

Population-based cancer survival trends in England and Wales up to 2007: an assessment of the NHS cancer plan for England

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Summary

Background The National Health Service (NHS) cancer plan for England was published in 2000, with the aim of improving the survival of patients with cancer. By contrast, a formal cancer strategy was not implemented in Wales until late 2006. National data on cancer patient survival in England and Wales up to 2007 thus offer the opportunity for a first formal assessment of the cancer plan in England, by comparing survival trends in England with those in Wales before, during, and after the implementation of the plan.

Methods We analysed population-based survival in 2·2 million adults diagnosed with one of 21 common cancers in England and Wales during 1996–2006 and followed up to Dec 31, 2007. We defined three calendar periods: 1996–2000 (before the cancer plan), 2001–03 (initialisation), and 2004–06 (implementation). We estimated year-on-year trends in 1-year relative survival for patients diagnosed during each period, and changes in those trends between successive periods in England and separately in Wales. Changes between successive periods in mean survival up to 5 years after diagnosis were analysed by country and by government office region of England. Life tables for single year of age, sex, calendar year, deprivation category, and government office region were used to control for background mortality in all analyses.

Findings 1-year survival in England and Wales improved for most cancers in men and women diagnosed during 1996–2006 and followed until 2007, although not all trends were significant. Annual trends were generally higher in Wales than in England during 1996–2000 and 2001–03, but higher in England than in Wales during 2004–06. 1-year survival for patients diagnosed in 2006 was over 60% for 12 of 17 cancers in men and 13 of 18 cancers in women. Differences in 3-year survival trends between England and Wales were less marked than the differences in 1-year survival. North–South differences in survival trends for the four most common cancers were not striking, but the North West region and Wales showed the smallest improvements during 2001–03 and 2004–06.

Interpretation The findings indicate slightly faster improvement in 1-year survival in England than in Wales during 2004–06, whereas the opposite was true during 2001–03. This reversal of survival trends in 2001–03 and 2004–06 between England and Wales is much less obvious for 3-year survival. These different patterns of survival suggest some beneficial effect of the NHS cancer plan for England, although the data do not so far provide a definitive assessment of the effectiveness of the plan.

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Introduction

In 1995, the Expert Advisory Group on Cancer published the Calman-Hine report,¹ in which they recommended that strategic improvements be made to cancer services in England and Wales. However, no additional resources were provided for the recommended improvements, and implementation of the recommendations was left to local initiative. By 1999, progress in improving cancer services was seen as inadequate.²

The National Health Service (NHS) cancer plan for England was published in late 2000.³ It was a comprehensive 10-year strategy, designed to improve prevention, early diagnosis, and screening, and to provide optimal treatment for all patients, thus improving survival and quality of life. An important feature was the creation of multi-disciplinary teams

(MDTs) of specialists to oversee the care of each patient. Annual funding for cancer services rose by about 35% in real terms over the three financial years from 2001 to 2004.

In Wales, the Cancer Services Expert Group recommended substantial changes to cancer services in 1996.⁴ Changes included the creation of MDTs and the designation of specialist clinicians, but the approach relied heavily on clinical collaboration, supported by directives from the devolved administration, rather than on a formal strategy. The full national cancer plan for Wales, *Designed to Tackle Cancer*,⁵ was not published until late 2006.

3-year progress reports on the NHS cancer plan were published in October, 2003,^{6,7} when, despite substantial progress, it was acknowledged that it would take time



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before the effects of the plan could be assessed. Here, we have chosen to examine survival trends during two 3-year periods after the introduction of the plan: 2001–03 and 2004–06. Population-based cancer survival serves as a broad measure of the overall effectiveness of health services. Survival is generally improving, so to measure the effect of the NHS cancer plan we looked for evidence of any acceleration in survival trends. Given the difficulty of introducing systematic, nationwide changes in the NHS, it would be surprising if survival trends for patients diagnosed in England during 2001–03 were to differ much from earlier trends as a direct result of the plan. However, for patients diagnosed during 2004–06, at least 3 years after implementation of the plan, any marked improvements in the overall effectiveness of cancer services might reasonably be expected to show an effect on trends in short-term survival.

Given the later implementation of a strategic cancer plan in Wales, comparison of survival trends in England and Wales over the same calendar periods could be instructive. A cancer plan that was implemented nationwide cannot later be assessed in the same way as a randomised trial. But an observational comparison of outcomes before and after the introduction of a plan in one of two adjacent countries, with similar societies and health systems, seemed to be a reasonable alternative. Similar trends in cancer survival might be expected in both countries up to 2000. But, if the cancer plan were effective, we would expect that England would experience a faster improvement in survival than Wales after several years of latency. Up to 7 years of follow-up are available for patients diagnosed since the introduction of the plan. 1-year survival trends might be expected to accelerate more rapidly in successive calendar periods in England than in Wales after the introduction of the plan, if the plan was effective. 3-year survival trends might also be different in England and Wales.

On Dec 10, 2008, the Office for National Statistics (ONS) published the official national statistics on survival for patients diagnosed with one of 21 common cancers in England during 2000–04 and followed up to 2005.⁸ National statistics on survival for cancer patients diagnosed in England during 2001–06 and followed up to Dec 31, 2007, were published on March 20, 2009.⁹ We have used these data, and the data for all cancer patients diagnosed in Wales, to study national and regional trends in survival up to the end of 2007.

Methods

Data collection

Population-based cancer registries collect a small standard dataset for all cancer patients in a defined population. Data-collection methods vary between cancer registries, but the main sources of data are hospital in-patient records and pathology records. The

National Cancer Registry has collated data from regional cancer registries covering the entire population of England and Wales since 1962. Since 1971, the National Health Service Central Register (NHSCR) has provided notification of the deaths of all cancer patients whose record was successfully flagged with details of the initial cancer registration.

Data for this study were extracted from the National Cancer Registry at the ONS after the linkage of cancer records with data on the patient's vital status (alive, emigrated, dead, not traced) at NHSCR. After powers to legislate on health policy were devolved to UK national assemblies from 1997, cancer registration in Wales passed to the Welsh Cancer Intelligence and Surveillance Unit, but the National Cancer Registry at the ONS continues to receive cancer data from Wales, and the vital status of all cancer patients in England and Wales is updated by the ONS. When the data were extracted on Oct 17, 2008, the vital status at Dec 31, 2007, was known for 99·6% of patients diagnosed with cancer during 1996–2006, without regional variation. The data were received on Dec 15, 2008.

Cancers were defined by their anatomical location (site), morphology, and behaviour (benign, in situ, or invasive). Tumour site was coded according to the tenth revision of the International Classification of Diseases (ICD-10).¹⁰ Morphology and behaviour were coded according to the second edition of the International Classification of Diseases for Oncology (ICD-O-2).¹¹ We examined data for 21 common cancers, 17 in men and 18 in women. We analysed survival for laryngeal cancer in men only, and for breast cancer in women only. Data on stage at diagnosis were not available for all patients and could not be usefully incorporated in our analyses. Standard criteria were used to decide whether a tumour record was eligible for inclusion in the analyses.¹² Records were excluded if they contained data of inadequate quality or were for patients not resident in England or Wales. 1·25 million of 8·4 million patients registered with benign tumours (behaviour code 0), tumours of uncertain behaviour (code 1), in-situ neoplasms (code 2) or a metastasis (code 6) were not included. Of 7043765 patients with an invasive primary malignancy eligible for survival analysis during 1971–2006, 6436299 (91·4%) had one of the 21 cancers selected for analysis, of whom 2338785 were diagnosed during 1996–2006. 6·2% of patients were excluded because their survival was either zero or unknown (tumour registered from a death certificate only [DCO]), and 1·4% of patients were excluded because of unknown vital status or sex, duplicate registration, synchronous tumours, or invalid dates or sequences of dates. Patients who had had a previous cancer of the same organ or tissue at any time since 1971 were also excluded. Data were analysed for 2163274 adults diagnosed with a primary malignant neoplasm during 1996–2006: 92·5% of those eligible (table 1).

The government office regions of England have provided a geographic focus for public-health policy in England since 1999, and have been closely linked with the new NHS strategic health authorities since 2006.¹³ We analysed the cancer data for each region, for England as a whole, and separately for Wales.

Statistical analysis

Survival trends were quantified as the year-on-year rate of change within each calendar period. The difference in survival trends between successive calendar periods provides a measure of any acceleration (or deceleration) in the rate of change in survival between successive periods. Differences or trends are given as the simple arithmetic values; so 12% is reported as 2% (not 20%) higher than 10%, and a rise from 10% to 14% over 4 years is reported as an increase of 1% per year.

We estimated relative survival for England, for Wales, and for the nine government office regions of England, for each cancer, each sex, and by year or period of diagnosis. Relative survival is the ratio of the observed probability of survival and the probability that would have been expected if the cancer patients had only experienced the normal (background) mortality of the general population in which they live,^{14,15} given the same distribution of factors such as age, sex, geographic area, calendar period, and deprivation. Relative survival is the standard approach to estimating population-based survival. It does not rely on accurate reporting of the cause of death,¹⁶ and it enables the estimation of long-term survival from cancer, when competing causes of death become more important.¹⁷ It can be interpreted as survival from cancer after adjustment for other causes of death.

Expected survival is derived from population life tables. Background mortality rates by age and sex differ widely between socioeconomic groups and geographic regions in England and Wales,¹⁸ and these differences have changed over time. We therefore constructed life tables (available online¹⁹) of all-cause death rates by single year of age (0–99 years), sex, deprivation category, and government office region for 1991, 2001, and 2005, using the mid-year population estimates and the mean annual number of deaths during the 3 years centred on the index year. Linear interpolation was then used to obtain life tables for each calendar year in the period 1992–2005. Life tables for 2006 and 2007 could not be constructed because the relevant data (deaths during 2007–08) were unavailable, so life tables for 2005 were used for those years without extrapolation. National and regional analyses for England were all done with life tables specific for sex, government office region, deprivation category, and calendar year from 1996.

