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Department of Health

Delivering the Cancer Reform Strategy

Technical Appendix

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Contents

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Introduction

National Audit Office estimates of the cost of cancer services and analyses of resource utilisation

This technical appendix explains the detail of the analyses we have carried out on the cost of cancer services and resource utilisation by cancer patients in the National Health Service (NHS), the results of which we have presented in our report *Delivering the Cancer Reform Strategy* (www.nao.org.uk/cancer-reform-2010). These are original National Audit Office (NAO) analyses based on data available to us during the course of the study, where we have exploited existing sources of research or made additional requests for data to be presented in a new way.

This technical appendix also includes results of analyses that we carried out but which have not been included in the report, where these may be of interest to users of the report, in particular analysts in the cancer community. It focuses mainly on our calculations and analyses of the costs of cancer services and resource utilisation.

Definitions of cancer, cancer services and cost of cancer services

1 Cancer is a group of diseases characterised by uncontrolled growth and spread of abnormal cells. There is a wide range of definitions of cancer in use by the Department of Health (the Department), the National Health Service (NHS) and the wider cancer community. Cancer services, narrowly defined, could include the hospital treatment and care for patients diagnosed with an invasive or malignant cancer; or, more broadly defined, could cover all services provided in organising and delivering cancer programmes including prevention, early detection, diagnosis, treatment and continuing care (such as rehabilitation and terminal care). Further extensions could include research into cancer and capital investment.

2 Irrespective of these definitions, the costs of cancer services can also be examined from different perspectives, for example, the direct NHS cost to the taxpayer or a broader societal perspective, which might include the cost of lost working days and carer costs. The estimates of costs will therefore vary depending on the definition of cancer used, the services included and the perspective under scrutiny.

3 We have defined cancer in accordance with the Programme Budgeting classifications for cancer and tumour used by the Department. For cancer services, we included programmes covered by the Cancer Reform Strategy (the Strategy) and paid for by the Department. We have estimated direct costs incurred by the Department and the NHS according to these definitions of cancer and cancer services.

4 'Cancer' has been defined differently in different documents by the Department and the NHS. Although the term is well defined in their respective documents, they are often used interchangeably by analysts and in various Departmental reports. Different references to cancer are usually classified by the categories of disease types included using the World Health Organisation International Classification of Diseases (ICD-10). For example, for cancer waiting times, cancer is defined as all malignant cancer types with an ICD-10 Code from C00 to C97 excluding C44 (non-melanoma skin cancer),[1] and plus D05 (Ductile Carcinoma in-situ). For incidence and prevalence,[2] cancer normally includes all cancer types under ICD-10 C00- C97 (excluding C44).[3] For cost reporting under Programme Budgeting, cancer is defined as cancer and tumour which includes all disease types under ICD-10 C00-C97, D00-D48 plus some services provided under ICD-10 codes starting with Ns and Zs.[4]

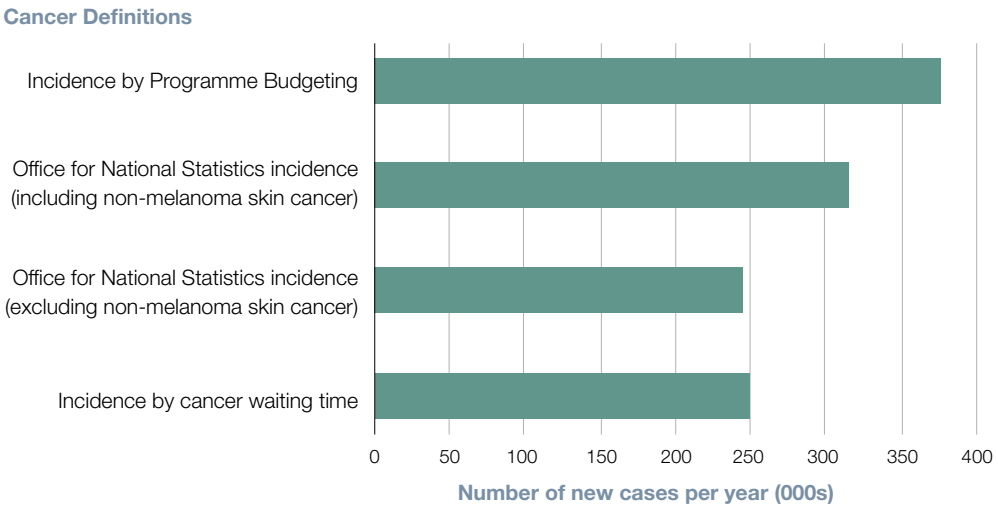
5 In our main report, in line with the Strategy and Cancer Registry practice, we have included cancer types under ICD-10 C00-C97 (excluding C44) for new diagnosis, cancer survivors and deaths attributable to cancer (see page 1, paragraphs 1 and 3 in the main report). For cost estimates, in line with the Department's cost reporting, we

have adopted the Programme Budgeting definitions for cancer and tumour for cost calculations in our report. **Figure 1** illustrates the differences in the number of new cases per year (incidence) covered by the main definitions used by the Department and the NHS.

6 In order to give a comprehensive view of the services provided by the Department and the NHS for cancer, we have included all services provided that are attributable to cancer and tumour in our cost calculation for our report *Delivering the Cancer Reform Strategy*, including prevention, screening, early detection (urgent referral[5]), diagnostics, treatment, continuing care, rehabilitation and terminal care for those with cancer. This will also include some services which are provided but may not result in a diagnosis of cancer (such as screening and urgent referral). We also included any programme specifically associated with supporting the delivery of the Cancer Plan and the Cancer Reform Strategy, particularly centrally run initiatives, for example, central support for screening programmes and the cost of the National Cancer Intelligence Network.

7 Our estimates of overall costs are based on an assessment of the costs of these services insofar as they are provided and paid for by the Department and the NHS. Under the Department's Programme Budgeting approach, these are largely covered by the costs of the Cancer and Tumour Programme. We additionally included, however, costs of services which are not included in the Cancer and Tumour Programme, but are nevertheless incurred in providing the cancer services described above.

Figure 1
Number of new cases of cancer each year by different cancer definition



Source: Analysis of data provided by the Department of Health and cancer registration data from Office for National Statistics (ONS)

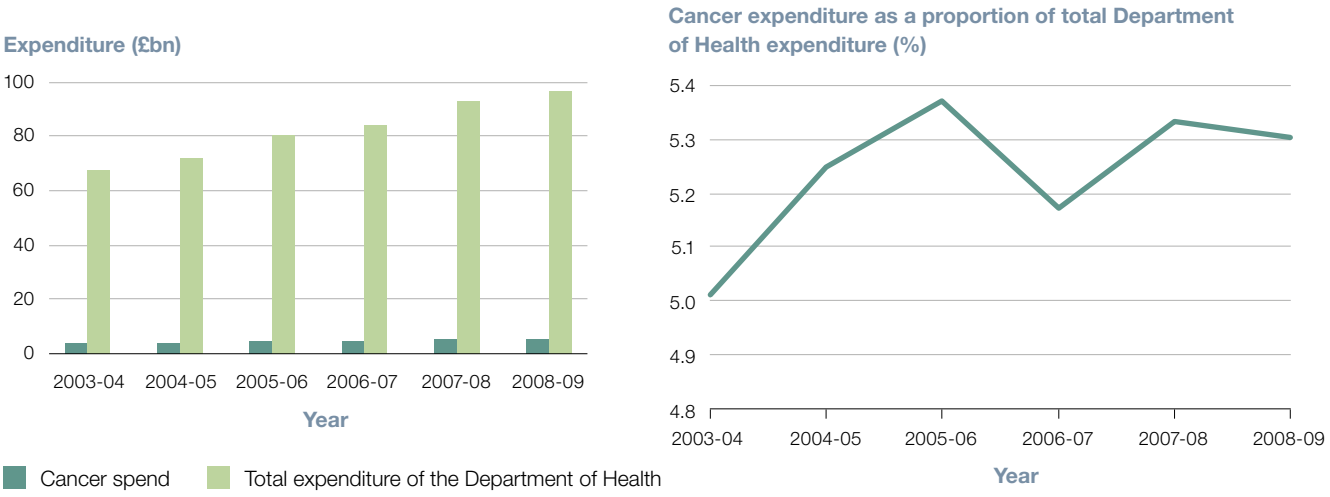
Cost of cancer services under Programme Budgeting

Programme Budgeting cancer expenditure

8 Since 2003-04, the Department has been monitoring through its Programme Budgeting approach the cost of services provided under 23 main programmes of care, such as cancer, mental health and cardiovascular diseases. These 23 programmes of care are based on the World Health Organisation's International Classification of Diseases (ICD-10). As part of this, the Department has been reporting the costs for cancer services under the Cancer and Tumour Programme.[6] It also carried out a one-off estimate of the costs of cancer for the development of the *Cancer Reform Strategy* using a bottom up approach.[7] That estimate differs from the Programme Budgeting approach, however, in its definition of cancer, and the categories of services included in the estimate.

9 Between 2003-04 and 2008-09, overall expenditure on cancer services increased to £5.1 billion from £3.4 billion under Programme Budgeting. This increase was broadly in line with overall increases in expenditure by the Department (**Figure 2**, which informed paragraph 3.2 in the main report).[8,9]

Figure 2
Trend in Programme Budgeting cancer spend and a comparison to total expenditure by the Department of Health



Source: England level Programme Budgeting Data for 2003-04 to 2008-09

Details of cost categories included and excluded from Programme Budgeting cancer expenditure

10 Our review of the Programme Budgeting guidelines,[10] and examination of the Programme Budgeting returns provided by the Programme Budgeting team have shown that Programme Budgeting cancer cost largely comprises of the cost incurred by patients with a cancer diagnosis in the acute sector and the prescription costs for cancer drugs in primary care. It covers the costs for:

- outpatient attendances under cancer specialties such as clinical and medical oncology, paediatric medical oncology and specialist multi-disciplinary team appointments;
- estimates of Accident & Emergency (A&E) attendances;
- hospital admissions with a primary diagnosis of cancer including all surgical procedures carried out;
- chemotherapy;
- radiotherapy;
- specialist services for critical care and palliative care, rehabilitation and community services; and
- prescription costs of cancer drugs in primary care.

It excludes the costs of several key elements of cancer services, which are:

- prevention services, including anti-smoking and human papilloma virus (HPV) vaccination;
- screening programmes;
- general practitioner (GP) consultations;
- referrals incurred through the urgent referral pathway and procedures carried out if referral is not to an oncology department;
- cancer patient outpatient attendances and procedures under general specialties such as general medicine, general surgery, clinical physiology and pharmacology;
- diagnostic testing including imaging (such as Computer Tomography and Magnetic Resonance Imaging) and biopsy procedures carried out in general surgery, and direct access to pathology and radiology services (eg by GPs);
- other services including paramedic services and patient travelling scheme (eg ambulance services related to cancer patients); and
- cancer-related activity funded by the Department, the Department's arm's length bodies and Strategic Health Authorities.[11]

Variations in reported per capita expenditure by Programme Budgeting

Variations

11 The King's Fund reported that there were large variations in Primary Care Trusts' (PCTs') expenditure per head on cancer services (Programme Budgeting) between PCTs for every financial year between 2004-05 and 2008-09. The ratio between the maximum and minimum expenditure PCTs has been reduced to 2.5:1 from about 4:1 over the period; however, there have been minimal changes in other measures such as the ratio between the top and bottom deciles or top and bottom quartiles, or standard deviation. There have also been inexplicable large fluctuations in expenditure per head for the same PCTs from year to year.[12]

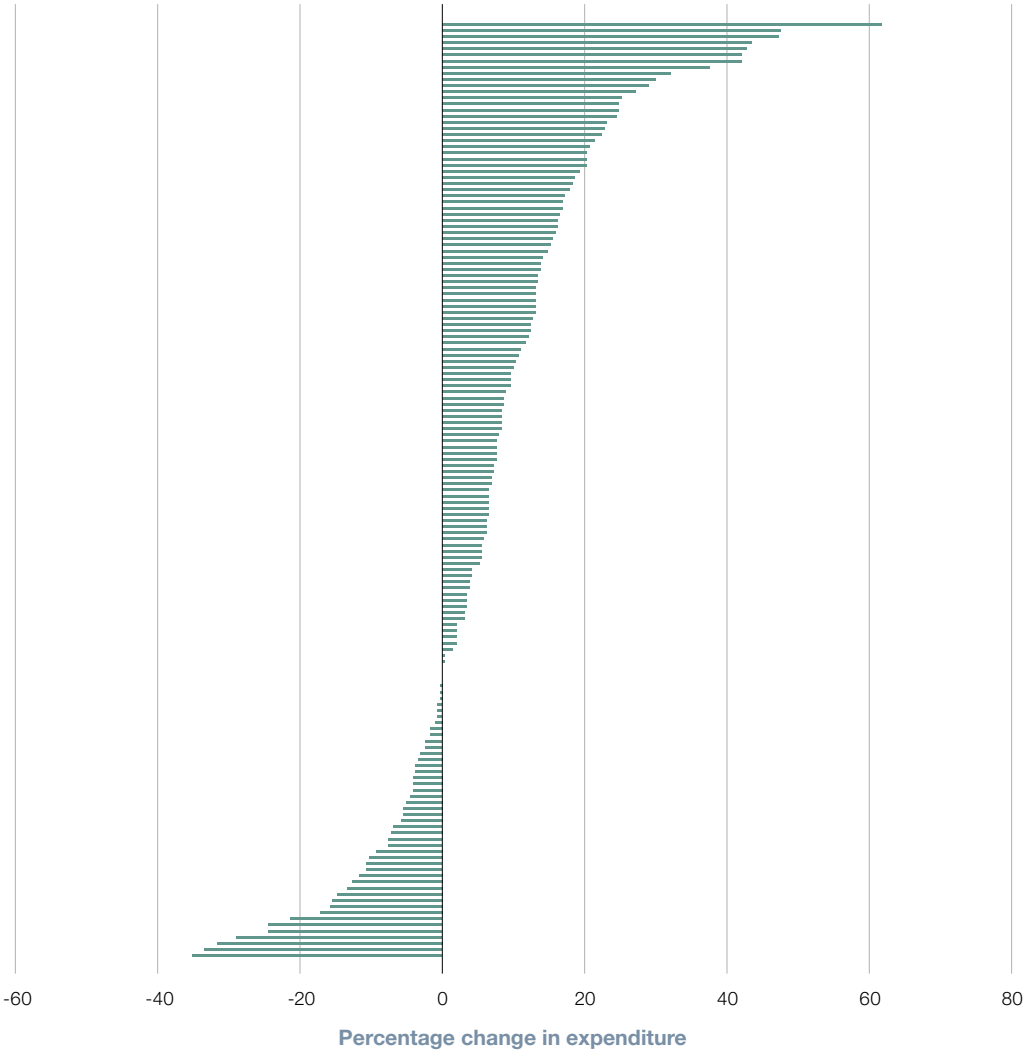
12 Our examination of Programme Budgeting data found that PCT expenditure on cancer services ranged from £55 to £154 per head of population in 2008-09. Thirty-one PCTs had an increase or decrease of 20 per cent or more between 2007-08 and 2008-09, even when adjusted for factors such as age structure, health needs, and staff pay variations (weighted capitation population used by the Department for budget allocation) (**Figure 3**, which informs paragraph 2.5 and 2.6 in the NAO main report).

