

Financial toxicity impact on younger versus older adults with cancer in the setting of care delivery

Kelsey L. Corrigan, MD, MPH ¹; Shuangshuang Fu, PhD²; Ying-Shiuan Chen, PhD¹; Kelsey Kaiser, MS¹; Michael Roth, MD³; Susan K. Peterson, PhD, MPH⁴; Ya-Chen T. Shih, PhD ²; Reshma Jaggi, MD, DPhil ^{5,6}; Sharon H. Giordano, MD, MPH^{2,7}; Robert J. Volk, PhD ²; K. Robin Yabroff, PhD, MBA⁸; Mathew P. Banegas, PhD, MPH ⁹; Chiara Acquati, PhD, LMSW ^{10,11}; Rena M. Conti, PhD¹²; Hilary Y. Ma, MD¹³; Kimberly Ku, BS¹; Y. Nancy You, MD, MHSc¹⁴; and Grace L. Smith, MD, PhD, MPH^{2,15}

BACKGROUND: Young adults and other working-age adults with cancer are at risk for cancer-related financial toxicity (FT), including material hardships, depletion of coping resources, and psychological burden. This study compares FT domains in young adults (18–39 years old) (YAs), other working-age adults (40–64 years old), and older adults (≥65 years old) receiving cancer care. **METHODS:** A total of 311 adults were surveyed using the multi-domain Economic Strain and Resilience in Cancer instrument measuring FT (0–10 score indicating least to greatest FT; score ≥5 severe FT). Participants were receiving ambulatory care from March–September 2019. Associations of age with overall FT and material hardship, coping resource depletion, and psychological burden FT domains were tested using Kruskal–Wallis and χ^2 tests and multivariable generalized linear models with gamma distribution. **RESULTS:** YAs (median age, 31.5 years) comprised 9.6% of the sample; other working-age adults comprised 56.9%. Overall, material, coping, and psychological FT scores were worse in younger age adults versus older adults ($P < .001$ in all multivariable models). Compared with older adults, younger age adults demonstrated worse material hardship (median scores, 3.70 vs 4.80 vs 1.30 for YAs, other working-age, and older adults, respectively; $P < .001$), coping resource depletion (4.50 vs 3.40 vs 0.80; $P < .001$), and psychological burden (6.50 vs 7.00 vs 1.00; $P < .001$). Fifty percent of YAs had severe overall FT versus 40.7% of other working-age adults and 9.6% of older adults ($P < .001$). **CONCLUSIONS:** Younger age adults with cancer bore disproportionate FT. Interventions to address unmet needs are critical components for addressing FT in this population. **Cancer** 2022;128:2455–2462. © 2022 American Cancer Society.

KEYWORDS: cancer survivors, financial toxicity, health care disparities, neoplasms, young adult.

INTRODUCTION

Working-age adults, including young adults (YAs), with cancer have high out-of-pocket medical costs compared with working-age adults and YAs without cancer.^{1,2} These excess costs render younger patients at high risk for cancer-related financial hardship and “financial toxicity” (FT).^{3,4} Several prior studies of adolescent and YA cancer survivors indicated especially severe and persistent financial concerns long after a cancer diagnosis. For example, in the Adolescent and Young Adult Health Outcomes and Patient Experience study, 51%, 70%, and 65% of cancer survivors 15 to 20, 21 to 29, and 30 to 39 years old, respectively, reported experiencing a negative financial impact of their disease.⁵ In another study, YA survivors identified financial concerns as one of their leading unmet survivorship needs.⁶

FT is a multidimensional problem and incorporates not only material (monetary) hardships, such as accumulating out-of-pocket costs and medical debt during and after receiving cancer care, but also accompanying psychosocial hardships. These include strain and/or drain on individuals’ coping resources, which leads to economizing responses, such as reduced spending on food and skipping medications, and psychological burden, such as distress and anxiety about cancer-related financial stressors. Moreover, these psychosocial consequences associated with FT can impact individuals’

Corresponding Author: Grace L. Smith, MD, PhD, MPH, The University of Texas MD Anderson Cancer Center, 1400 Pressler St, Houston, TX 77030 (gsmith@mdanderson.org).

¹Department of Radiation Oncology, The University of Texas MD Anderson Cancer Center, Houston, Texas; ²Department of Health Services Research, The University of Texas MD Anderson Cancer Center, Houston, Texas; ³Department of Pediatrics, The University of Texas MD Anderson Cancer Center, Houston, Texas; ⁴Department of Behavioral Science, The University of Texas MD Anderson Cancer Center, Houston, Texas; ⁵Department of Radiation Oncology, University of Michigan, Ann Arbor, Michigan; ⁶Center for Bioethics and Social Sciences in Medicine, University of Michigan, Ann Arbor, Michigan; ⁷Department of Breast Medical Oncology, The University of Texas MD Anderson Cancer Center, Houston, Texas; ⁸American Cancer Society, Atlanta, Georgia; ⁹Department of Radiation Medicine and Applied Sciences, University of California, San Diego, San Diego, California; ¹⁰Graduate College of Social Work, University of Houston, Houston, Texas; ¹¹Department of Health Disparities Research, The University of Texas MD Anderson Cancer Center, Houston, Texas; ¹²Department of Markets, Public Policy, and Law, Boston University School of Business, Boston, Massachusetts; ¹³Department of General Oncology, The University of Texas MD Anderson Cancer Center, Houston, Texas; ¹⁴Department of Colon and Rectal Surgery, The University of Texas MD Anderson Cancer Center, Houston, Texas; ¹⁵Department of Gastrointestinal Radiation Oncology, The University of Texas MD Anderson Cancer Center, Houston, Texas

