

Anxiety and depression in cancer patients and survivors in the context of restrictions in contact and oncological care during the COVID-19 pandemic

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Supplementary material

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Table S1. Comparison of non-respondents and respondents.

	Non-respondents ^a		Respondents ^b		Difference	<i>p</i> _{diff}
	n	col% ^c	n	col% ^c	col%	<i>p</i> (χ^2)
Total	10728	100	2435	100		
Sex						
male	5252	49.0	1186	48.7	-0.3	0.8239
female	5476	51.0	1249	51.3	0.3	
Age at survey						
≤49 years	784	7.3	189	7.8	0.5	<.0001
50-59 years	1489	13.9	460	18.9	5.0	
60-69 years	3028	28.2	781	32.1	3.9	
70-79 years	3262	30.4	741	30.4	0.0	
≥80 years	2165	20.2	264	10.8	-9.4	
Age at diagnosis						
≤49 years	964	9.0	253	10.4	1.4	<.0001
50-59 years	1852	17.3	574	23.6	6.3	
60-69 years	3187	29.7	794	32.6	2.9	
70-79 years	3421	31.9	670	27.5	-4.4	
≥80 years	1304	12.2	144	5.9	-6.3	
Year of diagnosis						
2015	166	1.5	26	1.1	-0.4	0.0392
2016	425	4.0	79	3.2	-0.8	
2017	426	4.0	102	4.2	0.2	
2018	1858	17.3	379	15.6	-1.7	
2019	4568	42.6	1070	43.9	1.3	
2020	3285	30.6	779	32	1.4	
Tumor site						
Breast cancer	875	8.2	323	13.3	5.1	<.0001
Colorectal cancer	3271	30.5	642	26.4	-4.1	
Lung cancer	3445	32.1	533	21.9	-10.2	
Prostate cancer	863	8.0	310	12.7	4.7	
Leukemia or lymphoma	2274	21.2	627	25.7	4.5	
Stage						
I	1786	16.6	449	18.4	1.8	<.0001
II	1577	14.7	416	17.1	2.4	
III	1612	15.0	373	15.3	0.3	
IV	1773	16.5	285	11.7	-4.8	
n.a. (leukemia/lymphoma)	2274	21.2	627	25.7	4.5	
Missing	1706	15.9	285	11.7	-4.2	
	Mean	SD	Mean	SD	years	<i>p</i> (t)
Age at survey (years)	68.1	12.3	65.5	11.8	-2.6	<.0001
Age at diagnosis (years)	66.0	12.4	63.5	11.9	-2.5	<.0001

Footnotes: ^aAll potentially eligible cancer patients and survivors (excluding those who were deceased, who had a second cancer, or an invalid diagnosis at the time of the invitation). ^bCancer patients and survivors who fulfilled the inclusion criteria and returned full-length questionnaire. N = 4 questionnaires could not be linked to the registry data and were used in the analysis but excluded from the respondents group in order not to count them double. ^cColumn percentages might not add up to 100% due to rounding up of decimals. SD: Standard deviation. Bold *p* values mark statistically significant differences (*p* < .05) in global comparison.

Table S2. Changes in domains of oncological care.

	Overall			Patients			Survivors			p_a	p_b
	N	% _a	% _b	N	% _a	% _b	N	% _a	% _b		
Any change	533	22.3		392	25.5		141	16.5		<.0001	
Surgery	72	3.0	11.8	63	4.1	11.3	9	1.1	17.0	<.0001	0.2235
Systemic therapy	65	2.7	6.2	50	3.3	6.3	15	1.8	5.8	0.030	0.7589
Radiotherapy	16	0.7	3.2	14	0.9	3.3	2	0.2	3.2	0.0511	0.9754
Follow-up care	172	7.2		107	7.0		65	7.6		0.5721	
Rehabilitation	235	9.8		190	12.4		45	5.3		<.0001	
Psychooncology	64	2.7		46	3.0		18	2.1		0.1942	
Nursing care	14	0.6		7	0.5		7	0.8		0.2664	

Footnotes: Patients: Cancer patients diagnosed between 07/2019 and 06/2020; Survivors: Cancer survivors diagnosed between 01/2015 and 06/2019. %_a: percentage in relation to number of participants; %_b: percentage in relation to planned treatments in this domain (data only available for surgery, systemic and radiotherapy). p_a : statistical significance of %_a difference between patients and survivors; p_b : statistical significance of %_b difference between patients and survivors. Bold p -values mark statistically significant differences ($p < .05$).

