

ORIGINAL ARTICLE

The role of social position in anxiety and depressive symptoms among Danish cancer survivors

HANNA B. HOVALDT^{1,2}, INGELISE ANDERSEN³, METTE SANDAGER⁴,
CECILIE SPERLING⁴, KIRSTEN FREDERIKSEN⁵, PERNILLE E. BIDSTRUP¹,
CHRISTOFFER JOHANSEN^{1,6} & SUSANNE O. DALTON¹

¹Survivorship, Danish Cancer Society Research Center, Copenhagen, Denmark, ²Department of Psychology, University of Copenhagen, Denmark, ³Section of Social Medicine, Department of Public Health, University of Copenhagen, Denmark, ⁴Documentation and Quality, the Danish Cancer Society, Copenhagen, Denmark, ⁵Statistics, Bioinformatics and Registry, Danish Cancer Society Research Center, Copenhagen, Denmark and ⁶Department of Oncology, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark

ABSTRACT

Background. Anxiety and depressive symptoms are common among cancer survivors. Studies of a possible association with social position have had divergent results. We examined these associations, social position being measured by education, in Danish cancer survivors approximately two years after diagnosis.

Material and methods. People aged over 18, living in Denmark and registered for a first cancer in the Danish National Patient Registry between 1 May and 31 August 2010 were contacted; 4346 returned a questionnaire shortly after diagnosis, and 2568 were followed up in 2012. Age, sex and cancer site were derived from the registry; all other information was self-reported, with that on education from the 2010 questionnaire and responses to the Hospital Anxiety and Depression Scale from the 2012 questionnaire. General linear models were used, with adjustment for demographic factors, cancer-specific factors, and comorbidity.

Results. The study population consisted of 1667 people (response rate, 51%). The mean symptom scores were 4.34 (SD 3.77) for anxiety and 2.94 (SD 3.25) for depression. People with medium and higher education had slightly higher anxiety symptom scores (mean difference_{medium} = 0.41, 95% CI –0.07; 0.88, mean difference_{higher} = 0.19, 95% CI –0.27; 0.65). Depressive symptom scores were slightly elevated for people with medium education and reduced for those with higher education (mean difference_{medium} = 0.34, 95% CI –0.07; 0.75, mean difference_{higher} = –0.11, 95% CI –0.50; 0.29). Female sex, smoking-related cancers and chemotherapy were significantly associated with higher scores for both anxiety and depressive symptoms, but somatic comorbidity and mental disorders at the time of treatment were most strongly, significantly associated with elevated anxiety and depressive symptom scores.

Conclusion. No overall significant differences in anxiety or depressive symptom scores were found with length of education. Previous mental disorders and somatic comorbidity are the strongest indicators of higher levels of anxiety and depressive symptoms.

Throughout cancer diagnosis and treatment, patients have to cope with uncertainties, side effects and late effects of treatment, which can be sources of distress for individual patients [1]. In a recent meta-analysis, 10.3% (95% CI 5.1; 17.0) of cancer patients had clinical anxiety and 16.3% (95% CI 13.4; 19.5) had clinical depression [2]. Further, cancer patients had a significantly higher risk for anxiety more than

two years after diagnosis than people without cancer (pooled RR 1.27, 95% CI 1.08; 1.50) [3] and a doubled risk for hospitalization for depression the first year after diagnosis (men: RR 2.02, 95% CI 1.82; 2.25, women: RR 1.87, 95% CI 1.73; 2.02) [4].

A Danish study showed a higher prevalence of depression among people in lower social positions, measured as short education and low income [5].

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Correspondence: H. B. Hovaldt, Øster Farimagsgade 2a, 1353 Copenhagen K, Denmark. Tel: +45 35 324800. Fax: +45 35 324802. E-mail: hanna.hovaldt@psy.ku.dk, habiho@cancer.dk

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Low social position has been linked to a higher burden of somatic disease, fewer psychosocial resources and a poorer social environment during chronic illness [6,7]. Further, people with a short education had a higher incidence of cancer with a generally worse prognosis and a general pattern of worse survival, regardless of cancer site [8]. These factors may all be essential for mental health during a cancer trajectory; however, little is known about the association between social position, anxiety and depressive symptoms among cancer survivors, and the results of previous studies diverge [1,9–13].

Cancer patients who need psychological support must be identified for effective prevention of anxiety and depression. Social position can be defined as “the social and economic factors that influence what position(s) individuals hold within the structure of society” [14 (p.14)]. We expect cancer survivors with a low social position to have more symptoms of anxiety and depression, as they have fewer psychosocial coping resources. Further, the general social gradient in depression might result in a higher prevalence of depressive symptoms before diagnosis among cancer survivors with a low social position.

The aim was to investigate the association between social position, as measured by education, and symptoms of anxiety and depression in Danish cancer survivors approximately two years after diagnosis, using information from a national follow-up questionnaire survey. Demographic factors were examined as potential confounders and cancer-specific factors and comorbidity as potential mediators.

