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Distribution of global health measures from routinely-collected PROMIS surveys in patients with breast cancer or prostate cancer

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Abstract

Background: The collection of patient-reported outcomes is an emerging priority internationally, guiding clinical care, quality improvement projects and research studies. Following the deployment of Patient-Reported Outcomes Measurement Information System (PROMIS) surveys in routine outpatient workflows at our academic cancer center, we used electronic health record data to evaluate survey completion rates and self-reported global health measures across two tumor types: breast and prostate cancer.

Methods: We retrospectively analyzed 11,657 PROMIS surveys from breast cancer patients and 4,411 surveys from prostate cancer patients, calculating survey completion rates, global physical health (GPH) and global mental health (GMH) scores between 2013–2018.

Results: A total of 36.6% of eligible breast cancer patients and 23.6% of prostate cancer patients completed at least one survey, with completion rates lower among Black patients in both tumor types ($p<0.05$). Mean T scores (calibrated to a general population mean of 50) for GPH were 48.4 ± 9 in breast cancer and 50.6 ± 9 in prostate cancer; and GMH scores were 52.7 ± 8 and 52.1 ± 9

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AUTHOR CONTRIBUTIONS

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- Acquisition of data: TS, THB
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respectively. GPH and GMH were frequently lower among ethnic minorities, patients without private health insurance, and those with advanced disease.

Conclusions: Our analysis provides important baseline data on patient-reported global health in breast and prostate cancer. Demonstrating that PROs can be integrated into clinical workflows, the study shows that supportive efforts may be needed to improve PRO collection and global health endpoints in vulnerable populations.

PRECIS

This study provides baseline data on patient-reported global health in breast and prostate cancer using real-world evidence from routine clinical visits. Differences in survey completion rates highlight populations that might be underrepresented in routinely collected PRO surveys and need supportive efforts to improve their global health across the patient care journey.

Keywords

Patient-Centered Outcomes; Global Health; Prostate; Breast; Real-World Evidence

INTRODUCTION

Patient-reported outcomes (PROs), including metrics such as quality of life, functional status and mental health, have emerged as a priority in cancer care internationally.[1,2] By providing a unique insight into the patient experience, PROs may help to inform treatment choices at a patient- and population-level, and are increasingly being used to benchmark quality of care.[3,4]

PROs were first collected in the context of prospective research studies, often as secondary endpoints in clinical trials. Recently, PROs have started to be integrated into routine care delivery and captured in the electronic health record (EHR).[5] Systematic reviews in oncologic settings have found that PRO collection facilitates patient-clinician communication by increasing the patient's awareness of symptoms and providing a stimulus for discussion, culminating in improved patient satisfaction.[6,7] Recently, randomized evidence demonstrated that routine collection of PROs combined with clinician feedback loops, where nurses were able to intervene when PROs suggested deterioration, conferred a survival benefit.[8]

The Patient-Reported Outcomes Measurement Information System (PROMIS) was a collaboration launched in 2004 by the National Institutes of Health with the goal of developing PRO measures that could be standardized and shared across sites and disease states.[9] In oncology, PROMIS item banks (typically Global-10 or PROMIS-29) are being used to monitor symptoms and quality of life for both research and clinical practice.[10,11] Consequently, there have been several recent efforts to establish baseline data and reference ranges for PROMIS responses in cancer populations. Past studies indicate that PROs are lower population-wide in cancer patients, and decline further in patients with advanced disease.[12,13]

Although PROMIS is gaining more widespread use in oncology practice, limited work has been done to evaluate the implementation of PROMIS measures into routine clinical workflows. Specifically, the value and variability of PROMIS scores over time in real-world patient populations is poorly understood, especially across different tumor types. This is despite previous literature showing important variations in quality of life between ethnic and socioeconomic subgroups during treatment and survivorship.[14]

In this study, we analyze EHR data following the integration of PROMIS Global-10 surveys in clinical workflows at a tertiary academic cancer center, assessing PROs across two tumor types: breast and prostate cancer. We evaluate survey completion rates and PROMIS global health scores (physical and mental) across different demographic and clinical subgroups, with a view to establish baseline data on the burden of cancer symptoms during treatment and survivorship. We identify population subsets that can be targeted in future PRO initiatives and quality improvement efforts.

