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Risk for unemployment of cancer survivors: A Danish cohort study

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ABSTRACT

Aim: To investigate whether cancer survivors are at an increased risk for unemployment after cancer.

Materials and methods: A cohort of 65,510 patients who were part of the workforce in the year before diagnosis and a random sample of 316,925 age and gender-matched controls were followed for up to 20 years in a longitudinal register-based cohort study. Demographic, socioeconomic and health-related information were obtained through Danish administrative registers.

Results: Cancer survivors had a small but significantly increased risk for unemployment following cancer. Stratified analyses showed that the risk for unemployment was highest amongst persons aged 50–60 years at time of diagnosis. Risk factors for unemployment were found to be manual work, medium income and vocational education.

Conclusion: Generally, cancer patients were at a small increased risk for unemployment and low socioeconomic position was a significant risk factor.

1. Introduction

Each year, cancer is diagnosed in close to 60,000 citizens aged 30–69 in the Nordic countries.[1] Early detection and molecular-based targeted therapy have improved the survival rates from many cancer types.[2] Therefore, the prevalence of persons with a history of cancer is increasing,[3] and the need to look beyond survival has become more important. Treatment for cancer often includes not only well-defined treatments, such as a surgery, but also other more complicated adjuvant treatments, such as irradiation, chemotherapy, endocrine therapy and stem-cell transplantations, depending on the site and stage of the cancer. Each of these treatments can have both physical and psychological late effects, whether given alone or in combination.[4] Not only do the side-effects of cancer treatment have an impact on the ability to work during treatment, but the late effects can also have a long-term effect on employment. The impact cancer has on the work ability might also be influenced by other somatic and psychiatric diseases as depression and musculoskeletal diseases factors that also play a pivotal role for working market participation amongst persons not affected by a cancer disease.

A diagnosis of cancer and its subsequent treatment can have a serious impact not only on the employment and productivity of cancer survivors but also on work-related discrimination as unwanted changes in working tasks and impossibility of changing job.[5,6] This discrimination might lead to work-related problems, increased vulnerability and expulsion years after the diagnosis.

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We conducted a nationwide, population-based cohort study of persons who were active in the labour market at the time of entry. We included only cancer sites with relatively good prognosis and with high incidences amongst middle-aged persons. In addition, the selected cancer sites should cover the socioeconomic spectrum of the Danish population. Many persons under the age of 30 years are students under education while it is possible to retire in Denmark after the age of 60 years and therefore we decided to define the working aged population as those between 30 and 60. Information from Danish administrative registers was used to determine the risk for first unemployment amongst cancer patients and in a cancer-free control cohort. In this study, we were able not only to adjust for age, gender and socioeconomic factors but also to include hospital admissions for somatic and psychiatric diseases as confounding risk factors for unemployment amongst cancer survivors.

2. Materials and methods

2.1. Cancer cohort

Since 1943, all incident cases of cancer in Denmark have been registered in the Danish Cancer Registry. We obtained information on 65,510 patients aged 30–60 years on the date of diagnosis of their first incident cancer between 1980 and 2000, who were alive 1 year after the date of diagnosis. The information retrieved included date of diagnosis, extent of disease and the personal identification number, which is assigned to all residents of Denmark shortly after birth by the Central Population Register. This identification number permits accurate linkage of information amongst registers. The selected cancer sites and extent of disease are listed in Table 1.

2.2. Control cohort

We sampled a random control cohort of 316,925 persons in the Central Population Register. Sampling was conducted once a year during the study period and five controls free of cancer at the time of sampling were frequency matched on gender and date of birth to one cancer case.

2.3. Statistics Denmark

Information on a number of demographic and socioeconomic characteristics for both cohorts was obtained by data linkage to the population-based Integrated Database for Labour Market Research, which has been administered by Statistics Denmark since 1980. The core variables in the Database are derived once a year by linkage with the Danish administrative registries. In order to obtain information on household income, we identified partners and their income for each year in the study period. All income variables were deflated according to the 2001 value of the Danish crown.

