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Financial Toxicities Persist for Cancer Survivors Irrespective of Current Cancer Status: An Analysis of Medical Expenditure Panel Survey

Mohammad A. Karim[1,2], **Rajesh Talluri**[3,4], **Surendra S. Shastri**[5], **Hye-Chung Kum**[2,6], **Sanjay Shete**[1,4,7]

[1]Department of Epidemiology, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States of America

[2]Population Informatics Lab, Texas A&M University, College Station, Texas, United States of America

[3]Department of Data Science, University of Mississippi Medical Center, Jackson, Mississippi, United States of America

[4]Department of Biostatistics, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States of America

[5]Department of Health Disparities Research, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States of America

[6]Department of Health Policy and Management, School of Public Health, Texas A&M University, College Station, Texas, United States of America

[7]Division of Cancer Prevention and Population Science, The University of Texas MD Anderson Cancer Center, Houston, Texas, United States of America

Abstract

This study estimates the out-of-pocket (OOP) expenditures for different cancer types among survivors with current vs no current cancer condition and across sex, which is understudied in the literature. This is a cross-sectional study of Medical Expenditure Panel Survey data for 2009-2018 where the primary outcome was the average per year OOP expenditure incurred by cancer survivors. Of 189 285 respondents, 15 010 (7.93%) were cancer survivors; among them, 46.28% had a current cancer condition. Average per year OOP expenditure for female survivors with a current condition of breast cancer ($1730), lung cancer ($1679), colon cancer ($1595), melanoma ($1783), non-Hodgkin lymphoma ($1656), nonmelanoma/other skin cancer (NMSC, $2118) and two or more cancers ($2310) were significantly higher than that of women with no history of cancer ($853, all $P < .05$). Similarly, average per year OOP expenditure for male survivors with a current condition of prostate cancer ($1457), lung cancer ($1131), colon cancer

Address for correspondence and reprints: Sanjay Shete, PhD, Division of Cancer Prevention and Population Sciences, The University of Texas MD Anderson Cancer Center, Pickens Academic Tower, 1400 Pressler Street, Houston, TX 77030. sshete@mdanderson.org.

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($1471), melanoma ($1474), non-Hodgkin's lymphoma ($1653), NMSC ($1789), and bladder cancer ($2157) were significantly higher compared with the men with no history of cancer ($621, all $P < .05$). These differences persisted in survivors with no current cancer condition for breast cancer among women; prostate, lung, colon, and bladder cancer among men; and melanoma, NMSC, and two or more cancers among both sexes. OOP expenditure varied across cancer types and by sex for survivors with and without a current cancer condition. These findings highlight the need for targeted interventions for cancer survivors.

Keywords

Cancer; Health expenditures; Out-of-pocket expenditure; Cancer survivors; Costs

INTRODUCTION

Cancer is the second leading cause of death in the United States and is projected to cost more than 608 570 lives in 2021.[1] Despite the high mortality associated with cancer, substantial progress has been made against cancer in recent decades.[1] With improved treatments and newly discovered drugs, the cancer death rate declined by 31% between 1991 and 2018.[1] Although substantial progress has been made to improve survivorship and reduce mortality associated with cancer, the additional burden of cancer-related financial distress has emerged as a matter of serious concern.[2] The financial toxicity of cancer[3] and out-of-pocket (OOP) burden on cancer survivors have garnered considerable attention from researchers, as well as policy makers, in recent times.[3–6]

Increasing numbers of cancer survivors are now living longer, sometimes without requiring active treatment while in remission.[7] However, long-term survivors may report significant symptom burden,[8, 9] post-treatment adverse events such as fatigue and pain,[9, 10] and treatment-related late toxicities.[11] Moreover, psychological distress, anxiety, depression, and insomnia are pronounced among long-term cancer survivors[9, 12] and may require additional treatments, resulting in increased costs. Previous studies have examined the costs affecting previously vs recently diagnosed cancer survivors[13–15]; however, none of these studies specifically examined OOP costs across cancer types. A 2018 study using 2008-2012 Health and Retirement Study data reported significantly higher total costs for recently diagnosed cancer survivors compared with long-term survivors; however, distinctions were not made across cancer types.[13] Similarly, 2 studies using 2001-2007 and 2008-2010 Medical Expenditure Panel Survey (MEPS) data reported significantly higher OOP expenses among both recently and previously diagnosed cancer survivors compared with noncancer controls, without examining cancer types.[14, 15]

The goal of this study is to assess OOP expenditure by cancer status and cancer types across sex. We used the current condition designation of MEPS to stratify cancer survivors between those with a current cancer condition and those with no current cancer condition,[16] and examined OOP expenditure by cancer types for these subgroups. We examined OOP expenditure across cancer types because treatment approaches and survival for different cancers vary considerably,[7] which may in turn cause variations in OOP expenditure.

Additionally, we stratified our analysis by sex because, as demonstrated for other health conditions such as diabetes, disease-specific OOP expenditure may vary across sex.[17] Adopting a more granular approach compared with the previous studies, we examined average OOP expenditure by current vs no current cancer condition and by specific cancer types across sex, which will help facilitate health policy discussions and formulate better targeted intervention strategies.