Material and methods

The Danish setting

In Denmark, most healthcare services are free of charge, financed primarily from income tax (Denmark.dk). Hospitals are responsible for providing specialized rehabilitation during and after hospitalization, and municipalities are responsible for general rehabilitation. General practitioners and hospital specialists serve as gatekeepers for referral to rehabilitation services. The services offered by municipalities vary widely, but the rehabilitation is suggested to include physical, mental and behavioral aspects [15].

The questionnaire survey and study population

Two questionnaire surveys were performed by the Danish Cancer Society to examine cancer survivors' experience of the performance of the Danish healthcare system during diagnosis, treatment and rehabilitation [16,17]. The first survey was performed in 2010 and the second in 2012. Both were approved

by the Danish Data Protection Agency. People with a first cancer diagnosed between 1 May 2010 and 31 August 2010, excluding non-melanoma skin and in situ cancers, and who were ≥ 18 years old at the time of diagnosis were identified through the National Patient Registry ($N = 8320$). The register was established in 1977 and since 2003 has recorded information on all admissions to inpatient and outpatient departments, emergency wards and private hospitals [18]. The register includes diagnosis, date of diagnosis and information on treatment. Previously inconsistency has been found between the National Patient Registry and some clinical databases [18]. To secure validity of cancer diagnoses in the retrieval from the National Patient Registry in 2010, registrations of colon and rectal cancers were compared with the Danish Pathological Data Bank. The comparison showed good compliance [16]. Exclusions due to death, emigration, research protection, unknown address and registration errors of diagnosis left 6720 people, who received a questionnaire in 2010. The first questionnaire was posted to patients on 21 September 2010 or 25 October 2010, with a reminder three weeks later, and was returned by 4346 people (65%). Non-respondents were characterized by high age, male sex, being married and lung, cervix or male genital cancers [16]. The follow-up questionnaire was posted on 22 June 2012 to 3298 people [17], and 2568 returned it (78%) (Figure 1).

Social position

Social position was measured as the highest attained educational level in 2010. For most people, educational level is determined in early adulthood, regardless of age, health and occupational circumstances, and is associated with the cognitive ability to cope with illness, communicate with health personnel, health behavior and use of health services [19]. Highest attained educational level was divided into three groups: basic education (≤ 10 years of primary and lower secondary school), medium education (10–12 years of upper secondary school or vocational education) and higher education. People for whom information on educational level was missing in 2010 were included if they provided the information in 2012 ($N = 52$). People whose educational level was missing ($N = 13$), unknown or not relevant ($N = 30$) were excluded.

Anxiety and depression

Symptoms of anxiety and depression were measured on the Hospital Anxiety and Depression Scale [HADS] [20] at follow-up in 2012. Symptoms of anxiety and depression were investigated separately

