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Survival from rectal and anal cancers in England and Wales, 1986–2001

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ABSTRACT

The aim of this study was to investigate the effects of tumour and patient characteristics on trends in the survival of patients with cancer of the anus or rectum in England and Wales. A total of 132,542 adults (15–99 years) who were diagnosed during the 14 years 1986–1999 were followed up to 2001 through the National Health Service Central Register. Relative survival up to 5 years after diagnosis was estimated, using deprivation-specific life tables. Generalised linear models were used to estimate relative excess risks of death, adjusted for patient and tumour characteristics. The results showed that 5-year relative survival was higher in women, younger patients and more affluent patients, and higher for anal cancer than rectal cancer. Survival improved by more than 10% from the late 1980s (around 38%) to the late 1990s (49%). This trend was not explained by changes in the distribution of age, anatomical site, morphology or deprivation. The trend was more marked in younger and more affluent patients, and for adenocarcinoma and epidermoid carcinoma than for tumours with other morphology. The inequality in survival between affluent and deprived patients widened. It is concluded that improvements in survival may reflect improvements in disease stage, diagnostic technique or treatment. Which of these factors contribute to the widening socioeconomic inequalities in survival remains to be elucidated.

1. Introduction

Cancers of the anus and rectum combined comprise the fifth most common cancer in adults in England and Wales,[1] accounting for 5% of all malignant tumours.[2] Survival from anorectal cancer is higher than for most other malignancies of the digestive tract, including colon, small intestine, stomach and oesophagus.

Survival reflects both the type of cancer and the stage of disease at presentation, as well as access to treatment and the effectiveness of treatment. Survival from anorectal cancer in England and Wales has improved significantly in the last 30 years. For example, 1-year survival increased by an average of 7–8% every 5 years between 1971 and 1996.[3] Similar improvements in survival have also been reported from Japan,[4] Switzerland[5] and the USA.[6] In addition to improvements in diagnosis and treatment, these trends could be accounted for by changes in the age or sex distribution of patients, or in the histology or precise anatomical location of the tumours.

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Morphology is an important prognostic factor. Adenocarcinomas and epidermoid carcinomas tend to respond better to treatment, while small-cell carcinoma, signet-ring cell carcinoma, malignant melanoma, sarcoma and undifferentiated carcinoma all have a less favourable outcome.[7,8] Morphology is closely related to anatomical site, with adenocarcinoma accounting for 70–90% of rectal cancers[9] and epidermoid carcinoma accounting for over half of all anal cancers.[10]

Here, we report the influence on cancer survival trends of the patient's age and socioeconomic status, and the morphology and anatomical sub-site of the tumour. We investigate whether temporal shifts in these factors could explain trends in anorectal cancer survival in England and Wales among patients who were diagnosed between 1986 and 1999 and followed up to 2001.

2. Materials and methods

The study is based on all first, primary, invasive malignant cancers of the rectum and anus, excluding anal margin and skin (International Classification of Diseases (ICD)-9: 1540–1548, ICD-10: C19, C20, C21.0–C21.8) that were diagnosed in adults (15–99 years) and registered in the National Cancer Registry for England and Wales between 1986 and 1999. Details of data collection methods have been fully described.[1] Information on the vital status and date of death of registered cancer patients was obtained through the National Health Service Central Register (NHSCR). About 10% of records were considered ineligible for survival analysis, mainly because of a previous primary cancer (3%) or because survival was zero or unknown (6%). The last group included patients registered solely from a death certificate (death certificate only, DCO cases), for whom no date of diagnosis was available; they could not be distinguished reliably from patients who did die on the day of diagnosis.