METHODS

Data Source and Study Sample

Data for our study were obtained from MEPS, a nationally representative survey of the noninstitutionalized US population, which collects information on healthcare use and expenditure.[18] The survey oversamples minority groups and provides person weights in the released public use data sets.[19] The MEPS design and data collection process have been described elsewhere.[20, 21] For our study, we pooled multiple years of data (2009-2015 and 2018) and adjusted the survey weights accordingly.[22] Among several publicly available MEPS data files, we used the Full Year Consolidated file—which provided information on demographics, socioeconomic status, insurance coverage, health status, ever having cancer, and healthcare expenditure[19]—and the Medical Conditions file, which provided information on select current clinical conditions, including cancer.[16] MEPS data were deidentified and publicly available, therefore, our study was exempt from institutional review board approval.

Definition of Current Cancer Condition, No Current Cancer Condition and No History of Cancer

In the survey, respondents 18 years or older were asked “Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?”; those responding yes to this question were then asked “what kind of cancer was it?”.[19, 23] Based on the responses to these 2 questions, we identified individuals as cancer survivors and those with no history of cancer.

Information about current conditions was obtained from the Clinical Classifications Software (CCS) codes or CCS Refined (CCSR) codes. Among the cancer survivors, those who had a cancer-specific CCS or CCSR code were identified as (1) survivors with a current cancer condition; the rest of the cancer survivors were identified as (2) survivors with no current cancer condition. In MEPS the current condition was defined as “any clinical condition which had an associated healthcare event or which was being actively experienced by the respondent during the survey year”.[16] Thus, respondents with a current cancer condition were those who either had a health care event or reported that they actively experienced cancer in the survey year. Respondents who had CCS or CCSR code for more than one type of cancer or responded that they had history of more than one prior cancer were classified under ‘two or more cancers’ category.

MEPS used International Classification of Diseases, Ninth Revision (ICD-9)–based CCS codes to report current conditions until 2015 and transitioned to ICD-10–based CCSR codes in 2018.[16] Because neither CCS nor CCSR codes were publicly available for the years

2016 and 2017, we were unable to identify cancer cases with a current condition for 2016 and 2017, and excluded these 2 years. Consequently, our final analytic sample consisted of respondents pooled for the years 2009-2015 and 2018. Cases with mismatched cancer types in the survey response and the current condition designation were excluded.

Primary Outcome Measure

Total OOP expenditure per person per year was the primary outcome variable in our analysis. The total OOP expenditure was the sum of all-cause OOP expenditure incurred per person per year for any healthcare event, including office-based visits, outpatient visits, ER visits, inpatient stays, prescription medication purchases, home health care events, and other medical equipment and services use.[19] All dollar values were inflation-adjusted to 2018 US dollars using the Consumer Price Index for Medical Care.[24] Expenditure data in MEPS was primarily self-reported with a subset of the responses verified with the healthcare providers.[19] Even with the possibility of underestimation of cost in MEPS,[25] as established in previous studies, use of MEPS data enabled us to examine OOP burden of cancer at the national level.[14, 26]

Covariates

The covariates in each of the estimation model were age, cancer types, race/ethnicity, marital status, educational attainment, income level, insurance status, survey year, number of comorbid conditions, and self-reported health status. All covariates except age were categorical variables (Table 1). In the race/ethnicity variable, non-Hispanic White, non-Hispanic Black, and Hispanic were separate categories, while all other race/ethnicities were grouped together into the “Others” category. Marital status was dichotomized to 2 groups: single (which included individuals who never married or were widowed, divorced, or separated) and married. Educational attainment was categorized into: less than high school diploma, high school diploma, college education or higher, and missing. Income level was categorized into: < 200% of federal poverty level, 200% to < 400% of federal poverty level, and ≥ 400% of federal poverty level.[27] Insurance status had 5 categories: private (employer sponsored), private (non-employer sponsored), Medicaid/dual eligible, Medicare, and Uninsured. The Medicaid/dual eligible category included the individuals who were covered by both Medicaid and Medicare.

Statistical Analysis

Because our data consists of 3 types of participants (1) those without cancer (2) survivors with current cancer condition and (3) survivors with no current cancer condition, a substantial number of survey respondents had zero OOP expenditure. To account for the heterogeneous samples and zero inflation, we adopted a 2-part regression model. We used logistic regression as the first part to model the probability of incurring any expenditure and used generalized linear model regression with log link and gamma distribution as the second part to model the non-zero expenditure.[28] This technique was used in the second part because the gamma distribution models the non-negative and right-skewed expenditure data appropriately, whereas the log link helps avoid retransformation.[28] Also, we stratified the analyses by those with current cancers and those with no current cancer. Within each analysis, types of cancer were used as covariate.

