UNIVERSITY OF BIRMINGHAM

West Midlands Commissioning Support Unit

Department of Public Health, Epidemiology and Biostatistics

School of Health and Population Sciences

College of Medical and Dental Sciences

West Midlands Key Health Data 2011/12

Chapter contributions from:

West Midlands Cancer Intelligence Unit

Health Protection Agency West Midlands

The Perinatal Institute

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FOREWORD

This is the fourteenth edition in the West Midlands Key Health Data series. The report is compiled by the West Midlands Commissioning Support Unit at the University of Birmingham. This year the report is a collaborative project between the Health Protection Agency - West Midlands, West Midlands Cancer Intelligence Unit, West Midlands Perinatal Institute, NHS Stoke-on-Trent, NHS Staffordshire/Staffordshire County Council, NHS Warwickshire, Warwickshire County Council, Heart of England Foundation Trust and the West Midlands Commissioning Support Unit.

Contributions include updates on infectious disease incidence, updates on maternity key performance indicators and the reduction in stillbirths in the West Midlands, evaluation of methods for tuberculosis case ascertainment, measuring inequalities in local level life expectancy, and measuring mental well-being. There is the regular health geography chapter, providing the latest overview of the structure of the new Public Health and NHS Commissioning organisations in the West Midlands, and, in a slight departure from previous reports, two chapters that focus on methodology rather than information. These two chapters showcase innovative ways of presenting health information in maps and trends charts and reflect the need for public health information specialists to not only interpret and contextualise information but also to communicate it effectively.

We thank those who have provided contributions to the report, especially as they have been made during a time of major reorganisation of the NHS commissioning organisations and the move of Public Health teams into the local Authorities.

The provision of high quality, relevant health intelligence is a fundamental pre-requisite needed to undertake evidence based commissioning and planning of services. We hope that the report will help to demonstrate that public health intelligence professionals have a set of specialised skills and knowledge that the new Clinical Commissioning Groups, local authority Public Health teams, and Health and Wellbeing Boards should continue to value into the future.

With all the changes to contributing organisations and the cessation of its current funding and host unit arrangements, the future of the Key Health Data series is itself in doubt. As such, this is a timely point to thank once again all those who have contributed to or helped to produce the Key Health Data series in the past.

The CD-ROM made available at this year's launch event includes all the past Key Health Data reports to form a definitive collection. All the reports can also be downloaded from the Key Health Data website.

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1. HEALTH GEOGRAPHY

1.1 Introduction

This chapter provides an overview of the geographies that will become important for the provision of public health information as a result of the Health and Social Care Act that received Royal Assent on 27 March 2012.[1] Primary Care Trusts, Cancer Registries, Public Health Observatories and the Health Protection Agency will cease to exist after 31 March 2013 and a number of new organisations will take over these and other public health functions. The new organisations will include a new executive agency of the Department of Health (DH) to be called Public Health England (PHE), a range of organisations under the NHS Commissioning Board (NHS CB) and the local Health and Wellbeing Boards (HWBs) based in upper tier local authorities. All will have core roles in the collection of health data, publication of information and assessment of health commissioning needs and resources.

This chapter will also include signposts to other geographic products available to support the publication of 2011 Census data.

1.2 Public Health England (PHE)

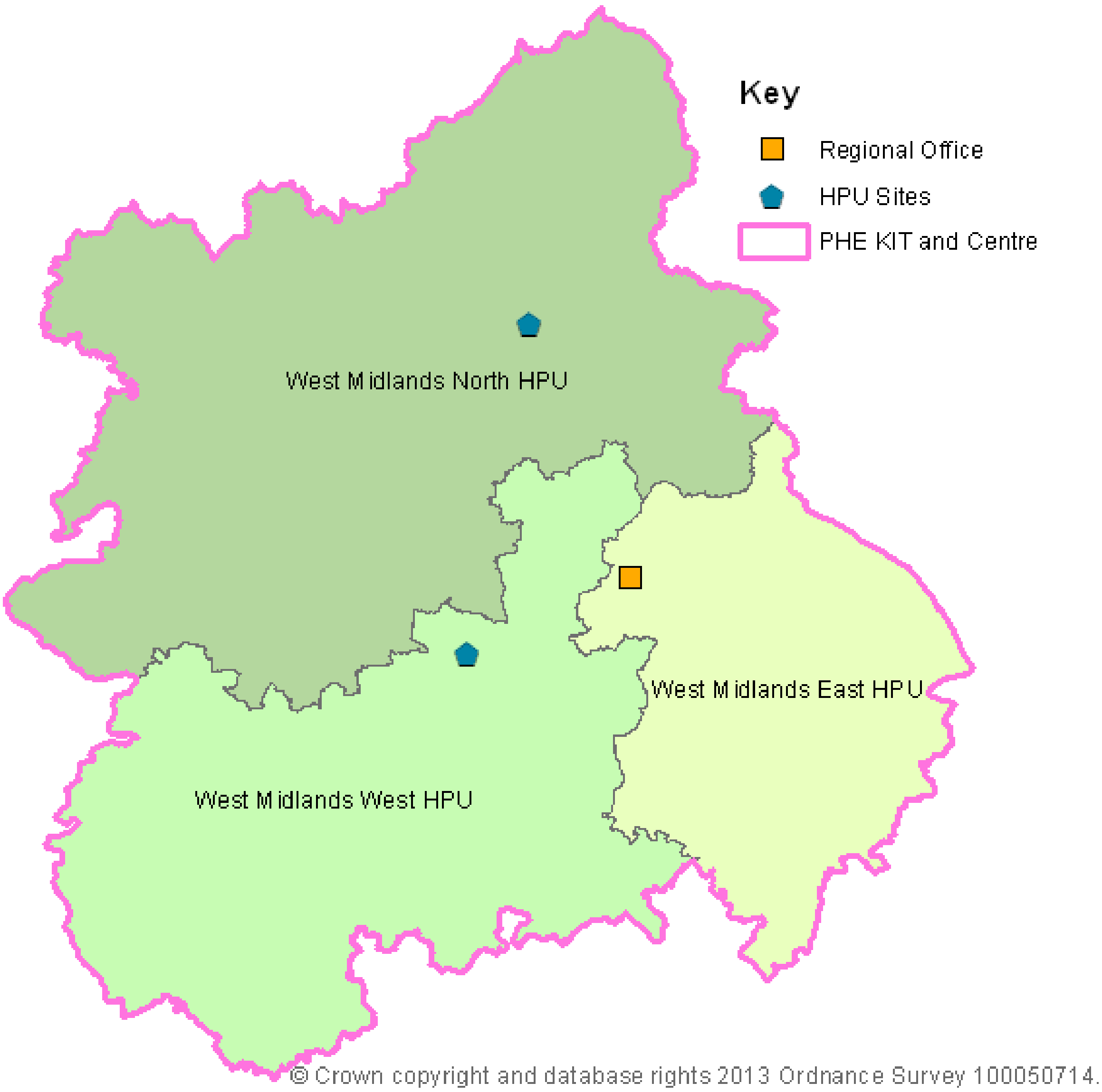
Public Health England will be established on 1 April 2013 and will become responsible for providing public health functions for health protection, health promotion, screening, immunisation and public health information & intelligence. PHE will operate as an Executive Agency of the Department of Health (DH) with a small national office led by a Chief Executive. A number of 'sender' organisations have been identified as core components of PHE, including the Health Protection Agency, public health observatories, cancer registries, National Drug Treatment Agency, National Drug Treatment Monitoring Service, and cancer and non-cancer screening quality assurance reference centres.

Public Health England will have three main geographic footprints:

- Four sub-national regions will cover the North of England, South of England, London and the Midlands & East of England.
- Eight Knowledge and Intelligence Teams (KITs) will provide knowledge and intelligence services to all NHS CB organisations, local HWBs and voluntary sector.
- 15 Centres will provide a local presence and leadership to local authorities for health protection, public health and specialised commissioning.

The West Midlands will be part of the Midlands and East of England region and have a single Knowledge and Intelligence Team dedicated to the same geographic area as the former SHA/GOR. There will be one PHE Centre covering the West Midlands although three Health Protection Units will continue to support local authorities (Figure 1.1).

Figure 1.1: Public Health England geographies in the West Midlands, April 2013



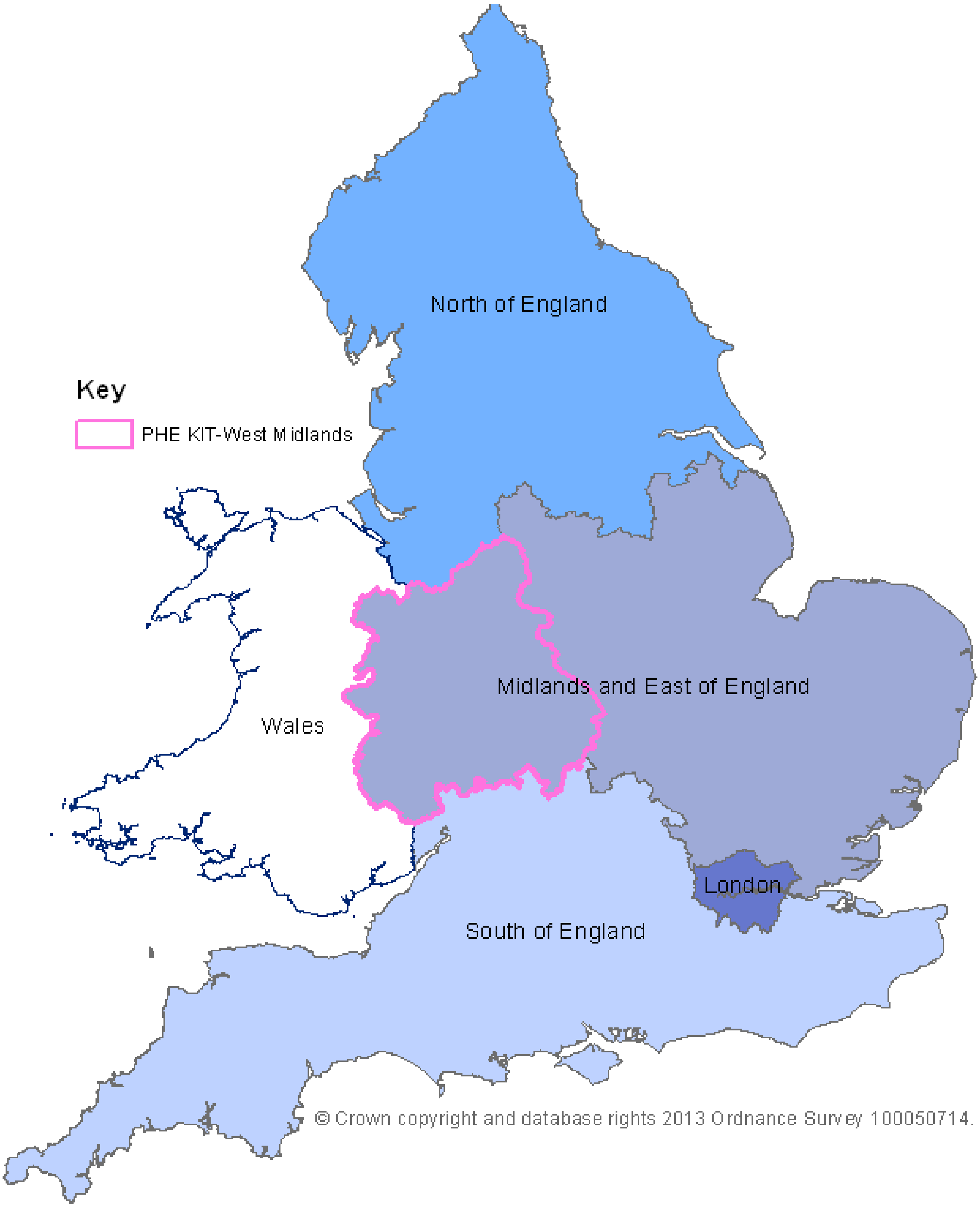
1.3 NHS Commissioning Board (NHS CB)

The first new organisation to be established under the Health and Social Care Bill was the NHS Commissioning Board Authority. It was established in shadow form as a Special Health Authority and replaced by the NHS Commissioning Board on 1 October 2012. Within the NHS CB structure there are both statutory and non-statutory organisations that will each have their own geographic footprint. The national office of the NHS CB in Leeds will oversee a commissioning budget of £80 billion.

Commissioning Regions (CRs)

There will be four Commissioning Regions (CRs) in England responsible for directly commissioning primary care and specialist services for their sector. They will cover the North of England, South of England, London, and the Midlands & East of England (Figure 1.2). Midlands and East of England CR will be responsible for services in the West Midlands.

Figure 1.2: NHS Commissioning Board Commissioning Regions in England, April 2013



Networks and hubs

There will be ten Specialised Commissioning Hubs in England whose functions will be provided within the Area Teams (ATs). They will lead on specialised commissioning across England. West Midlands will be covered by one Specialised Commissioning Hub coterminous with the PHE KIT boundary.

The 12 Clinical Senates identified by NHS CB will provide professional and clinical advice and leadership at a strategic level to CCGs and HWBs to support all commissioning decisions.

12 Specialised Commissioning Networks will provide specialist commissioning advice to the NHS CB and CCGs.

12 Strategic Clinical Networks will “help commissioners reduce unwarranted variation in services and encourage innovation”.

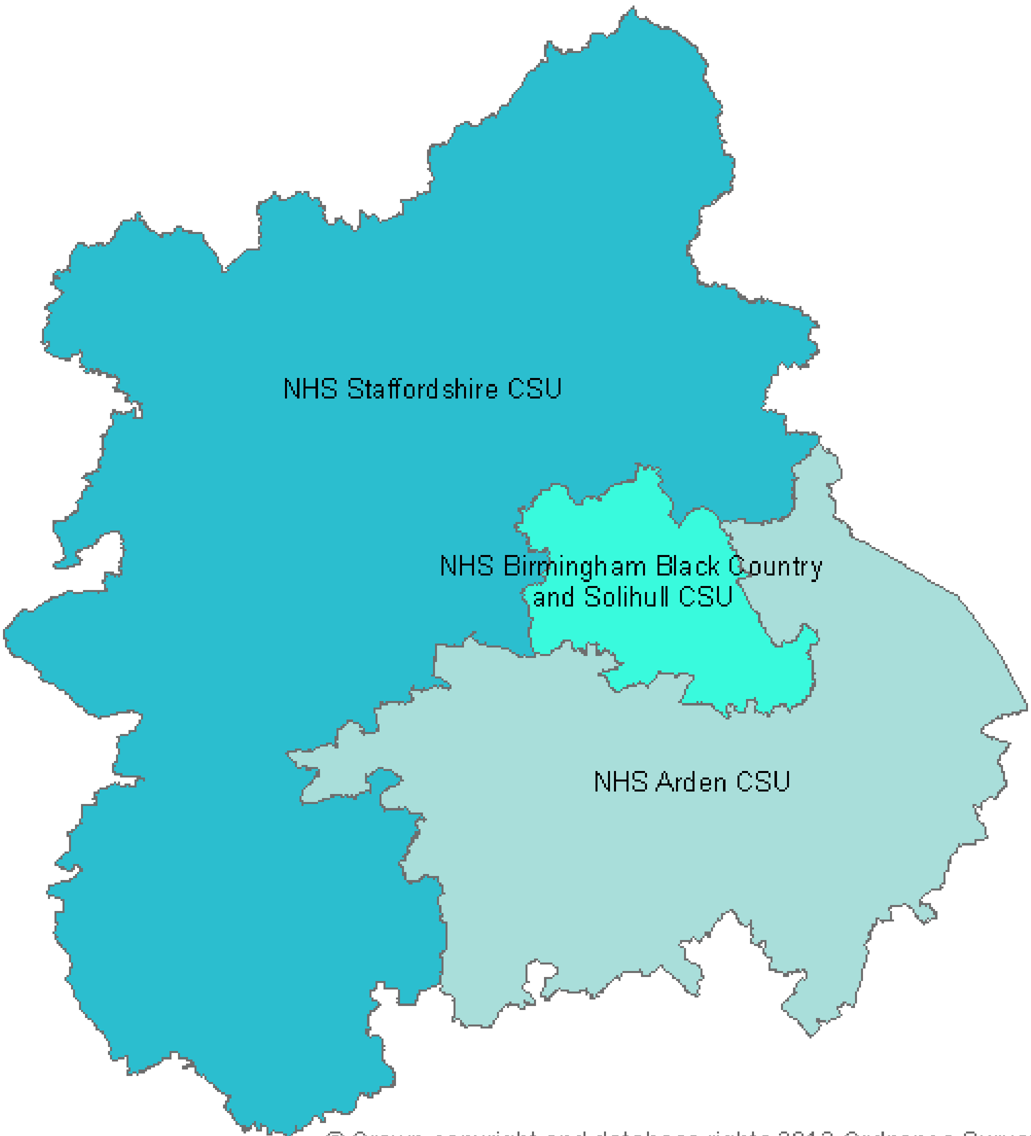
12 Operational Delivery Networks will be set up to closely collaborate with Strategic Clinical Networks, academic health science networks, senates and Health Education England for operational delivery issues.

Within the West Midlands the Clinical Senates, Specialised Commissioning Networks, Strategic Clinical Networks and Operational Delivery Networks are all coterminous with the PHE KIT boundary.

Commissioning Support Units (CSUs)

There will be 22 Commissioning Support Units (CSUs) across England who will support Clinical Commissioning Groups (CCGs) when commissioning local services.

Figure 1.3: Commissioning Support Units in the West Midlands, April 2013



Originally envisaged as having a geographic footprint it is now more likely that the CSUs will bid to provide a range of services to any CCG regardless of their geographic location. Some CCGs are planning to run their own CSU activities e.g. NHS Cambridgeshire and Peterborough CCG. Some CSUs will host Data and Management Integration Centres (DMICs).

It is expected that 3 CSUs will exist in West Midlands providing support to all CCGs but it is not clear whether they will include a DMIC (Figure 1.3).

Area Teams (ATs)

27 Area Teams (ATs) will support CCG development and assurance, emergency planning and directly commission GP, dental, pharmacy and optical services in England. There will be 3 ATs based in West Midlands (Figure 1.4).

Figure 1.4: NHS CB Area Teams in the West Midlands, April 2013

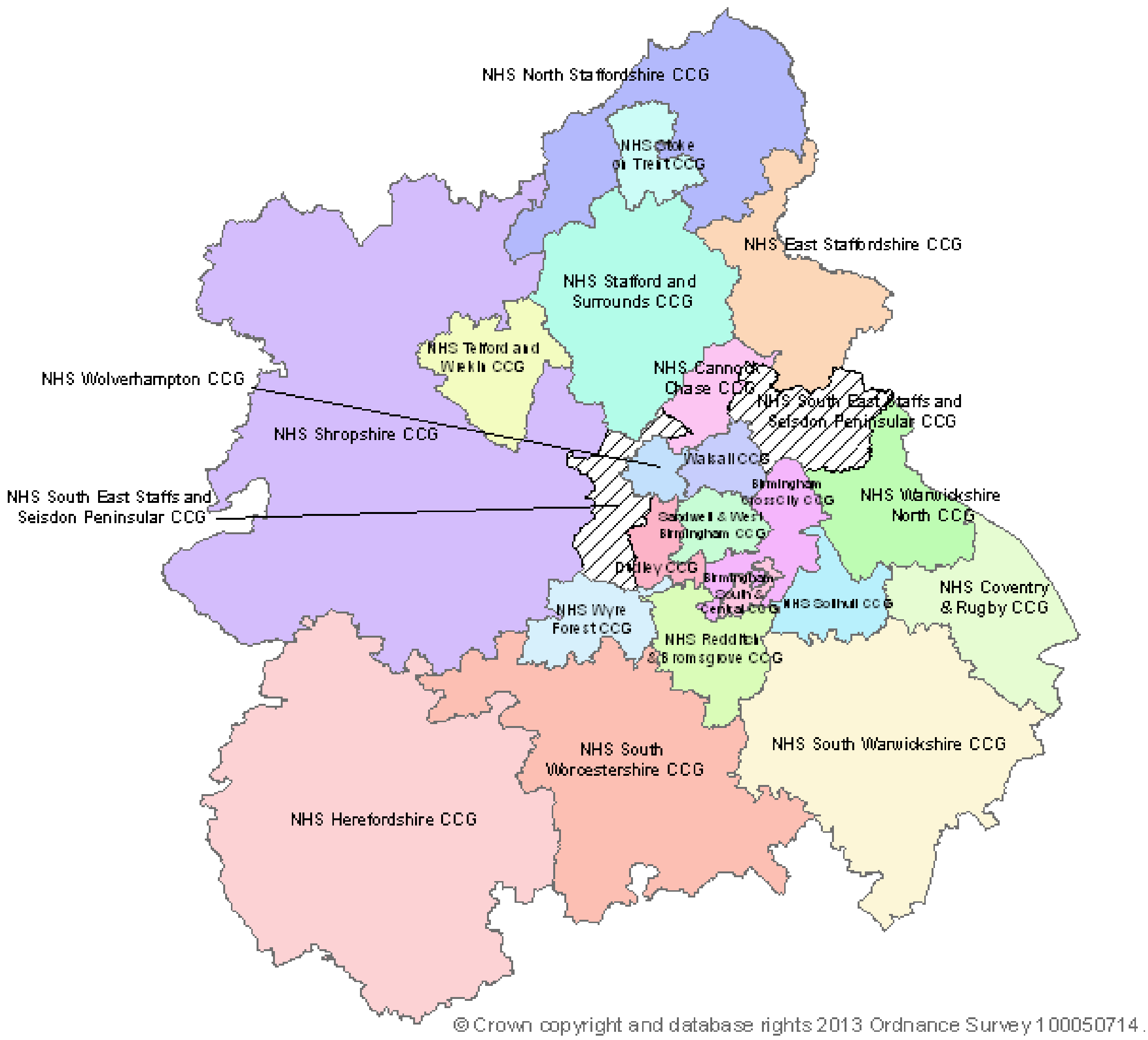
Clinical Commissioning Groups (CCGs)

Clinical Commissioning Groups (CCGs) are the only statutory organisations in the NHS CB family. Their function will be defined by Statute to commission local health services. 22 CCGs have been identified in West Midlands, one of which is split into two distinct geographic areas i.e. NHS South Staffordshire and Seisdon Peninsular CCG (identified by cross-hatch in Figure 1.5 below).

Ten CCGs have been authorised in Wave 1 and Wave 2. The remainder should be authorised in Waves 3 and 4 before 1 April 2013. The authorised CCGs are:

- NHS Dudley CCG
- NHS North Staffordshire CCG
- NHS Sandwell and West Birmingham CCG
- NHS Shropshire CCG
- NHS Stoke on Trent CCG
- NHS Redditch and Bromsgrove CCG
- NHS South Worcestershire CCG
- NHS Telford and Wrekin CCG
- NHS Walsall CCG
- NHS Wyre Forest CCG

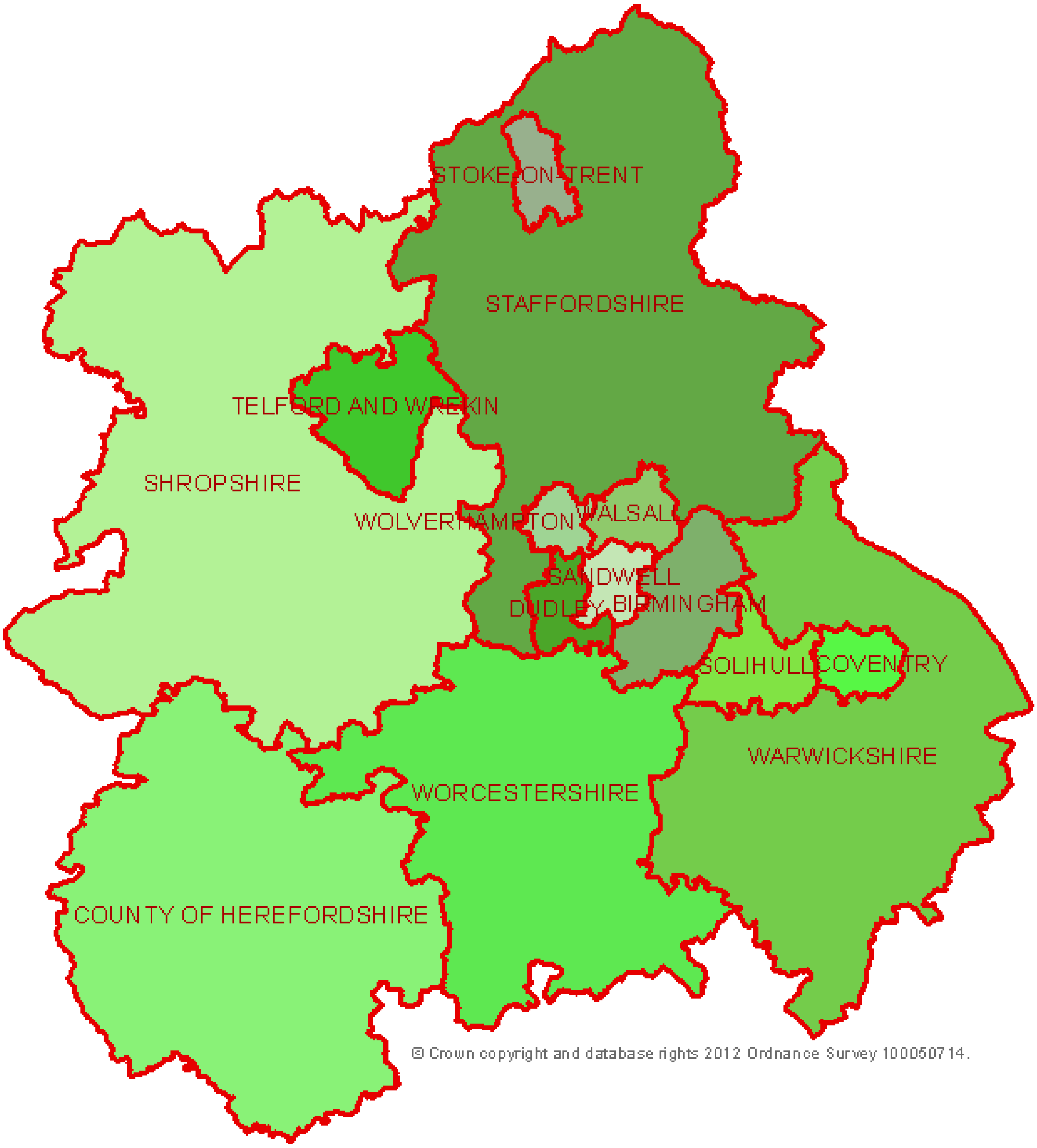
Figure 1.5: Clinical Commissioning Groups in the West Midlands, April 2013



1.4 Health and Wellbeing Boards (HWBs)

Local public health policy will be led by a Health & Wellbeing Board based in strategic or upper tier local authorities. The HWBs will provide the direction for local health policy and the targets for commissioning public health and clinical services. The local authority will host the Director of Public Health and a team of information specialists to support the work of the HWB. The Public Health team will take the lead for improving health and coordinating local efforts to protect and promote the public's health and wellbeing. Local political leadership will be central to making the new structure work. There are 14 HWBs in West Midlands (Figure 1.6).

Figure 1.6: Health and Well-being Boards in the West Midlands, April 2013



1.5 Other geographies

Parliamentary Constituencies

In September 2011 the Boundary Commission for England began a process of consultation on parliamentary constituency boundary changes to secure a reduction in the number of Members of Parliament from 533 to 502 before the next general election or 2015 whichever is the earlier. In the West Midlands they proposed a reduction in parliamentary constituencies from 59 to 54 with 10 boundaries unchanged. Details of the proposals are available at: http://consultation.boundarycommissionforengland.independent.gov.uk/ .

The Electoral Registration and Administration Act 2013 received Royal Assent on 31 January 2013 and postponed the date of the next boundary review to 2018.[2] The Boundary Commission for England has therefore ceased working on the 2013 Review and will no longer be reporting to the Secretary of State in autumn 2013.

Census 2011 geography

ONS Geography published new output area, lower super output area and middle super output area boundaries for 2011 census as 'extent of the realm' and 'mean high water mark' (coastline) files on 1 January 2013. Changes to output area boundaries are minimal and limited to change in less than 5% of output and lower super output areas. Wherever possible the changes to boundaries have been achieved by simple mergers and groupings rather than wholesale realignments. This strategy should allow more meaningful comparisons to be made between 2001 and 2011 results than was possible between previous Censuses.

The boundary sets are available to download under OpenData principles at:
http://www.ons.gov.uk/ons/guide-method/geography/products/census/spatial/2011/index.html

1.6 References

1 Great Britain. *The Health and Social Care Act 2012, Chapter 7*. London: The Stationery Office, 2012. Available at: http://www.legislation.gov.uk/ukpga/2012/7/contents/enacted

2 Great Britain. *The Electoral Registration and Administration Act 2013, Chapter 6*. London: The Stationery Office, 2013.
Available at: http://www.legislation.gov.uk/ukpga/2013/6/contents/enacted

1.7 Further information

Since 1 July 2012 a number of key documents have been published by DH and the NHS CB which identify the geographic footprint of many of the structures within PHE and the NHS CB. These publications were used to identify the boundaries describes in this chapter. They are:

NHS Commissioning Board. *Local Area Teams: staff briefing pack.* Leeds: NHS Commissioning Board, 20 June 2012.
Available at: http://www.commissioningboard.nhs.uk/2012/06/20/local-teams-senates/

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Public Health England Transition Team. *Structure of Public Health England. Factsheet*. London: Department of Health, 26 July 2012.
Available at: https://www.wp.dh.gov.uk/healthandcare/files/2012/07/PHE-structure.pdf

NHS Commissioning Board. *Review of Commissioning Support Units at Checkpoint 2*. Leeds: NHS Commissioning Board, 12 August 2012.
Available at: http://www.commissioningboard.nhs.uk/2012/08/10/cs-bulletin-issue4/

NHS Connecting for Health. *ODS Specification: non-legislative organisations* [Internet]. Leeds: NHS Connecting for Health, 6 December 2012.
Available at: http://www.connectingforhealth.nhs.uk/systemsandservices/data/ods/actchanges

1.8 Abbreviations

CCG	Clinical Commissioning Group
CR	Commissioning Region
CSU	Commissioning Support Unit
DH	Department of Health
DMIC	Data Management and Integration Centres
GoR	Government Office for the West Midlands
HPU	Health Protection Unit
HWB	Health and Wellbeing Board
KIT	Knowledge and Intelligence Team
AT	Area Team
NHS CB	NHS Commissioning Board
PHE	Public Health England
SHA	Strategic Health Authority

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2. HEALTH PROTECTION AGENCY UPDATE ON INFECTIOUS DISEASES

2.1 Introduction

Although many people have considered infectious diseases a beaten problem it is increasingly apparent that this is not the case. Infectious diseases are responsible for over 10% of deaths each year, largely due to pneumonia, a potentially vaccine preventable disease. Measles and pertussis are also vaccine preventable diseases and are included in this chapter as there has been a significant rise in the number of cases in recent years. Tuberculosis is included as, although contained, it is requiring more effort to maintain control of this disease.

The other three sections include sexually transmitted diseases which continue to be a major public health concern and antibiotic resistance in gonococci which threatens to return the disease back to the early parts of the 20th century when chronic infection resulted in significant morbidity such as infertility. HIV is also increasing. There is good news with the introduction of HPV vaccine that will substantially reduce infection with anogenital warts and cervical cancers. Finally hepatitis C has been described as a ticking time bomb with many of the people infected decades earlier progressing to cirrhosis, end stage liver disease and liver cancer. However, new drugs for hepatitis which have recently been developed will increase treatment options and result in more people successfully cured.

2.2 Tuberculosis (TB)

Introduction

Although infectious diseases have been considered as the problem of previous generations, tuberculosis is slowly increasing in the West Midlands and remains one of the main organisms of public health priority. There are large variations in rates of TB between Primary Care Trusts (PCTs) and local authorities across the region. Most of this can be explained by the factors known to increase the risk of tuberculosis.

Treatment for TB requires six months of treatment and the drugs are usually well tolerated and although treatment is long compared to most infections it is once daily so the regime is easy to follow. One of the major issues is that many people have difficulties in being able to complete treatment. A number of key factors are well recognised and these include drug use, alcohol abuse, homelessness and prison which put people at increased risk of disease and increased rate of failed treatment. Preventing treatment failures is a key policy objective. Non-compliance with medication results in people remaining infectious and therefore able to spread disease, but there is also a significant risk of inducing drug resistance. Drug resistance is a major threat to public health as treatment requires more complex and longer drug regimes making treatment harder. Recently extremely drug resistant TB bacteria [XDR-TB] have been identified further complicating control as the drug options are very limited and much longer therapy is required. Currently drug resistance of TB bacteria in the West Midlands remains low and is similar to the national picture.

The expansion of genetic analysis of TB isolates has greatly facilitated better investigation of links between cases; in particular identifying previously unrecognised links and excluding others.

Data sources

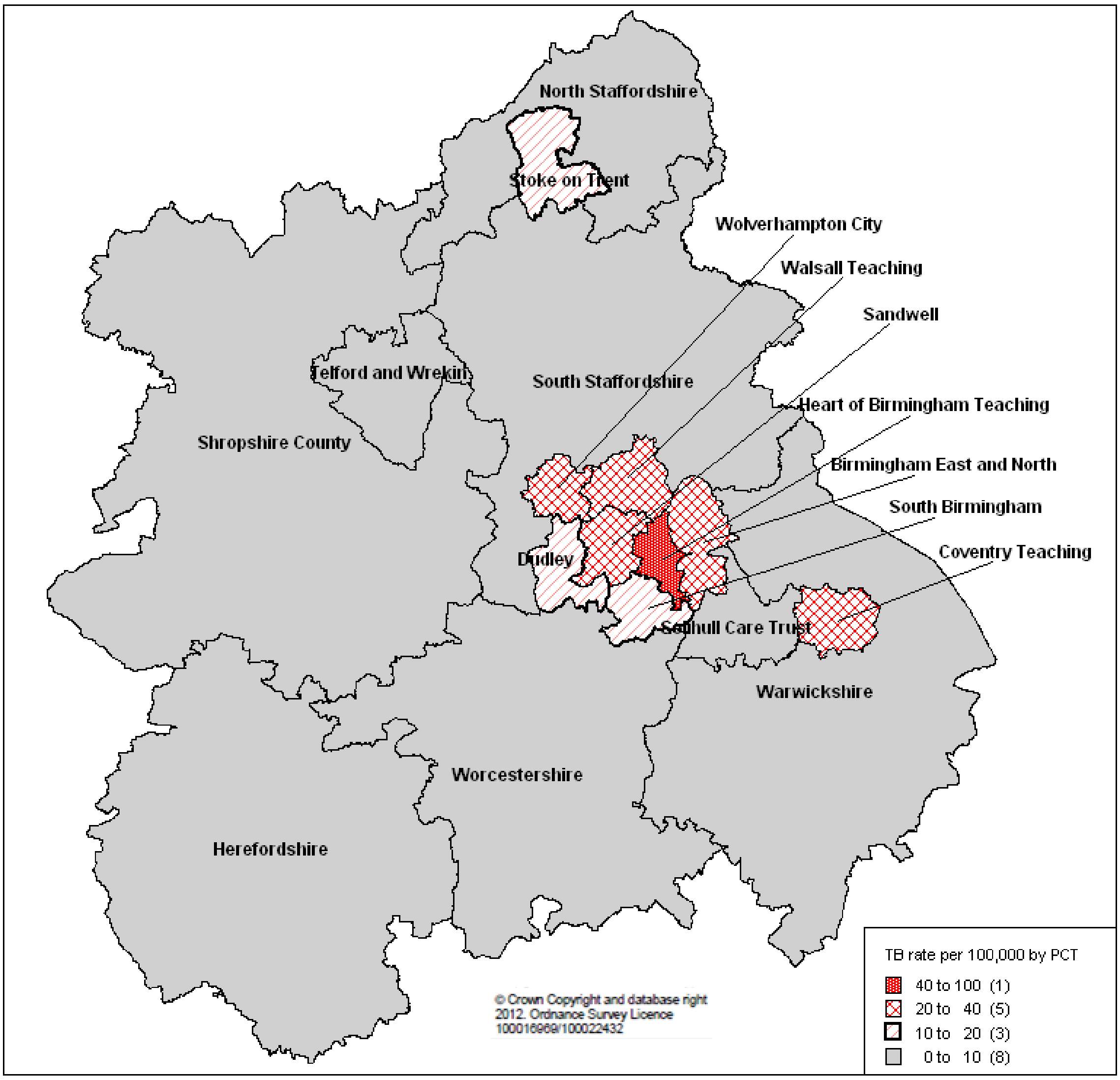
Tuberculosis is a statutory notifiable disease and the combination of clinician reports and laboratory notifications means that virtually all cases of tuberculosis infection get notified - so the data provide a very good picture of what is occurring in the community. In addition, TB is one of the diseases where there is a national programme of enhanced data collection which allows a much better picture of the public health impact of TB to be seen.[1] These data allow detailed epidemiological and clinical information to be linked to improve our knowledge of the local patterns of disease and also the national and international picture of transmission. Statistics in this report reflect 2011 data from the Enhanced TB Surveillance Database.

Results

The number of cases fluctuates from year to year although over the past 10 years there has been a small increasing trend in the number of cases identified. The national CMO action plan has a number of targets for TB reduction with West Midlands meeting the reduction in cases amongst people who entered the UK in the previous 5 years but not amongst UK born residents.

TB is very unevenly distributed across the West Midlands with Birmingham followed by the Black Country having the highest rates. Inner city areas generally have the highest rates with Heart of Birmingham PCT having a rate of 75 per 100,000, a rate statistically significantly higher than anywhere else in the West Midlands (Figure 2.1).

Figure 2.1: TB rates per 100,000 population by PCT, West Midlands 2011

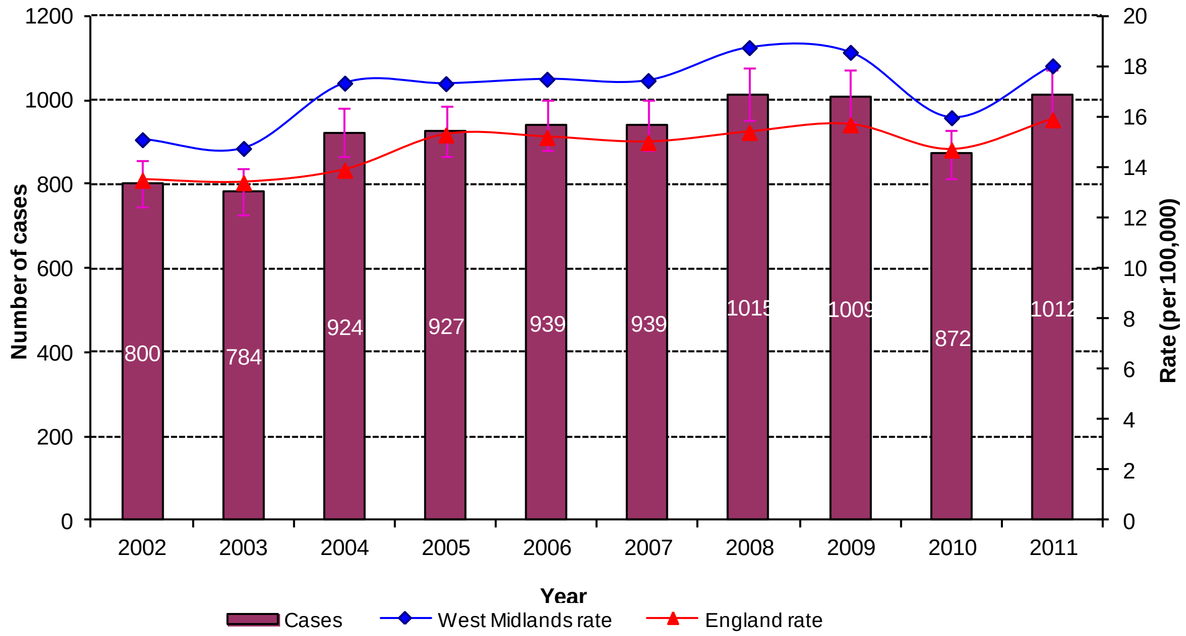


Source: CFI dataset, Health Protection Agency; Mid-year population estimates, Office for National Statistics.

The main reasons for this are a combination of the ethnic make-up of the populations and homelessness. Despite this, no local authority area had a rate above 40 per 100,000 which is the national threshold for implementing universal neonatal BCG. Even if the number was exceeded for one year the majority of these cases would be occurring in populations already targeted for BCG vaccination at birth. Given this, and the inter-year variability in TB rates, the decision to implement neonatal BCG could wait to see if the rate remains above the threshold in the subsequent year(s).

Disease rates have shown a small upward trend over the past 10 years (Figure 2.2).

Figure 2.2: TB cases and rates, West Midlands and England, 2002 to 2011 (with 95% CIs)



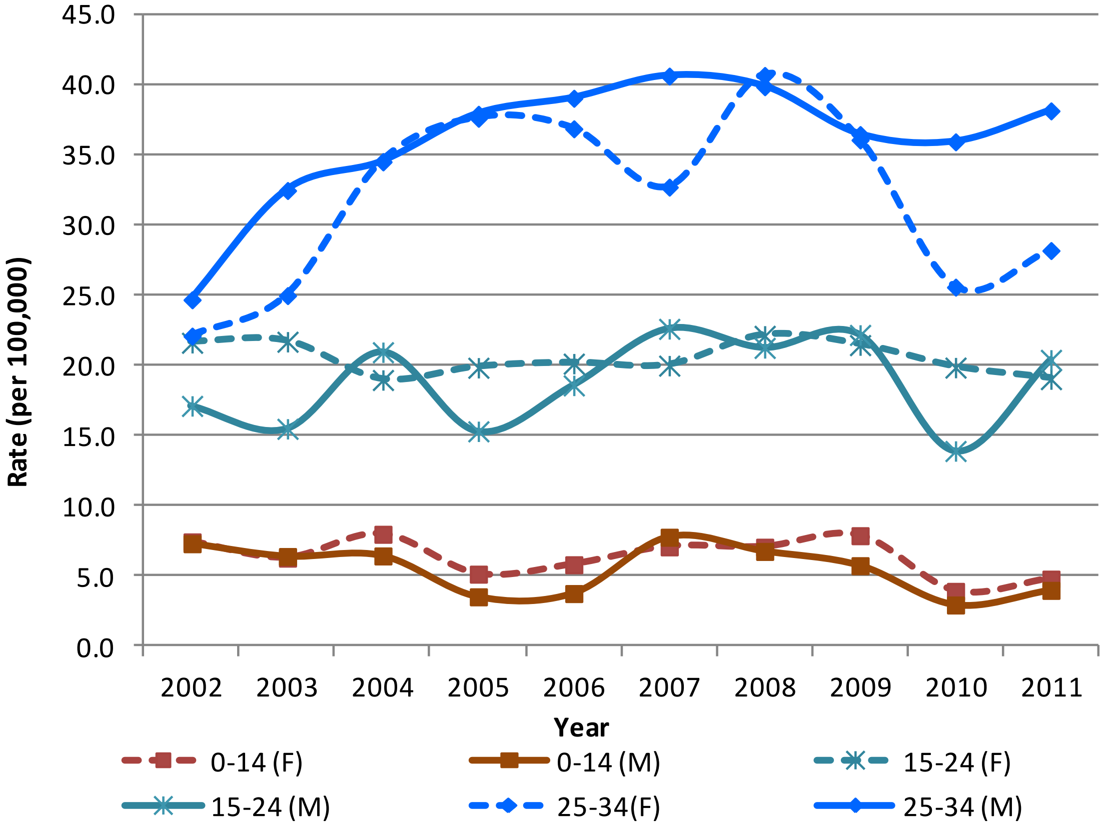
Source: Health Protection Agency; Mid-year population estimates, Office for National Statistics.

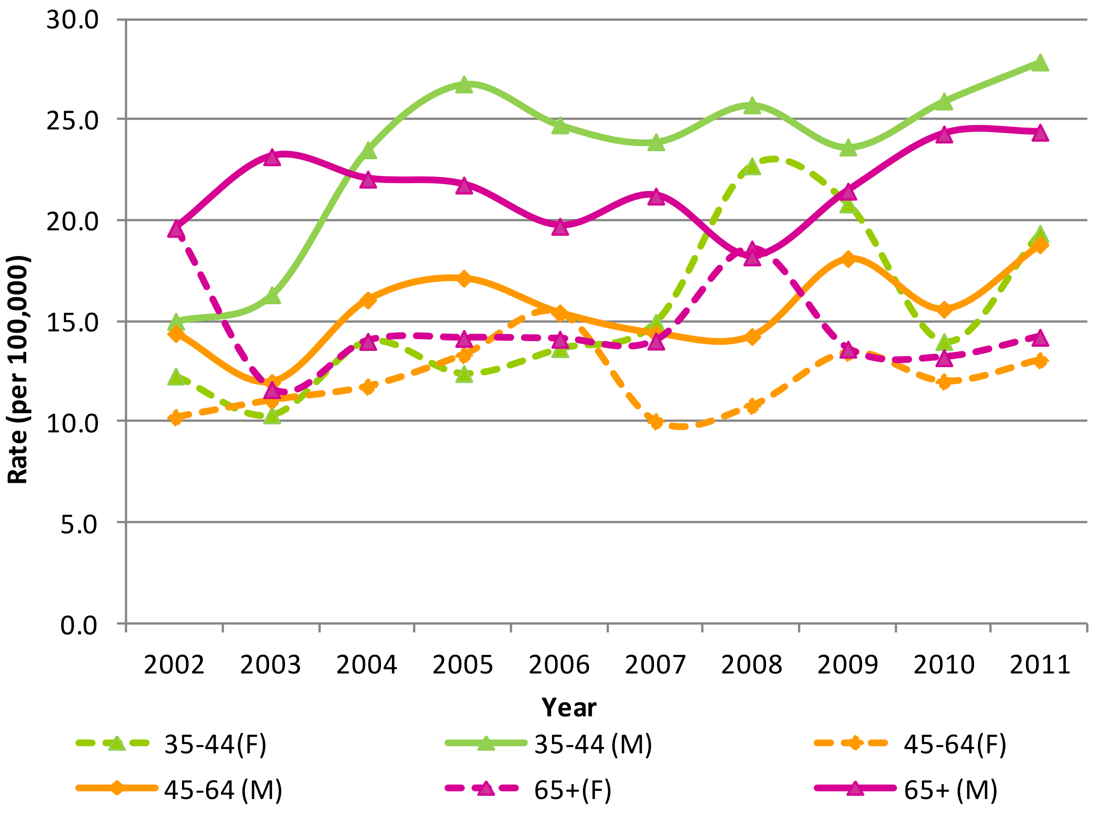
Cases are more common in males than females and most cases occur in the 15-54 age group although rates are equally high in the over 75s. Importantly within the 15-54 age groups, 25-34s have the highest rate followed by 15-24 and 35-44 having similar rates. The lowest rates are seen in the under 15s (Figure 2.3).

Rates are also higher in all non-white ethnic groups (Figure 2.4) but also noteworthy are those born outside the UK who have much higher rates than the same ethnic group born within the UK (Figure 2.5). This is most apparent in people born in sub-Saharan Africa where the impact of HIV and AIDS on TB epidemiology is most marked. People of ethnic groups from these high prevalence countries, despite being born in the UK are also at a higher risk.

Although TB is most common in the 15-54 age groups, in the areas with lower overall rates of infection, typically the more rural areas, a greater proportion of cases are aged 55 and older. This reflects the fact that many of the cases in these areas are due to re-activation of old TB infections rather than from new infections. These areas also have a predominant number of cases in the white ethnic groups and born within the UK. Amongst cases born outside these are predominantly from South Asia (435/656, 66.3%) and sub-Saharan Africa (139/656, 21.2%) reflecting the high disease rates in these countries.

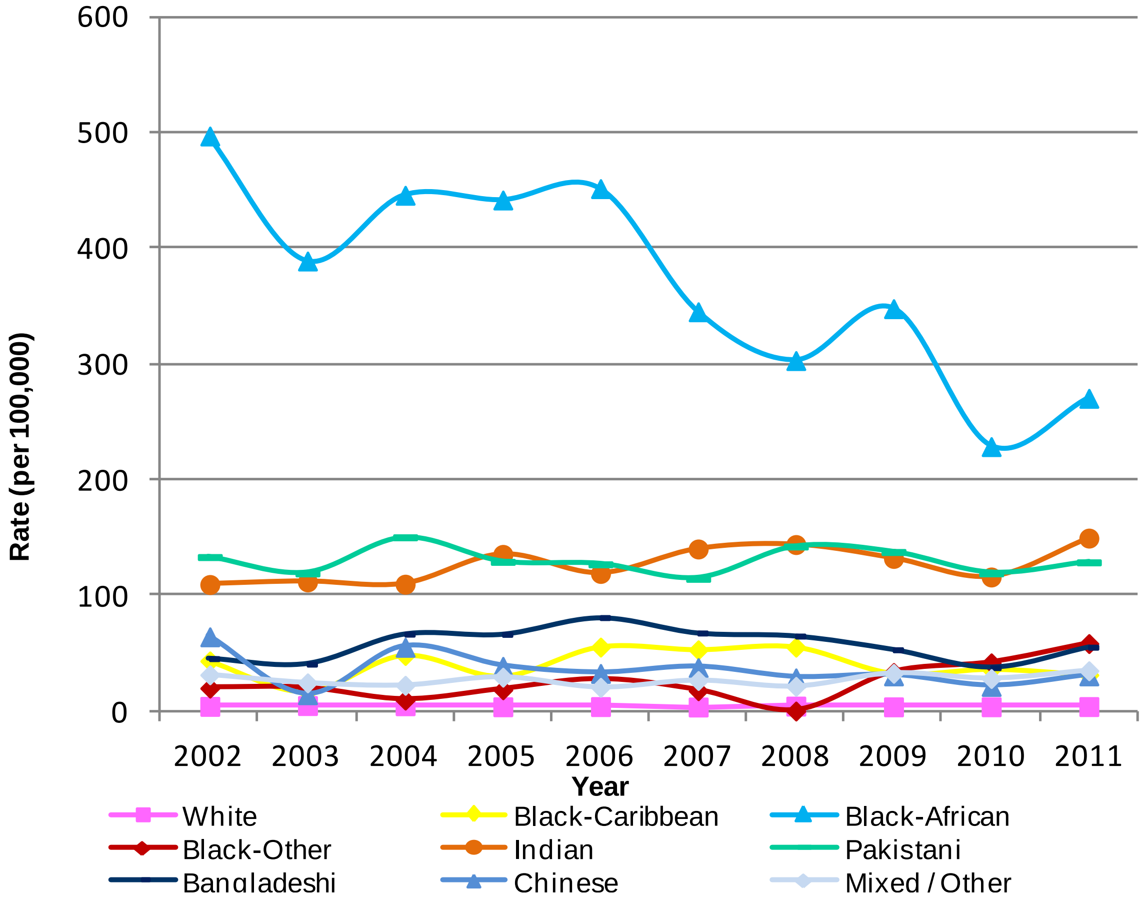
Figure 2.3: TB rates by age group, West Midlands, 2002 to 2011





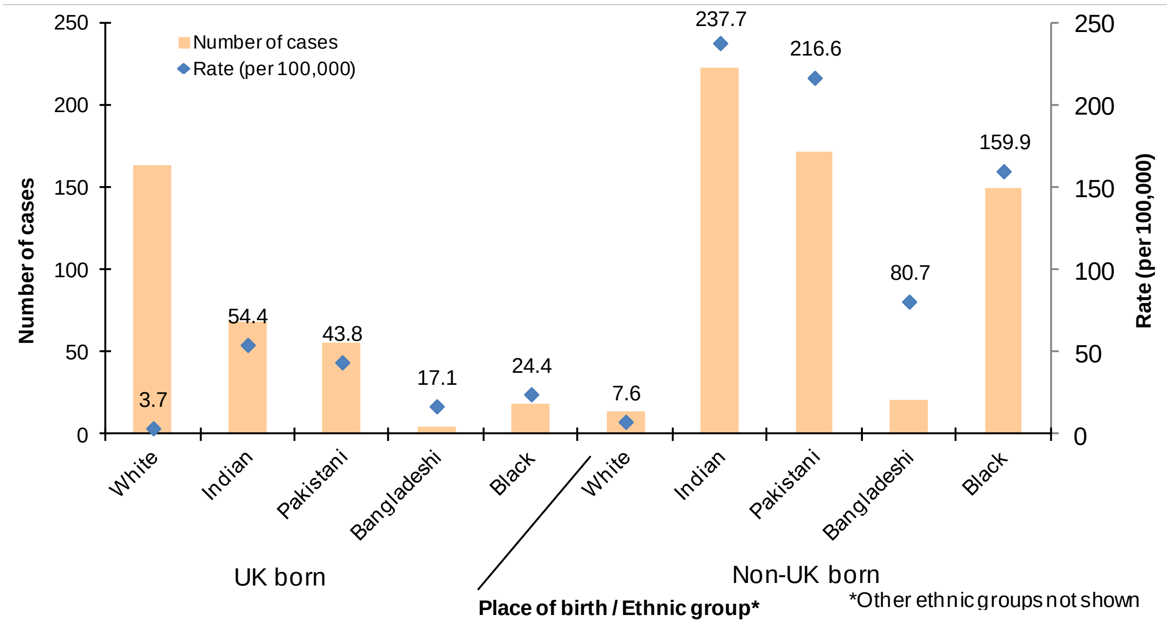
Source: CFI dataset, Health Protection Agency; Mid-year population estimates, Office for National Statistics - 2009 estimates were used for 2010 and 2011 rates.

Figure 2.4: TB rates by ethnic group, West Midlands, 2002 to 2011



Source: CFI dataset, Health Protection Agency; Mid-year population estimates, Office for National Statistics - 2009 estimates were used for 2010 and 2011 rates.

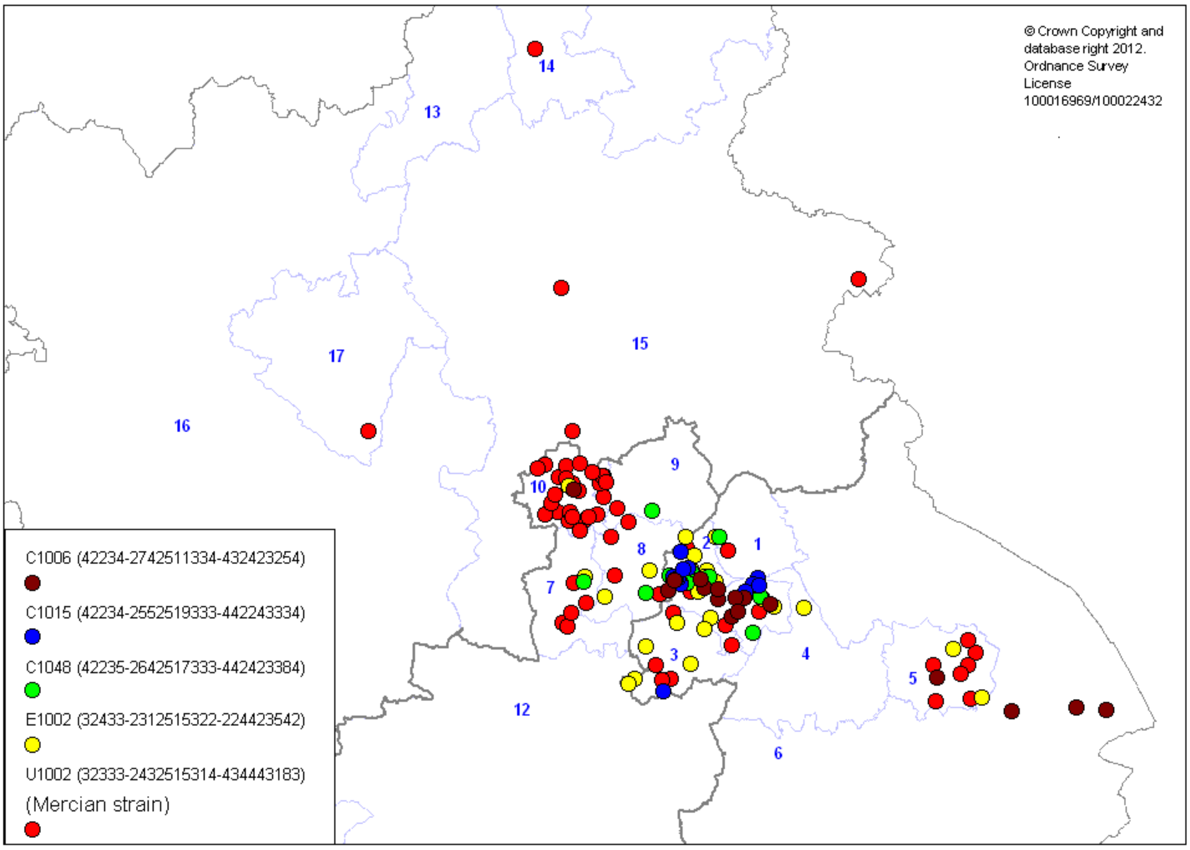
Figure 2.5: TB cases and rates by place of birth and ethnic group, West Midlands, 2011



Source: Health Protection Agency; 2011 Labour Force Survey population estimates, Office for National Statistics.

Advances in the genetic testing of TB bacteria have allowed the spread of a particular clone to be followed. Often links that were not originally suspected are identified, or cases that appear to be linked are shown not to be related which contribute to better control. It can also rule out transmission links in circumstances where there are different strains. This can also be particularly useful in investigation of transmission. It also shows how problematical control can be in some situations. People who are infected with the same strain are part of an outbreak related to that strain. The links may not be direct and it is certain there are unidentified links. Some of the local clones are particularly widespread, particularly the Mercian strain shown in red (Figure 2.6).

Figure 2.6: Selected current clusters of TB



No.	PCT	No.	PCT
1	Birmingham East and North	10	Wolverhampton City PCT
2	Heart of Birmingham Teaching PCT	11	Herefordshire PCT
3	South Birmingham PCT	12	Worcestershire PCT
4	Solihull Care Trust	13	North Staffordshire PCT
5	Coventry Teaching PCT	14	Stoke on Trent PCT
6	Warwickshire PCT	15	South Staffordshire PCT
7	Dudley PCT	16	Shropshire County PCT
8	Sandwell PCT	17	Telford and Wrekin PCT
9	Walsall Teaching PCT		

Source: Health Protection Agency.

Future

Improved identification of cases and latent cases of TB in people newly arrived from high prevalence counties would identify cases before people became infectious and infected other people.

Advances in genome sequencing are improving our understanding of TB infection patterns[2] and much of this work has been done in the West Midlands.

2.3 Human Immunodeficiency Virus (HIV)

Introduction

Significant advances in the management of HIV have meant that the current focus is on chronic disease management. However, there still remain areas of concern. These include: late diagnosis of HIV infection, which makes clinical management more difficult and is associated with a poorer outcome; large numbers of new infections, particularly among men who have sex with men; and new infections occurring with drug resistant HIV strains. It is estimated that one quarter of people with HIV in the UK are unaware of their infection.[3] These people will contribute to the disease burden for many years to come and are likely to present later with attendant increased morbidity and mortality.

Data sources

The Health Protection Agency (HPA) collects data from laboratories, Genito-Urinary Medicine (GUM) clinics and other physicians about HIV infections. Particular uses of these data include:

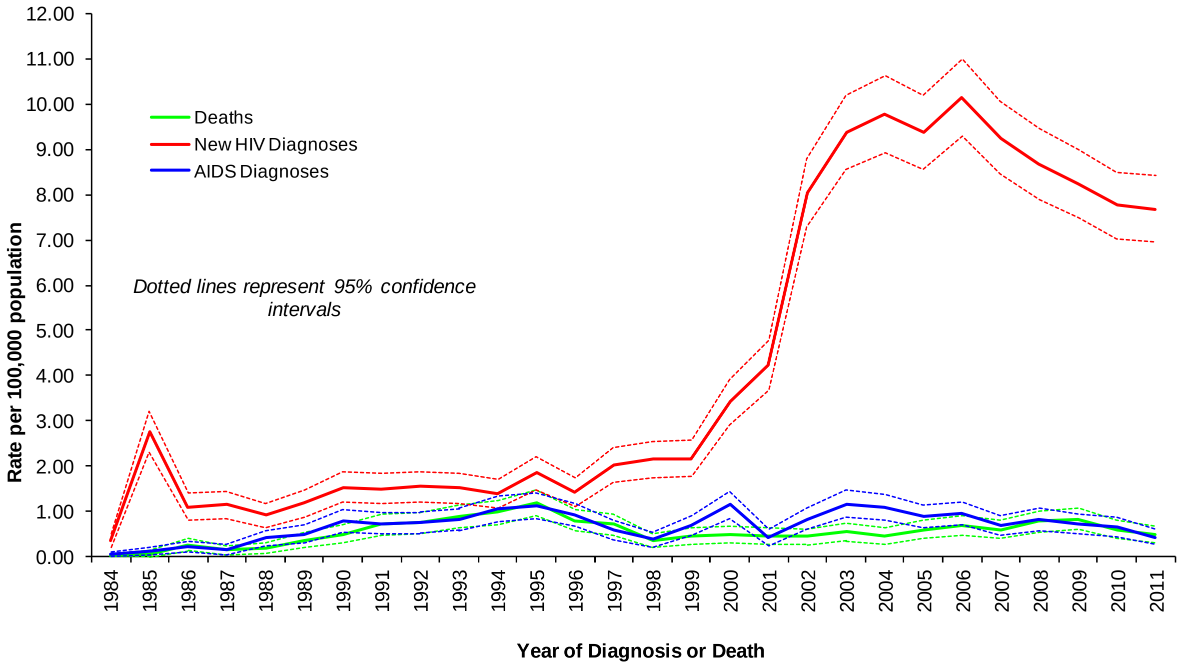
- Identifying the number of new infections and the likely sources of infection
- Identifying the number of people on treatment and those likely to benefit from treatment to assist commissioning and planning of services

As much of the data are anonymised, this dataset is not the easiest to maintain but nevertheless it is accurate for the data presented here, with estimates of undiagnosed HIV positive people being the least accurate.

