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Effects of breast and colorectal cancer on labour market outcomes—Average effects and educational gradients

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ABSTRACT

We estimate causal effects of breast and colorectal cancer on labour market outcomes 1–3 years after the diagnosis. Based on Danish administrative data we estimate average treatment effects on the treated by propensity score weighting methods using persons with no cancer diagnosis as control group. We conduct robustness checks using matching, difference-in-differences methods and an alternative control group of later cancer patients. The different methods give approximately the same results. Cancer increases the risks of leaving the labour force and receiving disability pension, and the effects are larger for the less educated. Effects on income are small and mostly insignificant. We investigate some of the mechanisms which may be important in explaining the educational gradient in effects of cancer on labour market attachment.

1. Introduction

Improvements in cancer screening, detection and treatment have led to an increase in the number of people surviving cancer and an increase in cancer survivorship as a chronic health condition; see e.g. Cutler (2008). Some types of cancer often strike people at working age, and the effects of cancer on labour market outcomes are important for the individual and society. First, if an individual cancer survivor leaves the labour force because of the cancer, it may be an indication of serious negative (long-term) effects on health and well-being. Similarly, reductions in working hours or earnings may be an indication of negative effects on health and well-being. Also, negative effects on employment and earnings for cancer survivors represent an economic loss to society in the same way as the loss of lifetime earnings due to cancer mortality (Bradley et al., 2008). Previous studies have found socioeconomic gradients in cancer survival (e.g. Dalton et al., 2007; Carlsen et al., 2008a) which may involve differences in the timing of diagnosis, in treatment, in recurrences/second cancers and in other factors. For cancer survivors, these factors may also be important for potential social inequality in effects of cancer on labour market outcomes, but other factors may be important as well, for instance differences in job options, which may depend on education, labour market experience and type of job before the cancer diagnosis.

This paper focuses on labour market outcomes (labour market attachment, earnings and total income) of cancer survivors up to three years after the diagnosis. We estimate causal effects of cancer using different identification strategies and investigate if there are educational gradients in these effects. We also analyse some mechanisms which might explain the educational gradients.

Different forms of cancer may have very different consequences for survivors in terms of labour market outcomes. In this paper we focus on two forms of cancer with high survival rates which strike relatively many people of working age: Breast cancer and colorectal cancer.[1]

[1] We conducted similar analyses for melanoma skin cancer which also strike many people of working age. However, we did not find any significant effects of melanoma skin cancer on labour market attachment or income. Therefore, we do not report specific estimation results for skin cancer in this paper. It is not surprising that the negative effects of breast and colorectal cancer are larger than the effects of melanoma skin cancer because of more serious effects on health conditions of the cancer disease itself, and also because of more adverse effects of the medical treatment, both in the short and long term.

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In a Grossman (1972) type model a negative health shock, e.g. due to cancer, may reduce labour supply by increasing time spent on being ill, raising tastes for leisure, decreasing productivity and increasing time needed for investment in health maintenance. However, if health insurance is tied to employment as it is in the US, a negative health shock may increase labour force participation and work effort for those who are still able to work, since the costs of losing their job and thereby their health insurance may increase; see Currie and Madrian (1999) and Bradley et al. (2012). Since we use Danish data and since the whole population in Denmark is covered by public health insurance, we expect negative effects of cancer on labour market participation and earnings.

The contributions of the present paper are the following. We use a large longitudinal administrative Danish dataset. We select for the years 2000–2004 all cases of breast and colorectal cancers of 30–60-year-olds who did not have cancer earlier and who survived at least three years after the diagnosis. We estimate separate effects for each type of cancer comparing with a large control group of people with no cancer diagnosis. There are no problems of attrition (except for death and emigration). Our sample is much larger than other population-based prospective and longitudinal studies estimating impacts of cancer on labour market attachment and earnings; see e.g. the survey by Steiner et al. (2004) and additional references in Moran et al. (2011). We are able to condition on a large number of baseline variables including demographics, education, labour market outcomes and health conditions. We observe outcomes for each person in each year for several years before and after the base year (year of diagnosis). We consider many outcomes including labour market attachment, earnings and total income before and after taxes. The large number of cancer cases in the dataset allows us to estimate separate effects for each type of cancer with great precision. We estimate the 'average treatment effect on the treated' using propensity score weighting techniques to estimate the counterfactual outcomes of cancer patients in case they did not have cancer, conditioning on baseline variables. We conduct robustness checks using matching estimators and difference-in-differences estimations. In other robustness checks we use an alternative control group of later cancer patients, which to our knowledge is a new approach in the estimation of effects of cancer on labour market outcomes. We investigate if there is social inequality (educational gradients) in the effects of cancer on labour market outcomes and explore some potential mechanisms behind such inequality.[2] We also present separate estimates for survivors with and without recurrences and/or second cancers.