We estimated the adjusted average OOP expenditure for several cancer types.[29] A permutation test was used to estimate the *P*-values for the OOP expenditure difference for each category compared with the "No history of cancer" reference category.[30] The permutation test is a nonparametric method which allowed us to construct the empirical null distribution of the incremental mean values for each cancer category with respect to the "No history of cancer" reference. *P*-values represent the statistical significance obtained using 1000 permutated replicates to test the hypothesis that the estimated average OOP expenditure for each cancer category is different than the "No history of cancer" category (2-sided *P*-value).[30] We conducted the permutation test in several steps. First, we permuted the outcome variable (i.e., OOP expenditure) 1000 times. Then we estimated the average OOP expenditure for all 1000 permutated outcome variables by applying the 2-part model, which formed the empirical null distribution. Finally, 2-sided *P*-values were obtained by comparing the estimated OOP expenditure from the actual data with the empirical null distribution generated through permutation. We conducted analyses by stratifying our sample by "current cancer condition" and "no current cancer condition" status. All analyses for male and female survivors were conducted separately.

To compare the differences in cancer-attributable OOP expenditure between female and male survivors, we first subtracted the estimated OOP expenditure for the "No history of cancer" category from each cancer type for women and men separately. Subtracting these cancer-attributable OOP expenditure values for men from the respective values for women yielded the incremental cancer-attributable OOP expenditures for each cancer type. The *P*-values were obtained by comparing these differences in estimated OOP expenditures between women and men to the respective differences in 1000 replicate data.

All analyses were conducted in SAS 9.4 (SAS Institute, Cary, NC; RRID:SCR_008567) and Stata15 (StataCorp, College Station, TX; RRID:SCR_012763) software, and 2-sided $P < 0.05$ was considered statistically significant. We incorporated survey weights in all our descriptive and covariate adjusted analyses and employed survey specific commands (i.e., svyset and svy: prefix) in Stata.

Data Availability

MEPS data analyzed in this study are publicly available from the Agency for Healthcare Research and Quality website at: https://meps.ahrq.gov/data_stats/download_data_files.jsp.

RESULTS

Characteristics of the Study Sample

Our study sample included 189 285 adult individuals (weighted N = 233 221 635) with an average age of 46.61 years. The weighted percentage of non-Hispanic White, non-Hispanic Black, Hispanic, and other race/ethnicity was 64.88%, 11.83%, 15.35%, and 7.95%, respectively. The study sample included 15 010 cancer survivors (weighted n = 22 631 973) with average age of 63.99 years. Among the cancer survivors, the weighted percentage of non-Hispanic White, non-Hispanic Black, Hispanic, and other race/ethnicity was 84.78%, 6.19%, 5.78%, and 3.25%, respectively. Of the cancer survivors, 10.57%

(weighted percentage) did not have any high school diploma and 28.27% lived below 200% of the federal poverty level.

The average age of the female cancer survivors (62.44 years) was lower than the average age of the male survivors (66.06 years). Among the 8902 (weighted n = 12 910 571) female survivors, 42% had a current cancer condition; among the 6108 (weighted n = 9 721 402) male survivors, 52.39% had a current cancer condition.

Table 1 illustrates the sociodemographic characteristics of the study sample stratified by sex and cancer status (i.e., no history of cancer, current cancer condition, no current cancer condition). The percentage of non-Hispanic White respondents was similar between survivors with a current cancer condition (female 82.18%, male 85.71%) and survivors with no current cancer condition (female 84.41%, male 87.37%), whereas it was lower among those with no history of cancer (female 62.41%, male 63.09%). There was no substantial difference in educational attainment between respondents with a current cancer condition vs no current cancer condition among either female or male cancer survivors. Most cancer survivors had income ≥ 400% of the federal poverty level, with a higher percentage of male survivors (current cancer condition 51.60%, no current cancer condition 50.21%) in this category compared with female survivors (current cancer condition 43.10%, no current cancer condition 38.99%). Although the uninsured rate was similar among female and male survivors with a current cancer condition, among the survivors with no current cancer condition, more women (6.61%) were uninsured than men (3.94%).

Estimated Out-of-Pocket Expenditure Among Female Cancer Survivors

Among female cancer survivors with a current cancer condition, those with breast cancer ($1730, $P < 0.001$), lung cancer ($1679, $P = 0.009$), colon cancer ($1595, $P = 0.010$), melanoma ($1783, $P = 0.002$), non-Hodgkin's lymphoma ($1656, $P = 0.018$), nonmelanoma skin cancer (NMSC)/other skin cancer ($2118, $P < 0.001$), and two or more cancers ($2310, $P < 0.001$) had statistically significantly higher OOP expenditures compared to the females with no history of cancer ($853); however, the difference was not statistically significant for females with a current cervical cancer condition ($882, $P = 0.855$) (Table 2).

Among female cancer survivors with no current cancer condition, those with cervical cancer ($1207, $P = 0.007$), breast cancer ($1364, $P < 0.001$), melanoma ($1396, $P = 0.015$), NMSC/other skin cancer ($1506, $P < 0.001$), and two or more cancers ($1578, $P = 0.007$) had significantly higher OOP expenditures compared with the females with no history of cancer ($857) (Table 2).

