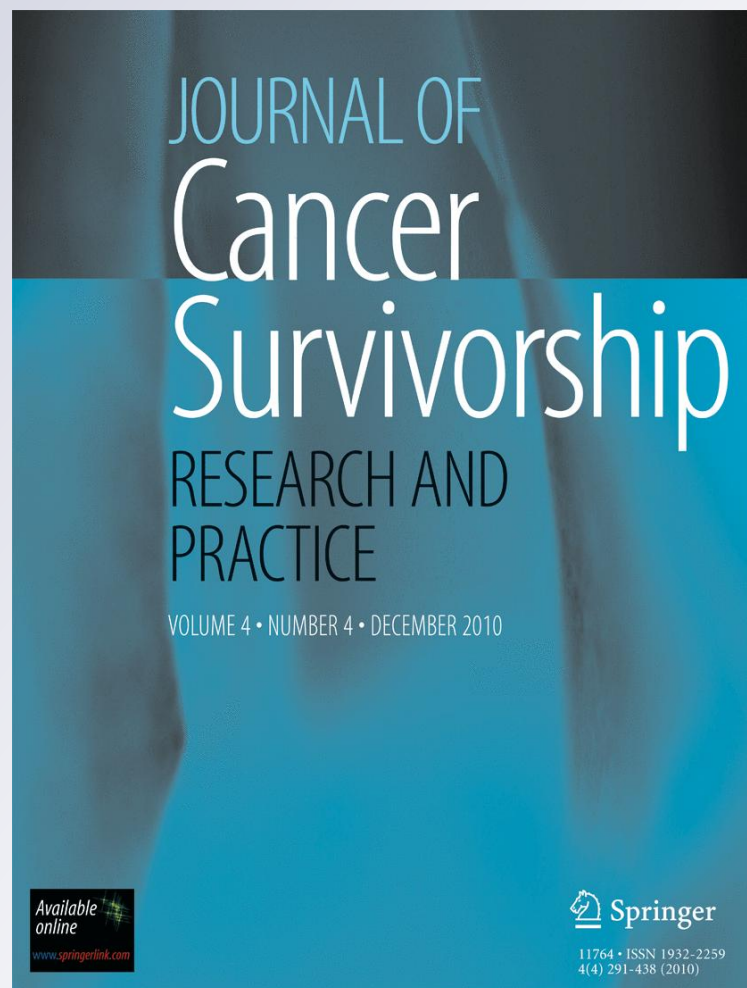


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Toward a cancer-specific model of psychological distress: population data from the 2003–2005 National Health Interview Surveys

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Abstract

Introduction Population-based estimates of emotional distress in cancer survivors are lacking, and little is known about specific correlates of clinically meaningful distress.

Methods Combined 2003–2005 National Health Interview Surveys (NHIS) data were analyzed to evaluate differences in non-somatic distress (measured using the Kessler 6) for those with a history of cancer, those with other chronic health conditions, and healthy adults.

Results The prevalence of clinically meaningful distress was higher in cancer survivors (5.7%) than those with other health conditions (4.3%) or healthy adults (0.7%). In multivariate models, the strongest correlates of serious distress were younger age, lower educational attainment, lack of health insurance coverage, being unmarried, and having pain, fair/poor health status, or other comorbid conditions. While predictors of distress overlapped considerably between those with cancer and other chronic health conditions, having a history of cancer significantly magnified the effects of age, number of children and elders in the household, and access to health insurance on distress.

Discussions/Conclusions The impact of psychological distress is more severe in those with cancer than those living with other chronic health conditions. Those at greatest risk appear to be those with fewer resources to manage their illness.

Implications for cancer survivors Identifying and understanding correlates of clinically meaningful distress may

improve efforts to prevent, identify, and treat significant distress in cancer survivors.

Keywords Distress · Cancer · Survivorship · Health disparities

Introduction

There are more than 11 million cancer survivors currently living in the United States [1]. Distress is one of the most common complaints in cancer survivors and has been found to be associated with a number of adverse outcomes [2–4], including lower quality of life [5, 6], poor adherence to physician recommendations [7–9], and increased morbidity and mortality [10–12]. Previously-identified correlates of distress in cancer survivors (i.e., younger age, unmarried, less than a high school education, uninsured, greater number of comorbidities [13]) are also correlates of distress in the healthy adult population. Understanding whether and how correlates of distress differ between cancer survivors and relevant comparison groups are important next steps for developing more specific models of distress in cancer survivors. Identifying the unique correlates of distress in cancer survivors could also be used to inform prevention, screening, and treatment strategies.

In the general population, higher prevalence of distress and other psychological symptoms has been linked with the presence of a chronic medical condition [14–19], being female [20, 21], lacking health insurance coverage [22], having lower educational attainment, being divorced or never married [23], and having comorbid medical problems [22, 23]. Several studies have also documented that the prevalence of psychological symp-

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toms in the general population decreases with increasing age [24–29].

Few studies have attempted to identify whether risk factors or correlates of distress differ between those with chronic health conditions, such as cancer, and the general population. Hoffman et al. [13] identified a higher prevalence of distress in cancer survivors but did not evaluate risk factors for distress across groups. In other medical conditions, some studies have suggested unique correlates of distress relative to those without such medical conditions [30]. However, some have also suggested that the correlates of psychological distress are similar in those with and without a chronic medical condition [31].