METHODS

PROMIS Implementation

The cancer center is affiliated with an academic medical institute and serves as a tertiary referral center for patients with all cancer diagnoses. In 2011, a team consisting of oncologists, oncology nurses, administrators, social workers and hospital chaplains convened to develop PRO reporting protocols for the cancer center, under the oversight of the Patient and Family Advisory committee. The team chose to use the Adult Global Health 10 survey (Global-10 v.1.0/1.1), containing 10 multiple choice questions about physical and mental health with responses on a 1–5 scale (1–10 scale for pain), in consideration of the ease of delivery and comprehensiveness of the tool. The survey was augmented with the question, “Would you like help with any issue noted above?”. After pilot testing using a paper-based instrument[15], two further questions from another PROMIS scale were added: “My life lacks meaning - how true was this before your illness?” and “My life lacks meaning - how true was this after your illness?”. The surveys were deployed into routine clinical workflows for oncology outpatients as follows: at the time of clinic appointments, patients were given a paper survey which was transcribed directly into the EHR by the medical assistant. In May 2013, this process was supplemented by an electronic one, where patients could access the survey through the EHR patient portal prior to an appointment. Approximately 75% of patients at the academic cancer center were enrolled in the EHR patient portal and could receive electronic reminders to complete a survey. If no survey was completed electronically, paper surveys were available at the time of the visit. The rollout of PROMIS surveys in different clinics was staggered: for breast cancer patients, surveys were routinely collected from March 2013 onwards; for prostate cancer patients, from June 2015 onwards.

Dataset & Study Population

We used data from Oncoshare (a breast cancer outcomes research database) and a prostate cancer research warehouse.[16,17] These are both clinical research data warehouses which combine data extracted from the EHR of an academic medical center with registry-level data

from the California Cancer Registry, a state-wide Surveillance, Epidemiology and End Results (SEER) program registry. Each warehouse contains information on patient demographics, clinical characteristics, and detailed treatment information. Patient demographics and clinical variables were identified at time of diagnosis. Retrospective data use was approved by the local institutional review board.

The total populations for breast and prostate cancer were defined as all subjects in the research data warehouse with at least one outpatient encounter recorded in the EHR following the date of PROMIS implementation (March 2013 for breast, June 2015 for prostate cancer). This cohort included patients across various stages of treatment and survivorship.

Index Dates

For all patients, the index date was set as the date of first treatment, so as to provide a relative marker of when a survey was completed in the patient's care pathway. For breast cancer, the following treatment categories were defined: surgery, surgery/radiotherapy, systemic therapy, surgery/systemic therapy, surgery/radiotherapy/systemic therapy, other/unknown. Multi-treatment categories were defined if multiple treatments were commenced within 12 months of the earliest treatment date. Breast cancer patients with no primary treatment listed in either the EHR or registry had the index date set as the diagnosis date and were classed as 'other/unknown'. For breast cancer patients with multiple distinct tumors, we used the tumor with index date in closest proximity to the survey in order to stratify that survey into time bins. For prostate cancer, the following treatments were included: surgery, active surveillance, radiotherapy, hormone therapy, chemotherapy, other/unknown. There was a large number of patients (n=4347) who did not receive primary treatment at the cancer center, where the primary treatment modality was unknown, which were categorized together in the 'other/unknown' category. For active surveillance patients and those with no primary treatment listed, the index date was set as the diagnosis date.

Based on the above index date, three time windows were defined: pre-treatment, 0–12 months post treatment initiation, >12 months post treatment initiation. Surveys were stratified into these time windows retrospectively. For each time window, only one survey per patient was used in calculating the average T score. For the pre-treatment window, the survey with the later date, i.e. closest to the treatment date, was used for analysis. For the post-treatment-initiation time windows, the earliest survey in each bin was used. A given patient may therefore have a PROMIS score recorded in between 0 and 3 time windows.

