NCIN
national cancer intelligence network
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Mortality from Prostate Cancer

Urological Cancers SSCRG

SOUTH WEST PUBLIC HEALTH OBSERVATORY

Headline Findings

Over 10,000 men die from prostate cancer in the UK each year, nearly 9,000 in England.

The rate of death from prostate cancer has decreased over the last 10 years.

Rates of death have decreased at every age, and in every part of England.

There are no differences in the rate of death between the most deprived and the least deprived people.

Black men have a higher rate of death from prostate cancer, but Indian, Pakistani and Bangladeshi men have a lower rate.

Introduction

Prostate cancer is the second biggest cancer killer for men, after lung cancer. In 2009 there were 10,292 prostate cancer deaths in the UK: 8,755 deaths in England, 205 in N. Ireland, 790 in Scotland and 542 in Wales. This compares to 19,319 deaths from lung cancer in men in the UK.

Although prostate cancer in the second highest cause of cancer related deaths in men, the prognosis is good and the number of deaths should be compared to the 34,788 new cases diagnosed in 2009, compared to 18,652 lung cancers diagnosed in men. One-year relative survival for prostate cancer is 95% (2006-08 cohort) and five-year relative survival is 84% (2002-04 cohort).

The increase in Prostate Specific Antigen (PSA) testing for prostate cancer has caused a large increase in the number of cases diagnosed (Potosky, Miller, Albertsen, & Kramer, 1995) and this has in turn contributed to increased survival, partly through lead-time bias (Telesca, Etzioni, & Gulati, 2008). Uptake of PSA testing is the main factor influencing incidence rates, but black men are also at an increased risk which may affect the rates in certain urban areas with higher proportions of ethnic minority groups.

Improving Outcomes in Urological Cancers (IOG) Guidance was published in 2002 (National Institute for Clinical Excellence 2002), which should ensure that more appropriate treatment is offered, and multi-disciplinary teams (MDTs) have been formed to discuss treatment options. In addition, radical prostatectomies should now be performed by fewer surgeons, who will be more experienced as a result. Patients are more likely to have the treatment pathway which is best for them, and get better results from it. Further guidance on implementation of treatment types helps to ensure that men with prostate cancer are appropriately treated whichever hospital they attend (National Institute for Health and Clinical Excellence, 2005; National Institute for Health and Clinical Excellence, 2008).

These guidelines are unlikely to have had an effect on mortality in the time periods under investigation, as the majority of men dying from prostate cancer will have been diagnosed and treated several years previously. However, there may have been an effect in the more aggressive cases where survival is shorter, and the use of hormone therapy has probably increased survival in those with metastatic prostate cancer.

To determine whether the outcome for prostate cancer patients is actually changing, and whether there is variation between different population groups, the NCIN Urology SSCRG has commissioned a breakdown report on prostate cancer mortality in England, and how it varies with social and personal factors. Although NCIN is a UK wide network, mortality data from the Office for National Statistics, provided to the South West Public Health Observatory (SWPHO), is for England only.

Method

Deaths from prostate cancer in England were identified from the ONS deaths data supplied to cancer registries for the time period of 1995 to 2009. It contains data on causes and place of death, and patient-specific information e.g. place of residence.

A prostate cancer death is identified as having the derived underlying cause code ICD-10 C61 or ICD-9 185. Age at death is extracted and postcode of residence is used to link each death to a Primary Care Trust (PCT), region and Lower Super Output Area (LSOA). LSOAs are small areas constructed by ONS to be a statistically comparable as possible, with similar sized populations. Importantly, detailed population breakdowns by age and sex are available from ONS, which are required for analysis. The LSOAs are used to group deaths into five groups (quintiles) according to the area's income deprivation score from the 2007 Indices of Deprivation (Department of Communities and Local Government). Quintile 5 is the most deprived fifth.

Age-specific counts of mortality are used to generate age-standardised mortality rates to the European Standard Population. This technique takes into account the age-structure of the populations being studied, and calculates what the rate would be in a fixed (standard) population. As the rates are calculated in the same population, it allows different areas or time periods to be compared with statistical validity even though their resident population may change.

Ethnicity for men dying of prostate cancer is derived by linking registration records with hospital admissions data from the Hospital Episode Statistics (HES) database. HES records contain an ethnicity field which is self-reported *i.e.* the ethnic group which the patient feels they belong to. Using this technique 89% of deaths from prostate cancer in 2007-09 were linked to a HES record, and 94% of these had a completed ethnicity code. Of the deaths linked to HES 91% were recorded as being for White men.