Five deprivation categories were defined from quintiles of the income domain score of the indices of multiple deprivation (IMD2004),²⁰ and the equivalent indices for Wales,²¹ using administrative data for the

	ICD-10* code	Eligible for analysis	Exclusions (%)			Number of patients included (%)
			DCO†	Zero survival‡	Other§	
Oesophagus	C15	71 205	3.8	1.9	0.5	66 829 (93.9)
Stomach	C16	88 637	4.6	2.9	0.5	81 517 (92.0)
Colon	C18	213 077	4.3	2.6	1.5	195 108 (91.6)
Rectum	C19–C21	125 458	2.3	1.4	0.6	120 023 (95.7)
Pancreas	C25	70 897	10.6	5.4	0.4	59 272 (83.6)
Larynx (men)	C32	17 281	2.0	1.0	0.8	16 624 (96.2)
Lung	C33, C34	366 597	6.9	4.2	0.7	323 157 (88.2)
Melanoma	C43	74 004	0.9	0.3	1.5	71 935 (97.2)
Breast (women)	C50	411 299	2.1	0.9	3.5	384 442 (93.5)
Cervix	C53	29 077	1.7	0.9	1.2	27 998 (96.3)
Uterus	C54, C55	59 567	2.1	1.1	0.6	57 306 (96.2)
Ovary	C56, 57.0–57.7	66 383	4.5	2.4	0.7	61 385 (92.5)
Prostate	C61	300 301	3.2	1.2	0.9	284 310 (94.7)
Testis	C62	18 679	0.4	0.2	2.1	18 194 (97.4)
Kidney	C64–C66, C68	63 650	5.5	3.2	0.9	57 536 (90.4)
Bladder	C67	112 712	2.7	1.2	0.8	107 398 (95.3)
Brain	C71	39 220	4.7	2.1	1.0	36 171 (92.2)
Hodgkin's disease	C81	13 655	0.8	0.6	1.2	13 305 (97.4)
Non-Hodgkin lymphoma	C82–C85	93 186	3.0	2.2	1.2	87 207 (93.6)
Myeloma	C90	36 866	5.0	2.5	0.7	33 865 (91.9)
Leukaemia	C91–C95	67 034	6.9	3.3	0.8	59 692 (89.0)
Total		2 338 785	4.0	2.2	1.4	2 163 274 (92.5)

All patients were aged 15–99 years. *Tenth revision of the International Classification of Diseases. †Registration from a death certificate only (DCO). ‡Date of diagnosis same as date of death, but record not flagged as a DCO registration. §Aged 100 years or over at diagnosis, vital status or sex unknown, sex-site error, invalid dates, duplicate registration, synchronous tumours, or a previous cancer of the same organ or tissue at some time since 1971.

Table 1: Number of patients eligible and included for analysis, and percentage exclusions, for adults diagnosed with one of 21 common cancers in England and Wales between 1996–2006 and followed up to 2007

34 378 lower super-output areas (LSOAs, mean population 1500)²² in England (2001) and Wales (2002–04). Cancer patients were assigned to the deprivation category of their LSOA, using the postcode of residence at diagnosis and a combined historic file of 2.1 million unique full postcodes, each linked to a complete set of geographic area codes for each year that the postcode was active. Death records were assigned to deprivation categories using the postcode and LSOA in the same way as the cancer cases, so that background mortality was precisely matched to the small areas of residence and deprivation categories of the cancer patients. Although socioeconomic inequalities (the so-called deprivation gap) in survival have been widening for many adult cancers in England and Wales,²³ tending to reduce the overall national gain in survival, recent trends in the deprivation gap in survival will be reported separately.

Survival probabilities were estimated at short (for example, 1-month) intervals in the first few months

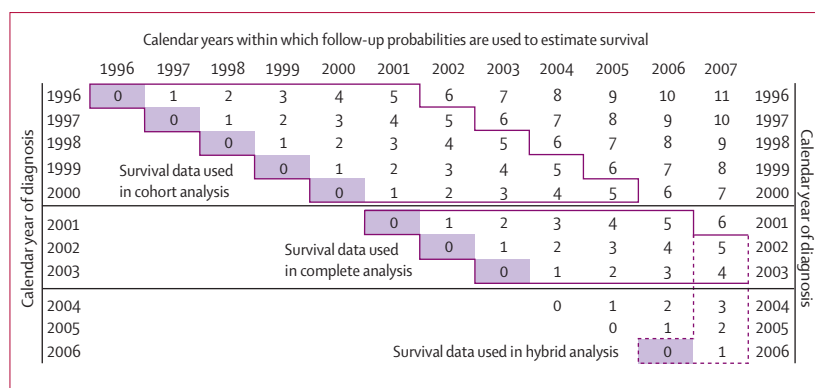


Figure 1: Structure of survival analyses in relation to NHS cancer plan, patients diagnosed 1996–2006 and followed up to 2007

Numbers in the cells indicate the minimum number of years of follow-up completed by patients surviving to the end of a given calendar year (columns) who were diagnosed in the index year (rows). In the cohort approach all patients diagnosed in a given period were followed up for at least 5 years. In the complete approach some patients were followed up for less than 5 years. In the hybrid approach survival is estimated from the most recent follow-up data (dashed lines). Conditional 5-year survival is restricted to those who had survived at least 1 year; ie, excluding follow-up in shaded cells.

after diagnosis, then at progressively longer intervals up to 10 years after diagnosis, using the maximum-likelihood approach for individual data.²⁴ We report the cumulative probabilities of relative survival at 1, 3, 5, and 10 years after diagnosis. We also report 5-year survival for patients who survived at least 1 year after their diagnosis (conditional survival).

Given the structure of the data, various analytical approaches were required. The classical (cohort) approach was suitable for the analysis of year-on-year trends in 1-year survival, since all patients were followed up at least that long (figure 1). For the period 1996–2000, the cohort approach was used for 5-year survival and the complete approach to estimate 10-year survival. Short-term prediction of survival for patients diagnosed during 2007 was made with the hybrid approach,²⁵ combining the 1-year survival probability for patients diagnosed during 2006 with the survival probabilities for the second and later years after diagnosis for patients who were alive and followed up for at least part of 2007. Conditional 5-year survival was available with the cohort approach for 1996–2000, the complete approach for 2001–03, and the period approach²⁶ for 2004–06 (figure 1).

Year-on-year trends in survival were estimated within a single variance-weighted linear regression²⁷ model covering all 11 years and each calendar period, including two extra parameters in addition to the baseline trend, to allow for different trends in successive periods. We report the relative survival estimate derived from the regression model for the last year of each calendar period. We report changing survival trends as the absolute difference between the regression slopes for each calendar period: a positive value implies acceleration of the upward trend in survival and a negative value implies deceleration (see webappendix). Survival analyses were done with the publicly available

Stata program *strel*.²⁸ Other analyses were programmed in Stata version 10.²⁹

We constructed funnel plots³⁰ to visualise the regional variability of 1-year survival in England and Wales for cancer patients diagnosed during 2004–06. The plots allowed us to estimate how much a particular estimate of survival deviates from the pooled England value (the target), given the precision of each estimate. 1-year relative survival estimates for 2004–06 for each population were plotted against the precision of the estimates, taken as the inverse square of their standard errors. The target value, taken as the estimate of 1-year relative survival pooled across the nine regions of England for all patients diagnosed during 2004–06, is represented by the horizontal line in each plot. Wales was not included in the target value, so that the estimates for Wales could be compared with those for England. The 95% and 99·8% control limits, derived from the complementary log–log transformation of the target estimate for England across the observed range of precision of the regional estimates,³¹ represent approximately two and three standard deviations, respectively, from the target value at each level of precision (webappendix). Estimates that lie inside the control limits were considered as within the geographical variation that could be expected by chance.

Funnel plots were also constructed to show regional variation in the year-on-year trend in 1-year survival during 2004–06. The target value in each plot was set as the mean absolute change per year between the 1-year relative survival estimates for all patients in England diagnosed in the single years 2004, 2005, and 2006. The control limits were constructed on the assumption that the target value for the year-on-year change in survival follows a normal distribution (see webappendix).

This analytical strategy, including definition of the calendar periods, the cancers, life tables, approaches to estimation of survival and survival trends, and the structure of the tables and graphics, was specified in advance, after data preparation was complete but before the start of any analyses. This was done to pre-empt any concerns regarding possible data-dredging in favour of a particular conclusion, whether for or against the effectiveness of the NHS cancer plan.

Legal authority to hold the cancer data derives from a contract with the ONS to produce the official national statistics³² on cancer survival. Approval to analyse the data was obtained from the ONS Medical Research Service (MR1101, Nov 20, 2007) and from the statutory Patient Information Advisory Group (PIAG; now the Ethics and Confidentiality Committee of the National Information Governance Board) under Section 61 of the Health and Social Care Act 2001 (PIAG 1-05(c)/2007, July 31, 2007). Ethical approval for the study was obtained from the Ethics Committee of the London School of Hygiene and Tropical Medicine (LSHTM; number 5192, Sept 12, 2007) and the NHS South East Research Ethics Committee (07/MRE01/52, May 15, 2007).