Survey Completion Rates

Survey completion rates were calculated by taking the ratio of (i) the number of distinct patients with at least one PROMIS survey, with (ii) the total number of eligible patients with at least one outpatient encounter in the EHR during the study period. Rates were separately calculated for a range of demographic and clinical parameters including primary treatment, age, race, and stage at diagnosis.

Global Physical & Mental Health Scores

All PROMIS responses were mapped to a 1–5 scale, with 1 as 'Poor' and 5 as 'Excellent'. Global physical health (GPH) and global mental health (GMH) were each calculated using the sum of four response items. Global physical health was the sum of physical health (Global03), activities of daily living (Global06), pain (Global07) and fatigue (Global08). Global mental health was the sum of quality of life (Global02), mental health (Global04), satisfaction with social activities and relationships (Global05) and anxiety/depression/ irritability (Global10).[18]

Raw GPH and GMH scores were converted to T scores for each patient using standard conversion tables.[18,19] T scores have previously calibrated to have a mean of 50 and a standard deviation of 10 based on a random sample of the US population.[20] A higher T score represents better global health. A 3-point difference in T-score was considered clinically meaningful, as in previous descriptive studies of PROMIS tools in oncology populations.[13]

Statistical Analysis

Within each time window, the subgroups in each demographic or clinical category were compared using the Kruskal-Wallis test, given that the GPH and GMH scores were not normally distributed based on the Shapiro-Wilk test ($p<0.001$). Within each demographic/ clinical category, the reference group (first listed group) was compared against all other subgroups using two-sided Dunn tests. Significanc e levels were reported relative to the reference category. Bivariate analyses of categorical variables were performed using Chi-square tests, followed by pairwise tests with the Bonferroni correction. Significance levels were reported relative to the reference category. Analyses were performed with R (v 3.4.2) and p-values less than 0.05 were considered significant.

RESULTS

A total of 11,485 breast and 8936 prostate patients were included in the study cohort - patients with at least one outpatient encounter following the rollout of PROMIS surveys for each tumor type. Within this cohort, there were 11,657 surveys from 4199 distinct breast cancer patients; and 4411 surveys from 2118 distinct prostate cancer patients (Table 1). 36.6% of breast cancer patients and 23.7% of prostate cancer patients had at least one survey. Of the patients with at least one survey, the median number of surveys completed was 2. The percentage of surveys completed electronically via the EHR patient portal was approximately 20–35% and trending upward over time, with the remainder completed on paper forms during the clinic appointment.

Table 2 shows the percentage of eligible patients (with at least one outpatient encounter) who completed at least one survey during the study period, as well as the median number of outpatient encounters in that subgroup. In breast cancer, patients with systemic therapy had higher completion rates, up to 50.7% in patients who received systemic therapy alone; whereas in prostate cancer, the highest rates were observed among active surveillance patients (49.8%). The survey completion rate among elderly prostate cancer patients >75

years was significantly lower than in the <55 years age group (16.5% versus 26.0%, p <0.001), although this age-dependency was not as pronounced in breast cancer.

There were significant differences between ethnic groups, with completion rates consistently lower among Black patients across both tumor types (Table 2). Prostate cancer patients with public or unknown insurance status had lower completion rates (a trend not observed in breast cancer). Rates were comparable across stage categories, except for stage 0 breast cancer patients and stage 2 prostate cancer patients. For breast subjects, high completion rates were often associated with a high median number of appointments (for example, in patients undergoing systemic therapy); however, this correlation was not as pronounced in prostate cancer.

Across all surveys, the mean T scores for GPH and GMH were 48.4 ± 9 and 52.7 ± 8 respectively in breast cancer (n=11,657); and 50.6 ± 9, 52.1 ± 9 in prostate cancer (n=4,411). The percentages of surveys with GPH and GMH T scores of less than 40 (one standard deviation below the population mean of the general US population) were 21.4% and 4.9% respectively in breast cancer; and 16.3%, 8.4% in prostate cancer.