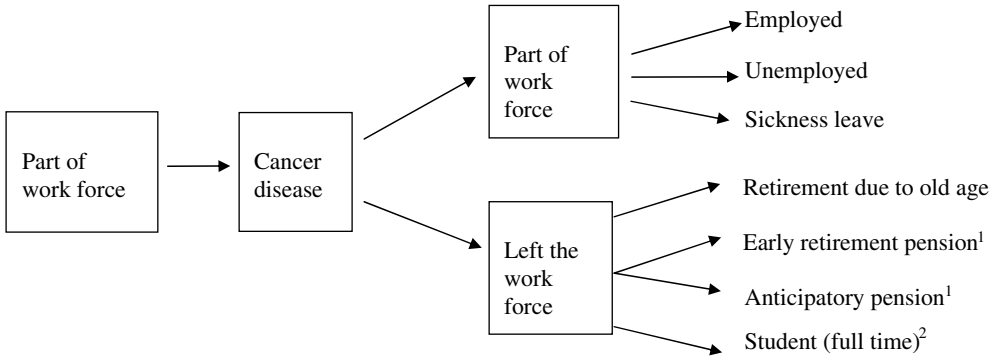
2.4. Variables related to economic subsidies

As in most European countries, Danish citizens are economically secured by various social security systems. Their insurance ranges from completely union-organised payments to tax-paid public social support. Most unemployed persons are supported by the union, and only a few are supported by the social security system administered by local municipal authorities. Unemployment benefit is only available for persons who are actively seeking job and only for a limited period of 2 years following the date of unemployment registration. If a person is not able to work due to disability or illness, it is not possible to receive unemployment benefit. Depending on the severity and duration of the disability or illness, a person may receive sickness benefit for a maximum of 52 weeks or retire permanently from the working market. Persons on sickness benefit are assumed to be able to work after a recovery period, but if the disability is so severe that it permanently reduces the ability to work by more than 50%, the person may be given a so-called 'early retirement pension', allowing the person to leave the workforce. Assignment to these social support op-

Table 1 – Cancer sites and extend of disease included in the study of cancer survivors and risk for unemployment, Denmark 1981–2000

Site	ICD-7 code[a]	Number of cases	Extent of disease			
			Local (%)	Regional (%)	Metastatic (%)	Unknown (%)
Colorectum	153, 154	7269	52	34	9	5
Breast	170	24,711	51	39	3	7
Cervix	171	4868	81	14	2	4
Uterus	172	2962	84	9	2	6
Ovary	175	3011	36	43	16	5
Prostate	177	1252	40	9	31	20
Testis	178	3052	70	9	8	12
Kidney	180	1751	68	9	10	13
Urinary bladder	181	4227	63	23	4	10
Malignant melanoma of the skin	190	6795	91	3	1	5
Non-Hodgkin lymphoma	200, 202	2887	26	15	18	41
Hodgkin lymphoma	201	904	21	22	14	43
Leukaemia	204	1821	5	13	12	70

a The notification follows a modified Danish version of the ICD-7 and since 1978 all cases have been notified in accordance with ICD-O.



[1] Including arrangements and regulations in relation to these schemes
[2] Any person affiliated with an educational institution is assigned to this group

Fig. 1 – The pathway into the workforce or out of the workforce after a cancer disease under the Danish legislation.

tions is mutually exclusive and closely surveyed by the social authorities in order to avoid illegal provision of one of the services. The different pathways are illustrated in Fig. 1.

We obtained information on unemployment insurance support provided in each of the years under study.

2.5. *Hospital-Discharge Register*

By linking the personal identification numbers to the files of the Hospital-Discharge Register, which has registered information on all hospitalisations in Denmark since 1978, we obtained a full history of illness leading to hospitalisation or outpatient visits for each cohort member from 1980 to 2001. The information in the Register includes hospital and department number, dates of admission and discharge, up to 20 diagnoses per hospitalisation and up to six operations per diagnosis, coded according to the *International Classification of Diseases* (ICD) revisions 8 and 10.[7] Somatic comorbidity was defined according to the Charlson index[8] of 19 selected diseases scored on a severity scale from 1 to 3. On the basis of the accumulated sum of scores, the comorbidity index was grouped into scores of 0 and $\geqslant$1. Further, we created a vari-