Tumour morphology was coded to the ICD for oncology, then grouped into four major types with standard definitions:[11,12] adenocarcinoma, epidermoid carcinoma, 'other carcinomas' and 'other cancers'. The last two groups each included both specified and unspecified subtypes. Patients were assigned to a deprivation category with one of two indices derived from characteristics of their electoral ward of residence at diagnosis. For patients diagnosed during 1986–1995, we used the Carstairs score[13] derived from the 1991 census. For patients diagnosed during 1996–1999, we used the income domain score from the indices of multiple deprivation (IMD 2000).[14] Both scores were derived for each of the 9309 electoral wards in England and Wales. Quintiles of the ranked distribution of ward scores were used to divide patients into five deprivation categories with approximately equal populations.

The follow-up time for each patient was calculated in exact years as the interval in days between the date of cancer registration and the earliest of the date of death, emigration or 31 December 2001, divided by 365.25. Relative survival was used to adjust for background mortality,[15] which differs widely by age, sex and deprivation. Relative survival is defined as the ratio of the observed survival among the cancer patients and the survival that would have been expected had they been subject only to the mortality rates of the general population. We used sex- and deprivation-specific life tables by single year of age, centred on 1991 and 1998, to control for background mortality by age, sex and deprivation during the periods 1986–1995 and 1996–2001, respectively. We report the cumulative probability of relative survival up to 5 years. Results for patients diagnosed during the calendar periods 1986–1990, 1991–1995 and 1996–1999 were examined for trends.

Multi-variable regression was done with generalised linear models and a Poisson error structure[16] to estimate the independent effects of explanatory variables on relative survival. Follow-up time was censored at 5 years. The estimates of relative excess risk (RER) can thus be interpreted as the risk of death attributable to the cancer up to 5 years after diagnosis among patients in a given category, relative to the risk among those in the referent category for that variable. Likelihood ratio tests were used to investigate interactions.

3. Results

After exclusion of 60 patients who could not be assigned to a deprivation category, we analysed the data for 132,542 patients diagnosed with anorectal cancer in England and Wales in the 14 years up to 1999. Women comprised 42% of the patients, with an average age at diagnosis of 71.5 years, some 3 years greater than for men (68.8 years) (Table 1). Overall, 75% of cancers arose in the rectum, and 19% in the recto-sigmoid junction, although the proportions differed slightly between men and women. Cancers of the anus and anal canal comprised 6% of cancers in women and 3% in men. Adenocarcinomas predominated (75%). Epidermoid carcinomas arise predominantly in the anus and anal canal, and adenocarcinomas in the rectum; the distribution of morphological types in men and women closely reflects the anatomical distribution of tumours in each sex.

The proportion of all tumours arising in men rose slightly, from 57% to 59%. The rising proportion of adenocarcinomas appears to reflect a decline in the proportion of tumours with unspecified morphology, which fell from 10% to 2%. This improvement in data quality suggests that the true proportion of adenocarcinomas is closer to the 86% seen for patients diagnosed during 1996–1999 than the overall figure of 75% for the entire period 1986–1999. More than half the patients (51%) lived in electoral wards in the two most deprived categories, and less than 30% in the two least deprived categories: since the populations in each category are similar, this distribution reflects a much higher risk of anorectal cancer in deprived sectors of the population.

Five-year relative survival rose by about 10% overall, from 38% to 48% in men and 39% to 51% in women (Table 2). The increase was more marked in younger patients. Similar improvements were seen for both rectal and anal cancers, although survival is 5–9% higher for patients with anal cancer than for those with rectal cancer. For patients diagnosed during 1996–1999, 5-year survival had reached 59% for epidermoid carcinoma and 52% for adenocarcinoma. Both had increased by around 10%. Again, because morphology and anatomical site are closely linked for these tumours, the patterns of survival by morphology reflect those by tumour site.