New diagnoses

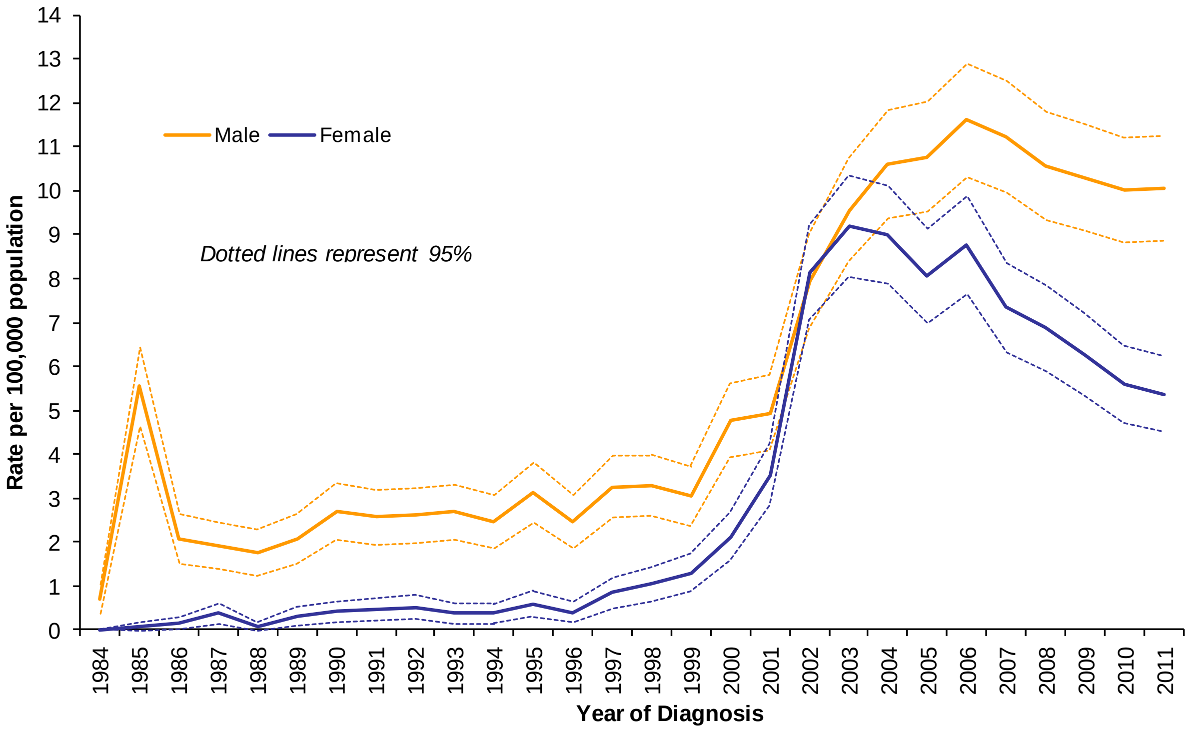
The annual number of new diagnoses rose rapidly in the 5 years from 1999 to 2004 peaking in 2006, following which there has been a steady decline (Figure 2.7). The rate of new infections is currently of the order of 7 cases per 100,000 population. There has been a greater decline seen in females in comparison to males (Figure 2.8).

Figure 2.7: New HIV and AIDS diagnosis and death rates per 100,000, West Midlands 1984-2011



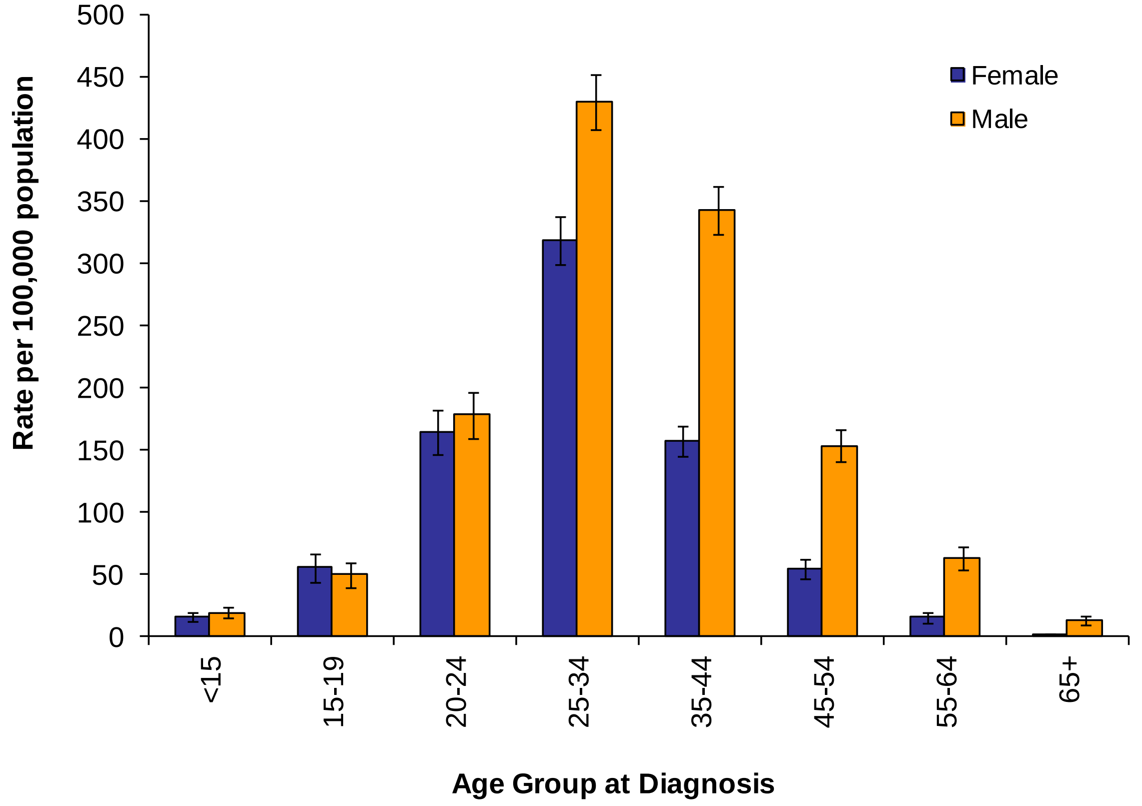
Source: West Midlands HIV Surveillance Project, Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.8: New HIV diagnosis rates per 100,000 by year of diagnosis and gender, West Midlands 1984-2011



Source: West Midlands HIV Surveillance Project, Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.9: New HIV diagnoses by age at diagnosis and gender (cumulative cases) Rate per 100,000, West Midlands 1981-2011



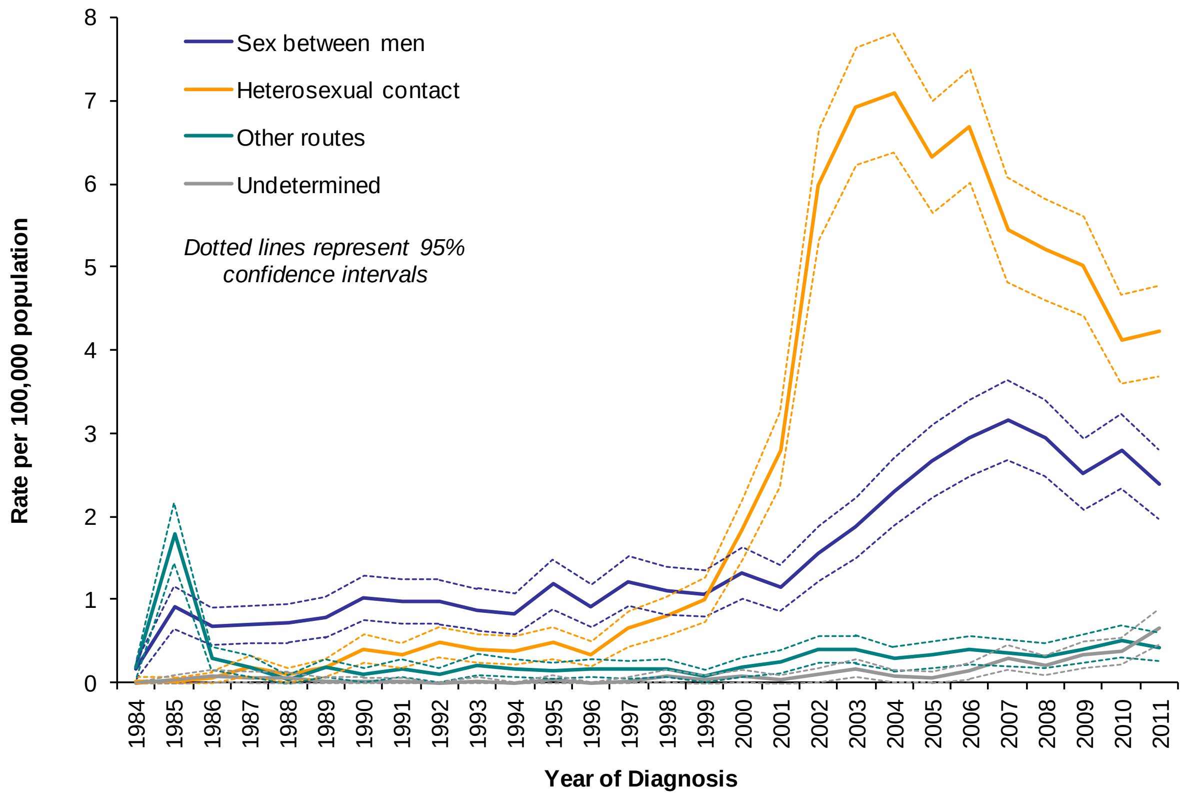
Source: West Midlands HIV Surveillance Project, Health Protection Agency; Mid-year population estimates, Office for National Statistics.

More males are being diagnosed with HIV and at an older age than females (Figure 2.9). Much of this reflects the epidemiology in sub-Saharan Africa, where many of the cases have been acquired, and some of the older males are men who have sex with men.

Routes of infection

From the first recognition of the pandemic in the early 1980s to 1999 men who had sex with men provided the largest number of new infections. Since 2000, sex between men and women has been the predominant route of infection (Figure 2.10). Most of these infections are thought to have occurred in sub-Saharan Africa where people infected in these countries have migrated to the UK. Although these are classified as infected in their home countries, transmission within the UK, or on return trips to Africa, cannot be excluded and is almost certainly occurring. Unless newly arrived people are tested soon after arrival in the UK this cannot be evaluated. There are clear benefits to testing these people who come from countries with a high prevalence as early treatment improves outcome, effective treatment also reduces infectivity virtually preventing further infections with HIV which would otherwise occur if safe sex is not exclusively practiced.

Figure 2.10: New HIV diagnoses by year of diagnosis and probable exposure category, rate per 100,000, West Midlands 1984-2011



Source: West Midlands HIV Surveillance Project, Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Table 2.1: New HIV diagnosis by group (cumulative cases), rates per 100,000, West Midlands 1981-2011

Ethnic Group	Number	Rate per 100,000
White	2,791	60
Black African	2,649	5,266
Black Caribbean	306	368
Other mixed	165	117
Black Other/unspecified	129	1,075
Indian/Pakistani/Bangladeshi	127	30
Other Asian	36	97
Chinese	12	36
Not known	228	-
Total	**6,443**	**119**

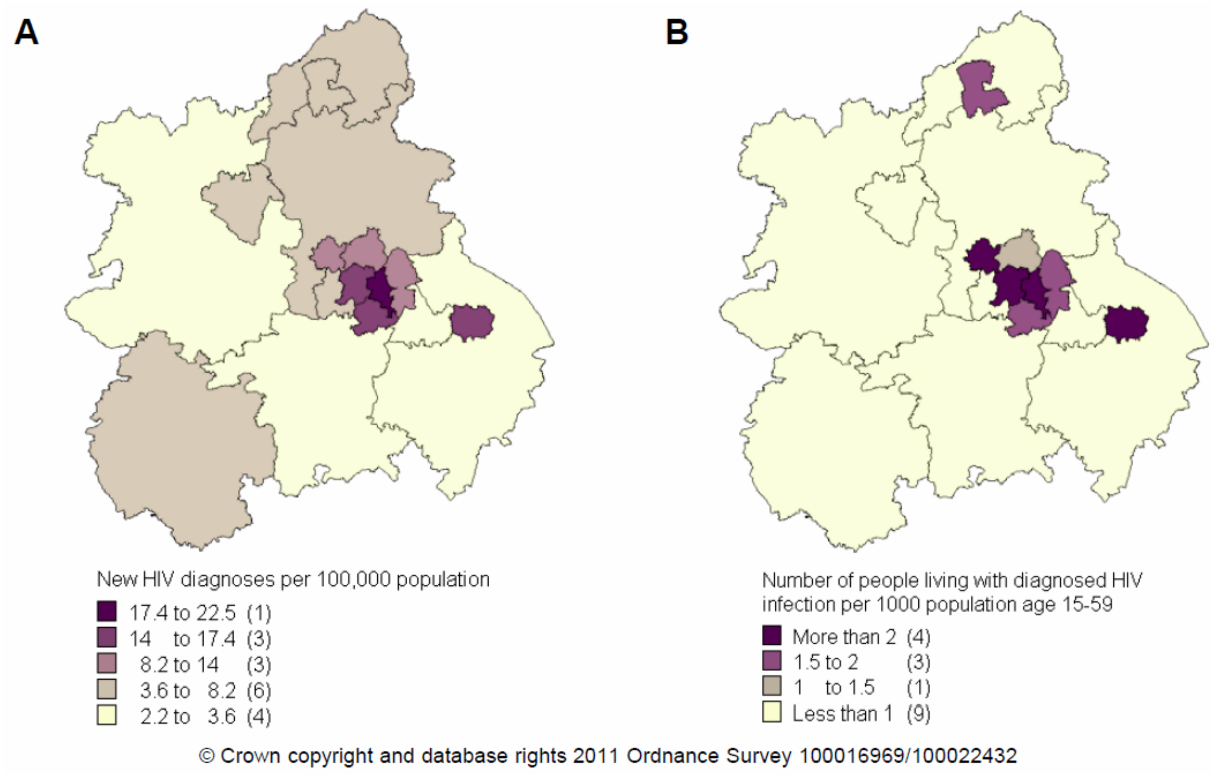
Source: West Midlands HIV Surveillance Project, Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Unsurprisingly people from countries with a high prevalence of HIV infections have the highest rates when local data is described by ethnicity (Table 2.1). Although sub-Saharan Africa is well recognised as having high rates, this also applies to some of the islands in the Caribbean.[4] Any person travelling abroad should be aware of the health risks of this and this includes risks to sexual health.

Current infection rates

New cases and numbers of people diagnosed with HIV infection are clustered in city areas (Figure 2.11).

Figure 2.11: (A) New HIV diagnosis rates per 100,000 population, and (B) prevalence of diagnosed HIV infection per 1,000 population aged 15-59 by PCT of residence, West Midlands 2010)



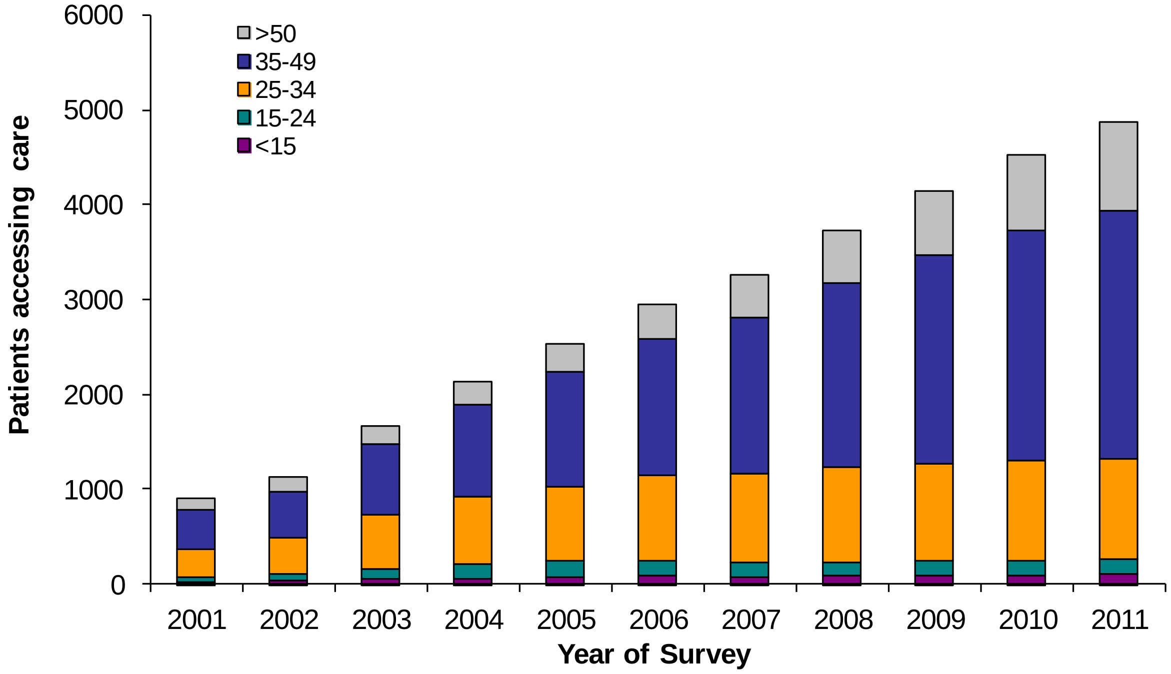
Source: (A) West Midlands HIV Surveillance Project, Health Protection Agency; (B) Survey of Prevalent HIV Infections Diagnosed (SOPHID), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

The Department of Health has recommended testing of all general medical admissions when the prevalence of HIV exceeds 2 per 1,000 people age 15-59 in that local area. Currently this applies to four PCTs in the West Midlands: Coventry, Heart of Birmingham, Sandwell and Wolverhampton. Implementing how this is done will present challenges to commissioners and the staff delivering the service. In Leicester where testing has been evaluated it has shown to be achievable and effective.[5]

Number of people receiving treatment

Over the last 10 years the number of people in the West Midlands receiving HIV related care has more than quadrupled from under 1,000 in 2001 to over 4,000 in 2011 (Figure 2.12). This can be attributed to the effectiveness of HAART preventing and reversing HIV disease and increased numbers of patients being diagnosed. HIV is now much more of drug regimes and chronic disease management rather than treating a series of opportunistic infections.

Figure 2.12: Residents accessing HIV-related care by age group and year, West Midlands 2001-2011



Source: Survey of Prevalent HIV Infections Diagnosed (SOPHID), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Late diagnosis

The national figure for late diagnosis is 47%. Because of small numbers the confidence intervals on these data for the PCTs within the West Midlands are wide but the problem of late diagnosis is greater where there is a higher prevalence (Table 2.2). Reasons for this should be evaluated as outcome is improved.

Future

Unlike many countries in Europe (particularly Southern and Eastern Europe), injecting drug use is responsible for very few cases of HIV infection. This is due to effective needle exchange schemes, along with harm reduction strategies, dating back to the early years of the HIV pandemic, and the continued delivery of these schemes. This has also helped to control other blood borne viruses particularly hepatitis B where vaccination can be offered at needle exchange sites.

Earlier diagnosis of HIV in those infected can be achieved by targeting those most at risk. Not only will their disease outcomes be improved but identifying people as infected leads to marked reduction in transmission as those place on treatment lose virtually all their infectivity and also improves their compliance in the use of condoms, further lowering the risk of onwards transmission.

Table 2.2: Late diagnosis (CD4<350/mm3 within three months of diagnosis) by upper-tier local authority, West Midlands 2009-2011

Upper-tier Local Authority	Proportion diagnosed late %	95% Confidence interval %
Birmingham	50.0	44.9 - 55.1
Coventry	61.5	52.2 - 70.1
Dudley	36.7	19.9 - 56.1
Herefordshire, County of	59.1	36.4 - 79.3
Sandwell	62.9	52.0 - 72.9
Shropshire	47.1	23.0 - 72.2
Solihull	36.4	17.2 - 59.3
Staffordshire	64.6	53.3 - 74.9
Stoke on Trent	65.9	49.4 - 79.9
Telford and Wrekin	37.5	15.2 - 64.6
Walsall	58.9	45.0 - 71.9
Warwickshire	50.0	35.5 - 64.5
Wolverhampton	54.8	42.7 - 66.5
Worcestershire	37.0	23.2 - 52.5

Source: 2012 HIV annual report, Health Protection Agency.

2.4 Hepatitis

Introduction

There are a number of different hepatitis viruses: A, B, C. delta and E. This report focuses on B and C which are the main public health issues.

Hepatitis A is travel related and small outbreaks do occur. These are mainly associated with overcrowding, homelessness and drug use. There is an effective vaccine to protect against hepatitis A which gives long term protection. Delta virus is a very unusual agent which can only exist when hepatitis B is also present. Therefore control of hepatitis B will control delta. Hepatitis E is being diagnosed increasingly often and we are rapidly learning more about this infection. It is now recognised to be much more common than originally thought. Most cases in the UK are travel related but, increasingly, consumption of undercooked pork products and contact with pigs are being implicated in cases.[6]

Hepatitis B and C are referred to as blood borne viruses as this is a major transmission route. Hepatitis B can also be transmitted sexually and from mother to child, particularly at the time of delivery. These two viruses are important as chronic infection leads to continuous liver damage that may frequently progresses to cirrhosis and, later, the development of hepatocellular (liver) cancer in the cirrhotic liver. Once cirrhosis has occurred the changes are permanent and if infection persists, liver damage continues. Although recent evidence suggests that treatment with some of the newer drugs might allow damage to be repaired when the virus is well controlled in hepatitis B.

Hepatocellular cancer generally only develops within cirrhotic livers giving an opportunity to screen patients with cirrhosis to diagnose liver cancer whilst it can be surgically resected.

The rise in liver cancer is often portrayed as being due to alcohol; but a significant part of the epidemic of cirrhosis and liver cancer is the result of these hepatitis viruses, particularly hepatitis C in recent years. Importantly, alcohol potentiates the damage done by chronic viral hepatitis infections.

Hepatitis C kills more people than HIV in the UK and this is even more marked in the West Midlands.

Data sources

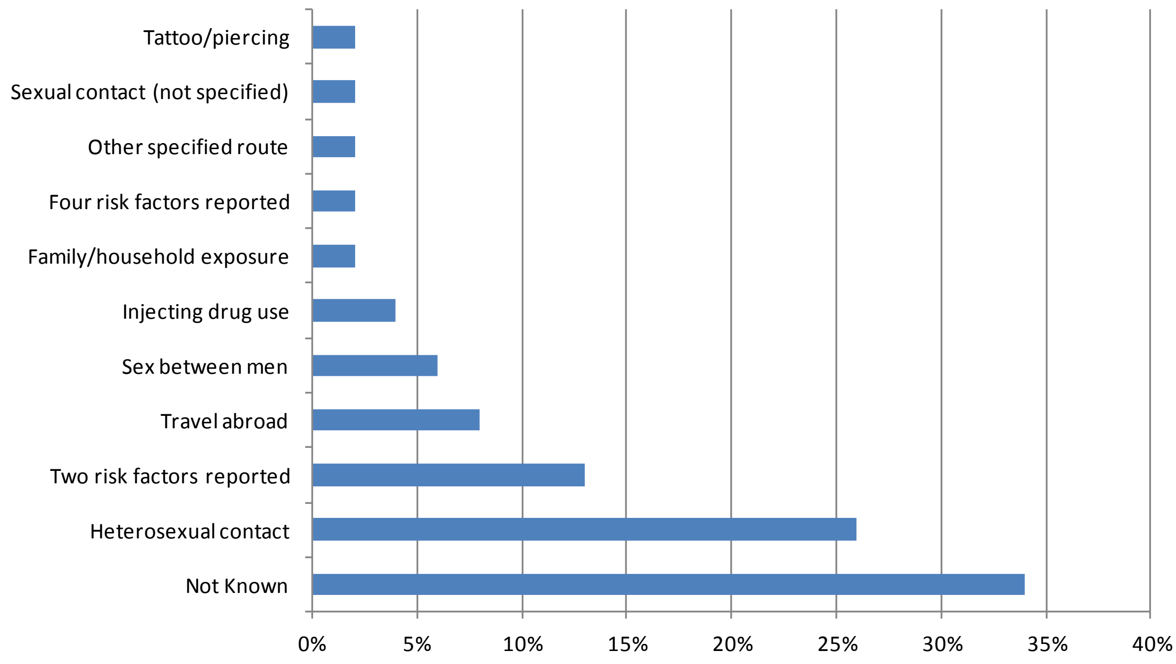
The data for this report have been collected from laboratory reports of hepatitis across the West Midlands. It is not possible to determine which hepatitis virus has caused the infection clinically so all data have to be derived from laboratory reports.

Epidemiology of Hepatitis B

Most people with chronic hepatitis B in the West Midlands will have acquired the infection in their country of birth. Rates of hepatitis B in the UK are amongst the lowest in the world. As chronic hepatitis B is invariably asymptomatic, until the late stages when severe liver disease has developed, people in high risk groups should be offered testing. These people who test positive need to be assessed to identify those who might benefit from treatment which can prevent or reduce the risk of progression to serious liver disease. Currently routine testing for hepatitis B takes place in ante-natal clinics, where all pregnant women are offered testing in order to prevent from mother to baby.

Acute hepatitis B infection is quite rare with only 49 reports in the West Midlands in 2011. There was an excess of males partly explained by men who have sex with men (MSM) but heterosexual spread was reported more commonly although some of this took place outside the UK. Injecting drug use and health care settings were very rare as a source of infection (Figure 2.13).

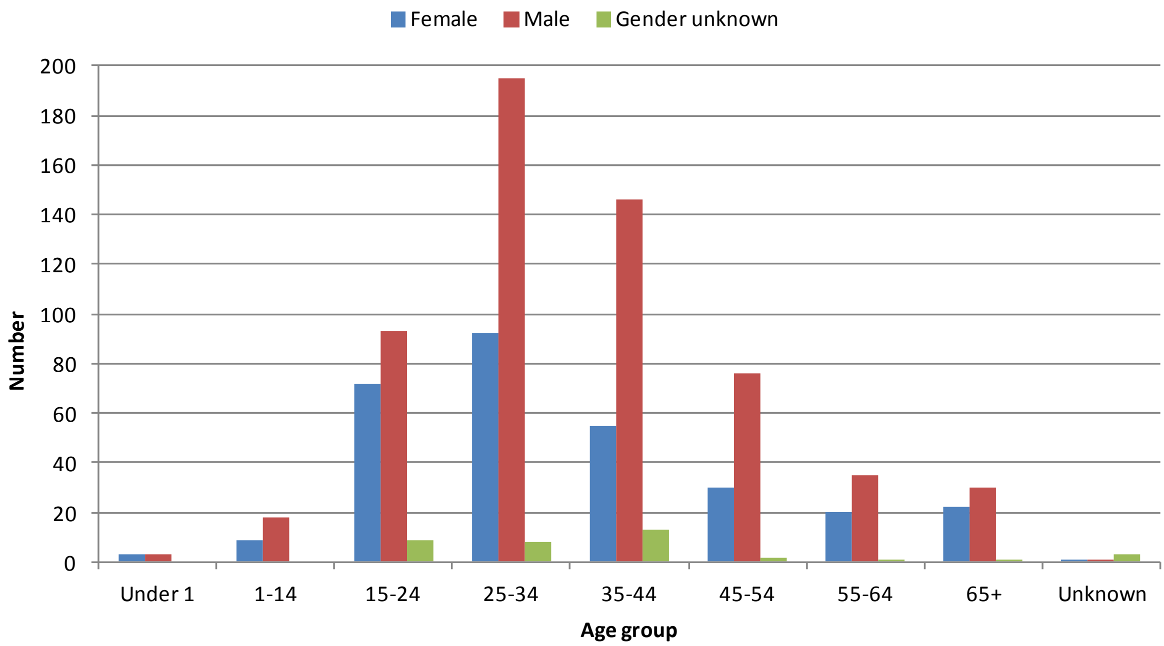
Figure 2.13: Risk factors for acute hepatitis B infection, West Midlands, 2011



Source: HP Zone, Health Protection Agency.

Rates of detection of hepatitis B (positive for HBsAg), mainly chronic infections, predominates in males with rates two-three fold higher than females depending on the age groups, and a peak aged 25-34 followed by the 35-44 age group (Figure 2.14). Some of the diagnosed cases in females are from the ante-natal screening programme which will identify women at a younger age group.

Figure 2.14: Age and sex distribution of individuals testing positive for HBsAg in the West Midlands sentinel laboratory (excluding antenatal screening), 2005-2011



Excludes dried blood spot, oral fluid, reference testing, and testing from hospitals referring all samples. Data are de-duplicated subject to availability of date of birth, soundex and first initial. All data are provisional.

Source: West Midlands Sentinel Laboratory, Health Protection Agency.

Many of the chronic hepatitis B infections in the West Midlands are as a result of infection at birth or in early childhood in first generation immigrants from countries with significant rates of hepatitis B (Table 2.3). As these people can be readily identified, screening is warranted so that appropriate investigation and treatment can be offered to those infected. This will also help to reduce secondary transmission.

The prevalence of hepatitis B is higher in people with South Asian names. This largely reflects that countries in that region have a higher prevalence and first generation immigrants will have acquired their infection at birth or in childhood.

Table 2.3: Number of individuals tested and the proportion testing positive for HBsAg in the West Midlands sentinel laboratory by ethnicity (excluding antenatal screening), 2005-2011.

Year	No name available		Non-South Asian origin		South Asian origin		Total	
	Number tested	% positive	Number tested	% positive	Number tested	% positive	Number tested	% positive
2005	2,325	1.6	2,450	2.0	826	5.8	5,601	2.4
2006	2,034	1.8	2,046	1.3	730	4.0	4,810	1.9
2007	1,657	2.9	2,957	1.3	996	3.7	5,610	2.2
2008	1,553	3.3	3,254	1.4	1,169	3.7	5,976	2.4
2009	1,902	2.1	3,878	1.6	1,491	3.4	7,271	2.1
2010	2,468	1.4	4,019	1.4	1,542	3.1	8,029	1.7
2011	2,598	1.3	4,462	1.6	1,542	3.2	8,602	1.8
Total	**14,537**	**1.9**	**23,066**	**1.5**	**8,296**	**3.7**	**45,899**	**2.0**

NamPehchan was used to identify individuals of South Asian origin based on the patient's surname as ethnicity is not routinely available from the participating laboratory information systems.

Excludes dried blood spot, oral fluid, reference testing, and testing from hospitals referring all samples. Data are de-duplicated subject to availability of date of birth, soundex and first initial. All data are provisional.

Source: West Midlands Sentinel Laboratory, Health Protection Agency.

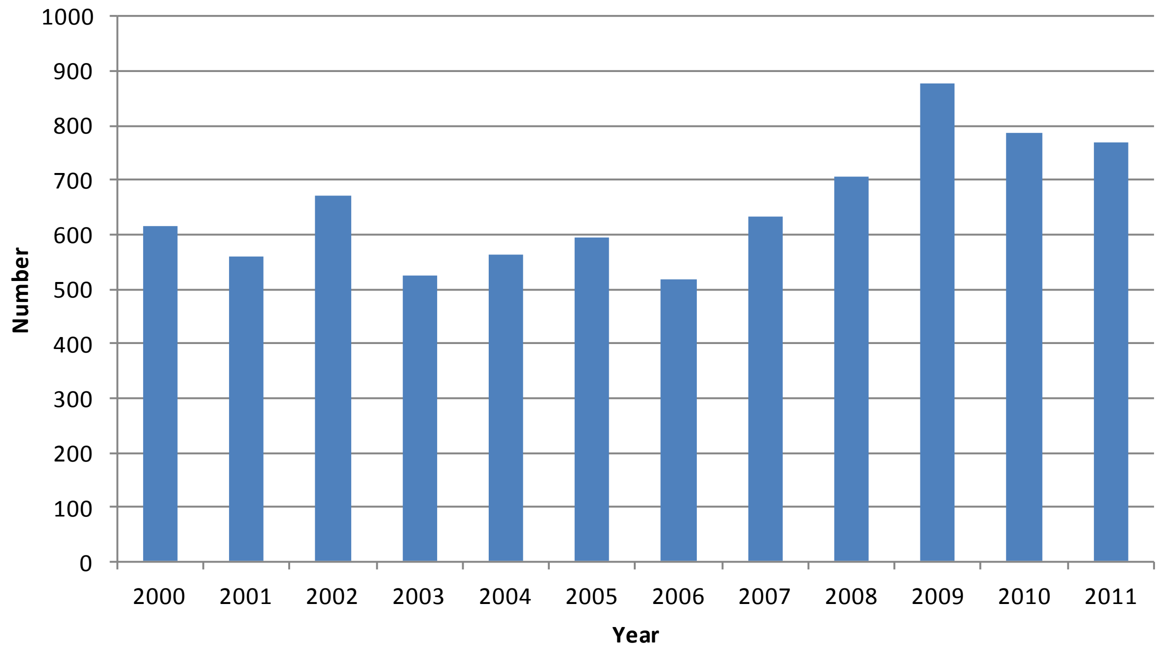
Epidemiology of Hepatitis C

Hepatitis C (HCV) was identified in 1988 as a result of identifying causes of post-transfusion hepatitis. In the UK, like most other countries, this risk has been virtually eliminated since the introduction of screening of all blood donors for hepatitis C infection when they donate. Transmission essentially only occurs in the UK amongst people who inject drugs (PWID). There are other possible risks such as self-tattooing and other unsterile practices where blood may be exchanged, but these remain rare as routes of infection within the UK. There is an increasing recognition that men who have sex with men (MSM), particularly if they are HIV positive, are at an increased risk of HCV infection.

The other populations with significant numbers of people chronically infected with HCV are people who were born in countries with a high prevalence (e.g. Pakistan) where re-use of needles, syringes and razors helps explain the high prevalence. These people often acquire their infection at a young age and are at increased risk of having developed significant liver damage. People staying for prolonged periods in high prevalence countries are also at potential risk when they seek health care services there.

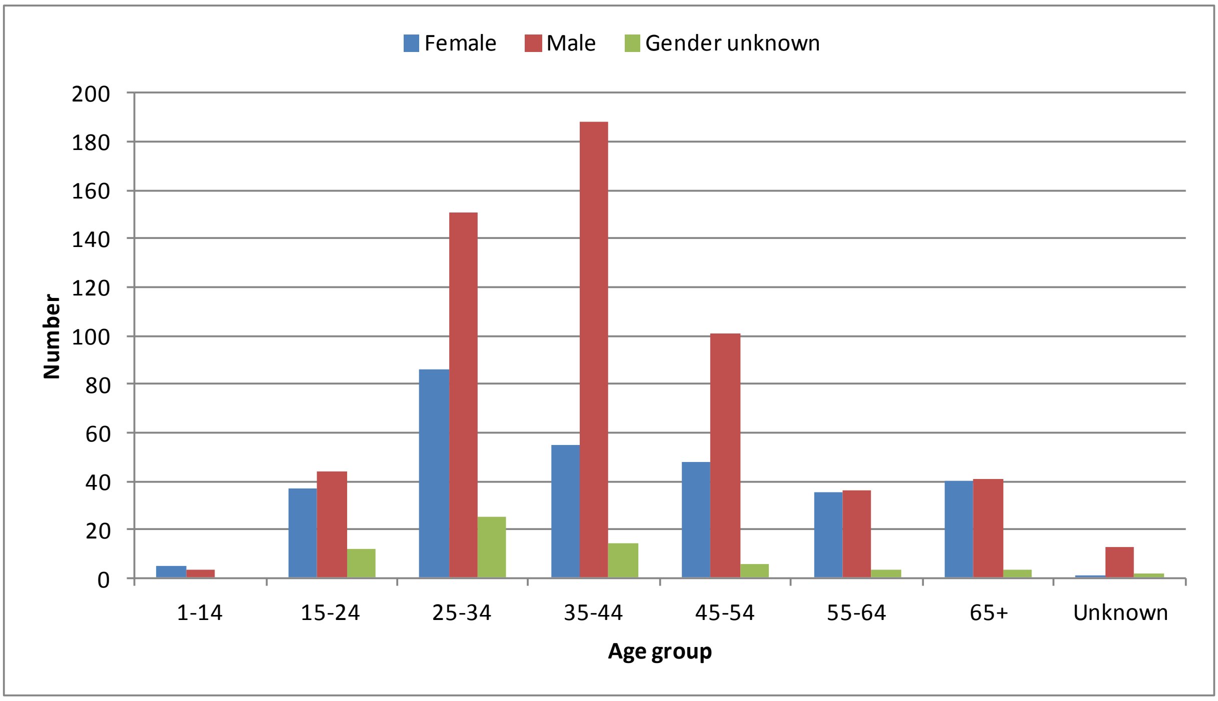
The prevalence in injecting drug users varies between 30% and 70% depending on which people are selected from testing and for how long they have been injecting. People born in high prevalence countries will have rates of chronic infection of between 1% and 5%.[7]

Figure 2.15: Laboratory reports of hepatitis C infection in the West Midlands, 2000-2011



Source: Health Protection Agency.

Figure 2.16: Individuals testing positive for anti-HCV by age group and gender in the West Midlands sentinel laboratory, 2005-2011

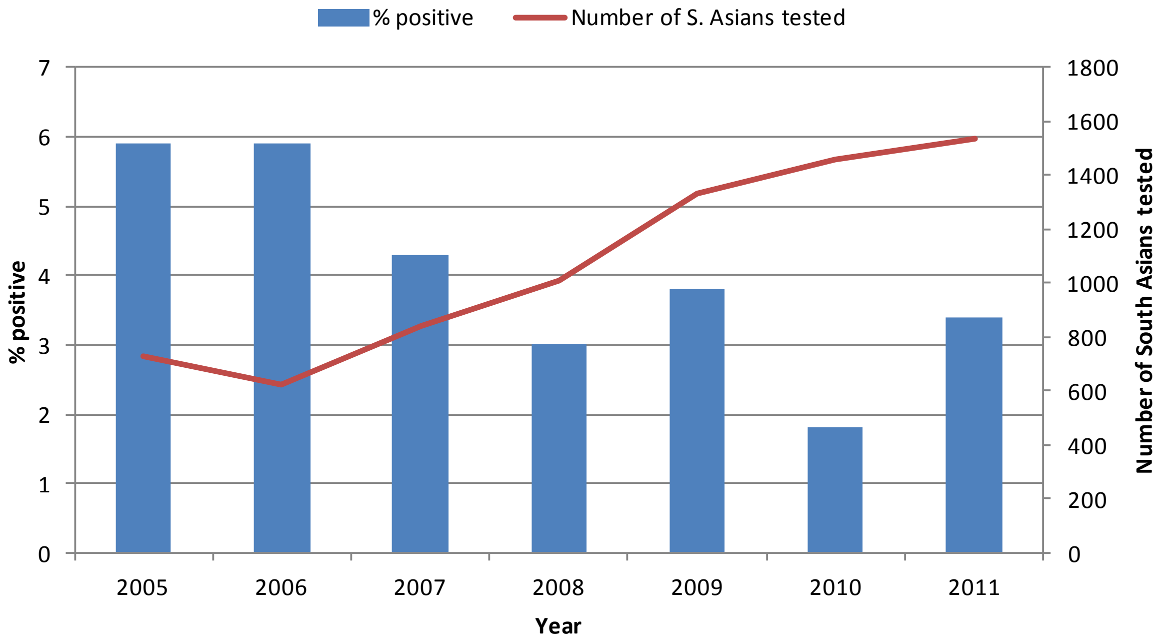


Excludes dried blood spot, oral fluid, reference testing, and testing from hospitals referring all samples. Data are de-duplicated subject to availability of date of birth, soundex and first initial. Excludes individuals aged less than one year, in whom positive tests may reflect the presence of passively-acquired maternal antibody rather than true infection. All data are provisional.

Source: West Midlands Sentinel Laboratory, Health Protection Agency.

The number of people testing positive for HCV has been steadily increasing since the introduction of testing (Figure 2.15). Males have higher rates, and the main age group is 35-44, followed by the 25-34 age group (Figure 2.16). There is also a strong association with inner city deprivation. These observations are a reflection on who injects drugs. The increased diagnoses in the 35-44 age group reflects people with previous injecting drug use who have come forward for testing, often when they are being considered for treatment following successful treatment for their addiction. There have been a number of campaigns encouraging past and current injecting drug users to come forward for testing but the impact of these campaigns in identifying infected persons has been difficult to determine accurately.

Figure 2.17: South Asians tested and % testing positive for anti-HCV in the West Midlands sentinel laboratory, 2005-2011*

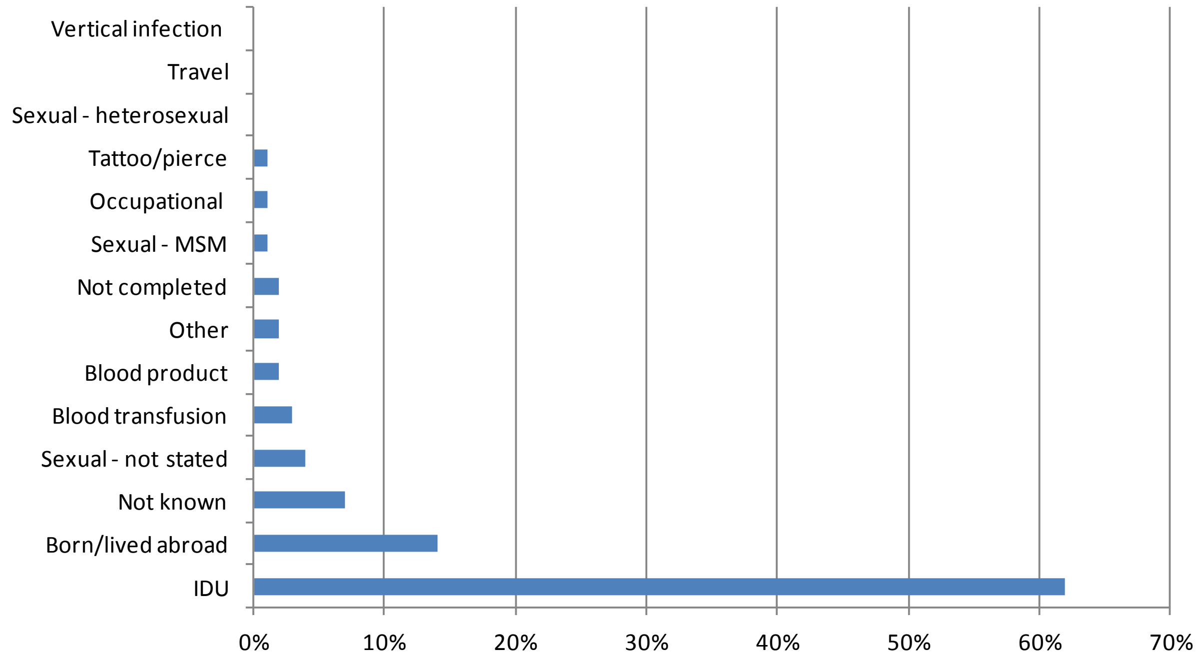


[*] *NamPehchan was used to identify individuals of South Asian origin as ethnicity is not routinely available from the participating laboratory information systems. Excludes dried blood spot, oral fluid, reference testing, and testing from hospitals referring all samples. Data are de-duplicated subject to availability of date of birth, soundex and first initial. Excludes individuals aged less than one year, in whom positive tests may reflect the presence of passively-acquired maternal antibody rather than true infection. All data are provisional.*

Source: West Midlands Sentinel Laboratory, Health Protection Agency.

The prevalence of hepatitis C is higher in people with South Asian names. This largely reflects that countries in that region have a higher prevalence and first generation immigrants will have acquired their infection most likely in childhood from contaminated medical equipment.

Figure 2.18: Risk exposures for individuals testing positive for anti-HCV in the West Midlands sentinel laboratory from questionnaire data, January 2002 to August 2006



Source: West Midlands Sentinel Laboratory, Health Protection Agency.

Recent estimates suggest that there are 15,000 people chronically infected with Hepatitis C in the West Midlands. Many of those who are infected but are unaware include the ‘baby-boomer’ generation who acquired infection as young adults through injecting drug use. This group has also had their infection for over 30 years and are at high risk of having developed, or soon to develop, cirrhosis of the liver. Of those identified with HCV the estimated treatment budget over the time course of the disease is £11 million, although recent additional drug options will increase this but also lead to more successful cures.

Across the region 33% of drug users tested as part of an anonymous testing programme were positive for HCV compared to the national figure of 45%. Also 62% of drug users have been tested for HCV in 2011.

Future

New drugs for the treatment of viral hepatitis, effective for B and C, have recently been licensed and there are more to come. These will improve the chances of treatment leading to a complete cure in some patients and reduction in virus levels in the others.

Needle exchange and other harm reduction projects need to be maintained to reduce on-going transmission of infection. Preventing one case by needle exchange will also reduce future transmission so amplifying the benefit of these programmes.

More people need to be identified and treatment initiated if indicated and deliverable. This will reduce long term costs as patients will not develop cirrhosis or hepatocellular cancer. These two conditions are very expensive to treat. HCV is already the leading indication for a liver transplant in the UK. The additional benefit is that by treating and eliminating infections there will be a reduction in the number of new infections as the number of potential source patients is reduced.

2.5 Sexually Transmitted Diseases (STIs)

Introduction

There are a number of different sexually transmitted infections which have significant personal and public health implications. Human papilloma viruses (HPV) are essentially the only cause of cervical cancer although co-factors alter the risk to the individual. Without HPV infection cervical cancer essentially never occurs. Chlamydia, one of the commonest chronic bacterial infections in the developed world, is a leading cause of female infertility. Gonorrhoea is approaching the status of a *superbug* with fewer and fewer antibiotics remaining for effective treatment. In some parts of the world there is only one effective antibiotic with decreasing antibiotic sensitivity, the first steps to complete resistance.

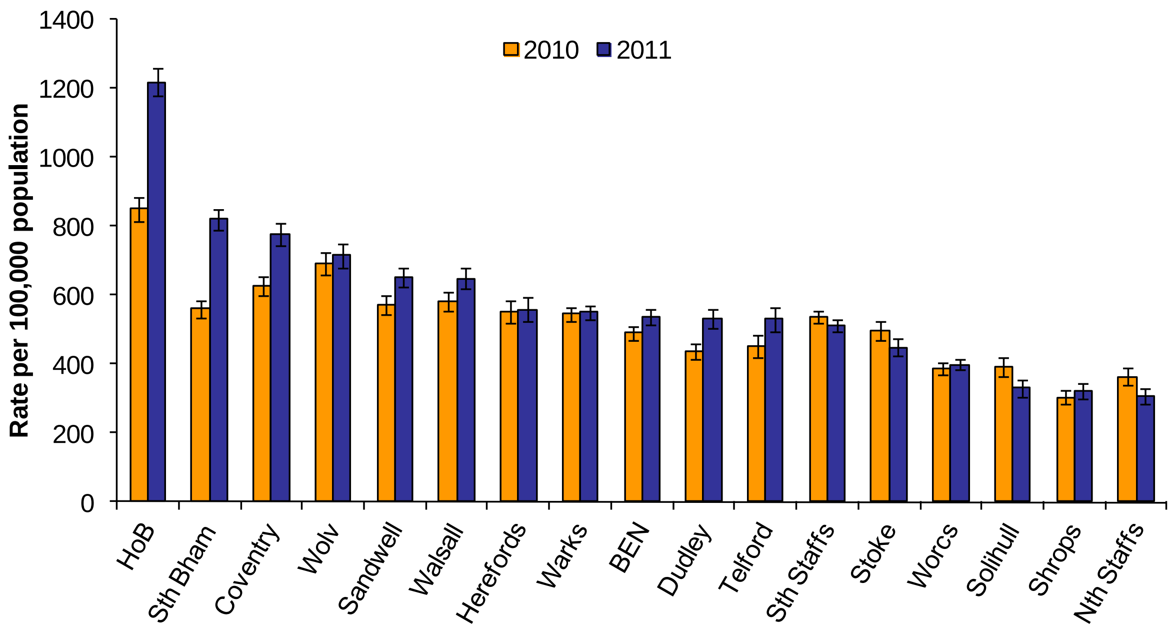
Data sources

The data for this report are sourced from the anonymised returns of activity from Genito-Urinary medicine (GUM) clinics. This is known as the GUMCAD report. It does not include data from the chlamydia screening programme unless specifically mentioned.

Epidemiology of STIs

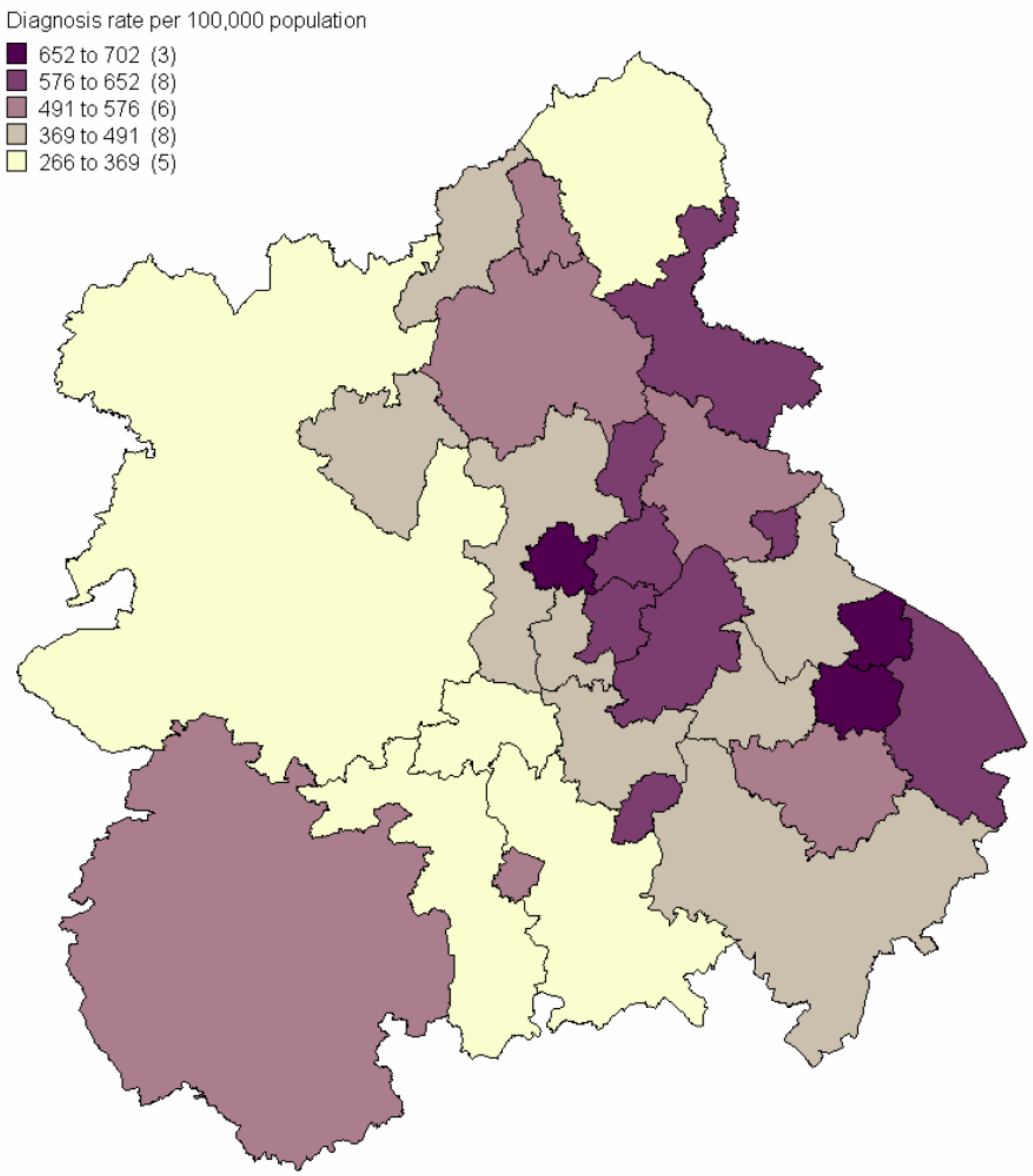
Overall acute STIs increased by 4% across the West Midlands from 2010 to 2011. Unlike most other diseases STIs predominantly affect young people with peak rates in females in the age group 15-24 and in males 20-24. People who report their ethnicity as black (both African and Caribbean) also have higher rates for all STIs. Higher rates of infection are also seen in inner city areas (Figure 2.19 and Figure 2.20) with Heart of Birmingham having the highest followed by South Birmingham and Coventry. Additionally men who have sex with men also have significantly higher rates of infections.

Figure 2.19: New STI diagnoses by PCT of residence, rate per 100,000, West Midlands 2010 and 2011 (GUM diagnoses only)



Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.20: New STI diagnoses by Local Authority of residence, rate per 100,000, West Midlands 2010 (GUM diagnoses only)



Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Chlamydia

From 2010 to 2011 there was a slight fall in the number of cases of Chlamydia diagnosed. Although total diagnoses fell by 3% overall there were increases of 15% in females and 7% in males diagnosed in GUM clinics; there were marked declines in community diagnosed cases of 11% in females and 18% in females.

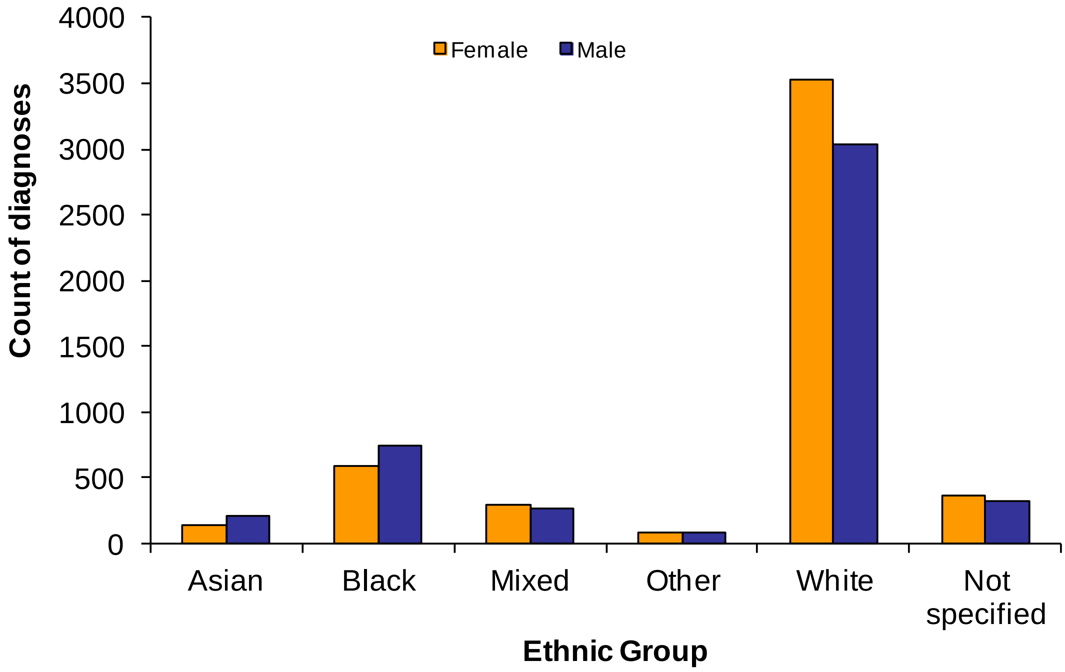
Most of the data in this report are derived from GUM clinic attendances. Chlamydia is less symptomatic in females than males so females would be less likely to attend if they have an infection. Some of the cases will be those identified by home or community self-testing for Chlamydia where females are more likely to have tests than males.

Being the commonest STI the pattern of Chlamydia infection is also that seen for all STIs. Infections are 3 times more common in females aged 15-19 compared to males, with gender equality in the 20-24 age group and a small predominance amongst males in the older age groups (Table 2.4).

In contrast higher rates are seen in the black ethnic group with a male predominance compared to a female predominance in all other groups (Figure 2.22). Although rates are higher in inner city areas (Figure 2.23 and Figure 2.24) some more rural areas also have high rates although some of this can be explained by how patients who are positive on self-testing are managed.

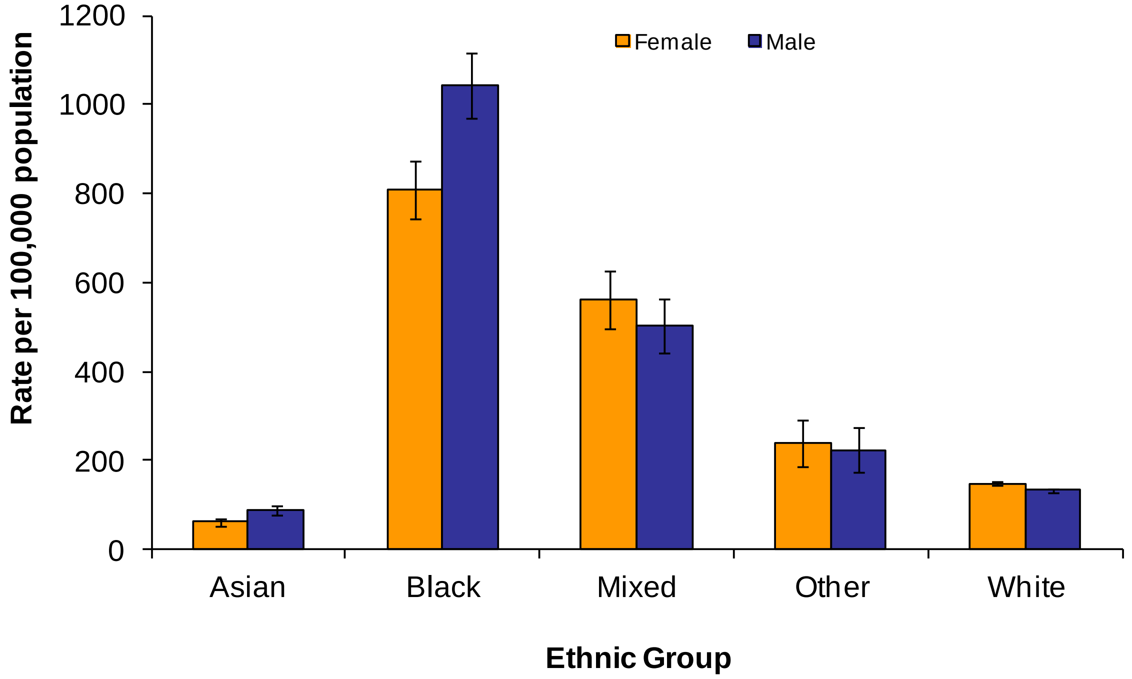
Rates of Chlamydia have increased over the past 15 years. Over the past two years this trend has reversed except for the over 25 age group of both sexes (Figure 2.25 and Figure 2.26). Similar trends are seen for each of the different sexually transmitted diseases; gonorrhoea, syphilis, anogenital herpes and anogenital warts.

Figure 2.21: Chlamydia (complicated and uncomplicated) diagnoses by ethnic group, West Midlands residents 2011 (GUM diagnoses only)



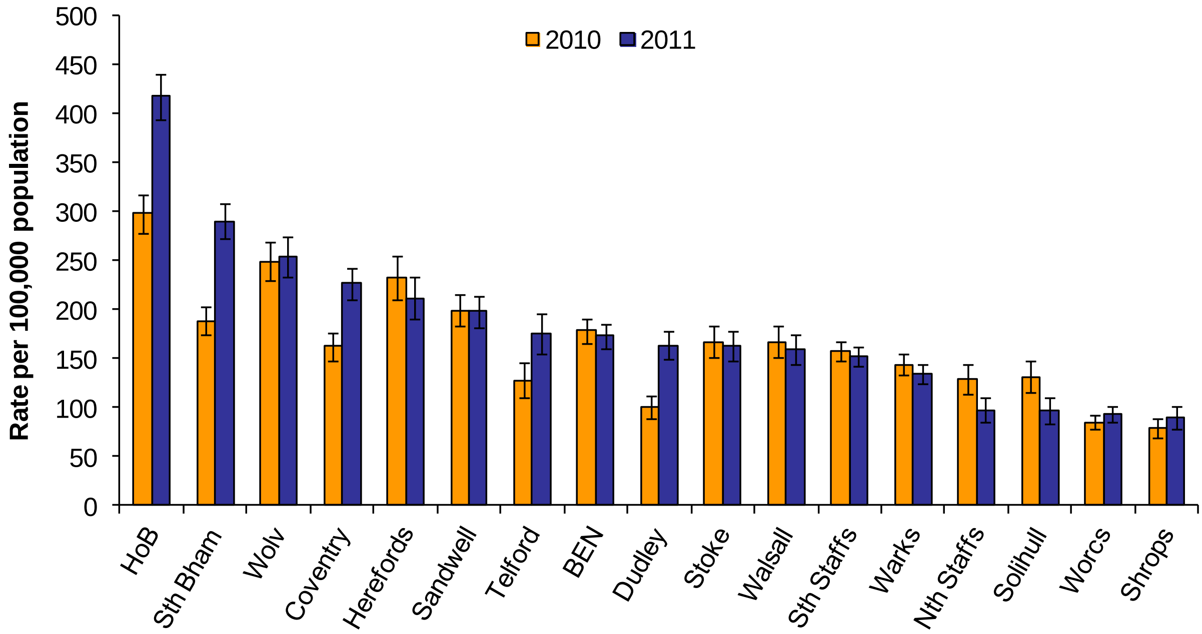
Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency.

