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How many deaths would be avoidable if socioeconomic inequalities in cancer survival in England were eliminated? A national population-based study, 1996–2006

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ABSTRACT

Aim: Inequalities in survival between rich and poor have been reported for most adult cancers in England. This study aims to quantify the public health impact of these inequalities by estimating the number of cancer-related deaths that would be avoidable if all patients were to have the same cancer survival as the most affluent patients.

Methods: National Cancer Registry data for all adults diagnosed with one of 21 common cancers in England were used to estimate relative survival. We estimated the number of excess (cancer-related) deaths that would be avoidable within three years after diagnosis if relative survival for patients in all deprivation groups was as high as the most affluent group.

Results: For patients diagnosed during 2004–2006, 7122 of the 64,940 excess deaths a year (11%) would have been avoidable if three-year survival for all patients had been as high as in the most affluent group. The annual number of avoidable deaths fell from 8435 (13%) a year for patients diagnosed during 1996–2000. Over 60% of the total number of avoidable deaths occurred within six months after diagnosis and approximately 70% occurred in the two most deprived groups.

Conclusion: The downward trend in the annual number of avoidable deaths reflects more an improvement in survival in England overall, rather than a narrowing of the deficit in cancer survival between poor and rich. The lack of any substantial change in the percentage of avoidable excess deaths highlights the persistent nature of the deficit in survival between affluent and deprived groups.

1. Introduction

Inequalities in survival between rich and poor have been reported for most adult cancers in England and Wales.[1,2] The origin of these disparities in survival is still not fully understood, but factors such as stage at diagnosis and access to optimal treatment have been implicated.[3] Such observations suggest that deprived patients do not benefit equally from health-care services in the United Kingdom (UK), despite a universal health-care system that is free to all at the point of use. Quantifying the public health impact of these inequalities in cancer survival is important to inform health policy. One such approach is to consider the number of deaths that would be avoidable if all patients were to have the same survival from their cancer as that observed for the most affluent patients.

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The NHS (National Health Service) Cancer Plan for England, published in late 2000, was designed to improve prevention, early diagnosis and screening, and to provide optimal treatment for all patients. One of the main aims of the Cancer Plan was to tackle inequalities in cancer survival for people from deprived or less affluent backgrounds.[4] Recent observations suggest there has been a modest acceleration of the previous upward trend in survival in England since implementation of the NHS Cancer Plan.[5] However, there is little evidence that the Cancer Plan has been effective in reducing socioeconomic inequalities in short-term survival in the period up to 2006.[2] Inequalities in short-term survival between rich and poor were still large for many cancers among patients diagnosed in 2006.

We set out to update the public health evaluation of socioeconomic inequalities in survival by estimating how many cancer deaths would have been avoidable within three years of diagnosis if relative survival for all patients had been as high as for the most affluent patients. We examined National Cancer Registry data for England in three calendar periods, defined in relation to the NHS Cancer Plan: 1996–2000 (five years; before the Cancer Plan), 2001–2003 (three years; initialisation) and 2004–2006 (three years; implementation). Trends in the annual number of avoidable deaths can be used as a public health measure of progress towards the goals set out in the NHS Cancer Plan.

2. Materials and methods

2.1. Relative survival, excess mortality and avoidable deaths

The overall mortality in a group of cancer patients can be divided into two components: the background mortality (or expected mortality, derived from all-cause death rates in the general population), and the excess mortality, attributable to the cancer. Excess (cancer-related) mortality is estimated using the relative survival approach.[6,7] Avoidable deaths are the component of excess mortality that would not occur if relative survival in all deprivation categories was as high as in affluent patients, i.e. if the socioeconomic inequalities in excess mortality did not exist (Fig. 1).

Relative survival is the standard approach to estimating population-based cancer survival.[6,7] Relative survival is interpretable as survival from the cancer after adjustment for other causes of death ('background mortality'), which varies widely by age, sex, socioeconomic group and over time. Background mortality is derived from annual life tables and corresponds to the age- and sex-specific mortality of the comparable general population. To account for the socioeconomic differences in mortality, complete deprivation-specific life tables were used.[8]

To estimate the number of avoidable deaths, we first produced estimates of relative survival: the method is described in detail elsewhere.[2] Briefly, we used National Cancer Registry data on all adults (15–99 years) diagnosed with one of 21 common primary malignant neoplasms in England during the 11 years 1996–2006 and followed up to the end of 2009. These 21 common cancers represent 90.7% of all cancers. Cancer patients were assigned to one of five deprivation categories, based on quintiles of the national distribution of IMD (income domain) scores at the Lower Super Output Area (LSOA) level.[9] Relative survival up to three years was estimated for each of five categories of socioeconomic deprivation, and for each cancer, sex and calendar period of diagnosis. All patients were followed up for at least three years, so the cohort approach was applied throughout.

