



Original research

Norwegian general population normative data for the European Organization for Research and Treatment of Cancer questionnaires: the Quality of Life Questionnaire-Core 30, the Sexual Health Questionnaire QLQ-SHQ22 and the sexual domains of the QLQ-BR23/BR45



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 QLQ-BR45;
 QLQ-SH22

Abstract Objective: The aim of this study was to provide sex-, age-, and morbidity-specific Norwegian general population normative values for the European Organization for Research and Treatment of Cancer Quality of Life Questionnaires QLQ-C30, the sexual health questionnaire QLQ-SHQ22 and the sexual domains of the breast modules QLQ-BR23 and QLQ-BR45.

Methods: A random nationwide sample stratified by sex and age groups (18–29, 30–39, 40–49, 50–59, 60–69 and ≥70 years) was drawn from the Norwegian National Population Register. Participants were notified through national online health services (HelseNorge) and postal mail. The survey included sociodemographic background information, health-related quality of life assessed by the EORTC questionnaires, and morbidity assessed by the Self-Administered Comorbidity Questionnaire. Multivariable linear regression was carried out to estimate the associations of age, sex and morbidity with the EORTC scale and item scores.

Results: Of the 15,627 eligible individuals, 5135 (33%) responded. Women and persons with morbidities reported lower functioning and higher symptom burden than men and persons without morbidities, respectively, on nearly all EORTC scales. Sex differences were most prominent for *emotional functioning, pain, fatigue and insomnia (QLQ-C30), body image, sexual functioning (QLQ-BR23/45), importance of sexual activity, libido and fatigue (QLQ-SHQ22)*. The score differences between persons with and without morbidity were highly significant and largest in the youngest and middle-aged groups.

Conclusion: This is the first study to provide normative values for the EORTC sexual health questionnaire QLQ-SHQ22 and the sexual subscales of the QLQ-BR23 and QLQ-BR45 for all, separately in age groups by sex and morbidity.

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1. Introduction

Patient-reported outcome measures (PROMs) reflect the patient's perceptions of health-related quality of life (HRQoL) [1,2]. The purpose of PROMs in oncology is to provide valuable information on how cancer and treatment affect HRQoL and thereby guide clinicians in patient-centred care [3–5]. PROMs are recognised as independent end-points in clinical studies and healthcare research worldwide [6].

The European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) is one of the most frequently used PROMs in oncology [5,7,8]. This cancer-specific core questionnaire is often supplemented by modules for specific diagnoses or conditions, for example, the breast cancer modules QLQ-BR23/QLQ-BR45 [9,10].

Even though these questionnaires are validated and frequently used, meaningful and consistent interpretations of scores remain challenging in both research and clinical practice [11–13]. One approach is to compare changes in PROMs at the group or patient level using clinically significant differences [14]. Thresholds for high symptom scores or low functional scores have been utilised [15,16], and thresholds for clinical importance of domains in the core EORTC QLQ-C30 have recently been developed [17]. General population data provide estimates of HRQoL scores among individuals of the same age and sex as the patients, thereby supporting the interpretation of PROMs in clinical practice and cancer studies [18–21].

Perceived HRQoL varies by age and sex [5,18,21–24], and further, poor health has a great negative impact on HRQoL [5,20,22,25]. Hence, a valid assessment of

Table 1
 Response by age and sex

Age groups (years)	Total sample		Women		Men	
	Approached (n)	Response rate (%)	Approached (n)	Response rate (%)	Approached (n)	Response rate (%)
18–79	15816	32.5	7896	34.6	7920	30.3
18–29	2649	29.5	1328	36.2	1321	22.7
30–39	2732	30.0	1383	34.9	1348	25.0
40–49	2663	32.9	1318	38.4	1342	27.6
50–59	2792	36.4	1404	38.5	1385	34.2
60–69	2726	36.0	1373	33.2	1359	38.9
70–79	2256	29.3	1091	24.6	1165	33.5

Table 2
Characteristics for the Norwegian general population sample

	Total sample, <i>N</i> (%)	Men, <i>n</i> (%)	Women, <i>n</i> (%)
Individuals	5135 (100)	2400 (46.7)	2735 (53.3)
Age, mean (SD)	49 (16.5)	52 (16.4)	47 (16.2)
Age categories (years)			
18–29	781 (15.2)	300 (12.5)	481 (17.6)
30–39	820 (16.0)	337 (14.0)	483 (17.7)
40–49	876 (17.0)	370 (15.4)	506 (18.5)
50–59	1 016 (19.8)	476 (19.8)	540 (19.7)
60–69	981 (19.1)	527 (22.0)	454 (16.6)
70–79	661 (12.9)	390 (16.3)	271 (9.9)
Education			
Compulsory or less	294 (5.8)	168 (7.0)	126 (4.6)
Junior high school (1–2 years)	1007 (19.7)	534 (22.4)	473 (17.4)
Senior high school (3–4 years)	1071 (21.0)	512 (21.3)	559 (20.4)
Junior and senior high school (1–4 years)	2078 (40.5)	1046 (43.6)	1032 (37.7)
University degree (< 4 years)	1283 (25.0)	604 (25.2)	679 (24.9)
Postgraduate degree (> 4 years)	1450 (28.4)	565 (23.5)	885 (32.5)
Relationship status			
Single/not in a steady relationship	864 (16.9)	396 (16.6)	468 (17.1)
Married or in a steady relationship	3747 (73.4)	1798 (75.3)	1949 (71.6)
Separated/divorced	340 (6.7)	142 (5.9)	198 (7.2)
Widowed	157 (3.1)	51 (2.1)	106 (3.9)
Employment status			
Employed full-time	2824 (55.0)	1426 (59.4)	1398 (51.2)
Employed part-time	599 (11.6)	207 (8.6)	392 (14.3)
Homemaker	100 (2.0)	33 (1.4)	67 (2.5)
Student	413 (8.1)	138 (5.8)	275 (10.1)
Unemployed	86 (1.7)	41 (1.7)	45 (1.7)
Retired	985 (19.2)	557 (23.2)	428 (15.7)
Full-time sick leave	122 (2.4)	41 (1.7)	81 (3.0)
Part-time sick leave	74 (1.4)	20 (0.8)	54 (2.0)
Disability pension	369 (7.2)	111 (4.6)	258 (9.5)
Occupational rehabilitation	46 (0.9)	23 (1.0)	23 (0.8)
Health status			
Morbidities 1*	1378 (26.8)	574 (24.9)	804 (29.4)
Morbidities 2**	3120 (60.9)	1314 (54.9)	1806 (66.1)
Cancer	453 (8.8)	228 (9.5)	225 (8.2)
Heart disease	334 (6.5)	244 (10.2)	90 (3.2)
High blood pressure	1356 (26.4)	742 (30.9)	614 (22.4)
Pulmonary disease	623 (12.1)	284 (11.8)	339 (12.4)
Migraine	1317 (25.6)	417 (17.4)	900 (32.9)
Diabetes	311 (6.1)	167 (7.0)	144 (5.3)
Kidney disease	180 (3.5)	97 (4.0)	83 (3.0)
Gastric ulcer or intestinal disease	460 (8.9)	214 (8.9)	246 (9.0)
Arthrosis	905 (17.6)	363 (15.1)	542 (19.8)
Epilepsy	68 (1.3)	28 (1.2)	40 (1.4)
Stroke or cerebral haemorrhage	116 (2.2)	72 (3.0)	44 (1.6)
Depression	1358 (26.5)	445 (18.5)	913 (33.4)
Other psychological issues	982 (19.1)	303 (12.6)	679 (24.8)
Rheumatic disease	394 (7.6)	148 (6.1)	246 (9.0)

* Morbidities 1 are based on the criteria of having one or more of the given conditions that limit activities/functioning.

** Morbidities 2 are based on the criteria of having one or more of the given conditions. The presence of each condition has the same criteria as morbidities 2.

morbidity should be included in the collection of normative data, and comorbidity should be accounted for in comparisons with cancer populations. Including such information, normative data may provide knowledge about health issues that are probably due to the cancer or treatment and not simply an effect of normal ageing, morbidities or sex [5,8,20,22]. Country-specific normative values for HRQoL have been conducted for European countries, including Norway in 1998 and 2007 [25,26],

showing national differences [5,8,19–24,27,28–33]. In 2019 the EORTC QOL group conducted a large normative study with data from 13 European countries [8]. However, Norway was not a part of this survey, and updated data are therefore essential to display the current HRQoL in the Norwegian general population.

Sexual health is an important aspect of HRQoL [34,35], and sexual problems are highly prevalent in cancer survivors [36]. Despite these facts, the only normative EORTC