Table S3. Prevalence of anxiety and depression in cancer patients and survivors, overall and stratified by change of active cancer treatment.

	N	Subclinical anxiety (HADS-A ≥ 8)			Clinically significant anxiety (HADS-A ≥ 11)			Subclinical depression (HADS-D ≥ 8)			Clinically significant depression (HADS-D ≥ 11)		
		Un- adjusted	Adjusted model ^c	Adjusted model ^d	Un- adjusted	Adjusted model ^c	Adjusted model ^d	Un- adjusted	Adjusted model ^c	Adjusted model ^d	Un- adjusted	Adjusted model ^c	Adjusted model ^d
Overall prevalence	2391	36.9			16.5			44.9			19.4		
Stratified by change of active cancer treatment^a													
None	955	35.9	37.1	54.7	15.1	14.4	23.1	41.7	42.3	63.9	16.2	15.1	29.1
As planned^b	1298	36.2	37.4	53.6	16.4	15.6	22.0	46.2	45.4	63.3	20.4	19.0	30.7
Changed^b	138	50.0	50.5	62.1	26.8	25.2	29.4	55.8	55.4	67.7	31.9	30.0	39.4
p (contrasts)													
As planned vs. none		0.89	0.88	0.70	0.43	0.47	0.69	0.0361	0.18	0.80	0.0107	0.0202	0.56
Changed vs. as planned		0.0016	0.0039	0.08	0.0024	0.0052	0.09	0.0320	0.0300	0.32	0.0021	0.0026	0.07

Footnotes: ^aActive cancer treatment refers to surgery, systemic or radiotherapy in the time between January 2020 and the survey in 2021, according to self-report or cancer registry. ^bChange refers to self-report of cancellation, postponement or other change of surgery, systemic or radiotherapy due to the COVID-19 pandemic. Treatments and treatment changes in further domains like rehabilitation were not considered in this analysis, as there was no information on the number of planned and executed treatments for these domains. ^cEstimated by logistic regression, adjusted for age at survey, sex, education, tumor site, and stage. ^dAdditionally adjusted for survivor status, cancer phase (diagnosis, primary treatment, remission, follow-up care, palliative or unknown), body mass index, previous COVID-19 infection, and contact restrictions to relatives, self-help groups, physicians, caregivers, and in public. Bold p values mark statistically significant subgroup differences ($p < .05$).

Table S4. Odds Ratios and 95% CI for factors explaining anxiety.