	Overall annual trend (%)*	Calendar period of diagnosis						Change in annual trend between			
		1996–2000		2001–03		2004–06		1996–2000 and 2001–03		2001–03 and 2004–06	
		Survival (%) for 2000†	Annual trend (%)*	Survival (%) for 2003†	Annual trend (%)*	Survival (%) for 2006†	Annual trend (%)*	Change‡ (%)	95% CI	Change‡ (%)	95% CI
England											
Oesophagus											
Men	1.2§	32.9	1.4§	36.5	1.1§	39.7	1.0¶	–0.3	–1.1 to 0.6	0.0	–1.5 to 1.4
Women	1.0§	29.9	1.3§	32.4	0.6	34.5	0.7	–0.7	–1.7 to 0.4	0.1	–1.8 to 2.0
Stomach											
Men	0.9§	36.2	1.0§	37.8	0.3	41.0	1.4¶	–0.7	–1.5 to 0.1	1.1	–0.3 to 2.6
Women	0.8§	34.5	0.9§	35.1	–0.2	38.4	1.7¶	–1.1	–2.1 to 0.0	1.9	0.0 to 3.8
Colon											
Men	0.5§	69.5	0.3¶	69.9	0.0	73.0	1.5§	–0.3	–0.8 to 0.3	1.5	0.5 to 2.4
Women	0.5§	67.6	0.5§	67.9	–0.1	70.4	1.3§	–0.6	–1.2 to 0.0	1.4	0.4 to 2.4
Rectum											
Men	0.5§	76.4	0.5§	77.1	0.1	79.3	1.0¶	–0.4	–1.0 to 0.2	0.9	–0.1 to 2.0
Women	0.4§	75.6	0.6§	75.8	–0.2	77.7	1.0¶	–0.8	–1.6 to 0.0	1.2	–0.1 to 2.5
Pancreas											
Men	0.4§	14.8	0.3	16.1	0.5	17.3	0.4	0.2	–0.6 to 1.0	–0.1	–1.4 to 1.2
Women	0.4§	13.2	0.2	14.4	0.5¶	16.4	0.7	0.3	–0.4 to 1.0	0.2	–1.0 to 1.5
Larynx											
Men	0.0	84.0	–0.3	84.9	0.6	85.5	0.0	0.9	–0.2 to 2.0	–0.6	–2.4 to 1.3
Lung											
Men	0.4§	25.0	0.5§	26.3	0.4¶	26.5	–0.1	–0.2	–0.5 to 0.2	–0.4	–1.1 to 0.2
Women	0.5§	26.7	0.7§	28.8	0.7§	29.1	–0.2	0.0	–0.5 to 0.5	–0.9	–1.7 to –0.2
Melanoma											
Men	0.2§	94.7	0.2	94.6	–0.1	95.9	0.7¶	–0.3	–0.9 to 0.2	0.9	0.1 to 1.7
Women	0.1	97.4	0.1	97.8	0.2	97.7	–0.2	0.1	–0.2 to 0.5	–0.4	–0.9 to 0.2
Breast											
Women	0.3§	95.1	0.3§	96.0	0.3§	96.6	0.2¶	0.0	–0.2 to 0.1	–0.1	–0.3 to 0.1
Cervix											
Women	0.3¶	84.0	0.0	84.2	0.1	86.8	1.2¶	0.1	–0.7 to 1.0	1.1	–0.3 to 2.6
Uterus											
Women	0.4§	88.9	0.5§	89.2	–0.1	91.1	1.0§	–0.7	–1.2 to –0.1	1.1	0.3 to 2.0
Ovary											
Women	0.5§	67.3	0.4¶	67.7	0.0	70.2	1.3¶	–0.4	–1.1 to 0.3	1.3	0.1 to 2.5
Prostate											
Men	0.8§	92.5	1.1§	94.4	0.4§	95.8	0.5§	–0.8	–1.0 to –0.5	0.1	–0.2 to 0.4
Testis											
Men	0.1	98.5	0.2	98.0	–0.3¶	98.4	0.4	–0.5	–0.9 to –0.1	0.7	0.0 to 1.4
Kidney											
Men	0.4§	66.4	0.5¶	66.3	–0.3	68.5	1.2¶	–0.8	–1.7 to 0.2	1.5	–0.1 to 3.0
Women	0.8§	64.4	1.0§	63.7	–0.8	68.6	2.9§	–1.8	–3.1 to –0.6	3.7	1.7 to 5.7
Bladder											
Men	–0.6§	78.4	–1.0§	76.3	–0.5¶	76.8	0.5	0.5	–0.2 to 1.1	1.0	–0.1 to 2.1
Women	–0.8§	65.8	–1.5§	62.0	–1.1¶	64.1	1.6¶	0.4	–0.7 to 1.5	2.8	0.8 to 4.8
Brain											
Men	0.5§	30.9	0.1	31.0	0.0	35.8	2.4§	0.0	–1.2 to 1.1	2.3	0.3 to 4.3
Women	0.2	30.2	0.5	30.5	–0.1	30.1	–0.1	–0.6	–2.0 to 0.7	0.0	–2.3 to 2.3
Hodgkin's disease											
Men	–0.2	91.7	–0.1	89.4	–1.1¶	90.0	0.8	–1.0	–2.3 to 0.3	1.9	–0.4 to 4.3
Women	–0.3	93.2	0.6¶	90.9	–1.5¶	87.5	–1.0	–2.1	–3.6 to –0.7	0.5	–2.1 to 3.2
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	Overall annual trend (%)*	Calendar period of diagnosis						Change in annual trend between			
		1996–2000		2001–03		2004–06		1996–2000 and 2001–03		2001–03 and 2004–06	
		Survival (%) for 2000†	Annual trend (%)*	Survival (%) for 2003†	Annual trend (%)*	Survival (%) for 2006†	Annual trend (%)*	Change‡ (%)	95% CI	Change‡ (%)	95% CI
(Continued from previous page)											
Non-Hodgkin lymphoma											
Men	0.5§	70.7	0.3	72.9	0.9§	75.0	0.6	0.6	–0.2 to 1.4	–0.3	–1.6 to 1.0
Women	0.6§	71.1	0.3	74.1	1.3§	75.5	0.1	1.0	0.1 to 1.8	–1.2	–2.6 to 0.1
Myeloma											
Men	0.3¶	65.8	0.4	67.6	0.7	67.4	–0.5	0.3	–1.1 to 1.6	–1.2	–3.4 to 1.1
Women	0.7§	64.4	0.6¶	67.1	1.0¶	68.6	0.2	0.4	–1.0 to 1.9	–0.8	–3.3 to 1.6
Leukaemia											
Men	–0.3¶	64.4	–0.1	63.7	–0.3	62.1	–0.7	–0.2	–1.2 to 0.8	–0.4	–2.1 to 1.3
Women	0.0	60.5	0.0	59.0	–0.7	60.5	1.1	–0.7	–1.9 to 0.4	1.9	–0.1 to 3.9
Wales											
Oesophagus											
Men	1.8§	35.8	2.6§	39.1	0.3	43.2	1.9	–2.3	–5.6 to 1.0	1.5	–4.1 to 7.1
Women	1.1¶	30.9	1.9¶	33.7	0.5	34.2	0.0	–1.4	–5.4 to 2.6	–0.4	–7.6 to 6.7
Stomach											
Men	0.5	36.2	1.1	39.1	0.9	36.4	–1.8	–0.3	–3.2 to 2.6	–2.6	–7.8 to 2.5
Women	0.2	30.9	–0.4	35.5	2.5	35.2	–1.4	2.9	–0.6 to 6.5	–3.9	–10.5 to 2.7
Colon											
Men	0.6¶	67.7	0.6	69.8	0.8	70.9	0.1	0.2	–1.9 to 2.3	–0.6	–4.1 to 2.8
Women	0.2	65.9	0.8	68.4	0.8	64.7	–2.3	0.0	–2.3 to 2.2	–3.1	–6.8 to 0.7
Rectum											
Men	0.6¶	75.9	1.3¶	77.4	0.1	76.9	–0.3	–1.3	–3.6 to 1.1	–0.4	–4.3 to 3.6
Women	0.5	75.0	0.3	77.0	0.9	79.1	0.7	0.6	–2.5 to 3.6	–0.2	–5.4 to 5.0
Pancreas											
Men	0.2	14.6	–0.3	15.3	0.5	17.3	0.7	0.8	–2.2 to 3.7	0.2	–4.9 to 5.4
Women	0.4	11.0	–0.2	15.0	2.1¶	16.2	–0.5	2.3	–0.3 to 5.0	–2.6	–7.4 to 2.2
Larynx											
Men	–0.5	82.7	0.6	82.6	–0.4	75.3	–3.5	–1.0	–5.4 to 3.4	–3.1	–11.5 to 5.3
Lung											
Men	0.4¶	23.7	0.8¶	25.2	0.4	24.8	–0.4	–0.5	–1.8 to 0.9	–0.7	–3.1 to 1.7
Women	0.5¶	25.8	1.1¶	29.9	1.5¶	26.4	–2.5¶	0.4	–1.3 to 2.2	–4.0	–6.9 to –1.1
Melanoma											
Men	0.6	91.5	1.4¶	90.9	–1.0	92.0	1.0	–2.4	–5.2 to 0.3	2.0	–1.9 to 6.0
Women	0.3	92.8	0.3	94.4	0.6	94.9	–0.1	0.3	–1.9 to 2.5	–0.7	–4.0 to 2.6
Breast											
Women	0.4§	92.7	0.3¶	94.0	0.5¶	95.7	0.6	0.1	–0.5 to 0.8	0.2	–0.9 to 1.2
Cervix											
Women	0.6	77.2	–0.1	79.8	1.3	83.6	1.2	1.5	–2.1 to 5.0	–0.1	–5.8 to 5.6
Uterus											
Women	0.4	87.9	0.3	88.3	0.0	90.5	1.1	–0.4	–2.4 to 1.7	1.1	–2.1 to 4.3
Ovary											
Women	0.2	62.8	0.3	65.9	1.4	63.4	–2.0	1.2	–1.6 to 3.9	–3.4	–8.1 to 1.4
Prostate											
Men	1.2§	85.5	1.3§	90.1	1.7§	92.4	0.3	0.3	–0.7 to 1.4	–1.3	–2.8 to 0.1
Testis											
Men	–0.1	97.8	–0.1	97.7	0.0	97.5	–0.1	0.2	–1.9 to 2.2	–0.1	–4.0 to 3.7
Kidney											
Men	0.4	65.2	0.7	67.3	0.7	66.0	–1.0	0.0	–3.5 to 3.5	–1.7	–7.4 to 3.9
Women	0.2	61.7	–0.1	65.7	2.1	64.4	–1.7	2.2	–2.4 to 6.9	–3.8	–11.0 to 3.4
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	Overall annual trend (%) [*]	Calendar period of diagnosis						Change in annual trend between			
		1996–2000		2001–03		2004–06		1996–2000 and 2001–03		2001–03 and 2004–06	
		Survival (%) for 2000†	Annual trend (%) [*]	Survival (%) for 2003†	Annual trend (%) [*]	Survival (%) for 2006†	Annual trend (%) [*]	Change‡ (%)	95% CI	Change‡ (%)	95% CI
(Continued from previous page)											
Bladder											
Men	0.0	85.2	0.0	85.7	0.2	85.1	–0.4	0.2	–1.5 to 1.9	–0.6	–3.4 to 2.3
Women	0.0	74.9	–0.1	74.8	0.0	74.8	0.0	0.1	–3.2 to 3.4	0.0	–5.5 to 5.5
Brain											
Men	0.7	29.9	0.3	29.2	–0.5	36.1	3.7	–0.8	–5.0 to 3.4	4.2	–3.4 to 11.8
Women	0.8	34.3	1.9	33.3	–1.5	34.7	1.4	–3.4	–8.7 to 2.0	2.9	–6.2 to 12.0
Hodgkin's disease											
Men	–1.7¶	88.6	–1.6	89.1	1.0	78.1	–6.0	2.6	–2.8 to 8.0	–7.0	–17.7 to 3.8
Women	–1.8	87.8	–0.8	89.6	1.3	73.2	–8.8	2.1	–5.3 to 9.4	–10.1	–29.6 to 9.4
Non-Hodgkin lymphoma											
Men	1.0¶	69.8	1.4	75.2	2.0	74.6	–1.3	0.6	–2.6 to 3.8	–3.3	–8.4 to 1.7
Women	1.0¶	69.9	1.0	75.2	2.2	75.9	–0.7	1.2	–2.2 to 4.6	–2.9	–8.3 to 2.5
Myeloma											
Men	1.7¶	66.0	1.8	69.3	0.7	75.7	2.8	–1.1	–5.8 to 3.7	2.1	–5.9 to 10.1
Women	0.3	61.0	–0.7	65.8	2.8	66.7	–1.0	3.5	–1.7 to 8.6	–3.7	–12.2 to 4.8
Leukaemia											
Men	0.8	62.8	1.1	60.7	–1.6	66.0	3.4	–2.6	–6.2 to 1.0	5.0	–1.0 to 10.9
Women	1.0¶	58.1	1.2	59.6	0.2	63.1	1.6	–1.0	–5.2 to 3.2	1.4	–5.4 to 8.3

All patients were aged 15–99 years, were diagnosed from 1996 to 2006, and were followed up until 2007. ^{*}Mean annual change (%) in relative survival within each calendar period (absolute value). [†]Fitted estimate of relative survival for the last year of the calendar period. [‡]Difference in the year-on-year trends between successive calendar periods. [§] $p<0.01$. [¶] $p<0.05$.