Table 3
Reference values for EORTC QLQ-C30 by age and sex

	Total													
	Female					Male								
	All women	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	All men	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years
Functional scales QLQ-C30														
Physical functioning (<i>n</i> = 5112)	M 90.6 SD 14.8	91.7 13.6	91.7 13.0	90.2 15.6	88.5 15.3	89.0 13.7	82.5 18.5	91.9 14.5	94.7 9.1	95.0 10.1	95.0 11.8	92.1 15.8	90.4 15.9	85.7 18.1
Role functioning (<i>n</i> = 5112)	M 86.8 SD 23.3	83.6 24.7	85.4 23.4	83.8 25.8	83.6 25.6	88.6 21.2	85.7 23.7	88.9 21.9	88.9 19.3	88.4 22.1	89.3 23.2	88.7 24.5	89.3 20.6	88.7 20.6
Emotional functioning (<i>n</i> = 5111)	M 80.9 SD 20.2	69.5 24.4	75.1 21.5	78.0 19.6	81.1 19.3	83.8 17.8	84.6 17.2	84.0 19.0	78.9 22.9	79.8 20.7	82.1 19.7	84.1 18.8	87.5 16.8	88.6 13.8
Cognitive functioning (<i>n</i> = 5110)	M 83.8 SD 20.5	81.6 22.1	79.5 22.7	80.8 23.1	83.6 19.6	86.8 17.6	86.0 16.9	86.2 18.2	82.9 22.2	85.5 20.1	87.2 18.1	86.7 18.3	88.1 16.0	85.0 15.2
Social functioning (<i>n</i> = 5109)	M 85.1 SD 23.2	84.5 24.2	83.3 24.0	80.5 26.1	81.6 25.0	85.8 21.7	85.3 22.7	87.3 21.9	89.7 18.7	89.0 21.3	87.8 22.2	86.8 23.0	86.6 22.5	85.0 22.0
Global health/QoL (<i>n</i> = 5114)	M 73.0 SD 21.9	67.1 22.4	68.8 21.8	70.7 22.0	71.2 23.6	75.3 21.1	76.0 21.4	75.2 21.3	71.1 20.0	72.8 21.1	74.3 22.1	76.3 21.6	77.5 21.8	76.8 19.9
Symptom scales QLQ-C30														
Fatigue (<i>n</i> = 5102)	M 30.4 SD 23.8	42.5 26.4	36.4 24.1	33.8 24.8	32.8 25.2	27.0 21.4	27.8 21.9	26.4 21.9	31.1 22.7	29.6 22.9	26.7 22.8	25.5 22.1	23.8 21.1	24.5 19.8
Nausea/vomiting (<i>n</i> = 5106)	M 4.8 SD 11.6	5.9 12.7	7.3 15.4	5.3 11.5	5.1 10.7	2.9 8.1	3.5 10.3	3.6 9.9	6.5 13.0	4.3 11.0	3.0 9.2	3.0 9.3	2.9 8.8	3.1 8.8
Pain (<i>n</i> = 5112)	M 21.9 SD 25.7	18.3 23.8	21.1 25.2	25.1 28.1	28.1 28.5	25.8 25.7	27.2 26.5	19.4 24.3	15.4 19.4	16.6 22.6	17.1 24.7	19.9 26.3	22.6 25.4	21.8 24.0
Dyspnoea (<i>n</i> = 5091)	M 13.0 SD 22.0	12.9 22.2	11.0 20.6	10.3 18.9	11.4 21.3	11.8 19.9	18.1 24.2	14.1 22.9	11.8 20.5	11.4 20.8	10.9 19.5	13.8 22.5	14.5 24.0	21.0 26.6
Insomnia (<i>n</i> = 5100)	M 26.8 SD 29.3	30.2 29.8	27.0 29.1	27.1 29.2	33.3 28.9	31.9 30.1	30.4 27.9	23.0 28.3	27.3 30.8	24.3 29.3	22.7 28.6	23.8 29.6	20.4 25.8	21.4 26.6
Appetite loss (<i>n</i> = 5100)	M 9.6 SD 20.3	11.7 22.2	13.0 22.7	10.6 21.1	9.2 18.6	6.2 15.5	7.31 16.0	7.3 17.7	16.1 24.5	9.0 19.5	7.6 19.0	5.6 15.2	4.8 14.0	4.2 12.7
Constipation (<i>n</i> = 5087)	M 12.9 SD 22.9	16.1 25.5	15.6 24.8	15.1 24.4	15.7 26.1	15.8 25.7	20.8 26.6	9.2 18.8	9.7 20.4	7.3 16.3	7.3 17.3	8.1 16.5	9.5 19.5	13.3 21.9
Diarrhoea (<i>n</i> = 5086)	M 14.7 SD 22.2	14.8 22.7	13.6 21.3	13.6 20.6	14.7 24.0	15.3 23.0	15.8 24.1	14.6 21.6	11.8 19.6	14.8 22.4	13.7 21.7	15.5 21.8	14.7 21.9	16.5 21.7
Financial problems (<i>n</i> = 5097)	M 8.2 SD 21.4	9.2 22.7	8.3 20.7	11.8 26.2	12.0 26.2	8.2 20.5	3.1 13.6	7.0 19.7	6.9 18.6	8.6 22.8	7.4 20.4	8.7 22.1	6.2 18.4	4.2 14.2

EORTC, European Organization for Research and Treatment of Cancer; M, mean; QLQ-C30, Quality of Life Questionnaire-Core 30; QoL, quality of life; SD, standard deviation.

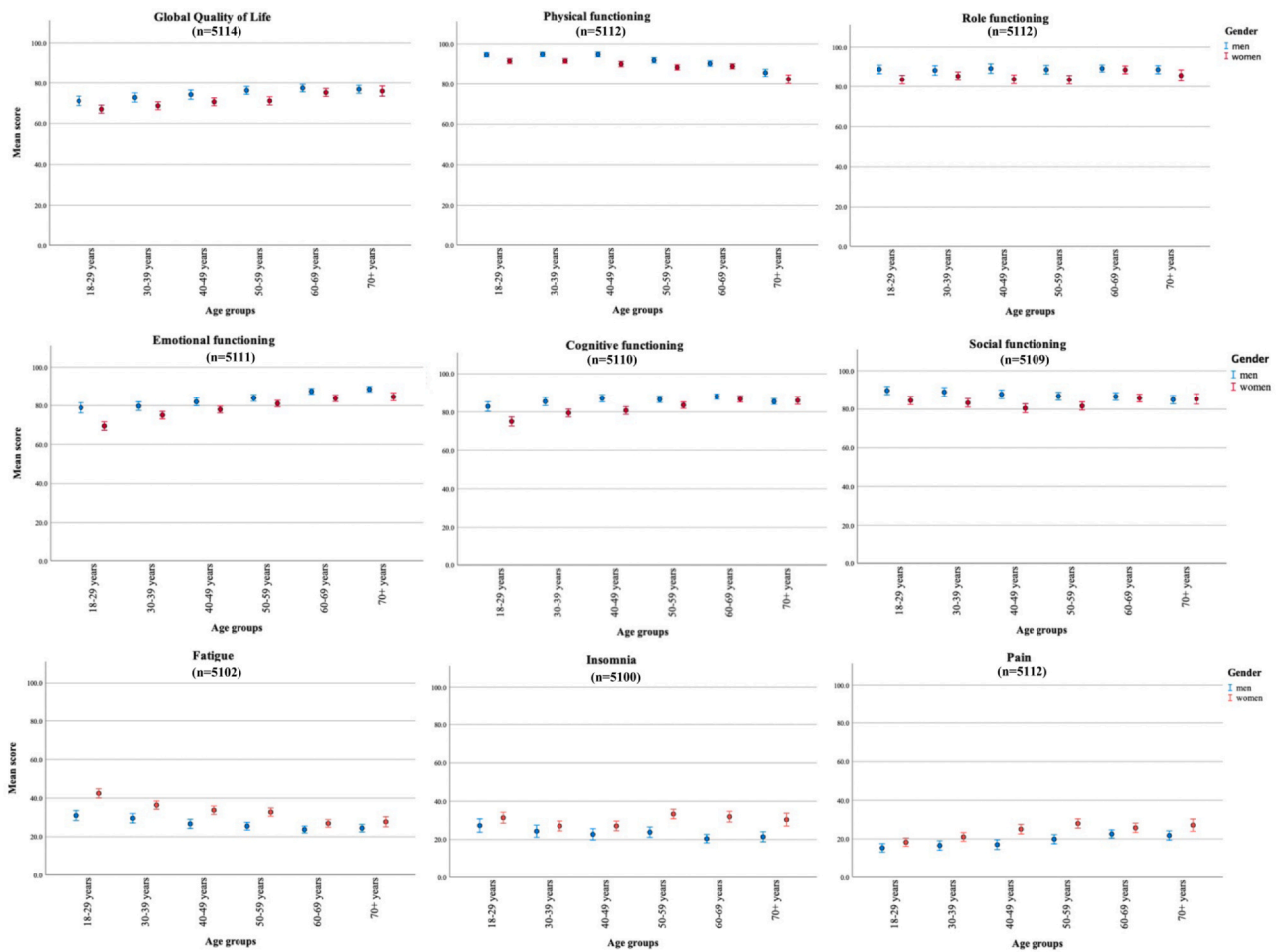


Fig. 1. EORTC QLQ-C30. Mean scores of all the functional scales and the most prominent symptoms for men and women in the Norwegian general population, presented in 10-year age groups from 29 to 79 years. Error bars represent mean scores with 95% confidence intervals. Higher scores on functional scales indicate better functioning, and higher scores on symptom scales imply more symptom burden. EORTC, European Organization for Research and Treatment of Cancer; QLQ-C30, Quality of Life Questionnaire-Core 30.

data on sexual health are from a Dutch study incorporating five single items from the EORTC's item bank [30]. So far, sexual concerns have been covered by a few items in some of the EORTC modules, for example, the two breast cancer modules QLQ-BR23 and QLQ-BR45 [9,10]. Thus, the EORTC has recently developed a stand-alone Sexual Health Questionnaire (QLQ-SHQ22) for a more comprehensive assessment of sexual health [37]. To date, no normative data on sexual health have been published from Scandinavia.

The primary aim of this study was to provide sex- and age-specific normative values from the Norwegian general population for HRQoL, including sexual health, addressed by the EORTC questionnaires QLQ-C30, QLQ-SHQ22, and the sexual domains of QLQ-BR23 and QLQ-BR45.

2. Methods

2.1. Study procedure and participants

The study was designed as a nationwide electronic and postal cross-sectional survey. The web solution eFORSK

(<https://www.klinforsk.no/info/Informasjon>), developed by the Central Norway Regional Health Authority IT department and run by the Norwegian Health Network, was utilised for data collection. A pilot study including 15 participants was performed to test the comprehensibility of the survey and the usability of the digital platform (eFORSK) for data collection, and adaptations were made accordingly.

The Norwegian Tax Administration gave permission to draw a randomly selected sample ($N = 15,627$) from the Norwegian National Population Register, stratified by sex and age (18–79 years). This sample size was estimated to ensure sufficient sample sizes for age subgroups (18–29, 30–39, 40–49, 50–59, 60–69 and 70–79 years). The data extraction was executed by the national IT company Evry ([Evry.com](https://www.evry.com)). To increase the response rate, participants received a digital postcard informing them about the upcoming study a week ahead of the survey release. The study was promoted to the general audience in social media, national and local newspapers, blogs, podcasts, external channels at the Norwegian University of Science and Technology and national radio news.