Estimated Out-of-Pocket Expenditure Among Male Cancer Survivors

Among male cancer survivors with a current cancer condition, those with prostate cancer ($1457, $P < 0.001$), lung cancer ($1131, $P = 0.027$), colon cancer ($1471, $P = 0.001$), melanoma ($1474, $P < 0.001$), non-Hodgkin's lymphoma ($1653, $P = 0.005$), NMSC/other skin cancer ($1789, $P < 0.001$), bladder cancer ($2157, $P < 0.001$), and two or more cancers ($2641, $P < 0.001$) had statistically significantly higher OOP expenditures than men with no history of cancer ($621) (Table 3).

Among male cancer survivors with no current cancer condition, those with prostate cancer ($1152, $P = 0.002$), colon cancer ($966, $P = 0.028$), melanoma ($1351, $P < 0.001$), NMSC/other skin cancer ($1478, $P < 0.001$), bladder cancer ($1321, $P = 0.019$), and two or more cancers ($1433, $P = 0.009$) had significantly higher OOP expenditures compared with men with no history of cancer ($621) (Table 3).

Differences in Cancer-Attributable Out-of-Pocket Expenditures Among Female Cancer Survivors Compared with Male Cancer Survivors

Table 4 shows incremental cancer-attributable OOP expenditures for female cancer survivors compared with male cancer survivors. Among survivors with current cancer condition, cancer-attributable OOP expenditures for females with two or more cancers was significantly lower than for males with two or more cancers (difference in cancer attributable OOP = −$564, $P = 0.021$). Among cancer survivors with no current cancer condition, cancer-attributable OOP expenditures for females with NMSC/other skin cancer was significantly lower than for males with NMSC/other skin cancer (difference in cancer attributable OOP = −$208, $P = 0.044$) (Table 4).

DISCUSSION

In this nationally representative study, we estimated average total per year OOP expenditures for several common cancer types among survivors with current and no current cancer conditions. Our results show that the OOP expenditures among survivors with a current cancer condition of breast cancer (female only), prostate cancer (male only), lung cancer, colon cancer, melanoma, non-Hodgkin's lymphoma, NMSC/other skin cancer, bladder cancer, and two or more cancers were significantly higher than the OOP expenditures among individuals with no history of cancer of respective sex. These differences were observed in female survivors with breast cancer; male survivors with prostate, lung, colon and bladder cancer; and survivors of both sexes with melanoma, NMSC/other skin cancer, and two or more cancers even when survivors had no current cancer condition. Among women with cervical cancer, average OOP expenditure was not significantly higher for those with a current cancer condition compared to women with no history of cancer; however, it was higher for those with no current cancer condition compared to women with no history of cancer.

As expected, we observed higher OOP expenditure among survivors with a current cancer condition compared with those with no current cancer for most cancer types (except cervical cancer). The higher OOP estimates are likely attributable to the greater healthcare needs among individuals recently diagnosed with cancer.[31, 32] Cancer treatment incurs its highest costs in the initial and terminal phases of care, and the cost is usually lower in the continuing phase. In addition to cancer-related care, additional health service needs, such as home healthcare and mental healthcare, are elevated among recently diagnosed survivors. According to Chesney et al, home healthcare is utilized by 43.7% of elderly cancer survivors in the first month after surgery, and the percentage decreases to 12.6% 5 years after surgery.[33] The initial treatment cost, coupled with the elevated supportive

healthcare needs, may have resulted in the higher OOP expenditures reported in our study among those with a current cancer condition.

One notable finding in our study is that the OOP expenditures for survivors with no current cancer condition for several cancer types (breast cancer among women; prostate, lung, colon, and bladder cancers among men; and melanoma, NMSC/other skin cancer, and two or more cancers among both sexes) were significantly higher compared to those with no cancer history. This finding highlights the persistence of higher healthcare spending among survivors who do not currently experience cancer or actively receive treatment for cancer. Although the maintenance phase of cancer care may incur lower costs than the initial phase,[31] long-term cancer survivors may still experience heightened health needs due to several persistent psychological and physiological conditions. Compared with the general population, significantly higher depression and anxiety have been reported among younger (<60 years) long-term cancer survivors.[34] Although the literature on depression and anxiety related to OOP burden in cancer survivors is lacking, total financial burden is well reported.[35, 36] Diagnosis of depression results in around 32% higher total expenditures among cancer survivors,[35] which may be associated with higher OOP expenditure. In addition to mental healthcare, supportive services such as home healthcare are used by more than 12% of long-term cancer survivors.[33] The persistent mental and home healthcare needs are possible reasons for the higher OOP expenditures among long-term survivors with no current cancer condition.

An interesting finding in our study was that OOP expenditure among women with a current cervical cancer condition was not significantly higher than women without a history of cancer. A possible explanation for this finding may be the way the treatment-related cost is transferred to the survivors by the insurers. Although extensive treatment may be required for cervical cancer,[37, 38] the insurers transfer only a fraction of the total treatment-related costs to the patients.[39] Blanco et al reported that the median OOP cost for commercially insured women with cervical cancer in the first 12 months after diagnosis was $2253, which was only 3.9% of the total treatment-related cost.[39] This lower cost transfer to recently diagnosed cervical cancer patients may help explain the reduced OOP burden on this subgroup.