13 The King's Fund report identified that such variations in per capita expenditure could arise from PCT resident populations' needs for cancer care, market price factors for care provided, local priorities, and variations in financial resources available; they could also be due to variations in the efficacy of local commissioning.

14 The National Audit Office's[13] 2008 *Good Governance Report Review of Programme Budgeting* also highlighted concerns about data quality, in particular with cost relating to episodes of care provided outside inpatient settings. We therefore examined the proportion of Programme Budgeting data covered by Payment by Results (PbR). The NHS comparator reported the cost of admitted cancer patient activity under Payment by Results to be £1.8 billion in 2009-10; for oncology departments (clinical oncology, medical oncology, clinical haematology and paediatric haematology), total outpatient appointments covered by the Payment by Results tariff is about £310 million; and for A&E the total is £1.1 billion,[14] of which about 10 per cent (£0.1 billion) would be included in the cancer cost under Programme Budgeting.[15] Assuming there is no major change in the Programme Budgeting cancer cost, around 40 per cent (£2.2 billion) of the £5.1 billion reported cancer cost under Programme Budgeting for 2008-09 is covered by Payment by Results (see paragraph 15 of the main report).

Figure 3

Percentage change in reported PCT spending per head of population on cancer services between 2007-08 and 2008-09



NOTE

1 Each bar represents a PCT.

Source: Programme Budgeting data

Studies have examined the causes of the variations in Programme Budgeting data

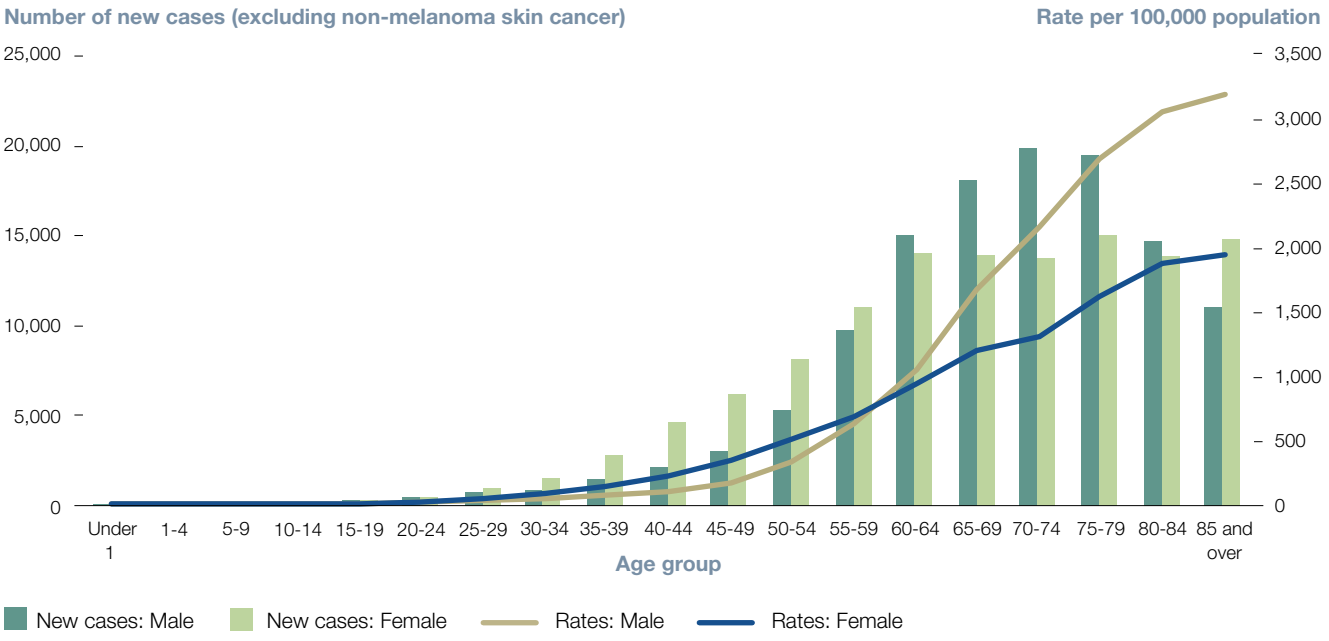
15 Programme Budgeting aims to focus on specific objectives, by analysing data at programme level on disease areas, instead of organisational or functional budgets (such as GP prescribing, hospitals or community services). This was intended to better inform value for money for the programmes delivered by readjusting the pattern of expenditure to get a closer fit with the needs of local populations. It also aimed to inform assessments of health inequalities and identification of areas for improvements in efficiency, effectiveness and equity (fairer shares of resources and reduction in inequality of health outcomes).[16] However, the reason for the difference in reported cancer expenditure per capita between PCTs is poorly understood.

16 The King's Fund found that variations in per capita expenditure on cancer services could partly be explained by the variations in burden of cancer faced by PCTs and the level of funding they received.[17] However, due to lack of data, it did not examine how the variations in expenditure related to variations in service activity such as chemotherapy and surgical interventions.

17 A study by the Thames Cancer Registry, using data for South East England in 2005-2007, found that the burden of cancer as measured by age-standardised incidence and mortality,[18] was unrelated to expenditure. It also found that those PCTs with lower levels of deprivation reported lower expenditure per capita, and that some aspects of disease management (notably bed days per capita and radiotherapy access) were positively correlated to reported expenditure.[19]

18 The apparent lack of correlation between cancer incidence and cancer expenditure in the latter study, which is contrary to the King's Fund report, could be due to the fact that through age standardisation, the actual level of cancer disease burden through different age profiles and accordingly the related service level required by PCTs could not be reflected directly. Cancer predominantly affects older people (**Figure 4**), so a PCT with an older population, despite having a similar level of age standardised incidence or mortality, could face a far greater number of cancer patients. In our analysis, therefore, we have avoided using age standardisation for incidence and prevalence.

Figure 4
New cases of cancer and rates by age and sex, England, 2007



Source: Office for National Statistics Cancer statistics registrations 2007 MB138, published online in 2010, London

Linear regression analysis (paragraph 3.3 of the main report)

Variables included in analysis

19 In order to understand better the variations of reported per capita cancer expenditure, we explored the associations between a range of variables that could contribute to these variations. We also carried out linear regression analysis on a range of variables, using 2008-09 per capita cancer expenditure from the Programme Budget tool provided by the Department Programme Budget Team. The variables examined were:

- unadjusted incidence (three-year average between 2005 and 2007 obtained from the Cancer Commissioning Toolkit), prevalence (GP reported prevalence from Quality and Outcome Framework statistics) and mortality (obtained from the Cancer Commissioning Toolkit) as a measure of the cancer disease need;
- income domain of the Multiple Deprivation Index[20] to evaluate the impact of deprivation on service provided, divided into deciles;
- number of inpatient admissions per new cancer diagnosis, number of inpatient admissions per prevalent case, number of day case admissions per new cancer diagnosis, average length of inpatient stay per admission, and proportion of admissions as emergency admissions from our analysis of 2008-09 Hospital Episode Statistics data (to reflect the pattern of service delivery);

- access to treatment including chemotherapy (measured as number of people on chemotherapy from Hospital Episode Statistics data for 2008-09 per new diagnosis), radiotherapy (measured as number of fractions delivered per new cancer diagnosis),[21] surgery (measured as number of main surgical procedures carried out from Hospital Episode Statistics 2008-09 per new diagnosis);[22]
- market force factors faced by PCTs to adjust for the price elements of the service outside PCT commissioners' control;[23]
- size of PCTs (ranked into bands rounded to the nearest 100,000 population) to allow for potential economies of scale in commissioning of services;
- unified weighted capitation weight,[24] which is used by the Department to measure the generic health need of the population, the market price faced by PCTs as well as policy initiatives or priorities to address health inequality (for example, spearheaded PCTs to tackle inequalities in mortality) and other deliberate policy initiatives or priorities which affect utilisation of resources, as an approximation for the general needs of the population; and
- actual budget allocation per head to measure the impact of funding received on the reported service cost.

Correlations

20 We found that higher per capita expenditure:

- is associated with higher incidence, prevalence or mortality;
- has little or no correlation with the recorded levels of treatment including chemotherapy and surgical procedures carried out for admitted patients;
- is positively correlated (but not statistically significant) with the number of inpatient admissions per cancer patient; and
- is negatively associated with the proportion of total admissions as emergency admissions.

21 The largest single factor associated with the level of expenditure is the generalised weighted capitation formula (the composite index used by the Department to allocate budget to PCTs), however, this is not the case for each individual element of the index. For example, the price level faced by PCTs as measured by market force factors is significantly negatively correlated to per capita expenditure. The size of PCT has a negative but insignificant correlation with per capita expenditure (**Figure 5**).

Linear regression analysis

22 Guidelines for Programme Budgeting data indicate that the data submitted for each programme should reflect the cost of the services actually provided for that disease programme, rather than the actual payment received or paid. Therefore, the reported expenditure should be compared directly to the level of services provided multiplied by the unit costs for those services. The level of service provided is a function of the number of cancer patients and how much treatment each cancer patient receives. To evaluate the causes of the variations taking account of these principles, we carried out a series of linear regressions.

Figure 5
Correlation between per capita expenditure and other variables

	Pearson correlation	Statistical significance (Two tailed)
Incidence per million population	0.15	0.07
Mortality per million population	0.27	0.00
Prevalence per million population	0.35	0.00
Access to chemotherapy (the number of patients on chemotherapy divided by the number of new diagnoses)	-0.04	0.62
Inpatient surgical procedures per new cancer diagnosis	-0.05	0.58
Proportion of admissions as emergency admissions	-0.19	0.02
Number of admissions per cancer prevalent case (QOF prevalence)	0.12	0.17
Day case admissions per new cancer diagnosis	-0.01	0.94
IMD income deprivation (deciles)	0.01	0.86
Market force factor	-0.43	0.00
PCT size by population (banded by every 100,000)	-0.09	0.30
Unified weighted capitation weight used by the Department	0.42	0.00

Source: National Audit Office analysis of data from various sources

23 There are strong correlations between some of the variables in Figure 5, with incidence, mortality and prevalence having a correlation coefficient of over 0.8 with each other. We selected prevalence, using the Department's Quality and Outcomes Framework dataset which provides the most up to date estimate of cancer prevalence at PCT level, as our approximation for the cancer specific need. We carried out linear regression analysis using per capita cancer expenditure on the above variables. The results are shown in **Figure 6**. We found that:

Figure 6
Linear Regression coefficients of cancer expenditure per capita

Predictor	Coefficient	Confidence Interval	P-value
Actual allocation per head of population	-0.04	(-0.09, 0.00)	.07
Average length of stay	0.14	(-2.48, 2.76)	.92
Access to chemotherapy (the number of patients on chemotherapy divided by the number of new cancer diagnoses)	6.97	(-29.68, 43.63)	.71
Day case admissions per new cancer diagnosis	-0.88	(-2.50, 0.73)	.29
IMD income deprivation (deciles)	0.78	(-0.68, 2.24)	.30
Inpatient surgical procedures per new cancer diagnosis	3.12	(-1.11, 7.36)	.15
Number of admissions per cancer prevalent case (QOF prevalence)	29.46	(6.65, 52.27)	.01
PCT size by population (banded by 100,000 population)	-2.03	(-4.48, 0.43)	.11
Prevalence per million population	0.01	(0.00, 0.01)	.00
Proportion of admissions as emergency admissions	-16.23	(-62.14, 29.67)	.49
Radiotherapy treatment sessions (fractions) per incident case (2009-10) *(assuming no change since 2008-09)*	0.91	(-0.36, 2.18)	.16
Unified weighted capitation weight used by the Department	66.87	(45.56, 88.18)	.00

Source: National Audit Office analysis

- the number of admissions, unified weighted capitation weight, and prevalence all have a significant impact on per capita expenditure;
- access to treatment including chemotherapy, radiotherapy and surgical procedures increases per capita expenditure but the correlation is not statistically significant;
- average length of stay is not co-related to variation in expenditure;
- higher rate of day case admissions is associated with lower expenditure but only marginally;
- higher levels of deprivation co-relate to lower expenditure;
- large PCTs tend to have lower per head expenditure, suggesting a potential economy of scale effect; and
- higher emergency admissions as a proportion of total admissions, even after controlling for other factors, is associated with lower expenditure per capita, although statistically not significant. Given the poor understanding of the drivers for emergency admissions (see main report paragraph 3.12), this merits further investigation.

