



Factors Associated with Cancer-related Pain among Utah Cancer Survivors

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Abstract

Purpose: To identify clinical and sociodemographic factors associated with cancer-related pain among Utah cancer survivors 2–5 years after diagnosis.

Methods: Participants include 2232 Utah cancer survivors diagnosed with invasive cancers at ages 18+ who responded to a probability-based sample survey administered by the Utah Cancer Registry from 2018–2023. Participants self-reported cancer-related pain status and methods of pain control. We calculated counts and percentages and used logistic regression to identify sociodemographic and clinical factors associated with cancer-related pain. All analyses were weighted to account for complex survey sample design and age-adjusted to the Utah cancer survivor population.

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Author Contributions

R.R.C., M.E.C., K.A.H., A.C.K., and M.M.M. contributed to the study conception and design. R.R.C., M.E.C., M.M.M. contributed to data acquisition. Analyses were performed by B.S.O.-A., K.A.H., and R.R.C. The first draft of the manuscript was written by R.R.C. M.M.M., J.A.D., and A.C.K. assisted in substantive revisions to the drafted manuscript. All authors reviewed the manuscript. Rachel R. Codden: Division of Epidemiology, University of Utah. 295 Chipeta Way, Salt Lake City, UT 84132
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Financial interests

The authors have no relevant financial or non-financial interests to disclose.

Ethics Approval

The Cancer Survivor Experiences Survey was reviewed by the Utah Department of Health and Human Services Institutional Review Board, which deemed the project exempt from human subjects research approval because it is a program evaluation initiative.

Consent to Participate

Informed consent was obtained from all participants included in this study.

Results: Twenty-two percent of survivors reported currently experiencing physical pain caused by their cancer or cancer treatment. Of those reporting pain, 24% reported their pain was not under control; 40% indicated their pain was under control with medication and 36% reported it was under control without medication. The most frequently used pain control methods were nonopioid analgesics (49%) and physical activity (37%). In multivariable models, younger survivors, those either underweight or obese, survivors of breast cancer, and those facing material financial hardships were more likely to report cancer-related pain.

Conclusion: Twenty-two percent of Utah cancer survivors experienced pain related to their cancer or cancer treatment. For some this pain is well managed, but approximately a quarter have uncontrolled pain.

Implications for Cancer Survivors: Cancer-related pain is not solely associated with clinical features, and the findings here can guide clinicians and researchers toward a better understanding of the needs of cancer survivors and tailor pain management treatments to this unique population.

Keywords

cancer survivor; cancer; chronic pain; social determinants of health

Introduction

Cancer survivors may be burdened by the effects of cancer for years after completion of treatment. For some survivors, cancer and its treatment come with long-term or chronic pain [1]. The prevalence of long-term pain is reported to be two times higher among cancer survivors compared to the general population, with an estimated 5.39 million cancer survivors reporting chronic pain [2]. Cancer-related pain is defined as daily pain lasting 3 or more months that is caused by the malignant process itself, anticancer treatment, or comorbid conditions [3, 4]. This persistent pain survivors experience for years after diagnosis has been considered a “consequence of cancer” or “the cost of survival” [2]. Within the healthcare system, cancer survivors have expressed that their pain is “easily dismissed” and there is not an appropriate system in place for management of this long-term pain, especially after the conclusion of cancer treatment and care by their oncology team [2, 5, 6].

Current practice guidelines from the American Society of Clinical Oncology published in “Management of Chronic Pain in Survivors of Adult Cancers” recommends that clinicians should screen cancer survivors for pain at each encounter [1]. With such assessment, clinicians should determine when pain management is necessary and consider nonpharmacologic and pharmacologic interventions [1]. Recent findings show that pharmacological treatments are the principal modality of pain control provided to cancer survivors [7]. Cancer survivors are prescribed opioids at a higher rate than those with non-cancer pain, with an estimated 5% of all opioid prescriptions in the United States going to cancer patients [8].

Through epidemiologic research there is evidence associating multiple clinical factors to long term cancer-related pain, and to date a few sociodemographic factors have been

associated with cancer-related pain as well. Known clinical factors associated with pain are cancer site, cancer stage, treatment type and other physical comorbidities [6, 9–11]. All cancer treatments have the potential to cause long-term pain, notably neuropathic pain from surgery and chemotherapy, and pain from tissue damage due to radiotherapy [6]. By cancer site, head and neck cancers have shown higher proportions of patients reporting pain [10, 12], as well as breast cancer, although this cancer is studied more extensively than others [8, 11, 13]. Cancer survivors who are female, have a higher BMI, depression, and anxiety disorders are more likely to report cancer-related pain [5, 14, 15]. There are equivocal findings on the relationship with cancer-related pain and age, with some research showing direct and some inverse relationships between these variables [5, 13–15].

