	(0.92–1.01)	99
Warley CB	1.02	(0.96–1.09)	51	1.07	(1.00–1.14)	42
Worcester CB	0.99	(0.89–1.09)	91	1.17	(1.06–1.28)	15
Worcestershire AC	1.05	(1.00–1.09)	30	1.08	(1.04–1.13)	33
Kingston upon Hull CB	0.96	(0.92–1.01)	120	0.93	(0.88–0.98)	113
Yorkshire E Riding AC	0.99	(0.93–1.05)	90	1.07	(1.01–1.12)	45
Middlesbrough CB	1.02	(0.98–1.07)	49	1.03	(0.99–1.08)	61
Yorkshire N Riding AC	1.07	(1.02–1.12)	15	1.07	(1.02–1.11)	43
Barnsley CB	0.95	(0.87–1.03)	127	0.97	(0.87–1.08)	95
Bradford CB	1.01	(0.97–1.05)	74	1.26	(1.21–1.31)	5
Dewsbury CB	1.01	(0.91–1.12)	66	1.13	(1.02–1.25)	21
Doncaster	1.00	(0.89–1.10)	86	1.10	(1.01–1.20)	29
Halifax CB	0.94	(0.87–1.01)	135	1.23	(1.14–1.32)	7
Huddersfield CB	0.94	(0.87–1.01)	133	1.04	(0.97–1.11)	58
Leeds CB	1.02	(0.98–1.06)	54	0.87	(0.84–0.91)	127
Rotherham CB	0.99	(0.91–1.07)	97	1.18	(1.08–1.29)	11
Sheffield CB	0.97	(0.93–1.00)	116	0.96	(0.92–1.00)	102
Wakefield CB	1.06	(0.96–1.16)	23	1.04	(0.95–1.14)	55
York CB	1.04	(0.95–1.12)	41	0.90	(0.82–0.98)	121
Yorkshire W Riding AC	1.03	(1.01–1.05)	46	1.08	(1.06–1.10)	34
Anglesey AC	1.19	(1.08–1.30)	1	1.05	(0.95–1.16)	51
Brecknockshire AC	0.99	(0.89–1.09)	98	1.07	(0.96–1.18)	46
Caernarvonshire AC	1.01	(0.95–1.08)	71	1.07	(1.01–1.14)	40
Cardiganshire AC	1.09	(1.00–1.19)	8	1.02	(0.93–1.12)	69
Carmarthenshire AC	1.04	(0.99–1.10)	33	1.18	(1.12–1.25)	10
Denbighshire AC	1.07	(1.01–1.13)	14	1.17	(1.11–1.23)	14
Flintshire AC	1.00	(0.93–1.08)	79	1.23	(1.16–1.30)	8
Cardiff CB	0.97	(0.91–1.02)	115	0.83	(0.78–0.88)	135
Merthyr Tydfil CB	0.99	(0.90–1.08)	96	0.98	(0.88–1.09)	91
Swansea CB	0.96	(0.90–1.02)	121	1.00	(0.94–1.06)	75
Glamorganshire AC	1.01	(0.98–1.04)	78	1.04	(1.00–1.07)	60
Merionethshire AC	0.97	(0.87–1.07)	114	1.12	(1.00–1.26)	23

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Newport CB	1.06	(0.97–1.15)	24	0.95	(0.87–1.03)	106
Monmouthshire AC	0.97	(0.93–1.02)	111	1.00	(0.95–1.05)	76
Montgomery, Radnor AC	1.05	(0.97–1.12)	29	1.25	(1.14–1.36)	6
Pembrokeshire AC	1.07	(1.00–1.15)	13	1.06	(0.98–1.14)	48
iii) Bronchitis and emphysema (ICD 8th Revision 490–492)						
Bedfordshire AC	0.98	(0.89–1.07)	91	0.91	(0.84–0.99)	96
Reading CB	1.08	(0.94–1.24)	29	0.92	(0.80–1.05)	93
Berkshire AC	0.95	(0.86–1.05)	106	0.84	(0.77–0.92)	115
Buckinghamshire AC	0.96	(0.88–1.05)	100	0.91	(0.85–0.98)	95
Cambridgeshire AC	0.89	(0.81–0.97)	137	0.96	(0.88–1.05)	82
Birkenhead CB	1.17	(1.06–1.29)	4	1.15	(1.03–1.27)	46
Chester CB	1.07	(0.91–1.25)	30	0.97	(0.81–1.15)	78
Stockport CB	1.15	(1.03–1.28)	7	1.25	(1.13–1.37)	29
Wallasey CB	1.05	(0.87–1.24)	44	1.12	(0.98–1.27)	50
Cheshire AC	1.07	(1.02–1.12)	33	0.89	(0.85–0.93)	104
Cornwall AC	0.89	(0.81–0.97)	136	0.65	(0.60–0.71)	148
Carlisle CB	0.95	(0.78–1.13)	111	0.85	(0.70–1.02)	112
Cumberland AC	0.93	(0.85–1.01)	122	0.76	(0.68–0.85)	130
Derby CB	0.94	(0.84–1.05)	116	1.01	(0.91–1.11)	70
Derbyshire AC	0.98	(0.93–1.03)	86	0.98	(0.93–1.03)	76
Exeter CB	1.02	(0.84–1.22)	59	0.75	(0.63–0.87)	132
Plymouth CB	0.91	(0.82–1.00)	133	0.92	(0.83–1.01)	94
Devon AC	1.03	(0.96–1.10)	49	0.63	(0.59–0.67)	149
Dorset AC	1.02	(0.93–1.12)	57	0.66	(0.60–0.72)	147
Darlington CB	1.15	(0.99–1.33)	6	1.12	(0.98–1.28)	52
Gateshead CB	0.91	(0.82–1.01)	132	1.08	(0.94–1.24)	55
Hartlepool CB	0.98	(0.87–1.10)	87	1.24	(1.08–1.41)	31
South Shields CB	0.99	(0.89–1.09)	82	1.35	(1.20–1.50)	17
Sunderland CB	0.95	(0.87–1.02)	113	1.19	(1.08–1.29)	39
Durham AC	1.02	(0.98–1.06)	62	1.16	(1.11–1.21)	42
Southend CB	1.03	(0.81–1.28)	50	0.86	(0.77–0.95)	110
Essex AC	0.85	(0.81–0.89)	151	1.00	(0.97–1.04)	72
Bristol CB	1.06	(1.00–1.13)	35	0.96	(0.90–1.03)	83
Gloucester CB	1.10	(0.92–1.30)	20	0.67	(0.56–0.81)	146
Gloucestershire AC	1.04	(0.96–1.11)	48	0.78	(0.73–0.84)	127
City of London	1.10	(0.84–1.39)	21	1.19	(0.36–2.49)	38
Camden LB	1.06	(0.98–1.15)	36	1.03	(0.91–1.15)	65
Croydon LB	0.99	(0.88–1.10)	83	0.99	(0.91–1.08)	73
Greenwich LB	1.03	(0.95–1.12)	51	1.31	(1.20–1.42)	23
Hackney LB	1.06	(0.99–1.13)	40	1.34	(1.23–1.45)	19
Hammersmith LB	1.02	(0.94–1.12)	55	1.27	(1.15–1.39)	28
Islington LB	1.04	(0.97–1.12)	45	1.27	(1.15–1.39)	27
Kensington Chelsea LB	1.02	(0.93–1.13)	56	1.03	(0.89–1.18)	64
Lambeth LB	1.00	(0.93–1.08)	69	1.31	(1.21–1.41)	24
Lewisham LB	0.99	(0.90–1.08)	81	1.21	(1.11–1.31)	35
Newham LB	0.99	(0.92–1.05)	84	1.35	(1.24–1.46)	16
Southwark LB	1.01	(0.96–1.06)	66	1.35	(1.26–1.46)	15
Tower Hamlets LB	1.07	(1.02–1.12)	34	1.46	(1.33–1.59)	9
Wandsworth LB	1.08	(1.01–1.16)	28	1.19	(1.11–1.29)	37
Westminster LB	1.13	(1.05–1.22)	11	0.89	(0.79–1.00)	103
London NOS	0.93	(0.90–0.97)	121			
Bournemouth CB	1.12	(0.90–1.36)	15	0.68	(0.60–0.76)	145
Portsmouth CB	0.93	(0.85–1.03)	120	0.95	(0.86–1.05)	87
Southampton CB	1.06	(0.95–1.18)	37	0.87	(0.77–0.96)	108
Hampshire AC	1.00	(0.94–1.08)	70	0.77	(0.73–0.81)	129
Herefordshire AC	1.05	(0.93–1.18)	42	0.73	(0.63–0.84)	136
Hertfordshire AC	1.02	(0.94–1.10)	58	0.93	(0.88–0.98)	90
Huntingdonshire AC	0.96	(0.83–1.09)	101	0.71	(0.62–0.81)	139
Canterbury CB	0.86	(0.64–1.12)	146	1.06	(0.81–1.35)	59
Kent AC	0.98	(0.94–1.02)	85	0.97	(0.93–1.00)	81
Barrow CB	0.92	(0.77–1.08)	125	0.87	(0.72–1.04)	106
Blackburn CB	0.94	(0.85–1.03)	117	1.58	(1.43–1.74)	4

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Blackpool CB	1.13	(0.92–1.35)	13	0.95	(0.86–1.04)	88
Bolton CB	1.06	(0.97–1.15)	39	1.07	(0.97–1.18)	57
Bootle CB	1.15	(0.99–1.33)	8	1.41	(1.21–1.61)	13
Burnley CB	1.10	(0.98–1.22)	22	1.44	(1.28–1.61)	11
Bury CB	0.92	(0.77–1.09)	127	0.85	(0.70–1.01)	114
Liverpool CB	1.12	(1.07–1.16)	16	1.13	(1.07–1.19)	48
Manchester CB	0.95	(0.91–1.00)	105	1.34	(1.27–1.41)	21
Oldham CB	1.10	(1.00–1.19)	24	1.66	(1.51–1.81)	2
Preston CB	0.94	(0.85–1.04)	118	1.40	(1.24–1.56)	14
Rochdale CB	1.03	(0.90–1.17)	52	1.04	(0.91–1.19)	60
St Helens CB	1.15	(1.03–1.27)	9	1.01	(0.89–1.13)	71
Salford CB	1.07	(0.99–1.15)	31	1.67	(1.53–1.82)	1
Southport CB	1.04	(0.86–1.24)	46	0.97	(0.84–1.10)	80
Warrington CB	1.02	(0.91–1.15)	54	1.48	(1.30–1.67)	8
Wigan CB	1.14	(1.03–1.25)	10	1.22	(1.07–1.37)	34
Lancashire AC	1.05	(1.02–1.08)	43	1.03	(1.00–1.05)	66
Leicester CB	0.94	(0.86–1.02)	119	1.01	(0.93–1.10)	69
Leicestershire AC	1.02	(0.94–1.09)	60	0.82	(0.76–0.88)	120
Lincs (Holland) AC	0.92	(0.79–1.05)	129	0.87	(0.74–1.00)	107
Lincoln CB	0.85	(0.70–1.01)	150	0.92	(0.77–1.09)	92
Lincs (Kesteven)AC	0.86	(0.75–0.98)	147	0.72	(0.62–0.82)	138
Grimsby CB	1.19	(1.05–1.34)	2	1.34	(1.18–1.51)	18
Lincs (Lindsey) AC	0.89	(0.82–0.96)	138	0.83	(0.76–0.90)	117
Middlesex AC	1.00	(0.95–1.05)	74	1.04	(1.01–1.07)	62
Great Yarmouth CB	1.09	(0.90–1.29)	27	0.68	(0.54–0.83)	144
Norwich CB	0.83	(0.73–0.95)	153	0.87	(0.75–1.00)	105
Norfolk AC	0.87	(0.81–0.94)	143	0.81	(0.75–0.87)	121
Northampton CB	0.92	(0.80–1.04)	130	1.04	(0.92–1.17)	61
Northamptonshire AC	0.90	(0.82–0.98)	135	0.96	(0.88–1.05)	84
Newcastle on Tyne CB	1.00	(0.93–1.06)	76	1.32	(1.22–1.43)	22
Tynemouth CB	0.97	(0.83–1.12)	94	1.15	(0.98–1.33)	45
Northumberland AC	0.96	(0.90–1.03)	97	1.02	(0.96–1.09)	67
Nottingham CB	1.01	(0.94–1.08)	68	1.43	(1.34–1.53)	12
Nottinghamshire AC	0.99	(0.93–1.06)	79	1.14	(1.08–1.20)	47
Oxford CB	1.00	(0.84–1.17)	71	0.96	(0.82–1.11)	85
Oxfordshire AC	0.96	(0.85–1.08)	99	0.74	(0.65–0.83)	134
Rutland AC				0.74	(0.50–1.03)	133
Shropshire AC	1.03	(0.95–1.10)	53	0.90	(0.83–0.97)	100
Bath CB	0.94	(0.79–1.11)	114	0.85	(0.72–1.00)	113
Somerset AC	1.00	(0.93–1.07)	73	0.75	(0.70–0.79)	131
Burton upon Trent CB	0.92	(0.77–1.08)	128	0.98	(0.80–1.19)	75
Dudley CB	1.06	(0.97–1.16)	38	1.24	(1.13–1.37)	30
Stoke upon Trent CB	1.00	(0.93–1.07)	75	1.21	(1.12–1.30)	36
Walsall CB	0.99	(0.90–1.09)	78	1.12	(1.01–1.23)	51
West Bromwich CB	1.11	(1.03–1.21)	17	1.52	(1.39–1.65)	5
Wolverhampton CB	1.01	(0.92–1.10)	65	1.07	(0.97–1.16)	58
Staffordshire AC	0.99	(0.94–1.05)	80	0.94	(0.89–1.00)	89
Ipswich CB	0.87	(0.72–1.03)	142	0.68	(0.57–0.80)	143
Suffolk East AC	0.95	(0.86–1.04)	108	0.53	(0.47–0.59)	153
Suffolk West AC	0.92	(0.81–1.04)	126	0.78	(0.68–0.89)	128
Surrey AC	0.99	(0.94–1.06)	77	0.81	(0.77–0.84)	122
Brighton CB	0.97	(0.85–1.10)	95	0.82	(0.73–0.92)	119
Eastbourne CB	0.88	(0.67–1.11)	141	0.60	(0.49–0.71)	150
Hastings CB	1.24	(1.05–1.45)	1	0.95	(0.83–1.09)	86
Sussex East AC	1.04	(0.94–1.13)	47	0.69	(0.64–0.74)	141
Sussex West AC	0.98	(0.87–1.10)	90	0.72	(0.67–0.77)	137
Birmingham CB	0.97	(0.93–1.01)	92	1.13	(1.08–1.18)	49
Coventry CB	0.89	(0.78–1.01)	139	1.10	(1.01–1.20)	53
Warwickshire AC	1.00	(0.93–1.08)	72	0.90	(0.84–0.95)	101
Westmorland AC	0.91	(0.76–1.08)	131	0.71	(0.57–0.85)	140
Wight, Isle of AC	0.97	(0.82–1.12)	96	0.80	(0.70–0.91)	123
Wiltshire AC	0.94	(0.87–1.02)	115	0.80	(0.73–0.86)	125

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Warley CB	1.12	(1.02–1.23)	14	1.29	(1.18–1.41)	25
Worcester CB	0.91	(0.76–1.07)	134	1.28	(1.09–1.48)	26
Worcestershire AC	1.01	(0.94–1.09)	63	0.98	(0.92–1.05)	74
Kingston upon Hull CB	0.96	(0.89–1.03)	98	1.16	(1.06–1.25)	43
Yorkshire E Riding AC	0.87	(0.77–0.97)	145	0.79	(0.71–0.87)	126
Middlesbrough CB	1.11	(1.03–1.19)	19	0.97	(0.90–1.04)	79
Yorkshire N Riding AC	0.95	(0.87–1.04)	107	0.68	(0.62–0.74)	142
Barnsley CB	1.09	(0.97–1.22)	26	1.63	(1.44–1.84)	3
Bradford CB	0.87	(0.80–0.94)	144	1.15	(1.07–1.24)	44
Dewsbury CB	0.92	(0.78–1.08)	123	1.51	(1.29–1.75)	6
Doncaster CB	0.85	(0.71–1.00)	152	1.17	(1.01–1.34)	40
Halifax CB	0.85	(0.74–0.97)	149	0.86	(0.73–0.99)	109
Huddersfield CB	0.95	(0.84–1.07)	109	0.90	(0.79–1.01)	98
Leeds CB	0.92	(0.87–0.98)	124	1.23	(1.16–1.30)	32
Rotherham CB	1.10	(0.98–1.22)	25	1.45	(1.28–1.64)	10
Sheffield CB	0.95	(0.90–1.00)	110	1.16	(1.10–1.23)	41
Wakefield CB	1.10	(0.95–1.25)	23	1.48	(1.29–1.68)	7
York CB	1.05	(0.92–1.19)	41	1.01	(0.89–1.15)	68
Yorkshire W Riding AC	0.95	(0.92–0.98)	112	1.22	(1.18–1.26)	33
Anglesey AC	0.95	(0.79–1.14)	103	0.86	(0.70–1.03)	111
Brecknockshire AC	1.02	(0.86–1.19)	61	0.91	(0.76–1.08)	97
Caernarvonshire AC	0.97	(0.86–1.09)	93	0.83	(0.73–0.93)	118
Cardiganshire AC	0.89	(0.73–1.06)	140	0.59	(0.47–0.73)	151
Carmarthenshire AC	0.98	(0.88–1.08)	89	0.84	(0.76–0.93)	116
Denbighshire AC	1.11	(1.01–1.21)	18	0.98	(0.89–1.07)	77
Flintshire AC	0.96	(0.84–1.08)	102	0.90	(0.80–0.99)	102
Cardiff CB	1.13	(1.04–1.23)	12	0.90	(0.82–0.98)	99
Merthyr Tydfil CB	1.07	(0.94–1.20)	32	1.34	(1.16–1.53)	20
Swansea CB	0.98	(0.88–1.08)	88	1.04	(0.94–1.14)	63
Glamorganshire AC	1.17	(1.12–1.22)	5	1.08	(1.03–1.13)	56
Merionethshire AC	0.85	(0.69–1.04)	148	0.80	(0.62–1.00)	124
Newport CB	1.01	(0.88–1.15)	64	0.93	(0.80–1.06)	91
Monmouthshire AC	1.17	(1.10–1.25)	3	1.10	(1.03–1.17)	54
Montgomery, Radnor AC	1.01	(0.86–1.16)	67	0.55	(0.43–0.67)	152
Pembrokeshire AC	0.95	(0.83–1.08)	104	0.73	(0.62–0.85)	135
iv) Stomach cancer (ICD 8th Revision 151)						
Bedfordshire AC	0.84	(0.73–0.97)	131	1.08	(0.95–1.21)	45
Reading CB	0.73	(0.56–0.92)	148	0.89	(0.70–1.10)	129
Berkshire AC	0.85	(0.73–0.99)	126	0.87	(0.76–0.99)	135
Buckinghamshire AC	0.81	(0.70–0.92)	141	1.01	(0.91–1.13)	74
Cambridgeshire AC	0.85	(0.73–0.97)	128	1.00	(0.87–1.13)	83
Birkenhead CB	1.06	(0.90–1.23)	51	0.86	(0.71–1.03)	136
Chester CB	0.89	(0.68–1.13)	117	1.21	(0.93–1.52)	5
Stockport CB	1.12	(0.93–1.32)	31	0.95	(0.80–1.12)	103
Wallasey CB	0.93	(0.69–1.20)	102	1.02	(0.83–1.24)	69
Cheshire AC	0.99	(0.92–1.07)	71	1.04	(0.97–1.10)	64
Cornwall AC	0.99	(0.88–1.10)	73	0.93	(0.83–1.02)	114
Carlisle CB	0.90	(0.69–1.15)	114	1.07	(0.83–1.34)	49
Cumberland AC	1.20	(1.07–1.33)	9	1.00	(0.88–1.13)	80
Derby CB	0.91	(0.77–1.06)	110	1.06	(0.91–1.21)	53
Derbyshire AC	0.97	(0.90–1.04)	80	1.06	(0.97–1.14)	54
Exeter CB	0.79	(0.60–1.00)	142	1.39	(1.13–1.67)	1
Plymouth CB	1.07	(0.93–1.21)	46	1.04	(0.90–1.18)	65
DevonAC	0.82	(0.74–0.91)	136	0.99	(0.91–1.07)	85
Dorset AC	1.02	(0.90–1.16)	61	0.94	(0.84–1.05)	108
Darlington CB	1.12	(0.87–1.41)	29	0.77	(0.60–0.97)	152
Gateshead CB	1.20	(1.03–1.38)	8	1.02	(0.83–1.22)	72
Hartlepool CB	1.32	(1.12–1.54)	2	1.10	(0.90–1.31)	38
South Shields CB	1.16	(0.98–1.35)	17	0.81	(0.65–0.98)	148
Sunderland CB	1.08	(0.96–1.20)	44	1.17	(1.03–1.32)	13
Durham AC	1.14	(1.08–1.21)	24	1.02	(0.95–1.09)	71