Results

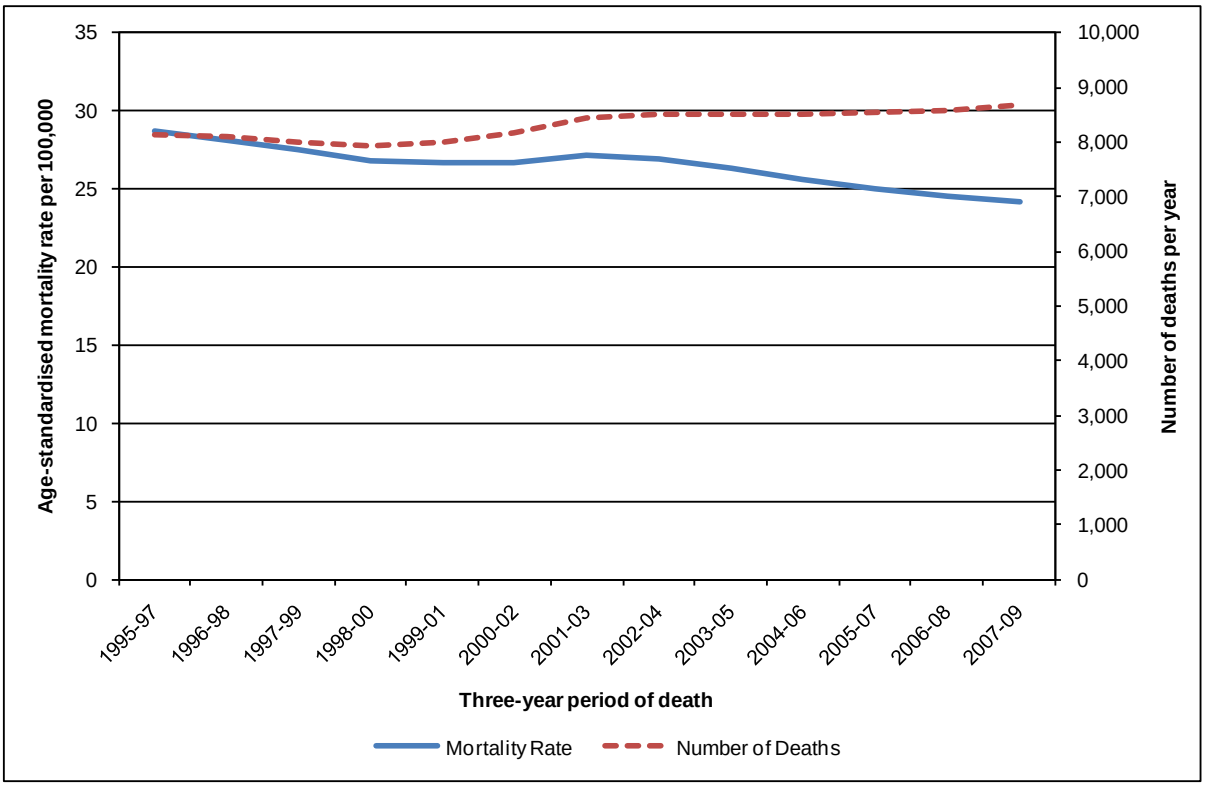
The total number of deaths from prostate cancer in 2007-09 was 26,077, an average of 8,692 per year. In comparison the number of deaths per year for 1995-97 was 8,135. Although the total number of deaths has increased this can all be attributed to the ageing of the population as the age-standardised rate in 2007-09 was 16% lower than in 1995-97 ($p<0.01$), and the rate has decreased in each non-overlapping three-year period apart from 1998-00 to 2001-03 (Table 1). The age-standardised mortality rate in 2007-09 was 24.2 per 100,000 compared to 28.7 per 100,000 in 1995-97.

Table 1: Deaths from prostate cancer (age-standardised mortality rate per 100,000), in England, comparison of three-year periods

Period 1	Period 2	ASR Period 1	ASR Period 2	Rate Ratio	Change
1998-00	1995-97	26.8	28.7	0.94	Lower ($p < 0.01$)
2001-03	1998-00	27.1	26.8	1.01	Not Significant
2004-06	2001-03	25.6	27.1	0.94	Lower ($p < 0.01$)
2007-09	2004-06	24.2	25.6	0.94	Lower ($p < 0.01$)
2007-09	1995-97	24.2	28.7	0.84	Lower ($p < 0.01$)

Source: Office for National Statistics

Figure 1: Deaths from prostate cancer (age-standardised mortality rate per 100,000 and total deaths per year), in England, by three-year period, 1995-2009



Source: Office for National Statistics

The total number of deaths appears to have increased quickly around the year 2000, concurrent with a flattening out of the mortality rate. After this point the rate falls consistently. Treatments have changed in this time period, for example androgen deprivation therapy (often referred to as hormone therapy) has become more widely used, both alone and in combination with radiotherapy. This has increased survival in advanced and metastatic cases. Any effect on survival from early stage prostate cancer, due to improved treatment in recent years, will not yet be apparent.

