Clinical Guideline

# Prostate Cancer: diagnosis and treatment

## An assessment of need

A report to the National Collaborating Centre for Cancer

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**Contents**

## 1. Incidence

The incidence of prostate cancer is the number of new cases occurring in a specified period of time and in a defined population. In this section calendar years are used. The populations are the number of men in England and Wales, or in individual cancer networks.

Prostate cancer is the most common cancer in men (Figure 1.1) and now makes up approximately 25% of the new diagnoses of malignant cancer in men in England & Wales.

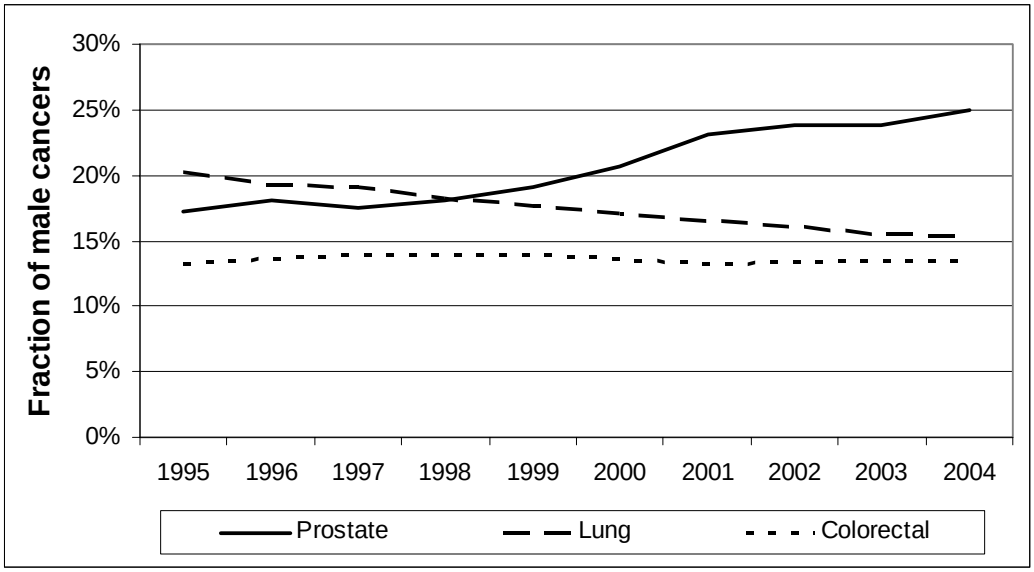


Figure 1.1, Fraction of malignant cancers in men (excluding non-melanoma skin) diagnosed in England and Wales. Data source: Office of National Statistics MB1 series and Welsh Cancer Intelligence unit and Surveillance (WCISU).

### 1.1 Trends in incidence rates

Figure 1.2 shows that prior to 1994 there was a steady rise in the rate of prostate cancer diagnoses. This was because of the increasing use of transurethral resection of the prostate (TURP) as a treatment for benign prostate hyperplasia[1,2]. Better recording of prostate cancer diagnoses due to improved registration practice may also have contributed to the increase.

From 1994 to 1998 the age standardised rate of prostate cancer diagnoses was approximately stable. This has been explained as the effect of a rising number of diagnoses due to PSA testing but a falling number related to

[1] Brewster DH et al. (2000) Rising incidence of prostate cancer in Scotland: increased risk or increased detection? *BJU Int.* 85(4): 463-72

[2] Evans HS et al. (2003) RecentTrends in Prostate Cancer Incidence and Mortality in Southeast England. *European Urology* 43: 337–341

performance of TURPs[2]. Between 1998 and 2001 there was a rapid increase in the rate. This is believed to be due to more widespread use of PSA testing[3].

From 2001 to 2003 the rate again remained approximately stable. In 2004 there was an increase in the rate which is statistically significant (z-test, p=0.003) compared to the previous three years indicating that the trend in incidence may continue upwards. Surveys carried out by the Prostate Cancer Risk Management Programme showed an increase in the rate of PSA testing between 2001/02 and 2003/04, explaining the rise in the number of new diagnoses.

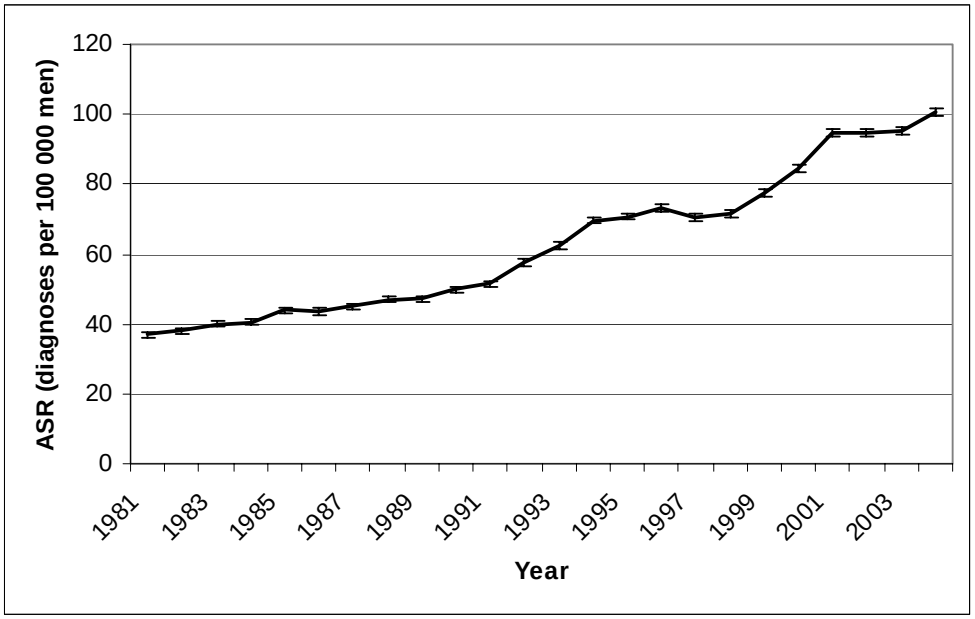


Figure 1.2, Directly Age Standardised Rate (ASR) of prostate cancer incidence in England and Wales (to European standard population). Data source: Office of National Statistics MB1 series and Welsh Cancer Intelligence unit and Surveillance (WCISU).

## 1.2 Age standardised incidence rates by cancer network

Figure 1.3 shows age standardised incidence rates for prostate cancer mapped across England and Wales for three time periods. These bands were chosen to fall in years in which the rate for England and Wales was approximately constant (1996-98 and 2002-04) and in years when it was showing rapid change (1999-2001).

The age standardised incidence rate increased in each three year period in all the cancer networks. The increase in the national incident rate between 1996 and 2004 cannot be wholly explained by a rise in any particular area of either country. Between the first and last time period, in England the average increase was 20% whilst in Wales it was 49%. Together they average 22%. There was a range of increases in individual networks between 1% and 66%.

[3] Office for National Statistics. Cancer Atlas of the UK and Ireland 1991-2000. Chapter 2, page 9. Available online at www.statistics.gov.uk/downloads/theme_health/caUKI91_00/Ch02_Summary.pdf

This almost certainly indicates varying rates of PSA testing. These increased rates may result from differences in local policy regarding the test or more public demand. Isolated areas with consistently raised rates include South Wales and Dorset. In each of the three periods the South appears to have a higher incidence, in general, than the North.

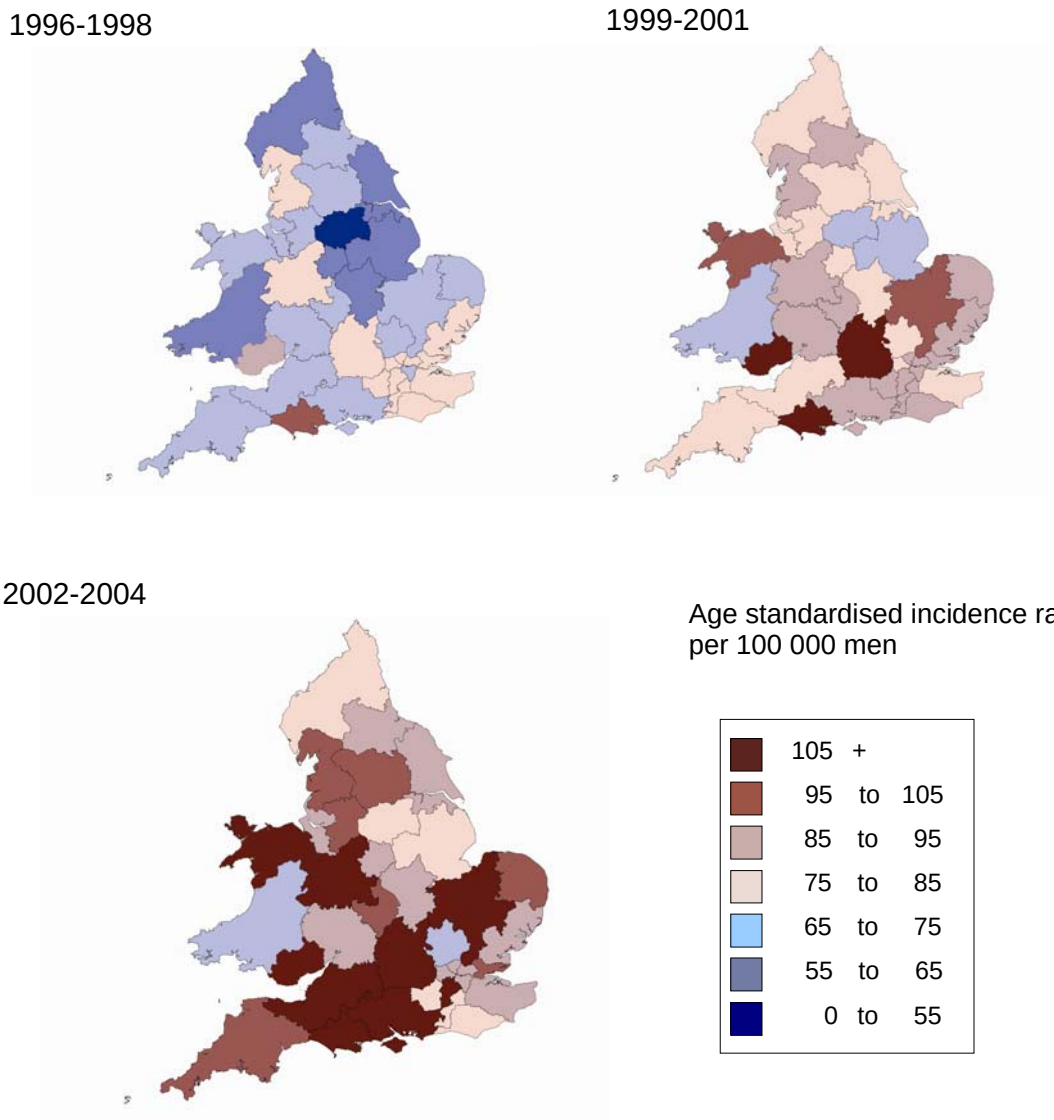


Figure 1.3, Age Standardised incidence Rate (to European Standard population) of prostate cancer by cancer network. Data source: cancer registries of England and Wales.

### 1.3 Incidence rates of prostate cancer by age-band

From age 50 the incidence rate increases approximately linearly with age and indicates that 1% of all men in England & Wales aged 85 or over are diagnosed with prostate cancer each year. (Figure 1.4)

Over the three periods examined the rate of prostate cancer diagnosis is increasing in every age band between 50-54 and 75-79 (z-test, all $p<0.001$). This increase is largest in the 65-69 age band indicating that the uptake of

PSA testing and subsequent diagnosis of cancer is higher in this age bandthan in younger men.

In the 80-84 and 85+ age bands the rate of diagnosis shows a decrease between 1996-98 and 2002-04 (z-test, p=0.01).

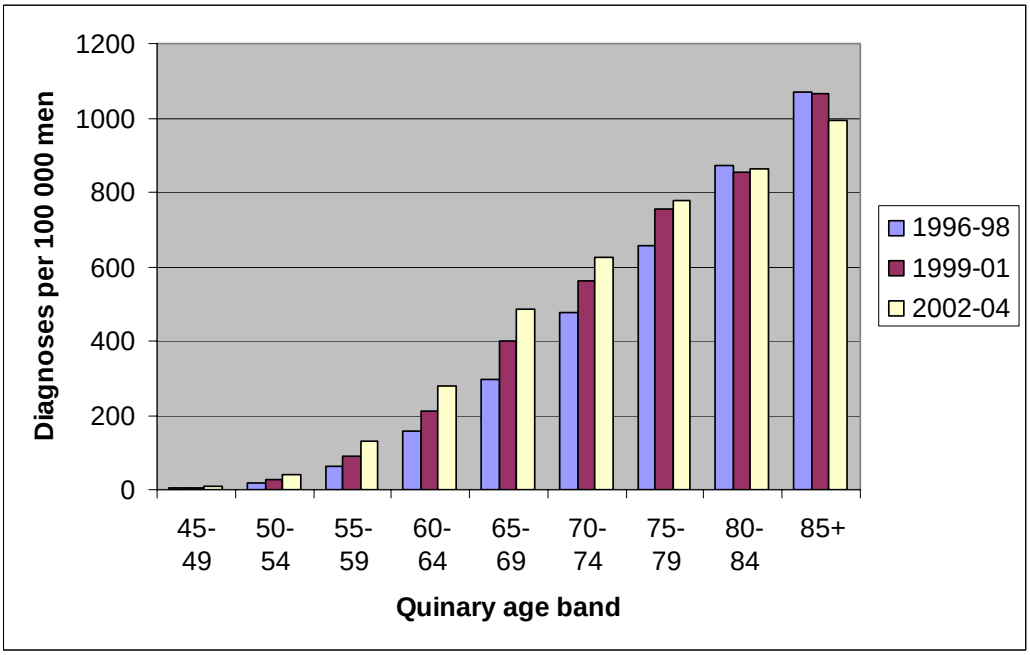


Figure 1.4 Rate of diagnosis of prostate cancer by 5-year age band. Data source: cancer registries of England and Wales.

A mean of the number of diagnoses is taken over each three year period. (Figure 1.5). There is a rapid increase in the number of new cases in the age-bands from age 60 to age 70. This is driven by both the increasing rate of new cases and by the aging of the population as a whole[4]. (Figure 1.5)

[4] Møller H (2007) The future burden of cancer in England: incidence and numbers of new patients in 2020 *British Journal of Cancer* 96: 1484-1488

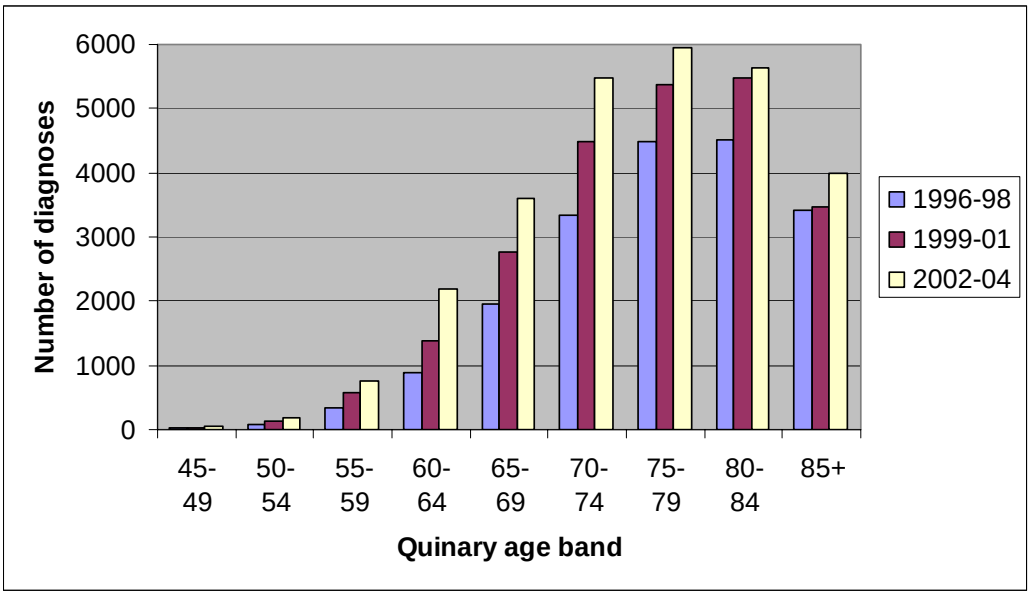


Figure 1.5, Mean number of diagnoses of prostate cancer in England and Wales for three periods, by 5-year age band. Data source: cancer registries of England and Wales.

## 1.4 Incidence rates of prostate cancer by grade and stage at diagnosis

The data in Figure 1.6 shows the fraction of prostate cancer diagnoses by Gleason score at time of diagnosis. Cases without a known Gleason score are not shown. Data is shown from two sources, firstly the South West Government office region, plus Hampshire and the Isle of Wight. The completeness of this data is estimated to be above 90% for prostate cancer patients in the region. More than 70% of patients are pathologically verified in the last five years of available data (2001-2005). Secondly, data is shown from the BAUS cancer registry, this has a national completeness of approximately 45%. Despite this the two sources are consistent, demonstrating that the completeness of the data does not lead to significant bias.

The proportion of new diagnoses with a total Gleason score of less than 6 has reduced sharply since 2001. This shift is explained by a shift in pathological reporting practice[5]. The draft protocol states that "The lowest Gleason growth pattern that can be assessed in needle biopsies is growth pattern 3, implying that a Gleason score of 6 is the lowest possible on peripheral zone needle biopsies". This is justified with reference to the work of Epstein *et al.*[6]

The proportion of tumours with Gleason score of 8 or more has remained approximately constant at between 20 and 25%. The fraction of Gleason 7 tumours is increasing, from less than 20% in 1996 to more than 30% in 2005 due to the change in pathological reporting.

[5] University of Liverpool (2003) Towards a Consensus Protocol on Prostate Biopsies: Indications, Techniques and Assessment. Conference Report p21. 6th June 2003. Available at http://www.cancerscreening.nhs.uk/prostate/conference-report.pdf

[6] Epstein JI (2000) Gleason score 2-4 adenocarcinoma of the prostate on needle biopsy: a diagnosis that should not be made. *Am J Surg Path* 24: 477-478

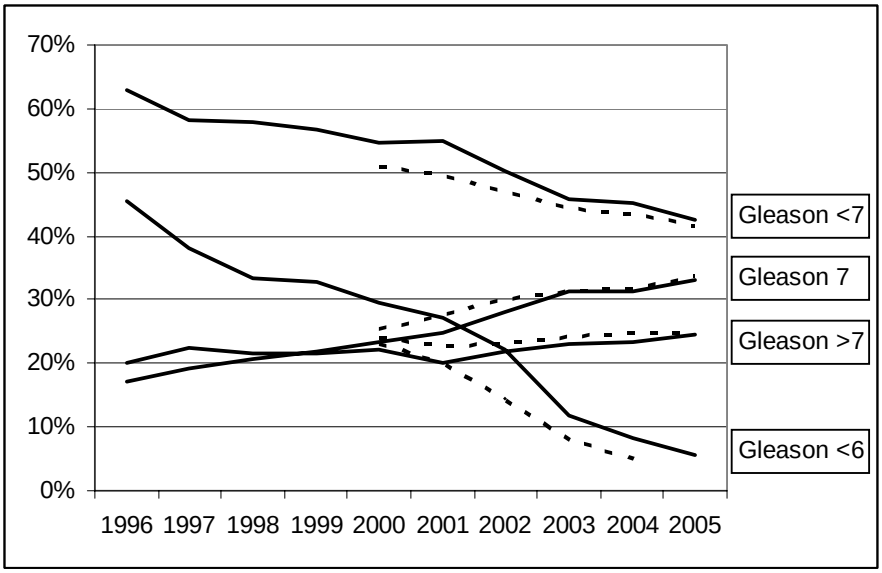


Figure 1.6, Plot of prostate cancer diagnoses broken down by Gleason score, where score is known. Data source: Solid line indicates data from South West Public Health Observatory, dotted line indicates British Association of Urological Surgeons registry database.

