Social Determinants of Health and Symptom Burden During Cancer Treatment

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Abstract

Background: Cancer survivors (defined as individuals from diagnosis to the end of life) in treatment experience multiple physical and psychological symptoms (e.g., fatigue, pain, depression, anxiety, disturbed sleep) that influence their well-being and treatment outcomes. Underrepresented cancer survivors may disproportionately experience greater symptom burden (number of symptoms, symptom severity, depression, anxiety).

Objectives: Examine the relationships of social determinants of health, including age, ethnicity, education, income and whether income meets the survivor's needs, neighborhood (rural vs. urban), access to health care (e.g., insurance), and social isolation, with symptom burden in cancer survivors.

Methods: This secondary analysis included baseline data from 400 cancer survivors of solid tumor cancers undergoing chemotherapy or targeted therapy who participated in a larger randomized trial of symptom management interventions. Symptom burden was measured by the Center for Epidemiological Studies–Depression scale for depression and Patient Reported

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Outcomes Measurement Information System scores for anxiety and social isolation, summed severity index of 16 symptoms from the General Symptom Distress Scale, and the total number of symptoms. Self-reported comorbid conditions were measured using the Bayliss tool. General linear models were used to relate symptom measures (one at a time) to age, number of comorbid conditions, level of education, marital status, income meeting needs, and size of metropolitan neighborhood. Additional covariates included site of cancer, its treatment, and whether the cancer was metastatic.

Results: Non-Hispanic White survivors ($n = 191$) were older, had more comorbid conditions, higher proportion of metastatic cancers, and higher levels of education and income compared to Hispanic ($n = 168$) and non-Hispanic survivors of other races ($n = 41$). Compared to the other two groups, Hispanic survivors had the lowest rate of health insurance availability, and non-Hispanic survivors of other races had the lowest social isolation. Age, number of comorbid conditions, and social isolation were significantly associated with number of symptoms, symptom severity, and depression. Age and social isolation were associated with anxiety. In addition, the symptom severity of non-Hispanic White survivors was lower than that of Hispanic and non-Hispanic survivors of other races.

Discussion: These findings highlight the health disparities in symptom burden experienced among cancer survivors when considering their social determinants of health. Assessing these may help clinicians address health disparities in cancer care.

Cancer survivors (defined as individuals from diagnosis to the end of life), while in cancer treatment, experience physical and psychological symptoms that negatively influence their quality of life (Decker et al., 2019). Symptom burden is often a primary reason for altering or stopping cancer treatment, leading to suboptimal dosing and potentially increasing risk of recurrence or metastasis (Global Burden of Disease Cancer Collaboration, 2018). The prevalence and severity of specific symptoms (e.g., fatigue, pain, depression, anxiety, disturbed sleep) vary by social determinants of health such as age, ethnicity, social isolation, and access to care (Asare et al., 2017; Yim et al., 2021).

According to the social disadvantage approach to social determinants of health (Flaskerud & DeLilly, 2012; Phelan et al., 2010), socioeconomic status, social capital, and living conditions influence disease through lack of access to resources that could reduce disease risk—the effects of which are reproduced over time. Lack of access to resources or inequitable distribution of resources generates stress, allostatic load, and degradation of psychological and physiological functioning. From this perspective, one could postulate that many of the burdensome symptoms of cancer and its treatment are likely aggravated by social determinants of health, resulting in downregulated coping responses, deteriorated quality of life, and poorer cancer recovery with increased symptom burden (number of symptoms, symptom severity, depression, and anxiety). A key assumption of the social disadvantage approach is that social determinants of health involve access to resources that people can use to avoid disease risks or minimize consequences of disease states once

they occur (Phelan et al., 2010). According to Phelan et al. (2010), these resources include money, prestige, power, and social connections. The social determinants of health selected for analysis in this investigation represent access to such resources (e.g., race, income, education, social connectedness).

In a recent systematic review, Van der Kruk et al. (2022) found mixed results for rural versus urban differences in psychosocial morbidity in cancer survivors. More studies revealed worse outcomes for urban cancer survivors than rural survivors, with urban survivors reporting worse social and emotional functioning and rural survivors reporting worse physical functioning. Individuals of racial/ethnic minority groups—particularly those living in rural areas—were also less likely to have insurance with limited access to care (American Cancer Society Cancer Action Network [ACSCAN], 2020).

The number of symptoms reported by cancer survivors varies by diagnosis, age, and ethnicity but can be as high as 14 (Pettersson et al., 2014). Cataldo et al. (2013) examined the multidimensional symptom experience of 593 oncology outpatients by comparing the symptom experience by age (age ≥ 60 years; age < 60 years). There were no differences between the two age groups in occurrence of four symptoms (lack of energy, pain, feeling drowsy, difficulty sleeping), severity of four symptoms (problems with sexual interest, hair loss, constipation, difficulty sleeping), frequency of three symptoms (problems with sexual interest, hair loss, lack of energy), or distress of two symptoms (problems with sexual interest, constipation). However, older patients reported significantly lower occurrence for 50% of the 32 symptoms listed on the Memorial Symptom Assessment Scale, lower severity ratings, lower frequency ratings, and lower distress ratings on about half of symptoms listed.