2.2. Calculation of avoidable deaths

The number of avoidable deaths compared with the most affluent category (reference category) was calculated for each of the deprivation categories 2, 3, 4 and 5 (most deprived), for each calendar period, sex, cancer and follow-up interval. To achieve this, the following formula was applied (for a given calendar period, sex, cancer, interval and deprivation category *x*):

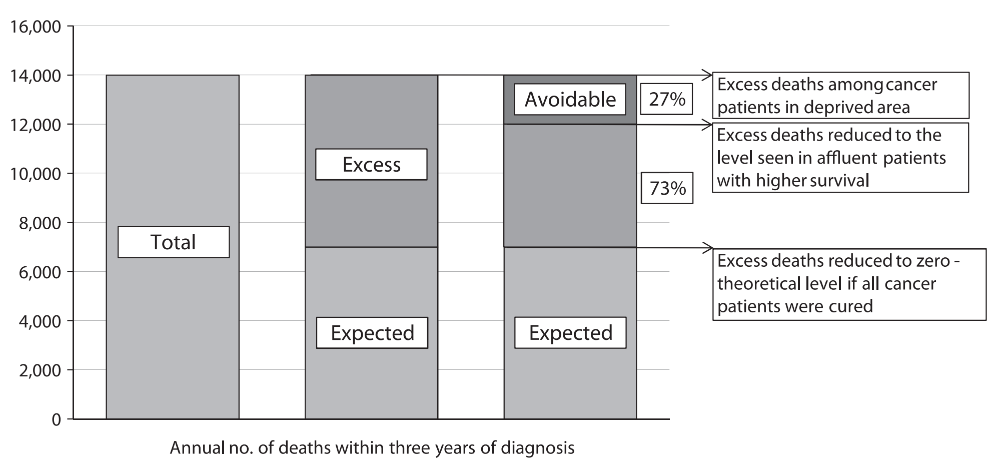

Fig. 1 – Partition of the annual number of deaths in cancer patients within three years since diagnosis into the number expected from background mortality and the number of excess deaths (attributable to cancer). This hypothetical example shows the proportion of all excess deaths that would be avoidable (27%) if relative survival in all deprivation categories were as high as in the most affluent patients.

Table 1 – Annual number of patients, and the number (and percentage) of excess deaths that would be avoidable in England within three years since diagnosis if relative survival were as high as in the most affluent category: selected cancers, adults diagnosed during 1996–2000, 2001–2003 and 2004–2006.

Cancer	1996–2000[a]				2001–2003[a]				2004–2006[a]			
	No. of patients	Excess deaths	Avoidable deaths	%[b]	No. of patients	Excess deaths	Avoidable deaths	%[b]	No. of patients	Excess deaths	Avoidable deaths	%[b]
Bladder	9774	2695	502	18.6	8334	2734	332	12.1	8164	2686	471	17.5
Brain	2991	1917	165	8.6	3126	2014	66	3.3	3220	2025	133	6.6
Breast	31,025	3355	904	26.9	33,661	2997	754	25.1	35,648	2643	646	24.4
Cervix	2511	627	179	28.6	2329	572	230	40.1	2261	488	152	31.1
Colon	16,163	5991	841	14.0	16,473	5889	701	11.9	17,596	5917	916	15.5
Hodgkin's disease[c]	1096	124	52	42.2	1131	129	26	20.0	1250	149	-18	-12.3
Kidney	4404	1706	196	11.5	5033	1905	264	13.9	5778	2032	214	10.5
Larynx	1444	363	104	28.8	1393	351	110	31.4	1405	323	61	18.9
Leukaemia	4878	1967	235	11.9	5335	2072	193	9.3	5479	2127	161	7.6
Lung	27,409	21,320	1621	7.6	27,726	21,147	1228	5.8	28,704	21,588	1350	6.3
Melanoma	5047	419	100	23.8	6468	451	63	14.0	7950	515	76	14.8
Myeloma	2763	1274	168	13.2	2969	1265	134	10.6	3196	1263	130	10.3
Non-Hodgkin Lymphoma	6942	2277	384	16.9	7715	2363	404	17.1	8310	2205	352	16.0
Oesophagus	5292	3830	389	10.2	5922	4110	472	11.5	6113	4096	327	8.0
Ovary	5132	2188	209	9.6	5480	2299	277	12.1	5316	2090	108	5.2
Pancreas	4684	3631	409	11.3	5234	4019	394	9.8	5710	4280	306	7.1
Prostate	19,949	3198	752	23.5	27,066	2805	759	27.0	29,753	2317	497	21.4
Rectum	9961	3362	603	17.9	10,182	3263	631	19.3	10,831	3298	677	20.5
Stomach	7401	5111	522	10.2	6774	4544	419	9.2	6153	4035	436	10.8
Testis	1526	41	4	10.8	1557	38	5	12.8	1664	43	13	31.5
Uterus	4361	744	94	12.6	5023	764	63	8.3	5612	820	114	13.9
Total	174,753	66,142	8435	12.8	188,930	65,729	7524	11.4	200,112	64,940	7122	11.0
Total excluding prostate	154,804	62,945	7683	12.2	161,864	62,924	6765	10.8	170,359	62,622	6625	10.6