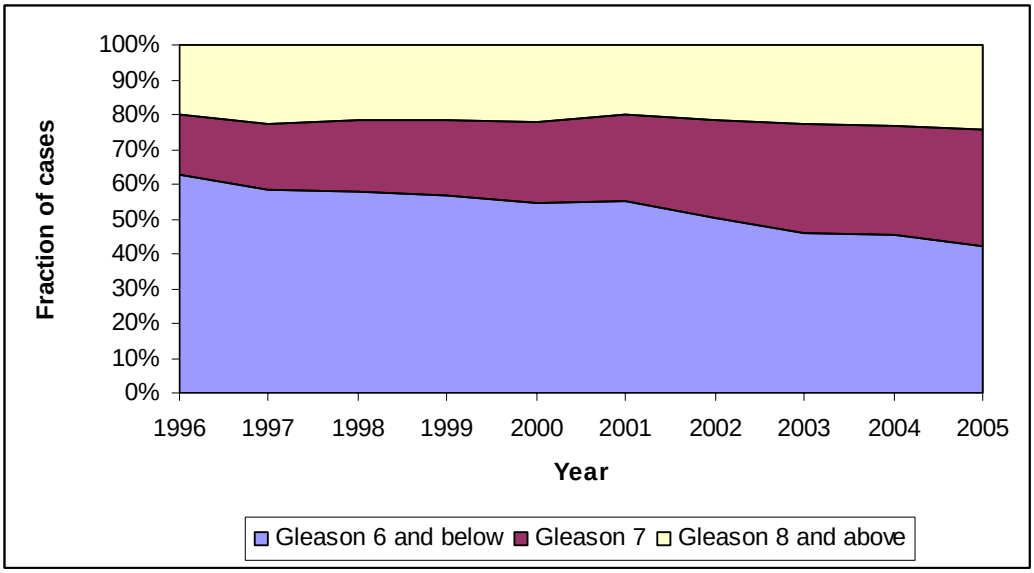


Figure 1.7, Stacked plot of prostate cancer diagnoses broken down by Gleason score (where the score is recorded) for the South West of England. Data source: British Association of Urological Surgeons registry database and South West Public Health Observatory

Figure 1.8 shows that the fraction of low staged diagnoses has climbed between 1999 and 2005.

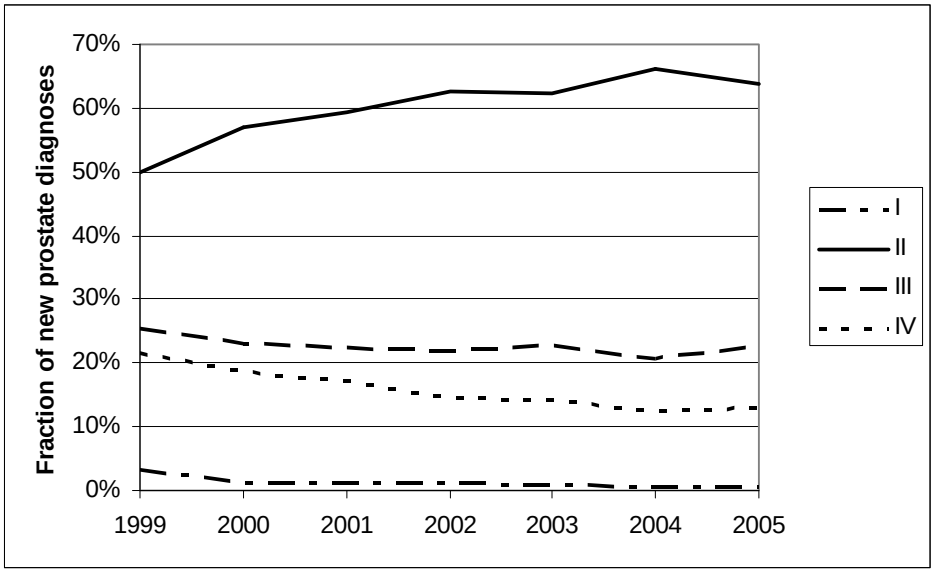


Figure 1.8, Plot of prostate cancer diagnoses broken down by stage, where stage is known. Data source: British Association of Urological Surgeons registry database.

## 1.5 Analysis of prostate cancer incidence rates by socio-economic deprivation

Figure 1.9 shows the age standardised incidence rate for prostate cancer in England and Wales by deprivation quintile for three time periods. Deprivation quintiles are defined by population so that one fifth of the population occupies each quintile.

The quintiles were constructed by ranking each local authority in England by their position in the Index of Multiple Deprivation 2004 income domain[7]. Quintiles for Wales were similarly constructed by ranking each Local Authority by the Welsh Index of Multiple Deprivation 2005[8].

The age standardised rate increases in all deprivation quintiles between the three year periods.

In each time period the incidence rate in the least deprived quintile is significantly higher than those in any of the other four. The difference between the least and most deprived quintiles is 10±3% in 1996-98 and 11±3% in 1999-01 and 2002-04. This indicates that the lower incidence in more socio-economically deprived areas, assumed to be due to higher rates of PSA testing among affluent men, has not changed between 1996 and 2004.

[7] Originally complied by the Office of the Deputy Prime Minister and is available from the Neighbourhood Renewal Unit www.neighbourhood.gov.uk/page.asp?id=1057

[8] Welsh Assembly Government and the Local Government Data Unit (2005) Welsh Index of Multiple Deprivation 2005

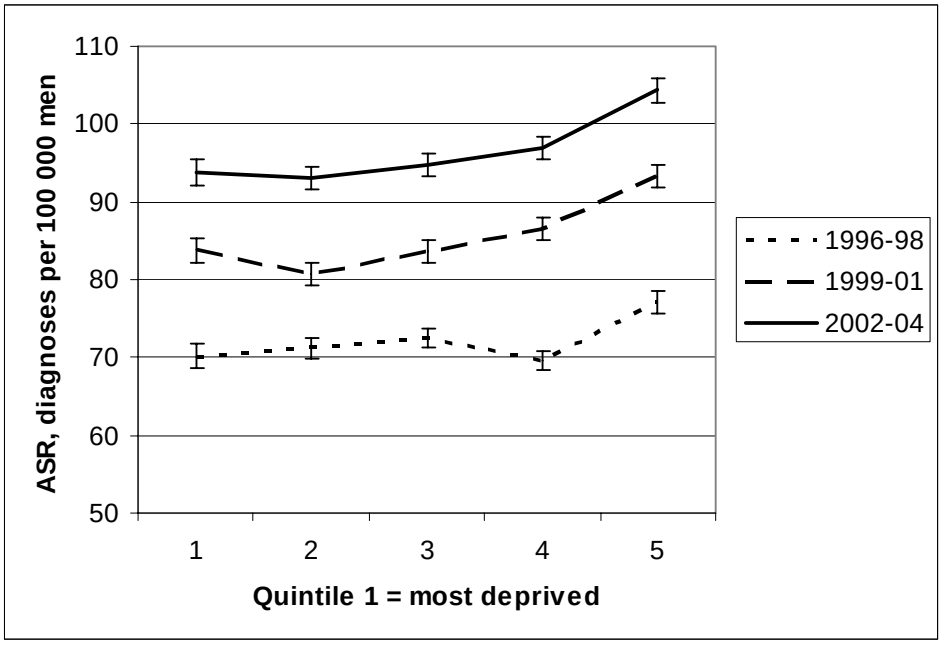


Figure 1.9, Age standardised rate of diagnoses of prostate cancer, by socio-economic deprivation quintile. Data source: cancer registries of England and Wales.

## 1.6 Analysis of incidence by ethnicity

Table 1.1 shows a wide variation in the incidence of prostate cancer. The highest rates are found in North America. Europe, the Caribbean, and Africa are somewhat lower. Incidence rates in Asia are substantially lower. The high rates in North America and Europe indicate a strong effect from high levels of ascertainment in these regions. However the similar rates in Africa to those in Europe indicate a significant ethnic effect. Similarly the low rates in Asia indicate a low incidence in Asiatic men.

| Region | Age Standardised Incidence Rate |
|---|---|
| World | 25.3 |
| More developed regions | 56.2 |
| Less developed regions | 9.4 |
| Middle Africa | 24.5 |
| Southern Africa | 40.5 |
| Caribbean | 52.4 |
| Northern America | 119.9 |
| Eastern Asia | 3.8 |
| South-Eastern Asia | 7 |
| South-Central Asia | 4.4 |
| Western Asia | 10.9 |
| Northern Europe | 57.5 |
| Southern Europe | 35.5 |
| Western Europe | 61.6 |

Table 1.1, Estimates of Age standardised incidence rate (to standard world population) in different regions in 2002. Data source: GLOBOCAN 2002[9].

[9] GLOBOCAN (2002) Data held by the Descriptive Epidemiology Groups of IARC and provided by CANCER*Mondial.* Available online at http://www-dep.iarc.fr/

The American Surveillence, Epidimiology and End Results (SEER) database[10] shows age standardised incidence rates (to the US 2000 standard population) of 161.4 (95% C.I.s: 160.7-162.1) in white men compared to 255.5 (95% C.I.s: 252.6-258.5) in black men and 96.5 (95% C.I.s: 94.7-98.3) in Asiatic men. Incidence rates in black men and white men rose by a similar amount on the spread in PSA testing (respectively a 102% and 108% increase from a 1986 baseline to peak incidence rate[11]), indicating that differences in ascertainment due to differential screening by race are small. The SEER data therefore presents strong evidence to support a higher incidence rate in black men.

The PROCESS study[12] was a population-based retrospective cohort study of 2140 Prostate cancer cases in Bristol and three areas of London. It compared the incidence rates in white, black African, and black Caribbean men. Table 1.2 shows that there is a significant, 3-fold increase in the risk of prostate cancer in black men compared to white men, but no significant difference due to the country of origin of the black men.

| | Age-adjusted risk ratio | | |
|---|---|---|---|
| | RR | 95% CI | p value |
| Black men vs. white men | 3.09 | 2.79-3.43 | <0.0001 |
| Black Caribbean vs. white men | 3.19 | 2.85-3.56 | <0.0001 |
| Black African vs. white men | 2.87 | 2.34-3.53 | <0.0001 |
| Black African vs. black Caribbean men | 0.9 | 0.73-1.12 | 0.35 |

Table 1.2, Age-adjusted risk ratios of being diagnosed with prostate cancer in three ethinc groups. Data Source: Y. Ben-Shlomo et al.[12]

[10] http://seer.cancer.gov/

[11] Stanford JL et al. (1999) Prostate Cancer Trends 1973-1995, SEER Program, National Cancer Institute. NIH Pub. No. 99-4543. Bethesda, MD, Available online at http://seer.cancer.gov/publications/prostate/inc_mort.pdf

[12] Ben-Shlomo *et al.* Y (2007) The Risk of Prostate Cancer amongst Black Men in the United Kingdom: The PROCESS Cohort Study. *Eur Urol.* Mar 1; [Epub ahead of print]

## 2. Mortality

The mortality due to prostate cancer is the number of deaths attributed to prostate cancer in a specified period of time and in a defined population. In this section calendar years are used. The populations are the number of men in England and Wales, or in individual cancer networks.

Prostate cancer accounts for the second highest number of deaths of any cancer in men in England and Wales, below only lung cancer. (Figure 2.1). Between 1996 and 2005 it has caused an average of 19% more deaths than colorectal cancer per year. Over this period it comprised 13% of all cancer deaths in men.

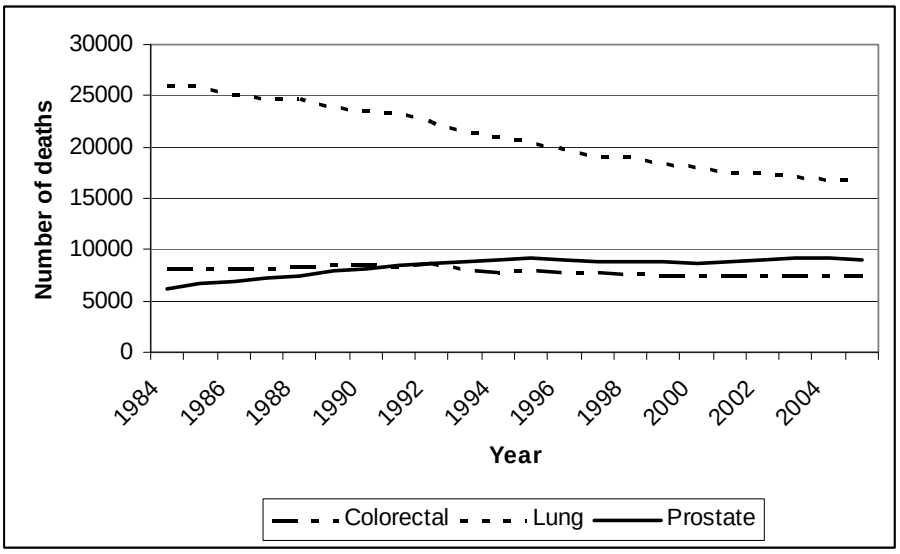


Figure 2.1, Number of deaths in men from Colorectal, Lung and Prostate cancer in England and Wales 1984-2005. Data source: Office of National Statistics.

### 2.1 Trends in mortality rates and numbers of deaths from prostate cancer

The number of deaths due to prostate cancer is calculated by the Office of National Statistics by processing the causes of death as entered on death certificates. The rules are based on World Health Organisation guidance but are subject to change. To compensate for changes made in 1993[13] and 2000[14] in interpretation of these rules the number deaths recorded between 1993 and 2000 have been multiplied by 1.038.[15]

[13] Rooney C, Devis T. (1996) Mortality trends by cause of death in England and Wales 1980-94: the impact of introducing automated cause coding and related changes in 1993. *Population Trends* 86: 29-35

[14] Office for National Statistics (2002) Report: Results of the ICD-10 bridge coding study, England and Wales, 1999. *Health Statistics Quarterly* 14: 75-83.

[15] Office for National Statistics (2003) Mortality statistics cause Review of the Registrar General on deaths by cause, sex and age, in England and Wales, 2001. Annex I, Series DH2, no.28. Office of National Statistics.

There was a steady rise in both the age standardised mortality rate and the number of recorded deaths from prostate cancer up to 1992. (Figure 2.2). Improved diagnosis and registration of cancer deaths is likely to have contributed to this increase. Factors such as aging of the population also contribute.

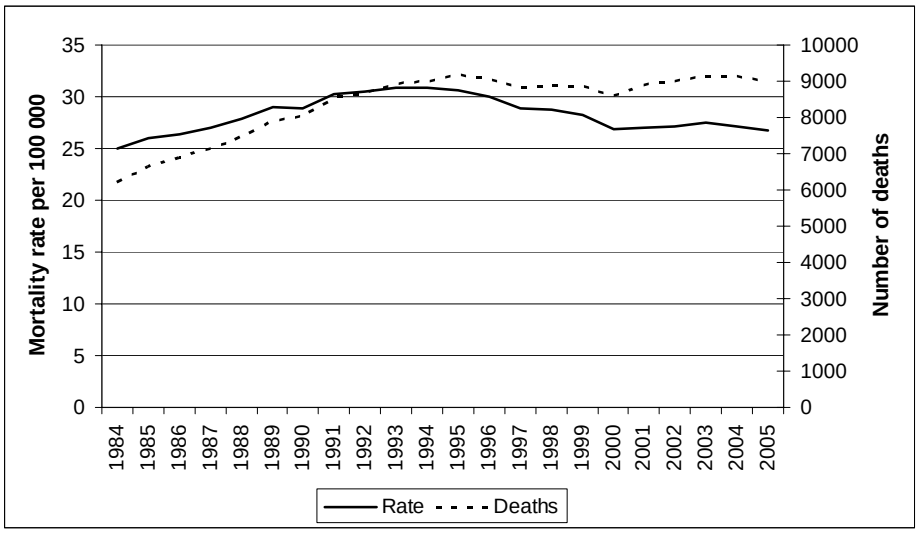


Figure 2.2, Directly Age Standardised mortality Rate (to European Standard population) and number of deaths from prostate cancer in England and Wales 1984-2005. Data source: Office of National Statistics.

There has been a statistically significant decline in the age standardised mortality rate between 1993 and 2005. However the number of deaths annually has remained roughly stable at 9000±200. This indicates that the declining mortality rate is counteracted by the aging of the population.

There is no observable effect on the mortality of the large (approximately 50%) rise in incidence since the year 2000.

## 2.2 Age standardised mortality rates by cancer network

Figure 2.3 shows age standardised mortality rates for each cancer network in England over the period of decline in national mortality rate from 1994 to 2005.

The variation in mortality decreased between 1994-96 and 2003-05, from the highest mortality network 35% above the lowest (interquartile range 2.5 deaths per 100 000) to the highest mortality network 24% above the lowest (interquartile range 1.7 deaths per 100 000).

In the first two three year periods mortality is high in the South of England. We see a contribution to the improvement in mortality from 1993 onwards from a reduction in the previously high rates in the South of England. Rates in London are lower than in the rest of Southern England.

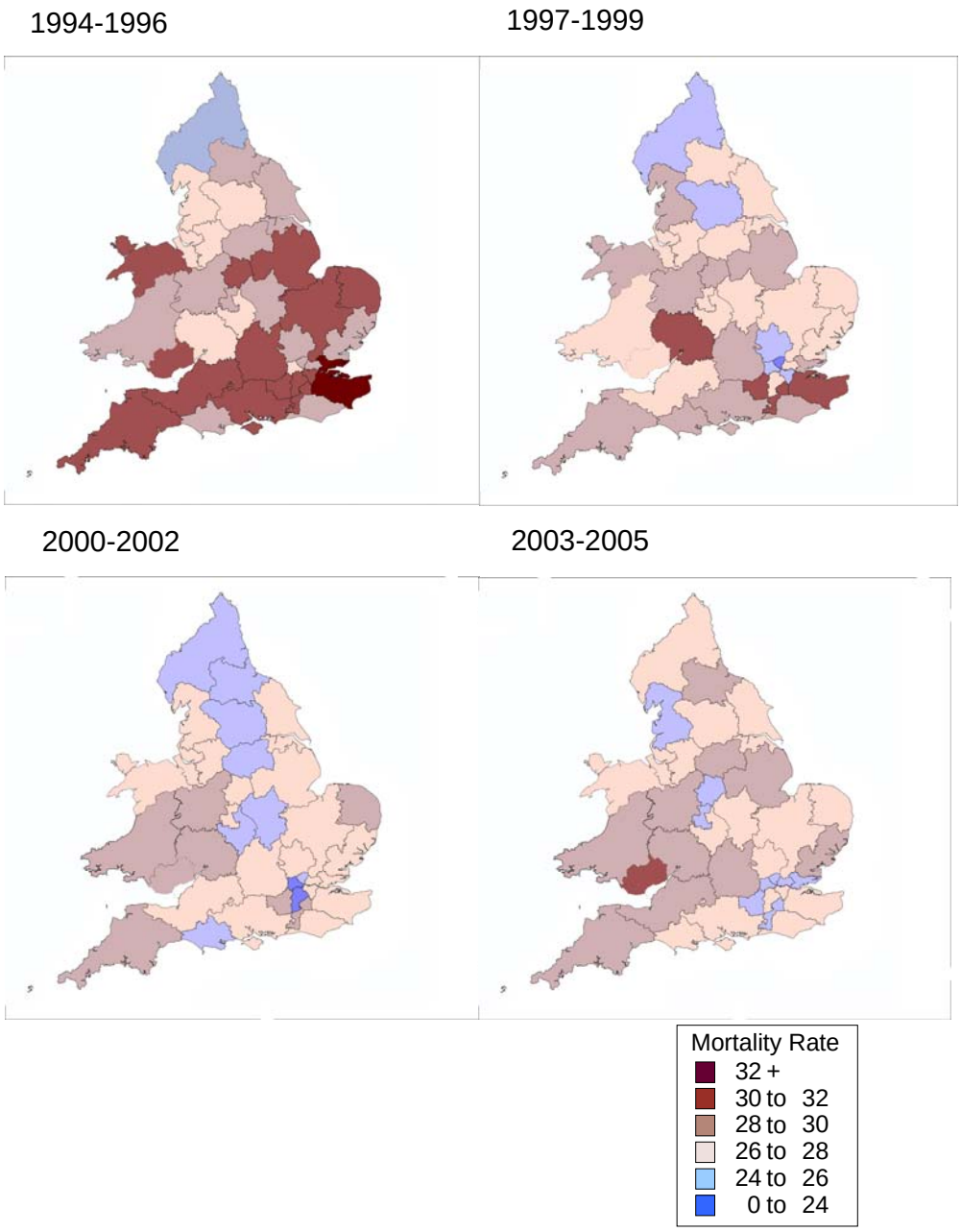


Figure 2.3, Directly Age Standardised mortality Rate (to European Standard population) by cancer network for England and Wales. Data source: Office of National Statistics and Ordnance Survey.

