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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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ARTICLE INFO

Article history:

Available online 15 November 2011

Keywords:

Cancer survival
Socioeconomic inequalities
Avoidable deaths

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.

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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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doi:10.1016/j.ejca.2011.10.008

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):

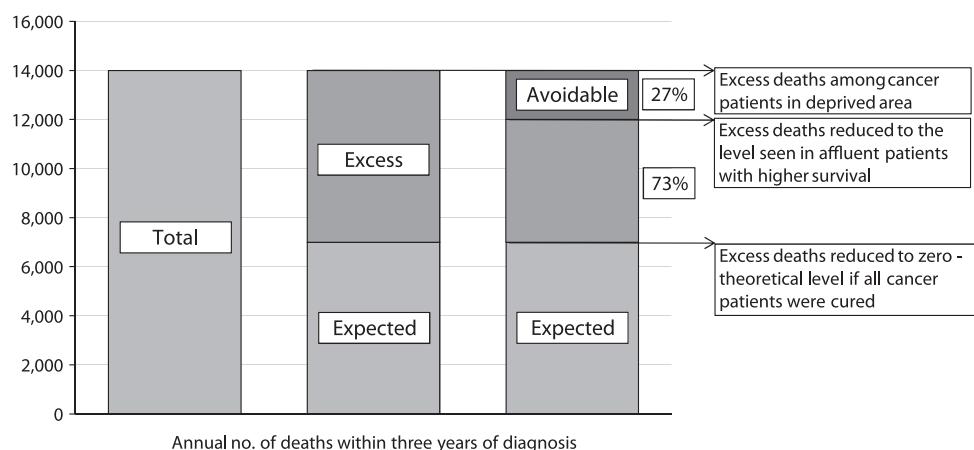


Fig. 1 – Partition of the annual number of deaths in cancer patients within three years since diagnosis into the number expected from background mortality and the number of excess deaths (attributable to cancer). This hypothetical example shows the proportion of all excess deaths that would be avoidable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

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