Social isolation—defined as feeling isolated and disconnected from others—has been widely reported as associated with higher symptom severity or burden (Segrin et al., 2019). Social isolation and the associated experience of loneliness indicate that a person's social relationships are not meeting their desired levels of quality and quantity (Segrin et al., 2020). Social isolation has been found to have a direct and significant effect on the experience of psychological symptoms such as depression and anxiety (King et al., 2022; Segrin & Badger, 2011).

Depression and anxiety (psychological distress) are frequently reported as comorbidities that increase symptom burden (Geng et al., 2018) and the severity of symptoms such as fatigue, pain, and/or insomnia (Unseld et al., 2021). Approximately 30% of cancer survivors report psychological distress (Iovino et al., 2020; Oechsle et al., 2020), with major depressive disorder occurring in about 16% of cancer survivors and subthreshold depressive disorders in 22% of cancer survivors. These prevalence rates are about 3 times higher than in the general population. Even when depression and anxiety do not meet the threshold for clinical diagnoses, these symptoms are still associated with significant health impairments and greater severity of other symptoms (Decker et al., 2019; Reilly et al., 2013).

Findings on age as a predictor of depression are mixed, with some studies (e.g., Cataldo et al., 2013) indicating higher depression among younger cancer patients and others (e.g., Parajuli et al., 2021) indicating higher depression among older patients. Higher rates of

psychological distress are typically seen among women compared to men (Riedl & Schüßler, 2022) and for Hispanic cancer survivors compared to non-Hispanic Whites (Bevilacqua et al., 2018). In past studies, Latinas with breast cancer reported higher numbers of symptoms, depression, and anxiety and more symptom burden than non-Hispanic White women (Badger et al., 2007, 2013). Previous research focused on cancer survivors' symptoms, often including age and ethnicity but have not included a broader array of social determinants of health. In addition to age and ethnicity, we have also included in this analysis neighborhood locations (rural vs. urban), socioeconomic factors (education, income, and whether the income meets the survivor's needs), access to health care (e.g., insurance status) and social connections (social isolation) that are associated to symptom burden in diverse cancer survivors.

Our objective was to examine the relationships of social determinants of health (age, ethnicity, education, income and whether income meets the survivor's needs, neighborhood (rural vs. urban), access to health care (e.g., insurance), social isolation with symptom burden (number of symptoms, symptom severity, depression, anxiety).

Methods

This report is based on baseline data from a sequential, multiple-assignment randomized trial to determine optimal strategies for symptom management of survivors during cancer treatment and their caregivers (for details of this clinical trial, see NCTT03743415 in Clinicaltrials.gov). Survivor–caregiver dyads were first randomized to either a symptom management handbook intervention alone or the handbook intervention plus counseling. Handbook dyads with elevated depression or anxiety were re-randomized at 4 weeks to continue with the handbook intervention or to handbook plus counseling. Baseline data were collected over the telephone prior to the random assignment.

Sample and Setting

Inclusion criteria for the survivors for the parent study and this study were: (a) age 18 or older; (b) undergoing chemotherapy, hormonal therapy, or targeted therapy for a solid tumor cancer; (c) able to perform basic activities of daily living; (d) cognitively oriented to time, place, and person (determined by recruiter); (e) reporting severity of ≥ 2 on depression or ≥ 4 on anxiety using a 0–10 standardized scale; (f) able to speak and understand English or Spanish; (g) access to a telephone; and (h) having a caregiver in any relationship role (e.g., spouse, sibling, parent) who could participate with them. Exclusion criteria were: (a) diagnosis of a psychotic disorder in the health record; (b) nursing home resident; (c) bedridden; and (d) currently receiving regular counseling and/or psychotherapy. These criteria allowed recruiting of adult cancer survivors and their caregivers who would be able to participate in the telephone intervention and who might benefit from supportive care telephone interventions because they were experiencing elevated depression or anxiety.

Table 1 includes the characteristics of the 400 survivors. The mean age was 59.97 years with five comorbid conditions (e.g., diabetes, heart disease, arthritis). Most cancer survivors were female, with breast cancer as the most frequently reported cancer site (50%). All survivors were in treatment (e.g., hormonal therapy, chemotherapy, and/or other targeted

therapy), and metastatic disease was reported by 44%. Almost half the sample was Hispanic (42%), and missing data for race (30%) were mostly from Hispanic participants. Because of grouping by race/ethnicity into Hispanic, non-Hispanic White, and non-Hispanic other races, race/ethnicity combination data were available for all survivors. Fifty-nine percent were married. Thirty-nine percent of survivors reported high school or less than high school for their highest educational level, and over half (57%) had incomes below $40,000. Few survivors (19%) reported working full- or part-time, with 35% reporting being retired.