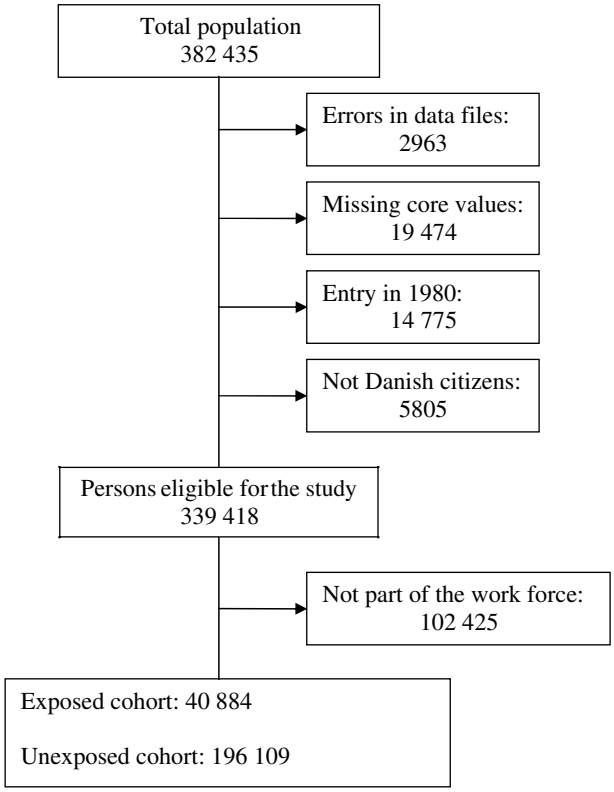


Fig. 2 – Exclusion criteria in the study 'Risk for unemployment of cancer survivors: a Danish cohort study'.

able, denoting the presence of musculoskeletal disorder, that although not affecting mortality is likely to influence the ability to maintain a job.

2.6. Danish Psychiatric Central Register

The nationwide Danish Psychiatric Central Register contains data on all admissions to psychiatric hospitals and psychiatric wards in general hospitals since 1969. We obtained information on date of admission, date of discharge and one main diagnosis for all cohort members. All hospital contacts for psychiatric comorbidity measured as depression were identified, and the variable was dichotomised.[9]

2.7. Total sample

In total, the two cohorts consisted of 382,435 individuals, representing 10.9% of the Danish population aged 10–60 years in 1980. In total we excluded 145,442 persons from the data set (Fig. 2), of whom 94,742 persons (27%) were not part of the workforce or were unemployed for more than 50% of the year preceding the start of follow-up and 7683 persons (2.0%) who had retired in the same year in which cancer was diagnosed or in which they entered the study, leaving 40 884 persons in the cancer cohort (75%) and 196,109 in the control cohort (60%) for the analysis.

2.8. Follow-up

All persons were followed from the date of cancer diagnosis (exposed) or entry (unexposed) until first unemployment, retirement, age of 61, date of death or 31st December 2001. Sub-analysis was performed where periods of unemployment were accumulated in four different periods.

2.9. Statistical analysis

The main outcome of the study was first receipt of unemployment benefits by persons under 61 years of age. All analyses were separated by gender. Rate ratios (RRs) for unemployment with 95% confidence intervals (CIs) were estimated on the assumption that any events were generated according to Cox's proportional hazard model. This means that persons in the two cohorts only add person years to the model as long as they are part of the workforce and therefore under risk for the outcome. To take into account the fact that information on outcome was available only once a year, discrete-time Cox regression models were fitted, in which the follow-up time was divided into 1-year age groups by the GENMOD procedure in SAS 9.1.3 with the complementary log–log function as the link function. All the multiple regression analyses included adjustment for age, year of entry, degree of urbanicity, family type, highest attained educational level, job type, household income and Charlson Index, musculoskeletal disorder and depression. All variables were entered as time-dependent variables with values divided into 1-year intervals. In addition to the adjusted estimate for unemployment for all cancer patients and controls, we estimated separate effects according to cancer site, time since diagnosis, extent of disease and year of diagnosis. Tests for linearity were performed for all continuous variables, and age, time since diagnosis, year of diagnosis and age at diagnosis were entered as linear variables. Calendar year was entered as a spline with a knot at 1994. In addition, we evaluated the effect of age at diagnosis and years of follow-up by making stratified analysis.

3. Results

Of the 236,993 persons in the study, 45,149 (19%) became unemployed during follow-up. The two cohorts accrued a total of 1,323,741 person–years of follow-up, with a mean of 5.2 years for cases and 5.6 years for controls (range, 1–20 years). Table 2 shows that there were no major differences between the exposed and unexposed cohorts in the included factors.

Socioeconomic factors such as manual work, median income and vocational education were found to be predictors for unemployment amongst cancer patients (Table 3). Physical comorbidity was found to be a risk factor only for the unexposed persons, whereas depression was found to be a risk factor independent of exposure status.