With the exception of Hoffman et al. [13], studies evaluating the prevalence and correlates of distress in cancer survivors have nearly all been derived from small samples [32, 33], within single institutions [34, 35], used convenience sampling [36, 37], or evaluated distress only within a single cancer type, commonly breast cancer [38, 39]. Few studies have looked at distress as a function of cancer type. In a study of over 4,400 patients at Johns Hopkins University, Zabora et al. [34] found that patients with cancers of the lung or brain exhibited the highest levels of distress. However, population data has not yet been used to evaluate distress across cancer types. Moreover, the literature has not yet evaluated likely correlates of distress that would be particularly salient for cancer survivors, including cancer type, health status, pain, and time since diagnosis.

It is not known whether correlates of distress in cancer survivors differ from those identified among healthy adults or those with other chronic medical conditions. Given the scarcity of resources available for quality of life issues faced by cancer survivors [40], having condition-specific models of distress would be useful for making sure that prevention, screening, and treatment efforts are targeted to those most likely to benefit. If correlates of distress are similar across groups, this finding would suggest possible common pathways between health and distress, and efforts to address distress in the general population may be generalizable to those with cancer and other chronic health conditions. However, if correlates differ across groups, identification of a cancer-specific model of distress could better inform the development and delivery of cancer-specific strategies. The primary aim of the current study was to identify the degree of specificity of correlates of distress in cancer survivors by comparing cancer survivors to healthy adults and those with other chronic medical conditions. To accomplish this aim, unadjusted and covariate-adjusted analyses were conducted to evaluate whether predictors of distress in cancer survivors are general (i.e., common to those with other chronic health conditions) or cancer-specific.

Methods

Procedure

The 2003 to 2005 National Health Interview Surveys were administered by trained interviewers using computer-assisted personal interviewing. Households were selected for inclusion using a stratified sampling design to obtain a representative sample of the U.S. population [41]. The sampling design oversampled minority adults and used a state-level stratification system that included 358 primary sampling units. For each identified household, one adult was randomly selected to complete the Sample Adult questionnaire, which contained the measures described below. Overall response rates were quite high: 74.2% in 2003, 72.5% in 2004 and 69.0% in 2005 [41].

Measures

Demographic and household variables included age, gender, education level, ethnicity, marital status, number of family members in the immediate family, number of kids under the age of 18 in the family, and number of elders over the age of 65 in the family. Current health status was measured with a single item asking respondents to describe their health as “excellent,” “very good,” “good,” “fair,” or “poor” [42]. Item responses were categorized as excellent/very good, good, and fair/poor prior for analysis.

Chronic health conditions were assessed by asking, “Have you ever been told by a doctor or other health professional that you had...” one of the following health conditions: hypertension, asthma, chronic pain, arthritis, liver disease, kidney disease, emphysema, cardiac disease, or diabetes. From this information, comorbidities were quantified using the Charlson Comorbidity Index [43]. Charlson Comorbidity Index scores have been associated with mortality and other important health outcomes and have also been used in previous NHIS analyses [44].

Cancer survivors included respondents who indicated that they had previously been told by a doctor or other health professional that they had cancer or “a malignancy of any kind.” Time since diagnosis was calculated as the difference between current age and age when cancer was diagnosed (or most recent cancer diagnosis for those reporting multiple cancers). Cancer types were condensed into ten categories based on SEER reporting standards, including a category for multiple cancers. Those with unspecified skin cancer or non-melanoma skin cancer were placed in the healthy group, as these types of cancer are considered to be acute, rather than chronic, health conditions.

Non-specific psychological distress was measured with the Kessler-6 (K6). The K6 has been used to identify psychological distress in population surveys conducted in

over 30 countries and is the primary distress measure for NHIS [45] and the Medical Expenditure Panel Survey [46]. It has consistent psychometric properties across major socio-demographic subsamples and has been validated as a screening tool for clinically significant psychological distress [47–49]. The measure asks respondents about six non-somatic distress symptoms: “During the past 30 days, how often did you feel (a) so sad nothing could cheer you up? (b) Nervous? (c) Restless or fidgety? (d) Hopeless? (e) That everything was an effort? And (f) worthless?” Possible responses were “All of the time,” “Most of the time,” “Some of the time,” “A little of the time,” and “None of the time.” Scoring was based on a 5-point Likert scale, and item scores were summed to generate a total symptom score. Internal consistency of the 6 items was good (Cronbach’s $\alpha=0.88$). Total scores equal to or greater than 13 were thought to be indicative of clinically significant distress, using a previously established cutpoint [49, 50]. This cut-point strongly discriminates between community cases and non-cases of DSM-IV/SCID disorders [51]. The K6 is particularly useful for measuring emotional distress symptoms in cancer survivors and those with other chronic health conditions because it does not assess somatic symptoms (e.g., changes in appetite, fatigue, insomnia, weight fluctuation) that overlap with direct effects of a medical condition or treatment [50]. Additionally, having a measure of psychological distress that can a) readily be linked with economic, utilization, and/or mortality data (e.g., [52]) and b) can be compared with other populations (e.g., [53–55]) is clearly of interest for future studies in cancer survivors.

Participants

The interviewed sample for the combined years 2003 through 2005 consisted of 111,009 households, yielding 285,257 persons in 113,323 families [41]. Responses from 93,606 adults were available for analysis. Three groups of sample adults were compared: cancer survivors, those with other chronic health conditions, and healthy adults.