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well-being across the cancer care continuum, from active cancer treatment to survivorship.^{3,7-10}

Evidence suggests that younger individuals with cancer, especially YAs, are particularly vulnerable to psychosocial distress that may exacerbate risk for, and consequences of, financial hardship.¹ Younger individuals with cancer have comparatively lower financial reserves, less financial literacy, and more extreme vocational disruption than older individuals. These problems may be exacerbated by less robust psychosocial coping skills and shifting social support sources in younger individuals.¹¹ Thus, FT assessment and intervention in cancer care delivery settings for individuals in younger, higher-risk age groups may warrant targeting multiple domains of FT, including its psychosocial aspects.¹¹

Informing the design of multidimensional, targeted FT assessment and intervention strategies for future routine implementation in cancer care requires a comprehensive analysis of the spectrum, severity, and comparative impact of the multiple domains of FT among younger age individuals (<65 years old), especially in the subpopulation of YAs (18-39 years old), because they face unique financial and psychosocial challenges. Early in the cancer care/survivorship trajectory—during treatment and early follow-up—is a phase in care when patients have high health care utilization (and expenses) and interact closely and frequently with providers. This is also a phase when early FT intervention may minimize downstream adverse effects of FT, such as accumulation of medical debt and nonadherence to curative cancer care.^{7,10,12} Accordingly, in this survey study, we sought to quantify and compare the domains and severity of the material, coping, and psychological FT burdens early in the care and survivorship trajectory for working-age adults (including YA 18-39 years old and other working-age adults 40-64 years old) and older adults with cancer.

MATERIALS AND METHODS

Study Sample

The study sample was derived from the Economic Strain and Resilience in Cancer¹³ study, which included individuals with cancer receiving ambulatory oncology care between March and September 2019. Individuals eligible for this study were ≥ 18 years old, had confirmed diagnosis of cancer, and were undergoing ambulatory cancer care (ie, active cancer treatment or follow-up/surveillance care) at participating oncology clinics within the larger Houston metropolitan area. Participating sites included an academic National Cancer Institute-designed comprehensive cancer hospital and one of the center's regional

affiliated community oncology clinics, and a county medical safety-net clinic in the community setting that provides medical financial assistance for individuals with a household income <150% of the federal poverty level. Patients were invited in-person to participate in this survey from participating medical, surgical, or radiation oncology clinics after screening for eligibility.^{14,15} Of 491 patients invited, 312 agreed to participate (recruitment response rate, 63.5%). Patients who did not answer >50% survey questions ($n = 1$) were omitted, leaving an analytic sample of 311 patients. This study was approved by the institutional review board.

Measuring FT

The 15-item Economic Strain and Resilience in Cancer instrument measures patient-reported FT,¹⁴⁻¹⁶ including an overall FT score as well as subscore domains of 1) material hardship such as out-of-pocket costs, spent savings, and lost income; 2) depletion of coping resources such as employment benefits, professional assistance resources from formal organizations, and instrumental help from family and friends; and 3) severity of psychological burdens, such as stress related to finances. These 3 conceptual domains have been previously identified as comprising FT.^{3,9}

Each item was scored on a 0 to 10 scale.¹³ Overall FT score (all items) and the material FT, coping FT, and psychological FT item subscores were calculated as an arithmetic average of item scores (re-weighted for missing items). The score for overall FT and subscore FT ranged from 0 to 10 (least to most severe FT burden). In analyses, this was tested as a continuous variable as well as a dichotomous variable categorized as “severe” (score ≥ 5) versus “not severe” (score <5), based on a scoring threshold identified in a prior study associated with adverse care delivery outcomes.¹²

Age

Participant age at the time of survey completion was calculated based on the date of birth abstracted from the electronic medical record. Patients 18 to 39 years old were defined as YA, per current clinical guidelines.¹⁷⁻¹⁹ Older adults were defined as ≥ 65 years old based on age-eligibility for Medicare insurance coverage.^{4,9,19,20} We conducted secondary exploratory analyses on more specific age group categories (18-26, 27-39, 40-54, 55-64, and ≥ 65 years old), to explore for differences in FT by more granular subgroups. The youngest subgroup was defined based on differences developmentally^{21,22} and eligibility for parental insurance under the Affordable Care Act.¹⁹

Other Covariates

Survey participants reported annual household income, health insurance coverage (including public [Medicaid or Medicare], private [employer-purchased or self-purchased], or uninsured) and highest attained education level. Other clinical and demographic covariates were abstracted from the electronic medical record, including gender, race and Hispanic ethnicity, cancer disease site (eg, breast, lung, prostate, etc), cancer stage at diagnosis, and treatment setting (comprehensive care center clinics or county safety net clinic). Categories in univariable and multivariable analyses were collapsed based on distributions.