	Subclinical anxiety (HADS-A ≥ 8)			Anxiety (HADS-A ≥ 11)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Active treatment change (ref: as planned)^a						
No active treatment planned	0.99 (0.83-1.18)	0.99 (0.82 - 1.20)	1.05 (0.84 - 1.30)	0.91 (0.72-1.15)	0.91 (0.71 - 1.17)	1.06 (0.80 - 1.41)
Active treatment changed	1.76 (1.24-2.51)	1.71 (1.19 - 2.47)	1.42 (0.97 - 2.08)	1.87 (1.25-2.81)	1.82 (1.20 - 2.78)	1.47 (0.94 - 2.28)
Age at survey (ref: 60-69 years)						
18-49 years	-	2.23 (1.58 - 3.15)	2.24 (1.54 - 3.28)	-	2.84 (1.90 - 4.23)	3.09 (1.98 - 4.82)
50-59 years	-	1.94 (1.52 - 2.47)	1.89 (1.45 - 2.47)	-	2.40 (1.78 - 3.24)	2.57 (1.85 - 3.58)
70-79 years	-	0.74 (0.59 - 0.93)	0.76 (0.60 - 0.97)	-	0.78 (0.57 - 1.06)	0.78 (0.56 - 1.08)
80-86 years	-	0.90 (0.66 - 1.22)	0.85 (0.61 - 1.19)	-	0.68 (0.43 - 1.09)	0.59 (0.36 - 0.98)
Cancer site by sex (ref: Colorectal cancer, males)						
Breast cancer	-	1.25 (0.87 - 1.80)	1.19 (0.81 - 1.74)	-	1.37 (0.82 - 2.27)	1.28 (0.75 - 2.18)
Colorectal cancer, females	-	1.81 (1.29 - 2.55)	1.69 (1.18 - 2.43)	-	2.06 (1.27 - 3.32)	1.82 (1.10 - 3.02)
Leukemia or lymphoma, females	-	2.05 (1.38 - 3.05)	1.89 (1.24 - 2.89)	-	2.03 (1.18 - 3.50)	1.81 (1.02 - 3.21)
Leukemia or lymphoma, males	-	0.89 (0.59 - 1.33)	0.83 (0.54 - 1.27)	-	1.01 (0.57 - 1.80)	0.94 (0.52 - 1.72)
Lung cancer, females	-	2.66 (1.85 - 3.82)	2.35 (1.60 - 3.46)	-	3.42 (2.10 - 5.57)	2.75 (1.64 - 4.59)
Lung cancer, males	-	1.56 (1.07 - 2.28)	1.58 (1.07 - 2.35)	-	1.91 (1.13 - 3.23)	1.79 (1.03 - 3.09)
Prostate cancer	-	1.17 (0.81 - 1.69)	1.25 (0.86 - 1.82)	-	1.18 (0.68 - 2.03)	1.24 (0.71 - 2.17)
UICC stage at diagnosis (ref: I)						
Stage II	-	1.02 (0.78 - 1.34)	1.04 (0.79 - 1.39)	-	1.05 (0.73 - 1.49)	1.06 (0.73 - 1.53)
Stage III	-	0.95 (0.72 - 1.26)	0.97 (0.72 - 1.30)	-	0.85 (0.59 - 1.24)	0.80 (0.54 - 1.18)
Stage IV	-	0.79 (0.58 - 1.08)	0.72 (0.51 - 1.03)	-	0.72 (0.48 - 1.09)	0.61 (0.38 - 0.97)
Education (ref: 10-11 years)						
12 or more years	-	0.90 (0.72 - 1.12)	0.90 (0.72 - 1.13)	-	0.97 (0.73 - 1.28)	0.92 (0.69 - 1.24)
9 years or less	-	1.24 (1.00 - 1.54)	1.09 (0.86 - 1.38)	-	1.23 (0.92 - 1.63)	1.07 (0.79 - 1.45)
Survivor status: patient (ref: survivor)	-	-	1.02 (0.83 - 1.25)	-	-	1.22 (0.93 - 1.61)
Treatment phase (ref: diagnosis)						
Primary	-	-	0.77 (0.45 - 1.31)	-	-	1.01 (0.49 - 2.08)
Remission	-	-	0.60 (0.36 - 0.99)	-	-	0.72 (0.36 - 1.45)
Follow-up	-	-	0.67 (0.41 - 1.09)	-	-	1.06 (0.55 - 2.03)

	Subclinical anxiety (HADS-A ≥ 8)			Anxiety (HADS-A ≥ 11)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Recurrence	-	-	1.52 (0.83 - 2.77)	-	-	2.07 (0.96 - 4.46)
Palliative	-	-	1.14 (0.60 - 2.16)	-	-	2.34 (1.04 - 5.30)
Previous COVID-19 infection (ref: none/ unsure)	-	-	1.10 (0.68 - 1.78)	-	-	1.23 (0.69 - 2.18)
BMI (ref: normal weight)						
Underweight	-	-	1.56 (0.86 - 2.84)	-	-	1.56 (0.79 - 3.04)
Pre-obesity	-	-	0.90 (0.73 - 1.11)	-	-	0.93 (0.71 - 1.22)
Obesity	-	-	1.08 (0.84 - 1.38)	-	-	0.82 (0.59 - 1.13)
Living situation (ref: with partner)						
Living with others/nursing home	-	-	0.85 (0.53 - 1.36)	-	-	0.80 (0.45 - 1.41)
Living alone, no partner	-	-	0.92 (0.71 - 1.19)	-	-	0.81 (0.58 - 1.14)
Working status (ref: full-time)						
Retired/ not employed	-	-	0.95 (0.71 - 1.27)	-	-	1.31 (0.91 - 1.90)
Part-time	-	-	0.94 (0.69 - 1.27)	-	-	1.03 (0.70 - 1.52)
Low income (ref: average or high)	-	-	1.78 (1.41 - 2.24)	-	-	1.71 (1.28 - 2.28)
Contact restrictions (ref per domain: none)						
...to relatives	-	-	1.27 (0.99 - 1.63)	-	-	1.22 (0.87 - 1.71)
...to peer support groups	-	-	1.35 (1.10 - 1.67)	-	-	1.31 (1.00 - 1.71)
...to physicians	-	-	1.90 (1.42 - 2.53)	-	-	1.84 (1.31 - 2.58)
...to caregivers	-	-	1.31 (0.98 - 1.75)	-	-	1.54 (1.09 - 2.19)
...in public	-	-	1.21 (0.89 - 1.64)	-	-	1.20 (0.78 - 1.84)

Footnotes: ^aActive cancer treatment refers to surgery, systemic or radiotherapy in the time between January 2020 and the survey in 2021, according to self-report or cancer registry. Change refers to self-report of cancellation, postponement or other change of surgery, systemic or radiotherapy due to the COVID-19 pandemic. Treatments and treatment changes in further domains like rehabilitation were not considered in this analysis, as there was no information on the number of planned and executed treatments for these domains. All results were estimated with hierarchical logistic regression. Bold Odds Ratios mark statistically significant factors (confidence interval not including 1).