In contrast, we found that OOP expenditure for cervical cancer survivors with no current cancer was significantly higher than the OOP expenditure for women without a cancer history. Substantial physiological and psychological needs[40–43] demonstrated by long-term cervical cancer survivors may explain this finding. Long-term cervical cancer survivors experience several physiological issues, many of which are associated with treatment interventions in the pelvic region.[40] Treatment-related adverse events include bladder dysfunction, gastrointestinal complications, sexual dysfunction, and lymphedema.[40–43] Bladder symptoms are very common, with 96.2% of cervical and endometrial cancer survivors reporting bladder storage issues and 82.7% reporting incontinence issues 1 year after treatment, and these percentages are significantly higher than in people with no cancer history.[40, 41] In addition, lymphedema, chronic radiation proctitis with late onset, and sexual dysfunction may affect long-term cervical cancer survivors.[40, 42] The clinical care related to these physiological conditions is the most likely cause of higher OOP burden observed

in this subgroup. This finding underscores the need to provide financial support to cervical cancer survivors even when they are a few years removed from their cancer diagnosis.

Similar to cervical cancer, lymphedema is observed in more than 40% of breast cancer survivors and in lower percentages among several other cancers.[44] Additionally, chronic radiation proctitis is observed in prostate, urinary bladder, uterine, and anal cancers, where radiation therapy poses a risk of rectum injury.[45] In our study, some of these cancer types, namely breast cancer (women) and prostate and bladder cancers (men), among survivors with no current cancer condition demonstrated significantly higher OOP expenditures compared with individuals without a cancer history. This is an indication that the long-term adverse effects related to cancer treatment may prevent cancer survivors' OOP costs from returning to their pre-cancer level. Specific aspects of these long-term adverse effects causing higher OOP costs should be investigated further in future research.

In addition to total OOP expenses incurred by female and male survivors separately, we investigated incremental cancer-attributable costs for female survivors compared with male survivors. We observed significantly lower cancer-attributable OOP expenditures for female survivors only among those with two or more cancers (among survivors with current cancer) and NMSC/other skin cancer (among survivors with no current cancer). These results suggest that sex does not play a significant role in OOP expenditure variations across most cancer types.

Significance of Findings/Policy Implications

Cancer is physically and psychologically debilitating, and it reduces survivor's ability and engagement to work. Considering this aspect of cancer, it is vitally important to adopt policy actions targeting the most vulnerable survivors. A good example of a federal initiative to alleviate financial distress related to cancer screening and diagnosis is the National Breast and Cervical Cancer Early Detection Program (NBCCEDP). This program reduces financial barriers related to breast and cervical cancer screening and diagnosis among underserved women and provides Medicaid access after diagnosis. Public health interventions similar to the NBCCEDP for other cancer types could lessen the financial burden on a substantial number of cancer survivors. To implement such interventions for other cancers in a cost-efficient manner, providing targeted assistance to the individuals with most in need is of vital importance. Targeting long-term survivors with financial intervention is equally important as targeting the survivors with current cancer because both groups may experience high OOP burden depending on the cancer type. To that extent, our study reports the specific cancer types with high OOP expenditures among survivors with current and no current cancer across both sexes, which may help identify the most financially vulnerable cancer survivors.

Strengths and Limitations

Our study was conducted using nationally representative data, which is a strength of this study. Despite this strength of our study, there are a few limitations. First, although based on nationally representative general adult population, the study may not be representative of cancer survivors because survey participants are usually a self-selected group in the general population and they are generally healthier than the non-participants.[46] The self-reported

nature of MEPS carries a possibility of recall bias;[47] however, possibilities of self-selection bias prevalent in web surveys[48] is potentially reduced through the implementation of personal interviews[49] with a population-representative complex survey design in MEPS. Second, the cost amounts might also be underestimated in MEPS due to the self-reported nature of the survey;[50, 51] however, a subset of the responses were verified by MEPS with healthcare providers data.[19] , Third, we were unable to incorporate cancer-related clinical information (e.g., age at diagnosis, time since diagnosis, stage) in our analyses due to the unavailability of those variables in MEPS. Finally, we had to exclude 2016 and 2017 data because CCS codes were not available for those years. Despite these limitations, MEPS is a valuable data source because it is the only nationally representative survey that collects healthcare utilization and expenditure data in the United States.[50–52]

CONCLUSION

We estimated the OOP expenditures for female and male survivors for several cancer types across current vs no current cancer conditions. Financial distress affects all aspects of life for cancer survivors, from negatively affecting the purchase of basic necessities like food to contributing as a risk factor for mortality.[53] Amidst an ongoing discussion on financial toxicity of cancer, several interventions to alleviate the OOP burden on the survivors have been suggested.[54, 55] Our study highlights that the financial distress varies across cancer types among the survivors with and without a current cancer condition. This highlights the need for targeted intervention to alleviate the burden on most financially vulnerable cancer survivors. Our findings will inform policy discussions around the financial toxicity of cancer and help formulate targeted interventions.

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Statement of significance

Our study found that out-of-pocket expenditures among survivors with a current cancer condition for several cancers were significantly higher than that of individuals without a cancer history. These differences persisted in female with breast cancer; male with prostate, lung, colon and bladder cancer; and survivors of both sexes with melanoma, and nonmelanoma/other skin cancer, even after there was no current cancer condition.

