ASSESSING THE IMPACT OF STAGE SHIFT AND TREATMENT ON SURVIVAL IMPROVEMENTS

A comparison of female breast and colorectal cancers in East Anglia

Nick Ormiston-Smith[a], David Greenberg[b], Catherine S Thomson[a], Colette Pryor[a], Brian Rous[b], and Jennifer Yiallouros[a]

[a] Statistical Information Team, Cancer Research UK, [b] Eastern Cancer Registration and Information Centre

INTRODUCTION

There have been improvements in survival for many cancers over time both in the UK and abroad. Most studies use all-stage survival, thus obscuring whether survival improvements are due to stage shift over time and/or improvements in treatment and care pathway management (known here as "treatment"). This study aimed to explore this, assuming that improvements in treatment are generally evidenced by improvements in survival within stage, while earlier diagnosis would result in stage shift.

METHODS

Initially, 117,530 cases of cancer diagnosed between 1981 and 2010 were selected from the Anglia Cancer Network. Cases with no stage information, zero survival, or aged over 100 were excluded, leaving 83,877 cases for analysis (46,340 female breast cancer (ICD-10 C50), 17,703 female colorectal cancer (ICD-10 C18-C20) and 19,834 male colorectal cancer). Long term trends in one-, five-, and ten-year relative survival (Hakulinen) by stage were calculated using rolling years. The proportion of cancers at each stage over time are presented for these cancers by all stages. Discussed differences between times periods are statistically significant.

RESULTS

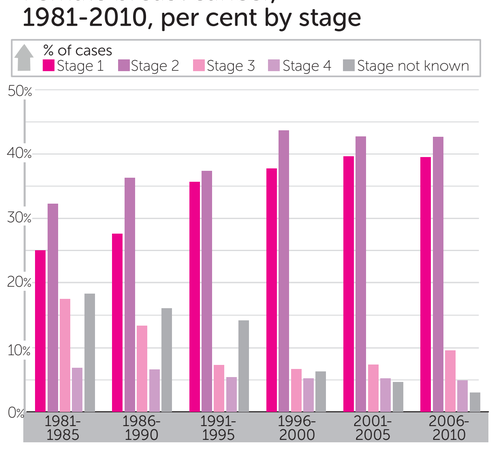
DISTRIBUTION BY STAGE — CHANGES OVER TIME

Breast cancer

Breast cancer has seen a clear stage shift between the early 1980s and the late 1990s for stage 1 and 2 cancers, although much of this shift may be due to previously unknown cases now being staged. Since the end of the last century there has been little change in the proportions of cases diagnosed with stage 1 or 2 cancers.

Not tested for significance

Female breast cancer, 1981-2010, per cent by stage

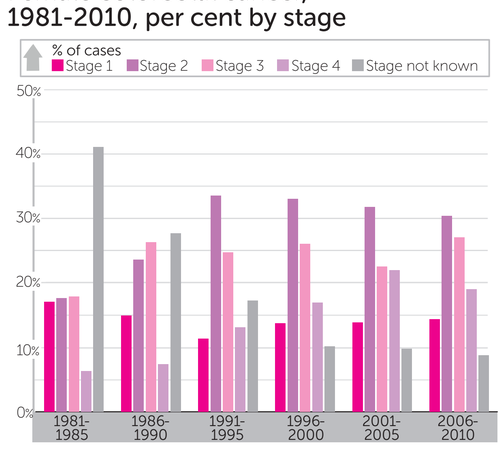


Colorectal cancer

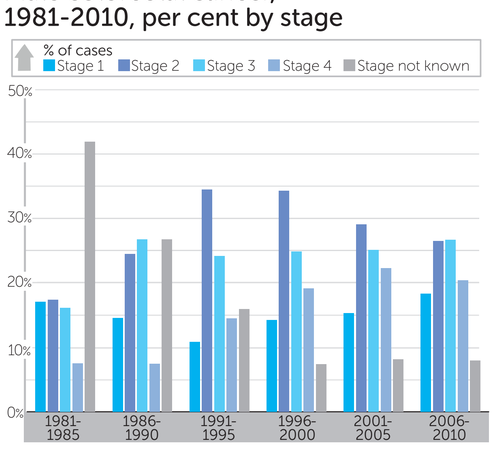
Colorectal cancer has seen little evidence of a clear stage shift. The proportion of stage 1 and stage 2 cancers combined has remained fairly constant since the early 1990s. The proportion of unknown stages has dropped while the proportion of stage 4 cancers has increased.

