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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.

JEL classification: I1; I14; J21

Keywords: Return to work; earnings; income; disability pension; social gradient

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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 and 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

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

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.

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

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

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, 2002b) 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 three hours 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 seven hours (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 hours. 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 two potential outcomes. We want to estimate the average treatment effect on the treated (ATT), i.e. $E(Y_{1i}|D_i = 1) - E(Y_{0i}|D_i = 1)$. The last term is unobserved (it is the potential outcome for cancer patients if they did not have a cancer diagnosis), and to estimate it we use the propensity score weighting method; see Hirano and Imbens (2001). We first estimate a propensity score function using a logit model for the probability of cancer, where we include as explanatory variables baseline characteristics which may affect both the probability of getting cancer and potential labour market outcomes. We then calculate weights for each person:

$$w_i = D_i + (1 - D_i)\hat{p}_i/(1 - \hat{p}_i) \quad (1)$$

where \hat{p}_i is the estimated propensity score. Thus, the weights for the treatment group are 1 and for the control group they are equal to the odds of the estimated propensity score. The weights for the

control group are normalised so that they add up to the number of observations in the treatment group. The ATT is then equal to the simple average of the outcome for the treatment group minus the weighted average for the control group.³ If the balancing properties after propensity score weighting are not satisfactory, Hirano and Imbens (2001) suggest correcting remaining covariate bias in a second stage regression. However, in our case there is no significant covariate bias after weighting the control group observations, and the simple propensity score weighting estimates are very similar to estimates from a second stage regression. Therefore, we do not show results from second stage regressions. We calculate standard errors corrected for the estimation of the propensity score using an M estimator framework as in Hirano and Imbens (2001).

The propensity score weighting estimator is based on the assumption of selection on observables, i.e. unconfoundedness given control for observed baseline characteristics, including lagged outcomes. We use administrative register data (see below) and we are able to take account of a very large set of control variables, including both the lagged levels and lagged trends of labour market variables, and initial health conditions. When estimating the ATT, we observe the outcomes for the cancer group, and we estimate their counterfactual outcome in case they did not have cancer by the weighted average outcome for the control group (where the weights are determined by all the control variables included in the propensity score function).

The most important unobserved confounders are lifestyle variables, for instance smoking and alcohol consumption, which may affect both the probability of cancer and potential labour market outcomes. For instance, smoking may increase the risk of cancer and it may also have a detrimental effect on labour market outcomes in case the smokers do not get cancer. Therefore, the fact that we do not observe smoking (or other lifestyle factors) might bias our estimates of labour market outcome effects of cancer downwards (i.e., exaggerate the negative effects). However, this potential bias may be assumed to be rather small given the very large set of control variables, especially the fact that we control for both the lagged levels and lagged trends of labour market variables and for initial health conditions. Anyway, we conduct several robustness checks. First, we estimate effects of cancer using difference-in-differences, taking account of unobserved individual fixed effects. Let

³ Hirano et al. (2003) show that this estimator is efficient if the propensity score is estimated non-parametrically. In a Monte Carlo study Frölich (2004) found that the weighting estimator performed poorly compared to matching estimators in finite samples. However, Busso et al. (2013) show that this result is due to specific features of Frölich's study. They conclude that reweighting is competitive with the most effective matching estimators when overlap is good, which is the case in our application where we estimate the ATT with a very large control group and no common support problems. Nevertheless, we have conducted robustness checks using matching; see Section 5.4.

Δy_{it} be the change in labour market status or income for person i from, e.g., two years before base year t (which for the treatment group is the year of cancer diagnosis) to, e.g., three years after the base year. A simple dif-in-dif estimate is the difference between the average of Δy_{it} for the treatment and control groups, respectively. However, we allow the change in labour market outcomes to depend on age and base year dummy variables (and gender if the analysis is not stratified by gender), and we weigh observations in the control group so that our dif-in-dif estimate is an ATT estimate. We use the two-step propensity score weighting dif-in-dif estimator suggested in Abadie (2005, p. 8): We estimate a propensity score function as in our main analysis, but only including age and base year dummies as explanatory variables, and use the odds of the estimated propensity scores as weights when computing the weighted mean of Δy_{it} for the control group. The identifying assumption is that (conditional on age and base year) the expected trend in y_{it} for the cancer group in case they did not have cancer would be equal to the trend for the control group.⁴

As another robustness check we conduct similar analyses using an alternative control group: Instead of using persons with no cancer as control group, we use persons who got cancer five years later than the treatment group. For instance, for the treatment group of persons diagnosed with breast cancer in the base year 2000 we choose as control group persons diagnosed with breast cancer in 2005. Since the follow-up period is limited to three years after the base year (up to 2003 in this case), the control group is not affected by cancer during this period. Presumably, this group of later cancer patients is more similar to the treatment group in terms of unobserved characteristics, including lifestyle variables, than a control group who did not have cancer.

4. Data

We use Danish administrative register data. The Danish Cancer Registry is a population-based registry containing data on the incidence of cancer throughout Denmark since 1943. Using personal identification numbers, this registry is merged with other population registers on demographics, education, labour market status, incomes, type of job, industry, municipality of residence, contacts to general practitioners, hospitalisation and purchase of prescription drugs.

⁴ The relation between dif-in-dif methods and methods based on the selection-on-observables assumption is discussed in, e.g., Imbens and Wooldridge (2009) and Lechner (2011).

4.1 Cancer and control groups

The treatment or cancer groups are selected from the Cancer Registry. We select all individuals who got a diagnosis of breast cancer (ICD10 code C50) or colorectal cancer (C18-C21) in the period 2000-2004; who did not have any cancer before this period (neither according to the Cancer Registry nor the hospitalisation registry); who were between 30 and 60 years of age in the year of diagnosis; and who survived at least to the end of the third year after the year of diagnosis.

For each base year 2000-2004 the basic control groups consist of all individuals aged 30 to 60, who survived at least three years after the base year, and who did not have any cancer diagnosis (neither before nor after the base year).⁵ Since these basic control groups are very large, we select a random sample for the analysis: A 4% random sample of women meeting the above criteria for the breast cancer analyses, and a 2% random sample of women and men for the colorectal cancer analyses.⁶ The procedure for randomly selecting the control groups for the analyses ensures that no person is in the control groups for two different base years, and that the age distribution of the control groups in each base year is the same as in the basic control groups. The alternative control group of later cancer patients used in robustness checks is discussed in Section 5.5.

We exclude from the analysis persons who received disability pension or transitional benefits two years before the base year.⁷ The majority of this group have left the work force permanently since disability pension is only given to persons with significantly and permanently reduced working capacity and transitional benefits were offered to older unemployed workers as a transition to early retirement pension (available from age 60). In the final estimations, the number of cases in the treatment groups are 5683 (breast cancer), 736 (colorectal cancer, women) and 952 (colorectal

⁵ We also require that each person in the cancer and control groups was living in Denmark (and therefore had records in the national registers) in each year since 1995.

⁶ A 4% random sample of women for the control group for the breast cancer analyses gives a ratio of controls to cancer patients of about 28/1. This ensures that there are no common support problems even if the (unweighted) control group and the cancer group have rather different characteristics, especially in terms of age, and that balancing properties are very fine after weighting the control group; see Section 5.1. A 2% random sample of men and women for the control group for the colorectal cancer analyses ensures a control group of about the same absolute size, but since colorectal cancer is less frequent, the ratio of controls to cancer patients is about 105/1. Reducing the control group for colorectal cancer to the same relative size as for breast cancer does not change results in any significant way.

⁷ The Danish terms are 'førtidspension' and 'overgangsydelse'.

cancer, men). The control group for breast cancer has 157,137 observations and those for colorectal cancer have 70,344 (women) and 95,392 (men).⁸

4.2 Outcome variables

Table 1 is a descriptive table of means of variables for labour market status, income and earnings of the cancer and control groups from two years before the base year to three years after. The basic variables for labour market status (employed, unemployed, out of labour force, wage earner and self-employed) in the upper part of the table are defined in terms of the most important type of income during the year. Thus, every person is classified as either employed, unemployed or 'out of the labour force'. The group of employed consists of wage earners and self-employed. Full-timers are self-employed or employed workers who work full time. The category 'out of the labour force' (or non-participants) consists mainly of people receiving social assistance, sickness benefits, disability pension or early retirement pension, or people on leave or being supported by their spouse; a small share are students.

The figures in Table 1 are purely descriptive. They are not corrected for age or other variables, and this is important since the cancer groups are much older than the control groups. Anyway, there seems to be a marked decrease in the share in employment for the cancer groups compared to the control groups, and a similar increase in the share out of the labour force, whereas the share of unemployed does not change much over time. For the cancer groups, the share of wage earners and self-employed decrease markedly, and the share of full-time employed decrease more than the share of employed reflecting an increase in part-time employment. The share receiving disability pension is zero in year t-2 due to the selection of the sample (see above). However, this share increases to about 10% for the cancer groups, whereas the increase for the control groups is much smaller. However, the age distribution for the different groups is very important. The variable 'unemployment' in the table is the fraction of the year a person is unemployed. As for the dummy variable for whether the person is unemployed for most of the year, there does not seem to be significant differences between the cancer and control groups in the development of this variable.

Earnings decrease markedly for the cancer groups compared to the control groups, which is not surprising given the decrease in labour market participation. The variable 'income' is total personal income before taxes (including transfer income), and disposable income is total personal after-tax

⁸ The control group for women with colorectal cancer is smaller than the control group for men because more women than men of ages 30-60 had a cancer diagnosis.

income. The development of the two income variables is not very different for the different groups, although it is less favourable for the cancer groups.⁹

4.3 Control variables

We use a large set of control variables. We control for age (30 dummy variables), whether the female had no children at the age of 30 (in the breast cancer analysis), family structure, the number of children at different ages and education. In addition, we control for variables measured at least two years before the base year (since these variables measured in the base year or the year before may be affected by cancer diagnosed in the base year, especially if the cancer is discovered and diagnosed at a late stage): Labour market status, income, earnings and labour market experience (two years before the base year and the change in these variables from five years before to two years before the base year), industry and job type (two years before the base year), initial health status measured by dummy variables for hospitalisation for categories of diagnoses and for purchase of main relevant types of prescription drugs, and the number of contacts to general practitioners. In addition we include dummies for region, type of municipality and base year. Table A1 in the appendix shows the means of these variables for each cancer and control group, and two-sample *t* statistics for differences in means. Cancer and control groups are very different in terms of age. The cancer groups are much older on average than the control groups. Differences with respect to some of the other variables are also important, but age-adjusted differences are in general much smaller than the differences in the unadjusted means shown in Table A1.

5. Results

5.1 Propensity score estimation and balancing properties

Table A2 in the appendix shows the results of estimating the three propensity score functions for getting cancer. Age is the most important predictor, as expected. Not having a child at the age of 30 significantly increases the risk of breast cancer. Baseline labour market attachment, industry, job function and hospitalisation are largely insignificant. The baseline variables for consumption of prescription drugs are also insignificant, except that antidepressants are positively correlated with the risk of cancer. The region of residence is significant, but only for breast cancer.

⁹ Negative incomes are set equal to zero. Incomes above the 99 percentile are set equal to this percentile.

After weighting the observations in the control groups by the weights determined by the estimated propensity scores, the balancing properties are very good. Two-sample t test statistics for equality of means of the control variables are all below 0.3 (numerically), and the majority is below 0.05.

5.2 Results for labour market attachment

Table 2 shows the results for the ATT for labour market attachment variables, earnings and income for the whole sample. For each of the three samples, there are three columns. The first one shows the weighted mean for the control group (WM C) which is the estimated counterfactual outcome for cancer patients in case they did not have cancer. The next column shows the average treatment effect on the treated (ATT), i.e. the difference between the (unweighted) average for the cancer group and the weighted average for the control group, and the third column shows the standard error for the ATT (corresponding to the two-sample t statistic for equality of the two means). We show all outcomes from period $t-2$ (two years before the base year/the year of diagnosis) to period $t+3$.

The first outcomes concern labour market attachment. Getting cancer in year t reduces the probability of being employed (most of the year) by about 3.6-4.5 percentage points in year $t+1$, by 5.7-7.3 percentage points in year $t+2$, and by 6.7-8.7 percentage points in $t+3$. Point estimates for year $t+2$ and $t+3$ indicate very similar effects of breast cancer (for women) and colorectal cancer for men, whereas effects of colorectal cancer for women are a little larger numerically (although these differences are not significant). The probability of being unemployed (for most of the year) is reduced by 1.2-2.4 percentage points in year t and $t+1$. This is not surprising, since unemployed workers who get cancer, and employed workers who lose their job because of cancer, are not considered unemployed, but out of the labour force, and they will receive sickness benefits instead of unemployment benefits, typically up to a year after diagnosis. There is no effect of getting cancer in year t on the risk of unemployment in $t+2$ and $t+3$. This may be due to counteracting forces: Cancer patients with work capability may be at a higher risk of becoming unemployed, but other cancer patients who would have had a high risk of being unemployed if they did not have cancer may typically receive disability pension, or they may receive sickness benefits for an extended period of time. Those who are not employed or unemployed are categorised as nonparticipants (out of the labour force), so the ATT for out of the labour force is equal to the sum of the ATT for being employed and unemployed with opposite sign.

The reduced probability of being employed as a consequence of getting cancer reflects reduced probabilities of being both wage earner and self-employed. The effect on being self-employed is insignificant due to the small share of self-employed (in year $t-2$ it is about 5% and 7% for women who get breast or colorectal cancer in year t , and 13% for men getting colorectal cancer), but according to the point estimates for year $t+3$ the relative reduction in the probability of being self-employed is larger than the relative reduction in the probability of being a wage earner.

The expected effect of cancer on the probability of working part time is not clear, since those who are part-timers at the outset may have a higher risk than full-timers of leaving the labour force, and at the same time some full-timers may shift to part-time employment because of cancer. For breast cancer the net effect is a small increase (of 1.2 percentage points) in the probability of part-time employment in $t+3$ (since the probability of being employed on full time is reduced by 7.9 percentage points, whereas the overall effect on being employed is a reduction of 6.7 percentage points); the share of part-timers *among the employed* increases from 10.3 to 12.9% because of breast cancer.¹⁰ This may seem surprising given that Bradley et al. (2002a, 2002b) found for US data that cancer survivors worked more hours per week than their non-cancer controls, but the different results might be due to different institutional settings. In the US health insurance is tied to employment which gives stronger incentives for cancer survivors to stay employed and increase working hours (although analyses in Bradley et al., 2002a, indicate that this is not an important explanation), and if financial losses during cancer treatment are larger in the US, cancer survivors may want to compensate for this later. The net effect of colorectal cancer on part-time employment is a small increase for women (by 0.6 percentage points) and a small reduction for men (by 0.8 percentage points); the share of part-timers among the employed increases from 12.6 to 15.1% for women, whereas it is approximately constant at 12.4% for men. Thus, cancer increases the share of part-timers among the employed by about 2.5 percentage points for women, while there is no effect for men. These results (and other results in Table 2 on effects of cancer) are not changed substantially by restricting the analysis to those employed at baseline; see Section 5.7.

A large share of persons leaving the labour force after getting cancer receive public disability pension. Cancer increases the probability of receiving disability pension by 1.3-2.6 percentage points in year $t+1$, by about 4 percentage points in $t+2$, and by about 6 percentage points in $t+3$. The

¹⁰ For the weighted control group, 79.3% are employed and 8.2% (79.3%-71.1%) are part-timers, and thus the share of part-timers among the employed is 10.3% (8.2/79.3). For the cancer group, 72.6% (79.3%-6.7%) are employed and 9.4% are part-timers.

effect of cancer on the fraction of the year a person is unemployed is negative in the year of diagnosis and the year after, as was the case for the probability of being unemployed most of the year.

The short-term effects of cancer (up to about one year after the diagnosis) discussed above reflect to some extent the institutional setting. Thus, in Denmark most white-collar workers who get cancer will keep their job and continue to receive their normal wages for about one year even if they are absent due to illness – and they are registered as employed workers. On the other hand, most blue-collar workers will only receive sickness benefits, which are significantly below normal wages for most workers, during their illness period. Workers receiving sickness benefits are in the out-of-labour-force category.