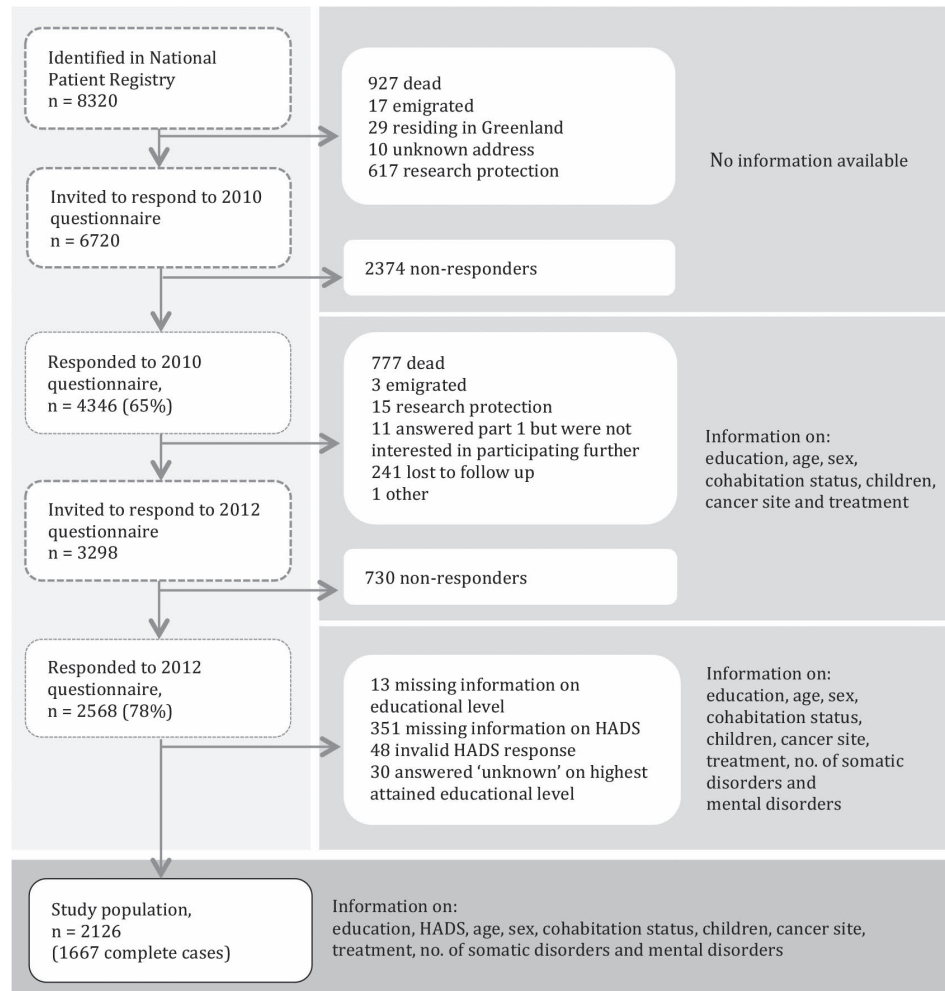


Figure 1. Inclusions and exclusions in the study population.

with scores ranging from 0 to 21. People for whom HADS scores were missing ($N = 351$) or who gave invalid answers ($N = 48$) were excluded. An anxiety or depressive symptom score ≥ 8 indicates a possible case of anxiety or depression and has been found to be the best balance between sensitivity and specificity [21]. In the multiple regression analyses, however, anxiety and depressive symptom scores were examined continuously, as dichotomizing the scales would have implied considerable loss of information.

Age, sex and cancer diagnosis were obtained from the National Patient Registry. Cancer diagnoses were classified into five categories: smoking-related cancers (Danish version of International Classification of Diseases 10th revision: C00, C02, C04, C06, C08-10, C13, C30, C32, C34, C64-65, C67, C73), colorectal cancer (C18, C20), breast cancer (C50), prostate cancer (C61) and other cancers (C15-17, C21-22, C24-25, C43, C45, C48-49, C51, C53-54, C56-57, C60, C62, C69, C71, C77-85, C88, C90-92 and anonymized cancer patients). For 23 people, the diagnosis had changed category between 2010 and

2012; they were registered by their diagnosis in 2010, as it determined their treatment.

Information on cohabitation status (married or cohabiting, widow or widowed, single), children (yes, living at home; yes, not living at home; yes, both; no), surgery (yes, no), radiation therapy (yes, no) and chemotherapy (yes, no) was self-reported on the 2010 questionnaire. On the 2012 questionnaire patients were asked: "Have you had one or more of the following disorders during the time when you were treated for your cancer illness?" The disorders were: diabetes, musculoskeletal, heart, lung, mental and other disorders with the response options yes or no. The answers with regard to somatic disorders were collapsed into a sum measure of the total burden of somatic comorbidity. Mental disorders were included as a yes or no variable.

Statistical analyses

Associations between educational level and anxiety and depressive symptom scores were examined in

general linear models for complete cases. Three models were estimated: the first was crude unadjusted mean differences, the second included demographic factors (age as a continuous variable, sex, cohabitation status and children), and the third also included cancer-specific factors and comorbidity (cancer site, surgery, radiation, chemotherapy, somatic comorbidity and mental disorders). Model assumptions were investigated graphically on residual plots, except for the requirement for linearity of the association with age, for which a quadratic term was added to account for non-linearity in analyses of depressive symptoms. In analyses of anxiety symptoms, the association with quadratic age was insignificant, and this was excluded from the models. The internal consistency of HADS as measured by the Cronbach's alpha coefficient was 0.87 for the anxiety subscale and 0.84 for the depression subscale indicating a satisfactory reliability.

Four sensitivity analyses were performed: models stratified by cancer site, models including people for whom values on covariates in models 1 and 2 were missing, models excluding people with mental disorders at the time of cancer treatment, and models excluding sex-specific cancer sites.

Non-participation and attrition were investigated descriptively. The level of statistical significance used in all analyses was 5%, and all tests were two-sided. All analyses were performed with SAS 9.3 (SAS Institute Inc, Cary, NC, USA).

Results

The study population for the main analysis consisted of 1667 people. Nearly half the population had higher education (47%), 34% had medium education, and 20% had basic education. The mean age was 63 years (SD 11.38), and 56% were women. Time from diagnosis to 2010 questionnaire ranged from 2 to 5 months. The mean time from diagnosis to 2012 questionnaire was two years (range 22–26 months). Most were married or cohabiting (78%) and had children not living at home (74%). A higher proportion of people with basic education had colorectal cancer, more men with medium education had prostate cancer, and more women with higher education had breast cancer (Table I). More people with higher education had received chemotherapy, and fewer had somatic comorbid disorders (Table I). The mean anxiety symptom score was 4.34, and 20% had scores ≥ 8 . The mean depressive symptom score was 2.94, and 10% had scores ≥ 8 (Figure 2).