## 2.3 Mortality rates and number of deaths by age band

Figure 2.4 shows the number of deaths from prostate cancer by 5-year age band. Numbers of deaths increase approximately linearly up to the ages of 75-79, with a slow increase in the 80-84 and 85+ age bands. Though the mortality rate due to prostate cancer increases extremely rapidly with advancing age (see Figure 2.5) the small population of males aged over 79

limits the numbers who die of prostate cancer at these ages. Figure 2.4 demonstrates that 84% of prostate cancer deaths occur in men of 70 or over.

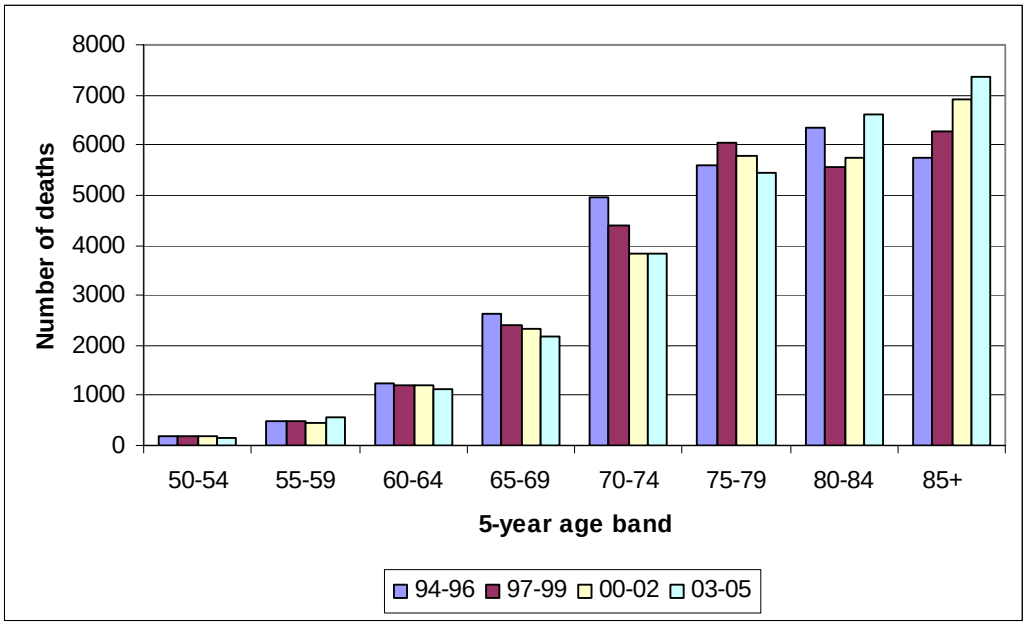


Figure 2.4, Number of deaths in England and Wales from prostate cancer per year, by 5 year age band. Data source: Office of National Statistics.

Reductions in the age specific mortality rates over time reflect success in reducing the risk of death from prostate cancer. There is evidence of a reduction in these age specific rates for men aged 79 and below.

The majority of men that die of prostate cancer do so at an advanced stage when the probability of death from other causes is high. Therefore any treatment that delays their death can plausibly reduce the apparent mortality rate due to prostate cancer.

These reduced age specific rates contribute to the overall reduction in age standardised mortality rate. (See Figure 2.2).

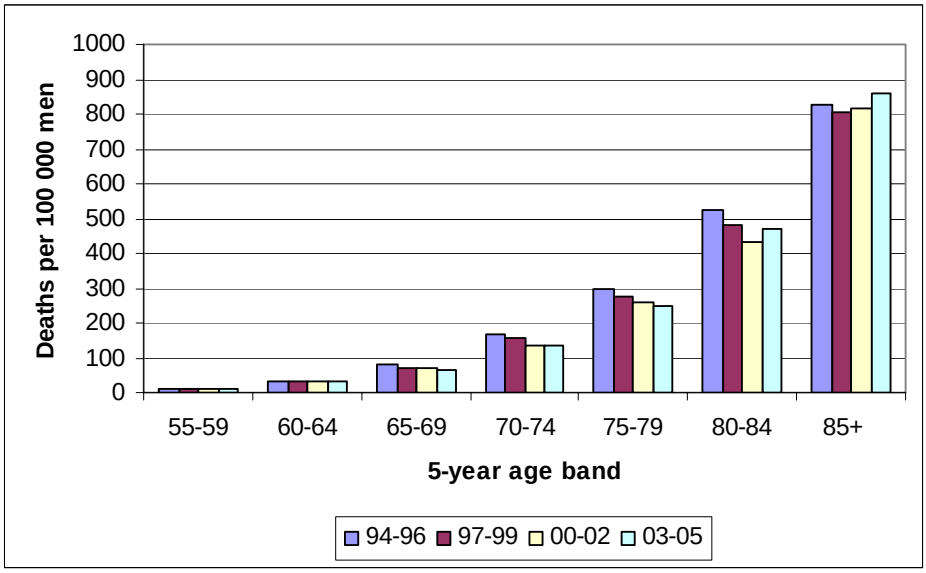


Figure 2.5, Age specific mortality rates in England and Wales by five year age band. Data source: Office of National Statistics.

## 2.4 Analysis of prostate cancer mortality rates by socio-economic deprivation

Figure 2.6 shows the age standardised mortality rate for prostate cancer in England and Wales by deprivation quintile[7,8] for three time periods.

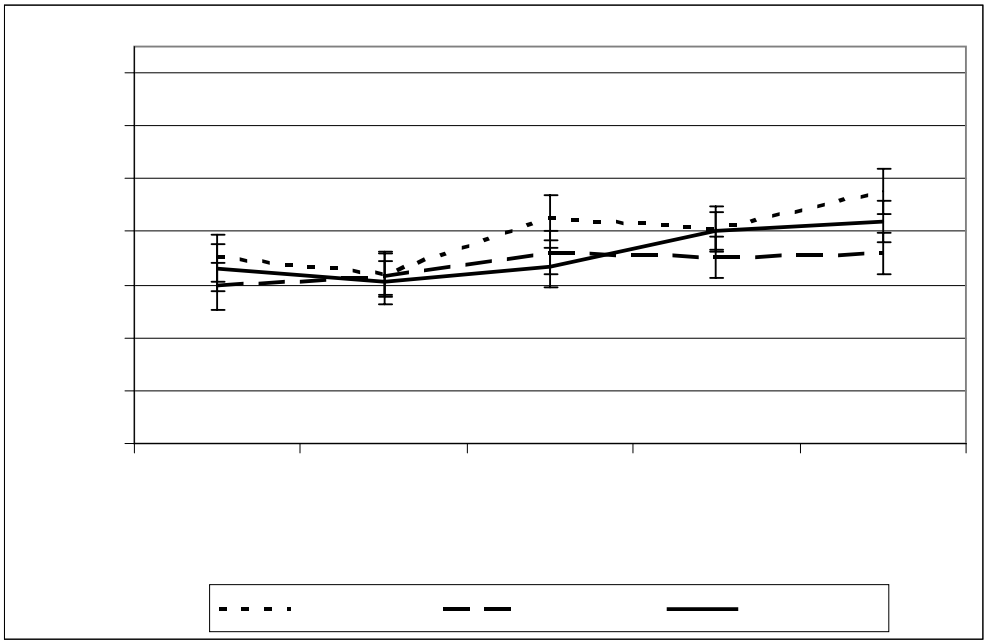

Figure 2.6, Directly Age Standardised prostate cancer mortality Rate (to European population) by socio-economic deprivation quintile. Data source: Office of national statistics.

Combining the data for the three periods shows a weak but statistically significant (ANOVA, p=0.02) difference in the mortality between the highest

and lowest deprivation quintiles. The most affluent quintile has the higher mortality.

This correlates well with the geographic analysis conducted in Figure 2.3 where the more affluent South of England had a noticeably higher mortality rate. A possible explanation for this is better case ascertainment in more affluent men, possibly because such men are more likely to have a diagnosis of prostate cancer. Similar data showing a higher mortality rate in Scottish men has been published by the Scottish Information Services Division though in this case the trend was not statistically significant ($p=0.16$)[16].

However, this result does not indicate that men from more affluent quintiles should undergo more frequent screening for prostate cancer.

## 2.5 Analysis of mortality by ethnicity

Table 2.1 shows a wide variation in mortality due to prostate cancer across different regions. The highest rates are found in the Caribbean, South Africa, and Mid Africa, followed by Europe and North America. Mortality rates in Asia are substantially lower. Using these countries as proxies for a predominantly white (North America and Europe), black (Caribbean and Africa) or Asiatic (Asia) population indicates that prostate cancer mortality does vary significantly by race.

| Region | Age Standardised Mortality Rate |
|---|---|
| World | 8.2 |
| Middle Africa | 21.1 |
| Southern Africa | 22.4 |
| Caribbean | 28 |
| Northern America | 15.9 |
| Eastern Asia | 1.9 |
| South-Eastern Asia | 4.5 |
| South-Central Asia | 2.8 |
| Western Asia | 6 |
| Northern Europe | 19.7 |
| Southern Europe | 13.2 |
| Western Europe | 17.5 |

Table 2.1, Estimates of Age standardised mortality rate (to standard world population) in different regions in 2002. Data Source: GLOBOCAN 2002

The American Surveillance, Epidemiology and End Results (SEER) database[17] shows age standardised mortality rates (to the US 2000 standard population) of 25.6 (95% C.I.s: 25.4-25.7) in white men compared to 62.3 (95% C.I.s: 61.5-63.1) in black men and 11.3 (95% C.I.s: 10.8-11.9) in Asiatic men. However once differences in stage at diagnosis and treatment received are taken into account there are no apparent biological differences in prostate

[16] ISD Scotland Cancer Statistics. Available on line at http://www.isdscotland.org/isd/1488.html#Prostate%20cancer
[17] http://seer.cancer.gov/

cancer fatality in black and white Americans[18], i.e. the increase in population mortality is due only to the higher incidence in black men. The fatality of prostate cancer is the number of cases of a disease ending in death due to that disease compared to the number of cases of the disease, usually expressed as a percentage. This may vary between different ethnic or socio-economic groups.

The recently completed PROCESS study on 2240 black and white men in England found that the prostate cancer mortality in black men as a population was higher than the white population, driven by the markedly higher incidence. However in contrast to the SEER data the fatality of the condition in black men was significantly lower than in white men[19]. This difference is under investigation and may be due to differences in staging in black men in the UK compared to the USA. Emigration of black men with prostate cancer back to their country of origin and their consequent loss to follow-up prior to death may also contribute.

[18] Bach PB (2002) Survival of Blacks and Whites After a Cancer Diagnosis *JAMA*;287: 2106-2113
[19] Ben-Schlomo Y. Personal communication June 2007.

## 3. Survival

Crude Survival is defined as the proportion of individuals diagnosed with prostate cancer surviving over a defined period of time (typically five years). Relative survival is the fractional survival of a prostate cancer sufferer compared to that of an otherwise similar person who does not have prostate cancer. Relative survival is then a measure of disease-specific survival.

In most cases prostate cancer has a long preclinical phase between onset and the appearance of clinical symptoms. The survival time after a symptomatic diagnosis is also long. Therefore the measured survival time for prostate cancer is easily confounded by lead time bias introduced by bringing forward the point of diagnosis with advances in biochemical screening.

Any measure of prostate cancer survival, especially one taken on a population basis, reflects changes in patient prognosis and a lead-time effect due to changes in diagnostic practice. *Differences in survival between countries are therefore more due to differences in diagnostic practice than the clinically relevant experience of the patient.*

### 3.1 European EUROCARE-3 data

The EUROCARE project[20],[21],[22] aims to standardise cancer survival data across Europe, in order to make meaningful comparisons possible between countries. The third and most recently published review, EUROCARE-3, collected data on patients diagnosed up to 1994 and followed up to 1999.

Although the EUROCARE results are the most comparable set of international data available there are several factors that may influence the survival rates. Some countries, including the UK, have a population based cancer registry with coverage that approaches 100%. However, data from some other countries are contributed to by regional cancer registries with a population coverage of less than 10%. This data may not therefore represent the country as a whole. In addition, variations in data collection practice are known to exist across Europe. With prostate cancer in particular the case-mix at presentation may vary significantly between countries because of different diagnostic practices. For example this varies from population based PSA screening in Tyrol to only symptomatic presentation in Denmark.

These issues make direct comparison of survival data between countries difficult and differences in data collection practice and diagnostic practice must be kept in mind.

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[20] Berrino F (2003) The EUROCARE Study: strengths, limitations and perspectives of population-based, comparative survival studies. *Ann Oncol* 14: v9-v13. Available online at http://annonc.oxfordjournals.org/cgi/reprint/14/suppl_5/v9

[21] Capocaccia R et al. (2003) The EUROCARE-3 database: methodology of data collection, standardisation, quality control and statistical analysis. *Ann Oncol* 14: v14-v27. Available online at http://annonc.oxfordjournals.org/cgi/reprint/14/suppl_5/v14

[22] http://www.eurocare.it/

In general the EUROCARE-3 data showed the countries of the UK (England, Scotland and Wales), for all cancers, to have a consistently lower survival than other countries in the EU. In The NHS Cancer Plan[23] this was explained as being due to later stage at diagnosis and longer time periods between diagnosis and treatment. This pattern is also seen in prostate cancer.(Figure 3.1). The 5-year survival across Europe varies between 40% and 80%, the widest variation of any cancer type. In particular the high survival of Austria can be explained by the large contribution for the Tyrol province which has had a population PSA screening programme in place since the early 1990's. The low survival in Denmark compared to other Scandinavian and Western European countries would be, if taken at face value, remarkable. However this has been linked to low Danish use of needle biopsy, and their active discouragement of the use of PSA testing.

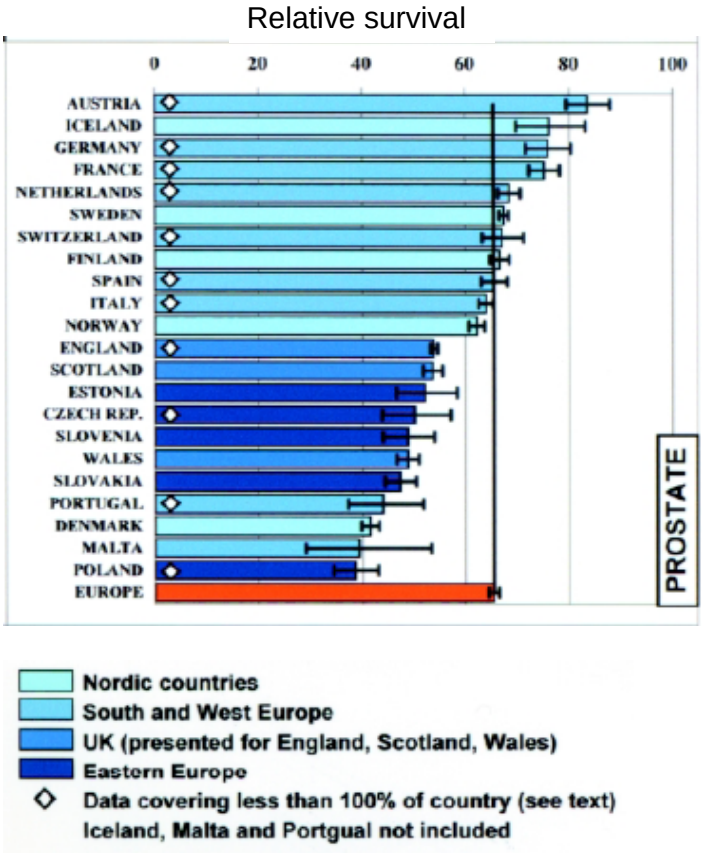


Figure 3.1, 5-year survival rates for men diagnosed with prostate cancer during the period 1990-1994. Data source: EUROCARE-3 Summary[24].

[23] Department of Health (2000). *The NHS Cancer Plan*. London, Department of Health. Available online at http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4009609

[24] Coleman MP et al. (2003) EUROCARE-3 Summary: cancer survival in Europe at the end of the 20th century *Annals of Oncology* v128-v149

Figure 3.2 shows the trends in relative five-year survival across Europe. Survival trends in Europe are very diverse. Again England and Wales have amongst the lowest survival rates of countries in Western Europe.

From these data it is hard to conclude whether the lower prostate cancer survival figures represent a poorer prognosis for patients, or are simply a reflection of the different patient case-mix and diagnostic practices across Europe.

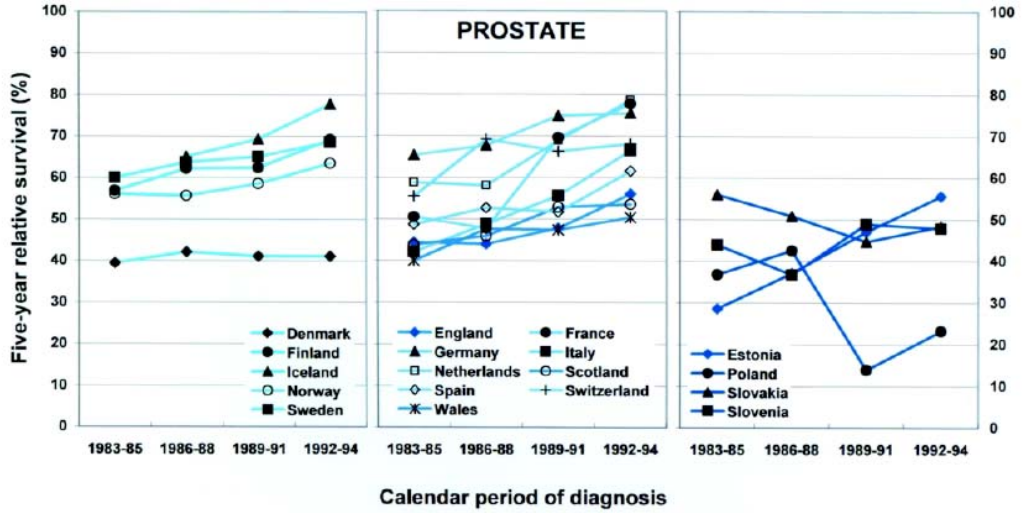


Figure 3.2, Trends in five-year relative survival. Data source: EUROCARE-3 Summary[25].