For women there was a borderline significant peak in risk for unemployment 2–3 years after diagnosis, while this peak in risk for unemployment was insignificantly increased for men (Fig. 3 and Table 4). In addition, risk for unemployment was highest for both women and men aged 50–60 years at time of diagnosis (RR, 1.18; 95% CI, 1.12; 1.25 and RR, 1.09; 95% CI, 1.01; 1.25 for women and men, respectively) (Table 4).

After adjustment for demographic, socioeconomic and cancer-specific variables, the risk for unemployment was found to be 1.12 (95% CI, 1.09; 1.16) for women and 1.06 (95% CI, 1.00; 1.11) for men (Table 5). Amongst women the risk was experienced by persons with all types of cancer, whereas it was close to unity for all types diagnosed in men. In general, although not significantly so, women were at higher risk than men. For both women and men there was no statistical difference in the risk estimates related to extent of disease.

4. Discussion

In this large population-based, nationwide study of persons who were working at the time of inclusion, cancer patients were at increased risk for unemployment during the 20 years of follow-up, with an overall increase in risk of 12% amongst women and 6% amongst men. Manual work, median income, vocational education, depression and high age were risk factors for unemployment.

Our finding is in line with those of the previously published population-based studies; however, direct comparison of the results is difficult, as the other studies addressed the chance of returning to work after treatment for cancer. In a retrospective study of 1433 survivors of various cancer types, the frequency of return to work after cancer increased from 73% after the first year to 84% after 4 years of follow-up.[10] Likewise, a prospective cohort study of 221 survivors of various cancer types showed that 24% had returned to work 6 months after diagnosis and 64% after 18 months.[11] Days lost from work were estimated in a population-based survey of 1823 cancer survivors and 5469 control persons matched on age, gender and education. In comparison with the control

Table 2 – Descriptive characteristics at time of inclusion of 40 884 persons with selected cancers and 196 109 age- and gender-matched cancer-free controls, Denmark 1981–2000

Characteristic	Women		Men	
	Exposed (*n* = 28 739) No. (%)	Unexposed (*n* = 137 780) No. (%)	Exposed (*n* = 12 145) No. (%)	Unexposed (*n* = 58 329) No. (%)
Age at time of diagnosis or entry (years)				
30–39	4439 (15)	21,547 (16)	2454 (20)	12,129 (21)
40–49	11,191 (39)	55,002 (40)	3428 (28)	16,651 (29)
50–60	13,109 (46)	61,231 (44)	6263 (52)	29,549 (51)
Year of entry				
1981–1985	5628 (20)	28,280 (21)	2339 (19)	11,635 (20)
1986–1990	6765 (24)	33,252 (24)	2803 (23)	13,835 (24)
1991–1995	7430 (26)	34,592 (25)	3179 (26)	14,980 (26)
1996–2000	8916 (31)	41,656 (30)	3824 (32)	17,879 (31)
Family type				
Single without children	4488 (16)	20,569 (15)	1784 (15)	9308 (16)
Single with children	1398 (5)	6751 (5)	114 (1)	586 (1)
Couple without children	13,905 (49)	66,386 (48)	5908 (49)	26,829 (46)
Couple with children	8778 (31)	43,610 (32)	4306 (36)	21,559 (37)
Degree of urbanicity				
Capital area	2620 (9)	11,862 (9)	1023 (8)	4547 (8)
Capital suburban area	4123 (14)	19,091 (14)	1742 (14)	7670 (13)
Provincial cities	3321 (12)	15,205 (11)	1376 (11)	6369 (11)
Rural area ⩾ 10,000 inhabitants	7880 (27)	40,043 (29)	3341 (28)	17,599 (30)
Rural area < 10,000 inhabitants	10,795 (38)	51,579 (37)	4663 (38)	22,144 (38)
Highest attained educational level				
Primary school	11,135 (39)	56,809 (41)	3510 (29)	18,675 (32)
High school	695 (2)	2799 (2)	348 (3)	1638 (3)
Vocational education	10,263 (36)	48,764 (35)	5607 (46)	26,216 (45)
Further education	6312 (22)	28,165 (20)	2529 (21)	11,106 (19)
Other or unknown	334 (1)	1243 (1)	151 (1)	694 (1)
Job type				
Self-employed or employer	830 (3)	3657 (3)	1392 (11)	6624 (11)
Assisting spouse[a]	1137 (5)	6620 (5)	–	–
Non-manual	14,803 (51)	68,613 (50)	6743 (35)	31,424 (54)
Manual	8419 (29)	42,398 (31)	3016 (25)	15,731 (27)
Other	3550 (12)	16,492 (12)	994 (18)	4550 (8)
Household income per person (euros)				
<22,000	8553 (30)	39,062 (28)	3660 (30)	16,407 (28)
22,000–30,000	6975 (24)	35,028 (25)	3255 (27)	16,267 (28)
30,000–38,000	6539 (23)	31,466 (23)	2957 (24)	14,646 (25)
>38,000	6672 (23)	32,224 (23)	2273 (19)	11,009 (19)
Charlson index (score)[b]				
0	27,392 (95)	131,524 (95)	11,309 (93)	54,712 (94)
⩾1	1347 (4)	6256 (4)	836 (7)	3617 (7)
Depression[c]				
Not present	28,379 (99)	135,993 (99)	12,048 (99)	57,864 (99)
Present	360 (1)	1787 (1)	97 (1)	465 (1)
Musculoskeletal disorders[d]				
Not present	27,946 (97)	134,031 (97)	11,693(96)	56,297 (97)
Present	793 (3)	3749 (3)	452 (4)	2032 (3)