Relative survival was higher for affluent than deprived patients in all three periods. The difference increased from

Table 1 – Anorectal cancer, England and Wales, patients diagnosed 1986–1999, followed up to 2001

	Calendar period of diagnosis						All periods 1986–1999					
	1986–1990		1991–1995		1996–1999		Men		Women		Persons	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Sex												
Men	24,362	56.8	27,624	58.0	24,699	58.9					76,685	57.9
Women	18,562	43.2	20,032	42.0	17,263	41.1					55,857	42.1
	42,924		47,656		41,962						132,542	
Age at diagnosis (years)												
15–59	7977	18.6	9076	19.0	8293	19.8	15,590	20.3	9756	17.5	25,346	19.1
60–69	12,245	28.5	12,903	27.1	11,266	26.9	23,600	30.8	12,814	22.9	36,414	27.5
70–79	14,286	33.3	15,729	33.0	13,988	33.3	25,702	33.5	18,301	32.8	44,003	33.2
80–89	7534	17.6	8871	18.6	7439	17.7	10,956	14.3	12,888	23.1	23,844	18.0
90–99	882	2.0	1077	2.3	976	2.3	837	1.1	2098	3.8	2935	2.2
Tumour site												
Recto-sigmoid junction	7955	18.5	9037	19.0	8420	20.1	14,242	18.6	11,170	20.0	25,412	19.2
Rectum	32,943	76.8	35,921	75.4	31,179	74.3	59,465	77.5	40,578	72.6	100,043	75.5
Anal canal	931	2.2	1104	2.3	943	2.3	1196	1.6	1782	3.2	2978	2.2
Anus, unspecified	825	1.9	1108	2.3	1016	2.4	1243	1.6	1706	3.1	2949	2.2
Other	270	0.6	486	1.0	404	1.0	539	0.7	621	1.1	1160	0.9
Morphology												
Adenocarcinoma	30,804	71.8	36,098	75.8	35,945	85.7	61,296	79.9	41,551	74.4	102,847	77.6
Epidermoid carcinoma	1580	3.7	1928	4.0	1907	4.5	2116	2.8	3299	5.9	5415	4.1
Other carcinoma	6366	14.8	5671	11.9	3297	7.9	8121	10.6	7213	12.9	15,334	11.6
Other	4174	9.7	3959	8.3	813	1.9	5152	6.7	3794	6.8	8946	6.7
Deprivation category												
1 (Least deprived)	5506	12.8	6578	13.8	5377	12.8	9997	13.0	7464	13.4	17,461	13.2
2	7057	16.4	7883	16.5	6785	16.2	12,354	16.1	9371	16.8	21,725	16.4
3	8265	19.3	9269	19.5	8430	20.1	14,773	19.3	11,191	20.0	25,964	19.6
4	10,267	23.9	11,304	23.7	9867	23.5	18,044	23.5	13,394	24.0	31,438	23.7
5 (Most deprived)	11,829	27.6	12,622	26.5	11,503	27.4	21,517	28.1	14,437	25.8	35,954	27.1

around 3% for those diagnosed during 1986–1990 to 8% for those diagnosed during 1996–1999.

The downward trend over successive calendar periods in the excess risk of death during the first year after diagnosis (short-term risk) was not significantly different from the trend in excess risk during the second to fifth years after diagnosis (longer-term risk) ($P = 0.56$ for men and 0.62 for women). In the categories of age at diagnosis, morphology and deprivation category, however, short-term risks were significantly different from longer-term risks (interactions significant at $P = 0.01$ or less, data not shown). We therefore present short-term and longer-term risks separately for all these variables (Table 3), both adjusted for age and more fully adjusted for age, period of diagnosis, morphology and deprivation category. Anatomical site was not included in these models, because most of its effect was explained by morphology.

Both short-term and longer-term excess risks fell significantly by 20–25% in men and women (Table 3). For patients diagnosed during 1996–1999, the age-adjusted short-term risk of death fell to around 0.71, compared with the reference value for patients diagnosed during 1986–1990, and the longer-term risk fell to 0.72 in women and 0.75 in men. Further adjustment for morphology and deprivation slightly moderated this fall in the short-term risk of death (RER 0.83), but it barely changed the longer-term risks (RER 0.73 in women and 0.76 in men). In other words, the fall in the short-term risk of death between 1986–1990 and 1996–1999 is explained partly by concomitant changes in the distribution of patient deprivation and tumour morphology, but these factors do not explain the fall in the longer-term excess risk.