5.3 Results for earnings and income

The last three outcomes in Table 2 are earnings, total income before taxes (including transfer income) and total income after taxes. The effect of cancer on earnings is negative and significant which is not surprising, since persons leaving the workforce have zero earnings. In year $t+3$ the reduction in average earnings is 9-11%, which is very similar to the reduction in employment. The negative effects on total income before and after taxes are very small, only about 3% before taxes and 1-2% after taxes in year $t+3$, and only statistically significant for breast cancer. It may seem surprising that average income effects are so small, but there are several explanations for this. First, as discussed above, most white-collar workers retain their job and earnings for about one year after they reported sick and blue-collar workers will receive sickness benefits which are 90% of previous earnings for low-income workers, but less for high-income workers due to a maximum ceiling on the benefits. The maximum duration of sickness benefits is normally one year, but in case of cancer (and other serious diseases) they may be extended for several years. Secondly, some cancer patients will receive disability pension (as discussed above). Thirdly, cancer patients who lose a significant amount of their working ability will receive insurance payouts from labour market pension schemes or private pension or insurance schemes in the form of a lump sum (non-recurring amount) and a recurring pension, typically a percentage of previous earnings or an amount equivalent to the old-age pension one would have been eligible for at the time of retirement; and these pension payouts will typically be on top of the public disability pension.

As we discussed above, the negative effect of cancer on earnings (see Table 2) corresponds to a similar relative decrease in the probability of being employed. It is of interest to estimate the earnings effect for wage earners who continue to be employees for most of the year. A negative earnings effect could indicate a loss of productivity even for cancer patients who maintain a strong labour market attachment, and it may also reflect an increase in part-time employment. Table 3 shows the effect of cancer on earnings where the sample in each year is restricted to persons who are employees (for most of the year). That is, we estimate separate propensity score functions for each year from $t-1$ to $t+3$ and calculate for each year the ratio of average earnings for the cancer groups relative to the weighted control groups. Restricting the samples to wage earners each year, cancer has only a small negative effect on earnings, which is less than 3% (except for men with colorectal cancer in year t and $t+1$ where it is 4.5%); the effect is marginally significant for breast cancer, but not for colorectal cancer (where we have fewer observations). However, it is important to note that these estimates are subject to an induced sample selection problem, since those who remain employed, in spite of having cancer, may have a greater commitment to their careers and therefore higher increase in earnings than other workers, suggesting that the true effects could be more negative.

Table 4 corresponds to Table 3 except that we estimate the effect on the hourly wage rate instead of earnings.¹¹ The estimates in Table 4 reflect potential productivity effects to a larger extent (since the hourly wage rate is not affected by the number of hours worked), but they are of course subject to the induced sample selection problem discussed above. There is no significant effect on the wage rate, and point estimates indicate a negative effect of only about 1% in year $t+3$ (and an even smaller effect for women with colorectal cancer).

5.4 Matching and difference-in-differences estimates

The results do not change in any significant way when we use propensity score matching instead of propensity score weighting, and point estimates are very similar across estimation methods. This is illustrated in Tables A3-A5 in the appendix showing results using nearest neighbour (one-to-one) matching and kernel matching (with and without trimming) based on the same estimated propensity scores as we use in the weighting estimations in Table 2. Details about the matching estimations are explained in the note to Table A3.

¹¹ The sample is somewhat smaller in Table 4 since it is restricted to employees for whom we have reliable administrative data for hourly wages.

The estimations above assume selection on observables; see Section 3. As a robustness check we use difference-in-differences which take account of unobserved individual fixed effects. For each person i in the cancer and control groups we calculate $\Delta y_{it+j} = y_{it+j} - y_{it-2}$, $j = 0,1,2,3$, where y is the outcome and t is the base year. The age structure of the cancer and control groups is very different (see Table A1), and the change in labour market outcomes may depend on age (and base year). Therefore, in order to estimate the ATT by dif-in-dif, we use a two-step procedure (see Abadie, 2005). First, we estimate a propensity score function including only the 30 age dummies and four base year dummies as explanatory variables. Second, we estimate the ATT by the average of Δy_{it+j} in the cancer group minus the weighted average of Δy_{it+j} in the control group, using the odds of the estimated propensity score as weights. These dif-in-dif estimates are shown in Table 5.¹² They are very similar to the corresponding main estimates in Table 2 discussed above and clearly not statistically different from these.

5.5 Alternative control groups of later cancer patients

As another robustness check we conduct similar dif-in-dif analyses using alternative control groups of persons who got cancer five years later than persons in the treatment groups. For instance, for the treatment group of persons diagnosed with breast cancer in the base year 2000 we choose as control group persons diagnosed with breast cancer in 2005 (who did not have any cancer diagnosis before 2005). Since the follow-up period is limited to three years after the base year (up to 2003 in this case), the control group is not affected by cancer during the period for which we measure outcomes (2000-2003). Since we have data from the Cancer Registry up to 2008, the analyses with the alternative control groups are limited to four base years, 2000-2003, with the control groups consisting of persons diagnosed with cancer in 2005-2008, respectively.

As we discussed in Section 3, this group of later cancer patients is, presumably, more similar to the treatment group in terms of unobserved characteristics, including lifestyle variables, than a control group who did not have cancer. The control group may of course still have somewhat more favourable unobserved characteristics than the treatment group since they get cancer five years later, but on the other hand their cancer diagnoses are on average more severe since we do not apply

¹² We show in Table 5 and the following tables only results for some of the outcomes in Table 2. Thus, we do not show effects on unemployment (since these are very small and insignificant except in years t and $t+1$) or results for the probability of being wage earner or self-employed (since effects on the probability of being self-employed are small and insignificant due to the low number of self-employed). Also, we do not show effects for years $t-1$ and $t-2$ which are, as expected, very small and clearly insignificant in all estimations.

any restrictions on survival after diagnosis for the control group, whereas the treatment group is restricted to persons surviving at least three years after the diagnosis.

The results using this alternative control group are very similar to the results reported in the previous sections; see Table 6 which may be compared to Tables 2 and 5. Restricting the control groups of later cancer patients to only include persons who survived for at least three years after diagnosis does not change results in any significant way; see Table A6 in the appendix.

5.6 Educational gradients

In order to investigate if there is an educational gradient in the effects of cancer, we split the sample according to education level: only compulsory education (9th grade), vocational education, and further education (short or long further education, or higher education). For each educational group we estimate a propensity score function (with the same explanatory variables as in Table A2) and calculate the weighted means of the outcomes for the control group.

Table 7 shows the effects of breast cancer. For women with only compulsory education, breast cancer increases the probability of being out of the labour force by 4-5 percentage points in the year of diagnosis, and by about 10 percentage points the following three years. For those with a further (or higher) education the short-term effect in the year of diagnosis is insignificant (and the point estimate indicates an effect of about 1 percentage point); in year $t+1$ the effect is about 3 percentage points, and it increases to about 5 percentage points in year $t+3$. Thus, the effects measured in absolute terms (in percentage points) are much larger for the low educated. However, this is not the case regarding long-term relative effects: Cancer increases the risk of being out of the labour force in year $t+3$ by about 50% (from 10.3 to 15.5%) for those with a further education, whereas the risk is increased by about 35% (from 27.1 to 36.8%) for those with no education beyond compulsory school. Effects for those with a vocational education fall in between the effects for the lower and higher educated. Effects on the probability of being employed are roughly equal (numerically) to the effects on the probability of being out of the labour force; there are some differences, especially in years t and $t+1$ and for the low-educated, due to effects on the probability of being unemployed.

The pattern of effects is similar for the probability of receiving disability pension. For those with no education beyond compulsory school cancer increases the probability of receiving disability pension by 3.5 percentage points in year $t+1$ and by 9.3 percentage points in $t+3$. The corresponding effects for those with a further education are only 0.3 and 3.7 percentage points, respectively.

Earnings losses are much larger for the low-educated (especially in relative terms and in year $t+1$) which reflects the higher probability of being out of the labour force. The estimated effects of cancer on total income before and after taxes are very similar across educational groups and only few are significantly different from zero. Thus, there is no significant educational gradient in income effects.

Table 8 shows the estimated effects for colorectal cancer by education (for women and men together and with gender included as an additional variable in the propensity score function). These effects are approximately the same as for breast cancer. We do not show these results separately for women and men because of the rather small number of observations in each educational group; point estimates indicate somewhat larger educational gradients for men than for women, especially for the probability of being out of the labour force, but standard errors become large and the gender differences are clearly not significant.

The estimated effects by education in Tables 7 and 8 are similar to estimates based on dif-in-dif. As an illustration, Tables A7 and A8 in the appendix show dif-in-dif ATT estimates of effects of breast and colorectal cancer, respectively, by education for the outcomes ‘out of labour force’ and ‘disability pension’. These estimates are very similar to the corresponding estimates in Tables 7 and 8, respectively; there are no significant differences.

Dif-in-dif estimates by education using the alternative control group of later cancer patients are shown in Tables A9 and A10 in the appendix for breast and colorectal cancer, respectively. The results using this alternative control group are very similar to the corresponding results reported in Tables 7-8 and A7-A8. The estimates in Tables A9 and A10 are not significantly different from the corresponding dif-in-dif estimates in Tables A7 and A8, or from the corresponding propensity score weighting estimates in Tables 7 and 8. For breast cancer, point estimates in Table A9 are very similar to the corresponding estimates in Tables 7 and A7. For colorectal cancer, point estimates are somewhat larger in Table A10 than in Tables 8 and A8, especially for the compulsory education and further education groups where estimated effects are up to about 2 percentage points larger. However, the differences between Table A10 and Tables 8 and A8 are clearly not significant, and we did not find indications of systematically larger point estimates when using the alternative control group of later cancer patients in the main analysis without stratification by education (compare Table 6 with Tables 2 and 5). Thus, the main conclusion is clear: the robustness checks

using dif-in-dif and alternative control groups do not indicate bias in the basic propensity score weighting estimates.

5.7 Results for those employed at baseline

In the above analyses the sample included persons who were out of the labour force or unemployed at baseline, i.e. in year $t-2$. In this section we discuss results using a restricted sample which only includes those employed at baseline (about 90% of the full sample). Table A11 in the appendix shows, for this restricted sample (and for some of the outcomes), propensity score weighting estimates corresponding to the estimates in Table 2 for the full sample. In this restricted sample, the probability of being employed in years t to $t+3$ is larger than in the full sample (for both cancer and control groups). The estimates of effects of cancer in Table A11 are very similar to the estimates for the full sample in Table 2. The point estimates of the effect of cancer on the probability of being employed in $t+3$ are numerically a little smaller (0.2-0.3 percentage points) in Table A11 than in Table 2. This is not surprising since cancer may have a larger negative effect on employment for those unemployed at baseline than for those who were employed. Breast and colorectal cancer increase the probability for being part-time employed for women (by 1.5 and 0.8 percentage points, respectively, according to the point estimates), whereas the effect of colorectal cancer for men is negative (-0.7 percentage points). These point estimates are also similar to those of Table 2 (although they are a little larger for breast cancer). The effect of breast cancer on the risks of being out of the labour force and receiving disability pension are a little smaller in the restricted than in the full sample, whereas effects are very similar for colorectal cancer for both genders. Earnings and income effects are also very similar in Tables A11 and 2.

Table A12 in the appendix shows estimates of the effect of breast cancer by education for the restricted sample of women who were employed at baseline. Results are very similar to (and not significantly different from) those of Table 7 for the full sample. The effects of cancer on the risks of being out of the labour force or receiving disability pension in year $t+3$ are a little smaller in Table A12 than in Table 7 according to point estimates. Results for effects of colorectal cancer by education for those employed at baseline (not shown) are also very similar to the corresponding estimates for the full sample in Table 8.

5.8 Type of job at baseline and the educational gradient

To investigate whether the educational gradient may be explained by the type of job at baseline, we classified jobs in year $t-2$ into two categories corresponding approximately to blue- and white-collar jobs.¹³ Table A13 in the appendix shows estimates for effects of breast cancer for each of these two categories of jobs at baseline. The sample size in this table is smaller than in Tables A11 and A12 since it is restricted to women who were wage earners in (most of) the year $t-2$ and who had a job at the end of November that year (since data on types of jobs is based on the occupation at the end of November). Only about 12% of blue-collar workers have a further education whereas this is the case for 77% of white-collar workers. Therefore, it is not surprising that the estimated effects for blue-collar workers in Table A13 are close to an average of the estimates for the compulsory and vocational education groups in Table A12, and that estimates for white-collar workers are close to those for the group with further education.

Table A14 in the appendix shows, for blue-collar workers, the effect of breast cancer by education. The educational gradient in the effect of cancer on the risk of being out of the labour force (or on the probability of being employed) in years $t+1$ and $t+2$ is approximately the same for blue-collar workers (at baseline) in Table A14 as for all employed (at baseline) in Table A12, but in year $t+3$ the educational gradient is much smaller (and insignificant) in Table A14 due to a marked increase in the effect of cancer on the risk of being out of the labour force for those with further education (this effect is 7.7 percentage points in Table A14, but only 4.4 percentage points in Table A12). However, for disability pension in year $t+3$ the educational gradient in the effect of cancer is not reduced much by restricting the sample to blue-collar workers (the difference in effects between low-educated and further-educated is 4.9 percentage points in Table A12 and 4.0 percentage points in Table A14).

Table A15 in the appendix is similar to Table A14 except that it shows results for white-collar workers. Among the 2078 women in the cancer group who were white-collar workers at baseline, only 161 (7.5%) were in the low-education group and standard errors of the estimates for this group are large. Point estimates indicate only very small educational gradients regarding the effect of breast cancer on the probability of being out of the labour force (or employed). In year $t+3$ the

¹³ This classification is based on the register variable 'pstill' for the main occupation at the end of November (codes 31-34 are assumed to indicate white-collar; 35-37 blue-collar) which is broadly consistent with the International Standard Classification of Occupations (ISCO88) codes (major groups 1-5 and 6-9, respectively).

effect of cancer on the risk of being out of the labour force is 3.9 percentage points for the group with compulsory education and 3.5 percentage points for those with further education. The effect of cancer on the risk of receiving disability pension in $t+3$ is about twice as large for the low-educated compared to those with further education (5.8 versus 3.0 percentage points), but the point estimate of the educational gradient is smaller than in Table A12 (where the numbers are 8.0 and 3.1 percentage points). We did not stratify the analysis by job type and education for colorectal cancer since groups become very small and standard errors large.

5.9 Recurrences and second cancers

One may expect that the effects of cancer for survivors with recurrences and/or second cancers are much larger than effects for other cancer survivors. To investigate this we use the cancer registry to identify cases of a second primary cancer (not the first cancer spreading to a new site) within three years after the first cancer. Recurrences (including cases where the first cancer spreads to a new site) were identified from the hospitalization registry by inpatient treatment for a cancer diagnosis (an ICD10 C-diagnosis) from two years after the date of the first cancer (and to the end of the third year after this first diagnosis). For breast cancer survivors, 2.2% experienced second cancers and 8.0% recurrences. For colorectal cancer survivors the shares are 3.1 and 14.7%. Differences in these percentages across education groups are very small and they are therefore not important for the educational gradients in effects of cancers presented above.¹⁴ As expected, effects of cancer are much larger for survivors with recurrences/second cancers. Table A16 in the appendix shows results for breast cancer patients. Cancer increases the risk of being out of the labour force in year $t+3$ by as much as 17 percentage points in case of recurrences/second cancers, but only by about 6% if there are no recurrences/second cancers. However, estimated effects on total income before or after taxes are not larger in case of recurrences/second cancers even if effects on earnings are larger in year $t+2$ and $t+3$ according to the point estimates. This may be due to the large differences between the two groups in effects of cancer on disability pension (see Table A16) and differences in terms of insurance payouts. Results for colorectal cancer are shown in Table A17 and they are very similar to those for breast cancer.

¹⁴ For breast cancer, patients with a further education have a risk of 11.3% of a second cancer/recurrence, whereas it is 9.8% for those with only compulsory education. For colorectal cancer, patients with a vocational education have the highest risk (18.9%) whereas those with a further education have the smallest risk (16.0%).

The estimated effects of breast and colorectal cancer on employment in year $t+3$ in Tables A16 and A17 may be compared to estimated effects in Moran et al. (2011) and Short et al. (2008) 2-6 years after diagnosis of any cancer (except superficial skin cancer) for survivors who were working at baseline and aged 28-54 and 55-65, respectively, at follow-up. These studies also divide the cancer group into survivors with and without new cancers, but their samples are much smaller. For females the estimates for younger workers in Moran et al. (2011) are rather similar to our estimates three years after diagnosis, although their point estimates indicate somewhat larger negative effects on the probability of being full-timer, and also on the probability of working for those with new cancers. In their sample of female cancer survivors, 50% had breast cancer and 2% had colorectal cancer. Estimates for the group of older females in Short et al. (2008) are more similar to ours for those with new cancers; their estimates for survivors without new cancers are not significant. Point estimates in Moran et al. (2011) for males are (numerically) larger than our estimates for effects of colorectal cancer for both genders, especially the estimates for new cancers. However, standard errors are large and in the sample of male cancer survivors in Moran et al. (2011) only 11% had colorectal cancer. The reason for these differences is not that we present results for males and females together in Table A17; effects for males are a little smaller than for females (see Table 2). Point estimates for older male workers in Short et al. (2008) are close to those in Table A17, but they are insignificant for those without new cancers.