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Southend CB	0.84	(0.57–1.16)	133	1.02	(0.87–1.17)	73
Essex AC	0.94	(0.87–1.00)	99	1.05	(1.00–1.10)	59
Bristol CB	0.98	(0.89–1.08)	76	1.10	(1.00–1.21)	35
Gloucester CB	0.95	(0.73–1.20)	94	1.04	(0.81–1.30)	60
Gloucestershire AC	0.81	(0.72–0.90)	140	1.00	(0.90–1.10)	82
City of London	0.66	(0.36–1.05)	152	1.11	(0.10–3.24)	27
Camden LB	1.09	(0.96–1.22)	42	0.94	(0.78–1.11)	110
Croydon LB	0.97	(0.82–1.14)	79	0.84	(0.73–0.96)	141
Greenwich LB	0.98	(0.86–1.10)	77	1.22	(1.07–1.39)	3
Hackney LB	1.10	(0.99–1.21)	41	1.06	(0.92–1.21)	51
Hammersmith LB	1.03	(0.90–1.17)	59	0.98	(0.82–1.15)	91
Islington LB	1.12	(1.01–1.24)	30	1.14	(0.98–1.31)	19
Kensington Chelsea LB	0.93	(0.79–1.08)	101	0.93	(0.74–1.15)	112
Lambeth LB	1.15	(1.03–1.27)	21	0.96	(0.84–1.09)	100
Lewisham LB	0.99	(0.85–1.13)	74	1.13	(1.00–1.27)	24
Newham LB	1.15	(1.05–1.25)	22	1.22	(1.08–1.37)	4
Southwark LB	1.25	(1.16–1.34)	5	0.93	(0.82–1.05)	113
Tower Hamlets LB	1.20	(1.12–1.29)	7	1.11	(0.96–1.27)	28
Wandsworth LB	0.96	(0.85–1.08)	87	0.87	(0.76–0.99)	134
Westminster LB	1.10	(0.98–1.23)	40	0.82	(0.68–0.98)	144
London NOS	0.99	(0.93–1.04)	75			
Bournemouth CB	0.74	(0.52–1.01)	147	0.98	(0.84–1.14)	90
Portsmouth CB	1.01	(0.88–1.15)	64	0.92	(0.79–1.06)	117
Southampton CB	0.90	(0.75–1.06)	116	0.98	(0.82–1.14)	93
Hampshire AC	0.85	(0.77–0.95)	127	0.92	(0.84–0.99)	119
Herefordshire AC	0.91	(0.75–1.08)	112	0.90	(0.73–1.08)	127
Hertfordshire AC	0.71	(0.62–0.81)	150	1.10	(1.01–1.19)	37
Huntingdonshire AC	0.94	(0.78–1.12)	98	1.13	(0.95–1.33)	22
Canterbury CB	0.83	(0.51–1.23)	135	0.84	(0.52–1.24)	142
Kent AC	0.84	(0.79–0.90)	130	0.96	(0.91–1.02)	99
Barrow CB	0.96	(0.75–1.21)	84	0.89	(0.67–1.15)	128
Blackburn CB	1.10	(0.94–1.27)	39	1.09	(0.92–1.27)	43
Blackpool CB	0.72	(0.49–0.98)	149	1.04	(0.90–1.19)	62
Bolton CB	0.97	(0.84–1.10)	82	1.15	(1.00–1.32)	16
Bootle CB	0.92	(0.71–1.17)	104	1.20	(0.94–1.50)	7
Burnley CB	0.92	(0.76–1.10)	105	1.09	(0.88–1.32)	42
Bury CB	0.78	(0.59–1.00)	144	1.10	(0.85–1.39)	31
Liverpool CB	1.07	(1.00–1.13)	49	1.10	(1.02–1.19)	29
Manchester CB	1.04	(0.97–1.11)	56	0.92	(0.84–1.01)	116
Oldham CB	1.04	(0.89–1.20)	57	1.07	(0.90–1.27)	48
Preston CB	0.91	(0.77–1.06)	109	1.19	(0.98–1.42)	9
Rochdale CB	0.96	(0.77–1.16)	91	1.05	(0.85–1.27)	57
St Helens CB	1.06	(0.90–1.23)	52	1.09	(0.91–1.30)	39
Salford CB	1.02	(0.90–1.15)	60	1.02	(0.86–1.19)	70
Southport CB	0.64	(0.43–0.89)	153	0.81	(0.64–1.01)	147
Warrington CB	1.11	(0.91–1.34)	32	0.82	(0.64–1.03)	145
Wigan CB	0.97	(0.82–1.12)	83	1.18	(0.96–1.42)	11
Lancashire AC	0.96	(0.92–1.01)	86	1.01	(0.97–1.05)	76
Leicester CB	0.90	(0.79–1.02)	113	1.10	(0.97–1.24)	33
Leicestershire AC	0.79	(0.70–0.88)	143	1.03	(0.92–1.15)	66
Lincs (Holland) AC	0.93	(0.74–1.13)	103	0.86	(0.67–1.06)	138
Lincoln CB	0.96	(0.73–1.22)	88	0.78	(0.58–1.01)	151
Lincs (Kesteven) AC	1.02	(0.84–1.21)	62	1.05	(0.87–1.24)	56
Grimsby CB	0.99	(0.80–1.20)	70	1.16	(0.94–1.41)	14
Lincs (Lindsey) AC	0.81	(0.71–0.92)	139	0.94	(0.82–1.05)	111
Middlesex AC	0.96	(0.89–1.02)	93	0.95	(0.90–1.00)	104
Great Yarmouth CB	0.87	(0.65–1.13)	123	0.92	(0.67–1.21)	118
Norwich CB	1.13	(0.96–1.31)	26	1.10	(0.92–1.30)	34
Norfolk AC	0.96	(0.86–1.06)	90	0.91	(0.82–1.01)	120
Northampton CB	1.08	(0.90–1.28)	43	1.14	(0.95–1.34)	20
Northamptonshire AC	0.88	(0.77–1.00)	122	1.18	(1.04–1.32)	12
Newcastle on Tyne CB	1.19	(1.08–1.31)	10	0.95	(0.84–1.07)	105
Tynemouth CB	1.15	(0.92–1.40)	20	1.14	(0.91–1.40)	18
Northumberland AC	1.01	(0.91–1.11)	66	0.98	(0.90–1.07)	88

Table 8A — *continued*

Area	Place of birth			Place of death		
	PMR	(95% confidence interval)	Rank	PMR	(95% confidence interval)	Rank
Nottingham CB	1.00	(0.89–1.11)	69	1.06	(0.94–1.19)	52
Nottinghamshire AC	0.90	(0.82–1.00)	115	1.03	(0.94–1.12)	67
Oxford CB	0.67	(0.48–0.88)	151	0.94	(0.72–1.20)	106
Oxfordshire AC	0.88	(0.74–1.04)	121	1.12	(0.95–1.30)	25
Rutland AC				1.19	(0.71–1.80)	8
Shropshire AC	1.04	(0.93–1.15)	58	0.96	(0.85–1.08)	101
Bath CB	1.11	(0.86–1.38)	38	0.88	(0.68–1.10)	131
Somerset AC	0.97	(0.88–1.07)	78	0.94	(0.86–1.02)	109
Burton upon Trent CB	0.89	(0.68–1.12)	119	0.98	(0.71–1.30)	89
Dudley CB	1.11	(0.96–1.27)	33	0.94	(0.80–1.10)	107
Stoke upon Trent CB	1.11	(1.00–1.21)	37	1.18	(1.06–1.31)	10
Walsall CB	1.06	(0.92–1.21)	50	1.09	(0.94–1.26)	40
West Bromwich CB	1.05	(0.91–1.20)	54	1.10	(0.94–1.27)	36
Wolverhampton CB	1.04	(0.92–1.18)	55	1.16	(1.02–1.31)	15
Staffordshire AC	0.95	(0.87–1.03)	95	1.04	(0.96–1.13)	61
Ipswich CB	0.91	(0.72–1.12)	111	1.14	(0.93–1.37)	21
Suffolk East AC	0.86	(0.75–0.97)	125	0.97	(0.84–1.11)	97
Suffolk West AC	0.85	(0.70–1.01)	129	1.08	(0.89–1.28)	46
Surrey AC	0.99	(0.90–1.08)	72	0.91	(0.85–0.96)	123
Brighton CB	1.00	(0.84–1.19)	67	1.05	(0.90–1.22)	55
Eastbourne CB	0.93	(0.65–1.27)	100	0.88	(0.68–1.09)	132
Hastings CB	0.82	(0.59–1.08)	137	0.90	(0.71–1.11)	125
Sussex East AC	0.77	(0.66–0.90)	145	0.82	(0.73–0.91)	146
Sussex West AC	0.84	(0.70–1.00)	132	0.87	(0.79–0.96)	133
Birmingham CB	1.13	(1.06–1.20)	27	0.93	(0.87–0.99)	115
Coventry CB	0.96	(0.78–1.15)	89	0.97	(0.84–1.11)	94
Warwickshire AC	0.92	(0.81–1.03)	107	0.88	(0.80–0.97)	130
Westmorland AC	0.88	(0.68–1.11)	120	1.03	(0.79–1.30)	68
Wight, Isle of AC	0.87	(0.67–1.09)	124	0.75	(0.60–0.92)	153
Wiltshire AC	0.77	(0.68–0.86)	146	1.10	(0.99–1.22)	32
Warley CB	1.12	(0.95–1.31)	28	0.91	(0.77–1.06)	122
Worcester CB	1.07	(0.80–1.37)	45	0.79	(0.58–1.03)	150
Worcestershire AC	0.97	(0.86–1.09)	81	0.84	(0.74–0.93)	143
Kingston upon Hull CB	1.19	(1.07–1.31)	12	0.98	(0.86–1.10)	92
Yorkshire E Riding AC	1.00	(0.85–1.16)	68	0.90	(0.79–1.03)	124
Middlesbrough CB	1.16	(1.04–1.28)	16	1.05	(0.94–1.16)	58
Yorkshire N Riding AC	0.81	(0.71–0.92)	138	0.97	(0.85–1.09)	98
Barnsley CB	1.07	(0.88–1.27)	48	1.13	(0.90–1.39)	23
Bradford CB	0.95	(0.84–1.06)	96	1.08	(0.96–1.20)	47
Dewsbury CB	0.89	(0.66–1.14)	118	0.95	(0.71–1.24)	102
Doncaster CB	0.92	(0.70–1.17)	106	1.06	(0.84–1.31)	50
Halifax CB	1.07	(0.88–1.27)	47	0.86	(0.69–1.04)	137
Huddersfield CB	0.96	(0.80–1.14)	85	1.00	(0.84–1.18)	79
Leeds CB	0.92	(0.83–1.00)	108	0.97	(0.88–1.06)	95
Rotherham CB	1.06	(0.86–1.28)	53	0.80	(0.62–1.01)	149
Sheffield CB	1.01	(0.93–1.09)	65	1.09	(1.00–1.19)	41
Wakefield CB	0.94	(0.72–1.19)	97	0.90	(0.69–1.14)	126
York CB	0.84	(0.67–1.03)	134	1.01	(0.81–1.22)	77
Yorkshire W Riding AC	0.96	(0.91–1.01)	92	1.01	(0.96–1.06)	75
Anglesey AC	1.29	(1.03–1.58)	4	1.10	(0.87–1.36)	30
Brecknockshire AC	1.11	(0.86–1.39)	35	0.85	(0.64–1.09)	139
Caernarvonshire AC	1.44	(1.25–1.64)	1	1.08	(0.94–1.24)	44
Cardiganshire AC	1.14	(0.92–1.40)	23	1.20	(0.96–1.48)	6
Carmarthenshire AC	1.15	(1.01–1.31)	18	0.97	(0.84–1.10)	96
Denbighshire AC	1.21	(1.06–1.37)	6	1.15	(1.01–1.29)	17
Flintshire AC	1.01	(0.84–1.20)	63	0.99	(0.84–1.14)	87
Cardiff CB	1.11	(0.98–1.25)	34	1.00	(0.88–1.12)	81
Merthyr Tydfil CB	1.17	(0.97–1.40)	14	0.91	(0.71–1.14)	121
Swansea CB	1.18	(1.04–1.34)	13	1.11	(0.97–1.27)	26
Glamorganshire AC	1.14	(1.07–1.21)	25	1.04	(0.97–1.11)	63
Merionethshire AC	1.31	(1.04–1.61)	3	1.23	(0.95–1.55)	2
Newport CB	1.19	(0.98–1.41)	11	1.00	(0.83–1.20)	78
Monmouthshire AC	1.11	(1.00–1.22)	36	0.99	(0.88–1.09)	86
Montgomery, Radnor AC	1.17	(0.96–1.40)	15	0.84	(0.64–1.07)	140
Pembrokeshire AC	1.15	(0.97–1.35)	19	0.99	(0.81–1.19)	84

Chapter 9 Mortality among immigrants in England and Wales, 1979–83

Contents

Table 9A Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(i) **All causes**						(ii) **Tuberculosis (incl. late effects) (ICD 010-018, 137)**					
Scotland	M	14,478	118	100	13,436	107	100	57	186	156	28	155	144
	F	7,628	118	100	15,630	111	100	17	125	105	10	116	104
All Ireland	M	18,961	128	100	13,768	116	100	123	330	255	47	269	230
	F	10,403	120	100	15,828	115	100	30	164	137	20	227	194
Indian	M	7,566	106	100	4,067	90	100	75	400	370	27	407	451
Sub-continent	F	3,427	105	100	4,518	107	100	74	1,009	983	22	798	734
Caribbean	M	3,190	79	100	673	78	100	19	175	224	4	309	397
Commonwealth	F	1,944	105	100	784	84	100	5	112	106	1	164	189
African	M	1,394	109	100	220	76	100	17	516	459	1	244	307
Commonwealth	F	652	114	100	173	71	100	8	557	483	–	–	–
Mediterranean	M	1,144	87	100	809	86	100	1	29	34	1	72	83
Commonwealth	F	541	78	100	922	102	100	–	–	–	–	–	–
Australia	M	403	85	100	440	88	100	1	85	101	–	–	–
	F	280	83	100	806	100	100	2	276	339	–	–	–
Canada	M	1,051	96	100	599	95	100	1	38	40	–	–	–
	F	510	85	100	656	104	100	1	85	99	–	–	–
New Zealand	M	178	84	100	182	86	100	–	–	–	1	342	409
	F	119	96	100	261	91	100	–	–	–	1	599	654
France	M	244	80	100	332	90	100	1	129	161	2	414	459
	F	246	75	100	1,291	93	100	–	–	–	1	141	151
Germany	M	966	87	100	986	91	100	1	35	42	3	200	220
(East and West)	F	1,356	93	100	1,937	94	100	–	–	–	1	79	85
Italy	M	759	65	100	525	82	100	1	32	49	–	–	–
	F	657	78	100	765	90	100	–	–	–	–	–	–
Poland	M	4,123	99	100	3,830	96	100	13	127	129	7	121	126
	F	819	97	100	2,384	106	100	3	166	175	3	211	197
Spain and	M	327	70	100	189	86	100	1	79	117	2	644	742
Portugal	F	226	56	100	299	83	100	1	105	194	–	–	–
USSR	M	1,552	96	100	1,918	97	100	3	75	78	5	179	185
	F	312	95	100	1,768	112	100	–	–	–	2	218	198
Republic of	M	500	97	100	836	97	100	–	–	–	3	233	240
S. Africa	F	383	94	100	1,060	101	100	–	–	–	3	417	420
USA	M	720	89	100	659	93	100	2	98	112	1	107	113
	F	351	85	100	1,115	108	100	2	221	253	1	171	167
		(iii) **All neoplasms (ICD 140–239)**						(iv) **Malignant neoplasm of lip oral cavity and pharynx (ICD 140-149)**					
Scotland	M	4,465	124	106	3,150	117	108	82	133	113	62	190	177
	F	3,092	116	98	2,597	121	108	31	116	98	21	90	80
All Ireland	M	5,323	123	96	3,018	115	99	154	206	160	68	216	186
	F	4,071	113	94	2,559	117	100	52	144	121	29	122	105
Indian	M	1,183	59	56	646	65	72	40	108	100	19	161	177
Sub-continent	F	939	68	66	699	102	94	27	202	193	12	162	149
Caribbean	M	744	65	83	153	78	101	17	78	101	1	43	55
Commonwealth	F	590	71	68	123	81	94	8	102	98	4	243	283
African	M	219	71	65	43	70	88	9	150	133	–	–	–
Commonwealth	F	195	83	75	25	62	80	9	409	374	–	–	–
Mediterranean	M	287	78	88	183	88	102	6	90	103	3	121	140
Commonwealth	F	204	70	91	130	87	85	1	35	45	3	187	181
Australia	M	112	82	98	76	81	96	1	43	51	1	83	96
	F	125	91	111	110	102	102	5	363	440	2	168	167
Canada	M	270	83	86	142	102	106	2	38	40	1	60	62
	F	186	78	92	134	130	120	3	123	145	4	356	332
New Zealand	M	43	72	88	32	73	88	–	–	–	–	–	–
	F	59	119	124	45	108	117	–	–	–	–	–	–
France	M	76	86	107	69	96	107	2	128	159	1	110	123
	F	121	88	117	177	98	106	2	147	196	1	50	54
Germany	M	253	78	91	182	82	89	4	71	84	2	73	80
(East and West)	F	645	102	110	335	106	114	9	143	155	3	87	93
Italy	M	242	74	113	106	87	104	6	97	148	2	129	155
	F	294	78	101	99	78	88	1	27	35	–	–	–
Poland	M	1,068	84	85	780	90	94	12	58	58	9	86	90
	F	287	81	85	353	99	93	3	84	87	1	26	24
Spain and	M	116	89	130	51	110	128	4	161	241	–	–	–
Portugal	F	104	58	106	35	61	73	2	117	214	1	161	194
USSR	M	392	80	83	418	101	104	7	86	89	5	99	102
	F	119	88	95	269	117	106	1	72	77	4	160	144
Republic of	M	140	94	98	189	98	101	1	40	42	2	87	90
S. Africa	F	155	94	100	203	114	114	–	–	–	1	52	52
USA	M	191	86	96	133	95	100	9	228	257	1	57	60
	F	155	93	107	140	95	92	5	300	346	2	123	120

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(v) **Malignant neoplasm of oesophagus (ICD 150)**						(vi) **Malignant neoplasm of stomach (ICD 051)**					
Scotland	M	195	153	131	105	133	124	340	111	96	246	95	88
	F	64	126	106	100	140	126	117	105	89	221	107	96
All Ireland	M	163	105	83	87	114	97	393	106	84	258	102	87
	F	99	144	120	104	145	124	198	131	110	237	114	98
Indian	M	45	64	60	20	69	77	78	48	45	42	44	49
Sub-continent	F	19	81	76	19	85	79	28	53	50	48	75	69
Caribbean	M	28	68	88	6	106	136	108	116	149	19	100	129
	F	8	61	60	1	20	24	31	106	103	14	99	115
African	M	4	41	37	2	112	141	13	60	54	5	84	106
Commonwealth	F	5	168	167	1	76	101	10	135	127	2	53	71
Mediterranean	M	2	15	17	6	99	115	11	36	41	14	70	81
Commonwealth	F	3	60	74	4	83	80	8	71	89	11	79	76
Australia	M	5	104	125	3	109	130	4	35	42	4	44	53
	F	6	234	282	4	109	110	6	106	127	11	103	103
Canada	M	6	52	54	7	174	180	17	60	62	11	82	85
	F	4	81	96	5	151	142	9	84	99	8	84	79
New Zealand	M	1	48	59	2	157	188	5	103	127	–	–	–
	F	1	115	116	4	289	312	–	–	–	2	50	54
France	M	6	190	233	–	–	–	6	81	100	5	72	81
	F	1	40	54	2	32	34	5	92	123	18	98	105
Germany	M	5	43	51	2	31	34	20	75	87	8	37	41
(East and West)	F	8	69	75	6	57	61	35	142	154	24	79	85
Italy	M	3	25	39	3	84	101	24	90	139	11	94	113
	F	5	77	99	–	–	–	16	115	147	16	130	145
Poland	M	33	72	73	17	67	70	131	118	120	92	110	115
	F	2	29	30	8	68	64	9	61	62	41	121	113
Spain and	M	3	66	97	4	297	342	14	135	198	3	67	78
Portugal	F	1	34	60	1	53	64	1	15	27	5	92	110
USSR	M	7	39	41	17	140	145	56	131	136	40	100	104
	F	5	180	192	10	128	116	4	67	71	21	93	84
Republic of	M	6	115	122	7	125	128	12	95	100	12	65	66
S. Africa	F	2	63	68	4	69	70	7	99	108	9	54	54
USA	M	5	65	73	3	74	78	10	56	62	12	89	94
	F	1	34	40	4	81	77	3	45	53	18	125	120
		(vii) **Malignant neoplasm of colon (ICD 153)**						(viii) **Malignant neoplasm of rectum & recto-sigmoid junction (ICD 154)**					
Scotland	M	254	122	104	219	118	110	186	116	99	149	111	104
	F	216	119	101	330	128	115	89	103	87	134	111	99
All Ireland	M	298	118	92	197	110	95	300	155	121	161	125	107
	F	288	117	98	292	113	97	152	130	109	131	108	93
Indian	M	66	56	52	40	59	66	37	42	39	29	60	66
Sub-continent	F	56	64	61	70	87	81	21	51	48	31	83	77
Caribbean	M	29	43	55	9	69	88	20	39	50	4	42	54
Commonwealth	F	20	40	39	9	51	59	15	64	62	8	97	113
African	M	12	68	60	4	95	121	4	31	28	1	33	42
Commonwealth	F	8	64	60	–	–	–	6	103	97	2	91	122
Mediterranean	M	13	60	68	9	64	74	12	74	83	5	49	57
Commonwealth	F	13	70	88	13	75	72	4	45	57	–	–	–
Australia	M	13	167	199	5	73	85	6	100	119	4	80	93
	F	8	87	105	14	103	104	3	68	83	5	78	79
Canada	M	24	129	135	8	85	89	13	90	94	4	59	62
	F	13	76	90	10	84	79	7	86	101	5	89	84
New Zealand	M	2	59	72	2	66	78	5	193	236	–	–	–
	F	7	219	223	5	99	107	1	66	67	2	84	92
France	M	6	118	146	3	58	65	3	76	94	3	81	90
	F	9	100	134	23	99	107	5	116	156	7	64	69
Germany	M	17	93	109	17	109	120	10	70	82	7	62	68
(East and West)	F	27	65	70	50	132	141	20	100	108	12	68	72
Italy	M	13	67	103	12	136	164	6	41	63	1	16	19
	F	12	50	65	4	26	29	12	106	136	2	28	31
Poland	M	59	82	83	51	86	89	49	86	87	45	105	109
	F	16	66	67	35	83	78	13	111	114	10	51	48
Spain	M	4	51	76	3	94	108	5	86	127	4	174	200
Portugal	F	6	54	98	2	30	35	7	134	244	1	32	38
USSR	M	14	51	52	32	111	114	12	54	56	22	106	109
	F	6	62	66	34	120	108	3	64	69	14	106	95
Republic of	M	11	128	134	12	92	95	5	76	80	5	53	55
S. Africa	F	12	105	115	19	92	92	6	111	121	8	83	83
USA	M	14	109	123	11	111	118	7	72	81	6	84	89
	F	6	62	140	19	105	100	2	39	45	7	82	78