Additionally, there are many social factors associated with cancer-related pain including socioeconomic status, educational attainment, and social connectedness [14]. Research has found that lower levels of all three of these factors are related to chronic pain in general, and specifically cancer-related pain [14, 16]. Those with lower socioeconomic status and educational attainment face greater barriers to pain treatment, and those with poor social connectedness have hindered pain perception and coping [17–19]. New research is showing evidence of an overlap between physical pain and social pain, with common neural and inflammatory pathways [20]. It is also likely that the interplay of clinical and sociodemographic factors influence a survivor's response to treatment, and therefore the severity of their pain over time [16].

Cancer-related pain has been studied in samples limited to certain cancer sites, age groups, and single cancer treatment centers, with few studies that encompass a broad sample of participants [11]. The purpose of this analysis is to identify the clinical and sociodemographic factors associated with cancer-related pain among Utah cancer survivors during the early years after diagnosis and treatment. Additionally, we identify the most common modalities used to control pain. By using a representative sample of survivors ascertained through a population-based central cancer registry, this study can provide a more complete picture of the survivorship experience with cancer-related pain. Our findings have the potential to expand clinical understanding of factors which may be associated with cancer-related pain 2–5 years from diagnosis, thereby better informing clinical care and interventions to improve survivorship quality of life.

Methods

Participants and data sources

Participants were those who completed a cross-sectional survey as part of the Cancer Survivors Experiences Project and answered all questions pertinent to this specific analysis. Twenty-seven participants were excluded due to incomplete responses to the survey questions of interest. The survey is a probability-based sample survey of Utah cancer survivors who are 2–5 years from diagnosis. Eligible survivors were adults aged 18 years or older diagnosed with any invasive cancer in Utah, as identified from Utah Cancer Registry records. The Utah Cancer Registry is a population-based central registry that collects and maintains information on all reportable cancer diagnoses in Utah. According to the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program and the

U.S. Centers for Disease Control and Prevention's National Program of Cancer Registries, Utah Cancer Registry data are of high quality and complete [21].

The Cancer Survivor Experiences Project survey was initiated in 2018 as part of a collaboration between the Utah Cancer Registry, the Utah Comprehensive Cancer Control Program, and the Utah Cancer Coalition to evaluate unmet needs of cancer survivors, which was an objective of the state's Comprehensive Cancer Control Plan. The focus of the survey is on health status and quality of life during the early survivorship period wherein survivors may have completed or are nearing completion of first course treatment and may be experiencing ongoing health and financial impacts of treatment. Survey questions address a variety of topics including experiences through cancer treatment, current health behaviors and needs, and financial impacts of cancer treatment. We collected responses using online and paper questionnaires. The survey uses a mixed-mode, with push-to-web methodology for those under 80 years old, and a paper response method for those 80 and above [22]. A \$2.00 cash incentive is included in the initial invitation. Reminder mailings and phone calls are used to follow-up with nonrespondents. This analysis includes responses collected during the first 6 years of this project, 2018–2023, from individuals diagnosed 2012–2021. The cumulative weighted survey response rate for this time is 57%. Additional details regarding survey methods and findings are detailed in prior publications [23–27].

Variables

Participants self-reported their current experience of cancer-related physical pain, pain control, and methods of pain control. These questions are displayed in Figure 1. The first two questions in this set are sourced from the CDC's Behavioral Risk Factor Surveillance System's optional module on cancer survivorship [28]. The list of response options for the third question were based upon Version 3.2017 of the National Comprehensive Cancer Network (NCCN) Pain Guidelines [29]. Participants also self-reported their race and ethnicity, height and weight (used to calculate BMI), education level, and current insurance coverage type. Another variable derived from survey responses included degree of social connectedness within the community, measured using a series of four items sourced from the National Social Life, Health and Aging Project's questionnaire and categorized into quartiles based on frequency of interaction [30]. Also, we asked whether they had a friend or family member serving as a caregiver during their cancer treatment (yes/no) [31], and we collected a summary count of the number of material financial hardships survivors reported experiencing [32]. These hardships consisted of experience with 9 circumstances within the last 12 months, including "put off major purchases, such as a new home or car," "been unable to pay for basic necessities like food, heat, or rent," "had to take money out of savings," "spent more than 10% of your income on medical expenses," "had to borrow money," "took on credit card debt," "took out a mortgage against your home or took out a loan," "thought about filing for bankruptcy," or "filed for bankruptcy" [32].