## 3.2 Analysis of prostate cancer survival rates by socio-economic deprivation

Figure 3.3 shows the 5-year relative survival by socio-economic status in England, for patients diagnosed in four five-year periods. The 5-year relative survival in England has greatly increased between 1981 and 2000, with almost all of the increase coming between 1991 and 2000. This is very likely due to the use of diagnostic PSA testing from around 1990 onwards. Use of PSA testing gives rise to a lead-time bias estimated at being between 5 and 10 years[26] and so dramatically increases the measured survival time. A fraction of asymtomatic diagnoses of prostate cancer arising from PSA testing are of no clinical significance and would not have contributed to the survival statistics in the absence of PSA testing, further improving the measured survival.

Relative survival from prostate cancer is significantly higher in more affluent men. This is the case in each five year period from 1981 to 2000 and so can not be explained solely by access to PSA testing.

[25] Coleman MP et al (2003) EUROCARE-3 Summary: cancer survival in Europe at the end of the 20th century *Annals of Oncology* v128-v149

[26] Post P (1999) Incidence and survival of prostate cancer since 1970. M.D. Thesis, Erasmus University Rotterdam 1999

Although relative survival has been increasing in all socio-economic groups, the difference in survival between the most affluent and most deprived has widened. For patients diagnosed between 1996 and 2000 it is 17%, as compared to 10% for patients diagnosed between 1981 and 1986. This may indicate increased uptake of PSA testing in more affluent socio-economic groups, especially in private healthcare screening programmes.

The apparent contradiction between a higher survival in affluent groups and a higher mortality in more affluent groups (see Figure 2.6) can be resolved by considering the lead time bias. The higher incidence in more affluent groups increases the survival despite the slightly higher mortality.

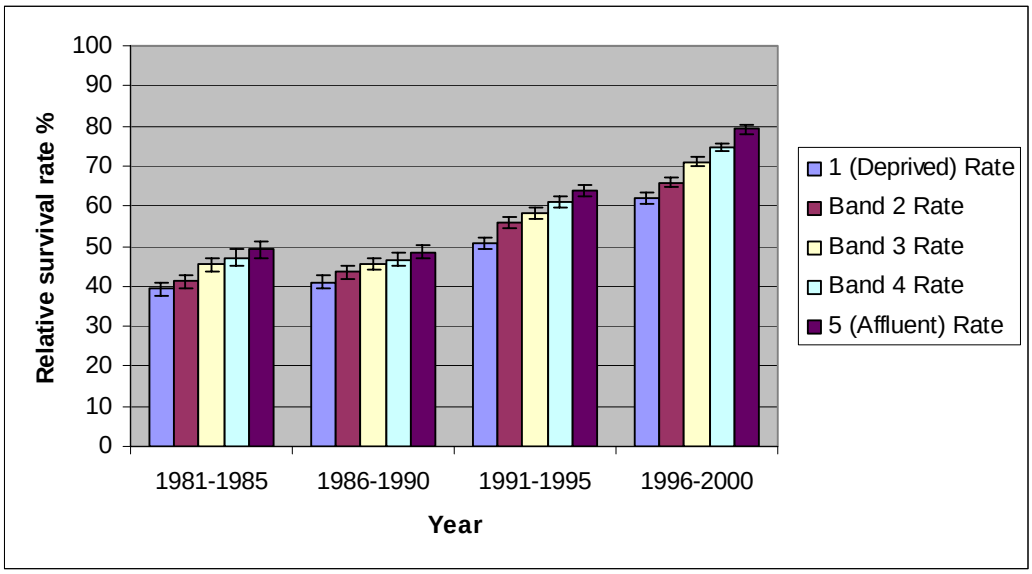


Figure 3.3, Five-year relative survival in England by socio-economic deprivation quintile. Data source: English and Welsh cancer registry data, Office of National Statistics.

## 4. Diagnosis and investigations

The four procedures commonly used as diagnostic tests for prostate cancer are Digital Rectal Examination (DRE), the Prostate-Specific Antigen (PSA) blood test, Trans-rectal Ultrasound (TRUS), and needle biopsy. The practice of these procedures has been detailed by Selley *et al*. [27] and the Prostate Cancer Risk Management Programme[28] also provides guidance on their use.

As detailed in Selley *et al*. TRUS is commonly used in conjunction with needle biopsy. DRE procedures are very common but are not well recorded in any centralised data source. Radiological scans including CT and MRI are used to aid diagnosis or staging but again there is no central recording of their frequency.

### 4.1 PSA testing

The level of PSA testing is not centrally monitored in England and Wales. However several surveys of GP practices and pathology labs have been carried out in recent years.

Melia et al. [29,30] surveyed PSA tests carried out at the request of a GP in a sample of 28 pathology laboratories between November 1999 and May 2002. The reason for testing patients was also surveyed in 391 GP practices. In England and Wales during this period 6% of men between 45 and 84 years of age with no previous diagnosis of prostate cancer underwent a PSA test. There were significant regional variations in testing rates of between 4.4% (Trent) and 8.8% (the South West). Analysis of the reasons given for the tests show asymptomatic, symptomatic and re-testing rates of 2.0%, 2.8%, and 1.2% respectively. This indicates that approximately a third of PSA tests conducted by GPs are asymptomatic.

Overall there was a significant increase in the rate of PSA testing from 1999 to 2002. Higher rates were reported than previous studies carried out in the mid 1990s[31,32]. The rate of PSA testing decreased with increasing socio-economic deprivation, and independently decreased with increasing proportion of either black or Asian populations. In black populations the

[27] Selly et al. (1997) Diagnosis, management and screening of early localised prostate cancer.*Health Technology Assessment* Vol. 1: No. 2. Available online at: http://www.ncchta.org/fullmono/mon102.pdf

[28] Prostate Cancer Risk Management Programme: UK Information Reference Booklet, available online at http://www.cancerscreening.nhs.uk/prostate/prostate-booklet-text.pdf

[29] Melia et al. (2003) Study to assess the rate of PSA testing in men with no previous diagnosis of prostate cancer. Report to the department of health, available online at: http://www.cancerscreening.nhs.uk/prostate/psa-mapping.doc

[30] Melia et al. (2004) Rates of prostate-specific antigen testing in general practice in England and Wales in asymptomatic and symptomatic patients: a cross-sectional study *BJU International* 94: 51-56

[31] Chamberlain J, Melia J, Moss S, Brown J, (1997) Report prepared for the Health Technology Assessment panel of the NHS Executive on the diagnosis, management, treatment and costs of prostate cancer in England and Wales. *Br J Urol* 79(3):1-32

[32] Melia J, Moss S (2001) Survey of the rate of PSA testing in general practice *Br J Cancer* 85: 656-7

incidence of prostate cancer is higher than the average for England while in Asian populations it is lower (see Section 1.6). Melia *et al.* speculate that lower rates in both these populations may be due to lower uptake of health services as well as lower incidence in the Asian populations.

The Prostate Cancer Risk Management Programme (PCRMP) has performed two surveys of 210 laboratories that participate in the UK National External Quality Assessment Service (NEQAS)[33] scheme. A subgroup of 79 laboratories responded to the survey by the PCRMP in both 2000-01 and 2003-04. In these laboratories the number of PSA tests increased by 39%, as shown in Table 4.1.

| | *Number of laboratories | *Mean number of tests per laboratory | Range | Total number of tests |
|---|---|---|---|---|
| Total PSA 2003-04 | 117 | 7313 | 74 to 23,312 | 855,638 |
| Total PSA 2000-01 | 142 | 5544 | 3 to 17,884 | 787,301 |
| Subgroup Total PSA 2003-04 | 79 | 7534 | 248 to 20,665 | 595,214 |
| Subgroup Total PSA 2000-01 | 79 | 5421 | 250 to 16,243 | 428,241 |

Table 4.1, Number of PSA tests carried out in a selection of laboratories. "*" indicates that only laboratories that provide the PSA test have been included. Data source: PCRMP First and Second Prostate Specific Antigen Services in England [34,35]

The origin of samples for PSA testing varied significantly between laboratories, as shown in Table 4.2. The source of the request showed a small but statistically significant increase in the fraction of tests requested by GPs at the expense of the fraction requested by Consultants other than Urologists indicating a shift toward a higher fraction of PSA tests carried out in primary care.

[33] http://www.ukneqas.org.uk/
[34] Prostate Cancer Risk Management Programme. First survey of Prostate Specific Antigen Services in England. Available online at http://www.cancerscreening.nhs.uk/prostate/survey-prostate-specific-antigen-services.pdf
[35] Prostate Cancer Risk Management Programme. Second survey of Prostate Specific Antigen Services in England. Available online at http://www.cancerscreening.nhs.uk/prostate/second-survey-psa-tests.pdf

| | | %GP | %Urologist | % Other Consultants |
|---|---|---|---|---|
| 2003-04 | Mean | 52 | 31 | 16 |
| | Range | 0 to 78 | 7 to 95 | 0 to 55 |
| 2000-01 | Mean | 49 | 32 | 19 |
| | Range | 0 to 95 | 0 to 95 | 0 to 60 |

Table 4.2, Source of samples for PSA test. Data Source PCRMP First and Second Prostate Specific Antigen Services in England [34,35]

There are many varieties of PSA test available from various manufacturers. The PCRMP classifies the quality of each type of PSA test used as “Acceptable”, “Borderline”, “Unacceptable” and “Unknown”. In the first survey 70% were rated acceptable and 26% unacceptable. In the second survey 64% were rated acceptable and 30% unacceptable. While this decrease is not statistically significant we can say that there is no evidence of improvement in the quality and consistency of the PSA tests being employed.

The PCRMP guidance states that the PSA level considered as a positive result should be age dependant according to a specified scheme. In their most recent survey of 118 laboratories, 77% employed age-related ranges, though only 5% of these used the exact range recommended.

## 4.2 Needle Biopsies

The number of needle biopsies performed nationally is not well recorded. Biopsies are commonly performed as an outpatient procedure, meaning that patient data are not captured on hospital administration systems and fed into centralised systems like the Hospital Episode Statistics (HES).

Figure 4.1 shows the overall trend in recorded inpatient and day-case biopsies. The numbers are roughly comparable to the incidence figures for prostate cancer as a whole. It is obvious that the data only represents a fraction of the biopsies that are performed yearly in the UK. It is likely that some of the increase in the numbers of biopsies recorded is due to more complete capture of biopsy records. However the rough doubling of the recorded biopsies between 1997-98 and 2003-04 does suggest an increase in the total number of biopsies caused by the increasing number of PSA tests being performed.

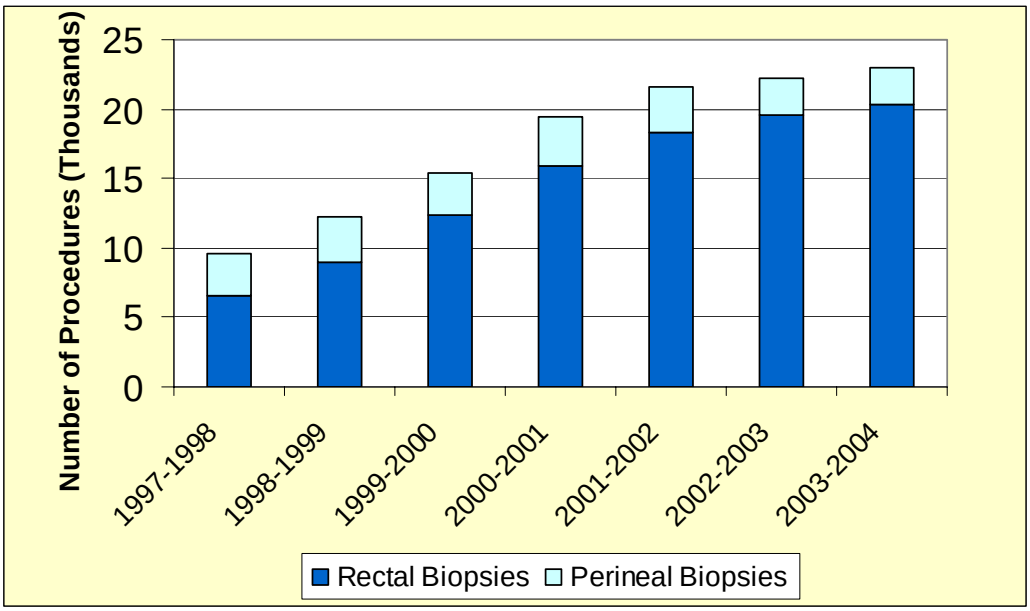


Figure 4.1, Number of rectal (OPCS-4[36] code M703) and perineal (OPCS-4 code M702) needle prostate biopsies performed as inpatient or daycase operations in England. Data source: HES data provided by NatCanSAT.

Figure 4.2 shows the age breakdown of the rectal biopsies, by year. In the most recent data the most biopsies are in men between the ages of 65 and 69. Biopsies in 1997-98 were most commonly performed on men aged between 70 and 74 years. However all age bands have shown an increase in this period and the reason for the downward shift in the peak age of biopsy is that numbers of men aged 65 to 69 has increased more rapidly. This cannot be explained by demographic change as the number of men in the three age bands 60-64, 65-69, and 70-74 each changed by less than 3% between 1997 and 2003[37].

[36] Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures (4th revision).
[37] UKACR Populations Database Version 2.1: September 2005 Release, base data provided by the Office of National Statistics.

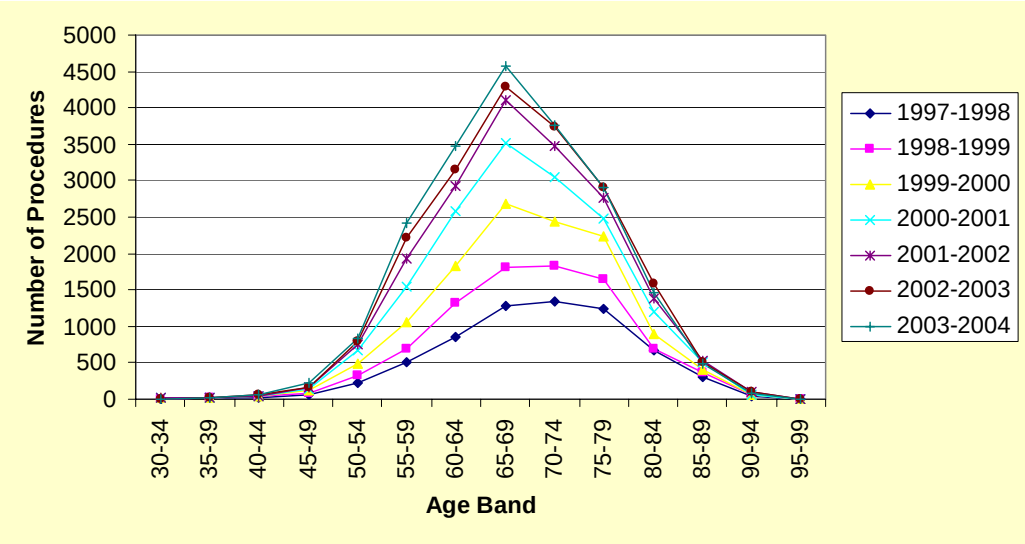


Figure 4.2, Age profiles of rectal needle prostate biopsies (OPCS code M703) performed as inpatient operations, by year. Data source: HES data provided by NatCanSAT.

### 4.3 Estimate of the actual number of needle biopsies

HES data captures approximately 23,000 prostate biopsies per year. As the HES data records only inpatient episodes and day-cases it misses biopsies carried out as outpatient procedures. In addition many biopsies are carried out in radiotherapy departments because of the expertise needed in the use of ultrasound equipment used during the biopsy. These procedures are believed to be less reliably included in HES data.

A better estimate of the total number of biopsies can be made using:

N: The number of men diagnosed with prostate cancer in a year
F: The fraction of these men known to have had a biopsy
P: The fraction of biopsies that prove positive.

Total number of biopsies is then $N \times F \times 1/P$

| | |
|---|---|
| N = 31650 | (2004 ONS data, MB1 series and Welsh Cancer Intelligence and Surveillance Unit) |
| F between 0.65 and 0.85 | (2004 South West Cancer Intelligence Service Registry data) |
| P = 1/3 | (Prostate Cancer Risk Management Programme estimate, 10% error assumed) |

Which gives a number of biopsies between 56,000 and 89,000 in England and Wales per year.

The lower limits on the SWCIS data are taken from the actual number of needle biopsies recorded in prostate cancer patients registered in the South West Region in 2004. The upper limit was calculated from all such patients who have a recorded Gleason score. Most of these are derived from needle

biopsies but some may have been generated from tissues samples taken during other procedures, e.g. a transurethral resection of the prostate (TURP) to relieve urinary symptoms or an endoscopic biopsy. It is assumed that the fraction of men having a biopsy in the South West can reasonably be extrapolated to England and Wales as a whole.

## 5. Surgery

The primary curative surgical procedure for prostate cancer is the total removal of the prostate, known as prostatectomy. The number of radical prostatectomy operations on men with prostate cancer more than tripled between 1997-98 and 2004-05. (Figure 5.1)

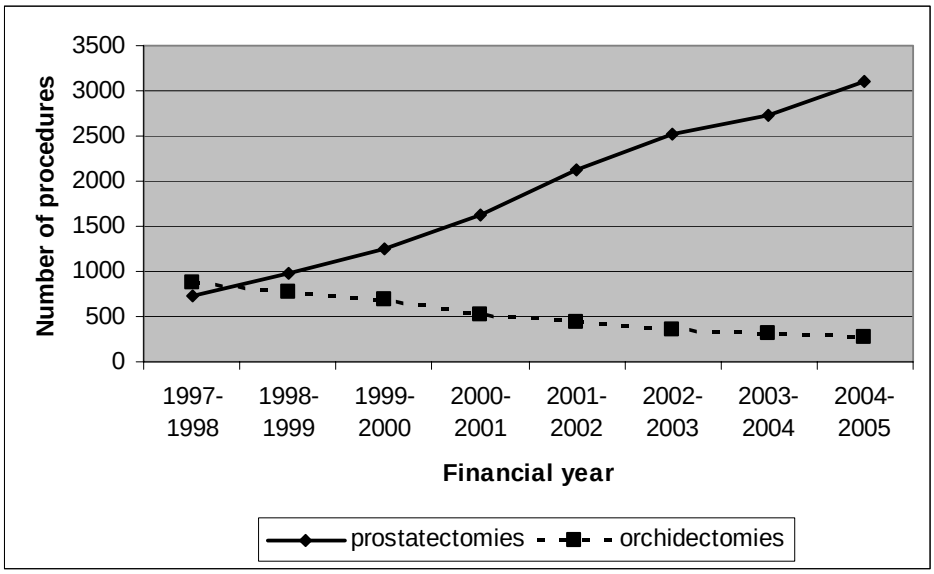


Figure 5.1, Numbers of all radical prostatectomy and orchidectomy operations on prostate cancer patients in England. Prostatectomies defined by OPCS code M61, Orchidectomies are defined by OPCS codes N05 and N06. Data source: HES data provided by NATCanSAT.