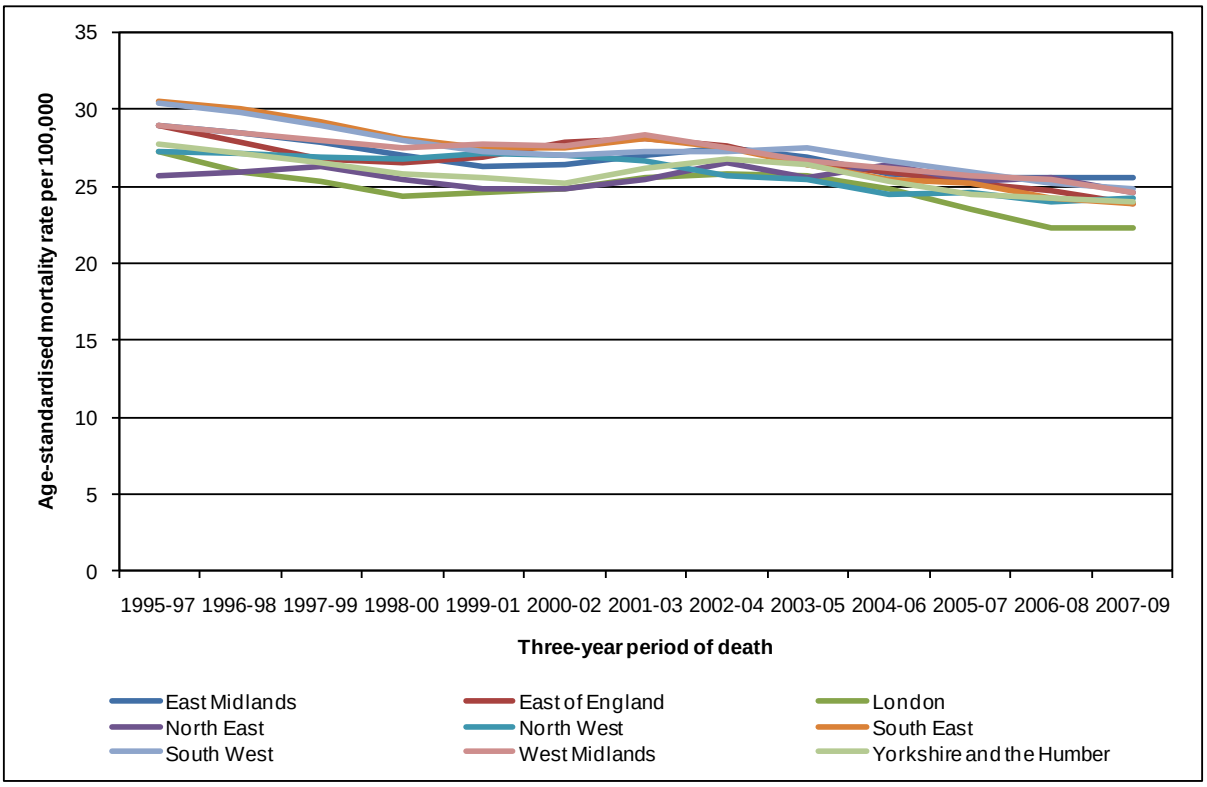
There is some regional variation in prostate cancer mortality. However, over time the spread of values has become narrower (Figure 2). In 1995-97 two regions (the South East and the South West) had an age-standardised mortality rate which was higher than the England average ($p<0.01$) and three regions (London, the North East and the North West) had a rate lower than the England average ($p=0.01$, $p<0.01$ respectively). The difference between the areas with highest and lowest rates was 4.8 per 100,000, or 19% (Table 2). In 2007-09 only two regions were statistically significantly different from the England average, the rate was higher in the East Midlands ($p<0.01$) and lower in London ($p<0.01$). The gap between the areas with highest and lowest rates had decreased to 3.2 per 100,000 or 14%.