Anxiety

A tendency to slightly higher scores for anxiety symptoms was seen for people with medium and

higher education than those with basic education (model 1–2), and the association with medium education was strengthened in the fully adjusted model (model 3); however, none of the associations were significant (Table II). Women had significantly higher scores, especially after full adjustment. Increasing age was significantly associated with lower scores, which remained unchanged with adjustment. Smoking-related cancer was strongly associated with high anxiety scores (mean difference 1.11, 95% CI 0.45; 1.76), as was chemotherapy. The number of somatic disorders significantly increased the scores (mean difference_{1 disorder} = 0.97, 95% CI 0.57; 1.36, mean difference _{≥ 2 disorders} = 1.25, 95% CI 0.60; 1.91), and having had a mental disorder was the factor most strongly associated with elevated scores (mean difference = 3.75, 95% CI 3.12; 4.38). When stratifying by cancer site, the overall patterns of associations were similar, except for prostate cancer that showed some indication of association (mean difference_{medium education} = -0.71, 95% CI -1.75; 0.33, mean difference_{higher education} = -1.60, 95% CI -2.64; -0.55).

Depression

People with higher education had slightly lower depressive symptom scores than those with basic education (mean difference = -0.18, 95% CI -0.59; 0.24) (model 1), but the association was of borderline significance and reduced in the fully adjusted model (model 3, Table III). Medium education was non-significantly associated with slightly higher scores, which increased further with adjustments (mean difference 0.34, 95% CI -0.07; 0.75) (Model 3, Table III). Women had higher depressive symptom scores, especially after full adjustment. Being single was associated with higher scores (mean difference 0.64, 95% CI 0.14; 1.13) (model 2), but this was weakened and of borderline significance in the fully adjusted model. Smoking-related cancer and chemotherapy were significantly associated with elevated scores. The number of somatic disorders was also strongly associated with elevated scores (mean difference_{1 disorder} = 1.22, 95% CI 0.88; 1.55, mean difference _{≥ 2 disorders} = 1.57, 95% CI 1.01; 2.13), and mental disorder at the time of cancer treatment was the factor most strongly associated with elevated depressive symptom scores (mean difference 3.46, 95% CI 2.92; 4.00). When stratifying by cancer site, the overall patterns of associations were similar, except for breast cancer that showed some indication of association (mean difference_{medium education} = 1.31, 95% CI 0.32; 2.08, mean difference_{higher education} = 1.03, 95% CI 0.32; 1.74).

Table I. Basic characteristics of cancer survivors living in Denmark about 2 years after diagnosis, complete cases (n = 1667).

	Total N (%) ^a	Education N (%) ^a			p (χ^2)
		Basic	Medium	Higher	
Total	1667 (100)	330 (100)	560 (100)	777 (100)	
Sex					<0.0001
Male	735 (44)	148 (45)	301 (54)	286 (37)	
Female	932 (56)	182 (55)	259 (46)	491 (63)	
Age (years)					<0.0001
19–39	59 (4)	4 (1)	16 (3)	39 (5)	
40–49	137 (8)	11 (3)	44 (8)	82 (11)	
50–59	366 (22)	50 (15)	108 (19)	208 (27)	
60–69	642 (39)	141 (43)	219 (39)	282 (36)	
70–79	363 (22)	92 (28)	135 (24)	136 (18)	
80–96	100 (6)	32 (10)	38 (7)	30 (4)	
Cohabitation status					<0.0001
Married/cohabiting	1295 (78)	238 (72)	448 (80)	609 (78)	
Widow/widower	155 (9)	55 (17)	50 (9)	50 (6)	
Single	217 (13)	37 (11)	62 (11)	118 (15)	
Children					<0.0001
Not living at home	1228 (74)	277 (84)	422 (75)	529 (68)	
Living at home	169 (10)	8 (2)	49 (9)	112 (14)	
Both	102 (6)	15 (5)	27 (5)	60 (8)	
No children	168 (10)	30 (9)	62 (11)	76 (10)	
Cancer site					0.004
Smoking-related	220 (13)	50 (15)	71 (13)	99 (13)	
Colorectal	248 (15)	62 (19)	91 (16)	95 (12)	
Breast	497 (30)	89 (27)	143 (26)	265 (34)	
Prostate	253 (15)	52 (15)	95 (17)	106 (14)	
Other	449 (27)	77 (23)	160 (29)	212 (27)	
Surgery					0.97
Yes	1352 (81)	266 (81)	455 (81)	631 (81)	
No	315 (19)	64 (19)	105 (19)	146 (18)	
Radiation					0.39
Yes	474 (28)	94 (28)	148 (26)	232 (30)	
No	1193 (72)	236 (72)	412 (74)	545 (70)	
Chemotherapy					0.05
Yes	579 (35)	102 (31)	184 (33)	293 (38)	
No	1088 (65)	228 (69)	376 (67)	484 (62)	
Somatic comorbidity					0.08
No disorders	1101 (66)	212 (64)	363 (65)	526 (68)	
1 disorder	444 (27)	90 (27)	145 (26)	209 (27)	
≥ 2 disorders	122 (7)	28 (8)	52 (9)	42 (5)	
Mental disorder					0.31
Yes	129 (8)	32 (10)	39 (7)	58 (7)	
No	1538 (92)	298 (90)	521 (93)	719 (93)	