The number of radical prostatectomies performed on men diagnosed with prostate cancer shows a significant rise in all age groups (linear regression, p values <0.05), groups. (Table 5.1). The number of operations is rising quickest in the 60-64 and 65-69 age groups. In the last year where data were available only 1.5% of prostatectomies are performed on those 75 or over, or those under 45 years of age.

Metastatic prostate cancer can be treated by the surgical removal of the testes, otherwise known as orchidectomy[38]. This suppresses the level of testosterone in the body and retards the growth of prostate tumours. Surgical orchidectomy is becoming a less common way of treating prostate cancer (see Figure 5.1). From 1997-98 to 2003-04 the number of operations which took place on prostate cancer sufferers reduced by 75%. Medical castration, using hormonal therapy, has replaced surgical castration in most cases.

The number of orchidectomies performed on men diagnosed with prostate cancer is falling for men above 45 years of age. (Table 5.2). Older age bands have a higher number of procedures, with 81% taking place in the over 70s in 1997-98. The decline in the numbers of procedures is higher in older age groups. There is little change in the fraction of procedures taking place in the

[38] Cancer Research UK, available online at http://www.cancerhelp.org.uk/help/default.asp?page=2875

older age bands, with 80% of procedures taking place in those over 70 in 2004-05.

| Patient Age | Financial Year | | | | | | | | | | | | | | | | Change per year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997-1998 | | 1998-1999 | | 1999-2000 | | 2000-2001 | | 2001-2002 | | 2002-2003 | | 2003-2004 | | 2004-2005 | | |
| | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | |
| 0-44 | 4 | 0.3 | 5 | 0.2 | 3 | 0.1 | 5 | 0.2 | 9 | 0.4 | 16 | 0.8 | 12 | 0.6 | 11 | 0.5 | 2 |
| 45-59 | 166 | 35.3 | 202 | 42.6 | 266 | 55.5 | 404 | 83.4 | 507 | 103.3 | 649 | 130.7 | 680 | 136.9 | 750 | 151.0 | 92 |
| 60-64 | 261 | 215.3 | 330 | 268.2 | 448 | 358.4 | 542 | 430.4 | 683 | 545.6 | 825 | 658.6 | 902 | 720.0 | 1080 | 862.1 | 117 |
| 65-69 | 228 | 206.4 | 326 | 295.7 | 410 | 373.1 | 495 | 450.1 | 696 | 629.9 | 774 | 693.0 | 874 | 782.5 | 913 | 817.4 | 105 |
| 70-74 | 49 | 52.0 | 88 | 93.8 | 89 | 94.9 | 155 | 164.8 | 191 | 201.7 | 233 | 244.7 | 233 | 244.7 | 306 | 321.4 | 36 |
| 75+ | 19 | 14.1 | 27 | 19.6 | 30 | 21.4 | 29 | 20.3 | 30 | 20.6 | 32 | 21.5 | 27 | 18.1 | 34 | 22.8 | 1 |
| Total | 727 | 523.4 | 978 | 720.1 | 1246 | 903.5 | 1630 | 1149 | 2116 | 1502 | 2529 | 1749 | 2728 | 1903 | 3094 | 2175 | 353 |

Table 5.1, Numbers (n) and age specific rates (ASR) per million men in the wider population, of prostatectomies in men diagnosed with prostate cancer, per financial year. Data were fitted by linear regression to find the average annual change per year. Data source: HES data for England provided by NATCanSAT.

| Patient Age | Financial Year | | | | | | | | | | | | | | | | Change per year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1997-1998 | | 1998-1999 | | 1999-2000 | | 2000-2001 | | 2001-2002 | | 2002-2003 | | 2003-2004 | | 2004-2005 | | |
| | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | n | ASR | |
| 0-44 | 3 | 0.2 | 0 | 0.0 | 0 | 0.0 | 1 | 0.0 | 2 | 0.1 | 1 | 0.0 | 0 | 0.0 | 2 | 0.1 | 0 |
| 45-59 | 15 | 3.2 | 12 | 2.5 | 8 | 1.7 | 7 | 1.4 | 11 | 2.2 | 3 | 0.6 | 6 | 1.2 | 5 | 1.0 | -1 |
| 60-64 | 58 | 47.8 | 46 | 37.4 | 40 | 32.0 | 26 | 20.6 | 20 | 16.0 | 13 | 10.4 | 11 | 8.8 | 15 | 12.0 | -7 |
| 65-69 | 99 | 89.6 | 98 | 88.9 | 85 | 77.4 | 46 | 41.8 | 50 | 45.3 | 44 | 39.4 | 37 | 33.1 | 31 | 27.8 | -11 |
| 70-74 | 227 | 240.8 | 159 | 169.4 | 118 | 125.9 | 114 | 121.2 | 72 | 76.0 | 71 | 74.6 | 71 | 74.6 | 44 | 46.2 | -23 |
| 75+ | 505 | 375.7 | 438 | 318.3 | 434 | 309.8 | 304 | 213.3 | 272 | 186.5 | 228 | 153.2 | 192 | 129.0 | 171 | 114.9 | -50 |
| Total | 907 | 757.3 | 753 | 616.5 | 685 | 546.7 | 498 | 398.5 | 427 | 326.1 | 360 | 278.2 | 317 | 246.7 | 268 | 201.9 | -92 |

Table 5.2, Numbers (n) and age specific rates (ASR) per million men in the wider population, of orchidectomies in men diagnosed with prostate cancer, per financial year. Data were fitted by linear regression to find the average annual change per year. Data source: HES data for England provided by NATCanSAT.

## 5.1 Numbers and rates of prostatectomies and orchidectomies by cancer network

The annual number of prostatectomies among residents varies greatly between cancer networks. (Table 5.3). The rate per million men in the population reveals a large variation, rates varying between 34 (Northern Cancer Network) and 132 (Dorset) procedures per million men per year.

The number of procedures has increased in every network between 1997-98 and 2004-05. These increases are significant ($p<0.05$, linear regression) for every network except Mount Vernon.

Age standardising allows the rates for prostatectomy to be directly compared between networks with different population age distributions. (Table 5.4). There is still a large variation in the rates (European standard population) between networks in 2004-05, with a maximum of 110±21 per million resident males for Dorset and a minimum of 31±7 for the Northern Cancer Network. This confirms that the observed trends are not due to age differences between the networks or changes in the age structure of the population.

There is considerable variation in the number of orchidectomies between cancer networks (Table 5.5) with Sussex performing the most at 40 per million resident males per year and five networks none at all in 2004-05. The rate per million men in the population varies between 36.5 per million men per year and zero.

The number of orchidectomies has decreased in every network between 1997-98 and 2004-05. These decreases are significant ($p<0.05$, linear regression) for 53% (18/34) of the networks.

Table 5.6 shows the age standardised rates (European standard population) for orchidectomies performed in prostate cancer patients by cancer network of residence with associated 95% confidence intervals. These rates are calculated in relation to the underlying population and do not take account of the higher incidence of prostate cancer in some networks. Given that the differences in mortality between cancer networks are modest (see Section 2.2) this gives a clear indication of over-treatment in networks with higher rates.

| | 1997-1998 | | 1998-1999 | | 1999-2000 | | 2000-2001 | | 2001-2002 | | 2002-2003 | | 2003-2004 | | 2004-2005 | | Annual diff. | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N01 Lancashire and South Cumbria | 20 | 13.5 | 30 | 20.3 | 36 | 24.4 | 43 | 29.0 | 74 | 49.9 | 82 | 55.1 | 100 | 67.2 | 86 | 57.8 | 12 | <0.001 |
| N02 Greater Manchester and Cheshire | 33 | 11.0 | 72 | 24.1 | 72 | 24.1 | 86 | 28.8 | 129 | 43.1 | 145 | 48.4 | 169 | 56.4 | 209 | 69.7 | 24 | <0.001 |
| N03 Merseyside & Cheshire | 22 | 10.8 | 25 | 12.3 | 25 | 12.3 | 39 | 19.2 | 43 | 21.3 | 51 | 25.3 | 38 | 18.8 | 110 | 54.5 | 9 | 0.02 |
| N04 Northern Cancer Network | 32 | 16.0 | 33 | 16.6 | 33 | 16.6 | 27 | 13.6 | 35 | 17.7 | 50 | 25.3 | 53 | 26.9 | 67 | 34.0 | 5 | 0.007 |
| N05 Cancer Care Alliance-Teesside & S. Durham | 18 | 18.1 | 49 | 49.3 | 49 | 49.3 | 75 | 75.3 | 78 | 78.3 | 69 | 69.1 | 86 | 86.2 | 79 | 79.1 | 8 | 0.005 |
| N06 Yorkshire Cancer Network | 22 | 8.7 | 52 | 20.5 | 52 | 20.5 | 74 | 29.1 | 86 | 33.6 | 124 | 48.3 | 144 | 56.0 | 168 | 65.4 | 20 | <0.001 |
| N07 Humber & Yorkshire Coast | 6 | 5.9 | 6 | 5.9 | 6 | 5.9 | 18 | 17.7 | 21 | 20.6 | 37 | 36.2 | 40 | 39.1 | 56 | 54.7 | 7 | <0.001 |
| N08 North Trent | 22 | 12.6 | 21 | 12.0 | 21 | 12.0 | 38 | 21.8 | 52 | 29.8 | 68 | 38.9 | 69 | 39.5 | 84 | 48.1 | 10 | <0.001 |
| N09 North West Midlands | 10 | 8.7 | 22 | 19.1 | 22 | 19.1 | 40 | 34.7 | 42 | 36.3 | 58 | 50.0 | 58 | 50.0 | 57 | 49.1 | 7 | <0.001 |
| N10 Black Country | 8 | 9.6 | 11 | 13.2 | 11 | 13.2 | 16 | 19.2 | 19 | 23.0 | 34 | 41.1 | 65 | 78.6 | 72 | 87.0 | 9 | 0.002 |
| N11 Pan Birmingham | 32 | 18.1 | 57 | 32.3 | 57 | 32.3 | 66 | 37.5 | 95 | 54.0 | 132 | 74.8 | 140 | 79.3 | 180 | 102.0 | 20 | <0.001 |
| N12 Arden | 20 | 20.8 | 27 | 28.0 | 27 | 28.0 | 50 | 51.8 | 45 | 46.3 | 62 | 63.2 | 67 | 68.3 | 96 | 97.9 | 10 | <0.001 |
| N13 Mid Trent | 5 | 3.2 | 35 | 22.5 | 35 | 22.5 | 46 | 29.5 | 54 | 34.4 | 67 | 42.3 | 79 | 49.9 | 107 | 67.6 | 12 | <0.001 |
| N14 Derby/ Burton | 4 | 6.0 | 7 | 10.5 | 7 | 10.5 | 17 | 25.3 | 21 | 31.0 | 26 | 38.1 | 41 | 60.0 | 37 | 54.2 | 6 | <0.001 |
| N15 Leicestershire, Northants and Rutland | 16 | 10.5 | 16 | 10.4 | 16 | 10.4 | 29 | 18.7 | 40 | 25.7 | 29 | 18.5 | 47 | 29.9 | 78 | 49.6 | 8 | 0.004 |
| N16 Norfolk & Waveney | 13 | 17.8 | 32 | 43.2 | 32 | 43.2 | 28 | 37.5 | 41 | 54.4 | 58 | 76.6 | 56 | 74.0 | 50 | 66.1 | 6 | 0.003 |
| N17 West Anglia | 20 | 11.4 | 53 | 29.9 | 53 | 29.9 | 55 | 30.8 | 76 | 42.3 | 93 | 51.5 | 105 | 58.1 | 120 | 66.4 | 13 | <0.001 |
| N18 Mid Anglia | 21 | 22.0 | 46 | 47.6 | 46 | 47.6 | 44 | 45.1 | 58 | 59.1 | 52 | 52.7 | 71 | 72.0 | 71 | 72.0 | 6 | 0.002 |
| N19 South Essex | 10 | 14.4 | 14 | 20.0 | 14 | 20.0 | 21 | 29.9 | 36 | 51.2 | 31 | 43.9 | 25 | 35.4 | 37 | 52.4 | 4 | 0.006 |
| N20 Mount Vernon | 21 | 18.4 | 56 | 48.4 | 56 | 48.4 | 66 | 56.7 | 66 | 56.6 | 88 | 75.5 | 70 | 60.0 | 61 | 52.3 | 5 | 0.06 |
| N21 West London | 33 | 19.5 | 46 | 26.6 | 46 | 26.6 | 55 | 31.3 | 78 | 43.7 | 97 | 53.7 | 102 | 56.5 | 88 | 48.7 | 10 | <0.001 |
| N22 North London | 24 | 20.9 | 46 | 39.3 | 46 | 39.3 | 48 | 40.5 | 57 | 47.5 | 66 | 54.4 | 60 | 49.4 | 65 | 53.6 | 5 | 0.002 |
| N23 North East London | 34 | 23.4 | 48 | 32.3 | 48 | 32.3 | 39 | 25.9 | 53 | 34.9 | 57 | 37.3 | 71 | 46.5 | 76 | 49.7 | 5 | 0.002 |
| N24 South East London | 22 | 15.0 | 41 | 27.5 | 41 | 27.5 | 37 | 24.6 | 51 | 33.6 | 57 | 37.6 | 77 | 50.8 | 60 | 39.6 | 6 | 0.004 |
| N25 South West London | 12 | 9.5 | 34 | 26.6 | 34 | 26.6 | 33 | 25.6 | 59 | 45.3 | 85 | 65.0 | 79 | 60.4 | 73 | 55.8 | 10 | 0.001 |
| N26 Peninsula | 25 | 16.3 | 23 | 14.8 | 23 | 14.8 | 33 | 21.0 | 45 | 28.5 | 49 | 30.8 | 52 | 32.7 | 64 | 40.2 | 6 | <0.001 |
| N27 Dorset | 21 | 30.8 | 31 | 45.2 | 31 | 45.2 | 67 | 97.0 | 68 | 98.1 | 89 | 127.8 | 63 | 90.5 | 92 | 132.1 | 10 | 0.003 |
| N28 Avon, Somerset & Wiltshire | 30 | 15.4 | 74 | 37.6 | 74 | 37.6 | 65 | 32.8 | 95 | 47.6 | 123 | 61.4 | 161 | 80.4 | 177 | 88.3 | 20 | <0.001 |
| N29 3 Counties | 6 | 6.0 | 7 | 6.9 | 7 | 6.9 | 15 | 14.8 | 18 | 17.7 | 33 | 32.3 | 28 | 27.4 | 42 | 41.1 | 5 | <0.001 |
| N30 Thames Valley | 23 | 11.2 | 39 | 18.7 | 39 | 18.7 | 80 | 38.1 | 111 | 52.7 | 124 | 58.8 | 139 | 65.9 | 152 | 72.1 | 20 | <0.001 |
| N31 Central South Coast | 36 | 19.0 | 75 | 39.2 | 75 | 39.2 | 139 | 72.3 | 143 | 74.1 | 135 | 69.7 | 142 | 73.3 | 170 | 87.8 | 17 | 0.001 |
| N32 Surrey, West Sussex & Hampshire | 18 | 12.9 | 48 | 33.9 | 48 | 33.9 | 43 | 30.3 | 71 | 49.9 | 109 | 76.6 | 85 | 59.7 | 77 | 54.1 | 10 | 0.01 |
| N33 Sussex | 30 | 28.0 | 38 | 35.0 | 38 | 35.0 | 47 | 43.1 | 73 | 66.7 | 63 | 57.5 | 67 | 61.1 | 79 | 72.1 | 7 | <0.001 |
| N34 Kent & Medway | 55 | 35.6 | 46 | 29.4 | 46 | 29.4 | 80 | 50.9 | 125 | 79.1 | 135 | 84.9 | 154 | 96.8 | 122 | 76.7 | 16 | 0.003 |

Table 5.3, Numbers of prostatectomies and rate of procedures per million resident men, in men diagnosed with prostate cancer, per financial year. These rates are calculated in relation to the underlying population and do not take account of the higher incidence of prostate cancer in some networks. Data were fitted by linear regression. “Annual diff.” shows the average annual change per year and “p” the significance of the change. Data source: HES data for England provided by NATCanSAT.

| | 1997-1998 | | 1998-1999 | | 1999-2000 | | 2000-2001 | | 2001-2002 | | 2002-2003 | | 2003-2004 | | 2004-2005 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N01 Lancashire and South Cumbria | 13 | 5 | 18 | 6 | 21 | 6 | 26 | 7 | 44 | 10 | 48 | 10 | 60 | 12 | 52 | 10 |
| N02 Greater Manchester and Cheshire | 11 | 3 | 19 | 5 | 23 | 5 | 28 | 6 | 41 | 7 | 47 | 8 | 55 | 8 | 68 | 9 |
| N03 Merseyside & Cheshire | 11 | 4 | 8 | 3 | 12 | 4 | 18 | 5 | 20 | 5 | 23 | 6 | 17 | 5 | 50 | 9 |
| N04 Northern Cancer Network | 15 | 5 | 10 | 4 | 15 | 5 | 13 | 4 | 16 | 5 | 24 | 6 | 25 | 6 | 31 | 7 |
| N05 Cancer Care Alliance-Teesside & S. Durham | 18 | 7 | 35 | 10 | 48 | 12 | 71 | 15 | 73 | 15 | 63 | 14 | 80 | 16 | 73 | 15 |
| N06 Yorkshire Cancer Network | 8 | 3 | 21 | 5 | 21 | 5 | 29 | 6 | 33 | 7 | 47 | 8 | 56 | 9 | 64 | 10 |
| N07 Humber & Yorkshire Coast | 4 | 2 | 8 | 4 | 5 | 3 | 16 | 6 | 19 | 7 | 31 | 9 | 35 | 10 | 49 | 12 |
| N08 North Trent | 11 | 4 | 15 | 5 | 11 | 4 | 20 | 6 | 27 | 7 | 36 | 8 | 36 | 8 | 43 | 9 |
| N09 North West Midlands | 9 | 5 | 14 | 6 | 18 | 7 | 31 | 9 | 33 | 9 | 44 | 11 | 44 | 11 | 43 | 11 |
| N10 Black Country | 9 | 5 | 10 | 5 | 12 | 6 | 16 | 7 | 21 | 8 | 37 | 11 | 69 | 16 | 76 | 17 |
| N11 Pan Birmingham | 18 | 6 | 23 | 7 | 31 | 8 | 37 | 8 | 55 | 10 | 74 | 13 | 77 | 13 | 101 | 15 |
| N12 Arden | 20 | 8 | 33 | 10 | 27 | 9 | 48 | 12 | 42 | 11 | 60 | 14 | 64 | 14 | 92 | 18 |
| N13 Mid Trent | 2 | 2 | 11 | 4 | 21 | 6 | 27 | 7 | 31 | 8 | 37 | 8 | 45 | 9 | 59 | 11 |
| N14 Derby/ Burton | 6 | 4 | 2 | 2 | 10 | 6 | 23 | 10 | 28 | 11 | 36 | 12 | 59 | 17 | 49 | 14 |
| N15 Leicestershire, Northants and Rutland | 11 | 5 | 10 | 4 | 10 | 4 | 19 | 6 | 27 | 8 | 18 | 6 | 30 | 8 | 49 | 10 |
| N16 Norfolk & Waveney | 15 | 7 | 19 | 8 | 36 | 11 | 31 | 10 | 45 | 13 | 63 | 15 | 59 | 14 | 55 | 14 |
| N17 West Anglia | 12 | 5 | 22 | 6 | 29 | 7 | 30 | 7 | 41 | 9 | 49 | 10 | 55 | 11 | 63 | 11 |
| N18 Mid Anglia | 20 | 8 | 31 | 10 | 44 | 12 | 41 | 11 | 54 | 13 | 46 | 12 | 64 | 14 | 64 | 14 |
| N19 South Essex | 15 | 8 | 12 | 6 | 20 | 9 | 28 | 11 | 48 | 14 | 42 | 13 | 33 | 12 | 49 | 14 |
| N20 Mount Vernon | 18 | 7 | 33 | 10 | 48 | 12 | 56 | 13 | 57 | 13 | 74 | 15 | 60 | 13 | 53 | 13 |
| N21 West London | 23 | 7 | 37 | 9 | 32 | 8 | 37 | 9 | 52 | 11 | 65 | 12 | 68 | 13 | 58 | 12 |
| N22 North London | 24 | 9 | 36 | 11 | 46 | 12 | 48 | 13 | 58 | 14 | 67 | 15 | 61 | 14 | 66 | 15 |
| N23 North East London | 28 | 9 | 27 | 8 | 38 | 10 | 31 | 9 | 43 | 11 | 46 | 11 | 57 | 12 | 61 | 13 |
| N24 South East London | 18 | 7 | 29 | 9 | 33 | 9 | 31 | 9 | 42 | 11 | 47 | 11 | 62 | 13 | 50 | 12 |
| N25 South West London | 11 | 5 | 17 | 7 | 32 | 10 | 31 | 10 | 55 | 13 | 78 | 16 | 72 | 15 | 67 | 15 |
| N26 Peninsula | 14 | 5 | 10 | 4 | 12 | 4 | 18 | 6 | 23 | 6 | 26 | 7 | 27 | 7 | 33 | 8 |
| N27 Dorset | 28 | 11 | 27 | 10 | 37 | 12 | 79 | 18 | 80 | 18 | 103 | 20 | 72 | 17 | 110 | 21 |
| N28 Avon, Somerset & Wiltshire | 15 | 5 | 21 | 6 | 35 | 8 | 32 | 7 | 45 | 9 | 57 | 10 | 76 | 12 | 82 | 12 |
| N29 3 Counties | 5 | 3 | 8 | 5 | 6 | 4 | 14 | 6 | 15 | 6 | 29 | 9 | 24 | 8 | 36 | 10 |
| N30 Thames Valley | 13 | 5 | 16 | 5 | 20 | 6 | 41 | 8 | 56 | 10 | 62 | 11 | 70 | 12 | 76 | 12 |
| N31 Central South Coast | 18 | 5 | 29 | 7 | 37 | 8 | 67 | 11 | 68 | 11 | 65 | 11 | 67 | 11 | 80 | 12 |
| N32 Surrey, West Sussex & Hampshire | 13 | 5 | 26 | 8 | 33 | 9 | 29 | 8 | 48 | 11 | 73 | 14 | 56 | 11 | 52 | 11 |
| N33 Sussex | 26 | 8 | 26 | 8 | 32 | 9 | 39 | 10 | 62 | 13 | 52 | 12 | 55 | 12 | 66 | 14 |
| N34 Kent & Medway | 34 | 8 | 22 | 7 | 28 | 8 | 47 | 10 | 72 | 13 | 76 | 13 | 88 | 14 | 69 | 12 |