Not tested for significance

Female colorectal cancer, 1981-2010, per cent by stage



Male colorectal cancer, 1981-2010, per cent by stage



SURVIVAL WITHIN STAGE — CHANGES OVER TIME

Breast cancer

All stages female breast cancer has seen improvements over the study period for one-, five-, and ten-year survival.

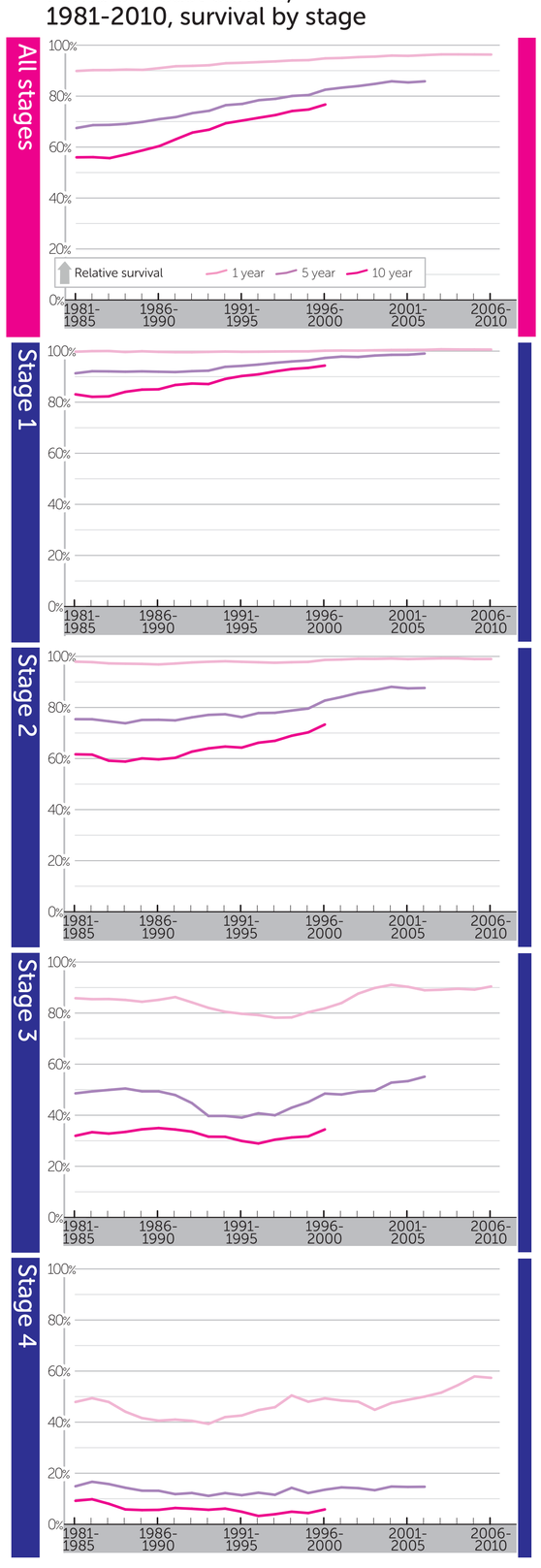
For stage 1 cancers, increases are seen for five- and ten-year survival (one-year survival was already 100% at the beginning of the study period).

Stage 2 breast cancer has seen increases from the mid-1990s for five-year survival and from the late 1980s for ten-year survival.

No significant increase is seen for stage 3 breast cancer in one-year survival over the study period as a whole. There is, however, a significant increase between 1991-1995 and 2006-2010. There has been no significant increase in five-year survival for those diagnosed with stage 3 cancers between 1981-1985 and 2001-2005. There was, however, a significant decrease between 1986-1990 and 1991-1995 and then a significant increase to 2006-2010. Ten-year survival for those diagnosed at stage 3 has shown very little variation between those diagnosed in the early 1980s and the late 1990s.