Table 2: Deaths from prostate cancer (age-standardised mortality rate per 100,000), by region, comparison of highest and lowest rates

Time Period	Max. Region	Min. Region	Max. ASR	Min. ASR	Rate Ratio	Significance
1995-97	South East	North East	30.5	25.7	1.19	p<0.01
2007-09	East Midlands	London	25.6	22.4	1.14	p<0.01

Source: Office for National Statistics

Figure 2: Deaths from prostate cancer (age-standardised mortality rate per 100,000), by region, by three-year period, 1995-2009



Source: Office for National Statistics

From 1995-97 to 2007-09 the age-standardised mortality rate decreased in all regions except the North East (Table 3). The greatest decrease was in the South East, from 30.5 to 23.8 per 100,000 or 22%. The smallest statistically significant decrease was in the North West, from 27.3 to 24.3 per 100,000 or 11%. In terms of actual numbers of deaths, in 2007-09 the most were in the South East (4,484 in total) and the least in the North East (1,341 in total). This should be taken in context of the populations of those regions, which are approximately 8.4 million in the South East and 2.6 million in the North East.

Table 3: Deaths from prostate cancer (age-standardised mortality rate per 100,000), by region, comparison of three-year periods

Region	Period 1	Period 2	ASR 1	ASR 2	Rate Ratio	Change
East Midlands	2007-09	1995-97	25.5	28.9	0.88	Lower (p<0.01)
East of England	2007-09	1995-97	23.9	29.0	0.82	Lower (p<0.01)
London	2007-09	1995-97	22.4	27.3	0.82	Lower (p<0.01)
North East	2007-09	1995-97	24.6	25.7	0.96	Not Significant
North West	2007-09	1995-97	24.2	27.3	0.89	Lower (p<0.01)
South East	2007-09	1995-97	23.8	30.5	0.78	Lower (p<0.01)
South West	2007-09	1995-97	24.9	30.4	0.82	Lower (p<0.01)
West Midlands	2007-09	1995-97	24.6	29.0	0.85	Lower (p<0.01)
Yorkshire and the Humber	2007-09	1995-97	24.0	27.7	0.86	Lower (p<0.01)

Source: Office for National Statistics

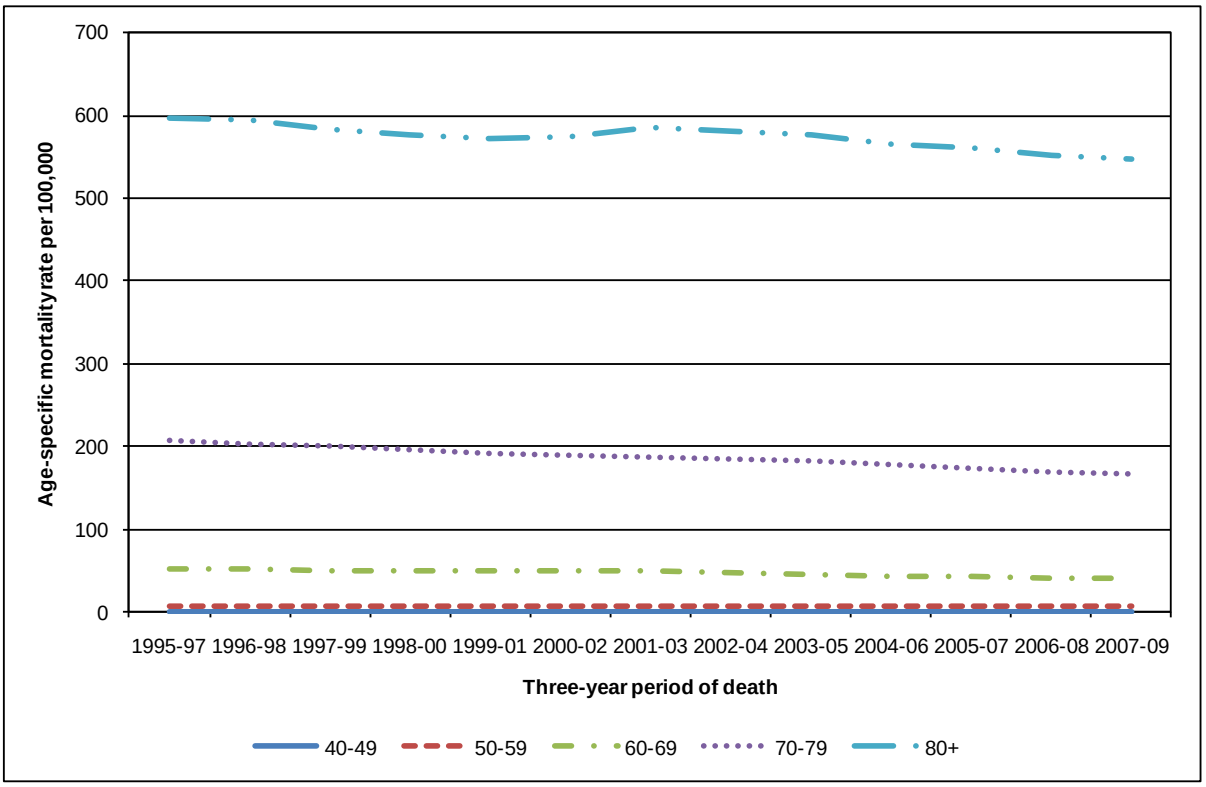
Most prostate cancer deaths occur in men aged 80 and over, and the proportion of total deaths which occur in this group is increasing. In 2007-09 53% of deaths were in men aged 80 and over, compared to 45% in 1995-97, and there has been a corresponding decrease in other age groups. However this change is driven by the aging population as a whole, and when looking at age-specific rates for 10-year age-bands there has been a decrease in all groups (Table 4). The largest decrease has been for men aged 40-49, where the rate decreased by 35% (p=0.03), although the number of deaths is only about 15 per year. The smallest decrease was for men aged over 80, with a decrease in age-specific rate from 595.9 to 547.8 per 100,000 or 8% (p<0.01).