24 In the model with the least variables selected without losing explanatory power (**Figure 7**), cancer specific need as measured by prevalence, patterns in inpatient management (number of admissions per prevalent case) and the unified weighted capitation weight explain about 50 per cent of the variations.

Figure 7
Linear regression coefficients of cancer expenditure per capita

Predictor	Coefficient	Confidence Interval	P-value
Unified weighted capitation weight used by the Department	76.44	(59.13, 93.73)	.00
Prevalence per million population	0.005	(0.004, 0.006)	.00
Number of admissions per cancer prevalent case	31.28	(10.99, 51.56)	.00

NOTE

1 R^2, a measure of the proportion of variation explained by the model, is 0.51 for this model.

Source: National Audit Office analysis

Multi-stage linear regression analysis

25 To quantify the variations contributed by each aspect of the services, we carried out a multi-stage regression analysis for the predictors following the order specified in **Figure 8**. Residuals from the first linear regression using per capita expenditure as the dependent variable and prevalence as the independent variable are then used as the next dependent variable for the second stage regression, with treatment as the explanatory variable; then the residuals obtained from the second regression are used as the next dependent variable for the third stage and so on. The ordering is based on the process of Programme Budgeting cost collection (see paragraph 22).[25] The variations associated with each element of the service are shown in Figure 8 (see also paragraph 3.3 in the main report).

Discussion

26 Our analyses have demonstrated that higher reported cancer expenditure arose from higher burden of cancer and higher rates of utilisation of inpatient services. Other factors such as age structure, deprivation and policy initiatives including those to address health inequalities reflected in the funding allocation by the Department also affected the reported cancer expenditure. However, after adjusting for these disease or policy factors, the actual funds PCTs received per capita at population level had very little or no effect on the reported cancer expenditure per head.

Figure 8
Multi-stage linear regression analysis results

Predictors	Variation explained (%)
Burden of disease (prevalence)	12.5
Access to treatment (chemotherapy, surgery and radiotherapy)	0.3
Patient management (the number of admissions and day cases per new diagnosis, proportion of admissions as emergency admission)	3.6
Market price factors	6.6
PCT size (banded by every 100,000 population)	3.0
Unified weighted capitation weight	20.2
Funding (actual allocation per head of population)	0.0

Source: National Audit Office analysis

27 There are large unexplained variations in per capita cancer expenditure by PCTs. Less than half of the variations could be explained by burden of cancer (13 per cent), price levels faced by PCTs (7 per cent), inpatient management patterns (4 per cent), size of PCT (3 per cent), and other needs of the population arising, for example, from deprivation and inequality, and deliberate policy initiatives and priorities to address these by PCTs or the Department (20 per cent). The remaining variation, which could not be explained (54 per cent), may be due to inconsistencies in data reporting or variations in efficiencies of service provision unknown to us (see paragraph 3.3 in the main report).

28 Of those factors which could be influenced by commissioners or service providers, the most significant is the number of admissions per patient, suggesting a need to focus on avoidable admissions. Larger PCTs tend to have a lower average per capita expenditure, suggesting that commissioners forming a larger pool can reduce their costs.

Assumptions and limitations

29 Due to data availability, some predictors are for the time periods other than 2008-09, for example, incidence is the three-year average between 2005 and 2007 and radiotherapy data are for the year 2009-10. We assumed that there was no significant change from one year to the next for these variables.

30 The prevalence data used may be incomplete, however the strong correlation between incidence and prevalence suggests that this should not significantly bias the result of the analysis. Data on chemotherapy and surgical procedures were derived from analyses of inpatient Hospital Episode Statistics, so the impact of outpatient procedures on expenditure are not accounted for.

Cost of service categories excluded from reported cancer expenditure

Prevention (Figure 15 in the main report)

31 The Strategy recognised that over half of all cancers could be prevented by changes in lifestyle, and recommended cross-governmental actions to tackle the major risk factors for cancer including smoking and obesity. Actions taken by the Department require considerable input of resources including promoting and monitoring the progress in smoking cessations, and the introduction of HPV vaccination. Our analysis has attempted to separate out the expenditures of programmes that can be attributed to cancer prevention.

32 We estimated that total expenditure on prevention services which can be attributed to cancer amount to about £110 million, comprising:

- smoking cessation: £34 million; and
- HPV vaccination: £76 million.

Smoking cessation

33 Smoking is a major cause of a wide range of diseases including cancer, respiratory and circulatory disease and many others. A recent analysis by the Health and Social Care Information Centre reported that for the years between 2003-04 and 2007-08, smoking related ill-health accounted for about 43 per cent of all finished inpatient episodes, of which cancer contributed about 11 per cent (322,000 admissions for 2007-08).[26] We therefore assumed that about one quarter of the expenditure of smoking cessation incurred by the NHS could be attributed to the prevention of cancer.

34 The NHS has taken a range of measures to promote smoking cessation. The reported expenditure for stop smoking services and nicotine replacement therapy has increased to £131.5 million in 2008-09 from £53.5 million in 2001-02.[27] This cost does not include other strands of anti-smoking intervention such as TV campaigns. We attributed £34 million, a quarter of this reported expenditure, to cancer prevention.

HPV vaccination

35 In September 2008, the Department began a national vaccination programme for girls aged 12-13 years against the human papillomavirus (HPV), to protect against the strains of the virus that cause around seven out of ten cases of cervical cancer. The programme is principally directed at prevention of cervical cancer. For this reason, we have attributed all of the expenditure of the programme to cancer prevention.

36 During the first year (2008-09) of the HPV vaccination programme, 80 per cent of eligible 12-13 year old girls completed the three-dose course of vaccine. The funding for 2008-09 is £76 million; for 2009-10, due to the catch-up programme, the funding was increased to £175 million. It is expected that the ongoing expenditure will be around £34 million annually thereafter.[28]

Other prevention programmes

37 Expenditure for other prevention programmes relating to cancer, notably the SunSmart Campaign for skin cancer, and alcohol and obesity awareness programmes are not included in our estimate.

Screening (Figure 15 in the main report)

38 There are three national cancer screening programmes: breast, bowel and cervical screening. Although prostate cancer screening is not mandated, there is a national management programme for prostate cancer and high volumes of PSA tests are currently prescribed by GPs.[29] We estimate that the total expenditure for the three screening programmes is over £357 million for 2008-09, comprising of:

- breast screening: £80 million;
- bowel screening: £52 million (partially rolled out – full annual expenditure £76.2 million);
- cervical screening: £206 million; and
- NHS cancer screening programmes: £19 million (including breast screening extension, HPV sentinel sites, IT and coordination).

Breast screening

39 The Strategy committed to extend the breast screening programme to cover those between the age of 47 and 49, and those between the ages of 71 and 73. Total number of screening rounds will increase from seven to nine per annum. In 2008-09, 1.77 million tests were carried out with an average expenditure of around £45.50 per test,[30] equivalent to about £80 million nationally. This is in line with the budget of £12 million for each round of cancer screening. NHS Cancer Screening Programmes manage the age extension with a budget of £12 million per annum.

Cervical screening

Organisation of cervical screening

40 Cervical screening covers women aged 25 to 64 years old in England. It tests for abnormalities in cells which might develop into cervical cancer if left untreated. The programme contributes to early diagnosis, and the Department has identified that it helps to prevent about 75 per cent of cancers in the screening age group.[31]

41 The expenditure of the cervical screening programme is not collected centrally. Unlike breast screening which is organised by screening centre, the cervical screening programme is coordinated by a nominated person by PCT. The NHS call and recall system sends out invitations, reminder letters and the results letter. Samples for tests are usually taken by a GP or practice nurse at a GP practice, or at a community clinic. The sample is then sent to be checked in the laboratory in a hospital's pathology department. Following the report of the result, a GP may refer women for further treatment including colposcopy if necessary. We estimated the expenditure for sample taking, expenditure of colposcopy referred and the expenditure of call and recall which constitutes the main elements of cervical screening.

Cost of cervical screening

42 In 2008-09, 3.6 million women aged 25 to 64 were screened, an increase of 12 per cent on 2007-08. **Figure 9** shows the overall cost estimation for sample taking and testing. We estimate that the overall cost for this is about £162 million. Through the call and recall system, we assumed that on average 2.5 letters are sent out per test, one for invitation and one for result, assuming 50 per cent followed up with a reminder. Assuming a cost of £1 per letter, the cost for this will be £9 million for the 3.6 million tests carried out. The actual cost for the call and recall system may be a lot higher than this, accounting for the time of preparing and processing of letters. Part of the cervical screening programme is the intervention following the testing. We estimate that the cost for those treatments is around £35 million (**Figure 10** on page 24). Therefore, we estimated that the total cost for cervical screening is £206 million comprising of:

- sample taking and testing: £162 million;
- call and recall system: £9 million; and
- further investigations carried out following the initial test: £35 million.

Figure 9
Estimated costs of cervical screening for sample taking and testing 2008-09

Sources of Sample	Number of samples (000)[1]	Unit price for sample taking (£)[2]	Unit price for tests at test centre (£)[3]	Cost (£000)
GP	655	26	30	36,658
GP practice nurse	2,168	5	30	91,644
NHS community clinic	130	26	30	7,280
GUM	17	80	30	1,870
NHS hospital	208	80	30	22,880
Private	14	26	30	784
Other	11	26	30	616
Total	**3,654**			**161,732**

NOTE

1 We assume that on average it takes about 8.6 minutes to take a sample[3], 20 per cent of all samples from a GP surgery are taken by a GP and 80 per cent by a practice nurse. The unit cost per minute is then estimated from PSSRU unit price as well as literature reviews listed below; all prices are inflated to the price level for 2008-09.[2] We also assume the cost for taking a sample in hospital and GUM is the same. We assume the unit cost is the same in GP surgery as in community clinic, private providers and other unspecified settings.

Source: 1 – Cervical Screening Programme, England 2008-09 Data tables, NHS Breast cancer screening programmes, 2009, 2 – Unit Costs of Health and Social Care 2009, PSSRU, 2009. Jit et al.,'Economic evaluation of human papillomavirus vaccination in the United Kingdom.' BMJ, vol 337 issue a769, July 2008, 3 – P Martin-Hirsch, B Rash, A Martin, B Standaert, 'Management of women with abnormal cervical cytology: treatment patterns and associated costs in England and Wales', British Journal of Obstetrics and Gynaecology, Volume 114 issue 4, April 2007, pp. 408-15

Bowel screening

43 The NHS Bowel Cancer Screening Programme offers screening every two years to all men and women aged 60 to 69. The NHS Bowel Cancer Screening Programme started being rolled out in July 2006 and achieved nationwide coverage by 2010. The Bowel Cancer Screening Programme extended the age range for screening from April 2010 to invite men and women up to their 75th birthday. The cost for the bowel cancer screening programme in 2008-09 was £51.5 million; this has increased to £76.2 million for 2009-10.[32] The programme has been funded centrally during the rollout period. This is until 2010 for the 60-69 age group and currently for the 70-74 age group extension. GPs are not directly involved in the programme.

Prostate Cancer Risk Management Programme

44 There is no organised screening programme for prostate cancer, but the Department offers a service under the informed choice programme: the Prostate Cancer Risk Management Programme. The prostate specific antigen (PSA) test is provided free by the NHS, and is available on demand to men worried about the disease.

Figure 10
Estimated treatments cost for cervical screening programme 2008-09

Treatment	Number of procedures carried out (000)[1]	Unit cost (£)[2]	Cost (£000)
Colposcopy only	**37**	216	7,879
Diagnostic biopsy	**45**	433	19,576
Excision	**16**	433	6,917
Ablation without biopsy	**1**	433	325
Ablation with biopsy	**0**	433	31
Other	**1**	433	473
Total	**119**		**35,202**

NOTE
1 Each intervention with a procedure is assumed to incur one outpatient office visit. We also assume that all procedures with a biopsy incur the same cost; all costs are in 2008-09 prices using NHS price inflators.

Source: 1 – NHS Cervical Screening Programme, England 2008-09 Data tables, NHS Breast cancer Screening programmes, 2009. 2 – B Rash B, A Martin, B Standaert, 'Management of women with abnormal cervical cytology: treatment patterns and associated costs in England and Wales', British Journal of Obstetrics and Gynaecology, Volume 114 issue 4, April 2007, pp. 408-15

45 A study for prostate specific antigen (PSA) testing in general practice in England and Wales for patients without a prior diagnosis reported that for men aged between 45-84 years in England, 6 per cent were prescribed the PSA test per annum,[33] the equivalent of 0.58 million requested tests. Assuming that each test comprised a GP consultation at £35,[34] and assuming the cost of a PSA test at £10,[35] then the cost of PSA testing for men each year in England without a prostate cancer diagnosis is about £26 million. We have, however, included this cost in the cost for GP consultations.

National cancer screening management

46 The NHS cancer screening programmes are nationally coordinated by a small national team, with a total budget for 2008-09 at £19 million. The team itself cost less than £1 million in 2008-09. It is responsible for commissioning new developments in cancer screening (such as the extensions to the age range for breast and bowel cancer screening, and human papillomavirus sentinel sites in cervical screening), and commissioning the national IT systems for breast and bowel cancer screening. Its role also includes coordinating the national programmes in order to ensure that they are delivered to a uniformly high standard, meet the needs of all sections of society, deliver nationally set objectives within the cancer programmes and that those incidents which occur are appropriately managed and learned from. Coordination and (where appropriate) IT costs in 2008-09 were £3.5 million for bowel cancer screening, £2.2 million for breast screening, £1 million for cervical screening and £250,000 for the Prostate Risk Management Programme.[36]

GP consultations (Figure 15 in the main report)

47 Under Programme Budgeting, the cost for general practice consultations is not included in disease specific categories. However, a large volume of general practice consultations are related to the diagnosis, treatment and follow-up monitoring of cancer patients. Morbidity Statistics from General Practice for 1992 reported that for every incident case of cancer (neoplasm) patient, there are over seven GP consultations related to cancer per annum; and if these are measured against prevalent case, there are over three GP consultations related to cancer per cancer patient per year.[37]

48 There has been a significant increase in the provision and utilisation of GP services for all patients, including cancer patients. Q-Research estimates that between 1995-96 and 2007-08, the number of GP consultations per person per year in England had increased by 10 per cent to 3.3 from 3.[38] Initiatives such as urgent referral and increased awareness have also led to higher GP activities relating to cancer diagnosis.