Table 1.

Sociodemographic Characteristics of Adult US Population with No History of Cancer and Cancer Survivors with a Current Cancer Condition and No Current Cancer Condition, 2009-2015 and 2018

Variable	Women									Men								
	No history of cancer (raw n=92 437)			Current cancer condition (raw n=3716)			No-current cancer condition (raw n=5186)			No history of cancer (raw n=81 838)			Current cancer condition (raw n=3230)			No-current cancer condition (raw n=2878)		
	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %
Cancer status and type																		
No history of cancer	92 437	107 371 495	100.00	NA	NA	NA	NA	NA	NA	81 838	103 218 167	100.00	NA	NA	NA	NA	NA	NA
Cervical cancer	NA	NA	NA	150	161 247	2.97	847	1 068 884	14.28	NA	NA	NA	NA	NA	NA	NA	NA	NA
Breast cancer	NA	NA	NA	1271	1 786 934	32.95	972	1 405 370	18.77	NA	NA	NA	NA	NA	NA	NA	NA	NA
Prostate cancer	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	892	1 230 541	24.16	672	976 012	21.09
Lung cancer	NA	NA	NA	99	131 137	2.42	39	43 084	0.58	NA	NA	NA	99	126 382	2.48	39	55 176	1.19
Colon cancer	NA	NA	NA	134	151 486	2.79	199	253 695	3.39	NA	NA	NA	163	218 424	4.29	191	263 248	5.69
Melanoma	NA	NA	NA	149	270819	4.99	295	507 968	6.78	NA	NA	NA	166	295 379	5.80	248	461 994	9.98
Non-Hodgkin's lymphoma	NA	NA	NA	83	119 854	2.21	64	95 426	1.27	NA	NA	NA	83	134 315	2.64	69	103 116	2.23
Nonmelanoma/ other skin cancer	NA	NA	NA	724	1 300 171	23.97	1181	2 127 129	28.41	NA	NA	NA	898	1 617 101	31.75	981	172 6733	37.31
Bladder cancer	NA	NA	NA	38	48 612	0.90	23	33 447	0.45	NA	NA	NA	104	179 228	3.52	62	93 110	2.01
Other/ unspecified	NA	NA	NA	851	1 130 565	20.85	1356	1 658 538	22.15	NA	NA	NA	608	926 017	18.18	526	798 044	17.24
≥ Two cancers	NA	NA	NA	217	322 232	5.94	210	293 971	3.93	NA	NA	NA	217	366 050	7.19	90	15 0533	3.25
Race/ethnicity																		
non-Hispanic white	36 805	67 006 708	62.41	2484	4 456 563	82.18	3622	6 320 396	84.41	34 777	65 120 015	63.09	2336	4365 836	85.71	2210	404 3615	87.37
non-Hispanic black	20 168	14 273 103	13.29	519	374 965	6.91	651	435 528	5.82	14 699	11 908 462	11.54	468	352 109	6.91	311	238 988	5.16
Hispanic	25 959	16 859 054	15.70	495	367 796	6.78	667	474 097	6.33	23 649	17 621 623	17.07	288	232 927	4.57	259	234 196	5.06
Others	9505	9 232 630	8.60	218	223 735	4.13	246	257 492	3.44	8713	8 568 067	8.30	138	142 565	2.80	98	111 167	2.40

Variable	Women									Men								
	No history of cancer (raw n=92 437)			Current cancer condition (raw n=3716)			No-current cancer condition (raw n=5186)			No history of cancer (raw n=81 838)			Current cancer condition (raw n=3230)			No-current cancer condition (raw n=2878)		
	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %
Marital status																		
Single [a]	50 269	52 977 458	49.34	1865	2 462 367	45.41	2869	3 779 027	50.47	39 927	49 057 238	47.53	1044	1 499 100	29.43	1043	160 4065	34.66
Married	42 168	54 394 037	50.66	1851	2 960 691	54.59	2317	3 708 486	49.53	41 911	54 160 928	52.47	2186	3 594 337	70.57	1835	302 3901	65.34
Educational attainment																		
< High school diploma	18 137	13 981 852	13.02	536	542 368	10.00	834	841 358	11.24	16 775	14 706 007	14.25	500	527 786	10.36	405	481 082	10.40
High school diploma	33 485	38 078 908	35.46	1452	2 052 912	37.86	2114	2 988 776	39.92	30 792	39 191 175	37.97	1163	1 807 971	35.50	1033	156 9773	33.92
≥ College education	33 566	47 822 870	44.54	1479	2 430 228	44.81	1909	3 169 802	42.33	27 720	42 109 400	40.80	1371	2 462 559	48.35	1249	225 6183	48.75
Missing	7249	7 487 865	6.97	249	397 550	7.33	329	487 577	6.51	6551	7 211 584	6.99	196	295 121	5.79	191	320 927	6.93
Income level																		
<200% of federal poverty level	41 495	35 260 388	32.84	1370	1 592 859	29.37	2121	2 450 842	32.73	30 005	28 462 518	27.58	1026	1 220 191	23.96	866	1 133 669	24.50
200% to <400% of federal poverty level	26 579	31 742 313	29.56	1052	1 493 071	27.53	1488	2 117 417	28.28	25 853	31 372 342	30.39	859	1 244 921	24.44	787	1 170 785	25.30
≥400% of federal poverty level	24 363	40 368 794	37.60	1294	2 337 128	43.10	1577	2 919 253	38.99	25 980	43 383 306	42.03	1345	2 628 325	51.60	1225	2 323 512	50.21
Insurance status																		
Private (employer sponsored)	44 042	61 143 226	56.95	1728	2 759 370	50.88	2142	3 514 924	46.94	41 839	60 785 918	58.89	1412	2 486 515	48.82	1367	2385 802	51.55
Private (non-employer sponsored)	7639	11 184 108	10.42	531	916 883	16.91	698	1 153 696	15.41	6534	9 976 135	9.67	569	970 337	19.05	450	770 487	16.65
Medicaid/dual eligible	18 273	14 259 959	13.28	618	565 611	10.43	921	898 364	12.00	9696	8 718 953	8.45	362	345 920	6.79	248	264 938	5.72
Medicare	6585	8 131 888	7.57	698	1 030 552	19.00	980	1 425 841	19.04	4946	6 176 535	5.98	808	1 179 316	23.15	670	1024 278	22.13