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(ix) Malignant neoplasm of liver and intrahepatic bile ducts (ICD 155)						(x) Malignant neoplasm of gallbladder and extrahepatic bile ducts (ICD 156)					
Scotland	M	69	188	160	26	143	132	18	97	83	18	119	110
	F	21	130	109	16	113	101	21	108	91	18	70	62
All Ireland	M	67	152	118	23	129	110	29	129	101	17	116	99
	F	18	82	68	21	145	124	32	121	102	41	155	132
Indian	M	36	170	158	9	135	148	17	166	154	3	54	60
Sub-continent	F	9	104	100	6	133	123	28	309	289	18	217	200
Caribbean	M	39	317	406	4	297	384	7	118	152	2	184	236
Commonwealth	F	5	98	92	1	100	116	12	235	228	1	55	63
African	M	19	552	494	–	–	–	1	69	61	–	–	–
Commonwealth	F	2	118	102	1	375	481	1	85	83	1	204	260
Mediterranean	M	10	259	298	3	213	246	2	106	119	1	86	100
Commonwealth	F	2	109	142	–	–	–	4	206	258	3	166	160
Australia	M	3	218	259	–	–	–	1	144	172	–	–	–
	F	–	–	–	–	–	–	–	–	–	2	159	160
Canada	M	4	126	131	2	209	217	1	59	62	–	–	–
	F	1	68	80	–	–	–	2	107	126	–	–	–
New Zealand	M	–	–	–	–	–	–	–	–	–	–	–	–
	F	–	–	–	–	–	–	–	–	–	–	–	–
France	M	2	216	272	–	–	–	–	–	–	–	–	–
	F	2	238	313	3	255	275	–	–	–	1	47	51
Germany	M	3	89	104	1	67	73	3	182	214	2	160	175
(East and West)	F	6	161	173	3	145	155	7	156	169	3	79	85
Italy	M	9	256	391	1	123	148	–	–	–	2	291	353
	F	4	180	232	2	239	270	4	157	204	7	457	516
Poland	M	25	196	199	10	171	178	4	61	61	8	165	172
	F	2	96	99	6	256	240	5	187	193	11	255	239
Spain and	M	3	214	317	1	322	372	–	–	–	–	–	–
Portugal	F	–	–	–	–	–	–	–	–	–	–	–	–
USSR	M	6	120	125	6	215	223	4	157	163	3	129	133
	F	–	–	–	2	132	120	2	188	201	4	144	132
Republic of	M	–	–	–	2	153	157	1	131	137	1	93	95
S. Africa	F	–	–	–	1	85	85	–	–	–	3	138	139
USA	M	3	130	147	1	107	112	–	–	–	–	–	–
	F	3	279	327	2	208	203	–	–	–	2	114	112
		(xi) Malignant neoplasm of pancreas (ICD 157)						(xii) Malignant neoplasm of larynx (ICD 161)					
Scotland	M	191	116	99	123	110	102	48	133	113	25	112	103
	F	118	127	107	126	108	96	7	83	70	10	171	152
All Ireland	M	239	120	94	137	126	108	63	143	113	25	115	98
	F	156	124	104	136	114	97	17	151	127	8	132	112
Indian	M	76	84	78	39	96	105	16	80	74	10	122	135
Sub-continent	F	38	89	83	45	121	111	2	52	49	–	–	–
Caribbean	M	41	77	100	4	49	63	1	8	11	1	62	79
Commonwealth	F	12	51	49	10	121	141	1	46	45	–	–	–
African	M	8	62	56	2	78	99	1	37	33	2	387	493
Commonwealth	F	4	71	69	2	91	118	–	–	–	–	–	–
Mediterranean	M	12	72	81	7	81	94	2	55	62	2	116	134
Commonwealth	F	8	87	108	6	74	72	–	–	–	–	–	–
Australia	M	4	65	78	6	154	183	–	–	–	2	254	301
	F	2	42	51	9	154	154	–	–	–	–	–	–
Canada	M	11	74	78	7	121	125	3	92	97	3	260	270
	F	5	56	66	6	108	100	–	–	–	1	341	314
New Zealand	M	3	113	139	3	166	198	1	172	211	–	–	–
	F	2	124	125	5	220	238	–	–	–	–	–	–
France	M	7	173	213	3	101	112	–	–	–	1	165	184
	F	6	133	178	8	81	87	2	484	651	–	–	–
Germany	M	14	96	113	14	151	166	–	–	–	2	107	118
(East and West)	F	22	105	114	14	81	87	–	–	–	1	117	124
Italy	M	8	53	81	4	79	95	2	60	92	–	–	–
	F	11	94	120	5	72	81	–	–	–	–	–	–
Poland	M	58	99	101	42	117	122	13	98	100	3	42	43
	F	17	135	138	24	124	116	–	–	–	–	–	–
Spain and	M	4	67	100	2	104	121	2	155	231	1	258	300
Portugal	F	6	112	201	4	128	154	–	–	–	–	–	–
USSR	M	17	75	78	19	111	114	2	39	40	7	202	209
	F	13	256	273	20	158	144	–	–	–	2	326	297
Republic of	M	12	179	188	9	113	116	3	205	216	–	–	–
S. Africa	F	6	102	112	18	185	186	1	196	215	2	400	404
USA	M	9	91	102	6	103	109	2	93	103	3	256	271
	F	4	74	86	7	87	85	1	212	250	–	–	–

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xiii) Malignant neoplasm of trachea, bronchus and lung (ICD 162)						**(xiv) Malignant melanoma of skin (ICD 172)**					
Scotland	M	187	131	113	1,225	124	115	41	130	105	8	117	108
	F	669	157	133	415	160	142	31	104	88	9	89	80
All Ireland	M	2,195	126	100	1,105	114	97	40	106	78	9	134	113
	F	798	139	117	452	166	141	36	90	75	19	184	157
Indian Sub-continent	M	346	47	44	197	54	60	7	29	26	2	80	87
	F	74	38	35	80	93	85	6	31	32	6	186	171
Caribbean Commonwealth	M	151	35	45	27	37	47	3	22	27	–	–	–
	F	36	32	32	8	42	48	6	49	45	1	139	161
African Commonwealth	M	37	39	36	13	58	72	2	32	28	–	–	–
	F	19	75	74	2	39	47	1	20	16	–	–	–
Mediterranean Commonwealth	M	113	81	91	61	79	92	1	23	29	1	186	218
	F	16	38	48	16	85	82	3	76	104	–	–	–
Australia	M	26	49	58	21	66	80	3	237	286	–	–	–
	F	21	98	119	10	84	83	9	540	657	–	–	–
Canada	M	94	70	73	54	105	108	4	187	195	1	273	283
	F	23	57	68	20	150	137	–	–	–	–	–	–
New Zealand	M	9	39	49	9	57	70	1	157	180	–	–	–
	F	3	41	42	4	80	88	3	427	484	–	–	–
France	M	24	68	84	18	72	80	–	–	–	–	–	–
	F	11	52	71	17	89	96	4	233	300	1	121	129
Germany (East and West)	M	75	58	69	47	59	64	2	69	77	2	359	394
	F	80	80	87	39	103	110	8	111	117	1	68	72
Italy	M	86	69	108	36	85	102	4	100	149	–	–	–
	F	25	45	58	13	86	99	5	107	138	–	–	–
Poland	M	360	67	68	240	76	79	13	173	173	3	136	142
	F	27	46	48	34	78	73	3	86	91	1	60	56
Spain and Portugal	M	42	89	130	16	95	110	3	163	236	–	–	–
	F	6	24	43	5	70	85	1	40	75	–	–	–
USSR	M	130	63	66	135	90	93	3	100	104	–	–	–
	F	16	69	74	27	101	93	1	84	88	1	93	85
Republic of S. Africa	M	44	75	79	73	102	105	5	360	360	1	203	207
	F	24	91	100	30	131	132	2	107	108	–	–	–
USA	M	69	84	92	44	90	94	2	73	91	–	–	–
	F	20	82	95	20	117	118	3	128	145	–	–	–
		(xv) Malignant neoplasm of female breast (ICD 174)						**(xvi) Malignant neoplasm of cervix uteri (ICD 180)**					
Scotland	F	696	103	86	370	108	96	179	137	115	62	146	129
All Ireland	F	934	100	83	312	89	76	201	115	95	55	124	106
Indian Sub-continent	F	267	71	70	102	93	86	52	66	67	20	143	131
Caribbean Commonwealth	F	191	78	74	18	74	86	55	112	105	4	129	148
African Commonwealth	F	52	77	71	7	109	138	7	38	32	–	–	–
Mediterranean Commonwealth	F	57	72	96	15	63	61	18	111	150	3	99	96
Australia	F	23	66	81	18	104	104	4	57	69	2	99	97
Canada	F	56	100	116	25	150	139	6	58	68	2	93	85
New Zealand	F	19	150	158	7	104	114	4	142	158	–	–	–
France	F	27	74	99	34	119	128	7	97	126	2	61	65
Germany (East and West)	F	143	84	91	53	105	113	57	183	194	10	160	171
Italy	F	88	82	108	13	64	72	16	81	104	2	80	91
Poland	F	68	76	80	48	85	80	14	88	93	7	99	93
Spain and Portugal	F	27	53	97	9	98	119	9	88	166	–	–	–
USSR	F	23	71	76	36	99	89	8	141	150	4	90	82
Republic of S. Africa	F	37	89	95	36	127	127	7	86	89	2	54	55
USA	F	47	108	124	14	59	58	6	63	72	2	70	69

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xvii) Malignant neoplasm of body of uterus (ICD 182)						(xviii) Malignant neoplasm of ovary and other uterine adnexa (ICD 183)					
Scotland	F	41	95	80	41	103	92	209	97	82	117	127	112
All Ireland	F	48	83	69	38	93	79	255	87	72	97	100	85
Indian Sub-continent	F	15	76	71	6	47	43	60	53	52	40	131	119
Caribbean Commonwealth	F	12	108	106	3	105	122	35	49	47	5	73	84
African Commonwealth	F	2	79	77	1	132	167	11	58	54	—	—	—
Mediterranean Commonwealth	F	5	118	148	3	107	104	16	66	88	7	105	102
Australia	F	1	46	56	—	—	—	12	110	134	1	23	23
Canada	F	3	73	87	4	205	189	17	92	107	11	234	214
New Zealand	F	—	—	—	1	129	141	4	102	107	2	113	123
France	F	2	95	128	3	93	101	6	53	70	11	159	171
Germany (East and West)	F	5	51	55	8	137	147	72	134	145	17	125	134
Italy	F	6	109	139	1	43	48	26	79	104	6	111	127
Poland	F	2	34	35	6	91	85	38	131	138	14	90	84
Spain and Portugal	F	2	80	143	—	—	—	10	66	120	—	—	—
USSR	F	2	85	91	6	143	130	14	129	140	10	104	96
Republic of S. Africa	F	1	37	41	3	89	90	15	114	123	7	86	87
USA	F	6	242	284	2	74	73	15	113	130	9	147	148
		(xix) Malignant neoplasm of prostate (ICD 185)						(xx) Malignant neoplasm of lymphatic & haematopoietic tissue (ICD 200–208)					
Scotland	M	118	91	80	339	116	108	245	104	86	132	101	94
	F							135	93	78	146	113	101
All Ireland	M	200	130	104	326	117	102	279	100	76	144	114	97
	F							210	109	91	142	107	91
Indian Sub-continent	M	35	62	59	85	80	89	153	98	92	44	92	102
	F							83	100	97	57	137	127
Caribbean Commonwealth	M	54	175	222	36	181	231	116	135	165	18	191	245
	F							69	143	133	13	142	164
African Commonwealth	M	6	101	96	8	122	155	40	104	96	—	—	—
	F							26	131	106	1	41	53
Mediterranean Commonwealth	M	11	97	105	22	101	116	30	105	126	9	90	104
	F							16	93	122	16	177	171
Australia	M	6	126	148	15	129	147	13	136	158	4	86	102
	F							7	87	105	6	94	94
Canada	M	13	98	101	12	83	88	22	115	119	8	119	124
	F							9	70	83	8	129	119
New Zealand	M	2	102	128	5	104	120	4	86	99	3	141	168
	F							3	91	101	5	200	216
France	M	2	69	85	15	177	196	8	131	171	6	170	189
	F							6	76	99	13	121	130
Germany (East and West)	M	11	104	119	20	80	88	31	140	156	23	211	232
	F							38	113	120	21	110	118
Italy	M	7	77	122	12	82	99	26	103	155	4	67	80
	F							23	116	147	8	104	117
Poland	M	35	70	72	71	76	79	86	116	117	59	141	147
	F							21	117	121	22	102	96
Spain and Portugal	M	2	59	81	7	138	158	10	92	128	2	89	103
	F							12	118	214	1	29	35
USSR	M	21	114	118	30	65	67	31	116	120	30	149	154
	F							9	133	140	17	122	111
Republic of S. Africa	M	7	129	136	23	113	117	15	146	146	13	140	144
	F							12	130	133	18	166	167
USA	M	7	101	110	20	124	132	24	130	151	6	88	93
	F							8	75	89	4	45	44

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xxi) Diabetes mellitus (ICD 250)						(xxii) Diseases of blood and blood forming organs (ICD 280–289)					
Scotland	M	63	75	64	80	91	85	16	74	63	28	98	92
	F	42	66	56	103	81	72	23	120	102	61	125	112
All Ireland	M	93	92	71	56	66	57	24	94	73	43	160	140
	F	47	55	46	87	68	58	26	102	85	52	109	95
Indian	M	148	297	276	53	165	183	11	85	81	12	118	131
Sub-continent	F	93	103	283	61	153	142	16	136	148	25	173	161
Caribbean	M	82	292	366	15	242	310	19	268	327	–	–	–
Commonwealth	F	71	424	410	28	320	371	8	138	131	–	–	–
African	M	20	219	196	3	150	191	4	139	130	–	–	–
Commonwealth	F	8	161	144	1	43	57	8	356	292	–	–	–
Mediterranean	M	10	109	126	14	210	241	–	–	–	–	–	–
Commonwealth	F	11	168	210	17	197	189	1	46	60	5	162	158
Australia	M	4	125	148	2	61	72	–	–	–	1	81	91
	F	3	90	108	6	92	93	–	–	–	3	105	106
Canada	M	7	96	100	7	158	165	6	316	325	3	214	227
	F	6	96	114	4	68	64	1	56	66	–	–	–
New Zealand	M	–	–	–	2	139	164	–	–	–	1	204	234
	F	1	84	85	2	81	87	–	–	–	–	–	–
France	M	1	49	61	3	123	137	–	–	–	1	113	126
	F	1	32	43	10	89	96	1	100	132	5	100	109
Germany	M	5	67	78	7	95	104	3	154	171	1	40	44
(East and West)	F	12	87	94	20	106	114	3	70	75	5	70	74
Italy	M	4	49	75	5	120	145	3	145	221	3	195	237
	F	11	142	181	20	263	294	2	82	103	6	203	223
Poland	M	36	131	133	28	99	104	5	73	74	7	77	80
	F	9	108	110	29	137	129	3	125	128	9	115	109
Spain and	M	3	89	129	1	66	76	–	–	–	1	199	229
Portugal	F	2	54	96	4	119	142	–	–	–	1	81	97
USSR	M	9	85	88	12	87	90	3	115	119	1	22	22
	F	6	180	188	22	157	143	–	–	–	5	90	80
Republic of	M	3	84	87	10	161	166	1	107	109	3	155	161
S. Africa	F	9	221	236	9	87	87	2	163	168	4	111	110
USA	M	4	71	82	4	85	91	1	64	71	1	59	64
	F	5	126	148	2	23	22	–	–	–	3	83	76
		(xxiii) Diseases of the nervous system and sense organs (ICD 320–389)						(xxiv) Multiple sclerosis (ICD 340)					
Scotland	M	141	94	78	132	106	99	24	95	78	5	155	142
	F	124	108	91	170	116	104	38	107	90	5	85	74
All Ireland	M	200	114	86	129	109	94	32	105	78	4	124	105
	F	168	110	92	161	110	95	46	96	79	9	140	118
Indian	M	71	69	65	49	109	120	5	28	25	–	–	–
Sub-continent	F	29	42	41	42	93	87	7	32	33	–	–	–
Caribbean	M	50	90	108	6	70	89	2	19	24	–	–	–
Commonwealth	F	38	94	87	10	100	118	3	21	20	–	–	–
African	M	24	86	80	1	35	45	2	50	44	–	–	–
Commonwealth	F	17	96	77	2	76	104	–	–	–	–	–	–
Mediterranean	M	15	79	97	10	107	123	1	31	38	–	–	–
Commonwealth	F	7	49	66	11	113	110	3	67	91	–	–	–
Australia	M	10	161	185	6	124	143	2	204	249	–	–	–
	F	6	92	112	8	101	101	4	210	256	–	–	–
Canada	M	13	110	112	7	113	119	3	165	174	–	–	–
	F	10	102	120	8	119	113	4	146	171	1	299	268
New Zealand	M	5	161	184	4	194	227	1	214	248	–	–	–
	F	5	182	204	4	137	149	1	131	146	–	–	–
France	M	1	25	34	1	28	31	–	–	–	–	–	–
	F	4	63	80	13	95	103	1	50	65	–	–	–
Germany	M	15	105	115	10	94	103	5	213	249	1	389	428
(East and West)	F	25	94	99	27	125	134	6	68	73	4	464	493
Italy	M	9	55	82	6	98	118	–	–	–	–	–	–
	F	8	50	63	6	68	76	1	18	23	–	–	–
Poland	M	31	74	75	41	103	107	6	86	87	–	–	–
	F	7	51	53	22	92	87	3	69	73	–	–	–
Spain and	M	1	14	19	7	324	372	–	–	–	–	–	–
Portugal	F	2	24	43	3	79	94	–	–	–	–	–	–
USSR	M	10	62	64	14	71	74	2	71	74	–	–	–
	F	2	39	42	21	129	116	–	–	–	–	–	–
Republic of	M	6	91	89	13	150	155	–	–	–	1	421	429
S. Africa	F	4	55	55	17	148	148	–	–	–	1	178	182
USA	M	5	40	46	1	15	16	2	103	126	–	–	–
	F	5	57	67	14	134	127	2	77	88	–	–	–

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xxv) Diseases of the circulatory system (ICD 390–459)						(xxvi) Chronic rheumatic heart disease (ICD 393–398)					
Scotland	M	6,594	109	93	6,649	105	98	54	94	79	28	108	99
	F	2,663	115	97	8,567	109	98	106	110	93	73	94	84
All Ireland	M	8,656	117	92	6,554	109	94	97	139	107	22	86	73
	F	3,685	118	99	8,539	111	97	166	127	107	95	119	102
Indian	M	4,494	133	124	2,244	99	109	25	72	66	10	105	115
Sub-continent	F	1,431	136	125	2,510	107	100	44	94	89	12	48	44
Caribbean	M	1,514	77	100	345	79	101	8	39	50	1	51	67
Commonwealth	F	783	141	137	453	87	104	16	59	57	5	90	104
African	M	618	127	114	120	82	108	5	86	77	–	–	–
Commonwealth	F	191	136	128	101	75	106	15	217	204	–	–	–
Mediterranean	M	622	100	113	423	89	103	4	64	73	4	196	231
Commonwealth	F	220	97	119	532	106	104	7	70	90	8	147	143
Australia	M	184	81	96	231	92	105	1	46	54	3	336	400
	F	86	72	87	460	102	102	1	21	25	2	52	51
Canada	M	535	97	102	290	91	96	6	122	129	2	145	150
	F	195	84	99	355	102	98	4	45	53	2	52	49
New Zealand	M	79	80	98	100	93	109	–	–	–	–	–	–
	F	33	81	80	133	83	91	1	59	60	1	66	72
France	M	103	69	85	182	98	109	1	68	85	1	144	161
	F	61	56	74	740	94	102	2	42	56	7	109	117
Germany	M	485	90	106	573	105	115	6	113	13	3	138	153
(East and West)	F	392	79	86	1,086	94	100	6	27	29	14	123	131
Italy	M	328	59	91	262	82	99	9	154	237	2	170	206
	F	212	78	100	442	93	103	8	62	80	3	65	74
Poland	M	2,335	109	110	2,130	105	110	12	61	62	7	84	88
	F	348	113	114	1,396	111	105	10	77	80	13	101	95
Spain and	M	118	54	79	80	73	84	4	171	255	–	–	–
Portugal	F	68	54	95	171	86	103	12	201	362	1	48	58
USSR	M	877	106	110	1,015	102	105	10	130	135	2	50	52
	F	134	106	111	1,013	115	102	5	98	106	10	121	110
Republic of	M	222	89	93	448	103	106	3	127	132	1	54	55
S. Africa	F	115	77	84	582	100	99	3	50	54	3	46	46
USA	M	326	89	99	336	94	101	2	54	61	–	–	–
	F	89	65	76	655	114	105	4	70	81	10	187	183
		(xxvii) Hypertensive disease (ICD 401–405)						(xxviii) Ischaemic heart disease (ICD 410–414)					
Scotland	M	90	80	69	97	92	86	4,959	111	95	3,711	104	96
	F	60	108	91	158	101	91	1,496	119	101	3,690	110	98
All Ireland	M	200	147	116	133	132	113	6,225	114	90	3,682	107	92
	F	87	115	97	205	133	115	2,023	120	100	3,530	106	91
Indian	M	87	141	131	37	97	107	3,410	136	126	1,320	102	112
Sub-continent	F	53	206	191	47	99	92	798	146	133	1,104	107	100
Caribbean	M	151	426	546	18	243	311	669	45	59	165	65	83
Commonwealth	F	101	728	707	21	201	237	214	76	75	154	68	80
African	M	29	316	282	6	250	321	400	113	100	55	67	86
Commonwealth	F	6	173	165	–	–	–	62	97	96	44	73	101
Mediterranean	M	15	131	148	5	63	73	470	102	115	258	95	110
Commonwealth	F	15	91	112	10	98	95	121	102	124	240	108	105
Australia	M	1	24	28	1	25	29	133	80	95	112	84	98
	F	4	141	168	11	129	130	40	63	75	161	88	88
Canada	M	9	88	92	7	131	137	396	99	104	152	83	87
	F	7	127	150	4	58	55	103	80	96	153	101	95
New Zealand	M	1	55	67	3	173	204	55	76	93	54	91	108
	F	–	–	–	2	65	70	10	47	46	42	63	68
France	M	1	37	46	1	34	38	79	72	88	92	92	103
	F	2	75	100	15	100	108	31	53	71	275	87	93
Germany	M	10	102	119	6	67	74	391	98	116	365	121	133
(East and West)	F	14	117	127	27	118	126	235	89	97	494	100	107
Italy	M	8	79	121	4	79	95	247	59	91	112	65	79
	F	5	75	95	9	96	106	110	78	98	168	83	92
Poland	M	43	109	111	42	125	130	1,802	114	116	1,328	116	121
	F	4	54	55	28	110	104	191	113	114	656	120	113
Spain and	M	3	74	109	–	–	–	80	49	73	49	79	92
Portugal	F	1	32	56	5	124	148	23	35	62	61	70	84
USSR	M	20	133	138	11	67	69	651	106	110	594	107	110
	F	8	266	280	23	132	118	73	104	109	446	119	107
Republic of	M	1	22	23	10	135	140	165	90	95	257	102	105
S. Africa	F	–	–	–	13	108	108	59	73	80	262	100	100
USA	M	1	15	16	8	140	149	231	86	96	170	88	94
	F	2	61	71	6	54	50	40	56	66	244	101	95