Types of GP activities included in our analysis

49 Cancer related GP consultation includes both consultations for suspected cancer (many of which will not result in a diagnosis of cancer) and those eventually diagnosed with cancer. We analysed the cost of GP consultations related to cancer services under the following three categories:

- By default, GP consultations followed by urgent referral but not diagnosed with cancer were considered as consultations for suspected cancer.
- GP consultations attributable to cancer before all referrals for diagnosis for those eventually diagnosed with cancer.
- GP consultations related to cancer monitoring and treatment after diagnosis of cancer.

Total number of GP consultations attributable to cancer services

50 In total, excluding those consultations related to cancer screening, we estimate that there are around 8.8 million GP consultations relating to diagnosis, treatment and monitoring of cancer patients in England. The total cost for those consultations is around £310 million using PSSRU unit price.

Two week fast track referral and GP consultations for suspected cancer

51 The cancer waiting time standards, in particular the urgent referral programme has been a particular focus for the Cancer Plan and the Cancer Reform Strategy. The number of patients referred under urgent referral has increased consistently since its introduction (Figure 13 in the main report).

52 In 2008-09, the total number of patients referred under urgent referral was 778,000, of which 90,000 were diagnosed with cancer and 688,000 were not.[39] Of those 688,000, some would have been included in the screening programme, or accounted for in the Prostate Risk Management Programme calculations above. However, we do not have data as to the extent of the overlap. The total number of fast track urological referrals for 2008-09 was 88,000, assuming all of which have been included in the Prostate Risk Management programme, the number of GP consultations related to suspected cancer not resulting a cancer diagnosis under urgent referral would be 600,000.

GP consultations for patients with a diagnosis of cancer using the General Practice Research Database

Results from analysis of the General Practice Research Database provided information on levels of GP consultations by cancer patients

53 In the absence of data on consultations incurred by cancer patients at a national level, we commissioned the General Practice Research Database to analyse the average number of consultations based on samples from the General Practice Research Database. We used the results of this analysis, in combination with the incidence and prevalence data, to estimate the total number of cancer related GP consultations.

54 The General Practice Research Database is a database of research standard collected on over six million active patients from around 600 primary care practices throughout the UK. It is the largest and most comprehensive source of data of its kind. Data analysis was carried out on patients with a cancer diagnosis for the period between 2000 and 2010 to estimate the patterns of consultations by cancer patients both before and after diagnosis.

Defining cancer patients in the General Practice Research Database

55 Cancer is defined using READ codes,[40] We built the cancer code list initially by using an ICD Read cross-map to link READ codes to ICD-10 cancer codes; we then manually examined the relevant disease Chapter (Chapter B), and searched the General Practice Research Database Medical Browser using keywords including cancer, tumour (and tumor), neoplasm and in-situ to identify those codes not initially linked and not in the relevant disease chapter.

56 GP consultations were stratified by year of diagnosis, time intervals from diagnosis, age, gender, staff type (GP, nurse or other health professional), malignancy (malignant, in-situ and other),[41] location of consultation and socio-economic groups. We excluded any consultations related to cancer screening.

57 The General Practice Research Database cancer patient sample is broadly representative of the cancer population in England. **Figure 11** overleaf is a comparison of the age distribution of the General Practice Research Database sample to that of the cancer population in England.

Summary of results

58 On average, a cancer patient visited their GP about 13 times in the 12 months following a cancer diagnosis for the period between 2008-09, compared to 10 times in 2000-01. This represents a 30 per cent increase over the last 10 years (**Figure 12** on page 29), a rate much higher than that for the 12 months preceding diagnosis (a 15 per cent increase).

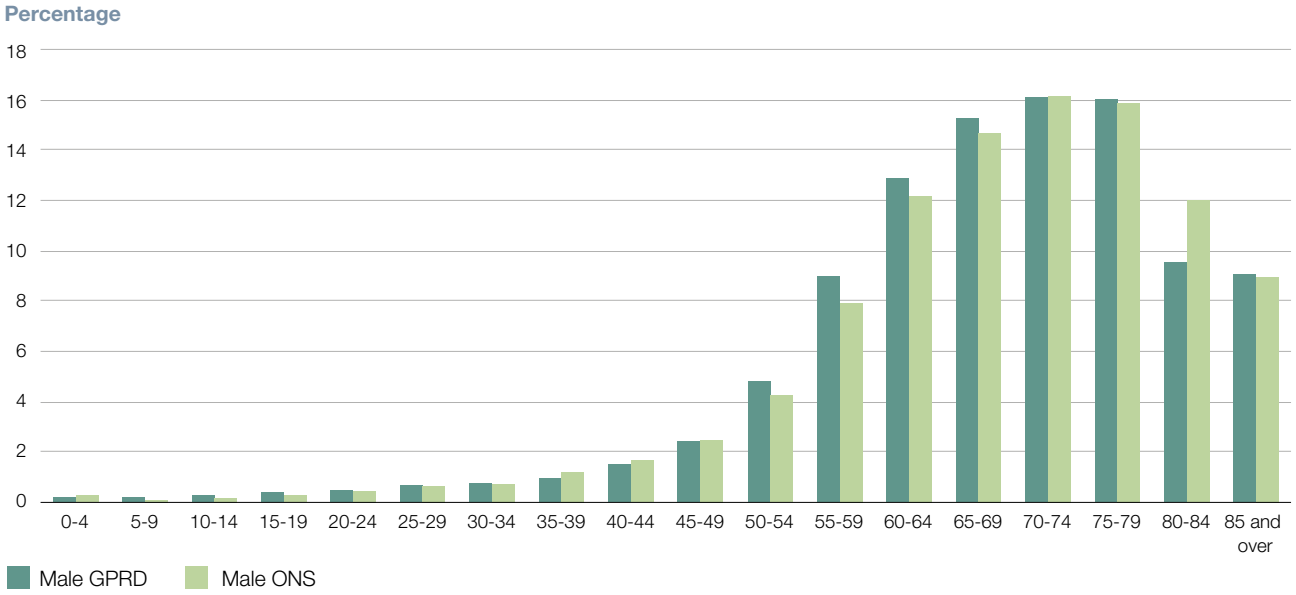
Number of GP consultations before referral for diagnosis for those patients diagnosed with a cancer

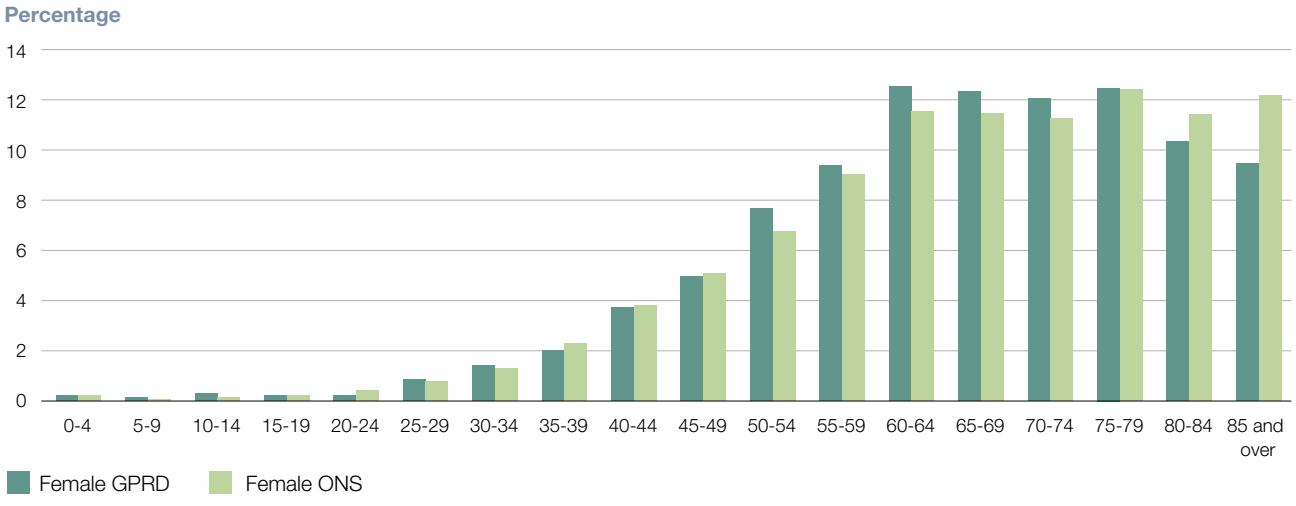
59 There is no comprehensive audit on the number of consultations incurred by symptomatic cancer patients before referral to specialist. A recent analysis of Significant Event Audit (SEA) for diagnosis of lung cancer and cancers in teenagers and young adults by the National Cancer Intelligence Network found that patients on average visit their GP three times before they are referred for diagnosis.[42] It also reported that about 60 per cent of patients were referred within 31 days after initial presentation.

60 We recognised that without examining individual records, it would be impossible to define the exact initial date of presentation for symptomatic cancer patients, and therefore, to estimate the number of consultations between initial presentation and referral. An audit on the diagnosis of cancer patients in primary care in Scotland[43] for patients diagnosed between 2005 and 2007 found that for most cancer types, over 50 per cent of patients are referred within 30 days of initial presentation; however, for cancers such as prostate, colorectal, melanoma and head and neck, over 25 per cent took longer than two months. The SEA audit and the Scottish audit indicate that three quarters of the cancer patients are referred within two months of initial presentation, and only a small number of patients are referred after six months.

Figure 11

Comparison of cancer patient distribution between General Practice Research Database (GPRD) and Office for National Statistics (ONS)



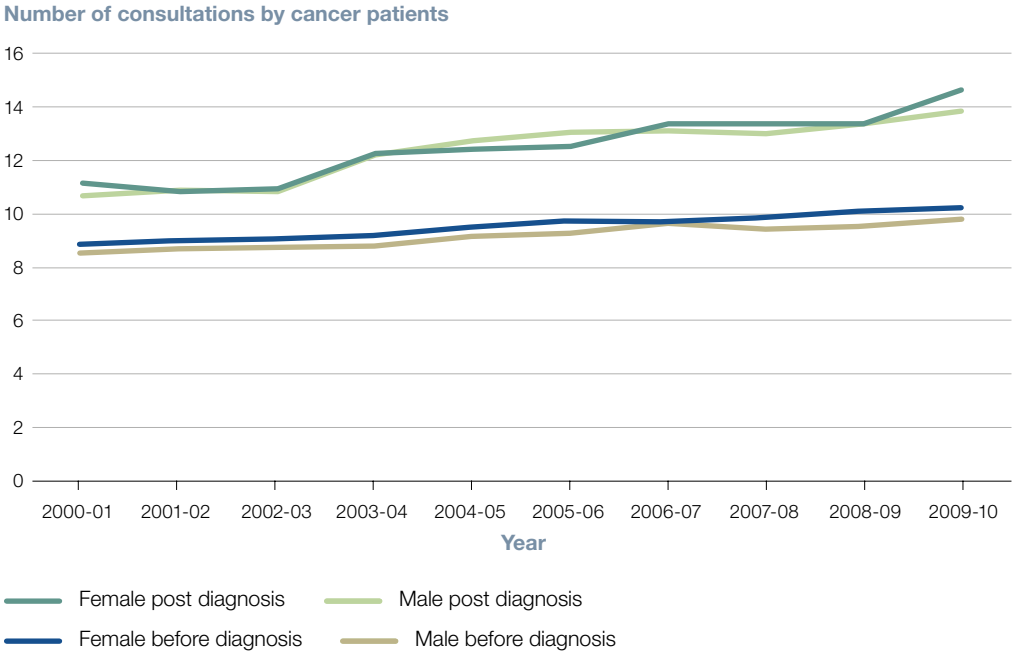


NOTE

1 For ICD-10 cancer code between C00 and C97 only.

Source: National Audit Office secondary analysis of General Practice Research Database summary data and Office for National Statistics data on cancer registration

Figure 12
Trends in number of GP consultations by patients with a cancer diagnosis



NOTE

1 For malignant cancer 12 months before and post diagnosis.

Source: National Audit Office representation of General Practice Research Database analysis

Marginal increase in the number of GP consultations before referral for diagnosis as the number of GP consultations contributable to cancer

61 In order to determine the number of GP consultations incurred, we examined the number of GP consultations for the periods of 0-4 weeks, 4-12 weeks, 12-24 weeks and 24-52 weeks leading up to cancer diagnosis. Consultations for the period of up to 12 weeks before diagnosis would be highly likely to be linked to cancer symptoms. We assumed that the average number of consultations incurred by cancer patients for the period between 24 and 52 weeks before their cancer diagnosis is the average number of GP consultations those patients would incur without cancer symptoms; and that the marginal increase in the number of consultations for the 24 weeks immediately before diagnosis is considered as cancer related. The results are shown in **Figure 13** overleaf (female) and **Figure 14** overleaf (male).

62 It is likely that the marginal increase in the number of consultations would be an underestimate, as some of the consultations in the 24-52 week period would be cancer related visits. The number of consultations for patients with an in-situ diagnosis is particularly low. This may reflect the nature of slower progression for in-situ tumours, and using the 24-52 week period as baseline may lead to a significant underestimate.