As discussed above, differences in the risk of second cancers/recurrences across education groups are small and cannot explain the educational gradients in the effects of cancer. The same is true for differences in cancer stage at diagnosis across education groups, which are also very small. For colorectal cancer, the relative risk of getting metastasised cancer (compared to localised cancer) is actually somewhat higher for those with further education.¹⁵

6. Conclusion and discussion

We estimate effects of breast and colorectal cancer on labour market outcomes and income for three-year survivors in Denmark using different estimation strategies: propensity score weighting (based on the selection on observables assumption) and dif-in-dif (allowing for unobserved

¹⁵ For breast cancer patients with localised cancer, 33.2% have a further education and 30.6% only compulsory education. For breast cancer patients with metastasised cancer (including both regional spread and a few cases of distant metastasis) these percentages are 34.1 and 30.5. For localised colorectal cancer, 27.9% have a further education and 34.5% only compulsory education. For metastasised colorectal cancer the percentages are 31.8 and 27.0. Separate effects of metastasised and localised breast cancer are analysed in Thielen et al. (2013) and Andersen et al. (2013).

individual fixed effects), and we use two different control groups: individuals with no cancer diagnosis, and an alternative control group of later cancer patients. Results are robust to these alternative estimation methods and control groups.

We find significant effects of breast and colorectal cancer on labour market participation and disability pension take-up, and a significant educational gradient: Three years after the diagnosis the risk of being out of the labour force increases by about 10 percentage points for people with no education beyond compulsory school, by about 7 percentage points for people with a vocational education, and by about 4-5 percentage points for those with a further or higher education. The corresponding figures for the risk of disability pension three years after the diagnosis are 9, 5-6 and 3-4 percentage points. For both types of cancer the negative effects on total income are small. Estimates indicate only very small negative effects on hourly wages and earnings for those who work, but these estimates may be biased due to induced sample selection, since those who remain employed, in spite of having cancer, may have greater commitment to their careers, suggesting that the true effects could be more negative.

Several mechanisms may be important in explaining the educational gradient in effects of cancer on labour market attachment. Firstly, as we have shown, individuals with a lower education have considerably higher baseline risks of leaving the labour force and of receiving disability pension. This may indicate that this group is more vulnerable in general, and therefore it may not be surprising that effects of cancer are larger in absolute terms. Thus, even though we find substantial and significant educational gradients in absolute terms, the differences between education groups are smaller in relative terms, i.e. when considering, e.g., the increased risk of leaving the labour force due to cancer divided by the baseline risk in case of no cancer.

Secondly, economic incentives may be important for individuals who are able to work. Thus, people with low education and low income may have stronger incentives to not working and to apply for disability pension because of a higher replacement ratio of public benefits, but on the other hand, people with a higher education and higher income will typically have access to more supplementary compensation from labour market pension schemes or private pension or insurance schemes. Our findings indicate that differences in economic incentives are not very important. Thus, we find only very small negative income effects of cancer and we do not find an educational gradient in income effects. However, there may be significant heterogeneity in coverage, and we do not observe the potential non-participation income of individuals who continue to work, so it might

be that highly educated individuals with a high income and poor supplementary coverage have a higher propensity to continue working instead of applying for disability pension.

Thirdly, individuals with a higher education might be in better health after cancer treatment because they are more aware of likely symptoms so that the cancer was discovered at an earlier stage, or because they receive different treatment, or because they are more efficient in terms of following advice from doctors during treatment and after. However, we found that the risks of metastasised cancer at diagnosis or second cancers/recurrences are not smaller for patients with a higher education.

Fourthly, a larger share of people with a lower education may have to accept physically demanding jobs which may be especially difficult to attend to after a cancer disease. Our results based on stratification by type of job at baseline (indicators of blue- and white-collar workers) are consistent with this hypothesis. Thus, some of the educational gradients in effects of cancer on employment are reduced considerably according to point estimates. However, standard errors in this analysis are large since very few with a further education are blue-collar workers and very few white-collar workers are low-educated. This is not surprising, especially since the indicators of job type are primarily based on the level of qualifications needed in the job rather than how physically demanding the job is. Nevertheless, if one of the mechanisms behind the educational gradients in effects of cancer on employment, which we find, is that a larger share of low-educated patients had physically demanding jobs at baseline, retraining policies targeted on this group which increase their chances of finding other types of jobs might be effective. Interventions that improve early detection and treatment and reduce symptoms of cancer patients in general may reduce educational gradients in employment effects of cancer, since improved ability to work may be more important for the low-educated who may to a greater extent have to accept physically demanding jobs.

It is important to note that effects of cancer (and other serious health conditions) on labour market outcomes and income may to some extent depend on the institutional setting, especially the welfare system, labour market policies and the prevalence and coverage of private health insurance and pension schemes. Therefore, our findings may not generalize to other industrialized countries, especially countries with very different institutional settings such as the US. This may in particular be true for effects on income and earnings and for very short-term employment effects. Our estimates of employment effects three years after diagnosis are largely consistent with results in Moran et al. (2011) and Short et al. (2008) for the US.

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Table 1. Descriptive statistics: Means of variables for labour market status and income for cancer and control groups from two years before the base year (t-2) to three years after (t+3)

	Breast Cancer		Colorectal Cancer: Women		Colorectal Cancer: Men	
	Cancer	Control	Cancer	Control	Cancer	Control
Employed t-2	0.895	0.867	0.889	0.866	0.942	0.921
Employed t-1	0.889	0.866	0.889	0.865	0.934	0.915
Employed t	0.872	0.859	0.863	0.858	0.905	0.905
Employed t+1	0.806	0.848	0.792	0.848	0.848	0.894
Employed t+2	0.766	0.835	0.728	0.836	0.795	0.883
Employed t+3	0.727	0.824	0.674	0.823	0.744	0.873
Unemployed t-2	0.037	0.038	0.038	0.038	0.034	0.028
Unemployed t-1	0.040	0.039	0.038	0.039	0.029	0.030
Unemployed t	0.026	0.042	0.027	0.043	0.032	0.035
Unemployed t+1	0.029	0.043	0.035	0.042	0.025	0.036
Unemployed t+2	0.042	0.043	0.045	0.041	0.034	0.035
Unemployed t+3	0.034	0.038	0.043	0.038	0.028	0.031
Out of labour force t-2	0.067	0.095	0.073	0.096	0.024	0.051
Out of labour force t-1	0.071	0.095	0.073	0.096	0.037	0.055
Out of labour force t	0.102	0.099	0.110	0.099	0.063	0.060
Out of labour force t+1	0.165	0.109	0.173	0.109	0.127	0.070
Out of labour force t+2	0.191	0.122	0.227	0.123	0.171	0.082
Out of labour force t+3	0.240	0.137	0.283	0.139	0.228	0.096
Wage earner t-2	0.845	0.819	0.821	0.818	0.814	0.813
Wage earner t-1	0.838	0.819	0.825	0.818	0.812	0.810
Wage earner t	0.822	0.813	0.804	0.812	0.789	0.803
Wage earner t+1	0.762	0.804	0.742	0.804	0.741	0.795
Wage earner t+2	0.728	0.792	0.689	0.793	0.693	0.787
Wage earner t+3	0.691	0.781	0.637	0.780	0.648	0.777
Self-employed t-2	0.051	0.049	0.068	0.048	0.128	0.107
Self-employed t-1	0.050	0.047	0.064	0.047	0.122	0.104
Self-employed t	0.050	0.046	0.058	0.046	0.117	0.102
Self-employed t+1	0.044	0.044	0.050	0.045	0.107	0.099
Self-employed t+2	0.038	0.043	0.039	0.043	0.102	0.096
Self-employed t+3	0.035	0.043	0.037	0.043	0.096	0.095
Full-timer t-2	0.823	0.799	0.806	0.799	0.879	0.853
Full-timer t-1	0.810	0.795	0.802	0.793	0.862	0.836
Full-timer t	0.788	0.788	0.779	0.787	0.828	0.826
Full-timer t+1	0.727	0.778	0.692	0.778	0.753	0.813
Full-timer t+2	0.682	0.764	0.621	0.764	0.700	0.798
Full-timer t+3	0.632	0.754	0.572	0.751	0.651	0.788
Disability pension t-2	0.000	0.000	0.000	0.000	0.000	0.000
Disability pension t-1	0.007	0.006	0.005	0.006	0.007	0.005
Disability pension t	0.018	0.012	0.011	0.013	0.017	0.010
Disability pension t+1	0.039	0.018	0.042	0.019	0.046	0.016
Disability pension t+2	0.071	0.025	0.079	0.025	0.071	0.022
Disability pension t+3	0.097	0.031	0.101	0.031	0.098	0.027
Unemployment t-2	0.051	0.060	0.052	0.059	0.042	0.044
Unemployment t-1	0.053	0.058	0.053	0.057	0.042	0.045
Unemployment t	0.039	0.059	0.045	0.058	0.040	0.047

	Breast Cancer		Colorectal Cancer: Women		Colorectal Cancer: Men	
	Cancer	Control	Cancer	Control	Cancer	Control
	Unemployment t+1	0.039	0.057	0.044	0.057	0.036
Unemployment t+2	0.050	0.055	0.055	0.054	0.039	0.045
Unemployment t+3	0.042	0.050	0.050	0.050	0.035	0.041
Earnings t-2	207.881	189.093	202.479	190.213	271.556	256.994
Earnings t-1	207.748	192.295	204.415	193.399	269.011	258.252
Earnings t	200.444	194.334	198.634	195.536	249.232	258.064
Earnings t+1	189.687	195.524	187.495	197.015	234.537	257.683
Earnings t+2	184.359	196.076	176.325	197.630	226.139	256.841
Earnings t+3	177.800	196.682	164.231	198.064	211.861	256.664
Income t-2	238.895	222.025	234.549	223.143	332.499	310.837
Income t-1	238.756	224.457	237.291	225.833	335.415	311.924
Income t	237.920	226.993	235.872	228.599	324.011	312.638
Income t+1	237.123	230.016	233.955	231.748	315.969	314.055
Income t+2	235.357	232.710	231.759	234.629	310.226	314.764
Income t+3	234.570	235.632	228.883	237.630	306.853	316.964
Disposable income t-2	144.603	139.173	139.188	139.869	177.909	162.624
Disposable income t-1	147.372	143.152	145.042	144.036	182.246	166.779
Disposable income t	151.423	148.131	148.741	149.374	182.384	172.478
Disposable income t+1	156.815	154.500	154.328	156.010	190.380	180.360
Disposable income t+2	160.768	161.067	159.013	162.674	194.289	188.666
Disposable income t+3	162.605	165.008	160.278	167.027	200.875	194.526
Observations	5683	157137	736	81664	952	95392

Note: Unemployment is the fraction of the year unemployed. Earnings, income before taxes and disposable income are in DKK deflated to 2000-prices. The other variables are dummies.

Table 2. Effect of cancer on labour market status and income from two years before the base year (t-2) to three years after (t+3): Weighted mean for the control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Breast cancer			Colorectal cancer: Women			Colorectal cancer: Men		
	WM C	ATT	s.e.	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t-2	0.895	-0.000	0.008	0.888	0.000	0.023	0.942	0.000	0.015
Employed t-1	0.890	-0.001	0.007	0.879	0.010	0.019	0.935	-0.002	0.012
Employed t	0.875	-0.003	0.007	0.863	-0.000	0.019	0.914	-0.008	0.013
Employed t+1	0.850	-0.044	***	0.837	-0.045	*	0.884	-0.036	*
Employed t+2	0.824	-0.057	***	0.801	-0.073	**	0.854	-0.059	***
Employed t+3	0.793	-0.067	***	0.761	-0.087	***	0.813	-0.069	***
Unemployed t-2	0.037	-0.000	0.005	0.038	-0.000	0.014	0.034	0.000	0.012
Unemployed t-1	0.040	-0.000	0.004	0.044	-0.006	0.010	0.033	-0.004	0.007
Unemployed t	0.044	-0.018	***	0.051	-0.024	**	0.043	-0.012	0.007
Unemployed t+1	0.044	-0.015	***	0.052	-0.016	*	0.043	-0.018	**
Unemployed t+2	0.044	-0.002	0.003	0.049	-0.004	0.009	0.039	-0.006	0.006
Unemployed t+3	0.037	-0.004	0.003	0.041	0.002	0.008	0.033	-0.005	0.006
Out of labour force t-2	0.067	0.000	0.007	0.074	-0.000	0.019	0.024	-0.000	0.010
Out of labour force t-1	0.070	0.002	0.006	0.077	-0.004	0.016	0.031	0.005	0.009
Out of labour force t	0.081	0.021	***	0.086	0.024	0.017	0.043	0.020	0.010
Out of labour force t+1	0.105	0.059	***	0.111	0.061	**	0.072	0.055	***
Out of labour force t+2	0.132	0.059	***	0.150	0.077	***	0.107	0.065	***
Out of labour force t+3	0.169	0.070	***	0.198	0.085	***	0.154	0.074	***
Wage earner t-2	0.845	-0.000	0.010	0.821	0.000	0.029	0.814	-0.000	0.026
Wage earner t-1	0.841	-0.003	0.009	0.814	0.011	0.025	0.809	0.003	0.023
Wage earner t	0.828	-0.006	0.008	0.802	0.002	0.024	0.792	-0.003	0.022
Wage earner t+1	0.805	-0.043	***	0.781	-0.039	0.025	0.768	-0.028	0.022
Wage earner t+2	0.781	-0.052	***	0.748	-0.060	*	0.742	-0.048	*
Wage earner t+3	0.751	-0.060	***	0.711	-0.074	**	0.704	-0.056	*
Self-employed t-2	0.051	-0.000	0.006	0.068	0.000	0.019	0.128	0.000	0.022
Self-employed t-1	0.049	0.001	0.005	0.065	-0.001	0.017	0.127	-0.005	0.020
Self-employed t	0.047	0.003	0.005	0.061	-0.002	0.016	0.122	-0.005	0.019
Self-employed t+1	0.045	-0.001	0.005	0.056	-0.006	0.014	0.116	-0.009	0.017
Self-employed t+2	0.043	-0.005	0.004	0.053	-0.014	0.012	0.112	-0.010	0.016
Self-employed t+3	0.042	-0.007	0.004	0.050	-0.013	0.011	0.109	-0.013	0.015
Full-timer t-2	0.823	-0.000	0.010	0.805	0.000	0.029	0.879	0.000	0.021
Full-timer t-1	0.812	-0.002	0.009	0.789	0.013	0.026	0.854	0.008	0.019
Full-timer t	0.795	-0.007	0.009	0.774	0.005	0.024	0.828	-0.000	0.018
Full-timer t+1	0.771	-0.044	***	0.744	-0.052	*	0.793	-0.040	*
Full-timer t+2	0.740	-0.058	***	0.707	-0.086	***	0.755	-0.055	**
Full-timer t+3	0.711	-0.079	***	0.665	-0.093	***	0.712	-0.061	**
Disability pension t-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Disability pension t-1	0.008	-0.002	0.001	0.010	-0.005	0.003	0.006	0.002	0.003
Disability pension t	0.016	0.001	0.002	0.020	-0.009	0.005	0.013	0.004	0.005
Disability pension t+1	0.025	0.014	***	0.029	0.013	0.008	0.021	0.026	***
Disability pension t+2	0.033	0.038	***	0.037	0.042	***	0.027	0.045	***
Disability pension t+3	0.040	0.057	***	0.045	0.056	***	0.032	0.066	***
Unemployment t-2	0.051	-0.000	0.004	0.052	0.000	0.012	0.042	-0.000	0.010
Unemployment t-1	0.052	0.001	0.004	0.055	-0.002	0.010	0.044	-0.001	0.007
Unemployment t	0.055	-0.015	***	0.060	-0.015	0.008	0.052	-0.012	0.007
Unemployment t+1	0.053	-0.015	***	0.061	-0.017	*	0.052	-0.016	**
Unemployment t+2	0.051	-0.002	0.003	0.057	-0.002	0.008	0.047	-0.008	0.005
Unemployment t+3	0.045	-0.004	0.002	0.049	0.001	0.007	0.040	-0.005	0.005
Earnings t-2	207.565	0.316	3.076	201.968	0.511	8.852	270.646	0.911	10.257
Earnings t-1	208.291	-0.543	2.948	201.921	2.495	8.488	267.617	1.394	10.041
Earnings t	207.102	-6.658	*	200.749	-2.115	8.330	261.394	-12.163	9.824
Earnings t+1	204.380	-14.694	***	197.367	-9.873	8.295	253.029	-18.492	9.660
Earnings t+2	200.498	-16.139	***	191.279	-14.954	8.335	243.947	-17.808	9.489
Earnings t+3	195.621	-17.821	***	184.215	-19.984	*	233.264	-21.402	*