Statistical Analysis

The univariable associations between age groups and continuous overall FT scores and FT subscores were tested using the Kruskal-Wallis test. Trends in FT scores across ordinal age groups were tested using the Jonckheere's test. Univariable associations for FT scores and the primary analysis categories for age groups, 18 to 39 years old versus 40 to 64 years old versus ≥ 65 years old, were tested using the Wilcoxon rank-sum and Kruskal-Wallis test. Other correlations between patient characteristic covariates and overall FT scores were tested using the Kruskal-Wallis test or Wilcoxon rank-sum test for categorical variables and Spearman's correlation coefficient for continuous variables.

Multivariable generalized linear regression models with γ distribution were used to test the associations between age group and overall FT and material, coping, and psychological FT scores, adjusted for clinical and demographic covariates retained in the model that initially demonstrated univariate associations with $P < .25$. The likelihood ratio test was used to examine for the overall effect of age in the multivariable models.

In secondary analyses, we performed exploratory analyses to describe the associations between age and FT outcomes using the specific age group categories (18-26, 27-39, 40-54, 55-64, and ≥ 65 years old). We also tested sensitivity models using the dichotomized FT outcome of severe (≥ 5) versus no severe (< 5) FT score. Analyses were conducted using SAS Enterprise Guide version 7.11 (Cary, North Carolina). Statistical tests were 2-sided with P value $< .05$ considered statistically significant.

RESULTS

Among 311 survey participants, 30 (9.6%) were 18 to 39 years old, 177 (47%) were 40 to 64 years old, and 104 (33.4%) were ≥ 65 years old. A total of 80 (25.7%)

received care in the medical safety net community oncology setting. A majority were female (57.2%) and non-Hispanic White (59.8%), and 30.6% had distant metastatic cancer at the time of cancer diagnosis and the most common disease site was breast cancer (35.7%). The median time from diagnosis to survey (FT assessment) for all participants was 7.4 months (interquartile range, 3.4, 13.2). Other key patient characteristics are summarized in Table 1. Univariable associations of clinical and demographic characteristics by age categories are summarized in Supporting Table 1.

FT and age

Median overall FT score (Table 2) as well as material, coping, and psychological FT scores (Fig. 1) were significantly worse for individuals in younger age groups (18-39 and 40-64 years old) compared to those ≥ 65 years old (Kruskal-Wallis $P < .001$ for all comparisons). In exploratory analysis, the limited sample of patients 18 to 26 years old similarly had trends for worse overall, material, coping, and psychological FT scores (Supporting Table 2).

After adjusting for demographic and clinical covariates, there remained an increased risk for higher overall FT scores among younger adult age groups: Risk ratio (RR), 1.95; 95% confidence interval (CI), 1.36-2.80; $P < .001$ for adults 18-39 years old; and RR, 1.93; 95% CI, 1.56-2.38; $P < .001$ for adults 40-64 years old, compared with adults ≥ 65 years old. Additional RRs for material, coping, and psychological FT are presented in Table 3, demonstrating significantly worse scores for each FT domain (material, coping, and psychological domains) among the younger age groups. There was no difference in risk for overall, material, coping, and psychological FT between the 2 working-age groups (18-39 vs 40-64 years old) (overall FT RR, 1.01; 95% CI, 0.72-1.41; $P = .94$; material FT RR, 0.89; 95% CI, 0.60-1.32; $P = .56$; coping FT RR, 1.17; 95% CI, 0.81-1.69; $P = .41$; and psychological FT RR, 0.92; 95% CI, 0.59-1.45; $P = .73$). In these models, other significant covariate predictors of FT varied depending on the FT domain outcome modeled and included distant metastatic disease at diagnosis, minority race or ethnicity, lower educational attainment, and treatment setting (Supporting Table 3a-d).

Severe FT in younger adults

Fifty percent of YAs 18 to 39 years old had severe (score, ≥ 5) overall FT versus 40.7% of adults 40 to 64 years old and 9.6% of adults ≥ 65 years old ($P < .001$). In

TABLE 1. Study Sample Demographic and Clinical Characteristics (n = 311)

| Characteristic | No. (%) |
|---|------------|
| Age, y | |
| 18-39 | 30 (9.6) |
| 40-64 | 177 (57.0) |
| ≥65 | 104 (33.4) |
| Median age (IQR) y | 60 (51-68) |
| Gender | |
| Female | 178 (57.2) |
| Male | 133 (42.8) |
| Race/ethnicity | |
| White, non-Hispanic | 186 (59.8) |
| Black, non-Hispanic | 61 (19.6) |
| Hispanic | 52 (16.7) |
| Other ^a | 12 (3.9) |
| Education level | |
| Less than high school | 18 (5.8) |
| High school or GED | 73 (23.5) |
| Associate degree or trade certification | 122 (39.2) |
| College degree | 61 (19.6) |
| Graduate degree | 23 (7.4) |
| Advanced degree | 13 (4.2) |
| No response | 1 (0.3) |
| Employment | |
| Full-time | 75 (24.1) |
| Part-time | 15 (4.8) |
| Unemployed or disabled | 87 (28) |
| Retired | 91 (29.3) |
| Other/no response | 43 (13.8) |
| Income | |
| \$0-\$19,999 | 69 (22.2) |
| \$20,000-\$49,999 | 66 (21.2) |
| \$50,000-\$99,999 | 77 (24.8) |
| \$100,000-\$199,999 | 54 (17.4) |
| \$200,000 or more | 37 (11.9) |
| No response | 8 (2.6) |
| Insurance status | |
| Private employer-based | 110 (35.4) |
| Private marketplace purchased | 20 (6.4) |
| Medicare | 112 (36) |
| Medicaid/state or none | 69 (22.2) |
| Treatment setting | |
| Medical safety net clinic | 80 (25.7) |
| Academic center | 311 (74.3) |
| Cancer type | |
| Breast | 111 (35.7) |
| Gastrointestinal | 42 (13.5) |
| Lung | 31 (10) |
| Prostate | 31 (10) |
| Head and neck | 29 (9.3) |
| Hematologic ^b | 23 (7.4) |
| Gynecologic | 7 (2.3) |
| Central nervous system | 4 (1.3) |
| Soft tissue | 7 (2.3) |
| Thyroid | 1 (0.3) |
| Other ^c | 25 (8.0) |
| Disease stage at diagnosis | |
| Local | 111 (38.1) |
| Regional | 91 (31.3) |
| Distant | 89 (30.6) |