^aSome percentages do not sum up to 100 because of rounding.*Non-participation and attrition*

The response rate to the 2010 questionnaire was 65%. Complete information was supplied by 51% of people invited to respond to the 2012 questionnaire. Complete cases had a higher educational level, were younger, were more often married or cohabiting, had had breast cancer, surgery and fewer somatic comorbid disorders than those excluded because of missing values on key variables, missing values on covariates and non-responders in 2012 (Table IV). People for whom

values on covariates were missing did not differ significantly by mean anxiety ($p = 0.09$, t-test) or depressive symptom score ($p = 0.17$, t-test) from complete cases (results not shown). Sensitivity analyses including people for whom values on covariates were missing showed less variation in estimates of complete case analyses. Sensitivity analyses excluding sex-specific cancer sites showed similar patterns of association as the original analyses, as did analyses excluding people with mental disorders at the time of treatment (results not shown).

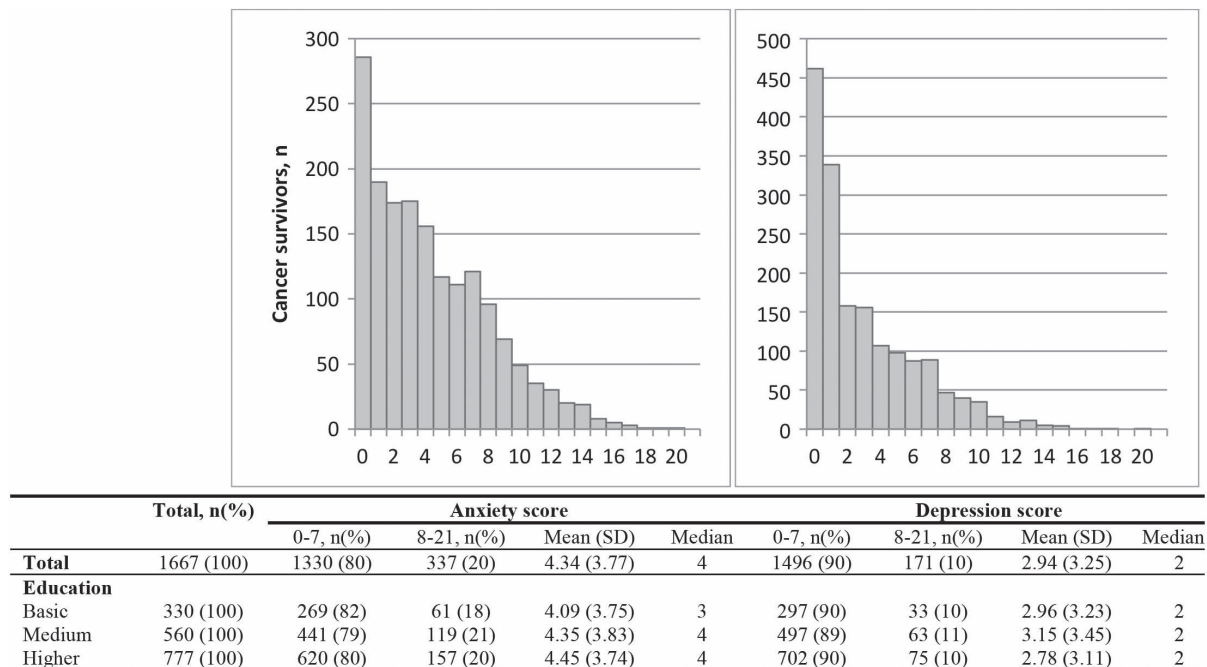


Figure 2. Distribution of scores for symptoms of anxiety and depression by length of education among cancer survivors living in Denmark 2 years after diagnosis, complete cases ($n = 1667$).

Discussion

About two years after diagnosis, 20% of cancer survivors had anxiety symptoms and 10% had depressive symptoms, indicating possible cases of these conditions. There was no association between education and anxiety symptom scores, except for prostate cancer patients. An indication of lower depressive symptom scores among people with higher education was partly explained by cancer site, somatic comorbidity and mental disorder at the time of cancer treatment, and these were the factors most strongly associated with symptoms of anxiety and depression.