[a] The annual number of patients, excess and avoidable deaths have been averaged over the three or five years in each calendar period.
[b] The percentage of avoidable deaths is the number of avoidable deaths as a proportion of the excess deaths.
[c] The number of avoidable deaths partly depends on the deficit in relative survival between affluent and deprived groups. If survival for a particular cancer is higher in deprivation categories 2–5 compared to the most affluent category (category 1), the number and proportion of avoidable deaths can be negative.

$$\text{Avoidable deaths in deprivation category } x = N_x \times ES_x \times (RS_{\text{affluent}} - RS_x) \quad (1)$$

where N is the number of cancer cases in the deprivation category of interest $(2, \ldots, 5)$, ES the expected survival in the deprivation category of interest derived from the deprivation-specific life table, and RS the relative survival in the deprivation category of reference (most affluent) or in the deprivation category of interest (x). The total number of avoidable deaths for a given calendar period, sex, cancer, and interval is the sum across deprivation categories.

The annual number of avoidable deaths and percentage of excess deaths were estimated up to three years after diagnosis. This was done for each calendar period and cancer. The cumulative number of avoidable deaths with time since diagnosis, and the relative contribution of each deprivation category to the total number of avoidable deaths are also shown.

3. Results

For patients diagnosed with one of 21 common cancers in England during 2004–2006, a total of 7122 of the 64,940 excess (cancer-related) deaths a year would have been avoidable within three years since diagnosis if survival for all patients had been as high as the most affluent group. This represents a fall in the number of avoidable deaths within three years since diagnosis from 8435 per year among patients diagnosed during 1996–2000. The percentage of excess deaths that was avoidable fell from 12.8% for patients diagnosed during 1996–2000 to 11.4% for those diagnosed during 2001–2003 and 11.0% for those diagnosed during 2004–2006 (Table 1 and Figs. 2a and 2b). Excluding prostate cancer from the total numbers did not change the overall trend (Table 1). Although some of the cancer-specific figures differed by sex, the overall patterns were very similar (see web Appendix A).

The single largest contributor to the total number of avoidable deaths was lung cancer. Among patients diagnosed with lung cancer during 2004–2006, 1350 deaths a year would have been avoidable within three years since diagnosis if survival for all patients had been as high as in the most affluent group. The annual number of avoidable deaths fell from 1621 for patients diagnosed during 1996–2000 to 1350 for those diagnosed during 2004–2006. The percentage of avoidable excess deaths was low (6–7%) due to the very high number of excess deaths, as expected for such a lethal cancer, and fell by just over 1% between 1996–2000 and 2004–2006. When examined by sex,