Stage 4 breast cancer has seen some increase in one-year survival for those diagnosed in 1986-1990 compared with those diagnosed 2006-2010. Five-year and ten-year survival have seen very little variation over the study period.

Female breast cancer, 1981-2010, survival by stage



Colorectal cancer

All stages colorectal cancer survival has seen improvements for both males and females since 1981-1985.

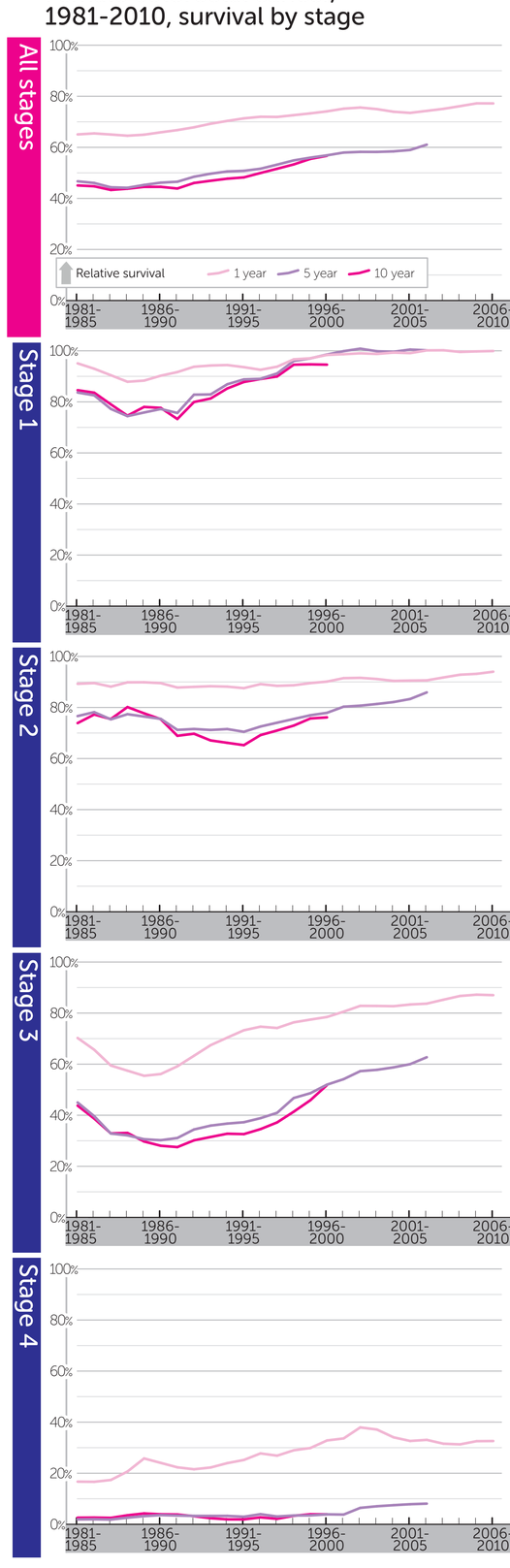
For stage 1 cancers, one-year survival has remained just under 100% for most of the study period for both males and females. For females, one-year survival has seen a significant increase between 1981-1985 and 2006-2010 while males have seen a significant increase between 1986-1990 and 2006-2010. Increases were seen for five-year survival from stage 1 colorectal cancer for both males and females. There was a significant increase in ten-year survival for both males and females for those diagnosed in 1996-2000 compared to those diagnosed in 1986-1990.

Stage 2 colorectal cancers have exhibited increases in one-year and five-year survival since the early 1990s for both males and females. However, only females have seen a significant increase in ten-year survival since the early 1990s.