Five thousand one hundred fifty respondents were cancer survivors. Of these, 4,698 (91.5%) reported a single cancer type, and 452 reported having 2 or more cancer types (8.5%). Among those with one primary cancer, cancer types represented were breast (24.4%, $n=1,126$), prostate (13.9%, $n=654$), colon/rectal (9.2%, $n=434$), gynecologic (20.3%, $n=952$), hematologic (5.5%, $n=260$), urinary tract (4.5%, $n=213$), melanoma (7.8%, $n=367$), lung/bronchus (3.7%, $n=176$), and other (10.6%, $n=497$: head/neck, $n=128$, thyroid, $n=102$, stomach, $n=54$, testis, $n=49$, brain, $n=46$, soft tissue, $n=36$, pancreas, $n=27$, liver, $n=25$, bone, $n=23$, and gallbladder, $n=7$). 55,154 reported a history of at least

one non-malignant chronic health condition (i.e., hypertension, asthma, chronic pain, arthritis, liver disease, kidney disease, emphysema, cardiac disease, diabetes), and 33,302 adults reported no history of cancer or other chronic health conditions.

Statistical analyses

All analyses were conducted using SAS 9.1 and employed sample weights to adjust for the sampling design and non-response. Variance estimates were calculated using the Taylor Series Method in SUDAAN [56] in order to account for the stratified multistage sampling design employed in NHIS 2003–2005 [57]. Subpopulations were specified as necessary to ensure that variance estimates were derived from the complete sample (i.e., cancer survivors, those with other chronic health conditions, and healthy adults).

We first compared demographic characteristics of the three groups. Differences in distress across the groups were then adjusted for any demographic and other significant between-group differences (specifically, age, gender, ethnicity, marital status, education, health insurance coverage, and comorbidities). Fourteen linear regression models were then used to identify univariate predictors of depression in cancer survivors. Bonferroni-corrected alpha was set to 0.0036 to minimize type I error rate. To facilitate interpretation of significant univariate effects, logistic regression analyses were used to generate odds ratios for significant mental illness ($K6>13$). To identify the most salient correlates of distress in cancer survivors, all significant univariate predictors were then included in a multivariate regression model predicting mood symptoms. All models used the continuously-distributed total score from the Kessler 6 scale, and odds ratios (i.e., odds of having clinically significant distress) have been provided for ease of clinical interpretation.

Finally, in order to evaluate whether predictors of depression were different in cancer survivors than in either healthy adults or those living with other chronic health conditions, we evaluated interaction effects between each significant predictor and group (cancer, other chronic condition, healthy) on depression symptoms. All continuous variables were centered prior to creation of interaction terms [58]. Bonferroni-corrected alpha was set to 0.005 to control for the number of interaction effects that were evaluated. Significant interaction effects were further interpreted by decomposing the interaction into 2 planned contrasts: 1) healthy adults contrasted with those living with any chronic health condition (i.e., collapsing cancer survivors and those with other chronic conditions into a single group) and 2) cancer survivors contrasted with those with other chronic conditions.

Results

Participants

Characteristics of the three diagnostic groups are presented in Table 1. Most participants were married and had at least some college education. Cancer survivors, relative to those with other chronic conditions and healthy participants, were significantly older (\bar{x} =62.8 years), more likely to be non-Hispanic White (86.2%), and more likely to be covered by health insurance (93.4%). The sample was largely representative of the population of cancer survivors in the United States, as estimated by SEER data, although there may have been under-sampling of prostate cancer survivors (13.9% in our sample vs. 19% in SEER) and oversampling of gynecologic cancer survivors (20.3% in our sample vs. 9% in SEER). Average time since diagnosis for cancer survivors was 10.8 years (sd =11.2, range=0 to 81.4 years).

The distribution of cancer types in the 2003, 2004, 2005 NHIS data mirrors that previously reported for 1998, 1999, and 2000 NHIS data [59].

Distress across diagnosis groups

Unadjusted comparisons revealed that cancer survivors reported significantly higher levels of distress (\bar{x} =3.21, 95% CI=3.05–3.37) than either those with other chronic health conditions (\bar{x} =2.94, 95% CI=2.89–2.99; p <0.001) or healthy participants (\bar{x} =1.21, 95% CI=1.17–1.26; p <0.0001). Differences in distress between cancer survivors (\bar{x} =3.21) and the general population (\bar{x} =2.27; including healthy adults and those with other chronic health conditions) were also significant, $F(1,339)=137.6$, p <.0001. Using Kessler-6 cut-off scores, a significantly higher proportion of cancer survivors (5.7%) exhibited clinically significant distress than those with other chronic health conditions

Table 1 Demographic and health status characteristics of cancer survivors, those with other chronic conditions, and healthy participants