This study was conducted with the approval of the University of Arizona's Institutional Review Board. Survivors were recruited during their cancer clinic visits in the Southwestern U.S. or community cancer events or were self-referred after reviewing a brochure or seeing materials on social media. Recruiters explained the study to survivors and their caregivers over the telephone or in person. After receiving informed consent from survivors and caregivers, separate baseline telephone interviews were scheduled and conducted in the participant's preferred language—English or Spanish. A "thank you" letter and a national retail gift card were sent to the participant after completing the interview, from which the data presented in this report were collected. Baseline data collected between January 2018 and October 2021 were analyzed for this report.

Measures

Sociodemographic characteristics included survivors' age, sex, ethnicity, education, employment, income and whether the income met the survivor's needs, marital status, health insurance, and population size of residence. For the analysis, the population of residence was summarized as < 100,000 people or 100,000 or more (Cordova-Marks et al., 2022). Site of cancer and treatment were also collected by self-report and confirmed by medical record review. Comorbidity was measured with the Bayliss tool that queried the presence of 20 comorbidities (Bayliss et al., 2009). The total number of comorbid conditions was derived from this checklist.

Depression was measured using the 20-item Center for Epidemiological Depression (CES-D) scale (Radloff, 1977). Higher scores indicate higher depressive symptoms. Both English and Spanish versions have been used with adequate reliability and validity in past studies (Badger et al., 2007, 2020). In this study, Cronbach's alpha was 0.89.

Anxiety was assessed using the 8-item short form from the Patient Reported Outcome Measurement Information System (PROMIS; Cella et al., 2019). Participants reported their experience from *never* (1) to *always* (5) for various statements (e.g., "I felt uneasy," "I felt fearful."). PROMIS Anxiety was scored in the T-metric, with the general population mean of 50 and standard deviations of 10. Higher T-scores are reflective of higher anxiety.

Summed symptom severity index was derived from the revised General Symptom Distress Scale (GSDS; Badger et al., 2011) that includes 18 common symptoms (fatigue, sleep difficulties, pain, headache, difficulty concentrating, lack of appetite, nausea, vomiting, constipation, diarrhea, numbness or tingling, skin rashes, swelling, weakness, shortness of breath, cough, depression, anxiety) associated with cancer and other chronic illnesses. Survivors indicated the presence or absence of symptoms along with symptom severity

on a 0–10 scale, with higher scores indicating greater symptom severity. Total number of symptoms (severity 1 or higher) out of 18 was determined. In addition, a summed severity index was computed based on 16 symptoms (range 0–160)—not including depression and anxiety because those were measured in greater detail using the CES-D and PROMIS. Internal consistency reliability does not apply to the checklist of symptoms.

Social isolation was measured with the PROMIS Social Isolation–Short Form 4a (Cella et al., 2019). Survivors responded to each item on a Likert scale of 1 (*never*) to 5 (*always*) on statements such as "I feel left out" or "I feel isolated from others "Social isolation was also scored in the T-metric, with higher T-scores reflecting greater social isolation.

Acculturation was measured by the Anglo Orientation subscale (AOS) from the Acculturation Rating Scale for Mexican Americans II (ARSMA-II; Cuellar et al., 1995). The total is derived by averaging 13 items. Cronbach's alpha was 0.89 in this study. Higher scores indicate greater Anglo orientation.

Statistical Analysis

The characteristics of survivors and symptom outcomes were summarized by race/ethnicity for three groups: Hispanic, non-Hispanic White, and non-Hispanic other races. The unadjusted comparisons of three groups on symptom outcomes, social determinants of health (age, level of education, marital status, income meeting needs, population of residence, social isolation, and availability of health insurance), and comorbidity were carried out using chi-square tests for categorical variables and analyses of variance for continuous variables. These variables for group comparisons were selected based on literature (e.g., Riedl & Schüßler, 2022; Siegel et al., 2022) and their representation of mechanisms intrinsic to the social disadvantage perspective on social determinants of health. Additional covariates selected based on symptom literature (e.g., Cleeland et al., 2013) reflected sex, site of cancer, its treatment, and whether the cancer was metastatic. Although sex is a social determinant of health, among cancer survivors, sex is often confounded with site of cancer and cancer treatments because certain cancers are sex-specific (e.g., prostate cancer) and are treated with sex hormone inhibitors. Sites of cancer and treatment types were collapsed into the following categories: female breast treated with chemotherapy or targeted therapy other than hormonal, female breast with hormonal treatment, female colorectal/gastrointestinal (GI), male colorectal/GI, female other, and male other.