Table 3 shows the GPH scores across demographic and clinical subgroups, stratified by the timing of the survey relative to the patient's index date (treatment start date or the diagnosis date in the absence of treatment), with only one survey per patient in each time bin. In both breast and prostate cancer, GPH was lower in the >12 month time bin in certain vulnerable populations: breast cancer patients who underwent radiotherapy and systemic therapy, prostate cancer patients with hormone or chemotherapy as the first line of treatment, patients over 75 years of age, patients on public insurance schemes (observed in earlier time windows also), and those with advanced disease at the time of diagnosis. In breast cancer only, there were strong ethnic differences, with Black, Hispanic and Asian patients all showing lower GPH scores than white subjects.

Table 4 shows the GMH scores across the same demographic and clinical groupings. Across both tumor types in the >12 month time bin, lower GMH scores were observed in Hispanic and Asian subjects, patients on public insurance schemes, and those with advanced disease. In prostate cancer only, GMH deficits were seen >12 months post treatment initiation in subjects who underwent first line hormone or chemotherapy, as well as in elderly patients.

DISCUSSION

Using one of the largest cohorts of PROMIS data from an oncology population, this study provides insights into how survey completion rates and survey content vary by demographic and clinical parameters across patients' treatment course. Survey completion rates were modest, yet nonetheless yielded over 16,000 surveys across the two tumor types. GPH and GMH scores demonstrated the most significant differences at >12 months following treatment initiation, and showed important variation on the basis of ethnicity, insurance status, treatment type and disease stage. To our knowledge, this is the first comprehensive study to generate baseline PRO data in breast and prostate cancers using the EHR. These data highlight vulnerable populations where future implementation efforts must be targeted.

Survey completion rates varied widely between the subgroups, within the range of 13.4–50.7%. Highest completion rates were found in breast cancer patients receiving systemic therapy and prostate cancer patients on active surveillance. In some cases, high rates were associated with a high median number of appointments (suggesting patients were given more opportunities to complete at least one survey); however, this was not uniformly the case, and not always commensurate with the difference in completion rates. It is worth noting the significant variation in completion rates between ethnic groups, in particular the consistently lower rates among Black subjects. This may be an effect of patient and/or staff behaviors; and emphasizes the importance of making efforts to target minority groups in PRO initiatives. Patients with advanced stage disease also had lower completion rates, which may reflect challenges in completing the surveys either at home or in clinic. Taken together, these data suggest that multiple demographic and clinical factors influence survey completion, and that in future implementations specific efforts may be required to boost completion rates in patients from certain ethnic minorities and treatment profiles.

Mean GPH and GMH scores across both tumor types were lower than the scores reported in the National Health Interview Survey (NHIS) on PROs among cancer survivors.[21] This may be related to the setting in which surveys were collected (mailed surveys in the NHIS compared to surveys delivered via the EHR patient portal or in the clinic in our study); and the proximity to diagnosis and treatment, as the majority of the NHIS cohort was more than 10 years since diagnosis, whereas the current study focused on patients during both treatment and survivorship. Our study provides valuable baseline data for in-hospital PROMIS surveys recorded during the course of routine care, as compared to household interviews or mailed surveys as in previous reference data.[13,21]

Supportive efforts to improve PROs in vulnerable populations, including racial minorities, uninsured patients, and those with advanced disease, are also warranted. Supportive therapies might include physical activity, regular symptom tracking or cognitive behavior therapy, which have previously been linked to improved quality of life measures.[22,23] We found that both GPH and GMH were lower among certain ethnic groups, including Black, Hispanic and Asian breast cancer patients. Across both tumor types, patients with advanced disease at the time of diagnosis also reported lower GPH and GMH scores, broadly consistent with reference data showing more severe symptoms and functional deficits with increasing stage.[13] In addition, prostate cancer patients undergoing chemotherapy or hormone therapy showed significant deficits in both physical and mental health, notably in the >12 month time bin. This is to be expected given that these therapies are administered in advanced disease, and also have a wide side effect profile. Many of these trends were not observed in the pre-treatment or 0–12 months post treatment time windows, likely because of smaller sample sizes. These data highlight the utility of implementing PRO assessment tools in the real-world setting and indicate vulnerable patient groups that may benefit from targeted support, namely the elderly, uninsured, ethnic minorities and advanced stage patients.