Figure 13

Number of GP consultations by cancer patients before diagnosis (female)

	4 weeks	4-12 weeks	12-24 weeks	24-52 weeks	Marginal increase
Breast cancer	1.05	1.25	1.50	3.37	0.91
Bowel cancer	1.56	2.39	2.23	4.16	2.61
Lung cancer	2.20	3.07	2.96	5.29	3.69
Other malignant	1.69	2.50	2.45	4.65	2.66
In-situ	0.73	1.23	1.57	3.37	0.64

NOTE

1 Marginal increase is calculated as the number of consultations for the period of 24 weeks before diagnosis less the expected number of consultations for those patients based on consultation patterns for the period of 24-52 weeks before diagnosis.

Source: National Audit Office analysis of General Practice Research Database summary data 2008-09

Figure 14

Number of GP consultations by cancer patients before diagnosis (male)

	4 weeks	4-12 weeks	12-24 weeks	24-52 weeks	Marginal increase
Bowel cancer	1.37	1.95	2.01	3.58	2.25
Lung cancer	1.90	2.56	2.23	4.45	2.88
Prostate cancer	1.14	2.22	2.16	3.93	2.16
Other malignant	1.58	2.21	2.01	3.68	2.65
In-situ	0.67	1.18	1.47	2.99	0.75

NOTE

1 Marginal increase is calculated as the number of consultations for the period of 24 weeks before diagnosis less the expected number of consultations for those patients based on consultation patterns for the period of 24-52 weeks before diagnosis.

Source: National Audit Office secondary analysis of General Practice Research Database summary data 2008-09

63 We triangulated the estimate from Figures 13 and 14 to the increase in the number of consultations estimated by comparing the number of GP consultations from the General Practice Research Database for each age and gender group to that estimated for the general population (discussed in paragraphs 47 and 48). All else being equal, we assumed that the marginal increase in the number of consultations for the General Practice Research Database cancer patients will be cancer related. The results shown in **Figure 15** are the average number of extra consultations incurred by patients, weighted by the age distribution of cancer patients in General Practice Research Database sample. The estimates are higher using this approach than those from the longitudinal approach in paragraph 61 above, particularly for patients with an in-situ diagnosis.

Average and total number of GP consultations for cancer patients before diagnosis

64 From the above analyses (Figures 13, 14 and 15), we assumed that on average, a cancer patient has three GP consultations from initial presentation with cancer symptoms until being referred to specialists; and for patients with an in-situ cancer, two GP consultations are incurred before referral. The latest estimate for incidence (Programme Budgetting definition) for 2007-08 is 314,000 for patients with a malignant (ICD-10 C00-C97) diagnosis and 62,000 with an in-situ (D00-D48) diagnosis. The total number of cancer related GP consultations related to cancer, therefore, is estimated to be 1.06 million for 2008-09.

Figure 15

Marginal increase in number of consultations by cancer patients comparing to that estimated from Q-research for the general population

Gender	Malignancy	Marginal increase
Male	In-situ	2.20
	Malignant	3.75
Female	In-situ	2.03
	Malignant	3.33

Source: National Audit Office secondary analysis of General Practice Research Database summary data 2008-09

Number of GP consultations for cancer patients within the first year following a cancer diagnosis

65 It is likely that there will be an increase in the number of GP consultations immediately following a cancer diagnosis, due to higher level of anxiety or treatment related issues. We divided patients post-diagnosis into two categories:

- Those patients diagnosed within the last 12 months for whom there will be a high level of treatment activity.
- Those who have survived one year after diagnosis.

66 We compared the average number of GP consultations for the 12-month period immediately after diagnosis with the expected average number of consultations based on the average for the 24-52 week period before diagnosis using the General Practice Research Database (**Figure 16 and Figure 17**). We then, as for the analysis for patients before diagnosis (paragraphs 59-64), compared the age and gender weighted average number of GP consultations from General Practice Research Database to that estimated from the Q-research (**Figure 18**).

Figure 16

Number of GP consultations for the 12 month period after cancer diagnosis compared to the 12 month period before diagnosis (female)

	24-52 weeks before diagnosis (GPRD)	12 months before diagnosis (GPRD)	12 months after diagnosis (GPRD)	Expected number of consultations for the 12 months after diagnosis	Increase in number of consultations compared to expected[1]
Breast	3.00	6.38	10.60	5.57	5.03
Bowel	3.70	9.20	12.97	6.87	6.10
Lung	4.71	12.03	17.69	8.75	8.94
Other malignant	4.14	10.06	12.11	7.69	4.42
Non malignant	3.00	6.15	6.39	5.57	0.82

NOTE

1 Number expected is based on the average number of consultations for the period 24-52 weeks before diagnosis.

Source: National Audit Office secondary analysis of General Practice Research Database summary data 2008-09

Figure 17

Number of GP consultations for the 12 month period after cancer diagnosis compared to the 12 month period before diagnosis (male)

	24-52 weeks before diagnosis (GPRD)	12 months before diagnosis (GPRD)	12 months after diagnosis (GPRD)	Expected number of consultations for the 12 months after diagnosis	Increase in number of consultations compared to expected[1]
Bowel	3.19	7.92	12.44	5.92	6.52
Lung	3.96	9.92	15.59	7.36	8.23
Prostate	3.50	8.41	11.68	6.49	5.19
Other malignant	3.27	8.43	11.45	6.08	5.37
Non malignant	2.66	5.61	5.93	4.94	0.99

NOTE

1 Number expected is based on the average number of consultations for the period 24-52 weeks before diagnosis.

Source: National Audit Office secondary analysis of General Practice Research Database summary data 2008-09

Figure 18

Marginal increase in the number of consultations by cancer patients compared to that estimated from Q-research for the general population

Gender	Malignancy	Marginal increase
Male	In-situ	2.54
	Malignant	7.45
Female	In-situ	2.23
	Malignant	6.55

Source: National Audit Office secondary analysis of General Practice Research Database summary data 2008-09, Q-research, weighted by the age distribution for cancer incidence cases from Office for National Statistics

67 There is a significant increase in the number of GP consultations for all cancer types following a cancer diagnosis. For an average lung cancer patient, there are almost 16-18 GP consultations in the year following diagnosis, an increase of almost six consultations compared to the year before diagnosis. Compared to the baseline as established from the time period between 24-52 weeks before diagnosis, there is an increase of 8-10 consultations. Compared to Q-research for the general population, there is a larger increase, as for the consultations before diagnosis. From this analysis, we assumed that on average, a malignant cancer patient and an in-situ cancer patient incurs, respectively, six and two GP consultations related to cancer in the 12 months post-diagnosis.

Total number of GP consultations for cancer patients following a cancer diagnosis within the first year of diagnosis

68 We estimated the number of cancer patients who are alive and within the first year of diagnosis (on year prevalence), by multiplying the incidence and the ratio between incidence and one year prevalence. This ratio was estimated from a sub-group of cancer patients for whom data for both incidence and one year prevalence are available. For this group of patients (ICD-10 C00-C97), one year prevalence is 166,000 at the end of 2006,[44] the incidence for 2006 was 249,000; therefore, the ratio of one year prevalence and incidence is about 0.67. The survival rate would be higher for in-situ cancer, so to be conservative, we assumed the same ratio. Using this ratio and the incidence figure in paragraph 64, we estimated that for 2008-09, there are 210,000 malignant prevalent cancer patients and 42,000 in-situ prevalent cancer patients living within one year of their diagnosis. Total number of GP consultations for those patients is 1.35 million for 2008-09.

Number of GP consultations for cancer patients who have survived more than a year after diagnosis

69 It is not appropriate to compare the number of GP consultations for those patients with a diagnosis over one year to the base-line obtained for the period before diagnosis, as there is an increasing propensity for GP consultations as people age.[45] We compared the number of GP consultations for patients, for each age group, with a diagnosis of cancer over one year with that for the general population obtained from Q-research (paragraph 48). We found that on average a patient with a malignant cancer visits their GP three times more than the general population, and a patient with an in-situ diagnosis has an increase of about one and a half times (**Figure 19**).

70 As in paragraph 68, we estimated the total number of cancer survivors based on incidence and the ratio between incidence and survivors for a sub-group of cancer patients. The number of people with a cancer diagnosis (C00-C97 excluding C44) is estimated to be 1,366,000 for England for 2004 and the number of cancer survivors is increasing by about 3.2 per cent each year.[46] We estimated that for 2008-09, there are about 1,549,000 cancer survivors in England. Based on the incidence for 2006-07 of 249,000, the ratio of prevalence to incidence for those cancer types is 6.2. Assuming that the ratio will apply to all other cancer types (C00-C97), the total number of cancer patients for all cancer types is 1,954,000 and the number for those tumour types defined by ICD D00-D48 is 386,000.

Figure 19

Marginal increase in the number of consultations by cancer patients compared to the rate estimated from Q-research for the general population

Gender	Malignancy	Marginal increase in the number of consultations
Male	In-situ	1.79
	Malignant	3.57
Female	In-situ	1.65
	Malignant	2.64

NOTE

1 Marginal increase in number of consultations is calculated as weighted average of marginal difference for each age group weighted by the age distribution obtained from the General Practice Research Database.

Source: National Audit Office secondary analysis of the General Practice Research Database *results 2008-09, Q-research, weighted by the age distribution for cancer incidence cases from the Office for National Statistics*

71 Those patients diagnosed within one year are already accounted for (paragraph 67) and we estimated that the total number of GP consultations for cancer patients with a diagnosis of one year or more is 5.75 million per year.

Expenditure on outpatient appointments related to the diagnosis and treatment of cancer (Figure 15 in the main report)

72 Outpatient appointments relating to cancer services include referrals under the two-week fast track referral programme, referrals following cancer screening, and first and follow-up appointments for the diagnosis of cancer patients not covered by urgent referral, first and follow-up appointments for the treatment and monitoring of those diagnosed with cancer.

73 Programme Budgeting cancer cost includes the costs of outpatient visits by patients with a cancer diagnosis outside oncology specialties (including multi-disciplinary team meetings), and all outpatient visits to oncology departments (including clinical, medical, paediatric and gynecological oncology departments). Those patients referred under the two-week fast track referral programme outside the oncology departments without being diagnosed with cancer are not included in the cancer Programme Budgeting cost. Outpatient visits by cancer patients outside oncology departments without a recorded cancer diagnosis are not included in cancer Programme Budgeting costs. We are unclear about the extent to which follow-up outpatient appointments outside the oncology specialties are captured in the Programme Budgeting cancer cost.

Summary of outpatient visit cost estimates

74 For those outpatients' appointments that would not be included in the reported Programme Budgeting cancer cost, assuming each referral for diagnosis only incurs one outpatient appointment and including only first consultant hospital visits, we estimated that the total number of outpatient appointments for cancer diagnosis is about 1.1 million comprising:

- 866,000 under the urgent referral pathway; and
- 224,000 outside of the screening and the urgent referral pathway.

75 Although a small proportion of these would have been included in the reported oncology outpatient appointments, a large amount of referrals would have incurred subsequent follow-up appointments before a diagnosis was made and we have not included this in this analysis. Assuming a unit cost of £167 for a consultant-led first appointment for cancer diagnosis,[47] the cost for these outpatient visits would be equivalent to £180 million.

Outpatients appointments (consultation only) attributable to cancer services relating to diagnosis

Coding of cancer outpatient visit

76 Outpatient consultations for cancer diagnosis are poorly coded in the Hospital Episode Statistics. For 2008-09, 488,000 outpatient visits with a cancer diagnosis (C00-C97, D00-D48) were recorded, of which 61,000 were first appointments.[48] Two cancer specialist hospitals reported 70 per cent of those outpatient visits with a cancer diagnosis, indicating that less than 20,000 first outpatient appointments outside the oncology departments were recorded. Those first appointments include both first appointments for diagnosis and first appointments for treatments. However, there are about 376,000 new cancer patients (Programme Budgeting definition C00-C97, D00-D48) each year, which means that the majority of outpatient appointments relating to the diagnosis of these cancer patients are not currently coded for cancer in the outpatient Hospital Episode Statistics.

77 We assumed that most of the reported outpatient appointments with a cancer diagnosis were to do with treatment. One specialist hospital consistently reported about one third of all reported outpatient appointments with a cancer diagnosis. It reported a total of 20,000 first appointments and 201,000 follow-up appointments for 2008-09, but it only received 1,686 referrals under the urgent referral pathway – less than 10 per cent of its reported number of first appointments.

Cancer outpatient visits relating to cancer diagnosis are under-reported in Programme Budgeting cancer expenditure

78 Based on the information above, it is clear that most diagnostic activities occur outside oncology departments or specialist hospitals, and as such are not being captured in the Programme Budgeting cancer cost. For oncology departments, a total of 282,000 first appointments and 1.8 million subsequent appointments were recorded for 2008-09.[37] The cancer waiting time dataset reported that 778,000 patients were referred for cancer diagnosis under fast track referral in 2008-09;[49] our analysis of patient level waiting time data indicates that about 11 per cent of those urgent referrals are not to the most appropriate specialist and are subsequently referred on to other specialists. We estimate that the fast track referral programme would incur 866,000 first outpatient appointments for cancer diagnosis in 2008-09, which is significantly higher than the total number reported by oncology departments.

79 A large number of outpatient appointments were incurred following the cancer screening programme, but these are excluded from Programme Budgeting cancer expenditure. Due to the variable pathway for cervical screening, we excluded this from our estimates.