	Cancer survivors <i>n</i> =5,150 (95% CI)	Those with other chronic conditions <i>n</i> =55,154 (95% CI)	Healthy participants <i>n</i> =33,302 (95% CI)
Age (<i>x</i> years)	62.8 (62.2–63.4) ^{bc}	49.0 (48.8–49.3) ^{ac}	38.7 (38.4–38.9) ^{ab}
Sex			
Male (%)	39.0 (37.4–40.6) ^{bc}	45.4 (45.0–45.9) ^{ac}	53.6 (52.9–54.2) ^{ab}
Female (%)	61.0 (59.4–62.6) ^{bc}	54.1 (55.0–61.0) ^{ac}	46.4 (45.8–47.1) ^{ab}
Race/ethnicity			
Hispanic (%)	4.8 (4.3–5.4) ^{bc}	10.3 (9.9–10.8) ^{ac}	17.0 (16.3–17.8) ^{ab}
Non-Hispanic White (%)	86.2 (85.1–87.2) ^{bc}	74.7 (73.9–75.4) ^{ac}	65.2 (64.2–66.1) ^{ab}
Non-Hispanic Black (%)	6.9 (6.1–7.8) ^{bc}	11.4 (10.8–12.0) ^a	11.8 (11.1–12.5) ^a
Non-Hispanic other (%)	2.0 (1.7–2.5) ^{bc}	3.6 (3.4–3.9) ^{ac}	6.0 (5.6–6.5) ^{ab}
Marital status			
Separated	2.0 (1.6–2.4)	2.4 (2.3–2.5) ^c	2.0 (1.8–2.1) ^b
Divorced	12.1 (11.3–13.0) ^c	11.5 (11.2–11.8) ^c	8.2 (7.9–8.5) ^{ab}
Married	59.7 (58.2–61.2) ^c	58.7 (58.0–59.3) ^c	55.3 (54.5–56.1) ^{ab}
Single/never married	8.1 (7.3–9.1) ^{bc}	18.9 (18.4–19.4) ^{ac}	31.4 (30.6–32.2) ^{ab}
Widowed	17.8 (16.8–18.9) ^{bc}	8.2 (8.0–8.5) ^{ac}	2.4 (2.2–2.5) ^{ab}
Unknown	0.3 (0.2–0.5)	0.4 (0.4–0.5)	0.8 (0.7–1.0)
Education			
Less than high school	18.9 (17.6–20.1) ^c	17.4 (16.8–17.9) ^c	15.1 (14.5–15.7) ^{ab}
At least some high school	30.7 (29.2–32.3)	30.3 (29.7–30.8) ^c	28.1 (27.4–28.8) ^b
At least some college	50.4 (48.7–52.1) ^c	52.4 (51.6–53.1) ^c	56.8 (55.9–57.7) ^{ab}
Health insurance			
Covered	93.4 (92.6–94.1) ^{bc}	85.7 (85.3–86.0) ^{ac}	78.8 (78.1–79.4) ^{ab}
Not covered	6.6 (5.9–7.4) ^{bc}	14.3 (14.0–14.7) ^{ac}	21.3 (20.6–21.9) ^{ab}
Distress	3.2 (3.1–3.4) ^{bc}	2.9 (2.9–3.0) ^{ac}	1.2 (1.2–1.3) ^{ab}
% with clinically significant distress	5.7 (4.9–6.5) ^c	4.3 (4.1–4.5) ^c	0.7 (0.6–0.8) ^{ab}

CI confidence interval

^a Denotes significant pairwise difference from cancer survivors at p <0.001

^b Denotes significant pairwise difference from those with chronic conditions at p <0.001

^c Denotes significant pairwise difference from healthy participants at p <0.001

Table 2 Social and demographic correlates of distress in cancer survivors, those with other chronic conditions, and healthy adults

	Cancer survivors		Other chronic conditions		Healthy adults	
	β (95% CI)	OR ^a (95% CI)	β (95% CI)	OR ^a (95% CI)	β (95% CI)	OR ^a (95% CI)
Age (in decades)	-.49* (-.39, -.60)	.75 (.69–.82)	-.23* (-.21, -.25)	.91 (.89, .94)	-.12* (-.10, -.15)	.86 (.77, .96)
Gender						
Female		Reference		Reference		Reference
Male	-.84* (-.54, -1.15)	.70 (.53–.92)	-.68* (-.60, -.76)	.64 (.58, .70)	-.23* (-.16, -.29)	.70 (.53, .94)
Education						
> high school		Reference		Reference		Reference
< high school	2.11* (1.63, 2.60)	3.34 (2.39–4.66)	1.46* (1.32, 1.59)	3.07 (2.76, 3.42)	.29* (.18, .40)	2.97 (2.08, 4.25)
High school	.73* (.39, 1.06)	1.51 (1.09–2.09)	0.42* (.32, .51)	1.61 (1.43, 1.81)	.04 (-.04, .12)	1.72 (1.18, 2.51)
Ethnicity						
White		Reference		Reference		Reference
Hispanic	1.55* (.85, 2.25)	2.02 (1.35–3.01)	.57* (.43, .70)	1.49 (1.32, 1.68)	-.11 (-.02, -.19)	1.25 (.89, 1.76)
Black	.62 (.10, 1.13)	1.56 (1.07–2.28)	.27* (.12, .42)	1.26 (1.09, 1.45)	.06 (-.04, .16)	1.18 (.79, 1.75)
Other	.64 (-.31, 1.59)	1.46 (.70–3.03)	.01 (-.24, .25)	.89 (.68, 1.17)	.01 (-.15, .17)	1.41 (.71, 2.78)
Marital status						
Married		Reference		Reference		Reference
Separated	3.50* (2.10, 4.89)	5.25 (2.85–9.68)	2.43* (2.13, 2.73)	4.09 (3.43, 4.88)	.89* (.66, 1.13)	4.60 (2.57, 8.23)
Divorced	1.90* (1.35, 2.45)	2.79 (1.92–4.07)	1.16* (1.04, 1.29)	2.31 (2.05, 2.60)	.46* (.34, .57)	2.29 (1.51, 3.47)
Single	1.50* (.97, 2.04)	2.64 (1.81–3.87)	1.15* (1.03, 1.26)	1.74 (1.53, 1.98)	.48* (.39, .56)	2.17 (1.51, 3.11)
Widowed	.54 (.20, .88)	1.38 (.96–1.99)	.50* (.35, .64)	1.41 (1.19, 1.67)	.23 (.05, .40)	1.87 (.84, 4.15)
Family size (# individuals)	.18 (.04, .32)	1.05 (.93–1.18)	-.02 (-.01, .05)	.99 (.95, 1.02)	-.01 (-.03, .01)	.99 (.89, 1.10)
# of elders living with family	-.80* (-.63, -.97)	.55 (.45–.67)	-.46* (-.40, -.52)	.72 (.66, .79)	-.12 (-.05, .20)	.84 (.56, 1.26)
# of children living with family	.45* (.24, .65)	1.19 (1.03–1.37)	.09* (.05, .13)	1.04 (1.00, 1.08)	.01 (-.02, .04)	1.00 (.89, 1.13)