	Breast cancer			Colorectal cancer: Women			Colorectal cancer: Men		
	WMC	ATT	s.e.	WMC	ATT	s.e.	WMC	ATT	s.e.
Income t-2	238.182	0.713	2.523	236.031	-1.483	7.990	336.246	-3.747	9.136
Income t-1	238.802	-0.045	2.434	236.276	1.015	7.558	332.697	2.717	9.127
Income t	239.516	-1.596	2.387	237.224	-1.352	7.326	328.127	-4.116	8.974
Income t+1	240.584	-3.461	2.373	238.040	-4.086	7.162	323.955	-7.986	8.695
Income t+2	241.289	-5.932	2.352	237.591	-5.832	7.207	320.044	-9.819	8.611
Income t+3	241.608	-7.038	** 2.341	237.078	-8.195	7.205	315.076	-8.223	8.523
Disposable income t-2	144.167	0.436	1.194	141.672	-2.484	3.665	175.884	2.025	4.051
Disposable income t-1	147.588	-0.216	1.199	144.731	0.310	3.740	179.693	2.553	4.163
Disposable income t	152.107	-0.684	1.232	149.640	-0.900	3.867	185.183	-2.799	4.079
Disposable income t+1	157.629	-0.814	1.269	155.291	-0.963	4.005	192.413	-2.033	4.171
Disposable income t+2	163.018	-2.250	1.284	159.843	-0.830	4.163	199.245	-4.956	4.262
Disposable income t+3	165.780	-3.175	* 1.303	162.757	-2.480	4.225	202.720	-1.844	4.290
N cancer	5683			736			952		
N controls	157137			81664			95392		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table 3. Relative ATT: Earnings for wage earners each year. Average earnings for cancer group wage earners divided by weighted average earnings for control group wage earners, and 95% confidence bounds

	Breast Cancer			Colorectal Cancer: Women			Colorectal Cancer: Men		
	Ratio	CI low	CI high	Ratio	CI low	CI high	Ratio	CI low	CI high
Earnings t-1	1.001	0.982	1.019	1.004	0.952	1.059	1.000	0.951	1.051
Earnings t	0.976	0.958	0.994	0.985	0.933	1.040	0.955	0.905	1.007
Earnings t+1	0.971	0.954	0.989	0.989	0.937	1.043	0.954	0.905	1.006
Earnings t+2	0.975	0.957	0.992	0.993	0.940	1.049	0.974	0.925	1.025
Earnings t+3	0.976	0.959	0.994	0.977	0.923	1.035	0.975	0.926	1.027

Table 4. Relative ATT: Hourly wage rate for wage earners each year. Average wage rate for cancer group wage earners divided by weighted average wage rate for control group wage earners, and 95% confidence bounds

	Breast Cancer			Colorectal Cancer: Women			Colorectal Cancer: Men		
	Ratio	CI low	CI high	Ratio	CI low	CI high	Ratio	CI low	CI high
Wage per hour t-1	0.998	0.980	1.016	1.007	0.963	1.054	0.999	0.932	1.070
Wage per hour t	1.005	0.987	1.023	1.003	0.957	1.052	1.002	0.932	1.076
Wage per hour t+1	1.003	0.985	1.021	1.004	0.957	1.053	0.996	0.928	1.070
Wage per hour t+2	0.993	0.974	1.011	0.999	0.951	1.049	0.984	0.916	1.058
Wage per hour t+3	0.988	0.970	1.007	0.999	0.948	1.051	0.991	0.920	1.068

Table 5. Dif-in-dif estimates of the effect of cancer on labour market status and income

	Breast Cancer			Colorectal cancer: Women			Colorectal cancer: Men		
	ATT		s.e.	ATT		s.e.	ATT		s.e.
Employed t	-0.003		0.004	-0.002		0.012	-0.006		0.009
Employed t+1	-0.044	***	0.005	-0.050	***	0.015	-0.035	**	0.012
Employed t+2	-0.058	***	0.006	-0.080	***	0.018	-0.057	***	0.014
Employed t+3	-0.067	***	0.007	-0.097	***	0.019	-0.069	***	0.016
Out of labour force t	0.022	***	0.004	0.025	*	0.010	0.023	**	0.007
Out of labour force t+1	0.060	***	0.005	0.066	***	0.013	0.058	***	0.011
Out of labour force t+2	0.060	***	0.006	0.084	***	0.016	0.068	***	0.013
Out of labour force t+3	0.072	***	0.007	0.094	***	0.019	0.078	***	0.016
Full-timer t	-0.008		0.005	-0.001		0.013	0.001		0.013
Full-timer t+1	-0.047	***	0.006	-0.060	***	0.016	-0.039	*	0.015
Full-timer t+2	-0.062	***	0.007	-0.097	***	0.019	-0.055	**	0.017
Full-timer t+3	-0.085	***	0.008	-0.107	***	0.021	-0.062	**	0.019
Disability pension t	0.002		0.002	-0.008	*	0.004	0.002		0.004
Disability pension t+1	0.015	***	0.003	0.015	*	0.007	0.024	***	0.007
Disability pension t+2	0.039	***	0.003	0.043	***	0.010	0.042	***	0.008
Disability pension t+3	0.058	***	0.004	0.058	***	0.011	0.063	***	0.010
Earnings t	-7.904	***	0.901	-3.739		2.509	-14.075	***	2.643
Earnings t+1	-16.420	***	1.208	-12.551	***	3.236	-20.910	***	3.703
Earnings t+2	-18.361	***	1.447	-18.676	***	4.089	-20.771	***	4.370
Earnings t+3	-20.443	***	1.688	-24.647	***	4.812	-24.841	***	5.302
Income t	-2.873	***	0.685	-0.787		1.995	-0.671		2.987
Income t+1	-4.940	***	0.832	-4.036		2.371	-4.808		3.533
Income t+2	-7.595	***	0.946	-6.425	*	2.538	-6.950		3.902
Income t+3	-8.882	***	1.039	-9.383	**	2.932	-6.055		4.551
Disposable income t	-0.945		0.513	1.108		1.434	-4.528		2.323
Disposable income t+1	-0.889		0.566	0.938		1.579	-3.608		2.281
Disposable income t+2	-2.169	***	0.609	0.786		1.789	-6.458	*	2.535
Disposable income t+3	-3.046	***	0.663	-1.090		2.001	-3.493		2.623
N cancer	5683			736			952		
N controls	157137			70344			95392		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table 6. Dif-in-dif estimates of the effect of cancer on labour market status and income, where the control group consists of persons diagnosed with cancer five year later than the treatment group

	Breast Cancer		Colorectal cancer: Women		Colorectal cancer: Men	
	ATT	s.e.	ATT	s.e.	ATT	s.e.
Employed t	-0.003		0.005		-0.018	
Employed t+1	-0.044	***	-0.046	*	-0.052	***
Employed t+2	-0.053	***	-0.087	***	-0.060	***
Employed t+3	-0.062	***	-0.100	***	-0.078	***
Out of labour force t	0.021	***	0.019		0.029	**
Out of labour force t+1	0.060	***	0.051	**	0.070	***
Out of labour force t+2	0.059	***	0.074	***	0.070	***
Out of labour force t+3	0.072	***	0.080	**	0.082	***
Full-timer t	-0.007		0.018		-0.006	
Full-timer t+1	-0.045	***	-0.047	*	-0.062	***
Full-timer t+2	-0.057	***	-0.087	***	-0.067	**
Full-timer t+3	-0.068	***	-0.097	***	-0.074	**
Disability pension t	0.001		-0.011		0.010	
Disability pension t+1	0.011	**	0.019	*	0.022	**
Disability pension t+2	0.035	***	0.047	***	0.042	***
Disability pension t+3	0.056	***	0.062	***	0.072	***
Earnings t	-6.662	***	1.838		3.336	***
Earnings t+1	-15.722	***	-8.092		4.417	***
Earnings t+2	-17.075	***	-14.952	**	5.518	***
Earnings t+3	-19.148	***	-18.926	**	6.543	***
Income t	-2.193	*	1.503		2.893	
Income t+1	-5.027	***	-1.983		3.430	
Income t+2	-7.917	***	-3.560		3.633	
Income t+3	-9.578	***	-4.824		4.199	
Disposable income t	-1.122		1.746		2.024	
Disposable income t+1	-1.131		2.533		2.344	
Disposable income t+2	-2.259	*	2.850		2.493	
Disposable income t+3	-3.371	***	2.159		2.804	
N cancer	4517		577		744	
N controls	6657		1578		2233	

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table 7. Effect of breast cancer by education: Weighted mean for the control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Compulsory education			Vocational education			Further education		
	WM C	ATT	s.e.	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.797	-0.020		0.883	0.007		0.923	-0.001	
Employed t+1	0.760	-0.079	***	0.856	-0.043	***	0.909	-0.020	*
Employed t+2	0.722	-0.088	***	0.829	-0.059	***	0.893	-0.035	***
Employed t+3	0.679	-0.089	***	0.798	-0.068	***	0.872	-0.051	***
Out of labour force t	0.138	0.046	**	0.068	0.014		0.052	0.010	
Out of labour force t+1	0.178	0.105	***	0.094	0.056	***	0.064	0.030	***
Out of labour force t+2	0.219	0.104	***	0.121	0.052	***	0.080	0.035	***
Out of labour force t+3	0.271	0.097	***	0.161	0.071	***	0.103	0.052	***
Full-timer t	0.700	-0.026		0.797	0.000		0.860	0.000	
Full-timer t+1	0.668	-0.079	***	0.772	-0.049	***	0.845	-0.015	
Full-timer t+2	0.626	-0.084	***	0.744	-0.065	***	0.821	-0.034	**
Full-timer t+3	0.588	-0.099	***	0.712	-0.081	***	0.800	-0.063	***
Disability pension t	0.029	0.008		0.015	-0.000		0.010	-0.002	
Disability pension t+1	0.042	0.035	***	0.022	0.009	*	0.015	0.003	
Disability pension t+2	0.056	0.071	***	0.029	0.035	***	0.021	0.018	***
Disability pension t+3	0.068	0.093	***	0.035	0.051	***	0.026	0.037	***
Earnings t	160.453	-12.350	*	194.621	-6.522		253.692	-2.816	
Earnings t+1	155.388	-22.264	***	191.664	-15.584	***	253.141	-8.681	
Earnings t+2	149.044	-19.947	***	188.026	-16.814	***	250.783	-13.060	**
Earnings t+3	141.969	-19.540	***	183.446	-18.574	***	247.036	-16.016	**
Income t	198.518	-3.188		225.246	-1.910		284.419	-0.816	
Income t+1	198.251	-5.340		225.670	-4.075		287.237	-2.294	
Income t+2	197.428	-6.349		226.542	-5.610		288.839	-6.743	
Income t+3	196.455	-7.523	*	226.798	-6.843	*	290.118	-7.634	
Disposable income t	130.621	-1.568		144.853	-1.285		175.446	0.170	
Disposable income t+1	133.896	-1.657		149.796	-1.248		183.202	-0.178	
Disposable income t+2	137.611	-1.582		155.037	-3.009		190.084	-2.505	
Disposable income t+3	138.899	-2.703		157.639	-3.524		193.960	-3.595	
N cancer	1495			2118			2070		
N controls	40992			59129			57016		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table 8. Effect of colorectal cancer by education: Weighted mean for the control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Compulsory education			Vocational education			Further education		
	WM C	ATT	s.e.	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.825	-0.010	0.027	0.906	-0.002	0.015	0.925	0.007	0.018
Employed t+1	0.786	-0.064	*	0.869	-0.036	0.019	0.907	-0.001	0.019
Employed t+2	0.744	-0.079	**	0.836	-0.062	**	0.884	-0.033	0.021
Employed t+3	0.696	-0.094	**	0.787	-0.064	**	0.857	-0.051	*
Out of labour force t	0.110	0.033	0.023	0.046	0.020	0.012	0.047	0.005	0.015
Out of labour force t+1	0.150	0.081	**	0.084	0.059	***	0.062	0.011	0.016
Out of labour force t+2	0.200	0.091	**	0.122	0.067	***	0.085	0.029	0.019
Out of labour force t+3	0.259	0.106	***	0.178	0.068	**	0.114	0.040	0.021
Full-timer t	0.729	-0.015	0.032	0.821	0.016	0.021	0.838	0.012	0.026
Full-timer t+1	0.689	-0.078	*	0.782	-0.034	0.023	0.811	-0.005	0.026
Full-timer t+2	0.644	-0.082	*	0.740	-0.065	**	0.785	-0.035	0.028
Full-timer t+3	0.595	-0.104	**	0.694	-0.055	*	0.752	-0.046	0.028
Disability pension t	0.027	-0.006	0.008	0.014	-0.000	0.005	0.010	-0.002	0.005
Disability pension t+1	0.042	0.025	0.013	0.021	0.027	**	0.015	0.003	0.007
Disability pension t+2	0.052	0.057	***	0.027	0.047	***	0.019	0.023	*
Disability pension t+3	0.061	0.088	***	0.033	0.065	***	0.024	0.028	**
Earnings t	186.731	-10.408	11.787	222.999	-9.885	9.125	295.847	-0.163	13.878
Earnings t+1	178.831	-16.798	11.419	215.425	-15.828	9.061	290.698	-6.535	13.570
Earnings t+2	170.210	-18.319	11.290	207.344	-13.831	9.014	284.361	-14.334	13.408
Earnings t+3	160.780	-22.437	*	197.224	-18.147	*	275.956	-17.456	13.275
Income t	237.218	-0.307	10.874	273.519	-3.729	8.358	355.355	-0.850	13.452
Income t+1	233.749	-1.599	10.239	271.122	-6.577	8.151	353.753	-5.383	13.030
Income t+2	231.095	-8.196	10.046	268.399	-3.633	8.059	352.285	-9.621	12.853
Income t+3	228.053	-6.585	10.028	265.528	-6.042	7.917	349.043	-8.136	12.673
Disposable income t	145.144	-3.857	4.916	162.516	-1.011	3.849	201.398	0.361	6.152
Disposable income t+1	148.739	0.792	5.133	169.313	-0.951	4.089	209.776	-2.183	6.180
Disposable income t+2	152.542	-4.537	5.250	175.030	-1.484	4.058	217.803	-1.806	6.244
Disposable income t+3	154.358	0.006	5.365	178.002	-0.518	4.243	222.101	-3.362	6.220
N cancer	475			714			499		
N controls	44972			70286			56669		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Appendix

This appendix contains supplementary tables which are discussed in the paper.

Notes on variables used in the analysis

The variables for labour market status (used as outcomes and in lagged form as controls) are mainly based on the Statistics Denmark variables ‘socio’ and ‘socio02’.

The baseline health variables based on hospitalisation data in Tables A1 and A2 are dummies for hospitalisation from five to two years before the base year for different types of diagnoses based on the standard main classification of ICD10 codes: Infectious disease (A00-B99); blood diseases, etc. (D50-D89); endocrine, nutritional and metabolic diseases (E00-E90); mental disorders (F00-F99); diseases of the nervous system (G00-G99); diseases of the eye and adnexa (H00-H59); diseases of the ear and mastoid process (H60-H95); diseases of the circulatory system (I00-I99); diseases of the respiratory system (J00-J99); diseases of the digestive system (K00-K93); diseases of the skin and subcutaneous tissue (L00-L99); diseases of the musculoskeletal system and connective tissue (M00-M99); diseases of the genitourinary system (N00-N99); pregnancy, childbirth and the puerperium (O00-O99); congenital malformations, deformations and chromosomal abnormalities (Q00-Q99); ill-defined conditions (R00-R99); injury, poisoning, etc. (S00-T98); contacts with health services and factors influencing health status (Z00-Z99).

Likewise, baseline variables for purchase of prescription drugs are dummies for consumption of drugs within certain categories, defined by ATC codes, between five and two years before the base year. The ATC codes for each variable are as follows: Blood pressure (B01, B02); heart disease (C01); rheumatism (M01-M04); hormonal preparation (H01, H02, H03C, H04); diabetes (A10); antipsychotic (N05A); antidepressant (N06A, N06C), analgesic (N02A); hypertension (C02-C03, C07-C09); Parkinson (N04); osteoporosis (M05); asthma (R03A); bronchitis (R03B); thyroid (H03A); anti-thyroid (H03B); antiepileptics (N03); anxiolytics (N05B); acid disorders (A02); acid antimigraine (N02C); headaches (N02B).