Table 2: 1-year relative survival (%) for patients diagnosed in selected years, and year-on-year trends (%) within calendar period of diagnosis and overall (1996–2006) for 21 common cancers in England and Wales

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Results

1-year survival improved for most cancers in patients diagnosed during 1996–2006 and followed until 2007, for both sexes and in England and Wales. For patients diagnosed in 2006, 1-year survival was over 60% for 25 of the 35 cancer–sex combinations, both in England and Wales (table 2). For cancers of the oesophagus, stomach, pancreas, lung, and brain, 1-year survival was poor, in the range 15–20% (pancreas) and rarely over 40%, despite noticeable improvement for some cancers (oesophagus, stomach, brain among men in England,

oesophagus in Wales). Table 2 summarises temporal trends in 1-year survival, both for the entire period 1996–2007 and in each of the three calendar periods.

For patients diagnosed in England during 1996–2000, before the NHS cancer plan, 1-year survival increased significantly ($p < 0.05$) for eight of 17 cancers in men and for 12 of 18 cancers in women. The annual increase was about 1% for cancers of the oesophagus, stomach, and prostate in men, and for cancers of the oesophagus, stomach, and kidney among women. The pattern was similar in Wales, but the trends were statistically significant less often because of the much smaller population.

During 2001–03, survival for most cancers did not increase, or else the upward trends observed for 1996–2000 were attenuated. This pattern was more marked in England, where upward trends slowed between these two periods for 21 of the 35 cancer–sex combinations, compared with 13 in Wales. The steep increase in 1-year survival for non-Hodgkin lymphoma is a notable exception: in Wales, 1-year survival rose by about 1% a year during 1996–2000, and by 2% a year during 2001–03 (1% a year in England).

For patients diagnosed during 2004–06, 1-year survival in England increased again for most cancers. The annual increase in survival was 1% or more for 15 of the 35 cancer–sex combinations, although the increases