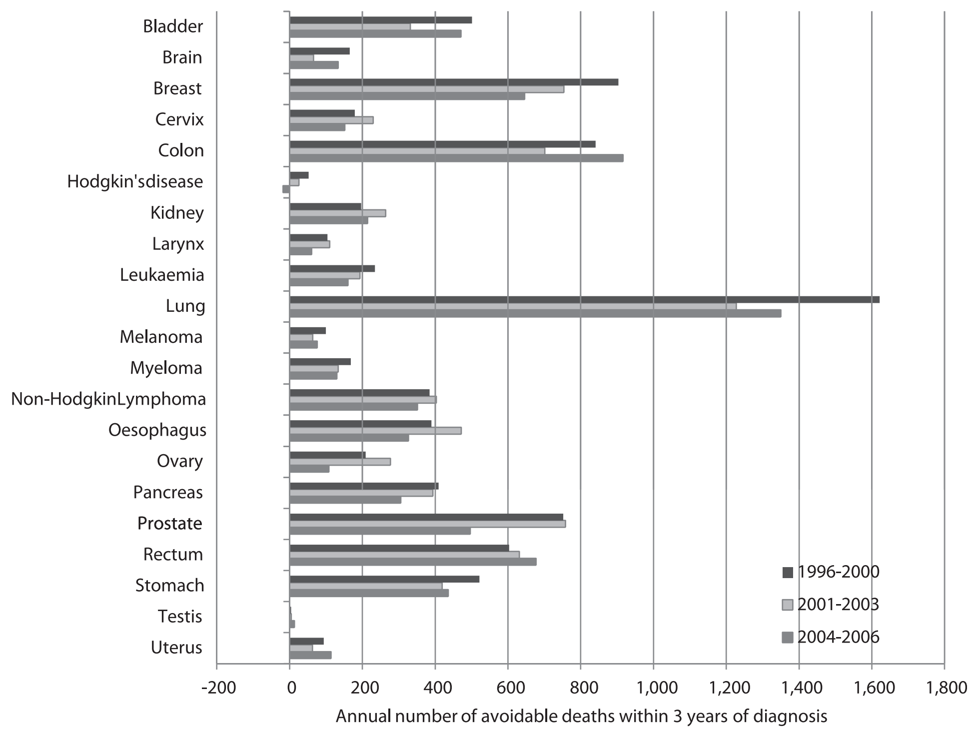

Fig. 2a – Annual number of avoidable cancer deaths[1] in England within three years since diagnosis: selected cancers, adults diagnosed during 1996–2000, 2001–2003 and 2004–2006. ***Footnote*****: [1]The number of avoidable deaths partly depends on the deficit in relative survival between deprived and affluent groups. If survival for a particular cancer is higher in deprivation categories 2–5 compared to the most affluent category (category 1), the number and proportion of avoidable deaths can be negative.**

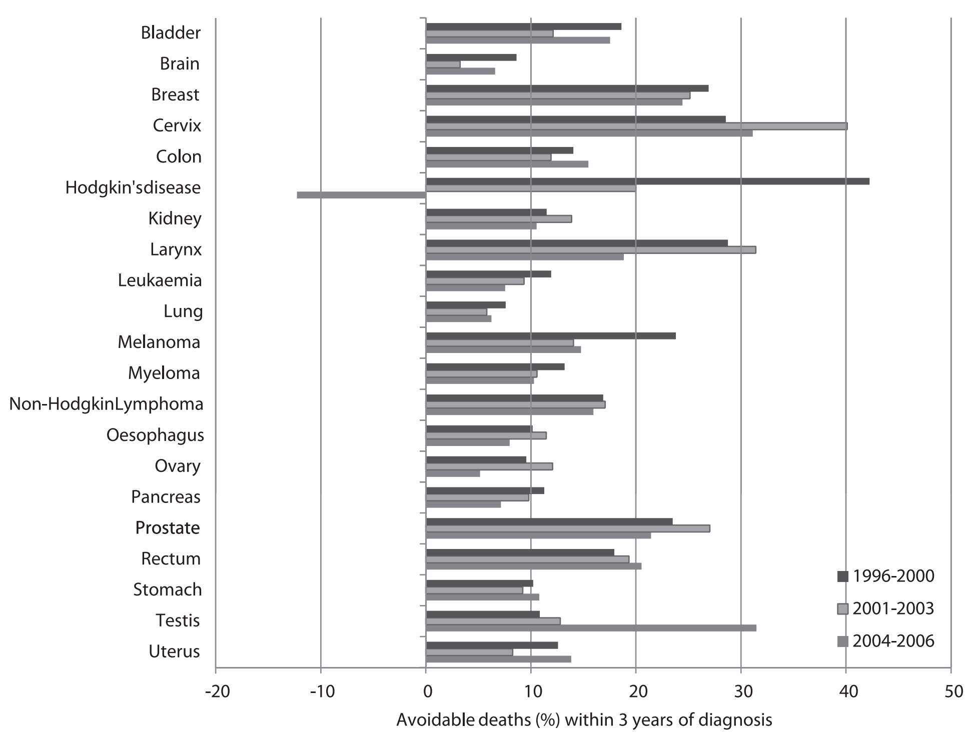

Fig. 2b – Avoidable cancer deaths as a percentage of excess (cancer-related) deaths[1] in England within three years since diagnosis: selected cancers, adults diagnosed during 1996–2000, 2001–2003 and 2004–2006. ***Footnote*****: [1]The number of avoidable deaths partly depends on the deficit in relative survival between deprived and affluent groups. If survival for a particular cancer is higher in deprivation categories 2–5 compared to the most affluent category (category 1), the number and proportion of avoidable deaths can be negative.**

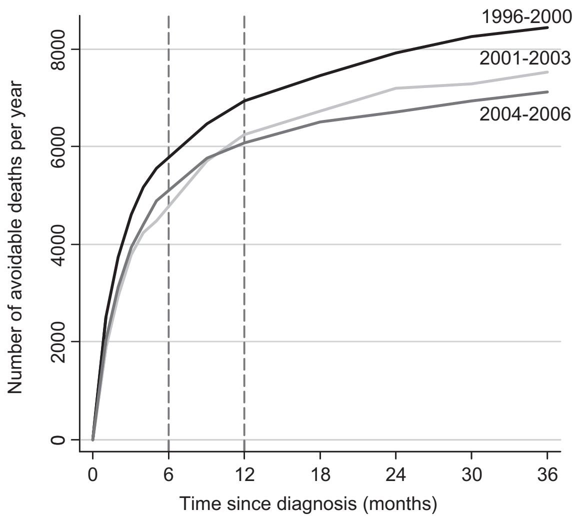

Fig. 3a – Cumulative annual number of avoidable deaths up to three years after diagnosis: 21 cancers combined, England.