Table A1. Unweighted means for control variables and two-sample t statistics for equality of means

	Breast Cancer			Colorectal cancer: Women			Colorectal cancer: Men		
	Cancer	Control	t-stat	Cancer	Control	t-stat	Cancer	Control	t-stat
Age = 30	0.001	0.037	-55.85	0.003	0.036	-16.33	0.003	0.035	-16.48
Age = 31	0.004	0.036	-32.99				0.002	0.033	-19.13
Age = 32	0.005	0.036	-27.95	0.003	0.035	-16.10	0.004	0.034	-13.70
Age = 33	0.007	0.036	-24.71	0.007	0.037	-9.72	0.004	0.035	-14.13
Age = 34	0.007	0.037	-23.93	0.003	0.037	-16.76	0.005	0.035	-12.22
Age = 35	0.008	0.038	-23.68	0.004	0.037	-13.56	0.009	0.035	-8.02
Age = 36	0.010	0.038	-19.89	0.003	0.038	-17.53	0.004	0.038	-15.45
Age = 37	0.013	0.039	-16.34	0.011	0.039	-7.30	0.005	0.037	-13.20
Age = 38	0.015	0.038	-14.22	0.008	0.039	-9.16	0.007	0.037	-10.61
Age = 39	0.017	0.037	-11.19	0.011	0.037	-6.82	0.002	0.036	-21.08
Age = 40	0.018	0.035	-9.25	0.010	0.035	-7.13	0.012	0.036	-6.98
Age = 41	0.020	0.035	-7.31	0.011	0.034	-6.07	0.006	0.034	-10.63
Age = 42	0.021	0.034	-6.69	0.012	0.035	-5.52	0.012	0.033	-6.18
Age = 43	0.029	0.034	-2.32	0.024	0.033	-1.49	0.013	0.032	-5.26
Age = 44	0.032	0.032	-0.09	0.019	0.033	-2.69	0.014	0.033	-5.07
Age = 45	0.036	0.032	1.62	0.014	0.032	-4.29	0.020	0.032	-2.63
Age = 46	0.040	0.031	3.09	0.022	0.031	-1.79	0.024	0.032	-1.62
Age = 47	0.043	0.031	4.63	0.031	0.031	0.09	0.026	0.031	-0.92
Age = 48	0.043	0.031	4.22	0.035	0.031	0.68	0.028	0.032	-0.61
Age = 49	0.044	0.031	4.74	0.037	0.030	1.03	0.028	0.032	-0.64
Age = 50	0.049	0.030	6.80	0.037	0.030	0.91	0.037	0.032	0.84
Age = 51	0.056	0.030	8.47	0.037	0.029	1.04	0.046	0.030	2.45
Age = 52	0.052	0.029	7.65	0.054	0.030	2.93	0.047	0.029	2.58
Age = 53	0.050	0.030	6.79	0.057	0.030	3.18	0.058	0.030	3.63
Age = 54	0.054	0.030	7.77	0.073	0.029	4.55	0.066	0.031	4.31
Age = 55	0.058	0.029	9.09	0.088	0.030	5.57	0.078	0.031	5.41
Age = 56	0.058	0.030	9.13	0.072	0.029	4.54	0.074	0.031	5.07
Age = 57	0.058	0.028	9.76	0.084	0.028	5.52	0.090	0.030	6.52
Age = 58	0.058	0.025	10.79	0.079	0.026	5.29	0.080	0.028	5.86
Age = 59	0.044	0.023	7.69	0.079	0.023	5.65	0.103	0.025	7.94
No child at age 30	0.276	0.290	-2.24						
Danish	0.954	0.941	4.64	0.958	0.942	2.10	0.956	0.942	2.03
Single with children	0.054	0.082	-9.35	0.027	0.081	-8.91	0.003	0.015	-6.23
Married without children	0.478	0.285	28.68	0.561	0.284	15.08	0.556	0.250	18.89
Married with children	0.226	0.355	-22.61	0.136	0.358	-17.41	0.199	0.350	-11.61
Cohabiting without children	0.048	0.054	-2.39	0.053	0.054	-0.14	0.057	0.067	-1.31
Cohabiting with children	0.030	0.083	-22.20	0.029	0.082	-8.64	0.016	0.086	-17.04
N. children aged 0-2	0.022	0.116	-42.71	0.014	0.116	-21.23	0.020	0.123	-22.01
N. children aged 3-6	0.072	0.215	-34.70	0.030	0.215	-26.24	0.047	0.193	-17.80
N. children aged 7-9	0.088	0.185	-23.16	0.056	0.186	-14.41	0.049	0.154	-13.34
N. children aged 10-14	0.227	0.355	-15.83	0.143	0.356	-12.03	0.144	0.289	-9.74
Upper secondary school	0.032	0.051	-8.19	0.042	0.052	-1.27	0.025	0.049	-4.59
Vocational education	0.373	0.376	-0.55	0.365	0.378	-0.69	0.467	0.438	1.80
Short further education	0.050	0.048	0.76	0.046	0.048	-0.25	0.066	0.068	-0.22
Long further education	0.222	0.207	2.75	0.182	0.205	-1.62	0.106	0.118	-1.14
Higher education	0.060	0.057	1.02	0.048	0.057	-1.25	0.081	0.079	0.25
Education missing	0.008	0.011	-2.14	0.012	0.012	0.14	0.012	0.014	-0.64
Self-employed t-2	0.051	0.049	0.69	0.068	0.048	2.12	0.128	0.107	1.92
Unemployed t-2	0.037	0.038	-0.14	0.038	0.038	0.01	0.034	0.028	0.91
Out of labour force t-2	0.067	0.095	-8.09	0.073	0.096	-2.33	0.024	0.051	-5.35
Unemployment t-2	0.051	0.060	-4.11	0.052	0.059	-1.13	0.042	0.044	-0.48
Full-timer t-2	0.823	0.799	4.55	0.806	0.799	0.47	0.879	0.853	2.47
Gross income t-2/100	2.423	2.238	11.52	2.389	2.236	2.44	3.460	3.183	3.64
Earnings t-2/100	2.099	1.903	11.94	2.025	1.904	2.71	2.834	2.618	3.09
Experience t-2 (years/10)	1.859	1.437	36.60	1.934	1.441	14.94	2.360	1.723	20.38
Experience squared	4.186	2.780	32.99	4.536	2.788	14.31	6.490	3.829	20.02
Self-employed: change t-5 to t-2	-0.007	-0.000	-2.77	-0.003	-0.001	-0.30	-0.015	0.001	-1.97
Unemployed: change t-5 to t-2	-0.007	-0.016	2.89	-0.008	-0.016	0.96	0.006	-0.011	2.31
Out of labour force: change t-5 to t-2	0.001	-0.013	4.22	0.011	-0.013	2.77	0.002	-0.003	0.96
Unemployment: change t-5 to t-2	-0.009	-0.020	4.00	-0.006	-0.020	2.08	0.000	-0.016	2.77
Full-timer: change t-5 to t-2	0.009	0.037	-5.76	0.001	0.036	-2.69	-0.026	0.006	-3.09
Income: change t-5 to t-2	0.081	0.132	-4.96	0.088	0.128	-0.78	-0.036	0.168	-4.34
Earnings: change t-5 to t-2	0.118	0.190	-6.76	0.062	0.188	-4.86	0.065	0.178	-3.05
Experience: change t-5 to t-2	0.230	0.216	9.99	0.226	0.216	2.51	0.236	0.232	1.17
Agriculture, etc.	0.016	0.023	-3.99	0.023	0.023	-0.02	0.034	0.035	-0.26
Manufacturing	0.044	0.053	-3.13	0.052	0.052	-0.02	0.108	0.125	-1.69
Energy	0.023	0.028	-2.10	0.020	0.028	-1.45	0.051	0.051	0.11
Construction	0.012	0.010	1.37	0.011	0.010	0.20	0.074	0.085	-1.31

	Breast Cancer			Colorectal cancer: Women			Colorectal cancer: Men		
	Cancer	Control	t-stat	Cancer	Control	t-stat	Cancer	Control	t-stat
Services	0.087	0.091	-1.25	0.069	0.093	-2.46	0.127	0.127	0.03
Transport	0.064	0.062	0.67	0.067	0.064	0.26	0.102	0.107	-0.51
Financial services	0.098	0.096	0.51	0.107	0.096	0.99	0.125	0.119	0.58
Industry missing	0.197	0.226	-5.51	0.232	0.225	0.45	0.248	0.238	0.72
Top Manager	0.014	0.012	1.38	0.022	0.013	1.64	0.062	0.039	2.97
Job function high	0.141	0.117	5.17	0.122	0.117	0.42	0.132	0.135	-0.22
Job function medium	0.213	0.200	2.45	0.175	0.199	-1.66	0.119	0.123	-0.45
Job function other	0.127	0.118	1.94	0.122	0.121	0.12	0.165	0.160	0.39
Job function unknown	0.100	0.129	-7.07	0.113	0.129	-1.35	0.053	0.083	-4.23
Hosp. t-2/t-5: infectious disease	0.008	0.012	-3.82	0.008	0.012	-1.01	0.013	0.011	0.40
Hosp. t-2/t-5: blood diseases	0.004	0.004	-0.31	0.001	0.004	-1.73	0.003	0.002	0.52
Hosp. t-2/t-5: endocrine disease	0.041	0.045	-1.71	0.050	0.046	0.58	0.023	0.024	-0.20
Hosp. t-2/t-5: mental disorders	0.006	0.006	-0.46	0.004	0.006	-0.96	0.005	0.009	-1.38
Hosp. t-2/t-5: nervous system	0.021	0.017	1.64	0.019	0.018	0.16	0.023	0.015	1.65
Hosp. t-2/t-5: eye diseases	0.013	0.011	1.27	0.016	0.012	1.01	0.019	0.012	1.57
Hosp. t-2/t-5: ear diseases	0.017	0.013	1.99	0.020	0.014	1.24	0.019	0.016	0.74
Hosp. t-2/t-5: circulatory system	0.050	0.037	4.25	0.046	0.037	1.13	0.068	0.038	3.72
Hosp. t-2/t-5: respiratory system	0.023	0.025	-1.18	0.030	0.025	0.71	0.026	0.025	0.25
Hosp. t-2/t-5: digestive system	0.052	0.052	-0.01	0.063	0.051	1.23	0.072	0.059	1.64
Hosp. t-2/t-5: skin	0.017	0.019	-1.09	0.014	0.018	-1.14	0.007	0.016	-3.19
Hosp. t-2/t-5: musculoskeletal system	0.101	0.086	3.76	0.103	0.087	1.43	0.086	0.084	0.23
Hosp. t-2/t-5: genitourinary system	0.097	0.087	2.47	0.091	0.087	0.37	0.038	0.025	1.99
Hosp. t-2/t-5: childbirth	0.071	0.206	-38.01	0.034	0.206	-25.12			
Hosp. t-2/t-5: malformations, etc.	0.005	0.005	0.04	0.005	0.006	-0.03	0.004	0.004	-0.09
Hosp. t-2/t-5: ill-defined conditions	0.048	0.049	-0.32	0.031	0.048	-2.56	0.044	0.034	1.44
Hosp. t-2/t-5: injury, poisoning, etc.	0.076	0.076	-0.04	0.067	0.076	-1.05	0.097	0.117	-2.13
Hosp. t-2/t-5: contacts	0.178	0.297	-22.88	0.156	0.297	-10.44	0.101	0.105	-0.47
Drugs t-2/t-5: blood pressure	0.055	0.040	4.95	0.045	0.041	0.49	0.043	0.018	3.74
Drugs t-2/t-5: heart disease	0.016	0.009	4.33	0.016	0.010	1.37	0.033	0.015	3.07
Drugs t-2/t-5: rheumatism	0.436	0.407	4.38	0.429	0.407	1.22	0.382	0.370	0.81
Drugs t-2/t-5: hormonal preparation	0.093	0.083	2.62	0.103	0.083	1.80	0.086	0.068	1.97
Drugs t-2/t-5: diabetes	0.009	0.010	-0.52	0.016	0.009	1.47	0.021	0.016	1.11
Drugs t-2/t-5: antipsychotic	0.028	0.021	3.05	0.014	0.020	-1.59	0.011	0.015	-1.21
Drugs t-2/t-5: antidepressive	0.105	0.066	9.43	0.107	0.066	3.60	0.069	0.039	3.71
Drugs t-2/t-5: analgesic	0.112	0.097	3.69	0.120	0.098	1.78	0.090	0.084	0.71
Drugs t-2/t-5: hypertension	0.191	0.134	10.78	0.223	0.137	5.60	0.163	0.076	7.23
Drugs t-2/t-5: parkinson	0.005	0.010	-4.98	0.007	0.010	-1.04	0.002	0.002	-0.14
Drugs t-2/t-5: osteoporose	0.002	0.001	1.34	0.004	0.001	1.22			
Drugs t-2/t-5: asthma	0.093	0.097	-0.99	0.096	0.098	-0.15	0.054	0.063	-1.35
Drugs t-2/t-5: bronchitis	0.066	0.065	0.10	0.076	0.065	1.12	0.039	0.041	-0.39
Drugs t-2/t-5: thyroid	0.023	0.017	3.04	0.031	0.017	2.19	0.006	0.003	1.43
Drugs t-2/t-5: antithyroid	0.012	0.007	3.05	0.015	0.007	1.69			
Drugs t-2/t-5: epilepsy	0.013	0.012	0.71	0.015	0.012	0.69	0.008	0.011	-0.72
Drugs t-2/t-5: antianxiolytic	0.150	0.108	8.84	0.133	0.109	1.93	0.081	0.061	2.28
Drugs t-2/t-5: acid disorders	0.111	0.103	1.95	0.118	0.103	1.31	0.108	0.094	1.38
Drugs t-2/t-5: acid antimigraine	0.073	0.060	3.75	0.060	0.060	-0.05	0.017	0.014	0.63
Drugs t-2/t-5: headaches	0.070	0.059	3.32	0.075	0.059	1.64	0.062	0.041	2.68
GP contacts t-2/t-5	6.496	6.983	-5.61	5.975	6.982	-4.35	3.587	3.498	0.65
Region: Northern Jutland	0.091	0.102	-2.94	0.122	0.103	1.57	0.119	0.108	0.97
Region: Central Jutland	0.201	0.226	-4.57	0.245	0.227	1.10	0.210	0.227	-1.27
Region: Southern Denmark	0.236	0.217	3.26	0.201	0.216	-1.00	0.232	0.218	1.06
Region: Zealand	0.148	0.155	-1.42	0.158	0.154	0.26	0.139	0.153	-1.29
Region: Bornholm	0.010	0.008	1.58	0.010	0.008	0.40	0.011	0.008	0.63
Municipality: Central Copenhagen	0.105	0.111	-1.36	0.096	0.112	-1.39	0.089	0.114	-2.66
Municip.: Copenhagen area suburbs	0.165	0.148	3.50	0.129	0.146	-1.39	0.154	0.137	1.49
Municip.: City > 10,000, Cph. area	0.048	0.045	1.15	0.049	0.045	0.48	0.049	0.042	0.97
Municip.: Other in Cph. area	0.042	0.038	1.32	0.042	0.038	0.51	0.041	0.039	0.31
Municip.: > 100,000 inhabitants	0.114	0.112	0.47	0.115	0.113	0.25	0.093	0.112	-1.93
Municip.: City 40,000 - 99,999	0.062	0.067	-1.41	0.052	0.068	-1.97	0.072	0.068	0.55
Municip.: City 20,000 - 39,999	0.095	0.096	-0.14	0.114	0.096	1.58	0.100	0.096	0.42
Municip.: City 10,000 - 19,999	0.071	0.073	-0.42	0.068	0.073	-0.59	0.082	0.073	1.00
Municip.: > 50% urbanized	0.084	0.087	-0.88	0.096	0.087	0.84	0.081	0.088	-0.85
Municip.: 33-50% urbanized	0.099	0.101	-0.50	0.101	0.101	-0.07	0.107	0.105	0.26
Municip.: < 33% urbanized	0.053	0.061	-2.47	0.071	0.059	1.22	0.075	0.063	1.37
Year 2001	0.198	0.205	-1.31	0.198	0.201	-0.17	0.196	0.203	-0.49
Year 2002	0.207	0.201	1.11	0.212	0.203	0.61	0.206	0.199	0.56
Year 2003	0.203	0.194	1.56	0.198	0.198	0.01	0.200	0.198	0.11
Year 2004	0.205	0.188	3.15	0.216	0.196	1.30	0.218	0.193	1.89

Table A2. Propensity score functions: Logit models for the probability of getting cancer