Outpatient appointments related to urgent referral

80 There are at least another 224,000 outpatient consultations related to cancer diagnosis outside the urgent referral programme and screening pathway. For 2008-09, 90,000 cancer patients were diagnosed through urgent referral (see paragraph 2.16 of the main report).[37] Cancer urgent referrals cover referrals for suspected carcinoma in-situ of breast but exclude non-melanoma skin cancer.[50] Incidences for the cancer types covered by the urgent referral pathway are about 250,000.[51] Therefore, 36 per cent of cancer patients were diagnosed through urgent referral for 2008-09 for those cancer types covered. A recent study, by the National Cancer Information Network for Southwest England, of cancer patients diagnosed during 2007, found that only about 28 per cent of cancer patients are diagnosed through urgent referral, and 5 per cent through cancer screening.[52] We assumed that for 2008-09, 40 per cent of all cancers are either diagnosed through screening or urgent referral, with a total incidence of 384,000 (C00-C94 and D00-D48) and, we estimated that there were 224,000 cancer patients diagnosed following pathways other than urgent referral and screening; and thus assuming one appointment before diagnosis, there were 224,000 outpatient appointments for these patients.

Outpatient surgical procedures for diagnosis are not included in our estimate

81 Cancer commissioning guidance[53] estimated a cost of £60 million for the following procedures performed in an outpatient setting for 2005-06:

- Fine-needle biopsy of breast.
- Needle biopsy of prostate.
- Biopsy of cervix uteri.
- Rigid sigmoidoscopy.
- Colposcopy.
- Bronchoscopy.
- Diagnostic endoscopic examination of larynx.
- Diagnostic endoscopic examination of pharynx.

82 This is likely to be an overestimate as not all procedures are related to cancer diagnosis, and also some of the cost would have been included in the screening cost; to be conservative we have not included these in our cost calculation.

Research costs

83 The Department currently spends some £160 million a year on cancer research via the Department's Policy Research Programme and the National Institute for Health Research. We have not, however, included this cost in our cost estimate. A large part of this expenditure supports clinical trials and other research undertaken by research partners of the Department in the public and charitable sectors.[54]

Other costs (Figure 15 in the main report)

84 Costs for diagnostic imaging tests, direct access pathology and diagnostic testing, paramedic services and patient travel programmes are currently included in the 'other' categories of the Programme Budget cost. However, a substantial amount of those costs will be directly incurred for services provided to cancer patients.

85 The NHS reference cost for 2008-09 provided activity and cost estimates for those categories, but, it is not possible to identify the cancer element of these costs. We identified the proportion of these costs attributable to cancer using measures suggested in the Cancer Commissioning Guidance.[55] These are given in **Figure 20**. The total cost of these categories is estimated to be £205 million.

Figure 20

Other categories of cost incurred by cancer patients that are not included in the Programme Budgeting cancer cost

Cost Category	Cost (£m)	Costs attributable to cancer services (%)	Notes on proportion
Diagnostic imaging test inpatient	106	11	Assumed to be in proportion to all admissions.
Diagnostic imaging test outpatient	679	11	Assumed to be in proportion to all admissions.
Direct access pathology	643	3	Low estimates where cancer was likely take a low proportion as in Cancer Commissioning Guidance.
Direct access diagnostic imaging	28	3	Low estimates where cancer was likely take a low proportion as in Cancer Commissioning Guidance.
Patient travel programme (admitted patient)	60	11	Assumed to be in proportion to all admissions.
Patient travel programme (outpatient)	131	6	Assumed to be in proportion to outpatient appointments: 3.3 million (2.2 million from oncology specialties and our estimate of 1.1 million for diagnosis) out of 61 million.
Patient travel programme (other)	28	6	
Paramedic services	1,387	6	Assumed to be in proportion to all emergency admissions.

Source: NHS reference cost '2008-09', Cancer commissioning guidance and National Audit Office analysis

Reconciliation of cancer service expenditure with the Department Programme Budgeting cancer expenditure

86 Programme Budgeting data indicate that expenditure on cancer services is £5.1 billion for 2008-09 after taking account of central earmarked cancer expenditure by the Department. We estimate, however, that the expenditure on cancer services in 2008-09 was £6.3 billion, as Programme Budgeting data exclude the costs of several key elements of cancer services (**Figure 21**, see Figure 15 in the main report). This estimate does not include other indirect central expenditure (about £17 billion for 2008-09) by the Department such as training and capital expenditure, which support the delivery of health services more generally.

Figure 21
Estimated NHS expenditure on cancer services, 2008-09

Area of expenditure		Cost (£m)
Programme Budgeting		**5,130**
Screening (breast, bowel and cervical screening programmes)	357	
GP consultations (before and after diagnosis)	336	
Costs related to first consultant hospital visit (the diagnostic process)	180	
Prevention (proportion of smoking cessation spend attributable to cancer, and HPV vaccination against cervical cancer)	110	
Other (including costs of imaging and pathology tests)	205	
Estimated cost of services excluded from Programme Budgeting		**1,188**[1]
Estimated total cost		**6,318**

NOTE

1 Includes costs associated with investigation of people who are suspected of having cancer, but are subsequently found not to have the disease.

Source: National Audit Office analyses of data from various sources

Trends in resource utilisation

Chemotherapy activity and cost (see paragraphs 1.14-1.16 and Figures 4-5 in the main report)

87 There are no national data on the total cost of chemotherapy or national expenditure on cancer drugs; nor are there national data on chemotherapy activity. We examined the cost of cancer drugs including chemotherapy using 2008-09 NHS Reference Costs, in combination with our analysis of Hospital Episode Statistics for the same period; we also analysed the trend in the number of people treated with chemotherapy between 2000-01 and 2008-09.

Chemotherapy activity

88 The Clinical and Medical Oncology Report[56] for the Thames Valley and Northamptonshire area has found that for those chemotherapy treatments monitored in that area, total courses delivered between 2002-03 and 2008-09 have increased by almost 80 per cent (**Figure 22** overleaf).

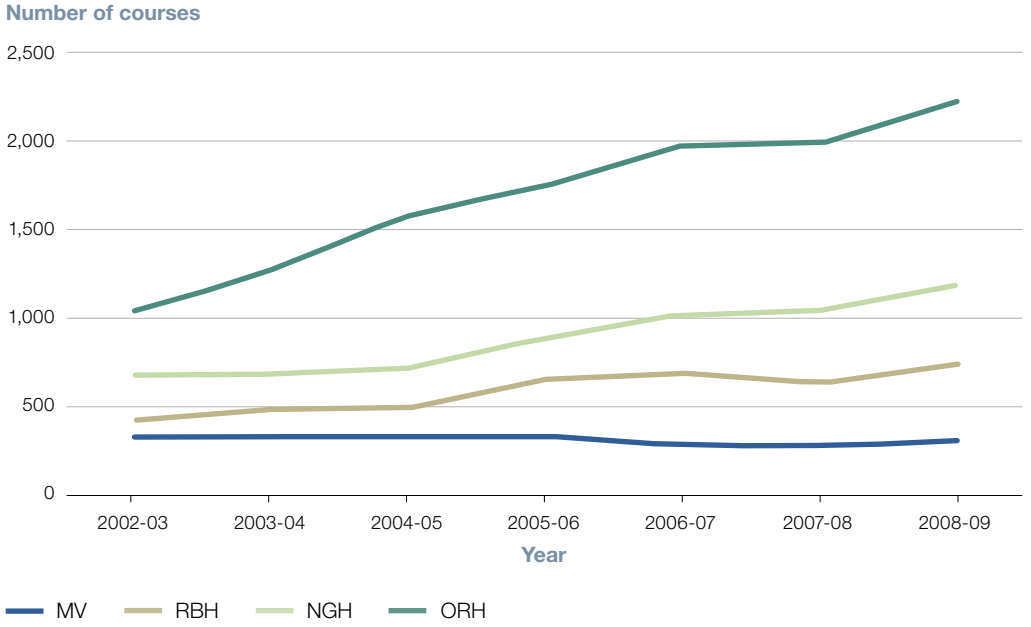
Hospital Episode Statistics data were used to analyse reported chemotherapy activity

89 Recent work by Trent Cancer Registry has demonstrated that Hospital Episode Statistics data are incomplete and do not enable identification of cycles of treatment. However, Hospital Episode Statistics data can be used for analysis of the number of people receiving chemotherapy and the cancer sites being treated. For the five cancer sites they investigated, using their NHS number, over 90 per cent of those patients on their registry who received chemotherapy from oncology departments were matched to those patients identified as receiving chemotherapy from Hospital Episode Statistics.[57]

90 Using SPSS, we analysed the number of NHS cancer patients (ICD-10 C00-C97, D00-D48) receiving chemotherapy using Hospital Episode Statistics data for the period between 2000-01 and 2009-10. A cancer patient is considered to have been treated with chemotherapy if a procedure with any of the codes in **Figure 23** on page 43 was recorded.

Figure 22
Trend in chemotherapy treatment activity in the Thames Valley area

All cancer chemotherapy trend by centre



NOTE

1 RBH, ORH, NOH, MV are Royal Berkshire hospitals, Oxford Radcliff hospitals, Northampton General and Mount Vemon centre for cancer treatment and West Hertfordshire hospitals.

Source: Oxford Cancer Intelligence Unit Clinical and Medical Oncology Report Thames Valley Cancer Network Clinical Information Analysis Programme 2008-09, Oxford Cancer Intelligence Unit, 2010

Summary of Hospital Episode Statistics analysis on chemotherapy activity

91 We analysed the number of patients with a chemotherapy treatment recorded as defined above, and the method of admission for the corresponding episode. For 2009-10, we only have the data for the first three quarters of the year. Results from these analyses are reported in **Figure 24** on page 44. Based on these data, for 2008-09 over 51,000 cancer patients received chemotherapy treatment, compared to some 24,000 in 2000-01. On average, each cancer patient receiving chemotherapy treatment had 11 day case admissions, while the number of inpatient admissions associated with chemotherapy has reduced from 2.3 on average in 2000-01 to 1.3 admissions in 2008-09.

Figure 23
Chemotherapy definition for Hospital Episode Statistics analysis

OPCS-4	Procedure
T133	Introduction of cytotoxic substances to pleural cavity
T482	Introduction of cytotoxic substances to peritoneal cavity
X352	Intravenous chemotherapy
X373	Intramuscular chemotherapy
X384	Subcutaneous chemotherapy
X701	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 1
X702	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 2
X703	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 3
X704	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 4
X705	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 5
X708	Other specified procurement of drugs for chemotherapy for neoplasm in Bands 1-5
X709	Unspecified procurement of drugs for chemotherapy for neoplasm in Bands 1-5
X711	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 6
X712	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 7
X713	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 8
X714	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 9
X715	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 10
X718	Other specified procurement of drugs for chemotherapy for neoplasm in Bands 6-10
X719	Unspecified procurement of drugs for chemotherapy for neoplasm in Bands 6-10
X721	Delivery of complex chemotherapy for neoplasm including prolonged infusional treatment at first attendance
X722	Delivery of complex parenteral chemotherapy for neoplasm at first attendance
X723	Delivery of simple parenteral chemotherapy for neoplasm at first attendance
X724	Delivery of subsequent element of cycle of chemotherapy for neoplasm
X728	Other specified delivery of chemotherapy for neoplasm
X729	Unspecified delivery of chemotherapy for neoplasm
X731	Delivery of exclusively oral chemotherapy for neoplasm
X738	Other specified delivery of oral chemotherapy for neoplasm
X739	Unspecified delivery of oral chemotherapy for neoplasm
X353	Intravenous immunotherapy (not included in this piece of work, but has been used by other registries)

NOTE

1 OPCS-4 is an abbreviation of the Office of Population, Censuses and Surveys Classification of Surgical Operations and Procedures (4th revision), used by Hospital Episode Statistics to code clinical procedures.

Source: List provided by Trent Cancer Registry

Figure 24

Trends in number of patients recorded as being treated with chemotherapy and patterns of admission related to those treatments

	Number of patients	Number of inpatient admissions	Number of day case admissions	Inpatient admissions per patient	Day case admissions per patient
2000-01	23,691	55,487	248,871	2.3	10.5
2001-02	23,688	50,616	252,768	2.1	10.7
2002-03	24,184	49,423	267,862	2.0	11.1
2003-04	25,044	49,518	279,355	2.0	11.2
2004-05	25,807	44,466	289,485	1.7	11.2
2005-06	26,581	52,010	309,814	2.0	11.7
2006-07	32,319	58,138	389,659	1.8	12.1
2007-08	42,587	62,514	469,193	1.5	11.0
2008-09	51,260	65,721	549,790	1.3	10.7
2009-10	66,565	62,685	574,105	1.3	10.7

NOTE

1 For 2009-10, we only had data for the first three quarters of the year; numbers in brackets are the total estimate for the 12 month period extrapolated from the data for the first three quarters.

Source: National Audit Office analysis of Hospital Episode Statistics data

Consistency check with trends in the oncology departments

92 We also analysed the specialties under which those chemotherapy admissions are managed. In order to avoid spurious trends derived from incomplete Hospital Episode Statistics data on chemotherapy treatments, we compared the trends in day case admissions related to chemotherapy to those reported for the four specialties: clinical oncology, medical oncology, haematology and clinical haematology to check the consistency in the trends in reported activity.

93 Together those specialties make up about 90 per cent of the day case admissions with a recorded chemotherapy treatment. Total number of day case admissions related to chemotherapy treatment for the four oncology departments accounted for 93 per cent of all day case admissions related to chemotherapy treatment for 2000-01; by 2008-09, this had decreased to 90 per cent (**Figure 25**). For urology and rheumatology, the number of day case admissions associated with chemotherapy treatment for patients with a cancer diagnosis has more than tripled between 2005-06 and 2008-09; for urology specialty, the increase is particularly marked, rising from 400 day case admissions in 2005-06 to 25,000 cases in 2008-09 (Figure 25).