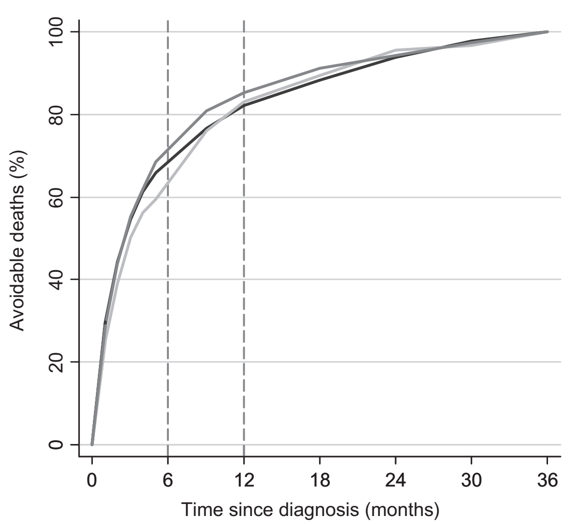

Fig. 3b – Cumulative proportion of avoidable deaths[1] up to three years after diagnosis: 21 cancers combined, England. ***Footnote*****: [1] The percentage of avoidable deaths is the cumulative number of avoidable deaths as a proportion of the total number of avoidable deaths.**

a slightly higher number of avoidable deaths is seen among men in all three calendar periods (719 of the 1350 avoidable deaths in 2004–2006), but the percentage of excess deaths that are considered avoidable is consistently higher in women (see web Appendix A).

The second largest contributor to the total number of avoidable deaths was colon cancer. Among patients diagnosed during 2004–2006, 916 (15.5%) of the 5917 excess deaths a year were considered to be avoidable. In contrast to lung cancer, the annual number and percentage of avoidable excess deaths have increased slightly since 1996–2000, although estimates fluctuate across the three calendar periods (Table 1 and Figs. 2a and 2b).

For women diagnosed with breast or cervical cancer, a high percentage of excess deaths were considered to be avoidable (over 25% on average), even though the absolute numbers of avoidable deaths was comparatively small (646 per year among breast cancer patients and 152 per year among cervical cancer patients in 2004–2006). This is because both cancers have high survival (so, few excess deaths) but inequalities in survival are fairly wide (therefore the percentage of those excess deaths that are potentially avoidable is high). The number of avoidable deaths fell for both cancers between 1996–2000 and 2004–2006, most dramatically so for breast cancer (from 904 deaths per year among patients diagnosed during 1996–2000 to 646 among patients diagnosed during 2004–2006) (Table 1 and Figs. 2a and 2b).

Cumulative avoidable mortality increased rapidly in the first year after diagnosis in all calendar periods examined (Fig. 3a). Over 60% of avoidable deaths in a given calendar year occurred within 6 months of diagnosis, and 80% within the first year since diagnosis; this pattern did not change over the period 1996–2006 (Fig. 3b). The patterns vary by cancer, but a rapid accumulation of avoidable deaths within the first 6 months is a common feature among the 21 common cancers examined. Notable exceptions are prostate cancer in men, breast cancer in women and melanoma of the skin, where the cumulative number of avoidable deaths increases more steadily with time since diagnosis (see figures on web Appendix B for individual cancers). This reflects the flatter survival curves seen in these cancers. The total number of avoidable deaths depends on the cut-off point in follow-up time. There is however some evidence to suggest that the total number of avoidable deaths has started to plateau at three years since diagnosis (Fig. 3a).

For all cancers combined, the total annual number of avoidable deaths within three years since diagnosis fell, but the proportionate contribution of each deprivation category to the total changed very little between 1996 and 2006 (Fig. 4). Deprivation categories 4 and 5 make the highest contribution, with approximately 70% of all avoidable deaths occurring in these two deprived groups. For patients diagnosed during 2004–2006, a similar proportion of avoidable deaths occurred in each group (35% in category 5 and 33% in category 4). Deprivation category 3 contributes approximately 20% of all avoidable deaths, with the remaining 10% in category 2. The most affluent group (1) is the reference group, so by definition, the number of avoidable deaths is zero.