Using these covariates and race/ethnicity group membership, multivariable analyses were conducted with symptom measures (one at a time) as dependent variables in general linear models. Independent variables were removed from final models if they were insignificant, and their removal did not change the estimates of the effects of other variables in an appreciable way. For Hispanic survivors, additional models for symptom severity measures were fit to include acculturation. All statistical tests were two-sided and conducted at .05 level of significance. For this cross-sectional analysis, general linear modeling technique does not allow for missing data in the outcome or covariates. Because of small amount of missing data, no imputations were performed. SAS 9.4 was used for data analysis.

Given the sizes for three groups of Hispanic ($n = 168$), non-Hispanic White ($n = 191$), and non-Hispanic survivors of other races ($n = 41$) and power of .80 or greater in two-sided tests at .05 level of significance, the detectable effect sizes in pairwise group comparisons ranged from .28 to .44 (Cohen's d) with the largest detectable effect size corresponding to the comparison of two smaller groups. These effect sizes are below the threshold d = 0.5, often used to gauge clinical significance (Norman et al.,2003).

Results

The characteristics of the sample, including missing data, are detailed in Table 1. Missing data for race were exclusive to Hispanic ethnicity, with many Hispanic participants not endorsing race beyond their Hispanic ethnicity. With the grouping of Hispanic, non-Hispanic White, and non-Hispanic of other races, there were no missing values in combined race/ethnicity group membership. In the symptom outcome measures, there were two missing scores for PROMIS Anxiety for non-Hispanic White group and one for Hispanic group. The Hispanic and non-Hispanic other than White races groups each had one missing score on the GSDS. There were significant differences among the three groups: Hispanic ($n = 168$), non-Hispanic White ($n = 191$), and non-Hispanic of other races ($n = 41$) concerning age, number of comorbid conditions, social isolation, education, whether the income met needs, health insurance coverage, and diagnosis of metastatic cancer (Table 2). Non-Hispanic White survivors were older, had more comorbid conditions, higher proportion of metastatic cancers, and higher levels of education and income compared to Hispanic and non-Hispanic survivors of other races. Compared to the other two groups, Hispanic survivors had lower rates of health insurance availability, and non-Hispanic survivors of other races had less social isolation.

The unadjusted comparisons for the three groups revealed significant differences in depressive symptoms, with non-Hispanic White survivors having significantly lower mean scores for depressive symptoms than the other two groups (Table 3); non-Hispanic survivors of other races had more depressive symptoms than the other two groups. All three groups differed significantly on the summed symptom severity index. There were differences in the overall summed severity index across most symptoms included in the GSDS (Table 3). Notably, 65% of the total sample reported distress associated with depressive symptoms, and 78% reported anxiety symptoms.

The differences by race/ethnicity remained significant in the multivariable analysis (Table 4) for the summed symptom severity index but not for depression, anxiety, or the number of symptoms. Younger age and higher social isolation were associated significantly with all outcomes. Greater number of comorbidities was associated with depression, summed symptom severity index, and the number of symptoms—but not anxiety. Accounting for other factors, income-meeting needs was associated with the summed severity index but not with other symptom outcomes. Whereas living in a residential area with less than 100,000 people compared to living in areas with greater than 100,000 people was associated with lower depression, anxiety, and number of symptoms, it was not associated with lower summed severity index. Among Hispanic survivors, acculturation was not related to the symptom measures over and above other factors.

Discussion

These analyses determined the associations between symptom burden in cancer survivors and race/ethnicity, in addition to other important social determinants of health. The most consequential associations were age, income, social isolation, and population residence. These variables were associated significantly with the number of symptoms, symptom severity, depression, and anxiety. This finding is consistent with the literature (Reidl & Schübler, 2022) about younger cancer survivors having more symptom burden.

Although symptoms, including depression, are sometimes thought of as ailments experienced by the elderly, in this sample, younger participants evidenced greater symptom burden. Both the Hispanic and non-Hispanic of other races participants were younger than the non-Hispanic White survivor participants, and we accounted for both age and race/ethnicity in the multivariable models. One potential explanation for the higher symptom burden with younger age could be the more aggressive cancers and treatments administered to younger people. Typically, minority cancer survivors are diagnosed at later stages, needing more aggressive treatments (ACSCAN, 2020). It is also possible that younger cancer survivors may be under greater stress due to competing demands with managing jobs and childcare during treatment, which could, in turn, exacerbate the symptoms that they experience. A symptom such as anxiety could be especially problematic for people in a context that is unlikely to have a parallel among much older survivors who are perhaps retired or have grown adult children not living in the home.