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xxix) **Other forms of heart disease (ICD 420–429)**						(xxx) **Cerebrovascular disease (ICD 430–438)**					
Scotland	M	258	94	80	555	93	88	834	105	90	1,561	109	102
	F	161	111	94	1,115	103	93	637	110	93	2,693	112	101
All Ireland	M	476	145	114	652	119	106	1,175	123	97	1,444	107	93
	F	230	118	98	1,263	124	109	922	117	98	2,621	112	97
Indian	M	170	111	104	205	100	110	645	153	143	507	99	110
Sub-continent	F	88	127	118	361	118	111	347	125	117	777	109	102
Caribbean	M	142	166	208	31	82	105	419	176	224	89	93	118
Commonwealth	F	52	142	137	55	80	99	316	210	203	174	110	132
African	M	47	171	157	11	76	111	103	163	148	38	116	153
Commonwealth	F	26	237	209	11	64	97	58	139	127	37	90	129
Mediterranean	M	19	66	76	40	93	110	84	105	118	77	73	84
	F	14	95	117	62	96	96	54	92	113	166	109	106
Australia	M	5	48	56	24	82	89	33	110	131	69	115	130
	F	7	92	110	79	113	112	28	93	111	151	108	109
Canada	M	26	105	109	26	89	96	67	90	94	78	111	117
	F	10	69	82	45	97	96	59	102	121	120	114	110
New Zealand	M	5	106	128	5	45	51	12	93	113	32	131	151
	F	2	73	74	23	98	110	12	113	113	51	104	114
France	M	2	30	38	22	106	119	12	63	79	51	117	131
	F	3	43	57	116	96	103	16	57	76	255	104	112
Germany	M	15	62	71	44	79	87	42	61	71	108	87	95
(East and West)	F	21	69	75	147	92	98	94	75	82	310	87	93
Italy	M	9	36	55	37	102	126	43	62	97	83	110	134
	F	21	125	158	73	111	121	53	76	97	151	104	114
Poland	M	81	87	88	165	87	92	290	103	105	422	93	97
	F	24	127	128	199	119	113	87	114	115	394	102	96
Spain and	M	8	79	112	4	37	43	17	62	89	21	84	97
Portugal	F	5	61	107	31	116	141	17	51	90	51	84	100
USSR	M	37	104	108	102	104	107	117	109	113	232	102	105
	F	10	130	135	136	109	95	30	97	102	290	106	94
Republic of	M	7	60	62	37	97	100	31	93	97	100	103	106
S. Africa	F	3	32	34	82	112	110	42	112	121	175	99	98
USA	M	19	107	120	28	71	80	54	112	125	95	115	124
	F	6	66	78	120	143	126	23	65	76	211	118	109
		(xxxi) **Diseases of arteries, arterioles and capillaries (ICD 440–448)**						(xxxii) **Phlebitis, thrombophlebitis, venous embolism and thrombosis (ICD 451–453)**					
Scotland	M	221	101	88	515	121	113	81	126	108	74	116	108
	F	79	121	103	613	122	110	55	90	76	113	85	76
All Ireland	M	278	107	85	476	119	103	92	119	93	51	83	72
	F	104	119	99	565	119	105	71	86	72	145	109	94
Indian	M	85	81	76	112	74	82	27	77	71	25	108	120
Sub-continent	F	26	90	81	150	105	98	43	143	134	28	69	64
Caribbean	M	62	106	134	28	98	125	37	184	235	6	134	172
Commonwealth	F	24	165	161	27	84	104	41	244	235	11	122	143
African	M	16	119	110	8	80	109	10	184	166	—	—	—
Commonwealth	F	9	230	210	8	99	150	10	201	178	1	42	58
Mediterranean	M	21	103	114	26	83	96	3	46	52	8	166	192
Commonwealth	F	7	112	135	32	106	105	7	109	138	8	91	88
Australia	M	4	49	58	16	86	97	5	207	246	1	42	48
	F	4	119	141	41	128	128	1	31	38	8	111	112
Canada	M	20	94	97	19	89	94	4	68	71	2	62	65
	F	5	74	88	20	93	91	3	51	60	2	33	31
New Zealand	M	4	117	145	4	53	61	—	—	—	1	95	112
	F	3	256	254	10	92	104	4	345	352	2	76	82
France	M	3	59	73	12	89	100	2	129	160	—	—	—
	F	1	33	44	53	95	103	5	165	218	13	104	112
Germany	M	9	49	56	32	84	93	6	107	124	8	149	163
(East and West)	F	10	75	82	61	83	88	8	59	64	23	117	125
Italy	M	7	41	64	17	73	89	2	34	53	3	98	118
	F	4	56	71	25	82	90	5	65	84	6	75	83
Poland	M	70	86	88	114	84	88	19	85	86	26	127	133
	F	12	139	140	69	89	84	12	150	154	20	92	86
Spain and	M	2	30	43	4	53	61	3	130	188	1	91	105
Portugal	F	6	179	310	12	97	117	3	82	144	3	87	103
USSR	M	25	82	85	52	76	78	8	93	97	11	110	114
	F	4	112	116	74	128	113	1	32	33	16	108	97
Republic of	M	8	88	92	31	108	112	5	187	195	8	179	185
S. Africa	F	4	94	102	30	88	86	—	—	—	9	86	86
USA	M	11	89	98	27	105	115	2	51	57	4	116	123
	F	8	206	245	45	116	104	—	—	—	10	105	99

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xxxiii) **Diseases of the respiratory system (ICD 460–519)**						(xxiv) **Pneumonia (ICD 480–486)**					
Scotland	M	1,148	113	98	2,424	101	95	411	113	98	1,392	103	97
	F	587	120	102	2,563	107	97	244	111	94	2,037	105	95
All Ireland	M	1,911	157	124	2,909	130	114	742	171	135	1,554	126	112
	F	918	140	117	2,934	129	114	363	122	102	2,260	123	109
Indian	M	455	88	84	715	85	94	201	107	102	461	99	110
Sub-continent	F	242	104	97	727	106	99	119	115	106	570	104	97
Caribbean	M	173	61	76	90	58	73	84	82	102	64	76	97
Commonwealth	F	127	101	98	99	64	79	63	116	112	87	70	87
African	M	80	105	98	33	59	81	43	145	133	15	46	67
Commonwealth	F	39	106	94	30	77	116	19	118	104	23	74	114
Mediterranean	M	56	57	64	118	67	78	26	72	81	68	71	83
Commonwealth	F	32	65	80	138	95	95	18	82	100	104	89	89
Australia	M	22	57	67	91	84	92	9	65	77	60	89	96
	F	13	51	61	146	97	96	9	78	93	122	97	96
Canada	M	103	105	109	109	93	99	27	78	81	62	95	102
	F	41	86	102	94	91	89	16	72	85	76	92	90
New Zealand	M	9	55	67	23	54	61	2	34	41	15	59	67
	F	10	110	112	47	91	103	3	73	73	37	87	99
France	M	16	66	83	52	66	74	6	70	88	39	82	92
	F	11	46	61	237	91	98	4	38	50	195	89	96
Germany	M	37	42	49	112	52	57	19	62	70	80	63	70
(East and West)	F	71	67	72	266	76	80	36	78	84	187	65	69
Italy	M	37	45	69	99	73	89	19	63	98	58	69	86
	F	34	57	73	128	88	97	18	71	90	105	89	97
Poland	M	270	73	74	559	73	77	117	91	93	359	84	88
	F	45	70	71	375	101	96	27	94	94	315	105	100
Spain and	M	24	73	103	33	77	89	13	108	151	22	90	105
Portugal	F	8	29	50	50	84	102	3	25	43	121	92	94
USSR	M	97	70	72	297	76	78	40	83	86	189	85	87
	F	15	58	61	288	105	92	11	93	97	236	105	92
Republic of	M	29	68	71	112	70	73	8	52	54	58	67	70
S. Africa	F	29	93	100	156	94	93	12	84	90	121	92	90
USA	M	43	71	79	126	85	94	22	99	111	87	97	108
	F	21	70	82	186	101	90	11	81	95	147	97	86
		(xxxv) **Influenza (ICD 487)**						(xxxvi) **Bronchitis, chronic and unspecified, emphysema and asthma (ICD 490–493)**					
Scotland	M	5	82	69	14	101	95	483	110	96	683	94	88
	F	1	23	19	25	98	89	213	128	108	302	117	105
All Ireland	M	13	182	139	18	141	125	783	150	119	923	134	116
	F	4	68	57	30	125	111	332	149	125	389	152	131
Indian	M	3	78	74	8	168	185	161	74	70	156	60	66
Sub-continent	F	5	216	205	3	42	39	70	88	82	88	112	104
Caribbean	M	3	144	173	–	–	–	58	48	61	19	38	49
Commonwealth	F	1	79	74	2	123	154	44	99	95	5	29	34
African	M	2	212	198	–	–	–	22	73	68	13	79	102
Commonwealth	F	1	202	164	–	–	–	12	94	83	4	87	119
Mediterranean	M	–	–	–	1	100	118	22	53	59	30	56	64
Commonwealth	F	1	207	263	1	66	66	11	64	81	19	112	109
Australia	M	–	–	–	1	144	154	9	55	64	20	70	81
	F	–	–	–	2	120	119	4	46	56	15	105	105
Canada	M	2	387	397	3	439	474	43	101	105	29	81	85
	F	3	726	859	1	92	91	13	82	97	8	68	64
New Zealand	M	–	–	–	1	383	433	6	85	105	4	33	39
	F	–	–	–	1	179	202	5	161	167	4	77	84
France	M	–	–	–	–	–	–	6	58	72	11	53	58
	F	–	–	–	3	104	112	4	48	64	26	106	115
Germany	M	–	–	–	2	154	169	10	26	30	25	40	44
(East and West)	F	1	108	115	7	187	199	24	63	68	38	100	107
Italy	M	1	165	248	–	–	–	12	34	53	30	83	101
	F	3	574	721	–	–	–	5	24	30	17	110	122
Poland	M	2	106	108	6	135	142	101	62	64	125	54	56
	F	1	188	191	–	–	–	13	58	60	37	89	84
Spain and	M	–	–	–	–	–	–	6	44	62	7	56	64
Portugal	F	–	–	–	2	320	389	2	20	36	7	105	126
USSR	M	–	–	–	–	–	–	44	72	75	76	66	69
	F	–	–	–	6	204	178	2	23	24	31	109	97
Republic of	M	2	751	754	2	226	233	14	77	80	35	70	72
S. Africa	F	1	354	364	5	294	287	12	115	123	18	90	90
USA	M	–	–	–	–	–	–	12	47	52	32	80	86
	F	–	–	–	1	50	44	6	59	69	22	118	111

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xxxvii) Diseases of the digestive system (ICD 520–579)						(xxxviii) Ulcer of stomach (ICD 531–533)					
Scotland	M	495	155	130	330	112	104	115	143	123	118	114	106
	F	342	158	133	534	121	109	53	136	115	151	127	114
All Ireland	M	633	163	126	373	134	116	190	196	154	135	138	119
	F	438	150	125	477	110	96	76	144	120	137	118	102
Indian	M	315	161	148	104	99	109	49	112	104	37	99	110
Sub-continent	F	116	104	100	154	117	109	22	120	112	46	130	121
Caribbean	M	106	94	120	15	75	96	24	95	122	4	57	73
Commonwealth	F	54	84	80	23	79	94	4	39	38	3	39	46
African	M	66	186	165	5	74	97	11	167	150	3	127	166
Commonwealth	F	11	56	50	4	53	74	2	78	75	2	98	140
Mediterranean	M	26	73	85	19	87	100	2	25	28	6	78	90
Commonwealth	F	14	60	76	28	99	96	1	25	32	7	92	90
Australia	M	10	82	98	7	58	66	3	100	118	3	71	81
	F	9	80	96	26	104	105	1	50	60	11	160	162
Canada	M	27	100	104	11	75	79	7	96	100	4	78	82
	F	20	100	118	19	98	93	3	79	93	8	154	148
New Zealand	M	6	109	131	2	40	47	1	77	94	1	58	67
	F	4	97	101	13	147	160	—	—	—	4	168	182
France	M	9	113	142	5	57	63	—	—	—	1	33	36
	F	4	36	48	39	90	97	1	53	70	12	99	107
Germany	M	23	80	93	24	94	103	7	99	115	5	56	61
(East and West)	F	42	85	91	69	106	114	5	57	62	18	102	110
Italy	M	26	80	123	13	86	104	4	55	85	7	132	160
	F	19	65	84	17	64	71	5	101	131	6	83	91
Poland	M	118	113	115	81	86	90	32	113	114	27	81	85
	F	31	110	113	72	101	96	6	114	117	22	115	108
Spain and	M	8	60	88	4	78	90	3	105	153	1	55	64
Portugal	F	9	64	116	14	125	149	1	44	77	3	99	118
USSR	M	36	89	93	53	113	117	11	101	105	18	109	113
	F	5	46	48	45	91	81	—	—	—	9	66	59
Republic of	M	26	194	200	24	119	123	2	60	63	11	154	160
S. Africa	F	16	117	125	32	97	96	2	81	87	10	113	112
USA	M	23	107	124	12	71	77	1	20	23	4	68	73
	F	14	101	117	40	124	115	1	43	50	12	136	126
		(xxxix) Chronic liver disease and cirrhosis (ICD 571)						(xl) Diseases of the genitourinary system (ICD 580–629)					
Scotland	M	209	216	178	28	144	132	81	88	76	229	108	101
	F	157	235	197	26	121	107	81	114	97	222	103	93
All Ireland	M	242	204	154	36	186	157	124	113	89	221	112	99
	F	180	198	165	34	150	126	114	119	100	207	99	86
Indian	M	172	255	231	9	125	137	99	197	185	77	103	115
Sub-continent	F	30	81	80	12	166	151	102	276	262	70	110	102
Caribbean	M	36	91	116	2	133	173	49	176	220	17	124	159
Commonwealth	F	12	52	49	—	—	—	44	210	199	14	99	118
African	M	31	236	204	—	—	—	19	217	197	2	40	56
Commonwealth	F	3	43	39	—	—	—	18	249	212	3	82	117
Mediterranean	M	11	93	109	3	195	227	17	180	206	23	150	174
Commonwealth	F	6	77	103	2	126	122	8	103	131	18	132	128
Australia	M	4	108	132	—	—	—	3	86	102	12	121	133
	F	6	174	212	1	104	102	3	79	95	15	121	122
Canada	M	11	150	159	1	95	98	6	72	74	9	87	93
	F	6	108	126	4	358	326	8	120	142	9	96	92
New Zealand	M	1	58	69	—	—	—	4	258	311	6	157	179
	F	2	156	166	1	242	264	—	—	—	—	—	—
France	M	3	120	151	—	—	—	1	45	57	6	85	95
	F	1	28	37	—	—	—	2	55	73	15	69	74
Germany	M	6	68	80	5	318	350	6	75	86	27	140	153
(East and West)	F	14	85	91	6	190	203	11	70	75	29	92	98
Italy	M	14	124	187	2	248	297	5	62	95	10	81	100
	F	7	69	89	3	239	275	13	143	183	8	61	68
Poland	M	39	136	138	9	144	150	25	79	81	63	93	98
	F	14	160	169	7	192	180	11	122	125	26	75	71
Spain and	M	1	21	31	1	303	353	5	150	213	5	132	152
Portugal	F	3	61	113	2	335	405	4	89	158	2	37	44
USSR	M	14	123	128	5	171	178	13	109	113	32	92	95
	F	—	—	—	1	45	42	3	85	89	21	86	77
Republic of	M	10	248	255	3	211	215	4	103	106	11	79	82
S. Africa	F	6	146	156	1	51	52	3	66	69	13	82	81
USA	M	7	100	119	1	104	108	5	86	97	18	135	149
	F	5	115	132	—	—	—	3	63	74	13	82	76

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xli) Nephritis, nephrotic syndrome and nephrosis (ICD 580–589)						(xlii) Infections of the kidney (ICD 590)					
Scotland	M	59	102	87	120	104	98	10	93	80	30	146	136
	F	44	109	92	124	93	84	20	124	104	51	120	108
All Ireland	M	89	129	100	112	105	92	14	109	85	27	141	124
	F	64	118	99	130	100	87	28	128	107	39	93	81
Indian	M	79	242	226	44	109	120	9	155	145	12	167	184
Sub-continent	F	76	372	350	40	101	95	14	164	157	16	125	117
Caribbean	M	36	199	247	10	135	172	3	93	117	1	74	95
Commonwealth	F	26	228	217	10	115	137	8	163	155	3	106	126
African	M	16	270	245	1	37	51	2	209	189	—	—	—
Commonwealth	F	10	263	224	3	132	190	4	240	206	—	—	—
Mediterranean	M	13	213	246	13	156	180	2	183	210	1	66	78
Commonwealth	F	5	116	146	10	118	115	1	56	71	5	182	177
Australia	M	3	136	161	4	75	83	—	—	—	2	209	228
	F	2	93	112	9	116	117	—	—	—	5	209	211
Canada	M	3	58	60	5	89	95	—	—	—	3	293	313
	F	7	182	216	6	104	100	1	67	78	3	159	151
New Zealand	M	2	202	243	4	196	222	1	556	678	—	—	—
	F	—	—	—	—	—	—	—	—	—	—	—	—
France	M	1	71	90	3	79	88	—	—	—	—	—	—
	F	—	—	—	7	5	55	1	120	158	5	120	130
Germany	M	5	98	112	14	134	147	—	—	—	1	53	58
(East and West)	F	8	90	97	14	71	76	2	54	58	8	128	137
Italy	M	4	76	116	6	91	111	1	106	162	1	83	102
	F	8	157	201	3	37	41	3	139	180	5	195	216
Poland	M	15	77	78	33	90	94	2	53	54	7	106	112
	F	6	116	118	17	79	75	4	193	199	6	88	83
Spain and	M	2	91	131	3	146	169	1	261	371	—	—	—
Portugal	F	2	81	143	1	30	35	1	95	168	1	92	110
USSR	M	8	107	112	18	96	99	2	140	145	1	30	31
	F	2	98	102	16	105	94	1	125	132	2	42	38
Republic of	M	2	82	84	4	52	54	1	222	228	3	222	229
S. Africa	F	2	77	82	8	81	81	1	97	101	3	93	93
USA	M	4	106	121	9	126	138	—	—	—	4	305	337
	F	—	—	—	11	111	102	1	92	107	1	32	30
		(xliii) Complications of pregnancy, childbirth and the puerperium (ICD 630–676)						(xliv) External causes of injury and poisoning (ICD E800–E999)					
Scotland	M							1,185	156	123	191	111	104
	F	8	157	139	—	—	—	465	143	121	321	119	107
All Ireland	M							1,556	190	135	233	144	125
	F	5	96	80	—	—	—	670	159	132	318	120	104
Indian	M							581	85	85	72	118	130
Sub-continent	F	20	361	359	—	—	—	266	113	113	84	104	97
Caribbean	M							352	105	114	14	120	154
Commonwealth	F	14	494	400	—	—	—	143	100	90	11	61	73
African	M							279	99	95	8	202	268
Commonwealth	F	11	354	247	—	—	—	110	136	103	6	129	179
Mediterranean	M							84	66	89	10	89	91
Commonwealth	F	1	95	137	—	—	—	34	71	99	21	121	118
Australia	M							48	128	137	6	84	94
	F	—	—	—	—	—	—	29	141	171	12	78	78
Canada	M							65	135	131	8	93	98
	F	—	—	—	—	—	—	30	118	140	13	107	102
New Zealand	M							29	130	140	7	237	275
	F	—	—	—	—	—	—	7	69	82	6	109	120
France	M							30	132	192	5	96	107
	F	1	236	251	—	—	—	35	172	217	26	98	106
Germany	M							126	147	148	26	173	190
(East and West)	F	1	95	85	—	—	—	115	148	152	51	129	137
Italy	M							81	80	115	10	111	135
	F	—	—	—	—	—	—	41	84	106	19	117	129
Poland	M							185	149	148	85	155	162
	F	—	—	—	—	—	—	62	179	189	50	116	109
Spain and	M							45	91	116	3	100	116
Portugal	F	—	—	—	—	—	—	21	75	134	7	102	122
USSR	M							99	203	208	49	179	185
	F	—	—	—	—	—	—	19	165	170	39	129	115
Republic of	M							55	148	133	9	77	80
S. Africa	F	—	—	—	—	—	—	39	186	173	18	89	88
USA	M							106	113	129	11	110	119
	F	—	—	—	—	—	—	40	131	157	24	121	112

Table 9A *(continued)* **Number of deaths, standardised mortality ratios (SMRs) and proportional mortality ratios (PMRs) for persons aged 20–69 and 70 years and over, by sex, country of birth and selected causes, 1979–83**

England and Wales

Country of birth	Sex	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over	Observed deaths 20–69	SMR 20–69	PMR 20–69	Observed deaths 70 and over	SMR 70 and over	PMR 70 and over
		(xlv)	**Accidental poisoning and late effects (ICD E890–E899)**					(xlvi)	**Accidents caused by fire and flames (ICD E890-E899)**				
Scotland	M	85	252	196	3	89	83	45	286	230	20	232	218
	F	44	222	187	4	101	89	25	245	207	24	186	168
All Ireland	M	96	272	189	1	31	27	74	410	300	23	286	250
	F	78	303	251	13	314	267	25	188	156	22	173	149
Indian	M	42	128	129	3	244	272	15	121	114	3	98	109
Sub-continent	F	12	79	80	2	153	140	15	214	214	6	154	144
Caribbean	M	24	157	165	1	426	544	16	248	287	3	532	675
Commonwealth	F	15	160	143	–	–	–	8	191	173	1	117	138
African	M	19	130	124	–	–	–	4	98	91	–	–	–
Commonwealth	F	7	132	100	–	–	–	7	313	241	–	–	–
Mediterranean	M	5	83	116	–	–	–	3	132	169	–	–	–
Commonwealth	F	3	98	139	1	349	340	1	70	95	2	238	228
Australia	M	3	169	181	–	–	–	–	–	–	1	265	296
	F	2	158	193	–	–	–	3	480	582	–	–	–
Canada	M	3	154	145	–	–	–	–	–	–	1	238	254
	F	1	69	81	–	–	–	2	243	288	1	178	169
New Zealand	M	1	90	94	1	1,818	2,143	–	–	–	–	–	–
	F	–	–	–	1	1,284	1,411	–	–	–	–	–	–
France	M	1	96	146	–	–	–	–	–	–	–	–	–
	F	3	236	292	–	–	–	1	164	207	2	162	175
Germany	M	7	176	173	1	353	387	1	64	68	–	–	–
(East and West)	F	12	252	258	3	514	549	3	127	131	3	158	169
Italy	M	6	127	181	–	–	–	1	52	75	2	430	519
	F	3	96	121	–	–	–	2	136	171	–	–	–
Poland	M	9	216	211	7	653	681	9	258	260	5	182	190
	F	3	149	160	2	301	282	3	270	282	4	190	179
Spain and	M	1	42	52	1	1,731	1,979	1	109	147	1	666	760
Portugal	F	–	–	–	–	–	–	1	120	215	–	–	–
USSR	M	2	122	124	1	190	197	1	74	77	2	144	148
	F	1	159	162	1	243	221	–	–	–	2	138	124
Republic of	M	4	231	198	–	–	–	1	137	131	–	–	–
S. Africa	F	2	157	145	1	288	292	–	–	–	2	201	200
USA	M	4	87	102	–	–	–	2	128	154	–	–	–
	F	4	207	244	–	–	–	1	109	129	–	–	–
		(xlvii)	**Homicide (ICD E960–E969)**										
Scotland	M	31	234	181	1	120	111						
	F	14	147	125	4	264	235						
All Ireland	M	51	366	254	1	124	106						
	F	25	215	178	5	319	272						
Indian	M	34	261	260	2	668	728						
Sub-continent	F	24	279	281	1	204	186						
Caribbean	M	15	242	256	–	–	–						
Commonwealth	F	26	511	445	–	–	–						
African	M	6	105	100	–	–	–						
Commonwealth	F	7	185	135	–	–	–						
Mediterranean	M	5	208	289	–	–	–						
Commonwealth	F	2	117	169	–	–	–						
Australia	M	1	147	157	–	–	–						
	F	2	286	339	–	–	–						
Canada	M	–	–	–	–	–	–						
	F	–	–	–	–	–	–						
New Zealand	M	–	–	–	–	–	–						
	F	–	–	–	–	–	–						
France	M	–	–	–	–	–	–						
	F	1	149	180	–	–	–						
Germany	M	4	264	258	–	–	–						
(East and West)	F	1	47	46	2	903	964						
Italy	M	3	159	225	–	–	–						
	F	2	144	172	–	–	–						
Poland	M	1	66	64	1	380	399						
	F	4	536	572	1	400	375						
Spain and	M	1	104	132	–	–	–						
	F	1	106	183	–	–	–						
USSR	M	–	–	–	1	791	810						
	F	2	998	935	–	–	–						
Republic of	M	1	148	131	–	–	–						
S. Africa	F	3	472	393	–	–	–						
USA	M	–	–	–	–	–	–						
	F	1	86	106	–	–	–						

Chapter 10 Perinatal, neonatal, postneonatal and infant mortality by mother's country of birth, 1982–85

Contents

Annex to Figure 10.1 Infant, perinatal, neonatal, and postneonatal mortality rates by mother's country of birth*, England and Wales 1982–85