Figure 2.22: Chlamydia (complicated and uncomplicated) diagnoses by ethnic group, rate per 100,000, West Midlands residents 2011 (GUM diagnoses only)



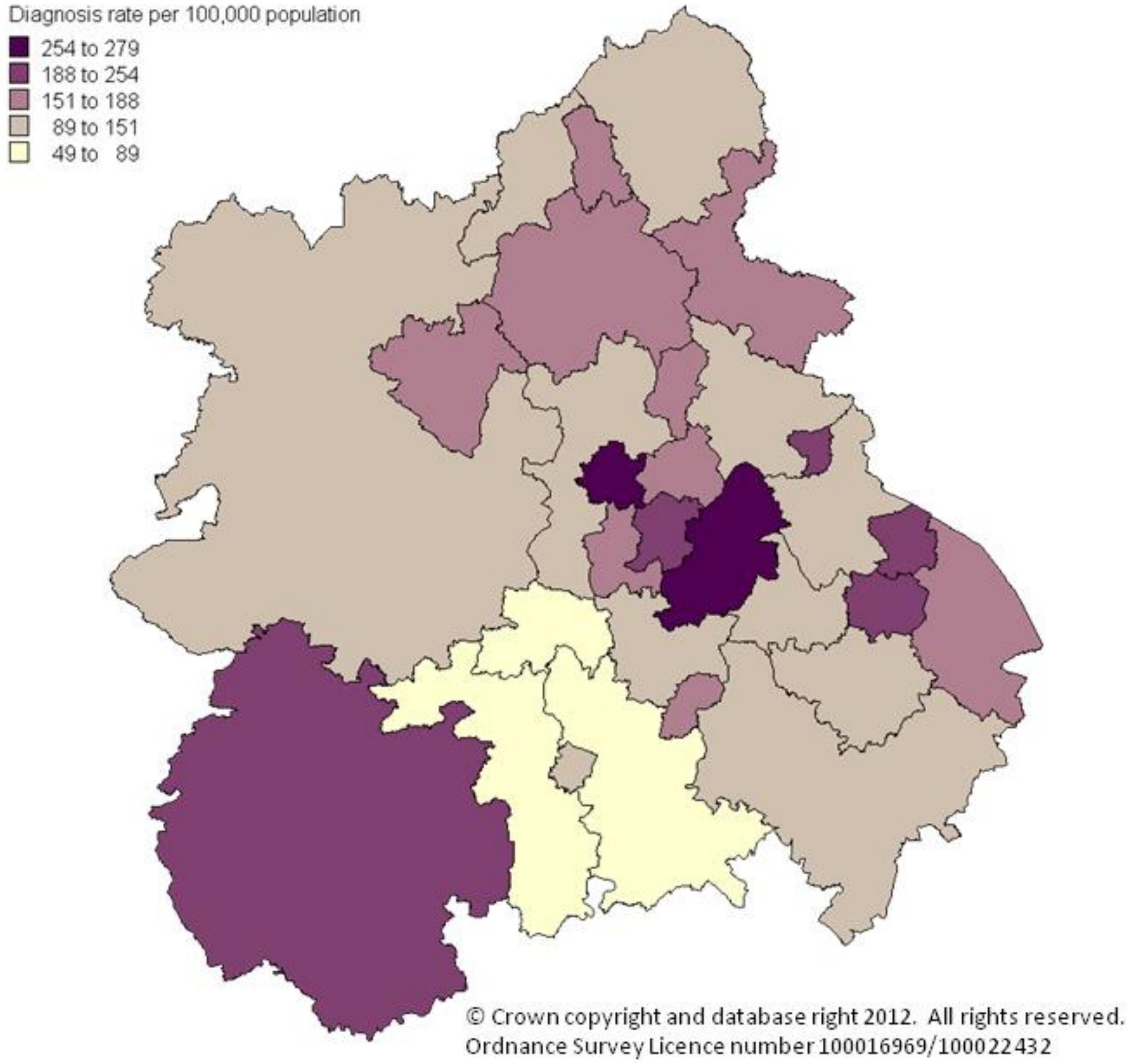
Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.23: Chlamydia (complicated and uncomplicated) diagnoses by PCT of residence, rate per 100,000, West Midlands 2010 and 2011 (GUM diagnoses only)



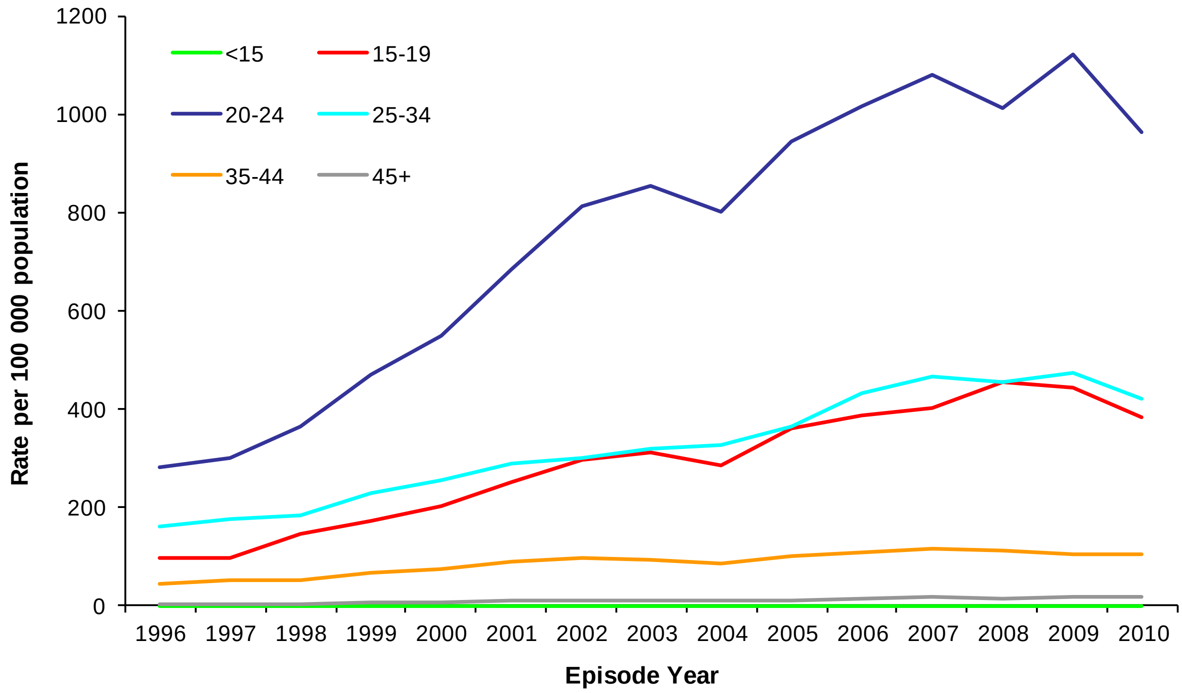
Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.24: Chlamydia (complicated and uncomplicated) diagnoses by Local Authority of residence, rate per 100,000, West Midlands 2011 (GUM diagnoses only)



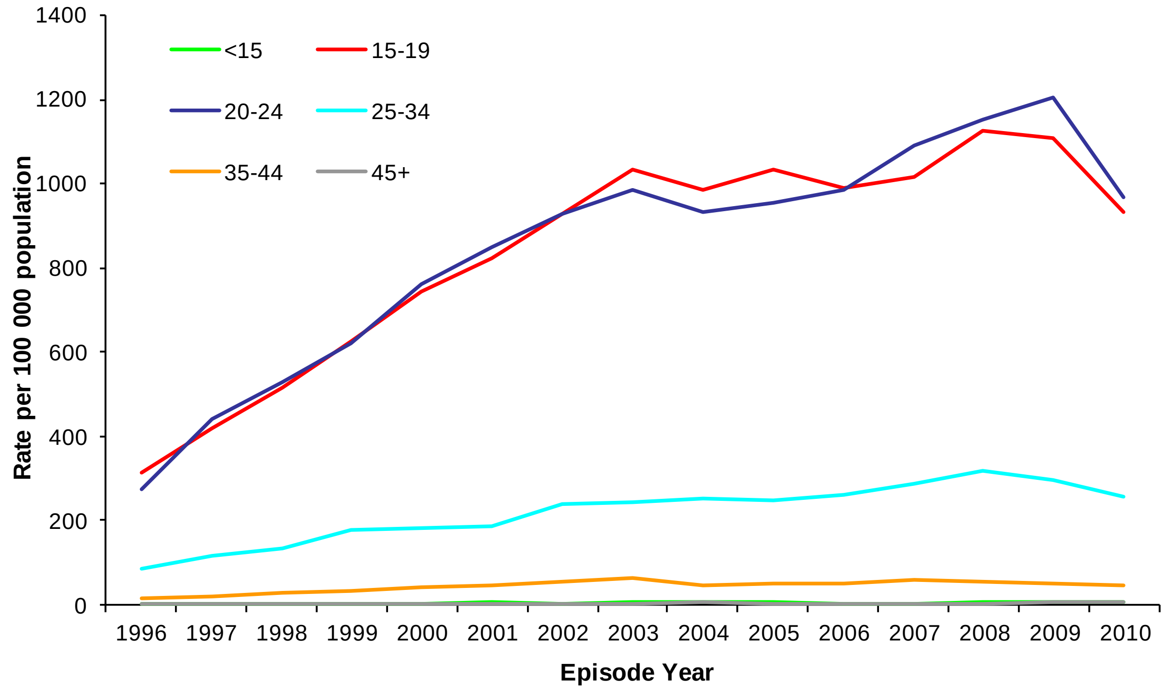
Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.25: Chlamydia (complicated and uncomplicated) diagnoses in males at West Midlands GUM clinics, rate per 100,000 population, 1996-2010



Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.26: Chlamydia (complicated and uncomplicated) diagnoses in females at West Midlands GUM clinics, rate per 100,000 population, 1996-2010



Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Table 2.4: Chlamydia diagnosis by gender, age group and year, rates per 100,000, West Midlands residents, 1996-2011

Age Group	Year															
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Females																
<15	1.4	2.2	1.8	3.9	2.4	4.8	3.4	4.3	4.7	4.8	3.3	4.0	4.8	4.6	5.8	3.9
15-19	263.5	362.3	452.3	552.7	658.9	730.0	800.4	889.9	831.7	816.7	794.3	831.8	858.8	1061.0	901.3	935.4
20-24	229.6	370.8	470.9	547.0	673.1	764.0	801.5	848.2	777.1	798.6	835.6	926.5	904.6	1172.4	927.1	1054.4
25-34	74.6	103.0	117.5	156.5	160.5	167.8	205.0	208.4	218.3	212.1	229.5	246.1	253.2	287.9	245.5	337.3
35-44	13.4	18.8	25.9	29.6	36.6	41.0	48.9	52.4	41.6	44.7	41.7	53.6	43.2	47.9	44.1	55.8
45+	1.0	1.5	1.2	1.1	1.6	2.4	2.6	3.3	4.1	3.6	2.6	3.7	2.8	4.9	4.8	6.0
Males																
<15	0.4	0.2	0.2	0.2	0.2	0.0	0.2	0.2	0.8	0.4	0.8	0.6	0.2	0.4	0.4	0.4
15-19	84.9	84.3	122.4	151.4	170.4	216.7	246.9	248.9	224.3	284.7	321.9	318.7	336.0	418.3	372.1	386.3
20-24	230.1	250.9	303.5	402.2	476.2	585.2	676.1	697.4	640.2	761.9	826.5	885.1	735.9	1060.5	918.2	975.9
25-34	133.1	147.5	157.9	197.9	221.8	254.8	258.2	268.8	269.9	299.1	366.3	398.0	338.5	447.0	410.1	445.2
35-44	36.0	44.0	41.9	56.9	63.2	76.4	80.1	76.4	68.3	78.4	94.1	101.3	87.0	99.1	98.5	109.7
45+	3.1	2.7	3.7	4.8	6.3	7.3	7.8	8.0	7.3	7.7	12.0	13.3	11.0	15.7	17.3	15.9

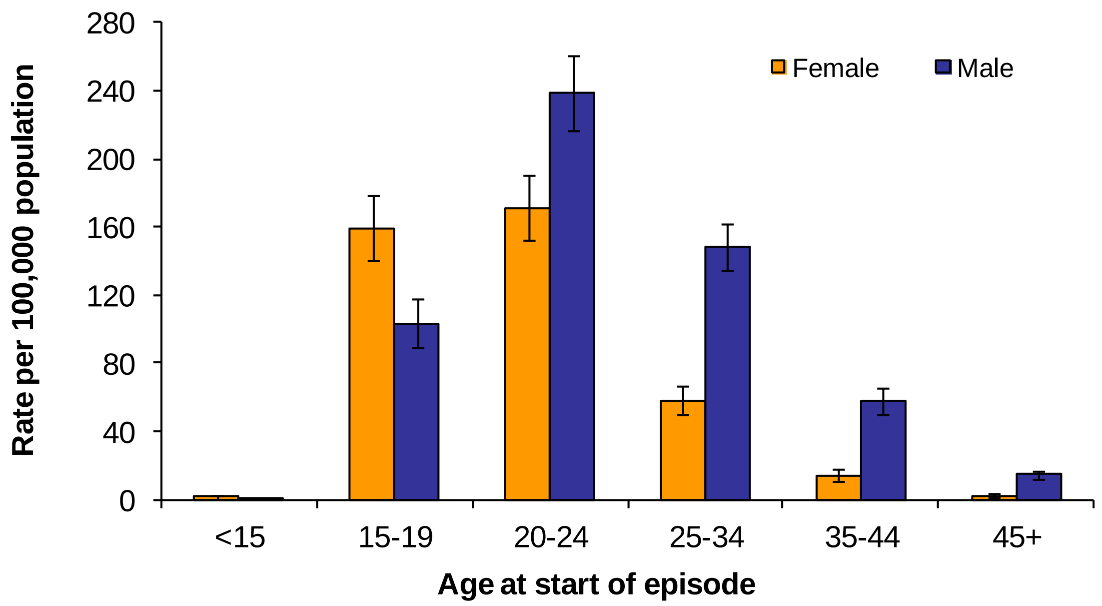
Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Gonorrhoea

There was a 37% increase in the number of confirmed cases of gonorrhoea between 2010 and 2011. Some of this increase is as a result of expanding molecular methods rather than traditional microbiology. The increase was similar in both males and females. Rates of diagnosed gonorrhoea in males is twice that in females (Figure 2.27); although some of this can be explained by the fact that males are more likely to develop symptoms after infection and therefore seek treatment. The other important differences are a 10 fold higher diagnoses rates amongst the black ethnic group (Figure 2.29) and marked urban - rural differences of over five-fold. Much of the increase in the overall number of cases across the West Midlands occurred in just two PCT areas: Heart of Birmingham and South Birmingham.

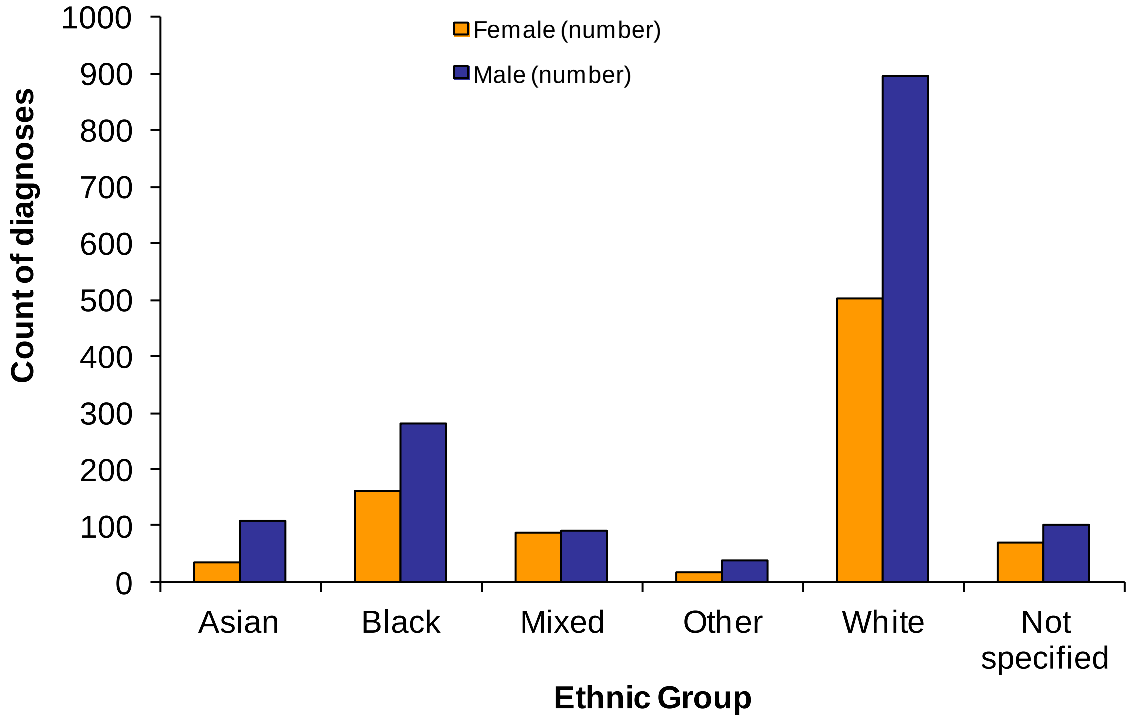
Of particular concern is the increasing antibiotic resistance being seen in gonococci. There are no parts of the world where the infection can only be treated by a single agent which has to be injected. Locally there is good news in that the West Midlands had the best compliance of any region for the recommended treatment regime for gonorrhoea and the lowest rate of clinically important antibiotic resistance. In 2011 all 160 tested strains were sensitive to one of the antibiotics in the preferred schedule and 159 sensitive to both antibiotics. Two antibiotics are used to reduce the possibility of developing resistance to antibiotics.

Figure 2.27: Gonorrhoea (complicated and uncomplicated) diagnoses by age group and gender, rate per 100,000, West Midlands residents 2011 (GUM diagnoses only)



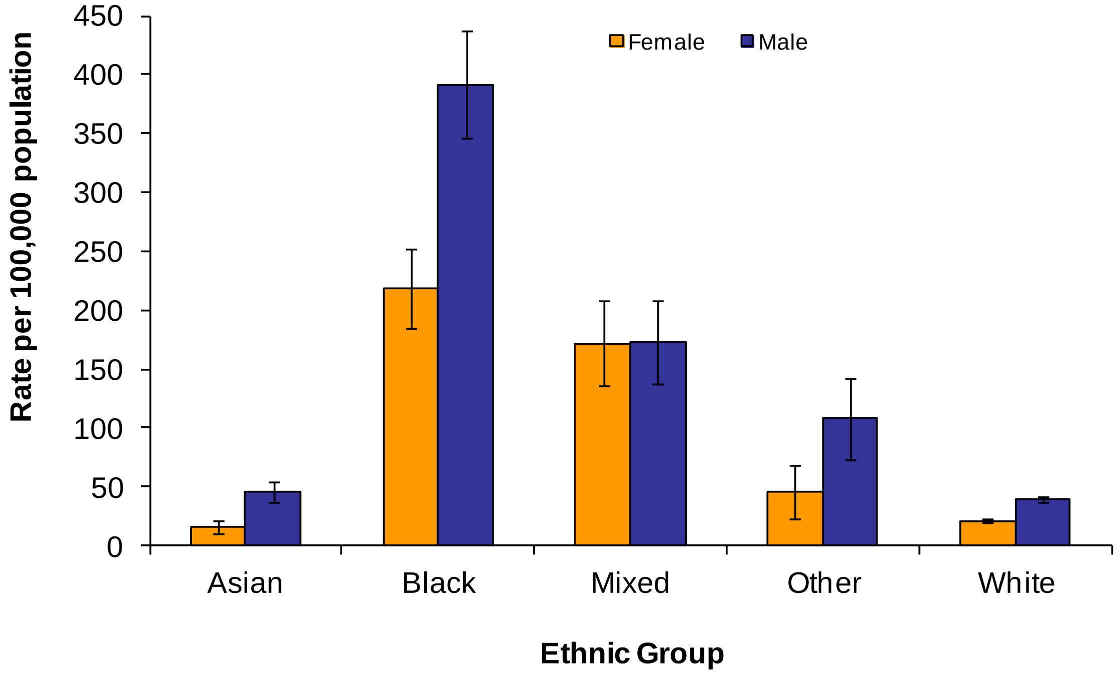
Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.28: Gonorrhoea (complicated and uncomplicated) diagnoses by ethnic group and gender, West Midlands residents 2011 (GUM diagnoses only)



Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency.

Figure 2.29: Gonorrhoea (complicated and uncomplicated) diagnoses by ethnic group and gender, rate per 100,000, West Midlands residents 2011 (GUM diagnoses only)



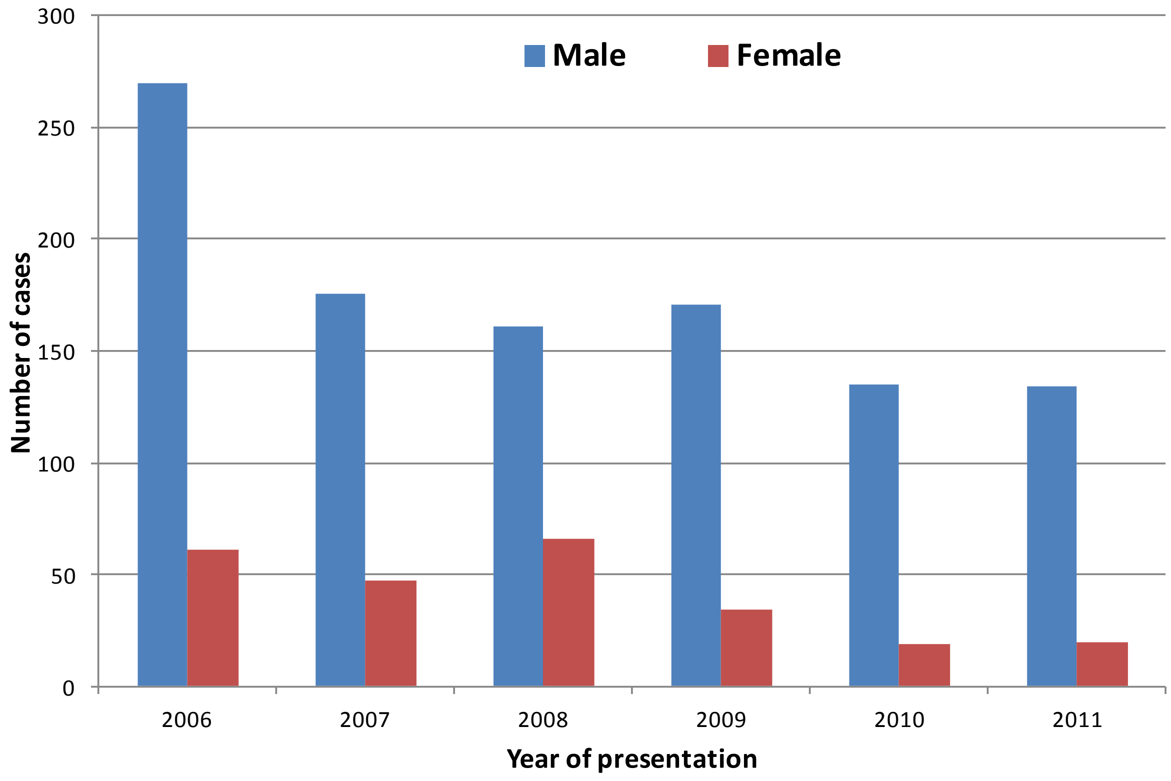
Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Syphilis

Syphilis was once one of the major causes of death and morbidity up to about the 1900s prior to the introduction or arsenic based medicines. Nationally in the past decade there have been changes in the epidemiology of syphilis with MSM still having significantly high rates but a disproportionate number of cases being diagnosed in people from Eastern European countries who have higher rates of infection.

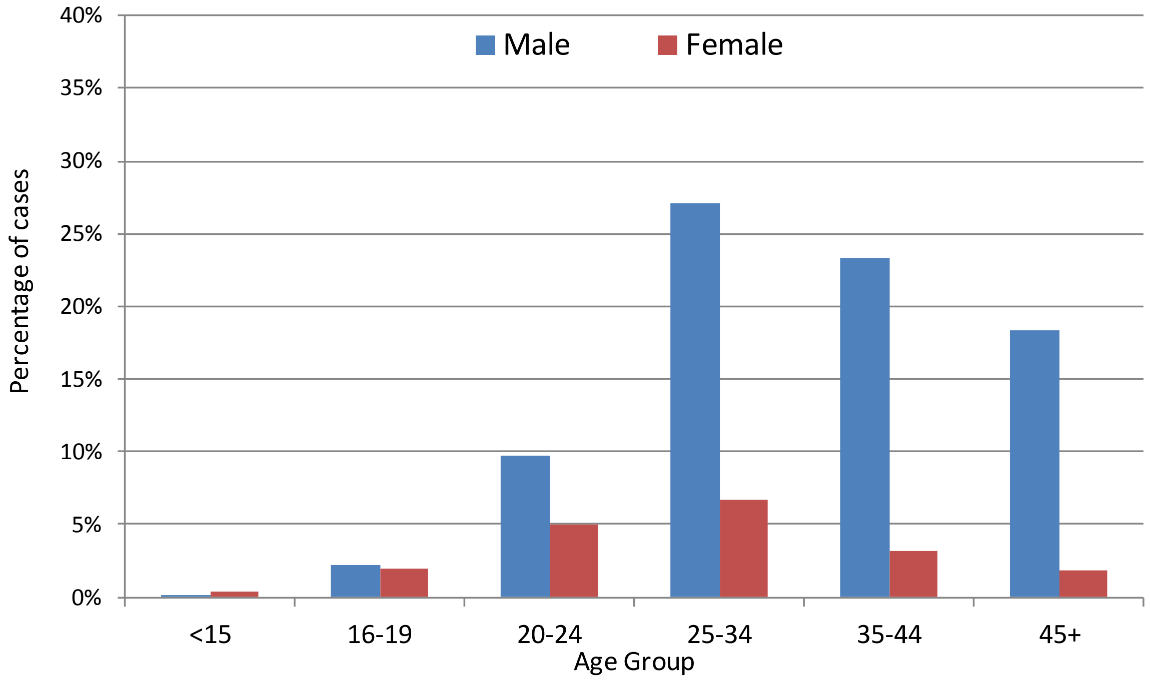
Within the West Midlands we have seen a decline in syphilis cases over the past 5 years (Figure 2.30) and also very few cases linked to Eastern Europe. There are also differences in who gets syphilis compared to other STIs. Men are much more affected than women at a ratio of 5:1 (Figure 2.31), compared to nearer 1:1 for other STIs. This is mainly a result of 70% of cases being in MSM. In addition the age distribution of syphilis cases is shifted to older age groups compared to other STIs, with nearly 50% of the cases in the 35 and over age group.

Figure 2.30: Infectious syphilis cases by year of presentation and gender, 2006-2011



Source: West Midlands Enhanced Surveillance of Syphilis Scheme, Health Protection Agency.

Figure 2.31: Infectious syphilis cases by age group and gender, 2006-2011



Source: West Midlands Enhanced Surveillance of Syphilis Scheme, Health Protection Agency.

Human Papilloma Virus (HPV)

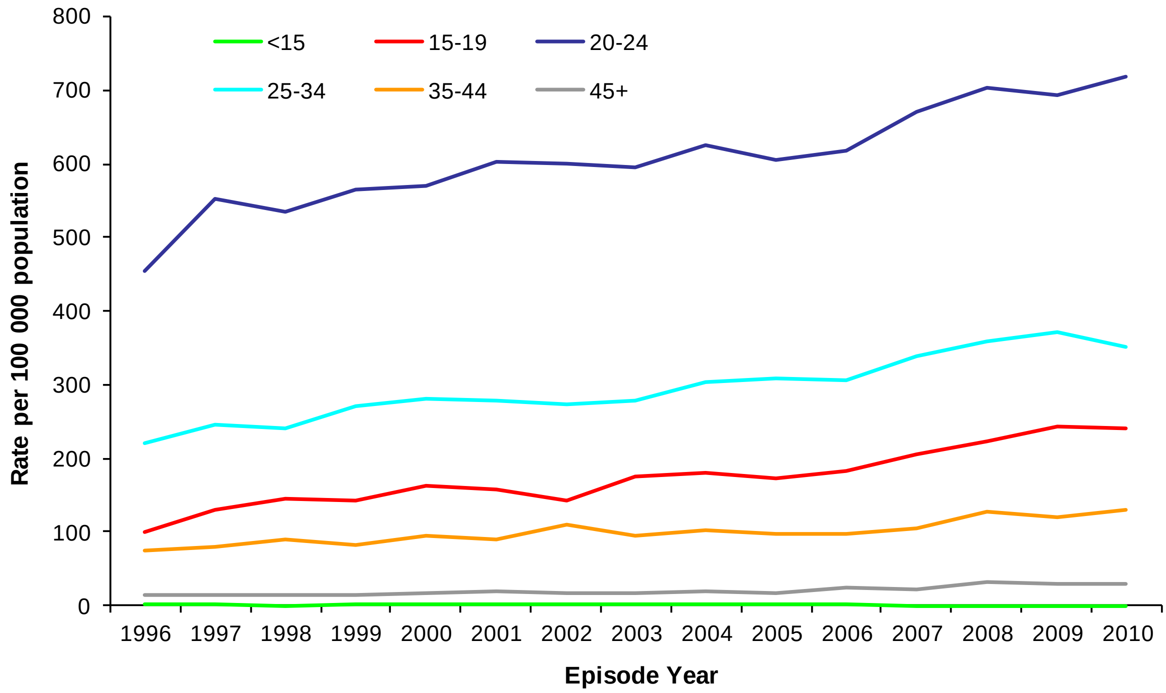
Genital warts are one of the commonest STIs and are of importance to GUM clinics as there is a much greater workload associated with managing warts where there is the need for multiple treatments to clear them and significant psychological morbidity associated with the condition.

The most important development in genital warts has been the switch to Gardasil as the HPV vaccine of choice. This also protects against HPV types 6 and 11 which are responsible for 90% of all genital wart infections. In countries like Australia which used this version of the vaccine, infections with genital warts fell significantly within the first year in the vaccinated age group. Although males were not included in the vaccine campaign, the decline was also rapid but to a smaller degree.[8]

HPV is also important as it is a factor in virtually all cases of cervical cancer, this being the disease targeted in the original HPV vaccine programme. The addition to include two more genotypes (HPV 6 and 11) will not only decrease genital warts but also decrease further the number of changes found at cervical cytology screening. This is because the wart strains also induce mild abnormalities in the cervix that do not progress but these cannot easily be distinguished from those that might progress.

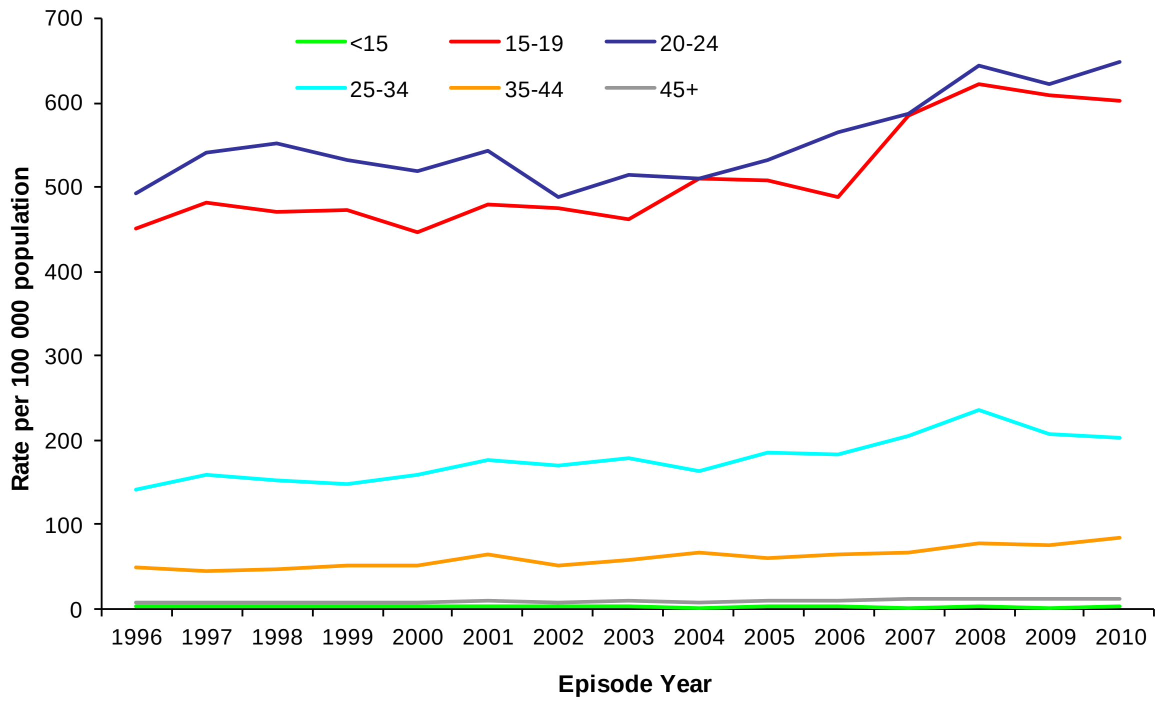
Anogenital wart infections show the same pattern as other STIs with 20-24 year old males (Figure 2.32) and 15-24 year old females (Figure 2.33) most likely to present with first infections. This reflects the general pattern of STIs.

Figure 2.32: Rates of genital warts (first episode) diagnoses per 100,000 males at West Midlands GUM clinics by age, 1996-2010



Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Figure 2.33: Rates of genital warts (first episode) diagnoses per 100,000 females at West Midlands GUM clinics by age, 1996-2010



Source: GUMCAD (GUM Clinic Activity Dataset), Health Protection Agency; Mid-year population estimates, Office for National Statistics.

Future

The main predictions are that we will see:

A decline in genital warts in people born after 2000 with the switch to the Gardasil vaccine.

A decline in abnormalities in young women at their first cervical smear at the age of 25 and in those tested at younger age as infection rates with HPV 16 and 18 fall.

In the next few years extremely drug resistant gonococci will be identified within the UK, these will probably be imported initially.

Rates of positivity in self-testing for Chlamydia will fall to below the target level as the self-testing programme leads to reductions in the number of asymptomatic infections which reduces the number of infectious people leading to lower disease rates. This is particularly likely to occur first in smaller communities with above average socio-economic levels.

2.6 Measles

Introduction

Measles is a highly infectious systemic viral disease caused by a paramyxovirus. In most European countries, it remains an important public health problem and is preventable by a vaccine that provides lifelong immunity to over 99% of recipients. In the pre-vaccination era, most of the population would have been infected in childhood resulting in a significant number of deaths in childhood. In the United Kingdom, since the introduction of measles vaccination, measles related deaths are a rare occurrence but complications still occur with pneumonia and deafness occurring most frequently.

Cases of measles infection still continue to be reported mostly in unvaccinated individuals with the majority of cases related to clusters and outbreaks in population sub-groups with low vaccine uptake.

The UK along with other European Union (EU) Member States and international partners has made a commitment to eliminate measles in the EU and the World Health Organisation (WHO) region of Europe by 2015. The elimination target for measles is less than one confirmed case per million population per year. Over a twelve month period (October 2011 to September 2012), the UK, France, Italy, Romania and Spain accounted for the majority (93%) of all cases reported in the EU with most of these cases linked to outbreaks in a variety of settings/population sub-groups. Over this same period, the EU observed a rate of 15.9 cases per million of the population while the UK reported 24.2 cases per million of population.[9] This target for measles elimination has been achieved in other parts of the world.[10]

To support the attainment of the elimination goal, the UK undertakes epidemic intelligence and enhanced surveillance of measles infection to detect outbreaks as well as monitor progress towards interruption of endemic transmission. These combined with the routine delivery of measles-mumps-rubella (MMR) vaccine as part of the childhood immunisation programme and a co-ordinated health protection and health service response to clusters and outbreaks form part of the multi-pronged approach to eliminating measles in the UK.

Data sources

The data presented in this report were obtained from laboratory surveillance systems operated by the Health Protection Agency (HPA) which operates at local level across the country and at regional and national levels.

There is a statutory duty on all doctors to notify the local Health Protection Unit (HPU) if they see a patient, usually a child or young adult, who they suspect may have measles. These notifications usually come from general practitioners and paediatricians. The HPU will arrange for a special saliva test be carried out to confirm the diagnosis. This allows confirmation of the diagnosis to be made and can also provide data of the genetic makeup of the virus, particularly useful in identifying and following outbreaks of measles.

The identification of possible measles cases allows the HPU to take action to reduce ongoing transmission. The targets for this prevention are mainly members of the same household and other children that attend the same nursery or school as the child with measles. In most circumstances those who have not been given two doses of the MMR vaccine would be offered one, even if this was earlier than the routine schedule. Persons at further risk would also be offered an immunoglobulin injection which contains protective antibodies against measles infection.

Epidemiology

Provisional data for 2012 show that with a rate of 2.14 cases per 100,000 the West Midlands has one of the lowest rates of measles in the UK. Based on findings from the investigation of reported cases, a significant proportion of cases in the West Midlands are linked to small clusters of measles in other parts of the country and unvaccinated traveller communities. Sustained measles transmission is not occurring in the West Midlands.

Nationally, over the last two years, the number of laboratory confirmed cases of measles has increased (Table 2.5). Provisional data for 2012 shows that the largest increase has been in the North West and South East regions, both of which have been dealing with large outbreaks.[11] These outbreaks have occurred in communities with low MMR vaccination rates.

Very few cases of measles occur in the older population as they generally caught measles when there were high levels of circulating virus in their youth (Table 2.6). Since the introduction of MMR in 1988, large numbers of people under the age of 25 have now been vaccinated against measles and the low number of cases is a reflection of the success of the introduction of MMR.

Vaccination rates against measles (MMR) remain high across the West Midlands, hence explaining why there is no sustained transmission of measles within the region (Figure 2.34 and Figure 2.35). The WHO has recommended a target of over 95% uptake for two doses which we do not meet. Five PCTs achieve a 95% level for one dose at 2 years but none for the second dose, although three PCTs are above 93% for MMR2 (Table 2.7). Usually rural areas have a better uptake than urban areas but there is still disparity within urban area PCTs demonstrating that high rates of vaccine uptake can also be achieved in predominantly urban areas.

Future

New strategies need to be implemented in order to target vaccination against the small groups who remain at increased risk of infection due to low uptake of vaccination.

Catch up of MMR vaccine for older children who have missed one of both doses of MMR needs to be considered.

Table 2.5: Laboratory confirmed cases of measles infection by year 2000 to 2012

Year	West Midlands		England & Wales	
	Count	Rate per 100,000	Count	Rate per 100,000
2000	9	0.17	100	0.19
2001	1	0.02	70	0.13
2002	5	0.09	308	0.59
2003	4	0.08	438	0.83
2004	8	0.15	191	0.36
2005	2	0.04	77	0.14
2006	41	0.76	740	1.38
2007	26	0.48	990	1.83
2008	113	2.09	1,370	2.52
2009	95	1.75	1,144	2.09
2010	14	0.26	380	0.68
2011	40	0.07	1,086	1.93
2012*	120	2.14	2,016	3.59

**2012 data are provisional*

Source: Health Protection Agency. Mid-year population estimates, Office for National Statistics.

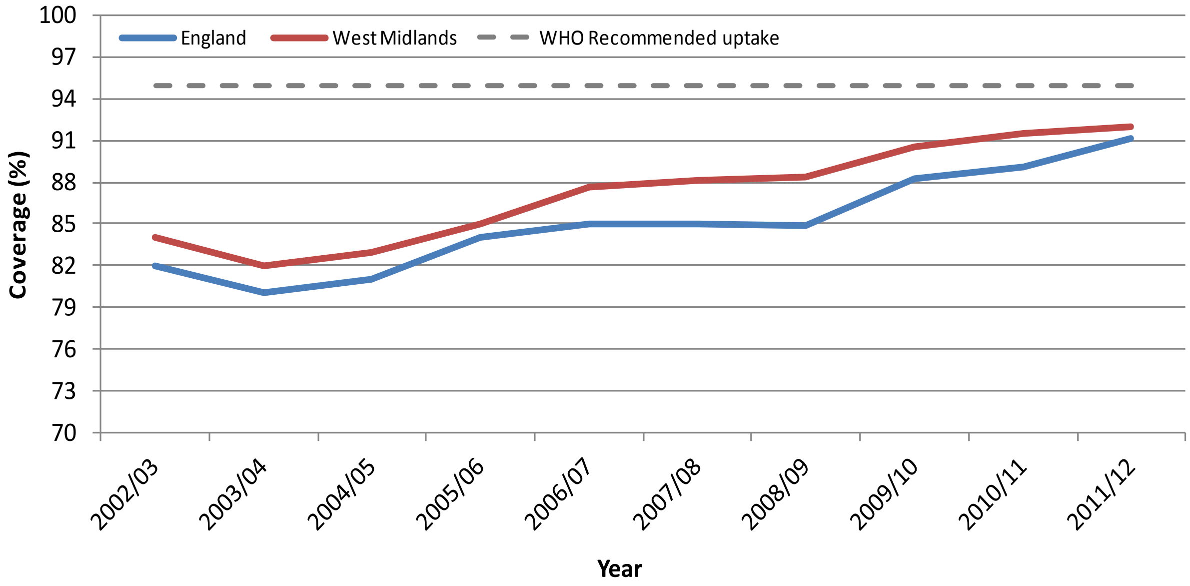
Table 2.6: Laboratory confirmed cases of measles infection by age group, West Midlands 2008-12

Age	Year				
	2008	2009	2010	2011	2012*
less than 1 year	8	10	0	6	6
1-4 years	25	23	4	4	28
5-9 years	30	21	3	7	25
10-14 years	17	20	1	9	18
15-19 years	9	9	2	5	14
20-24 years	4	6	2	5	8
25-29 years	7	2	2	0	3
30-34 years	5	3	0	2	3
≥35 years	8	1	0	2	15
Total	**113**	**95**	**14**	**40**	**120**

**2012 data are provisional*

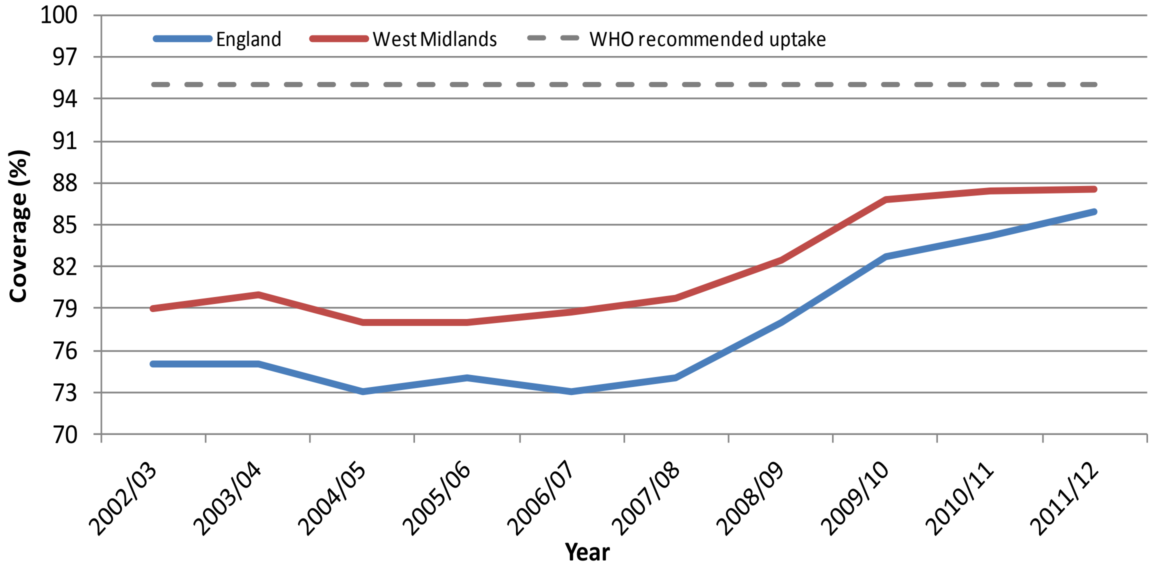
Source: Health Protection Agency.

Figure 2.34: MMR1 coverage (%) at 24 months (1 dose) in the West Midlands and England, 2002/03 to 2011/12 (Apr-Mar)



Source: Health Protection Agency/Cover of Vaccination Evaluated Rapidly (COVER) data.

Figure 2.35: MMR1&2 coverage (%) at 5 years (2 doses) in the West Midlands and England, 2002/03 to 2011/12 (Apr-Mar)



Source: Health Protection Agency/Cover of Vaccination Evaluated Rapidly (COVER) data.

Table 2.7: Coverage (%) of MMR1 and MMR2 by PCT, West Midlands Apr 2011- Mar 2012

Primary Care Trust	24 months (MMR) (%)	5 years (MMR 1 dose) (%)	5 years (MMR 2 doses) (%)
Birmingham East & North PCT	86.8	92.8	80.0
Coventry Teaching PCT	94.6	97.3	93.3
Dudley PCT	94.4	95.5	89.6
Heart of Birmingham Teaching PCT	91.5	94.9	89.3
Herefordshire PCT	87.7	92.4	82.5
North Staffordshire PCT	95.7	96.5	92.9
Sandwell PCT	89.7	93.8	86.4
Shropshire County PCT	95.4	95.5	91.1
Solihull PCT	91.0	91.2	86.3
South Birmingham PCT	87.6	92.3	79.6
South Staffordshire PCT	91.0	93.7	87.6
Stoke on Trent PCT	94.6	96.5	91.9
Telford & Wrekin PCT	96.5	95.4	91.2
Walsall Teaching PCT	95.6	96.5	93.7
Warwickshire PCT	95.6	96.1	93.7
Wolverhampton City PCT	89.5	92.3	80.6
Worcestershire PCT	93.1	92.9	85.4
West Midlands	**92.0**	**94.3**	**87.5**
England	**91.2**	**92.9**	**86.0**

Source: Health Protection Agency/Cover of Vaccination Evaluated Rapidly (COVER) data.

2.7 Pertussis

Introduction

Pertussis, also known as whooping cough, is an acute bacterial infection of the respiratory tract caused by *Bordetella pertussis*. It is an important public health disease that is responsible for serious illness in infants particularly in those who are unimmunised or partially immunised against pertussis. The disease is preventable by vaccination and the current immunisation schedule in the United Kingdom (UK) is designed to provide optimal protection in the first few years of life, when the risk of serious disease and poor outcomes is highest.

Immunity against pertussis infection, after vaccination or natural infection, is not life-long so individuals can get re-infected and spread the disease to others. Vaccinated people can still get a mild infection, particularly as immunity wanes in late adolescence and adulthood, and these people may act as a source of infection to those children who are too young to be vaccinated. There is an increasing recognition that pertussis frequently infects adults during epidemics.

Although pertussis vaccine coverage levels remain relatively high in the UK, the disease still displays a cyclical pattern with epidemics occurring at 3 to 4 yearly intervals. In the UK, the number of pertussis cases were at a historic low level for over two decades but since the third quarter of 2011 pertussis activity has increased to epidemic levels and is currently at an all-time high relative to levels observed in recent epidemic years.

Nationally, 14 children have died in the UK from pertussis in this outbreak; about 1 in 50,000 of all children born in this period (number accurate as of 14th January 2013).[12] A similar increase has been reported in other Western countries such as the United States, Canada, Australia, Norway and The Netherlands. The reasons for this increase remain unclear and are currently being investigated.

In the UK a number of measures have been implemented to investigate and control this recent increase and these include a national case control study (ongoing), salivary testing for the under 16s, changes to health protection guidance,[13] health promotion activities and a temporary vaccination programme aimed at boosting immunity in pregnant women so as to optimise passive immunity in unvaccinated infants in the first few months of life until the pertussis vaccine can be administered.[14]

Data sources

The data presented in this report were obtained from laboratory surveillance systems operated by the Health Protection Agency (HPA) which operates at local level across the country and at regional and national levels.

There is a statutory duty on all doctors to notify the local Health Protection Unit (HPU) if they see a patient they suspect may have pertussis. These notifications usually come from general practitioners and paediatricians. Depending on the circumstances the HPU will try and confirm the diagnosis. This can be done by a nasal swab for culture or PCR, serology looking for a rise in antibodies post-infection and introduced recently in order to obtain more data on pertussis in England, a special saliva test avoiding the need for a blood specimen.

Because of the nature of the clinical course of pertussis infection, it is only one of a number of infections that can cause a cough. It is only the late onset of the ‘whoop’ that distinguishes pertussis from other respiratory infections along with the duration. Pertussis in China is known as the 100 day cough. Not all cases develop the classic whoop, particularly in adults and confirmatory microbiological testing late in the illness requires blood tests.

Microbiological testing is much more likely to be positive early in the illness but in the absence of an epidemic may not be considered as a diagnosis. Relying only on microbiological testing will under report the number of cases substantially, whilst clinical diagnosis may miss cases but also risk over diagnosis, especially during an epidemic as many illnesses get called pertussis which are due to other causes of cough. Laboratory confirmed cases are the best method for showing trends in infection rates.

Epidemiology

Cases of pertussis in the West Midlands increased three to four fold between 2010 and 2011 (Table 2.8) and in the first half of 2012 case numbers were twice the number reported for the whole of 2011 (Table 2.9). Provisional figures for 2012 (Jan to Dec), show that there have been 9,741 laboratory confirmed cases in England with the West Midlands accounting for 8% (n=755) of these cases. The increase in pertussis activity has been observed across all regions in England and Wales. The highest numbers of confirmed cases in 2012 have been in the South East and the South West regions.[15]

Table 2.8: Laboratory confirmed cases of Pertussis infection by year, West Midlands & England, 2000 to 2012* (confirmed by culture, PCR and/or serology).

Year	West Midlands		England & Wales	
	Count	Rate per 100,000	Count	Rate per 100,000
2000	22	0.41	200	0.38
2001	38	0.72	291	0.56
2002	47	0.89	354	0.67
2003	15	0.28	209	0.40
2004	19	0.36	288	0.54
2005	57	1.07	385	0.72
2006	23	0.43	412	0.77
2007	39	0.73	625	1.16
2008	89	1.65	902	1.66
2009	50	0.92	719	1.31
2010	20	0.37	422	0.76
2011	73	1.30	1,118	1.99
2012*	755	13.48	9,741	17.34

** Data for 2012 are provisional*

Source: Health Protection Agency; Mid-year population estimates, Office for National Statistics.

The reasons for the particularly high epidemic this year is still unclear but it is likely that some of the high levels of reporting may, in part, be due to increased awareness amongst health professionals improving case ascertainment in older age groups – at least up to 2008. This is reflected by the increased demand for serology testing which is the predominant method of confirmation in adolescents and adults who typically present with milder features late in the course of the illness. However, it is also considered that the observed increases reflect a real change in pertussis activity with waning immunity following vaccination and/or natural infection likely to be important contributory factors.[16] This is supported by the high number of confirmed cases in infants under three months of age in whom ascertainment has been more consistent through time. Deaths in young children are invariably investigated so the increase in deaths from pertussis clearly demonstrates that this is a significant epidemic.

The apparent increase in number of laboratory confirmed cases up to 2008 corresponds with the availability of enhanced diagnostic methods; since mid-2006 there has been greater awareness and use of these testing methods compared to previous years, as illustrated by the increasing proportion of reports diagnosed by PCR and or serology.

Table 2.9: Laboratory confirmed cases of Pertussis infection by specimen date in the West Midlands & England; Jan-Dec 2012 (confirmed by culture, PCR and/or serology).

Month	West Midlands	England & Wales
Jan	7	228
Feb	8	217
Mar	12	277
Apr	18	370
May	53	708
Jun	42	684
Jul	69	1,062
Aug	109	1,230
Sep	117	1,332
Oct	147	1,633
Nov	N/A	1,168
Dec	N/A	832
2012*	**582**	**7,728**

** 2012 data are provisional.*
Monthly breakdown for West Midlands only available for Jan-Oct.

Source: Health Protection Agency.

The high numbers in children under 3 months (Table 2.10) reflects more testing in this age group compared to other ages as this age group is usually the sickest, frequently requiring hospital admission where testing will be carried out. The cases in the age groups 10 to 14 and 15 and above reflect waning immunity and spread within secondary schools and the community and that this age group has borne the brunt of the epidemic. It is also easier, and a greater readiness, to collect blood in older people but the introduction of saliva testing for children less than 16 years of age should improve case ascertainment in 2013. The pattern of age distribution of cases is replicated nationally.

There is significant variation within areas across the West Midlands (Figure 2.36). Direct comparisons are difficult because of the small numbers involved in some areas. A small number of general practitioners testing a lot of patients can readily increase the figures within that area.

Table 2.10: Laboratory confirmed cases of Pertussis infection by age group, West Midlands, 2008 to 2012 (Jan-Oct) (confirmed by culture, PCR and/or serology)

Age	Year				
	2008	2009	2010	2011	2012* (Jan-Oct)
<3 months	38	12	5	22	52
3-5 months	7	2	0	3	9
6-11 months	0	2	1	2	1
1-4 years	3	1	1	2	11
5-9 years	2	0	0	2	12
10-14 years	7	3	1	3	52
15+ years	32	30	12	39	445
Total	**89**	**50**	**20**	**73**	**582**

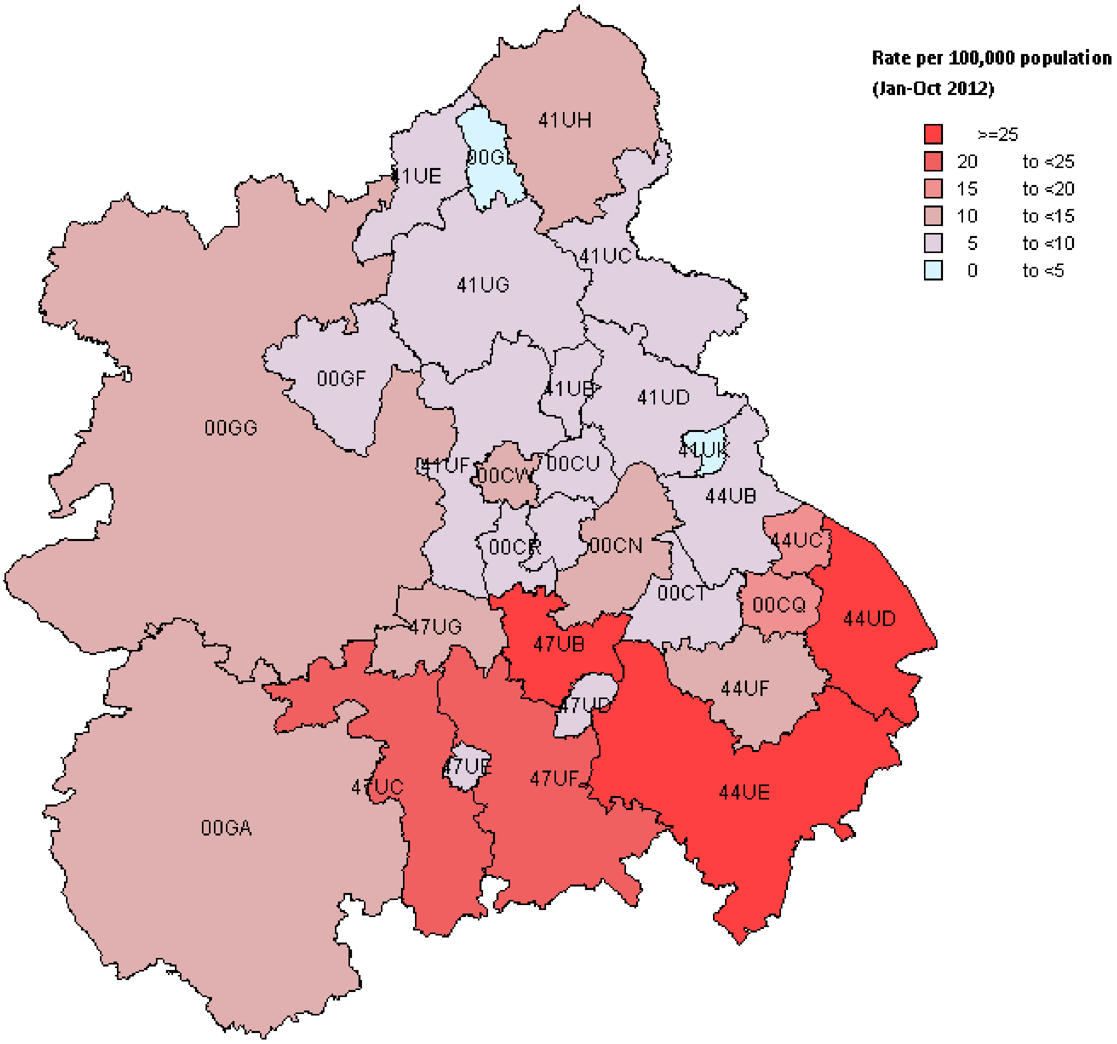
**Data for 2012 are provisional*
Source: Health Protection Agency.

Future

The vaccination of pregnant women was introduced as a temporary measure whilst pertussis disease levels remain high. Currently disease activity is above the levels of disease when the decision to introduce the vaccination was taken so the policy will remain in place for some time.

The HPA has just made salivary testing for children under the age of 16 available to enable more precision in diagnosis to be made. This will help our understanding of the nature of the current pertussis epidemic.

Figure 2.36: Laboratory confirmed cases of pertussis by Local Authority, rate per 100,000 population, West Midlands, Jan-Oct 2012.



LA Code	LA	41UK	Tamworth District	00GL	City of Stoke-on-Trent		
44UE	Stratford-on-Avon District	00CQ	Coventry District	00GA	County of Herefordshire	41UE	Newcastle-under-Lyme District
44UD	Rugby District	44UC	Nuneaton and Bedworth District	41UF	Staffordshire Moorlands District	41UD	Lichfield District
47UB	Bromsgrove District	00CN	Birmingham District	00GG	Shropshire	00GF	Telford and Wrekin
47UF	Wychavon District	47UG	Wyre Forest District	44UF	Warwick District	41UG	Stafford District
47UC	Malvern Hills District	00CW	City of Wolverhampton District	41UB	Cannock Chase District	00CT	Solihull District
00CR	Dudley District	47UD	Redditch District	47UE	Worcester District	44UB	North Warwickshire District
00CU	Walsall District	41UF	South Staffordshire District	00CS	Sandwell District	41UC	East Staffordshire District

Source: Health Protection Agency. Mid-year population estimates, Office for National Statistics.

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2.9 Further information

HPA web site**:** http://www.hpa.org.uk/

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18 March 2013

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3. KPIS FOR MATERNITY CARE: BASELINE RATES FOR WEST MIDLANDS CCGS

3.1 Introduction

Under the new NHS, maternity care in the West Midlands will face new challenges, and Clinical Commissioning Groups (CCGs) as the new agencies responsible for commissioning equitable, safe and cost effective care, will have to be aware of the needs of their population.

In collaboration with the West Midlands Strategic Health Authority and all of the region's Primary Care Trusts (PCTs), West Midlands Perinatal Institute (WMPI) conducted a region wide maternity data collection programme from 2009-2011 which included 5 Key Performance Indicators (KPIs) agreed by West Midlands stakeholders. The KPIs were:

1. Early booking
2. Continuity of carer
3. Antenatal detection of fetal growth restriction
4. Smoking in pregnancy
5. Breastfeeding initiation

The KPIs together with a set of population descriptors and quality indicators were reported within quarterly reports www.pi.nhs.uk/pnm/maternity_reports.htm and the interactive PEERview reporting system for data by Cluster, PCT and Maternity unit / Trust www.pi.nhs.uk/PEERview/2a/Display.aspx.

Trend analysis showed that even over this relatively short period, there were demonstrable improvements in the overall regional performance within each KPI, which was attributed to the monitoring and identifying of areas needing improvement.

In this chapter for West Midlands Key Health Data 2013, we present an overview of the evidence and rationale for each KPI, together with the average performance within each CCG area *as a baseline based on the period (2009-2011) when comprehensive regional data were collected from all units.* As can be seen, there is considerable variation in the levels each of these indicators.

With the termination of the WMPI's regional remit and funding from April 2013, this will be our final report on such data. To address the wide variation, we recommend that CCGs ensure continued monitoring of such performance, as these are important patient level indicators of the quality of maternity care that mothers and babies receive in the West Midlands.

3.2 Key Performance Indicators

Key Performance Indicator 1: EARLY BOOKING

Definition:
Proportion of all pregnancies where the woman had a health and social care assessment before 12 completed weeks of pregnancy.

Target - 90% in first trimester (=up to 12 weeks 6 days of pregnancy)

Red	<80%
Amber	80-89%
Green	90+%

Rationale: National policy and guidelines recommend that all women have seen a midwife or a maternity healthcare professional for health and social care assessment of needs, risks and choices by 12 completed weeks of pregnancy

Context: Early booking is essential to engage the mother early in her care, to be aware of essential information about the pregnancy and available choices, and for her carers to be able to assess risk and needs.

Associated links:
- Maternity Matters: Choice, Access and Continuity of Care in a Safe Service (2007) www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_073312
- NICE Clinical Guideline. Antenatal Care: Routine Care for the Healthy Pregnant Woman. NICE March 2008 www.nice.org.uk/guidance/index.jsp?action=download&o=40115
- NHS West Midlands IfH Project 2C Workstream 4: Building Commissioning Capacity www.ifh.westmidlands.nhs.uk/FileDocs/pdf/323.pdf
- Reducing Perinatal Mortality Project indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm
- Birmingham Infant Mortality indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm

Existing Data item for National targets:
- Payment by results, DH (2012) – Antenatal care pathway payment is contingent upon risk assessment at booking www.dh.gov.uk/health/2012/02/maternity-pathway-payment-system
- National Vital Signs (2008) www.dh.gov.uk/en/publicationsandstatistics/publications/publicationspolicy and guidance/DH 082542

Required data item from 2013:
- Commissioning outcomes framework, NCB (2012) www.nice.org.uk/aboutnice/cof/MaternityAndReproductive.jsp

Regional target:
- Quarterly Health Improvement report
- West Midlands Perinatal Commissioning Group Maternity Services Specification (2012)

Comment: This indicator has shown ongoing improvement. More up to date figures for CCG populations where data collection has continued are available on PEERView. www.pi.nhs.uk/PEERview/2a/Display.aspx

Key Performance Indicators

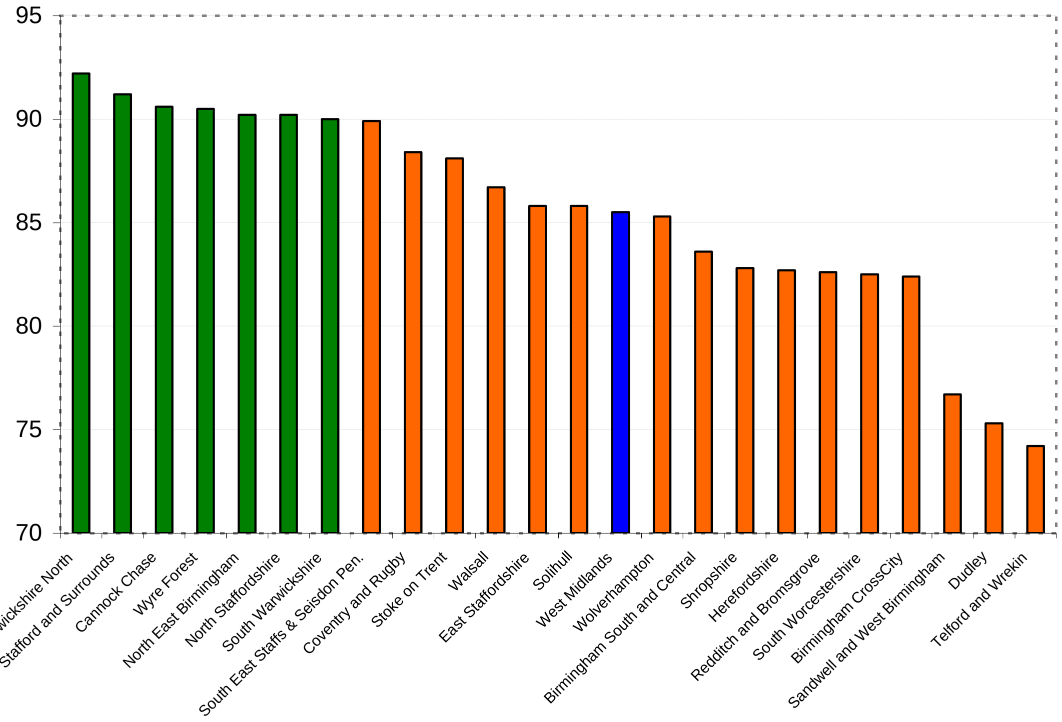
Data Source: PEER - West Midlands Perinatal Institute
Data Period: July 2009 - January 2011

KPI1: Early Booking

Clinical Commissioning Group	%	95% CI
West Midlands	**85.5**	**85.9 - 85.3**
Birmingham CrossCity	82.4	81.7-83.1
Birmingham South and Central	83.6	82.6 - 84.6
Cannock Chase	90.6	89.6 - 91.4
Coventry and Rugby	88.4	87.9 - 89.0
Dudley	75.3	74.3 - 76.2
East Staffordshire	85.8	84.6 - 86.9
Herefordshire	82.7	81.6 - 83.8
North East Birmingham	90.2	88.8 - 91.4
North Staffordshire	90.2	89.3 - 91.0
Redditch and Bromsgrove	82.6	81.0 - 84.1
Sandwell and West Birmingham	76.7	76.0 - 77.4
Shropshire	82.8	81.2 - 84.4
Solihull	85.8	84.5 - 87.1
South East Staffs & Seisdon Pen.	89.9	89.1 - 90.8
South Warwickshire	90.0	89.3 - 90.7
South Worcestershire	82.5	81.2 - 83.8
Stafford and Surrounds	91.2	90.2 - 92.0
Stoke on Trent	88.1	87.4 - 88.7
Telford and Wrekin	74.2	72.0 - 76.3
Walsall	86.7	86.1 - 87.3
Warwickshire North	92.2	91.5 - 92.9
Wolverhampton	85.3	84.2 - 86.3
Wyre Forest	90.5	88.5 - 92.2

Early Booking

Target Ranges
90+
70 - 89
<70



Key Performance Indicator 2: CONTINUITY OF CARER

Definition: Total number of antenatal visits in primary care setting divided by number with two lead professionals in community

Target - 75% of visits with one of the same 2 maternity health care professionals in community setting

Thresholds

Red	<40%
Amber	40-74%
Green	75% +

Rationale: National policy and guidance supports continuity of carer during pregnancy. Maternity Matters states 'every woman will be supported by a midwife she knows and trusts throughout her pregnancy and after birth' (p5)

Context: Initial attempt to define it as contact with one midwife proved not feasible, so Investing for Health Board amended this KPI to *'one of two lead carers'*. Indicator important to foster supportive ongoing relationship with mother which is more likely to help develop trust and detect warning signs of developing medical and social risks during pregnancy.