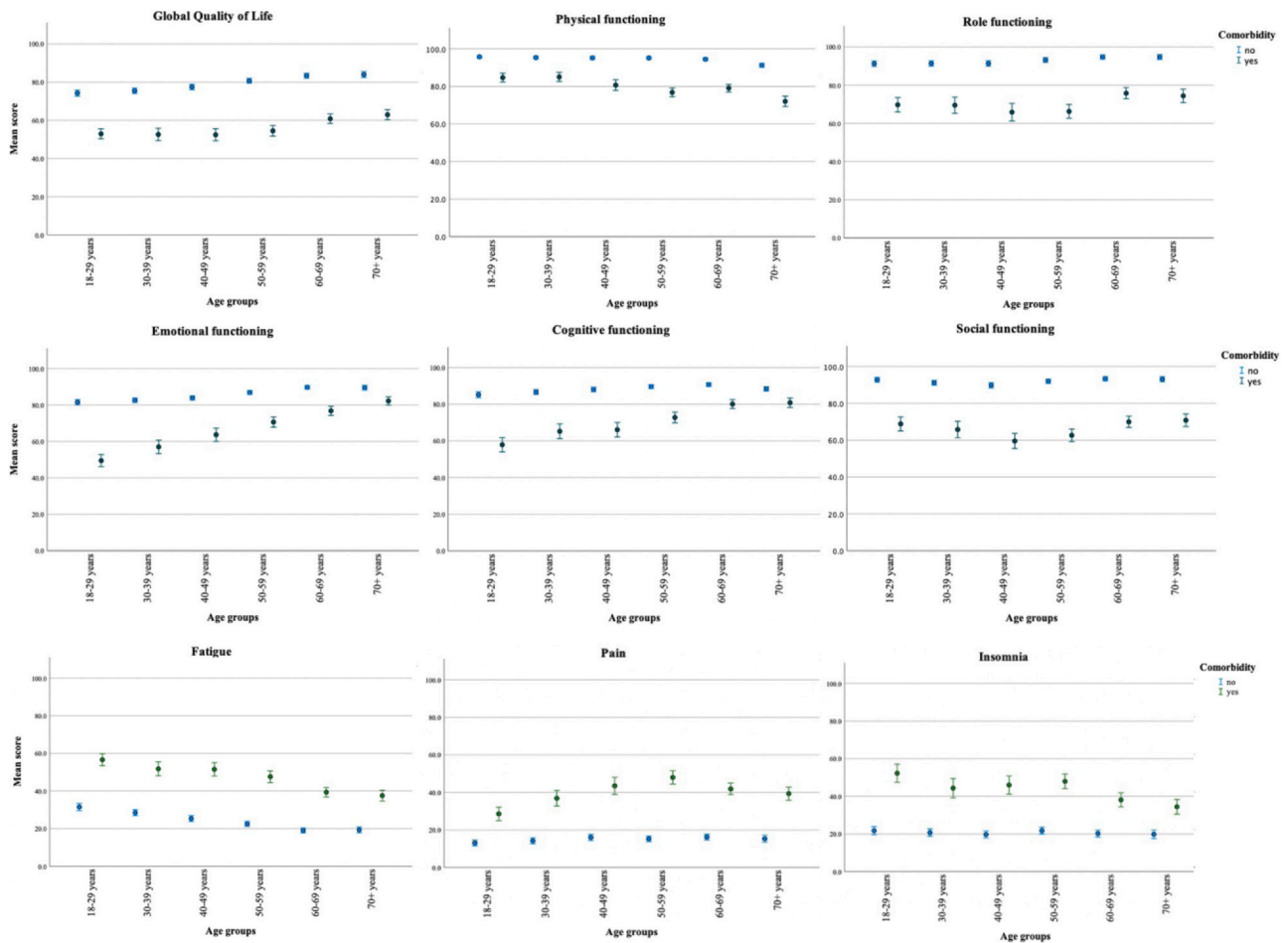


Fig. 2. EORTC QLQ-C30. Mean scores of all the functional scales and the most prominent symptoms for persons with and without comorbidities in the Norwegian general population, presented in 10-year age groups from 29 to 79 years. Morbidity is based on the criteria of having one or more conditions that cause limitations in activity/functioning. Error bars represent mean scores with 95% confidence intervals. Higher scores on functional scales indicate better functioning, and higher scores on symptom scales imply more symptom burden. EORTC, European Organization for Research and Treatment of Cancer; QLQ-C30, Quality of Life Questionnaire-Core 30.

The survey was released from eFORSK from August to November 2021. Participants were consecutively notified and informed through the national online health services *Helsenorge*, the digital mailbox *Digipost*, email or SMS. Digitally unreachable individuals ($n = 42$) received the survey by postal mail. After 2 weeks, one reminder was sent to the digital responders.

2.2. Measures

Age, sex and habitation were automatically collected from the National Population Register through eFORSK. Sociodemographic information regarding marital status, living situation, education, profession, employment status and income was included as self-reported background information.

HRQoL was assessed by the EORTC QLQ-C30 questionnaire [38] consisting of one global health/QoL scale, five functional scales (*physical, role, cognitive, emotional and social functioning*), three symptom scales (*fatigue, nausea and pain*) and six single items.

Sexual health was assessed by the EORTC sexual health questionnaire QLQ-SHQ22 [39]. It consists of eight functional scales measuring *sexual satisfaction* (among the sexually active), *importance of sexual activity* (with or without a partner), *libido*, *impact of treatment*, *communication with professionals about sexual problems*, *insecurity with a partner* (among those with a partner), *femininity* (women only), *masculinity and confidence with erection* (men only), and four symptom scales assessing the impact of *sexual pain*, *worry about incontinence*, *fatigue and vaginal dryness* (women only). The instrument has proven psychometric properties and is found applicable in research and clinical practice for assessing sexual health in survivors and patients, across diagnosis and stages of disease [37].

Sexual health items not covered by the SHQ22 were added from the breast cancer modules QLQ-BR23 and QLQ-BR45 [9,10]. These include all items in the functional scales *body image, sexual functioning and sexual enjoyment* (in BR23/45) in addition to symptom items in the BR45 scales: *endocrine therapy symptoms* and

Table 4
Reference values for EORTC QLQ-C30 by age and morbidity for women

	Morbidity*										No morbidity																	
	All women		18–29 years		30–39 years		40–49 years		50–59 years		60–69 years		70–79 years		All women		18–29 years		30–39 years		40–49 years		50–59 years		60–69 years		70–79 years	
	M	SD	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years	years
Functional scales QLQ-C30																												
Physical functioning																												
M	79.3	83.6	84.7	79.8	75.9	79.9	70.6	93.6	95.3	94.0	93.5	94.0	94.0	93.4	89.4													
SD	18.6	18.0	16.5	18.8	18.2	15.7	22.3	10.7	9.0	10.8	12.8	10.8	12.8	9.7	10.8													
Role functioning																												
M	69.7	68.1	70.4	66.5	65.2	76.1	73.0	91.4	90.6	90.3	89.3	90.3	89.3	91.5	93.2													
SD	28.2	28.2	27.1	30.2	28.6	25.4	28.3	19.2	19.3	19.9	21.6	19.9	21.6	19.5	16.5													
Emotional functioning																												
M	65.5	48.3	57.3	64.7	70.4	74.3	81.0	83.5	79.1	80.9	82.3	80.9	82.3	85.8	86.8													
SD	25.0	22.9	25.2	23.2	23.0	21.7	19.8	16.2	18.1	16.4	16.2	16.4	16.2	15.2	15.1													
Cognitive functioning																												
M	69.4	57.3	62.8	65.6	72.6	77.7	81.8	86.7	83.0	84.9	85.6	84.9	85.6	88.4	88.5													
SD	26.7	28.9	26.7	28.0	23.3	22.6	22.1	17.4	21.4	18.2	18.9	18.2	15.6	12.5	12.5													
Social functioning																												
M	65.8	67.9	64.8	26.8	61.4	71.6	71.8	90.5	92.0	89.3	87.4	90.5	92.7	93.2	93.2													
SD	27.9	28.3	29.1	26.9	27.9	26.1	26.3	18.0	16.7	18.6	21.7	18.6	17.4	15.6	15.6													
Global health/QoL																												
M	55.3	52.3	52.2	53.9	52.1	60.6	62.6	77.7	73.8	74.1	76.0	74.1	76.0	79.5	83.8													
SD	21.3	18.6	22.7	20.3	22.4	20.2	21.6	19.3	20.7	18.5	19.7	18.5	19.7	18.9	17.1													
Symptom scales QLQ-C30																												
Fatigue																												
M	49.5	59.5	51.9	52.4	50.0	41.6	39.8	27.3	34.8	31.4	27.9	31.4	27.9	25.3	20.7													
SD	25.3	22.4	25.2	25.5	27.1	21.4	25.1	21.4	24.5	21.4	21.5	21.4	21.5	20.2	16.1													
Nausea/vomiting																												
M	10.4	16.8	14.2	11.2	8.3	5.1	6.3	4.0	7.1	5.1	3.4	5.1	3.4	3.6	1.7													
SD	15.9	18.2	20.5	16.4	11.6	10.6	14.0	10.6	14.2	12.6	8.7	12.6	8.7	10.0	6.8													
Pain																												
M	40.9	29.1	35.5	44.0	50.3	43.5	42.5	17.1	13.4	16.4	19.1	16.4	19.1	18.4	17.9													
SD	29.1	26.9	26.9	31.6	29.8	26.2	28.3	22.0	20.6	22.9	24.0	22.9	24.0	21.7	20.5													
Dyspnoea																												
M	22.1	21.9	21.7	19.6	21.4	21.3	28.3	7.9	8.8	7.5	7.2	7.5	7.2	7.0	12.0													
SD	26.4	25.6	26.0	24.9	27.6	25.5	28.9	16.7	19.1	17.1	15.4	17.1	15.4	16.0	18.4													
Insomnia																												
M	47.1	51.9	44.7	46.8	50.6	45.2	40.3	23.1	22.1	21.3	20.8	21.3	20.8	25.8	25.5													
SD	32.3	34.5	33.9	31.2	30.1	32.0	31.5	25.5	26.5	24.8	25.5	24.8	25.5	24.8	23.7													
Appetite loss																												
M	20.4	36.9	23.6	21.7	16.5	11.5	10.1	8.0	15.3	9.5	7.0	9.5	7.0	6.0	5.7													
SD	27.8	33.8	28.7	27.8	24.1	20.8	18.7	18.1	25.2	19.2	17.0	19.2	17.0	14.6	14.1													
Constipation																												
M	22.9	24.2	21.5	20.3	23.4	23.6	23.7	13.3	12.0	13.7	13.5	13.7	13.5	12.3	11.9													
SD	29.6	29.5	29.2	26.0	32.6	30.9	27.6	23.0	22.9	22.8	23.7	22.9	23.7	21.7	25.9													
Diarrhoea																												
M	21.6	25.5	20.5	23.4	20.7	21.7	21.7	12.0	12.4	11.3	11.8	12.4	11.8	12.1	12.2													
SD	26.6	27.2	26.6	20.7	28.2	26.9	26.5	20.2	20.0	18.8	19.6	20.0	19.6	21.5	21.8													
Financial problems																												
M	22.1	21.5	20.5	32.8	27.0	20.7	6.3	3.8	2.6	4.4	5.1	4.4	5.1	5.5	1.2													
SD	31.9	31.7	29.3	36.6	34.4	29.5	19.9	14.4	11.0	15.0	17.2	15.0	17.2	18.4	7.2													

EORTC, European Organization for Research and Treatment of Cancer; M, mean; QLQ-C30, Quality of Life Questionnaire-Core 30; QoL, quality of life; SD, standard deviation.
* Mean scores are given for respondents with one or more health conditions affecting daily functioning/activities.