Table 5.4, Age Standardised Rates per million men and 95% confidence intervals, of prostatectomies in men diagnosed with prostate cancer, per financial year. Data source: HES data for England provided by NATCanSAT.

| Network of residence | 1997-1998 | | 1998-1999 | | 1999-2000 | | 2000-2001 | | 2001-2002 | | 2002-2003 | | 2003-2004 | | 2004-2005 | | Annual diff. | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N01 Lancashire and South Cumbria | 33 | 22.4 | 41 | 27.8 | 47 | 31.8 | 26 | 17.6 | 27 | 18.2 | 26 | 17.5 | 21 | 14.1 | 19 | 12.8 | -1.4 | 0.05 |
| N02 Greater Manchester and Cheshire | 109 | 36.5 | 112 | 37.5 | 112 | 37.5 | 101 | 33.8 | 80 | 26.8 | 47 | 15.7 | 46 | 15.3 | 22 | 7.3 | -3.2 | 0.004 |
| N03 Merseyside & Cheshire | 59 | 28.8 | 61 | 30.1 | 61 | 30.1 | 68 | 33.6 | 36 | 17.8 | 38 | 18.8 | 23 | 11.4 | 25 | 12.4 | -2.2 | 0.02 |
| N04 Northern Cancer Network | 71 | 35.5 | 30 | 15.1 | 30 | 15.1 | 20 | 10.1 | 14 | 7.1 | 20 | 10.1 | 7 | 3.5 | 6 | 3.0 | -2.2 | 0.01 |
| N05 Cancer Care Alliance-Teesside & S. Durham | 5 | 5.0 | 5 | 5.0 | 5 | 5.0 | 0 | 0.0 | 1 | 1.0 | 0 | 0.0 | 1 | 1.0 | 0 | 0.0 | -0.3 | 0.02 |
| N06 Yorkshire Cancer Network | 34 | 13.4 | 42 | 16.5 | 42 | 16.5 | 12 | 4.7 | 17 | 6.6 | 12 | 4.7 | 7 | 2.7 | 7 | 2.7 | -1.7 | 0.01 |
| N07 Humber & Yorkshire Coast | 5 | 4.9 | 4 | 3.9 | 4 | 3.9 | 4 | 3.9 | 1 | 1.0 | 3 | 2.9 | 2 | 2.0 | 5 | 4.9 | -0.2 | 0.43 |
| N08 North Trent | 18 | 10.3 | 24 | 13.8 | 24 | 13.8 | 24 | 13.8 | 40 | 23.0 | 29 | 16.6 | 25 | 14.3 | 27 | 15.5 | -0.5 | 0.04 |
| N09 North West Midlands | 7 | 6.1 | 11 | 9.6 | 11 | 9.6 | 15 | 13.0 | 4 | 3.5 | 7 | 6.0 | 6 | 5.2 | 6 | 5.2 | -0.7 | 0.4 |
| N10 Black Country | 15 | 17.9 | 20 | 24.0 | 20 | 24.0 | 24 | 28.9 | 19 | 23.0 | 12 | 14.5 | 12 | 14.5 | 12 | 14.5 | -0.9 | 0.23 |
| N11 Pan Birmingham | 32 | 18.1 | 6 | 3.4 | 6 | 3.4 | 9 | 5.1 | 17 | 9.7 | 11 | 6.2 | 11 | 6.2 | 14 | 7.9 | -1.8 | 0.46 |
| N12 Arden | 13 | 13.5 | 7 | 7.3 | 7 | 7.3 | 4 | 4.1 | 1 | 1.0 | 7 | 7.1 | 4 | 4.1 | 0 | 0.0 | -0.4 | 0.01 |
| N13 Mid Trent | 20 | 12.9 | 53 | 34.1 | 53 | 34.1 | 25 | 16.0 | 19 | 12.1 | 23 | 14.5 | 11 | 6.9 | 9 | 5.7 | -3 | 0.14 |
| N14 Derby/ Burton | 24 | 36.2 | 13 | 19.4 | 13 | 19.4 | 12 | 17.9 | 10 | 14.8 | 11 | 16.1 | 4 | 5.9 | 5 | 7.3 | -0.6 | 0.01 |
| N15 Leicestershire, Northants and Rutland | 7 | 4.6 | 6 | 3.9 | 6 | 3.9 | 6 | 3.9 | 5 | 3.2 | 8 | 5.1 | 8 | 5.1 | 4 | 2.5 | -0.3 | 0.7 |
| N16 Norfolk & Waveney | 3 | 4.1 | 2 | 2.7 | 2 | 2.7 | 3 | 4.0 | 8 | 10.6 | 6 | 7.9 | 4 | 5.3 | 1 | 1.3 | -0.3 | 0.8 |
| N17 West Anglia | 14 | 8.0 | 10 | 5.6 | 10 | 5.6 | 8 | 4.5 | 9 | 5.0 | 4 | 2.2 | 3 | 1.7 | 5 | 2.8 | -0.3 | 0.003 |
| N18 Mid Anglia | 18 | 18.9 | 3 | 3.1 | 3 | 3.1 | 1 | 1.0 | 2 | 2.0 | 2 | 2.0 | 3 | 3.0 | 3 | 3.0 | -1 | 0.15 |
| N19 South Essex | 26 | 37.5 | 7 | 10.0 | 7 | 10.0 | 1 | 1.4 | 3 | 4.3 | 0 | 0.0 | 2 | 2.8 | 0 | 0.0 | -1.2 | 0.03 |
| N20 Mount Vernon | 25 | 21.9 | 17 | 14.7 | 17 | 14.7 | 9 | 7.7 | 11 | 9.4 | 10 | 8.6 | 5 | 4.3 | 5 | 4.3 | -0.5 | 0.001 |
| N21 West London | 23 | 13.6 | 19 | 11.0 | 19 | 11.0 | 5 | 2.8 | 15 | 8.4 | 9 | 5.0 | 5 | 2.8 | 14 | 7.7 | -1.1 | 0.09 |
| N22 North London | 15 | 13.0 | 17 | 14.5 | 17 | 14.5 | 5 | 4.2 | 13 | 10.8 | 6 | 4.9 | 7 | 5.8 | 8 | 6.6 | -0.7 | 0.054 |
| N23 North East London | 7 | 4.8 | 5 | 3.4 | 5 | 3.4 | 3 | 2.0 | 5 | 3.3 | 3 | 2.0 | 5 | 3.3 | 1 | 0.7 | -0.2 | 0.03 |
| N24 South East London | 8 | 5.5 | 10 | 6.7 | 10 | 6.7 | 8 | 5.3 | 5 | 3.3 | 6 | 4.0 | 9 | 5.9 | 4 | 2.6 | -0.4 | 0.13 |
| N25 South West London | 12 | 9.5 | 6 | 4.7 | 6 | 4.7 | 7 | 5.4 | 2 | 1.5 | 4 | 3.1 | 4 | 3.1 | 5 | 3.8 | -0.4 | 0.048 |
| N26 Peninsula | 21 | 13.7 | 21 | 13.5 | 21 | 13.5 | 10 | 6.4 | 7 | 4.4 | 3 | 1.9 | 4 | 2.5 | 1 | 0.6 | -0.7 | 0.002 |
| N27 Dorset | 21 | 30.8 | 7 | 10.2 | 7 | 10.2 | 1 | 1.4 | 3 | 4.3 | 3 | 4.3 | 4 | 5.7 | 0 | 0.0 | -0.9 | 0.03 |
| N28 Avon, Somerset & Wiltshire | 38 | 19.6 | 18 | 9.1 | 18 | 9.1 | 10 | 5.0 | 4 | 2.0 | 2 | 1.0 | 4 | 2.0 | 0 | 0.0 | -1.1 | 0.003 |
| N29 3 Counties | 17 | 17.0 | 5 | 5.0 | 5 | 5.0 | 2 | 2.0 | 5 | 4.9 | 2 | 2.0 | 3 | 2.9 | 1 | 1.0 | -0.7 | 0.04 |
| N30 Thames Valley | 29 | 14.1 | 16 | 7.7 | 16 | 7.7 | 3 | 1.4 | 5 | 2.4 | 7 | 3.3 | 4 | 1.9 | 10 | 4.7 | -1.2 | 0.045 |
| N31 Central South Coast | 55 | 29.1 | 15 | 7.8 | 15 | 7.8 | 15 | 7.8 | 7 | 3.6 | 8 | 4.1 | 13 | 6.7 | 4 | 2.1 | -2.3 | 0.053 |
| N32 Surrey, West Sussex & Hampshire | 8 | 5.7 | 0 | 0.0 | 0 | 0.0 | 3 | 2.1 | 2 | 1.4 | 1 | 0.7 | 7 | 4.9 | 4 | 2.8 | -0.7 | 0.9 |
| N33 Sussex | 61 | 56.9 | 70 | 64.4 | 70 | 64.4 | 55 | 50.4 | 34 | 31.1 | 29 | 26.5 | 43 | 39.2 | 40 | 36.5 | -2.1 | 0.04 |
| N34 Kent & Medway | 11 | 7.1 | 7 | 4.5 | 7 | 4.5 | 12 | 7.6 | 7 | 4.4 | 3 | 1.9 | 4 | 2.5 | 3 | 1.9 | -0.5 | 0.07 |

Table 5.5, Numbers of orchidectomies and rate of procedures per million resident men, in men diagnosed with prostate cancer, per financial year. These rates are calculated in relation to the underlying population and do not take account of the higher incidence of prostate cancer in some networks. Data were fitted by linear regression. “Annual diff.” shows the average annual change per year and “p” the significance of the change. Data source: HES data for England provided by NATCanSAT.

| | 1997-1998 | | 1998-1999 | | 1999-2000 | | 2000-2001 | | 2001-2002 | | 2002-2003 | | 2003-2004 | | 2004-2005 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N01 Lancashire and South Cumbria | 14 | 4 | 17 | 5 | 20 | 5 | 11 | 4 | 10 | 4 | 10 | 4 | 8 | 3 | 7 | 3 |
| N02 Greater Manchester and Cheshire | 26 | 5 | 26 | 5 | 26 | 5 | 24 | 5 | 19 | 4 | 11 | 3 | 10 | 3 | 5 | 2 |
| N03 Merseyside & Cheshire | 20 | 5 | 24 | 5 | 20 | 5 | 22 | 5 | 11 | 3 | 12 | 3 | 7 | 3 | 8 | 3 |
| N04 Northern Cancer Network | 23 | 5 | 15 | 4 | 10 | 3 | 6 | 2 | 4 | 2 | 6 | 2 | 2 | 1 | 2 | 1 |
| N05 Cancer Care Alliance-Teesside & S. Durham | 4 | 3 | 6 | 3 | 3 | 2 | 0 | - | 1 | 1 | 0 | - | 1 | 1 | 0 | - |
| N06 Yorkshire Cancer Network | 8 | 3 | 9 | 3 | 10 | 3 | 3 | 1 | 4 | 2 | 2 | 1 | 2 | 1 | 2 | 1 |
| N07 Humber & Yorkshire Coast | 3 | 2 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 3 | 2 |
| N08 North Trent | 7 | 3 | 8 | 3 | 10 | 3 | 9 | 3 | 16 | 5 | 11 | 4 | 10 | 3 | 11 | 4 |
| N09 North West Midlands | 4 | 2 | 8 | 4 | 6 | 3 | 8 | 4 | 2 | 2 | 4 | 3 | 4 | 2 | 4 | 2 |
| N10 Black Country | 12 | 5 | 17 | 7 | 15 | 6 | 17 | 6 | 15 | 6 | 10 | 5 | 9 | 4 | 10 | 5 |
| N11 Pan Birmingham | 13 | 4 | 8 | 3 | 2 | 2 | 3 | 2 | 7 | 3 | 5 | 2 | 4 | 2 | 5 | 2 |
| N12 Arden | 9 | 4 | 6 | 3 | 4 | 3 | 3 | 2 | 0 | 0 | 5 | 3 | 2 | 1 | 0 | - |
| N13 Mid Trent | 9 | 3 | 22 | 6 | 20 | 5 | 9 | 3 | 7 | 3 | 8 | 3 | 5 | 2 | 3 | 2 |
| N14 Derby/ Burton | 29 | 10 | 9 | 5 | 13 | 6 | 12 | 6 | 11 | 6 | 11 | 6 | 4 | 3 | 4 | 3 |
| N15 Leicestershire, Northants and Rutland | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 4 | 2 | 4 | 2 | 2 | 1 |
| N16 Norfolk & Waveney | 3 | 2 | 4 | 3 | 2 | 1 | 3 | 2 | 6 | 4 | 5 | 3 | 3 | 2 | 1 | 1 |
| N17 West Anglia | 6 | 3 | 6 | 3 | 4 | 2 | 4 | 2 | 3 | 2 | 2 | 1 | 2 | 1 | 2 | 1 |
| N18 Mid Anglia | 13 | 5 | 4 | 2 | 2 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 |
| N19 South Essex | 25 | 8 | 7 | 4 | 7 | 4 | 1 | 1 | 2 | 2 | 0 | - | 2 | 2 | 0 | - |
| N20 Mount Vernon | 16 | 6 | 11 | 5 | 11 | 4 | 6 | 3 | 6 | 3 | 6 | 3 | 3 | 2 | 3 | 2 |
| N21 West London | 10 | 4 | 7 | 3 | 9 | 4 | 2 | 2 | 7 | 3 | 4 | 2 | 3 | 2 | 6 | 3 |
| N22 North London | 11 | 5 | 9 | 4 | 11 | 5 | 3 | 2 | 9 | 4 | 4 | 2 | 5 | 3 | 6 | 3 |
| N23 North East London | 4 | 2 | 6 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 0 | 0 |
| N24 South East London | 4 | 2 | 3 | 2 | 6 | 3 | 4 | 2 | 3 | 2 | 4 | 2 | 5 | 3 | 3 | 2 |
| N25 South West London | 8 | 4 | 3 | 2 | 4 | 3 | 4 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 |
| N26 Peninsula | 7 | 3 | 6 | 2 | 8 | 3 | 4 | 2 | 3 | 2 | 1 | 1 | 2 | 1 | 0 | - |
| N27 Dorset | 13 | 5 | 9 | 4 | 6 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 0 | - |
| N28 Avon, Somerset & Wiltshire | 12 | 3 | 7 | 3 | 6 | 2 | 3 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | - |
| N29 3 Counties | 11 | 5 | 6 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 |
| N30 Thames Valley | 12 | 4 | 11 | 4 | 6 | 3 | 1 | 1 | 2 | 1 | 3 | 2 | 1 | 1 | 3 | 2 |
| N31 Central South Coast | 19 | 5 | 10 | 3 | 4 | 2 | 5 | 2 | 2 | 1 | 2 | 1 | 4 | 2 | 1 | 1 |
| N32 Surrey, West Sussex & Hampshire | 4 | 2 | 1 | 1 | 0 | - | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 2 | 2 | 1 |
| N33 Sussex | 26 | 6 | 29 | 7 | 31 | 7 | 23 | 6 | 12 | 4 | 11 | 4 | 19 | 5 | 15 | 4 |
| N34 Kent & Medway | 4 | 2 | 4 | 2 | 3 | 2 | 5 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |

Table 5.6, Age Standardised Rates per million men and 95% confidence intervals, of orchidectomies in men diagnosed with prostate cancer, per financial year. Data source: HES data for England provided by NATCanSAT.

## 5.2 Prostatectomy by Gleason score

Figure 5.2 shows that the majority of prostatectomies recorded on the British Association of Urological Surgeons (BAUS) cancer registry are performed on patients with a Gleason score of 6 or 7. This fraction has remained approximately constant (linear regression shows no significant trend) even while the number of prostatectomies has doubled (see Figure 5.1).

The BAUS database has a completeness of approximately 50% for prostate cancer patients and 70% for prostatectomies. Data are recorded voluntarily by surgeons. While this self-selection may introduce some bias into the results it is the only national dataset that records the Gleason score and intended surgery by patient.