Table S5. Odds Ratios and 95% CI for factors explaining depression.

	Subclinical depression (HADS-D ≥ 8)			Depression (HADS-D ≥ 11)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Active treatment change (ref: as planned)^a						
No active treatment planned	0.83 (0.70-0.99)	0.89 (0.74 - 1.06)	1.03 (0.83 - 1.27)	0.75 (0.60-0.93)	0.76 (0.61 - 0.96)	0.93 (0.71 - 1.21)
Active treatment changed	1.47 (1.03-2.10)	1.50 (1.04 - 2.15)	1.22 (0.83 - 1.79)	1.82 (1.24-2.67)	1.83 (1.24 - 2.70)	1.47 (0.97 - 2.22)
Age at survey (ref: 60-69 years)						
18-49 years	-	1.07 (0.76 - 1.50)	1.05 (0.72 - 1.54)	-	0.97 (0.62 - 1.52)	1.07 (0.65 - 1.74)
50-59 years	-	1.18 (0.92 - 1.50)	1.24 (0.95 - 1.61)	-	1.51 (1.13 - 2.02)	1.72 (1.24 - 2.38)
70-79 years	-	0.85 (0.69 - 1.05)	0.83 (0.66 - 1.04)	-	0.98 (0.75 - 1.28)	0.92 (0.69 - 1.23)
80-86 years	-	1.17 (0.87 - 1.57)	1.03 (0.74 - 1.42)	-	1.45 (1.01 - 2.08)	1.14 (0.77 - 1.68)
Cancer site by sex (ref: Colorectal cancer, males)						
Breast cancer	-	1.08 (0.77 - 1.52)	1.03 (0.71 - 1.48)	-	0.73 (0.47 - 1.15)	0.64 (0.40 - 1.02)
Colorectal cancer, females	-	1.20 (0.87 - 1.66)	1.07 (0.76 - 1.52)	-	0.96 (0.64 - 1.45)	0.75 (0.48 - 1.17)
Leukemia or lymphoma, females	-	1.71 (1.17 - 2.50)	1.52 (1.02 - 2.28)	-	1.44 (0.90 - 2.29)	1.19 (0.72 - 1.96)
Leukemia or lymphoma, males	-	1.16 (0.79 - 1.69)	1.13 (0.76 - 1.68)	-	0.91 (0.56 - 1.49)	0.91 (0.54 - 1.52)
Lung cancer, females	-	2.45 (1.73 - 3.47)	2.07 (1.43 - 3.00)	-	1.72 (1.14 - 2.59)	1.22 (0.79 - 1.90)
Lung cancer, males	-	2.13 (1.50 - 3.03)	2.20 (1.52 - 3.19)	-	1.61 (1.06 - 2.45)	1.55 (1.00 - 2.40)
Prostate cancer	-	0.80 (0.57 - 1.13)	0.87 (0.61 - 1.24)	-	0.57 (0.36 - 0.91)	0.61 (0.38 - 1.00)
UICC stage at diagnosis (ref: I)						
Stage II	-	1.05 (0.81 - 1.37)	1.07 (0.81 - 1.41)	-	1.06 (0.75 - 1.50)	1.10 (0.77 - 1.58)
Stage III	-	0.94 (0.72 - 1.24)	0.92 (0.69 - 1.23)	-	1.01 (0.71 - 1.43)	0.99 (0.69 - 1.43)
Stage IV	-	1.23 (0.91 - 1.66)	1.00 (0.71 - 1.40)	-	1.09 (0.76 - 1.58)	0.94 (0.62 - 1.43)
Education (ref: 10-11 years)						
12 or more years	-	0.81 (0.66 - 1.00)	0.80 (0.64 - 0.99)	-	0.79 (0.60 - 1.03)	0.77 (0.58 - 1.02)
9 years or less	-	1.22 (0.99 - 1.51)	1.09 (0.87 - 1.37)	-	1.05 (0.81 - 1.35)	0.88 (0.67 - 1.16)
Survivor status: patient (ref: survivor)	-	-	1.12 (0.92 - 1.36)	-	-	1.28 (0.99 - 1.64)
Treatment phase (ref: diagnosis)						
Primary	-	-	1.43 (0.84 - 2.42)	-	-	1.64 (0.81 - 3.32)
Remission	-	-	0.95 (0.58 - 1.56)	-	-	1.14 (0.58 - 2.26)
Follow-up	-	-	1.12 (0.70 - 1.81)	-	-	1.43 (0.75 - 2.75)