Abbreviations: GED, high school equivalency diploma; IQR, interquartile range.

^aOther includes Asian, Native American, other, and no response.

^bHematologic malignancies include leukemia, lymphoma, and myeloma.

^cOther includes neuroendocrine, non-prostate genitourinary, skin, and thymic cancers.

sensitivity analyses using the dichotomous FT outcome (severe vs not severe FT), there was increased likelihood of severe FT across younger groups: adjusted odds ratio (OR), 5.84; 95% CI, 2.07-16.5; $P < .001$ for adults 18 to 39 years old; and OR, 4.58; 95% CI, 2.16-9.72; $P < .001$ for adults 40 to 64 years old, compared with the referent group of adults ≥65 years old. YAs also frequently encountered severe FT across the separate domains: 47% reported severe material, 47% severe coping, and 70% severe psychological FT burden.

On sensitivity analyses, in multivariable models, the increased likelihood of severe FT remained for both younger age groups (YAs and other working-age adults) compared with the referent group of older adults. For severe material FT in YAs, OR, 4.08; 95% CI, 1.58-10.53; $P = .004$ and in other working-age adults, OR, 4.57; 95% CI, 2.43-8.57; $P < .001$. For severe coping FT in YAs, OR, 6.54; 95% CI, 1.94-21.99; $P = .002$ and in other working-age adults, OR, 4.38; 95% CI, 1.70-11.32; $P = .002$. For severe psychological FT in YAs, OR, 3.78; 95% CI, 1.41-10.13; $P = .008$ and in other working-age adults, OR, 4.54; 95% CI, 2.52-8.17; $P < .001$.

DISCUSSION

Among patients receiving cancer care in diverse ambulatory treatment settings, younger cancer patients and survivors demonstrated significantly worse multidimensional aspects of FT. These included worse material hardship, coping resource depletion, and psychological burden compared with older adults ≥65 years old. Confounding effects of minority race/ethnicity, lower educational attainment, lower household income, uninsurance, medical safety net treatment setting, and diagnosis of cancer at later stage among younger patients partly explained worse FT scores across the younger age spectrum. Yet even after adjustment for these covariates, there was persistently increased risk of FT for participants 18 to 39 and 40 to 64 years old compared with older participants ≥65 years old, suggesting other unaccounted factors—socioeconomic, psychosocial, and/or clinical—further contribute to the complex, multidimensional high-risk FT profile in younger individuals with cancer. A prior study from the National Health Interview Survey³ found that significantly more longer-term cancer survivors 18 to 49 years old—approximately 70%—reported any financial hardships compared with approximately 39% of survivors ≥65 years old. Our study adds to available

TABLE 2. Overall FT Score Distributions by Study Participant Characteristics (n = 311)

| Characteristic | Median Overall Financial Toxicity Score | IQR | P ^a |
|---|---|---------|----------------|
| Age, y | | | <.001 |
| 18-39 | 4.6 | 2.0-7.1 | |
| 40-64 | 4.2 | 2.1-6.3 | |
| ≥65 | 1.3 | 0.2-3.1 | |
| Gender | | | .21 |
| Female | 3.5 | 1.6-5.7 | |
| Male | 2.8 | 1.0-5.4 | |
| Race/ethnicity | | | <.001 |
| White, non-Hispanic | 2 | 0.5-4.4 | |
| Black, non-Hispanic | 5 | 3.6-7.3 | |
| Hispanic | 4 | 2.2-6.7 | |
| Other ^b | 6.3 | 2.8-8.1 | |
| Education level | | | .001 |
| Less than high school | 3.5 | 2.5-5.3 | |
| High school or GED | 3.9 | 1.5-5.9 | |
| Associate degree or trade certification | 3.9 | 1.7-6.4 | |
| College degree | 2.8 | 0.6-5.1 | |
| Graduate degree | 1.8 | 1.0-3.1 | |
| Advanced degree | 1.3 | 0.3-2.4 | |
| Employment | | | <.001 |
| Full-time | 2.5 | 1.0-4.7 | |
| Part-time | 5.2 | 2.4-7.3 | |
| Unemployed or disabled | 5.4 | 3.4-7.3 | |
| Retired | 1.3 | 0.2-3.4 | |
| Other/no response | 3.3 | 1.6-5.7 | |
| Income | | | <.001 |
| \$0-\$19,999 | 5.3 | 2.5-7.3 | |
| \$20,000-\$49,999 | 4.5 | 2.0-6.4 | |
| \$50,000-\$99,999 | 2.9 | 0.7-5.2 | |
| \$100,000-\$199,999 | 1.8 | 0.6-3.2 | |
| \$200,000 or more | 1.2 | 0.5-3.4 | |
| No response | 4.5 | 2.7-8.5 | |
| Insurance Status | | | <.001 |
| Private employer-based | 3.2 | 1.3-5.1 | |
| Private marketplace purchased | 4.5 | 2.1-6.3 | |
| Medicare | 1.8 | 0.3-3.9 | |
| Medicaid/state or none | 5.4 | 3.4-7.1 | |
| Cancer Type | | | .003 |
| Breast | 3.1 | 1.4-5.4 | |
| Gastrointestinal | 4.2 | 1.7-6.2 | |
| Lung | 3.4 | 1.3-5.6 | |
| Prostate | 1.7 | 0.3-2.6 | |
| Head and neck | 2.4 | 0.6-5.3 | |
| Hematologic ^c | 4.6 | 1.3-7.3 | |
| Gynecologic | 1.9 | 1.3-4.1 | |
| Central nervous system | 3.5 | 1.8-6.0 | |
| Soft tissue | 7.7 | 3.3-9.5 | |
| Thyroid | 7.5 | 7.5-7.5 | |
| Other ^d | 4.0 | 1.7-5.4 | |
| Disease stage | | | <.001 |
| Local | 2.0 | 0.4-4.2 | |
| Regional | 3.5 | 1.3-5.3 | |
| Distant | 4.5 | 2.5-6.7 | |