a Only women.

b ICD-8 410; 427.09; 427.10; 427.11; 427.19; 428.99; 782.49; 440; 441; 442; 443; 444; 445; 430–438; 290.09–290.19; 293.09; 290.09–290.19; 293.09; 712; 716; 734; 446; 135.99; 530.91; 530.98; 531–534; 571; 573.01; 573.04; 249.00; 249.06; 249.07; 249.09; 250.00; 250.06; 250.07; 250.09; 344; 403; 404; 580–583; 584; 590.09; 593.19; 753.10-753.19; 792; 249.01–249.05; 249.08; 250.01–250.05; 250.08; 070.00; 070.02; 070.04; 070.06; 070.08; 573.00; 456.00–456.09; 079.83. ICD-10 I21; I22; I23; I50; I11.0; I13.0; I13.2; I70; I71; I72; I73; I74; I77; I60–I69; G45; G46; F00–F03; F05.1; G30; J40–J47; J60–J67; J68.4; J70.1; J70.3; J84.1; J92.0; J96.1; J98.2; J98.3; M05; M06; M08; M09; M30; M31; M32; M33; M34; M35; M36; D86; K22.1; K25–K28; B18; K70.0–K70.3; K70.9; K71; K73; K74; K76.0; E10.0, E10.1; E10.9; E11.0; E11.1; E11.9; G81; G82; I12; I13; N00–N05; N07; N11; N14; N17–N19; Q61; E10.2–E10.8; E11.2–E11.8; B15.0; B16.0; B16.2; B19.0; K70.4; K72; K76.6; I85;B21–B24.

c ICD-8, 296.09-39, 296.89–99, 298.19, 301.19 and 300.49; ICD-10, F30-39.

d ICD-8: 015.09, 712.49, 713.00–713.29, 725, 728; ICD-10: M15.0–M19.9, M45.0–M54.9.

Table 3 – Mutually adjusted rate ratios (RRs) for unemployment in 40,884 persons with selected cancers and 196 109 age- and gender-matched cancer-free persons, Denmark 1981–2000