Time since diagnosis (years)	Men							Women						
	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡
	1996–2000	2001–03	2004–06	2001–03	2004–06	Overall†		1996–2000	2001–03	2004–06	2001–03	2004–06	Overall†	
England														
Oesophagus														
3	11.0	13.9	15.5	0.7§	0.5¶	0.5§	17.1	10.5	13.2	14.9	0.7§	0.6¶	0.5§	16.3
5	7.9	10.4	..	0.6§	..	..	13.0	8.0	10.3	..	0.6§	..	..	12.1
5 (conditional)	26.2	28.9	..	0.7¶	..	..	32.9	28.9	32.5	..	0.9¶	..	..	35.1
10	6.2	..	..	..	..	..	10.7	6.5	..	..	..	..	..	9.3
Stomach														
3	16.8	18.2	19.4	0.3¶	0.4¶	0.3§	21.0	17.4	18.8	18.0	0.3¶	–0.3	0.1¶	18.4
5	13.1	14.4	..	0.3¶	..	..	16.5	14.1	15.4	..	0.3¶	..	..	15.3
5 (conditional)	38.3	38.0	..	–0.1	..	..	40.2	43.5	43.2	..	–0.1	..	..	39.5
10	10.6	..	..	..	..	..	13.6	11.6	..	..	..	..	..	13.1
Colon														
3	53.5	54.6	57.6	0.3¶	1.0§	0.3§	58.8	52.5	53.8	55.9	0.3¶	0.7§	0.3§	57.5
5	47.6	48.9	..	0.3¶	..	..	53.4	47.6	49.2	..	0.4§	..	..	52.7
5 (conditional)	69.1	70.1	..	0.3	..	..	73.4	71.2	72.8	..	0.4¶	..	..	74.7
10	43.2	..	..	..	..	..	48.7	44.2	..	..	..	..	..	49.5
Rectum														
3	57.5	59.4	61.8	0.5§	0.8§	0.4§	62.6	58.2	59.4	61.5	0.3	0.7¶	0.3§	62.1
5	49.6	51.9	..	0.6§	..	..	54.3	51.2	53.6	..	0.6§	..	..	56.0
5 (conditional)	65.7	67.4	..	0.4¶	..	..	68.4	68.7	70.8	..	0.5¶	..	..	72.2
10	42.8	..	..	..	..	..	47.7	45.8	..	..	..	..	..	50.1
Pancreas														
3	3.9	4.1	5.0	0.0	0.3¶	0.1¶	5.1	3.4	3.9	4.1	0.1	0.1	0.1¶	4.4
5	2.9	2.8	..	0.0	..	..	3.7	2.3	2.7	..	0.1	..	..	3.2
5 (conditional)	20.1	18.4	..	–0.4	..	..	22.1	18.4	19.3	..	0.2	..	..	19.6
10	2.2	..	..	..	..	..	2.8	1.8	..	..	..	..	..	2.6
Larynx														
3	70.6	70.8	73.2	0.0	0.8	0.2	74.9	..	..	..	..	..	..	..
5	64.9	66.1	..	0.3	..	..	70.4	..	..	..	..	..	..	..
5 (conditional)	76.7	78.4	..	0.4	..	..	82.0	..	..	..	..	..	..	..
10	56.3	..	..	..	..	..	61.6	..	..	..	..	..	..	..
Lung														
3	8.7	9.2	9.7	0.1¶	0.2¶	0.1§	9.7	9.7	11.3	11.5	0.4§	0.1	0.2§	11.4
5	6.2	6.6	..	0.1¶	..	..	7.0	7.1	8.3	..	0.3§	..	..	8.5
5 (conditional)	26.0	25.5	..	–0.1	..	..	26.5	28.3	29.4	..	0.3	..	..	29.4
10	4.6	..	..	..	..	..	5.2	5.1	..	..	..	..	..	6.0
Melanoma														
3	84.1	86.3	86.8	2.5§	0.4	2.6§	87.8	92.6	93.5	94.4	0.2¶	0.3¶	0.2§	93.8
5	78.6	81.9	..	3.7§	..	..	82.9	89.7	91.3	..	0.4§	..	..	91.8
5 (conditional)	83.3	86.4	..	3.5§	..	..	86.5	92.3	93.4	..	0.3¶	..	..	94.1
10	73.4	..	..	..	..	..	78.2	86.3	..	..	..	..	..	88.6
Breast														
3	86.4	88.7	90.4	0.6§	0.6§	0.4§	90.7
5	80.6	83.7	..	0.8§	86.0
5 (conditional)	85.2	87.5	..	0.6§	89.0
10	72.8	78.4
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Time since diagnosis (years)	Men							Women						
	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡
	1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†		1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†	
(Continued from previous page)														
Cervix														
3	..	..	..	..	..	..	..	71.1	72.0	74.4	0.2	0.8¶	0.3¶	75.6
5	..	..	..	..	..	..	..	67.3	68.8	..	0.4¶	..	..	72.1
5 (conditional)	..	..	..	..	..	..	..	80.0	82.4	..	0.6§	..	..	83.5
10	..	..	..	..	..	..	..	64.4	..	..	..	..	..	69.1
Uterus														
3	..	..	..	..	..	..	..	78.7	80.5	81.3	0.5§	0.3	0.3§	82.5
5	..	..	..	..	..	..	..	75.0	77.0	..	0.5§	..	..	78.6
5 (conditional)	..	..	..	..	..	..	..	85.3	86.5	..	0.3¶	..	..	86.3
10	..	..	..	..	..	..	..	71.6	..	..	..	..	..	75.2
Ovary														
3	..	..	..	..	..	..	..	45.8	46.5	48.7	0.2	0.7§	0.2§	50.6
5	..	..	..	..	..	..	..	38.6	38.2	..	–0.1	..	..	42.1
5 (conditional)	..	..	..	..	..	..	..	57.8	57.0	..	–0.2	..	..	59.5
10	..	..	..	..	..	..	..	33.3	..	..	..	..	..	36.1
Prostate														
3	78.7	86.1	89.6	1.9§	1.2§	1.3§	90.2	..	..	..	..	..	..	..
5	71.4	81.5	..	2.5§	..	..	86.2	..	..	..	..	..	..	..
5 (conditional)	79.1	86.8	..	1.9§	..	..	90.1	..	..	..	..	..	..	..
10	59.8	..	..	..	..	..	75.7	..	..	..	..	..	..	..
Testis														
3	96.7	96.9	97.5	0.1	0.2	0.1	97.5	..	..	..	..	..	..	..
5	96.3	96.7	..	0.1	..	..	97.3	..	..	..	..	..	..	..
5 (conditional)	98.1	98.3	..	0.0	..	..	99.1	..	..	..	..	..	..	..
10	96.0	..	..	..	..	..	96.5	..	..	..	..	..	..	..
Kidney														
3	52.7	52.7	54.5	0.0	0.6¶	0.1	55.4	50.1	52.4	54.2	0.6¶	0.6	0.4§	55.9
5	47.0	47.5	..	0.1	..	..	50.2	45.9	47.7	..	0.4	..	..	51.3
5 (conditional)	71.5	72.0	..	0.1	..	..	73.8	73.4	74.4	..	0.2	..	..	74.9
10	40.1	..	..	..	..	..	43.3	39.6	..	..	..	..	..	43.9
Bladder														
3	68.7	62.0	60.8	–1.7§	–0.4	–1.0§	60.6	57.4	48.4	48.4	–2.2§	0.0	–1.3§	49.7
5	64.0	57.3	..	–1.7§	..	..	55.8	53.6	44.1	..	–2.4§	..	..	45.2
5 (conditional)	79.5	74.8	..	–1.2§	..	..	73.1	77.8	70.4	..	–1.9§	..	..	71.8
10	58.1	..	..	..	..	..	50.9	48.5	..	..	..	..	..	41.5
Brain														
3	16.3	16.0	15.9	–0.1	0.0	0.0	17.5	17.1	16.2	17.5	–0.2	0.4	–0.1	17.7
5	12.4	12.5	..	0.0	..	..	14.0	13.9	13.4	..	–0.1	..	..	14.2
5 (conditional)	40.3	40.0	..	–0.1	..	..	40.2	47.9	43.7	..	–1.0¶	..	..	48.1
10	7.9	..	..	..	..	..	9.1	9.6	..	..	..	..	..	9.7
Hodgkin's disease														
3	86.7	85.0	84.2	–0.4	–0.2	–0.3¶	85.9	86.7	86.6	83.4	0.0	–1.1¶	–0.2	82.3
5	83.8	82.6	..	–0.3	84.1	83.0	83.6	..	0.1	77.7
5 (conditional)	91.1	91.5	..	0.1	93.8	90.3	90.6	..	0.1	89.1
10	80.0	81.2	80.2	76.3
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Time since diagnosis (years)	Men							Women						
	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡
	1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†		1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†	
(Continued from previous page)														
Non-Hodgkin lymphoma														
3	57.7	59.9	64.2	0.6§	1.4§	0.6§	64.6	59.2	62.3	66.6	0.8§	1.4§	0.7§	66.3
5	51.8	55.0	..	0.8§	..	..	60.5	53.8	57.5	..	0.9§	..	..	62.5
5 (conditional)	73.6	76.8	..	0.8§	..	..	81.2	76.0	79.7	..	0.9§	..	..	83.7
10	44.3	..	..	..	..	..	53.0	45.5	..	..	..	..	..	54.1
Myeloma														
3	42.1	44.5	47.7	0.6¶	1.1¶	0.5§	47.0	39.8	42.4	45.6	0.6¶	1.0¶	0.6§	44.8
5	28.8	31.6	..	0.7¶	..	..	35.9	26.7	29.2	..	0.6¶	..	..	30.9
5 (conditional)	44.3	47.4	..	0.8¶	..	..	54.1	42.1	44.4	..	0.6	..	..	46.2
10	15.2	..	..	..	..	..	19.8	13.3	..	..	..	..	..	15.6
Leukaemia														
3	50.0	50.0	49.9	0.0	0.0	0.0	49.3	46.3	46.5	47.2	0.1	0.2	0.1	47.3
5	42.7	43.6	..	0.2	..	..	42.7	40.3	41.7	..	0.4	..	..	42.7
5 (conditional)	66.3	68.2	..	0.5	..	..	69.1	66.1	70.5	..	1.1§	..	..	70.4
10	32.2	..	..	..	..	..	33.8	32.7	..	..	..	..	..	35.3
Wales														
Oesophagus														
3	12.4	16.5	14.4	1.0¶	–0.7	0.5¶	14.5	12.4	16.5	14.4	1.0¶	–0.7	0.5¶	14.3
5	10.8	11.7	..	0.2	..	..	9.2	8.8	10.5	..	0.4	..	..	12.2
5 (conditional)	34.3	30.5	..	–0.9	..	..	21.1	32.6	31.1	..	–0.4	..	..	34.3
10	7.5	..	..	..	..	..	7.0	6.9	..	..	..	..	..	8.9
Stomach														
3	16.2	17.4	20.2	0.3	1.0	0.3	18.4	16.1	17.8	22.4	0.4	1.5	0.5¶	24.8
5	12.7	14.3	..	0.4	..	..	16.0	12.9	15.3	..	0.6	..	..	19.9
5 (conditional)	38.1	36.2	..	–0.5	..	..	43.8	41.4	43.3	..	0.5	..	..	55.4
10	11.2	..	..	..	..	..	12.6	10.4	..	..	..	..	..	15.4
Colon														
3	51.7	54.4	56.3	0.7	0.6	0.5¶	56.7	49.4	53.3	52.5	1.0¶	–0.3	0.5¶	51.4
5	46.5	49.9	..	0.9	..	..	51.7	44.1	47.8	..	0.9¶	..	..	45.8
5 (conditional)	70.3	71.9	..	0.4	..	..	73.5	68.6	71.2	..	0.7	..	..	71.3
10	42.9	..	..	..	..	..	45.0	40.5	..	..	..	..	..	43.0
Rectum														
3	52.8	57.9	58.0	1.3¶	0.0	0.7¶	58.0	56.7	58.7	62.0	0.5	1.1	0.5	58.9
5	46.4	48.5	..	0.5	..	..	49.5	50.7	53.9	..	0.8	..	..	56.3
5 (conditional)	63.6	62.0	..	–0.4	..	..	64.7	68.1	71.2	..	0.8	..	..	72.1
10	41.1	..	..	..	..	..	42.6	44.6	..	..	..	..	..	48.8
Pancreas														
3	5.6	4.4	5.0	–0.3	0.2	–0.1	5.0	3.6	4.4	5.0	0.2	0.2	0.2	3.3
5	4.5	3.5	..	–0.3	..	..	4.0	3.0	2.8	..	–0.1	..	..	2.0
5 (conditional)	29.9	22.4	..	–1.9	..	..	20.2	24.0	23.0	..	–0.2	..	..	12.9
10	3.5	..	..	..	..	..	3.1	2.4	..	..	..	..	..	1.6
Larynx														
3	65.7	67.2	64.6	0.4	–0.9	0.1	62.4
5	60.3	63.4	..	0.8	54.7
5 (conditional)	74.6	75.4	..	0.2	72.4
10	50.8	48.8
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Time since diagnosis (years)	Men							Women						
	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡
	1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†		1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†	
(Continued from previous page)														
Lung														
3	8.0	9.4	9.4	0.4¶	0.0	0.2¶	9.7	8.8	12.6	12.0	1.0§	−0.2	0.5§	11.8
5	5.9	6.5	..	0.1	..	..	6.9	6.7	9.2	..	0.6¶	..	..	9.4
5 (conditional)	27.2	25.1	..	−0.5	..	..	27.5	29.1	29.8	..	0.2	..	..	36.2
10	4.6	..	..	..	..	..	5.2	4.6	..	..	..	..	..	6.5
Melanoma														
3	74.0	79.2	81.2	1.3	0.7	0.9¶	81.0	85.9	86.6	91.1	0.2	1.5¶	0.4	91.3
5	69.8	73.7	..	1.0	..	..	72.1	81.6	83.3	..	0.4	..	..	90.1
5 (conditional)	78.7	81.1	..	0.6	..	..	78.2	89.1	88.3	..	−0.2	..	..	95.9
10	62.5	..	..	..	..	..	67.5	78.4	..	..	..	..	..	83.5
Breast														
3	..	..	..	..	..	..	..	83.2	86.7	88.7	0.9§	0.7¶	0.6§	90.4
5	..	..	..	..	..	..	..	77.9	82.3	..	1.1§	..	..	85.5
5 (conditional)	..	..	..	..	..	..	..	84.8	87.7	..	0.7§	..	..	89.2
10	..	..	..	..	..	..	..	71.5	..	..	..	..	..	80.2
Cervix														
3	..	..	..	..	..	..	..	63.2	64.3	66.1	0.3	0.6	0.3	72.0
5	..	..	..	..	..	..	..	58.6	61.8	..	0.8	..	..	69.3
5 (conditional)	..	..	..	..	..	..	..	75.1	80.3	..	1.3	..	..	80.0
10	..	..	..	..	..	..	..	56.1	..	..	..	..	..	64.4
Uterus														
3	..	..	..	..	..	..	..	77.5	79.1	79.2	0.4	0.0	0.2	80.8
5	..	..	..	..	..	..	..	74.1	75.2	..	0.3	..	..	78.2
5 (conditional)	..	..	..	..	..	..	..	84.9	85.8	..	0.2	..	..	86.8
10	..	..	..	..	..	..	..	71.1	..	..	..	..	..	76.1
Ovary														
3	..	..	..	..	..	..	..	42.7	44.5	47.7	0.4	1.1	0.4	44.2
5	..	..	..	..	..	..	..	36.4	37.7	..	0.3	..	..	37.1
5 (conditional)	..	..	..	..	..	..	..	58.7	58.2	..	−0.1	..	..	59.3
10	..	..	..	..	..	..	..	30.8	..	..	..	..	..	32.3
Prostate														
3	70.4	80.0	86.0	2.4§	2.0§	1.7§	85.2	..	..	..	..	..	..	..
5	63.3	76.4	..	3.3§	..	..	82.8	..	..	..	..	..	..	..
5 (conditional)	76.3	86.4	..	2.5§	..	..	90.2	..	..	..	..	..	..	..
10	53.5	..	..	..	..	..	74.2	..	..	..	..	..	..	..
Testis														
3	95.4	96.4	94.8	0.2	−0.5	0.0	94.3	..	..	..	..	..	..	..
5	95.4	96.2	..	0.2	..	..	93.5	..	..	..	..	..	..	..
5 (conditional)	98.2	98.6	..	0.1	..	..	99.1	..	..	..	..	..	..	..
10	95.3	..	..	..	..	..	92.8	..	..	..	..	..	..	..
Kidney														
3	51.3	53.4	55.6	0.5	0.7	0.4	52.5	52.4	51.5	58.4	−0.2	2.3	0.3	56.1
5	46.0	48.0	..	0.5	..	..	47.1	48.4	50.5	..	0.5	..	..	52.5
5 (conditional)	71.5	74.1	..	0.7	72.7	77.9	81.0	..	0.8	79.5
10	40.3	42.0	42.2	43.8
(Continues on next page)														