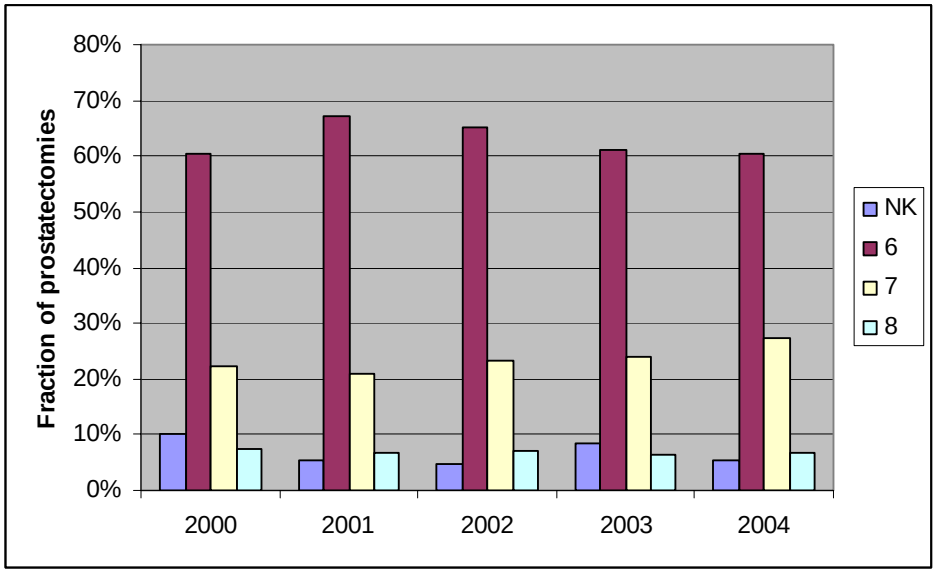


Figure 5.2, Fraction of all prostatectomy operations plotted by Gleason score (NK signifies "Not Known") at time of diagnosis. Data source: BAUS cancer registry.

## 5.3 Radical prostatectomies and cystectomies performed per surgeon.

HES data includes the consultant code of the supervising consultant. For a surgical episode this is not necessarily the surgeon who performed the surgery, but this is the best national data available to estimate the trends in surgical practice.

Table 5.7 shows the number of finished consultant episodes which contained either a prostatectomy or a cystectomy, in patients diagnosed with prostate or bladder cancer. These are broken down by the frequency of these episodes per year. The total number of consultants to which these episodes are registered is approximately constant over the eight years of recorded data. There is a significant ($p<0.001$, linear regression) drop in the number of consultants with less than ten such episodes between 1997-98 and 2004-05, from 86% to 56%. However this is a linear trend with no obvious effect following the publication of the NICE Improving Outcomes Guidance in Urological Cancer in 2002. It is therefore likely that the increasing total volume of prostatectomies is driving the reduction in the number of consultants performing a small number of procedures per year.

The number of consultants performing these procedures has stayed remarkable consistent, between 371 and 387. However over the eight years of data 674 individual consultants are represented, indicating a replacement rate which is on the order of 10% of the total per year.

| Episodes per consultant | 1997-1998 | 1998-1999 | 1999-2000 | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-2005 |
|---|---|---|---|---|---|---|---|---|
| 1-9 | 333 | 310 | 294 | 269 | 261 | 233 | 231 | 209 |
| 10-19 | 44 | 55 | 74 | 70 | 78 | 76 | 91 | 82 |
| 20-29 | 6 | 19 | 14 | 25 | 36 | 46 | 44 | 52 |
| 30-39 | 3 | 2 | 3 | 5 | 9 | 15 | 14 | 22 |
| 40-49 | 1 | 1 | 3 | 3 | 2 | 6 | 7 | 6 |
| 50-59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 387 | 387 | 388 | 372 | 386 | 376 | 387 | 371 |

Table 5.7, Number of consultants with an episode containing prostatectomy or cystectomy registered to them, for patients diagnosed with cancer, by number of such episodes per financial year. Data source: HES data for England provided by NATCanSAT.

Table 5.8 shows the number of finished consultant episodes which contain either a prostatectomy or a cystectomy, in patients diagnosed with prostate or bladder cancer. The data show that over the eight year period there has been an increase in the number of episodes registered to consultants who have many such episodes registered per year. In 1997-98 56% of episodes were registered to consultants with less than 10 such episodes per year. In 2004-05 this showed a significant drop ($p<0.001$, linear regression) to 16%.

| Episodes per consultant | 1997-1998 | 1998-1999 | 1999-2000 | 2000-2001 | 2001-2002 | 2002-2003 | 2003-2004 | 2004-2005 |
|---|---|---|---|---|---|---|---|---|
| 1-9 | 1159 | 1173 | 1037 | 942 | 907 | 860 | 769 | 683 |
| 10-19 | 588 | 707 | 959 | 1017 | 1112 | 1072 | 1295 | 1192 |
| 20-29 | 152 | 453 | 357 | 611 | 850 | 1095 | 1036 | 1258 |
| 30-39 | 108 | 70 | 94 | 168 | 285 | 507 | 469 | 764 |
| 40-49 | 44 | 49 | 125 | 136 | 82 | 266 | 299 | 263 |
| 50-59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 2051 | 2452 | 2572 | 2874 | 3236 | 3800 | 3868 | 4160 |

Table 5.8, Number of episodes containing a prostatectomy or cystectomy, for patients diagnosed with cancer, by number of such episodes per financial year. Data source: HES data for England provided by NATCanSAT.

## 6. Hormonal therapy

Prescription data was provided by Intercontinental Medical Statistics Health Medical Data Index[39]. This gives the numbers of prescriptions for luteinising hormone-releasing hormone (LHRH) agonists, anti-androgens and oestrogen derivatives written for prostate cancer patients in 125 GP practices. These figures are projected to the population of England and Wales to estimate the total number of prescriptions.

Data on the number of prescriptions dispensed is also available from the NHS Business Services Authority Prescription Pricing Divison (NHSBSA PPD). This is available by British National Formulary (BNF) category but is not tied specifically to a diagnosis of prostate cancer. PPD data covers the number of prescriptions dispensed in primary care. Data presented in this section may therefore be seen as a lower bound estimate of hormone prescriptions for prostate cancer. An upper bound estimate may be derived by multiplying figures by the appropriate factor in Table 6.1.

| | IMS estimate / PPD estimate 2000-2004 |
|---|---|
| Bicalutamide | 108% |
| Cyproterone acetate | 175% |
| Flutamide | 230% |
| Goserelin | 118% |
| Leuprorelin | 206% |

Table 6.1, Fraction of prescriptions in 2000-2004 from IMS Health Medical Data Index compared to NHSBSA PPD data.

Hormonal therapy prescriptions have increased dramatically since the mid-1980s (Figure 6.1). Anti-androgen prescriptions rose from zero prior to 1983 to approximately 150,000 per annum in 2004. LHRH agonists increased from zero prior to 1986 to over 300,000 in 2004. Oestrogen prescriptions declined between the 1970s and mid 1990s, falling to a minimum of 14,000 prescriptions in 1996. Between 1996 and 2004 there has been a statistically significant ($p<0.001$, ANOVA) upward trend in oestrogen prescriptions.

[39] http://research.imshealth.com/databases/databases.htm

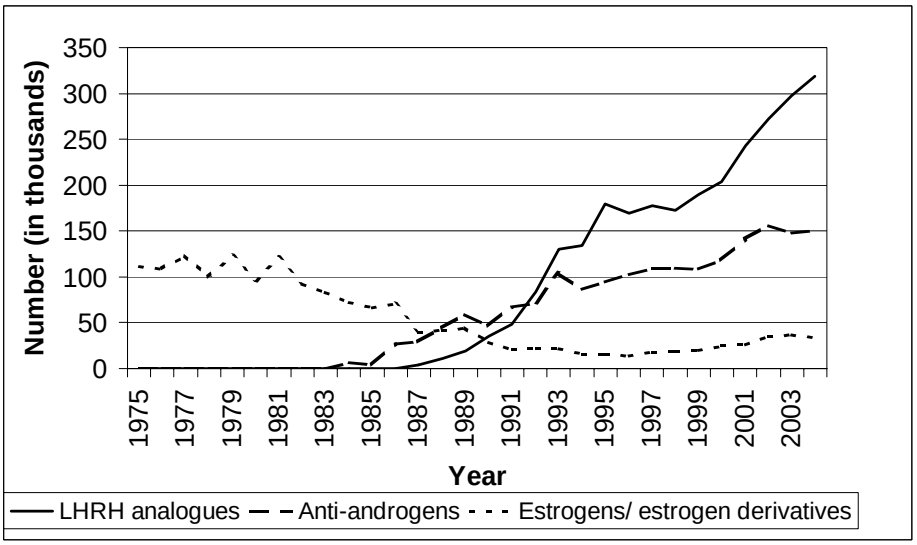


Figure 6.1, Number of prescriptions of hormone treatment for prostate cancer patients. Data for 1988 is interpolated. Data source: IMS Health Medical Data Index, London.

The majority of the rise in anti-androgen prescriptions since the mid 1990s is due to the use of bicalutamide (Figure 6.2). Prescriptions of cyprotereone acetate peaked in 1993, since then the number of prescriptions have fallen by approximately two thirds. Flutamide has fallen from a peak of approximately 40,000 prescriptions per year in 1996 to no recorded prescriptions in 2004. Between 2002 and 2004 bicalutamide made up 79% of anti-androgen prescriptions with Cyproterone acetate 18%.

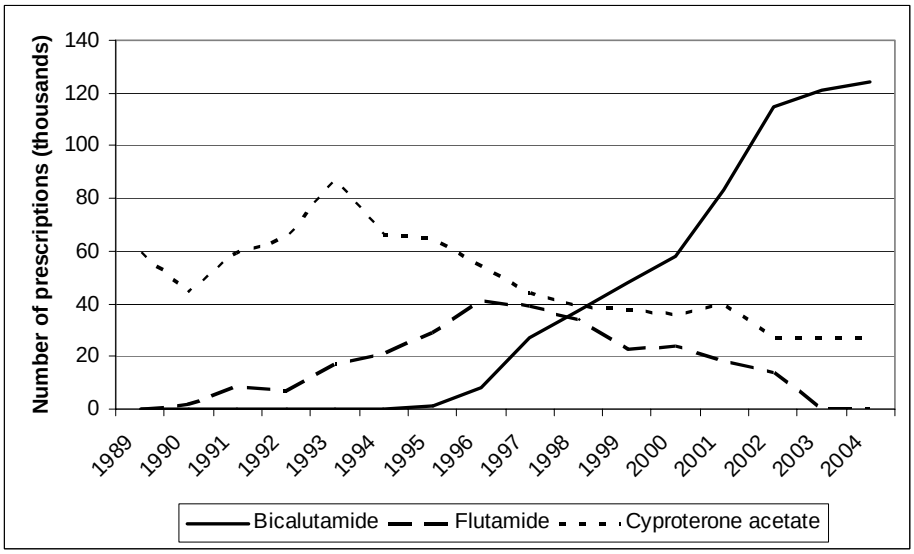


Figure 6.2, Number of prescriptions of anti-androgens for prostate cancer patients. Data source: IMS Health Medical Data Index, London.

Goserelin makes up the majority of the increase in prescription of LHRH agonists (Figure 6.3). Between 2002 and 2004 Goserelin made up 87% of LHRH agonists prescriptions and Leuprorelin 13%.

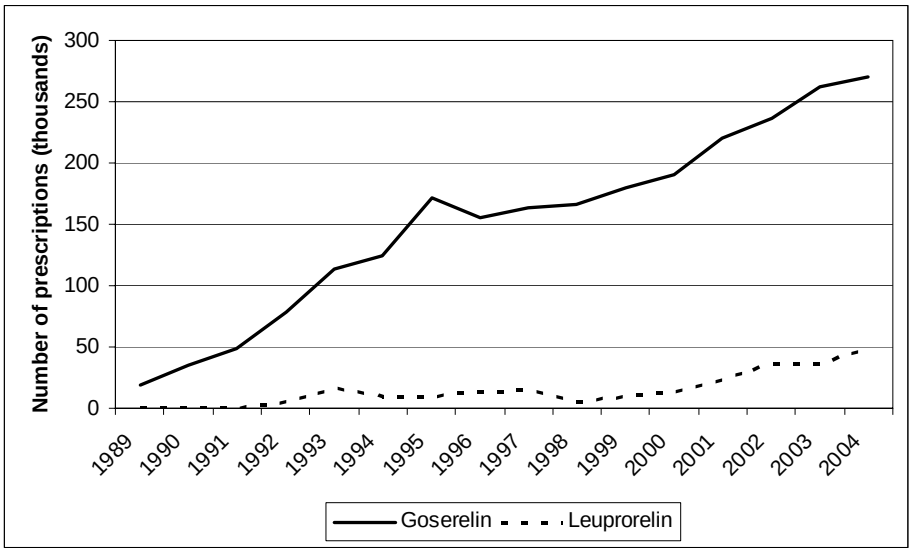


Figure 6.3, Number of prescriptions of LHRH agonists for prostate cancer patients. Data source: IMS Health Medical Data Index, London.

Stilboestrol makes up the majority of oestrogen prescriptions for prostate cancer patients (84% of all prescriptions between 1975 and 2003). (Figure 6.4). In 2004 Estradurin makes up half of the total prescriptions.

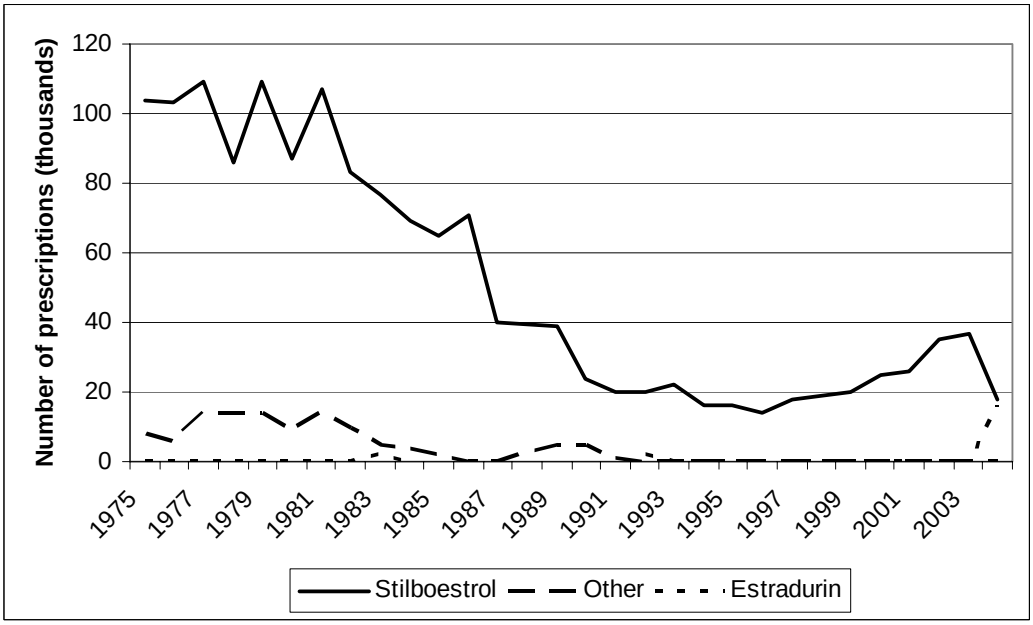


Figure 6.4, Number of prescriptions of estrogen treatment for prostate cancer patients. Data for 1988 is interpolated. Data source: IMS Health Medical Data Index, London.

## 6.1 Estimated cost of hormonal therapy

The NHSBSA PPD provided numbers of prescriptions and cost estimates for anti-androgens and LHRH agonists dispensed in primary care. These were not prostate cancer specific and included hormones dispensed for other medical purposes. The NHSBSA PPD cost estimates were applied to the numbers of prescriptions provided

by IMS for prostate-cancer specific prescriptions in order to estimate the cost of prostate cancer specific prescriptions.

The total cost of all prescriptions recorded by the NHSBSA PPD in 2004 was 8.1 £Billion[40]. Of this 292 £Million was recorded under BNF section 8, "Malignant disease & immunosuppression" with hormone treatment for prostate cancer making up approximately 40%.

Bicalutamide has a higher cost per prescription than Cyproterone acetate or Flutamide. This increases its share of the total cost for LHRH agonists (Figure 6.5) compared to its share of the number of prescriptions (see Figure 6.2).

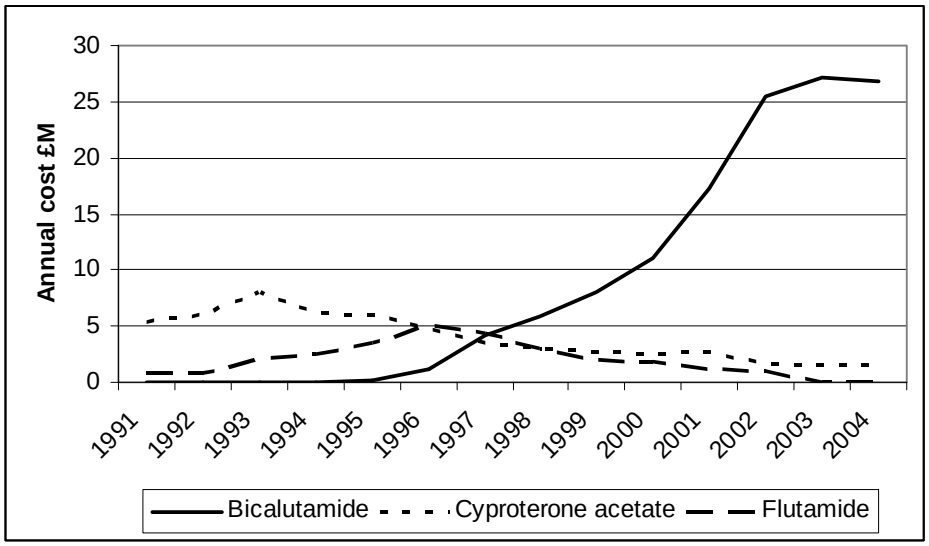


Figure 6.5, Cost of prescriptions of anti-androgens for prostate cancer patients. Data source: IMS Health Medical Data Index, London and PCA data from PPA.

Goserelin has a higher unit cost than Leuprorelin, increasing its share of the total cost for LHRH agonists. (Figure 6.6) compared to its share of the number of prescriptions. (Figure 6.3).

[40] Department of Health. *Prescription Cost Analysis: England 2004.* Accessed 8 April 2005 Available online at http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsStatistics/DH_4107504

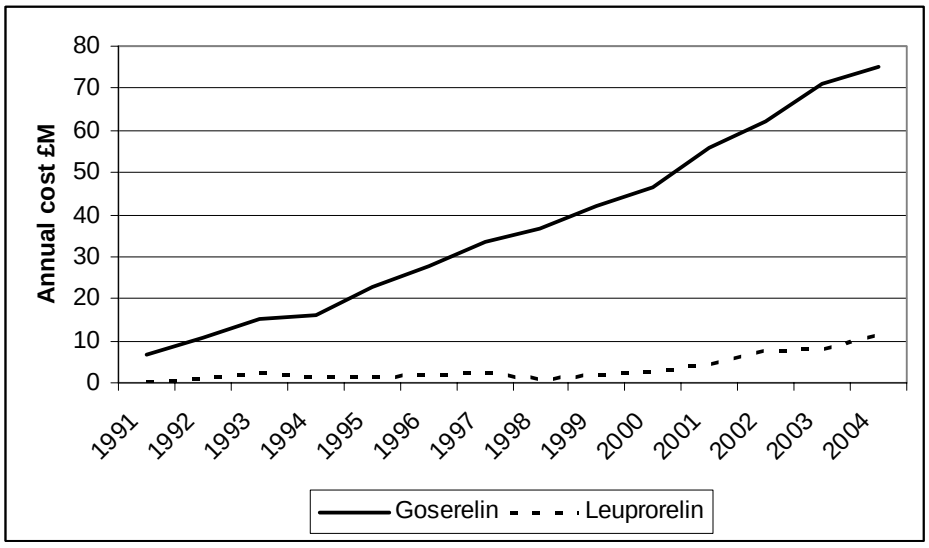


Figure 6.6, Cost of prescriptions of LHRH analogues for prostate cancer patients. Data source: IMS Health Medical Data Index, London and Prescription Cost Analysis data from the PPA.