Compared with patients aged 15–59 years at diagnosis, the short-term excess risk of death rose steadily with age at diagnosis, reaching three-fold for patients aged 90–99 years, even after adjustment for morphology and deprivation as well as age-specific background mortality. The impact of age at diagnosis on the longer-term risk was much less marked (adjusted RERs rising with age to 1.3-fold for men aged 90–99 years and to 2.1-fold for women: Table 3).

Compared with patients diagnosed with adenocarcinoma, the age-adjusted short-term risk of death for women with epidermoid carcinoma tends to be lower, but the difference is largely explained by deprivation and period of diagnosis. For men, the excess risks of death for adenocarcinoma and epidermoid carcinoma are very similar.

There is a significant gradient in the short-term excess risk of death across deprivation categories. Compared with the most affluent group, the age-adjusted risk rises steadily to 1.30-fold in men and 1.24-fold in women in the most deprived category. The deprivation gradient in the longer-term excess risk of death is less marked, the age-adjusted risk among the most deprived patients rising to 1.13-fold in both sexes.

Table 2 – Five-year relative survival (%) and 95% confidence interval, by calendar period of diagnosis: anorectal cancer, England and Wales, patients diagnosed 1986–1999, followed up to 2001

	Period of diagnosis					
	1986–1990 (*n* = 42,924)		1991–1995 (*n* = 47,656)		1996–1999 (*n* = 41,962)	
	%	95% CI	%	95% CI	%	95% CI
Sex						
Men	37.8	37.1–38.5	41.1	40.4–41.8	48.5	47.6–49.4
Women	39.0	38.2–39.9	44.1	43.3–44.9	51.0	50.0–52.1
Age at diagnosis (years)						
15–59	43.7	42.6–44.8	48.2	47.2–49.3	57.0	55.7–58.3
60–69	41.1	40.1–42.1	45.4	44.4–46.4	53.8	52.6–55.0
70–79	38.2	37.2–39.3	41.3	40.3–42.3	47.6	46.3–48.8
80–89	28.6	27.1–30.2	33.3	31.8–34.8	35.5	33.4–37.5
90–99	15.1	11.2–20.0	22.4	17.6–27.6	18.5	13.1–24.7
Tumour site						
Recto-sigmoid junction	36.2	34.9–37.4	41.5	40.3–42.7	47.2	45.7–48.7
Rectum	38.4	37.8–39.0	42.3	41.7–42.9	49.9	49.1–50.7
Anal canal	45.7	42.0–49.5	49.9	46.4–53.3	56.4	51.8–60.7
Anus, unspecified	51.2	47.0–55.1	45.5	42.0–49.0	54.5	50.1–58.8
Other	36.3	29.7–42.8	38.4	33.3–43.5	44.9	37.2–52.2
Morphology						
Adenocarcinoma	41.7	41.0–42.3	45.6	45.0–46.2	51.7	50.9–52.4
Epidermoid carcinoma	49.1	46.4–52.2	49.4	46.8–51.9	58.8	55.7–61.9
Other carcinoma	19.2	18.2–20.4	16.1	15.1–17.3	19.5	17.8–21.2
Other	39.2	37.4–40.9	46.9	45.0–48.7	53.7	48.8–58.3
Deprivation category						
1 (Least deprived)	39.8	38.3–41.3	44.7	43.3–46.1	53.8	51.9–55.6
2	40.2	38.8–41.5	45.0	43.7–46.3	53.4	51.7–55.1
3	39.1	37.9–40.3	43.8	42.6–45.0	51.0	49.4–52.5
4	38.4	37.2–39.5	41.6	40.5–42.6	47.9	46.5–49.3
5 (Most deprived)	36.2	35.1–37.2	39.1	38.1–40.1	45.5	44.2–46.8

Further adjustment for calendar period and morphology does not alter the pattern of these risks.