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Time since diagnosis (years)	Men							Women						
	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡	Relative survival (%)			Annual change (%)*			Survival (%) predicted for 2007‡
	1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†		1996– 2000	2001–03	2004–06	2001– 03	2004– 06	Overall†	
(Continued from previous page)														
Bladder														
3	76.3	74.9	76.6	–0.3	0.6	–0.1	77.8	66.3	66.4	67.0	0.0	0.2	0.0	68.8
5	71.8	72.4	..	0.2	..	..	74.9	63.3	63.5	..	0.0	..	..	65.0
5 (conditional)	84.0	85.9	..	0.5	..	..	87.6	84.0	85.8	..	0.4	..	..	87.3
10	66.4	..	..	..	..	..	70.0	59.3	..	..	..	..	..	61.6
Brain														
3	18.6	18.3	15.5	–0.1	–1.0	–0.2	17.3	20.8	18.9	20.5	–0.5	0.5	–0.2	19.1
5	14.2	14.2	..	0.0	..	..	12.5	19.0	15.9	..	–0.8	..	..	16.4
5 (conditional)	46.0	45.6	..	–0.1	..	..	35.2	60.9	47.6	..	–3.3¶	..	..	44.0
10	9.8	..	..	..	..	..	9.6	13.2	..	..	..	..	..	11.9
Hodgkin's disease														
3	82.7	83.5	77.6	0.2	–2.0	–0.2	75.8	80.1	82.3	78.9	0.6	–1.1	0.1	87.6
5	78.1	81.4	..	0.8	..	..	70.6	||	||	..	||	..	..	87.6
5 (conditional)	86.3	91.7	..	1.3	..	..	93.3	||	||	..	||	..	..	90.6
10	74.0	..	..	..	..	..	67.7	72.0	..	..	..	..	..	83.8
Non-Hodgkin lymphoma														
3	52.5	64.8	64.9	3.1§	0.0	1.8§	62.8	54.2	61.6	66.3	1.9¶	1.6	1.3§	65.6
5	44.8	57.9	..	3.3§	..	..	57.1	49.5	57.5	..	2.0¶	..	..	61.5
5 (conditional)	67.5	78.1	..	2.6§	..	..	77.4	72.8	79.3	..	1.6¶	..	..	81.9
10	36.7	..	..	..	..	..	43.3	43.4	..	..	..	..	..	55.1
Myeloma														
3	36.5	45.4	49.8	2.2¶	1.5	1.5¶	46.0	40.9	41.2	41.2	0.1	0.0	0.0	35.2
5	25.3	34.9	..	2.4¶	..	..	36.8	27.4	27.6	..	0.1	..	..	22.4
5 (conditional)	40.7	51.8	..	2.8¶	..	..	51.2	43.2	44.9	..	0.4	..	..	32.4
10	12.4	..	..	..	..	..	20.7	14.1	..	..	..	..	..	7.5
Leukaemia														
3	45.5	47.4	46.2	0.5	–0.4	0.2	48.3	45.1	46.7	50.6	0.4	1.3	0.5	51.4
5	38.4	41.1	..	0.7	..	..	45.3	38.5	41.0	..	0.6	..	..	40.7
5 (conditional)	63.6	65.5	..	0.5	..	..	69.1	70.2	66.7	..	–0.9	..	..	63.3
10	27.8	..	..	..	..	..	35.9	32.0	..	..	..	..	..	33.4

All patients were adults aged 15–99 years, were diagnosed between 1996 and 2006 in England and Wales, and were followed up to 2007. *Mean annual change (%) in relative survival since previous calendar period. †Annual change (%) in relative survival over the three periods. ‡Survival predicted for patients diagnosed in 2007 using the hybrid approach (see text). § $p < 0.01$. ¶ $p < 0.05$. ||Not enough data to be estimated.

Table 3: National trends in relative survival (%) at 3, 5, and 10 years after diagnosis, and 5-year conditional survival, by sex and calendar period of diagnosis, and predicted survival for 2007

were not always statistically significant. In Wales, by contrast, survival fell for 19 of the 35 cancer–sex combinations, although none of the declines were significant.

Another way to summarise the contrast is to examine the differences between England and Wales in survival trends within each of the three periods. During 1996–2000, the annual increase in 1-year survival was greater in Wales than in England for 14 of 17 cancers in men and eight of 18 cancers in women. The situation was similar during 2001–03, with survival trends for

eight of 17 cancers in men and 16 of 18 cancers in women in Wales slightly more favourable than in England and only seven less favourable. However, this pattern was reversed during 2004–06, when annual trends in England were more favourable than in Wales for 11 of 17 cancers in men and 12 of 18 cancers in women.

Longer-term survival was estimated for each calendar period and predicted for 2007, as was the change in survival between successive periods (table 3). In England, both 3-year and 5-year survival improved

between 1996–2000 and 2001–03 for most tumours, except those of the bladder and brain (both sexes), and Hodgkin's disease (men only). The picture in Wales was similar, but there was no improvement for tumours of the bladder or brain in men, or for tumours of the kidney or brain in women. The improvements in longer-term survival are similar to the earlier increases in 1-year survival in both countries.

Changes in 3-year survival between 2001–03 and 2004–06 in both England and Wales were similar to those

observed between 1996–2000 and 2001–03, with no clear trend emerging. The changes in 3-year survival were also compared between England and Wales. Between the periods 1996–2000 and 2001–03, survival increased more quickly in Wales than in England for 12 of 17 cancers in men and 13 of 18 cancers in women. Differences between Wales and England in survival trends between 2001–03 and 2004–06 were much less obvious for men, but the pattern was unchanged for women. The different timing of increases in 3-year survival between England and

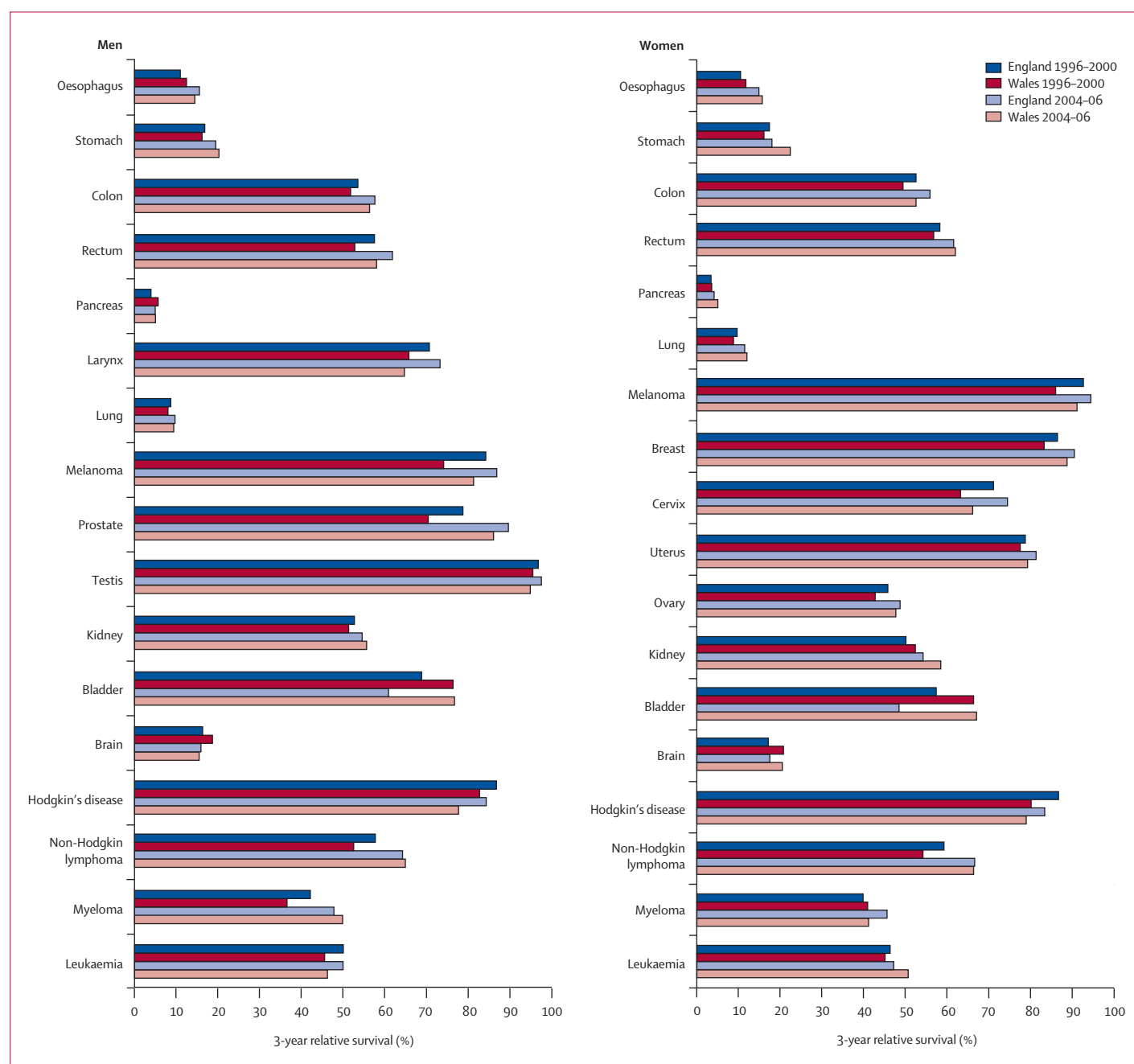


Figure 2: 3-year relative survival (%) for adults diagnosed with 21 common cancers during 1996–2000 and 2004–06 in England and Wales