Table 5
Reference values for EORTC QLQ-C30 by age and morbidity for men

	Morbidity*												
	All men						No morbidity						
	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	All men	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years
Functional scales QLQ-C30													
Physical functioning	M 79.2	87.7	85.7	82.6	78.1	73.1	95.9	96.3	97.1	97.3	96.4	95.3	92.5
	SD 20.5	14.4	16.7	20.9	22.4	21.0	8.7	6.3	6.2	6.9	8.3	10.6	11.5
Role functioning	M 72.0	74.2	68.0	64.7	67.8	75.5	94.3	92.2	93.0	94.0	95.1	94.7	95.8
	SD 29.6	25.2	32.0	34.3	32.8	27.3	15.4	15.9	16.0	16.7	16.8	14.6	10.4
Emotional functioning	M 71.8	52.7	56.5	61.7	71.0	83.2	87.9	84.9	85.1	85.9	88.1	90.8	91.4
	SD 25.2	25.7	24.6	27.9	25.4	15.8	14.5	17.4	15.4	14.8	13.9	12.8	11.6
Cognitive functioning	M 74.9	59.4	69.9	67.2	73.1	80.1	89.8	88.2	89.1	91.1	90.9	90.3	88.3
	SD 24.2	26.0	27.8	25.8	25.8	18.5	14.0	17.3	15.9	13.1	12.6	13.4	12.1
Social functioning	M 67.6	71.5	67.7	61.9	64.6	70.1	93.5	93.9	93.8	92.7	93.7	93.9	93.1
	SD 28.4	25.4	32.2	30.4	29.8	26.1	14.7	13.8	14.1	16.0	14.9	14.8	13.8
Global health/QoL	M 58.2	54.5	53.2	49.4	57.8	63.1	80.6	74.9	77.2	79.2	82.0	84.0	84.2
	SD 22.7	19.5	21.4	24.4	24.0	20.0	17.7	18.1	18.4	18.0	17.2	17.2	15.4
Symptom scales QLQ-C30													
Fatigue	M 42.2	48.9	51.5	49.8	44.1	35.8	21.4	27.0	24.6	22.3	19.6	18.5	18.4
	SD 23.6	23.9	25.0	22.5	24.9	19.9	18.8	20.3	19.2	20.0	17.3	17.9	16.8
Nausea/vomiting	M 6.8	12.7	9.1	7.5	7.5	4.2	2.5	5.1	3.2	2.1	1.6	1.9	2.4
	SD 13.6	15.7	14.4	15.5	14.7	11.1	8.1	11.8	9.7	7.1	6.3	6.7	7.2
Pain	M 39.3	27.3	39.5	42.5	44.6	37.0	13.0	12.7	11.4	12.2	12.1	15.6	13.6
	SD 28.4	24.5	30.6	30.7	30.4	26.6	18.8	16.9	16.4	19.9	19.0	20.9	17.8
Dyspnoea	M 29.1	21.2	25.3	23.9	30.1	35.3	9.3	9.6	8.2	8.3	8.8	8.6	13.2
	SD 29.9	27.5	28.7	27.5	30.0	30.8	17.6	17.9	17.0	16.4	16.6	17.8	20.2
Insomnia	M 38.2	53.3	43.7	44.4	44.0	30.1	18.1	21.4	19.9	18.4	17.6	16.1	16.7
	SD 34.2	34.9	36.3	36.1	36.0	29.2	24.3	26.4	25.6	24.8	24.2	21.4	23.9
Appetite loss	M 14.4	27.9	25.3	21.1	15.6	6.7	5.0	13.4	5.2	5.0	2.5	3.4	2.8
	SD 23.4	28.5	27.5	28.1	22.4	16.2	14.7	22.7	14.9	15.4	10.4	11.5	10.2
Constipation	M 16.4	21.2	11.8	15.0	15.5	19.1	6.9	7.0	6.3	5.8	5.8	7.3	10.0
	SD 24.0	28.9	18.2	24.1	21.5	25.9	16.2	16.9	15.7	15.3	13.9	16.9	18.7
Diarrhoea	M 21.4	18.2	23.6	24.4	22.2	19.0	12.4	10.3	12.7	11.7	13.4	11.8	15.1
	SD 25.6	24.7	27.9	27.4	26.7	22.9	19.7	17.9	20.5	19.8	19.6	19.5	20.9
Financial problems	M 19.6	23.6	33.3	25.0	25.8	8.8	3.0	3.0	2.9	3.9	3.4	2.5	1.7
	SD 30.8	30.5	39.6	34.0	33.5	20.8	11.9	11.7	10.7	14.3	12.3	11.5	8.0

EORTC, European Organization for Research and Treatment of Cancer; M, mean; QLQ-C30, Quality of Life Questionnaire-Core 30; QoL, quality of life; SD, standard deviation.
* Mean scores are given for respondents with one or more morbidities affecting daily functioning/activities.

Table 6
Regression model for predicting EORTC QLQ-C30 values by age, sex and morbidity

	Intercept	Age		Age ²		Sex		Age-by-sex		Morbidity	
		Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Physical functioning	95.70	0.03	0.438	-0.00	<0.001	2.05	0.010	0.00	0.794	-14.89	<0.001
Role functioning	90.78	-0.11	0.123	0.00	<0.002	3.15	0.015	-0.03	0.434	-22.32	<0.001
Emotional functioning	74.06	0.30	<0.001	0.00	0.581	5.26	<0.001	-0.06	0.056	-18.14	<0.001
Cognitive functioning	77.68	0.38	<0.001	-0.00	0.060	7.34	<0.001	-0.14	<0.001	-16.74	<0.001
Social functioning	92.95	-0.34	<0.001	0.01	<0.001	4.98	<0.001	-0.08	0.018	-25.52	<0.001
Global QoL	73.21	0.05	0.422	0.00	<0.007	2.55	0.031	-0.02	0.522	-23.09	<0.001
Fatigue	37.39	-0.36	<0.001	0.00	0.770	-8.44	<0.001	0.11	0.003	22.47	<0.001
Nausea/vomiting	10.19	-0.28	<0.001	0.00	<0.001	-3.60	<0.001	0.07	<0.001	5.67	<0.001
Pain	8.56	0.53	<0.001	-0.01	<0.001	-1.77	0.210	-0.07	0.101	24.86	<0.001
Dyspnoea	9.48	-0.26	<0.001	0.00	<0.001	0.73	0.568	0.06	0.117	16.21	<0.001
Insomnia	22.88	0.03	0.737	0.00	0.866	0.81	0.632	-0.20	<0.001	22.71	<0.001
Appetite loss	21.59	-0.70	<0.001	0.00	<0.001	-4.34	<0.001	0.05	0.097	11.73	<0.001
Diarrhoea	12.91	-0.05	0.471	0.00	0.570	-0.97	0.470	0.04	0.298	9.25	<0.001
Constipation	15.23	-0.24	0.001	0.00	<0.001	-6.52	<0.001	-0.00	0.916	9.22	<0.001
Financial problems	0.54	0.46	<0.001	-0.00	<0.001	-0.21	0.864	-0.02	0.638	18.24	<0.001

Coding: age in years above 18, sex (male = 0, women = 1), morbidity (no morbidity = 0, one or more morbidities affecting daily functioning/activities = 1). For illustration, the following equation estimates the physical functioning in a woman aged 50, with one or more health conditions affecting daily functioning: Physical functioning (predicted) = 95.70 + sex * 2.05 + (age-18) * 0.03 + (age-18)² * - 0.00 + sex*(age-18) * - 0.00 + health condition * -14.89. Physical functioning (predicted) = 95.70 + 0 (female) * 2.05 + (50 - 18) * 0.03 + (50 - 18)² * - 0.00 + 0 * (50 - 18) - 0.00 + 1 (one or more health conditions) -14.89.

EORTC, European Organization for Research and Treatment of Cancer; QLQ-C30, Quality of Life Questionnaire-Core 30; QoL, quality of life.

endocrine sexual symptoms regarding pain or stiffness in joints or bones, pain in muscles, weight gain, mood alteration and menopausal status. As the QLQ-BR45 is not yet in Norwegian, the research team translated the items used according to the EORTC translation manual.

Response options for all the items are *Not at all* (1) to *Very much* (4), except for the two global health/QoL items, ranging from *Very poor* (1) to *Excellent* (7). To strengthen the questionnaire's face validity and content validity in a general population, an extra response option, *Not relevant*, was given to the three single items 8, 20 and 22, asking whether disease or treatment has an impact on various life conditions. The recall period was 1 week for the general health items and 4 weeks for the sexual items in BR23/45 and SHQ22. Scales were transformed into a 0–100 scale following the EORTC scoring manual. Higher scores indicate better functioning/QoL and higher symptom burden [40].

Morbidity was assessed by the *Self-Administered Comorbidity Questionnaire (SCQ)* [41]. The SCQ addresses the presence of up to 15 health conditions, whether the person receives treatment and whether the condition limits any activities or functioning. In our study, overall morbidity was defined as having one or more morbidities that limited daily activities/functioning.

2.3. Statistical analyses

Normative values are presented in six age groups (18–29, 30–39, 40–49, 50–59, 60–69, and ≥70 years) by means and standard deviation (SD) by sex and morbidity. Mean scores

by sex and morbidity for all functional scales and the most prominent symptoms are illustrated by graphs [mean, 95% confidence interval (CI)]. Group differences were tested by Student's *t*-test. Floor and ceiling effects were calculated for the scales in QLQ-C30 and QLQ-SHQ22.

Multivariable linear regression was carried out to estimate the associations of each EORTC scale with age and sex, sex–age interaction and morbidity (0 = none, 1 = one or more conditions limiting activities/functioning). In sex-specific analyses, the variable sex and interaction sex*age were excluded. To predict scores for all of the EORTC scales for individuals or groups at a certain age and morbidity, we developed regression models following procedures of previous publications [5,7] (Table 6 and Table 10).

2.4. Ethics

The study was approved by the Regional Committee for Medical Research Ethics (REK 2020/58888). Study information was enclosed with the survey, with completion regarded as informed consent.

3. Results

3.1. Participants

A total of 5135 individuals responded, giving an overall response rate of 33% with the highest response in women between 40 and 59 years and in men between 60 and 69 years (both 39%) (Table 1). The vast majority (99%) responded digitally (Supplementary Table I), and participant characteristics are shown in Table 2.

Table 7
Reference values for EORTC QLQ-SHQ22 and for the sexual scales in QLQ-BR23 and QLQ-BR45 by age and sex