The calendar trends in risk and the effects of age and deprivation were not significantly different in any of the four morphology categories we defined (no interaction between morphology and the other variables: data not shown).

4. Discussion

This study demonstrates steady improvement in survival from cancers of the rectum and anus in England and Wales over the period 1986–2001, with a 17% decline in the risk of death during the first year after diagnosis (short-term risk), and about a 25% decline in risk for the second to fifth years after diagnosis (longer-term risk). This improvement is not explained by any trends in the age or deprivation status of patients, or in the morphology of the tumours. The study also confirms that the deprivation gradients in survival from these cancers are actually widening with time. Recent work has shown that this survival gradient is steepening significantly by 2.5% every 5 years, more rapidly than for most other common cancers.[3] The effects of age and deprivation are more marked on the short-term risk of death than the longer-term risk.

Strengths of this study include the very large data series from a long-standing population-based national cancer registry with fairly complete ascertainment, covering a population of over 50 million people, and with complete follow-up and linkage of data on deaths among these patients up to the end of 2001. Relative survival estimates were adjusted for the differing background risks of death in each of five socioeconomic groups, as well as by sex and calendar time, with a specific life table for each combination of these variables. In addition, we used recently developed multi-variable models to examine patterns of the relative excess risk of death with mutual adjustment for several co-variates.

One limitation is the exclusion of a small proportion of patients (around 6%) whose cancer was registered solely from a death certificate (DCO cases). Although there is no practical alternative, because their survival time is unknown, the exclusion of DCO cases has been shown to lead to some over-estimation of survival.[17] The proportion of cases excluded for this reason fell by 3% over the three periods (data not shown), which would have been expected to reduce survival rates over time. These exclusions cannot therefore explain the improvements in relative survival. Nor can they account for the deprivation gradient in survival, since the proportion of DCO cases was very similar in all deprivation groups (data not shown).

Another limitation was the heterogeneity with respect to survival of tumour types included in the morphological groups we used. Survival was poorest for 'other carcinomas',

Table 3 – Relative excess risks (and 95% CI) of death within 5 years of diagnosis: ano-rectal cancer, England and Wales, patients diagnosed 1986–1999