Table 4: Deaths from prostate cancer (age-specific mortality rate per 100,000), by age-band, comparison of three-year periods

Age-band	Period 1	Period 2	Rate Period 1	Rate Period 2	Rate Ratio	Change
40-49	2007-09	1995-97	0.4	0.6	0.65	Lower (p=0.03)
50-59	2007-09	1995-97	6.4	7.7	0.83	Lower (p<0.01)
60-69	2007-09	1995-97	40.6	52.3	0.78	Lower (p<0.01)
70-79	2007-09	1995-97	166.3	207.5	0.80	Lower (p<0.01)
80+	2007-09	1995-97	547.8	595.9	0.92	Lower (p<0.01)

Source: Office for National Statistics

Figure 3: Deaths from prostate cancer (age-specific mortality rate per 100,000), by age-band, by three-year period, 1995-2009



Source: Office for National Statistics

The incidence of prostate cancer varies with income deprivation, with the highest rates in the least deprived areas. This disparity is primarily driven by education about, and uptake of, PSA testing through GPs. The difference in incidence between deprivation groups has only appeared since PSA testing became available. Mortality rates in 2007-09 do not exhibit any difference between deprivation groups, although in 1995-97 there was a difference in age-standardised rate of 3.2 per 100,000 or 12% between quintile 3 and quintile 5 ($p<0.01$) (Table 5 and Figure 4)).

Table 5: Deaths from prostate cancer (age-standardised mortality rate per 100,000), by quintile of income deprivation, comparison of highest and lowest rates

Time Period	Max. Quintile	Min. Quintile	Max. ASR	Min. ASR	Rate Ratio	Significance
1995-97	3	5	29.9	26.8	1.12	p<0.01
2007-09	4	5	24.4	24.2	1.01	Not Significant