Abbreviations: FT, financial toxicity; GED, high school equivalency diploma; IQR, interquartile range.

Higher score indicates worse FT. P value is reported for the Kruskal-Wallis test comparing scores by group.

^aRepresents the results of a Kruskal-Wallis test.

^bOther includes Asian, Native American, other, and no response.

^cHematologic malignancies include leukemia, lymphoma, and myeloma.

^dOther includes neuroendocrine, non-prostate genitourinary, skin, and thymic cancers.

evidence by quantifying separate domains of FT experienced by younger individuals in active treatment and early survivorship and accounts for sociodemographic and clinical patient-level covariate characteristics. These specific FT domains are critical to understand and tailor interventions around material hardship, coping burden, and psychological burden for this vulnerable population. Additionally, our study identified that severe FT was highly prevalent among these younger groups during both active treatment and early survivorship.

Effective interventions mitigating FT within care delivery settings remain elusive. An existing model for FT intervention is through “financial navigation,” a strategy to proactively provide treatment cost estimates, budget support, and direct monetary assistance (eg, copay assistance or insurance maximization, medication assistance) as well as assistance from community resources to help address other social needs (eg, transportation and housing issues) during treatment or clinical trial participation.²³ Early data from ongoing prospective studies suggest that financial navigation alone may only modestly impact the severity of FT scores,²⁴⁻²⁶ and therefore the efficacy of FT interventions may need further advancement by magnifying targets for coping and psychological FT domains. Data from our present analysis support a strong need to enhance the current model of intervention of financial navigation alone by layering intervention components that specifically address psychosocial distress and provide patients with relevant coping strategies. Kirchoff and Jones²⁷ recently proposed a model for FT intervention that tailors not only to patients’ socioeconomic and clinical characteristics but also to material and psychological domains of FT as they affect patient health outcomes. Our study results support this model of intervention, demonstrating significant impacts of socioeconomic and clinical characteristics, along with patient age, across material, coping, and psychological FT measures.

Nevertheless, a persistent challenge will be adapting and implementing successful intervention models across care settings. Specialty centers, such as a large comprehensive academic center, may have more specialized resources for younger and YA patients, whereas community-based or underserved settings may have limitations on such resources. This is of concern because the majority of YAs receive their cancer care in the community setting.²⁸

Younger individuals, especially those designated in the YA cancer population (18-39 years old) remain a population with a recognized spectrum of persistently unmet needs—including management of symptoms, emotional

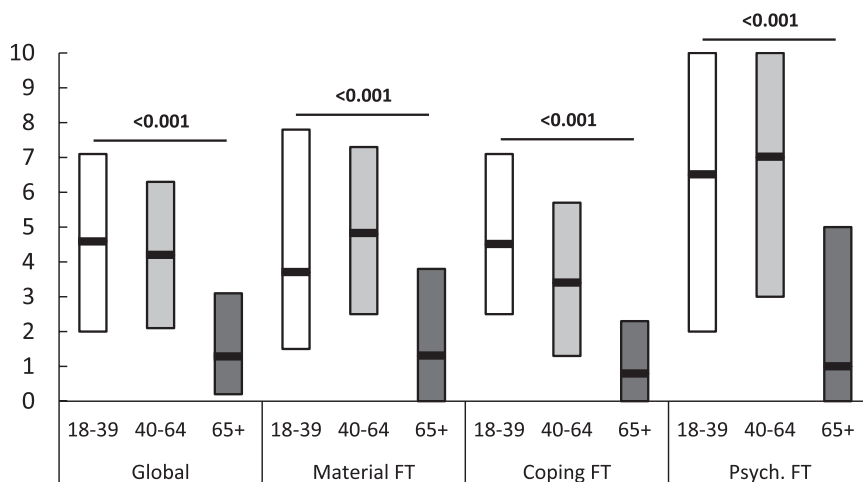


FIGURE 1. Median financial toxicity (FT) scores and interquartile range, across domains (overall, by age groups: 18-39, 49-64, and ≥65 years old), compared across 3 groups using the Kruskal-Wallis test. Higher scores indicate more severe FT.