	Breast cancer		Colorectal cancer: Women		Colorectal cancer: Men				
	beta	s.e.	beta	s.e.	beta	s.e.			
Age = 30	-4.429	***	0.418	-2.469	***	0.726	-3.503	***	0.606
Age = 31	-3.086	***	0.227				-3.854	***	0.731
Age = 32	-2.817	***	0.201	-2.434	***	0.726	-3.205	***	0.533
Age = 33	-2.650	***	0.186	-1.591	***	0.476	-3.241	***	0.533
Age = 34	-2.599	***	0.178	-2.545	***	0.727	-3.010	***	0.483
Age = 35	-2.594	***	0.174	-2.220	***	0.602	-2.455	***	0.379
Age = 36	-2.358	***	0.157	-2.744	***	0.728	-3.362	***	0.530
Age = 37	-2.147	***	0.143	-1.453	***	0.393	-3.132	***	0.480
Age = 38	-2.022	***	0.137	-1.823	***	0.443	-2.805	***	0.414
Age = 39	-1.835	***	0.130	-1.545	***	0.393	-4.022	***	0.727
Age = 40	-1.715	***	0.126	-1.691	***	0.415	-2.354	***	0.343
Age = 41	-1.577	***	0.121	-1.569	***	0.392	-2.930	***	0.438
Age = 42	-1.535	***	0.119	-1.506	***	0.373	-2.305	***	0.339
Age = 43	-1.205	***	0.108	-0.805	**	0.287	-2.205	***	0.327
Age = 44	-1.035	***	0.104	-1.076	***	0.313	-2.175	***	0.315
Age = 45	-0.904	***	0.100	-1.451	***	0.355	-1.765	***	0.272
Age = 46	-0.790	***	0.097	-0.991	***	0.296	-1.616	***	0.252
Age = 47	-0.657	***	0.094	-0.629	*	0.260	-1.506	***	0.244
Age = 48	-0.688	***	0.093	-0.531	*	0.250	-1.468	***	0.236
Age = 49	-0.643	***	0.092	-0.476		0.247	-1.479	***	0.234
Age = 50	-0.465	***	0.089	-0.513	*	0.246	-1.229	***	0.213
Age = 51	-0.340	***	0.087	-0.500	*	0.246	-0.936	***	0.198
Age = 52	-0.386	***	0.088	-0.129		0.220	-0.923	***	0.194
Age = 53	-0.447	***	0.088	-0.090		0.217	-0.764	***	0.181
Age = 54	-0.372	***	0.086	0.169		0.204	-0.652	***	0.173
Age = 55	-0.262	**	0.085	0.326		0.196	-0.499	**	0.165
Age = 56	-0.255	**	0.084	0.163		0.205	-0.540	**	0.166
Age = 57	-0.180	*	0.084	0.366		0.197	-0.310	*	0.157
Age = 58	-0.057		0.085	0.328		0.201	-0.386	*	0.161
Age = 59	-0.254	**	0.090	0.505	*	0.201	0.007		0.151
No child at age 30	0.225	***	0.033						
Danish	0.110		0.070	-0.048		0.198	-0.033		0.169
Single with children	0.100		0.074	-0.434		0.262	-0.942		0.587
Married without children	0.117	**	0.041	0.019		0.103	0.198	*	0.098
Married with children	0.137	*	0.058	-0.254		0.178	0.227		0.140
Cohabiting without children	-0.037		0.071	-0.104		0.184	0.078		0.160
Cohabiting with children	-0.090		0.093	-0.045		0.269	-0.546		0.286
N. children aged 0-2	-0.246	*	0.099	-0.699	*	0.348	-0.169		0.241
N. children aged 3-6	0.018		0.067	-0.486		0.274	-0.047		0.156
N. children aged 7-9	0.081		0.051	0.131		0.174	-0.126		0.158
N. children aged 10-14	0.015		0.030	0.049		0.103	-0.071		0.087
Upper secondary school	0.005		0.083	0.315		0.201	-0.285		0.222
Vocational education	0.087	*	0.037	-0.124		0.095	0.009		0.085
Short further education	0.153	*	0.070	0.009		0.194	0.146		0.149
Long further education	0.122	*	0.052	-0.091		0.144	-0.213		0.141
Higher education	0.181	*	0.079	0.006		0.228	-0.024		0.165
Education missing	-0.257		0.152	0.004		0.350	-0.158		0.314
Self-employed t-2	-0.072		0.113	0.390		0.302	-0.045		0.242
Unemployed t-2	0.304		0.181	0.093		0.504	0.122		0.522
Out of labour force t-2	0.196		0.120	0.210		0.328	-0.114		0.397
Unemployment t-2	-0.242		0.213	-0.145		0.603	0.002		0.585
Full-timer t-2	0.127		0.067	-0.026		0.175	-0.066		0.198
Gross income t-2/100	0.053	**	0.020	-0.022		0.070	-0.006		0.019
Earnings t-2/100	0.033		0.030	0.090		0.092	0.047		0.028
Experience t-2	0.105		0.078	0.392		0.203	0.198		0.175
Experience squared	-0.030		0.019	-0.066		0.049	-0.047		0.041
Self-employed: change t-5 to t-2	-0.069		0.100	-0.181		0.271	-0.223		0.191
Unemployed: change t-5 to t-2	-0.116		0.136	-0.231		0.378	0.198		0.400
Out of labour force: change t-5 to t-2	-0.125		0.096	-0.073		0.266	0.089		0.320

	Breast cancer		Colorectal cancer: Women		Colorectal cancer: Men				
	beta	s.e.	beta	s.e.	beta	s.e.			
Unemployment: change t-5 to t-2	0.102	0.152	0.235	0.436	0.043	0.413			
Full-timer: change t-5 to t-2	-0.098	0.069	0.006	0.185	0.055	0.198			
Income: change t-5 to t-2	-0.032	0.022	0.087	0.079	0.009	0.022			
Earnings: change t-5 to t-2	-0.012	0.031	-0.120	0.099	-0.036	0.039			
Experience: change t-5 to t-2	-0.116	0.326	0.389	0.913	-0.166	0.793			
Agriculture, etc.	-0.198	0.110	0.090	0.257	-0.142	0.213			
Manufacturing	-0.095	0.070	0.154	0.180	-0.213	0.149			
Energy	-0.007	0.093	-0.100	0.271	-0.019	0.181			
Construction	0.190	0.126	0.146	0.365	-0.164	0.166			
Services	0.070	0.053	-0.130	0.158	0.048	0.143			
Transport	0.024	0.061	0.124	0.163	-0.131	0.149			
Financial services	0.019	0.051	0.248	0.134	0.031	0.137			
Industry missing	0.003	0.060	0.251	0.157	0.097	0.153			
Top Manager	-0.198	0.123	0.183	0.286	-0.007	0.161			
Job function high	-0.015	0.059	-0.050	0.165	-0.173	0.139			
Job function medium	0.043	0.045	-0.072	0.127	-0.081	0.117			
Job function other	0.053	0.046	-0.143	0.126	0.003	0.102			
Job function unknown	-0.042	0.092	-0.028	0.240	-0.530	*	0.240		
Hosp. t-2/t-5: infectious disease	-0.278	0.156	-0.130	0.417	0.348	0.299			
Hosp. t-2/t-5: blood diseases	-0.065	0.226	-0.973	1.007	0.267	0.594			
Hosp. t-2/t-5: endocrine disease	-0.025	0.075	0.195	0.193	-0.437	0.243			
Hosp. t-2/t-5: mental disorders	-0.149	0.183	-0.294	0.592	-0.342	0.461			
Hosp. t-2/t-5: nervous system	0.071	0.099	0.009	0.280	0.307	0.227			
Hosp. t-2/t-5: eye diseases	-0.071	0.120	0.006	0.298	0.202	0.244			
Hosp. t-2/t-5: ear diseases	-0.047	0.108	0.036	0.267	-0.293	0.244			
Hosp. t-2/t-5: circulatory system	0.037	0.067	-0.126	0.189	-0.003	0.158			
Hosp. t-2/t-5: respiratory system	-0.059	0.094	0.209	0.229	0.083	0.213			
Hosp. t-2/t-5: digestive system	-0.063	0.064	0.160	0.163	0.025	0.132			
Hosp. t-2/t-5: skin	0.010	0.107	-0.182	0.323	-0.694	0.384			
Hosp. t-2/t-5: musculoskeletal system	0.042	0.048	0.018	0.131	-0.031	0.124			
Hosp. t-2/t-5: genitourinary system	0.190	***	0.233	0.134	0.243	0.176			
Hosp. t-2/t-5: childbirth	0.160	0.083	-0.208	0.300					
Hosp. t-2/t-5: malformations, etc.	0.207	0.190	0.245	0.510	0.155	0.511			
Hosp. t-2/t-5: ill-defined conditions	-0.029	0.066	-0.489	*	0.219	0.166			
Hosp. t-2/t-5: injury, poisoning, etc.	-0.034	0.053	-0.187	0.152	0.043	0.114			
Hosp. t-2/t-5: contacts	-0.033	0.044	0.096	0.118	-0.021	0.116			
Drugs t-2/t-5: blood pressure	0.025	0.062	-0.213	0.186	0.022	0.192			
Drugs t-2/t-5: heart disease	0.176	0.114	0.086	0.308	0.085	0.211			
Drugs t-2/t-5: rheumatism	0.024	0.030	-0.000	0.082	-0.065	0.073			
Drugs t-2/t-5: hormonal preparation	0.020	0.049	0.085	0.128	0.167	0.122			
Drugs t-2/t-5: diabetes	-0.236	0.148	0.190	0.313	-0.068	0.248			
Drugs t-2/t-5: antipsychotic	0.029	0.088	-0.714	*	0.331	-0.384	***	0.330	
Drugs t-2/t-5: antidepressive	0.398	***	0.048	0.551	***	0.129	0.622	***	0.139
Drugs t-2/t-5: analgesic	0.045	0.047	0.127	0.126	-0.073	0.124			
Drugs t-2/t-5: hypertension	-0.025	0.038	0.095	0.098	0.197	0.104			
Drugs t-2/t-5: parkinson	-0.133	0.196	0.597	0.464	-0.178	0.724			
Drugs t-2/t-5: osteoporose	-0.230	0.300	0.294	0.594					
Drugs t-2/t-5: asthma	-0.005	0.059	-0.051	0.164	-0.054	0.185			
Drugs t-2/t-5: bronchitis	-0.012	0.069	0.220	0.183	-0.014	0.216			
Drugs t-2/t-5: thyroid	-0.034	0.096	0.128	0.228	0.509	0.425			
Drugs t-2/t-5: antithyroid	0.327	*	0.136	0.434	0.330				
Drugs t-2/t-5: epilepsy	-0.035	0.125	0.277	0.317	-0.327	0.366			
Drugs t-2/t-5: antianxiolytic	0.082	*	0.042	-0.114	0.119	0.010	0.132		
Drugs t-2/t-5: acid disorders	-0.018	0.047	0.055	0.124	-0.025	0.113			
Drugs t-2/t-5: acid antimigraine	0.009	0.054	-0.196	0.160	0.058	0.259			
Drugs t-2/t-5: headaches	-0.066	0.057	0.017	0.151	0.019	0.148			
GP contacts t-2/t-5	0.005	0.002	-0.010	0.009	-0.007	0.010			
Region: Northern Jutland	-0.311	**	0.099	0.182	0.262	-0.017	0.238		
Region: Central Jutland	-0.294	**	0.092	0.092	0.247	-0.150	0.227		
Region: Southern Denmark	-0.084	0.091	-0.033	0.249	-0.026	0.225			
Region: Zealand	-0.210	**	0.075	0.005	0.202	-0.244	0.184		
Region: Bornholm	-0.000	0.163	0.193	0.453	-0.017	0.389			

	Breast cancer		Colorectal cancer: Women		Colorectal cancer: Men	
	beta	s.e.	beta	s.e.	beta	s.e.
Municipality: Central Copenhagen	-0.130	0.109	-0.171	0.294	0.123	0.272
Municip.: Copenhagen area suburbs	-0.119	0.101	-0.256	0.272	0.172	0.252
Municip.: City > 10,000, Cph. area	-0.074	0.103	-0.070	0.270	0.267	0.254
Municip.: Other in Cph. area	-0.048	0.104	-0.049	0.276	0.129	0.259
Municip.: > 100,000 inhabitants	0.093	0.071	-0.083	0.189	0.043	0.182
Municip.: City 40,000 - 99,999	-0.076	0.079	-0.333	0.221	0.231	0.188
Municip.: City 20,000 - 39,999	0.029	0.072	0.041	0.185	0.216	0.176
Municip.: City 10,000 - 19,999	-0.007	0.076	-0.253	0.206	0.252	0.183
Municip.: > 50% urbanized	-0.021	0.073	-0.002	0.189	0.041	0.182
Municip.: 33-50% urbanized	-0.001	0.072	-0.128	0.192	0.140	0.176
Municip.: < 33% urbanized	-0.072	0.081	0.057	0.204	0.301	0.186
Year 2001	0.073	0.044	0.066	0.122	0.098	0.107
Year 2002	0.111	*	0.103	0.121	0.151	0.107
Year 2003	0.105	*	0.055	0.123	0.080	0.108
Year 2004	0.140	**	0.086	0.122	0.181	0.107
Constant	-3.030	***	-4.635	***	-3.557	***
Observations	162820		82400		96344	

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively. Reference categories are: age 60, single without children, no education beyond compulsory school (grade 9), wage earner in year t-2, employed in public services, job function low, region Copenhagen, municipality not urbanized, and year 2000.

Table A3. Effect of breast cancer: Propensity score weighting and three different matching estimators.

	Propensity score weighting			Nearest neighbour matching			Kernel matching 2% trim			Kernel matching No trim		
	ATT		s.e.	ATT		s.e.	ATT		s.e.	ATT		s.e.
Employed t	-0.003		0.007	-0.002		0.006	-0.003		0.005	-0.003		0.005
Employed t+1	-0.044	***	0.008	-0.042	***	0.007	-0.043	***	0.005	-0.044	***	0.005
Employed t+2	-0.057	***	0.008	-0.052	***	0.008	-0.057	***	0.006	-0.057	***	0.006
Employed t+3	-0.067	***	0.008	-0.062	***	0.008	-0.067	***	0.006	-0.067	***	0.006
Out of labour force t	0.021	***	0.006	0.019	***	0.006	0.020	***	0.004	0.020	***	0.004
Out of labour force t+1	0.059	***	0.007	0.060	***	0.007	0.059	***	0.005	0.059	***	0.005
Out of labour force t+2	0.059	***	0.007	0.056	***	0.007	0.059	***	0.005	0.059	***	0.005
Out of labour force t+3	0.070	***	0.008	0.066	***	0.008	0.071	***	0.006	0.071	***	0.006
Full-timer t	-0.007		0.009	-0.008		0.008	-0.006		0.006	-0.006		0.006
Full-timer t+1	-0.044	***	0.009	-0.041	***	0.008	-0.044	***	0.006	-0.044	***	0.006
Full-timer t+2	-0.058	***	0.009	-0.053	***	0.009	-0.058	***	0.006	-0.058	***	0.006
Full-timer t+3	-0.079	***	0.009	-0.075	***	0.009	-0.081	***	0.007	-0.079	***	0.007
Disability pension t	0.001		0.002	0.002		0.002	0.002		0.002	0.001		0.002
Disability pension t+1	0.014	***	0.003	0.013	***	0.003	0.014	***	0.003	0.014	***	0.003
Disability pension t+2	0.038	***	0.004	0.036	***	0.004	0.038	***	0.003	0.038	***	0.003
Disability pension t+3	0.057	***	0.004	0.053	***	0.005	0.057	***	0.004	0.057	***	0.004
Earnings t	-6.658	*	2.887	-6.666	**	2.293	-6.443	***	1.642	-6.349	***	1.638
Earnings t+1	-14.694	***	2.916	-14.380	***	2.405	-14.485	***	1.742	-14.427	***	1.739
Earnings t+2	-16.139	***	2.913	-14.916	***	2.478	-15.891	***	1.787	-15.938	***	1.782
Earnings t+3	-17.821	***	2.950	-16.164	***	2.557	-17.728	***	1.843	-17.691	***	1.837
Income t	-1.596		2.387	-1.297		1.907	-1.299		1.338	-1.272		1.339
Income t+1	-3.461		2.373	-3.529		1.940	-3.130	*	1.365	-3.167	*	1.367
Income t+2	-5.932	*	2.352	-5.306	**	1.962	-5.507	***	1.380	-5.687	***	1.379
Income t+3	-7.038	**	2.341	-5.747	**	1.970	-6.536	***	1.398	-6.854	***	1.393
Disposable income t	-0.684		1.232	-0.405		1.042	-0.572		0.732	-0.585		0.731
Disposable income t+1	-0.814		1.269	-0.812		1.083	-0.666		0.763	-0.724		0.761
Disposable income t+2	-2.250		1.284	-1.946		1.106	-2.110	**	0.782	-2.203	**	0.780
Disposable income t+3	-3.175	*	1.303	-2.457	*	1.138	-3.060	***	0.806	-3.152	***	0.803
N treatment	5683											
N controls	157137											

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively. Standard errors of the matching estimates are not corrected for the estimation of the propensity score. The propensity score weighting estimates are identical to the corresponding estimates in Table 2. Nearest neighbour matching is with replacement. Kernel matching estimates are based on the Epanechnikov kernel and a bandwidth of 0.01. In the 'kernel matching 2% trim' estimations we drop 2% of the treatment observations for which the propensity score density of the control observations is the lowest.