Source: Office for National Statistics

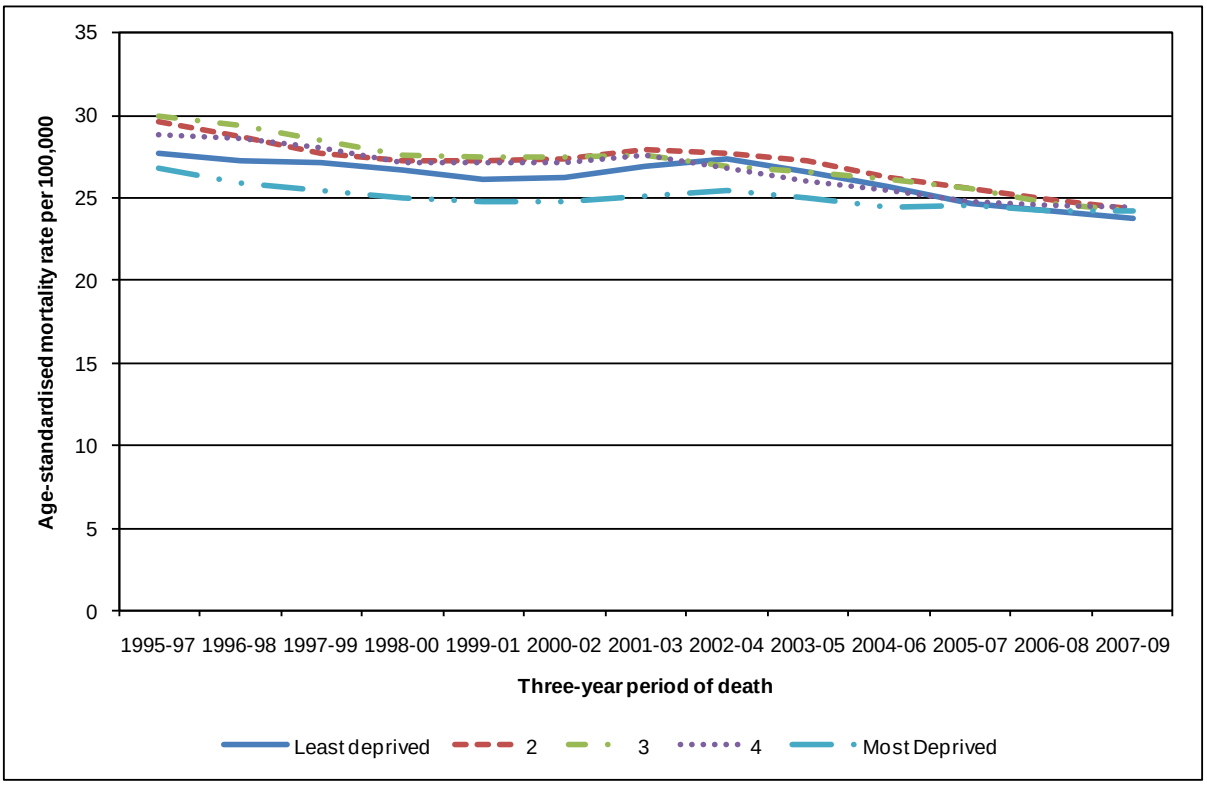
Age-standardised mortality rates have decreased in all quintiles of income deprivation with the biggest decrease in quintile 3, where the rate decreased from 29.9 to 24.2 per 100,000 or 19%. The smallest decrease was in quintile 5 (most deprived) where the rate decreased from 26.8 to 24.2 per 100,000 or 10%. The narrowing of mortality rates by deprivation appears to occur from 2003 onwards.

Table 6: Deaths from prostate cancer (age-specific mortality rate per 100,000), by quintile of income deprivation, comparison of three-year periods

Quintile	Period 1	Period 2	ASR 1	ASR 2	Rate Ratio	Change
1 (Least Deprived)	2007-09	1995-97	23.7	27.7	0.86	Lower (p<0.01)
2	2007-09	1995-97	24.3	29.6	0.82	Lower (p<0.01)
3	2007-09	1995-97	24.2	29.9	0.81	Lower (p<0.01)
4	2007-09	1995-97	24.4	28.9	0.85	Lower (p<0.01)
5 (Most Deprived	2007-09	1995-97	24.2	26.8	0.90	Lower (p<0.01)

Source: Office for National Statistics

Figure 4: Deaths from prostate cancer (age-standardised mortality rate per 100,000), by quintile of income deprivation, by three-year period, 1995-2009



Source: Office for National Statistics

There is no apparent geographical correlation between statistically high or low age-standardised rates of prostate cancer mortality, when examined by PCT (Figure 5). In fact, the PCT with the highest mortality rate and the PCT with the lowest rate are both in London. In 2007-09 the PCT with the highest mortality rate was NHS Haringey with a rate of 32.0 per 100,000 (80 deaths in total), and the PCT with the lowest rate was NHS Kensington and Chelsea with a rate of 14.5 per 100,000 (45 deaths in total). The rate in NHS Haringey was 120% higher than in NHS Kensington and Chelsea (Table 7), an absolute gap of 17.4 per 100,000 (p<0.01). Looking at the earliest mortality data available, i.e. 1995-97, the PCT with the highest mortality rate was NHS Hastings and Rother with a rate of 38.8 per 100,000 (181 deaths in total), and the PCT with the lowest rate was NHS Hammersmith and Fulham with a rate of 21.4 per 100,000 (44 deaths in total). The rate in NHS

Hastings and Rother was 81% higher than in NHS Hammersmith and Fulham, with an absolute gap of 17.4 per 100,000 ($p<0.01$).

Therefore, although the rates of mortality in PCTs have decreased, the absolute gap between the highest and lowest rates is unchanged. This makes the relative gap larger in 2007-09 than it was in 1995-97. The data on mortality by deprivation suggest that existing variation by PCT is probably due to other factors. This merits further investigation of quality of care and access to services by PCT, as well as the variation in early presentation, and percentage of the population which are ethnic minorities.