TABLE 3. Multivariable Models: Adjusted RR for FT Score (Across the Score Range of 0-10) by Age Categories (n = 311)

| Age Category, y | Overall FT, RR (95% CI) | Material FT, RR (95% CI) | Coping FT, RR (95% CI) | Psychological FT, RR (95% CI) |
|-----------------------|-------------------------|--------------------------|------------------------|-------------------------------|
| ≥65 | Reference | Reference | Reference | Reference |
| 40-64 | 1.93 (1.56-2.38) | 1.92 (1.50-2.47) | 1.89 (1.50-2.39) | 2.01 (1.50-2.69) |
| 18-39 | 1.95 (1.36-2.81) | 1.71 (1.12-2.63) | 2.21 (1.49-3.28) | 1.85 (1.13-3.03) |
| <i>P</i> ^a | <.001 | <.001 | <.001 | <.001 |

Abbreviations: CI, confident interval; FT, financial toxicity; RR, risk ratio.

^aRepresents the results of the likelihood ratio test for age. Covariates included race/ethnicity, gender, education, insurance, treatment facility, and disease stage.

needs, and social needs.²⁹ In the present study, YAs demonstrated frequent and severe burden from the coping and psychosocial components/domains of FT, much more than older adults.^{30,31} YAs and younger working age adults both can face high out-of-pocket care costs, job loss, disability, and medical debt. The youngest of survivors may be especially vulnerable with lower financial reserves to meet financial demands.³²⁻³⁵ Economizing behaviors in younger age cancer patients and survivors, such as sacrificing material or basic needs, appropriate health care, and/or social activities, could have adverse synergistic effects with other unmet psychosocial needs in this group.¹¹ There was a limited number of individuals in the youngest subset (18-26 years old). However, descriptively, in our exploratory analysis of this group, median scores across all FT domains remained high, emphasizing a need for future investigation focused on this group. In a recent study of FT specifically within YAs with cancer during the coronavirus disease 2019 pandemic, economizing behaviors were more prevalent in the context of pandemic-related financial stressors and were associated with worse FT.³⁶ Thus, patient-level interventions to

address the coping and psychological domains of FT in YAs with cancer are warranted and timely.

Although offering patient-level intervention resources is important to help mitigate FT, other simultaneous advances are needed. In care delivery, implementation of multidimensional FT assessment and screening need to be age-appropriate and cancer phase-appropriate.¹¹ Establishing guidance on quality practice for FT screening needs to be defined, for example, with systematic FT screening and methods for documenting FT at initial clinical encounters and periodic reassessments throughout care to guide and engage the health care team's response to patient FT.³⁷⁻³⁹ In addition, collection of FT measures should be embedded in the design phase of clinical trials and prospective clinical studies alongside other patient-reported-outcome measures to proactively define the comprehensive toxicity profile of new therapeutic options, especially in those at high risk for FT such as younger patients,⁴⁰ who face distinct stressors such as onco-fertility costs⁴¹ and vocational challenges that impact stability of insurance.⁴² Broad scale collection of these data are critical for informing future targeted policy

changes, such as continued uptake of state initiatives to mandate coverage of onco-fertility in YAs⁴¹ and incorporating FT screening as a quality measure linked to value-based or performance-based payment. Ultimately, policies to address the root causes of FT are needed, specifically to regulate the growth in the cost of cancer treatments and limit the increase in cost-sharing requirements of private insurance.

This study has limitations. Although the study was multi-site and sought to include a diverse sample, it was performed in a single large metropolitan area in a non-Medicaid expansion state in cross-sectional design. Therefore, future validation of findings in other settings, including other cancer treatment settings, will be needed to increase generalizability. Additionally, longitudinal studies are needed to explicitly characterize changes in FT domains and needs in acute cancer delivery through long-term survivorship to expand the evidence base on changes in the magnitude, severity, and domains of FT over time. Finally, given that the cognitive sequelae of disease and its treatment may impact psychosocial functioning and needs, larger studies inclusive of young patients with additional cancer types such as central nervous system cancers will be needed to broaden applicability of these initial findings.

In this investigation, working-age adults with cancer (including YAs) bore disproportionate FT, including across coping and psychological domains of FT. Comprehensive mitigation strategies that target multiple FT domains early in the care delivery trajectory are needed to help address the unmet needs of younger, high-risk individuals. Current strategies to address unmet psychosocial needs during cancer treatment delivery and survivorship may further serve as a critical component to mitigate FT in vulnerable younger individuals with cancer.