		Men										Total				
		Women					Men									
		All women	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	All men	18–29 years	30–39 years		40–49 years	50–59 years	60–69 years	70–79 years
Functional scales QLQ-SHQ22																
Sexual satisfaction	M	53.3	56.7	57.4	55.6	51.1	48.4	48.2	57.7	60.9	62.5	60.0	59.6	55.5	49.5	57.7
	SD	26.0	25.1	23.2	26.6	27.3	25.6	26.3	25.5	26.1	23.8	23.9	25.8	25.2	26.0	25.9
Importance of sexual activity	M	48.5	54.3	61.2	46.6	46.6	38.4	25.3	60.6	56.5	68.0	69.1	65.2	57.3	48.3	54.2
	SD	33.3	33.4	30.6	32.4	32.4	30.8	29.0	31.9	33.7	30.2	29.4	30.2	31.0	32.3	33.2
Libido	M	61.8	72.5	65.3	63.7	63.7	55.4	49.9	76.8	85.2	82.4	83.4	79.3	73.4	60.8	68.8
	SD	33.6	31.6	31.7	33.5	33.5	33.3	34.4	29.0	24.6	24.6	25.5	27.5	29.0	33.5	32.4
Treatment*	M	78.7	88.2	93.3	75.7	75.7	75.2	80.7	78.2	88.0	87.8	88.8	81.0	70.9	63.8	78.4
	SD	32.6	24.9	16.5	34.4	34.4	33.6	32.4	33.7	24.5	27.3	24.6	30.7	37.2	39.8	33.0
Communication with professionals	M	6.7	13.0	6.7	4.8	5.4	5.1	3.6	6.0	7.9	4.3	3.7	5.3	7.0	7.9	6.3
	SD	16.5	22.3	16.5	12.9	15.8	13.4	12.6	15.8	17.3	12.0	11.8	14.6	15.8	18.0	15.9
Security with partner	M	79.9	72.9	77.4	83.8	83.8	81.5	79.1	75.2	74.9	76.9	79.5	77.4	73.7	68.8	77.7
	SD	26.6	28.6	28.3	24.1	24.1	26.6	26.7	28.7	28.9	30.4	25.2	28.0	29.8	29.0	27.7
Confidence erection	M	-	-	-	-	-	-	-	66.9	72.4	78.5	75.0	67.0	60.0	50.9	-
	SD	-	-	-	-	-	-	-	34.1	33.7	31.0	31.1	33.2	34.3	34.1	-
Femininity/masculinity*	M	80.9	85.8	82.6	77.2	77.2	82.3	79.9	79.5	88.6	82.9	87.6	80.5	76.6	66.4	-
	SD	30.7	28.1	29.4	34.4	34.4	28.6	34.2	30.6	25.2	29.5	24.3	30.3	32.1	33.1	-
Symptom scales QLQ-SHQ22																
Sexual pain	M	10.3	15.4	8.2	7.3	7.3	12.2	9.8	2.5	3.8	2.4	2.0	2.1	2.4	2.6	6.6
	SD	19.0	21.8	15.3	16.0	16.0	21.3	20.6	8.5	11.1	7.2	7.9	6.9	8.1	9.9	15.5
Worry incontinence	M	14.9	7.6	12.4	15.9	15.9	16.0	24.4	9.1	2.5	5.0	5.0	9.4	12.5	16.4	12.2
	SD	24.9	18.8	22.8	26.0	25.9	25.2	29.5	19.3	9.6	14.4	13.1	19.6	22.4	24.6	22.7
Fatigue	M	32.4	29.8	39.7	35.7	35.7	26.1	22.5	20.1	15.8	22.7	19.8	20.7	19.9	21.1	26.7
	SD	32.8	33.6	33.1	32.4	32.4	30.4	29.3	26.9	24.7	28.2	26.6	26.4	26.7	28.1	30.8
Vaginal dryness	M	22.5	19.5	17.2	16.7	16.7	32.1	32.9	-	-	-	-	-	-	-	-
	SD	27.0	24.0	24.3	24.4	24.4	29.1	28.6	-	-	-	-	-	-	-	-
Functional scales QLQ-BR23																
Body image	M	70.6	62.1	64.8	69.8	72.8	77.7	82.0	85.1	80.4	82.2	85.0	84.7	87.6	88.8	77.4
	SD	27.3	29.9	28.7	26.4	26.3	24.3	21.9	18.9	21.4	20.7	17.5	19.6	17.3	16.2	24.8
Sexual functioning	M	47.5	54.5	52.4	49.7	44.4	41.8	38.0	58.3	58.3	63.4	62.8	60.2	55.6	51.1	52.6
	SD	25.6	24.7	24.0	24.4	26.2	24.8	26.6	24.3	25.5	23.9	22.7	23.0	23.6	25.7	25.6
Sexual enjoyment	M	70.7	70.4	71.1	73.8	71.0	67.7	67.3	75.9	75.4	77.5	79.1	77.1	74.2	72.1	73.2
	SD	26.9	27.4	26.9	26.3	27.1	26.4	27.3	25.4	26.8	25.8	23.8	25.1	25.4	25.7	26.3
Symptom scales QLQ-BR45																
Endocrine therapy symptoms	M	21.6	14.9	18.1	21.1	25.7	24.8	27.2	16.2	10.5	12.5	13.8	17.3	18.9	21.2	19.0
	SD	18.6	14.9	17.5	19.1	19.8	18.2	18.9	16.1	12.7	14.3	15.6	16.8	16.5	16.4	17.3
Endocrine sexual symptoms	M	18.1	19.5	14.4	13.0	19.0	23.9	23.0	-	-	-	-	-	-	-	-
	SD	21.0	21.4	17.9	18.0	22.5	23.5	21.7	-	-	-	-	-	-	-	-

EORTC, European Organization for Research and Treatment of Cancer; M, mean; QLQ-C30, Quality of Life Questionnaire-Core 30; QoL, quality of life; SD, standard deviation; SHQ, Sexual Health Questionnaire.

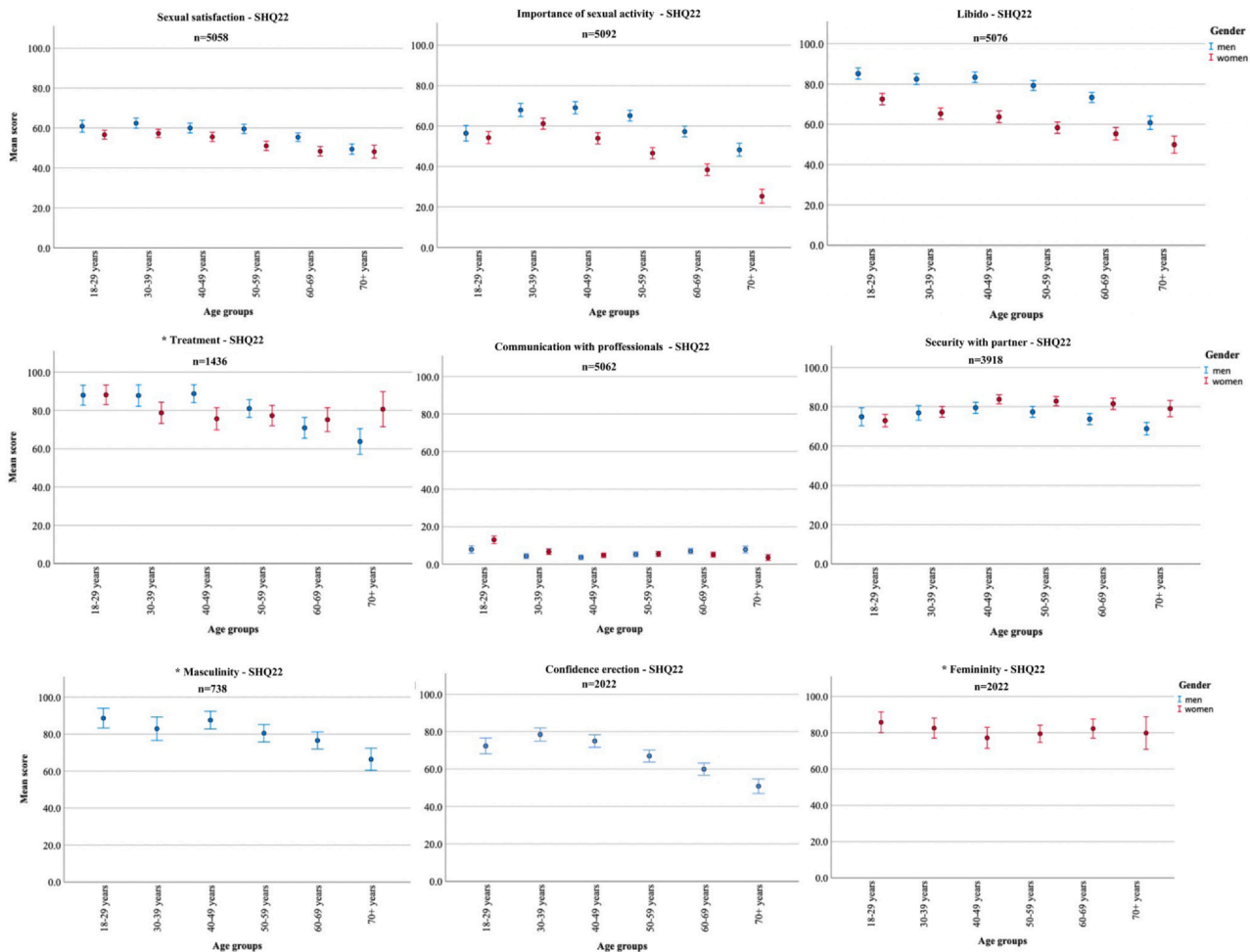


Fig. 3. EORTC QLQ-SHQ22, QLQ-BR23, and QLQ-BR45. Mean scores of functional and symptom scales for men and women in the Norwegian general population, presented in 10-year age groups from 29 to 79 years. Error bars represent mean scores with 95% confidence intervals. Higher scores on functional scales indicate better functioning, and higher scores on symptom scales imply more symptom burden. *These single items/scales (8, 20, 22) asked whether disease or treatment has an impact on various life conditions and were therefore given an extra response option, *Not relevant*, to strengthen the questionnaire's validity in a general population. Thus, items were answered only by those having a disease or a treatment for a disease. More item formation on <https://qol.eortc.org/questionnaires/>. EORTC, European Organization for Research and Treatment of Cancer; QLQ, Quality of Life Questionnaire; SHQ, Sexual Health Questionnaire.

3.1.1. Normative data for EORTC QLQ-C30

Normative scores for the EORTC QLQ-C30 scales by sex and age groups are presented in Table 3. The most prominent symptoms were fatigue, insomnia and pain. Floor and ceiling effects are displayed in Supplementary Table II. The regression model for predicting individual EORTC QLQ-C30 normative scores for sex, age and morbidity is provided in Table 6.

Women reported generally lower functioning and higher symptom scores than men. Sex differences were most pronounced for emotional functioning, pain, fatigue and insomnia. The youngest women (18–29 years) reported poorer emotional function (9.4 points) and more fatigue (11.4 points), and the older women (59–79 years) reported more pain (8.2 points) and sleep problems (9.5 points) compared to men in the corresponding age groups (Fig. 1, Table 3).

Respondents with morbidities scored significantly lower on global QoL and functional scales and higher on symptom scales than persons without morbidities across all age groups (Fig. 2). The largest differences were observed among the youngest (18–29 years) in emotional and cognitive functioning (32 and 28 points). Physical functioning was most divergent in the middle-aged (15 points) and oldest-age groups (19 points). Normative values for the EORTC QLQ-C30 scales for individuals with and without morbidity (one or more health conditions affecting daily functioning) by sex and age groups are presented in Tables 4 and 5.