Mother's country of birth	Infant mortality rate†		Perinatal mortality rate**		Neonatal mortality rate†		Postneonatal mortality rate**	
United Kingdom	**9.7**	**(21,515)**	**10.1**	**(22,503)**	**5.6**	**(12,438)**	**4.1**	**(9,077)**
Eire	10.1	(269)	10.4	(279)	5.9	(158)	4.1	(111)
India	10.0	(459)	12.5	(576)	6.1	(278)	3.9	(181)
Bangladesh	9.3	(145)	14.3	(225)	6.5	(101)	2.8	(44)
East Africa	9.3	(255)	12.8	(351)	6.3	(172)	3.0	(83)
West Africa	11.0	(128)	12.7	(149)	8.0	(93)	3.0	(35)
Caribbean	12.9	(274)	13.4	(288)	8.4	(179)	4.5	(95)
Pakistan	16.6	(892)	18.8	(1,022)	10.2	(549)	6.4	(343)
All countries of birth	9.8	(24,919)	10.3	(26,524)	5.7	(14,547)	4.1	(10,372)

** Observed deaths are given in parentheses.*
† Per 1000 live births.
*** Per 1000 live and stillbirths.*

Annex to Figure 10.2 Infant mortality rates by mother's age and country of birth*, England and Wales 1982–85

per 1,000 live births

Mother's country of birth	Age of mother									
	Less than 20		20–24		25–29		30–34		35–39		40 and over	
United Kingdom	**14.9**	**(3,075)**	**10.7**	**(7,346)**	**8.2**	**(6,211)**	**8.1**	**(3,365)**	**9.2**	**1,275**	**12.1**	**(243)**
Eire	17.7	(16)	15.1	(61)	9.9	(84)	7.4	(61)	9.2	(38)	10.3	(9)
India	10.9	(20)	10.9	(171)	9.4	(153)	10.1	(86)	8.6	(25)	6.8	(4)
Bangladesh	15.3	(29)	8.1	(36)	7.4	(29)	8.1	(23)	13.1	(16)	9.2	(12)
East Africa	7.2	(4)	9.1	(60)	8.7	(106)	10.1	(65)	12.4	(18)	11.9	(2)
West Africa	7.8	(2)	13.1	(32)	10.2	(47)	10.4	(30)	10.1	(12)	20.4	(5)
Caribbean	13.8	(6)	12.7	(60)	13.3	(113)	11.5	(59)	14.5	(28)	13.9	(8)
Pakistan	19.1	(61)	16.9	(288)	15.8	(289)	15.4	(151)	16.0	(52)	22.8	(51)

**Observed deaths are given in parentheses.*

Annex to Figure 10.3 Perinatal mortality rates by age and parity for mothers born in the UK and the Indian subcontinent, 1982–85

Per 1,000 live and stillbirths

Mother's country of birth	a) Mother's age					
	Less than 20	20–24	25–29	30–34	35–39	40 and over
United Kingdom	**13.1**	**10.1**	**8.8**	**9.6**	**12.2**	**17.5**
India	13.6	11.1	11.9	13.4	16.0	28.0
Bangladesh	16.8	10.0	9.6	16.7	20.9	26.9
Pakistan	19.8	16.7	17.8	18.3	23.6	35.4

Mother's country of birth	b) Parity*			
	0	1	2	3
United Kingdom	**10.5**	**7.9**	**9.4**	**12.2**
India	13.5	10.9	10.7	16.6
Bangladesh	17.0	10.0	7.4	17.3
Pakistan	21.0	15.3	17.9	19.9

**Births within marriage only.*

Annex to Figure 10.4 Percentage birthweight distribution by mother's country of birth*, England and Wales 1982–85

Mother's country of birth	All Birthweights		Birthweight (grams)				
			Less than 2500	2500–2999	3000–3499	3500–3999	4000 and over
United Kingdom	**100**	**(2,238,096)**	**6.8**	**17.8**	**38.4**	**28.0**	**9.0**
Eire	100	(26,908)	6.4	15.9	36.5	30.0	11.2
India	100	(46,225)	11.4	31.5	38.5	15.4	3.3
Bangladesh	100	(15,783)	10.4	32.2	39.6	14.6	3.2
East Africa	100	(27,509)	13.3	34.6	36.1	13.4	2.6
West Africa	100	(11,725	8.0	19.3	40.0	24.8	7.9
Caribbean	100	(21,438)	9.9	23.0	39.5	21.6	6.0
Pakistan	100	(54,459)	9.7	26.2	39.6	19.4	5.2

* *Total births in parentheses.*

Annex to Figure 10.7 Infant mortality by main causes of death and mother's country of birth*, England and Wales 1982–85

Mother's country of birth	Cause of death									
	Respiratory system (ICD460–519)		Congenital anomalies (ICD740–759)		Perinatal conditions (ICD660–778)		Sudden infant death (ICD798)		Other	
United Kingdom	**0.8**	**(1,750)**	**2.5**	**(5,559)**	**3.6**	**(8,091)**	**1.8**	**(4,031)**	**0.9**	**(2,084)**
Eire	0.7	(19)	3.0	(79)	3.7	(99)	1.9	(52)	0.7	(20)
India	0.5	(21)	3.4	(155)	3.5	(160)	1.0	(46)	1.7	(77)
Bangladesh	0.6	(10)	3.3	(52)	3.8	(60)	0.4	(6)	1.1	(17)
East Africa	0.5	(14)	2.9	(79)	4.3	(117)	0.7	(20)	0.9	(25)
West Africa	0.6	(7)	2.1	(25)	6.7	(78)	0.7	(8)	0.9	(10)
Caribbean	1.1	(24)	2.9	(62)	6.3	(134)	1.5	(32)	1.0	(22)
Pakistan	1.0	(54)	6.8	(365)	4.8	(258)	0.9	(51)	3.0	(164)
All countries of birth	**0.8**	**(1,966)**	**2.6**	**(6,627)**	**3.7**	**(9,364)**	**1.7**	**(4,425)**	**1.0**	**(2,537)**

* *Rates per 1000 live births, observed deaths in parentheses.*

Annex to Figure 10.9 Percentage contribution of selected causes of death to infant mortality by mother's country of birth*, England and Wales 1982–85

Mother's country of birth	All infant deaths	Cause of death				
		Congenital anomalies (ICD740–759)	Perinatal conditions (ICD760–779)	Sudden deaths (ICD798)	Respiratory diseases (ICD450–519)	Other
	%	%	%	%	%	%
United Kingdom	**100**	**25.8**	**37.6**	**18.7**	**8.1**	**9.7**
Eire	100	29.4	36.8	19.3	7.1	7.4
India	100	33.8	34.9	10.0	4.6	16.8
Bangladesh	100	35.9	41.4	4.1	6.9	11.7
East Africa	100	31.0	45.9	7.8	5.5	9.8
West Africa	100	19.5	60.9	6.3	5.5	7.8
Caribbean	100	22.6	48.9	11.7	8.8	8.0
Pakistan	100	40.9	28.9	5.7	6.1	18.4
All countries of birth	**100**	**26.6**	**37.6**	**17.8**	**7.9**	**10.2**

Appendix III Availability of mortality data, 1979–83

(a) Microfiche (available from OPCS, £10.00)

There are three main types of table on microfiche: those showing the populations at risk, the numbers of deaths, and death rates per million population. Each of these presents data by locality at two levels — the first for standard regions, counties and regional health authorities in England and Wales, and the second for districts within counties and metropolitan areas. Numbers of deaths are given both by locality within cause, and by cause within locality. (See List 1 at the end of this Appendix for the causes used in the main microfiche tables.) All the tables present data by age, usually in 10 year groups, with some aggregations and finer grouping under the age of five. Separate tables are given for males and females. The table layouts and numbers are given in Figure 3A.

In addition there are tables which present data for the 13 external causes of death (see List 2 in this appendix), but only for the period 1979–80 and 1982–83. These are given because of the problem with the external cause coding in 1981 due to the registrars strike (see Chapter 2, section 2.4), and are labelled Table 2.1A, 2.1B, 3.1A, etc.

In utilising the microfiche tables, readers should consult the lists of localities and causes in Appendix 1 and this appendix respectively. In addition Appendix 4 gives a comprehensive index to the tables, both by locality and by cause. Thus for any given locality, or any given cause the index shows where the relevant data may be found on the microfiche frames for each of the table types. A broad summary of the table and microfiche numbers is given in the table below.

The published microfiche tables are available from Information Branch (publications), OPCS, Room 501, St Catherines House, 10 Kingsway, London WC2B 6JP.

(b) Unpublished data

(i) **Five-year age-groups.** Reference tables have been produced for those users who wish to examine the data by five-year age-groups. The data are spread across two frames of microfiche to accommodate the 21 age-groups, i.e. under 1, 1–4, 5–9, ... 90–94, 95 and over. The data are presented for both county and county district level. There are separate tables for males and females, and material is available for the populations at risk, the deaths in the 1979–83 period, and the associated death rates. Further tables present the expected number of deaths and the ratios of observed deaths to expected. These tables are identified as follows:

Ref table 0 (a, b) — Populations at risk
Ref table 1 (a, b) — Deaths in the period 1979–83
Ref table 2 (a, b) — Death rates per million population
Ref table 3 (a, b) — Expected number of deaths
Ref table 4 (a, b) — Ratio of observed to expected deaths

(ii) **Cause.** The causes of death selected for the published microfiche are based on the number of deaths occurring in the data period. However, there are other causes of interest, which did not justify inclusion in the published tables. List 3 in this Appendix shows a supplementary list of causes for which additional tables have been produced. These tables are available in the format of the published tables with 10 year age-groups, and also the unpublished tables with five-year age-groups.

Readers should consult the Medical Statistics Unit of OPCS for further details.

FIGURE 3A Layouts of Microfiche Tables

Table 1A	(males)	Average numbers of live births 1979–83	Standard regions, Districts and Regional Health Authorities of England and Wales
Table 1B	(females)	Population numbers at 1981 Census for ages 1+	

			Age group											
Area	Annual Average Live births (Age 0)	All Ages Over One	1–4	5–14	Total Aged 15–64	15–24	25–34	35–44	45–54	55–64	Total Aged 65 & over	65–74	75–84	85–94	95 & over

Table 2A	(males)	Numbers of deaths 1979–83 and	Standard regions, Counties and Regional Health Authorities of England and Wales
Table 2B	(females)	Standardised Mortality Ratios (SMRs)	
Table 3A	(males)	Numbers of deaths 1979–82 and	Districts in England and Wales
Table 3B	(females)	Standardised Mortality Ratios (SMRs)	
Table 4A	(males)	Death rates per million population	Standard regions, Counties and Regional Health Authorities of England and Wales
Table 4B	(females)	and Standardised Mortality Ratios (SMRs)	
Table 5A	(males)	Death rates per million population	Districts in England and Wales
Table 5B	(females)	and Standardised Mortality Ratios (SMRs)	

				Age group											
Area Within Each of 88 Cause Groups	All Ages OBS SMR	15–64 OBS SMR	65 & over OBS SMR	Under 1	1–4	5–14	15–24	25–34	35–44	45–54	55–64	65–74	75–84	85–94	95 & over

Table 6A	(males)	Numbers of deaths 1979–83 and	Standard regions, Counties, Districts and Regional Health Authorities of England and Wales
Table 6B	(females)	Standardised Mortality Ratios (SMRs)	

				Age group											
Area Within Each of 88 Cause Groups	All Ages OBS SMR	15–64 OBS SMR	65 & over OBS SMR	Under 1	1–4	5–14	15–24	25–34	35–44	45–54	55–64	65–74	75–84	85–94	95 & over

Cause of death lists

List 1: Main Causes

Chapter	ICD 9th Revision category	Cause of death
	000–999	**All causes**
I	**001–139**	**Infectious and parasitic diseases**
	010–018, 137	All tuberculosis, with late effects
	010–012, 137.0	Respiratory tuberculosis and late effects of respiratory or unspecified tuberculosis
II	**140–239**	**All neoplasms**
	140–208	Malignant neoplasms
	140–149	Malignant neoplasm of lip, oral cavity and pharynx
	150	Malignant neoplasm of oesophagus
	151	Malignant neoplasm of stomach
	153	Malignant neoplasm of colon
	154	Malignant neoplasm of rectum, rectosigmoid junction and anus
	157	Malignant neoplasm of pancreas
	161	Malignant neoplasm of larynx
	162	Malignant neoplasm of trachea, bronchus and lung
	172	Malignant melanoma of skin
	173	Other malignant neoplasm of skin
	174	Malignant neoplasm of female breast

List 1: Main Causes — *continued*

Chapter	ICD 9th Revision category	Cause of death
	179–182	Malignant neoplasm of uterus (F only)
	180	Malignant neoplasm of cervix uteri (F only)
	182	Malignant neoplasm of body of uterus (F only)
	183	Malignant neoplasm of ovary and other uterine adnexa (F only)
	185	Malignant neoplasm of prostate (M only)
	188	Malignant neoplasm of bladder
	189	Malignant neoplasm of kidney and other and unspecified urinary organs
	191	Malignant neoplasm of brain
	200–208	Malignant neoplasm of lymphatic and haematopoietic tissue
	204–208	Leukaemia
	210–229	Benign neoplasms
III	**240–279**	**Endocrine, nutritional and metobolic diseases and immunity disorders**
	250	Diabetes mellitus
IV	**280–289**	**Diseases of blood-forming organs**
	280–285	Anaemias
V	**290–319**	**Mental disorders**
	290	Senile and presenile organic psychotic conditions
VI	**320–389**	**Diseases of the nervous system and sense organs**
	332	Parkinson's disease
	340	Multiple sclerosis
VII	**390–459**	**Diseases of the circulatory system**
	393–398	Chronic rheumatic heart disease
	401–405	Hypertensive disease
	410–414	Ischaemic heart disease
	410	Acute myocardial infarction
	415.1	Pulmonary embolism
	416	Chronic pulmonary heart disease
	420–429	Other forms of heart disease
	428.0	Congestive heart failure
	430–438	Cerebrovascular disease
	430	Subarachnoid haemorrhage
	431–438	Cerebrovascular disease, excluding subarachnoid haemorrhage
	440–448	Diseases of arteries, arterioples and capillaries
	441	Aortic aneurysm
	451–453	Phlebitis, thrombophlebitis, venous embolism and thrombosis
VIII	**460–519**	**Diseases of the respiratory system**
	480–486	Pneumonia
	481	Pneumococcal pneumonia
	485	Bronchopneumonia
	487	Influenza
	490–493	Bronchitis, chronic and unspecified, emphyseam and asthma
	491	Chronic bronchitis
	493	Asthma
	496	Chronic airways obstruction, nec
	500–508	Pneumoconioses and other lung disease due to external agents
IX	**520–579**	**Diseases of the digestive system**
	531–533	Ulcer of stomach and duodenum
	531	Gastric ulcer
	532	Duodenal ulcer
	550–553	Hernia of abdominal cavity
	560	Intestinal obstruction without mention of hernia
	562	Diverticula of intestine
	571	Chronic liver disease and cirrhosis
X	**580–629**	**Diseases of genitourinary system**
	580–589	Nephritis, nephrotic syndrome and nephrosis
	590	Infections of kidney
	600	Hyperplasia of prostate (M only)
XI	**630–676**	**Complications of pregnancy, childbirth and the puerperium (F only)**
XII	**680–709**	**Diseases of skin and subcutaneous tissue**
XIII	**710–739**	**Diseases of the musculoskeletal system and connective tissue**
	714	Rheumatoid arthritis, except spine
	715	Osteoarthrosis and allied disorders
XIV	**740–759**	**Congenital anomalies**
	741	Spina bifida
	745–746	Congenital anomalies of heart

List 1: Main Causes — *continued*

Chapter	ICD 9th Revision category	Cause of death
XV	**760–779**	**Certain conditions originating in the perinatal period**
	761–763, 767	Obstetric complications affecting fetus or newborn and birth trauma
	764, 765	Slow fetal growth, fetal malnutrition and immaturity
	768–770	Hypoxia, birth asphyxia and other respiratory conditions
XVI	**780–799**	**Signs, symptoms and ill-defined conditions**
	798.0	Sudden infant deaths syndrome
XVII	**800–999**	**Injury and poisoning**

List 2: External causes — supplementary classification

Chapter	ICD 9th Revision category	Cause of death
E XVII	**E800–E999**	**External causes of injury and poisoning**
	E800–E848, E929.0 & .1	Transport accidents and late effects
	E810–E825, E929.0	Motor vehicle accidents and late effects
	E850–E869, E929.2	Accidental poisoning and late effects,
	E950–E959, E980–E989	suicide and self-inflicted injury, and injury undetermined whether accidentally or purposely inflicted
	E880–E888, E929.3	Accidental falls and late effects
	E950–E959	Suicide and self-inflicted injury
	E960–E969	Homicide and injury purposely inflicted by other persons

List 3: Supplementary causes

Chapter	ICD 9th Revision category	Cause of death
		All causes
	013–018, 137.1–137.4	Other tuberculosis and late effects
	150–159	MN of digestive organs and peritoneum
	152	MN of small intestine (inc. duodenum)
	155	MN of liver, etc
	156	MN of gallbladder and extra hepatic bile ducts
	201	Hodgkin's disease
	230–234	Carcinoma in situ
	235–239	Neoplasms of uncertain behaviour and unspecified nature
	240–246	Disorders of thyroid gland
	733	Other disorders of bone and cartilage
	740–742	Congenital anomalies of central nervous system
	E800–E807	
	E826–E848 E929.1	Other transport accidents and late effects
	E890–899	Accidents caused by fire and flames
	E910	Accidental drowning
XVII	**800–899**	**Injury and poisoning**
	800–804	Fracture of skull and face
	805–809	Fracture of neck and trunk
	820–829	Fracture of lower limb
	850–854	Intracranial injury, excluding those with skull fracture
	860–869	Internal injury of chest, abdomen and pelvis
	940–949	Burns
	960–979	Poisoning by drugs, medicaments and biological substances
	980–989	Substances chiefly non-medicinal
	994.1	Drowning and non-fatal submersion
	994.7	Asphyxiation and strangulation

Appendix IV Index to microfiche tables of mortality data 1979–83

Index A by area

Area	Table number					
	1A	1B	6A	6B	6.1A	6.1B
England, Wales and elsewhere	1 B01	1 G02	42 B01	52 B01	50 B01	60 B01
England	1 B01	1 G02	42 E01	52 E01	50 B01	60 B01
Standard regions, metropolitan counties and counties						
North	1 B01	1 G02	42 H01	52 H01	50 C01	60 C01
Tyne & Wear	1 B01	1 G02	42 K01	52 K01	50 C01	60 C01
Cleveland	1 B01	1 G02	42 B02	52 B02	50 D01	60 D01
Cumbria	1 B01	1 G02	42 E02	52 E02	50 D01	60 D01
Durham	1 B01	1 G02	42 H02	52 H02	50 E01	60 E01
Northumberland	1 B01	1 G02	42 K02	52 K02	50 E01	60 E01
Yorkshire and Humberside	1 B01	1 G02	42 B03	52 B03	50 F01	60 F01
South Yorkshire	1 B01	1 G02	42 E03	52 E03	50 F01	60 F01
West Yorkshire	1 B01	1 G02	42 H03	52 H03	50 G01	60 G01
Humberside	1 B01	1 G02	42 K03	52 K03	50 G01	60 G01
North Yorkshire	1 B01	1 G02	42 B04	52 B04	50 H01	60 H01
East Midlands	1 B01	1 G02	42 E04	52 E04	50 H01	60 H01
Derbyshire	1 B01	1 G02	42 H04	52 H04	50 I01	60 I01
Leicestershire	1 B01	1 G02	42 K04	52 K04	50 I01	60 I01
Lincolnshire	1 B01	1 G02	42 B05	52 B05	50 J01	60 J01
Northamptonshire	1 B01	1 G02	42 E05	52 E05	50 J01	60 J01
Nottinghamshire	1 B01	1 G02	42 H05	52 H05	50 K01	60 K01
East Anglia	1 B01	1 G02	42 K05	52 K05	50 K01	60 K01
Cambridgeshire	1 B01	1 G02	42 B06	52 B06	50 L01	60 L01
Norfolk	1 B01	1 G02	42 E06	52 E06	50 L01	60 L01
Suffolk	1 B01	1 G02	42 H06	52 H06	50 M01	60 M01
South East	1 C01	1 H02	42 K06	52 K06	50 M01	60 M01
Greater London	1 C01	1 H02	42 B07	52 B07	50 B02	60 B02
Inner London	1 C01	1 H02	42 E07	52 E07	50 B02	60 B02
Outer London	1 C01	1 H02	42 H07	52 H07	50 C02	60 C02
Bedfordshire	1 C01	1 H02	42 K07	52 K07	50 C02	60 C02
Berkshire	1 C01	1 H02	42 B08	52 B08	50 D02	60 D02
Buckinghamshire	1 C01	1 H02	42 E08	52 E08	50 D02	60 D02
East Sussex	1 C01	1 H02	42 H08	52 H08	50 E02	60 E02
Essex	1 C01	1 H02	42 K08	52 K08	50 E02	60 E02
Hampshire	1 C01	1 H02	42 B09	52 B09	50 F02	60 F02
Hertfordshire	1 C01	1 H02	42 E09	52 E09	50 F02	60 F02
Isle of Wight	1 C01	1 H02	42 H09	52 H09	50 G02	60 G02
Kent	1 C01	1 H02	42 K09	52 K09	50 G02	60 G02
Oxfordshire	1 C01	1 H02	42 B10	52 B10	50 H02	60 H02
Surrey	1 C01	1 H02	42 E10	52 E10	50 H02	60 H02
West Sussex	1 C01	1 H02	42 H10	52 H10	50 I02	60 I02
South West	1 C01	1 H02	42 K10	52 K10	50 I02	60 I02
Avon	1 C01	1 H02	42 B11	52 B11	50 J02	60 J02
Cornwall and Scilly Isles	1 C01	1 H02	42 E11	52 E11	50 J02	60 J02
Devon	1 C01	1 H02	42 H11	52 H11	50 K02	60 K02
Dorset	1 C01	1 H02	42 K11	52 K11	50 K02	60 K02
Gloucestershire	1 C01	1 H02	42 B12	52 B12	50 L02	60 L02
Somerset	1 C01	1 H02	42 E12	52 E12	50 L02	60 L02
Wiltshire	1 C01	1 H02	42 H12	52 H12	50 M02	60 M02
West Midlands	1 C01	1 H02	42 K12	52 K12	50 M02	60 M02
West Midlands	1 C01	1 H02	42 B13	52 B13	50 B03	60 B03
Hereford and Worcester	1 C01	1 H02	42 E13	52 E13	50 B03	60 B03
Shropshire	1 C01	1 H02	42 H13	52 H13	50 C03	60 C03
Staffordshire	1 C01	1 H02	42 K13	52 K13	50 C03	60 C03
Warwickshire	1 C01	1 H02	42 B14	52 B14	50 D03	60 D03