Data items from the Utah Cancer Registry were combined with survey responses to comprise a set of clinical and sociodemographic covariates. The items sourced from the registry included age at diagnosis, sex, stage at diagnosis, cancer site, years from diagnosis, treatment modalities used, and race and ethnicity when not self-reported. For purposes

of analysis and to protect patient confidentiality, some variables are broadly categorized, including age at diagnosis, race and ethnicity, education level, years from diagnosis, cancer site, current insurance coverage, social connectedness, and number of material financial hardships reported.

Statistical analysis

All analyses were weighted to account for the sampling design, unit nonresponse, and survivor age distribution. This process was done by calculating base weights from the reciprocal of a respondent's probability of selection, applying a nonresponse adjustment factor determined through propensity scoring, and standardizing the age distribution of this nonresponse-adjusted sample to match the age distribution of Utah Cancer Registry's survivor population. Categorical variables were summarized as counts with percentages. We summarized pain management modalities and treatment characteristics among those who experienced pain and reported counts and percentages. We compared sociodemographic and clinical characteristics between survivors who reported experiencing pain and those who did not, testing for differences using chi-square tests for nominal variables and linear trend tests using logistic regression for ordinal variables.

To identify factors associated with cancer-related pain, we performed univariable and multivariable logistic regression analyses. Survivor characteristics adjusted for in the multivariable model were age at diagnosis, sex, race and ethnicity, BMI, stage at diagnosis, cancer site, treatment type, presence of a caregiver during or after cancer treatment, level of social connectedness, and number of reported material financial hardship experiences. Results were reported as odds ratios (ORs) with lower and upper 95% confidence intervals (CI). All statistical tests were two-sided, and statistical significance was assessed at a threshold of 0.05. Analyses were performed using SAS version 9.4 and R version 4.3.0.

Results

The analytic sample was comprised of 2232 individuals. Table 1 shows descriptive statistics for all survivors and stratified by reported experience of pain. The percentages displayed are weighted to account for survey sample design and nonresponse. There were 493 survivors (weighted percentage: 22%) who reported current physical pain caused by their cancer or cancer treatment.

One third of survivors were under age 57 at diagnosis, a third between the ages of 57 and 67, and the final third 68 years and older. Age at diagnosis was statistically significantly associated with experiencing cancer-related of pain, with 31% of the youngest tertile of survivors experiencing pain, followed by 18% of the middle age group, and only 15% of the oldest third ($p < 0.001$). There was also a difference in experience of pain by sex ($p < 0.001$) with a higher fraction of females experiencing pain (26%) than males (16%). The Utah cancer survivor population is largely non-Hispanic White (71%), with 80% of these survivors not reporting pain, compared to 77% of non-Hispanic survivors of any race other than White, and 64% of Hispanic survivors, a statistically significant difference ($p = 0.001$). Over half of survivors had a local stage at diagnosis (64%). Survivors who were at a more advanced stage at diagnosis reported pain at a higher proportion (distant stage

39%, regional 30%) compared to local stage (16%, $p < 0.001$). The cancer sites that were represented by 40 or more survey participants are displayed in the table, and all other sites are grouped into the “Other” category. Breast cancer is the most common diagnosis, representing 21% of the survivors, followed by prostate cancer (17%), and melanoma (14%). There was an association between cancer site and experience of pain ($p < 0.001$), with 37% of breast, 27% of lymphoma, and 23% of lung cancer survivors reporting pain. Survivors who had a caregiver during or after cancer were more likely to have pain ($p < 0.001$). Social connectedness of survivors was associated with report of pain ($p < 0.001$), and those categorized as most connected had the lowest proportion experiencing pain from cancer at 14.1%. Some types of insurance coverage (plans provided through an employer or union, Medicare, Medicaid, and Military-related healthcare) were statistically significantly associated with likelihood of having cancer-related pain. The total number of material financial hardships faced by the survivor was associated with reporting pain ($p < 0.001$), and those with 3 or more hardships had the highest proportion experiencing pain from cancer at 40.8%.