	Subclinical depression (HADS-D ≥ 8)			Depression (HADS-D ≥ 11)		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Recurrence	-	-	3.09 (1.67 - 5.69)	-	-	2.91 (1.37 - 6.18)
Palliative	-	-	3.61 (1.87 - 7.00)	-	-	3.54 (1.61 - 7.78)
Previous COVID-19 infection (ref: none/ unsure)	-	-	1.13 (0.70 - 1.80)	-	-	1.17 (0.67 - 2.04)
BMI (ref: normal weight)						
Underweight	-	-	1.53 (0.83 - 2.80)	-	-	1.82 (0.97 - 3.43)
Pre-obesity	-	-	1.04 (0.85 - 1.27)	-	-	0.89 (0.69 - 1.14)
Obesity	-	-	1.03 (0.81 - 1.31)	-	-	0.88 (0.65 - 1.18)
Living situation (ref: with partner)						
Living with others/nursing home	-	-	1.31 (0.81 - 2.11)	-	-	1.01 (0.57 - 1.77)
Living alone, no partner	-	-	1.31 (1.02 - 1.68)	-	-	1.65 (1.24 - 2.21)
Working status (ref: full-time)						
Retired/ not employed	-	-	1.31 (0.98 - 1.73)	-	-	1.60 (1.11 - 2.32)
Part-time	-	-	1.05 (0.77 - 1.41)	-	-	1.07 (0.71 - 1.60)
Low income (ref: average or high)	-	-	1.54 (1.23 - 1.94)	-	-	1.58 (1.22 - 2.06)
Contact restrictions (ref per domain: none)						
...to relatives	-	-	1.45 (1.14 - 1.85)	-	-	1.50 (1.10 - 2.05)
...to peer support groups	-	-	1.23 (1.00 - 1.51)	-	-	1.19 (0.93 - 1.54)
...to physicians	-	-	1.80 (1.34 - 2.41)	-	-	1.46 (1.05 - 2.03)
...to caregivers	-	-	1.53 (1.14 - 2.05)	-	-	2.07 (1.49 - 2.87)
...in public	-	-	1.17 (0.87 - 1.56)	-	-	0.73 (0.51 - 1.05)

Footnotes: ^aActive cancer treatment refers to surgery, systemic or radiotherapy in the time between January 2020 and the survey in 2021, according to self-report or cancer registry. Change refers to self-report of cancellation, postponement or other change of surgery, systemic or radiotherapy due to the COVID-19 pandemic. Treatments and treatment changes in further domains like rehabilitation were not considered in this analysis, as there was no information on the number of planned and executed treatments for these domains. All results were estimated with hierarchical logistic regression. Bold Odds Ratios mark statistically significant factors (confidence interval not including 1).

Table S6. Prevalence of anxiety and depression in cancer patients and survivors with a change in active cancer treatment, stratified by decision-maker, domain of change, and reason for change.

		N	Subclinical anxiety (HADS-A ≥ 8)	Clinically significant anxiety (HADS-A ≥ 11)	Subclinical depression (HADS-D ≥ 8)	Clinically significant depression (HADS-D ≥ 11)
Any change^a		138	50.0	26.8	55.8	31.9
Stratified by decision-maker	No information	26	57.7	38.5	57.7	46.2
	Only own decision(s)	9	66.7	33.3	55.6	44.4
	Only physician's decision(s)	77	39.0	16.9	53.3	27.3
	Shared decision(s)	26	69.2	42.3	61.5	26.9
	<i>p</i> (χ^2)		0.0266	0.0287	0.90	0.25
Change of surgery		72	55.6	29.2	62.5	37.5
Stratified by reason	Infection risk	18	72.2	27.8	72.2	44.4
	Lack of capacities	41	53.7	31.7	58.5	36.6
	Other or unknown reason	13	38.5	23.1	61.5	30.8
	<i>p</i> (χ^2)		0.16	0.83	0.60	0.73
Change of systemic therapy		65	44.6	26.2	50.8	26.2
Stratified by reason	Infection risk	20	50.0	25.0	40.0	30.0
	Lack of capacities	11	27.3	18.2	54.6	9.1
	Other or unknown reason	34	47.1	29.4	55.9	29.4
	<i>p</i> (χ^2)		0.44	0.75	0.51	0.37
Change of radiotherapy		16	56.3	31.3	37.5	25.0
Stratified by reason	Infection risk	5	80.0	60.0	60.0	40.0
	Lack of capacities	3	66.7	33.3	33.3	0.0
	Other or unknown reason	8	37.5	12.5	25.0	25.0
	<i>p</i> (χ^2)		0.30	0.20	0.44	0.45