Comparison with other findings

Earlier studies of social position, anxiety and depression among cancer survivors in industrialized societies vary widely in design, statistical models and results; however the mean levels of anxiety and depressive symptoms correspond to previous findings among cancer patients [1,10]. Studies of survivors of breast, prostate, colorectal and brain cancers support ours in finding no social gradient in anxiety symptoms years after cancer diagnosis, even though different measures of anxiety were used [10,11,22]. Two studies indicated that survivors with short education or who were unskilled workers had a significantly higher risk for anxiety than survivors holding a university degree or who were skilled workers [1,9]. One of the studies was a cross-sectional study of 3–23-year cancer survivors,

and the association may therefore indicate a general social difference in anxiety symptoms rather than a social difference after cancer [9]. The other study comprised only 77 cancer survivors, entailing a considerable risk of statistical chance [1]. One study found a reversed social gradient in anxiety symptoms measured on the Psychological General Well Being Index [13]. The differences from our results might thus be due to the use of different measures of anxiety.

Arnold et al. (2008) and Christensen et al. (2009) found a social gradient, measured as education, occupation and income, in depressive symptoms [11,12]. The latter studied information on breast cancer survivors from national registers and questionnaires and used Beck's Depression Inventory. They found that not being affiliated with the labor market and having a low income were associated with higher mean depressive symptom scores. Other studies found no association with social position [1,9,13,22]; however, several had few participants, no adjustment for confounding or risk for selection bias. A study on 352 people showed no effect of social position on depression approximately one year after cancer diagnosis [10]. The analyses were adjusted for cancer site, stage and treatment, corresponding to our model 3, in which the association between education and depressive symptoms seemed partly explained by cancer-specific factors and comorbidity in our larger study population. Unadjusted residual confounding due to, e.g. behavioral factors or use of antidepressants might, however, have been present in our study. Similarly, recurrence of cancer

Table II. Mean difference estimates (B) from general linear models of anxiety symptoms among cancer survivors living in Denmark about 2 years after diagnosis (n = 1667).

	Model 1 ^a			Model 2 ^b			Model 3 ^c		
	B	95% CI	p ^d	B	95% CI	p ^d	B	95% CI	p ^d
Education			0.34			0.43			0.23
Basic	0	–		0	–		0	–	
Medium	0.36	–0.12; 0.85		0.26	–0.48; 0.50		0.41	–0.07; 0.88	
Higher	0.26	–0.25; 0.78		0.01	–0.25; 0.76		0.19	–0.27; 0.65	
Sex						< 0.0001			< 0.0001
Male				0	–		0	–	
Female				1.09	0.71; 1.46		1.38	0.92; 1.85	
Age per year						< 0.0001			0.001
				–0.04	–0.07; –0.02		–0.04	–0.06; –0.01	
Cohabitation status						0.17			0.70
Married/cohabiting				0	–		0	–	
Widow/widower				0.18	–0.47; 0.84		–0.01	–0.63; 0.61	
Single				0.53	–0.03; 1.09		0.22	–0.31; 0.75	
Children						0.27			0.56
Not living at home				0	–		0	–	
Living at home				–0.19	–0.91; 0.53		–0.05	–0.73; 0.63	
Both				0.41	–0.37; 1.20		0.42	–0.33; 1.17	
No children				–0.47	–1.12; 0.17		–0.21	–0.82; 0.40	
Cancer site									< 0.0001
Smoking-related							1.11	0.45; 1.76	
Colorectal							0	–	
Breast							–0.79	–1.41; –0.16	
Prostate							–0.24	–0.93; 0.46	
Other							–0.18	–0.76; 0.40	
Surgery									0.23
Yes							0.30	–0.19; 0.78	
No							0	–	
Radiation									0.86
Yes							0.04	–0.38; 0.45	
No							0	–	
Chemotherapy									0.006
Yes							0.57	0.17; 0.98	
No							0	–	
Somatic comorbidity									< 0.0001
No disorders							0	–	
1 disorder							0.97	0.58; 1.36	
≥ 2 disorders							1.25	0.60; 1.91	
Mental disorder									< 0.0001
Yes							3.75	3.12; 4.38	
No							0	–	

^aUnadjusted association between education and anxiety symptom scores; ^bInclusion of sex, age, cohabitation status, and children; ^cFurther inclusion of cancer form, surgery, radiation, chemotherapy, somatic comorbidity and mental disorder; ^dFor association with anxiety symptoms.

could be a potential mediator. The higher symptom scores of people with smoking-related cancers might be due to a worse prognosis, causing greater psychological distress, or correspond to reversed causality, in which poor mental health leads to smoking and thereby increases the risks for both smoking-related cancer and mental health problems.