Among symptoms, *insomnia and fatigue* displayed the largest differences between persons with and without morbidities among the youngest (25 and 31 points) and middle-aged groups (26 points on both symptoms), whereas differences in pain were the largest in the

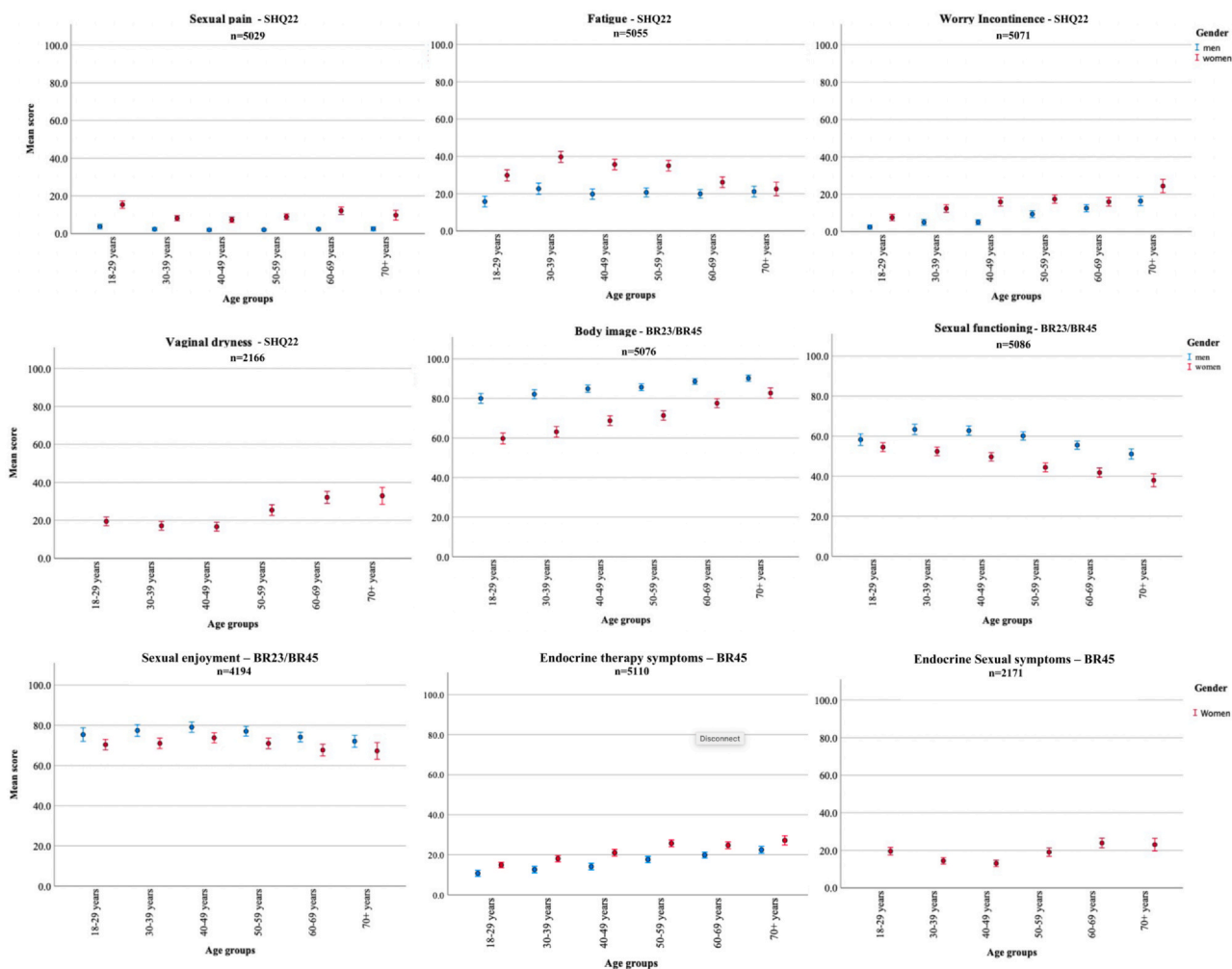


Fig. 3. (continued)

middle-aged group (28 points). All group differences were highly significant ($p < 0.001$, Table 6).

3.1.2. Normative data for EORTC QLQ-SHQ22 and the sexual scales in EORTC QLQ-BR23 and QLQ-BR45

Normative scores for the EORTC QLQ-SHQ22 and sexual scale scores from the EORTC QLQ-BR23/BR45 are presented in Table 7. Floor and ceiling effects are displayed in Supplementary Table III. The regression model for predicting individual EORTC QLQ-SHQ22 and QLQ-BR23 normative scores for sex, age and morbidity is provided in Table 10. Among symptoms, *fatigue* influenced sexual life the most (Fig. 3, Table 7).

Women reported generally lower functioning and higher symptom scores than men (Fig. 4). Sex differences in the functional scales were most pronounced for *importance of sexual activity* (22 points), *libido* (20 points), *body image*, particularly among the youngest (20 points, 18–29 years), and *sexual functioning*, which differed by 10–13 points between sexes from the age of 30–69 years.

The influence of *fatigue* on sexual life was most sex divergent among the youngest (18–39 years) and

middle-aged groups (40–59 years), with a gap between 14 and 17 points (Fig. 3 and Table 7).

Respondents with morbidities scored lower in general on functioning and higher on symptoms than persons without morbidities, as illustrated in Fig. 4. The largest mean difference was observed in men, with and without comorbidities, on masculinity (40–49 years), with a gap of 30 points. In both sexes, *sexual satisfaction*, *libido*, *security with a partner*, *body image* and *sexual enjoyment* were significantly lower in persons with morbidities, with the most pronounced differences among the youngest and middle-aged. *Treatment* had significantly more impact on sexual life in persons with morbidities, and the youngest men (18–39 years) with morbidities were significantly less *confident in erection*. Normative values for the EORTC QLQ-SHQ22, QLQ-BR23/45 scales and by sex, age groups and morbidity (one or more health conditions affecting daily functioning) are presented in Tables 8 and 9.

The influence of *fatigue* on sexual life displayed the largest differences among the youngest and the middle-aged group (26 points, 18–49 years) between persons with and without morbidities (Fig. 4). Among women,

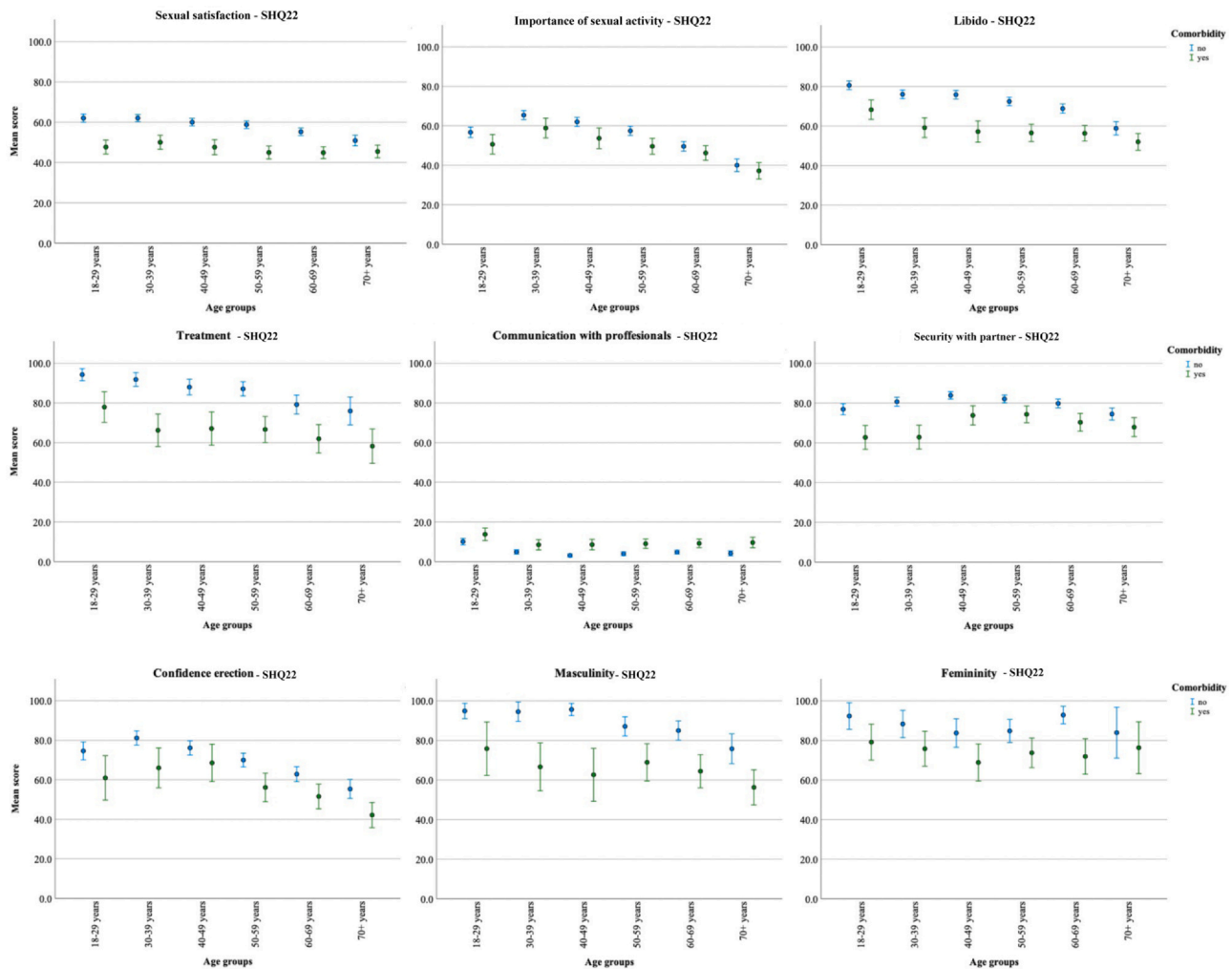


Fig. 4. EORTC QLQ-SHQ22, QLQ-BR23, and QLQ-BR45. Mean scores of functional and symptom scales for persons with and without morbidities in the Norwegian general population, presented in 10-year age groups from 29 to 79 years. Morbidity is based on the criteria of having one or more conditions that cause limitations in activity/functioning. Error bars represent mean scores with 95% confidence intervals. Higher scores on functional scales indicate better functioning, and higher scores on symptom scales imply more symptom burden EORTC, European Organization for Research and Treatment of Cancer; QLQ, Quality of Life Questionnaire; SHQ, Sexual Health Questionnaire.

endocrine therapy symptoms (which reflected mood swings, pain or stiffness in joints, bones and muscles, and weight gain) were most divergent in the middle-aged group (19 points) and for *femininity* in the age group 60–60 years (21 points). Group differences were all highly significant ($p < 0.001$, Table 10).

4. Discussion

The present study is the first to present normative values on the EORTC sexual health questionnaire QLQ-SHQ22 and the sexual scales in QLQ-BR23 and QLQ-BR45. It also provides updated Norwegian general population normative values on the EORTC QLQ-C30.

Global health/QoL and emotional and cognitive functioning increased by age in the Norwegian population, in line with recent studies in Italy [5] and Australia [42], but in contrast to previous normative studies in

Europe [26–28,31]. This pattern could be due to an improved healthcare system and a healthier lifestyle among elderly citizens in recent years.

The most prominent symptoms were fatigue, insomnia and pain, similar to findings in the Italian [5], Swedish [23], Danish [20] and previous Norwegian normative population samples [25,26]. However, compared to prior EORTC studies, a new symptom distribution across age groups was observed where fatigue and insomnia were more severe in the youngest age groups, particularly among women. Increased fatigue among the youngest was also found in recent Norwegian normative studies using generic HRQoL questionnaires [43,44]. Similar trends of higher symptom burden among the youngest have been found in the latest European normative studies [5,21,22]. This pattern may possibly be explained by high demands, the high influence of social media and often many options for today's youths to navigate.