Footnotes: ^aChange refers to self-report of cancellation, postponement or other change of surgery, systemic or radiotherapy due to the COVID-19 pandemic. Treatment changes in further domains like rehabilitation were not considered in this analysis. Bold *p* values mark statistically significant differences ($p < .05$) between decision-makers or reasons in global comparison according to chi-square tests.

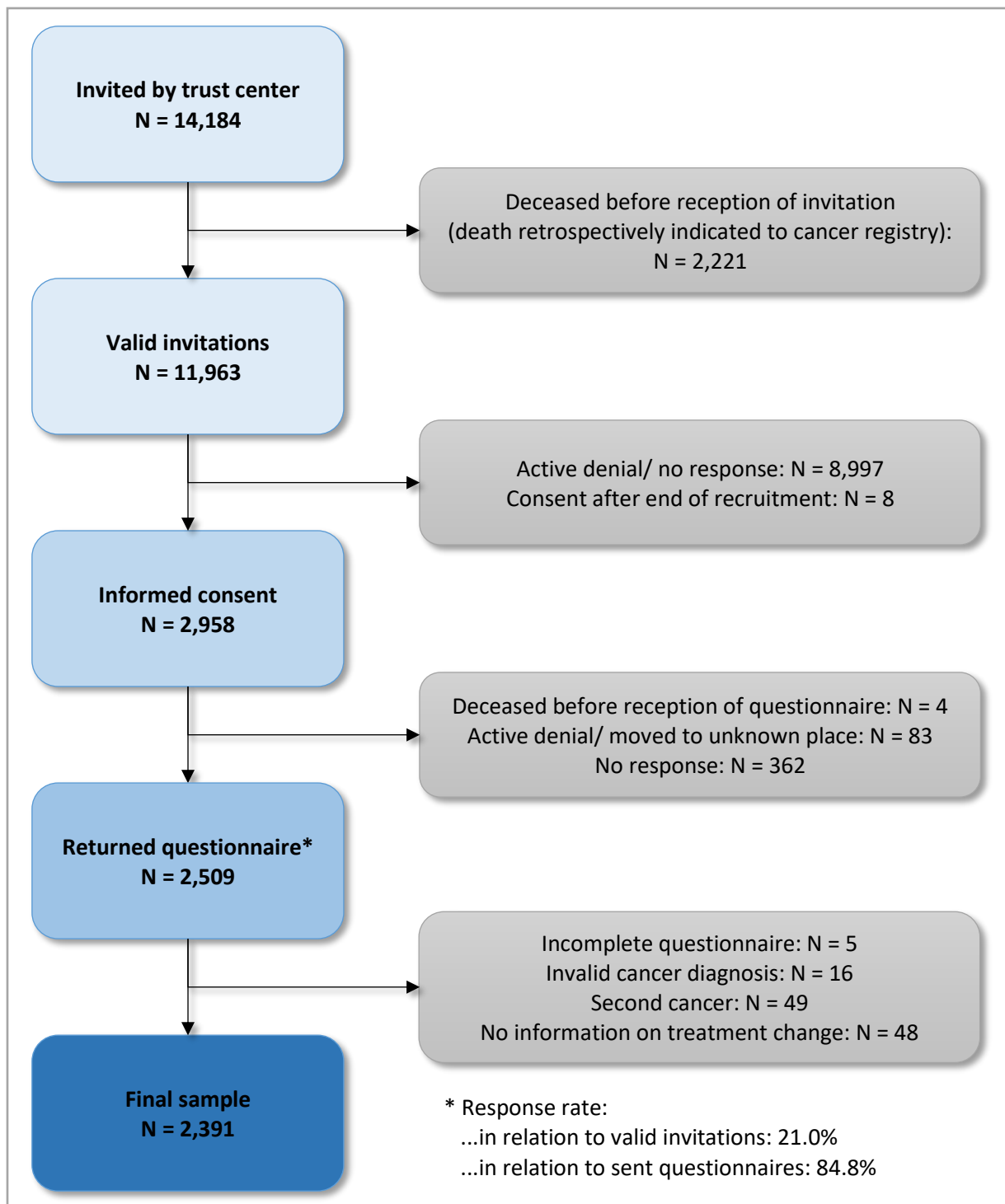


Figure S1. Flowchart of the study.