This study was limited in using retrospective data from a PROMIS deployment that was not standardized across time or tumor types. As a consequence, many patients had only one survey and surveys were collected at varying timepoints in the patient's care journey,

making it difficult to assess trends on an individual patient level. Our calculation of completion rates was an approximation, using all patients with an outpatient encounter as the pool of eligible patients; however, it is unclear whether all of these patients were offered a PROMIS survey. The different methods of survey distribution (paper forms versus EHR patient portal) may have influenced completion rates, and further study is warranted to investigate whether the survey format contributed to demographic differences in completion rates. In prostate cancer, many patients were lacking information about their primary treatment modality if they were treated outside our academic cancer center. Nevertheless, given the size of the cohort relative to previous PROMIS analyses, we believe that our data still have utility as high-level approximations for global health measures. We recognize that there are correlations between the demographic and clinical variables we have compared, such as higher age among Stage 4 patients. Our data should not be used to draw causal conclusions; however, they do provide a high-level overview of completion rates and global health measures across clinical and demographic subgroups in one of the largest observational cohorts of PROMIS surveys analysed to date. In future work, we will analyze how PROMIS scores correlate with clinical outcomes such as recurrence and mortality; as well as investigating the influence of treatment choices (e.g. active surveillance versus surgery) on PROMIS scores using matched populations.

In conclusion, this study demonstrates the utility of integrating PROMIS surveys into routine clinical workflows to collect valuable global health measures, which show significant variability across demographic and clinical parameters. In particular, vulnerable populations including the elderly, uninsured, ethnic minorities and advanced stage patients often report lower global physical and mental health, as well as lower survey completion rates. This evidence may help to inform the design of supportive interventions to improve both PRO collection and patient wellbeing in these vulnerable groups.

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Table 1.

Number of PROMIS surveys and distinct patients in breast and prostate cancer populations.

	Breast	Prostate
Total patients in database, n	11485	8936
Number of surveys, n	11675	4411
Distinct patients with survey, n (% of total)	4199 (36.6%)	2118 (23.7%)
Surveys per patient, median (min-max)	2 (1–12)	2 (1–12)
Age at first survey, mean ± SD	58.1 ± 15	70.1 ± 9

Table 2.

Survey completion rates by demographic and clinical subgroups (percentage of all patients who completed at least one PROMIS survey).