Associated evidence

- Maternity Matters: Choice, Access and Continuity of Care in a Safe Service (2007): www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_073312
- NICE Clinical Guideline. Antenatal Care: Routine Care for the Healthy Pregnant Woman. NICE March 2008 www.nice.org.uk/guidance/index.jsp?action=download&o=40115
- Local evidence: The Bellevue Model. Please refer to: www.perinatal.nhs.uk/pc-aims/main.htm
- Saving Mother's Lives, BJOG (2006-08) www.bjog.org/details/news/1025937/New_BJOG_supplement_published_today_CMACE_Saving_Mothers_Lives_report.html
- Patient experience in adult NHS services (2012) www.nice.org.uk/guidance/qualitystandards/patientexperience/ContinuityOfCare.jsp

Existing Data item for:

- Quarterly Health Improvement report
- The NHS Outcomes Framework, DH, 2011/12
- Domain 4.5 improving women and their families experience of care healthandcare.dh.gov.uk/outcomes-frameworks/

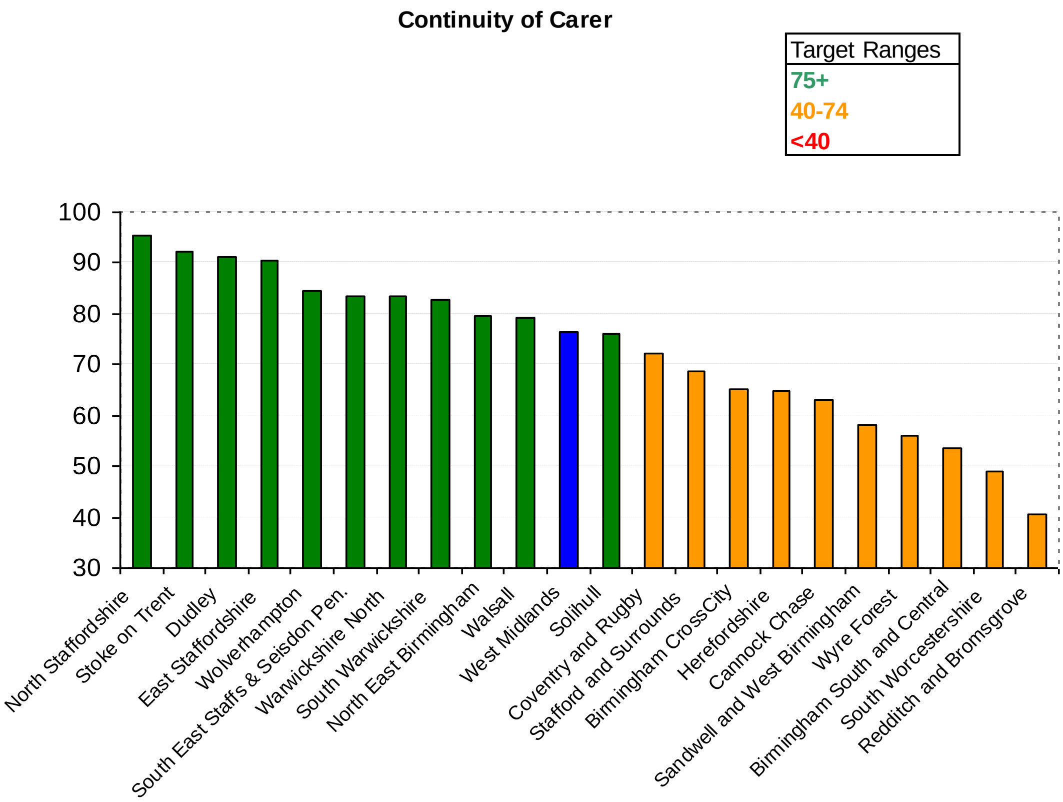
Comment: This KPI often depends on the way maternity services are organised, and the wide variation shown in the ensuing Table and Graph is an indication of this. Nevertheless, continuity of carer is an important KPI to ensure midwives get to know the women they are caring for, can spot any changes and ensure the wellbeing of mother and baby.

Key Performance Indicators

Data Source: PEER, West Midlands Perinatal Institute
Data Period: July 2009 - January 2011

KPI 2: Continuity of Carer

Clinical Commissioning Group	%	95% CI
West Midlands	**79.2**	**78.7 - 79.6**
Birmingham CrossCity	65.1	63.2 - 66.9
Birmingham South and Central	53.7	50.8 - 56.5
Cannock Chase	63.1	61.2 - 65.0
Coventry and Rugby	72.3	71.4 - 73.2
Dudley	91.1	90.2 - 91.9
East Staffordshire	90.6	89.3 - 91.8
Herefordshire	64.7	63.0 - 66.5
North East Birmingham	79.7	76.7 - 82.3
North Staffordshire	95.6	94.7 - 96.3
Redditch and Bromsgrove	40.5	37.1 - 43.9
Sandwell and West Birmingham	58.2	56.9 - 59.5
Shropshire		
Solihull	76.2	72.8 - 79.3
South East Staffs & Seisdon Pen.	83.3	81.8 - 84.7
South Warwickshire	82.6	81.5 - 83.7
South Worcestershire	48.9	46.0 - 51.8
Stafford and Surrounds	68.7	66.8 - 70.5
Stoke on Trent	92.1	91.3 - 92.7
Telford and Wrekin		
Walsall	79.1	78.1 - 80.1
Warwickshire North	83.3	82.0 - 84.5
Wolverhampton	84.6	82.3 - 86.6
Wyre Forest	56.0	49.7 - 62.1



Key Performance Indicator 3: ANTENATAL DETECTION OF FETAL GROWTH RESTRICTION

Definition: Number of babies with fetal growth restriction (FGR) at birth who were diagnosed with FGR antenatally. Note: FGR is defined retrospectively as <10th customised centile birthweight.

Target – Long term target of 60%.
Increase in antenatal detection of growth restricted babies detected by 10% per year.

Red	<5%
Amber	5-10%
Green	>10%

Rationale: Fetal growth restriction is the largest contributory factor associated with antepartum stillbirths. Antenatal detection is essential to provide information to the mother about increased risk for the baby, and to initiate additional investigations of fetal well-being as required.

Context: Overall detection rate is a composite of ascertainment in low and high risk pregnancy.
Low risk – detection relies mainly on serial fundal height measurement, plotted on customised GROW charts and appropriate care pathways for referral.
High risk - relies on appropriate protocols and resources to provide serial scanning.
Fetal growth restriction is the single largest risk factor for stillbirth, and antenatal detection halves the risk www.bmj.com/content/346/bmj.f108

Associated evidence:
- Royal College of Obstetricians and Gynaecologists. The Investigation and Management of the small-for-gestational-age Fetus. Guideline No. 31. November 2002. www.rcog.org.uk/index.asp?PageID=531
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- Gardosi J and Francis A. Controlled trial of fundal height measurement plotted on customized antenatal growth charts. British Journal of Obstetrics and Gynaecology. 1999. 106 309-317.
- West Midlands Confidential Enquiry into Stillbirths with IUGR www.pi.nhs.uk/rpnm/CE_SB_Final.pdf

Existing Data item for:
- Quarterly Health Improvement report
- NHS West Midlands IfH Project 2C Work stream 4: Building Commissioning Capacity www.ifh.westmidlands.nhs.uk/FileDocs/pdf/323.pdf
- Reducing Perinatal Mortality Project indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm
- Birmingham Infant Mortality indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm

For baseline 2009/10 data for this target:
www.pi.nhs.uk/pnm/maternitydata/Q2_2010-11_Perinatal_KPI_report.pdf
- Data item – 'Record of *either* SGA/FGR/IUGR in the notes,
or : EFW<10th customised centile on growth chart.

For examples of good practice:
Community Growth Scanning Project - www.pi.nhs.uk/cogs/

NB data collection period too short to allow RAG rating for trend.

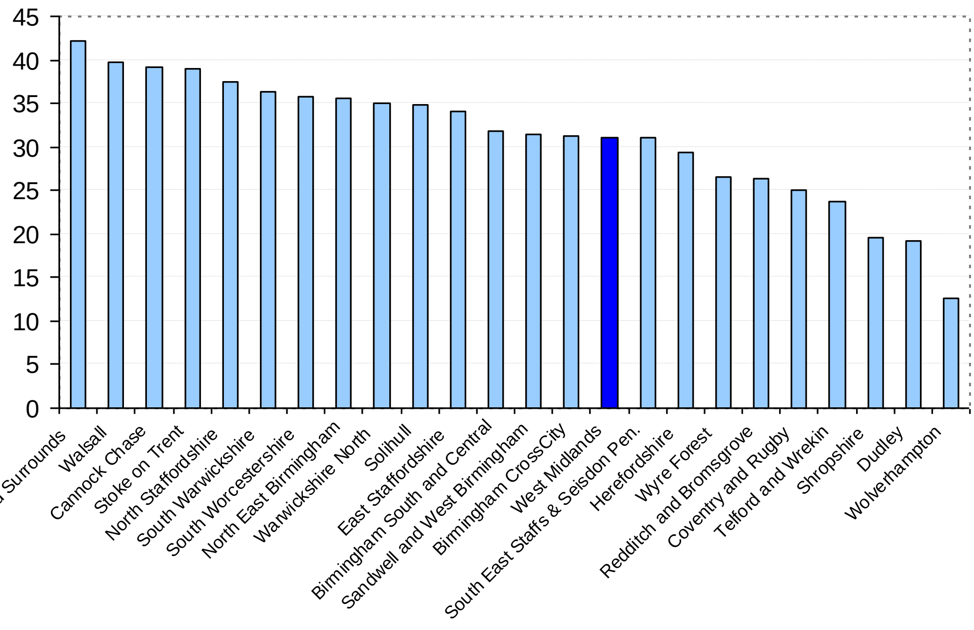
Comment: Antenatal detection of the fetus at risk due to growth restriction is still a considerable challenge, and overall rates are poor although improving. The best performing units tend to be the ones which have had the most training, and have implemented the most solid protocols.

Key Performance Indicators
Data Source: PEER, West Midlands Perinatal Institute
Data Period: July 2009 - January 2011

KPI 3: Antenatal detection of fetal growth restriction

Clinical Commissioning Group	%	95% CI
West Midlands	**31.0**	**30.2 - 31.8**
Birmingham CrossCity	31.2	29.0 - 33.0
Birmingham South and Central	31.8	28.1 - 35.6
Cannock Chase	39.2	34.2 - 44.1
Coventry and Rugby	25.0	22.4 - 27.7
Dudley	19.2	16.5 - 21.8
East Staffordshire	34.1	28.0 - 40.1
Herefordshire	29.4	25.0 - 34.0
North East Birmingham	35.5	29.5 - 41.5
North Staffordshire	37.5	32.5 - 42.4
Redditch and Bromsgrove	26.4	21.4 - 31.3
Sandwell and West Birmingham	31.4	29.2 - 33.6
Shropshire	19.6	14.9 - 24.4
Solihull	34.9	29.5 - 40.3
South East Staffs & Seisdon Pen.	31.0	26.7 - 35.2
South Warwickshire	36.4	32.1 - 40.6
South Worcestershire	35.8	30.8 - 40.9
Stafford and Surrounds	42.1	36.6 - 47.6
Stoke on Trent	38.9	35.6 - 42.1
Telford and Wrekin	23.8	18.3 - 29.3
Walsall	39.8	36.8 - 42.7
Warwickshire North	35.0	30.8 - 39.1
Wolverhampton	12.6	10.1 - 15.1
Wyre Forest	26.6	18.3 - 34.9

Antenatal detection of fetal growth restriction



NB data collection period too short to allow RAG rating for trend.

Key Performance Indicator 4: SMOKING IN PREGNANCY

Definition: Proportion of women smoking at booking
Proportion of women smoking during pregnancy – as ascertained at delivery

Target - Reduce to prevalence of 15%, or 1% reduction per year

Thresholds (smoking at delivery)

Red	≥18%
Amber	15-17.9%
Green	<15%

Rationale: Smoking in pregnancy causes adverse outcomes, including increased risk of miscarriage, fetal growth restriction and perinatal death.

Context: Recent work assessing the effect of smoking on risk of stillbirth found it to be the second strongest risk factor (after FGR without smoking), and strongly linked to FGR.
www.bmj.com/content/346/bmj.f108

Associated Evidence:

- NICE public Health Programme Guidance. Smoking Cessation Services. 2008.
  www.nice.org.uk/guidance/index.jsp?action=byID&o=11925

- Review of Health Inequalities - Infant Mortality PSA Target. Department of Health, 2007
  www.dh.gov.uk/prod_consum_dh/idcplg?IdcService=GET_FILE&dID=116196&Rendition=Web

- Tackling Health Inequalities: A programme for action - Department of Health 2003
  www.dh.gov.uk/prod_consum_dh/idcplg?IdcService=GET_FILE&dID=10311&Rendition=Web

Existing Data item for:
National target:
- Local delivery plan return
- PSA Target 06a:www.connectingforhealth.nhs.uk/dscn/dscn2002/502002.pdf

Regional target:
- Quarterly Health Improvement report
- NHS WM IfH Project 2C Workstream 4: Building Commissioning Capacity
  www.ifh.westmidlands.nhs.uk/FileDocs/pdf/323.pdf
- Reducing Perinatal Mortality Project indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm
- Birmingham Infant Mortality indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm

Secondary indicators:
(i) Number of British Europeans smoking at delivery
(ii) Number of teenagers smoking at delivery

Comment: Smoking rates vary with the demographics of the population, and indicate the need to provide appropriate smoking cessation services, as it is one of the most avoidable causes of adverse pregnancy outcome

Key Performance Indicators

Data Source: PEER, West Midlands Perinatal Institute

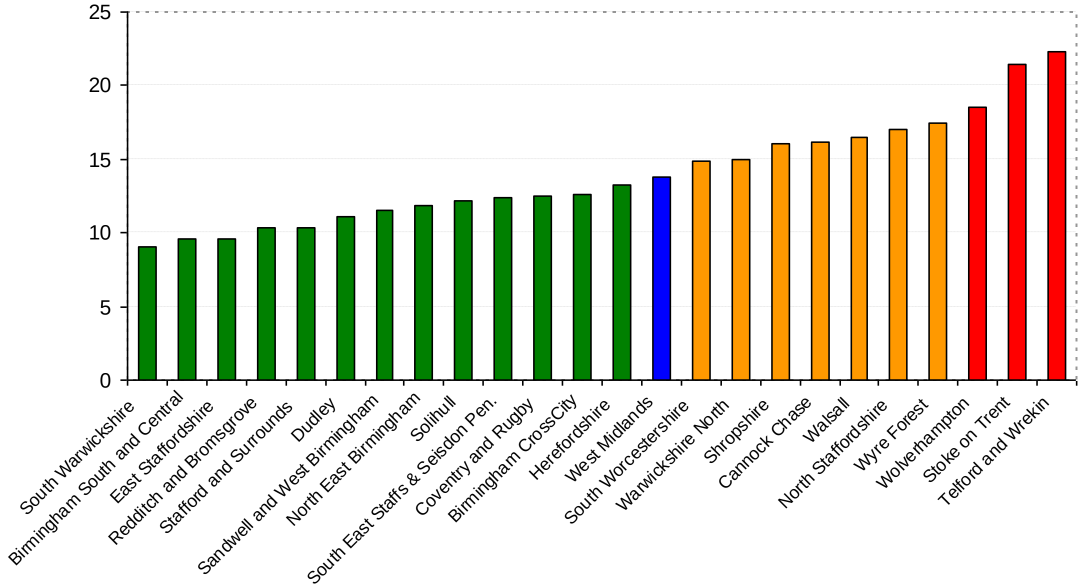
Data Period: July 2009 - January 2011

KPI 4a: Smoking at Booking **KPI 4b: Smoking at Delivery**

	Smoking at booking			Smoking at delivery	
Clinical Commissioning Group	**%**	**95% CI**		**%**	**95% CI**
West Midlands	**19.1**	**18.3 - 19.3**		**13.8**	**13.6 - 14.0**
Birmingham CrossCity	17.7	17.0 - 18.4		12.6	11.9 - 13.3
Birmingham South and Central	12.9	12.0 - 13.8		9.6	8.7 - 10.5
Cannock Chase	22.4	21.2 - 23.7		16.2	15.1 - 17.4
Coventry and Rugby	18.5	17.9 - 19.2		12.5	11.9 - 13.1
Dudley	19.0	18.1 - 19.8		11.1	10.5 - 11.8
East Staffordshire	16.7	15.6 - 18.0		9.6	8.7 - 10.6
Herefordshire	18.9	17.8 - 20.1		13.3	12.2 - 14.4
North East Birmingham	16.9	15.3 - 18.6		11.9	10.4 - 13.6
North Staffordshire	21.2	20.0 - 22.4		17.0	16.0 - 18.2
Redditch and Bromsgrove	15.9	14.5 - 17.4		10.3	9.0 - 11.8
Sandwell and West Birmingham	16.7	16.1 - 17.3		11.5	11.0 - 12.1
Shropshire	18.9	17.3 - 20.6		16.1	14.6 - 17.7
Solihull	17.4	16.1 - 18.9		12.2	10.9 - 13.7
South East Staffs & Seisdon Pen.	18.4	17.3 - 19.5		12.4	11.5 - 13.4
South Warwickshire	12.5	11.8 - 13.3		9.0	8.3 - 9.8
South Worcestershire	17.9	16.6 - 19.2		14.9	13.6 - 16.3
Stafford and Surrounds	14.9	13.8 - 16.1		10.3	9.4 - 11.3
Stoke on Trent	26.0	25.1 - 26.9		21.4	20.6 - 22.3
Telford and Wrekin	26.4	24.3 - 28.6		22.3	20.4 - 24.5
Walsall	23.5	22.8 - 24.4		16.5	15.8 - 17.3
Warwickshire North	22.5	21.4 - 23.6		15.0	14.0 - 16.1
Wolverhampton	21.3	20.1 - 22.5		18.5	17.4 - 19.7
Wyre Forest	22.9	20.4 - 25.7		17.5	15.1 - 20.2

Smoking at delivery

Target Ranges
<15
15-17.9
>=18



Key Performance Indicator 5: BREASTFEEDING INITIATION

Definition: Number of babies that received breast milk within 48 hours of birth
(secondary target – breastfeeding at 6 weeks – not collected on PEER)

Target - Increase in breast feeding initiation rates by 2% per year

Thresholds

Red	<1%
Amber	>1-2%
Green	>2%

Rationale: Breastfeeding protects babies and their mothers from a wide range of illnesses, including infection, sudden infant death syndrome, allergic diseases in babies and breast and ovarian cancer in mothers.

Associated Evidence:

- NICE public Health Programme Guidance. Maternal and Child Nutrition Programme. NICE. Guidance March 2008. www.nice.org.uk/guidance/index.jsp?action=byID&o=11943
- NICE. Postnatal care: Routine postnatal care of women and their babies July 2006. www.nice.org.uk/CG037
- Demott K, Bick D, et al (2006) Clinical Guidelines and Evidence Review for Post Natal Care Of Recently Delivered Women and Their babies**.** London: National Collaborating Centre for Primary Care and Royal College of General Practitioners.

Existing Data item for:
National target:

- Local delivery plan return
- PSA Target 06b

Regional target:

- Quarterly Health Improvement report
- IfH Project 2C Workstream 4: Building Commissioning Capacity www.ifh.westmidlands.nhs.uk/FileDocs/pdf/323.pdf
- Reducing Perinatal Mortality Project indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm
- Birmingham Infant Mortality indicator: www.pi.nhs.uk/rpnm/rpnmmain.htm

NB data collection period too short to allow RAG rating for trend.

Comment: Wide regional variation in breastfeeding rates is again in part linked to demographics, but also highlights the need for improved performance in this indicator.

Key Performance Indicators

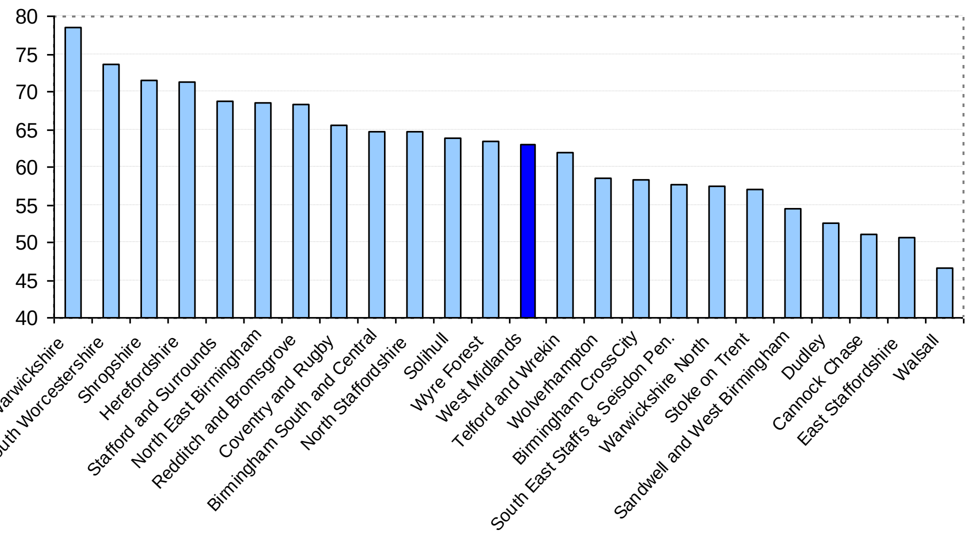
Data Source: PEER, West Midlands Perinatal Institute

Data Period: July 2009 - January 2011

KPI 5: Breastfeeding Initiation < 48 Hrs

Clinical Commissioning Group	%	95% CI
West Midlands	**63.0**	**62.7 - 63.3**
Birmingham CrossCity	58.4	57.4 - 59.4
Birmingham South and Central	64.7	63.3 - 66.1
Cannock Chase	51.1	49.6 - 52.7
Coventry and Rugby	65.6	64.7 - 66.5
Dudley	52.5	51.3 - 53.7
East Staffordshire	50.6	48.8 - 52.4
Herefordshire	71.2	69.6 - 72.8
North East Birmingham	68.5	66.2 - 70.8
North Staffordshire	64.7	63.3 - 66.1
Redditch and Bromsgrove	68.3	66.4 - 70.2
Sandwell and West Birmingham	54.5	53.5 - 55.4
Shropshire	71.4	69.5 - 73.3
Solihull	63.9	62.0 - 65.8
South East Staffs & Seisdon Peninsular	57.7	56.2 - 59.2
South Warwickshire	78.5	77.5 - 79.5
South Worcestershire	73.6	71.9 - 75.2
Stafford and Surrounds	68.8	67.3 - 70.3
Stoke on Trent	57.0	55.9 - 58.0
Telford and Wrekin	62.0	59.6 - 64.4
Walsall	46.7	45.7 - 47.6
Warwickshire North	57.5	56.1 - 58.8
Wolverhampton	58.5	57.0 - 59.9
Wyre Forest	63.5	60.1 - 66.7

Breastfeeding Initiation < 48 Hrs



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4. REDUCING STILLBIRTHS IN THE WEST MIDLANDS

4.1 Introduction

As we highlighted in previous Key Health Data reports (www.pi.nhs.uk/pnm/khd.htm) the West Midlands has consistently had one of the highest stillbirth rates in the country. Furthermore, confidential enquiries have demonstrated that, after excluding congenital anomalies, the majority are potentially avoidable www.pi.nhs.uk/pnm/clinicaloutcomereviews/index.htm.

The largest factor associated with stillbirths was fetal growth restriction, and improved antenatal recognition could be demonstrated to be associated with significantly reduced rates of stillbirth www.bmj.com/content/346/bmj.f108

4.2 Actions

The West Midlands Perinatal Institute (WMPI) implemented a co-ordinated programme for stillbirth prevention which focussed on improved antenatal recognition of pregnancies at risk due to fetal growth restriction. This included

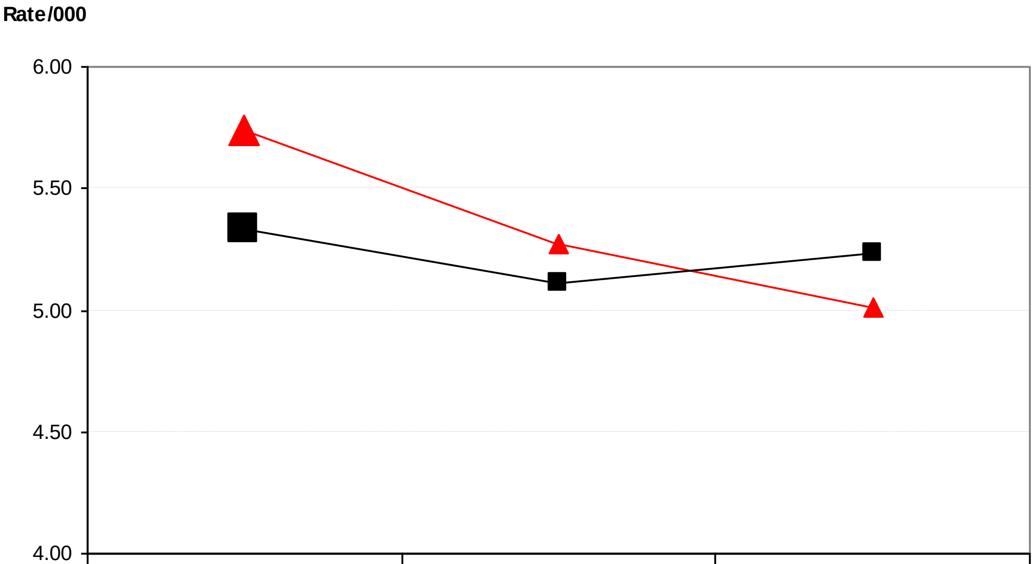
- designation of ‘antenatal detection of fetal growth restriction’ as a Key Performance Indicator (see Chapter 3);
- a rolling programme of implementation, training and support in the use of customised growth charts;
- benchmarking and reporting on performance, which demonstrated significant increases in antenatal detection www.pi.nhs.uk/pnm/maternity_reports.htm;
- implementation of enhanced serial ultrasound scan protocols for high risk pregnancies (www.pi.nhs.uk/cogs/).

4.3 Results

The results of the efforts put in by many clinicians in provider units around the region were encouraging. According to latest (2011) ONS figures, stillbirth rates in the West Midlands have dropped to their lowest ever levels in 50 years (since regional rates were first available in 1963). Furthermore, they fell for the first time below the national average: West Midlands: 5.01 vs. England and Wales: 5.24 /1000 (Figure 4.1).

This trend is illustrated in Figure 4.1 for crude (total) stillbirth rates by comparing 2010 and 2011 figures with the preceding 10 year baseline. While England and Wales rates remained essentially unchanged, there was a statistically significant ($p<0.05$) downward trend in stillbirths in the West Midlands. Compared to the expected yearly number of stillbirths based on the 10 year baseline, this drop represented 53 fewer stillbirths in the West Midlands in one year alone (2011).

Figure 4.1: Crude stillbirth rates, West Midlands and England & Wales 2000-09, 2010 and 2011



	2000-2009	2010	2011
West Midlands	5.74	5.27	5.02
Confidence interval	5.56-5.92	4.77-5.83	4.53-5.55
England & Wales	5.33	5.11	5.24
Confidence interval	5.28-5.39	4.95-5.28	5.07-5.41

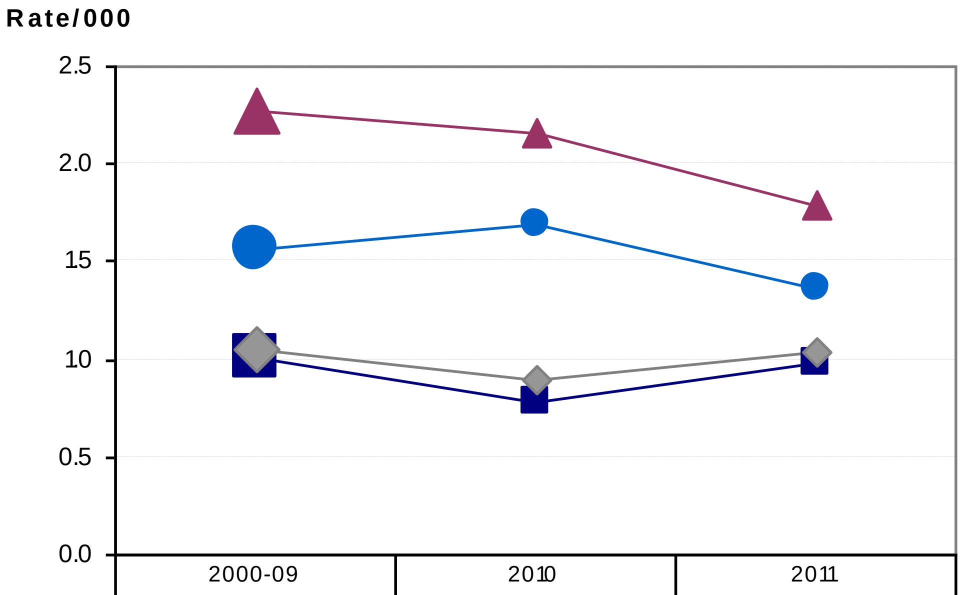
Analysis within the 4 main stillbirth subgroups (congenital anomalies, fetal growth restriction, miscellaneous causes, and unclassified) shows that this downward trend was limited to stillbirths associated with fetal growth restriction, which dropped from a baseline of 2.28 to 1.79/1000 (22% reduction; OR 0.8; CI 0.7-0.9) (Figure 4.2).

These results indicate clear beneficial effects of the regional initiative, which led to increased awareness of the significance of fetal growth restriction, and gradual improvements in its antenatal detection as reported on the quarterly updated PEERview www.pi.nhs.uk/PEERview/2a/Display.aspx

However uptake of prevention measures has not been uniform and improvements were proportionate to efforts put into co-ordinated strategies. As shown in the KPI 3 analysis (Chapter 3), there is wide variation in FGR detection rates, ranging from 42% down to 12% for CCG populations across the West Midlands. This performance was related to the degree to which appropriate protocols and training have been implemented.

While overall rates have been dropping, stillbirth rates still vary widely. This is illustrated in Table 4.1 and Figure 4.3, showing the variation in crude stillbirth rates for West Midlands CCG, with average annual rates ranging from 1.6/1000 to almost fivefold higher: 7.8 /1000.

Figure 4.2: Main categories of stillbirths, West Midlands 2000-09, 2010, 2011



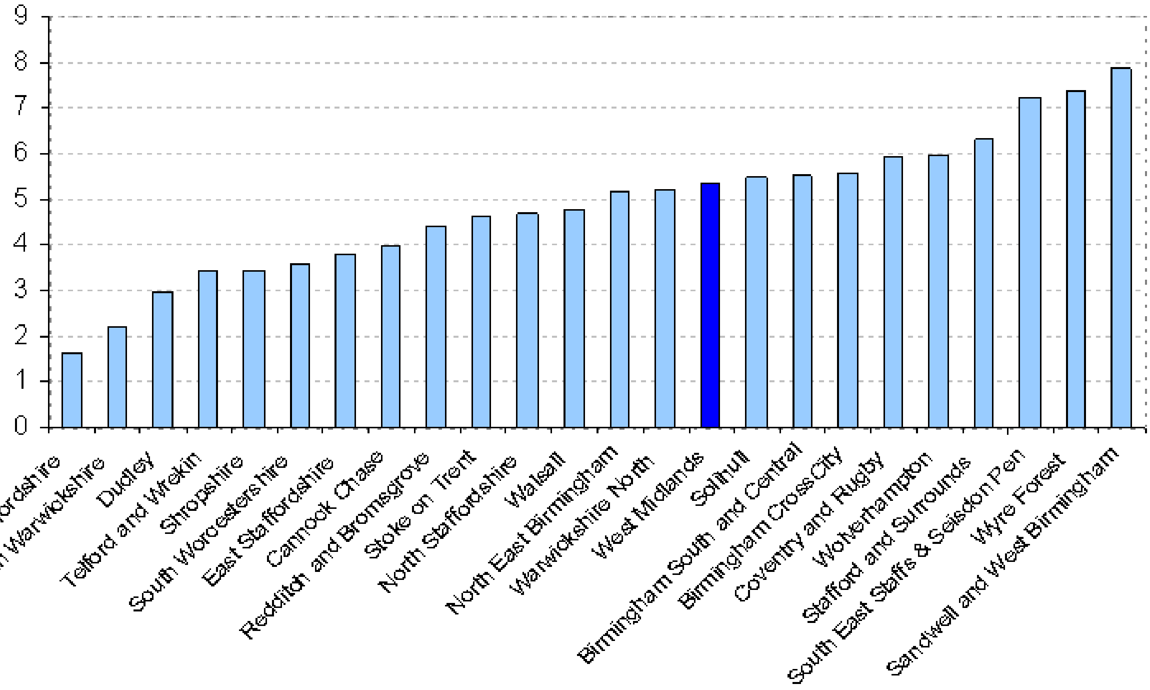
	2000-09	2010	2011
Fetal Growth Restriction	2.28	2.15	179
Miscellaneous	157	170	136
Congenital Anomalies	100	0.79	0.98
Unclassified	104	0.90	104

Table 4.1: Stillbirths (rate per 1,000 births) by CCG, West Midlands 3-year average 2009-11

Clinical Commissioning Group	Rate /000	95% CI
West Midlands	**5.3**	**5.0 - 5.6**
Birmingham CrossCity	5.6	5.4 - 7.2
Birmingham South and Central	5.5	4.7 - 7.9
Cannock Chase	4.0	1.7 - 5.1
Coventry and Rugby	5.9	3.6 - 5.6
Dudley	3.0	3.4 - 5.9
East Staffordshire	3.8	3.8 - 8.2
Herefordshire	1.6	1.3 - 4.0
North East Birmingham	5.2	2.1 - 5.8
North Staffordshire	4.7	2.7 - 6.0
Redditch and Bromsgrove	4.4	3.1 - 6.6
Sandwell and West Birmingham	7.8	6.7 - 9.0
Shropshire	3.5	3.2 - 6.0
Solihull	5.5	3.8 - 7.4
South East Staffs & Seisdon Pen	7.2	4.2 - 7.8
South Warwickshire	2.2	2.3 - 5.2
South Worcestershire	3.6	2.4 - 4.9
Stafford and Surrounds	6.3	2.1 - 5.8
Stoke on Trent	4.6	3.7 - 6.3
Telford and Wrekin	3.4	3.1 - 6.4
Walsall	4.8	4.0 - 6.7
Warwickshire North	5.2	2.6 - 5.6
Wolverhampton	6.0	5.0 - 8.0
Wyre Forest	7.4	2.9 - 7.8

Data Source: ONS

Figure 4.3: Stillbirths (rate per 1,000 births) by CCG, West Midlands 3-year average 2009-11



We hope that, after the discontinuation of WMPI's regional funding from April 2013, the CCGs as new commissioners will ensure that improvements in quality, safety and equity in maternity care remain a priority in the West Midlands, and that providers will have the resources to maintain the momentum which has been generated in stillbirth prevention.

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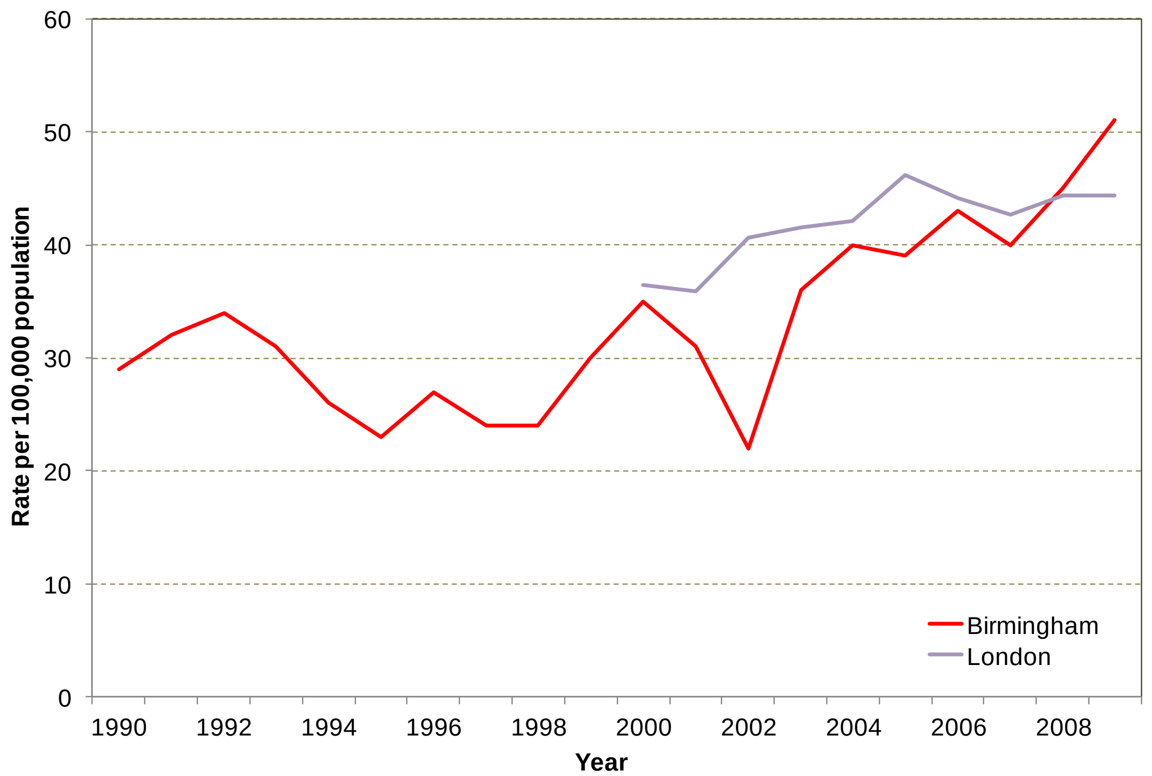
5. EVALUATING NOVEL APPROACHES TO TUBERCULOSIS CASE ASCERTAINMENT AND MANAGEMENT

5.1 Introduction

There has been a steady increase in the number of tuberculosis (TB) cases in the UK since the 1990's. This is in contrast to a decline in TB cases across most of Europe and the United States. In 2011 the incidence of TB in the UK was 14.4 per 100,000 (8963 cases), but incidence varies markedly across the country. The majority of cases occur in London but there are other high incidence areas across the UK, one of which is Birmingham and specifically the area covered by Heart of Birmingham Primary Care Trust (HOBPCT) where the incidence of TB in 2011 was 80 per 100,000.[1] The incidence of TB in Birmingham has been rising since the mid 1990's mirroring the national trend (Figure 5.1).

Figure 5.1: Trends in TB incidence rate, Birmingham and London 1990 - 2009



Source: Health Protection Agency.

Around 70% of TB cases in Birmingham occur in people born overseas. The remainder of cases are acquired in the UK. As it is a statutorily notifiable disease, when a person is diagnosed with TB in Birmingham the case is reported to the Birmingham Chest Clinic. This clinic houses the TB nursing service that covers the whole of Birmingham. Each new case of TB is allocated to a specialist nurse who undertakes contact tracing. The purpose of contact tracing is to identify active cases of TB and treat them before further spread can occur and also to identify latent cases of TB and offer eligible people chemoprophylaxis to prevent them developing and possibly spreading TB in the future.

Contact tracing conventionally this consists of asking the patient who they mix with and how much time they spend with those people. For cases of extra pulmonary TB which is usually considered non-infectious only close family members are identified and screened for active and latent TB. For cases of respiratory TB which is considered infectious close family members are screened and if more than 10% are found to be either active or latently infected wider screening is undertaken to include the index cases work place, school or other place of social aggregation. This method of screening is known as the stone in the pond method where further screening of contacts is based on the number found to be infected in each group screened, screening progresses in concentric circles until the yield is below the predetermined threshold.[2]

It is increasingly being recognized that a conventional approach to contact screening may miss both active and latent TB cases.[3] In an effort to improve the pick-up rate of screening in Birmingham a service evaluation of the current screening programme was undertaken to determine the number of patients screened for each case notified over the past 20 years.

In order to try and improve the number of contacts identified for each new case of TB a service evaluation and improvement programme was undertaken by the Birmingham and Solihull TB service, funded by HOBPCT, to look at the use of social network analysis to investigate clusters of TB patients.[4-13] This report contains preliminary results from the project.

5.2 Methods

All TB case notifications in Birmingham are reported to Birmingham Chest Clinic where they are entered into a database before being submitted nationally. The database contains a comprehensive set of data for all TB cases and their contacts going back to 1980. An evaluation of the number of notifications and the outcome of their contacts was made by analyzing anonymous data from this database.

Samples from all cases of TB in Birmingham and Solihull are sent to the Health Protection Agency (HPA) laboratory based at Heartlands Hospital for culture. Any sample where an isolate is cultured is typed using variable number tandem repeats (VNTR) of 24 loci. This system has been in place since 2010. These 24 loci VNTR codes are used to identify clusters of TB patients who may potentially have transmitted TB to each other, this technique has been used to study the molecular epidemiology of TB in Birmingham previously.[14,15] As TB strains are typed the VNTR codes are loaded into the central TB database and on a monthly basis the HPA laboratory produces lists of clustered patients. These clusters are discussed at a monthly meeting at Birmingham Chest Clinic, where the TB specialist nurses, clinicians and public health team look for links between the patients and decide on possible further investigation or screening that needs to be undertaken. The definition of a cluster and the action undertaken is based on HPA guidance.[16]

Many clusters have obvious links between different cases, e.g. a cluster may contain a mother and her children or husband. But often no obvious links are found between cases. For these cases a TB specialist nurse was tasked to visit and interview patients using a social network questionnaire focusing on risk factors and places of possible social aggregation where cases may have met.

Data from these interviews was used to construct network diagrams to illustrate how cases and contacts are linked. Diagrams are produced using nodeXL.[17] Data were analyzed using Epi Info version 7.1.1.14.[18]

The data analysed in this report were collected as part of routine public health management of TB cases therefore ethical approval was not required. The service evaluation was approved by the research and development department of Heart of England Foundation Trust.

5.3 Results

Between 1 January 1990 and 31 December 2012 a total of 43,968 contacts of TB patients were identified.

There were 22,191 (50.5%) females with a mean age of 25.3 years (Standard deviation (SD) 19.2 years) and 20,759 (49.5%) males with a mean age of 24.1 years (SD 19.1 years).

The mean number of contacts identified per case of respiratory TB fell from 8.7 in 1990-94 to 5.6 in 2005-09.

Outcomes were available for 40,479 (92%) cases. Overall 16,806 (42%) of contacts did not complete screening. This proportion did not vary across the four 5-year time intervals analysed. The proportion of patients given chemoprophylaxis rose from 2.6% (303 out of 11,809) in 1990-94 to 5.3% (577 out of 10,832) in 2005-09.

Amongst contacts of respiratory TB patients who were smear positive, the proportion of contacts receiving chemoprophylaxis rose from 4.3% (180 out of 4,225) in 1990-94 to 9.4% (369 out of 3,922) in 2004-09 (Table 5.1, Table 5.2, Table 5.3).

A univariate analysis of factors associated with completing screening is shown in Table 5.4. Individuals were more likely to complete screening if they were being screened as part of a school TB incident, or if the index case had respiratory TB.

The outcomes of a monthly cluster discussion meeting are summarized in Table 5.5. From the discussions at this meeting clusters were chosen for further investigation by social network analysis. Clusters for further investigation were identified based on several factors, firstly that the links between patients were not known and secondly that the cluster was growing. To date 15 clusters have been investigated. An example of a cluster diagram generated is shown in Figure 5.2. These diagrams were used to illustrate to the TB team how patients may have mixed and possibly passed TB between themselves. Contacts of the patients were also illustrated showing possible unidentified links between patients.

Table 5.1: Outcome of screening of contacts to respiratory TB patients

Time period	Did not complete screening	Well	Given BCG	Given LTBI Treatment	Given full TB treatment	Total
1990-94	4,238 *(47%)*	3,816 *(42%)*	521 *(6%)*	271 *(3%)*	162 *(2%)*	9,008
1995-99	3,050 *(65%)*	1,027 *(22%)*	286 *(6%)*	190 *(4%)*	153 *(3%)*	4,706
2000-04	3,415 *(42%)*	3,934 *(48%)*	338 *(4%)*	359 *(4%)*	155 *(2%)*	8,201
2005-09	3,848 *(46%)*	3,366 *(40%)*	435 *(5%)*	526 *(6%)*	229 *(3%)*	8,404
Total	**14,551**	**12,143**	**1,580**	**1,346**	**699**	**30,319**

Source: Birmingham and Solihull TB database.

Table 5.2: Outcome of screening of contacts to non-respiratory TB patients

Time period	Did not complete screening	Well	Given BCG	Given LTBI Treatment	Given full TB treatment	Total
1990-94	520 *(19%)*	2,136 *(76%)*	93 *(3%)*	32 *(1%)*	20 *(1%)*	2,801
1995-99	406 *(20%)*	1,501 *(74%)*	84 *(4%)*	34 *(2%)*	12 *(1%)*	2,037
2000-04	589 *(24%)*	1,746 *(71%)*	75 *(3%)*	37 *(2%)*	16 *(1%)*	2,463
2005-09	442 *(21%)*	1486 *(71%)*	111 *(5%)*	42 *(2%)*	7 *(0%)*	2,088
Total	**1,957**	**6,869**	**363**	**145**	**55**	**9,389**

Source: Birmingham and Solihull TB database.

Table 5.3: Outcome of screening of contacts to smear positive respiratory TB patients

Time period	Did not complete screening	Well	Given BCG	Given LTBI Treatment	Given full TB treatment	Total
1990-94	2,050 *(49%)*	1,605 *(38%)*	277 *(7%)*	180 *(4%)*	113 *(3%)*	4,225
1995-99	1,584 *(62.5%)*	526 *(21%)*	179 *(7%)*	135 *(5%)*	109 *(4%)*	2,533
2000-04	1,867 *(41%)*	2,113 *(46%)*	192 *(4%)*	267 *(6%)*	117 *(3%)*	4,556
2005-09	1,560 *(40%)*	1,626 *(42%)*	188 *(5%)*	369 *(9%)*	179 *(5%)*	3,922
Total	**7,061**	**5,870**	**836**	**951**	**518**	**15,236**

Source: Birmingham and Solihull TB database.

Table 5.4: Predictors of completing screening

Risk Factor	Group	Odds ratio	95% confidence interval	p-value
Age	0-15	2.87		<0.001
	16 -64	-		-
	65 +	1.38	(1.19 - 1.60)	<0.001
Male sex		0.84	(0.79 - 0.89)	<0.001
Ethnicity	White	-		
	Black	0.56	(0.50 - 0.64)	<0.001
	ISC	0.67	(0.61 - 0.74)	<0.001
	Other	0.95	(0.80 - 1.14)	0.61
Relation to index case	1st degree relative	-		
	Partner	1.4	(1.25 - 1.47)	<0.001
	Other relative	0.70	(0.65 - 0.76)	<0.001
	In-law	0.90	(0.81 - 0.99)	0.038
	Friend	0.82	(0.70 - 0.96)	0.014
	School	4.75	(3.62 - 6.24)	<0.001
	Other	1.52	(1.31 - 1.76)	
Index has smear positive respiratory TB		1.03	(0.96 - 1.11)	0.39
Index has respiratory TB		0.28	(0.26 - 0.30)	<0.001

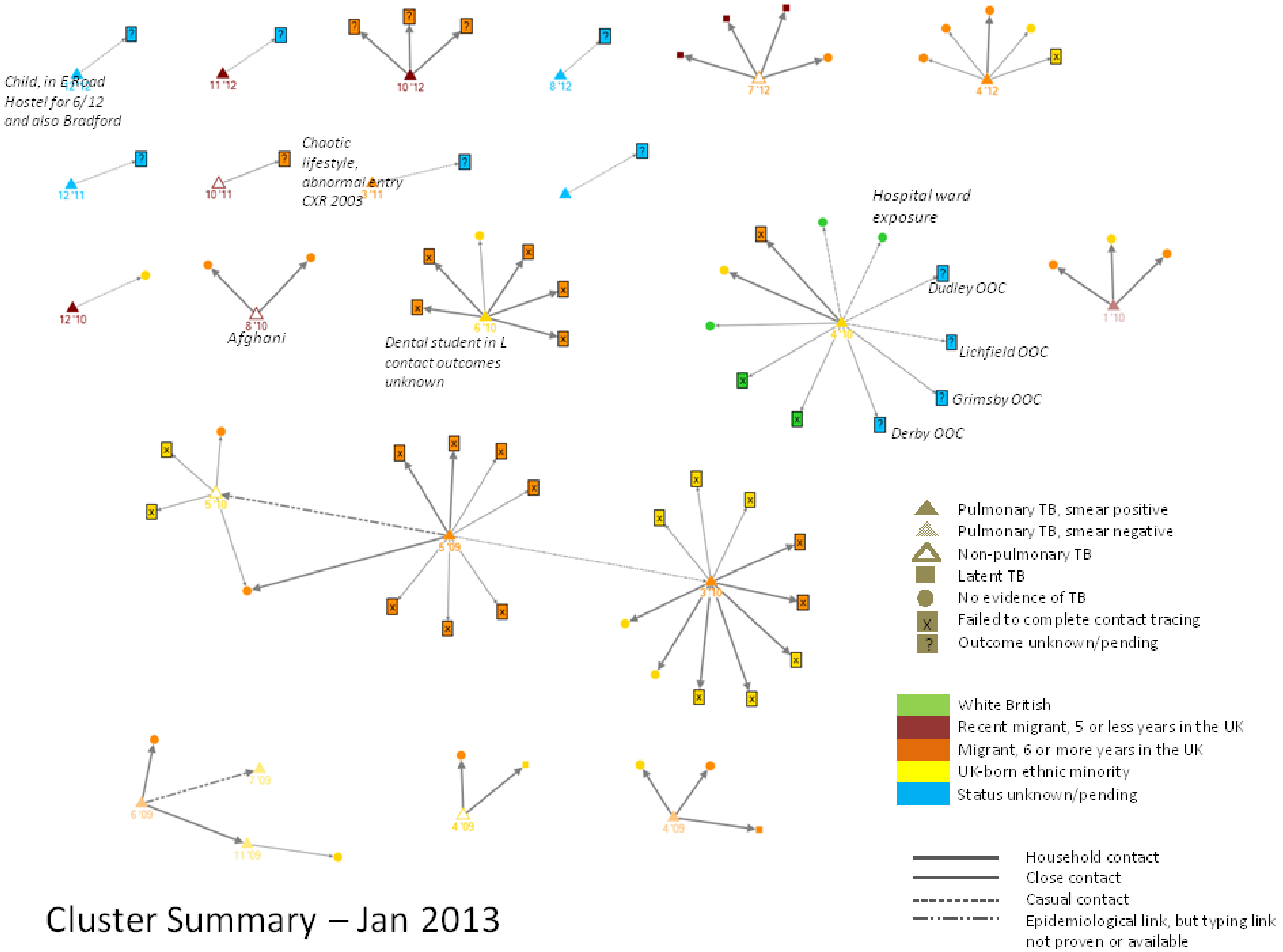
Source: Birmingham and Solihull TB database.

Table 5.5: Summary of monthly TB cluster meetings, 2012

Total number of clusters discussed	121
Number of further investigations started	48
Number new links between clustered patients (previously unsuspected links)	5
Number of extra people identified for screening	80 (to date)
Number of extra TB cases identified	2

Source: Birmingham and Solihull TB database.

Figure 5.2: An example of a cluster diagram.



5.4 Conclusions

Analysis of the contact database of the Birmingham and Solihull TB service revealed that 42% of people identified as contacts of TB patients did not complete screening. This is worrying. If we are to control TB in Birmingham it is important that all identified contacts of TB patients are assessed for both active and latent disease and treated appropriately to prevent spread of TB and morbidity from future cases. In light of our findings the TB nursing team are taking a more proactive approach in following up people who do not attend screening including increased home visits, writing to the person and contacting their general practitioner (GP). Patients who start screening but do not complete it or do not complete latent TB treatment are being visited at home and being written to by their treating clinician as well as their GP being informed. The impact of this change will be assessed after one year.

The results of the cluster investigations reported above are preliminary. The service evaluation of social network analysis is due to continue until November 2013. But the results of the first years' meetings and investigations have been useful. For example using a social network questionnaire a cluster of Eritrean patients was found to attend a single place of worship. An information session delivered at this site led to the opportunistic screening of 80 people with possible TB exposure. This was a good demonstration that a place can be key to determining the route of TB transmission.[19] Despite these promising early results much still needs to be done. Birmingham has many diverse communities and questions used for one group may well be inappropriate for another. It will be important to develop culturally sensitive social network tools.

Currently we are using 24 loci VNTR typing to link TB cases, more specific techniques are becoming available and have been evaluated using whole genome sequencing. This technique may allow much more focused contact investigation and reduce time spent trying to link cases erroneously identified as clustered.[20,21] Geographical information systems may also provide an extra layer of data to aid identifying contacts (see Chapter 2, Section 2.2, Figure 2.6).

An enhanced contact tracing service may contribute to reducing the incidence of TB in Birmingham. It will be vital to provide robust data on its effectiveness to aid commissioners decide on what type of service to fund.

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6. ASSESSING AND EXPLORING MENTAL WELL-BEING IN STAFFORDSHIRE AND STOKE-ON-TRENT

Selected findings from research carried out using the Warwick and Edinburgh Mental Well-being Scale in parts of Staffordshire and Stoke-on-Trent and the relationship between well-being and lifestyle, social capital and the five ways to well-being.

6.1 Introduction and background

This chapter presents the findings from research conducted by Information by Design to assess and explore mental well-being on behalf of NHS Stoke-on-Trent and South Staffordshire Primary Care Trust (PCT). The research was conducted in Stoke-on-Trent between December 2009 and March 2010 and in the southern part of Staffordshire between June 2010 and October 2010.

Measuring mental well-being

The importance of mental health, emotional well-being and quality of life is increasingly raised in reference to its impact on health, education, culture, employment, crime, regeneration and social inclusion. Therefore, there is increasing interest in the concept of positive mental health and the term is often used interchangeably with the term mental well-being. It is a complex concept and positive mental health is recognized as having major consequences for health and social outcomes. The demand for instruments suitable for use with both individuals and populations has led to a considerable amount of research on measures of mental well-being. The two primary approaches are those developed by Warwick and Edinburgh University (with NHS Health Scotland) and the work of Paul Dolan from Imperial College. This later work has been termed 'happiness' measurement and has linked mental well-being factors to economic costs.[1] For this research it was decided to use the Warwick and Edinburgh Mental Well-being Scale (WEMWBS) to measure positive mental well-being.

The Warwick and Edinburgh Mental Well-being Scale

WEMWBS is a simple to use 14 point or 7 point sale for measuring well-being.[2] It has been psychometrically tested showing good content validity and high test-retest reliability scores (0.83 at one week). It is an ordinal scale comprising 14 positively phrased Likert style items. Development was undertaken by an expert panel drawing on the current academic literature, qualitative research with focus groups, and psychometric testing of an existing scale (the Affectometer 2). The new scale was validated on student and representative population samples in the UK using qualitative as well as quantitative methods and performed well against classic criteria for scale development. Its distribution was near normal and did not show ceiling effects in population samples. It discriminated between population groups in a way this is largely consistent with the results of other population surveys.

Survey aims and objectives

The overall aim of both research projects was to establish the baseline prevalence of mental well-being in parts of NHS Stoke-on-Trent and parts of Staffordshire covered by South Staffordshire PCT (referred to as South Staffordshire in the tables and charts) and to gain some insights into resilience and social capital to help target messages promoting positive mental health and reducing risk factors. There were therefore commonalities in the specific objectives of the research, particularly in exploring the factors that influence mental well-being and how the New Economics Foundation 'five ways to well-being'[3] might be used to promote well-being. In South Staffordshire PCT area the survey also set out to examine differences across age groups and different deprivation quintiles (Table 6.1).

Table 6.1: Research objectives

NHS Stoke-on-Trent	South Staffordshire PCT
To explore: • the particular factors influencing mental well-being in the communities of interest and how these might be addressed to promote good mental health • the extent to which community members take action to maintain and manage their own mental well-being, using the 'five ways to well-being' (New Economics Foundation) as a framework	To examine: • differences in well-being across the PCT including differences in urban and rural areas, across deprivation quintiles and age groups, for example, young adults, working age population and older people • differences in predictors of well-being including resilience, social capital, protective factors and risk factors across the different population groups • to obtain insight into how to promote the 'five ways to well-being' across the PCT in the categories above

6.2 Methodology

The methodology was a mixed method approach using both quantitative (face-to-face household survey) and qualitative research (focus groups). The initial work was conducted in Stoke-on-Trent and was replicated with some modifications in Staffordshire. The methodology and the questionnaire used in both surveys was the same to enable comparisons.

The basis of the survey was the Warwick and Edinburgh Mental Well-being 14 item scale (WEMWBS) that addresses subjective well-being, psychological functioning and positive mental health (as opposed to mental illness). This was used in the face-to-face survey of residents and discussed in the focus groups.

The questionnaire also included a number of demographic and potential explanatory variables including:

- Age, gender, ethnic group and postcode/ward/place of residence
- Employment status, income, home ownership and education
- Actions taken to manage their own mental well-being
- General health status, and long term limiting illness
- Social and family networks
- Lifestyle factors

The content of the questionnaire was agreed by the NHS Stoke-on-Trent project steering group and was piloted with 50 respondents and then re-piloted following changes made as a result of the pilot.

Lay researchers were appointed and trained both to undertake interviewing and to provide support to the focus groups. This was intended to support well-being in a proactive and positive way, by providing training and job opportunities to local people. Details of the differences in methodology are given in Table 6.2.

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Table 6.2: Details of methods used in both surveys

NHS Stoke-on-Trent	South Staffordshire PCT
• 5 focus groups • 860 respondents to face-to-face survey • The area chosen was to the north of the City in the electoral wards of Tunstall, Burslem North, Chell and Packmoor and Norton and Bradeley • Final stage included a reflector group with the public and an evaluation session with the lay researchers and NHS Stoke-on-Trent staff	• 6 focus groups • 600 respondents, selected at random from the electoral role with quota controls set on age and gender and selected based on an analysis of Lower Super Output Areas (LSOAs) by rural/urban split and deprivation quintile • A face-to-face booster survey with 100 respondents: 50 from Polish and 50 Pakistani backgrounds in inner city Burton-on-Trent

The user guide for WEMWBS gives an indication of the way in which the analysis should be presented, in particular using mean or median scores.[4] Mean scores were reported on in both surveys.

Further detail is given in the main project reports.[5,6]

This chapter reports on key findings from the quantitative element of the survey and does not include the Polish and Pakistani booster sample in Staffordshire.