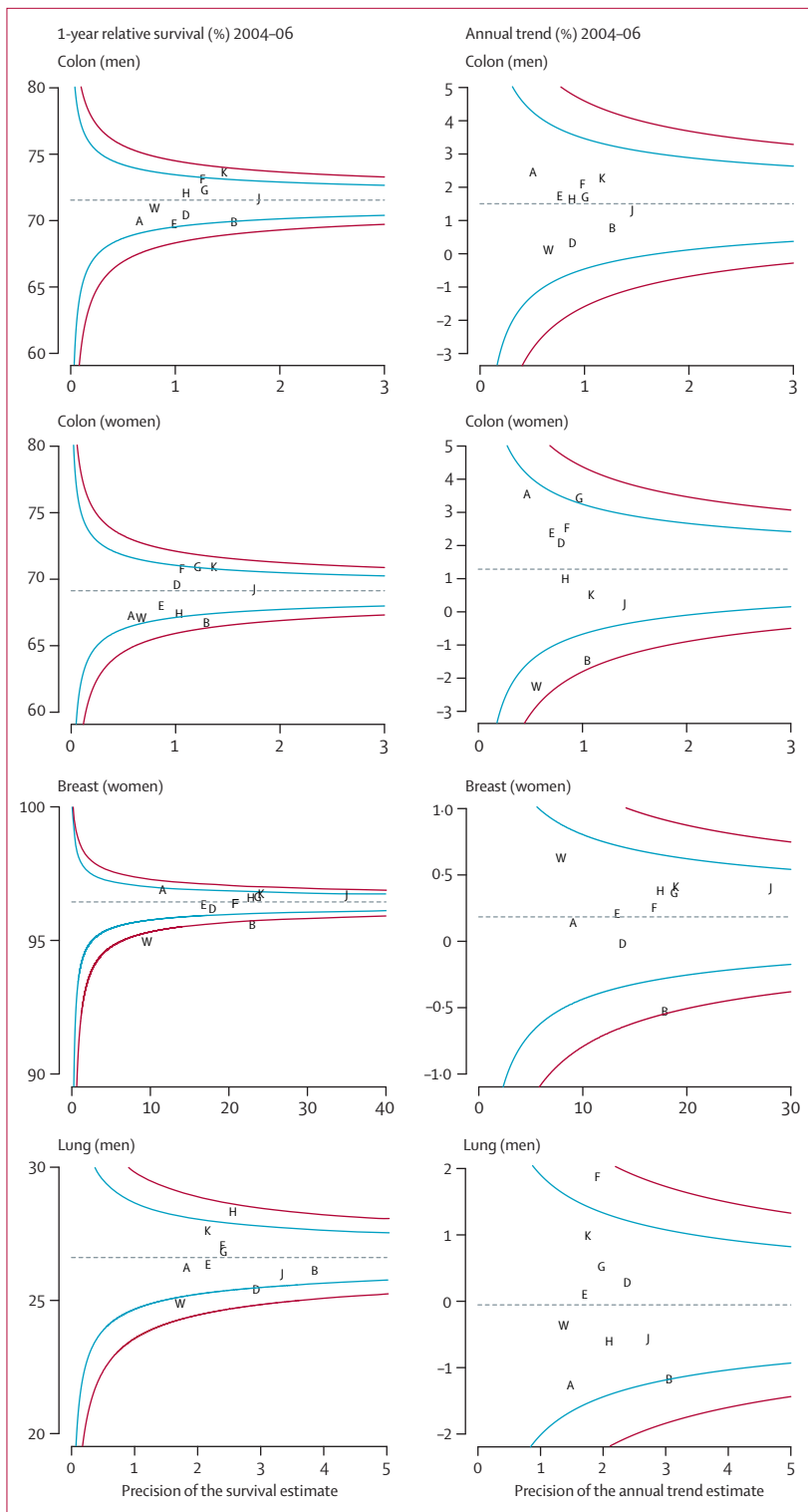


Figure 3: Funnel plots of 1-year relative survival (%) and year-on-year trend (%) during 2004-06: selected cancers, by sex, in the nine government office regions of England, and Wales
All patients were adults aged 15-99 years, and were diagnosed during 2004-06. A=North East. B=North West. D=Yorkshire and the Humber. E=East Midlands. F=West Midlands. G=East of England. H=London. J=South East. K=South West. W=Wales. Control limits are shown by coloured curves: the inner limits are for 95%, the outer limits are for 99.8%.

Wales produced similar overall changes during 1996-2006, as shown for each sex in figure 2.

The North-South gradient in cancer survival in England³¹ is only partially confirmed. The gradient was present in the case of colon cancer, but it has been attenuated by increases in survival in so-called low-survival regions over the period 1996-2006 (table 4). Even so, the funnel plots show that the South West region (figure 3, symbol K) was still a high-survival outlier in 2004-06, while the North West region (figure 3, symbol B) was still a low-survival outlier.

Very little regional variation in breast-cancer survival was seen in England, where 1-year survival was close to 95% for women diagnosed during 1996-2000 and 96% for those diagnosed in 2001-03, and 92% and 94%, respectively, in Wales (table 4). Even so, survival continued to increase in most regions, although in the North West the annual trend decelerated by 1% between 2001-03 and 2004-06. 1-year survival for women diagnosed in each of the English regions during 2004-06 is tightly clustered around 96% (figure 3). Survival in the North West (figure 3, symbol B) is lower than the pooled English value: the difference is small, but the value is below the 99.8% control limits, and the downward annual trend during 2004-06 is outside the control limit. 1-year survival in Wales (figure 3, symbol W) during 2004-06 was also below the control limits, but the year-on-year trend during that period was positive, and within the control limits.

Despite gradual improvement, 1-year relative survival from lung cancer remains poor, around 27% for men diagnosed during 2004-06 (table 4). 1-year survival in the Yorkshire and Humber region (figure 3, symbol D) and Wales (figure 3, symbol W) was below the lower 95% control limit in that period, whereas survival in the London region (figure 3, symbol H) was above the upper limit. Again, the annual trend in the North West region (figure 3, symbol B) during 2004-06 was just below the lower 95% control limit, whereas the trend in the West Midland region (figure 3, symbol F) was above the upper limit.

Discussion

Cancer survival, especially at 1 year after diagnosis, improved for most of the 21 cancers examined, both in England and Wales, during the period 1996-2007. Two distinct groups of cancers emerge from this analysis. The first group, with a generally poor prognosis, consists of five cancers for which 1-year survival is often below 40% in men and women: cancers of the oesophagus, stomach, pancreas, lung, and brain. Survival from cancers of the pancreas and lung has hardly improved at all between 1996-2007, and 1-year survival for pancreatic cancer remains below 20%. For the 25 remaining cancer-sex combinations, short-term prognosis is moderate or good, with 1-year survival over 60%. The gap of 20% or more in 1-year survival between

these two groups of cancers is striking and persistent. The range of survival in the group of cancers with higher survival has tended to narrow over time, because of a ceiling effect among malignancies for which 1-year survival is already 90% or higher: melanoma of the skin and cancers of the breast, uterus, prostate, and testis, and in England only, Hodgkin's disease. Part of the increase in survival for prostate cancer may be attributable to the diagnosis of more indolent tumours as a result of widespread prostate-specific antigen (PSA) testing.

A key aim of the NHS cancer plan for England, published in September, 2000, was to improve the prospects of survival for cancer patients. This study examines survival trends for 21 common cancers in England and Wales up to 2007. The availability of 6 years of data on incident cancers in both England and Wales since the publication of the cancer plan provided an early opportunity to examine its effect. The nearest equivalent cancer strategy for Wales, *Designed to Tackle Cancer*,⁵ was not published until December, 2006, so survival trends in Wales offer an interesting comparison with trends in England.

	Men						Women					
	Period of diagnosis*			Change in annual trend (%)†			Period of diagnosis*			Change in annual trend (%)†		
	1996–2000	2001–03	2004–06	2001–03	2004–06	Overall	1996–2000	2001–03	2004–06	2001–03	2004–06	Overall
Colon												
England	68.8	69.9	71.5	–0.3	1.5‡	1.2§	66.6	68.0	69.1	–0.6‡	1.4‡	0.8‡
North East	68.1	68.5	70.3	–0.6	2.8	2.2	64.2	66.7	66.9	–3.0‡	5.2‡	2.2
North West	66.6	70.0	70.3	–1.4	1.0	–0.4	64.1	68.3	66.9	–1.4	–1.4	–2.9‡
Yorkshire and Humber	67.7	68.8	70.3	0.4	–0.3	0.2	65.3	66.8	69.3	–0.2	1.9	1.7
East Midlands	66.7	68.6	69.5	–1.1	2.1	1.0	64.4	66.6	68.1	–1.4	2.9	1.5
West Midlands	67.7	70.2	73.4	–0.1	1.5	1.4	66.1	68.4	70.9	–0.8	2.5	1.8
East of England	71.6	70.6	72.1	0.2	1.8	2.0‡	67.9	67.7	70.5	–0.3	3.7‡	3.4‡
London	69.9	68.6	72.0	1.6	0.8	2.4‡	67.3	65.3	67.7	1.6	0.3	1.9
South East	70.3	69.5	71.5	0.7	1.0	1.7‡	69.0	69.0	69.4	0.1	0.2	0.3
South West	70.8	72.9	73.3	–1.9‡	3.2‡	1.3	69.1	71.1	71.0	–1.1	0.9	–0.3
Wales	66.5	69.1	70.7	0.2	–0.6	–0.5	64.3	67.6	66.9	0.0	–3.1	–3.1‡
Rectum												
England	75.4	77.0	78.2	–0.4	0.9	0.6	74.4	76.0	76.7	–0.8‡	1.2	0.4
North East	73.6	75.5	78.1	0.5	0.0	0.5	73.0	75.5	76.8	0.5	–1.8	–1.3
North West	72.7	76.8	78.1	–0.2	–1.1	–1.4	71.5	74.4	74.1	0.1	–2.7	–2.6‡
Yorkshire and Humber	75.9	76.4	78.2	–0.8	3.3‡	2.5‡	73.8	75.7	75.8	–2.7‡	4.8‡	2.1
East Midlands	75.0	75.5	75.8	–1.0	2.3	1.3	72.7	74.8	74.3	–1.8	2.0	0.2
West Midlands	74.4	76.4	78.2	–0.4	1.1	0.8	74.5	77.0	77.4	0.2	–1.9	–1.7
East of England	76.5	79.1	79.4	–0.9	0.5	–0.4	77.3	77.9	78.8	–1.8	4.6‡	2.8‡
London	75.5	75.3	76.0	0.1	0.7	0.8	74.0	73.4	73.6	–0.7	2.2	1.4
South East	77.3	78.4	80.0	0.1	0.4	0.5	75.6	76.1	77.2	–0.3	1.3	1.0
South West	77.8	79.0	79.2	–1.2	2.0	0.8	77.3	79.8	82.0	–0.5	1.5	1.0
Wales	73.3	77.3	77.2	–1.3	–0.4	–1.6	74.4	76.1	78.5	0.6	–0.2	0.4
Prostate												
England	90.2	94.0	95.3	–0.8§	0.1	–0.6§	..	..	..	..	..	..
North East	91.0	95.5	96.2	–1.0‡	–0.5	–1.5‡	..	..	..	..	..	..
North West	88.5	93.1	95.0	–0.2	–1.1‡	–1.4§	..	..	..	..	..	..
Yorkshire and Humber	89.5	94.5	95.5	–1.3§	0.3	–1.0‡	..	..	..	..	..	..
East Midlands	86.2	91.6	93.7	–1.1‡	0.5	–0.6	..	..	..	..	..	..
West Midlands	90.5	95.2	97.2	–0.7‡	0.1	–0.6	..	..	..	..	..	..
East of England	92.2	94.8	96.1	–0.1	–0.4	–0.5	..	..	..	..	..	..
London	93.4	93.9	95.5	0.3	0.5	0.8‡	..	..	..	..	..	..
South East	90.8	94.0	94.8	–0.8‡	0.3	–0.5
South West	88.8	93.9	94.2	–2.1§	1.1‡	–1.0‡
Wales	82.9	88.5	92.1	0.3	–1.3	–1.0