^aOR = Odds Ratio for having a Kessler-6 score greater than or equal to 13, indicating clinically significant distress. *p*-values are based on beta coefficients. Odds ratios are provided for ease of interpretation of significant beta coefficients

**p*<0.001

(4.3%; *p*<0.001) or healthy participants (0.7%; *p*<.0001). Group differences in distress remained significant after adjusting for age, gender, ethnicity, marital status, education, health insurance coverage, and comorbidities, $F(2, 339)=942.7, p<.0001$. After adjustment, distress was higher in cancer survivors ($\bar{x}=3.13$) than those with other chronic health conditions ($\bar{x}=2.82; p<0.0001$) or healthy participants ($\bar{x}=1.50; p<0.0001$).

Sociodemographic and medical correlates of distress

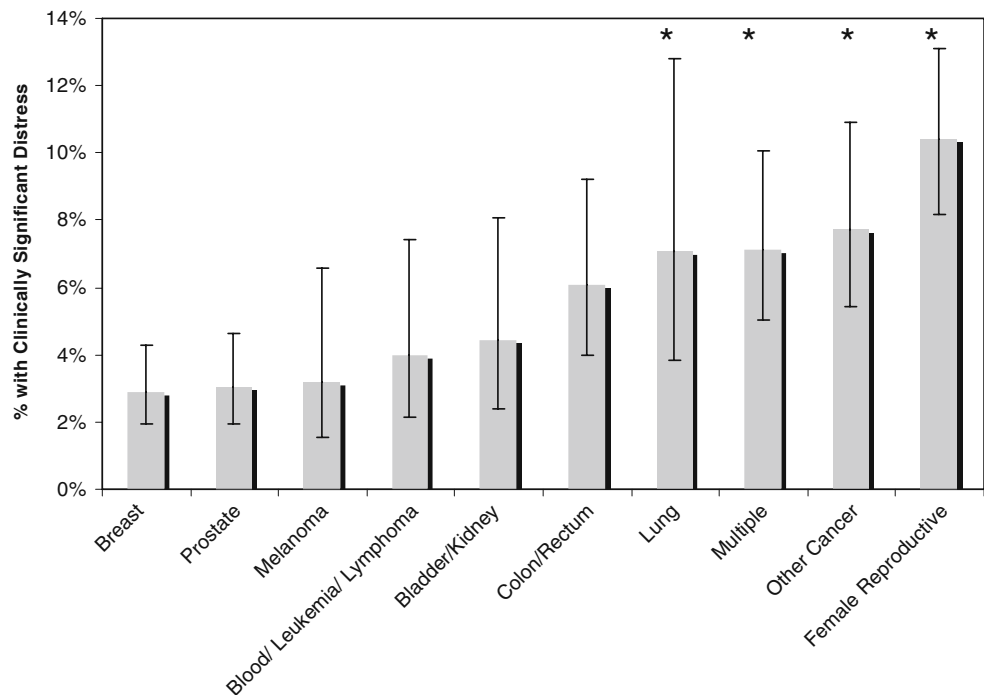
Within each group (cancer survivors, those with other chronic health conditions, and healthy participants), higher distress was associated with a number of shared risk factors: younger age, female gender, having less than a high school education, being unmarried, lacking health insurance coverage, having comorbidities, and having worse health status (all *p*'s<.001, see Tables 1 and 2). Cancer survivors and those with other chronic health

conditions had several additional risk factors for distress, including ethnicity (higher distress in Hispanics and Blacks relative to Whites), having fewer elders living in the house, having children, and having pain (*p*'s<.001). The strength of the association between distress and each risk factor was greater for cancer survivors than those with other chronic health conditions. Cancer type was also significantly associated with distress, with those with female reproductive, lung, multiple primary cancers, or “other” cancers having the greatest risk for distress (see Fig. 1, Table 3).

Do cancer survivors have different determinants of distress than those with other chronic health conditions?