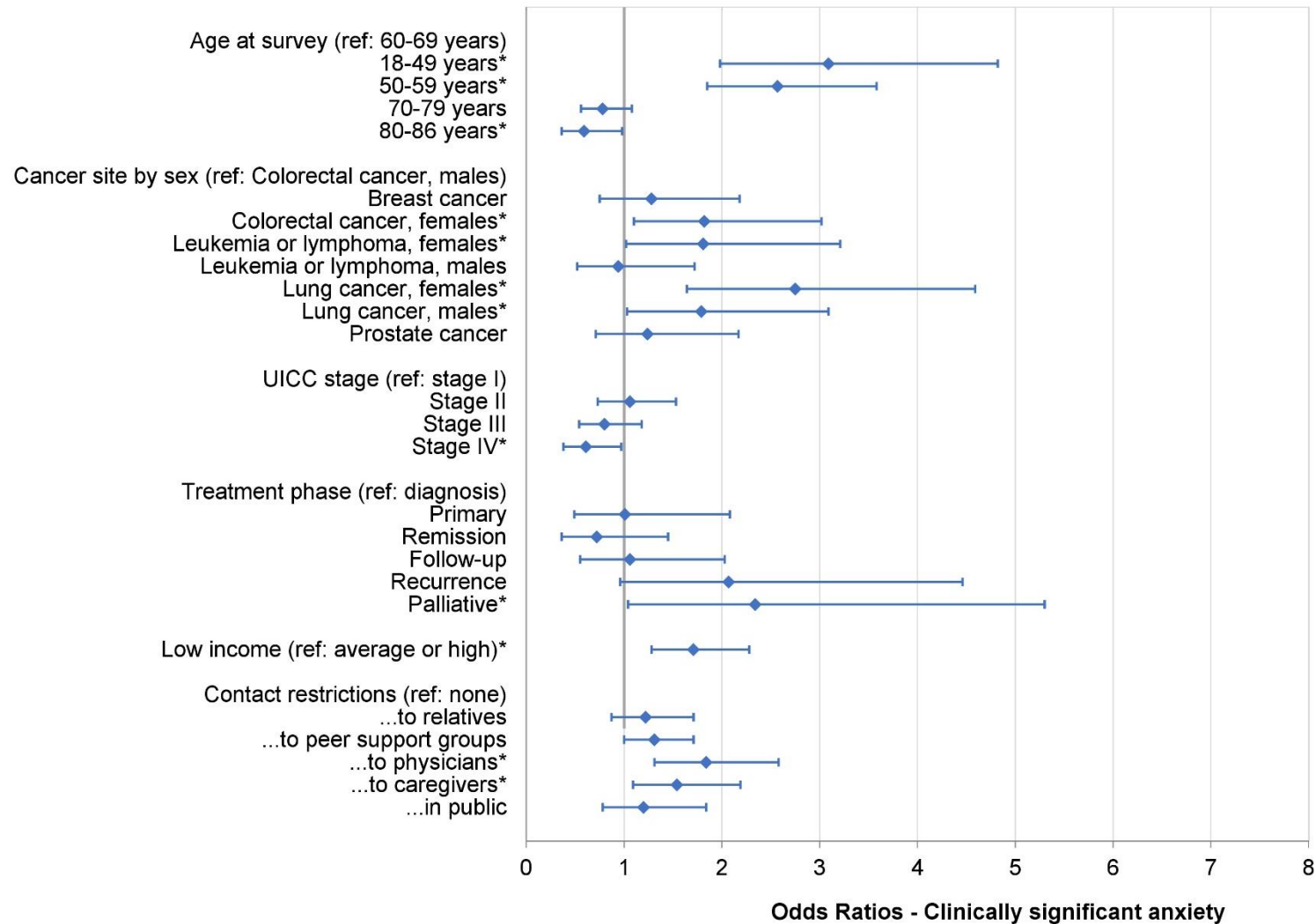


Figure S2. Odds ratios for anxiety (HADS-A cut-off ≥ 11).