Breast			*Prostate*		
Subpopulation (total pts)	**% of patients with survey**	**Median no. outpatient encounters**	**Subpopulation (total pts)**	**% of patients with survey**	**Median no. outpatient encounters**
First line of treatment			**First line of treatment**		
Surgery (2371)	29.5	9	Surgery (1796)	32.1	7
Surgery + Radiotherapy (1175)	29.3	10	Active surveillance (478)	**49.8*****	8
Systemic (223)	**50.7*****	16	Radiation (968)	**19.6*****	8
Surg + Rad + Systemic (4598)	**37.8*****	11	Hormone (1171)	31.2	9
Radiotherapy + Systemic (78)	34.6	14	Chemo (176)	39.8	18
Surgery + Systemic (2828)	**41.2*****	12	Other/Unknown (4347)	**15.6*****	7
Other/Unknown (212)	**52.8*****	8			
Age			**Age**		
<45 (2592)	36.8	10	<55 (780)	26.0	5
45–60 (4832)	36.9	11	55–75 (6113)	25.8	7
60–75 (3275)	37.0	11	>75 (2043)	**16.5*****	9
>75 (786)	31.8	10			
Race			**Race**		
White (7451)	33.8%	10	White (6415)	24.4	7
Black (403)	**21.8*****	11	Black (508)	**13.4*****	9
Hispanic (867)	**42.7*****	13	Hispanic (384)	24.2	7
Asian (2380)	**45.4*****	12	Asian (940)	29.0*	9
Other/Unknown (384)	37.5	10	Other/Unknown (689)	**17.4*****	5
Insurance status			**Insurance status**		
Private (7660)	37.5	10	Private (2167)	28.1	5
Public (3212)	38.0	12	Public (6004)	**23.1*****	8
None/Unknown (613)	**17.0*****	10	None/Unknown (765)	**16.2*****	7
Stage at diagnosis			**Stage at diagnosis**		
0 (1901)	28.5	9	1 (941)	33.9	8
1 (4108)	**37.5*****	10	2 (3193)	**26.3*****	8
2 (3222)	**36.3*****	11	3 (649)	36.5	7
3 (999)	**37.6*****	13	4 (452)	35.2	8
4 (340)	**36.8***	10	Unknown (3701)	**15.2*****	7
Unknown (915)	**48.6*****	15			

Bolded cells are significant based on a corrected pairwise T test relative to the reference category within that time bin (first listed group)

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*
p <0.05 *,

**
p<0.01,

***
p<0.001

Table 3.

Global physical health scores for demographic and clinical subgroups.

	Breast		
	Pre (n=218)	**0–12mo (n=1026)**	**>12mo (n=3869)**
First line of treatment			
Surgery	47.9 ± 9 (56)	47.9 ± 10 (190)	48.7 ± 10 (611)
Surgery + Radiotherapy	53.1 ± 7 (26)	49.2 ± 9 (97)	49.0 ± 9 (305)
Systemic	51.5 ± 9 (16)	44.2 ± 10 (57)	45.7 ± 10 (98)
Surg + Rad + Systemic	48.8 ± 10 (40)	47.9 ± 10 (287)	49.2 ± 9 (1656)
Radiotherapy + Systemic	-	-	**42.7 ± 9** * (23)
Surgery + Systemic	49.1 ± 10 (72)	47.5± 9 (356)	48.2± 9 (1072)
Other/Unknown	-	50.0 ± 11 (31)	45.5 ± 10 (104)
Age			
<45	48.6 ± 9 (43)	47.1 ± 10 (201)	48.8 ± 9 (874)
45–60	49.3 ± 8 (89)	47.5 ± 10 (453)	48.9 ± 9 (1650)
60–75	50.2 ± 10 (68)	48.8 ± 10 (299)	48.4 ± 9 (1123)
>75	46.0 ± 12 (18)	44.5± 11 (73)	**47.7 ± 9** ** (222)
Race			
White	49.9 ± 9 (118)	48.6 ± 10 (597)	49.6 ± 9 (2318)
Black	-	44.5 ± 11 (21)	**45.3 ± 9** *** (78)
Hispanic	45.5 ± 8 (15)	44.6 ± 11 (99)	**46.1 ± 10** *** (338)
Asian	50.1 ± 9 (66)	47.3 ± 9 (269)	**47.6 ± 9** *** (1004)
Other/Unknown	-	46.2 ± 10 (40)	47.0 ± 10 (131)
Insurance status			
Private	49.9 ± 8 (139)	48.0 ± 10 (683)	49.4 ± 9 (2657)
Public	47.7 ± 11 (68)	**46.8 ± 10** * (309)	**46.8 ± 9*** (1118)**
None/Unknown	-	49.4 ± 8 (34)	47.6 ± 9 (94)
Stage at diagnosis			
0	49.7 ± 8 (50)	49.3 ± 11 (91)	50.3 ± 9 (500)
1	49.3 ± 9 (54)	48.7 ± 9 (279)	49.6 ± 9 (1458)
2	48.5 ± 10 (41)	46.9 ± 10 (234)	**48.3 ± 9** *** (1103)
3	-	46.3 ± 10 (85)	**46.2 ± 10** *** (358)
4	45.0 ± 8 (18)	**42.6 ± 11** ** (39)	**45.2 ± 10** *** (108)
Unknown	49.8 ± 10 (76)	48.1 ± 10 (298)	**46.5 ± 10** *** (342)
	Prostate		
	Pre (n=294)	**0–12mo (n=793)**	**>12mo (n=1425)**
First line of treatment			
Surgery	55.3 ± 8 (78)	50.3 ± 9 (271)	52.6 ± 8 (351)