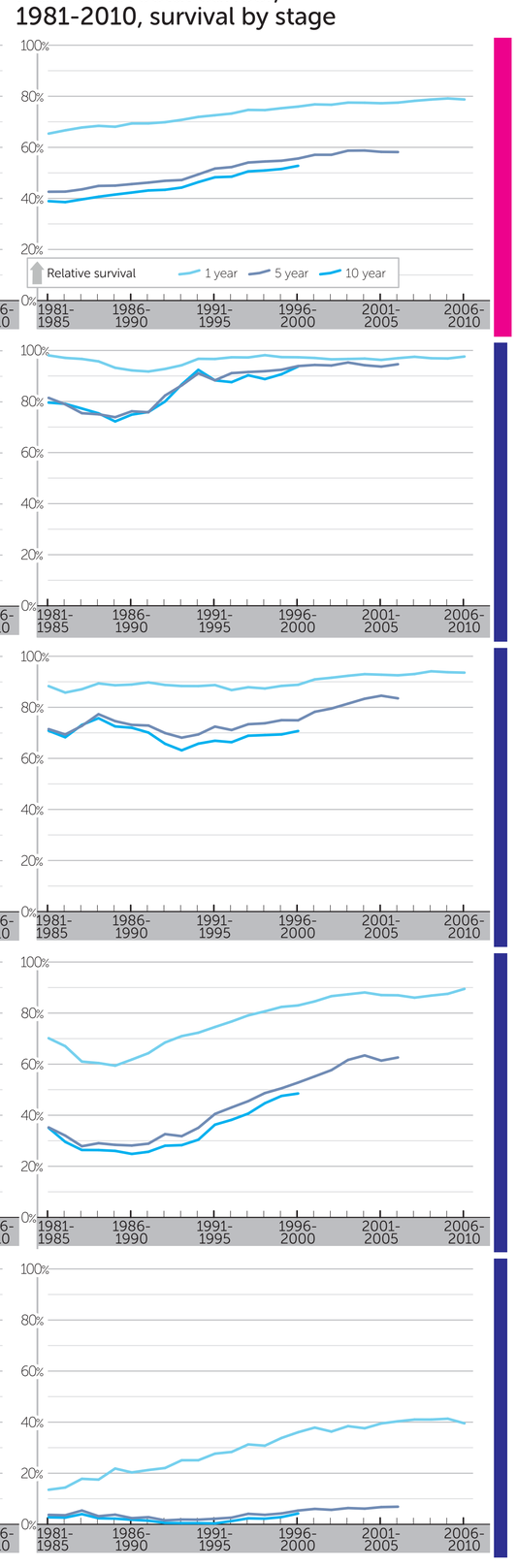
Stage 3 colorectal cancer has also seen a marked increase in one-, five-, and ten-year survival since the early 1990s.

Stage 4 colorectal cancer has seen clear increases in one-year survival. Five-year and ten-year survival rates have been consistently low since the beginning of the study period.

Female colorectal cancer, 1981-2010, survival by stage



Male colorectal cancer, 1981-2010, survival by stage



DISCUSSION

While improvements over time in survival by stage are likely to be associated with improvements in treatment, it is possible that stage migration also contributes. Improved diagnostic techniques are likely to have 'up-staged' the worst prognosis cases in each stage and so will have improved survival of each stage according to the Will Rogers phenomenon.[1]

Breast cancer

Treatment effects for those diagnosed with stage 3 or stage 4 cancers are limited over the study period, and increases in overall survival are likely to be predominantly due to stage shift and earlier diagnosis, with some additional improved treatment effect for stage 1 and 2 cancers for five- and ten-year survival.

Colorectal cancer

Treatment effects are apparent for those diagnosed with stage 1, 2 or 3 cancers while stage 4 cancers are only showing improvements in one-year survival. Stage shifts are difficult to ascertain as there have been a high proportion of cases staged as unknown. Increases in overall one-year survival for colorectal cancer seem to be due to improvements in treatment for stage 3 and 4 cancers, while overall increases in five- and ten-year colorectal cancer survival are likely to be because of improvements in treatment for stage 1 to 3 cancers. Screening programmes should increase the proportion of people diagnosed at an earlier stage.

1 Feinstein AR, Sosin DM, Wells CK. The Will Rogers phenomenon. Stage migration and new diagnostic techniques as a source of misleading statistics for survival in cancer. New Engl J Med 1985; 312 (25): 1604–1608

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