4. Discussion

The absolute number of avoidable deaths for a particular cancer depends on the deficit in relative survival between affluent and deprived groups (the 'deprivation gap'), but also on the number of patients diagnosed with that cancer and on the relative survival for that cancer. Our findings show that for adult cancer patients diagnosed in England during 2004–2006, 7122 (11%) of the 64,940 cancer-related deaths that occurred each year within three years since diagnosis would have been avoidable if relative survival for all patients had been as high as for the most affluent patients. Despite an

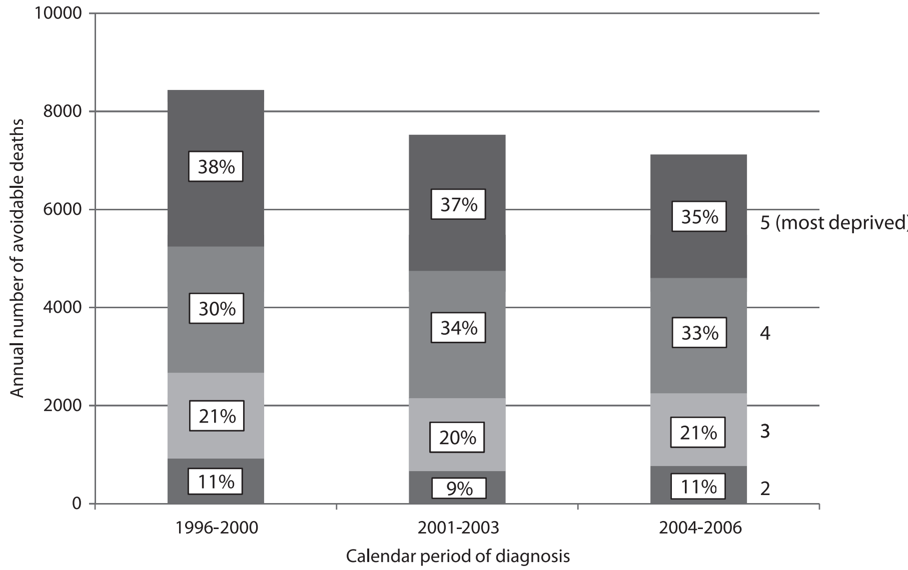

Fig. 4 – Contribution of each deprivation category to the annual number of avoidable deaths in England within three years since diagnosis: 21 cancers combined, by calendar period.

increase in the number of patients diagnosed with cancer, the trend in the number of avoidable deaths declined over the period 1996–2006. This reflects an encouraging improvement in cancer survival in England overall and hence a reduction in the number of excess (cancer-related) deaths. It does not, however, reflect a substantial narrowing of the deprivation gap in cancer survival overall. The percentage of those excess deaths in cancer patients that may be attributable to socioeconomic inequalities in cancer survival fell by just under 2% over this period, highlighting the persistent nature of the deficit in survival between affluent and deprived groups.

The National Cancer Registry contains no information about the income or socioeconomic status of individual cancer patients. Instead, an ecological measure of deprivation was used (the income domain score of the Index of Multiple Deprivation 2004[9] or IMD), on the basis of characteristics of the small area in which each patient was resident at the time of diagnosis. We used the smallest geographic area for which the IMD could be derived in England (Lower Super Output Area, socially homogeneous population approximately 1500) to minimise any misclassification. The effect of deprivation on all-cause[8] and cancer[10] mortality remains strong at an ecological level. The IMD 2004 is based on administrative and census data from 2001–2002, which roughly equates to the mid-point of the study. The IMD 2004 was therefore used to estimate deprivation for all patients included in the study to ensure consistency.

The calculation of avoidable deaths to quantify the public health impact of inequalities in cancer survival has been performed for a number of different comparators. A similar study of avoidable deaths among patients diagnosed in Finland during 1996–2005 reported that approximately 10% of deaths would have been avoidable if all cancer patients had the same survival as those with the highest educational background. The authors conclude that even in an equitable society with high health care standards, inequalities in cancer survival persist, and that early diagnosis may play a key role.[11] The percentage of avoidable deaths among Finnish cancer patients if inequalities in survival did not exist is similar to our findings for England. In a series of studies examining the effect of socioeconomic status on cancer survival in Canada and the United States (US), two countries with higher survival than England, a significant advantage was found for deprived patients in Canada compared to deprived patients in the US,[12] even after adjusting for differences in stage at diagnosis.[13] These findings implicate systematic differences in access to health care between the two countries, in particular in health insurance coverage for the most deprived populations. It is also worthy of note that differences in cancer survival between black and white populations in the US[14] are wider than any difference in survival between socioeconomic[1,2] or ethnic[15] groups in England.