As shown in Table 2, 40% of survivors experiencing pain had their pain under control with medication or treatment, and 36% had their pain under control without medication or treatment. The remaining 24% of survivors did not feel their pain is under control. The most commonly used treatment modalities were nonopioid analgesics (49%), physical activity (37%), local therapies (27%), opioids (17%), and antidepressants or anticonvulsants (14%). Survivors, on average, indicated using 2.2 different treatments from the provided list.

Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) from the multivariable logistic regression model are displayed in Figure 2 (see Supplemental Table for univariable results). Younger survivors (Tertile 1, age < 57 years, OR 1.59, CI: 1.09, 2.34) were more likely to experience pain than the oldest third of survivors (Tertile 3, 68+ years). Compared to those with normal BMI, underweight and obese survivors both had higher odds of reporting pain (underweight OR 3.94, CI: 1.14, 13.66; obese OR 1.58, CI: 1.10, 2.27). Those diagnosed with a distant stage cancer had higher odds of pain than those with a local stage (OR 2.87, CI: 1.81, 4.55). Breast cancer survivors had higher odds of pain compared to the reference cancer, colorectal cancer (OR 1.94, CI: 1.05, 3.57). Survivors who received 2 cancer treatment modalities (OR 2.07, CI: 1.41, 3.04), 3 or more modalities (OR 3.56, CI: 2.18, 5.83), or no treatment (OR 1.85, CI: 1.10, 3.12) had higher odds of pain compared to those who received 1 treatment type. Those without a caregiver during treatment had lower odds of pain than those with a caregiver (OR 0.52, CI: 0.34, 0.80). Survivors who have no insurance coverage (OR 0.41, CI: 0.17, 0.98) or unknown/missing coverage status (OR 0.49, CI: 0.17, 1.44) had lower odds of pain than those reporting coverage. Those facing material financial hardships had higher odds of pain than those who did not (1–2 hardships OR 1.90, CI: 1.34, 2.68; 3 or more hardships OR 2.95, CI: 1.94, 4.48). There were no statistically significant associations between cancer pain and survivor sex, years from diagnosis, or social connectedness in multivariable analysis.

Breast cancer patients comprised 22% of survivors and 40% of the female cancer cases in the study. After finding that breast cancer survivors had a notably higher prevalence of cancer-related pain (37% compared to 22% of all survivors), we repeated all analyses

stratified by cancer site (breast vs. other). There were no substantial differences in the findings among only breast cancer patients compared to the remainder of the sample, thus results are not shown here.

Discussion

This analysis provides an estimated prevalence of cancer-related pain among a representative sample of the recent cancer survivor population of the entire state of Utah. Just under a quarter of survivors (22%) experience current pain related to their cancer or its treatment, with 24% of those experiencing pain reporting that their pain is not under control.

Survivors commonly use nonopioid analgesics, physical activity, and local therapies for pain control. Many factors were found to be significantly associated with the report of pain, in multivariate analysis including younger age, a BMI in the underweight or obese ranges, diagnosis with a more advanced stage cancer, and cancer of the breast. The analysis also showed association with cancer-related pain among those who received a higher number of treatment modalities, had a caregiver during treatment, were currently without health insurance, and those facing higher levels of material financial hardship. This study is notable in that our sample is without restriction by cancer site and is derived from a population-based registry rather than a single clinical practice or health center.

There are mixed findings to date on the relationship between age at diagnosis and cancer-related pain [5, 15]. We found that those aged below 57 were more likely to report pain than those under age 68 and above. More research is needed to better understand the relationship between age and the experience of cancer pain and the factors driving this association. To note, today's cancer survivors are in a unique position as they face serious pain during an opioid epidemic [33]. A recent qualitative study by Marshall, et al. discovered that their sample of survivors would rather let their pain remain uncontrolled than risk addiction to opioids or be labelled as "drug-seeking" by their providers, commonly addressing this by taking the lowest suggested dose even when it did not fully relieve their pain [34]. The sample of survivors interviewed by Marshall, et al. expressed interest in pain treatments other than opioids or other pharmaceutical treatments, however explained that these were less likely to be covered by insurance and were difficult to obtain on a regular basis [34]. Financial barriers are especially prevalent in the younger cancer survivor population, where they are known to report their cancer diagnosis has a greater impact on finances, work, and school than their older counterparts [35]. The knowledge that younger survivors face chronic pain from cancer and its treatment and likely have many years of life ahead of them, highlights the importance of pain management in this population.