At a more general level, these findings support the social disadvantage perspective for understanding the social determinants of health in these cancer survivors (Flaskerud & DeLilly, 2012). The results of this investigation provide some insight as to why Hispanic cancer survivors are in a disadvantaged context. Relative to other groups, they are underrepresented in the category of survivors who indicate that their income meets their needs and in the category of survivors with health insurance; they are overrepresented in the category of survivors with lower levels of education (a high school education or less). These factors likely explain, at least in part, why Hispanic cancer survivors reported greater symptom severity than their non-Hispanic White counterparts. This might suggest that among racial/ethnic minorities who experience similar number of symptoms (see Table 3), severity is not as well-managed as for non-Hispanic Whites. One plausible explanation might be that younger people—an ethnic minority with less income and education—often also have less insurance and access to care. These findings are consistent with the literature that 1 in 4 Hispanic adults do not have a usual source of health care (ACSCAN, 2020).

Additional social determinants of health beyond age and ethnicity measured in this investigation emerged as significantly associated with number of symptoms, symptom severity, depression, or anxiety. These included social isolation, lower income, and residing in a more populated community. Social isolation has devastating consequences for health and well-being (Hawkley & Cacioppo, 2010). In this sample, the more socially isolated survivors reported more burden. Among many other deficiencies, social isolation implies reduced availability of social support that can otherwise be highly beneficial to coping and adjustment. As in other investigations, symptom burden was highest among those whose

incomes least met their needs (Ell et al., 2008; Ilowite et al., 2018). Of all the social determinants of health, income is perhaps the most powerful indicator of access to resources; survivors on the lower end of this spectrum are exceptionally susceptible to high symptom burden and psychological distress. Lack of resources is often cited as the reason for delaying needed health care.

Finally, residential status was associated with more symptoms, greater depression, and greater anxiety, but for those living in more populated communities. This finding supports previous literature (Van der Kruk et al., 2022) about worse outcomes in urban dwellers and conflicts with past evidence that rural cancer survivors experience greater symptom burden and psychological distress compared to their urban-dwelling counterparts (Cahir et al., 2017). Most urban-dwelling residents in the present investigation resided in two cities in Arizona with poverty rates 1.5–2 times higher than the poverty rate of the U.S. general population. Accordingly, rural living might not be a proxy for low income in this sample because of the preponderance of low-income survivors regardless of their residential status. More generally, urban–rural disparities may fluctuate by geographic location.

Sex as a social determinant of health was challenging to interpret because the results for sex are inherently comingled with those for certain sites of cancer and treatment types. By far, the greatest number of participants in this sample were females with breast cancer. Still, these findings were consistent with the literature (Reidl & Schūber, 2022) that women typically report higher psychological distress than men. It should also be noted that in this study, men had higher symptom severity overall.

These findings also document more negative outcomes for cancer survivors who are Hispanic and non-Hispanic of other races compared to non-Hispanic Whites. In addition, younger, lower-income, urban, and socially isolated cancer survivors often had significantly worse symptom burdens than their counterparts on the other end of these spectrums. In the case of social isolation, these disparities were strong and ubiquitous across all outcomes. Consistent with the social disadvantage perspective, most of these social determinants of health reflect lack of resources and access associated with unfavorable symptom burden in cancer survivors.

The results of this investigation confirm that many of the traditional social determinants of health—such as race and income—play an essential role in symptom distress and burden during cancer treatment. A more unique aspect of these findings is the documentation of social isolation and age as equally important social determinants of health in quality of life during cancer treatment. Although social isolation is related to various health problems, its association with symptom distress during cancer treatment has rarely been the source of research attention. Age is often considered a social determinant of health that is positively associated with disease risk. Although altered biology, cumulative exposure to pathogenic environmental influences, and long-term wear and tear underwrite many age-related risks to health, in this study, it was the younger participants who appeared to experience greatest complications. This may be explained by the social disadvantage perspective on social determinants of health. It was the younger participants, who were mostly in their 30s and 40s, who uniformly experienced worse symptom profiles and had greater social isolation and

less income than their older counterparts. It could be argued that these younger participants had less access to resources that would help them minimize the aversive consequences of cancer treatment.

Limitations and Strengths

A limitation of this study was the cross-sectional nature of the analysis, in addition to the smaller sample size of those who live in rural areas or were non-Hispanic of other races and insufficient male and female participants with same cancer to allow for comparisons. The racial and ethnic composition of the sample was reflective of the population served by participating cancer centers. Compared to the U.S. population, our sample had a somewhat lower percentage of non-Hispanic Whites, a higher percent of Hispanics, and close but lower percentage of non-Hispanic participants of races other than White. The analysis results reflect associations and leave questions about the direction of causality unanswered. However, it is worth noting that many of the social determinants of health examined in this investigation (e.g., race, sex, age, health insurance coverage) could not plausibly cause symptoms and symptom burden outcomes that were assessed. Also, we did not use an instrument specifically designed to measure multiple aspects of social determinants of health. Though, a strength was the diversity of the sample in terms of ethnicity/race, the inclusion of many survivors with low incomes, and the inclusion of survivors with a range of different types of cancer.