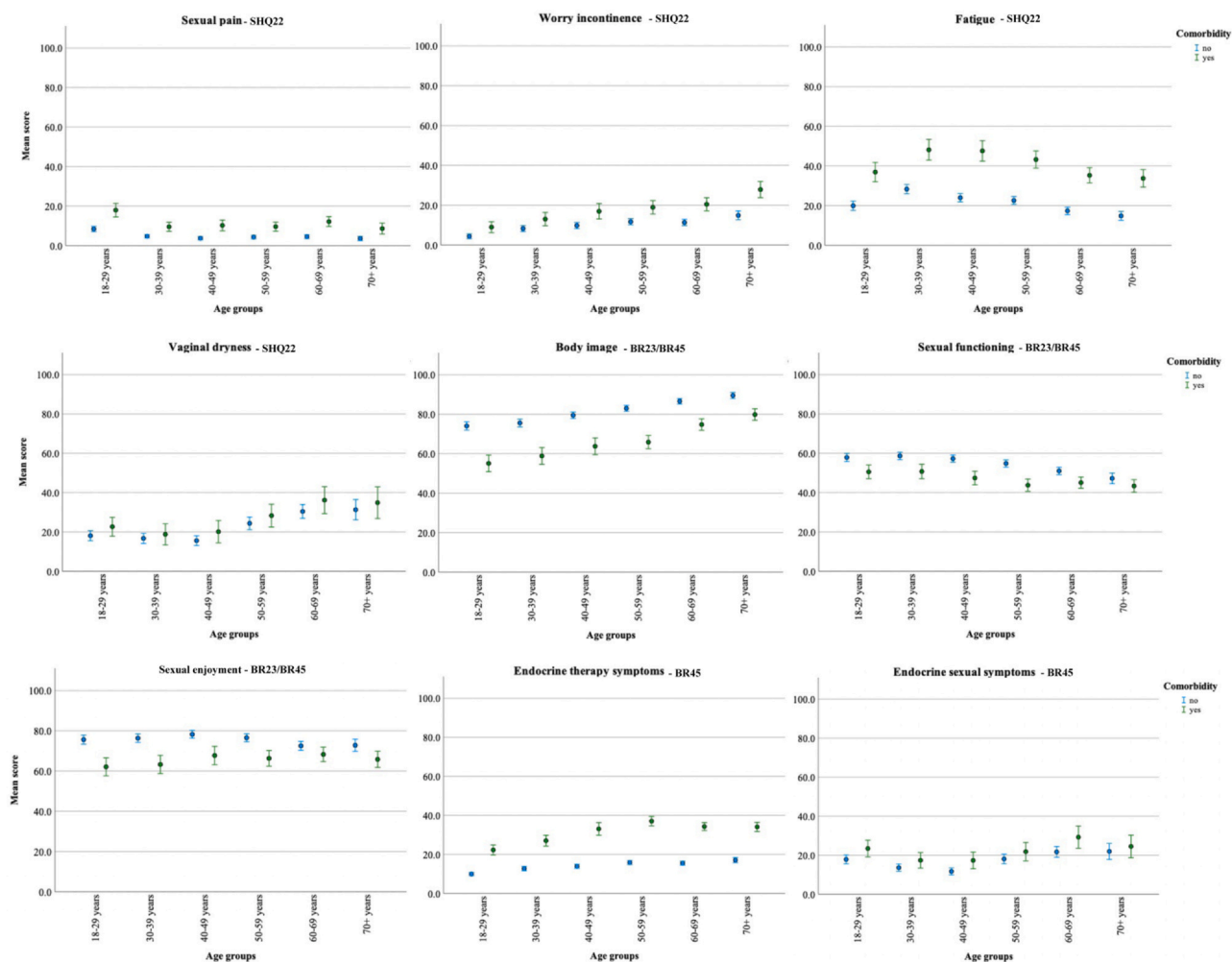


Fig. 4. (continued)

Norwegian women reported more symptoms and lower functioning than men, in line with previous studies [5,18,20–24]. Sex differences were more prominent in the Norwegian population than in the German [45] and Danish populations [20] but in line with findings in a recent Italian study [5]. However, the differences in score patterns between groups with morbidity or not were far more pronounced than the sex differences and congruent with other norm studies with valid detection of morbidities [5,20–22,46].

Normative scores for sexual health are the first of its kind for EORTC QLQ-SHQ22 worldwide and BR-23/45 in Scandinavia, though such knowledge is highly required in research and clinical use [30].

Sex differences were even more pronounced in the sexual dimensions of HRQoL, particularly in the youngest age groups, where females scored the lowest. The most striking results were the huge difference between sexes in *body image*, *libido*, *sexual functioning*, *importance of sexual activity*, *sexual satisfaction* and *sexual enjoyment*, where women scored lower on all these functional scales. Our findings are in line with previous Norwegian studies where sexual health challenges were most pronounced among

women > 30 years [47]. Among the symptoms, the impact of *fatigue* on sex life was most prominent in women between 30 and 59 years, similar findings to a previous Norwegian study, which found that tiredness and lack of interest were the most frequent reasons for sexual inactivity among the youngest age groups [48]. This symptom pattern may to some extent explain the low sexual functioning scores in the youngest age groups.

Morbidities had a negative impact on all sexual domains except for *the importance of sexual activity*, which highlights the importance of sexual life independent of health status, and underpin the fact that sexual health is an important aspect of HRQoL [34,35]. The Norwegian general population reports nearly no communication with healthcare professionals about sexual topics, supporting the frequently reported barriers regarding discussing such issues in the patient–clinician relation [49,50].

The overall response rate of 35% for women and 31% for men might threaten the generalisability to the general population. Evidently, adding questions about sensitive topics, such as sexual health, implies an increased risk of a lower response rate [47,48], which we

Table 8
Reference values for EORTC QLQ-SHQ22 and for the sexual scales in QLQ-BR23 and QLQ-BR45 by age and morbidity for women

	Morbidity*														
	No morbidity														
	All women	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	All women	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	
Functional scales QLQ-SHQ22															
Sexual satisfaction	M	46.0	47.2	49.6	49.7	42.5	42.2	46.9	56.3	61.0	59.9	57.4	54.8	51.3	48.8
	SD	25.5	23.7	23.7	26.9	27.1	25.8	24.4	25.6	24.6	22.5	26.3	26.6	25.1	27.5
Importance of sexual activity	M	44.1	49.7	56.8	50.9	44.0	35.2	25.5	50.3	56.4	62.7	54.9	47.8	39.9	25.2
	SD	34.0	34.6	33.0	35.5	33.4	28.8	29.4	32.8	32.7	29.6	30.9	31.9	31.6	28.9
Libido	M	54.2	64.4	53.6	56.2	50.0	48.3	52.2	65.5	76.2	69.2	66.1	61.9	58.7	48.5
	SD	35.8	36.7	33.9	36.8	37.2	33.6	33.3	32.2	28.3	30.0	32.1	31.5	32.6	35.1
Treatment	M	69.3	81.1	64.7	66.1	68.7	66.0	73.3	86.1	94.6	88.6	82.3	84.6	82.8	88.0
	SD	35.4	30.0	34.3	37.3	36.2	36.2	37.3	27.0	17.1	25.0	30.8	27.5	29.4	25.2
Communication with professionals	M	9.3	15.5	9.3	7.9	8.2	7.4	6.7	5.5	11.9	5.8	3.7	4.2	4.0	1.7
Security with partner	SD	19.8	24.4	19.4	17.2	19.7	17.0	17.9	14.7	21.3	15.3	11.1	15.5	11.2	7.3
	M	72.4	63.2	61.7	78.8	77.7	74.4	78.2	82.7	76.6	82.1	85.3	84.9	84.7	79.3
	SD	31.8	32.6	34.4	27.1	29.0	33.3	30.2	23.8	26.0	24.3	22.9	22.6	22.5	24.8
Confidence erection	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SD	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Femininity	M	73.9	79.2	75.8	68.9	73.8	71.9	76.3	87.5	92.4	88.3	83.8	84.8	92.9	84.0
	SD	33.3	31.2	31.3	36.2	32.6	33.8	35.7	26.4	23.1	26.6	31.5	26.0	16.5	32.5
Symptom scales QLQ-SHQ22															
Sexual pain	M	15.7	21.4	11.9	12.2	13.1	19.7	14.2	8.0	12.6	7.0	5.8	7.2	8.5	7.2
	SD	24.1	26.3	17.5	20.0	22.7	26.7	28.2	15.9	18.7	14.3	14.1	15.4	17.1	13.7
Worry incontinence	M	19.4	10.1	14.8	20.4	20.9	21.5	32.3	13.1	6.4	11.6	14.5	15.9	13.3	19.4
	SD	28.5	21.1	23.8	28.7	29.3	29.9	33.5	23.1	17.6	22.4	24.8	24.3	22.1	25.6
Fatigue	M	43.9	38.9	55.4	59.4	48.2	39.0	31.2	27.7	25.7	34.6	31.6	29.3	20.0	17.1
	SD	36.3	36.4	34.1	29.9	37.8	33.8	34.9	30.1	31.4	31.1	30.2	30.1	26.6	23.9
Vaginal dryness	M	26.1	22.6	18.8	46.0	28.3	36.2	34.9	21.1	18.1	16.7	15.6	24.4	30.4	31.3
	SD	30.1	27.4	26.1	24.3	30.1	33.4	32.5	25.5	22.3	23.8	22.8	28.5	27.1	25.7
Functional scales QLQ-BR23															
Body image	M	61.2	49.9	54.5	68.6	61.0	70.5	75.1	74.5	67.6	68.1	73.2	78.0	81.2	86.1
	SD	29.7	29.7	29.4	29.2	29.4	26.9	25.3	25.3	27.4	27.7	24.3	23.0	22.2	18.4
Sexual functioning	M	42.6	49.1	46.3	34.3	37.6	38.5	38.2	49.6	57.0	54.4	50.8	47.4	43.4	37.7
	SD	25.1	24.7	24.7	22.2	25.3	24.3	24.7	25.5	24.3	23.5	24.3	26.1	24.8	27.7
Sexual enjoyment	M	64.7	61.1	62.1	68.6	65.1	67.0	65.1	72.9	74.4	73.6	75.4	73.1	68.0	68.7
	SD	27.7	29.1	26.1	29.2	28.1	26.4	25.3	26.3	25.7	26.6	25.1	26.5	26.4	28.7
Symptom scales QLQ-BR45															
Endocrine therapy symptoms	M	33.5	22.5	28.7	34.3	40.0	37.7	38.0	16.2	11.4	14.9	16.7	19.1	17.4	18.8
	SD	20.3	18.1	18.3	22.2	19.8	17.8	19.7	14.2	10.7	14.9	15.1	15.6	12.8	13.1
Endocrine sexual symptoms	M	22.2	23.4	17.4	17.3	21.8	29.3	24.5	16.5	17.8	13.6	11.7	18.1	21.7	21.9
	SD	24.0	24.4	19.4	21.6	24.7	27.8	23.6	19.6	19.7	17.4	16.5	21.7	21.1	20.5

EORTC, European Organization for Research and Treatment of Cancer; M, mean; QLQ, Quality of Life Questionnaire; SD, standard deviation; SHQ, Sexual Health Questionnaire.

* Mean scores are given for respondents with one or more health conditions affecting daily functioning.