Our analysis confirmed that survivors of metastatic cancers and those who received more extensive cancer treatment (treatment with 2 or more modalities) are more likely to experience cancer-related pain than those with earlier stage disease and those who received one type of treatment, even while controlling for other factors. These findings are consistent with prior literature [6, 8] and highlight the physical toll that multimodal cancer treatment can take. We also found that cancer site is associated with the likelihood of experiencing cancer-related pain. While breast cancer survivorship has been well researched, it is usually studied in isolation and is not usually compared to other cancer sites [8, 11, 15]. In general,

there is a lack of literature comparing cancer-related pain by site, with the most recent systematic review from 2007 [12]. Our analysis found that the odds of reporting pain as a breast cancer survivor are 1.94 times that of a colorectal cancer survivor, and there were no other cancer sites that had statistically significant differences compared to the reference site, colorectal cancer. Prior literature has found that breast cancer survivors commonly experience chronic pain in the ipsilateral limb, aromatase inhibitor-induced arthralgia, lymphatic complications, and numbness [8, 11, 15]. This finding suggests that it may be beneficial to closely monitor breast cancer survivors' pain after conclusion of cancer treatment. Our analysis did not include a "head and neck cancer" grouping and therefore was unable to confirm previous findings that this cancer site is associated with higher reports of pain. Looking at the proportion of Utah cancer survivors experiencing pain, oral cavity and pharynx survivors had the 5th highest percentage (22%) out of the 11 specific sites examined.

Our analysis showed that those with a caregiver during cancer treatment had higher odds of pain than those without a caregiver. This could be interpreted multiple ways, one explanation being that those facing aggressive cancer and treatment sought out or required additional support during treatment, and due to the effects of this aggressive cancer are continuing to experience pain [36]. Another finding from the multivariable model was that survivors without insurance coverage were less likely to report pain than those with coverage. Although this is a unique finding that differs from current literature, it should be interpreted with caution due to the small number of survivors represented in the "No coverage" (2%) and "Unknown coverage" groupings (2%).

Our study further contributes to knowledge of cancer pain experiences by evaluating additional sociodemographic variables that are less studied but important to assess from a social determinants of health perspective [37]. We found that survivors who are experiencing 1–2 material financial hardships are 1.90 times more likely to report pain than those with 0 hardships, and those facing 3 or more hardships are 2.95 times more likely to report pain. Survivors with lower socioeconomic status may have fewer resources to help with pain management, as doing so can require additional medical appointments and treatment costs [19, 38, 39]. The treatments indicated by NCCN Pain Guidelines for cancer survivors are largely pharmacologic, with others requiring multiple medical visits such as physical therapy, interventional procedures, and psychosocial support [29]. These survivors may also have more demands and fewer resources to help with activities of daily living, which further exacerbates pain. After facing the cost of cancer diagnosis and treatment, survivors may have financial difficulties preventing them from managing cancer-related pain [40, 41].

The lack of an association between social connectedness and cancer-related pain indicates that pain experience doesn't seem to hinder involvement with family or the community, or that those with stronger social connection have a different experience with pain than those with less connection. There was also no significant association between race and ethnicity and pain, and education level and pain, indicating that other social determinants of health have stronger relationships with pain. Although not explored in this analysis, mental health is another important factor in a survivors' experience with pain [42]. Depression likely has a bidirectional relationship with chronic pain [43]. Some research shows chronic pain can

lead to the development of depression [44], and depression has been known to aggravate and accentuate the pain experience [45].

Many pain control interventions have been studied among cancer survivors, with newer options such as medical cannabis, neuromodulatory techniques, and psychological interventions. These interventions are important as they are generally associated with fewer side effects than traditional pharmacological options and can be used in conjunction with other treatments [1, 46–49]. The most common intervention reported among Utah cancer survivors were nonopioid analgesics, with very few survivors reporting use of cannabis, interventional procedures, or psychosocial support as methods of pain control. It is possible that there are some barriers to access these options, such as physical barriers presented by the COVID-19 pandemic, or shortages of providers knowledgeable in these interventions [50]. More research is needed to identify the most effective pain treatments and ensure access within the cancer survivorship community.