Conclusion

Important social determinants of health, such as age, income, social isolation, and population residence beyond ethnicity or race, were associated with these symptom outcomes. Future research needs to explore these associations over time to determine the most salient factors influencing health outcomes, including which factors are amenable to interventions. Given the strong relationship between social isolation and symptom burden, interventions targeting social isolation during cancer treatment may be particularly fruitful. Knowledge of these factors enables nurses and other clinicians to further explore these factors to appropriately refer survivors to supportive care services and ensure that survivors can access quality cancer care. In clinical settings, these social determinants of health could provide valuable guidance for treatment plans designed to ameliorate insults to quality of life, such as lacking health care access that often accompanies cancer diagnosis and treatment.

Acknowledgments

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Table 1

Characteristics of Survivors

Characteristic	Survivors, N = 400 Mean (*SD*) or *n* (%)
Age	59.87 (12.71)
Number of comorbid conditions	5.00 (2.58)
Gender	
Male	87 (22%)
Female	313 (78%)
Ethnicity	
Hispanic	168(42%)
Not Hispanic	231 (59%)
Unknown	1 (<1%)
Race	
American Indian or Alaska native	17 (4%)
Asian	4 (1%)
Black or African American	9 (2%)
Native Hawaiian or Pacific Islander	2 (<1%)
White	228 (57%)
More than one race	20 (5%)
Did not respond	120 (30%)
Marital status	
Married/Living with a partner	234 (59%)
Divorced	81 (20%)
Single/never married	53 (13%)
Widowed	32 (8%)
Level of education	
Less than high school	67 (17%)
High school	87 (22%)
Vocational school/some college	105 (27%)
4-year college	85 (21%)
Graduate/professional degree	55 (14%)
Income [*]	
$100,000 or more	44 (12%)
$70,000–$99,999	45 (12%)
$40,000–$69,999	68 (19%)
$10,000–$39,999	140 (38%)
Under $10,000	69 (19%)
Income meets needs [*]	
Not at all	38 (10%)

Characteristic	Survivors, N = 400 Mean (*SD*) or *n* (%)
Barely	181 (47%)
Meets needs	164 (43%)
Employment	
Unemployed	54 (14%)
Part time	20 (5%)
Full time	53 (14%)
Retired	139 (35%)
Disabled	74 (19%)
Student/homemaker	44 (11%)
On sick leave	14 (4%)
Health insurance coverage	
Yes	363 (91%)
No	37 (9%)
Population of residence [*]	
Over 1,000,000 people	42 (11%)
500,000–999,999 people	236 (60%)
100,000–499,999 people	10 (3%)
50,000–99,999 people	24 (6%)
25,000–49,999 people	26 (7%)
< 25,000 people	55 (14%)
Type of health insurance (not mutually exclusive)	
Current employer	61 (15%)
Former employer (COBRA)	22 (6%)
Medicare	158 (40%)
Medicaid	71 (18%)
Retiree insurance	11 (3%)
Purchased policy not related to employment	38 (10%)
Military (Tricare or VA)	19 (5%)
Other government	61 (15%)
Site of cancer	
Bladder	6 (2%)
Breast	201 (50%)
Colorectal	30 (8%)
Cervical	4 (1%)
GI	25 (6%)
Head and neck	5 (1%)
Kidney	5 (1%)
Liver	8 (2%)
Lung	30 (8%)

Characteristic	Survivors, N = 400 Mean (*SD*) or *n* (%)
Lymphoma or myeloma	12 (3%)
Melanoma	6 (2%)
Ovarian	14 (4%)
Pancreatic	16 (4%)
Prostate	10 (3%)
Uterine	8 (2%)
Other	19 (5%)
Recurrent cancer [*]	
Yes	100 (26%)
No	292 (74%)
Metastatic cancer [*]	
Yes	172 (44%)
No	220 (56%)

Note.

[*] Some data are missing;

SD = standard deviation

Table 2

Demographic and Clinical Characteristics and Social Determinants of Health by Race/Ethnicity