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CONFLICT OF INTEREST DISCLOSURES

K. Robin Yabroff is employed by the American Cancer Society, which receives grants from private and corporate foundations, including foundations associated with companies in the health sector, for research outside the submitted work. She is not funded by or key personnel for any of these grants, and her salary is solely funded through American Cancer Society funds. Matthew P. Banegas has received grants or contracts from the National Cancer Institute (R01CA237322) and is a member of the board

of directors of the Community Health Development Foundation. Reshma Jagsi has received grants for unrelated work from the National Institutes of Health, the Doris Duke Foundation, the Greenwall Foundation, the Komen Foundation, and Blue Cross Blue Shield of Michigan for the Michigan Radiation Oncology Quality Consortium; had a contract to conduct an investigator-initiated study with Genentech; has delivered dozens of invited lectures to academic institutions and professional societies in the past 36 months (these are independent talks and not associated with any industry funding or speakers' bureaus); has served as an expert witness for Sherinian and Hasso, Dressman Benzinger LaVelle, and Kleinbard LLC; is a former member of the board of directors of the American Society of Clinical Oncology and cochairman of the ethics committee of the American Society for Radiation Oncology; has stock options as compensation for her advisory board role in Equity Quotient; and has received personal fees from the National Institutes of Health, Doris Duke, and Greenwall (in addition to grants). Ya-Chen T. Shih has received grants or contracts from the National Cancer Institute (R01CA225646, R01CA225647, and R01 CA207216), the Alliance Foundation, and Health Care Service Corporation through Blue Cross Blue Shield of Texas; has received consulting fees, travel support, and accommodations for serving on a grants review panel for Pfizer, Inc, and an advisory board for AstraZeneca; and is a member of the American Cancer Society Guideline Development Group. The other authors made no disclosures.

AUTHOR CONTRIBUTIONS

Kelsey L. Corrigan: Methodology and writing and editing. **Shuangshuang Fu:** Formal analysis and writing and editing. **Ying-Shiuan Chen:** Conceptualization and writing and editing. **Kelsey Kaiser:** Conceptualization and writing and editing. **Michael Roth:** Writing and editing. **Susan K. Peterson:** Writing and editing. **Ya-Chen T. Shih:** Writing and editing. **Reshma Jagsi:** Writing and editing. **Sharon H. Giordano:** Conceptualization and writing and editing. **Robert J. Volk:** Writing and editing. **K. Robin Yabroff:** Writing and editing. **Mathew P. Banegas:** Writing and editing. **Chiara Acquati:** Writing and editing. **Rena M. Conti:** Writing and editing. **Hilary Y. Ma:** Writing and editing. **Kimberly Ku:** Writing and editing. **Y. Nancy You:** Writing and editing. **Grace L. Smith:** Conceptualization, methodology, formal analysis, and writing and editing.

REFERENCES

1. Lu AD, Zheng Z, Han X, et al. Medical financial hardship in survivors of adolescent and young adult cancer in the United States. *J Natl Cancer Inst.* 2021;113:997-1004.
2. Guy GP Jr, Yabroff KR, Ekwueme DU, et al. Estimating the health and economic burden of cancer among those diagnosed as adolescents and young adults. *Health Aff (Millwood).* 2014;33:1024-1031.
3. Zheng Z, Jemal A, Han X, et al. Medical financial hardship among cancer survivors in the United States. *Cancer.* 2019;125:1737-1747.
4. Yabroff KR, Zhao J, Han X, Zheng Z. Prevalence and correlates of medical financial hardship in the USA. *J Gen Intern Med.* 2019;34:1494-1502.
5. Bellizzi KM, Smith A, Schmidt S, et al. Positive and negative psychosocial impact of being diagnosed with cancer as an adolescent or young adult. *Cancer.* 2012;118:5155-5162.
6. Pannier ST, Warner EL, Fowler B, Fair D, Salmon SK, Kirchoff AC. Age-specific patient navigation preferences among adolescents and young adults with cancer. *J Cancer Educ.* 2019;34:242-251.
7. Smith GL, Lopez-Olivo MA, Advani PG, et al. Financial burdens of cancer treatment: a systematic review of risk factors and outcomes. *J Natl Compr Canc Netw.* 2019;17:1184-1192.
8. Han X, Zhao J, Zheng Z, de Moor JS, Virgo KS, Yabroff KR. Medical financial hardship intensity and financial sacrifice associated with cancer in the United States. *Cancer Epidemiol Biomarkers Prev.* 2020;29:308-317.
9. Yabroff KR, Dowling EC, Guy GP Jr, et al. Financial hardship associated with cancer in the United States: findings from a population-based sample of adult cancer survivors. *J Clin Oncol.* 2016;34:259-267.
10. Banegas M, Guy G, de Moor J, et al. For working-age cancer survivors, medical debt and bankruptcy create financial hardships. *Health Aff (Millwood).* 2016;35:54-61.