Measurements

Self-reporting implies a subjective interpretation of the self and the questions asked. This may be influenced by the individual's attitude and potentially affect

reporting of education, anxiety and depressive symptoms. Nevertheless, self-reporting of anxiety and depressive symptoms captures the individual experience of symptoms. We used education as measure of social position. Bias is expected to be minor for self-reported education, as the straightforward categories are easier to recall than other self-reported measures of social position. Inclusion of further measures of social position, such as income or job position, could have captured additional aspects, avoided potential risk of cohort effect due to the higher educational level among younger people, and captured aspects like people with short education having a high income and

Table III. Mean difference estimates (B) from general linear models of depressive symptoms among cancer survivors living in Denmark about 2 years after diagnosis (n = 1667).

	Model 1 ^a			Model 2 ^b			Model 3 ^c		
	B	95% CI	p ^d	B	95% CI	p ^d	B	95% CI	p ^d
Education			0.13			0.05			0.03
Basic	0	–		0	–		0	–	
Medium	0.19	–0.25; 0.63		0.20	–0.25; 0.64		0.34	–0.07; 0.75	
Higher	–0.18	–0.59; 0.24		–0.25	–0.68; 0.18		–0.11	–0.50; 0.29	
Sex						0.06			0.0002
Male				0	–		0	–	
Female				0.32	–0.02; 0.65		0.77	0.37; 1.17	
Age per year				–0.09	–0.19; 0.02	0.10	–0.11	–0.20; –0.01	0.03
Quadratic age per year				0.001	–0.0001; 0.002	0.08	0.001	0.0002; 0.002	0.02
Cohabitation status						0.02			0.07
Married/cohabiting				0	–		0	–	
Widow/widower				–0.29	–0.88; 0.30		–0.45	–1.00; 0.09	
Single				0.64	0.14; 1.13		0.33	–0.12; 0.79	
Children						0.59			0.52
Not living at home				0	–		0	–	
Living at home				0.13	–0.53; 0.78		0.17	–0.43; 0.78	
Both				0.49	–0.21; 1.19		0.45	–0.20; 1.09	
No children				–0.01	–0.58; 0.57		0.22	–0.31; 0.75	
Cancer site									<0.0001
Smoking-related							0.93	0.37; 1.49	
Colorectal							0	–	
Breast							–0.67	–1.20; –0.13	
Prostate							0.20	–0.40; 0.80	
Other							–0.35	–0.84; 0.15	
Surgery									0.31
Yes							–0.22	–0.63; 0.20	
No							0	–	
Radiation									0.66
Yes							–0.08	–0.43; 0.28	
No							0	–	
Chemotherapy									<0.0001
Yes							0.85	0.50; 1.20	
No							0	–	
Somatic comorbidity									<0.0001
No disorders							0	–	
1 disorder							1.22	0.88; 1.55	
≥ 2 disorders							1.57	1.01; 2.13	
Mental disorder									<0.0001
Yes							3.46	2.92; 4.00	
No							0	–	

^aUnadjusted association between education and depressive symptoms; ^bInclusion of sex, age, cohabitation status and children; ^cFurther inclusion of cancer site, surgery, radiation, chemotherapy, somatic comorbidity and mental disorder; ^dFor association with depressive symptoms.

vice versa [19]. The risk for recall bias of mental disorders at time of treatment due to self-reporting was considered small, as sensitivity analyses excluding people with former mental disorders showed similar patterns of association as the original analyses.

A recent systematic review of the latent structure of HADS concluded that HADS do not consistently differentiate between symptoms of anxiety and depression. They suggest that HADS should be used as a total scale measuring emotional distress [23]; however this was not the original purpose when developing the scale, we therefore used HADS as

originally suggested. Somatic symptoms are not included in HADS, which might underestimate the true levels of anxiety and depressive symptoms. Symptoms of cancer are sometimes similar to somatic symptoms of depression, however, so that a scale that included somatic symptoms might lead to overestimates of anxiety and depressive symptoms.

Selection

Identifying cancer patients through a national administrative registry ensured nationwide identification of

Table IV. Basic characteristics distributed by level of participation in survey (n = 3298).