Characteristic	Hispanic, *n* = 168 Mean (*SD*) or *n* (%)	Non-Hispanic White, *n* = 191 Mean (*SD*) or *n* (%)	Non-Hispanic other races, *n* = 41 Mean (*SD*) or *n* (%)	*p*
Age	56.35 (12.47)	63.75 (12.00)	56.17 (11.86)	<.01
Number of comorbid conditions	4.55 (2.52)	5.44 (2.57)	4.78 (2.55)	<.01
PROMIS social isolation	42.93 (9.45)	43.04 (8.42)	49.08 (10.48)	<.01
Gender				
Male	34 (20%)	45 (24%)	8 (20%)	.70
Female	134 (80%)	146 (76%)	33 (80%)	
Marital status				
Married	96 (57%)	118 (62%)	21 (51%)	.37
Not married	77 (43%)	73 (38%)	20 (49%)	
Income meets needs				<.01
Not at all	18 (12%)	15 (8%)	5 (12%)	
Barely	106 (69%)	58 (31%)	17 (41%)	
Meets needs	30 (19%)	115 (61%)	19 (46%)	
Level of education				<.01
High school or less	107 (64%)	34 (18%)	13 (32%)	
At least some college	61 (36%)	156 (82%)	28 (68%)	
Population of residence				.21
< 100,000 people	41 (25%)	57 (30%)	7 (18%)	
100,000 or more people	123 (75%)	132 (70%)	33 (83%)	
Health insurance coverage				<.01
Yes	133 (79%)	190 (99%)	40 (98%)	
No	35 (21%)	1 (1%)	1 (2%)	
Cancer and treatment				.66
Female breast hormonal therapy	30 (18%)	41 (22%)	10 (24%)	
Female breast chemotherapy/other targeted therapy	53 (32%)	52 (27%)	12 (29%)	
Female colorectal/GI	17 (10%)	10 (5%)	4 (10%)	
Male colorectal/GI	9 (5%)	11 (6%)	4 (10%)	
Female other	33 (20%)	42 (22%)	7 (17%)	
Male other	25 (15%)	34 (18%)	4 (10%)	
Metastatic cancer				.02
Yes	61 (37%)	96 (51%)	15 (39%)	
No	105 (63%)	92 (49%)	23 (61%)	

Note.

Table 3

Symptom Burden Overall and by Race/Ethnicity

Symptom Burden	Entire sample N = 400		Hispanic, n = 168	Non-Hispanic White, n = 191	Non-Hispanic other races, n = 41	p
	Mean (SD)	Prevalence N (%)	Mean (SD)	Mean (SD)	Mean (SD)	
Depressive symptoms[a]	16.89 (11.58)	N/A	17.88 (12.55)	15.27 (10.29)	20.42 (12.18)	.01
Anxiety[b]	53.27 (10.48)	N/A	53.95 (11.09)	52.18 (9.69)	55.62 (11.14)	.09
Summed symptom severity index[c]	41.11 (24.55)	N/A	43.67 (26.29)	36.20 (20.44)	53.83 (29.15)	<.01
Number of symptoms[d]	9.73 (3.73)	N/A	9.75 (3.95)	9.39 (3.42)	11.30 (3.89)	.01
Fatigue[e]	4.91 (2.95)	358 (90%)	4.61 (3.17)	4.96 (2.76)	5.90 (2.68)	.04
Pain	3.92 (3.31)	296 (74%)	4.23 (3.43)	3.14 (3.09)	5.45 (3.17)	<.01
Sleep difficulties	4.39 (3.22)	322 (81%)	4.64 (3.38)	3.95 (3.08)	5.48 (2.93)	<.01
Headache	2.08 (2.69)	204 (51%)	2.50 (2.82)	1.58 (2.38)	2.75 (3.15)	<.01
Difficulty concentrating	3.44 (2.97)	297 (75%)	3.53 (3.24)	3.19 (2.71)	4.25 (2.97)	.11
Lack of appetite	2.40 (2.95)	208 (52%)	2.50 (3.00)	2.08 (2.79)	3.53 (3.22)	.02
Nausea	2.01 (2.88)	184 (46%)	2.56 (3.16)	1.30 (2.22)	3.03 (3.61)	<.01
Vomiting	0.72 (2.07)	67 (17%)	1.07 (2.37)	0.25 (1.15)	1.48 (3.32)	<.01
Constipation	2.35 (3.14)	195 (49%)	3.18 (3.53)	1.49 (2.43)	2.98 (3.39)	<.01
Diarrhea	1.43 (2.53)	142 (36%)	1.11 (2.36)	1.68 (2.64)	1.60 (2.62)	.09
Numbness or tingling	3.27 (3.27)	254 (64%)	3.68 (3.34)	2.77 (3.16)	3.93 (3.27)	.01
Swelling	1.93 (2.87)	164 (41%)	1.90 (2.84)	1.80 (2.80)	2.73 (3.21)	.17
Weakness	3.57 (3.14)	288 (72%)	3.65 (3.24)	3.24 (2.98)	4.80 (3.17)	.01
Shortness of breath	1.85 (2.73)	178 (45%)	1.68 (2.56)	1.82 (2.72)	2.68 (3.78)	.12
Cough	1.47 (2.52)	151 (38%)	1.50 (2.46)	1.47 (2.61)	1.38 (2.40)	.96
Depression	2.87 (3.07)	257 (65%)	2.95 (3.23)	2.60 (2.80)	3.88 (3.40)	.05
Anxiety	3.89 (3.11)	309 (78%)	3.87 (3.36)	3.82 (2.95)	4.35 (2.89)	.62

Note.