We sought to determine whether predictors of distress in cancer survivors predicted distress differently than in healthy adults or those with other chronic disease conditions. Significant group (cancer, other chronic condition,

Figure 1 Prevalence of clinically significant distress in cancer survivors by cancer type. Note. $\chi^2(9)=80.2, p<.0001$; * = significantly higher than reference group (prostate cancer); Error bars indicate the 95% CI for the population prevalence of clinically significant distress in each cancer type.



Note. $\chi^2(9) = 80.2, p < .0001$; * = significantly higher than reference group (prostate cancer); Error bars indicate the 95% CI for the population prevalence of clinically significant distress in each cancer type.

no chronic conditions) by predictor interactions were observed for age, gender, education, ethnicity, marital status, health insurance coverage, health status, number of elders living in the family, and number of children in the household (all p 's < 0.0001), suggesting that these variables predicted distress differently for the three groups. In each case, the strength of the association with distress was weakest in those with no chronic conditions and strongest in those with cancer or another chronic condition (see Table 4). Omnibus interaction effects were not significant for family size or comorbidities.

We then conducted follow-up analyses to conduct two specific contrasts. First, all those with a chronic health condition (collapsing cancer survivors and those with another chronic condition) were compared with healthy adults. Second, cancer survivors were compared to those with another chronic health condition. In each analysis, we evaluated the interaction between the group contrast and the predictor variable. Each model addressed the question of whether the predictor variable predicts distress more strongly in one group than another (e.g., cancer survivors vs. those with other chronic health conditions).

Any chronic condition vs. healthy adults

Significant group contrasts between all those with a chronic health condition and healthy adults were observed for each predictor: age, gender, educational attainment, ethnicity, marital status, health insurance coverage, health status,

number of elders in the household, and number of children in the household (all p 's < 0.001, see Table 4). In all cases, having a chronic health condition intensified the strength of the association between the predictors and distress.

Cancer vs. other chronic conditions

After Bonferroni-adjustment, significant group contrasts between cancer survivors and those with other chronic health conditions were observed only for age, health insurance coverage, number of elders in the family, and number of children in the family. Associations between age and distress, health insurance coverage and distress, number of elders in the family, and number of children in the family (all p 's < 0.001), were each significantly stronger in cancer survivors than those with other chronic health conditions (see Fig. 2). Specifically, younger age, lack of health insurance, more children, and fewer elders in the household disproportionately increased distress in cancer survivors relative to those with other chronic health conditions. Associations between gender, ethnicity, education, marital status, health status, and distress symptoms did not differ between cancer survivors and those with other chronic conditions (see Table 4).

Multivariate modeling of distress

In order to identify the most salient risk factors for distress in each group, significant univariate predictors of distress were entered into separate multiple regression models for

Table 3 Medical correlates of distress in cancer survivors: univariate relationships

	Cancer survivors		Other chronic conditions		Healthy adults	
	β (95% CI)	OR ^a (95% CI)	β (95% CI)	OR ^a (95% CI)	β (95% CI)	OR ^a (95% CI)
Health insurance						
Covered		Reference		Reference		Reference
Not covered	2.50* (1.83, 3.16)	3.25 (2.22–4.76)	1.32* (1.18, 1.46)	2.24 (2.02, 2.48)	.32* (.23, .40)	2.22 (1.61, 3.04)
Comorbidities						
	.80* (.67, .93)	1.42 (1.32–1.54)	.64* (.59, .69)	1.46 (1.42, 1.51)	.65* (.46, .85)	1.66 (1.06, 2.61)
Chronic pain						
Absent		Reference		Reference		
Present	2.77* (2.48, 3.06)	4.81 (3.45, 6.69)	1.88* (1.80, 1.95)	4.09 (3.56, 4.70)		N/A
Health status						
Very good or excellent		Reference		Reference		Reference
Good	.66* (.41, .91)	1.73 (1.03–2.91)	.78* (.69, .87)	2.38 (2.08, 2.72)	.50* (.40, .59)	2.54 (1.85, 3.49)
Fair or poor	3.86* (3.47, 4.25)	8.61 (5.53–13.40)	3.61* (3.45, 3.77)	10.29 (9.09, 11.66)	2.27* (1.87, 2.67)	10.83 (7.59, 15.46)
Cancer type						
Prostate		Reference		N/A		N/A
Breast	.55 (.12, 0.98)	0.95 (.53–1.73)				
Colon/rectum	.85 (.26, 1.44)	2.08 (1.08–4.00)				
Female reproductive	2.54* (1.99, 3.09)	3.72 (2.20–6.29)				
Blood/leukemia/lymphoma	.93 (.30, 1.56)	1.34 (0.61–2.91)				
Kidney	.63 (–.03, 1.29)	1.48 (0.67–3.28)				
Melanoma	.48 (–.12, 1.08)	1.06 (0.44–2.54)				
Lung	1.82* (.79, 2.85)	2.45 (1.11–5.40)				
Other	1.78* (1.19, 2.37)	2.69 (1.51–4.79)				
Multiple cancers	1.96* (1.36, 2.56)	2.47 (1.36–4.46)				
Time since cancer diagnosis	.10 (–.02, .22)	1.05 (0.95–1.17)		N/A		N/A

^aOR = Odds Ratio for having a Kessler-6 score greater than or equal to 13, indicating clinically significant distress. *p*-values are based on beta coefficients. Odds ratios are provided for ease of interpretation of significant beta coefficients