Five ways to well-being

In 2008, the New Economics Foundation was commissioned by the Government's Foresight Project on Mental Capital and Well-being to review inter-disciplinary work with the aim of identifying a set of evidence-based actions to improve well- being, which individuals could be encouraged to build into their daily lives. They identified 'five ways to well-being' (5WWB) as follows:

- Connect with the people around you
- Be active
- Take notice (of the world around you)
- Keep learning
- Give

For this project the 5WWB were utilized in the following ways:

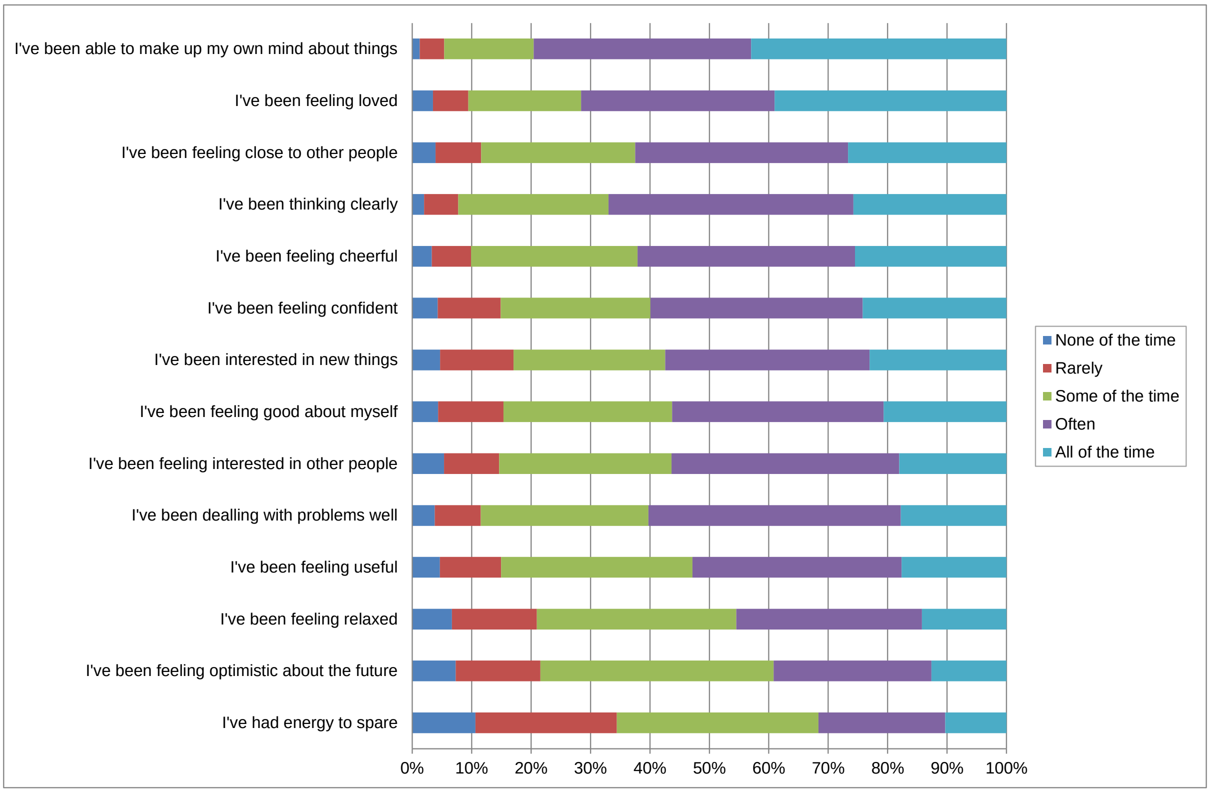
- Staff who worked on the project were given information on the 5WWB
- Leaflets featuring the 5WWB were given to the respondents on completion of the interviews
- The focus groups looked at the way in which people could use the 5WWB to support them to achieve mental well-being (see respective reports for further details of the focus group findings)
- The questionnaire included two questions on 5WWB – one on the way in which respondents were achieving the 5WWB and another to provide some direction to policy makers on the ways in which 5WWB could be supported in the community.

6.3 Results

WEMWBS item rankings

The rankings of the 14 different items on the WEMWBS scale for Stoke-on-Trent and South Staffordshire PCT are shown in Figure 6.1 and Figure 6.2 (these have been ranked by 'all of the time'). For the statement, 'I've been able to make up my own mind about things', 43.0% of respondents in Stoke-on-Trent were able to do this 'all of the time', compared with 45.0% in Staffordshire. However, 20.4% of respondents in Stoke-on-Trent and 16.8% of respondents in Staffordshire reported being able to make up their own mind about things 'some of the time', 'rarely' or 'none of the time'.

Figure 6.1: WEMWBS 14 items ranking for NHS Stoke-on-Trent in 2010

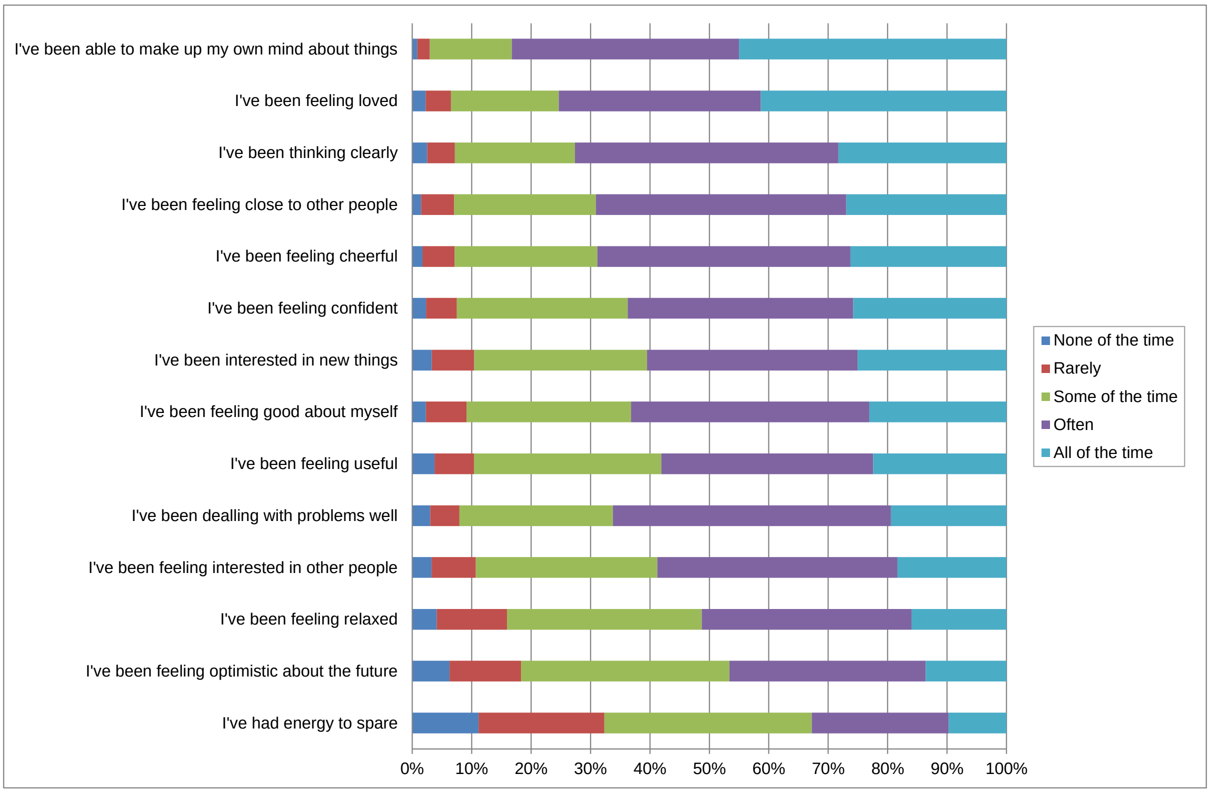


Source: Information by Design 2010

Looking at the lower ranking items, only 31.6% of respondents in Stoke-on-Trent said they had 'energy to spare' either 'often or all of the time', whilst, in contrast, 34.4% reported having energy to spare 'none of the time or rarely'. In Staffordshire, the respective figures for energy to spare were 32.8% (for 'often or all of the time') and 32.4% (for 'none of the time or rarely').

Combining the response categories of 'none of the time/rarely', and 'often/all of the time', revealed two pictures: first, across all 14 WEMWBS items, respondents in Stoke-on-Trent were more likely to report 'none of the time/rarely'; second, in contrast, across all 14 items, respondents in Staffordshire were more likely to report 'often/all of the time'.

Figure 6.2: WEMWBS 14 items ranking for South Staffordshire PCT in 2010



Source: Information by Design 2010

Distribution of WEMWBS scores

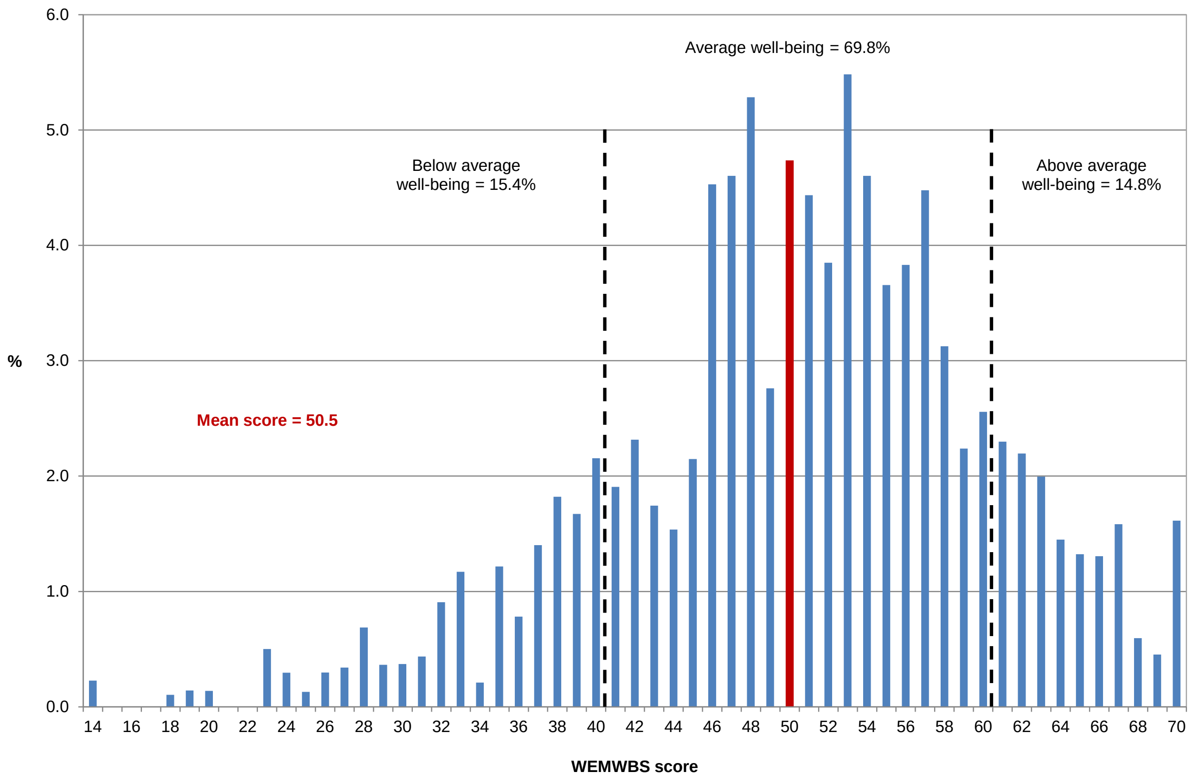
The distribution of the WEMWBS scores for Stoke-on-Trent and Staffordshire are shown in Figure 6.3 and Figure 6.4. In Stoke-on-Trent, the mean WEMWBS score was 50.5 (with a standard deviation of 9.8, and a range of 14 to 70, number = 811). The mean WEMWBS score in Staffordshire was higher, 52.1 (with a standard deviation of 9.3, the same range, number = 613). To benchmark the local results, data collected by Warwick and Edinburgh Universities (in the development of the WEMWBS scale) reported a mean score of 50.7 (with a standard deviation of 8.8, number = 1,749).

Figure 6.3 and Figure 6.4 show that the largest proportion of respondents in both Stoke-on-Trent (69.8%) and Staffordshire (69.7%) fell within the 'average' well-being range (that is, within one standard deviation of the mean). In both areas, between 15% and 16% of respondents were recorded as having 'below average' mental well-being as measured by WEMWBS.

Differences by community safety

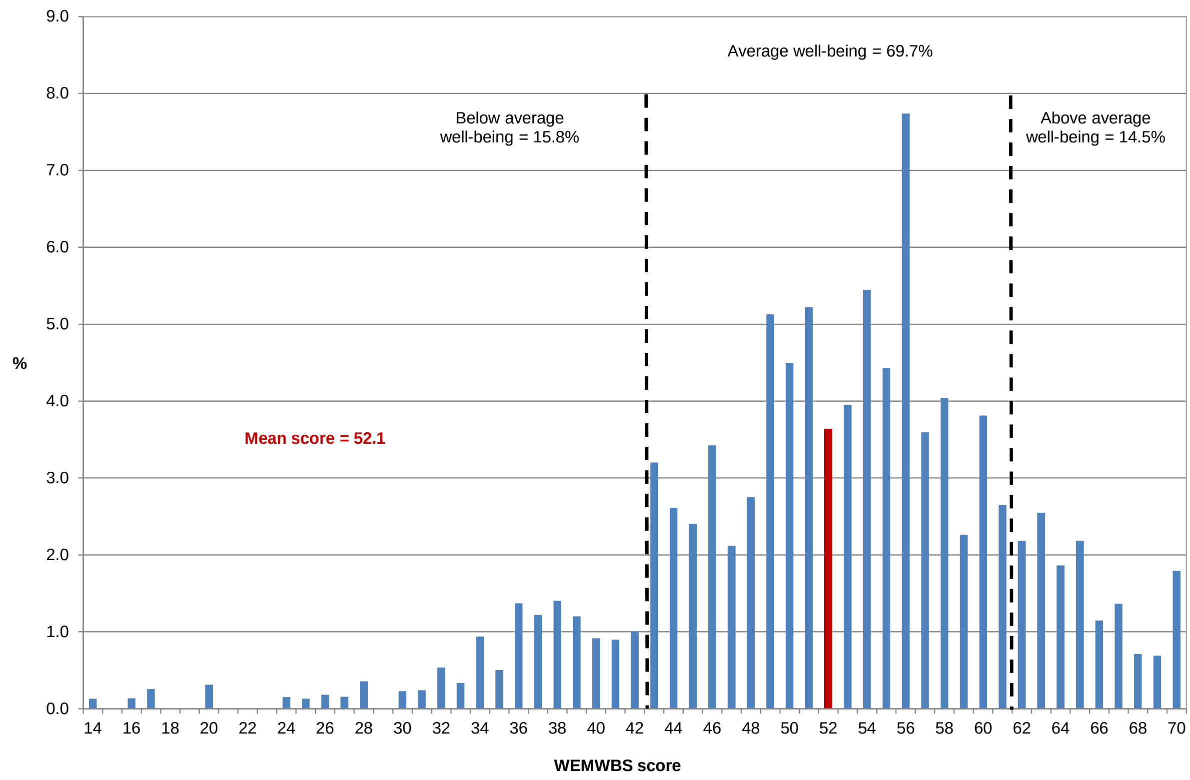
Three areas of community safety were explored across Stoke-on-Trent and Staffordshire: 'being alone at home at night'; 'being alone in an area during daytime'; 'walking alone in an area after dark'. In general, respondents who felt 'very safe' had significantly higher mean WEMWBS scores compared with those who 'never go out'. The main findings for the three community safety indicators are summarised in Table 6.3 and illustrated in Figure 6.5 (for walking alone in an area after dark).

Figure 6.3: Distribution of WEMWBS scores for NHS Stoke-on-Trent in 2010



Source: Information by Design 2010

Figure 6.4: Distribution of WEMWBS scores for South Staffordshire PCT in 2010



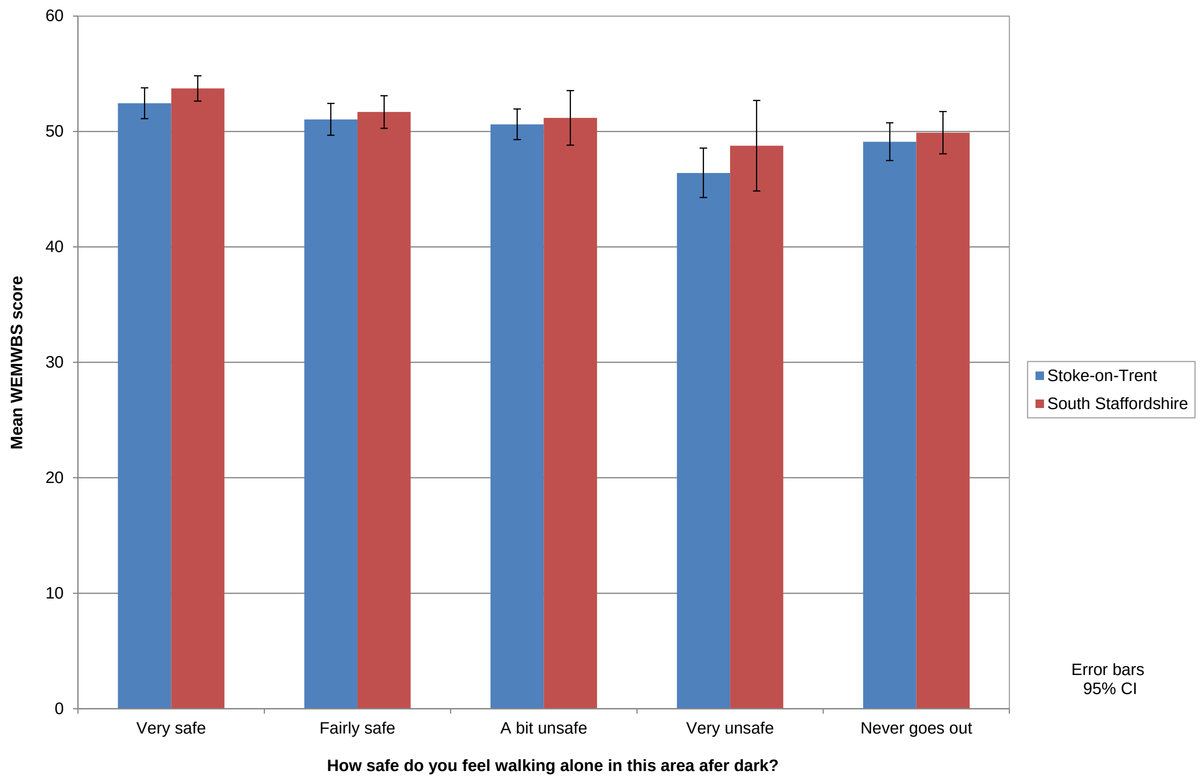
Source: Information by Design 2010

Table 6.3: Feelings of community safety and WEMWBS for NHS Stoke-on-Trent and South Staffordshire PCT in 2010

Indicator	Summary
Alone at home at night	**Significant difference** – residents who felt 'very or fairly safe' had a higher mean WEMWBS score ('very safe' for South Staffordshire)
Alone in area during daytime	**Significant difference** – residents who felt 'very or fairly safe' had a higher score ('very safe' for South Staffordshire)
Walking alone in area after dark	**Significant difference** – residents who felt 'very or fairly safe' had a higher score (both areas)

Source: Information by Design 2010

Figure 6.5: Walking alone in an area after dark and feelings of safety by mean WEMWBS score for NHS Stoke-on-Trent and South Staffordshire PCT in 2010



Source: Information by Design 2010 and NHS Stoke-on-Trent 2012

Differences by social capital and social networks

Three measures of social capital and six measures of social networks were examined in the two areas of Stoke-on-Trent and Staffordshire. Across the three measures of social capital – 'trust', 'neighbours looking out for each other', and 'satisfaction with the neighbourhood as a place to live' – there were significantly higher mean WEMWBS scores among those with greater levels of trust, where neighbours looked out for each other, and where there were greater satisfaction levels with the neighbourhood as a place to live (Table 6.4). There were more likely to be significant differences among respondents in Stoke-on-Trent compared with Staffordshire.

Across the six social network measures, people who 'spoke to friends' more regularly had significantly higher mean WEMWBS scores compared with those who did not, whilst respondents in Stoke-on-Trent who spoke to 'neighbours' more regularly reported significantly higher scores (Table 6.4). No (significant) differences emerged within both areas in regards to 'sending texts to friends/family' and visiting 'chat rooms/social networking sites'.

Table 6.4: Social capital, social networks and WEMWBS for NHS Stoke-on-Trent and South Staffordshire PCT in 2010

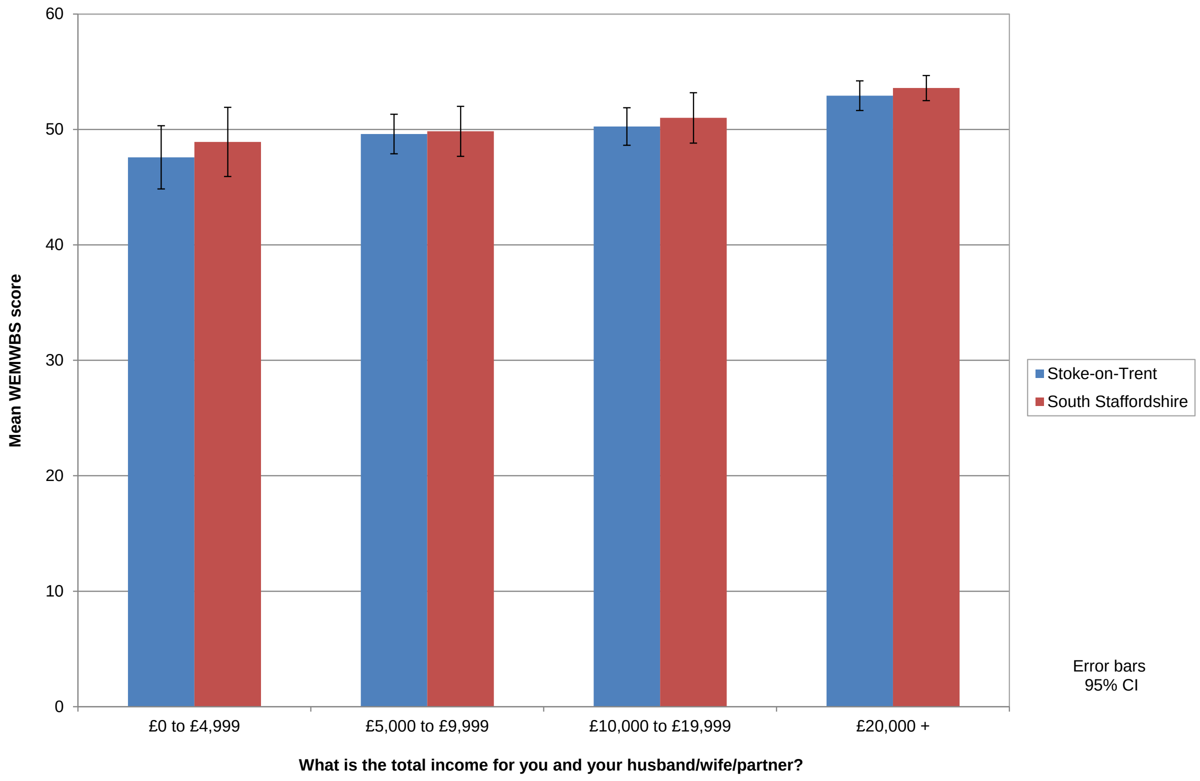
Indicator	Summary
Social capital	
Trust	**Significant difference** – residents who reported they trusted 'most or many' of the people in their neighbourhood had a higher mean WEMWBS score (no difference in South Staffordshire)
Neighbours look out for each other	**Significant difference** – residents who felt the neighbourhood was one where people 'look out for each other' had a higher score (no difference in South Staffordshire)
Satisfaction with neighbourhood as place to live	**Significant difference** – residents with 'high levels of satisfaction' with their neighbourhood had a higher score (both areas)
Social networks	
Speak to family members	**No significant difference** – residents who spoke to family regularly had similar levels of mental well-being as those who did not (both areas)
Speak to friends	**Significant difference** – residents who spoke to friends 'more regularly' had a higher score (both areas)
Speak to neighbours	**Significant difference** – residents who spoke to neighbours 'more regularly' had a higher score (no difference in South Staffordshire)
Text friends/family	**No significant difference** – residents who sent texts more regularly to friends/family had similar levels of mental well-being as those who did not (both areas)
Email friends/family	**Significant difference** – residents who emailed family/friends 'everyday' had a higher score (no difference in Stoke-on-Trent)
Go on chat rooms/social networking sites	**No significant difference** – residents who used social networking sites regularly had similar levels of mental well-being as those who did not (both areas)

Source: Information by Design 2010

Income levels and well-being

Respondents with a total income of £20,000 and over in both Stoke-on-Trent and Staffordshire reported significantly higher mean WEMWBS scores compared with those whose total income was below £10,000 (Figure 6.6). Across both areas, as income increased, so did levels of mental well-being.

Figure 6.6: Income levels by mean WEMWBS score for NHS Stoke-on-Trent and South Staffordshire PCT in 2010



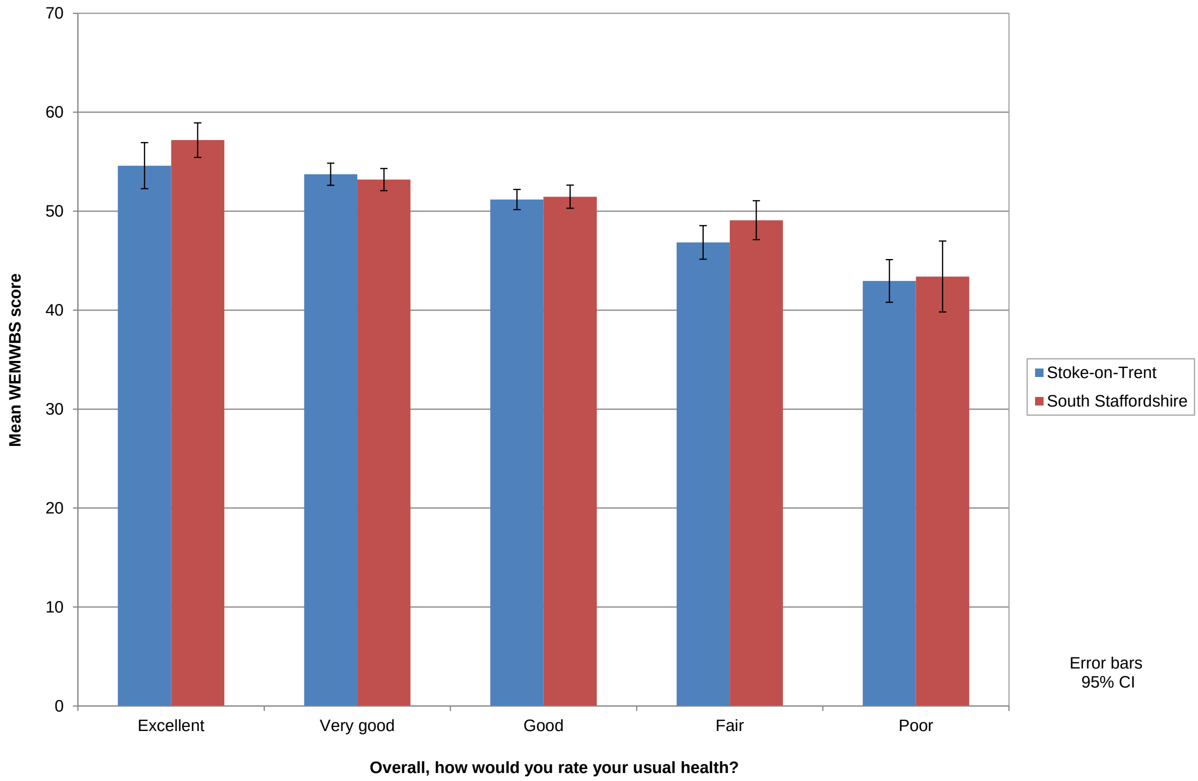
Source: Information by Design 2010 and NHS Stoke-on-Trent 2012

General health status and well-being

There was a clear correlation between mental well-being and perceived health status. Respondents in both areas who reported better levels of general health status had significantly higher mental well-being scores (Figure 6.7). For instance, in Stoke-on-Trent, the mean WEMWBS score among respondents who reported 'excellent' health was 54.6 compared with a score of 43.0 among those whose health was perceived to be 'poor'. In Staffordshire, the respective figures were 57.2 and 43.4.

In addition, respondents who reported having a 'limiting longstanding illness, health problem or disability' had a lower mean WEMWBS score compared with those who reported none of these (in Stoke-on-Trent: 47.2 versus 51.9; in Staffordshire: 48.6 versus 53.5).

Figure 6.7: General health status by mean WEMWBS score for NHS Stoke-on-Trent and South Staffordshire PCT in 2010



Source: Information by Design 2010 and NHS Stoke-on-Trent 2012

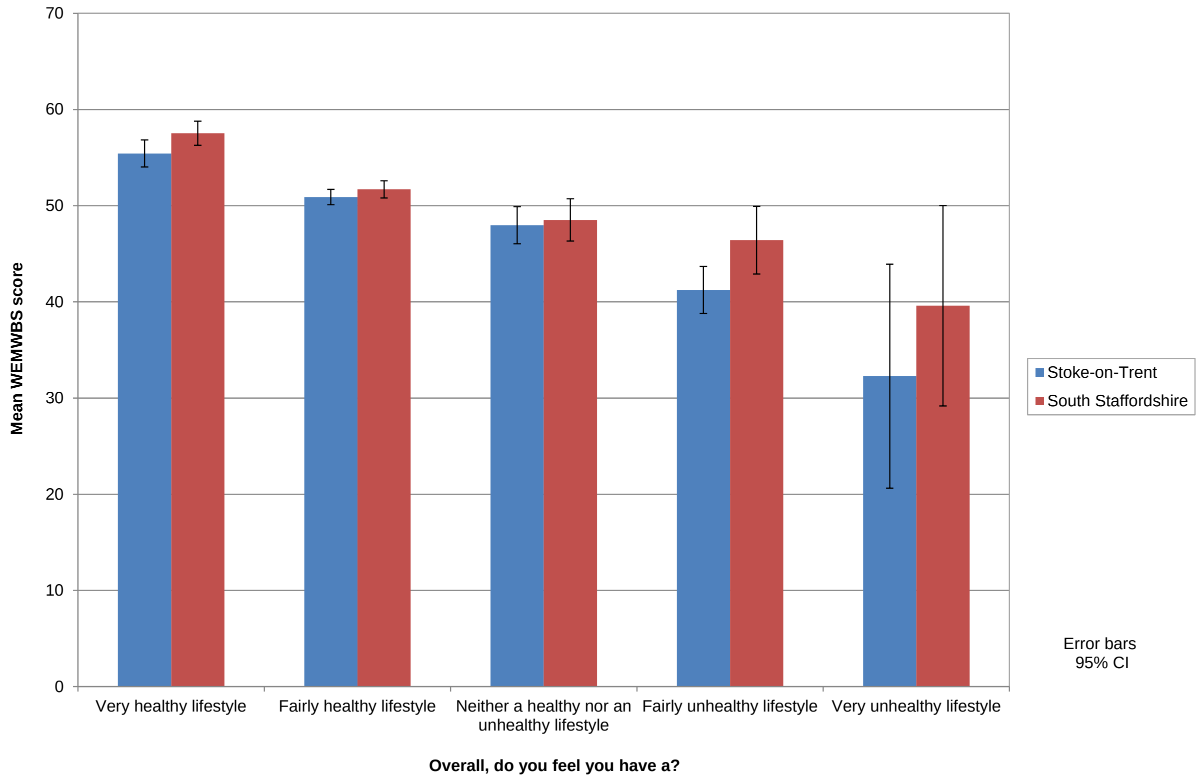
Lifestyles and well-being

As with general health status, there was a clear correlation between mental well-being and perceived quality of lifestyle (Figure 6.8). There was a significant difference between respondents in both areas between those reporting ‘very healthy lifestyles’ compared with those reporting ‘less healthy lifestyles’. The mean WEMWBS score for those reporting a very healthy lifestyle in Stoke-on-Trent was 55.4 and 57.5 in Staffordshire. This compared with mean scores of 32.3 and 39.6 for the two areas among respondents who reporting very unhealthy lifestyles.

There were also some differences among two other key lifestyle measures – smoking and alcohol consumption. Respondents who currently smoked had lower mean WEMWBS scores than those who had never smoked (in Stoke-on-Trent: 48.5 versus 52.6; in Staffordshire: 50.5 versus 52.7). Smokers who had stopped also had higher WEMWBS scores compared with current smokers.

Although there was a less clear pattern in the mean WEMWBS scores for alcohol consumption, the differences (not significant) suggested that those who drank alcohol every day, and those who never drank alcohol, had slightly lower mean scores.

Figure 6.8: Quality of lifestyle by mean WEMWBS score for NHS Stoke-on-Trent and South Staffordshire PCT in 2010



Source: Information by Design 2010 and NHS Stoke-on-Trent 2012

WEMWBS and the five ways to well-being

Five ways to well-being is a set of evidence based actions designed to help people improve their mental well-being. A simple regression model was used to examine the relationship between WEMWBS and the variables used to measure the five ways to well-being. For both Stoke-on-Trent and Staffordshire, the results suggested that three variables had a significant impact on mental well-being: ‘Connect’, ‘Take Notice’, and ‘Keep Learning’ (Table 6.5). In Staffordshire, ‘Be Active’ was identified as an additional driver for the community.

WEMWBS and the New Economics Foundation

The New Economics Foundation (NEF) is an independent ‘think and do’ tank which looks at innovative ways of improving mental well-being. As with the five ways to well-being, a simple regression model was used to examine the relationship between WEMWBS and the nine NEF measures of mental well-being (Table 6.6). For both Stoke-on-Trent and Staffordshire, a number of variables had a significant impact on mental well-being, including: ‘a good balance between work/rest of life’, connecting with ‘your local community’, enough ‘green space’, and ‘too much information out there’. Within Stoke-on-Trent, ‘sufficiently flexible working hours’ was an additional key driver for mental well-being, whilst in Staffordshire, ‘spaces without advertising’ and ‘encouraged to learn new things’ were extra mental well-being drivers.

Table 6.5: Relationship between Five Ways to Well-being and WEMWBS for NHS Stoke-on-Trent and South Staffordshire PCT in 2010

Indicator	Stoke-on-Trent		South Staffordshire	
	Coefficient	Sig	Coefficient	Sig
I have lots to do with family, friends, colleagues or neighbours (**Connect**)	-2.380	0.000	-1.114	0.016
I do a lot of activities like walking, cycling, gardening or dancing (**Be Active**)	-0.430	0.137	-1.303	0.000
I take a lot of notice of the things around me, such as the scenery (**Take Notice**)	-1.090	0.003	-1.395	0.002
I keep learning by trying a lot of new things (**Keep Learning**)	-1.658	0.000	-1.700	0.000
I give a lot to others such as friends or strangers, such as volunteering (**Give**)	-0.148	0.613	-0.009	0.825

Source: Information by Design 2010

Table 6.6: Relationship between NEF drivers and WEMWBS for NHS Stoke-on-Trent and South Staffordshire PCT in 2010

Indicator	Stoke-on-Trent		South Staffordshire	
	Coefficient	Sig	Coefficient	Sig
…that you have/had a good balance between the work that you do, and the rest of your life	-0.994	0.015	-2.197	0.000
…that you have/had sufficiently flexible working hours	-0.859	0.016	0.016	0.731
…that you spend/spent too much time commuting to work	0.215	0.475	0.016	0.911
…are connected with your local community	-1.150	0.001	-0.912	0.003
…there is enough green space in this area you live for exercise and play	-0.688	0.033	-1.005	0.005
…that there is too much information out there nowadays	0.851	0.008	0.783	0.016
…that you would like to see some spaces that have no advertising around your community	0.543	0.129	-0.930	0.001
…that you are encouraged to learn new things	-0.274	0.479	-1.077	0.003
…that you are encouraged to participate in social and political life in your community	-0.479	0.228	-0.038	0.619

Source: Information by Design 2010

6.4 Discussion

The two almost identical surveys, in two very different socioeconomic and geographical areas have provided the opportunity to:

- add to the knowledge of the use of WEMWBS amongst two different populations, one deprived one more affluent
- provide information to test the consistency of any relationship between well-being and a variety of other factors (for example, lifestyle, social networks)
- provide information to test the usefulness of WEMWBS to inform the public health agenda around well-being

Similarities and differences between WEMWBS rankings in Staffordshire and Stoke-on-Trent

Despite the differences in socioeconomic makeup of the two areas, the overall rankings of the 14 items were very similar. For 11 items the order was the same in both areas when ranked by ‘all of the time’, both at the top and bottom of the rankings. For only three items in the middle of the rankings the order was not the same. Respondents in both areas felt most positive about making up their own minds on things, feeling loved (over 70% said always or often in both areas). Other items where over 60% said always or often in both areas were ‘feeling close to other people’, thinking clearly’, ‘feeling cheerful’ and ‘feeling confident’.

Respondents felt least positive in both areas about ‘having energy to spare (just over 30% said always or often in both areas) ‘feeling optimistic about the future’ and ‘feeling relaxed’ – although higher proportions were reported in South Staffordshire.

However, in general, the more affluent South Staffordshire PCT area had a more positive response to the 14 WEMWBS questions, with a higher proportion saying that they were able to undertake the activity ‘all of the time’ and fewer saying ‘rarely’ or ‘none of the time’. This was therefore reflected in the overall WEMWBS score of 52.1 in South Staffordshire PCT compared to 50.5 in Stoke-on-Trent. The South Staffordshire PCT overall score was higher than the benchmarking results collected by Warwick and Edinburgh Universities which reported a mean sore of 50.7. Both areas displayed the full range of possible scores from 14 to 70.

Relationship between well-being and other factors

Attributing cause and effect is not possible with descriptive cross sectional surveys of this type. For example, there was a very strong relationship between mental well-being and perceived health status, but it is not possible to ascertain whether good mental health produces positive lifestyles and good health status or vice versa. However some interesting associations are demonstrated, showing in both areas that positive well-being is associated with feeling safe, positive measures of social capital and social networks, higher income, good quality of lifestyles and high self perceived general health status. These relationships are of a dose-response type –- showing increasing or decreasing WEMWBS scores according to the variable scale for the factor being reported. In particular, feelings of community safety, higher income levels, good general health status, and good quality of lifestyle were associated with higher WEMWBS scores. However, the relationship for alcohol consumption was more complex, with moderate alcohol consumption being associated with higher well-being scores.

Social capital and social networks

The results for social capital and social networks showed some interesting differences across the areas – satisfaction with neighbourhood, and speaking to friends regularly were significantly related positively to mental well-being in both areas. However, other measures of social capital/networks were significant for Stoke-on-Trent residents (neighbours looking out for each other, trust, speaking to neighbours) which may reflect the more concentrated sample area in Stoke-on-Trent or be a reflection of the locally well known traditional tight knit communities of the Potteries.

Using the WEMWBS to inform the public health agenda

Although the associations demonstrated should be treated with caution, the results from both surveys suggest the potential for improving mental well-being, particularly in areas that are of relevance to working within a local authority setting. For example:

- The relationship between positive well-being and community safety suggests that interventions that promote being able to feel safe in the home (for example, fitting of safety locks or alarms), or walking alone after dark (for example, better street lighting, design of street settings) could be beneficial.
- Social interaction was positively associated with well-being, therefore interventions to promote this could be encouraged. For example, enhancing broadband connectivity (especially in Staffordshire), ensuring that planning applications include areas of communal space, or supporting social interactions in other ways, including volunteering.
- The association between income and mental well-being was very strong, therefore policies that promote employment are indicated, which also impacts on social interactions and social networks.

The surveys also indicated that WEMWBS could be a useful tool for measuring improvements in well-being following lifestyle interventions. The results do show that WEMWBS can produce large statistically significant results with a reasonable sample size and therefore could be useful for use in monitoring mental well-being before and after a lifestyle intervention (either in total populations or samples). For example, Table 6.7 shows the difference in WEMWBS scores for different health status in the two areas –in Stoke-on-Trent the difference in WEMWBS scores for people in excellent health compared to poor health was nearly 12 WEMWBS points and 13.5 in Staffordshire. A smaller but possibly important difference of about 5 WEMWBS points was seen for the presence or absence of a disability.

Table 6.7: Examples of differences in WEMWBS score for different health states

WEMWBS score	Health is excellent	Heath is poor	Difference (points score)
Stoke-on-Trent	54.6	43.0	11.6
South Staffordshire	57.2	43.4	13.5
	No disability	Has disability	
Stoke-on-Trent	51.9	47.2	4.7
South Staffordshire	53.6	48.6	5.0

Source: Information by Design 2010

6.5 Follow-up action

In Stoke-on-Trent the survey results led to the following developments and commissioning activity between 2010 and 2012:

Social action for health

- Small Grants fund established for community groups to respond to the findings in their own area. Staffordshire Community Foundation have awarded six grants in total that support local people to connect and keep learning, particularly those most vulnerable to poor mental well-being. Projects encompass well-being support for parents, arts and creativity, and social connection for older people and asylum seekers and refugees.
- Community Learning Champions programme supported to recommence its activity to encourage uptake of learning opportunities by people in the City. Community Learning Champions have been re-engaged or recruited, trained, and supported to reach members of the community that would not normally participate in learning or who have been out of education for some time. Champions have established their own drop-ins for particular groups, worked in community venues such as local markets and volunteered to extend their role to act as mentors to support people to stay with the learning opportunities they have taken up.

Mental well-being at work

- Direct support for employers provided to create mentally healthy workplaces that are inclusive and supportive of people with mental health issues, using the 'How's Your Business Feeling?' tool. Through the programme, local employers are being encouraged to achieve Mindful Employer status, to demonstrate their commitment to good mental health at work and to continue to improve workplace well-being on an on-going basis.

Brief Intervention for mental well-being

- A model of brief intervention for mental well-being, based on the evidence-based five ways to well-being, has been introduced to the smoking cessation service to promote well-being in a group more likely to experience poor mental health and support their efforts to quit smoking. The process involves identifying an individual's current activity against the five ways framework and signposting them towards local opportunities to take further action to promote their mental well-being.

Targeting existing provision

- The results of the exercise have been shared widely, with a view to informing the targeting of existing provision towards those most likely to experience poor mental well-being.

6.6 Conclusion

The Public Health White Paper 'Healthy Lives, Healthy People' is the first public health strategy to give equal weight to both mental and physical health.[7] 'No health without mental health: a cross-government mental health outcomes strategy for people of all ages' recognises that good mental health and well-being is associated with a range of better outcomes for people of all ages and backgrounds.[8] These include improved physical health and life expectancy, better educational achievement, increased skills, reduced health risk behaviours such as smoking and alcohol misuse, reduced risk of mental health problems and suicide, improved employment rates and productivity, reduced anti-social behaviour and criminality, and higher levels of social interaction and participation. Therefore, the results of these surveys will be of interest to all those engaged in the above activities and have already informed some commissioned activity in Stoke-on-Trent.

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http://www.dh.gov.uk/health/2011/07/healthy-lives-healthy-people/

8 HM Government / Department of Health. *No health without mental health A cross-government mental health outcomes strategy for people of all ages*. London: Department of Health; 2 Feb 2011.
http://www.dh.gov.uk/health/2011/07/mental-health-strategy/

6.8 Further information

More information and details on requirements for use of the WEMWBS can be found on the NHS Health Scotland web site:

NHS Health Scotland. *Measuring mental well-being*.
http://www.healthscotland.com/understanding/population/Measuring-positive-mental-health.aspx
Updated 26 Sep 2012. (accessed 14 Feb 2013).

6.9 Acknowledgements

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Thanks also go to the respondents who took part in the face to face surveys and focus group

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7. MEASURING INEQUALITIES IN SMALL AREA LIFE EXPECTANCY

7.1 Introduction

Life expectancy at birth is one of the longest standing measures of health status in England and Wales,[1] the first official life tables being published by the Registrar General William Farr in 1839. Right from its origin life expectancy has been used to highlight variations in mortality experience between different geographical regions of the country and this tradition has been continued by the Office for National Statistics (ONS) in recent times. [2]

Life expectancy figures are widely used, not just for policy and planning purposes in the public sector but also in private sector activities such as insurance and pensions. Indeed the first ever life tables were constructed by Sir Edmund Halley for the purpose of pricing annuities. Within healthcare and Public Health, life expectancy has particular importance as it is used by a number of high profile reports, strategies and frameworks as a high level indicator of health status and health inequality.

The Marmot review into health inequalities used life expectancy to highlight that health is not experienced equally across our society, with the observation that people living in the poorest neighbourhoods will die on average 7 years earlier than those living in the richest neighbourhoods. Marmot proposed that national health outcome targets in the immediate future should cover both life expectancy (to capture years of life) and health expectancy (to capture the quality of those years).

This proposal has taken shape in the Public Health Outcomes Framework (PHOF).[3] The purpose of this framework is set the vision for the whole public health system in order to provide positive health outcomes for the population and reduce inequalities in health. It includes two overarching outcomes:

- increased healthy life expectancy, i.e. taking account of the health quality as well as the length of life;
- reduced differences in life expectancy and healthy life expectancy between communities (through greater improvements in more disadvantaged communities).

One of the reasons for including life expectancy as part of the second outcome is to enable the measurement of *within-area* inequalities as well as between-area inequalities in health. It is not feasible to collect data on within-area differences in healthy life expectancy.

The high-level outcome of reduced differences in life expectancy between communities is considered to be the key element in addressing health inequalities within the PHOF. The emphasis for delivery of improvements will be on local authorities in partnership with health and wellbeing boards. They will need to measure progress against those indicators that best reflect local health need as set out in their respective Joint Strategic Needs Assessments and Joint Heath and Wellbeing Strategies. It is therefore envisaged that specific progress against the measures in the PHOF will be built into the Joint Strategic Needs Assessment and Joint Heath and Wellbeing Strategy as appropriate.

The PHOF update published in November 2012 includes five indicators to measure the differences in life expectancy between communities all based on the slope index of inequality. This includes the measurement of within local authority inequalities in life expectancy based on grouping lower super output areas (LSOAs) into local deprivation quintiles. [4]

The Secretary of State for Health made specific recommendations to ensure that outcomes measures within the Public Health Outcomes Framework are twinned, where appropriate, with those in the NHS Outcome Framework (NHSOF). The NHSOF provides the national accountability framework for the outcomes that the NHS delivers. One of its underlying principles is the need to promote equality and reduce inequalities in health outcomes. Domain one of the NHSOF, preventing people from dying prematurely, includes the overarching indicator life expectancy at age 75. [5]

Prior to these outcome frameworks a previous Public Service Agreement (PSA) target was in place to reduce inequalities in life expectancy between local authorities by 10 per cent.

The purpose of this chapter is to describe life expectancy at birth within the West Midlands and look at the ways in which local variations and inequalities can be presented within local authorities. Warwickshire County is used as an example.

7.2 Definitions

Life expectancy, when calculated from a period life table, provides a summary measure of the mortality rates in a population in the stated time period. Alternative summary measures that might be used include directly age-standardised mortality rates (DSRs) and indirectly age-standardised mortality ratios (SMRs). Life expectancy at birth is an estimate of the average number of years that a new born baby can expect to live if he or she experiences the population's age-specific mortality rates of the specified period throughout their life. It is calculated by constructing a life table. Such a table creates and follows a hypothetical cohort of new babies as they age, using the population's specified time period's age-specific mortality rates to estimate how many of the cohort survive or die at each year of age.

Life expectancy at birth should not be regarded as a prediction of the number of years that the baby can actually expect to live, both because the mortality rates of the population are likely to change in the future and because many of those babies would not reside in the same area throughout their lives.

7.3 Data sources

The Office for National Statistics (ONS) regularly publishes life expectancy data at national and local authority level.[6] The ONS also provides trends in 3-year average life expectancy at birth and age 65 at local authority and Primary Care Trust level for the Compendium of Population Health Indicators published by the NHS Information Centre for health and social care (NHS IC).[7] However, the ONS does not routinely calculate life expectancy for areas smaller than local authorities.

Experimental ward-level life expectancy figures for 1999-2003 were published by ONS to test the feasibility of producing figures for small geographic areas but they were not fully developed and did not meet the requirements of the UK Statistics Authority Code of Practice.[8] At around the same time the South East Public Health Observatory published a technical report looking at the feasibility of producing small area life expectancy estimates and comparing existing life table methods.[1] Following this report the Association of Public Health Observatories (APHO) calculated and published life expectancy at birth estimates for both electoral wards and Middle Super Output Areas (MSOAs). Figures for the period 2006-10 are currently available on the Local Health page of the Network of Public Health Observatories' (formerly APHO) Health Profiles web site.[9]

For this report we have used the ONS figures for 2008-10 to describe national, regional and local authority level life expectancies and the Public Health Observatories' figures for 2006-10 for electoral ward and MSOA comparisons.

7.4 National life expectancy

England has the highest life expectancy at birth of all the constituent countries of the United Kingdom, for both males and females. For the three-year period 2008-10 these were 78.6 years for males and 82.6 years for females.

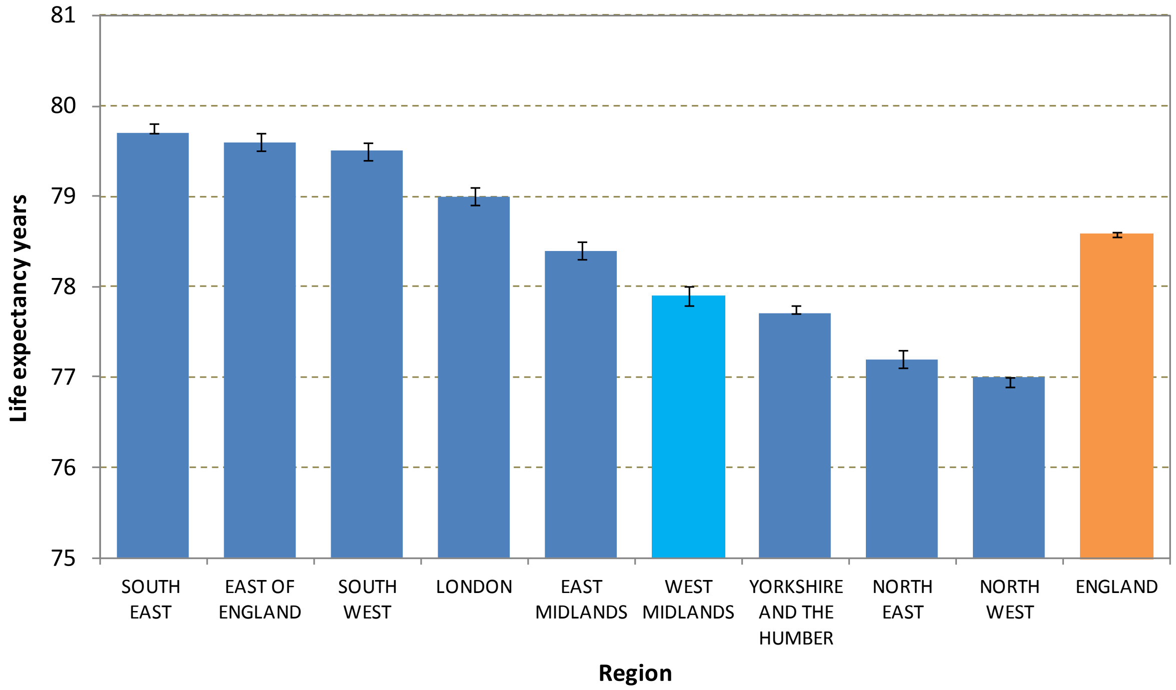
There was a difference of 11.5 years between the local authority with highest male life expectancy and that with the lowest. These were Kensington and Chelsea at 85.1 years and Blackpool at 73.6 years respectively.

For female life expectancy the range between the highest and lowest local authorities was 10.6 years. These were Kensington and Chelsea at 89.8 years and Manchester at 79.1 years respectively.[2]

7.5 Life expectancy in the West Midlands

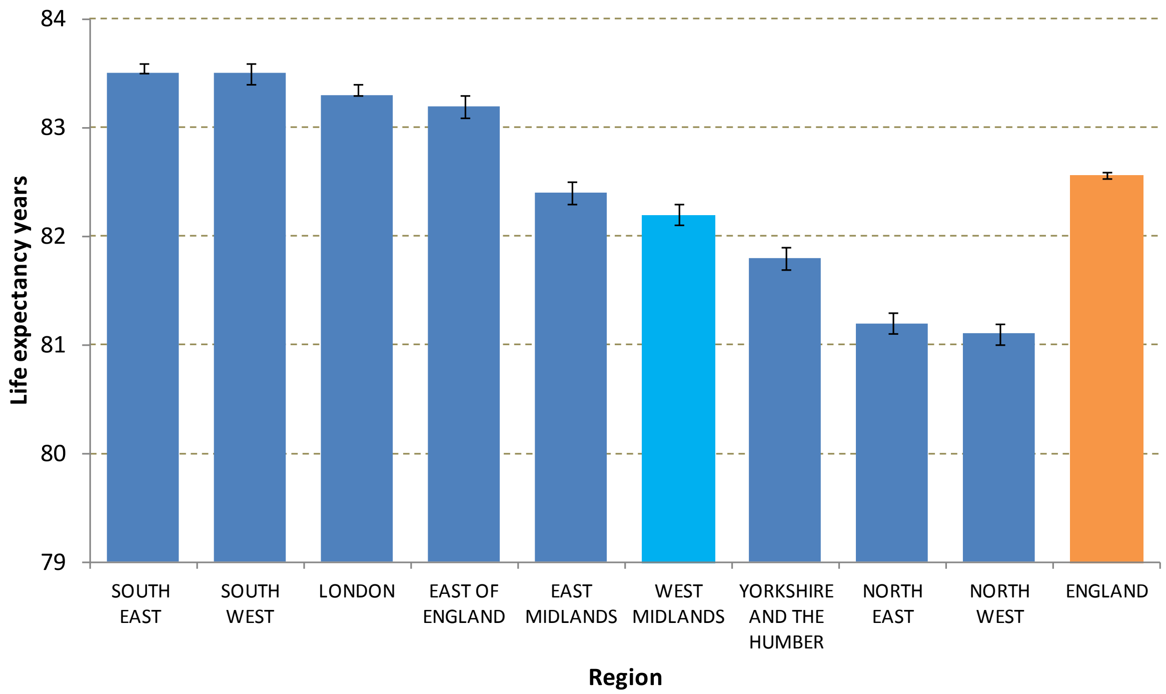
In the period 2008-10 life expectancy in the West Midlands region was lower than the national average for both males and females. For males the West Midlands figure of 77.9 years was 0.7 years lower than the national average. Compared to the other regions, the West Midlands had the fourth lowest life expectancy (Figure 7.1). For females, the West Midlands life expectancy was 82.2 years, 0.4 years lower than the national average. Again the West Midlands ranked the fourth lowest of the English regions (Figure 7.2).

Figure 7.1: Male life expectancy at birth by region, England 2008-10



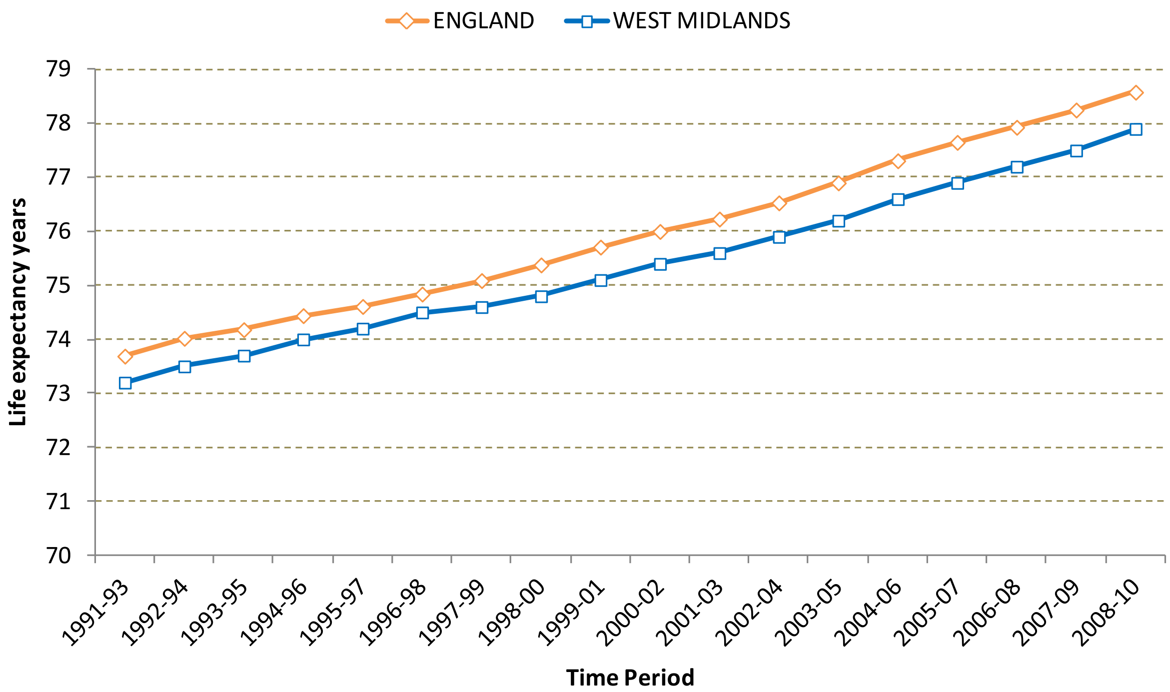
Source: Compendium of Population Health Indicators, NHS Information Centre.

Figure 7.2: Female life expectancy at birth by region, England 2008-10



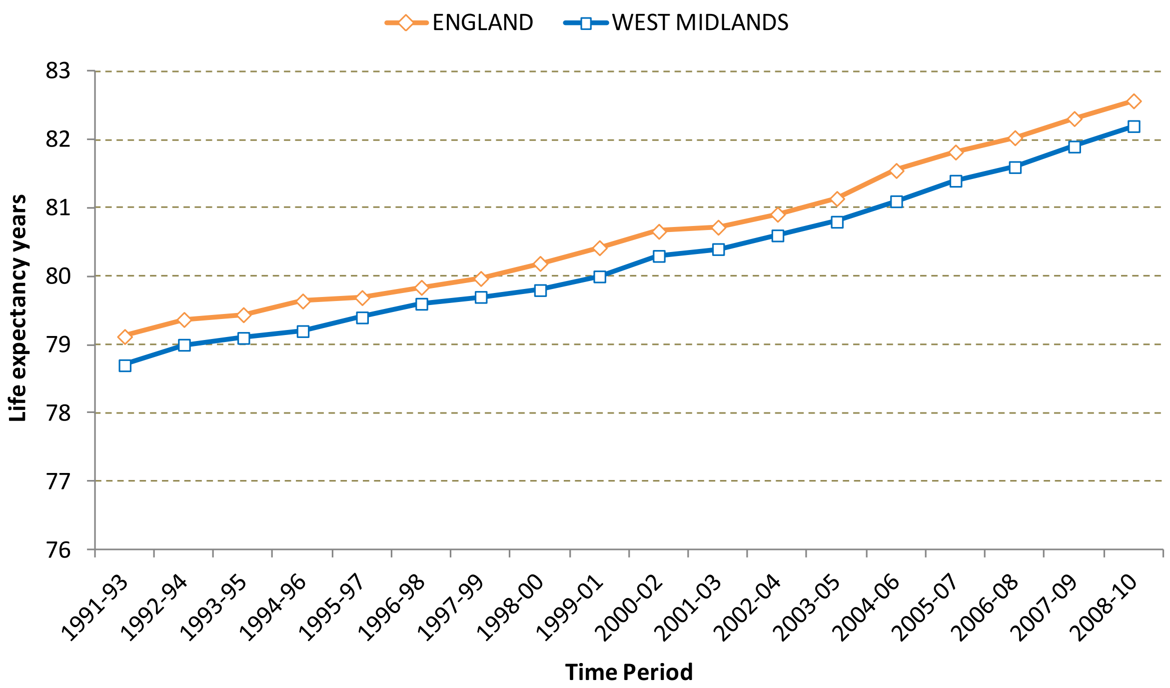
Source: Compendium of Population Health Indicators, NHS Information Centre.

Figure 7.3: Male life expectancy at birth, England and the West Midlands 1991-93 to 2008-10



Source: Compendium of Population Health Indicators, NHS Information Centre.

Figure 7.4: Female life expectancy at birth, England and the West Midlands 1991-93 to 2008-10



Source: Compendium of Population Health Indicators, NHS Information Centre.

The difference between the regional and national male life expectancies has been consistent over the past two decades, though there is some evidence that it is slowly increasing. Over the period from 1991-93 to 2008-10 male life expectancy in the West Midlands has improved by 4.7 years – nationally the improvement has been 4.9 years (Figure 7.3).

Over the same time period the regional female life expectancy has also been consistently lower than the national average. The overall regional improvement is 3.5 years, marginally higher than the national improvement of 3.4 years (Figure 7.4).

7.6 Life expectancy by local authority

Within the West Midlands in the period 2008-10 there was a 5.1 year range between the local authority district with the highest male life expectancy and that with the lowest. These were Solihull at 80.6 years and Sandwell at 75.5 years respectively (Table 7.1). The five local authorities with the highest male life expectancies were Solihull, Stratford-upon-Avon, Wychavon, Warwick and Malvern Hills. The five with the lowest were Sandwell, Stoke-on-Trent, Wolverhampton, Birmingham and Walsall.

For females the range between the highest and lowest life expectancies was 4.1 years, from Warwick's 84.3 years to Stoke-on-Trent's 80.2 years. The highest female life expectancies were seen in Warwick, Wychavon, Solihull, Herefordshire and Stratford-upon-Avon. The lowest were seen in Stoke-on-Trent, Sandwell, Wolverhampton, Birmingham and Coventry.

Figure 7.6 and Figure 7.7 map the geographical variation in the local authority life expectancy for males and females respectively. There is a clear geographic divide with higher expectancies in the less deprived rural areas particularly in the south and west of the Region. Low life expectancies are concentrated in the more deprived urban local authorities, particularly in the former West Midlands

Metropolitan County area covered by Birmingham, the Black Country and Coventry.