Table 9
Reference values for EORTC QLQ-SHQ22 and for the sexual scales in QLQ-BR23 and QLQ-BR45 by age and morbidity for men

	Morbidity*	No morbidity													
		18–29 years		30–39 years		40–49 years		50–59 years		60–69 years		70–79 years			
		All men	M	SD	All men	M	SD	All men	M	SD	All men	M	SD		
Functional scales QLQ-SHQ22															
Sexual satisfaction	M	47.2	49.2	51.1	43.6	48.6	47.5	55.4	61.0	63.6	65.0	63.4	63.0	58.6	52.3
	SD	25.1	28.7	24.1	21.2	26.5	25.3	24.2	24.7	24.8	23.0	23.0	24.7	24.5	26.4
Importance of sexual activity	M	55.0	53.3	62.9	59.3	57.7	57.0	54.3	62.4	57.2	69.1	70.8	67.5	57.5	49.9
	SD	33.8	39.3	35.8	35.6	32.5	31.6	31.7	31.0	32.4	28.7	27.7	29.1	30.8	32.5
Libido	M	63.1	78.8	69.9	59.3	66.1	64.0	51.8	81.1	86.6	85.3	87.9	83.4	77.0	65.5
	SD	33.8	29.6	31.2	36.6	34.1	33.0	32.5	25.9	23.1	21.9	19.6	23.7	26.4	33.0
Treatment	M	61.6	72.2	69.1	69.8	64.2	58.6	51.7	85.9	94.1	95.5	93.4	88.9	77.3	72.2
	SD	38.7	35.0	40.2	36.4	36.9	40.3	39.1	27.9	15.4	14.1	18.3	23.7	33.9	38.3
Communication with professionals	M	10.3	9.1	6.9	10.0	10.1	10.9	11.8	4.7	7.6	3.7	2.3	3.7	5.4	5.7
	SD	19.2	16.3	13.6	19.7	19.9	19.5	21.4	13.3	17.6	11.5	9.0	12.2	13.7	15.5
Security with partner	M	65.5	61.1	65.8	62.9	69.5	66.9	62.5	77.9	77.4	78.8	82.2	79.4	76.3	72.0
	SD	32.0	30.6	36.4	31.2	32.4	33.6	29.1	27.1	27.9	28.9	23.0	26.4	27.7	28.5
Confidence erection	M	55.0	61.0	66.0	68.6	56.2	51.6	57.8	70.3	74.6	81.2	76.2	70.0	62.9	55.4
	SD	35.2	35.7	36.9	33.9	34.9	33.9	31.9	33.0	32.9	29.0	30.4	32.2	34.0	33.5
Masculinity	M	65.0	75.9	66.7	62.7	69.0	64.5	56.3	88.3	94.9	94.6	95.7	87.2	85.0	75.8
	SD	35.4	35.5	35.2	32.4	35.8	36.7	33.7	23.2	14.9	17.1	13.6	24.5	25.5	29.7
Symptom scales QLQ-SHQ22															
Sexual pain	M	5.3	8.3	5.1	6.3	4.5	5.1	4.7	1.6	2.8	1.8	1.1	1.3	1.3	1.4
	SD	12.5	17.6	10.4	13.6	10.4	11.6	12.8	6.5	8.7	6.0	5.9	5.1	5.9	7.7
Worry incontinence	M	16.7	6.1	9.7	10.0	16.1	19.5	24.7	6.6	1.6	3.9	4.0	7.3	9.7	11.9
	SD	26.2	15.7	20.4	18.7	26.5	28.0	29.6	15.8	7.3	12.5	11.5	16.5	19.0	20.2
Fatigue	M	35.3	31.5	34.4	46.1	36.0	31.8	35.6	15.3	12.2	20.0	14.6	15.7	15.2	13.4
	SD	33.0	31.7	34.1	34.7	32.7	32.0	32.9	22.6	21.3	26.0	21.3	21.8	22.6	21.6
Vaginal dryness	M	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	SD	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Functional scales QLQ-BR23															
Body image	M	76.0	69.0	67.1	72.8	73.1	78.9	83.3	88.0	83.0	85.6	87.3	88.2	91.0	91.7
	SD	24.2	28.1	26.2	24.9	24.5	22.8	19.7	15.8	18.6	17.5	14.6	16.4	13.1	13.0
Sexual functioning	M	51.7	54.5	59.1	50.3	52.7	51.5	47.0	60.4	59.1	64.3	65.2	62.5	57.1	53.5
	SD	24.2	26.3	23.1	21.8	24.8	23.6	24.2	24.0	25.3	24.0	22.1	22.0	23.5	26.1
Sexual enjoyment	M	67.1	65.1	65.4	66.0	67.7	69.3	66.3	78.5	77.5	80.0	81.5	79.7	75.8	75.0
	SD	27.5	29.4	31.0	27.6	28.0	25.9	26.6	24.2	25.8	23.7	22.3	23.6	25.0	24.8
Symptom scales QLQ-BR45															
Endocrine therapy symptoms	M	29.7	21.6	24.0	30.7	32.7	30.9	31.2	12.0	8.0	9.9	10.5	12.5	14.0	15.9
	SD	19.0	19.3	19.1	22.0	20.4	17.4	16.6	12.3	9.0	11.5	11.5	12.1	13.4	13.4
Endocrine sexual symptoms	M	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	SD	–	–	–	–	–	–	–	–	–	–	–	–	–	–

EORTC, European Organization for Research and Treatment of Cancer; M, mean; QLQ, Quality of Life Questionnaire; SD, standard deviation; SHQ, Sexual Health Questionnaire.
* Mean scores are given for respondents with one or more health conditions affecting daily functioning.

Table 10
Regression model for the EORTC QLQ-SHQ22, QLQ-BR23 and QLQ-BR45 values by age, sex and morbidity

	Intercept	Age		Age ²		Sex		Age-by-sex		Morbidity	
		Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Functional scales QLQ-SHQ22											
Sexual satisfaction	57.91	0.03	0.710	-0.00	0.004	4.47	0.004	0.01	0.788	-11.10	<0.001
Importance of sexual activity	52.89	0.74	<0.001	-0.02	<0.001	1.00	0.601	0.41	<0.001	-4.92	<0.001
Libido	75.15	-0.18	0.075	-0.00	0.016	15.45	<0.001	0.02	0.622	-12.50	<0.001
Treatment	92.94	-0.27	0.180	0.00	0.466	10.44	0.006	-0.36	<0.001	-19.76	<0.001
Communication with professionals	12.53	-0.43	<0.001	0.00	<0.001	-4.83	<0.001	0.14	<0.001	4.59	<0.001
Security with partner	71.18	0.79	<0.001	-0.01	<0.001	1.38	0.499	-0.21	<0.001	-10.86	<0.001
Confidence erection	74.66	0.43	0.017	-0.01	<0.001	-	-	-	-	-12.55	<0.001
Femininity	95.40	-0.65	0.025	0.01	0.029	-	-	-	-	-13.6	<0.001
Masculinity	94.83	0.05	0.835	-0.00	0.141	-	-	-	-	-22.14	<0.001
Symptom scales QLQ-SHQ22											
Sexual pain	12.98	-0.32	<0.001	0.04	<0.001	-7.72	<0.001	0.12	0.636	5.91	<0.001
Worry incontinence	5.78	0.23	0.001	0.00	0.910	-6.92	<0.001	0.00	0.814	7.16	<0.001
Fatigue	24.32	0.61	<0.001	-0.01	<0.001	-17.82	<0.001	0.23	<0.001	18.50	<0.001
Vaginal dryness	18.19	-0.22	0.096	0.00	<0.001	-	-	-	-	4.15	0.001
Functional scales QLQ-BR23											
Body image	63.79	0.27	<0.001	0.00	0.038	19.01	<0.001	-0.21	<0.001	-13.78	<0.001
Sexual functioning	55.43	0.03	0.687	-0.00	<0.001	5.86	<0.001	0.18	<0.001	-6.90	<0.001
Sexual enjoyment	72.33	0.18	0.057	-0.00	0.008	4.77	0.006	0.01	0.786	-9.28	<0.001
Symptom scales QLQ-BR45											
Endocrine therapy symptoms	7.87	0.43	<0.001	-0.00	<0.001	-3.66	<0.001	-0.03	0.128	17.06	<0.001
Endocrine sexual symptoms	19.00	-0.42	<0.001	0.00	<0.001	-	-	-	-	4.98	<0.001

Coding: age in years above 18, sex (male = 0, women = 1), morbidity (no morbidity = 0, one or more morbidities affecting daily functioning/activities = 1). For illustration, the following equation estimates the sexual satisfaction in a woman aged 50, with one or more health conditions affecting daily functioning: sexual satisfaction (predicted) = 57.91 + sex * 4.47 + (age-18) * 0.03 + (age-18)² * -0.00 + sex * (age-18) - 0.00 + health condition * -11.10. Sexual satisfaction (predicted) = 57.91 + 0 (female) * 4.47 + (50-18) * 0.03 + (50-18)² * -0.00 + 0 * (50-18) - 0.00 + 1 (one or more health conditions) - 11.10.

EORTC, European Organization for Research and Treatment of Cancer; QLQ, Quality of Life Questionnaire; SHQ, Sexual Health Questionnaire.

tried to counteract through several efforts in the data collection process. The response from a general population is naturally lower than from panel participants [8,21,30]. However, our response rate was equal to previous Norwegian general population studies [25,51], which none of them included sexual health data. As we decided to stratify our sample by both sex and in EORTC-recommended age groups (to ensure equal sized and large enough groups), our sample is not necessarily representative of the total sample, but more importantly, it should be representative of the actual age groups, in which data are presented. Comparing our sample with data from Statistics Norway, we reached a larger proportion of the oldest and youngest men due to stratification (Supplementary Table IV).

As the new breast module QLQ-BR45 was not available in Norwegian at the time of data collection, our research team translated the few items in the two new sexual dimensions *Endocrine therapy symptoms* and *Endocrine sexual symptoms* in line with standard procedures, which turned out to be equal to the current final EORTC translation.

The strengths of this study are the large sample size, and the age- and sex-stratified random sampling from the Norwegian population, ensuring high statistical power in the subgroup analyses. Following advice from

previous studies [5,22], morbidity was registered in more detail by adding information on its influence on daily functioning [41]. Our final national sample of 5135 participants is the largest normative EORTC study in Europe and the first to include sexual health as an important aspect of HRQoL.

5. Conclusion

This study presents updated Norwegian normative general population data for the EORTC QLQ-C30. It is the first to provide normative values for the EORTC sexual health questionnaire QLQ-SHQ22 and the sexual subscales of the breast modules QLQ-BR23 and QLQ-BR45 for all, separately in age groups by sex and morbidity. Normative values can serve as a support when interpreting HRQoL profiles in Norwegian cancer populations.

CRedit authorship contribution statement

R.E. Åsberg: Data collection, Formal analysis, Investigation, Methodology, Project administration, Validation, Visualisation, Writing – original draft.
M. Nilsen: Data collection, Methodology, Project administration, Supervision, Validation, Writing – original draft.

M.J. Hjermsstad, K.V. Reinertsen, and J. Karlsen: Validation, Writing – original draft. **G.F. Giskeødegård:** Formal analysis, Funding acquisition, Methodology, Supervision, Validation, Writing – original draft. **R.J. Reidunsdatter:** Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.ejca.2023.112943](https://doi.org/10.1016/j.ejca.2023.112943).

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