[a] Center for Epidemiological-Depression scale (CES-D)-potential range 0–60, higher score = worse depression;

[b] Anxiety Patient Reported Outcomes Measurement Information System (PROMIS)-T scores range 43.2–83.1, higher score = more anxiety;

[c] Summed symptom severity-potential range 0–150, without depression and anxiety, higher score = greater severity;

[d] number of symptoms-potential range 0–17, includes depression and anxiety, higher score = more symptoms;

[e] All symptoms (Fatigue-Anxiety) scored on 0–10 scale-higher score=more distressing/severe the symptom

Table 4

Multivariable Models for Symptom Outcomes

Outcome	Number of symptoms[a] $R^2 = .30$		Symptom severity index[b] $R^2 = .38$		Depressive symptoms[c] $R^2 = .47$		Anxiety[d] $R^2 = .32$	
Predictor	**Coefficient (SE)**	**p**	**Coefficient (SE)**	**p**	**Coefficient (SE)**	**p**	**Coefficient (SE)**	**p**
Age	−0.06 (0.02)	<.01	−0.32 (0.10)	<.01	−0.11 (0.04)	.01	−0.08 (0.04)	.04
Number of comorbid conditions	0.56 (0.07)	<.01	3.68 (0.45)	<.01	0.83 (0.20)	<.01	0.23 (0.20)	.25
Social isolation	0.11 (0.02)	<.01	0.79 (0.12)	<.01	0.72 (0.05)	<.01	0.55 (0.05)	<.01
Race/Ethnicity								
Hispanic	0.17 (0.43)	.69	5.41 (2.70)	.04	1.53 (1.17)	.19	0.23 (1.20)	.85
Non-Hispanic other races	0.77 (0.60)	.20	9.46 (3.79)	<.01	0.00 (1.63)	.99	−0.73 (1.66)	.67
Non-Hispanic White	Ref.		Ref.		Ref.		Ref.	
Income meets needs								
Meets	−0.31 (0.64)	.63	−11.52 (4.04)	<.01	−2.91 (1.76)	.10	0.17 (1.80)	.92
Barely	−0.09 (0.64)	.88	−6.25 (3.77)	<.01	−1.38 (1.64)	.40	1.43 (1.69)	.40
Not all	Ref.	-	Ref.	-	Ref.	-	Ref.	-
Level of education								
More than high school	−0.59 (0.40)	.14	−2.23 (2.48)	.37	−0.85 (1.08)	.43	−0.25 (1.10)	.82
High school or less	Ref.		Ref.		Ref.		Ref.	
Marital status								
Not married	−0.25 (0.36)	.49	1.47 (2.28)	.52	0.87 (0.99)	.38	−0.70 (1.01)	.49
Married	Ref.		Ref.		Ref.		Ref.	
Population of residence								
<100,000 people	−0.83 (0.39)	.04	−3.79 (2.47)	.13	−3.10 (1.07)	<.01	−2.70 (1.11)	.02
100,000 or more	Ref.		Ref.		Ref.		Ref.	
Cancer and treatment								
Female breast chemotherapy/other targeted therapy			5.81 (3.05)	.06	0.83 (1.32)	.53	0.11 (1.36)	.93
Female colorectal/GI	0.27 (0.70)	.69	6.20 (4.38)	.16	−0.46 (1.91)	.81	−0.85 (1.96)	.66
Male colorectal/GI	2.72 (0.80)	<.01	13.96 (5.06)	<.01	0.72 (2.20)	.74	−0.89 (2.25)	.69
Female other	0.45 (0.54)	.40	9.83 (3.36)	<.01	1.40 (1.46)	.34	−0.81 (1.49)	.58
Male other	1.22 (0.58)	.03	10.36 (3.61)	<.01	0.61 (1.56)	.70	−2.02 (1.60)	.21
Female breast hormonal therapy	Ref.		Ref.	-	Ref.		Ref.	
Metastatic cancer								
Yes	0.45 (0.34)	.19	2.14 (2.15)	.32	1.34 (0.94)	.15	0.96 (0.49)	.63
No	Ref.		Ref.		Ref.		Ref.	

Note.

[a] Number of symptoms-potential range 0–17, includes depression and anxiety, higher score = more symptoms;

[b]Summed symptom severity-potential range 0–150, without depression and anxiety, higher score = greater severity;

[c]Center for Epidemiological-Depression scale (CES-D)-potential range 0–60, higher score = worse depression;

[d]Anxiety Patient Reported Outcomes Measurement Information System (PROMIS)-T scores range 43.2–83.1, higher score = more anxiety