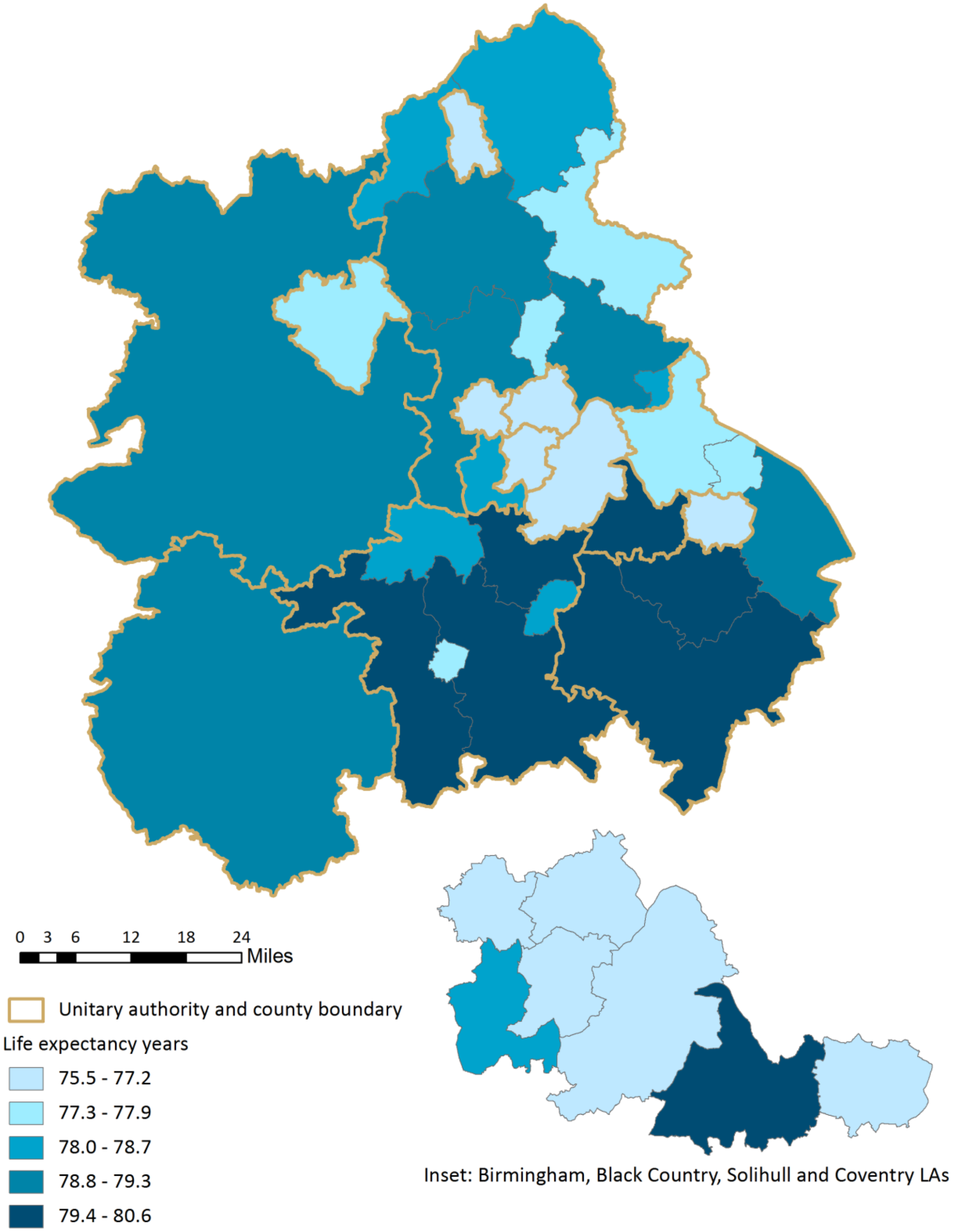
Table 7.1: Life expectancy at birth by local authority and gender, West Midlands 2008-10

ONS Area code	LA Name	Males			Females		
		Life Expectancy	95% confidence limits Lower	95% confidence limits Upper	Life Expectancy	95% confidence limits Lower	95% confidence limits Upper
E12000005	**WEST MIDLANDS**	77.9	*77.8*	*78.0*	82.2	*82.1*	*82.3*
E06000019	Herefordshire, County of UA	79.3	*78.8*	*79.8*	83.6	*83.1*	*84.1*
E06000051	Shropshire UA	78.8	*78.4*	*79.2*	82.9	*82.6*	*83.3*
E06000021	Stoke-on-Trent UA	76.2	*75.7*	*76.6*	80.2	*79.8*	*80.6*
E06000020	Telford and Wrekin UA	77.5	*76.9*	*78.0*	82.1	*81.6*	*82.7*
E10000028	Staffordshire						
E07000192	Cannock Chase	77.3	*76.7*	*78.0*	81.7	*81.1*	*82.3*
E07000193	East Staffordshire	77.4	*76.7*	*78.1*	83.0	*82.4*	*83.6*
E07000194	Lichfield	78.8	*78.1*	*79.5*	81.8	*81.1*	*82.4*
E07000195	Newcastle-under-Lyme	78.3	*77.6*	*78.9*	81.8	*81.2*	*82.4*
E07000196	South Staffordshire	79.1	*78.4*	*79.7*	82.8	*82.2*	*83.4*
E07000197	Stafford	79.1	*78.5*	*79.7*	83.3	*82.8*	*83.8*
E07000198	Staffordshire Moorlands	78.4	*77.7*	*79.2*	82.6	*82.0*	*83.3*
E07000199	Tamworth	78.7	*77.8*	*79.5*	82.7	*82.0*	*83.4*
E10000031	Warwickshire						
E07000218	North Warwickshire	77.9	*77.0*	*78.8*	82.2	*81.4*	*82.9*
E07000219	Nuneaton and Bedworth	77.5	*76.9*	*78.1*	81.9	*81.4*	*82.5*
E07000220	Rugby	78.8	*78.1*	*79.5*	82.7	*82.0*	*83.4*
E07000221	Stratford-on-Avon	80.4	*79.8*	*81.0*	83.5	*82.9*	*84.1*
E07000222	Warwick	79.9	*79.3*	*80.4*	84.3	*83.8*	*84.9*
E11000005	West Midlands (Met County)						
E08000025	Birmingham	76.8	*76.5*	*77.0*	81.6	*81.4*	*81.8*
E08000026	Coventry	77.2	*76.8*	*77.6*	81.6	*81.2*	*82.0*
E08000027	Dudley	78.1	*77.7*	*78.5*	82.5	*82.1*	*82.8*
E08000028	Sandwell	75.5	*75.1*	*76.0*	80.8	*80.4*	*81.2*
E08000029	Solihull	80.6	*80.2*	*81.1*	83.8	*83.3*	*84.2*
E08000030	Walsall	76.9	*76.5*	*77.3*	81.9	*81.5*	*82.3*
E08000031	Wolverhampton	76.7	*76.3*	*77.2*	80.8	*80.3*	*81.2*
E10000034	Worcestershire						
E07000234	Bromsgrove	79.6	*78.9*	*80.2*	82.7	*82.0*	*83.3*
E07000235	Malvern Hills	79.8	*79.0*	*80.5*	83.4	*82.7*	*84.0*
E07000236	Redditch	78.0	*77.3*	*78.8*	82.6	*81.8*	*83.3*
E07000237	Worcester	77.7	*77.0*	*78.4*	82.4	*81.8*	*83.1*
E07000238	Wychavon	80.3	*79.7*	*80.9*	84.0	*83.4*	*84.5*
E07000239	Wyre Forest	78.6	*77.9*	*79.3*	82.8	*82.2*	*83.4*

Source: Compendium of Population Health Indicators, NHS Information Centre.

Figure 7.5: Key to West Midlands local authority districts

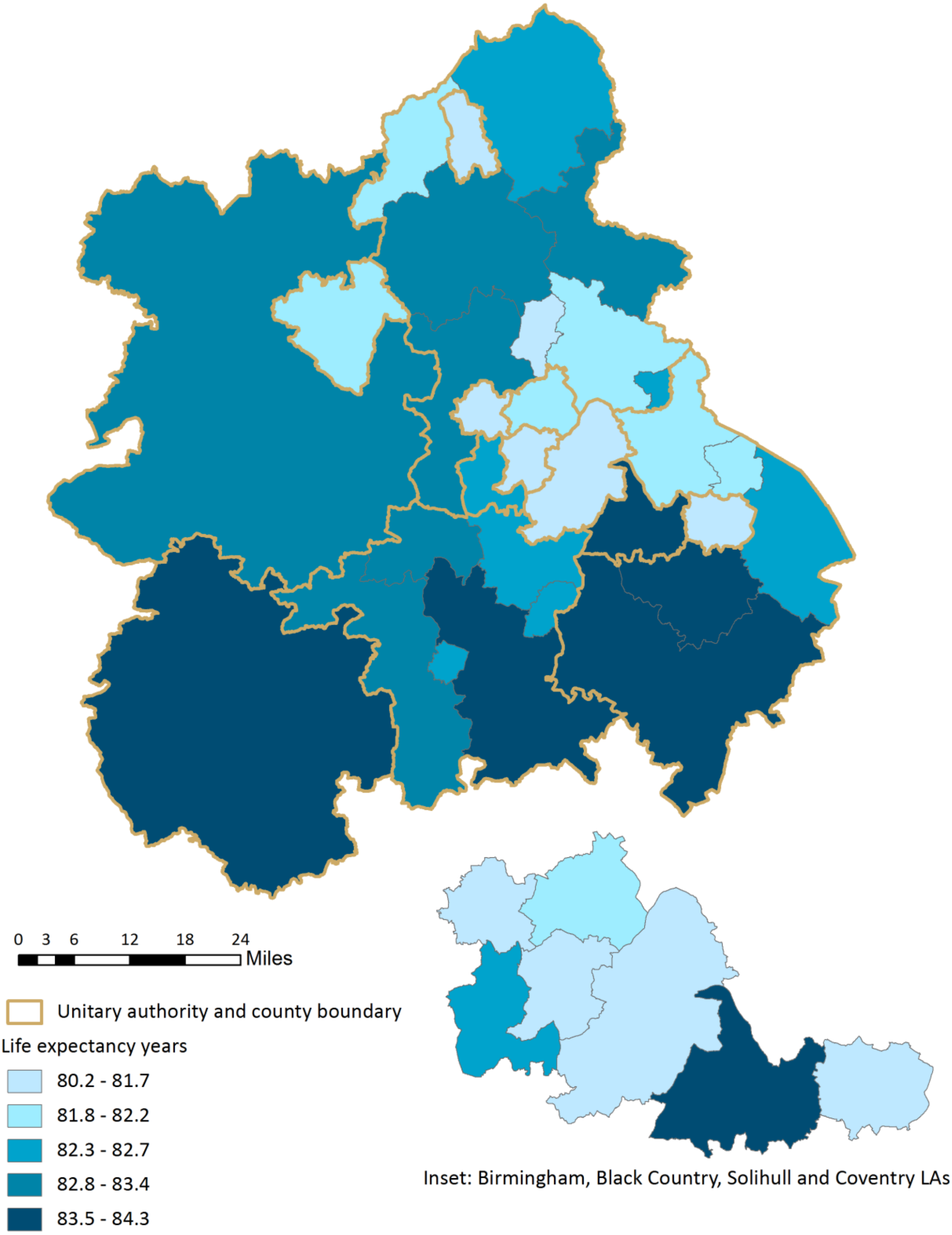
Figure 7.6: Male life expectancy at birth by local authority, West Midlands 2008-10



Source:
Compendium of Public Health Indicators,
NHS Information Centre

Produced by WMCSU, University of Birmingham.

Figure 7.7: Female life expectancy at birth by local authority, West Midlands 2008-10



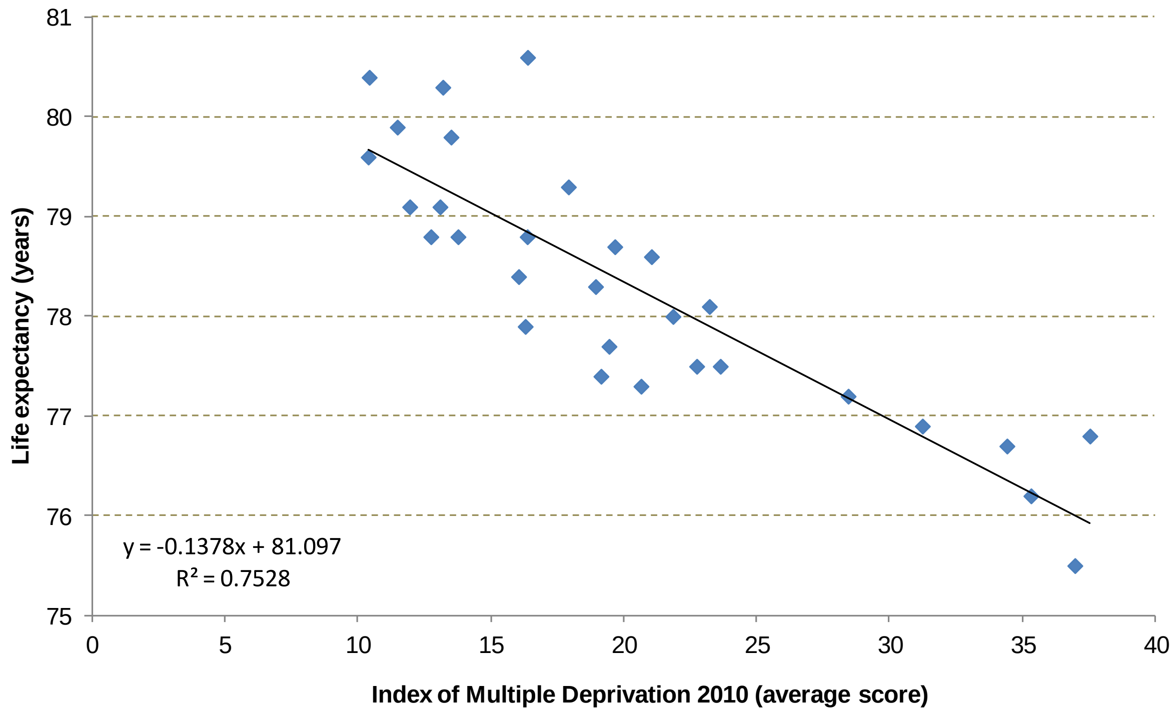
Source:
Compendium of Public Health Indicators,
NHS Information Centre

Produced by WMCSU, University of Birmingham.

Figure 7.8 presents the relationship within the West Midlands between male life expectancy and deprivation, as measured by the Index of Multiple Deprivation (IMD) 2010 average score. It demonstrates a strong and statistically significant negative correlation (Pearson R coeff. = - 0.87; $p< 0.001$) between the two with more deprived authorities (i.e. those with higher IMD scores) having lower male life expectancies.

A similarly strong correlation exists between female life expectancy and deprivation (Pearson R coeff. = - 0.78; $p< 0.001$) although the gradient of the relationship is not quite as steep.

Figure 7.8: Male life expectancy vs. IMD 2010 by local authority, West Midlands 2008-10



Source: Compendium of Population Health Indicators, NHS Information Centre; Indices of Deprivation 2010, Department for Communities and Local Government.

7.7 Small area geography

Below local authority level there are a multitude of geographies can be used to bring more localised issues into focus. Areas can be geographically divided by a variety of methods including administrative, postal, health and statistical boundaries.[10]

The most commonly used small area geographies for the analysis of health information are electoral wards and Super Output Areas (SOAs). Electoral wards are key building block for the administrative geography of England being the constituency areas for the election of local government councillors. As such they are politically relevant areas for local authorities and councillors, they generally reflect natural boundaries of local communities and they have meaningful names which are (usually) recognisable to local people. Disadvantages of electoral wards as units of analysis include their large range in population size and their frequent boundary changes which often cause problems when trying to match numerator and denominator data and/or measuring changes over time.

To improve the comparability and usefulness of small area statistics the Neighbourhood Statistics section of the ONS developed a statistical geography hierarchy based on stable small area building blocks called 2001 Super Output Areas (SOAs). These come in two levels: Lower Super Output Areas (LSOAs) and the larger Middle Super Output Areas (MSOAs).[11] These later became the standard units for presenting local statistical information across National Statistics.

Table 7.2 provides a comparison of the electoral ward and SOA geographies in the West Midlands. Across the region there are 719 wards with a mean population of approximately 7,800. However it can be seen that the average ward population size varies almost eight-fold between local authorities from 3,400 in the Malvern Hills to 26,800 in Birmingham.[12] The MSOAs are similar in number, 735, to the electoral wards and consequently have a similar mean population size of 7,600. However the variation in the mean population size across local authorities is much smaller, ranging from 6,200 in Wychavon to 9,200 in Warwick. Each MSOA is made up of a number of LSOAs of which there are 3,487 across the region with a mean population of almost 1,600.

Table 7.2: Comparison of electoral ward and Super Output Area geographies in the West Midlands

Local Authority	Population	Number of:			Average Population by:		
		Wards	MSOAs	LSOAs	Ward	MSOA	LSOA
Birmingham	1,073,000	40	131	639	26,800	8,200	1,700
Bromsgrove	93,600	23	14	58	4,100	6,700	1,600
Cannock Chase	97,500	15	13	60	6,500	7,500	1,600
Coventry	317,000	18	42	195	17,600	7,500	1,600
Dudley	312,900	24	43	201	13,000	7,300	1,600
East Staffordshire	113,600	21	15	72	5,400	7,600	1,600
Herefordshire, County of	183,500	40	23	116	4,600	8,000	1,600
Lichfield	100,700	26	12	58	3,900	8,400	1,700
Malvern Hills	74,600	22	11	45	3,400	6,800	1,700
Newcastle-under-Lyme	123,900	24	16	80	5,200	7,700	1,500
North Warwickshire	62,000	17	7	38	3,600	8,900	1,600
Nuneaton and Bedworth	125,300	17	18	81	7,400	7,000	1,500
Redditch	84,200	12	13	55	7,000	6,500	1,500
Rugby	100,100	20	12	61	5,000	8,300	1,600
Sandwell	308,100	24	38	186	12,800	8,100	1,700
Shropshire	306,100	63	39	193	4,900	7,800	1,600
Solihull	206,700	17	29	134	12,200	7,100	1,500
South Staffordshire	108,100	25	14	68	4,300	7,700	1,600
Stafford	130,900	26	16	80	5,000	8,200	1,600
Staffordshire Moorlands	97,100	27	13	59	3,600	7,500	1,600
Stoke-on-Trent	249,000	20	34	159	12,500	7,300	1,600
Stratford-on-Avon	120,500	31	15	73	3,900	8,000	1,700
Tamworth	76,800	10	10	51	7,700	7,700	1,500
Telford and Wrekin	166,600	33	23	108	5,000	7,200	1,500
Walsall	269,300	20	39	167	13,500	6,900	1,600
Warwick	137,600	20	15	86	6,900	9,200	1,600
Wolverhampton	249,500	20	33	158	12,500	7,600	1,600
Worcester	98,800	15	14	63	6,600	7,100	1,600
Wychavon	116,900	32	19	78	3,700	6,200	1,500
Wyre Forest	98,000	17	14	65	5,800	7,000	1,500
West Midlands region	**5,601,900**	**719**	**735**	**3,487**	**7,800**	**7,600**	**1,600**

Source: 2011 Census. Populations have been rounded to the nearest 100.
http://www.ons.gov.uk/ons/search/index.html?newquery=census+pp04+table

One disadvantage of using MSOAs has been the lack of local names for the areas. To address this a succession of national and regional consultations co-ordinated by the West Midlands Cancer Intelligence Unit (WMCIU) have been undertaken and have resulted in an unofficial list of names for MSOAs in the West Midlands.[13]

Comparing the numbers of electoral wards and MSOAs within each of the local authorities it can be seen that within the more rural and suburban authorities the MSOAs tend to be larger in population size and therefore fewer in number than the electoral wards. In the urban authorities the opposite tends to be the case with MSOAs providing greater geographical detail than electoral wards.

Electoral ward level is the smallest geographical area for which population life expectancy estimates have been published by the ONS. The Network of Public Health Observatories has published life expectancies for both electoral ward and MSOA geographies on its Local Health web site. The Public Health Observatory figures have been used for the following small area analyses.

7.8 Life expectancy by small area

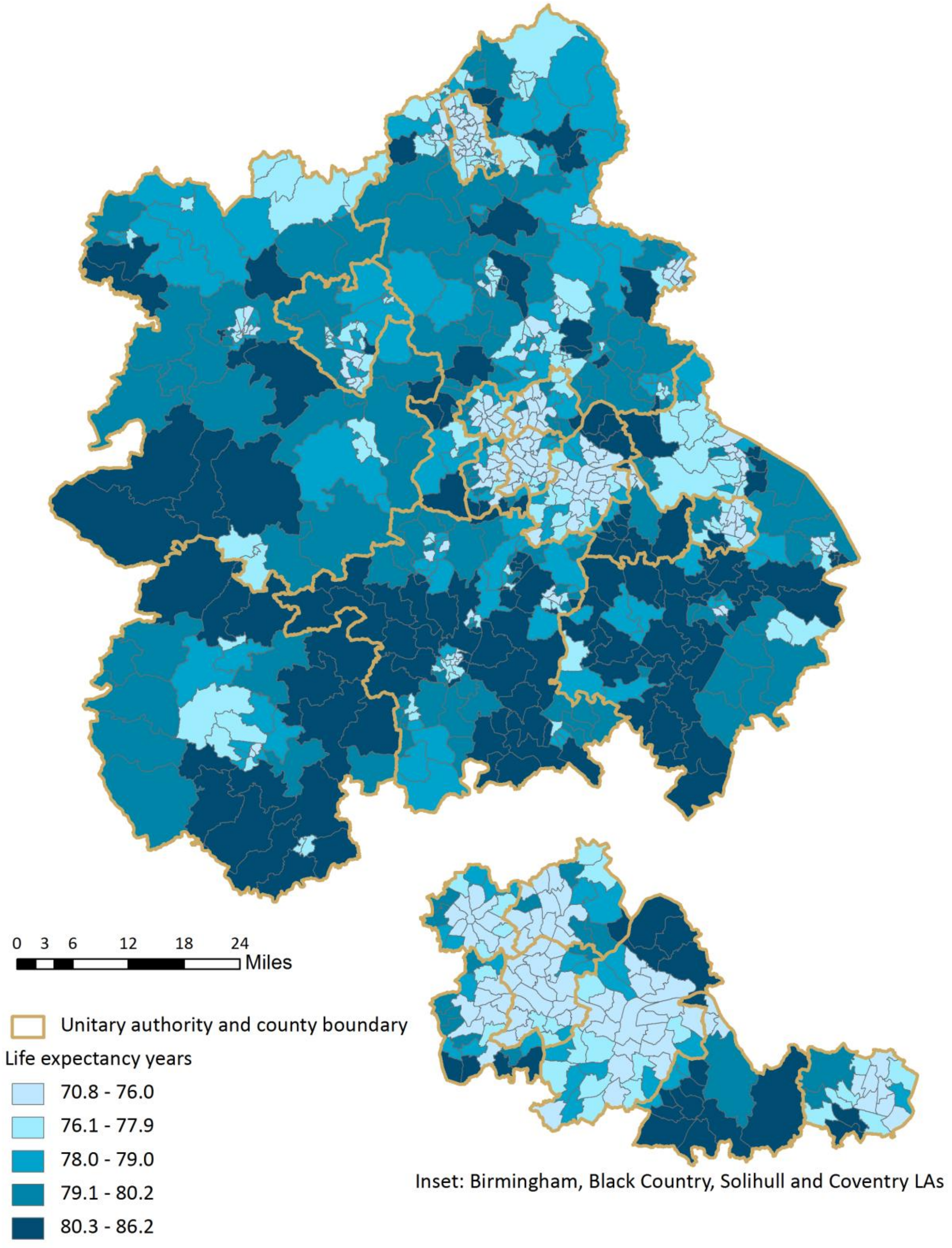
Figure 7.9 and Figure 7.10 map male life expectancy across the West Midlands by electoral ward and MSOA respectively. Also shown on the maps are the upper-tier local authority boundaries, i.e. the County Councils, Unitary Authorities and Metropolitan Districts. The electoral wards and MSOAs are banded into quintiles based on all the life expectancies for such areas in the West Midlands. As is to be expected the two maps show a similar geographical pattern across the region. The electoral ward provides greater granularity in the rural areas where wards are generally smaller than MSOAs and the MSOA map shows greater detail in the urban areas such as Birmingham where the opposite is true.

A clear observation from both maps is that within all the individual local authorities, irrespective of their overall life expectancy experience, there exists significant variation between their local communities. All the local authorities have MSOAs that fall into the highest life expectancy quintile in the region and others that fall into the lowest. Some areas are more homogenous than others – the counties of Shropshire, Herefordshire, Worcestershire and Warwickshire, and the Unitary Authority of Solihull MSOAs or electoral wards with high life expectancies predominate. The few areas with low life expectancies are concentrated in the towns. In the electoral ward map in particular towns such as Hereford, Worcester, Redditch, Telford, Shrewsbury, Bridgenorth and Rugby are clearly identifiable from their surrounding areas. Stone-on-Trent and the authorities in the Black Country are dominated by MSOAs or electoral wards with low life expectancies. Sandwell is particularly notable as being very homogenous with very few areas having a male life expectancy higher than the regional average.

The remaining authorities in Birmingham, Staffordshire, Coventry and Telford and Wrekin have a more balance distribution of life expectancies. In Birmingham the electoral wards show a north/south divide with the city with the northern wards around Sutton Coldfield having higher life expectancies than the rest of Birmingham. The greater detail provided by the MSOAs in Birmingham however identify a second pocket of high life expectancies in the south west of the city around the Edgbaston, Harborne, Sellyoak and Bourneville areas.

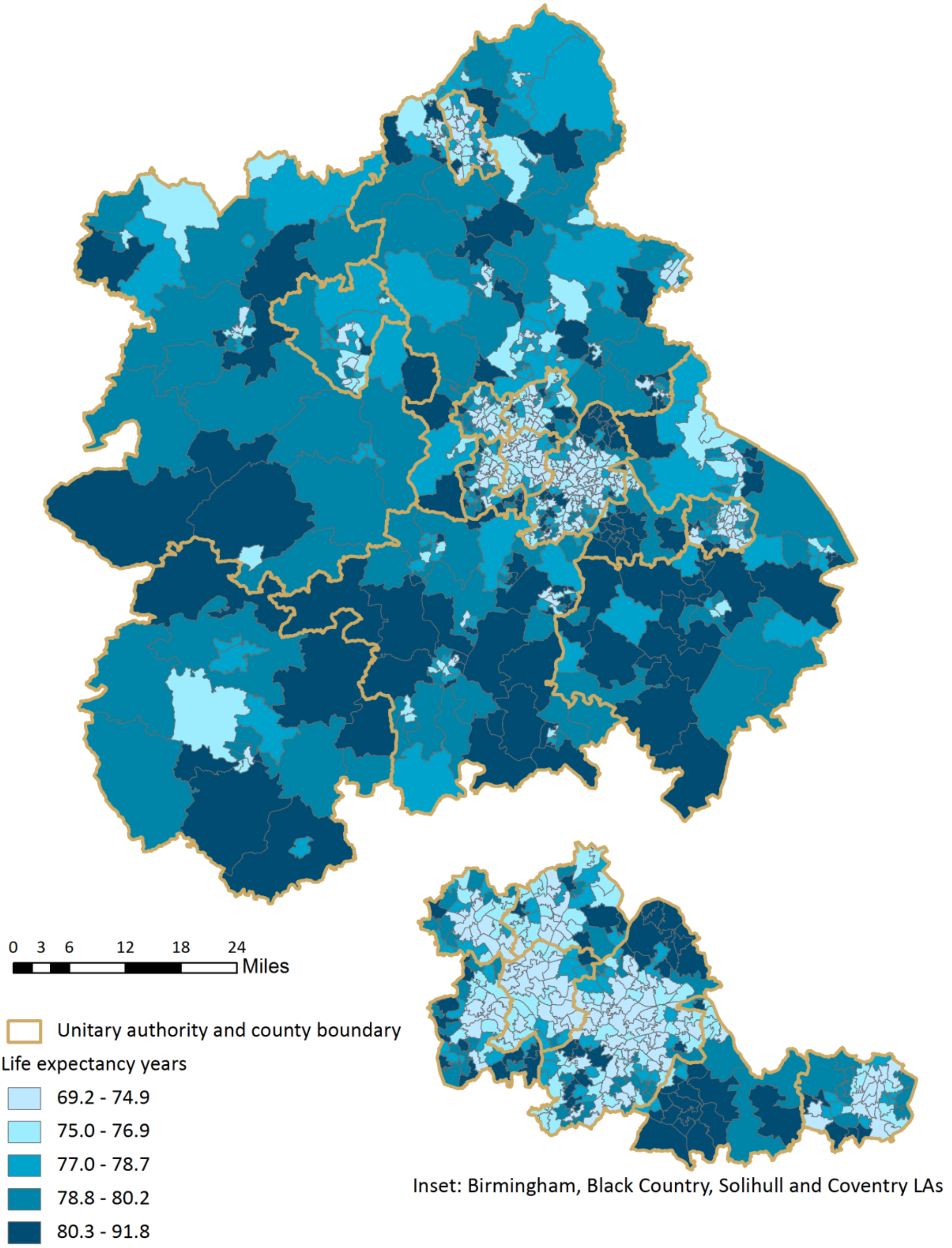
Figure 7.11 and Figure 7.12 present the corresponding female life expectancy maps by electoral ward and MSOA respectively. The broad picture is similar to that for males with a concentration of low life expectancies in the urban centres of Birmingham, the Black Country, Coventry and Stoke-on-Trent. However within the more rural counties the areas with lower life expectancies are more evenly spread and not as concentrated within the county towns as are those for males.

Figure 7.9: Male life expectancy at birth by electoral ward, West Midlands 2006-10



Source:
Health profiles - local health,
Department of Health / Network of Public Health Observatories

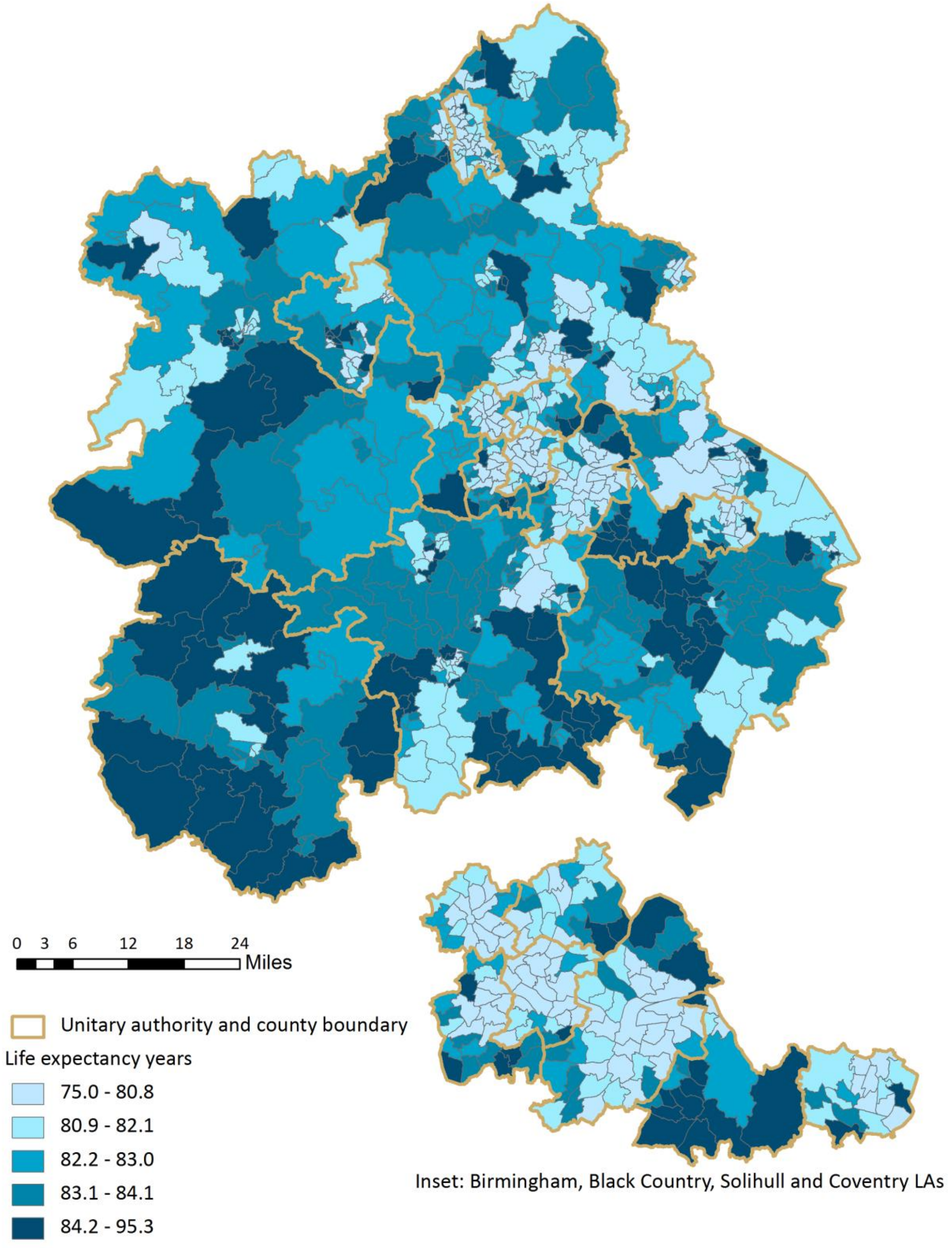
Figure 7.10: Male life expectancy at birth by MSOA, West Midlands 2006-10



Source:
Health profiles – local health,
Department of Health / Network of Public Health Observatories

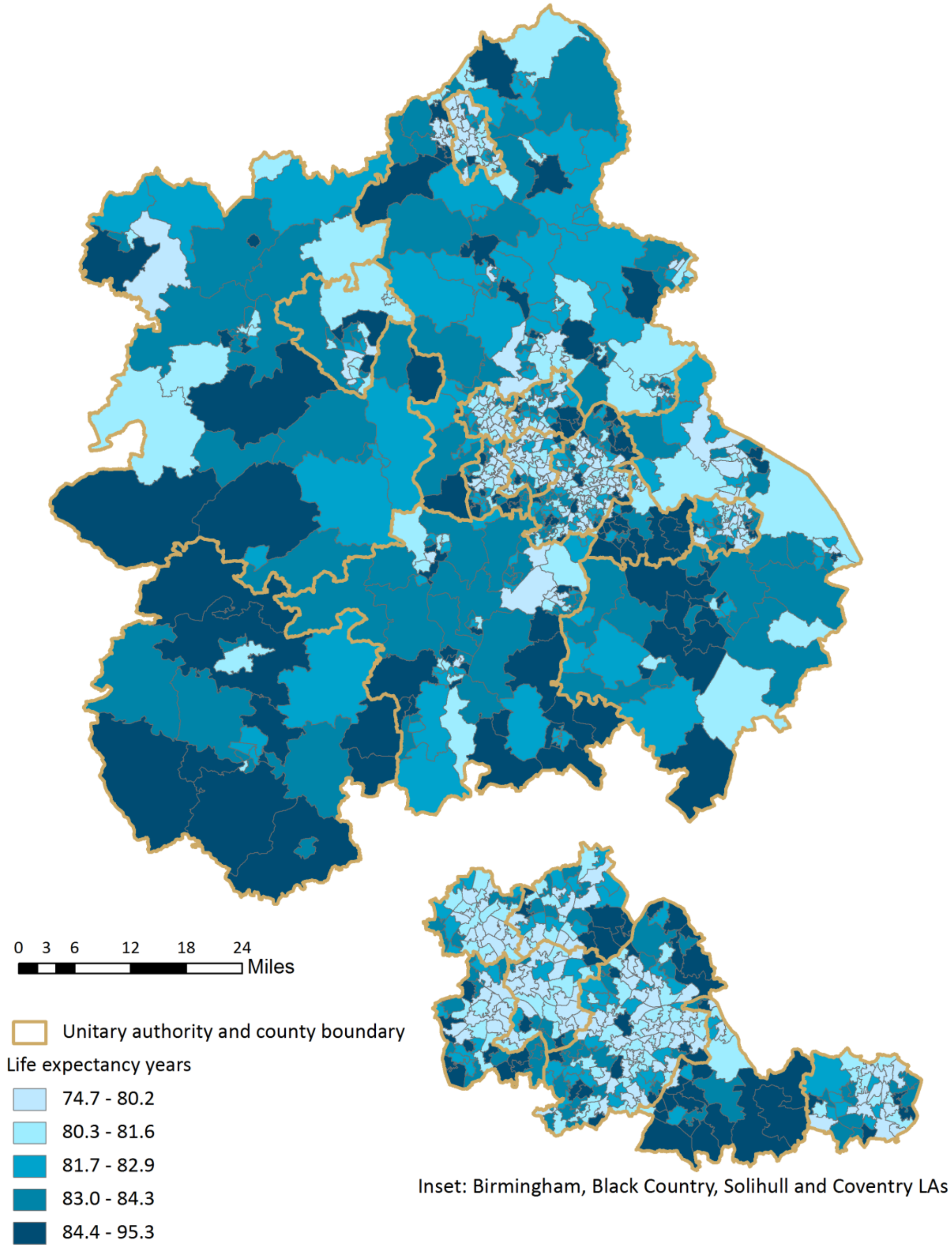
Produced by WMCSU, University of Birmingham.

Figure 7.11: Female life expectancy at birth by electoral ward, West Midlands 2006-10



Source:
Health profiles - local health,
Department of Health / Network of Public Health Observatories

Figure 7.12: Female life expectancy at birth by MSOA, West Midlands 2006-10



Source:
Health profiles – local health,
Department of Health / Network of Public Health Observatories

Produced by WMCSU, University of Birmingham.

Table 7.3 presents the 15 highest and lowest MSOA life expectancies in the West Midlands for both males and females. The range in male life expectancies is 22.6 years from Peter's Hill in Dudley at 91.8 years to Highgate Sparkbrook in Birmingham at 69.2 years. Birmingham local authority clearly has a very wide variation in life expectancies within its boundaries having three MSOAs in the highest 15 and eight in the lowest 15. The range in female life expectancies is 20.6 years from Lyppard Grange in Worcestershire at 95.3 years to Middleport and Burslem in Stoke-on-Trent at 74.7 years.

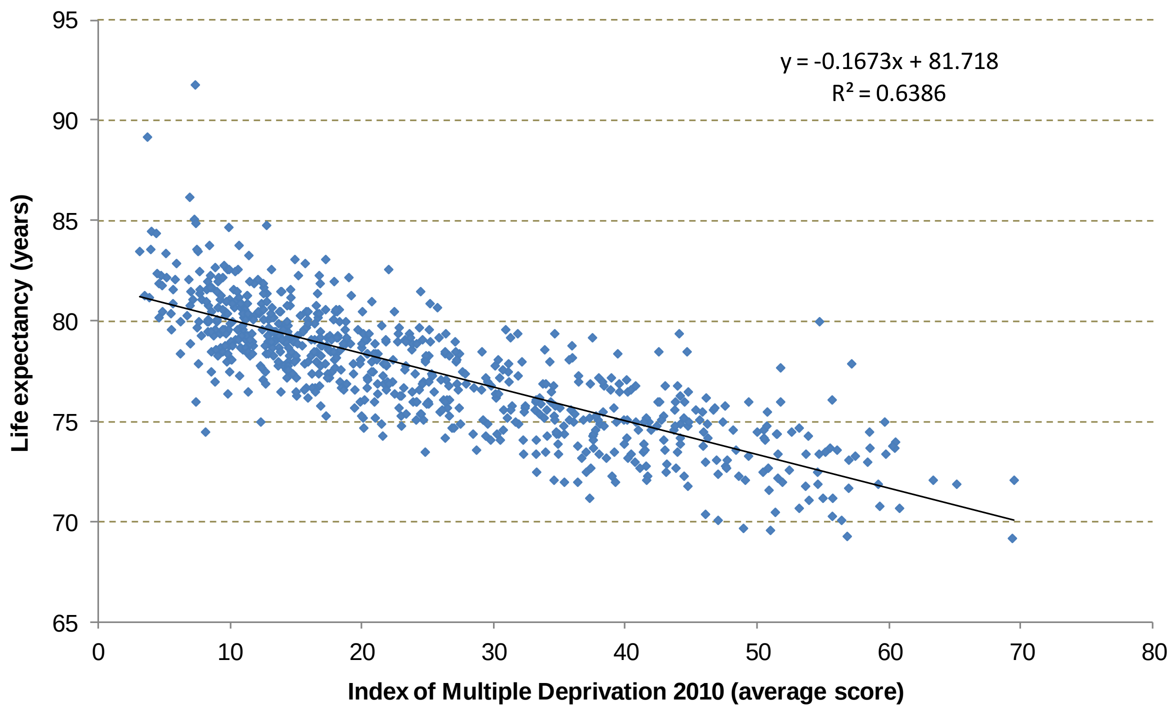
Table 7.3: 15 Highest and lowest life expectancies by MSOA by gender, West Midlands 2006-10

	Males				Females			
Highest	E02002027	Dudley	Peter's Hill	91.8	E02006741	Worcestershire	Lyppard Grange	95.3
	E02002107	Solihull	Monkspath	89.2	E02002027	Dudley	Peter's Hill	92.5
	E02006741	Worcestershire	Lyppard Grange	86.2	E02002934	Telford and Wrekin	Apley Castle & Leegomery	90.1
	E02001841	Birmingham	Wylde Green	85.1	E02006201	Staffordshire	Baswich & Brocton	89.9
	E02006148	Staffordshire	Longden & Chorley	84.9	E02002106	Solihull	Knowle	88.7
	E02001905	Birmingham	Edgbaston & University	84.8	E02002141	Walsall	Streetly West	88.4
	E02006736	Worcestershire	Blackpole Warndon & Trotshill	84.7	E02002103	Solihull	Bills Wood	88.4
	E02002108	Solihull	Dorridge	84.5	E02002099	Solihull	Solihull Central	88.4
	E02002137	Walsall	Streetly Central	84.4	E02002109	Solihull	Blythe Parishes	88.2
	E02006766	Worcestershire	Bredon & Eckington	83.8	E02001829	Birmingham	Roughley Moor Hall	87.9
	E02001832	Birmingham	Rectory Park & Barracks	83.8	E02006520	Warwickshire	Park Hill	87.8
	E02006145	Staffordshire	Barton, Tatenhill & Rangemore	83.6	E02001876	Birmingham	Newtown & Eastside	87.8
	E02002104	Solihull	Hillfield	83.6	E02001975	Coventry	Hipswell Highway & Ansty Road	87.7
	E02006201	Staffordshire	Baswich & Brocton	83.5	E02006766	Worcestershire	Bredon & Eckington	87.4
	E02001998	Coventry	Green Lane	83.5	E02006499	Warwickshire	Eastlands	87.4
Lowest	E02002068	Sandwell	Cape Hill	71.2	E02002143	Walsall	Palfrey	77.5
	E02001918	Birmingham	Moseley Village	71.2	E02002173	Wolverhampton	Blakenhall Central	77.4
	E02002965	Stoke-on-Trent	City, Festival Park & Etruria	71.1	E02002147	Walsall	Moxley & Darlaston West	77.4
	E02001866	Birmingham	Lozells	70.8	E02006127	Staffordshire	Hawks Green	77.3
	E02002062	Sandwell	West Bromwich East	70.7	E02002062	Sandwell	West Bromwich East	77.3
	E02001869	Birmingham	Holborn	70.7	E02002984	Stoke-on-Trent	Trentham East & Ley	77.1
	E02002959	Stoke-on-Trent	Middleport & Burslem	70.5	E02002172	Wolverhampton	Blakenhall East	77.1
	E02001876	Birmingham	Newtown & Eastside	70.4	E02002152	Wolverhampton	Bushbury Hill & Wood Hayes	77.0
	E02001867	Birmingham	Victoria Holte	70.3	E02002051	Sandwell	Ocker Hill	77.0
	E02002070	Sandwell	Uplands	70.1	E02006163	Staffordshire	Bradwell & Beasley	76.9
	E02001947	Birmingham	Druids Heath	70.1	E02001996	Coventry	Willenhall	76.9
	E02002139	Walsall	Walsall Central	69.7	E02002127	Walsall	Goscote/ Ryecroft/ Coalpool	76.5
	E02006735	Worcestershire	Gorse Hill North	69.6	E02001889	Birmingham	Little Bromwich South	76.5
	E02001894	Birmingham	Lee Bank Digbeth	69.3	E02002082	Solihull	Smith's Wood North	76.4
	E02001897	Birmingham	Highgate Sparkbrook	69.2	E02002959	Stoke-on-Trent	Middleport & Burslem	74.7

Source: Health Profiles - Local Profiles, Network of Public Health Observatories.

The relationship between male life expectancy and deprivation at a small area level is presented in Figure 7.13 using MSOAs as the unit for analysis. As at the local authority district level there is a strong negative correlation between male life expectancy and deprivation – the higher the MSOAs deprivation score, the lower its male life expectancy. The strength of the relationship is similar to that seen for the local authority districts (Pearson R coeff = -0.80, p<0.001) and its gradient is slightly steeper. For females the strength of the correlation is not as great (Pearson R coeff = -0.61, p<0.001) and the gradient less steep than for males. This reflects the less polarised distribution seen in the rural areas in the maps.

Figure 7.13: Male life expectancy vs. IMD 2010 by MSOA, West Midlands 2008-10



Source: Health profiles – local health, Network of Public Health Observatories; Indices of Deprivation 2010, Department for Communities and Local Government.

7.9 Are variations in life expectancy in small areas meaningful?

An important issue when describing the variation in life expectancy in small areas is the robustness of the life expectancy estimates, i.e. are the life expectancies calculated from the observed mortality rates a true reflection of the underlying mortality risks. As the populations under consideration become smaller the number of deaths observed become fewer and the relative effect of chance on the number of deaths becomes greater. There is a danger that we are merely mapping random variations, or statistical noise, rather than true differences in risk. The uncertainty in a life expectancy estimate is quantified by its 95% confidence interval – this is a range of values which has a 95% probability of including the true underlying life expectancy. For the MSOAs in the West Midlands the width of the confidence interval around the life expectancy estimate is on average +/- 2.2 years for both males and females. This confidence interval can be used to assess whether a MSOA's life expectancy is statistically significantly different from that of the regional average. If the confidence interval does not overlap the regional figure we can say that the difference is unlikely (less than 1 chance in 20) to have occurred by chance.

Figure 7.14 and Figure 7.15 map the statistical significance of the MSOA life expectancies for males and females respectively. For male life expectancy approximately one half of the MSOAs have values that are statistically significantly different from the regional MSOA average. These are split evenly between those that have higher life expectancies and those that have lower. For females life expectancy the proportion of MSOAs which differ significantly from the average is lower at around 38%. Again the split between high and low life expectancies is more or less even.

For both males and females the significantly low life expectancies are concentrated in the urban MSOAs and the significantly high ones in the suburban and rural MSOAs.

These figures demonstrate that using 5 years of mortality data at the MSOA level gives a reasonable ability to differentiate true variations in the life expectancy over and above that caused by chance.

7.10 Measuring inequalities in small area life expectancy

In the November 2012 update to the Public Health Outcome Framework three indicators were specified for with the purpose of measuring inequalities in the overarching life expectancy at birth indicator. [4]

These are:

Indicator 0.2i: Slope index of inequality (SII) in life expectancy at birth based on national deprivation deciles of Lower Super Output Areas (LSOAs) within England [National level].

Indicator 0.2ii: Number of upper tier local authorities for which the local SII in life expectancy (as defined in 0.2.iii) has decreased [National level].

Indicator 0.2iii: SII in life expectancy at birth within each English upper tier local authority, based on local deprivation deciles of LSOAs [LA level].

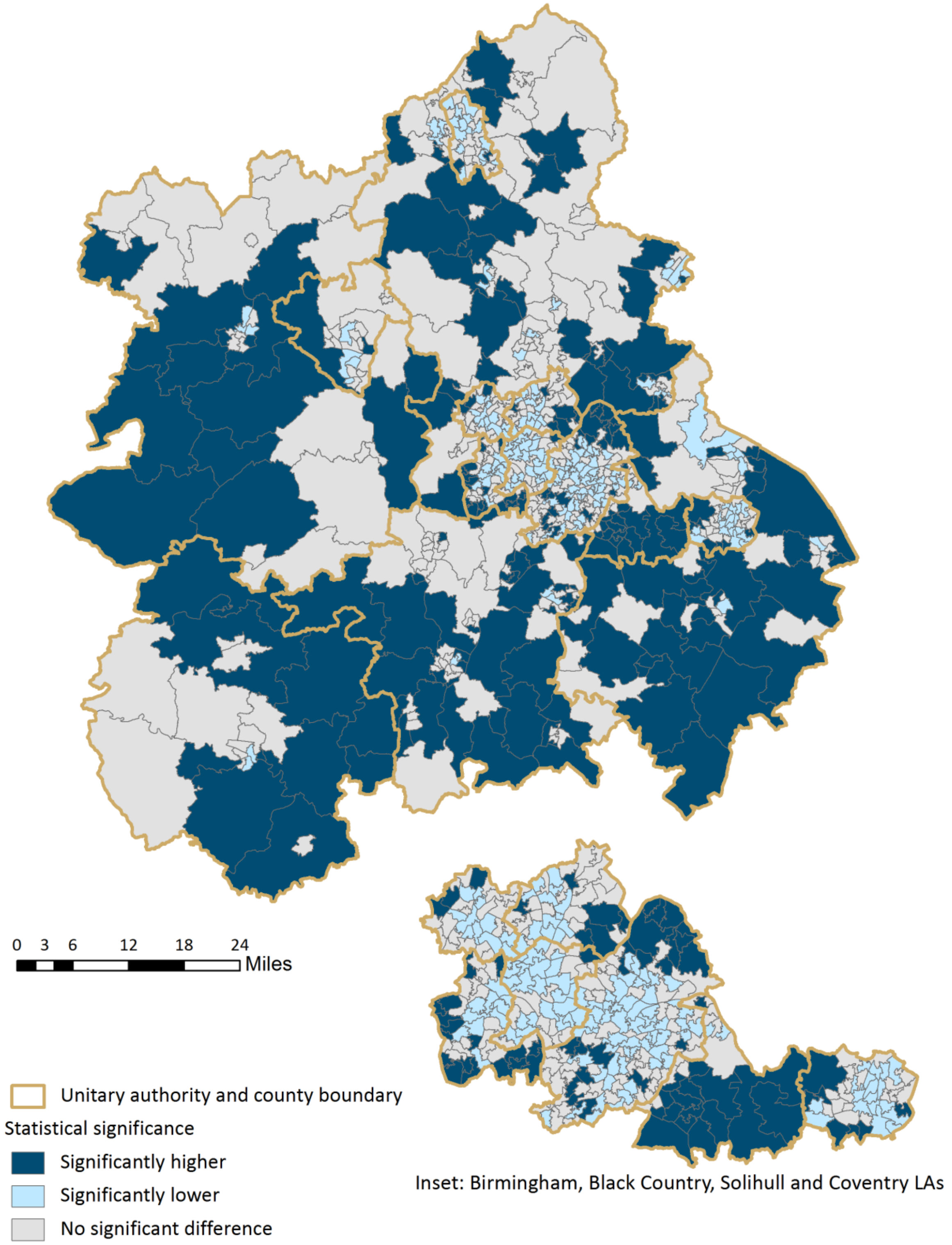
The SII was developed in 2004 by Low and Low as a method for summarising the absolute health gap across different deprivation status groups.[14] The method was recommended by APHO for use in a life expectancy at birth inequalities indicator at the Primary Care Trust level within the World Class Commissioning Assurance Framework.[15] The PHOF indicator applies the same method at the upper-tier local authority level (indicators 0.2ii and 0.2iii) and national level (indicator 0.2i).

The SII for a local authority is calculated by grouping the LSOAs within it into deciles based on the LSOAs' IMD scores. These deciles are locally allocated, i.e. they are calculated from just the LSOAs in the authority, and are not based on regional or national deciles. For each decile the overall life expectancy for the aggregated LSOAs is calculated using the most recent five years of data available. The life expectancies are plotted against the population weighted deprivation deciles and a regression line fitted. The slope of this line is used to quantify the absolute difference in life expectancy between the extreme ends of the authority's deprivation scale.

Table 7.4 presents SII for male and female life expectancy at birth for the upper-tier local tier local authorities in the West Midlands, published by the Network of Public Health Observatories.[16] For males, the absolute inequality in life expectancy between the most and least deprived within an authority ranges from 4.8 years in Herefordshire to 11.7 years in Coventry. Birmingham, Walsall and Solihull all have ranges over 10 years in width. The observation for Solihull is particularly noteworthy as this authority has the highest male life expectancy in the region in 2008-10. It shows that even within areas that are relatively healthy as a whole there may be hidden inequalities.

The index values for female life expectancy are generally smaller than those for males, ranging from 2.8 years in Telford and Wrekin to 10.3 years in Solihull. This Solihull figure is an outlier, the next largest female SII being 7.9 years in Coventry. These observations mirrors those made above where the gradient of the relationship between the MSOA life expectancies and deprivation was less steep for females than for males.

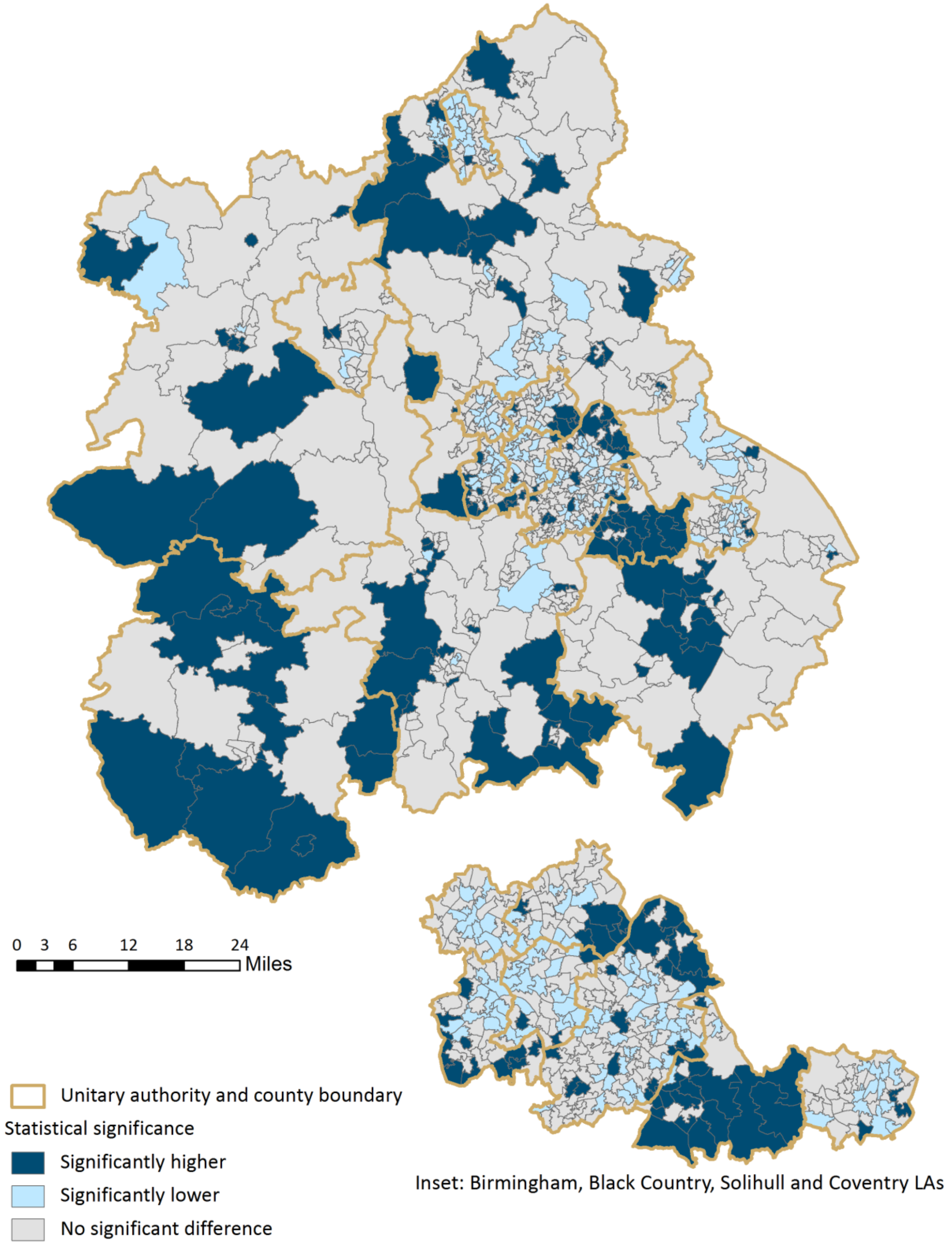
Figure 7.14: Statistically significant male life expectancy at birth by MSOA, West Midlands 2006-10



Source:
Health profiles – local health,
Department of Health / Network of Public Health Observatories

Produced by WMCSU, University of Birmingham.

Figure 7.15: Statistically significant female life expectancy at birth by MSOA, West Midlands 2006-10



Source:
Health profiles – local health,
Department of Health / Network of Public Health Observatories

Produced by WMCSU, University of Birmingham.

Table 7.4: Slope Index of Inequality for life expectancy at birth by upper-tier local authority and gender, West Midlands 2006-10

ONS Area code	LA Name	Males			Females		
		SII	95% confidence limits		SII	95% confidence limits	
			Lower	*Upper*		Lower	Upper
E06000019	Herefordshire, County of UA	4.8	*1.1*	*8.4*	4.1	*1.0*	*7.2*
E06000051	Shropshire UA	6.7	*4.2*	*9.1*	4.3	*2.8*	*5.8*
E06000021	Stoke-on-Trent UA	8.2	*5.7*	*10.7*	4.7	*1.0*	*8.5*
E06000020	Telford and Wrekin UA	7.0	*4.3*	*9.6*	2.8	*-1.3*	*6.8*
E10000028	Staffordshire	8.0	*6.9*	*9.1*	6.2	*4.0*	*8.5*
E10000031	Warwickshire	8.3	*6.0*	*10.6*	7.6	*5.2*	*9.9*
E10000034	Worcestershire	7.8	*5.6*	*10.0*	5.4	*4.0*	*6.8*
E08000025	Birmingham	10.8	*9.2*	*12.5*	5.9	*4.3*	*7.5*
E08000026	Coventry	11.7	*9.8*	*13.7*	7.9	*5.1*	*10.8*
E08000027	Dudley	9.9	*8.7*	*11.0*	5.7	*3.4*	*8.1*
E08000028	Sandwell	9.6	*7.5*	*11.8*	6.4	*4.3*	*8.6*
E08000029	Solihull	10.8	*8.3*	*13.2*	10.3	*7.7*	*12.8*
E08000030	Walsall	10.8	*8.9*	*12.6*	6.9	*3.2*	*10.5*
E08000031	Wolverhampton	9.7	*7.4*	*11.9*	5.8	*2.8*	*8.8*

Source: Health Inequality Indicators, Network of Public Health Observatories.

The Public Health Observatories also publish SII data for local authority districts and life expectancy values for each deprivation decile within each local authority district.[16]

The PHOF does not specify exactly how improvements in the SII indicators will be assessed. It can be seen from Table 7.4 that the confidence intervals for the SII scores can be quite wide, even with five years data. It will be difficult to judge whether any increases or decreases in the scores are actually significant, especially if comparing scores for overlapping rolling time periods.

7.11 Life expectancy by electoral ward in Warwickshire

This section describes a more focussed look at the variation in life expectancy at small areas within a particular upper-tier local authority – in this case the county of Warwickshire.

At a county level, all cause mortality SMRs in Warwickshire, both for all ages, at 97.8 and for those aged under 75 at 92.3, are statistically significantly lower than the England index value of 100.[9]

Similarly, life expectancy at birth at 78.8 years for males and 82.6 years for females are both statistically significantly better than the England figures of 78.3 years and 82.3 years respectively.[9]

To contrast with the MSOA analyses presented above for the West Midlands as a whole, the unit of analysis used here within Warwickshire is the electoral ward. There are 105 electoral wards within Warwickshire. In comparison there are 66 MSOAs and 339 LSOAs.

At ward level, life expectancy at birth shows considerably more variation than it does at local authority level. For example, male life expectancy at birth 2006-10, ranges from a low of 72.0 years in Abbey ward in Nuneaton up to a high of 82.7 years in Cubbington, Radford and Stoneleigh wards – a variation of 10.7 years as opposed to 2.8 years at local authority level in Warwickshire (Figure 7.16, Table 7.5).

Although, for females, overall life expectancy is greater than for males there is still a considerable difference across the county, ranging from 78.4 years in Abbey ward in Nuneaton to 87.8 years in Park Hill ward in Kenilworth (Figure 7.17).

Table 7.5: Life expectancy at birth by county district and gender, Warwickshire 2006-10

County District	Males	Females
North Warwickshire	77.9	81.7
Nuneaton & Bedworth	77.1	81.3
Rugby	79.0	82.4
Stratford	79.9	83.1
Warwick	79.8	83.9
Warwickshire County	**78.8**	**82.6**

Source: Health Profiles – Local Health, Network of Public Health Observatories.

A look at the statistical significance of the electoral ward level life expectancy data, against the county average, paints a largely similar picture of the county. For example, the 4 wards with the lowest male life expectancy are all in Nuneaton and Bedworth Borough (marked in red in Figure 7.18) and have life expectancies that are statistically significantly lower than the county average of 78.8 years at birth. Eight of the nine wards with statistically higher male life expectancies than the county average, have expectancies that are in the highest banding (marked in green in Figure 7.18). For females, the picture is broadly similar to that for males (Figure 7.19).