Characteristic	Women		Men	
	Adjusted RR[1] (95% CI)		Adjusted RR[1] (95% CI)	
	Exposed	Unexposed	Exposed	Unexposed
Number of persons unemployed	5578 (20%)	28,213 (21%)	1774 (14%)	9584 (15%)
Running age (per year)[a]	0.99 (0.99–1.00)	0.99 (0.99–0.99)	1.00 (0.99–1.01)	0.99 (0.99–1.00)
Period (per year of follow-up)[b]				
1981–1994	1.02 (1.0–1.0)	1.03 (1.0–1.0)	0.97 (1.0–1.0)	0.97 (1.0–1.0)
1994–2001	0.90 (0.9–0.9)	0.90 (0.9–0.9)	0.91 (0.9–0.9)	0.92 (0.9–0.9)
Family type				
Single without children	0.81 (0.7–0.9)	0.96 (0.9–1.0)	1.38 (1.1–1.7)	1.14 (1.0–1.3)
Single with children	0.79 (0.7–0.9)	1.04 (1.0–1.1)	1.18 (0.8–1.9)	0.84 (0.7–1.0)
Couple without children	1.00	1.00	1.00	1.00
Couple with children	0.86 (0.8–0.9)	0.92 (0.9–1.0)	0.82 (0.7–0.9)	0.87 (0.8–0.9)
Degree of urbanicity				
Capital area	0.91 (0.8–1.0)	0.91 (0.9–1.0)	0.87 (0.7–1.0)	1.04 (1.0–1.1)
Capital suburban area	0.77 (0.7–0.8)	0.80 (0.8–0.8)	0.71 (0.6–0.8)	0.86 (0.8–0.9)
Provincial cities	1.04 (1.0–1.1)	1.03 (1.0–1.0)	0.93 (0.8–1.1)	1.16 (1.1–1.2)
Rural area ⩾10 000 inhabitants	1.00 (0.9–1.0)	1.03 (1.0–1.0)	1.11 (1.0–1.3)	1.03 (1.0–1.1)
Rural area < 10 000 inhabitants	1.00	1.00	1.00	1.00
Highest attained educational level				
Primary and high school	1.05 (1.0–1.1)	1.09 (1.1–1.1)	0.88 (0.8–1.0)	0.97 (0.9–1.0)
Vocational education	1.00	1.00	1.00	1.00
Further education	0.70 (0.7–0.8)	0.70 (0.7–0.7)	0.61 (0.5–0.7)	0.61 (0.6–0.7)
Other or unknown	0.86 (0.7–1.1)	0.95 (0.8–1.1)	0.99 (0.7–1.5)	1.26 (1.1–1.5)
Job type the previous year				
Self-employed or employer	0.97 (0.8–1.2)	1.03 (1.0–1.1)	0.49 (0.4–0.6)	0.47 (0.4–0.5)
Assisting spouse[c]	0.77 (0.7–0.9)	0.80 (0.8–0.9)	–	–
Manual	1.42 (1.3–1.5)	1.31 (1.3–1.4)	1.77 (1.6–2.0)	1.70 (1.6–1.8)
Non-manual	1.00	1.00	1.00	1.00
Other	2.00 (1.8–2.3)	1.74 (1.7–1.8)	2.07 (1.6–2.7)	1.50 (1.3–1.7)
Household income per person the previous year (euros)				
<22,000	1.08 (1.0–1.2)	1.11 (1.1–1.2)	2.38 (2.0-2.9)	2.01 (1.8–2.2)
22,000–30,000	1.48 (1.4–1.6)	1.40 (1.4–1.5)	1.97 (1.7–2.3)	1.88 (1.8–2.0)
30,000–38,000	1.30 (1.2–1.4)	1.24 (1.2–1.3)	1.46 (1.3–1.7)	1.39 (1.3–1.5)
>38,000	1.00	1.00	1.00	1.00
Unknown	1.44 (1.3–1.7)	1.31 (1.2–1.4)	1.66 (1.3–2.1)	1.72 (1.6–1.9)
Charlson index[d]				
0	1.00	1.00	1.00	1.00
⩾1	1.00 (0.9–1.0)	1.14 (1.1–1.2)	0.98 (0.9–1.1)	1.16 (1.1–1.2)
Depression[e]				
Present	1.62 (1.3–2.0)	1.53 (1.4–1.7)	1.68 (1.1–2.5)	1.42 (1.2–1.7)
Not present	1.00	1.00	1.00	1.00
Musculoskeletal disorders[f]				
Present	1.03 (0.9–1.2)	1.18 (1.1–1.2)	1.11 (1.0–1.4)	1.10 (1.0–1.2)
Not present	1.00	1.00	1.00	1.00

CI: confidence interval.

a Age at time of unemployment or censoring.

b Running calendar year.

c Only women.

d ICD-8 410; 427.09; 427.10; 427.11; 427.19; 428.99; 782.49; 440; 441; 442; 443; 444; 445; 430–438; 290.09–290.19; 293.09; 290.09–290.19; 293.09; 712; 716; 734; 446; 135.99; 530.91; 530.98; 531–534; 571; 573.01; 573.04; 249.00; 249.06; 249.07; 249.09; 250.00; 250.06; 250.07; 250.09; 344; 403; 404; 580–583; 584; 590.09; 593.19; 753.10–753.19; 792; 249.01–249.05; 249.08; 250.01–250.05; 250.08; 070.00; 070.02; 070.04; 070.06; 070.08; 573.00; 456.00–456.09; 079.83. ICD-10 I21; I22; I23; I50; I11.0; I13.0; I13.2; I70; I71; I72; I73; I74; I77; I60–I69; G45; G46; F00–F03; F05.1; G30; J40–J47; J60–J67; J68.4; J70.1; J70.3; J84.1; J92.0; J96.1; J98.2; J98.3; M05; M06; M08; M09; M30; M31; M32; M33; M34; M35; M36; D86; K22.1; K25–K28; B18; K70.0–K70.3; K70.9; K71; K73; K74; K76.0; E10.0. E10.1; E10.9; E11.0; E11.1; E11.9; G81; G82; I12; I13; N00–N05; N07; N11; N14; N17–N19; Q61; E10.2–E10.8; E11.2–E11.8; B15.0; B16.0; B16.2; B19.0; K70.4; K72; K76.6; I85; B21–B24;