A limitation of this analysis is the cross-sectional nature of the data. Due to the study design, directionality between the clinical and sociodemographic factors and experience of pain cannot be assumed. A further limitation is the inability to determine objectively if the survivors' pain is cancer-related. Cancer survivors in this sample may have concomitant chronic pain that is not directly attributable to cancer or its treatment, given that cancer is usually a disease of middle and older age when other causes of chronic pain may be involved [8]. However, the subjective nature of the survey questions do offer a unique angle that fully involves the survivor's perspective of the impact of their cancer on their current state. Another limitation is that the survey did not include measures of all relevant factors that are likely associated with pain, such as mental health conditions. Next, while our sample is representative of the cancer survivor population of Utah, these results may not generalize elsewhere. Particularly with respect to race, since Utah's survivor population is predominantly of White race, we were unable to analyze the data without collapsed race and ethnicity groupings. This limited our ability to fully assess the relationship between race and cancer pain with our data, where prior research has indicated Black cancer survivors are more likely to have pain [5, 51]. Lastly, we acknowledge that a portion of the survivors in our analysis were diagnosed and/or treated for cancer during the COVID-19 pandemic. It is possible that social distancing negatively impacted social connectedness, health communication, and access to care, worsening cancer-related pain in our survivor population [17, 50, 52].

In conclusion, chronic pain is a serious negative consequence of cancer which affects a range of cancer survivors for their lifetime. By using population-based samples of cancer survivors from central cancer registries we can better understand the magnitude of this problem. Findings from this analysis representing cancer survivors in Utah are consistent with recent studies on more restricted populations and highlight the need for greater attention to cancer-related pain. Cancer-related pain is not solely related to clinical features, and the findings here within social determinants of health can guide clinicians and researchers toward a better understanding of the needs of survivors. By further developing this understanding of the correlates of cancer-related pain, clinicians can apply the knowledge to tailor pain management to this unique population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data Availability

The dataset generated during and/or analyzed during the current study are not publicly available due to privacy restrictions.

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Do you currently have physical pain caused by your cancer or cancer treatment?

- ☐ Yes
☐ No

→ Would you say your pain is currently under control...?

- ☐ With medication (or treatment)
☐ Without medication (or treatment)
☐ Not under control with medication (or treatment)
☐ Not under control without medication (or treatment)

Currently, which of the following do you use to control your pain associated with cancer or cancer treatment? Please read through the list carefully and select all that apply.

- ☐ Opioids (Examples: hydrocodone, oxycodone, codeine, morphine, fentanyl)
☐ Nonopioid analgesics including nonsteroidal anti-inflammatory drugs (NSAIDs) and acetaminophen (Examples: aspirin, ibuprofen, Advil, Motrin, Tylenol, COX-2 inhibitors)
☐ Corticosteroids (Example: dexamethasone)
☐ Antidepressants or anticonvulsants
☐ Muscle relaxants (Examples: diazepam, lorazepam, metaxalone)
☐ Mind body therapies (Examples: biofeedback, breathing, hypnosis, mindfulness, relaxation)
☐ Psychosocial support
☐ Physical or occupational therapy
☐ Physical activity including walking, exercise, stretching, strength training, and yoga
☐ Local therapies including heat, cold packs, massage, medicated creams, ointments, and topical patches
☐ Interventional procedures (Examples: electrical nerve stimulation, nerve blocks, neurotomy with radiofrequency ablation, and dorsal column stimulation)
☐ Acupuncture
☐ Medical cannabis (marijuana)
☐ None (I do not use anything to control my pain)
☐ Other