Figure 7.16: Male life expectancy at birth by electoral ward, Warwickshire 2006-10

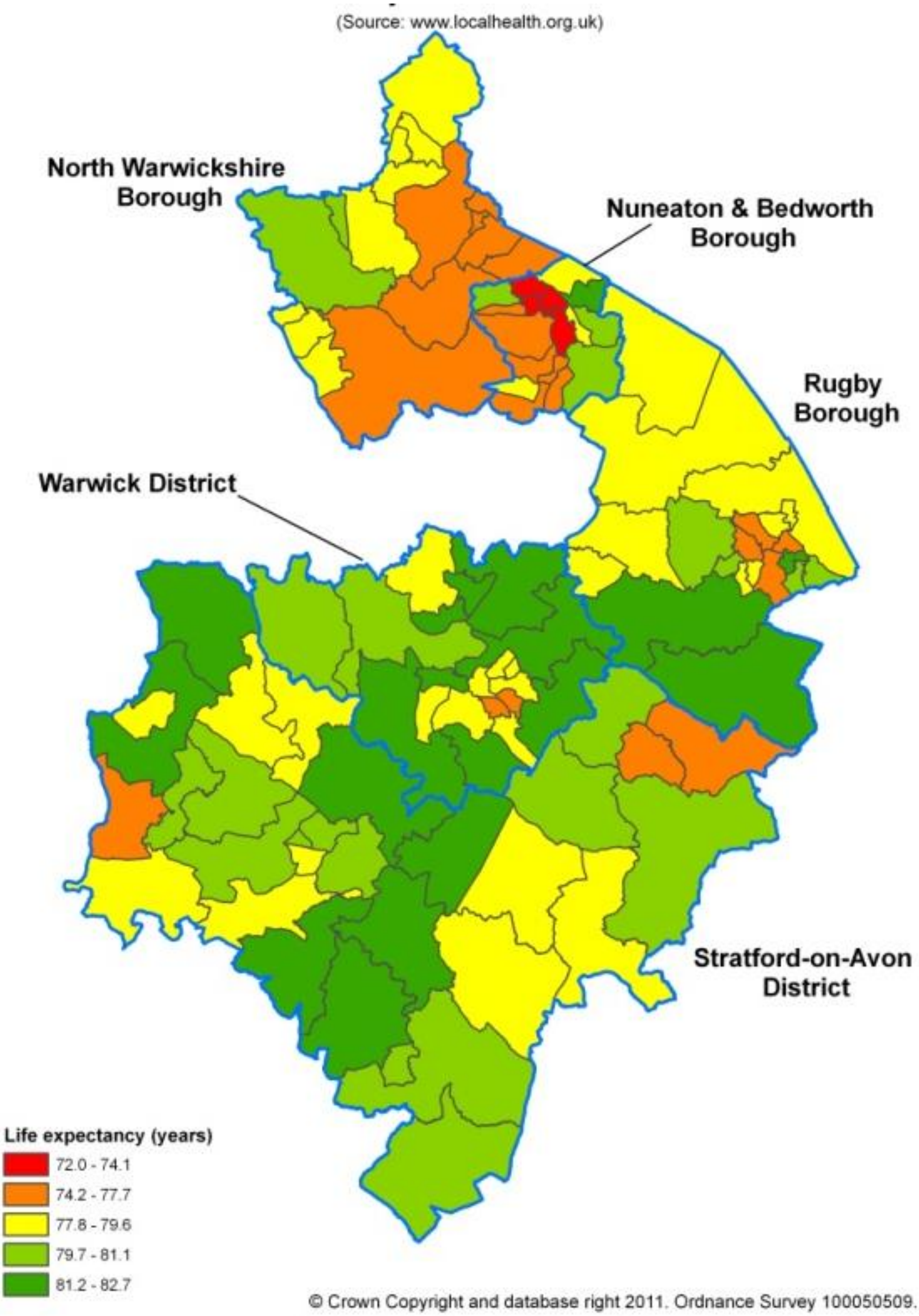


Figure 7.17: Female life expectancy at birth by electoral ward, Warwickshire 2006-10

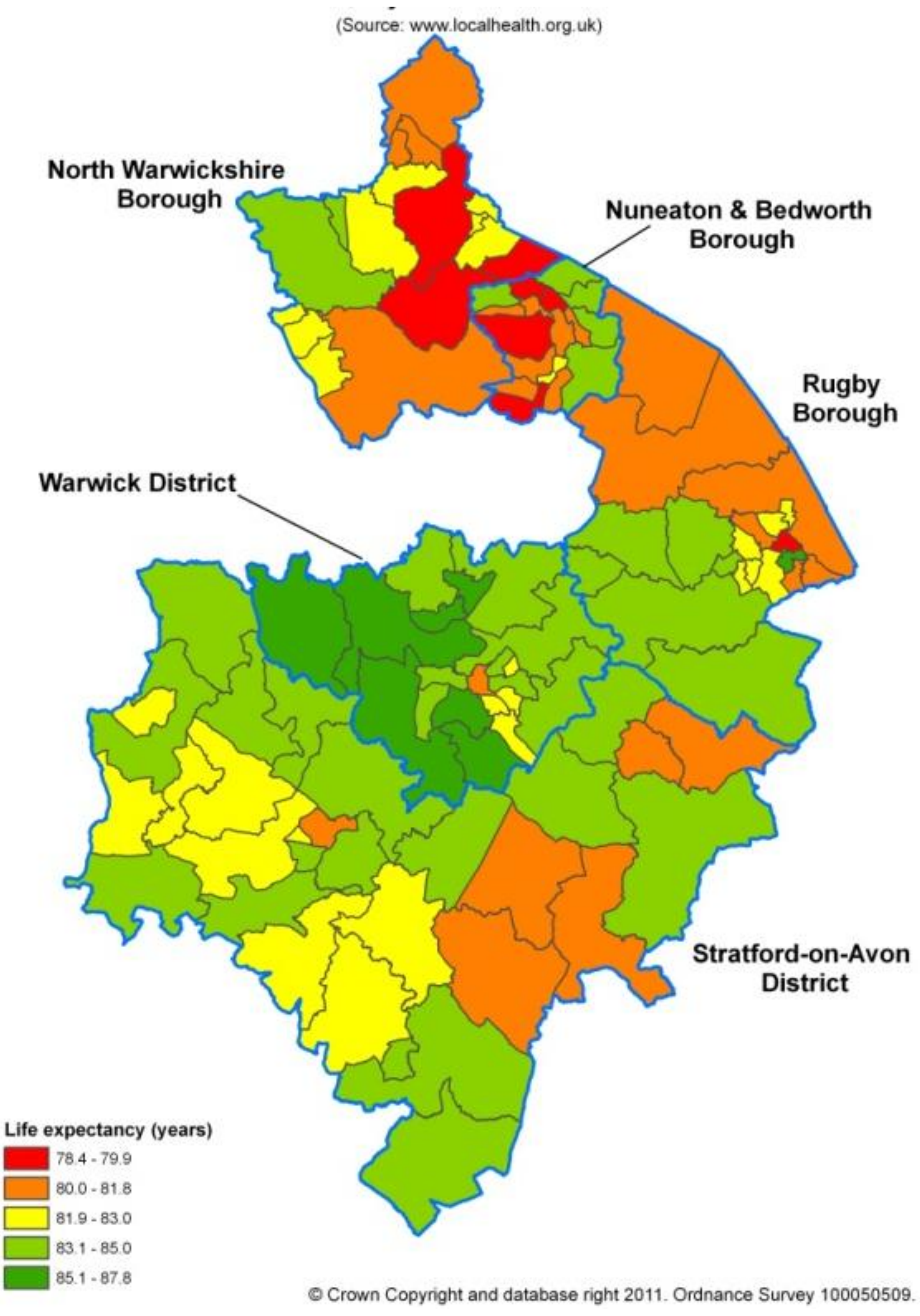


Figure 7.18: Statistical significance of male life expectancy by electoral ward, Warwickshire 2006-10

(Source: www.localhealth.org.uk)

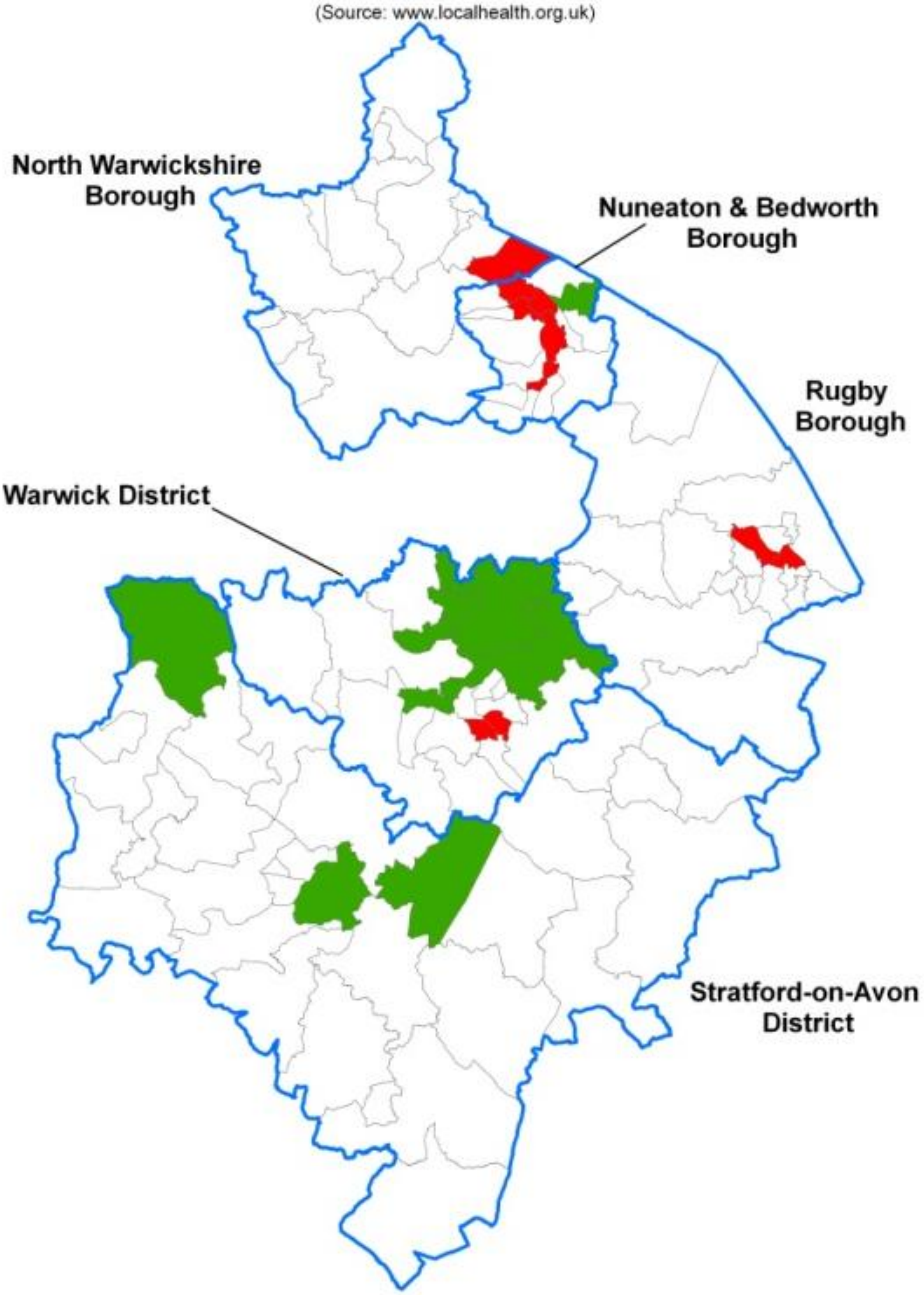


Figure 7.19: Statistical significance of female life expectancy at birth by electoral ward, Warwickshire 2006-10

(Source: www.localhealth.org.uk)

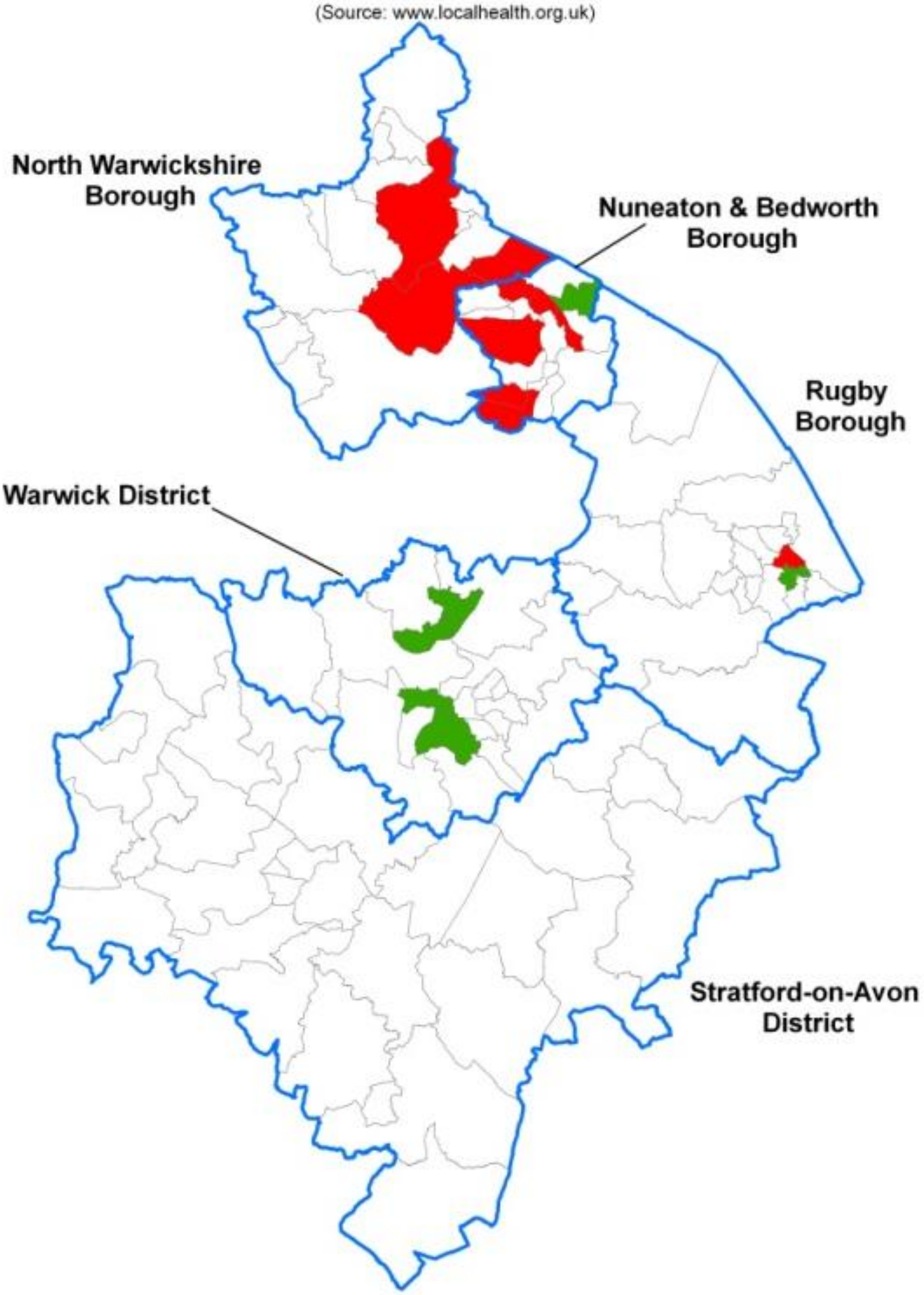
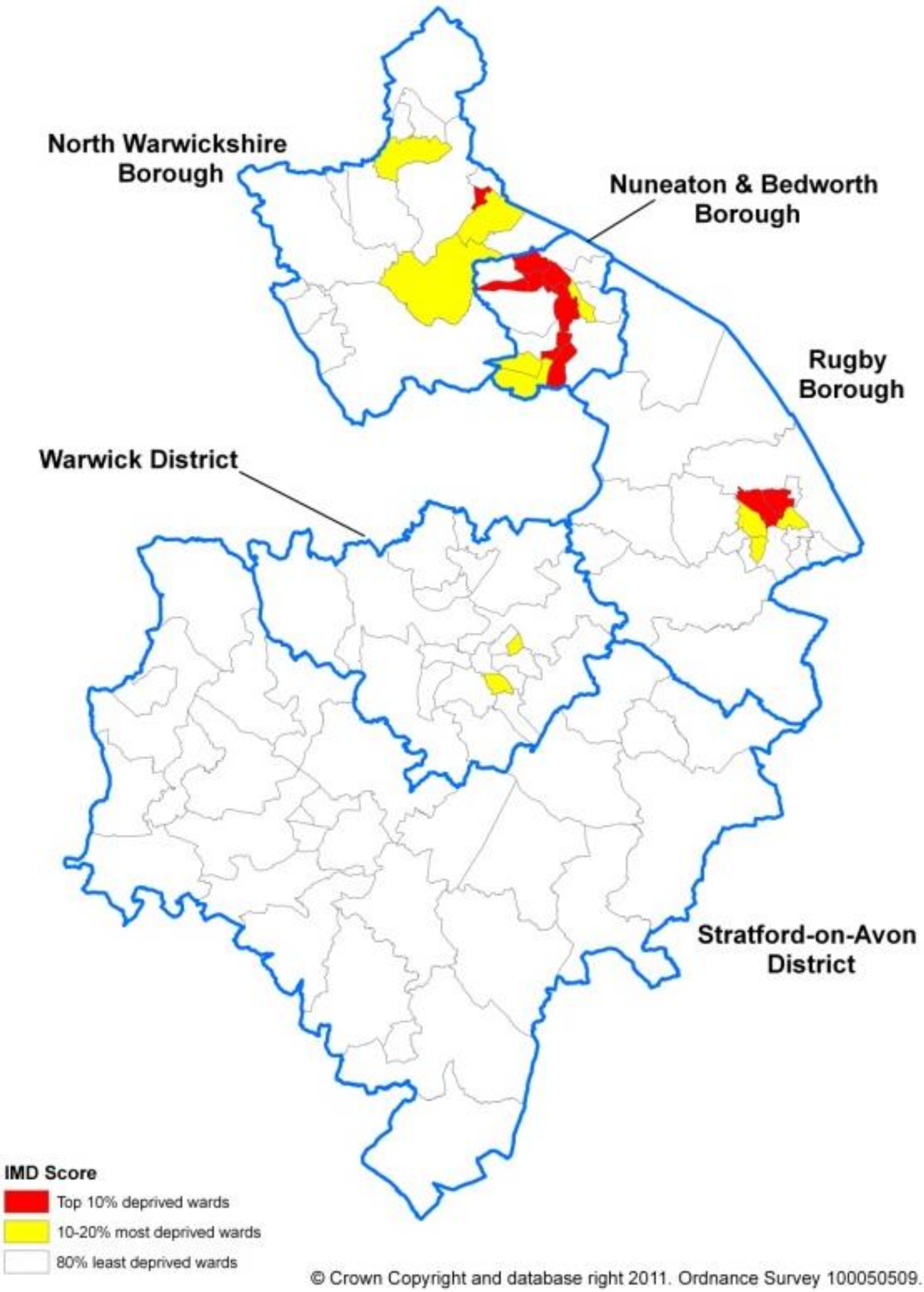


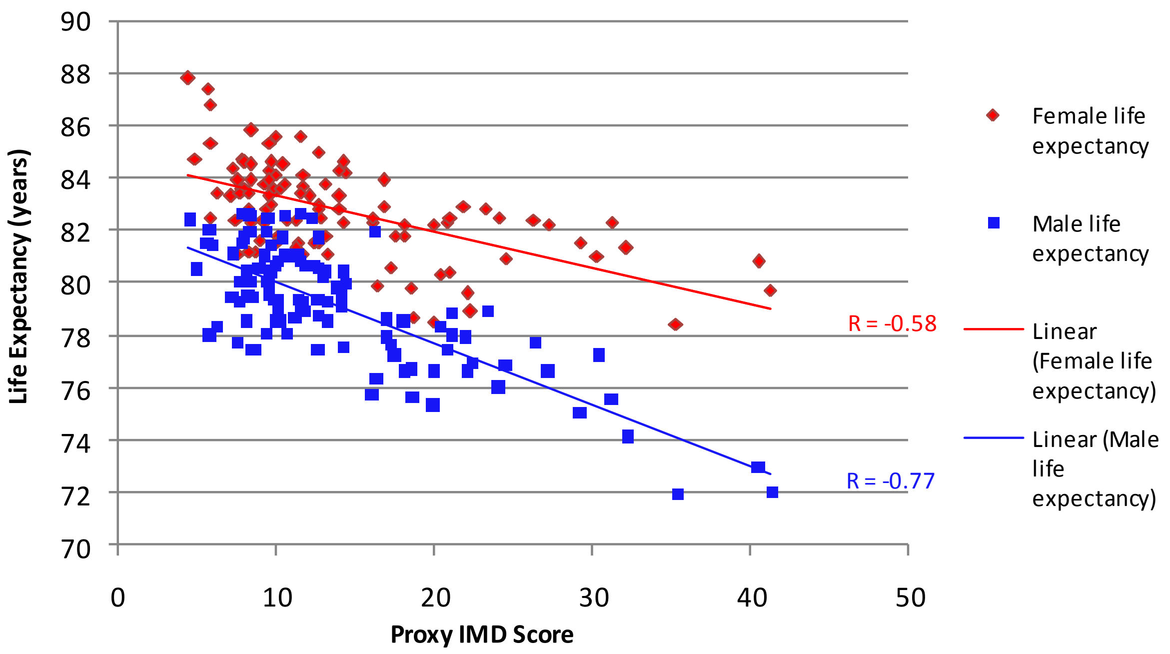
Figure 7.20: Most deprived electoral wards in Warwickshire based on proxy Index of Multiple Deprivation 2010 scores



The relationship between deprivation and life expectancy was considered by assessing the degree of correlation between the two variables. The Index of Multiple Deprivation (IMD) 2010 is recognised in England as a national measure of deprivation. IMD data is published at LSOA level, therefore to enable analysis to be made against the electoral ward level life expectancies, the LSOA IMD scores must be combined (using population-weighting) to give proxy electoral ward level deprivation scores. When these proxy IMD scores are mapped (Figure 7.20) it is clear that deprivation is greatest in the northern areas of the county, particularly in Nuneaton and Bedworth Borough. However, there are also more localised pockets of deprivation within Rugby Borough and Warwick District.

Male and female life expectancy can be charted and correlated against electoral ward level proxy IMD scores, as shown in Figure 7.21. For males, the Pearson correlation coefficient (R) value of -0.77 ($p<0.001$) is indicative of a strong negative relationship between life expectancy and deprivation score, i.e. more deprived electoral wards have lower life expectancies. For females a similar negative relationship is seen but the correlation is not quite as strong (Pearson R = -0.58, $p<0.001$). Comparison of the regression lines shows that the gradient of the male life expectancy relationship with deprivation is steeper than that of female life expectancy. These observations are consistent with those seen earlier at MSOA level across the whole of the West Midlands.

Figure 7.21: Life expectancy at birth vs. proxy IMD scores by electoral ward and gender, Warwickshire 2006-10



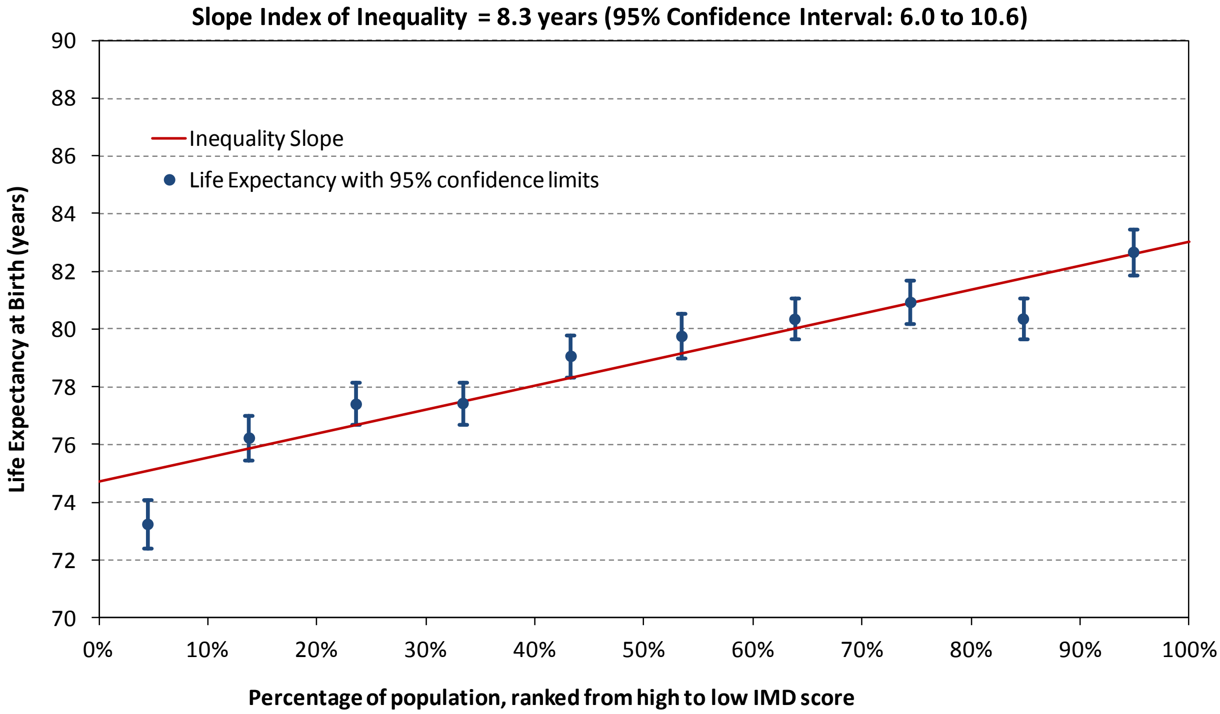
Source: Health Profiles – Local Profiles, Network of Public Health Observatories.

The SEPHO technical report on calculating small area life expectancy highlighted the potential effect that concentrations of nursing homes (which hold a particularly morbid population) in particular electoral wards might have.[1] With an ageing population in Warwickshire, this possibility of electoral ward level life expectancy being affected by care/nursing homes has been investigated. The number of beds, per home, varies from 2 to 254, hence the number of care/nursing establishments would not be an appropriate measure to quantify he possible effect, as it would take no account of the enormous variation in home sizes. Within the county, there are 195 homes with a total of nearly 4,500 beds distributed across 69 of the 105 wards. Instead the number of nursing home beds in each ward has been used.

Correlation coefficients were calculated and analysed for life expectancy at birth against the number of care home beds by electoral ward for both males and females within the county. Surprisingly, there was virtually no correlation for either males or females. The Pearson correlation coefficient (R) value for males for the 69 wards with care homes was 0.00. For all 105 Warwickshire wards the value was -0.08. Coefficients for females are negative, but fractionally greater, at -0.08 and -0.16 respectively which again suggests there is very little correlation between the numbers of care home beds and electoral ward level life expectancy.

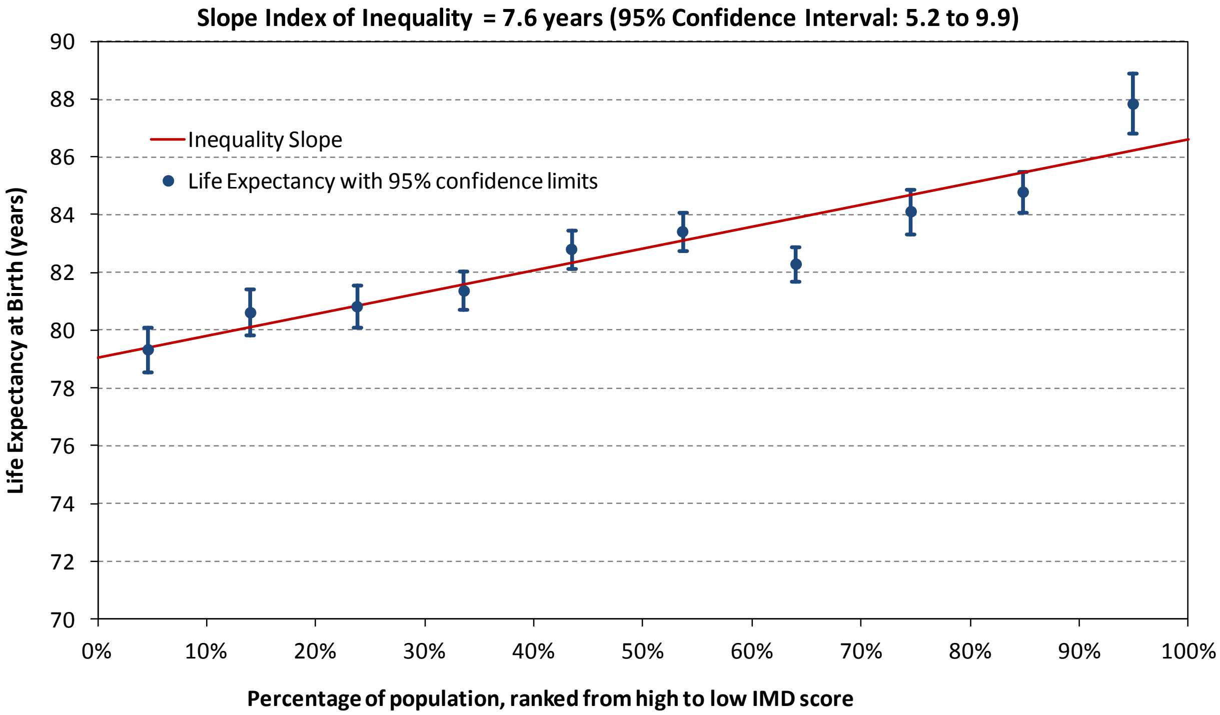
Figure 7.22 and Figure 7.23 show the SII for the county of Warwickshire for males and females respectively and Table 7.6 presents the life expectancy values for each of the LSOA based deprivation deciles within the county. These show that there is a range in the male life expectancy of 8.3 years between the least and most deprived parts of the Warwickshire population. For females the range is 7.6 years.

Figure 7.22: Male life expectancy at birth by deprivation decile showing the Slope Index of Inequality, Warwickshire 2006-10



Source: Health Inequality Indicators, Network of Public Health Observatories.

Figure 7.23: Female life expectancy at birth by deprivation decile showing the Slope Index of Inequality, Warwickshire 2006-10



Source: Health Inequality Indicators, Network of Public Health Observatories.

Table 7.6: Life expectancy by deprivation decile by gender, Warwickshire 2006-10

Deprivation decile	Males				Females			
	Life Expectancy	95% confidence limits		Population	Life Expectancy	95% confidence limits		Population
		Lower	*Upper*			*Lower*	*Upper*	
1	73.3	*72.4*	*74.1*	23,400	4.1	*78.6*	*80.1*	24,700
2	76.2	*75.5*	*77.0*	25,600	4.3	*79.8*	*81.4*	25,800
3	77.4	*76.7*	*78.1*	26,000	4.7	*80.1*	*81.6*	26,700
4	77.4	*76.7*	*78.2*	25,500	2.8	*80.7*	*82.0*	25,900
5	79.1	*78.4*	*79.8*	26,600	6.2	*82.2*	*83.5*	27,000
6	79.8	*79.0*	*80.5*	26,900	7.6	*82.8*	*84.1*	27,700
7	80.4	*79.7*	*81.1*	27,600	5.4	*81.7*	*82.9*	28,100
8	80.9	*80.2*	*81.7*	28,200	5.9	*83.4*	*84.9*	28,500
9	80.4	*79.7*	*81.1*	26,100	7.9	*84.1*	*85.5*	26,700
10	82.7	*81.9*	*83.5*	27,100	5.7	*86.8*	*88.9*	27,500

Sources: Death registration data and mid-year population estimates, ONS; Indices of Deprivation 2010, Department of Communities and Local Government. Analysis carried out by LHO and EMPHO.

Source: Health Inequality Indicators, Network of Public Health Observatories.

7.12 Summary points

- Life expectancy is a high profile outcome indicator that needs to be monitored by Health and Wellbeing boards, including the assessment of within local authority inequality.
- Life expectancy in the West Midlands is continuing to improve but has remained persistently below the national average for both men and women.
- There is a range of life expectancy between the highest and lowest local authority districts in the West Midlands of approximately 5 years for males and 4 years for females.
- It is possible to show significant variation in life expectancy at the electoral ward and MSOA level and between LSOA deprivation deciles within local authorities using 5-years of mortality data.
- At local authority, electoral ward and MSOA level there is a strong association between life expectancy and deprivation with people in more deprived areas living shorter lives. The association is stronger and the relationship steeper for males than for females.
- Wide inequalities in life expectancy exist within even those local authorities that have high life expectancies overall.
- Slope Index of Inequality values describing the inequality in life expectancy across the deprivation gradient within each upper-tier local authority range from 4.8 to 11.7 years for males and 2.8 to 10.3 years for females.
- Measuring the change in the SII over time in individual local authorities will be problematic as the confidence intervals are wide and long time periods are needed. Changes from one year to the next will be small and very difficult to detect in a robust way.

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15. Fryers P, Fitzpatrick J. *World Class Commissioning Assurance Framework – Recommendations for a health inequalities indicator*. APHO, 2009.

16. Network of Public Health Observatories *Health inequality indicators for local authorities and primary care organisations* [online]. Available at: http://www.apho.org.uk/RESOURCE/VIEW.ASPX?RID=110504

7.14 Further information

In addition to the references and resources cited above the reader may find the following resources of use:

- The Neighbourhood Statistics web site provides an introduction and data files and look-up tables for small area geographies, classifications and conversions.
  Neighbourhood Statistics Geography. Available at: http://www.neighbourhood.statistics.gov.uk/dissemination/Info.do?page=nessgeography/ness-geography.htm

- Collated by the Public Health Observatories the Public Health Outcomes tool currently presents data for available indicators at England and upper tier local authority levels.
  Public Health England. *Public Health Outcomes Framework Data Tool* [online]. Available at: http://www.phoutcomes.info/

- The South East Public Health Observatory (SEPHO) life expectancy calculator enables users with death and population data for small areas to calculate life expectancy figures.

SEPHO. *Life expectancy calculator: LA and ward level* [online]. Available at: http://www.sepho.org.uk/ViewResource.aspx?id=8943

- An APHO technical briefing assesses the types of small area data available to analysts and local policy makers and describes a range of analytical and presentational methods that may be used and some of the analytical issues that may be encountered.
  Croft S, Heard H, Mills P. *Technical briefing 6: Using small area data in public health intelligence*. APHO, 2009. Available at: http://www.apho.org.uk/resource/item.aspx?RID=74894

7.15 Authors

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Version 1.0
18 March 2013

PRESENTATION METHODS CHAPTERS

8. DIFFUSION BASED MAPPING TECHNIQUES: SEEING WEST MIDLANDS DEMOGRAPHY AND HEALTH IN A NEW WAY

8.1 Summary

The presentation of certain types of information on maps where shape and size is defined solely by land surface area has the potential to mislead the viewer, particularly where very different population densities exist. International and national work has demonstrated the value of density equalizing cartograms in correcting for this visual bias whilst still retaining immediate accessibility to the untrained viewer.

We discuss the development of a West Midlands density equalizing projection for local authority areas, and demonstrate variations of this method for common demographic variables and determinants of health. We provide a description of the method with the intention of encouraging local use of similar techniques, and further innovation in the geographical display of data for the West Midlands.

8.2 Introduction

Geographic Information System (GIS) techniques have become established as valuable tools in the communication of place-anchored data for both health and social care datasets. Providing sound principles are followed (Figure 8.1) large volumes of data can be concisely presented, made visually accessible, and used to identify differences and inequalities associated to place.

Figure 8.1: Relevant principles of good GIS usage

1. **Accurate raw data, including precise geolocation in standardised format**
2. **Appropriate choice of projection and mapping resources**
3. **Intelligent selection of class limits to categorise a colour representation**
4. **Selection of appropriate colour progression for continuous and discreet variable outcomes**
5. **Sufficient but not excessive groupings to achieve meaningful display whilst protecting individuals**

Health intelligence specialists in the United Kingdom have access to high quality, and freely available, raster and vector layers for use in producing GIS analysis, and maps now form a common part of many health intelligence products.

However, the complex geography of the United Kingdom, with areas of very high population density, interspersed by areas of low population rural landscapes, makes the fair presentation of spatial data difficult. As a familiar example, electoral maps of the United Kingdom and the United States often struggle to show apportionment of political preference, with rural areas that cover a large area implying one political persuasion dominates over an alternate party more favoured by the much smaller area inner city constituencies, when in fact voting numbers are much more balanced.

These problems also occur in the presentation of healthcare data. If raw numbers are presented on maps, the effect of population density is ignored, and larger areas receive undue attention. If standardised rates are used to produce choropleths (seeking to correct for variation attributed to known factors) the greater physical area of the less populated rural areas can lead the viewer to miss the relevance of the urban area rates which, although covering a much smaller area of the map, represent a far greater number of individuals experiencing that health outcomes. With either solution, comparison of rural and urban areas is difficult.

Cartograms are maps where the area of the shapes are not constrained or defined by land-surface area or exact geographical position and can be used in one form to standardise for the effect of density, whilst allowing the observer to more accurately weigh the information presented. For the production of these density-weighted cartograms, the relative size of different map areas is adjusted by a variable, allowing the shape itself to become the representation of this variable. In its simplest form, this can be an adjustment by population, allowing the map to become a representation not of surface area, but of population density. When applied well in healthcare, this has a particular value in expanding centres of dense urban population, to allow them to be fairly compared against their surrounding rural areas.

Developments in this method have been in progress for many years.[1,2] Very early examples made minimal attempt to maintain coherence to geography, or were based on their creators' subjective impression of how each piece of geography should be sized and arranged. Subsequent methods became more systematic, but relied on complex manual approaches, repeated over many iterations to produce a finished product. The advent of advanced computational techniques, and computers with sufficient processing power has greatly enhanced the production of cartograms, but there is an inherent tension between achieving a meaningful transformation whilst keeping a visually relevant display.

Dorling, one of the recent leaders in developing the cartogram method, described the ideal cartogram method, and this highlights the tension in producing a ‘good’ map; his recommendations are seen in Figure 8.2.

Dorling undertook work to attempt to meet these criteria, summarised initially in 1996.[3] It not only provides a historical overview of the development of the modern cartogram, but also developed the ‘cellular automata’ method, to produce more visually relevant displays of information. Dorling’s plain language description of this approach is to divide a map up into cells, and then iterate a process that allows ‘regions represented by too few cells … to gain cells from regions represented by too many’ until a steady state was reached.

This work remains under copyright, but the effect of this transformation on Great Britain can be seen in the paper by Gastner Newman 2004,[4] or by visiting
http://www.pnas.org/content/101/20/7499/F2.expansion.html

Dorling noted the challenge of reaching steady state without losing the familiarity of the base shapes, particularly at the corners of shapes, and in the context of the coastline or map boundary. He therefore also presented an alternative method, which discarded the attempt to maintain recognisable boundaries for individual geographies, and instead use a circle of proportional area, spatially positioned in a way to remain identifiable with knowledge of the background geography. If geographies were simply replaced with a proportional circle at their centroid, there would be overlap and gaps, so a process was used to achieve disambiguation between the circles, whilst retaining relative geography, and minimal separation. Local examples can be seen in Dorling's 'New Social Atlas of Britain' [5] and a dynamic example of a similar method in action for US states can be seen at Provotis,[6] an open source java implementation of many mapping techniques.

Figure 8.2: Dorling recommendations on cartogram technique

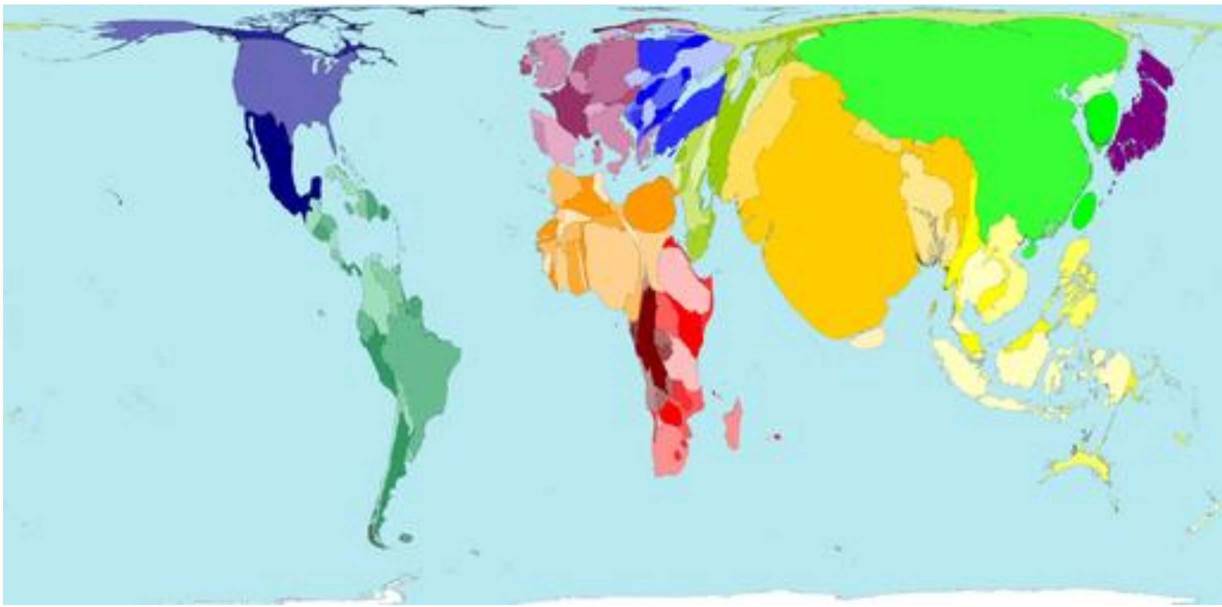
- **Be as simple and easy to understand and implement as possible**
- **Generate readable maps by minimizing the distortion of the shape of the geographical areas being mapped**
- **Preserves accuracy and maintains topological features**
- **Unambiguous**
- **Minimizes computational speed for the construction of new visualisations**
- **End result is independent of the initial projection being used**
- **End result looks aesthetically acceptable**
- **Has no overlapping regions or other more complex portrayal.**

Another key contribution to the recent rise in popularity of the cartogram is the work undertaken by Gastner and Newman.[4] Their work recognised the complexity of performing the transformation, and proposed a new mathematical theory to drive the shift. This involves the production of a 'diffusion cartogram', which uses a mathematical variation of a 'blur' on the population density to generate a flow of population from high density to low density areas. As population moves, it is allowed to take area and shape with it, whilst being 'floated' in a sea of surrounding uniform population to stop the map from equalising outwards from the margins. Gastner and Newman assert this method as a development as it allowed a more universal transformation of the map, as compared to Dorling's work which can consider the interplay of nearest neighbours only. (Other alternate solutions, including the work of Kocmoud and House,[7] have also been proposed)

Cartograms based on this method have been popularised in recent years through the 'Worldmapper' project, which offers global cartograms with geography modified by variables sourced from many different domains, including health, income, fuel, exploitation and food. Their base map, reproduced in Figure 8.3 shows a global projection modified to demonstrate population density. The Worldmapper project also produces country specific projections for population density, available through work from the University of Sheffield.[8] Closely allied to this work, and used in the production of the Worldmapper Cartograms, is the Gridded Population of the World produced by the NASA SocioEconomic Data and Applications Center (SEDAC) which provides international and national population synthetic estimates from available data sources.[9]

More recently, the Chief Medical Officer's report for England [10] used the Gastner Newman transformation based population density cartograms as the base layer for all mapping displays, as demonstrated in Figure 8.4.

Figure 8.3: Total population by country, 2002



The West Midlands has areas of very high and very low population density. Presentation of regional data therefore encounters the same problems as the national and international examples considered above. We therefore undertook work to develop a series of base geography cartograms for the West Midlands, whilst also seeking to identify a method that would be accessible and reproducible by local health intelligence teams for their own purposes, and stimulate future innovation in the presentation of West Midlands geography, demography and other health and social care outcomes.

8.3 Cartogram creation

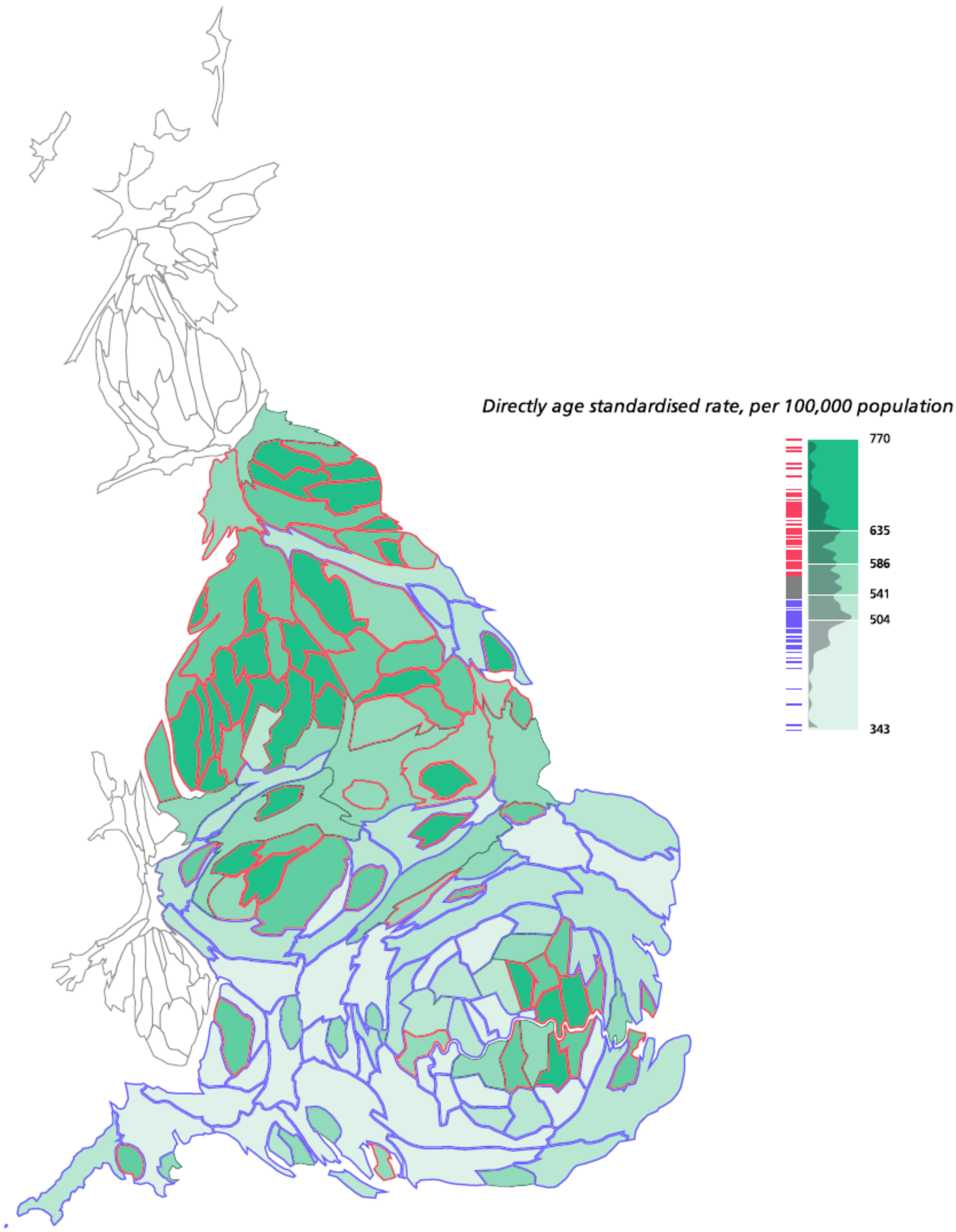
The cartograms were created using ArcMap 10 and an Environmental Systems Research Institute (ESRI) script written by Tom Gross[12] which replicates the Gastner and Newman methodology[4] and is available for free download.

Installation and utility information are detailed and proved very useful in setting up the correct layers to produce the required outputs. For example, cartograms must be generated from positive numeric attribute values and all outputs must be written to a geodatabase even though shapefiles can be used as inputs.

Production of cartograms relies on equal area based projection. The example data frame and data layers provided with the download is set up with projection GCS_WGS_1984. Experimentation with alternative projections such as, Albers conic, Lambert conformal conic, and Eckert IV produced good cartograms but their shapes were less appealing than those produced here using the default GCS_WGS_1984 projection.

The data frame and all layers were transformed to this projection. The polygon file for geographical boundaries was joined to the attribute dataset and then exported and re-imported as a new layer to the projection of the data frame.

Figure 8.4: Average annual mortality due to all causes by upper tier local authority, England, 2008-2010



Source: Death registrations and 2008 to 2010 population estimates, ONS. (Analysis by DH)

Excerpt from Report of the Chief Medical Officer [10]

The cartograms were produced using population data and additional attribute data has been displayed thematically. Data has been classified as five equal counts of areas, quintiles. This method does not account for the variation and distribution of the data itself therefore careful attention should be given to the thresholds when interpreting the data.

8.4 Alternate methods

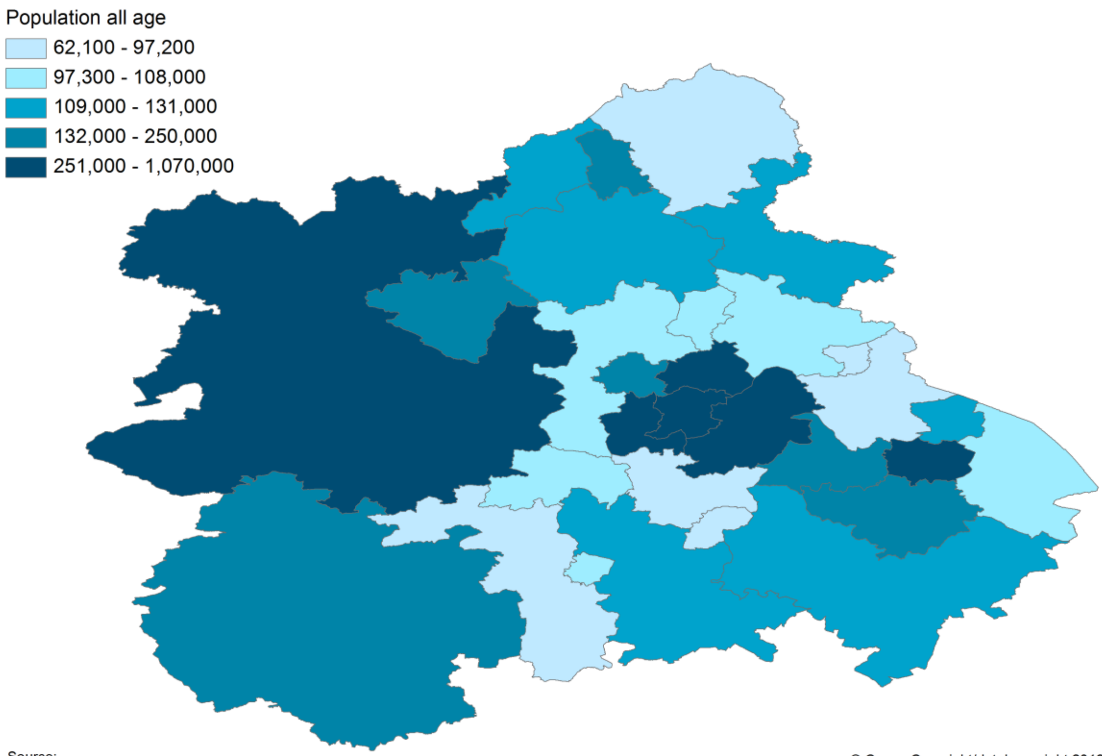
After experimentation with stock data provided by the tool, we found the ArcMap tool relatively easy and reliable to use. However, alternate solutions do exist. For users of MapInfo, and other GIS software, it would be possible to create cartograms using the free software application, ScapeToad.[13] A shapefile can be easily imported into this standalone application and although the production of the final cartogram takes some time and the default legend needs alteration, the final output is a good cartogram. ScapeToad also produces a set of statistics by which the accuracy and appropriateness of the final cartogram can be reviewed, a feature requiring manual calculations in ArcMap. ScapeToad was used in the production of the report of the Chief Medical Officer. [10]

We also identified the plug-in ‘Cartogram Creator’ available for use with the open source Quantum GIS software, downloadable from within the QGIS software. This plug-in also performed well, generating credible cartograms in relative short time frames. However, it lacks documentation, particularly around the selection of number of iterations required to achieve appropriate transformation.

8.5 West Midlands cartograms

Figure 8.5: West Midlands local authority boundaries projected with British National grid

Figure 8.6: Base geography: Midyear population estimates by local authority, all ages, West Midlands 2011.



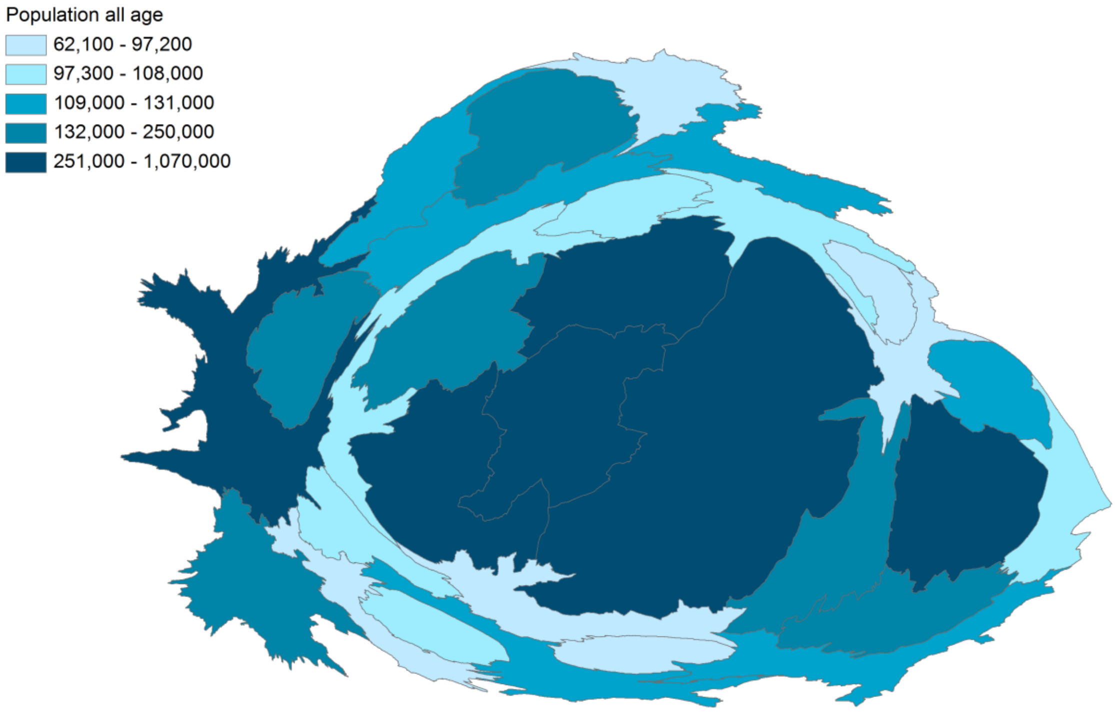
Source:
Compendium of Population Health Indicators, NHS Information Centre

Produced by WMCSU, University of Birmingham.

The choropleth base map of the West Midlands (Figure 8.6) demonstrates the complexity of interpreting information using land area based boundaries. The urban conurbation of Birmingham and the Black Country at the centre of the region is coloured to show a high population, as is Coventry. However, Shropshire is also shaded to represent a similar population. An observer, without additional context, has no means of identifying where the population density lies. If population count were to be replaced with a health outcome, it is easy to see that the relatively small area of the central population could have its outcomes under represented on this map.

We used this projection as the base map to generate our population cartograms.

Figure 8.7: Population cartogram sized by: Midyear population estimates by local authority, all ages, West Midlands 2011

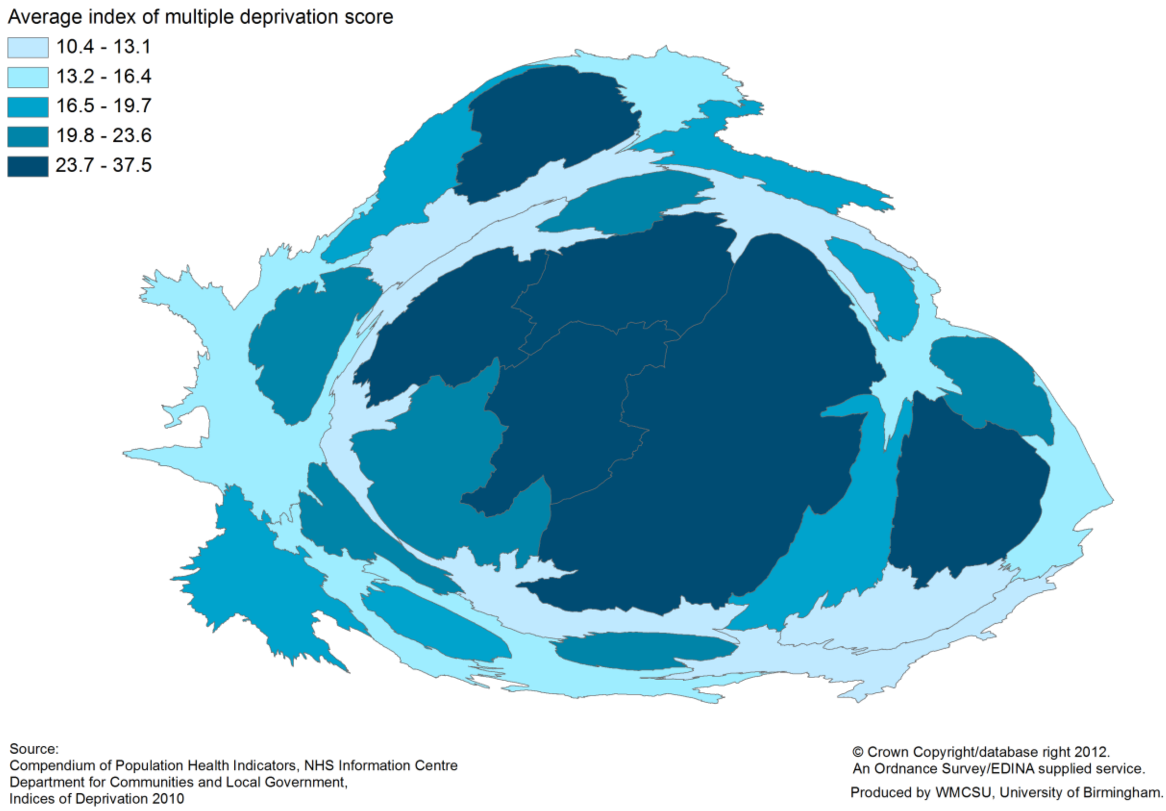


Source:
Compendium of Population Health Indicators, NHS Information Centre

Produced by WMCSU, University of Birmingham.

The population cartogram in Figure 8.7 demonstrates the base transformation applied to the West Midlands. The dense urban population has been used to expand shapes and give these areas greater significance. Shropshire has been reduced in size, but retains its relative position, and a surface area that still fairly represents its total population. The significance of the population of Coventry is now more clearly identifiable. The technique has also coped well with the other significant population centres, including Stoke, which although not in the highest population category, is now expanded to be more fairly visible.

Figure 8.8: Population cartogram sized by: Midyear population estimates by local authority, all ages, West Midlands 2011. Thematically representing: Index of multiple deprivation 2010 by local authority, West Midlands.



Using our base cartogram, we display in Figure 8.8 the IMD scores for each of the local authority regions. The significance of the high scores in the dense population regions would be visually underrepresented on a standard map, but here, the proportion of the West Midlands population exposed to high deprivation is fairly represented, and immediately obvious to the observer.

Figure 8.9: Population cartogram sized by: Midyear population estimates by local authority, all ages, West Midlands 2011. Thematically representing: Percentage population change from midyear 2011 to 2021

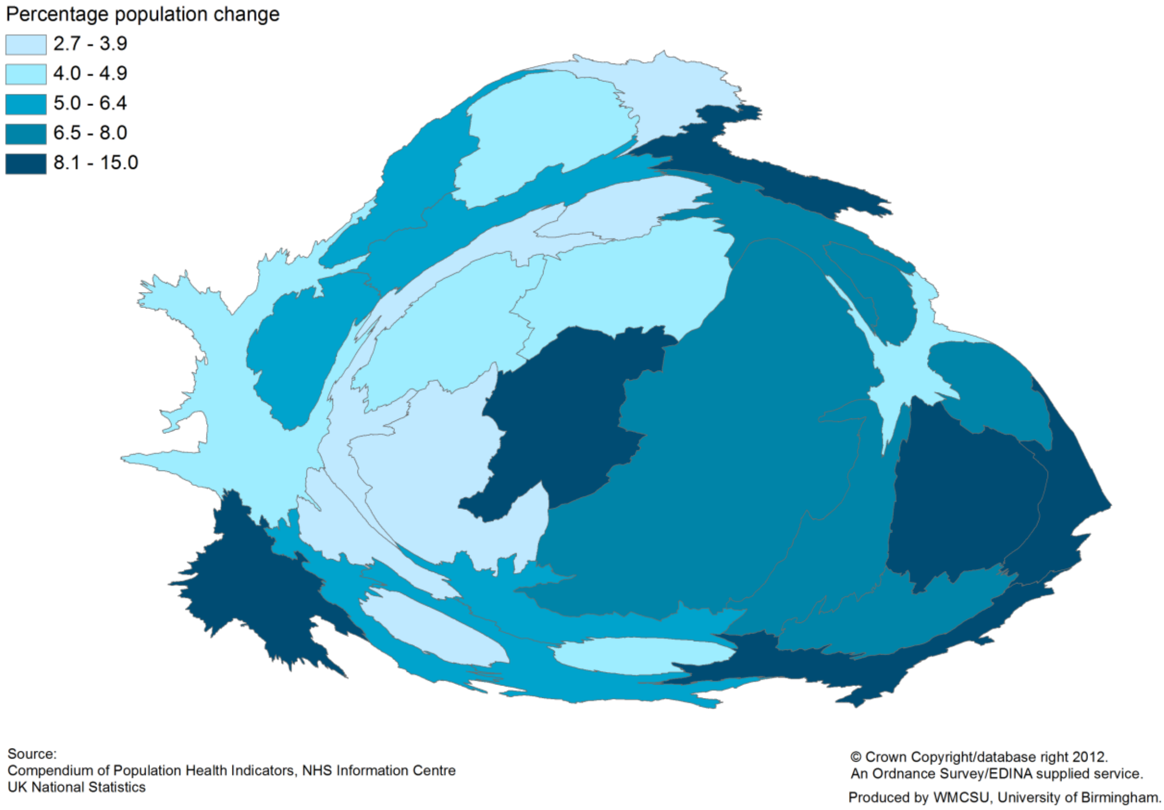
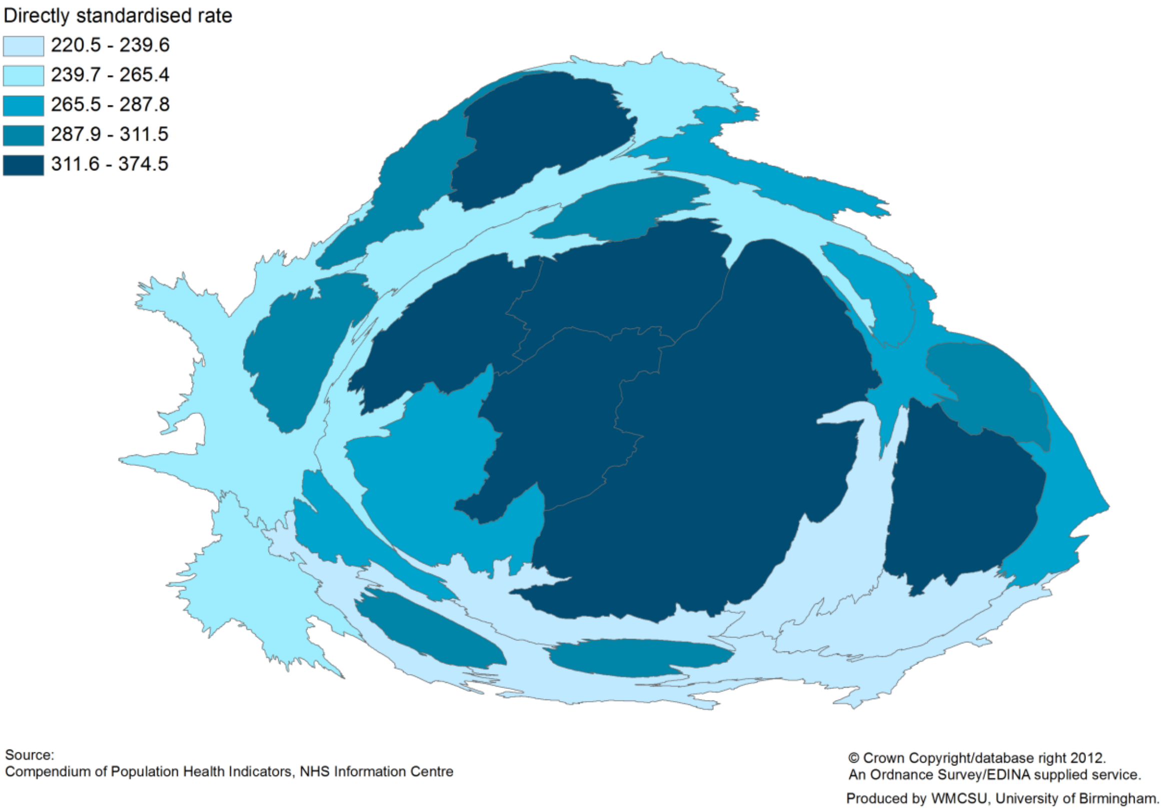


Figure 8.9 presents the forecast population change across the West Midlands between 2011 and 2021. Again, the population based cartogram allows the relative importance of this to be considered against a fair background of population density. For example, the high percentage forecast change in Herefordshire, if presented on a standard projection, could be over-represented against the equally significant changes forecast in some of the urban centres. The impact of a moderate change in a highly populous area is also more easily appreciated on this map.