## 7. Radiotherapy

Recording of radiotherapy (RT) is poor on central systems. By collecting usage data from accelerators it is possible to estimate a lower bound on the number of external beam RT procedures. (Figure 7.1). However, some procedures will be missed due to poor recording of the tumour site and/or patient demographics.

### 7.1 Radiotherapy by patient grade

Radical and palliative RT procedures are not distinguished. However the large number of RT procedures carried out on patients with Gleason score 6 and 7 tumours suggests that radical RT is a more common treatment than prostatectomy.

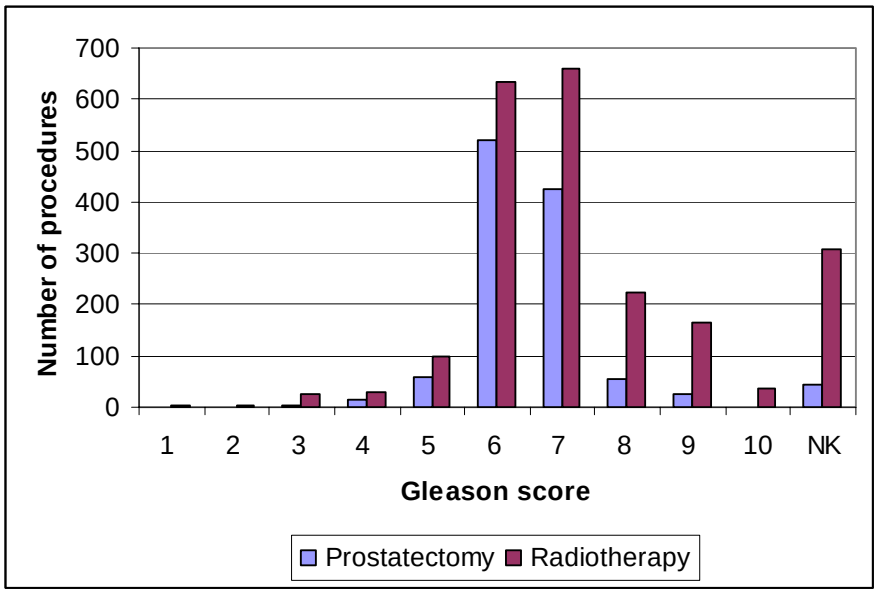


Figure 7.1, Number of patients undergoing prostatectomy or at least one external beam Radiotherapy procedure within a year of diagnosis. Patients resident within the SW Government office Region, Hampshire and the Isle of Wight diagnosed 2003-04 only. “NK” indicates that the Gleason score was Not Known. Data source: South West Public Health Observatory and RES dataset provided by NatCanSAT

### 7.2 Variation in dose and fractions in external beam radiotherapy

Tables 7.1 and 7.2 show the variation in prescribed dose and number of fractions in external beam radiotherapy treatment of prostate cancers in a sample of five NHS trusts in the South West Government office Region. Treatment occurred in 2003 or 2004. Caution should be used in interpreting this data as there is likely to be significant under-ascertainment. However the trusts do show clear differences in the patterns of dose and fractionation, indicating a variation in practice.

| Dose (Gy) | Trust A | Trust B | Trust C | Trust D | Trust E |
|---|---|---|---|---|---|
| 0-4 | 34 | | 2 | 99 | 263 |
| 5-9 | 12 | 2 | 142 | 21 | 194 |
| 10-14 | 6 | 1 | 30 | 2 | 72 |
| 15-19 | 14 | | 13 | | 25 |
| 20-24 | 8 | 1 | 39 | 3 | 30 |
| 25-29 | 11 | | 2 | 1 | 317 |
| 30-34 | 183 | | 2 | 52 | 168 |
| 35-39 | 21 | 1 | | 2 | 374 |
| 40-44 | | | 5 | | 4 |
| 45-49 | | 1 | 5 | | 3 |
| 50-54 | | 1 | 25 | | 2 |
| 55-59 | | 2 | 152 | | |
| 60-64 | | 6 | 3 | | 2 |
| 65-69 | | | 2 | | 1 |
| 70-74 | | | 10 | | |

Table 7.1, Dose (Grays) administered per course of external beam radiotherapy for a sample of prostate cancer treatments in five NHS trusts in the South West Government office Region, 2003-2004. Data source: RES data provided by NATCanSAT

| Fractions | Trust A | Trust B | Trust C | Trust D | Trust E |
|---|---|---|---|---|---|
| 0-4 | 274 | 7 | 191 | 98 | 1048 |
| 5-9 | 11 | 3 | 32 | 21 | 345 |
| 10-14 | 4 | | 5 | 2 | 62 |
| 15-19 | | | 20 | | |
| 20-24 | | | 153 | 3 | |
| 25-29 | | | 16 | 1 | |
| 30-34 | | 5 | 4 | 53 | |
| 35-39 | | | 11 | 2 | |

Table 7.2, Number of fractions per course of external beam radiotherapy for a sample of prostate cancer treatments in five NHS trusts in the South West Government office Region, 2003-2004. Data source: RES data provided by NATCanSAT

A patient's treatment may be delivered in multiple courses. Figure 7.2 shows the total dose delivered to patients in the five trusts between 2003 and 2004. 61% received a total dose between 0 and 49 Grays, 35% a dose between 50 and 79 Grays, and 4% a total dose in excess of 80 Grays over the two years. Lack of recording of patient demographic data may prevent the total for each patient from being correctly recorded, leading to a bias in favour of lower total doses. However the variation in the total for doses over 50 Gray indicates a variation in practice for radical radiotherapy.

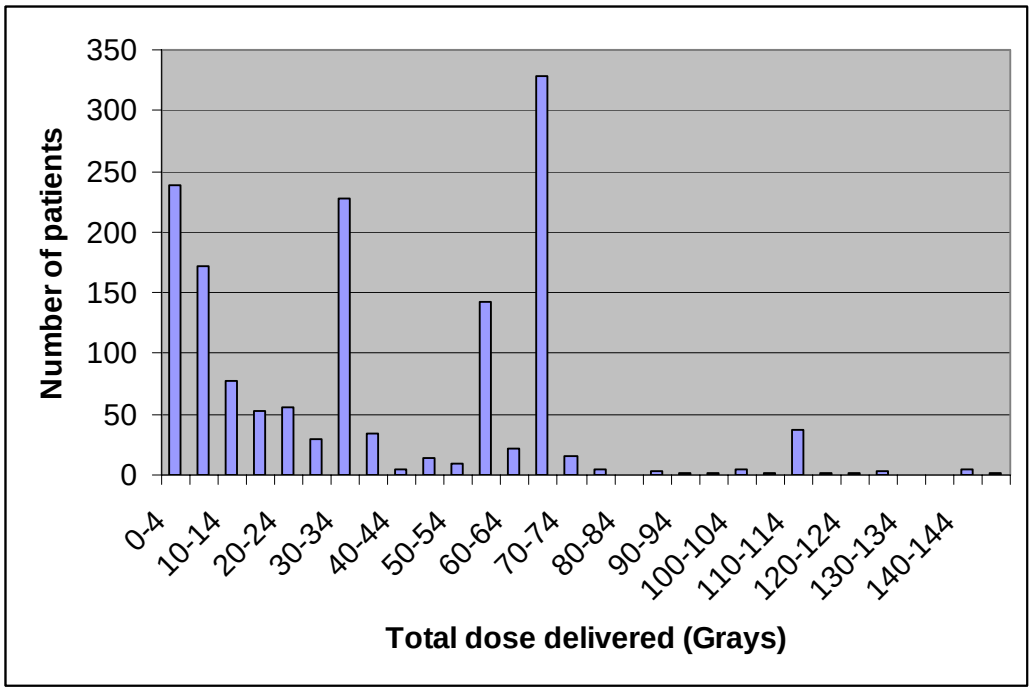


Figure 7.2, Total dose delivered to prostate cancer patients in five NHS trusts, 2003-2004. Data source: RES data provided by NATCanSAT

## 8. The Findings of Cancer Peer Review of Urology Cancer Teams in England 2004-2007

Following the publication of the NICE guidance on Improving Outcomes in Urological Cancer in 2002 (ref), a process was put in place in England (as for other cancer sites covered by Service Guidance from the Department of Health or NICE) to monitor the progress made in implementing the changes in service organisation and delivery which had been recommended.

By July 2004, each network was expected to have in place an agreed action plan for the implementation of the Guidance and to agree guidelines for the management of urological cancers, including the reconfiguration of radical prostate surgery. This included the designation of local and specialist urological cancer teams who were expected to meet various measures of structure and process in delivering care to patients. Each cancer network in England and all the designated local and specialist urology cancer teams were reviewed by a team of clinical peers between November 2004 and May 2007. Serious variations from the key recommendations in the Guidance were cited by reviewers as 'concerns' or, where patient wellbeing was considered to be compromised, as 'immediate risks'. The reports of these reviews are available publicly via the 'CQuiNS' website.

Similar requirements for the implementation of the Guidance apply in Wales but these have not been subject to peer review as in England.

(For details of the peer review process, access the Department of Health website; for individual network and team reports and for the manual of measures against which teams were reviewed, access the CQuiNS website).

The peer review covered the 34 networks in England which were in existence in 2004, fifty specialist urology cancer teams (which will carry out radical prostatectomy and other radical treatments) and 122 local urology teams (which will provide non-radical treatment for men with prostate cancer).

Almost one third of networks did not have compliant action plans for the implementation of the Guidance. This was mostly due to the designated specialist urology cancer teams serving populations of less than one million. There were, and still are, some networks who have not submitted agreed plans.

Those networks which had identified specialist urology cancer teams which were clearly functioning as such had higher compliance levels for clinical guidelines and specialist teams had overall better compliance than local teams (75% versus 68%). This was especially marked for the broad range of measures which apply equally to both teams, e.g. patient experience and service improvement.

Local urology cancer teams performed particularly poorly for attendance of core members at MDT meetings, cover arrangements, referral guidelines, patient experience and service improvement.

One quarter of teams do not have complete core membership, most notably for clinical oncology (11%). Oncology attendance at MDT meetings is deficient in 23% of teams. Attendance of radiologists and pathologists is also relatively low.

Overall, 43 immediate risks were raised. About half of these related to surgeons performing fewer than five radical procedures per year (the ‘rule of five’ was a Key Recommendation in the 2002 Guidance for immediate implementation) or to teams performing fewer than fifty radical procedures. These were especially focused on London where only one of six specialist urology cancer teams complied compared with seven out of eight in the North of England.

Headline overall compliance levels were lower for urology teams (69%) than for all other reviewed cancer sites, e.g. breast (77%), colorectal (76%) and gynaecology (73%). The figure for urology was lowered by lower compliance for supranetwork teams in testicular (62%) and penile (67%) cancers. Compared with other specialist teams following surgical reconfiguration, urology achieved 75% compliance, gynaecology 81% and upper GI 76%. However, as the poorly complied with clinical guideline measures sit outside the team assessment for urology alone, this comparison is actually rather flattering for urology.

## Appendix A Cancer Nurse Specialist Support

One of the key recommendations of the 2002 Improving Outcome in Urological Cancers Guidance[41] was:

"Major improvements are required in information and support services for patients and carers. Nurse specialist members of urological cancer teams will have key roles in these services."

The workload of cancer nurse specialists was surveyed in the English cancer networks in 2005-6[42]. 25 networks responded. Figure A.1 shows the average number of new cases per Cancer Nurse Specialist (CNS) per year, in eight major cancer types. The average in areas excluding urology is 110 new cases per year per CNS while in Urology it is 203 new cases per year per CNS.

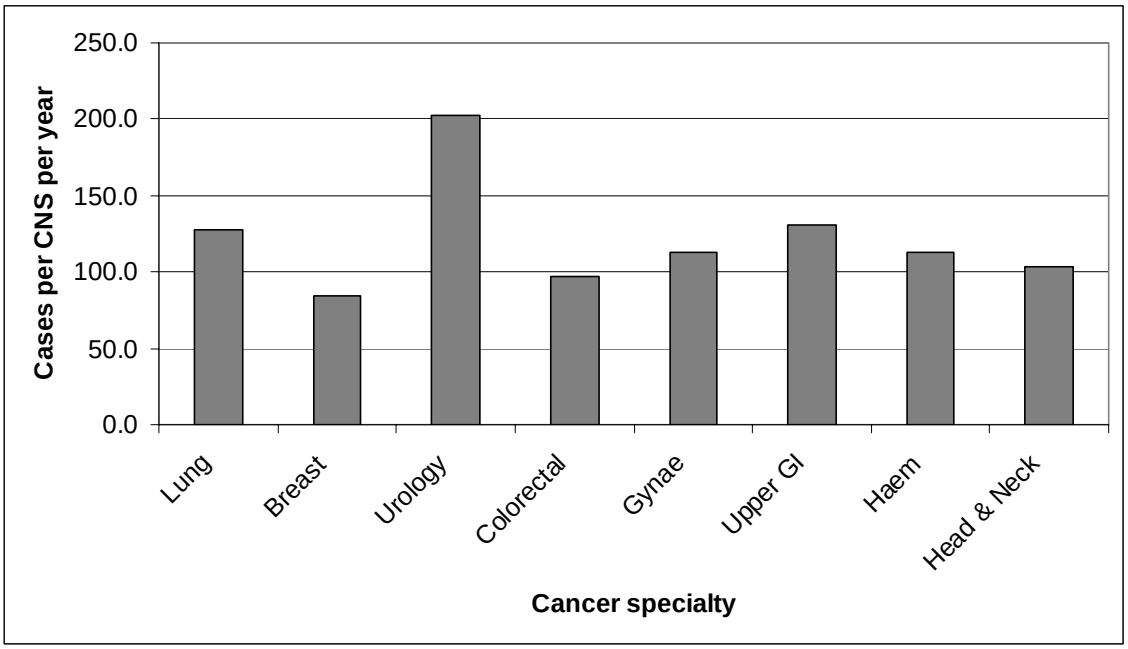


Figure A.1, Number of new cases per Cancer Nurse Specialist per year. Data source: Honnor C, Trevett P (2005) Clinical Nurse Specialist Workforce Mapping. National Prostate Cancer Conference 2006

The survey also showed a wide variation between levels of CNS support in different networks (Figure A.2) with a variation of 417%.

[41] National Institute for Clinical Excellence (2002) Improving Outcomes in Urological Cancers. *NICE cancer service guidance.* London: National Institute for Clinical Excellence

[42] Honnor C, Trevett P (2005) Clinical Nurse Specialist Workforce Mapping. National Prostate Cancer Conference 2006, London

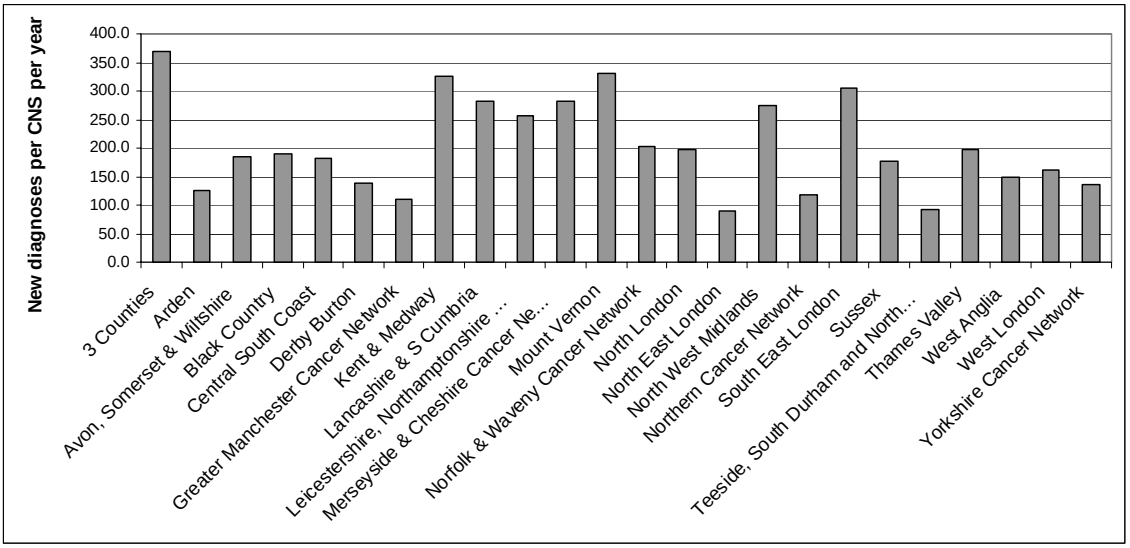


Figure A.2, Number of new cases per Cancer Nurse Specialist per year, by network. Data source: Honnor C, Trevett P (2005) Clinical Nurse Specialist Workforce Mapping. National Prostate Cancer Conference 2006

## Appendix B Clinical Trial Support

One of the key recommendations of the 2002 Improving Outcome in Urological Cancers Guidance[43] was:

"There are many areas of uncertainty about the optimum form of treatment for patients with urological cancers. High-quality research studies should be supported, with encouragement of greater rates of participation in clinical trials."

The National Cancer Research Network[44] was established in 2001 to support cancer clinical trials in England. A summary of their database relating to prostate cancer clinical trials is shown in Table B1. There is a rapid increase in the number of patients accrued to clinical trials in 2003-4 which can be attributed to the creation of the NCRN.

| Financial Year | Accrual | Total number open with recruitment data | Number opening | Number closing |
|---|---|---|---|---|
| Pre-2001 | No data | N/A | 7 | 0 |
| 2001-2 | 291 | 4 | 6 | 1 |
| 2002-3 | 857 | 10* | 4 | 0 |
| 2003-4 | 2541 | 22 | 2 | 4 |
| 2004-5 | 2804 | 18 | 2 | 3 |
| 2005-6 | 2073 | 17 | 2 | 4 |

Table B.1, Accrual to prostate cancer studies within the NCRN Portfolio and numbers of studies opening and closing. *Accrual to these 10 studies in 2003/4 increased to 1581 and remained at 1487 the following year despite 2 of the studies closing. Data source: Provided by request from R Moser, Business and Research Activity Manager, National Cancer Research Network.

[43] National Institute for Clinical Excellence (2002) Improving Outcomes in Urological Cancers. *NICE cancer service guidance.* London: National Institute for Clinical Excellence

[44] http://www.ncrn.org.uk/index.htm

## Appendix C Cancer Networks

Cancer networks were created following the recommendations from the Calman Hine Report[45]. Each cancer network acts to co-ordinate primary, secondary and tertiary cancer services for a population of (typically) 1-2 million people. They are "intended to deliver a uniform standard of high quality care to all patients"[45]. They are funded by and are accountable to the Primary Care Trusts that they cover. They have close links with the Strategic Health Authorities and commissioners of cancer services though they themselves have no commissioning funds and are non-statutory bodies.

When first implemented there were 34 cancer networks covering England. Several networks have subsequently merged. As of June 2007 there were 30 cancer networks in England[46]. There are three equivalent networks covering Wales.

[45] Calman K, Hine D (1995) Policy framework for commissioning cancer services: a report by the expert advisory group on cancer to the chief medical officers of England and Wales. London: Department of Health.

[46] Survey conducted by UK Association of Cancer Registries. Conducted by D. Edwards, West Midlands Cancer Intelligence Unit.