Note: Asterisks (*) reflect statistically significant factors in the overall model. Further non-significant factors in the model were: Treatment change, employment, education, living situation, patient vs. survivor, previous COVID-19 infection, BMI (data not shown). All results are based on 25 imputations of missing values in the non-conditional variables.

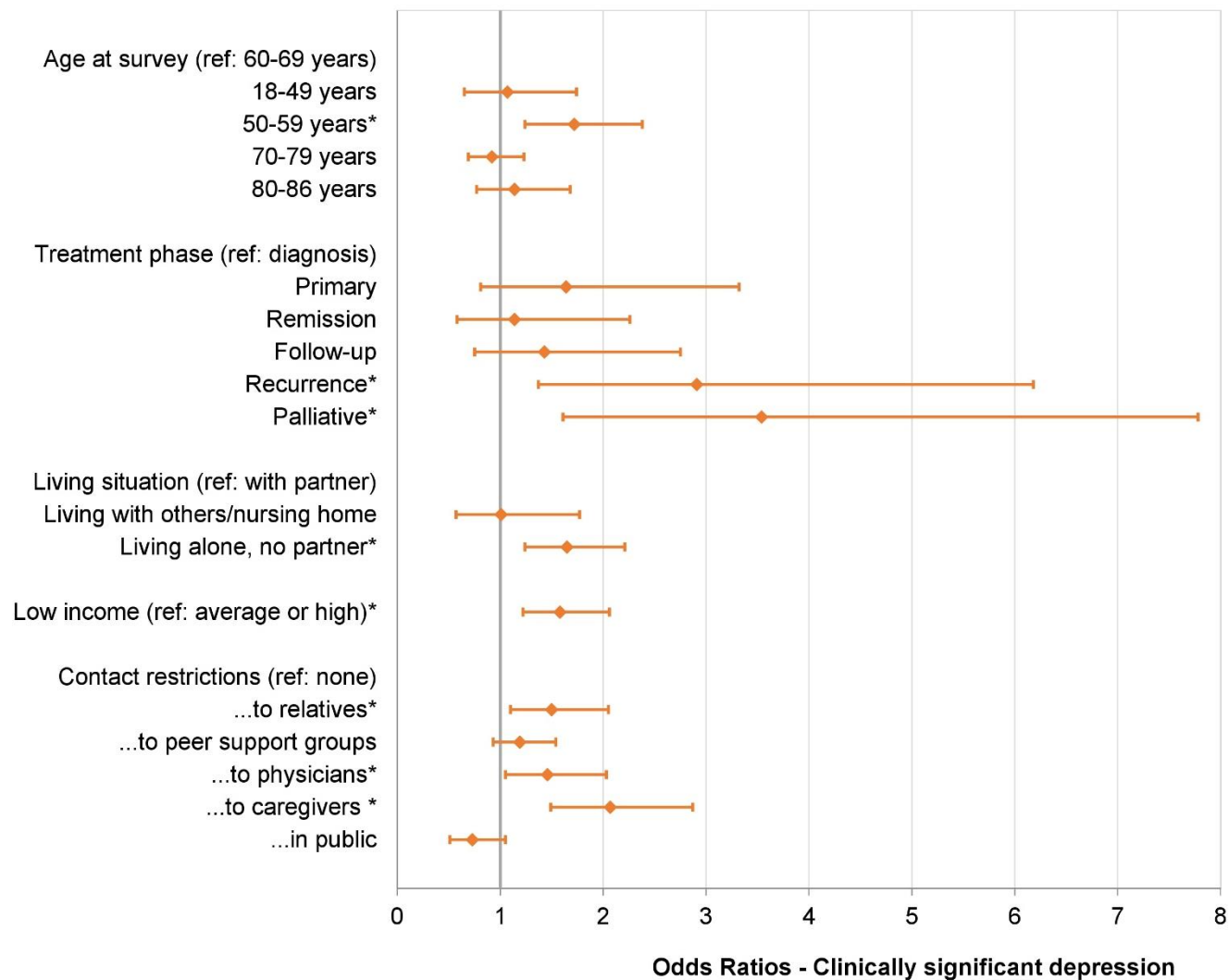


Figure S3. Odds ratios for depression (HADS-D cut-off ≥ 11).

Note: Asterisks (*) reflect statistically significant factors in the overall model. Further non-significant factors in the model were: Treatment change, cancer site/sex, employment, stage, patient vs. survivor, previous COVID-19 infection, BMI (data not shown). All results are based on 25 imputations of missing values in the non-conditional variables.