	Complete cases, n(%) ^a	Missing covariates, n(%) ^a	p ^b	Missing key variables, n(%) ^a	p ^b	Non-responders in 2012, n(%) ^a	p ^b
Total	1667 (100)	459 (100)		442 (100)		730 (100)	
Education			< 0.0001		< 0.0001		< 0.0001
Basic	330 (20)	136 (30)		177 (41)		174 (26)	
Medium	560 (34)	162 (35)		128 (30)		230 (35)	
Higher	777 (47)	161 (35)		87 (20)		245 (37)	
Unknown	0 (0)	0 (0)		37 (9)		15 (2)	
Missing	0	0		13		66	
Sex			0.16		0.10		0.09
Male	735 (44)	219 (48)		214 (48)		349 (48)	
Female	932 (56)	240 (52)		228 (52)		381 (52)	
Age (years)			0.007		< 0.0001		< 0.0001
19–39	59 (4)	9 (2)		6 (1)		39 (5)	
40–49	137 (8)	42 (9)		17 (4)		64 (9)	
50–59	366 (22)	75 (16)		40 (9)		136 (19)	
60–69	642 (39)	183 (40)		126 (29)		218 (30)	
70–79	363 (22)	106 (23)		143 (32)		170 (23)	
80–96	100 (6)	44 (10)		110 (25)		103 (14)	
Cohabitation status			0.03		< 0.0001		0.001
Married/cohabiting	1295 (78)	317 (77)		284 (69)		476 (70)	
Widow/widowed	155 (9)	54 (13)		69 (17)		85 (13)	
Single	217 (13)	42 (10)		61 (15)		117 (17)	
Missing	0	46		28		52	
Children			0.79		< 0.0001		0.24
Not living at home	1228 (74)	303 (76)		330 (81)		466 (70)	
Living at home	169 (10)	39 (10)		18 (4)		77 (11)	
Both	102 (6)	24 (6)		8 (2)		50 (7)	
No children	168 (10)	34 (9)		51 (13)		77 (11)	
Missing	0	59		35		60	
Cancer site			0.008		0.01		0.001
Smoking-related	220 (13)	59 (13)		63 (14)		114 (16)	
Colorectal	248 (15)	55 (12)		68 (15)		117 (16)	
Breast	497 (30)	126 (27)		104 (24)		156 (21)	
Prostate	253 (15)	102 (22)		93 (21)		110 (15)	
Other	449 (27)	117 (25)		114 (26)		231 (32)	
Missing	0	0		0		2	
Surgery			0.90		< 0.0001		0.0002
Yes	1352 (81)	293 (81)		273 (68)		494 (74)	
No	315 (19)	67 (19)		126 (32)		173 (26)	
Missing	0	99		43		63	
Radiation			0.02		0.92		0.64
Yes	474 (28)	97 (35)		104 (28)		176 (27)	
No	1193 (72)	177 (65)		265 (72)		465 (73)	
Missing	0	185		73		89	
Chemotherapy			0.001		0.02		0.57
Yes	579 (35)	142 (45)		109 (28)		235 (36)	
No	1088 (65)	173 (55)		275 (72)		418 (64)	
Missing	0	144		58		77	
Somatic comorbidity			0.04		0.0001		
No disorders	1101 (66)	163 (58)		186 (55)		–	
1 disorder	444 (27)	89 (32)		107 (32)		–	
≥ 2 disorders	122 (7)	27 (10)		43 (13)		–	
Missing	0	180		106		–	
Mental disorder			0.74		0.18		
Yes	129 (8)	20 (7)		19 (6)		–	
No	1538 (92)	259 (93)		317 (94)		–	
Missing	0	180		106		–	

^aSome percentages do not sum up to 100 because of rounding; ^bFor χ^2 -test of difference with the population included for multiple regression analyses. Missing values are not included in test.

potential participants. In a Dutch population-based study, non-participation was associated with short education and mental disorders, leading to underestimation of differences among study subjects [24]. Basic education was associated with both non-participation and attrition in our study. As lack of motivation and energy are known symptoms of depression and anxiety, the high rate of non-participation in 2012 of people with symptoms of anxiety and depression is plausible and might have introduced selection bias towards the null-hypothesis in our results, as in the Dutch study [24].

The sensitivity analyses showed diminishing variation with a stronger social gradient in depressive symptom scores when people for whom values were missing were included. This indicates a true social gradient in depressive symptoms, which might be hidden in our data by missing values and selection. Attrition has been associated with both low social position and unfavorable health outcomes, leading to underestimates of social differences in health [25], which is also probably the case in our study. Severe or terminal illness might have caused further attrition in 2012, as those excluded because of missing key variables and non-responders in 2012 were characterized by old age, smoking-related cancers or not having had surgery, indicating a worse prognosis (Table IV).

The finding of slightly higher depressive symptom scores for people with medium education is contrary to that expected. Although it might indicate different social help-seeking behavior, Suppli et al. (2011) found that unemployment at the time of breast cancer diagnosis was significantly associated with an increased risk for use of antidepressants, and income with a risk of borderline significance [26]. Thus, our results are probably influenced by non-response, attrition, or statistical chance, as no general dose-response pattern is observed, and further studies should be conducted.

Conclusion and implications

This study is one of the largest of social position, anxiety and depression in a nationwide population of cancer survivors based on patient-reported outcomes with validated measures of anxiety and depressive symptoms. We found that, about two years after diagnosis, 20% of cancer survivors had anxiety symptoms and 10% had depressive symptoms reaching a level that indicated possible cases. We did not, however, find any convincing social difference in anxiety or depression scores.

Mental disorders and somatic comorbidity at the time of cancer treatment were most strongly associated with anxiety and depressive symptoms among

cancer survivors; and sex and cancer site were also significantly associated with higher scores. Thus, these factors could be used as indicators by health-care professionals in identifying cancer survivors who need psychological support.

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