Figure 5: Deaths from prostate cancer (age-standardised mortality rate per 100,000), by PCT of residence, 2007-09

Source: Office for National Statistics; Ordnance Survey

Mortality rates in different ethnic groups have been calculated, but differently to the mortality rates discussed above. Population data for ethnic groups is only available to the year 2008, and for broad age-bands of 0-15, 16-64 and 65 and over. This means the age-standardised rates are not comparable to the results presented above, which are based on five-year age bands of population (0-4, 5-9 etc.). The broad-age-standardised mortality rate in White men was 70.5 per 100,000 which compares to 24.2 per 100,000 calculated using full populations (Table 1) and illustrates the strong variation of mortality with age which is accounted for in the full calculation. The standardised rates based on broad age bands are more accurate than crude rates, but there is still potential for a difference in population distribution within the age bands to affect the results.

The mortality rate in Black men was 30% higher than in White men ($p<0.01$) (Table 7, Figure 6) with a rate of 91.6 per 100,000. It is known that prostate cancer risk is increased in Black men (Cancer of the Prostate - SEER Stat Fact Sheets, 2011), however deaths are not only affected by risk but the treatment given.

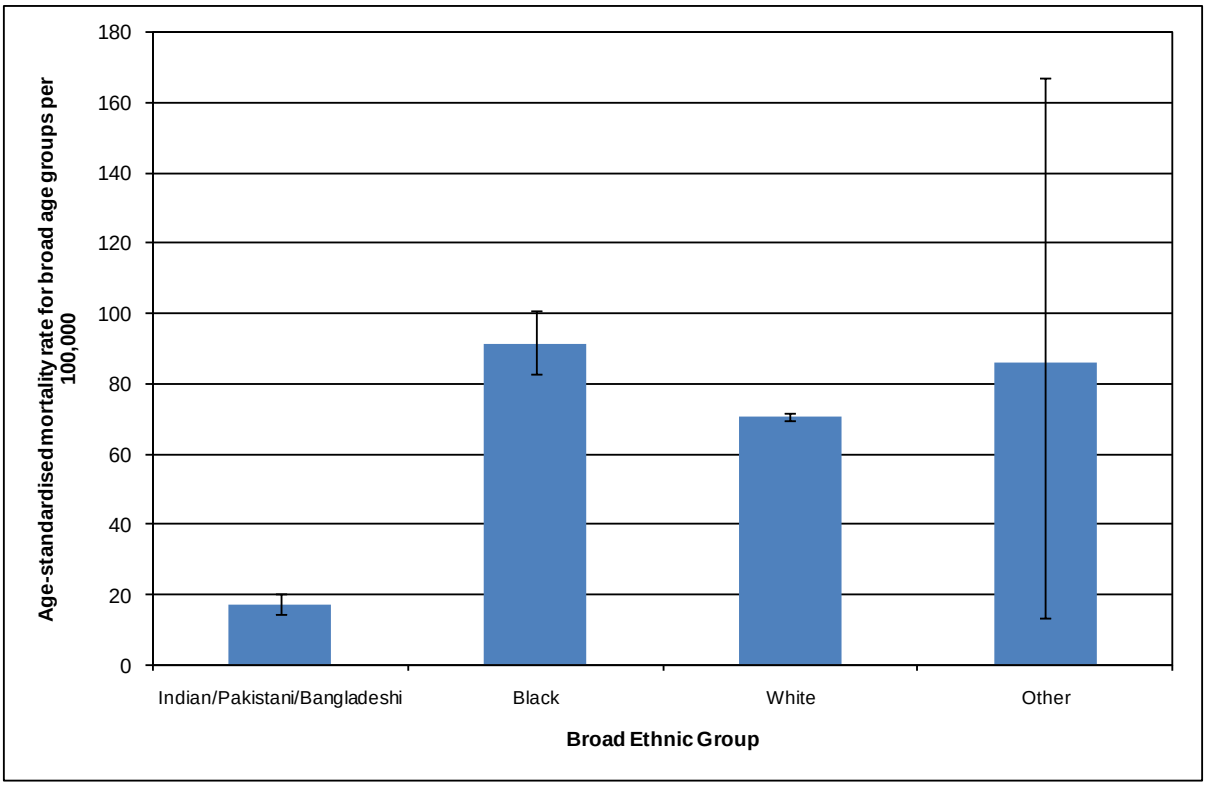
The mortality rate in men from India, Pakistan and Bangladesh was only a quarter of the rate in White men, at 17.2 per 100,000 ($p<0.01$). This is consistent with a low mortality rate in India, Pakistan and Bangladesh as calculated by the GLOBOCAN project. The age-standardised mortality rate in 2008 (for a world population rather than a European population) in these countries was 2.5 per 100,000; 4 per 100,000; and 1.2 per 100,000 respectively. However, the life expectancy in these countries is shorter than in the UK and many men will die of other causes before dying of prostate cancer.