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	Men						Women					
	Period of diagnosis*			Change in annual trend (%)†			Period of diagnosis*			Change in annual trend (%)†		
	1996–2000	2001–03	2004–06	2001–03	2004–06	Overall	1996–2000	2001–03	2004–06	2001–03	2004–06	Overall
(Continued from previous page)												
Breast												
England	..	..	..	..	..	..	94.5	95.7	96.5	0.0	–0.1	–0.1
North East	..	..	..	..	..	..	94.3	96.4	96.9	–0.4	–0.1	–0.5
North West	..	..	..	..	..	..	93.8	95.5	95.7	–0.1	–0.9‡	–1.0§
Yorkshire and Humber	..	..	..	..	..	..	95.1	96.2	96.2	–0.4	0.0	–0.4
East Midlands	..	..	..	..	..	..	93.9	95.6	96.2	–0.3	0.0	–0.3
West Midlands	..	..	..	..	..	..	94.4	96.0	96.5	–0.4	0.2	–0.2
East of England	..	..	..	..	..	..	95.7	96.0	96.7	0.1	0.2	0.3
London	..	..	..	..	..	..	95.0	95.2	96.7	0.6‡	–0.1	0.5‡
South East	..	..	..	..	..	..	95.3	95.9	96.7	0.1	0.2	0.3
South West	..	..	..	..	..	..	93.0	94.9	96.8	0.3	–0.3	0.0
Wales	..	..	..	..	..	..	92.1	93.5	95.1	0.1	0.2	0.3
Lung												
England	23.9	25.9	26.6	–0.2	–0.4	–0.6‡	25.2	28.1	29.3	0.0	–0.9‡	–0.9‡
North East	24.6	26.5	26.7	0.4	–2.0	–1.6	26.2	28.9	29.0	–0.7	–0.2	–1.0
North West	22.1	25.5	26.1	0.1	–2.1‡	–2.0§	23.7	27.0	28.9	0.3	–1.3	–1.0
Yorkshire and Humber	23.8	25.2	25.4	–0.5	0.3	–0.2	25.4	28.5	28.6	0.8	–3.9§	–3.2§
East Midlands	22.0	25.6	26.2	–0.9	–0.1	–1.0	24.6	26.3	27.7	–0.8	2.0	1.2
West Midlands	24.0	25.1	26.9	–0.4	1.9	1.5‡	24.7	27.2	31.7	–0.1	2.8‡	2.7‡
East of England	25.0	25.8	26.7	0.0	0.3	0.3	24.6	28.6	28.4	–0.7	–1.7	–2.4‡
London	26.9	27.3	28.3	0.9	–1.4	–0.5	28.1	30.9	32.0	–0.1	–0.8	–0.9
South East	23.6	25.1	25.9	0.4	–1.3	–0.8	24.2	26.5	28.2	0.8	–1.8	–1.0
South West	24.1	27.6	27.6	–1.7‡	1.4	–0.3	25.9	29.1	29.9	–0.6	–0.4	–1.0
Wales	22.1	24.9	25.2	–0.5	–0.7	–1.2	23.6	28.3	28.9	0.4	–4.0‡	–3.6§

English regions correspond with the government office regions of England. All patients were adults aged 15–99 years, were diagnosed between 1996–2006, and were followed up until 2007. *Fitted estimate of relative survival at the mid-point of the calendar period. †A negative value implies deceleration in the year-on-year trends between successive calendar periods. A positive value implies acceleration. The overall value compares the trend in 2004–06 with the trend in 1996–2000. ‡p<0.05. §p<0.01.

Table 4: Regional trends in relative survival (%) at 1 year after diagnosis, and year-on-year change (%), by sex and calendar period of diagnosis for selected cancers

Survival is very similar in England and Wales, but the temporal pattern of change clearly differs after 2001. On average, the gains in 1-year survival were more marked in Wales during 1996–2000 and 2001–03, whereas gains in England were more marked from 2004. For a number of cancers including stomach, colon, rectum, cervix, uterus, ovary, and kidney, survival trends in England improved between 2001–03 and 2004–06 in the absence of screening or the widespread delivery of more effective new treatments. The different time trends in England and Wales suggest that those recent gains might be attributable to improvements in cancer care, including earlier diagnosis and more widespread adherence to treatment guidelines. The earlier improvement in Wales correlates with the timing of clinicians implementing the recommendations in the Cameron report⁴ from 1997. Although cancer services in Wales undoubtedly improved after the publication of the Cameron report, clinical cancer outcomes and cancer

information were not given such high priority by hospital trusts as in England after the publication of the NHS cancer plan.

We identified no difference between England and Wales in survival trends at 3 years or more after diagnosis for patients diagnosed up to 2003. 3-year survival increased slightly more in England than in Wales between 2001–03 and 2004–06. The more rapid increase in short-term survival in England than in Wales since 2004 could be interpreted as related to the cancer plan, but we do not have evidence of the extent to which the various initiatives in the cancer plan were fully implemented by that time. Even so, predicted 3-year survival for cancers diagnosed in 2007 in England was generally higher than for 2004–06, suggesting that survival is likely to continue to increase. By contrast, there are fewer predicted improvements in survival in Wales.

One aspect that suggests the results are plausible is the similarity of survival patterns between men and

women in each country. Thus, the recent upward trend in 1-year survival in England occurred in both sexes, while a levelling off of the trends was also seen in both sexes in Wales. The use in all analyses of region-specific and deprivation-specific life tables for each calendar year and each sex ensured that the background mortality used to estimate relative survival corresponded as closely as is feasible to that of each cancer patient.

Socioeconomic inequalities in survival have been widening for many adult cancers in England and Wales.⁸ The NHS cancer plan aimed to reduce socioeconomic inequalities (the deprivation gap) in survival. Although that objective has not yet been fully assessed, and despite real recent improvements in 1-year survival in some of the more deprived regions, the previously described North–South gradient for cancer survival¹³ and other socioeconomic and health-related parameters¹⁸ is still present, and relative survival for most cancers in the more affluent southern regions is generally higher than the mean survival for England. The funnel plots presented in figure 3 (and webappendix) provide insight into regional variation in survival and whether recent trends will enable regions with low survival to catch up. To the extent that gains in survival are less marked among more deprived groups than more affluent groups, this will reduce the overall national trends in survival, and thus the overall effectiveness of the plan.

The survival estimates reported here are not age-standardised because the age distribution of cancer patients was fairly stable for most cancers during this short period (11 years). Age-standardised survival analyses showed almost no effect on the estimation of survival or trends in survival (data not shown). A notable exception was Hodgkin's disease, for which the marked fall in survival during 2004–06 was partly due to an increase in the age at diagnosis of patients diagnosed with this malignancy: the mean age at diagnosis increased by about 3 years between 1998 and 2005. Incidence of the 21 cancers examined was generally stable over the period 1996–2006, except for a rise in cancers of the prostate and breast, and melanoma of the skin, and a fall in cancers of the lung and stomach in men. Recorded incidence and survival have fallen for bladder cancer in England, but not in Wales (figure 2). The fall in survival in England is mainly attributable to progressive change in the recorded spectrum of urothelial malignancies, following changes in pathological classification and coding³⁴ that have not yet occurred to the same extent in Wales.

Patients who had previously had a primary malignancy in a different organ or tissue were included in these analyses, by contrast with our previous work.^{23,35} This was done mainly because of the marked increase of asymptomatic prostate cancer detected by PSA, since these men have extremely high survival, which would artificially raise the proportion of patients excluded for

a previous primary cancer. Survival estimates were virtually identical with and without the exclusion of patients with more than one tumour (data not shown).

In the past, patients who died on the date of diagnosis could not be distinguished in the national cancer registry data from DCO registrations, for which the true duration of survival is unknown.⁹ A flag to indicate DCO status is now available for more than 90% of cancers registered since 1996 in England and Wales, but we excluded both DCO registrations and other cases with zero recorded survival, for consistency with most other publications on cancer survival. Inclusion of those patients who do appear to have died on the same day as the diagnosis (no DCO flag) would have reduced the estimates of 1-year survival for some cancers by up to 1%, but it had no effect on the estimated trends in survival (data not shown).

Successive EUROCARE studies have shown that cancer survival in both England and Wales has lagged behind other countries in western and northern Europe, despite encouraging recent results showing that both countries have tended to approach the levels of survival in other European countries during 1995–2002.³⁶ The EUROCARE studies formed part of the impetus to create the NHS cancer plan.² A recent editorial³⁷ questioned whether the UK really has an effective cancer plan, on the basis of findings in the EUROCARE-4 study,³⁶ which included patients diagnosed up to 2002. Results from EUROCARE are in agreement with our own findings, particularly for cancers of moderate and good prognosis. However, the NHS cancer plan only dates from 2000, so the EUROCARE-4 study cannot offer a fully viable European comparison of survival trends after its implementation.

1-year survival is the only cohort-based measure of outcome that is available for the whole period up to 2006. Even 3-year survival can only be estimated for patients diagnosed during 2004–06 by using the complete approach, and no estimation of 5-year survival for 2004–06 is currently possible without using the hybrid approach to incorporate follow-up data for patients who were diagnosed (and whose treatment will have begun) in earlier periods (figure 1). 1-year survival is nevertheless a valuable public-health measure. International differences³⁸ and, in England and Wales, socioeconomic differences²³ in 5-year survival are largely attributable to higher cancer-related mortality soon after diagnosis.

The data analysed here represent the earliest period from which an overall assessment of survival trends after implementation of the cancer plan could reasonably be attempted. Recent survival trends in England, more favourable than those in Wales, do indicate that the NHS cancer plan is having some beneficial effect in England.

Our findings do not, however, provide a definitive verdict on the overall effectiveness of the cancer plan.

The national data include over 2 million cancer patients and they are remarkably up to date, with follow-up data available to Dec 31, 2007. But even with a large and timely dataset, and the latest techniques to assess recent survival trends, it seems we will need at least 3 years of follow-up data for all patients diagnosed during the period 2004–06, up to the end of 2009. The findings also need to be extended for a longer period after the implementation of the cancer plan (patients diagnosed in 2007 or later). Future survival analyses for Wales should also provide further information on the overall efficacy of cancer plans. Scotland implemented a strategic cancer plan in 2001,³⁹ while Northern Ireland has not yet done so. Incorporation of survival trends in Scotland and Northern Ireland in the same analytical strategy might improve the evaluation of national cancer plans in the UK.

Finally, it is essential to do more detailed analyses to investigate the effect on time trends and regional inequalities in cancer survival of some of the more specific measures listed in the cancer plan and the Cancer Reform Strategy,⁴⁰ such as MDTs, shorter waiting times for investigation and treatment, and the training and specialisation of surgeons and other specialists. Such studies will require more prompt and efficient linkage of the national cancer data—and linkage to a wider range of health datasets—than is currently possible, as well as new ways of using this information to improve health policy.

Contributors

MPC and BR led the study design. BR, MPC, LE, CM, UN, AS, and SW did the data preparation and quality control. BR, CM, UN, MQ, and SW did the analyses. MPC, BR, JS and DF contributed to the interpretation of the findings. MPC, BR, JS, LE, AS, LW, UN, SW, and CM drafted the report. All authors revised the report.

Conflicts of interest

The authors declared no conflicts of interest.

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