Figure 1.
Pain Questions from a survey of Utah cancer survivors

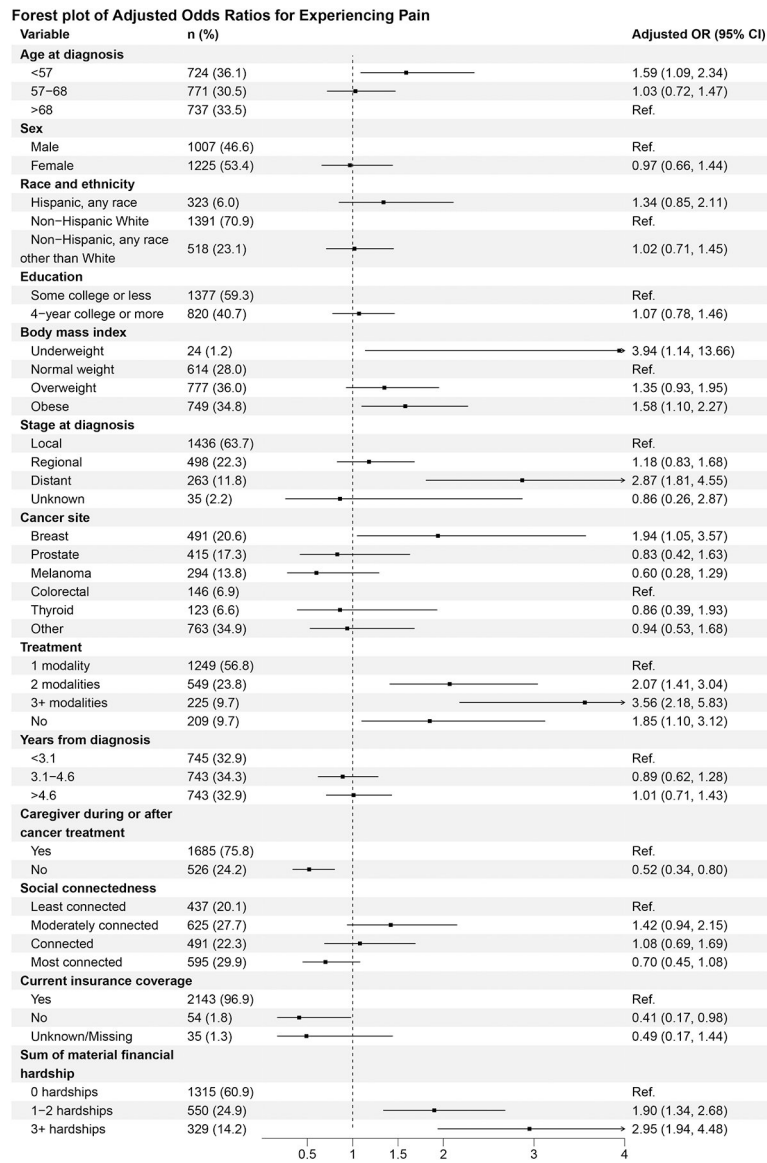


Figure 2. Multivariate association between sociodemographic and clinical variables and likelihood of experiencing pain from cancer or cancer treatment, adjusted ORs and 95% CIs

Table 1.
Descriptive summary of the study population overall and by pain status

	All survivors		Pain status				p-value ^a
			Experiencing pain from cancer		Not experiencing pain from cancer		
Variable	n	% ^b	n	% ^b	n	% ^b	
Totals	2232		493	21.5	1739	78.5	
Age at diagnosis							<0.001 ^c
<57 years, Tertile 1	724	36.1	235	30.7	489	69.3	
57–<68 years, Tertile 2	771	30.5	152	17.7	619	82.3	
68+ years, Tertile 3	737	33.5	106	15.0	631	85.0	
Sex							<0.001
Male	1007	46.6	166	16.3	841	83.7	
Female	1225	53.4	327	26.1	898	73.9	
Race and Ethnicity							0.001
Hispanic, any race	323	6.0	104	35.7	219	64.3	
Non-Hispanic White	1391	70.9	275	19.8	1116	80.2	
Non-Hispanic, any race other than White	518	23.1	114	23.0	404	77.0	
Education level							0.190
Some college or less	1377	59.3	329	22.7	1048	77.3	
4-year college or more	820	40.7	155	19.9	665	80.1	
Body mass index							0.013
Underweight (<18.5)	24	1.2	^	41.1	^	58.9	
Normal weight (18.5–<25)	614	28.0	114	18.6	500	81.4	
Overweight (25–<30)	777	36.0	154	19.2	623	80.8	
Obese (30+)	749	34.8	196	25.3	553	74.7	
Stage at diagnosis							<0.001
Local	1436	63.7	233	15.5	1203	84.5	
Regional	498	22.3	147	30.1	351	69.9	
Distant	263	11.8	105	39.4	158	60.6	
Unknown	35	3.0	^	14.8	^	85.2	
Cancer site							<0.001
Breast	491	20.6	180	36.5	311	63.5	
Prostate	415	17.3	47	10.6	368	89.4	
Melanoma	294	13.8	22	7.6	272	92.4	
Colorectal	146	6.9	35	19.0	111	81.0	
Thyroid	123	6.6	20	18.1	103	81.9	
Endometrial	97	4.0	^	7.7	^	92.3	
Lymphoma	89	4.4	16	26.7	73	73.3	
Kidney	82	3.5	^	8.8	^	91.2	