	Men				Women			
	First year after diagnosis		Second to fifth years since diagnosis		First year after diagnosis		Second to fifth years since diagnosis	
	Age-adjusted	Fully adjusted[a]	Age-adjusted	Fully adjusted[a]	Age-adjusted	Fully adjusted[a]	Age-adjusted	Fully adjusted[a]
Period of diagnosis								
1986–1990	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
1991–1995	0.87 (0.85–0.90)	0.93 (0.90–0.96)	0.93 (0.90–0.97)	0.94 (0.91–0.98)	0.82 (0.79–0.85)	0.88 (0.85–0.91)	0.89 (0.86–0.94)	0.91 (0.87–0.95)
1996–1999	0.72 (0.70–0.75)	0.83 (0.81–0.87)	0.75 (0.72–0.79)	0.76 (0.73–0.79)	0.70 (0.67–0.73)	0.82 (0.79–0.86)	0.72 (0.68–0.76)	0.73 (0.69–0.77)
Age at diagnosis (years)								
15–59		1.00		1.00		1.00		1.00
60–69		1.28 (1.22–1.33)		0.99 (0.95–1.03)		1.29 (1.21–1.37)		1.03 (0.97–1.09)
70–79		1.72 (1.65–1.79)		0.99 (0.95–1.04)		1.88 (1.78–1.99)		1.07 (1.01–1.13)
80–89		2.59 (2.47–2.72)		1.05 (0.98–1.13)		2.90 (2.75–3.07)		1.25 (1.17–1.34)
90–99		3.30 (2.95–3.70)		1.31 (0.98–1.74)		3.84 (3.54–4.16)		2.11 (1.82–2.46)
Morphology								
Adenocarcinoma	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Epidermoid carcinoma	1.03 (0.94–1.13)	1.09 (0.96–1.24)	0.98 (0.89–1.07)	0.99 (0.85–1.15)	0.74 (0.68–0.81)	0.91 (0.81–1.02)	0.91 (0.84–0.99)	1.01 (0.89–1.15)
Other carcinoma	3.51 (3.39–3.63)	3.41 (3.30–3.53)	1.50 (1.42–1.59)	1.44 (1.36–1.53)	3.83 (3.69–3.97)	3.75 (3.61–3.89)	1.55 (1.45–1.66)	1.49 (1.39–1.60)
Other	1.42 (1.35–1.50)	1.36 (1.28–1.43)	0.85 (0.79–0.92)	0.80 (0.75–0.86)	1.55 (1.46–1.65)	1.51 (1.42–1.60)	0.93 (0.85–1.01)	0.88 (0.81–0.95)
Deprivation category								
1 (Least deprived)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	1.03 (0.98–1.09)	1.02 (0.97–1.08)	0.97 (0.92–1.03)	0.97 (0.91–1.03)	1.01 (0.95–1.07)	1.02 (0.96–1.09)	0.97 (0.90–1.04)	0.97 (0.90–1.04)
3	1.09 (1.04–1.15)	1.10 (1.04–1.15)	1.00 (0.94–1.06)	1.00 (0.95–1.06)	1.09 (1.03–1.15)	1.08 (1.02–1.15)	0.98 (0.91–1.05)	0.98 (0.91–1.05)
4	1.17 (1.12–1.23)	1.16 (1.10–1.22)	1.05 (0.99–1.11)	1.05 (0.99–1.11)	1.16 (1.10–1.23)	1.16 (1.09–1.22)	1.06 (0.99–1.13)	1.05 (0.98–1.12)
5 (Most deprived)	1.30 (1.24–1.36)	1.29 (1.23–1.35)	1.13 (1.08–1.20)	1.13 (1.08–1.20)	1.24 (1.18–1.31)	1.24 (1.17–1.31)	1.13 (1.05–1.20)	1.13 (1.06–1.21)

a RERs are adjusted for all other variables in the table.

but this group includes some neuro-endocrine tumours, such as carcinoid tumour, for which recently introduced treatment modalities have good outcomes.[18] The 'other' group also contained some melanomas, which have a poor prognosis,[7,11] as well as tumours for which no pathological investigation was undertaken. For these patients, either the histology could not be determined or else no pathology was done, including those who were not operated, usually those with more advanced disease. These two poorly specified morphological groups contained a disproportionate number of elderly people (80 years and above).

The public health implications of this study are limited by the lack of information on stage of disease at presentation, which is an important predictor of survival.[10] The observed improvements in survival could be attributable both to earlier presentation and diagnosis and to improved treatment. A recent study in Scotland found no evidence that colorectal cancers were being diagnosed at an earlier stage in 1991–1994 compared with an equivalent group diagnosed in 1974–1979. The authors concluded that improvements in colorectal survival were largely due to better surgery and the specialisation of clinicians.[19]

Further studies with clinical data of good quality will be required to determine the extent to which improvements in treatment, in particular total meso-rectal excision, but also pre-operative radiotherapy and adjuvant chemotherapy, could have contributed to the trends in survival. Reductions in post-operative mortality contributed to improved survival from colorectal cancer in France over the period 1976–1995.[20] Total meso-rectal excision, as part of conservative surgery in rectal cancer, has been shown to reduce loco-regional recurrence to 4% at 5 years, with 78% disease-free survival at 5 years.[21] This is despite the technical difficulty of this procedure, which requires specialised training.[22] Pre-operative radiotherapy for Dukes B and C adenocarcinomas of the rectum reduces loco-regional recurrence by 50% at 5 years, and increases 5-year survival by 10%.[23] A population-based study of 3635 rectal cancer patients diagnosed between 1980 and 2000 in the south-east Netherlands confirmed that total meso-rectal excision has become widely used for cancer patients in the general population.[24] It also identified a substantial shift from post-operative radiotherapy (25–4%) to pre-operative radiotherapy (1–35%) over this period, and a reduction of more than 50% in the risk of death among patients under 60 years of age, after adjustment for age, sex sub-site and stage of disease at diagnosis. The authors conclude that these developments in surgery, radiotherapy and surgical sub-specialisation had all contributed to this substantial improvement in survival.