Area	Table number					
	1A	1B	6A	6B	6.1A	6.1B
North West	1 D01	1 I02	42 E14	52 E14	50 D03	60 D03
Greater Manchester	1 D01	1 I02	42 H14	52 H14	50 E03	60 E03
Merseyside	1 D01	1 I02	42 K14	52 K14	50 E03	60 E03
Cheshire	1 D01	1 I02	42 B15	52 B15	50 F03	60 F03
Lancashire	1 D01	1 I02	42 E15	52 E15	50 F03	60 F03
Wales	1 D01	1 I02	42 H15	52 H15	50 G03	60 G03
Clwyd	1 D01	1 I02	42 K15	52 K15	50 G03	60 G03
Dyfed	1 D01	1 I02	42 B16	52 B16	50 H03	60 H03
Gwent	1 D01	1 I02	42 E16	52 E16	50 H03	60 H03
Gwynedd	1 D01	1 I02	42 H16	52 H16	50 I03	60 I03
Mid-Glamorgan	1 D01	1 I02	42 K16	52 K16	50 I03	60 I03
Powys	1 D01	1 I02	42 B17	52 B17	50 J03	60 J03
South Glamorgan	1 D01	1 I02	42 E17	52 E17	50 J03	60 J03
West Glamorgan	1 D01	1 I02	42 H17	52 H17	50 K03	60 K03
Greater London	1 D01	1 I02	42 K17	52 K17	50 K03	60 K03
Metropolitan counties	1 D01	1 I02	43 B18	52 B18	50 L02	60 L03
Non-metropolitan counties	1 D01	1 I02	43 E18	52 E18	50 L03	60 L03
Outside England and Wales	1 D01	1 I02	43 H18	52 H18	50 M03	60 M03
Metropolitan counties, Metropolitan county districts, London boroughs						
Greater London	1 E01	1 J02	43 K18	52 K18	50 M03	60 M03
City of London	1 E01	1 J02	43 B01	53 B01	50 B04	60 B04
London Boroughs	1 E01	1 J02	43 E01	53 E01	50 B04	60 B04
Barking and Dagenham	1 E01	1 J02	43 H01	53 H01	50 C04	60 C04
Barnet	1 E01	1 J02	43 K01	53 K01	50 C04	60 C04
Bexley	1 E01	1 J02	43 B02	53 B02	50 D04	60 D04
Brent	1 E01	1 J02	43 E02	53 E02	50 D04	60 D04
Bromley	1 E01	1 J02	43 H02	53 H02	50 E04	60 E04
Camden	1 E01	1 J02	43 K02	53 K02	50 E04	60 E04
Croydon	1 E01	1 J02	43 B03	53 B03	50 F04	60 F04
Ealing	1 E01	1 J02	43 E03	53 E03	50 F04	60 F04
Enfield	1 E01	1 J02	43 H03	53 H03	50 G04	60 G04
Greenwich	1 E01	1 J02	43 K03	53 K03	50 G04	60 G04
Hackney	1 E01	1 J02	43 B04	53 B04	50 H04	60 H04
Hammersmith and Fulham	1 E01	1 J02	43 E04	53 E04	50 H04	60 H04
Haringey	1 E01	1 J02	43 H04	53 H04	50 I04	60 I04
Harrow	1 E01	1 J02	43 K04	53 K04	50 I04	60 I04
Havering	1 E01	1 J02	43 B05	53 B05	50 J04	60 J04
Hillingdon	1 E01	1 J02	43 E05	53 E05	50 J04	60 J04
Hounslow	1 E01	1 J02	43 H05	53 H05	50 K04	60 K04
Islington	1 E01	1 J02	43 K05	53 K05	50 K04	60 K04
Kensington and Chelsea	1 E01	1 J02	43 B06	53 B06	50 L04	60 L04
Kingston upon Thames	1 E01	1 J02	43 E06	53 E06	50 L04	60 L04
Lambeth	1 E01	1 J02	43 H06	53 H06	50 M04	60 M04
Lewisham	1 E01	1 J02	43 K06	53 K06	50 M04	60 M04
Merton	1 E01	1 J02	43 B07	53 B07	50 B05	60 B05
Newham	1 E01	1 J02	43 E07	53 E07	50 B05	60 B05
Redbridge	1 E01	1 J02	43 H07	53 H07	50 C05	60 C05
Richmond upon Thames	1 E01	1 J02	43 K07	53 K07	50 C05	60 C05
Southwark	1 E01	1 J02	43 B08	53 B08	50 D05	60 D05
Sutton	1 E01	1 J02	43 E08	53 E08	50 D05	60 D05
Tower Hamlets	1 E01	1 J02	43 H08	53 H08	50 E05	60 E05
Waltham Forest	1 E01	1 J02	43 K08	53 K08	50 E05	60 E05
Wandsworth	1 E01	1 J02	43 B09	53 B09	50 F05	60 F05
Westminster, City of	1 E01	1 J02	43 E09	53 E09	50 F05	60 F05
Greater Manchester	1 F01	1 K02	43 H09	53 H09	50 G05	60 G05
Bolton	1 F01	1 K02	43 K09	53 K09	50 G05	60 G05
Bury	1 F01	1 K02	43 B10	53 B10	50 H05	60 H05
Manchester	1 F01	1 K02	43 E10	53 E10	50 H05	60 H05
Oldham	1 F01	1 K02	43 H10	53 H10	50 I05	60 I05
Rochdale	1 F01	1 K02	43 K10	53 K10	50 I05	60 I05
Salford	1 F01	1 K02	43 B11	53 B11	50 J05	60 J05
Stockport	1 F01	1 K02	43 E11	53 E11	50 J05	60 J05
Tameside	1 F01	1 K02	43 H11	53 H11	50 K05	60 K05

Area	Table number					
	1A	1B	6A	6B	6.1A	6.1B
Trafford	1 F01	1 K02	43 K11	53 K11	50 K05	60 K05
Wigan	1 F01	1 K02	43 B12	53 B12	50 L05	60 L05
Merseyside	1 F01	1 K02	43 E12	53 E12	50 L05	60 L05
Knowsley	1 F01	1 K02	43 H12	53 H12	50 M05	60 M05
Liverpool	1 F01	1 K02	43 K12	53 K12	50 M05	60 M05
St Helens	1 F01	1 K02	43 B13	53 B13	50 B06	60 B06
Sefton	1 F01	1 K02	43 E13	53 E13	50 B06	60 B06
Wirral	1 F01	1 K02	43 H13	53 H13	50 C06	60 C06
South Yorkshire	1 F01	1 K02	43 K13	53 K13	50 C06	60 C06
Barnsley	1 F01	1 K02	43 B14	53 B14	50 D06	60 D06
Doncaster	1 F01	1 K02	43 E14	53 E14	50 D06	60 D06
Rotherham	1 F01	1 K02	43 H14	53 H14	50 E06	60 E06
Sheffield	1 F01	1 K02	43 K14	53 K14	50 E06	60 E06
Tyne and Wear	1 F01	1 K02	43 B15	53 B15	50 F06	60 F06
Gateshead	1 F01	1 K02	43 E15	53 E15	50 F06	60 F06
Newcastle upon Tyne	1 F01	1 K02	43 H15	53 H15	50 G06	60 G06
North Tyneside	1 F01	1 K02	43 K15	53 K15	50 G06	60 G06
South Tyneside	1 F01	1 K02	43 B16	53 B16	50 H06	60 H06
Sunderland	1 F01	1 K02	43 E16	53 E16	50 H06	60 H06
West Midlands	1 G01	1 L02	43 H16	53 H16	50 I06	60 I06
Birmingham	1 G01	1 L02	43 K16	53 K16	50 I06	60 I06
Coventry	1 G01	1 L02	43 B17	53 B17	50 J06	60 J06
Dudley	1 G01	1 L02	43 E17	53 E17	50 J06	60 J06
Sandwell	1 G01	1 L02	43 H17	53 H17	50 K06	60 K06
Solihull	1 G01	1 L02	43 K17	53 K17	50 K06	60 K06
Walsall	1 G01	1 L02	43 B18	53 B18	50 L06	60 L06
Wolverhampton	1 G01	1 L02	43 E18	53 E18	50 L06	60 L06
West Yorkshire	1 G01	1 L02	43 H18	53 H18	50 M06	60 M06
Bradford	1 G01	1 L02	43 K18	53 K18	50 M06	60 M06
Calderdale	1 G01	1 L02	43 B01	53 B01	50 B07	60 B07
Kirklees	1 G01	1 L02	43 E01	53 E01	50 B07	60 B07
Leeds	1 G01	1 L02	43 H01	53 H01	50 C07	60 C07
Wakefield	1 G01	1 L02	43 K01	53 B01	50 C07	60 C07
Avon	1 G01	1 L02	43 B02	53 B02	50 D07	60 D07
Bath	1 G01	1 L02	43 E02	53 E02	50 D07	60 D07
Bristol	1 G01	1 L02	43 H02	53 H02	50 E07	60 E07
Kingswood	1 G01	1 L02	43 K02	53 K02	50 E07	60 E07
Northavon	1 G01	1 L02	43 B03	53 B03	50 F07	60 F07
Wansdyke	1 G01	1 L02	43 E03	53 E03	50 F07	60 F07
Woodspring	1 G01	1 L02	43 H03	53 H03	50 G07	60 G07
Bedfordshire	1 G01	1 L02	44 K03	54 K03	50 G07	60 G07
North Bedfordshire	1 G01	1 L02	44 B04	54 B04	50 H07	60 H07
Luton	1 G01	1 L02	44 E04	54 E04	50 H07	60 H07
Mid Bedfordshire	1 G01	1 L02	44 H04	54 H04	50 I07	60 I07
South Bedfordshire	1 G01	1 L02	44 K04	54 K04	50 I07	60 I07
Berkshire	1 G01	1 L02	44 B05	54 B05	50 J07	60 J07
Bracknell	1 G01	1 L02	44 E05	54 E05	50 J07	60 J07
Newbury	1 G01	1 L02	44 H05	54 H05	50 K07	60 K07
Reading	1 G01	1 L02	44 K05	54 K05	50 K07	60 K07
Slough	1 G01	1 L02	44 B06	54 B06	50 L07	60 L07
Windsor and Maidenhead	1 G01	1 L02	44 E06	54 E06	50 L07	60 L07
Wokingham	1 G01	1 L02	44 H06	54 H06	50 M07	60 M07
Buckinghamshire	1 H01	1 M02	44 K06	54 K06	50 M07	60 M07
Aylesbury Vale	1 H01	1 M02	44 B07	54 B07	50 B08	60 B08
South Bucks	1 H01	1 M02	44 E07	54 E07	50 B08	60 B08
Chiltern	1 H01	1 M02	44 H07	54 H07	50 C08	60 C08
Milton Keynes	1 H01	1 M02	44 K07	54 K07	50 C08	60 C08
Wycombe	1 H01	1 M02	44 B08	54 B08	50 D08	60 D08
Cambridgeshire	1 H01	1 M02	44 E08	54 E08	50 D08	60 D08
Cambridge	1 H01	1 M02	44 H08	54 H08	50 E08	60 E08
East Cambridgeshire	1 H01	1 M02	44 K08	54 K08	50 E08	60 E08
Fenland	1 H01	1 M02	44 B09	54 B09	50 F08	60 F08
Huntingdonshire	1 H01	1 M02	44 E09	54 E09	50 F08	60 F08
Peterborough	1 H01	1 M02	44 H09	54 H09	50 G08	60 G08
South Cambridgeshire	1 H01	1 M02	44 K09	54 K09	50 G08	60 G08

Area	Table number											
	1A		1B		6A		6B		6.1A		6.1B	
Cheshire	1	H01	1	M02	44	B10	54	B10	50	H08	60	H08
Chester	1	H01	1	M02	44	E10	54	E10	50	H08	60	H08
Congleton	1	H01	1	M02	44	H10	54	H10	50	I08	60	I08
Crewe & Nantwich	1	H01	1	M02	44	K10	54	K10	50	I08	60	I08
Ellesmere Port & Neston	1	H01	1	M02	44	B11	54	B11	50	J08	60	J08
Halton	1	H01	1	M02	44	E11	54	E11	50	J08	60	J08
Macclesfield	1	H01	1	M02	44	H11	54	H11	50	K08	60	K08
Vale Royal	1	H01	1	M02	44	K11	54	K11	50	K08	60	K08
Warrington	1	H01	1	M02	44	B12	54	B12	50	L08	60	L08
Cleveland	1	H01	1	M02	44	E12	54	E12	50	L08	60	L08
Hartlepool	1	H01	1	M02	44	H12	54	H12	50	M08	60	M08
Langbaurgh	1	H01	1	M02	44	K12	54	K12	50	M08	60	M08
Middlesbrough	1	H01	1	M02	44	B13	54	B13	50	B09	60	B09
Stockton-on-Tees	1	H01	1	M02	44	E13	54	E13	50	B09	60	B09
Cornwall & Scilly Isles	1	I01	1	N02	44	H13	54	H13	50	C09	60	C09
Caradon	1	I01	1	N02	44	K13	54	K13	50	C09	60	C09
Carrick	1	I01	1	N02	44	B14	54	B14	50	D09	60	D09
Kerrier	1	I01	1	N02	44	E14	54	E14	50	D09	60	D09
North Cornwall	1	I01	1	N02	44	H14	54	H14	50	E09	60	E09
Penwith	1	I01	1	N02	44	K14	54	K14	50	E09	60	E09
Restormel	1	I01	1	N02	44	B15	54	B15	50	F09	60	F09
Isles of Scilly	1	I01	1	N02	44	E15	54	E15	50	F09	60	F09
Cumbria	1	I01	1	N02	44	H15	54	H15	50	G09	60	G09
Allerdale	1	I01	1	N02	44	K15	54	K15	50	G09	60	G09
Barrow-in-Furness	1	I01	1	N02	44	B16	54	B16	50	H09	60	H09
Carlisle	1	I01	1	N02	44	E16	54	E16	50	H09	60	H09
Copeland	1	I01	1	N02	44	H16	54	H16	50	I09	60	I09
Eden	1	I01	1	N02	44	K16	54	K16	50	I09	60	I09
South Lakeland	1	I01	1	N02	44	B17	54	B17	50	J09	60	J09
Derbyshire	1	I01	1	N02	44	E17	54	E17	50	J09	60	J09
Amber Valley	1	I01	1	N02	44	H17	54	H17	50	K09	60	K09
Bolsover	1	I01	1	N02	44	K17	54	K17	50	K09	60	K09
Chesterfield	1	I01	1	N02	44	B18	54	B18	50	L09	60	L09
Derby	1	I01	1	N02	44	E18	54	E18	50	L09	60	L09
Erewash	1	I01	1	N02	44	H18	54	H18	50	M09	60	M09
High Peak	1	I01	1	N02	44	K18	54	K18	50	M09	60	M09
North East Derbyshire	1	I01	1	N02	45	B01	55	B01	50	B10	60	B10
South Derbyshire	1	I01	1	N02	45	E01	55	E01	50	B10	60	B10
West Derbyshire	1	I01	1	N02	45	H01	55	H01	50	C10	60	C10
Devon	1	J01	1	O02	45	K01	55	K01	50	C10	60	C10
East Devon	1	J01	1	O02	45	B02	55	B02	50	D10	60	D10
Exeter	1	J01	1	O02	45	K01	55	K01	50	C10	60	C10
North Devon	1	J01	1	O02	45	H02	55	H02	50	E10	60	E10
Plymouth	1	J01	1	O02	45	K02	55	K02	50	E10	60	E10
South Hams	1	J01	1	O02	45	B03	55	B03	50	F10	60	F10
Teignbridge	1	J01	1	O02	45	E03	55	E03	50	F10	60	F10
Mid Devon	1	J01	1	O02	45	H03	55	H03	50	G10	60	G10
Torbay	1	J01	1	O02	45	K03	55	K03	50	G10	60	G10
Torridge	1	J01	1	O02	45	B04	55	B04	50	H10	60	H10
West Devon	1	J01	1	O02	45	E04	55	E04	50	H10	60	H10
Dorset	1	J01	1	O02	45	H04	55	H04	50	I10	60	I10
Bournemouth	1	J01	1	O02	45	K04	55	K04	50	I10	60	I10
Christchurch	1	J01	1	O02	45	B05	55	B05	50	J10	60	J10
North Dorset	1	J01	1	O02	45	E05	55	E05	50	J10	60	J10
Poole	1	J01	1	O02	45	H05	55	H05	50	K10	60	K10
Purbeck	1	J01	1	O02	45	K05	55	K05	50	K10	60	K10
West Dorset	1	J01	1	O02	45	B06	55	B06	50	L10	60	L10
Weymouth and Portland	1	J01	1	O02	45	E06	55	E06	50	L10	60	L10
Wimborne	1	J01	1	O02	45	H06	55	H06	50	M10	60	M10
Durham	1	J01	1	O02	45	K06	55	K06	50	M10	60	M10
Chester-le-Street	1	J01	1	O02	45	B07	55	B07	50	B11	60	B11
Darlington	1	J01	1	O02	45	E07	55	E07	50	B11	60	B11
Derwentside	1	J01	1	O02	45	H07	55	H07	50	C11	60	C11
Durham	1	J01	1	O02	45	K07	55	K07	50	C11	60	C11
Easington	1	J01	1	O02	45	B08	55	B08	50	D11	60	D11

Area	Table number											
	1A		1B		6A		6B		6.1A		6.1B	
Sedgefield	1	J01	1	O02	45	E08	55	E08	50	D11	60	D11
Teesdale	1	J01	1	O02	45	H08	55	H08	50	E11	60	E11
Wear Valley	1	J01	1	O02	45	K08	55	K08	50	E11	60	E11
East Sussex	1	K01	1	B03	45	B09	55	B09	50	F11	60	F11
Brighton	1	K01	1	B03	45	E09	55	E09	50	F11	60	F11
Eastbourne	1	K01	1	B03	45	H09	55	H09	50	G11	60	G11
Hastings	1	K01	1	B03	45	K09	55	K09	50	G11	60	G11
Hove	1	K01	1	B03	45	B10	55	B10	50	H11	60	H11
Lewes	1	K01	1	B03	45	E10	55	E10	50	H11	60	H11
Rother	1	K01	1	B03	45	H10	55	H10	50	I11	60	I11
Wealden	1	K01	1	B03	45	K10	55	K10	50	I11	60	I11
Essex	1	K01	1	B03	45	B11	55	B11	50	J11	60	J11
Basildon	1	K01	1	B03	45	E11	55	E11	50	J11	60	J11
Braintree	1	K01	1	B03	45	H11	55	H11	50	K11	60	K11
Brentwood	1	K01	1	B03	45	K11	55	K11	50	K11	60	K11
Castle Point	1	K01	1	B03	45	B12	55	B12	50	L11	60	L11
Chelmsford	1	K01	1	B03	45	E12	55	E12	50	L11	60	L11
Colchester	1	K01	1	B03	45	H12	55	H12	50	M11	60	M11
Epping Forest	1	K01	1	B03	45	K12	55	K12	50	M11	60	M11
Harlow	1	K01	1	B03	45	B13	55	B13	50	B12	60	B12
Maldon	1	K01	1	B03	45	E13	55	E13	50	B12	60	B12
Rochford	1	K01	1	B03	45	H13	55	H13	50	C12	60	C12
Southend-on-Sea	1	K01	1	B03	45	K13	55	K13	50	C12	60	C12
Tendring	1	K01	1	B03	45	B14	55	B14	50	D12	60	D12
Thurrock	1	K01	1	B03	45	E14	55	E14	50	D12	60	D12
Uttlesford	1	K01	1	B03	45	H14	55	H14	50	E12	60	E12
Gloucestershire	1	K01	1	B03	45	K14	55	K4	50	E12	60	E12
Cheltenham	1	K01	1	B03	45	B15	55	B15	50	F12	60	F12
Cotswold	1	K01	1	B03	45	E15	55	E15	50	F12	60	F12
Forest of Dean	1	K01	1	B03	45	H15	55	H15	50	G12	60	G12
Gloucester	1	K01	1	B03	45	K15	55	K15	50	G12	60	G12
Stroud	1	K01	1	B03	45	B16	55	B16	50	H12	60	H12
Tewkesbury	1	K01	1	B03	45	E16	55	E16	50	H12	60	H12
Hampshire	1	L01	1	C03	45	H16	55	H16	50	I12	60	I12
Basingstoke and Deane	1	L01	1	C03	45	K16	55	K16	50	I12	60	I12
East Hampshire	1	L01	1	C03	45	B17	55	B17	50	J12	60	J12
Eastleigh	1	L01	1	C03	45	E17	55	E17	50	J12	60	J12
Fareham	1	L01	1	C03	45	H17	55	H17	50	K12	60	K12
Gosport	1	L01	1	C03	45	K17	55	K17	50	K12	60	K12
Hart	1	L01	1	C03	45	B18	55	B18	50	L12	60	L12
Havant	1	L01	1	C03	45	E18	55	E18	50	L12	60	L12
New Forest	1	L01	1	C03	45	H18	55	H18	50	M12	60	M12
Portsmouth	1	L01	1	C03	45	K18	55	K18	50	M12	60	M12
Rushmoor	1	L01	1	C03	46	B01	56	B01	50	B13	60	B13
Southampton	1	L01	1	C03	46	E01	56	E01	50	B13	60	B13
Test Valley	1	L01	1	C03	46	H01	56	H01	50	C13	60	C13
Winchester	1	L01	1	C03	46	K01	56	K01	50	C13	60	C13
Hereford and Worcester	1	L01	1	C03	46	B02	56	B02	50	D13	60	D13
Bromsgrove	1	L01	1	C03	46	E02	56	E02	50	D13	60	D13
Hereford	1	L01	1	C03	46	H02	56	H02	50	E13	60	E13
Leominster	1	L01	1	C03	46	K02	56	K02	50	E13	60	E13
Malvern Hills	1	L01	1	C03	46	B03	56	B03	50	F13	60	F13
Redditch	1	L01	1	C03	46	E03	56	E03	50	F13	60	F13
South Herefordshire	1	L01	1	C03	46	H03	56	H03	50	G13	60	G13
Worcester	1	L01	1	C03	46	K03	56	K03	50	G13	60	G13
Wychavon	1	L01	1	C03	46	B04	56	B04	50	H13	60	H13
Wyre Forest	1	L01	1	C03	46	E04	56	E04	50	H13	60	H13
Hertfordshire	1	L01	1	C03	46	H04	56	H04	50	I13	60	I13
Broxbourne	1	L01	1	C03	46	K04	56	K04	50	I13	60	I13
Dacorum	1	L01	1	C03	46	B05	56	B05	50	J13	60	J13
East Hertfordshire	1	L01	1	C03	46	E05	56	E05	50	J13	60	J13
Hertsmere	1	L01	1	C03	46	H05	56	H05	50	K13	60	K13
North Hertfordshire	1	L01	1	C03	46	K05	56	K05	50	K13	60	K13