Table A4. Effect of colorectal cancer for women: Propensity score weighting and three different matching estimators.

	Propensity score weighting		Nearest neighbour matching		Kernel matching 2% trim		Kernel matching No trim	
	ATT	s.e.	ATT	s.e.	ATT	s.e.	ATT	s.e.
Employed t	-0.000		-0.010	0.018	0.004	0.013	0.002	0.013
Employed t+1	-0.045	*	-0.050	*	-0.044	**	-0.045	**
Employed t+2	-0.073	**	-0.076	***	-0.071	***	-0.076	***
Employed t+3	-0.087	***	-0.087	***	-0.089	***	-0.093	***
Out of labour force t	0.024		0.045	**	0.018		0.021	
Out of labour force t+1	0.061	**	0.068	***	0.059	***	0.060	***
Out of labour force t+2	0.077	***	0.082	***	0.073	***	0.079	***
Out of labour force t+3	0.085	***	0.098	***	0.086	***	0.091	***
Full-timer t	0.005		0.015		0.009		0.005	
Full-timer t+1	-0.052	*	-0.037		-0.053	**	-0.055	**
Full-timer t+2	-0.086	***	-0.083	***	-0.089	***	-0.091	***
Full-timer t+3	-0.093	***	-0.079	**	-0.101	***	-0.102	***
Disability pension t	-0.009		-0.005		-0.010	**	-0.008	*
Disability pension t+1	0.013		0.016		0.011		0.014	
Disability pension t+2	0.042	***	0.046	***	0.038	***	0.043	***
Disability pension t+3	0.056	***	0.063	***	0.054	***	0.058	***
Earnings t	-2.115		-2.860		-1.582		-0.625	
Earnings t+1	-9.873		-7.186		-10.356	*	-9.101	
Earnings t+2	-14.954		-13.304		-15.536	**	-15.066	**
Earnings t+3	-19.984	*	-15.919	*	-21.318	***	-20.985	***
Income t	-1.352		-6.506		-0.782		0.312	
Income t+1	-4.086		-8.230		-3.915		-2.810	
Income t+2	-5.832		-7.129		-5.995		-4.873	
Income t+3	-8.195		-9.780		-8.624	*	-7.630	
Disposable income t	-0.900		-3.433		-1.153		-0.686	
Disposable income t+1	-0.963		-2.922		-1.432		-0.928	
Disposable income t+2	-0.830		-1.415		-1.562		-1.068	
Disposable income t+3	-2.480		-3.750		-3.343		-2.899	
N treatment	736							
N controls	81664							

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively. See note of Table A3.

Table A5. Effect of colorectal cancer for men: Propensity score weighting and three different matching estimators.

	Propensity score weighting		Nearest neighbour matching		Kernel matching 2% trim		Kernel matching No trim	
	ATT	s.e.	ATT	s.e.	ATT	s.e.	ATT	s.e.
Employed t	-0.008	0.013	-0.002	0.013	-0.007	0.010	-0.006	0.010
Employed t+1	-0.036	* 0.015	-0.032	* 0.016	-0.031	** 0.012	-0.035	** 0.012
Employed t+2	-0.059	*** 0.017	-0.058	*** 0.018	-0.056	*** 0.013	-0.059	*** 0.013
Employed t+3	-0.069	*** 0.019	-0.064	*** 0.019	-0.069	*** 0.014	-0.072	*** 0.014
Out of labour force t	0.020	0.010	0.020	0.010	0.017	* 0.008	0.018	* 0.008
Out of labour force t+1	0.055	*** 0.014	0.046	*** 0.014	0.050	*** 0.011	0.053	*** 0.011
Out of labour force t+2	0.065	*** 0.016	0.059	*** 0.016	0.062	*** 0.012	0.065	*** 0.012
Out of labour force t+3	0.074	*** 0.018	0.067	*** 0.018	0.074	*** 0.014	0.077	*** 0.014
Full-timer t	-0.000	0.018	0.011	0.018	0.003	0.012	0.002	0.012
Full-timer t+1	-0.040	* 0.019	-0.037	0.019	-0.037	** 0.014	-0.039	** 0.014
Full-timer t+2	-0.055	** 0.020	-0.055	** 0.021	-0.054	*** 0.015	-0.056	*** 0.015
Full-timer t+3	-0.061	** 0.021	-0.066	** 0.021	-0.063	*** 0.016	-0.064	*** 0.016
Disability pension t	0.004	0.005	0.000	0.006	0.004	0.004	0.004	0.004
Disability pension t+1	0.026	*** 0.007	0.024	** 0.008	0.024	*** 0.007	0.026	*** 0.007
Disability pension t+2	0.045	*** 0.009	0.042	*** 0.010	0.042	*** 0.008	0.045	*** 0.008
Disability pension t+3	0.066	*** 0.010	0.066	*** 0.011	0.064	*** 0.010	0.066	*** 0.010
Earnings t	-12.163	9.824	-15.117	7.972	-9.398	5.662	-10.744	5.624
Earnings t+1	-18.492	9.660	-22.655	** 8.227	-16.202	** 5.839	-17.678	** 5.811
Earnings t+2	-17.808	9.489	-18.612	* 8.266	-16.704	** 5.873	-17.655	** 5.848
Earnings t+3	-21.402	* 9.380	-22.298	** 8.459	-21.453	*** 6.006	-22.192	*** 5.979
Income t	-4.116	8.974	-5.740	7.558	0.156	5.530	-1.511	5.490
Income t+1	-7.986	8.695	-7.258	7.591	-4.226	5.469	-5.891	5.421
Income t+2	-9.819	8.611	-5.121	7.523	-6.723	5.521	-8.198	5.482
Income t+3	-8.223	8.523	-4.935	7.634	-6.108	5.617	-7.294	5.587
Disposable income t	-2.799	4.079	-5.658	3.816	-0.607	2.675	-1.197	2.660
Disposable income t+1	-2.033	4.171	-1.422	3.907	0.325	2.805	-0.478	2.779
Disposable income t+2	-4.956	4.262	-3.081	3.962	-2.803	2.866	-3.457	2.844
Disposable income t+3	-1.844	4.290	0.698	4.102	0.092	2.939	-0.557	2.924
N treatment	952							
N controls	95392							

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively. See note of Table A3.

Table A6. Dif-in-dif estimates of the effect of cancer on labour market status and income, where the control group consists of persons diagnosed with cancer five year later than the treatment group, and where persons in both groups survive at least three year after diagnosis

	Breast Cancer		Colorectal cancer: Women		Colorectal cancer: Men				
	ATT	s.e.	ATT	s.e.	ATT	s.e.			
Employed t	-0.005	***	0.006	0.014	0.025	-0.005	0.019		
Employed t+1	-0.046	***	0.008	-0.047	0.027	-0.042	0.022		
Employed t+2	-0.055	***	0.009	-0.091	**	0.031	-0.057	*	0.023
Employed t+3	-0.065	***	0.010	-0.104	**	0.033	-0.077	**	0.027
Out of labour force t	0.023	***	0.005	0.022		0.018	0.019		0.013
Out of labour force t+1	0.063	***	0.007	0.055	*	0.025	0.060	***	0.017
Out of labour force t+2	0.062	***	0.008	0.078	**	0.028	0.063	**	0.020
Out of labour force t+3	0.075	***	0.010	0.080	*	0.032	0.081	***	0.024
Full-timer t	-0.008		0.007	0.029		0.027	-0.001		0.024
Full-timer t+1	-0.047	***	0.009	-0.041		0.032	-0.059	*	0.026
Full-timer t+2	-0.059	***	0.010	-0.086	*	0.036	-0.067	*	0.028
Full-timer t+3	-0.070	***	0.010	-0.100	**	0.038	-0.076	*	0.030
Disability pension t	0.004		0.003	-0.014		0.010	0.006		0.008
Disability pension t+1	0.013	***	0.004	0.017		0.013	0.023	*	0.011
Disability pension t+2	0.038	***	0.004	0.045	**	0.016	0.046	***	0.012
Disability pension t+3	0.059	***	0.005	0.059	**	0.018	0.077	***	0.014
Earnings t	-6.991	***	1.313	3.429		4.948	-13.579	**	5.149
Earnings t+1	-16.175	***	1.722	-7.194		5.875	-24.146	***	6.661
Earnings t+2	-17.566	***	2.036	-15.389	*	6.888	-22.745	**	7.712
Earnings t+3	-19.766	***	2.346	-18.386	*	8.168	-30.281	***	8.942
Income t	-2.499	*	1.038	1.881		4.239	-2.360		5.637
Income t+1	-5.430	***	1.225	-2.278		4.242	-8.530		6.462
Income t+2	-8.384	***	1.378	-3.328		5.024	-9.702		7.544
Income t+3	-10.066	***	1.493	-4.477		5.685	-7.830		7.666
Disposable income t	-1.127		0.803	3.018		2.644	-5.058		3.982
Disposable income t+1	-1.122		0.865	2.618		2.819	-3.365		4.063
Disposable income t+2	-2.471	**	0.896	2.637		3.212	-6.321		4.524
Disposable income t+3	-3.610	***	0.962	1.630		3.632	-3.987		4.726
N cancer	4517		577		744				
N controls	6116		1083		1500				

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A7. Dif-in-dif estimates of ATT for breast cancer by education

	Compulsory education			Vocational education			Further education		
	ATT		s.e.	ATT		s.e.	ATT		s.e.
Out of labour force t	0.047	***	0.009	0.018	**	0.006	0.009		0.005
Out of labour force t+1	0.106	***	0.012	0.061	***	0.008	0.029	***	0.007
Out of labour force t+2	0.106	***	0.014	0.057	***	0.009	0.035	***	0.008
Out of labour force t+3	0.101	***	0.016	0.076	***	0.011	0.052	***	0.009
Disability pension t	0.010	*	0.005	0.001		0.003	-0.001		0.002
Disability pension t+1	0.037	***	0.007	0.011	**	0.004	0.004		0.003
Disability pension t+2	0.073	***	0.009	0.037	***	0.005	0.019	***	0.004
Disability pension t+3	0.095	***	0.010	0.054	***	0.006	0.039	***	0.005

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively. Numbers of observations are as in Table 7.

Table A8. Dif-in-dif estimates of ATT for colorectal cancer by education

	Compulsory education			Vocational education			Further education		
	ATT		s.e.	ATT		s.e.	ATT		s.e.
Out of labour force t	0.036	*	0.014	0.024	**	0.009	0.001		0.009
Out of labour force t+1	0.085	***	0.019	0.064	***	0.014	0.007		0.011
Out of labour force t+2	0.096	***	0.023	0.071	***	0.017	0.024		0.015
Out of labour force t+3	0.111	***	0.027	0.073	***	0.020	0.032		0.018
Disability pension t	-0.006		0.007	-0.000		0.004	-0.002		0.004
Disability pension t+1	0.027	*	0.012	0.027	***	0.008	0.003		0.006
Disability pension t+2	0.058	***	0.014	0.047	***	0.010	0.022	*	0.009
Disability pension t+3	0.088	***	0.016	0.065	***	0.011	0.028	**	0.010

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively. Numbers of observations are as in Table 8.

Table A9. Dif-in-dif estimates of ATT for breast cancer by education, where the control group consists of persons diagnosed with cancer five years later than the treatment group

	Compulsory education			Vocational education			Further education		
	ATT		s.e.	ATT		s.e.	ATT		s.e.
Out of labour force t	0.046	***	0.012	0.021	**	0.008	0.004		0.007
Out of labour force t+1	0.100	***	0.016	0.064	***	0.011	0.027	**	0.009
Out of labour force t+2	0.097	***	0.019	0.062	***	0.013	0.031	**	0.011
Out of labour force t+3	0.093	***	0.021	0.080	***	0.016	0.051	***	0.013
Disability pension t	0.011		0.007	-0.001		0.004	-0.002		0.003
Disability pension t+1	0.029	**	0.009	0.006		0.005	0.004		0.004
Disability pension t+2	0.066	***	0.011	0.029	***	0.007	0.018	**	0.006
Disability pension t+3	0.093	***	0.012	0.049	***	0.008	0.037	***	0.007
N cancer	1219			1681			1617		
N controls	1837			2480			2340		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A10. Dif-in-dif estimates of ATT for colorectal cancer by education, where the control group consists of persons diagnosed with cancer five years later than the treatment group

	Compulsory education			Vocational education			Further education		
	ATT		s.e.	ATT		s.e.	ATT		s.e.
Out of labour force t	0.055	**	0.018	0.024	*	0.011	0.002		0.012
Out of labour force t+1	0.110	***	0.025	0.064	***	0.018	0.020		0.014
Out of labour force t+2	0.102	***	0.029	0.078	***	0.021	0.046	*	0.018
Out of labour force t+3	0.131	***	0.033	0.071	**	0.025	0.057	*	0.024
Disability pension t	0.001		0.009	0.003		0.006	-0.002		0.005
Disability pension t+1	0.037	**	0.014	0.024	*	0.009	0.004		0.007
Disability pension t+2	0.068	***	0.018	0.041	***	0.012	0.028	*	0.011
Disability pension t+3	0.107	***	0.020	0.068	***	0.013	0.032	**	0.012
N cancer	375			553			393		
N controls	1174			1562			1080		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A11. Effect of cancer on labour market status and income for those employed two years before the base year (in t-2): Weighted mean for the control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT (propensity score weighting)