Table 7: Deaths from prostate cancer (age-standardised mortality rate for broad age bands per 100,000), comparison of ethnic groups for 2006-08

Group 1	Group 2	ASR 1	ASR 2	Rate Ratio	Significance
Black	White	91.6	70.5	1.30	p<0.01
Indian/Pakistani/Bangladeshi	White	17.2	70.5	0.24	p<0.01

Source: Office for National Statistics; Hospital Episode Statistics

Figure 6: Deaths from prostate cancer (age-standardised mortality rate for broad age bands per 100,000), by ethnic groups for 2006-08



Source: Office for National Statistics; Hospital Episode Statistics

Conclusions

Deaths from prostate cancer are increasing in number. This increase in number reflects the ageing of the population, and the age-standardised rate has been steadily falling over the last decade. This decrease in rate is occurring in all regions except the North East, and the difference between regions is becoming smaller.

Differences in the mortality rate which were apparent in different deprivation groups in the mid-1990s are no longer statistically significant. The rate has decreased in all quintiles of income deprivation.

The majority of prostate cancer deaths occur in men aged 80 and over, and the proportion for that age group is increasing. However the age-specific mortality rates for each 10-year age band have all decreased, with the biggest decrease in men aged 40-49, although this is a small group.

Black men have a higher prostate cancer mortality rate than White men, based on broad age bands. Men from Indian, Pakistan and Bangladesh have a lower mortality rate than White men.

Less deprived populations are more likely to present with earlier-stage disease due to PSA testing, but there is no difference in mortality rate. This is mainly because the generally high survival from prostate cancer means many men dying in 2007-09 were diagnosed before PSA testing was widespread. The differences in mortality rate by region or PCT are thus unlikely to be linked to differences in population deprivation, but perhaps to availability of treatments or location of specialist services.

Increasing survival and an aging population have led to more men dying from prostate cancer and at an older age. This is a topic which needs consideration, as palliative or end-of-life care services for men dying from prostate cancer may need to change to reflect increased need and different requirements e.g increased co-morbidities.

Conclusions on differences in mortality between ethnic groups are more difficult as the detailed populations required to calculate a full age-standardised rate are not available. However, the higher mortality rate in black men is supported by a study in New York which also found a higher mortality rate, which was ascribed to later presentation and lower rates of radical prostatectomy (Imperato, Nenner, & Will, 1996), and SEER data on men in the USA as a whole (Cancer of the Prostate - SEER Stat Fact Sheets, 2011).

The IOG guidance of 2002 recommended reorganisation of services, and the formation of multi-disciplinary teams (MDTs) to discuss treatment options (National Institute for Clinical Excellence, 2002). It recommended offering hormone therapy to men with advanced disease and this may have impacted survival in that group. However, care should be taken in assigning overall improvements in mortality to this guidance, as many men in the time period studied would have been treated several years previously.

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The NCIN is a UK-wide initiative, working to drive improvements in standards of cancer care and clinical outcomes by improving and using the information collected about cancer patients for analysis, publication and research.

Sitting within the National Cancer Research Institute (NCRI), the NCIN works closely with cancer services in England, Scotland, Wales and Northern Ireland. In England, the NCIN is part of the National Cancer Programme.

Our aims and objectives cover five core areas to improve the quality and availability of cancer data from its collection to use:

- **Promoting efficient and effective data collection throughout the cancer journey**
- **Providing a common national repository for cancer datasets**
- **Producing expert analyses, to monitor patterns of cancer care**
- **Exploiting information to drive improvements in cancer care and clinical outcomes**
- **Enabling use of cancer information to support audit and research programmes**

Further information

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About the South West Public Health Observatory

The South West Public Health Observatory (SWPHO) is part of a network of regional public health observatories in the UK (funded by the Department of Health) and Ireland. These were established in 2000 as outlined in the Government White Paper *Saving lives: our healthier nation*. Key tasks include: monitoring health and disease trends; identifying gaps in health information; advising on methods for health and health impact assessment; drawing together information from different sources; and carrying out projects on particular health issues.

The SWPHO incorporates the National Drug Treatment Monitoring System South West (NDTMS-SW), and in April 2005 merged with the South West Cancer Intelligence Service (SWCIS). The SWPHO works in partnership with a wide range of agencies, networks and organisations regionally and nationally to provide 'a seamless public health intelligence service' for the South West.

For more information about the SWPHO and its partner organisations, please visit www.swpho.nhs.uk