Area	Table number					
	1A	1B	6A	6B	6.1A	6.1B
St Albans	1 L01	1 C03	46 B06	56 B06	50 L13	60 L13
Stevenage	1 L01	1 C03	46 E06	56 E06	50 L13	60 L13
Three Rivers	1 L01	1 C03	46 H06	56 H06	50 M13	60 M13
Watford	1 L01	1 C03	46 K06	56 K06	50 M13	60 M13
Welwyn Hatfield	1 L01	1 C03	46 B07	56 B07	50 B14	60 B14
Humberside	1 M01	1 D03	46 E07	56 E07	50 B14	60 B14
E Yorks Borough of Beverley	1 M01	1 D03	46 H07	56 H07	50 C14	60 C14
Boothferry	1 M01	1 D03	46 K07	56 K07	50 C14	60 C14
Cleethorpes	1 M01	1 D03	46 B08	56 B08	50 D14	60 D14
Glanford	1 M01	1 D03	46 E08	56 E08	50 D14	60 D14
Great Grimsby	1 M01	1 D03	46 H08	56 H08	50 E14	60 E14
Holderness	1 M01	1 D03	46 K08	56 K08	50 E14	60 E14
Kingston upon Hull	1 M01	1 D03	46 B09	56 B09	50 F14	60 F14
East Yorkshire	1 M01	1 D03	46 E09	56 E09	50 F14	60 F14
Scunthorpe	1 M01	1 D03	46 H09	56 H09	50 G14	60 G14
Isle of Wight	1 M01	1 D03	46 K09	56 K09	50 G14	60 G14
Medina	1 M01	1 D03	46 B10	56 B10	50 H14	60 H14
South Wight	1 M01	1 D03	46 E10	56 E10	50 H14	60 H14
Kent	1 M01	1 D03	46 H10	56 H10	50 I14	60 I14
Ashford	1 M01	1 D03	46 K10	56 K10	50 I14	60 I14
Canterbury	1 M01	1 D03	46 B11	56 B11	50 J14	60 J14
Dartford	1 M01	1 D03	46 E11	56 E11	50 J14	60 J14
Dover	1 M01	1 D03	46 H11	56 H11	50 K14	60 K14
Gillingham	1 M01	1 D03	46 K11	56 K11	50 K14	60 K14
Gravesham	1 M01	1 D03	46 B12	56 B12	50 L14	60 L14
Maidstone	1 M01	1 D03	46 E12	56 E12	50 L14	60 L14
Rochester-upn-Medway	1 M01	1 D03	46 H12	56 H12	50 M14	60 M14
Sevenoaks	1 M01	1 D03	46 K12	56 K12	50 M14	60 M14
Shepway	1 M01	1 D03	46 B13	56 B13	50 B15	60 B15
Swale	1 M01	1 D03	46 E13	56 E13	50 B15	60 B15
Thanet	1 M01	1 D03	46 H13	56 H13	50 C15	60 C15
Tonbridge and Malling	1 M01	1 D03	46 K13	56 K13	50 C15	60 C15
Tunbridge Wells	1 M01	1 D03	46 B14	56 B14	50 D15	60 D15
Lancashire	1 N01	1 E03	46 E14	56 E14	50 D15	60 D15
Blackburn	1 N01	1 E03	46 H14	56 H14	50 E15	60 E15
Blackpool	1 N01	1 E03	46 K14	56 K14	50 E15	60 E15
Burnley	1 N01	1 E03	46 B15	56 B15	50 F15	60 F15
Chorley	1 N01	1 E03	46 E15	56 E15	50 F15	60 F15
Fylde	1 N01	1 E03	46 H15	56 H15	50 G15	60 G15
Hyndburn	1 N01	1 E03	46 K15	56 K15	50 G15	60 G15
Lancaster	1 N01	1 E03	46 B16	56 B16	50 H15	60 H15
Pendle	1 N01	1 E03	46 E16	56 E16	50 H15	60 H15
Preston	1 N01	1 E03	46 H16	56 H16	50 I15	60 I15
Ribble Valley	1 N01	1 E03	46 K16	56 K16	50 I15	60 I15
Rossendale	1 N01	1 E03	46 B17	56 B17	50 J15	60 J15
South Ribble	1 N01	1 E03	46 E17	56 E17	50 J15	60 J15
West Lancashire	1 N01	1 E03	46 H17	56 H17	50 K15	60 K15
Wyre	1 N01	1 E03	46 K17	56 K17	50 K15	60 K15
Leicestershire	1 N01	1 E03	46 B18	56 B18	50 L15	60 L15
Blaby	1 N01	1 E03	46 E18	56 E18	50 L15	60 L15
Charnwood	1 N01	1 E03	46 H18	56 H18	50 M15	60 M15
Harborough	1 N01	1 E03	46 K18	56 K18	50 M15	60 M15
Hinkley and Bosworth	1 N01	1 E03	47 B01	57 B01	50 B16	60 B16
Leicester	1 N01	1 E03	47 E01	57 E01	50 B16	60 B16
Melton	1 N01	1 E03	47 H01	57 H01	50 C16	60 C16
N W Leicestershire	1 N01	1 E03	47 K01	57 K01	50 C16	60 C16
Oadby and Wigston	1 N01	1 E03	47 B02	57 B02	50 D16	60 D16
Rutland	1 N01	1 E03	47 E02	57 E02	50 D16	60 D16
Lincolnshire	1 N01	1 E03	47 H02	57 H02	50 E16	60 E16
Boston	1 N01	1 E03	47 K02	57 K02	50 E16	60 E16
East Lindsey	1 N01	1 E03	47 B03	57 B03	50 F16	60 F16
Lincoln	1 N01	1 E03	47 E03	57 E03	50 F16	60 F16
North Kesteven	1 N01	1 E03	47 H03	57 H03	50 G16	60 G16
South Holland	1 N01	1 E03	47 K03	57 K03	50 G16	60 G16

Area	Table number											
	1A		1B		6A		6P		6.1A		6.1B	
South Kesteven	1	N01	1	E03	47	B04	57	B04	50	H16	60	H16
West Lindsey	1	N01	1	E03	47	E04	57	E04	50	H16	60	H16
Norfolk	1	O01	1	F03	47	H04	57	H04	50	I16	60	I16
Breckland	1	O01	1	F03	47	K04	57	K04	50	I16	60	I16
Broadland	1	O01	1	F03	47	B05	57	B05	50	J16	60	J16
Great Yarmouth	1	O01	1	F03	47	E05	57	E05	50	J16	60	J16
North Norfolk	1	O01	1	F03	47	H05	57	H05	50	K16	60	K16
Norwich	1	O01	1	F03	47	K05	57	K05	50	K16	60	K16
South Norfolk	1	O01	1	F03	47	B06	57	B06	50	L16	60	L16
Kings Lynn and W Norfolk	1	O01	1	F03	47	E06	57	E06	50	L16	60	L16
Northamptonshire	1	O01	1	F03	47	H06	57	H06	50	M16	60	M16
Corby	1	O01	1	F03	47	K06	57	K06	50	M16	60	M16
Daventry	1	O01	1	F03	47	B07	57	B07	50	B17	60	B17
East Northamptonshire	1	O01	1	F03	47	E07	57	E07	50	B17	60	B17
Kettering	1	O01	1	F03	47	H07	57	H07	50	C17	60	C17
Northampton	1	O01	1	F03	47	K07	57	K07	50	C17	60	C17
South Northamptonshire	1	O01	1	F03	47	B08	57	B08	50	D17	60	D17
Wellingborough	1	O01	1	F03	47	E08	57	E08	50	D17	60	D17
Northumberland	1	O01	1	F03	47	H08	57	H08	50	E17	60	E17
Alnwick	1	O01	1	F03	47	K08	57	K08	50	E17	60	E17
Berwick-upon-Tweed	1	O01	1	F03	47	B09	57	B09	50	F17	60	F17
Blyth Valley	1	O01	1	F03	47	E09	57	E09	50	F17	60	F17
Castle Morpeth	1	O01	1	F03	47	H09	57	H09	50	G17	60	G17
Tynedale	1	O01	1	F03	47	K09	57	K09	50	G17	60	G17
Wansbeck	1	O01	1	F03	47	B10	57	B10	50	H17	60	H17
North Yorkshire	1	O01	1	F03	47	E10	57	E10	50	H17	60	H17
Craven	1	O01	1	F03	47	H10	57	H10	50	I17	60	I17
Hambleton	1	O01	1	F03	47	K10	57	K10	50	I17	60	I17
Harrogate	1	O01	1	F03	47	B11	57	B11	50	J17	60	J17
Richmondshire	1	O01	1	F03	47	E11	57	E11	50	J17	60	J17
Ryedale	1	O01	1	F03	47	H11	57	H11	50	K17	60	K17
Scarborough	1	O01	1	F03	47	K11	57	K11	50	K17	60	K17
Selby	1	O01	1	F03	47	B12	57	B12	50	L17	60	L17
York	1	O01	1	F03	47	E12	57	E12	50	L17	60	L17
Nottinghamshire	1	B02	1	G03	47	H12	57	H12	50	M17	60	M17
Ashfield	1	B02	1	G03	47	K12	57	K12	50	M17	60	M17
Bassetlaw	1	B02	1	G03	47	B13	57	B13	50	B18	60	B18
Broxtowe	1	B02	1	G03	47	E13	57	E13	50	B18	60	B18
Gedling	1	B02	1	G03	47	H13	57	H13	50	C18	60	C18
Mansfield	1	B02	1	G03	47	K13	57	K13	50	C18	60	C18
Newark and Sherwood	1	B02	1	G03	47	B14	57	B14	50	D18	60	D18
Nottingham	1	B02	1	G03	47	E14	57	E14	50	D18	60	D18
Rushcliffe	1	B02	1	G03	47	H14	57	H14	50	E18	60	E18
Oxfordshire	1	B02	1	G03	47	K14	57	K14	50	E18	60	E18
Cherwell	1	B02	1	G03	47	B15	57	B15	50	F18	60	F18
Oxford	1	B02	1	G03	47	E15	57	E15	50	F18	60	F18
South Oxfordshire	1	B02	1	G03	47	H15	57	H15	50	G18	60	G18
Vale of White Horse	1	B02	1	G03	47	K15	57	K15	50	G18	60	G18
West Oxfordshire	1	B02	1	G03	47	B16	57	B16	50	H18	60	H18
Shropshire	1	B02	1	G03	47	E16	57	E16	50	H18	60	H18
Bridgnorth	1	B02	1	G03	47	H16	57	H16	50	I18	60	I18
North Shropshire	1	B02	1	G03	47	K16	57	K16	50	I18	60	I18
Oswestry	1	B02	1	G03	47	B17	57	B17	50	J18	60	J18
Shrewsbury and Atcham	1	B02	1	G03	47	E17	57	E17	50	J18	60	J18
South Shropshire	1	B02	1	G03	47	H17	57	H17	50	K18	60	K18
The Wrekin	1	B02	1	G03	47	K17	57	K17	50	K18	60	K18
Somerset	1	B02	1	G03	47	B18	57	B18	50	L18	60	L18
Mendip	1	B02	1	G03	47	E18	57	E18	50	L18	60	L18
Sedgemoor	1	B02	1	G03	47	H18	57	H18	50	M18	60	M18
Taunton Deane	1	B02	1	G03	47	K18	57	K18	50	M18	60	M18
West Somerset	1	B02	1	G03	48	B01	58	B01	51	B01	61	B01
South Somerset	1	B02	1	G03	48	E01	58	E01	51	B01	61	B01
Staffordshire	1	C02	1	H03	48	H01	58	H01	51	C01	61	C01
Cannock Chase	1	C02	1	H03	48	K01	58	K01	51	C01	61	C01
East Staffordshire	1	C02	1	H03	48	B02	58	B02	51	D01	61	D01

Area	Table number											
	1A		1B		6A		6B		6.1A		6.1B	
Lichfield	1	C02	1	H03	48	E02	58	E02	51	D01	61	D01
Newcastle-under-Lyme	1	C02	1	H03	48	H02	58	H02	51	E01	61	E01
Sourth Staffordshire	1	C02	1	H03	48	K02	58	K02	51	E01	61	E01
Stafford	1	C02	1	H03	48	B03	58	B03	51	E01	61	E01
Staffordshire Moorlands	1	C02	1	H03	48	E03	58	E03	51	F01	61	F01
Stoke-on-Trent	1	C02	1	H03	48	H03	58	H03	51	G01	61	G01
Tamworth	1	C02	1	H03	48	K03	58	K03	51	G01	61	G01
Suffolk	1	C02	1	H03	48	B04	58	B04	51	H01	61	H01
Babergh	1	C02	1	H03	48	E04	58	E04	51	H01	61	H01
Forest Heath	1	C02	1	H03	48	H04	58	H04	51	I01	61	I01
Ipswich	1	C02	1	H03	48	K04	58	K04	51	I01	61	I01
Mid Suffolk	1	C02	1	H03	48	B05	58	B05	51	J01	61	J01
St Edmundsbury	1	C02	1	H03	48	E05	58	E05	51	J01	61	J01
Suffolk Coastal	1	C02	1	H03	48	H05	58	H05	51	K01	61	K01
Waveney	1	C02	1	H03	48	K05	58	K05	51	K01	61	K01
Surrey	1	C02	1	H03	48	B06	58	B06	51	L01	61	L01
Elmbridge	1	C02	1	H03	48	E06	58	E06	51	L01	61	L01
Epsom and Ewell	1	C02	1	H03	48	H06	58	H06	51	M01	61	M01
Guildford	1	C02	1	H03	48	K06	58	K06	51	M01	61	M01
Mole Valley	1	C02	1	H03	48	B07	58	B07	51	B02	61	B02
Reigate and Banstead	1	C02	1	H03	48	E07	58	E07	51	B02	61	B02
Runnymede	1	C02	1	H03	48	H07	58	H07	51	C02	61	C02
Spelthorne	1	C02	1	H03	48	K07	58	K07	51	C02	61	C02
Surrey Heath	1	C02	1	H03	48	B08	58	B08	51	D02	61	D02
Tandridge	1	C02	1	H03	48	E08	58	E08	51	D02	61	D02
Waverley	1	C02	1	H03	48	H08	58	H08	51	E02	61	E02
Woking	1	C02	1	H03	48	K08	58	K08	51	E02	61	E02
Warwickshire	1	D02	1	I03	48	B09	58	B09	51	F02	61	F02
North Warwickshire	1	D02	1	I03	48	E09	58	E09	51	F02	61	F02
Nuneaton and Bedworth	1	D02	1	I03	48	H09	58	H09	51	G02	61	G02
Rugby	1	D02	1	I03	48	K09	58	K09	51	G02	61	G02
Stratford-on-Avon	1	D02	1	I03	48	B10	58	B10	51	H02	61	H02
Warwick	1	D02	1	I03	48	E10	58	E10	51	H02	61	H02
West Sussex	1	D02	1	I03	48	H10	58	H10	51	I02	61	I02
Adur	1	D02	1	I03	48	K10	58	K10	51	I02	61	I02
Arun	1	D02	1	I03	48	B11	58	B11	51	J02	61	J02
Chichester	1	D02	1	I03	48	E11	58	E11	51	J02	61	J02
Crawley	1	D02	1	I03	48	H11	58	H11	51	K02	61	K02
Horsham	1	D02	1	I03	48	K11	58	K11	51	K02	61	K02
Mid Sussex	1	D02	1	I03	48	B12	58	B12	51	L02	61	L02
Worthing	1	D02	1	I03	48	E12	58	E12	51	L02	61	L02
Wiltshire	1	D02	1	I03	48	H12	58	H12	51	M02	61	M02
Kennet	1	D02	1	I03	48	K12	58	K12	51	M02	61	M02
North Wiltshire	1	D02	1	I03	48	B13	58	B13	51	B03	61	B03
Salisbury	1	D02	1	I03	48	E13	58	E13	51	B03	61	B03
Thamesdown	1	D02	1	I03	48	H13	58	H13	51	C03	61	C03
West Wiltshire	1	D02	1	I03	48	K13	58	K13	51	C03	61	C03
Clwyd	1	D02	1	I03	48	B14	58	B14	51	D03	61	D03
Alyn and Deeside	1	D02	1	I03	48	E14	58	E14	51	D03	61	D03
Colwyn	1	D02	1	I03	48	H14	58	H14	51	E03	61	E03
Delyn	1	D02	1	I03	48	K14	58	K14	51	E03	61	E03
Glyndwr	1	D02	1	I03	48	B15	58	B15	51	F03	61	F03
Rhuddlan	1	D02	1	I03	48	E15	58	E15	51	F03	61	F03
Wrexham Maelor	1	D02	1	I03	48	H15	58	H15	51	G03	61	G03
Dyfed	1	E02	1	J03	48	K15	58	K15	51	G03	61	G03
Carmarthen	1	E02	1	J03	48	B16	58	B16	51	H03	61	H03
Ceredigion	1	E02	1	J03	48	E16	58	E16	51	H03	61	H03
Dinefwr	1	E02	1	J03	48	H16	58	H16	51	I03	61	I03
Llanelli	1	E02	1	J03	48	K16	58	K16	51	I03	61	I03
Preseli	1	E02	1	J03	48	B17	58	B17	51	J03	61	J03
South Pembrokeshire	1	E02	1	J03	48	E17	58	E17	51	J03	61	J03
Gwent	1	E02	1	J03	48	H17	58	H17	51	K03	61	K03
Blaenau Gwent	1	E02	1	J03	48	K17	58	K17	51	K03	61	K03
Islwyn	1	E02	1	J03	48	B18	58	B18	51	L03	61	L03
Monmouth	1	E02	1	J03	48	E18	58	E18	51	L03	61	L03
Newport	1	E02	1	J03	48	H18	58	H18	51	M03	61	M03
Torfaen	1	E02	1	J03	48	K18	58	K18	51	M03	61	M03

Index A by area — *continued*

Area	Table number											
	1A		1B		6A		6B		6.1A		6.1B	
Gwynedd	1	E02	1	J03	49	B01	59	B01	51	B04	61	B04
Aberconwy	1	E02	1	J03	49	E01	59	E01	51	B04	61	B04
Arfon	1	E02	1	J03	49	H01	59	H01	51	C04	61	C04
Dwyfor	1	E02	1	J03	49	K01	59	K01	51	C04	61	C04
Meirionnydd	1	E02	1	J03	49	B02	59	B02	51	D04	61	D04
Ynys Mon (Anglesey)	1	E02	1	J03	49	E02	59	E02	51	D04	61	D04
Mid-Glamorgan	1	E02	1	J03	49	H02	59	H02	51	E04	61	E04
Cynon Valley	1	E02	1	J03	49	K02	59	K02	51	E04	61	E04
Merthyr Tydfil	1	E02	1	J03	49	B03	59	B03	51	F04	61	F04
Ogwr	1	E02	1	J03	49	E03	59	E03	51	F04	61	F04
Rhondda	1	E02	1	J03	49	H03	59	H03	51	G04	61	G04
Rhymney Valley	1	E02	1	J03	49	K03	59	K03	51	G04	61	G04
Taff-Ely	1	E02	1	J03	49	B04	59	B04	51	H04	61	H04
Powys	1	E02	1	J03	49	E04	59	E04	51	H04	61	H04
Brecknock	1	E02	1	J03	49	H04	59	H04	51	I04	61	I04
Montgomeryshire	1	E02	1	J03	49	K04	59	K04	51	I04	61	I04
Radnor	1	E02	1	J03	49	B05	59	B05	51	J04	61	J04
South Glamorgan	1	F02	1	K03	49	E05	59	E05	51	J04	61	J04
Cardiff	1	F02	1	K03	49	H05	59	H05	51	K04	61	K04
Vale of Glamorgan	1	F02	1	K03	49	H05	59	H05	51	K04	61	K04
West Glamorgan	1	F02	1	K03	49	B06	59	B06	51	L04	61	L04
Port Talbot	1	F02	1	K03	49	B06	59	B06	51	L04	61	L04
Lliw Valley	1	F02	1	K03	49	H06	59	H06	51	M04	61	M04
Neath	1	F02	1	K03	49	K06	59	K06	51	M04	61	M04
Swansea	1	F02	1	K03	49	B07	59	B07	51	B05	61	B05
Regional Health Authorities												
Northern	1	F02	1	K03	49	E07	59	E07	51	B05	61	B05
Yorkshire	1	F02	1	K03	49	B07	59	B07	51	C05	61	C05
Trent	1	F02	1	K03	49	K07	59	K07	51	C05	61	C05
East Anglian	1	F02	1	K03	49	B08	59	B08	51	D05	61	D05
North West Thames	1	F02	1	K03	49	E08	59	E08	51	D05	61	D05
North East Thames	1	F02	1	K03	49	H08	59	H08	51	E05	61	E05
South East Thames	1	F02	1	K03	49	K08	59	K08	51	E05	61	E05
South West Thames	1	F02	1	K03	49	B09	59	B09	51	F05	61	F05
Wessex	1	F02	1	K03	49	E09	59	E09	51	F05	61	F05
Oxford	1	F02	1	K03	49	H09	59	H09	51	G05	61	G05
South Western	1	F02	1	K03	49	K09	59	K09	51	G05	61	G05
West Midlands	1	F02	1	K03	49	B10	59	B10	51	H05	61	H05
Mersey	1	F02	1	K03	49	E10	59	E10	51	H05	61	H05
North Western	1	F02	1	K03	49	H10	59	H10	51	I05	61	I05

Index B By selected cause group

ICD code	Cause description	Table number															
		2A		2B		3A		3B		4A		4B		5A		5B	
i) *Main causes*																	
001–999	**All causes**	2	B01	5	B01	8	B01	15	B01	22	B01	25	B01	28	B01	35	B01
001–139	**I Infections & parasitic diseases**	2	F01	5	F01	8	D02	15	F01	22	F01	25	D02	28	D02	35	D02
010–018, 137	Tuberculosis (including late effects)	2	J01	5	J01	8	F03	15	F03	22	J01	25	J01	28	F03	35	F03
010–012, 137.0	Respiratory tuberculosis (including late effects of respiratory or unspecified TB)	2	B02	5	B02	8	H04	15	H04	22	B02	25	B02	28	H04	35	H04
140–239	**II Neoplasms**	2	F02	5	F02	8	J05	15	J05	22	F02	25	F02	28	J05	35	J05
140–208	Malignant neoplasms (MN)	2	J02	5	J02	8	L06	15	L06	22	J02	25	J02	28	L06	35	L06
140–149	MN of lip, oral cavity & pharynx	2	B03	5	B03	8	N07	15	N07	22	B03	25	B03	28	N07	35	N07
150	MN of oesophagus	2	F03	5	F03	8	B09	15	B09	22	F03	25	F03	28	B09	35	B09
151	MN of stomach	2	J03	5	J03	8	D10	15	D10	22	J03	25	J03	28	D10	35	D10
153	MN of colon	2	B04	5	B04	8	F11	15	F11	22	B04	25	B04	28	F11	35	F11
154	MN of rectum, rectosigmoid junction & anus	2	F04	5	F04	8	H12	15	H12	22	F04	25	F04	28	H12	35	H12
157	MN of pancreas	2	J04	5	J04	8	J13	15	J13	25	J04	28	J04	28	J13	35	J13
161	MN of larynx	2	B05	5	B05	8	L14	15	L14	22	B05	25	B05	28	L14	35	L14
162	MN of trachea, bronchus & lung	2	F05	5	F05	8	N15	15	N15	22	F05	25	F05	28	N15	35	N15
172	Malignant melanoma of skin	2	J05	5	J05	8	B17	15	B07	22	J05	25	J05	28	B17	35	B17
173	Other MN of skin	2	B06	5	B06	8	D18	15	D18	22	B06	25	B06	28	D18	35	D18
174	MN of female breast			5	F06			16	F01			25	F06			36	F01
179–182	MN of uterus			5	J06			16	H02			25	J06			36	H02
180	MN of cervix uteri			5	B07			16	J03			25	B07			36	J03
182	MN of body of uterus			5	F07			16	L04			25	F07			36	L04
183	MN of ovary & other uterine adnexa			5	J07			16	N05			25	J07			36	N05
185	MN of prostate	2	F06			9	F01			22	F06			29	F01		
188	MN of bladder	2	J06	5	B08	9	H02	16	B07	22	J06	25	B08	29	H02	36	B07
189	MN of kidney & other & unspecified urinary organs	2	B07	5	F08	9	J03	16	D08	22	B07	25	F08	29	J03	36	D08
191	MN of brain	2	F07	5	J08	9	L04	16	F09	22	F07	25	J08	29	L04	36	F09
200–208	MN of lymphatic & haematopoietic tissue	2	J07	5	B09	9	N05	16	H10	22	J07	25	B09	29	N05	36	H10
204–208	Leukaemia	2	B08	5	F09	9	B07	16	J11	22	B08	25	F09	29	B07	36	J11
210–229	Benign neoplasms	2	F08	5	J09	9	D08	16	L12	22	F08	25	J09	29	D08	36	L12
240–279	**III Endocrine, nutritional & metabolic diseases & immunity disorders**	2	J08	5	B10	9	F09	16	N13	22	J08	25	B10	29	F09	36	N13
250	Diabetes mellitus	2	B09	5	F10	9	H10	16	B15	22	B09	25	F10	29	H10	36	B15
280–289	**IV Diseases of blood & blood forming organs**	2	F09	5	J10	9	J11	16	D16	22	F09	25	J10	29	J11	36	D16
280–285	Anaemias	2	J09	5	B11	9	L12	16	F17	22	J09	25	B11	29	L12	36	F17
290–319	**V Mental disorders**	2	B10	5	F11	9	N13	16	H18	22	B10	25	F11	29	N13	36	H18
290	Senile & presenile organic psychotic conditions	2	F10	5	J11	9	B15	17	J01	22	F10	25	J11	29	B15	37	J01