	Breast Cancer			Colorectal cancer: Women			Colorectal cancer: Men		
	WM C	ATT	s.e.	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.937	0.000	0.004	0.932	-0.005	0.013	0.946	-0.006	0.009
Employed t+1	0.909	-0.038	***	0.902	-0.046	**	0.915	-0.033	**
Employed t+2	0.879	-0.053	***	0.863	-0.079	***	0.882	-0.052	***
Employed t+3	0.845	-0.064	***	0.817	-0.085	***	0.839	-0.067	***
Out of labour force t	0.030	0.015	***	0.031	0.023	*	0.022	0.016	*
Out of labour force t+1	0.057	0.050	***	0.058	0.054	***	0.050	0.048	***
Out of labour force t+2	0.085	0.050	***	0.096	0.076	***	0.084	0.058	***
Out of labour force t+3	0.124	0.064	***	0.147	0.083	***	0.133	0.072	***
Full-timer t	0.854	-0.004	0.007	0.838	0.005	0.022	0.859	-0.000	0.016
Full-timer t+1	0.827	-0.041	***	0.804	-0.053	*	0.822	-0.039	*
Full-timer t+2	0.793	-0.056	***	0.763	-0.093	***	0.781	-0.050	*
Full-timer t+3	0.761	-0.079	***	0.716	-0.093	***	0.737	-0.060	**
Disability pension t	0.009	0.001	0.002	0.011	-0.002	0.004	0.009	0.004	0.004
Disability pension t+1	0.015	0.011	***	0.018	0.017	*	0.015	0.026	***
Disability pension t+2	0.021	0.033	***	0.025	0.043	***	0.020	0.046	***
Disability pension t+3	0.027	0.049	***	0.032	0.056	***	0.024	0.066	***
Earnings t	225.100	-6.046	*	220.008	-2.864	8.147	272.878	-10.951	9.770
Earnings t+1	221.431	-14.108	***	215.566	-10.004	8.197	263.690	-16.839	9.648
Earnings t+2	216.747	-16.107	***	208.533	-15.569	8.387	253.810	-15.703	9.527
Earnings t+3	210.935	-17.786	***	200.259	-20.614	*	242.158	-19.870	*
Income t	252.495	-1.356	2.322	252.110	-2.850	7.203	336.739	-3.196	9.033
Income t+1	253.256	-3.144	2.320	252.601	-5.350	7.038	332.080	-7.508	8.797
Income t+2	253.660	-6.096	2.314	251.814	-7.076	7.143	328.067	-8.412	8.729
Income t+3	253.588	-7.024	**	250.628	-9.252	7.219	322.527	-7.276	8.650
Disposable income t	158.343	-0.520	1.189	156.909	-1.485	3.777	188.965	-1.798	4.105
Disposable income t+1	164.019	-0.671	1.232	162.833	-1.646	3.921	196.278	-1.534	4.223
Disposable income t+2	169.517	-2.419	1.251	167.614	-1.759	4.076	203.200	-3.773	4.290
Disposable income t+3	172.211	-3.446	**	170.309	-3.179	4.164	206.587	-1.151	4.329
N cancer	5088			654			897		
N controls	136301			68457			87824		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A12. Effect of breast cancer by education for those employed two years before the base year: Weighted mean for control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Compulsory education			Vocational education			Further education		
	WM C	ATT	s.e.	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.900	-0.014		0.935	0.009		0.963	0.002	
Employed t+1	0.856	-0.071	***	0.906	-0.041	***	0.946	-0.015	*
Employed t+2	0.812	-0.084	***	0.876	-0.058	***	0.927	-0.028	***
Employed t+3	0.761	-0.091	***	0.841	-0.065	***	0.903	-0.046	***
Out of labour force t	0.046	0.041	***	0.029	0.008		0.020	0.005	
Out of labour force t+1	0.091	0.093	***	0.055	0.049	***	0.035	0.024	***
Out of labour force t+2	0.136	0.096	***	0.084	0.046	***	0.053	0.026	***
Out of labour force t+3	0.194	0.095	***	0.125	0.065	***	0.078	0.044	***
Full-timer t	0.795	-0.022		0.846	0.001		0.900	0.003	
Full-timer t+1	0.756	-0.074	***	0.820	-0.050	***	0.881	-0.010	
Full-timer t+2	0.708	-0.083	***	0.788	-0.067	***	0.854	-0.029	*
Full-timer t+3	0.665	-0.104	***	0.753	-0.082	***	0.831	-0.059	***
Disability pension t	0.013	0.009	*	0.009	-0.001		0.006	-0.002	
Disability pension t+1	0.022	0.030	***	0.015	0.006		0.010	0.003	
Disability pension t+2	0.031	0.063	***	0.020	0.033	***	0.015	0.015	***
Disability pension t+3	0.039	0.080	***	0.026	0.048	***	0.020	0.031	***
Earnings t	184.152	-12.171	*	208.861	-6.054		268.002	-2.138	
Earnings t+1	177.708	-22.291	***	205.020	-15.646	***	266.507	-7.534	
Earnings t+2	170.019	-20.584	***	200.650	-17.256	***	263.403	-12.269	**
Earnings t+3	161.297	-20.577	***	195.238	-18.643	***	258.827	-15.082	**
Income t	214.797	-2.927		234.733	-1.832		295.280	-0.412	
Income t+1	214.168	-5.131		234.861	-4.095		297.713	-1.589	
Income t+2	212.808	-6.806		235.529	-6.048		298.989	-6.359	
Income t+3	211.022	-7.789	*	235.492	-7.283	*	299.902	-6.851	
Disposable income t	138.223	-1.179		149.536	-1.180		180.454	0.325	
Disposable income t+1	141.715	-1.470		154.483	-1.377		188.249	0.341	
Disposable income t+2	145.474	-1.850		159.824	-3.450	*	195.211	-2.148	
Disposable income t+3	146.562	-3.107		162.360	-4.166	*	198.983	-3.219	
N cancer	1248			1919			1921		
N controls	31086			53169			51360		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A13. Effect of breast cancer by type of job two years before the base year (in t-2) : Weighted mean for control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Blue-collar worker in year t-2			White-collar worker in year t-2		
	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.913	-0.000	0.007	0.968	0.004	0.004
Employed t+1	0.876	-0.054	***	0.950	-0.012	**
Employed t+2	0.842	-0.074	***	0.929	-0.022	***
Employed t+3	0.802	-0.084	***	0.900	-0.034	***
Out of labour force t	0.042	0.021	***	0.016	0.002	***
Out of labour force t+1	0.076	0.070	***	0.031	0.022	**
Out of labour force t+2	0.111	0.070	***	0.052	0.019	***
Out of labour force t+3	0.157	0.085	***	0.081	0.033	***
Full-timer t	0.828	-0.004	0.011	0.928	0.003	0.008
Full-timer t+1	0.796	-0.060	***	0.906	-0.010	0.009
Full-timer t+2	0.759	-0.087	***	0.876	-0.023	*
Full-timer t+3	0.716	-0.101	***	0.844	-0.056	***
Disability pension t	0.012	0.001	0.002	0.007	-0.001	0.002
Disability pension t+1	0.019	0.014	***	0.011	0.004	0.003
Disability pension t+2	0.027	0.041	***	0.015	0.016	***
Disability pension t+3	0.034	0.058	***	0.019	0.033	***
Earnings t	197.677	-8.329	**	283.205	-2.941	3.557
Earnings t+1	192.245	-19.314	***	280.271	-8.047	*
Earnings t+2	186.577	-20.124	***	275.587	-12.525	**
Earnings t+3	180.209	-20.918	***	269.147	-15.639	***
Income t	218.535	-0.686	2.320	298.641	-1.507	3.498
Income t+1	218.592	-3.580	2.312	300.270	-2.201	3.476
Income t+2	218.631	-5.834	*	300.888	-6.396	3.436
Income t+3	218.211	-6.568	**	301.207	-7.679	*
Disposable income t	142.507	-0.445	1.286	180.970	-0.445	1.742
Disposable income t+1	146.657	-0.868	1.346	188.654	-0.548	1.764
Disposable income t+2	150.975	-2.709	*	195.545	-2.204	1.756
Disposable income t+3	152.950	-3.359	*	199.023	-3.048	1.797
N cancer	2737			2078		
N controls	77224			49313		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A14. Effect of breast cancer by education for those who were blue-collar workers two years before the base year: Weighted mean for control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Compulsory education			Vocational education			Further education		
	WM C	ATT	s.e.	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.889	-0.017		0.930	0.008		0.919	0.015	
Employed t+1	0.842	-0.082	***	0.897	-0.043	***	0.896	-0.010	
Employed t+2	0.799	-0.092	***	0.864	-0.066	***	0.883	-0.045	
Employed t+3	0.746	-0.097	***	0.829	-0.076	***	0.868	-0.075	**
Out of labour force t	0.057	0.044	***	0.032	0.006		0.044	0.008	
Out of labour force t+1	0.103	0.103	***	0.061	0.054	***	0.059	0.031	
Out of labour force t+2	0.149	0.100	***	0.091	0.055	***	0.076	0.028	
Out of labour force t+3	0.209	0.102	***	0.134	0.075	***	0.089	0.077	**
Full-timer t	0.798	-0.029		0.849	0.004		0.825	0.044	
Full-timer t+1	0.759	-0.087	***	0.819	-0.051	**	0.814	-0.008	
Full-timer t+2	0.708	-0.097	***	0.785	-0.083	***	0.805	-0.064	
Full-timer t+3	0.659	-0.115	***	0.743	-0.094	***	0.779	-0.076	*
Disability pension t	0.016	0.002		0.010	-0.000		0.005	-0.002	
Disability pension t+1	0.026	0.028	***	0.017	0.007		0.010	-0.003	
Disability pension t+2	0.036	0.057	***	0.022	0.034	***	0.015	0.012	
Disability pension t+3	0.046	0.076	***	0.028	0.050	***	0.023	0.036	*
Earnings t	181.211	-12.735	**	203.591	-6.620		226.385	-0.845	
Earnings t+1	173.642	-25.246	***	199.001	-17.222	***	224.444	-8.406	
Earnings t+2	165.661	-22.598	***	194.017	-19.563	***	223.507	-13.827	
Earnings t+3	156.930	-21.803	***	188.391	-21.016	***	221.422	-16.569	
Income t	204.302	-0.764		221.780	-0.803		251.232	1.796	
Income t+1	203.516	-4.530		222.006	-3.518		253.542	0.994	
Income t+2	202.694	-6.707	*	222.522	-5.458		254.625	-3.437	
Income t+3	201.252	-7.468	*	222.649	-6.648	*	255.745	-2.455	
Disposable income t	133.749	0.065		144.376	-0.813		163.356	0.463	
Disposable income t+1	136.881	-1.657		148.786	-0.579		169.459	1.768	
Disposable income t+2	140.394	-3.091		153.404	-2.282		175.426	-2.484	
Disposable income t+3	141.431	-3.804		155.825	-3.231		178.895	-1.810	
N cancer	1022			1426			289		
N controls	25836			40599			9596		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A15. Effect of breast cancer by education for those who were white-collar workers two years before the base year: Weighted mean for control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Compulsory education			Vocational education			Further education		
	WM C	ATT	s.e.	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.946	0.023	0.020	0.957	0.016	0.011	0.972	0.000	0.005
Employed t+1	0.917	0.021	0.025	0.933	-0.020	0.019	0.956	-0.012	0.007
Employed t+2	0.888	-0.018	0.034	0.910	-0.027	0.021	0.936	-0.020	*
Employed t+3	0.841	-0.027	0.043	0.883	-0.029	0.024	0.910	-0.036	***
Out of labour force t	0.022	-0.009	0.012	0.017	-0.002	0.008	0.015	0.004	0.004
Out of labour force t+1	0.047	0.002	0.023	0.033	0.035	*	0.015	0.020	**
Out of labour force t+2	0.077	0.035	0.032	0.060	0.006	0.017	0.048	0.020	**
Out of labour force t+3	0.129	0.039	0.043	0.090	0.017	0.022	0.075	0.035	***
Full-timer t	0.898	0.003	0.036	0.923	0.014	0.019	0.932	0.001	0.009
Full-timer t+1	0.859	-0.002	0.042	0.895	-0.016	0.023	0.913	-0.008	0.010
Full-timer t+2	0.812	-0.036	0.047	0.869	-0.020	0.025	0.884	-0.022	0.012
Full-timer t+3	0.774	-0.060	0.051	0.828	-0.046	0.028	0.854	-0.058	***
Disability pension t	0.009	0.016	0.014	0.006	-0.001	0.004	0.006	-0.002	0.002
Disability pension t+1	0.013	0.018	0.016	0.013	-0.002	0.007	0.010	0.004	0.003
Disability pension t+2	0.017	0.051	*	0.015	0.011	0.009	0.015	0.013	**
Disability pension t+3	0.023	0.058	*	0.017	0.030	*	0.019	0.030	***
Earnings t	264.511	-4.586	13.491	275.712	-4.233	8.818	287.087	-2.503	4.065
Earnings t+1	256.296	-4.695	13.402	271.051	-10.051	9.207	285.122	-7.943	4.234
Earnings t+2	244.949	-11.600	14.040	264.725	-10.227	9.461	281.256	-12.945	**
Earnings t+3	232.763	-13.875	15.546	257.450	-14.683	9.873	275.792	-15.979	***
Income t	284.977	-5.102	12.149	288.910	-3.649	8.168	302.894	-0.996	4.090
Income t+1	282.377	0.153	12.166	288.864	-3.107	8.000	305.346	-2.583	4.078
Income t+2	279.821	-4.455	11.555	287.526	-5.249	7.961	306.531	-6.993	4.025
Income t+3	275.002	-3.531	11.659	287.404	-8.009	7.979	307.576	-8.218	*
Disposable income t	171.277	-2.166	6.054	174.485	-1.521	4.023	183.799	-0.194	2.041
Disposable income t+1	176.393	0.478	6.208	181.426	-2.784	3.988	191.941	-0.302	2.065
Disposable income t+2	181.827	4.237	6.445	187.649	-4.531	3.950	199.050	-2.403	2.052
Disposable income t+3	181.692	5.497	6.602	191.061	-5.450	4.089	202.877	-3.401	2.095
N cancer	161			382			1535		
N controls	2686			8280			37471		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A16. Effect of breast cancer for survivors with and without recurrences/second cancers: Weighted mean for control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Recurrence/second cancer			No recurrence/second cancer			
	WM C	ATT	s.e.	WM C	ATT	s.e.	
Employed t	0.867	0.022	0.020	0.876	-0.006		0.007
Employed t+1	0.843	-0.040	0.023	0.851	-0.044	***	0.008
Employed t+2	0.817	-0.093	0.025	0.825	-0.053	***	0.008
Employed t+3	0.791	-0.154	0.027	0.793	-0.057	***	0.009
Out of labour force t	0.086	0.003	0.018	0.081	0.023	***	0.006
Out of labour force t+1	0.110	0.066	0.022	0.105	0.058	***	0.007
Out of labour force t+2	0.137	0.103	0.024	0.132	0.054	***	0.008
Out of labour force t+3	0.170	0.170	0.026	0.169	0.059	***	0.008
Full-timer t	0.787	0.026	0.026	0.795	-0.010		0.009
Full-timer t+1	0.764	-0.029	0.027	0.771	-0.046	***	0.009
Full-timer t+2	0.736	-0.101	0.028	0.741	-0.053	***	0.010
Full-timer t+3	0.712	-0.190	0.028	0.711	-0.066	***	0.010
Disability pension t	0.018	0.005	0.007	0.016	0.001		0.002
Disability pension t+1	0.027	0.030	0.011	0.025	0.012	***	0.003
Disability pension t+2	0.036	0.106	0.016	0.033	0.030	***	0.004
Disability pension t+3	0.044	0.194	0.019	0.040	0.041	***	0.004
Earnings t	202.405	-3.550	8.826	207.620	-6.995	*	3.035
Earnings t+1	200.291	-13.008	9.082	204.838	-14.878	***	3.059
Earnings t+2	197.057	-24.135	9.054	200.882	-15.225	***	3.057
Earnings t+3	193.491	-39.542	9.110	195.860	-15.354	***	3.096
Income t	237.497	0.350	7.229	239.710	-1.781		2.509
Income t+1	239.064	-0.799	7.172	240.723	-3.729		2.496
Income t+2	240.002	-3.675	7.115	241.400	-6.152	*	2.473
Income t+3	240.953	-7.525	7.078	241.648	-6.949	**	2.462
Disposable income t	152.385	0.353	3.658	152.055	-0.781		1.299
Disposable income t+1	158.145	0.354	3.745	157.552	-0.928		1.339
Disposable income t+2	163.551	0.138	3.815	162.940	-2.503		1.353
Disposable income t+3	166.458	-1.776	3.908	165.687	-3.318	*	1.373
N cancer	579			5104			
N controls	157137			157137			

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.

Table A17. Effect of colorectal cancer for survivors with and without recurrences/second cancers: Weighted mean for control group (WM C), average treatment effect on the treated (ATT) and standard error (s.e.) of ATT

	Recurrence/second cancer			No recurrence/second cancer		
	WM C	ATT	s.e.	WM C	ATT	s.e.
Employed t	0.879	-0.026	0.030	0.892	0.003	0.012
Employed t+1	0.849	-0.069	* 0.032	0.860	-0.027	0.014
Employed t+2	0.815	-0.112	** 0.034	0.826	-0.046	** 0.015
Employed t+3	0.775	-0.155	*** 0.037	0.782	-0.049	** 0.016
Out of labour force t	0.074	0.039	0.026	0.061	0.016	0.010
Out of labour force t+1	0.105	0.098	** 0.030	0.093	0.042	*** 0.012
Out of labour force t+2	0.143	0.131	*** 0.033	0.131	0.048	*** 0.014
Out of labour force t+3	0.188	0.169	*** 0.036	0.181	0.048	** 0.016
Full-timer t	0.783	-0.013	0.038	0.803	0.011	0.016
Full-timer t+1	0.754	-0.084	* 0.039	0.767	-0.028	0.017
Full-timer t+2	0.715	-0.131	*** 0.039	0.727	-0.044	* 0.018
Full-timer t+3	0.671	-0.167	*** 0.038	0.683	-0.042	* 0.018
Disability pension t	0.019	-0.009	0.007	0.016	-0.000	0.004
Disability pension t+1	0.028	0.045	** 0.016	0.023	0.015	* 0.006
Disability pension t+2	0.035	0.115	*** 0.022	0.030	0.028	*** 0.007
Disability pension t+3	0.042	0.192	*** 0.026	0.036	0.033	*** 0.008
Earnings t	233.032	-10.768	16.502	234.328	-6.098	7.303
Earnings t+1	225.600	-24.272	16.295	227.637	-10.867	7.201
Earnings t+2	217.898	-30.357	15.670	219.513	-11.446	7.194
Earnings t+3	208.858	-45.666	** 14.941	209.712	-12.588	7.201
Income t	289.604	7.716	15.566	287.186	-4.142	6.806
Income t+1	287.477	0.730	14.870	284.852	-6.372	6.632
Income t+2	284.561	-4.423	14.337	282.325	-7.204	6.598
Income t+3	281.571	-1.281	14.472	279.183	-7.933	6.515
Disposable income t	170.211	-1.209	7.172	168.978	-1.541	3.174
Disposable income t+1	175.805	1.809	7.364	175.484	-1.462	3.279
Disposable income t+2	182.364	-2.773	7.477	181.071	-2.311	3.375
Disposable income t+3	185.410	1.412	7.609	184.184	-1.799	3.426
N cancer	300			1388		
N controls	164468			177056		

Note: *, ** and *** denote significance at the 5, 1 and 0.1% level, respectively.