Trends in the incidence of colorectal cancer in England and Wales over the period 1986–1999 were similar across all deprivation categories.[25] This suggests that the widening deprivation gap in survival is unlikely to be explained by increasing use of opportunistic screening (i.e. patients requesting tests rather than being tested within a population-based screening programme) or to earlier diagnosis among people living in more affluent districts.

While substantial improvements in rectal cancer survival over the period 1971–1990 have been documented in England and Wales,[1] this appears to be the first assessment of the extent to which those trends may be explained by changes in the distribution of tumour characteristics over time. Survival estimates for each sub-site or histological type of anorectal cancer have not previously been reported in the United Kingdom (UK). They are of interest because of the differences in aetiology and treatment between tumours of the anus and rectum, essentially between epidermoid carcinomas and adenocarcinomas. We have not found comparable population-based estimates of relative survival for sub-sites of the anorectum from other populations. In the USA, survival is higher (or much higher) than in the UK and other European countries for many solid tumours.[26] For example, 5-year relative survival rates reported by the Surveillance, Epidemiology and End Results (SEER) programme, which covers approximately 14% of the US population, were 61% and 73% for men and women, respectively, who were diagnosed with anal cancer during 1994–2000, some 13% and 22% higher than in our study.[27] The reasons for this are the subject of an ongoing study (CONCORD).[28]

We have documented large inequalities in relative survival by socioeconomic deprivation. These differences are likely to be under-estimates, given the potential for misclassification of individuals inherent in using measures of deprivation based on the area of residence. These survival patterns are also coherent with observations of higher mortality from rectal cancer in people of lower socioeconomic position or income in Britain [29] and the USA.[30] It is noticeable that the socioeconomic and age differentials in survival tend to attenuate with time since the diagnosis. Among patients who survive the first year, i.e. who do respond to initial treatment, socioeconomic differentials in the excess risk of death are smaller, although they persist up to 5 years after diagnosis. We believe it is unlikely that the disparities we describe are due to underlying biological differences in disease between deprivation groups. The magnitude of the deprivation gradients in survival is one of the largest seen among the 20 common cancers in England and Wales, and it is increasing more rapidly than for most cancers.[3] However, with the available data, we are unable to determine whether this is attributable to differences in the stage of the cancer at presentation, or to availability of or access to appropriate health services. Studies to investigate these issues should be a research priority, to provide the evidence required to reduce inequalities in survival.

While the increases in anorectal cancer survival at the end of the 20th century are substantial and encouraging, 5-year survival for rectal cancer patients diagnosed in England during 1990–1994 was still less than the EUROCARE study average.[31] A large EUROCARE high-resolution study, in which detailed clinical data were collected from the medical records of 2700 patients in six European countries, suggests that much of the difference in survival between the UK and other countries appears to be due to differences in the stage of disease at diagnosis.[32] Despite these encouraging results, further improvement might be achieved through structural changes in the health service, since survival from rectal cancer is known to be amenable to improvement through high-quality training and the management of all patients by specialised multi-disciplinary teams.[33]

In conclusion, we have shown continuing improvement in survival from anorectal cancer in England and Wales over the period 1986–2001, but a worsening of socioeconomic inequalities. These changes are not explained by changes in the age distribution of patients or changes in tumour morphology or sub-site distribution. Further investigation is required to determine whether the socioeconomic inequalities are due to stage at presentation, co-morbidity or sub-optimal treatment.

Conflict of interest statement

None declared.

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