	All survivors		Pain status				p-value ^a
			Experiencing pain from cancer		Not experiencing pain from cancer		
Variable	n	% ^b	n	% ^b	n	% ^b	
Oral Cavity and Pharynx	50	2.4	^	21.6	^	78.4	
Leukemia	48	2.1	^	22.3	^	77.7	
Lung	40	1.7	^	23.4	^	76.6	
Other	357	16.7	121	32.4	236	67.6	
Treatment							<0.001
Yes, 1 modality	1249	56.8	161	12.9	1088	87.1	
Yes, 2 modalities	549	23.8	181	31.8	368	68.2	
Yes, 3 or more modalities	225	9.7	110	48.9	115	51.1	
No	209	9.7	41	19.2	168	80.8	
Years from diagnosis							0.430 ^c
<3.1, Tertile 1	745	32.9	182	23.7	563	76.3	
3.1–<4.6, Tertile 2	743	34.3	154	19.4	589	80.6	
4.6+, Tertile 3	743	32.9	157	21.6	586	78.4	
Caregiver during or after cancer treatment							<0.001
Yes	1685	75.8	440	25.2	1245	74.8	
No	526	24.2	48	9.6	478	90.4	
Social connectedness							<0.001
Least connected	437	20.1	114	24.8	323	75.2	
Moderately connected	625	27.7	155	26.4	470	73.6	
Connected	491	22.3	111	21.7	380	78.3	
Most connected	595	29.9	91	14.1	504	85.9	
Current insurance coverage ^d							
Through an employer or union	967	45.9	246	24.3	721	75.7	0.015
Purchased directly from an insurance company or the insurance marketplace	324	15.8	70	20.6	254	79.4	0.670
Medicare	1127	49.3	197	17.6	930	82.4	<0.001
Medicaid or other government-sponsored program	112	5.0	36	37.5	76	62.5	0.021
Military-related healthcare	109	5.2	16	14.1	93	85.9	0.046
Some other source	67	2.9	23	29.5	44	70.5	0.280
No coverage of any type	54	1.8	^	16.2	^	83.8	0.370
Sum of material financial hardship							<0.001
0 hardships	1315	60.9	181	14.1	1134	85.9	
1–2 hardships	550	24.9	164	28.2	386	71.8	
3 or more hardships	329	14.2	139	40.8	190	59.2	

^aChi-Squared test with Rao & Scott's second-order correction

^bPercentage weighted to account for survey sample design and nonresponse

^cP-value for trend was computed using logistic regression

^dSelect all that apply question format

[^]Small cell counts are suppressed for confidentiality

Missing values: Education=37 (1.6%), Body mass index=72 (3.2%), Years since diagnosis=3 (0.1%), Caregiver during or after cancer treatment=31 (1.4%), Social connectedness=90 (4%), Current insurance coverage=45 (2%), Sum of material financial hardship=41 (1.8%).

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Table 2.

Descriptive summary of pain management and treatment regimen among those experiencing cancer-related pain

	Survivors experiencing pain from cancer	
	n	% ^a
Would you say your pain is currently under control?		
With medication (or treatment)	190	39.8
Without medication (or treatment)	161	36.2
Not under control, with medication (or treatment)	62	12.7
Not under control, without medication (or treatment)	62	11.4
Currently, which of the following do you use to control your pain associated with cancer or cancer treatment? ^b		
Opioids	88	17.4
Nonopioid analgesics	215	48.9
Corticosteroids	17	3.7
Antidepressants or anticonvulsants	58	13.8
Muscle relaxants	37	7.5
Mind body therapies	55	12.4
Psychosocial support	^	1.5
Physical or occupational therapy	39	9.7
Physical activity	167	37.4
Local therapies	125	26.6
Interventional procedures	16	2.9
Acupuncture	16	2.6
Medical cannabis	42	7.8
None	92	20.5
Other	45	7.5

^aPercentage weighted to account for survey sample design and nonresponse

^bSelect all that apply question format

[^]Small cell counts are suppressed for confidentiality

Missing values: Would you say your pain is currently under control?=18 (3.7%), Currently, which of the following do you use...=17 (3.4%).