	Breast		
	Pre (n=218)	**0–12mo (n=1026)**	**>12mo (n=3869)**
Active surveillance	-	**55.6 ± 7**** (25)	52.4 ± 9 (220)
Radiation	53.2 ± 9 (55)	51.5 ± 9 (55)	50.5 ± 10 (129)
Hormone	51.8 ± 9 (37)	50.4 ± 9 (151)	**47.6 ± 9***** (251)
Chemo	49.5 ± 10 (25)	49.9 ± 9 (32)	**44.9 ± 11***** (33)
Other/Unknown	48.2 ± 9 (75)	49.8 ± 9 (213)	50.8 ± 9 (478)
Age			
<55	54.3 ± 7 (26)	51.2 ± 9 (72)	51.6 ± 9 (143)
55–75	52.7 ± 9 (191)	50.9 ± 9 (550)	51.4 ± 9 (112)
>75	**48.3 ± 9*** (56)	48.8 ± 7 (135)	**46.5 ± 9***** (207)
Race			
White	52.4 ± 9 (200)	51.1 ± 9 (540)	51.0 ± 9 (1095)
Black	48.7 ± 11 (11)	47.6 ± 10 (35)	50.8 ± 10 (42)
Hispanic	-	47.6 ± 11 (27)	48.2 ± 9 (73)
Asian	54.5 ± 6 (33)	50.2 ± 8 (106)	50.1 ± 9 (187)
Other/Unknown	**45.8 ± 9*** (24)	48.5 ± 9 (49)	51.0 ± 11 (65)
Insurance status			
Private	54.1 ± 9 (100)	51.6 ± 9 (286)	53.3 ± 9
Public	**51.1 ± 9*** (151)	**49.8 ± 9*** (417)	**50.0 ± 9***** (1028)
None/Unknown	**48.3 ± 7*** (22)	50.5 ± 9 (54)	**47.8 ± 9***** (66)
Stage at diagnosis			
1	52.3 ± 9 (30)	51.5 ± 9 (85)	52.5 ± 9 (249)
2	54.4 ± 8 (111)	51.5 ± 9 (300)	51.3 ± 9 (581)
3	57.7 ± 6 (23)	50.6 ± 8 (99)	51.1 ± 9 (174)
4	50.2 ± 11 (10)	48.4 ± 9 (69)	**47.2 ± 9***** (118)
Unknown	47.9 ± 9 (99)	49.4 ± 9 (204)	**49.5 ± 10***** (340)

Mean T score +/− SD (n)

* p<=0.05,

** p<= 0.01,

*** p<= 0.001 relative to the reference category within that time bin (first listed group). General US population mean T score 50, SD 10. Cells with counts below 10 omitted.

Table 4.

Global mental health scores for demographic and clinical subgroups.