Variable	Women									Men								
	No history of cancer (raw n=92 437)			Current cancer condition (raw n=3716)			No-current cancer condition (raw n=5186)			No history of cancer (raw n=81 838)			Current cancer condition (raw n=3230)			No-current cancer condition (raw n=2878)		
	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %
Uninsured	15 898	12 652 313	11.78	141	150 641	2.78	445	494 688	6.61	18 823	17 560 626	17.01	79	111 348	2.19	143	182 460	3.94
Survey year																		
2009	11 928	12 885 970	12.00	461	644 034	11.88	667	918 562	12.27	10 476	12 533 478	12.14	410	632 270	12.41	309	467 412	10.10
2010	10 752	13 019 930	12.13	430	613 064	11.30	604	937 259	12.52	9502	12 652 110	12.26	352	565 708	11.11	316	510 220	11.02
2011	11 569	13 257 408	12.35	482	706 518	13.03	605	832 032	11.11	10 208	12 642 315	12.25	409	648 623	12.73	343	551 007	11.91
2012	12 789	13 426 056	12.50	521	738 766	13.62	658	869 926	11.62	11 401	12 800 383	12.40	416	607 623	11.93	375	580 938	12.55
2013	12 077	13 453 874	12.53	455	676 793	12.48	605	960 243	12.82	10 718	12 929 583	12.53	360	596 691	11.71	354	642 027	13.87
2014	11 411	13 572 148	12.64	431	693 692	12.79	616	953 366	12.73	10 096	13 068 864	12.66	385	701 512	13.77	320	562 359	12.15
2015	11691	13 701 065	12.76	461	709 879	13.09	657	948 653	12.67	10 462	13 207 538	12.80	434	713 102	14.00	357	593 829	12.83
2018	10 220	14 055 044	13.09	475	640 312	11.81	774	1 067 471	14.26	8975	13 383 895	12.97	464	627 908	12.33	504	720 174	15.56
Number of comorbid conditions																		
Zero	37 082	41 266 220	38.43	463	635 535	11.72	686	1 036 269	13.84	34 072	39 686 930	38.45	243	338 627	6.65	304	490 832	10.61
One	19 589	23 438 807	21.83	549	815 282	15.03	813	1 169 529	15.62	18 877	24 652 945	23.88	388	644 884	12.66	431	741 033	16.01
Two	12 780	15 595 161	14.52	646	985 335	18.17	899	1 313 735	17.55	11 689	15 829 467	15.34	630	1 023 200	20.09	527	845 984	18.28
Three	9382	11 465 780	10.68	647	987 588	18.21	903	1 355 629	18.11	7744	10 537 546	10.21	629	953 679	18.72	565	880 799	19.03
≥Four	13 604	15 605 527	14.53	1411	1 999 317	36.87	1885	2 612 350	34.89	9456	12 511 279	12.12	1340	2 133 047	41.88	1051	1 669 318	36.07
Health status																		
Fair/poor	13 988	13 648 439	12.71	1071	1 310 864	24.17	1287	1 595 559	21.31	10 120	11 358 664	11.00	1005	1 391 303	27.32	633	939 360	20.30

Variable	Women									Men								
	No history of cancer (raw n=92 437)			Current cancer condition (raw n=3716)			No-current cancer condition (raw n=5186)			No history of cancer (raw n=81 838)			Current cancer condition (raw n=3230)			No-current cancer condition (raw n=2878)		
	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %	Raw n	Weighted n	Weighted %
Good	28 319	30 347 707	28.26	1169	1 685 116	31.07	1656	2 268 204	30.29	23 425	27 903 465	27.03	1037	1 654 293	32.48	928	1 419 364	30.67
Very good/ excellent	50 130	63 375 348	59.02	1476	2 427 078	44.75	2243	3 623 750	48.40	48 293	63 956 038	61.96	1188	2 047 840	40.21	1317	2 269 241	49.03

[a]The “single” category includes individuals who never married or were widowed, divorced or separated.