**p*<0.001

cancer survivors, those with other chronic health conditions, and healthy adults. Younger age, being unmarried, lacking health insurance, having comorbidities, and having worse health status remained significant predictors (*p*'s<.001) in each of the three groups, suggesting that these are shared risk factors for distress across all levels of the population. For cancer survivors and those with other chronic health conditions, having lower education and pain were also significant independent risk factors for distress (*p*'s<.001). Unique independent risk factors in those with other chronic health conditions included female gender, non-White ethnicity, and having fewer elders in the house (*p*'s<.001). However, gender (*p*=.21), ethnicity (*p*=.25), and number of elders in the household (*p*=.28) were not unique risk factors for cancer survivors, and cancer type appeared to overlap considerably with other risk factors in the model (*p*=.056). Multivariate models accounted for 25.8% of

distress variance in cancer survivors, 18.3% in those with other chronic health conditions, and 4% in healthy adults.

Discussion

Our findings replicate and extend the existing literature on distress in cancer survivors by 1) identifying shared/common risk factors for distress in cancer survivors and those with other chronic health conditions, lending support to a general health model of distress and 2) identifying the specific ways in which patterns of risk for distress in cancer survivors differ from those with other chronic health conditions. A general health model of distress suggests that shared risk factors (i.e., those that are common to cancer survivors and those with or without other chronic health conditions) for distress include

Table 4 Predictors of distress in cancer survivors, those with other chronic health conditions, and those with no other chronic conditions: significant differences in strength of prediction across groups

Predictor	β_{healthy}	β_{chronic}	β_{cancer}	Contrast effects	
				Healthy vs. chronic/cancer	Chronic vs. cancer
Age	-.12	-.23	-.49	***	***
# of elders living with family	-.12	-.46	-.80	***	**
# of children living with family	.01	.09	.45	***	**
Gender					
Female	<i>reference group</i>			<i>reference group</i>	
Male	-.23	-.68	-.84	***	<i>ns</i>
Education					
> high school	<i>reference group</i>			<i>reference group</i>	
< high school	.29	1.46	2.11	***	^c
high school	.04	.42	0.73	***	<i>ns</i>
Ethnicity					
White	<i>reference group</i>			<i>reference group</i>	
Hispanic	-.11	.57	1.55	***	^c
Black	.06	.27	.62	<i>ns</i>	<i>ns</i>
Other	.01	.01	.64	<i>ns</i>	<i>ns</i>
Marital status					^a
Married	<i>reference group</i>			<i>reference group</i>	
Separated	.89	2.43	3.50	***	
Divorced	.46	1.16	1.90	***	
Single	.48	1.15	1.50	***	
Widowed	.23	.50	.54	^c	
Health insurance					
Covered	<i>reference group</i>			<i>reference group</i>	
Not covered	.32	1.32	2.50	***	**
Health status					^b
Very good or excellent	<i>reference group</i>			<i>reference group</i>	
Fair or poor	2.27	3.61	3.86	***	
Good	.50	.78	.66	***	

Significance effects are shown to deconstruct significant omnibus interaction effects. Follow-up analyses were not conducted where omnibus effects were non-significant

^a Omnibus interaction was not statistically significant; the effect of marital status on distress did not differ between cancer survivors and those with other chronic conditions

^b Omnibus interaction was not statistically significant; the effect of health status on distress did not differ between cancer survivors and those with other chronic conditions

^c .01 > $p \geq .005$

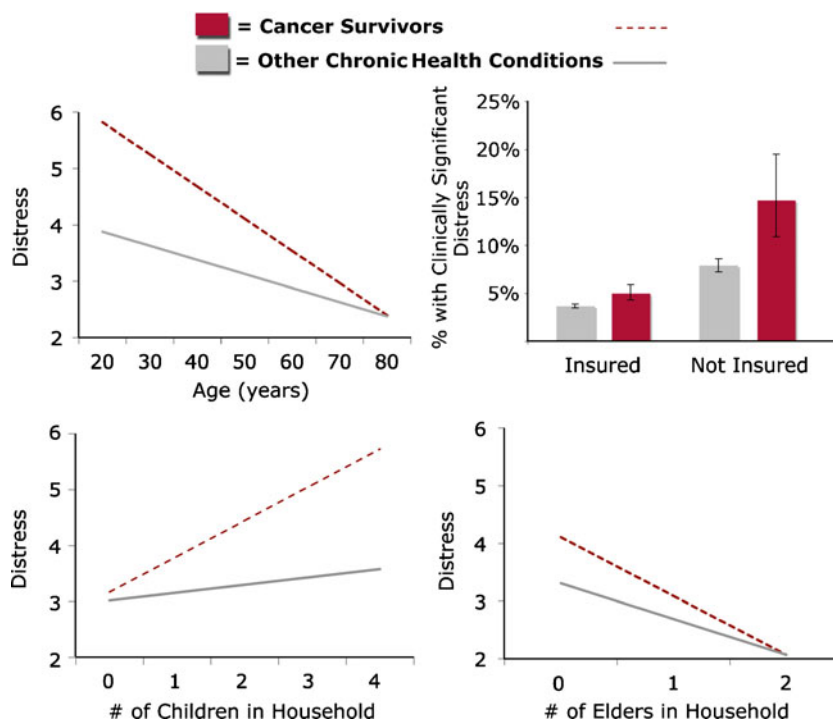
* $p < 0.005$, ** $p < 0.001$, *** $p < 0.0001$

younger age, non-White ethnicity, being female, having lower educational attainment, being unmarried, lacking health insurance, and having lower self-reported health. These results replicate the recent study by Hoffman et al. [13] and further suggest that these risk factors are not specific to cancer survivors.