e ICD-8. 296.09–39. 296.89–99. 298.19. 301.19 and 300.49; ICD-10. F30-39

f ICD-8: 015.09. 712.49. 713.00–713.29. 725. 728; ICD-10: M15.0–M19.9. M45.0–M54.9

Adjusted for age at diagnosis, period, family type, degree of urbanicity, job type the pervious year, education, income the previous year, depression, musculoskeletal diseases and Charlson index.

Fig. 3 – Adjusted rate ratios (RRs) for first-time unemployment of 28,739 women and 12 ,45 men diagnosed with cancers at selected sites, compared to the cancer-free cohort, Denmark 1981–2000.

Table 4 – Relative risk (RR)[a] for unemployment amongst 40,884 persons with selected cancers compared to 196 109 age- and gender-matched cancer-free controls, Denmark 1981–2000

	Women	Men
Risk for unemployment stratified on years after diagnosis		
0–2 years after diagnosis	1.03 (1.0–1.1)	1.00 (1.0–1.7)
3–5 years after diagnosis	1.07 (1.0–1.1)	1.05 (1.0–1.1)
6–10 years after diagnosis	1.00 (1.0–1.1)	0.99 (1.0–1.1)
10–15 years after diagnosis	0.99 (0.9–1.1)	0.90 (0.8–1.1)
Risk for first-time unemployment by age at diagnosis		
30–39 years	1.05 (1.0–1.1)	0.96 (0.9–1.1)
40–49 years	1.12 (1.1–1.2)	1.08 (1.0–1.2)
50–60 years	1.18 (1.1–1.3)	1.09 (1.0–1.3)

a Adjusted for calendar year, family type, degree of urbanicity, job type the previous year, highest attained education, income the previous year, depression, musculoskeletal diseases and Charlson index. In addition, risk for unemployment stratified on years after diagnosis is also adjusted for age and risk for first-time unemployment by age at diagnosis is also adjusted for time since diagnosis.

Table 5 – Adjusted rate ratios (RRs) for unemployment of 28,739 women and 12,145 men diagnosed with cancers at selected sites, Denmark 1981–2000

Cancer site	RR (95% CI)	
	Women	Men
All	1.12 (1.09–1.16)	1.06 (1.00–1.11)
Cancer site		
Bladder	1.23 (0.9–1.7)	0.91 (0.6–1.5)
Breast	1.22 (0.9–1.6)	–
Cervix	1.29 (1.0–1.8)	–
Colorectal	1.31 (1.0–1.8)	0.96 (0.6–1.6)
Hodgkin lymphoma	1.38 (0.9–2.1)	1.06 (0.6–1.8)
Kidney	1.48 (1.0–2.2)	0.83 (0.5–1.4)
Leukaemia	1.13 (0.8–1.7)	1.01 (0.6–1.7)
Melanoma	1.18 (0.9–1.6)	0.90 (0.6–1.5)
Non-Hodgkin lymphoma	1.25 (0.9–1.7)	0.95 (0.6–1.6)
Ovary	1.18 (0.9–1.6)	–
Prostate	–	0.92 (0.5–1.6)
Testis	–	1.03 (0.6–1.7)
Uterus	1.13 (0.8–1.5)	–
Extent of disease		
Local	0.93 (0.8–1.1)	1.18 (0.9–1.5)
Regional	0.94 (0.9–1.0)	1.06 (0.9–1.2)
Metastatic	1	1
Unknown	0.92 (0.8–1.0)0)	0.98 (0.8–1.2)0)

CI, confidence interval.
Adjusted for time since diagnosis, age at diagnosis, period, family type, degree of urbanicity, job type, education, income, depression, musculoskeletal diseases, Charlson index and sickness benefits the previous year.

group, the cancer survivors were less likely to have a job after their treatment, and those who had a job had more days off during follow-up.[12] The relative risk for being in work at the time of follow-up was 9% lower for cancer survivors than for controls in a Finnish register-based study including 46,312 cancer patients of working age.[13]