Figure 25
Trends in number of day case admissions related to chemotherapy treatment

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Gastroenterology	0	128	87	245	659	742	775	1,114	1,737
Urology	929	383	497	397	395	389	7,981	18,500	25,235
Rheumatology	2,657	2,931	2,935	1,768	1,374	1,934	2,002	2,540	6,954
General surgery	2,807	3,304	2,301	2,067	1,922	2,396	1,349	1,405	1,069
General medicine	4,888	2,401	2,178	3,065	3,235	2,595	1,533	1,398	2,661
Paediatrics	5,109	6,083	6,316	5,554	5,939	6,818	9,780	11,572	12,174
Haematology	6,824	4,241	4,210	4,056	3,212	3,000	3,937	6,493	7,952
Clinical haematology	35,136	34,554	34,303	34,560	36,716	39,553	48,094	63,610	84,433
Medical oncology	62,773	65,002	75,971	82,602	90,947	99,644	130,864	155,413	170,524
Clinical oncology	125,594	131,772	138,852	145,002	144,327	150,903	179,695	202,948	229,364
Other	2,142	1,819	1,890	2,412	2,598	2,746	3,715	4,046	4,272

Source: National Audit Office analysis of Hospital Episode Statistics data

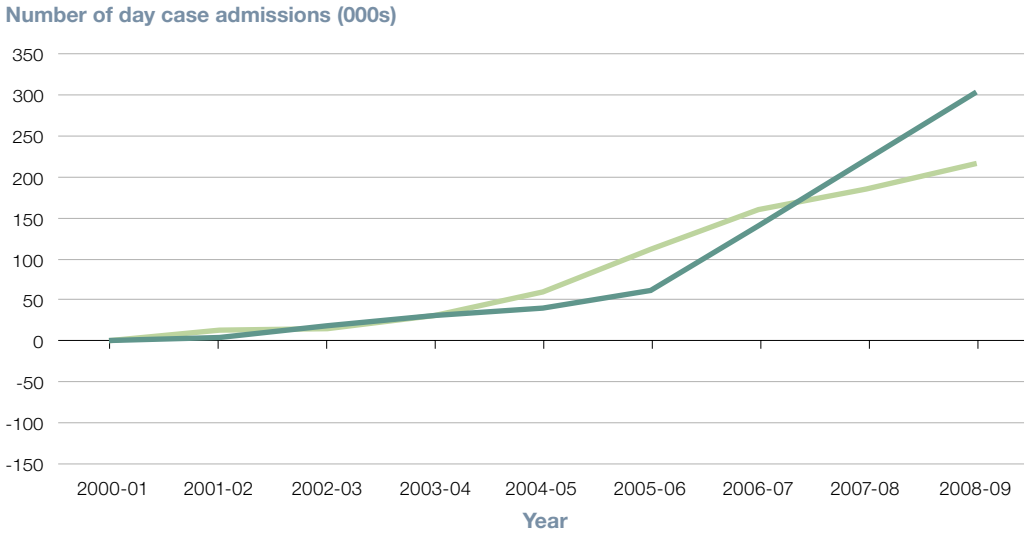
94 We found that the trends in the number of cancer patients treated with chemotherapy from our analysis of Hospital Episode Statistics are consistent with the trends in day case admissions for oncology departments. This is particularly the case for the period between 2000-01 and 2004-05. Day case admissions increased faster during this period than the number of cancer patients treated; this faster increase is associated with a shift of treatment from inpatient settings to day case settings (**Figure 26** overleaf and **Figure 27** on page 47). From 2005-06, inpatient admissions for cancer patients with a recorded chemotherapy treatment increased.

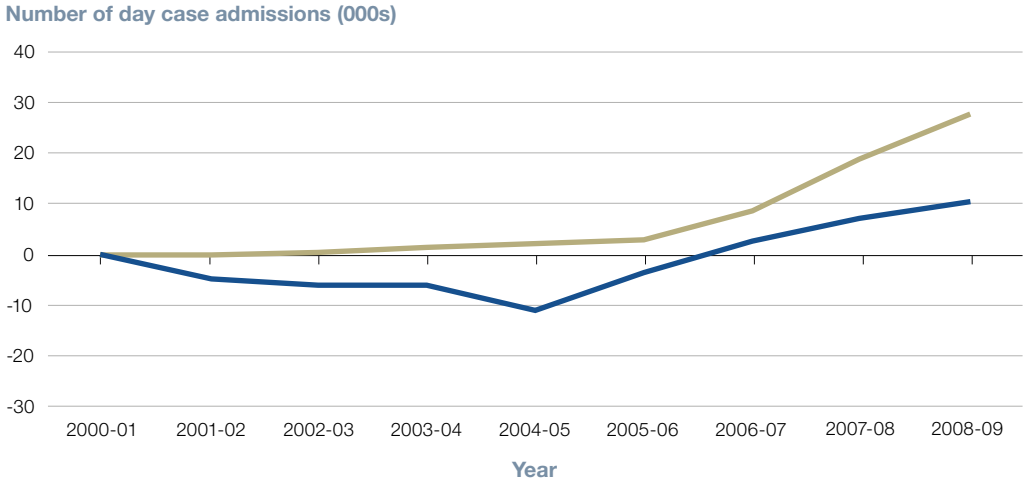
95 Day case admissions related to chemotherapy increased slightly faster than those for the total day case admissions for oncology departments. This is partly due to an increased number of cancer patients treated with chemotherapy outside the four oncology specialties as reported in paragraph 93.

96 We conclude that the trends for the number of people recorded as being treated with chemotherapy are consistent with the trends in chemotherapy related admissions recorded for cancer patients.

Figure 26

Change in the number of admissions and the number of cancer patients recorded as treated with chemotherapy

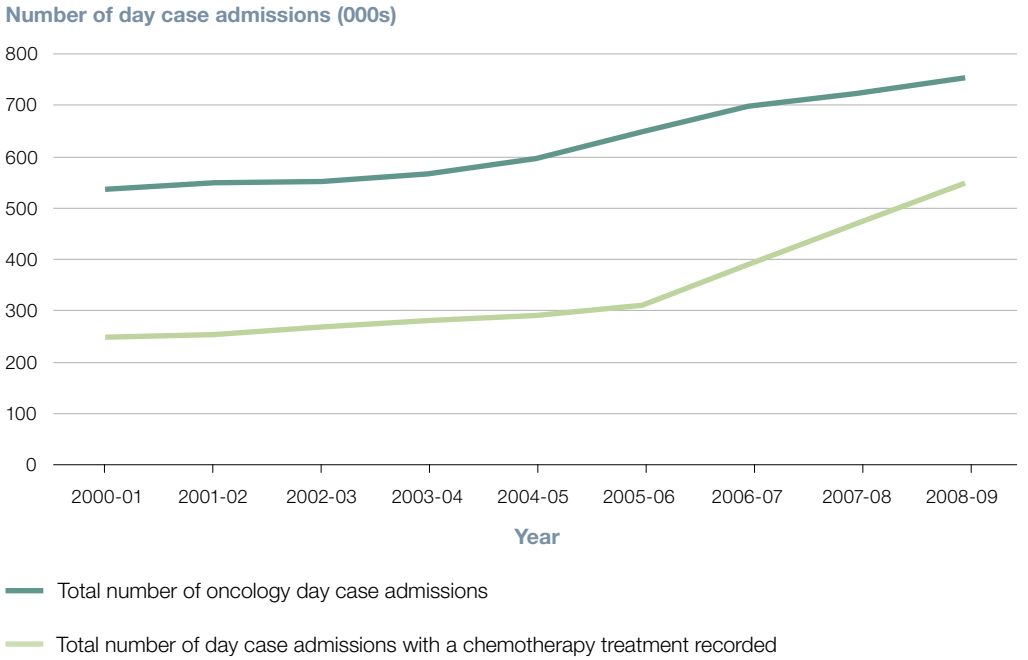


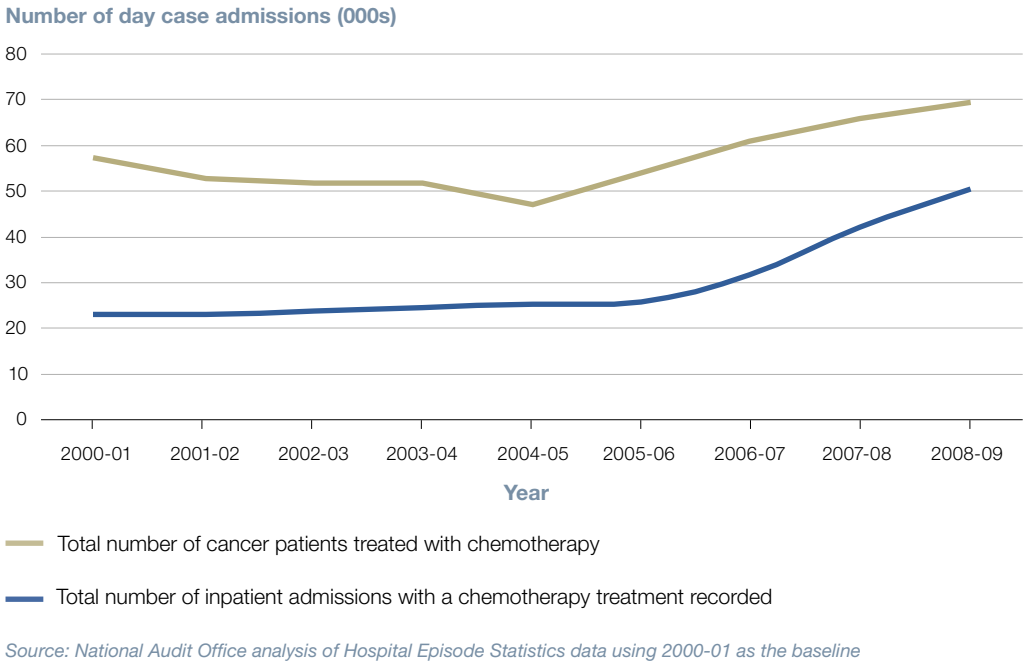


Source: National Audit Office analysis of Hospital Episode Statistics data using 2000-01 as the baseline

Figure 27

The number of cancer patients recorded as being treated with chemotherapy and patient admissions related to chemotherapy treatment





Source: National Audit Office analysis of Hospital Episode Statistics data using 2000-01 as the baseline

Chemotherapy cost (see paragraph 1.14 in the main report)

97 We estimate that the total cost of cancer treatment with cancer drugs including chemotherapy and its delivery was around £1 billion for 2008-09. The NHS Reference Cost 2008-09 reported that the total cost for chemotherapeutic drugs prescribed in the acute sector, including the cost of administration, was over £636 million (**Figure 28**).

98 The NHS Reference Cost data for 2008-09 reported the number of activities and the average costs for those activities related to chemotherapy.[58] These data show that about a quarter of all chemotherapy treatments, as measured by drug cost, are administered in inpatient settings. However, the NHS Reference Cost does not include the cost of delivery of chemotherapy treatment in inpatient settings.

99 Based on the Hospital Episode Statistics data for 2008-09, and using the previous definition of chemotherapy (Figure 23), we found that a total of 420,000 bed days were recorded for those inpatient admissions relating to a chemotherapy treatment. On the basis of a cost of £200 per bed day per inpatient, the cost for those admissions is some £84 million. In addition, the cost for cancer drugs prescribed in primary care was £316 million for 2008-09.[59]

Figure 28
Chemotherapy cancer drug cost 2008-09

Cost categories	Cost (£m)
Chemotherapy drug cost	470
Chemotherapy delivery cost for day case and outpatient settings	166
Chemotherapy delivery cost for inpatient settings	84
Subtotal	720
Cancer drugs prescribed in primary care	316
Total	1,036

NOTE

1 The costs only include those we can identify and exclude high cost drugs. For the drugs prescribed in primary care, only net ingredients cost is included. See paragraph 1.14 in the main report.

Source: NHS reference cost, NHS prescription service and National Audit Office analysis of Hospital Episode Statistics

Trends in inpatient bed days, admissions and length of stay (see paragraphs 3.6-3.11 and Figures 16-18 in the main report)

100 The strategy made a commitment to improve inpatient management by shifting care from inpatient to an ambulatory care setting. It recognised that there is considerable potential to streamline care, avoid unnecessary emergency admissions, and reduce non value-adding lengths of stay, across elective and emergency pathways. However, it is not clear in the strategy how progress is going to be measured.

Different approaches to measurement

101 The Strategy identified that new models of care can bring advantages to patients and release resources for investment in cancer services. It established the Transforming Inpatient Care Programme to improve the quality of care for cancer patients by avoiding unnecessary inpatient admissions and reducing length of stay.

102 The progress is generally reported using data analyses of the Hospital Episode Statistics. Due to various definitions of cancer in use by the Department (see paragraph 4), the number of cancer patients included could vary significantly. The Department's National Cancer Intelligence Network measures inpatient cancer activity on the basis of admissions for patients with a diagnosis of cancer in any of the first three diagnostic fields in the Hospital Episode Statistics data. 'Cancer patient' is defined as any admitted patient with any of the following ICD-10 diagnostic codes: C*, D0*, D32, D33, D353, D354, D37, D38, D39, D4*.

103 In contrast, the Department's Programme Budgeting data assign costs to cancer activity on the basis of diagnostic codes for cancer and tumours (including benign tumours) and for patients with a primary diagnosis of cancer only (for detailed codes see paragraph 4). As a result, calculations of savings derived from reductions in inpatient cancer activity are on a different basis to the Department's measure of total expenditure on cancer services derived from Programme Budgeting data (see paragraph 3.2 in the main report).

104 There are also different approaches to an analysis of the Hospital Episode Statistics. For example, bed days can be estimated based on the duration of stay for finished consultant episodes (FCEs) ended in the relevant year, which may have been admitted before the start of the financial year, thus including bed days which occurred in the previous financial year. Bed days could also be estimated based on the actual bed days incurred by cancer patients during the financial year. There is also the distinction between including and not including non-NHS patients. The most common approach adopted by the NHS is based on the duration of FCEs in a financial year.