However, it is important to note that patterns of risk identified by a general health model are more pronounced for cancer survivors. Across all of the risk factors identified,

having a cancer diagnosis appeared to magnify existing disparities in the experience of significant psychological distress, and this was particularly true for younger age, lack of health insurance coverage, having young children living in the household, and having fewer elders living in the household. Our pattern of results shows that there is something unique, and more difficult, about having cancer in comparison with other chronic health conditions. Possible mechanisms for this magnification effect in cancer survivors

Figure 2 Significant differences between cancer survivors and those with other chronic health conditions: interaction effects for age, insurance status, and number of children and elders living in the household.



include a) poor coordination of healthcare services across the spectrum of oncology-related treatment providers (i.e., fragmentation of care [60]), b) heightened concerns about recurrence and mortality among cancer survivors [61, 62], or c) a greater degree of general life disruption (e.g., changes in social support networks, work status, quality of life, etc.) among cancer survivors [63]. Fawzy and Fawzy [64] have described cancer as representing an existential disruption of a person's expected life trajectory, and a cancer diagnosis can result in substantial changes in an individual's short and long-term plans in life [65, 66]. Such disruptions may be less expected and potentially more severe for younger adults [67, 68], those responsible for young children [69, 70] and those lacking in personal/financial resources necessary to cope with health-related difficulties [71].

Results from the multivariate model also suggest interesting differences between cancer survivors and those with other chronic health conditions. Specifically, for both healthy adults and those with other chronic health conditions, females and those of non-White ethnicity were at greater risk for distress, even after adjusting for other univariate predictors. However, neither gender nor ethnicity remained significant in the multivariate model for cancer survivors. These findings suggest that these established risk factors for distress in the general population may be less salient in cancer survivors, perhaps because of overlap with other risk factors (i.e., health status, health insurance, age, marital status, and comorbidities) whose effects on distress appear to be stronger than in those with other health conditions or in the general population. Furthermore,

although cancer type was not significant in the multivariate model, it is important to note that cancer type overlaps considerably with other included variables (e.g., gender, age, health status, etc.). Identifying differences in distress across cancer types is particularly important given that those cancer types with the highest levels of distress (female reproductive, lung, multiple, and other cancers) have received less attention in the treatment literature than cancer types with lower distress [72, 73].

The relationship we observed between pain and distress is well-substantiated in the extant literature. Because pain is thought to go undertreated for many cancer survivors [74], continuing emphasis on appropriate analgesic therapies [75] has some promise for reducing the excess burden of distress experienced by cancer survivors. Other identified correlates of distress are unfortunately non-modifiable (e.g., age, gender, etc.), but provide information that could be used to deliver targeted psychosocial resources to those groups most likely to benefit. Development and delivery of psychosocial resources should be empirically-guided and provide prevention, screening, and treatment services that are both affordable and easily accessed by those subgroups with the highest levels of distress. Where such resources are available to patients and survivors, they consist largely of community-based support groups [76], and psychosocial programs are often developed without a systematic plan or vision [77]. Given known patterns of use of support groups among cancer survivors [78], existing psychosocial services seem unlikely to reach those cancer survivors at greatest risk for distress.

There are several noteworthy limitations to the present study. First, as is true of most nationally-representative datasets, the assessment of mood disturbance and other cancer characteristics was limited. Use of more specific and/or comprehensive measures (e.g., structured clinical interviews) could provide much greater resolution with respect to presence and type of clinical mood disorders, and it was not possible to evaluate the effects of disease severity, treatment history, or cancer staging on levels of distress. Secondly, the NHIS questionnaires were administered to sample adults able to engage in the interview. Those cancer survivors living with active, advanced disease or those experiencing more severe psychological distress may have been less likely to participate in the interview process. The results of the study may therefore underestimate the way in which health status, or other unmeasured variables, might impact participation in the NHIS and therefore influence associations with clinically significant distress. Finally, this study evaluated predictors of distress across cancer survivors by aggregating across cancer types. Given that cancer is a constellation of distinct diseases, an important next step would be to use population data to identify specific correlates of distress within and across cancer types.

In many ways, cancer is increasingly a chronic disease [79], thanks to dramatic gains in cancer prevention, screening, and treatment. Our results highlight that there are many more similarities, with respect to psychological distress, than differences between cancer survivors and those with other chronic health conditions. Furthermore, distress is not randomly distributed in the population, and the burden is disproportionately borne by cancer survivors with few resources (i.e., lacking health insurance or a current spouse/partner, etc.), high unexpected demands (i.e., those at younger ages, raising more children, poor health), and non-White ethnicity. A recognition that cancer magnifies these disparities may have important implications for policy makers and those responsible for allocating scarce healthcare resources. Because the availability of prevention, screening, and treatment resources related to distress in cancer survivors is limited [40], understanding cancer-specific correlates of distress is essential for guiding these efforts [32] and overcoming barriers to care [80].

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