We find that for patients with breast or colorectal cancers, the average risk of leaving the labour force increases by 5–8 percentage points 1–3 years after the diagnosis. There is a significant social gradient. For patients with no education beyond compulsory school the effect is 8–11 percentage points whereas it is 1–5 percentage points for patients with a further or higher education. A large share of the patients leaving the labour force receive disability pension which implies leaving the labour force permanently due to health conditions. The negative effects on total income are small. Estimates also indicate only very small negative effects on hourly wages and earnings for those who work (although these estimates may be biased due to induced sample selection, since those who remain employed, in spite of having cancer, may have a greater commitment to their careers, suggesting that the true effects could be more negative). The educational gradients in the risk of leaving the labour force are not explained by differences in the risks of metastasised cancer at diagnosis or second cancers/recurrences across education groups, since these differences are very small. Effects of cancer on the risk of leaving the labour force are much larger for those who were blue-collar workers at baseline than for those who were white-collar workers, and stratification by job type at baseline reduces educational gradients in effects of cancer on labour market status.

The contents of the remainder of this paper are as follows. Section 2 contains a short survey of related studies. In Section 3 we discuss the empirical methods. Section 4 describes the data. In Section 5 we present results, and Section 6 contains conclusion and discussion.

2. Previous literature

Most papers in the literature on labour market effects of cancer use US survey data, and many papers focus on breast cancer. Bradley et al. (2002a,b) find (based on data from the Health and Retirement Study of women aged 51–61) that the probability that breast cancer survivors are working 1–32 years after the diagnosis (on average seven years after) is about 7 percentage points less than for women without breast cancer; among women who work, breast cancer survivors work about 3 h more per week, their hourly wage rate is about 13% higher, and their earnings are about 20% higher. The substantial positive effects for cancer survivors who continue to work are surprising, but apparently they are not caused by selection or the fact that health insurance in the US is linked to employment status. Bradley et al. (2005) find that the probability of employment is reduced by 18 percentage points 6 months after the diagnosis for breast cancer patients in Detroit, and weekly working hours are reduced by 7 h (19%) conditional on employment at follow-up.

Other papers in the literature lump together many different types of cancer. Moran et al. (2011) estimate the effect of cancer on employment outcomes 2–6 years after diagnosis for workers aged 28–54 at the follow-up. They use data from the US and lump together all types of cancer except superficial skin cancers. They find that probabilities of working and working full-time are reduced by 7–8 and 6–10 percentage points, respectively, and that the negative effect on usual weekly working hours is 3–6 h. Short et al. (2008) conduct a similar analysis for older workers and find similar or somewhat smaller effects for this group. Datta Gupta et al. (2011) estimate the effect of cancer on the probability of not working 2–4 years after the diagnosis for individuals who were about 54–62 years of age at the time of diagnosis. They use data for the US and Denmark and lump together all types of cancer except skin cancer. They find that cancer increases the probability of not working by 8–9 percentage points.

Carlsen et al. (2008b,c) estimate effects of cancer on the risk of unemployment and disability pension, respectively, using Danish register data. Their results indicate a small increased risk of unemployment (which is significant when several types of cancer are lumped together, but not for each type of cancer separately) and a substantially increased risk of receiving disability pension. However, it is problematic to interpret their estimates as causal effects of cancer since they estimate Cox proportional hazards models with *time-dependent* covariates including income, job type and various health indicators, which are not exogenous to cancer status.

3. Empirical methods

We estimate the causal effect of cancer on labour market outcomes. Let D_i denote 'treatment' status of person i, where $D_i = 1$ if the person has cancer (is in the treatment group) and 0 otherwise (i.e. if he/she is in the control group), and let Y_{0i} and Y_{1i} denote the

[2] To the best of our knowledge, social inequality in effects of cancer on labour market outcomes has not been analysed before.