Despite the differences in the outcome measured, these studies indicate that many cancer patients experience periods away from work after diagnosis and treatment of their disease, either because they are on sick leave, unemployed, at home or retired. The social mechanism linking cancer to one of these four outcomes probably differs according to the social security system, the socioeconomic position of the patient at the time of cancer diagnosis and the stage of disease.[11,14]

Our finding of a relation between higher age and risk for unemployment is also observed in other studies and might reflect that older cancer survivors approach retirement. In a retrospective population-based cohort study of 646 breast cancer survivors, Drolet et al. found that between both survivors and comparison women the risk for not working was

significantly increased in the group of women aged 50–59 years[15] Likewise on a study of cancer survivors aged 55–65, at time of diagnosis it was observed that older survivors were more likely to quit working after diagnosis than the younger survivors.[16] Similarly, Schultz et al. observed that amongst 4.364 long-term cancer survivors age, was a significant risk factor for being unable to work 5 years after diagnosis.[17] In analyses stratified by time since diagnosis, we observed that women were at a small but significant risk for unemployment only in the first 5 years following diagnosis.

Breast cancer is the most frequent cancer amongst Danish women.[18] In this study, we found that survivors of breast cancer were at increased but insignificant risk for unemployment (RR, 1.22; 95% CI, 0.92; 1.62). Only three previous studies of the risk for unemployment of breast cancer patients included a non-cancer control group,[13,19,20] and apart from one of the studies,[13] the observed estimates are comparable to our finding. It has been shown that the chance of returning to work increases with time since end of treatment.[18,21] Taken together, the results of our study and others point to an increased risk for a period of unemployment after diagnosis and treatment of breast cancer. The available data do not allow a conclusion about whether the periods of unemployment are transient or permanent.

One characteristic shared by survivors of cancers of the cervix, testis and melanomas is a peak in incidence in younger age groups.[22–24] Further, most patients with testis cancer or melanoma are treated only by surgery. Three studies between 74 and 223 testis cancer survivors showed that 5–20% of men with this cancer experienced a period of unemployment after treatment,[25] but the low risk estimates for employment problems observed in other studies of survivors of testis cancer and melanoma probably indicate that these persons return to work some time after treatment rather than retire definitively.

When interpreting the risk for unemployment following cancer it is important to include the societal context. The risk for unemployment is dependent on economic conditions as shown by an increased risk for unemployment during periods of recession and a reduced risk in periods of boom (Table 3). In contrast to the absolute risk which is dependent on the national context, identified risk factors and the relative risk can be compared between countries and can be used to establish mechanisms behind exclusion from the working market in a broad range of societies.

Unemployment, as opposed to retirement or sick leave, can be a stress factor, as it can be assumed that it is involuntary and that unemployed persons are actually looking for a job. In a society with a high participation rate in the labour market, unemployment can result in the loss of some aspects of the social network. If cancer patients have to cope not only with unemployment but also the psychological pressure due to cancer, their quality of life might be further reduced.

The findings of this study point to the need for carefully assessing factors associated with employment as a part of the psychosocial support provided to cancer patients. The results of this study also point to some groups of cancer patients, who are at an increased risk of losing their job. Unemployment may influence the compliance of the cancer patients and. health behaviour recommendations may be ignored due to lack of the necessary financial basis. In a large study of a nationwide and population-based cohort of breast cancer patients, it was shown that women with higher education, higher income and an active labour market affiliation, as well as measures of material living standards, such as house ownership and size of housing had an increased survival rate compared to the most socially deprived women.[26] In the light of the rising number of cancer survivors, the need for counselling of cancer patients about future employment becomes more important, and doctors have to be focused on the social distribution of this problem in the clinical practise.

Our study had some limitations, including the inability to evaluate the extent to which cancer survivors return to work, and that we were unable to distinguish between persons receiving unemployment benefits as a supplement to part-time work and those receiving benefits because of complete absence from the labour market.

In conclusion, we found that cancer patients are generally at a small but significantly increased risk for unemployment and that patients with a low socioeconomic status face a higher risk than those with high income, high education and non-manual jobs. This result is supported by the results of a review, which showed that, on average, 62% of cancer patients return to work. Although our results point to an important area for psychosocial and workplace-related intervention, more knowledge is needed before targeted programmes can be launched for cancer patients at risk for unemployment.

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Conflict of interest statement

None declared.

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