ICD code	Cause description	Table number															
		2A		2B		3A		3B		4A		4B		5A		5B	
320–389	**VI Diseases of the nervous system & sense organs**	2	J10	5	B12	9	D16	17	L02	22	J10	25	B12	29	D16	37	L02
332	Parkinson's disease	2	B11	5	F12	9	F17	17	N03	22	B11	25	F12	29	F17	37	N03
340	Multiple sclerosis	2	F11	5	J12	9	M18	17	B03	22	F11	25	J12	29	H18	37	B05
390–459	**VII Diseases of the circulatory system**	2	J11	5	B13	10	J01	17	D06	22	J11	25	B13	30	J01	37	D06
393–398	Chronic rheumatic heart disease	2	B12	5	F13	10	L02	17	F07	22	B12	25	F13	30	L02	37	F07
401–405	Hypertensive disease	2	F12	5	J13	10	N03	17	H08	22	F12	25	J13	30	N03	37	H08
410–414	Ischaemic heart disease	2	J12	5	B14	10	B05	17	J09	22	J12	25	B14	30	B05	37	J09
410	Acute myocardial infarction	2	B13	5	F14	10	D06	17	L10	22	B13	25	F14	30	D06	37	L10
415.1	Pulmonary embolism	2	F13	5	J14	10	F07	17	N11	22	F13	25	J14	30	F07	37	N11
416	Chronic pulmonary heart disease	2	J13	5	B15	10	H08	17	B13	22	J13	25	B15	30	H08	37	B13
420–429	Other forms of heart disease	2	B14	5	F15	10	J09	17	D14	22	B14	25	F15	30	J09	37	D14
428.0	Congestive heart failure	2	F14	5	J15	10	L10	17	F15	22	F14	25	J15	30	L10	37	F15
430–438	Cerebrovascular disease	2	J14	5	B16	10	N11	17	H16	22	J14	25	B16	30	N11	37	H16
430	Subarachnoid haemorrhage	2	B15	5	F16	10	B13	17	J17	22	B14	25	F16	30	B13	37	J17
431–438	Other cerebrovascular disease	2	F15	5	J16	10	D14	17	L18	22	F15	25	J16	30	D14	37	L18
440–448	Diseases of arteries, arterioles & capillaries	2	J15	5	B17	10	F15	18	N01	22	J15	25	B17	30	F15	38	N01
441	Aortic aneurysm	2	B16	5	F17	10	H16	18	B03	22	B16	25	F17	30	H16	38	B03
451–453	Phlebitis, thrombophlebitis, venous embolism & thrombosis	2	F16	5	J17	10	J17	18	D04	22	F16	25	J17	30	J17	38	D04
460–519	**VIII Diseases of the respiratory system**	2	J16	5	B18	10	L18	18	F05	22	J16	25	B18	30	L18	38	F05
480–486	Pneumonia	2	B17	5	F18	10	N01	18	H06	22	B17	25	F18	31	N01	38	H06
481	Pneumococcal pneumonia	2	F17	5	J18	11	B03	18	J07	22	F17	25	J18	31	B03	38	J07
485	Bronchopneumonia, organism unspecified	2	J17	6	B01	11	D04	18	L08	22	J17	26	B01	31	D04	38	L08
487	Influenza	2	B18	6	F01	11	F05	18	N09	22	B18	26	F01	31	F05	38	N09
490–493	Bronchitis, chronic & unspecified, emphysema & asthma	2	F18	6	J01	11	H06	18	B11	22	F18	26	J01	31	H06	38	B11
491	Chronic bronchitis	2	J18	6	B02	11	J07	18	D12	22	J18	26	B02	31	J07	38	D12
493	Asthma	3	B01	6	F02	11	L08	18	F13	23	B01	26	F02	31	L08	38	F13
496	Chronic airways obstructions, not elsewhere classified	3	F01	6	J02	11	N09	18	H14	23	F01	26	J02	31	N09	38	H14
500–508	Pneumoconioses & other lung diseases due to external agents	3	J01	6	B03	11	B11	18	J15	23	J01	26	B03	31	B11	38	J15
520–579	**IX Diseases of the digestive system**	3	B02	6	F03	11	D12	18	L16	23	B02	26	F03	31	D12	38	L16
531–533	Ulcer of stomach & duodenum	3	F02	6	J03	11	F13	18	N17	23	F02	26	J03	31	F13	38	N17
531	Gastric ulcer	3	J02	6	B04	11	H14	19	B01	23	J02	26	B04	31	H14	39	B01
532	Duodenal ulcer	3	B03	6	F04	11	J15	19	D02	23	B03	26	F04	31	J15	39	D02
550–553	Hernia of abdominal cavity	3	F03	6	J04	11	L15	19	F03	23	F03	26	J04	31	L16	39	F03
560	Intestinal obstruction without mention of hernia	3	J03	6	B05	11	N17	19	H04	23	J03	26	B05	31	N17	39	H04
562	Diverticula of intestine	3	B04	6	F05	12	B01	19	J05	23	B04	26	F05	32	B01	39	J05
571	Chronic liver disease & cirrhosis	3	F04	6	J05	12	D02	19	L06	23	F04	26	J05	32	D02	39	L06

Index B By selected cause group — *continued*

ICD code	Cause description	Table number															
		2A		2B		3A		3B		4A		4B		5A		5B	
580–629	**X Diseases of the genito-urinary system**	3	J04	6	B06	12	F03	19	N07	23	J04	26	B06	32	F03	39	N07
580–589	Nephritis, nephrotic syndrome and nephrosis	3	B05	6	F06	12	H04	19	B09	23	B04	26	F06	32	H04	39	B09
590	Infections of kidney	3	F05	6	J06	12	J05	19	D10	23	F05	26	J06	32	J05	39	D10
600	Hyperplasia of prostate	3	J05			12	L06			23	J05			32	L06		
630–676	**XI Complications of pregnancy, childbirth & the puerperium**			6	B07			19	F11			26	B07			39	F11
680–709	**XII Diseases of the skin & subcutaneous tissue**	3	B06	6	F07	12	N07	19	H12	23	B06	26	F07	32	N07	39	H12
710–739	**XIII Diseases of the musculoskeletal system & connective tissue**	3	F06	6	J07	12	B09	19	J13	23	F06	26	J07	32	B09	39	J13
714	Rheumatoid arthritis	3	J06	6	B08	12	D10	19	L14	23	J06	26	B08	32	D10	39	L14
715	Osteoarthrosis & allied disorders	3	B07	6	F08	12	F11	19	N15	23	B07	26	F08	32	F11	39	N15
740–759	**XIV Congenital anomalies**	3	F07	6	J08	12	H12	19	B17	23	F07	26	J08	32	H12	39	B17
741	Spina bifida	3	J07	6	B09	12	J13	19	D18	23	J07	26	B09	32	J13	39	D18
745–746	Congenital anomalies of heart	3	B08	6	F09	12	L14	20	G01	23	B08	26	F09	32	L14	40	F01
760–779	**XV Certain conditions originating in the perinatal period**	3	F08	6	J09	12	N15	20	H02	23	F08	26	J09	32	N15	40	H02
761–763, 767	Obstetrics complications affecting foetus or newborn, & birth trauma	3	J08	6	B10	12	B17	20	J03	23	J08	26	B10	32	B17	40	J03
764–765	Slow foetal growth, foetal malnutrition & immaturity	3	B09	6	F10	12	D18	20	L04	23	B09	26	F10	32	D18	40	L04
768–770	Hypoxia, birth asphyxia & other respiratory conditions	3	F09	6	J10	13	F01	20	N05	23	F09	26	J10	33	F01	40	N05
780–799	**XVI Signs, symptoms & ill-defined conditions**	3	J09	6	B11	13	H02	20	B07	23	J09	26	B11	33	H02	40	B07
798.0	Sudden infant death syndrome	3	B10	6	F11	13	J03	20	D08	23	B10	26	F11	33	J03	40	D08
E800–E999	**External causes of injury & poisoning**	3	F10	6	J11	13	L04	20	F09	23	F10	26	J11	33	L04	40	F09

Index B *continued*

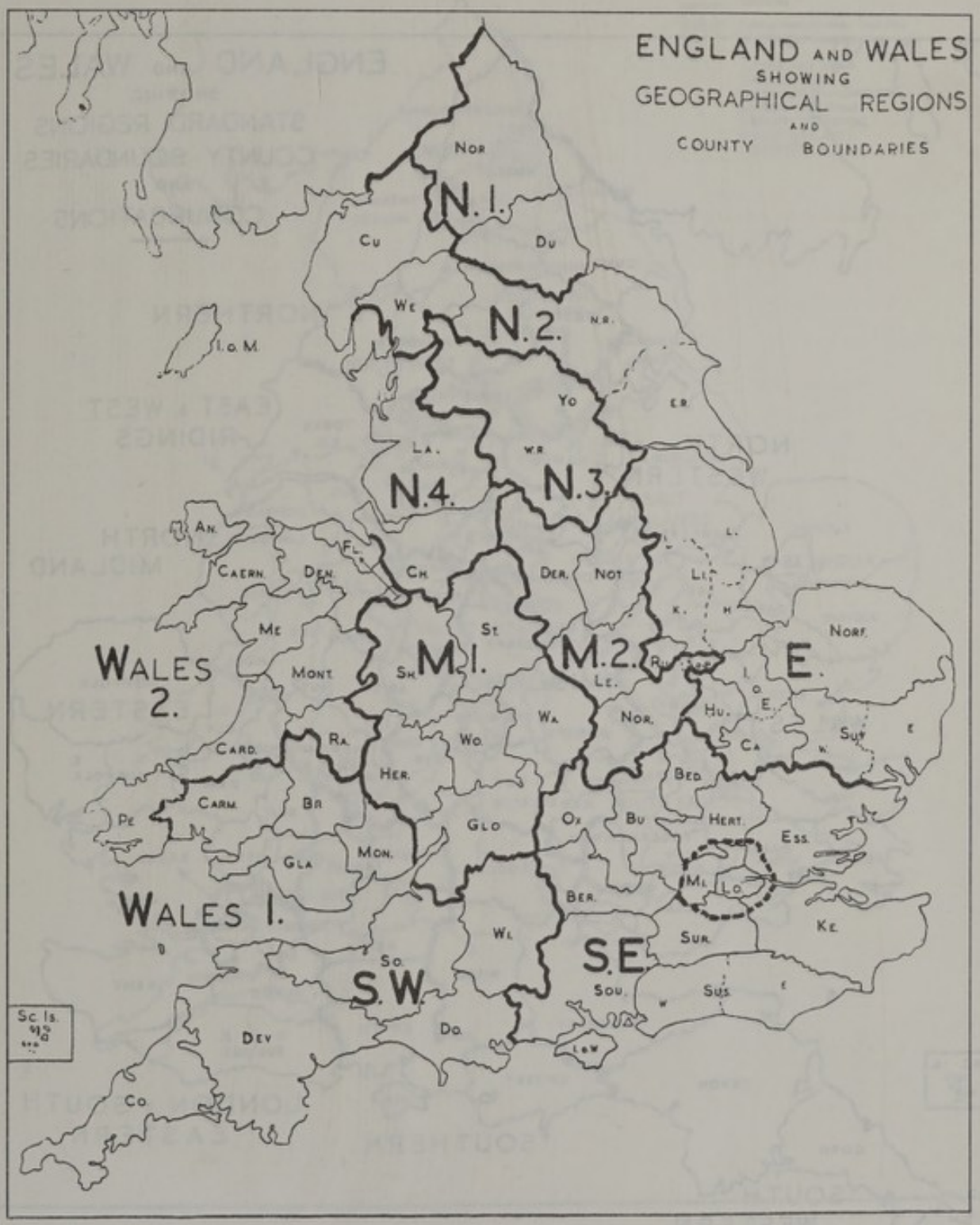
ICD code	Cause description	Table number															
		2.1A		2.1B		3.1A		3.1B		4.1A		4.1B		5.1A		5.1B	
i) *External causes*																	
001–999	**All causes**	4	B01	7	B01	14	B01	21	B01	24	B01	27	B01	34	B01	41	B01
E800–E999	**External causes of injury and poisoning**	4	F01	7	F01	14	D02	21	D02	24	F01	27	F01	34	D02	41	D02
E800–E848 E929.0–E929.1	Transport accidents (including late effects)	4	J01	7	J01	14	F03	21	F03	24	F01	27	F01	34	F03	41	F03
E810–E825 E929.0	motor vehicle traffic accidents	4	B02	7	B02	14	H04	21	H04	24	B02	27	B02	34	H04	41	H04

Index B By selected cause group — *continued*

ICD code	Cause description	Table number															
		2A		2B		3A		3B		4A		4B		5A		5B	
(E810–E825) 0.03	Motor vehicle accidents — Drivers and passengers	4	F02	7	F02	14	J05	21	J05	24	F02	27	F02	34	J05	41	J05
(E810–E825) .7	Motor vehicle accidents — pedestrians	4	J02	7	J02	14	L06	21	L06	24	J02	27	J02	34	L06	41	L06
E800–E807 E826–E848 E929.1	Other transport accidents (including late effects)	4	B03	7	B03	14	N07	21	N07	24	B03	27	B03	34	N07	41	N07
E850–E869 E929.2 E950–E959 E980–E989	Suicides accidental poisoning and injury undetermined whether accidently or purposely inflicted	4	F03	7	F03	14	B09	21	B09	24	F03	27	F03	34	B09	41	B09
E850–E869) E929.2	Accidental poisoning (including late effects)	4	J03	7	J03	14	D10	21	D10	24	J03	27	J03	34	D10	41	D10
E880–E888 E929.3	Accidental falls (including late effects)	4	B04	7	B04	14	F11	21	F11	24	B04	27	B04	34	F11	41	F11
E890–E899	Accidents caused by fire and flames	4	F04	7	F04	14	H12	21	H12	24	F04	27	F04	34	H12	41	H12
E910	Accidental drowning and submersion	4	J04	7	J04	14	J13	21	J13	24	J04	27	J04	34	J13	41	J13
E950–E959	Suicide	4	B05	7	B05	14	L14	21	L14	24	B05	27	B05	34	L14	41	L14
E960–E969	Homicide and injury purposely inflicted by other persons	4	F05	7	F05	14	N15	21	N15	24	F05	27	F05	34	N15	41	N15

Appendix 5 Maps showing counties of England and Wales

A 1921–30



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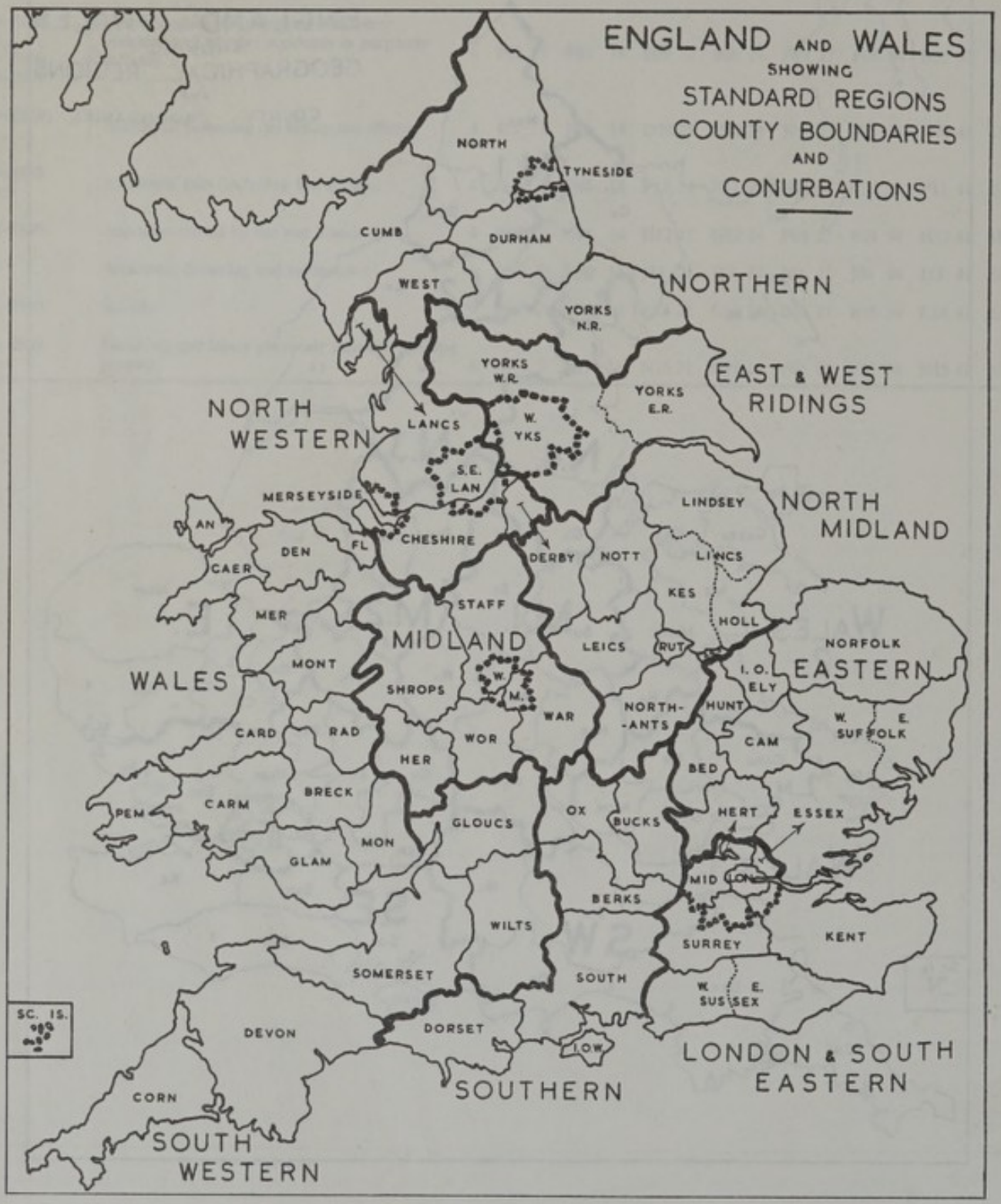

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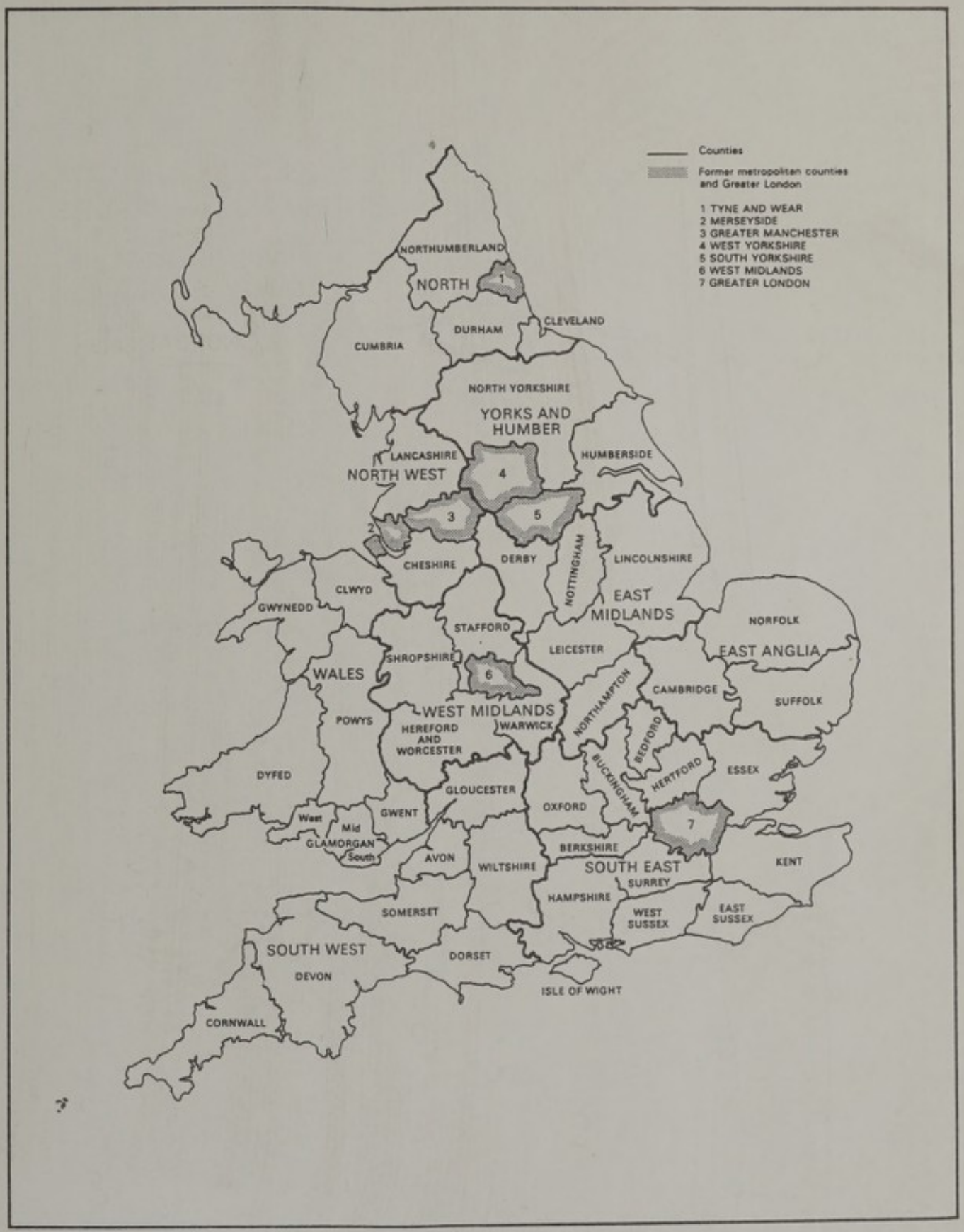

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