Figure 8.10: Population cartogram sized by: Midyear population estimates by local authority, under 75, West Midlands 2011. Thematically representing: Mortality from all causes: directly standardised rate per 100,000 population by local authority, under 75, West Midlands 2008-10



The population based cartograms for all cause mortality in the under 75s presented in Figure 8.10, and the discreet male and female life expectancy cartograms presented in Figure 8.11 and Figure 8.12, demonstrate an important principle in the application of the transformation method. The base population used to transform the geography must be appropriate for the context being presented. In the life expectancy example, it is important that the transformation be driven by the male population only for Figure 8.11 and the female population only for Figure 8.12. Although the final transformations in these examples are almost equivalent, there are situations where this would not be the case, and the authors have noted examples of this mistake in well recognised literature.

Figure 8.11: Population cartogram sized by: Midyear population estimates by local authority, all ages, males, West Midlands 2011. Thematically representing: Male life expectancy at birth by local authority, West Midlands 2008-10.

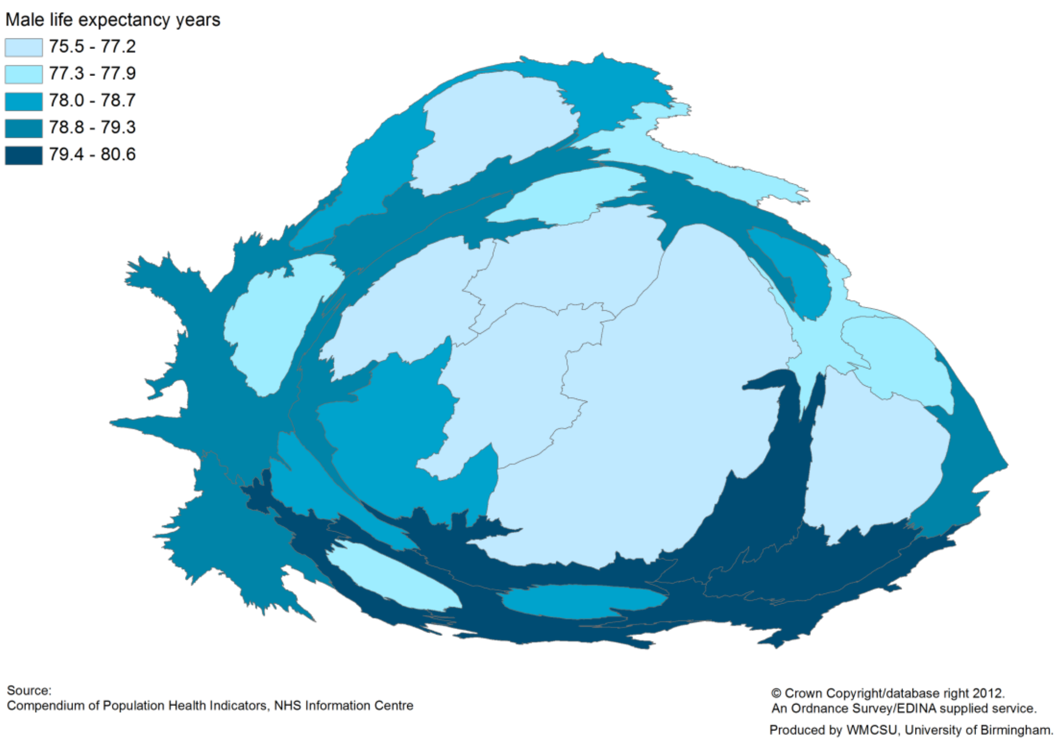


Figure 8.12: Population cartogram sized by: Midyear population estimates by local authority, all ages, females, West Midlands 2011. Thematically representing: Female life expectancy at birth by local authority, West Midlands 2008-10.

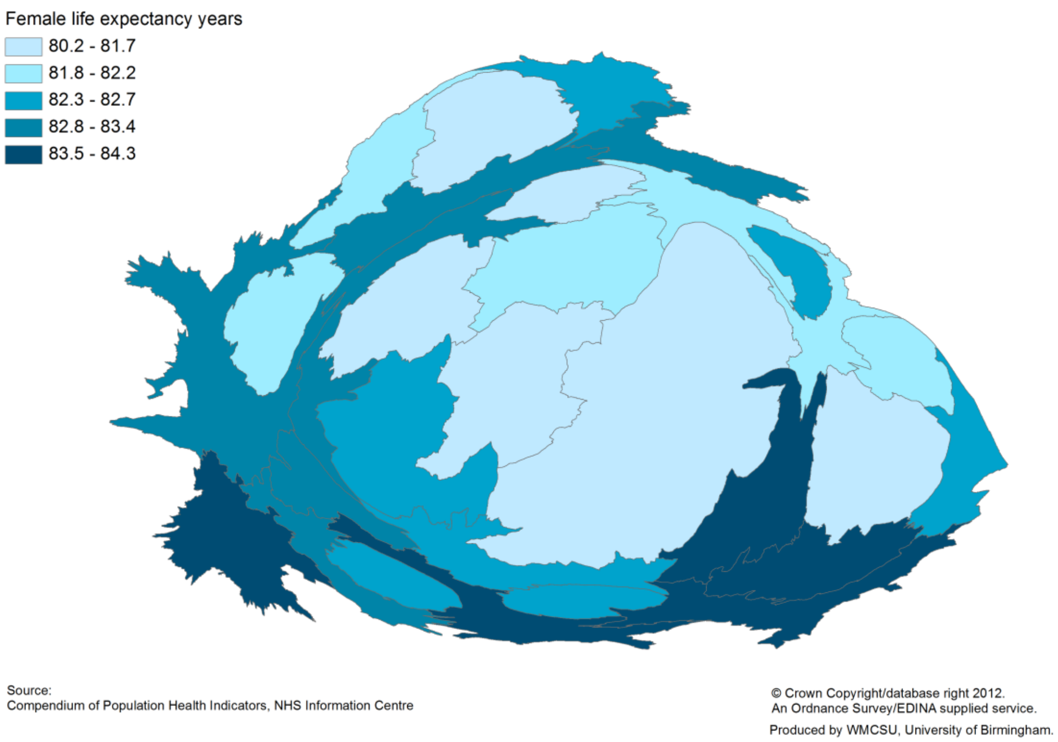
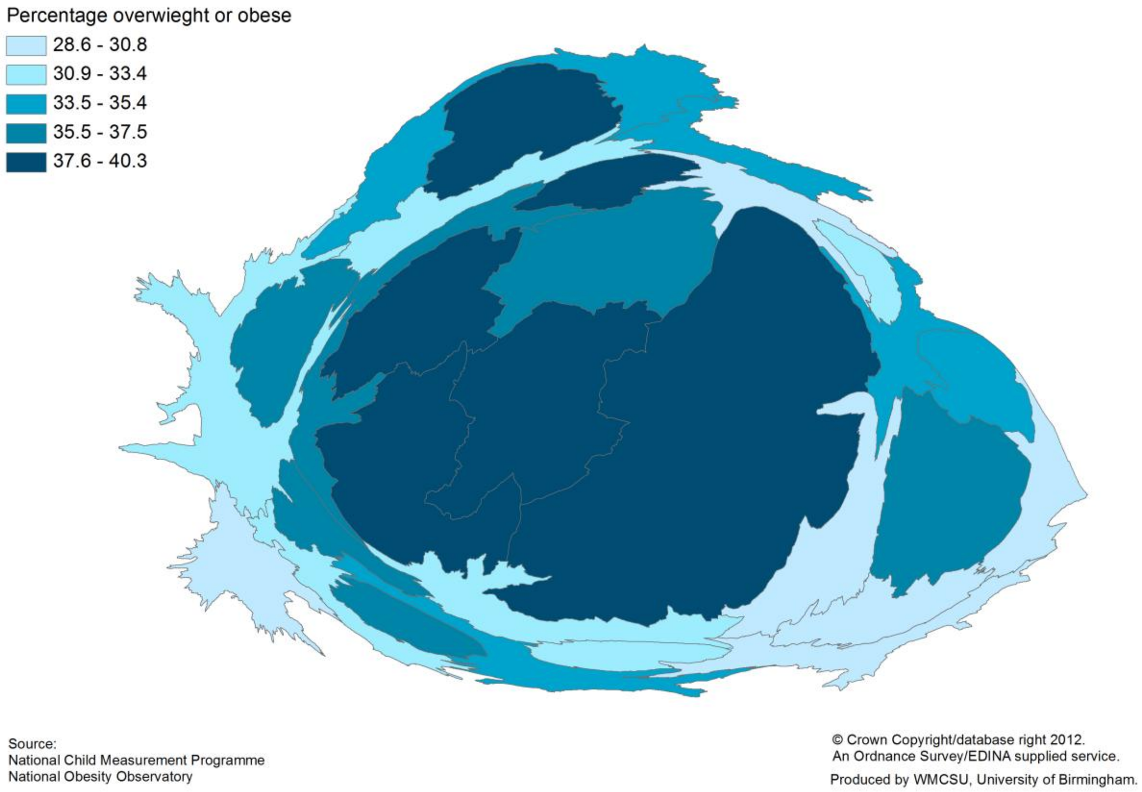


Figure 8.13: Obesity cartogram sized by: Number of children aged 10-11 overweight and obese 2011-12. Thematically representing: Percentage of children aged 10-11 overweight and obese by local authority, West Midlands, 2011-12.



The value used to drive the transformation does not necessarily need to be an overall population density function. In Figure 8.13 we used the number of overweight or obese year 6 children to make the transformation, to allow a transformation that represents the distribution of these individuals across the West Midlands, and highlighting the significant need in the urban centres.

Individual projects may demand different transformations, depending on the population group or outcome of interest.

8.6 Discussion and application

Our transformed maps allow the health outcomes of the more densely populated areas to be more fairly visualised. We established a new transformation for the West Midlands that standardises for the visual bias due to geographical area, and demonstrated the relevance of this in the display of common demographic and health variables. Appropriate use of this method should assist in regional comparisons, and has potential to also be used in smaller area geographies.

Despite the increasing popularity of value based cartograms, we found it difficult to identify a standardised method for the production of local context maps. We tested several software plug-ins, with very variable results. The approximately circular nature of the West Midlands, with a central density of population has ‘squeezed’ the physically peripheral local authority regions, creating greater distortion at the boundaries, and although the physical area of these shapes is representative, the ribbon effect of being spread at the boundaries has potential to visually over-moderate the significance of these regions. Sandwell’s central physical location within the boundary shape file has created what the authors have locally termed the ‘Mappa Mundi’ effect, where a centrally positioned shape tends to be preserved, giving the impression of its co-incidental representation of the centre of the world!

We were unable to identify a viable and locally reproducible bubble cartogram method, which has potential to avoid this failure.

In the context of Dorling’s recommendations for the ideal cartogram, we suggest our projections;

- ✓ Are simple and relatively easy to implement
- ✓ Generate maps that do preserve the majority of the West Midlands relationships
- – Have variable accuracy to topological features, with poor performance at the margins
- ✓ Have a single processing step, avoiding ambiguity compared to other software
- ✓ Can be performed on standard office computers
- ✘ Vary aesthetically in output based on initial projection chosen
- ✓ Have no overlapping regions

Our final solution is clearly only one part of developing more intelligent representations of geographical information for the West Midlands, but we believe it has demonstrated there is value in developing techniques for more intelligent data display.

8.7 Recommendations

In considering new mapping techniques, we make the following recommendations based on our own learning experience;

1. The use of cartograms should be considered wherever information mapping covers both densely and lightly populated regions, and where small areas physical area may mask greater need.
2. Rigorous methodology should be used in performing the transformations, particularly in the selection of projection, numerator, denominator and transformation technique.

3. The increasing use of cartograms in international and national publications requires that end users should be familiar with appraising cartograms, particularly in establishing if the presented information is a fair representation of the underlying information.

8.8 Further information

We commend to interested readers several sources of information and examples which inspired our development of alternative mapping solutions;

1. **How to Make Area Cartogram Maps in ArcGIS (Dempsey C, GIS Lounge).** Walkthrough including common pitfalls, in generating cartograms within ArcGIS.
   Accessible at: http://www.gislounge.com/how-to-make-area-cartogram-maps-in-arcgis/

2. **Scapetoad (Choros)**. As well as providing freeware javascript transformation, includes references and links to developing cartogram techniques.
   Accessible at: http://scapetoad.choros.ch/index.php

3. **Indiemaps (Johnson Z).** Blog covering variety of techniques and tools for improving data visualisation.
   Accessible at: http://indiemaps.com/blog/

4. **Improving Visualisation (Dataviz).** Commissioned by the Department of Communities and Local Government and carried out by Oxford Consultants for Social Inclusion. Provides diverse examples of data visualisation relevant to the public sector at all levels, including case studies.
   Accessible at: http://www.improving-visualisation.org/

5. **Geographer At Large (Anon).** Blog posts on different mapping techniques, particularly in the context of New York. Quote: “Geography invariably leads to revolution”
   Accessible at: http://geographer-at-large.blogspot.co.uk/2011_10_01_archive.html

6. **Gapminder World (Gapminder Foundation)**. Non profit venture promoting sustainable global development, with an interest in innovative data display.
   Accessible at: http://www.gapminder.org/

7. **MAPresso (Herzog A).** Downloadable Java applet that can be used to generate different cartogram formats, including ‘Dorling Cartograms’ on local shape files and data.
   Accessible at: http://www.mapresso.com/

8.9 References

1 Johnson Z. Early cartograms. [Internet] 2008 [Cited 24th February 2013]. Available at: http://indiemaps.com/blog/2008/12/early-cartograms/

2 Tobler W. Thirty Five Years of Computer Cartograms. 2004. *Annals of the Association of American Geographers* 94(1)58-73

3 Dorling D. *Area Cartograms: Their Use and Creation. 1996. Concepts and Techniques in Modern Geography* series no. 59, University of East Anglia: Environmental Publications.

4 Gastner M Newman M. Diffusion based method for producing density-equalizing maps. PNAS. May 18, 2004. 101 (20): 7499-7504

5 Dorling D. *A New Social Atlas of Britain.* London: John Wiley and Sons [Internet] 1995. [Cited 24th February 2013] Available at: http://sasi.group.shef.ac.uk/publications/new_social_atlas/index.html

6 Protovis: Dorling Cartograms [Internet] 2012 [Cited 24th February 2013] Available at: http://mbostock.github.com/protovis/ex/cartogram.html

7 Kocmoud C, House D. Constructing Continous Cartograms: A Constraint based approach. 1998. *8th international symposium on Spatial Data Handling,* Vol. 1:236-246

8 Hennig BD. *The Human Shape of Britain* [Internet] 2012 [Cited 24th February 2013] Available at: http://www.viewsoftheworld.net/?p=2233

9 Center for International Earth Science Information Network (CIESIN)/Columbia University, International Food Policy Research Institute (IFPRI), The World Bank, and Centro Internacional de Agricultura Tropical (CIAT). *Global Rural-Urban Mapping Project, Version 1 (GRUMPv1): Population Density Grid.* [Internet] 2011 [Cited 24th February 2013] Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). Available at: http://sedac.ciesin.columbia.edu/data/set/grump-v1-population-density

10 Davies SC. *Annual Report of the Chief Medical Officer, Volume One, 2011, On the State of the Public's Health.* London: Department of Health, 2012.

11 Dorling D. *Worldmapper Dataset 002: Total Population*. SASI, University of Sheffield. [Internet] 2nd May 2005 [Cited 24th February 2012]. Available at: http://sasi.group.shef.ac.uk/worldmapper/display.php?selected=2#

12 Gross, T. *Cartogram geoprocessing tool version 2*. New York: Environmental Systems Research Institute (2007, 2009). Available at: http://arcscripts.esri.com/details.asp?dbid=15638 (accessed 15/01/2013)

13 Andrieu D, Kaiser C, Ourednik A. *ScapeToad*. [Internet] 2008 [Cited 24th February 2012] Available at: http://scapetoad.choros.ch/index.php

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Version 1.0
18 March 2013

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9. HORIZON CHARTS: DRAWING INSIGHT FROM LARGE TIME-SERIES DATASETS

9.1 Introduction

This paper provides an overview of a data visualisation technique called horizon charts. The approach, originally devised by data visualisation software company Panopticon,[1] has been around approximately five years but is not widely applied. The horizon chart can appear complex at first sight, but this paper explores the purpose of the approach and describes the scenarios where it might be a valuable tool for drawing insight from large time-series datasets.

In summary, the horizon chart is a variation on the area chart, modified to deal with both positive and negative values. Rather than presenting negative values beneath the x-axis, the negative area is mirrored on to the positive side and then coloured differently to indicate its negative polarity. The result is a chart that occupies a single row of space, which helps to accommodate multiple stories onto a single display and facilitates comparison to pick out local and global patterns of change over time.

This paper draws heavily from a previous review of the horizon chart approach by Stephen Few.[2] His paper provided an extremely comprehensive assessment of the general merits of this technique, and the primary purpose of this paper is to consider the technique in a local application, specifically health data for the West Midlands region. Specifically, this paper illustrates how these charts can be used to identify unusual behaviours within large time-series datasets and understand patterns amongst many cases over time and the paper goes on to consider both the strengths and weaknesses of the approach, and highlight where it is an appropriate methodology to employ.

9.2 Methodology

Horizon charts can be overwhelming at first glance, but once the underlying principles and construction have been understood the simplicity of the approach and ease of interpretation can be appreciated. Figure 1 presents an example of the horizon chart.

The remainder of this section describes the process undertaken to produce the chart presented in Figure 9.1. It uses actual local health data, the rate of unplanned hospitalisations per 100,000 for chronic ambulatory care sensitive conditions (adults) across districts/boroughs and unitary areas within West Midlands Region (see References for a link to the raw data). Data with similar attributes can be used. Horizon charts are ideal to display time series data with a relatively large number of comparable cases, the example presented here is particularly useful at illustrating the nuances of the technique.

The technique demonstrated here can be created using an add-in developed for Microsoft Excel called Sparklines.[3] This add-in is relatively straightforward to use, once the parameters are understood. Once the formula is established for one case (e.g. a local authority area) it can be simply copied and pasted for all other cases. A chart like the ones presented in this paper could be constructed within half an hour.

However, the stages displayed in this illustration have been created by hand using Excel and Adobe Illustrator to help explain the methodology in more detail. For this exercise we are using the West Midlands data for unplanned hospitalisation for chronic ambulatory care sensitive conditions which are published as indicator 2.3 of the NHS Outcomes Framework.[6] An extract of the data is presented in Figure 9.2. The data are arranged into rows of cases, which in this example are the local authority areas, and columns of dates, in this case years disaggregated into quarters.

Figure 9.1: Example horizon chart using West Midlands data for unplanned hospitalisation for chronic ambulatory care sensitive conditions

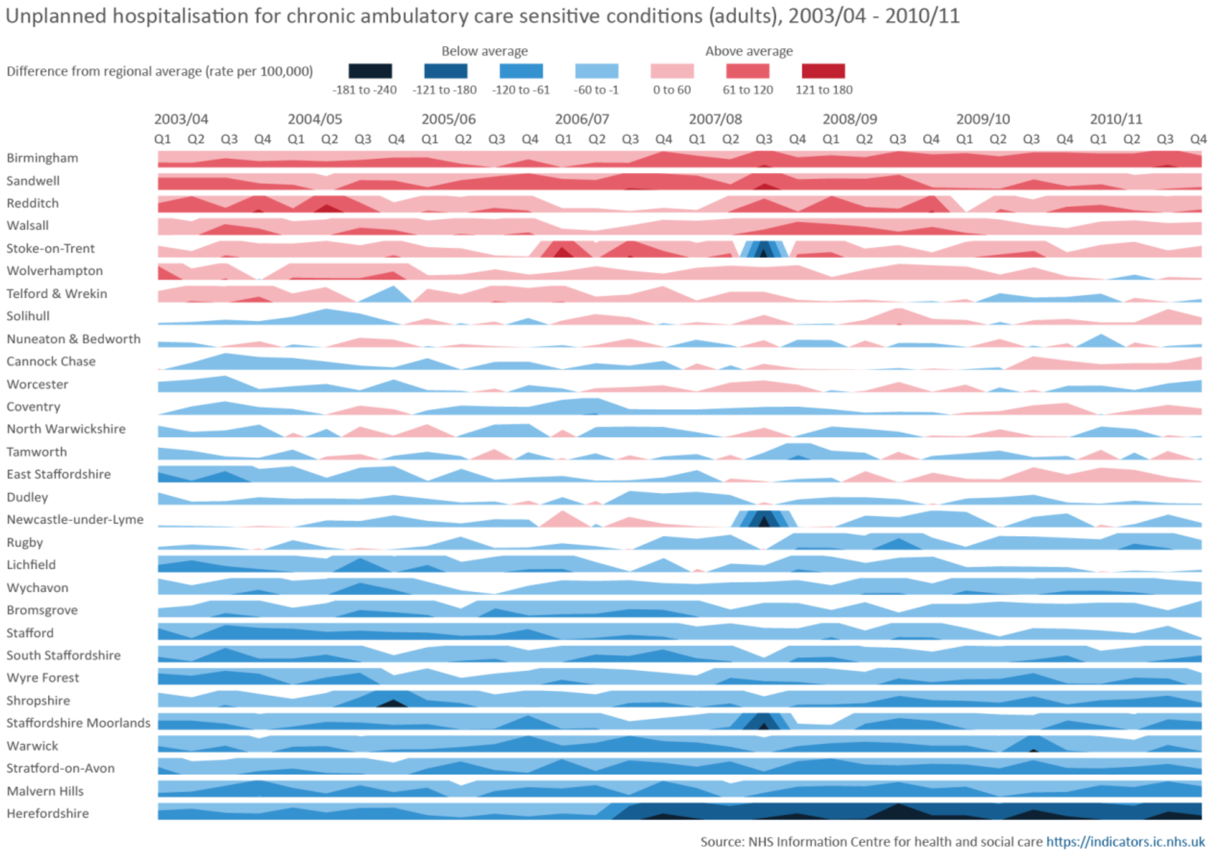


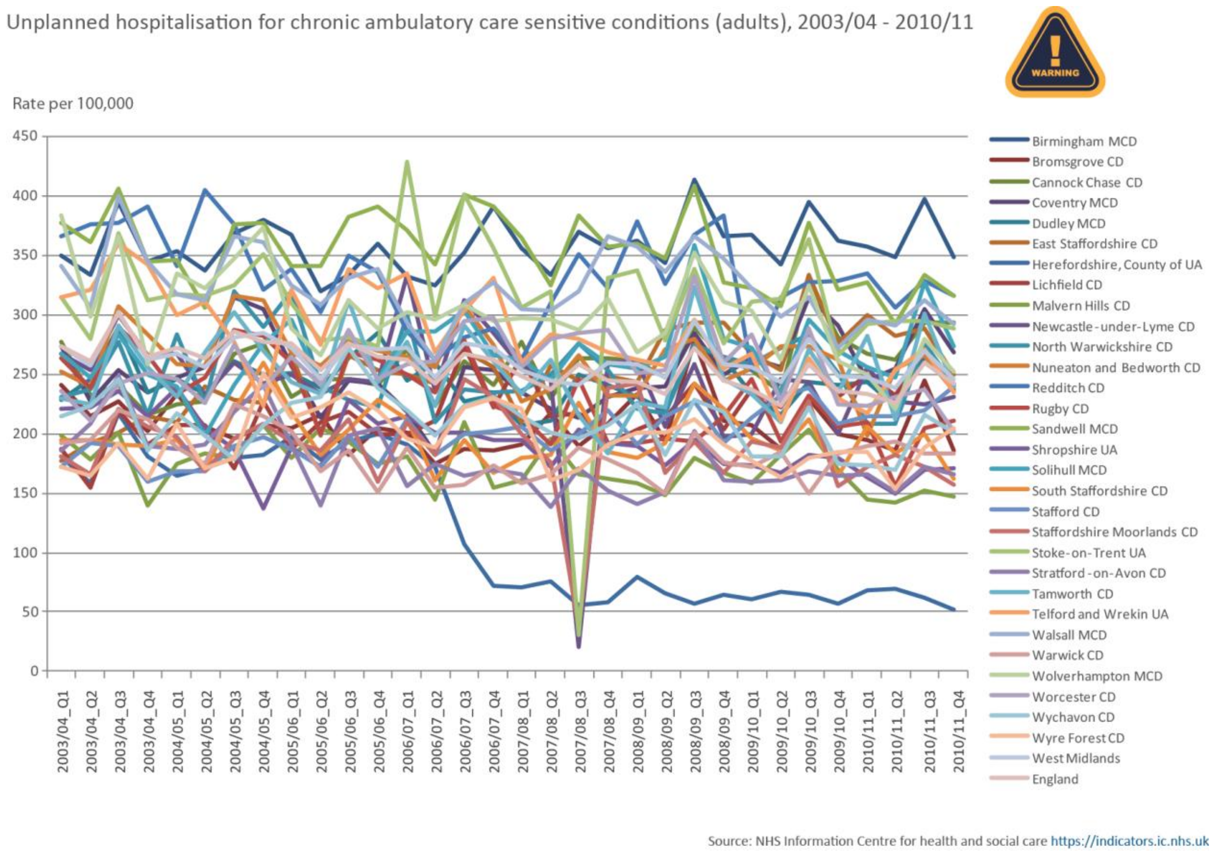
Figure 9.2: Source data in Excel spreadsheet format

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	**NHS Outcomes Framework - Domain 2: Enhancing quality of life for people with long-term conditions.**												
2	**Indicator 2.3.i:**	**Unplanned hospitalisation for chronic ambulatory care sensitive conditions (adults)**											
3													
4	*Statistic:*	Indirectly standardised admission rate per 100,000 population											
5	*Age Group:*	Aged over 19 years											
6	*Period:*	2003/04 Quarter 1 to 2010/11 Quarter 4											
7	*Scale:*	Per 100, 000 population											
8	*Indicator source:*	NHS Outcome Framework Indicators, NHS Information Centre for health and social care (NHS IC). Available at https://indicators.ic.nhs.uk, indicator ID I00708.											
9	*Numerator data source:*	Hospital Episode Statistics, NHS Information Centre for health and social care (NHSIC).											
10	*Denominator data source:*	Mid-year population estimates, Office for National Statistics (ONS).											
11	*Notes:*	The age-standardised admission ratio is multiplied by the crude admission rate for the England 2010/11 standard period to give the indirectly standardised admission rate.											
12		Plotting these figures presents the trend in the admission rate.											
13													
14	Org Code	ONS Code	Organisation	2003/04_Q1	2003/04_Q2	2003/04_Q3	2003/04_Q4	2004/05_Q1	2004/05_Q2	2004/05_Q3	2004/05_Q4	2005/06_Q1	2005/06_Q2
15	00CN	E08000025	Birmingham MCD	350.7	333.8	395	344.6	353.6	337.8	368.4	379.8	368.2	319
16	47UB	E07000234	Bromsgrove CD	241.3	215.3	227.6	201.6	233.9	205.5	196	206.8	205	215
17	41UB	E07000192	Cannock Chase CD	277.3	231.9	241.3	216.2	225.1	226.7	266.8	276	230.8	2
18	00CQ	E08000026	Coventry MCD	273.8	227.8	253.8	234.8	246.8	256.6	314.7	304.5	256.8	21
19	00CR	E08000027	Dudley MCD	229.1	246.5	289.5	235.4	246.1	233.5	261.3	249.5	251.1	23
20	41UC	E07000193	East Staffordshire CD	177.1	192.5	201.5	214.3	209.7	240.3	228.8	226.3	268.3	19
21	00GA	E06000019	Herefordshire, County of UA	180.6	158.5	217.8	180.6	164.4	170.8	179.8	181.7	197.2	17
22	41UD	E07000194	Lichfield CD	187	154	220	191.2	207	207	170.7	227.1	186.8	209
23	47UC	E07000235	Malvern Hills CD	198.5	177.9	201.4	139.7	174.7	183.4	179	206.7	179.1	204
24	41UE	E07000195	Newcastle-under-Lyme CD	267.6	253	299.9	266.6	267.9	232	259.7	242.2	250.4	233
25	44UB	E07000218	North Warwickshire CD	231.3	237.9	277.2	216.1	283.5	225.5	320.1	290	319.6	239
26	44UC	E07000219	Nuneaton and Bedworth CD	252.8	240	307.3	284.1	258.4	257.2	315.8	312.3	268.1	257
27	47UD	E07000236	Redditch CD	366.4	376.1	378	391.6	341.7	404.7	376.1	320.7	338.3	302
28	44UD	E07000220	Rugby CD	263.2	238.2	289.7	266.2	233.2	247.8	287.1	282.7	259.8	19
29	00CS	E08000028	Sandwell MCD	377.6	361.3	406.3	345.5	345.9	306	376.9	378.3	341.7	34
30	00GG	E06000051	Shropshire UA	221.3	222.1	235.5	214.6	238.2	204.8	186.6	137.1	187.9	
31	00CT	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

It might be possible to make some basic observations by means of a simple scan of the data. However, we have 1,024 values to consider (32 areas x 32 points in time), and it is obviously difficult to understand the full complexity of the story this way. So, we naturally consider more visual ways to explore the data.

Where the interest is in examining trends over time and comparing areas with each other, a line chart would be a typical approach. Running the data through Excel and producing a default line chart provides us with Figure 9.3.

Figure 9.3: The default line chart

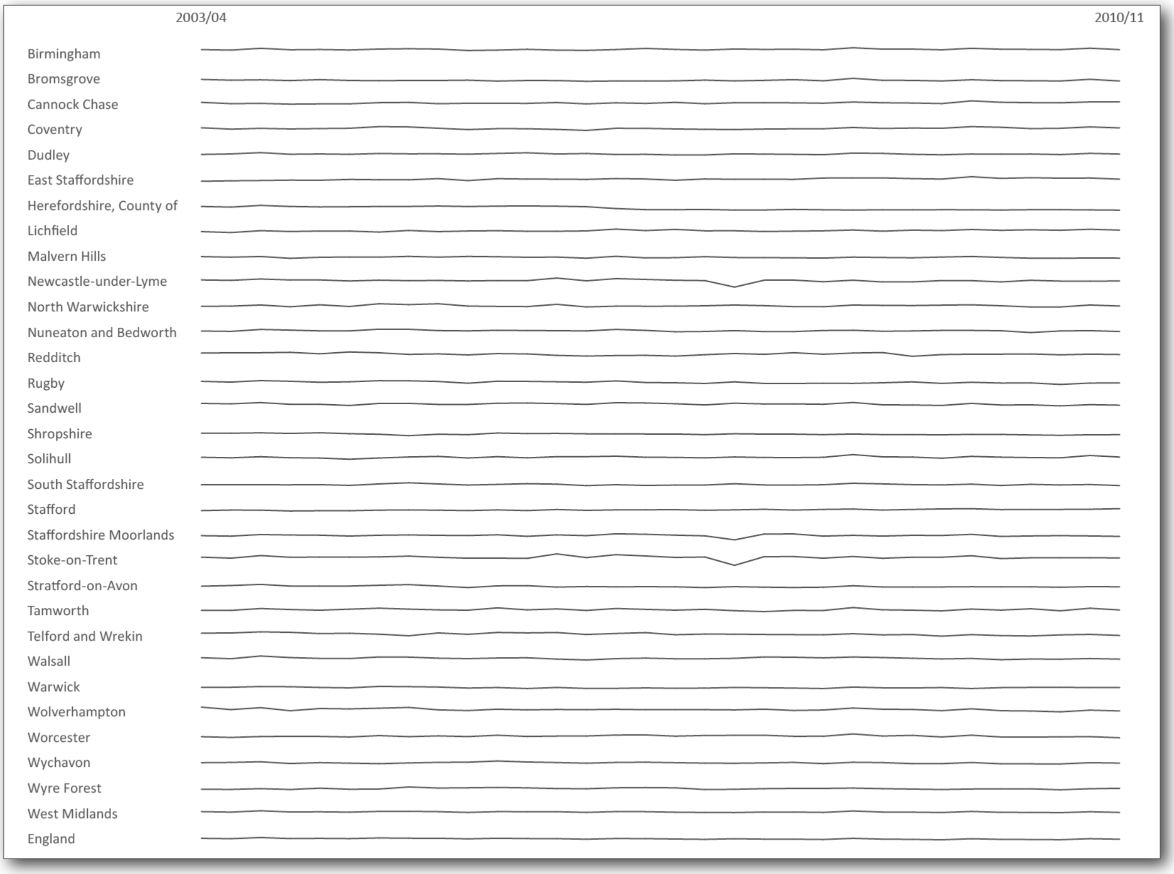


Clearly this chart is difficult to decipher and is of limited value. All we can say is that the figures tend to range between 150 and 400 per 100,000 and fluctuate year on year. There are some outliers that catch the eye, but it is very hard to identify which areas these relate to given the proximity of the lines and the limited number of colours that can be used.

It is virtually impossible to follow a specific area over time, identify which areas the lowest and highest rates relate to or compare an individual area to the regional average. This is where the Horizon Chart can add value, and we now go on to explore the process behind producing these diagrams.

First, in order to try and understand more easily what is happening in each area, we separate the data into individual line charts (Figure 9.4). This method is sometimes referred to as 'small multiples', a label usually attributed to Edward Tufte.[4,5] As we can see, 32 line charts arranged in rows are not ideal. It is difficult to pick out key trends and there is still no way to examine the relative experience of each area compared to, for example, the average across the whole region.

Figure 9.4: Line charts for all areas



The available space does not allow us to produce individual charts with enough height to understand the changes taking place; the lines are too flat. How can we present and explore the data more effectively, in a way that helps us see patterns more clearly?

Let us examine an individual area in more detail; Figure 9.5 presents the data for Solihull.

Figure 9.5: Data for an individual area

Figure 9.6 compares the figures in Solihull with the average for the West Midlands region. We start to see how local figures can vary from the average, but again 32 of these would still be incredibly hard to interpret.

Figure 9.6: An individual area compared with the regional average

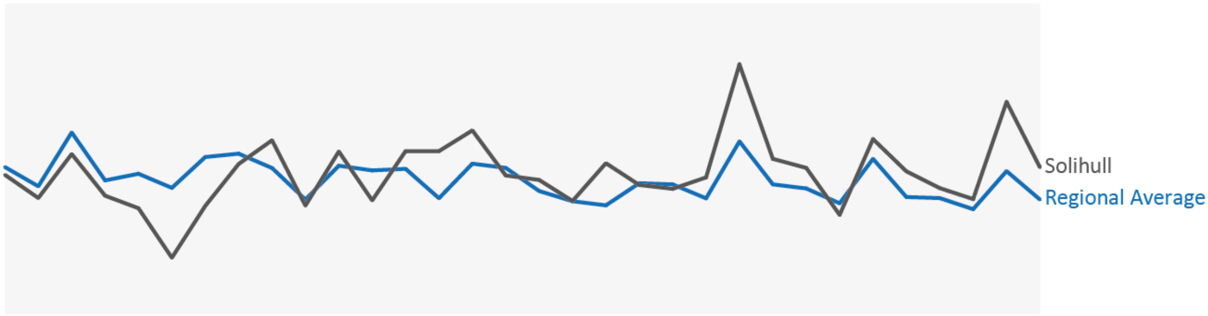
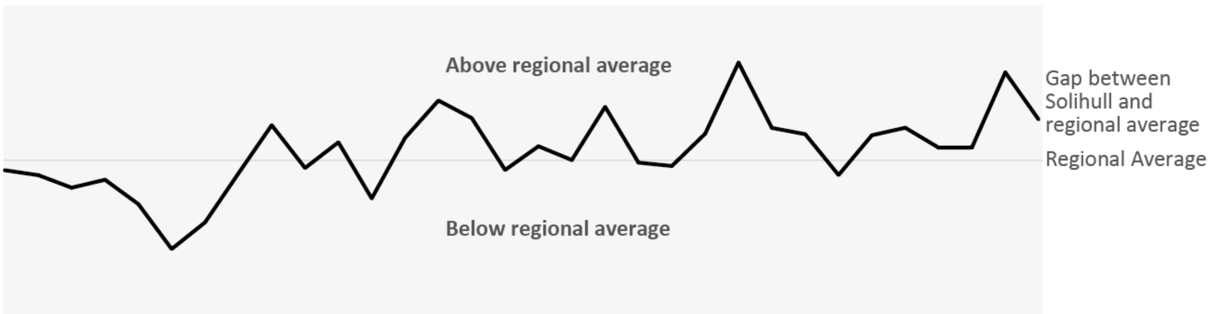


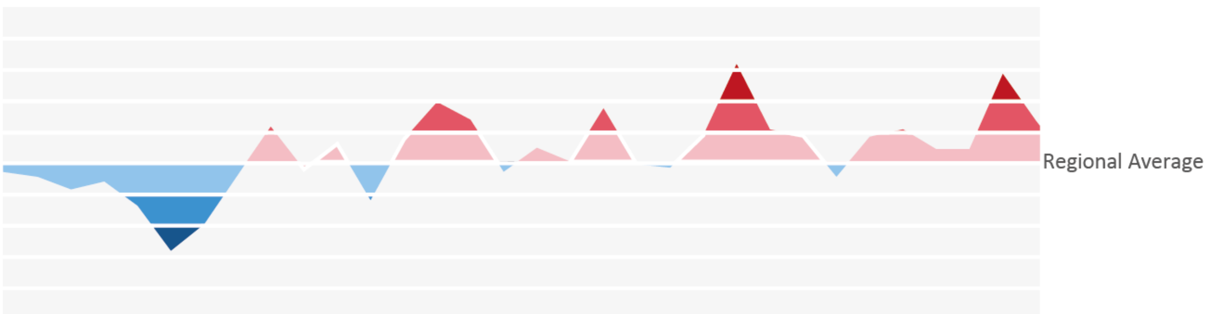
Figure 9.7 simplifies things by looking at the difference between Solihull and the regional average. We are now able to begin identifying the trend taking in place in Solihull in a regional context. Namely, after falling below the average for a short period at the beginning of our study period, the rate in Solihull then returned to levels similar to the regional average, remaining at or above the average for the majority of the period in question.

Figure 9.7: Illustrating the gap between an individual area and the regional average



Colour has been added in Figure 9.8 to draw attention to instances where the local figures for Solihull are above or below the regional average. Red denotes a local rate above the average, blue represents periods where Solihull's rate is below the average. The intensity of the colour makes larger variations stand out more easily; rather than varying colour intensity continuously, it has been varied in discrete steps. Given the complicated nature of a graphic consisting of 32 individual charts, applying steps in colour intensity will make it easier to identify notable changes in data values.

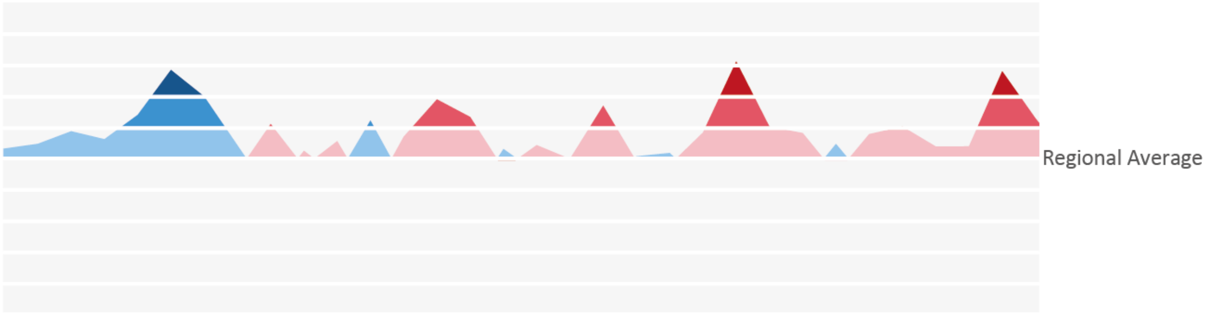
Figure 9.8: Adding colour to make the differences more visible



It is now much easier to identify extreme values, both above and below the average, when all 32 charts are eventually put together.

Given that there will still be a limitation to the height of the final diagram, it is helpful to make the best possible use of the vertical space. We do this by inverting the negative (in this case, blue) values and placing them above the horizontal axis. This provides us with Figure 9.9.

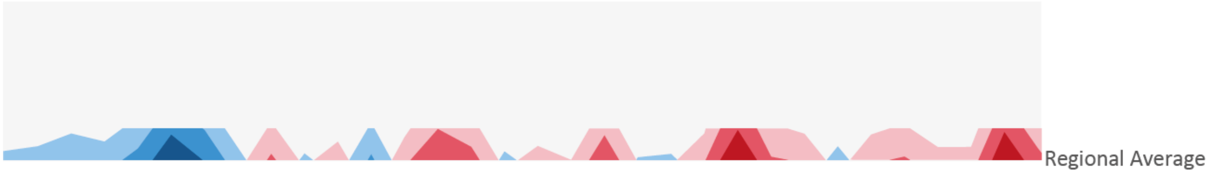
Figure 9.9: Inverting the negative values to utilise the available space more effectively



This works because of course at any one point in time the value can only be either above or below (or equal to) the regional average; there is no risk of any data being hidden. The slight downside is that the reader now needs to understand that some values are above the average while others are below; this is why the choice of colour is important. This example uses red because, intuitively, people associate red with a 'warning' of poor or weaker performance. In this case, red is interpreted as a higher than average rate of unplanned hospitalisations per 100,000 for chronic ambulatory care sensitive conditions. The darker the red, the further away from the average is the local rate.

Having improved the use of the vertical space, we can go one stage further and 'collapse' the colour bands so that they all sit on the same baseline. The darker colours sit at the front so that they can be seen. Applying this approach to the Solihull data gives us Figure 9.10.

Figure 9.10: Collapsing the colour bands to make best use of the space

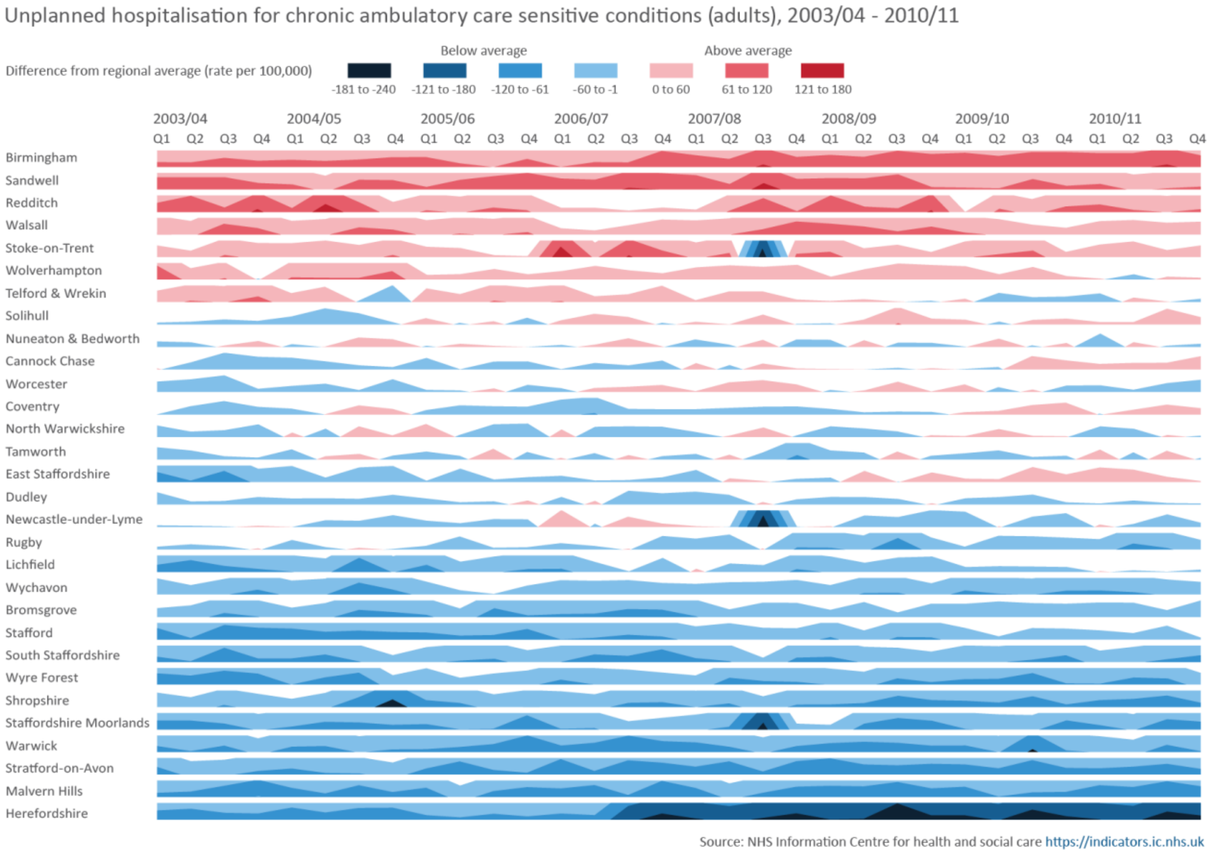


The vertical space gained from this approach allows us to either heighten the display of these values and/or increase the number of rows of charts on the screen. There are some trade-offs with this approach, which are discussed in Section 9.4.

Returning to the full dataset, Figure 9.11 presents information for all of the local authority areas in a single chart. Note that the thresholds for determining the final set of colour bands are broader than those used in Figure 9.9; using the same thresholds would have produced too many shades of red and blue for those areas with more extreme values and the graph would have been harder to interpret. It is advised that around six to eight colour bands are used (three or four for both positive and negative values). In this example, each shift in colour band represents an extra 60 (per 100,000) above or below the regional average.

The areas have been sorted from high to low in terms of average distance from the regional average over the full time period. This means that those areas that are generally above the regional average feature towards the top of the chart. Therefore we have a predominance of red towards the top of the chart and blue towards the bottom, giving a horizon effect. This is where the name of the chart comes from.

Figure 9.11: The final horizon chart



Putting image size aside for a moment (it would work more effectively in landscape and full screen, and you can explore an online version here), it has certainly become easier to pick out some of the key messages. Once we are familiar with the methodology a scan of Figure 9.11 can reveal the following:

- Birmingham has, across the time period in question, the largest above average deviation from the regional trend.
- In addition to Birmingham, Sandwell, Redditch and Walsall remain above the regional average throughout the entire period.
- Conversely, Herefordshire has the lowest average rate and, particularly towards the end of the period, is considerably below the regional average (denoted by the very dark shades of blue). The chart prompts the question 'what has caused this step change?'.
- Other areas, such as North Warwickshire and Tamworth, remain close to the regional average (denoted by the lighter shades and smaller peaks).
- In overall terms, we see more blue than red. This tells us that fewer areas tended to be above the average than below it. There could be two reasons for this; either the highest rates are more extreme, relative to the average rate, than the lowest rates or the higher rates tend to be associated with the more populous areas therefore skewing the average towards these higher rates. We see that the highest rates belong to areas like Birmingham, Sandwell, Walsall, Stoke and Wolverhampton. These are indeed the larger metropolitan boroughs and we can say that their values will be having a greater impact on the regional average than those at the foot of the chart.

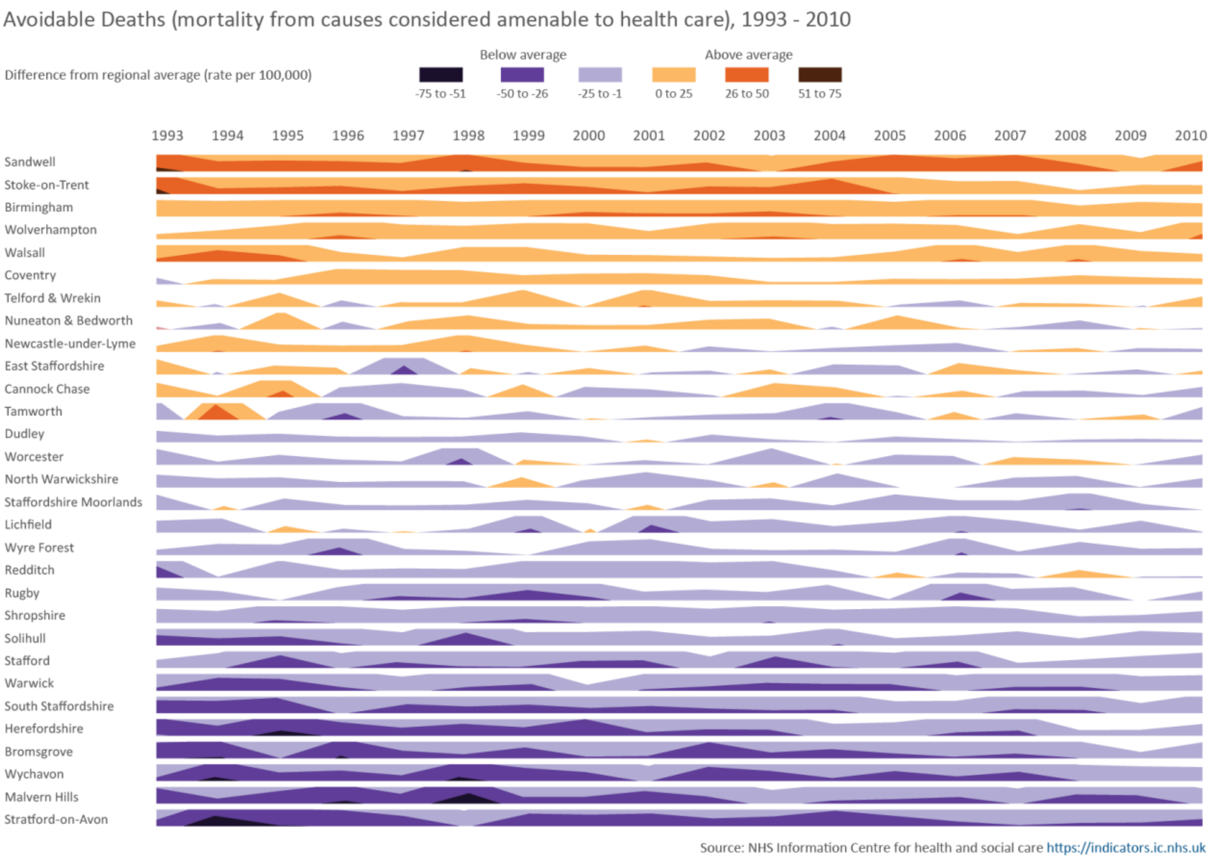
- Our eye is also drawn to a number of strange looking values in quarter three of 2007/08. The charts for three areas seem to spike with large negative values. The areas in question are Stoke, Newcastle-under-Lyme and Staffordshire Moorlands. Is it a coincidence that these areas are all in the broader definition of Staffordshire? Is there a data accuracy issue for that particular quarter? These outliers will have been hard to detect from a scan of the raw data, but the horizon chart immediately draws attention to the issue.

9.3 Practical local examples

To illustrate the approach applied to other datasets, a further three examples are provided here. All use health data covering the West Midlands region. Although we argue in Section 4 that the red-blue colour scheme is the most effective way of presenting the horizon chart, we have used different colour schemes in these three further examples to help distinguish between them.

Figure 9.12 presents data on avoidable deaths (mortality from causes considered amenable to health care) over the period 1993 to 2010.[7] We see some interesting patterns emerge. For example the higher prevalence of dark shades towards the start of the time period indicates that, over time, there has been an underlying trend towards the regional average, with less extreme variation since the turn of the century. We also see that the metropolitan areas again feature towards the top of the diagram, specifically parts of the Black Country, Stoke and Birmingham.

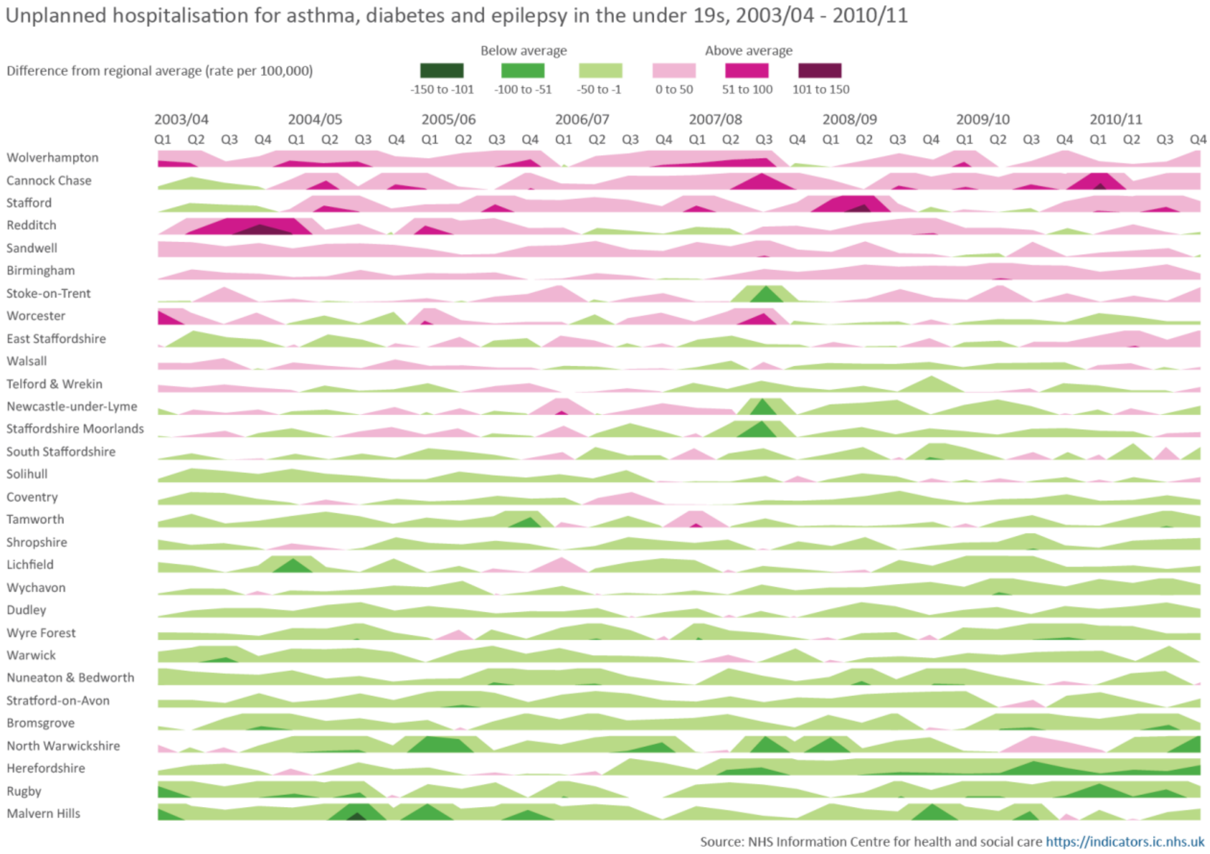
Figure 9.12: Avoidable deaths in horizon chart form



(Click here to see a full screen version)

Next, we have presented data on unplanned hospitalisation for asthma, diabetes and epilepsy in the under-19 population (Figure 9.13).[8] Again, the horizon chart approach allows us to generate some quick insight from around 1,000 statistics. For example, there are fewer instances of the darkest shades; this means values vary less from the average than we have seen in our other examples. There are fewer extreme values. Also, we see that individual local authority areas are less likely to remain above or below the regional average throughout the entire study period. Even those areas with the highest average rates (Wolverhampton, Cannock Chase, Stafford and Redditch) all fall below the regional average on at least one occasion (denoted by the green within their individual charts). Conversely, those areas with the lowest rates (including Malvern Hills, Rugby, Herefordshire and North Warwickshire) all rise above the regional average at some point. We can conclude that these health conditions vary less across the region than the other datasets we have examined, and that individual areas are less likely to display consistently strong or weak performance (in relative terms) on this indicator.

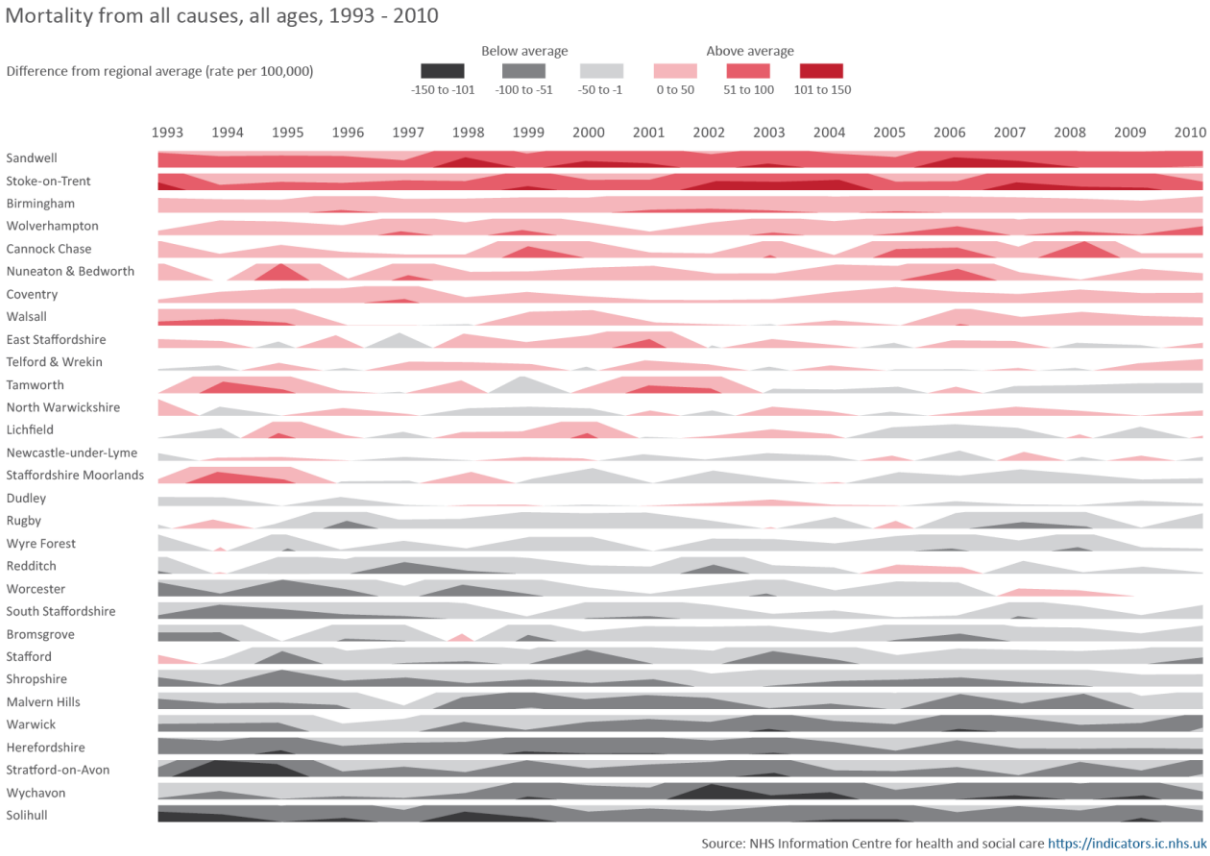
Figure 9.13: Hospitalisation for asthma, diabetes and epilepsy (<19 yrs) in horizon chart form



(Click here to see a full screen version)

Finally, we examine mortality rates (all ages, all causes) across the region over the past two decades.[9] Figure 9.14 illustrates the various trends. Again, the highest variations from the regional average appear in metropolitan areas, notably Sandwell, Stoke, Birmingham, Wolverhampton and Walsall. Areas that tend to have the lowest rates include Stratford-on-Avon, Malvern Hills and Wychavon. This data would also work well in mapped form, demonstrating the differences in terms of urban/rural, but of course we would require a separate map for each year if we wished to examine trends over time as well.

Figure 9.14: Mortality rates (all ages, all causes) in horizon chart form



(Click here to see a full screen version)

9.4 Discussion and further applications

Although this methodology has been around for a few years, it is not widely applied and the purpose of this paper is to both make readers aware of the approach and discuss some of its strengths and weaknesses.

Firstly, let us consider the benefits of the horizon chart:

- It presents large amounts of data in a digestible way, once the method is understood. Readers may need time to absorb the approach the first time they see it, but subsequent views should prove immediately enlightening. The examples used in Sections 2 and 3 each present around 1,000 individual data points in a single chart.

- It is easy to identify extreme values and patterns. There is some perceptual effort required in understanding the chart, but this is outweighed by the benefit of being able to see a large volume of time series data.

- It enables an easy understanding of how a large number of cases (in our example, local authority districts) compare against a benchmark (in our example, the regional average). It can be applied in many other scenarios. For example, the individual cases could be comparable geographical areas, age groups, ethnic groups or socio-economic cohorts. The benchmark could be a national or local average, an overall population average or even a specific parameter that needs to be used for context. The horizon chart is an ideal tool to display information for performance measures and other metrics where interpretation of variation between areas or groups over time would be beneficial

- A more generic point is that the 'classic' horizon chart, using a red-blue colour system is accessible to almost all readers. Often, data visualisations use a red-green approach to represent good/strong versus poor/weak performance. Around ten per cent of the population has a red-green colour deficiency, and the red-blue approach provides a useful and intuitive alternative.

Now, the limitations:

- The chart does not illustrate actual trends, only the *relative* performance of individual cases against a benchmark/average. We are not able to tell whether the actual rate of unplanned hospitalisations for chronic ambulatory care sensitive conditions is going up or down during the period in question. The purpose of the horizon chart is identify cases (areas) of notably high or low performance against an average, and whether cases are moving away from or towards the average over time. The chart illustrates relative rather than absolute change.

- It is not possible to see the actual values (in this case, rates per 100,000). Again, this is because the chart is being used to quickly identify key trends and patterns rather than the detail; this can be explored in the raw data once some areas of interest have been identified.

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9.6 Further information

The charts produced in this paper were initially created using the Sparklines add-in for Excel and then modified in Adobe Illustrator. The Sparklines tool and a user manual can be accessed here: Available at: www.sparklines-excel.blogspot.co.uk

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