Abbreviations: NA, not applicable.

Table 2.

Average Per Year Out-of-Pocket Expenditure for Female Cancer Survivors[a]

Cancer Status and Type	Current Cancer Condition		No Current Cancer Condition	
	Average out-of-pocket expenditures, $US[b]	*P* [c]	Average out-of-pocket expenditures, $US[b]	*P* [c]
No history of cancer [Reference]	853		857	
Cervical cancer	882	.855	1207	.007
Breast cancer	1730	<.001	1364	<.001
Lung cancer	1679	.009	1131[c]	.322
Colon cancer	1595	.010	1142	.083
Melanoma	1783	.002	1396	.015
Non-Hodgkin's lymphoma	1656	.018	1216	.126
Nonmelanoma/other skin cancer	2118	<.001	1506	<.001
Bladder cancer	1848[d]	.024	1015[c]	.650
Other/unspecified	1621	<.001	1106	.008
≥Two cancers	2310	<.001	1578	.007

[a]Estimates were obtained from survey weighted and covariate-adjusted analysis of pooled Medical Expenditure Panel Survey data for the years 2009-2015 and 2018. The dollar values were inflation-adjusted to 2018 US dollars using the Consumer Price Index (CPI).

[b]Estimated average out-of-pocket expenditure by applying the 2-part regression model to specific cancer subtypes. Each model was adjusted for age, cancer status and type, race/ethnicity, marital status, educational attainment, income level, insurance status, survey year, number of comorbid conditions, and self-reported health status.

[c]*P*-value represents the statistical significance obtained using 1000 permutated replicates to test the hypothesis that the estimated average out-of-pocket expenditure for each cancer category is different than the "'No history of cancer" category (2-sided *P*-value). Each replicate model was adjusted for the same set of predictors as the base model, and the dependent variable, out-of-pocket expenditure, was permuted for each replicate analyses.

[d]Unweighted sample size less than 60

Table 3.

Average Per Year Out-of-Pocket Expenditures for Male Cancer Survivors[a]

Cancer Status and Type	Current Cancer Condition		No Current Cancer Condition	
	Average out-of-pocket expenditures, $US[b]	*P* [c]	Average out-of-pocket expenditures, $US[b]	*P* [c]
No history of cancer [Reference]	621		621	
Prostate cancer	1457	<.001	1152	.002
Lung cancer	1131	.027	1323[d]	.031
Colon cancer	1471	.001	966	.028
Melanoma	1474	<.001	1351	.001
Non-Hodgkin's lymphoma	1653	.005	646	.916
Nonmelanoma/other skin cancer	1789	<.001	1478	<.001
Bladder cancer	2157	<.001	1321	.019
Other/unspecified	2255	<.001	1080	.003
≥ Two cancers	2642	<.001	1433	.009

[a]Estimates were obtained from survey weighted and covariate adjusted analysis of pooled Medical Expenditure Panel Survey data for the years 2009-2015 and 2018. The dollar values were inflation-adjusted to 2018 US dollars using the Consumer Price Index (CPI).

[b]Estimated average out-of-pocket expenditure by applying the 2-part regression model to specific cancer subtypes. Each model was adjusted for age, cancer status and types, race/ethnicity, marital status, educational attainment, income level, insurance status, survey year, number of comorbid conditions, and self-reported health status.

[c]*P*-value represents the statistical significance obtained using 1000 permutated replicates to test the hypothesis that the estimated average out-of-pocket expenditure for each cancer category is different than "'No history of cancer" category (2-sided *P*-value). Each replicate model was adjusted for the same set of predictors as the base model, and the dependent variable, out-of-pocket expenditure, was permuted for each replicate analyses.

[d]Unweighted sample size less than 60

Table 4.

Incremental Cancer-Attributable Per-Year Out-of-Pocket Expenditures for Female Cancer Survivors Compared to Male Cancer Survivors

Cancer Status and Type	Current Cancer Condition		No Current Cancer Condition	
	Incremental cancer-attributable average out-of-pocket expenditure, $US[a]	*P* [b]	Incremental cancer-attributable average out-of-pocket expenditure, $US[a]	*P* [b]
Lung cancer	316	236	−428	.264
Colon cancer	−108	638	−60	.765
Melanoma	77	693	−191	.263
Non-Hodgkin's lymphoma	−229	.368	334	.271
Nonmelanoma/other skin cancer	97	.364	−208	.044
Bladder cancer	−541	.119	−542	.180
Other/unspecified	−866	<.001	−210	.061
≥ Two cancers	−564	.021	−91	.669

[a]Cancer attributable incremental per year out-of-pocket (OOP) expenditure values were obtained by deducting cancer attributable OOP expenditure values for males from the respective values for women for each cancer type. Negative sing means that the cancer attributable OOP expenditure for women was lower than for men.

[b]*P*-value represents the statistical significance obtained using 1000 permutated replicates to test the hypothesis that for each specific cancer type the cancer attributable average OOP expenditures for female survivors are different from those of male survivors.