	Breast		
	Pre (n=218)	**0–12mo (n=1026)**	**>12mo (n=3869)**
First line of treatment			
Surgery	54.1 ± 8	53.4 ± 8	53.1 ± 8
Surgery + Radiotherapy	56.5 ± 6	53.6 ± 8	53.0 ± 8
Systemic	55.8 ± 8	50.4 ± 8	51.2 ± 8
Surg + Rad + Systemic	53.0 ± 8	52.0 ± 8	53.0 ± 8
Radiotherapy + Systemic	-	-	51.2 ± 9
Surgery + Systemic	53.0 ± 8	52.1 ± 8	52.7 ± 8
Other/Unknown	-	53.4 ± 10	51.2 ± 8
Age			
<45	52.8 ± 7	52.2 ± 8	52.6 ± 8
45–60	54.3 ± 8	52.0 ± 8	52.9 ± 8
60–75	54.2 ± 9	53.2 ± 8	53.0 ± 8
>75	50.0 ± 11	51.9 ± 8	52.5 ± 8
Race			
White	54.8 ± 8	53.0 ± 8	53.8 ± 8
Black	-	51.0 ± 7	**50.6 ± 8** **
Hispanic	50.3 ± 7	51.3 ± 9	**50.9 ± 8** ***
Asian	53.8 ± 8	51.6 ± 8	**51.4 ± 8** ***
Other/Unknown	-	51.7 ± 9	52.1 ± 8
Insurance status			
Private	54.7 ± 7	52.7 ± 8	53.3 ± 8
Public	52.7 ± 9	51.6 ± 9	**51.5 ± 8** ***
None/Unknown	-	52.4 ± 8	52.3 ± 8
Stage at diagnosis			
0	54.3 ± 9	53.9 ± 9	53.9 ± 8
1	54.3 ± 8	53.1 ± 8	53.6 ± 8
2	52.9 ± 9	51.9 ± 9	**52.5 ± 8** **
3	-	51.4 ± 9	**51.3 ± 8** ***
4	50.4 ± 5	**48.8 ± 9** *	**50.9 ± 8** **
Unknown	54.0 ± 8	52.4 ± 8	**51.4 ± 8** ***
	Prostate		
	Pre (n=273)	**0–12mo (n=757)**	**>12mo (n=1462)**
First line of treatment			
Surgery	53.2 ± 10	52.1 ± 9	53.2 ± 8

	Breast		
	Pre (n=218)	**0–12mo (n=1026)**	**>12mo (n=3869)**
Active surveillance	52.6 ± 6	55.7 ± 8	53.1 ± 10
Radiation	52.5 ± 8	52.9 ± 9	52.8 ± 9
Hormone	53.2 ± 8	53.1 ± 9	**49.9 ± 8*****
Chemo	52.2 ± 11	51.7 ± 10	**47.7 ± 11***
Other/Unknown	51.0 ± 9	51.2 ± 9	52.2 ± 9
Age			
<55	52.4 ± 9	53.3 ± 9	51.9 ± 10
55–75	52.4 ± 9	52.2 ± 9	52.6 ± 9
>75	52.3 ± 9	51.9 ± 9	**49.8 ± 9***
Race			
White	53.0 ± 9	52.8 ± 9	52.6 ± 9
Black	48.2 ± 9	50.5 ± 7	52.8 ± 8
Hispanic	50.8 ± 8	51.2 ± 8	**49.4 ± 9***
Asian	53.2 ± 7	51.4 ± 8	**50.3 ± 9****
Other/Unknown	48.1 ± 10	49.8 ± 10	52.0 ± 9
Insurance status			
Private	52.7 ± 9	52.5 ± 9	53.3 ± 9
Public	52.7 ± 9	52.2 ± 9	**51.9 ± 9***
None/Unknown	48.5 ± 10	51.0 ± 9	**49.5 ± 8****
Stage at diagnosis			
1	50.9 ± 11	52.3 ± 8	53.4 ± 10
2	53.5 ± 9	53.2 ± 9	52.4 ± 9
3	55.6 ± 6	52.4 ± 9	52.0 ± 9
4	51.9 ± 9	50.3 ± 9	**50.2 ± 9****
Unknown	50.8 ± 9	51.4 ± 9	**51.6 ± 9***

Mean T score +/− SD (n)

* p<=0.05,

** p<= 0.01,

*** p<= 0.001 relative to the reference category within that time bin (first listed group). General US population mean T score 50, SD 10. Cells with counts below 10 omitted.