Impact of various approaches to measurement

105 These differences in approach to analysis could lead to significantly different estimates for cancer related bed days. **Figure 29** illustrates the impact of different definitions of cancer and approaches to analysis using the Hospital Episode Statistics on the number of total bed days and bed days saved attributable to cancer. **Figure 30** illustrates the differences in trends in bed days between 2000-01 and 2009-10. These different approaches affect the magnitude of the number of total bed days more than the change in the number of bed days from year to year. Our analyses demonstrate that the number of bed days saved between 2006-07 and 2008-09 could range from 270,000 to 320,000 depending on the definition of cancer and the measurement approach adopted. Therefore, in order to accurately reflect the progress made on inpatient management, it is important to have a consistent definition of cancer and a transparent method of analysis.

Our analyses of key trends using Hospital Episode Statistics data

106 In our report, for cancer inpatient activities, we have used the National Cancer Intelligence Network definition of cancer[60] and included admissions with any one of the ICD codes recorded in the top three diagnostic fields in Hospital Episode Statistics. We excluded non-NHS patients from our analyses, and duplications of episodes as discussed in paragraph 107.

Figure 29
Bed days and bed days saved between 2006-07 and 2008-09 varies depending on the definitions and diagnostic codes used

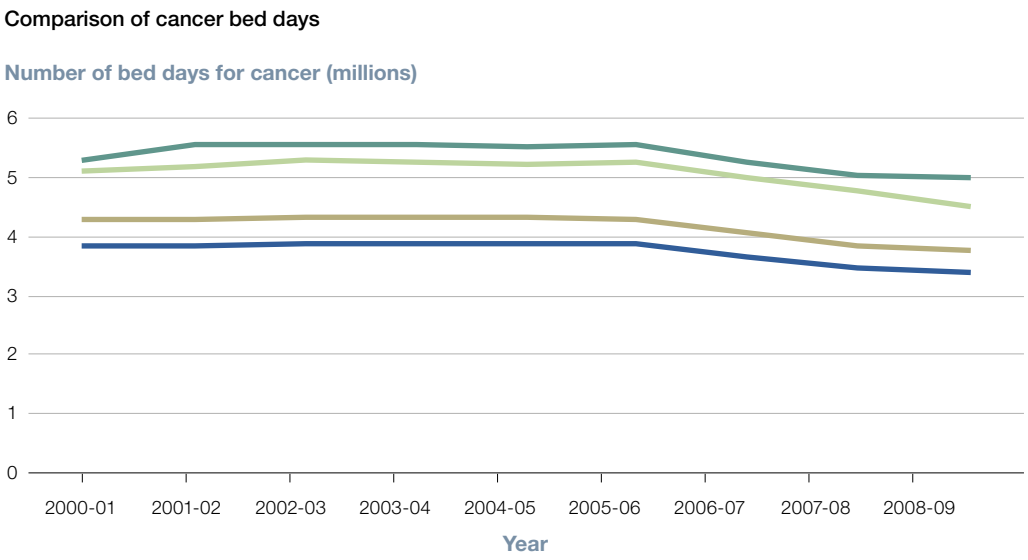
Diagnostic codes[1]	2006-07	2008-09	Bed days saved
Programme budgeting primary diagnosis only (HES-online)	4,031,269	3,719,969	311,300
National Cancer Intelligence Network codes for primary diagnosis only (National Audit Office)	3,811,436	3,522,949	288,487
Programme Budgeting definitions using top three diagnostic fields (National Audit Office)	5,266,713	4,995,109	271,604
National Cancer Intelligence Network codes for top three diagnostic fields including non-NHS patients and bed days from day case patients (National Cancer Intelligence Network)	5,012,050	4,688,966	323,084
National Cancer Intelligence Network codes for top three diagnostic fields excluding non-NHS patients and day case bed days (National Audit Office)	4,949,824	4,668,590	281,234

NOTE

1 All calculations define a cancer patient using the ICD-10 code list used by Programme Budgeting for cancer and tumour but the National Cancer Intelligence Network statistical team use a subset of those codes to reflect the fact that some tumours are benign and do not require patient treatment – the National Audit Office calculation excludes duplications, non-NHS patients and bed-days used by day case patients.

Source: National Audit Office analyses of Hospital Episodes Statistics, National Cancer Information Network and HES-online summary data

Figure 30
Comparison of trends in bed days attributable to cancer patients



NOTE

1 National Audit Office analyses exclude non-NHS patients while The National Cancer Services Analysis Team includes all patients.

Source: The National Cancer Services Analysis Team, National Audit Office and HES-online summary data

107 A Hospital Episode Statistics record is defined as an episode, which is a period of care under one consultant. Due to errors of data entry, duplications of episodes may be recorded in the Hospital Episode Statistics. In our analysis, duplications of records are defined as any two episodes of care having the following four identical fields in Hospital Episode Statistics:

- Hospital Episode Statistics identification number.
- Date episode started.
- Date episode ended.
- Order of the episode.

108 We carried out analyses on three variables for the financial years between and including 2000-01 and 2008-09 (a financial year is defined as starting from 1 April and ending on 31 March the following calendar year):

- Bed days.
- Length of stay.
- Number of admissions including emergency admissions.

109 Bed days are calculated as the sum of the durations of those episodes ended in each financial year (EPIDUR in Hospital Episode Statistics). Length of stay is calculated as the average duration of an admission (SPELDUR in Hospital Episode Statistics) which has been discharged (SPELEND= 'Y' in Hospital Episode Statistics) during the financial year for each admission method: elective or emergency.

110 An admission could be made up of several episodes of care. Number of admissions is calculated by counting the number of episodes which:

- ended in the financial year which are recorded as the first episode following an admission (EPIORDER=1 in Hospital Episode Statistics);
- ended in the financial year which are not recorded as the first episode of care but have no previous episodes recorded for that patient; and
- ended in the financial year which are not recorded as the first episode of care, but have previous episodes recorded with a different admission date.

Summary of results (see Figures 16-18 in the main report)

111 The results of our analyses are summarised in **Figure 31**.

Figure 31

Summary of Hospital Episode Statistics analysis on cancer patient admissions, bed days and length of stay

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Admissions									
Elective admissions	297,740	290,962	301,238	307,175	305,429	325,766	307,863	302,724	301,206
Emergency admissions	231,073	238,568	247,194	255,590	267,319	282,852	288,896	291,544	300,617
Other	19,411	17,106	18,829	18,565	17,906	17,811	16,789	15,658	15,156
Total	**548,224**	**546,636**	**567,261**	**581,330**	**590,654**	**626,429**	**613,548**	**609,926**	**616,979**
Average length of stay									
Elective admissions	6.4	6.6	6.1	5.9	5.8	5.6	5.6	5.4	5.3
Emergency admissions	12.1	12.7	12.6	12.3	11.8	11.2	10.4	9.9	9.6
All admissions	9.2	9.6	9.3	9.1	8.9	8.5	8.2	7.9	7.7
Bed days (Excluding day case bed days)									
Elective admissions	1,906,055	1,903,004	1,827,582	1,814,747	1,766,685	1,798,163	1,708,413	1,619,883	1,590,344
Emergency admissions	2,703,805	2,930,859	3,027,197	3,042,291	3,064,282	3,087,614	2,943,820	2,814,235	2,824,960
Other	318,080	328,090	330,098	323,504	326,394	319,477	297,591	273,652	253,286
Total	**4,927,940**	**5,161,953**	**5,184,877**	**5,180,542**	**5,157,361**	**5,205,254**	**4,949,824**	**4,707,770**	**4,668,590**
Day case admissions	695,136	738,847	769,608	805,828	843,490	945,290	1,022,175	1,084,453	1,159,565

NOTE

1 Day case admissions include day, regular day and night attendances.

Source: National Audit Office analysis of Hospital Episode Statistics data

Endnotes

1 DSC Notice: 22/2002, Notification of change – National cancer waiting times monitoring, NHS Information Authority, June 2002.

2 'Incidence' refers to the total number of new cancer cases in a year, and 'prevalence' refers to the total number of patients with a cancer diagnosis at a point in time.

3 Office for National Statistics *Cancer statistics registrations 2007* MB138, published online 2010, London. www.statistics.gov.uk/StatBase/Product.asp?vlnk=8843

4 Department of Health, *ICD10 to PB category grouper,* published online 2006, accessed 30 June 2010. www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_112543.xls

5 'Urgent referral' refers to the cancer waiting time standards: two weeks to first outpatient appointment following urgent referral by a GP for suspected cancer patients.

6 Programme Budgeting, Department of Health, 12 August 2010. www.dh.gov.uk/en/Managingyourorganisation/Financeandplanning/Programmebudgeting/index.htm

7 *Cancer reform strategy,* Department of Health, 3 December 2007, pp. 118-122.

8 Department of Health *Annual report*, Cm 6524, 21 June 2005, Cm 6814, 11 May 2006, Cm7093, 18 May 2007, Cm7393, 19 May 2008.

9 Estimated England level gross expenditure by Programme Budget, Department of Health, 15 April 2010, accessed 3 November 2010. www.dh.gov.uk/prod_consum_dh/groups/dh_general/@dh/@en/documents/digitalasset/dh_118577.pdf

10 *Programme Budgeting guidance manual*, Department of Health, 13 March 2007. www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/Department_073055

11 *NHS Manual for Accounts 2008-09 Programme Budgeting Guidance for NHS Health Care Providers,* Department of Health, 2008

12 The King's Fund, *Explaining variations in Primary Care Trusts' expenditure on cancer services,* Department of Health, 2010 (unpublished).

13 *Good Governance Report: Review of Programme Budgeting,* National Audit Office, 2008.

14 PBR indicators from NHS Comparators, NHS Information Centre and Connecting for Health. www.nhscomparators.nhs.uk/NHSComparators/PbRCommissionerQuery.aspx

15 According to our correspondence with the Programme Budgeting team from the Department of Health, A&E activity are prorated to the proportion of inpatient activities to different disease categories.

16 *NHS Manual for Accounts 2008-09 Programme Budgeting guidance for NHS Health Care Commissioners,* Department of Health, 2008.

17 The King's fund report on *Explaining variations in Primary Care Trusts' expenditure on cancer services,* Department of Health, 2010.

18 Age-standardised incidence refers to the number of new cases for a standard hypothetical population estimated by applying the actual incidence rate to that hypothetical population for each age group, thereby removing the effect of age profile on the number of new cases for that population.

19 C Okello, H Møller, E Davies, *Reported cancer expenditure in relation to population characteristics, disease burden and service activity for Primary Care Trusts in Southeast England,* King's College London, 2010.

20 Indices of Deprivation (2007), Department for Communities and Local Government, December 2007, accessed 26 July 2010. www.webarchive.nationalarchives.gov.uk/+/www.communities.gov.uk/communities/neighbourhoodrenewal/deprivation/deprivation07/

21 National Radiotherapy Dataset (2009-10), the National Cancer Services Analysis Team (NATCANSAT), 2010, unpublished data provided on request.

22 The analyses are based on analyses of surgical procedures using Hospital Episode Statistics based on a list of surgical procedure codes provided by Thames Cancer Registry on request.

23 Exposition book 2009-10 and 2010-11, Department of Health, 19 March 2010, accessed online 26 July 2010. www.webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Managingyourorganisation/Financeandplanning/Allocations/Department_091850

24 Resource allocation: *Weighted capitation formula*, 6th edition, Department of Health, 12 Dec 2008. www.webarchive.nationalarchives.gov.uk/+/www.dh.gov.uk/en/Managingyourorganisation/Financeandplanning/Allocations/Department_076396

25 According to the Programme Budgeting manual, acute trusts submit activity based expenditures to the relevant PCTs mapped according to disease categories. PCTs then add other expenditures in primary care which are identifiable to disease categories, which in turn are either activity based or programme based according to local knowledge; finally there will be some adjustment by PCTs to reconcile activity-based cost with the actual budget. The cost of activity for the acute sector

is the product of the volume of activity and the unit cost for those activities. Volume of activity in the acute sector for cancer patients is determined by the number of cancer patients from each PCT, level of access to treatment, and level of resource utilisation in terms of inpatient admissions and day cases per patient. The unit costs of these activities are influenced by market price factors beyond the control of PCTs and also by the bargaining power or commissioning arrangement PCTs have with acute trusts.

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27 NHS Information Centre Lifestyle Statistics, *Statistics on Smoking: England, 2009*, The Health and Social Care Information Centre, Department of Health, published online 29 September 2009. www.ic.nhs.uk/webfiles/publications/smoking09/Statistics_on_smoking_England_2009.pdf

28 Unpublished correspondence with the Immunisation Team, Department of Health.

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31 *NHS Cervical Screening Programme Annual Review 2008*, NHS Cancer Screening Programmes, 2008, accessed online 8 November 2010. www.cancerscreening.nhs.uk/cervical/publications/cervical-annual-review-2008.pdf

32 Cancer Screening and Male Cancers, Department of Health Cancer Policy Team Area, unpublished correspondence on bowel cancer screening cost, Department of Health, 29 October 2010.

33 J Melia et al., 'Rate of prostate specific antigen testing in general practice in England and Wales in asymptomatic and symptomatic patients: a cross-sectional study', *British Journal of Urology International,* vol 94 issue 1, July 2004, pp. 51-56.

34 L Curtis, *Unit Costs of Health and Social Care 2009*, PSSRU, University of Kent, 2010, p. 121. www.pssru.ac.uk/uc/uc2009contents.htm

35 O Korim et al. reported a cost of £5-6 per PSA test (O Korim et al.,'Point-of-care PSA testing: an evaluation of PSAwatch', *Prostate Cancer and Prostatic Diseases*, Vol 10, September 2007, p.p 270-273., we also factored in an average cost of £4 for blood sampling and transportation (D.Xu, C Groom, *Services for people with rheumatoid arthritis – Economic models of identification and treatment of early rheumatoid arthritis*, National Audit Office, published online May 2009, p.11.)

36 Correspondence with the Cancer Screening and Male Cancers, Department of Health Cancer Policy Team Area.

37 *Morbidity Statistics from General Practice,* Office of Population and Survey, London, 1995.

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