We have previously estimated that approximately 7000 cancer-related deaths a year would have been avoidable among adults diagnosed in Britain during 1995–1999 if five-year cancer survival had been equivalent to the mean European level.[16] Narrowing the gap in survival between rich and poor in England could contribute significantly to reducing the gap in survival between England and the rest of Europe, a key aim of the NHS Cancer Plan.[4]

Socioeconomic inequalities in survival persist for most adult cancers in England, and the NHS Cancer Plan has, so far, had little effect on reducing the deficit in survival between rich and poor.[2] The number of deaths among cancer patients within three years of diagnosis that would have been avoidable if inequalities in survival did not exist helps to quantify its public health importance. It provides insight into how much the excess cancer mortality could be reduced if the relative survival attained by the most affluent patients could be achieved in all patients. The absolute number of avoidable deaths is one measure of the cancer burden, and it can be used to help prioritise heath provision and expenditure. By contrast, the percentage of avoidable excess deaths can be used to evaluate the efficacy of health care measures in reducing inequalities in cancer survival.

This study suggests there are still vast improvements to be made. The proportion of cancer-related deaths in England that would be avoidable if socioeconomic inequalities in survival were eliminated is still over 10%. More than 80% of the avoidable deaths in the first three years occurred during the first year after diagnosis, highlighting the importance of timely diagnosis and treatment, which is a key aim of the Department of Health's National Awareness and Early Diagnosis Initiative (NAEDI).[17] More than two-thirds of the total avoidable deaths are contributed by the two most deprived groups, in almost equal proportions, and there is an urgent need to target these patients and improve their access to the healthcare system. The government report 'Improving Outcomes: A strategy for Cancer,'[18] published in 2011, aims to save an extra 5000 lives a year; a goal that could almost certainly be achieved by eliminating inequalities in survival in England. This is dependent on the success of Government initiatives such as NAEDI.

Lung cancer contributed a large number of avoidable deaths, although the deficit in survival between affluent and deprived patients is small (approximately 2%). The public health impact in terms of avoidable deaths is substantial because lung cancer is so common: even small improvements in survival for deprived patients could prevent large numbers of deaths. Despite differential trends in lung cancer incidence in men and women,[19] examination of avoidable deaths by sex revealed only small differences because relative survival and the 'deprivation gap' in survival are similar for both sexes and have been for several decades.[2,20]

One of the most rapid falls in the annual number of avoidable deaths was among men diagnosed with prostate cancer, and this was despite a substantial increase in the number of patients diagnosed over the period 1996–2006. An explanation for these phenomena may be an equalisation in the uptake of PSA (Prostate–Specific Antigen) testing among affluent and deprived men. Men in the most deprived groups, who had lower uptake of PSA testing during the 1990s,[21] have started to 'catch up' with affluent men. This is supported by an increase in the number of prostate cancer cases among deprived men included in these analyses after around 2000. Furthermore, by applying the annual prostate cancer incidence rate in deprived men in 1996–2000 to the population of deprived men in 2004–2006, we estimated that approximately 20% of cases among deprived men diagnosed during 2004–2006 could be due to increased uptake of PSA testing.

For cancers included in national screening programmes during the study period, the number (breast) and percentage (cervix) of avoidable deaths were high, and there is no doubt that improving the low uptake of screening among the more deprived populations would dramatically reduce these avoidable deaths.

The overall downward trend in avoidable deaths is replicated in the vast majority of cancers, with a few notable exceptions. Among patients diagnosed with cancers of the colon, rectum, kidney and uterus, the annual number of avoidable deaths increased over time, despite substantial improvements in survival.[5] This is due to an increase in incidence combined with either a static or widening deficit in survival between affluent and deprived. In 2004–2006, colon cancer was the second largest contributor to the total number of avoidable deaths.

Differences in the uptake of screening,[22] stage at diagnosis,[3] level of comorbidity[23,24] and access to optimal treatment[25] are all potential explanations for the difference in cancer survival between rich and poor patients. Whilst differences in stage at diagnosis and comorbidity have explained only a small proportion of the socioeconomic disparities in survival from colorectal cancer,[26] differential access to healthcare has been shown to strongly influence these inequalities in survival.[27,28] This is likely to hold true for other common cancers. Future research will focus on selected cancers and examine the number of deaths that would be avoidable if stage at diagnosis and treatment were the same for all deprivation groups.

Role of funding source

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Author contributions

B.R. and M.P.C. led the study design. L.E., B.R. and M.P.C. carried out the data preparation and quality control. L.E. did the analyses. L.E., B.R. and M.P.C. contributed to interpretation of the findings and drafted the report.

Conflict of interest statement

None declared.

Acknowledgments

We thank the Cancer Registry staff in England: their sustained data collection and quality control have enabled the survival of patients to be analysed and compared in this study. We also thank the Cancer Team at ONS for extensive work in preparing the data in the National Cancer Registry.

Appendix A

Table A1 – Annual number of patients, and the number (and percentage) of excess deaths that would be avoidable in England within three years since diagnosis if relative survival were as high as in the most affluent category: selected cancers by sex, adults diagnosed during 1996–2000, 2001–2003 and 2004–2006.

Cancer		1996–2000[a]				2001–2003[a]				2004–2006[a]			
		No. of patients	Excess deaths	Avoidable deaths	%[b]	No. of patients	Excess deaths	Avoidable deaths	%[b]	No. of patients	Excess deaths	Avoidable deaths	%[b]
Bladder	Men	7032	1740	332	19.1	5984	1753	188	10.7	5876	1746	254	14.5
	Women	2742	955	170	17.8	2349	981	144	14.7	2288	940	217	23.1
Brain	Men	1733	1099	35	3.1	1840	1173	6	0.5	1908	1199	98	8.2
	Women	1258	818	131	16.0	1286	841	60	7.1	1312	826	35	4.3
Breast	Women	31,025	3355	904	26.9	33,661	2997	754	25.1	35,648	2643	646	24.4
Cervix	Women	2511	627	179	28.6	2329	572	230	40.1	2261	488	152	31.1
Colon	Men	8088	2942	410	13.9	8394	2945	314	10.7	9080	2966	403	13.6
	Women	8075	3050	431	14.1	8079	2944	387	13.1	8515	2951	514	17.4
Hodgkin's	Men	626	71	29	41.3	657	79	8	10.0	694	78	-23	-29.1
disease[c]	Women	470	53	23	43.5	475	50	18	35.6	556	71	4	6.1
Kidney	Men	2756	1039	132	12.7	3154	1178	154	13.1	3638	1275	218	17.1
	Women	1648	667	65	9.7	1879	727	110	15.1	2140	757	-4	-0.5
Larynx	Men	1444	363	104	28.8	1393	351	110	31.4	1405	323	61	18.9
Leukaemia	Men	2755	1062	81	7.7	3058	1143	119	10.4	3183	1215	130	10.7
	Women	2123	906	154	17.0	2276	929	75	8.0	2296	912	31	3.4
Lung	Men	17,183	13,335	902	6.8	16,602	12,666	665	5.3	16,761	12,622	719	5.7
	Women	10,226	7986	719	9.0	11,124	8481	562	6.6	11,943	8966	631	7.0
Melanoma	Men	2171	256	62	24.3	2854	280	36	12.8	3639	340	62	18.3
	Women	2876	163	37	23.0	3614	172	28	16.1	4311	175	14	7.9
Myeloma	Men	1446	641	77	12.0	1604	662	70	10.6	1738	665	84	12.6
	Women	1317	633	92	14.5	1365	603	64	10.6	1458	598	46	7.7
Non-Hodgkin	Men	3673	1204	152	12.6	4079	1269	175	13.8	4455	1189	170	14.3
Lymphoma	Women	3269	1073	232	21.7	3635	1094	229	20.9	3855	1016	182	17.9
Oesophagus	Men	3239	2332	244	10.5	3759	2591	292	11.3	3964	2639	234	8.9
	Women	2053	1498	146	9.7	2163	1519	180	11.8	2148	1457	93	6.4
Ovary	Women	5132	2188	209	9.6	5480	2299	277	12.1	5316	2090	108	5.2
Pancreas	Men	2310	1781	246	13.8	2566	1944	191	9.8	2786	2058	166	8.1
	Women	2375	1850	164	8.9	2668	2075	203	9.8	2924	2222	140	6.3
Prostate	Men	19,949	3198	752	23.5	27,066	2805	759	27.0	29,753	2317	497	21.4
Rectum	Men	5959	2028	419	20.7	6177	1969	400	20.3	6622	2014	456	22.6
	Women	4002	1334	184	13.8	4005	1293	231	17.9	4209	1285	222	17.2
Stomach	Men	4784	3290	298	9.1	4398	2948	283	9.6	4021	2599	305	11.7
	Women	2617	1821	224	12.3	2375	1595	137	8.6	2132	1436	131	9.1
Testis	Men	1526	41	4	10.8	1557	38	5	12.8	1664	43	13	31.5
Uterus	Women	4361	744	94	12.6	5023	764	63	8.3	5612	820	114	13.9
Total	Men	86,673	36,422	4278	11.7	95,143	35,794	3774	10.5	101,188	35,288	3845	10.9
	Women	88,079	29,721	4157	14.0	93,787	29,935	3750	12.5	98,924	29,652	3277	11.0
Total excluding prostate	Men	66,725	33,224	3527	10.6	68,077	32,989	3015	9.1	71,435	32,971	3349	10.2

[a] The annual number of patients, excess and avoidable deaths have been averaged over the three or five years in each calendar period.
[b] The percentage of avoidable deaths is the number of avoidable deaths as a proportion of the excess deaths.
[c] The number of avoidable deaths partly depends on the deficit in relative survival between affluent and deprived groups. If survival for a particular cancer is higher in deprivation categories 2–5 compared to the most affluent category (category 1), the number and proportion of avoidable deaths can be negative.

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ejca.2011.10.008.

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