11. Salsman JM, Bingen K, Barr RD, Freyer DR. Understanding, measuring, and addressing the financial impact of cancer on adolescents and young adults. *Pediatr Blood Cancer*. 2019;66:e27660.
12. Maldonado JA, Fu S, Chen YS, et al. Sensitivity of psychosocial distress screening to identify cancer patients at risk for financial hardship during care delivery. *JCO Oncol Pract*. 2021;17:e1856-e1865.
13. Smith GL, Mendoza TR, Lowenstein LM, Shih YT. Financial hardship in survivorship care delivery. *J Natl Cancer Inst Monogr*. 2021;2021:10-14.
14. Smith GL, Lowenstein LM, Peterson SK, et al. Financial toxicity of cancer care: defining pathways of decline vs resilience. *J Clin Oncol*. 2018;36:e22150.
15. Smith GL, Volk RJ, Lowenstein LM, et al. ENRICH: validating a multidimensional patient-reported financial toxicity measure. *J Clin Oncol*. 2019;37:153.
16. de Souza JA, Yap BJ, Wroblewski K, et al. Measuring financial toxicity as a clinically relevant patient-reported outcome: the validation of the COmprehensive Score for financial Toxicity (COST). *Cancer*. 2017;123:476-484.
17. National Cancer Institute. Closing the Gap: Research and Care Imperatives for Adolescents and Young Adults With Cancer—Report of the Adolescent and Young Adult Oncology Progress Review Group. US Department of Health and Human Services; 2006.
18. National Comprehensive Cancer Network. NCCN Guidelines: Adolescents and Young Adults With Cancer, V1.2021. National Comprehensive Cancer Network; 2020.
19. Young Adults and the Affordable Care Act: protecting young adults and eliminating burdens on businesses and families FAQs. Accessed September 27, 2020. <https://www.dol.gov/agencies/ebsa/about-ebsa/our-activities/resource-center/faqs/young-adult-and-aca>
20. Johnson R. Why the “average age of retirement” is a misleading measure of labor supply. *Mon Labor Rev*. 2001;124:38-40.
21. Arnett JJ. Emerging adulthood. A theory of development from the late teens through the twenties. *Am Psychol*. 2000;55:469-480.
22. Young adults and the Affordable Care Act: protecting young adults and eliminating burdens on businesses and families FAQs. US Department of Labor. Accessed October 8, 2021. <https://www.dol.gov/agencies/ebsa/about-ebsa/our-activities/resource-center/faqs/young-adult-and-aca>
23. Yezefski T, Steelquist J, Watabayashi K, Sherman D, Shankaran V. Impact of trained oncology financial navigators on patient out-of-pocket spending. *Am J Manag Care*. 2018;24:S74-S79.
24. Nipp RD, Lee H, Gorton E, et al. Addressing the financial burden of cancer clinical trial participation: longitudinal effects of an equity intervention. *Oncologist*. 2019;24:1048-1055.
25. Sadigh G, Gallagher K, Obenchain J, et al. Pilot feasibility study of an oncology financial navigation program in brain cancer patients. *J Am Coll Radiol*. 2019;16:1420-1424.
26. Watabayashi K, Steelquist J, Overstreet KA, et al. A pilot study of a comprehensive financial navigation program in patients with cancer and caregivers. *J Natl Compr Canc Netw*. 2020;18:1366-1373.
27. Kirchoff A, Jones S. Financial toxicity in adolescent and young adult cancer survivors: proposed directions for future research. *J Natl Cancer Inst*. 2021;113:948-950.
28. Yeager ND, Hoshaw-Woodard S, Ruymann FB, Termuhlen A. Patterns of care among adolescents with malignancy in Ohio. *J Pediatr Hematol Oncol*. 2006;28:17-22.
29. Keegan TH, Lichtensztajn DY, Kato I, et al. Unmet adolescent and young adult cancer survivors information and service needs: a population-based cancer registry study. *J Cancer Surviv*. 2012;6:239-250.
30. Banegas MP, Schneider JL, Firemark AJ, et al. The social and economic toll of cancer survivorship: a complex web of financial sacrifice. *J Cancer Surviv*. 2019;13:406-417.
31. Thom B, Benedict C. The impact of financial toxicity on psychological well-being, coping self-efficacy, and cost-coping behaviors in young adults with cancer. *J Adolesc Young Adult Oncol*. 2019;8:236-242.
32. Kaul S, Avila JC, Mehta HB, Rodriguez AM, Kuo YF, Kirchoff AC. Cost-related medication nonadherence among adolescent and young adult cancer survivors. *Cancer*. 2017;123:2726-2734.
33. Parsons HM, Harlan LC, Lynch CE, et al. Impact of cancer on work and education among adolescent and young adult cancer survivors. *J Clin Oncol*. 2012;30:2393-2400.
34. Parsons SK, Kumar AJ. Adolescent and young adult cancer care: financial hardship and continued uncertainty. *Pediatr Blood Cancer*. 2019;66:e27587.
35. Thom B, Benedict C, Friedman DN, Kelvin JF. The intersection of financial toxicity and family building in young adult cancer survivors. *Cancer*. 2018;124:3284-3289.
36. Thom B, Benedict C, Friedman DN, Watson SE, Zeitler MS, Chino F. Economic distress, financial toxicity, and medical cost-coping in young adult cancer survivors during the COVID-19 pandemic: findings from an online sample. *Cancer*. 2021;127:4481-4491.
37. Jagsi R, Ward KC, Abrahamse PH, et al. Unmet need for clinician engagement regarding financial toxicity after diagnosis of breast cancer. *Cancer*. 2018;124:3668-3676.
38. Bradley CJ, Yabroff KR, Shih YT. A coordinated policy approach to address medical financial toxicity. *JAMA Oncol*. 2021;7:1761-1762.
39. Bradley CJ, Yabroff KR, Zafar SY, Shih YT. Time to add screening for financial hardship as a quality measure? *CA Cancer J Clin*. 2021;71:100-106.
40. Berkman AM, Murphy KM, Siembida EJ, et al. Inclusion of patient-reported outcomes in adolescent and young adult phase III therapeutic trials: an analysis of cancer clinical trials registered on ClinicalTrials.gov. *Value Health*. 2021;24:1820-1827.
41. Omesi L, Narayan A, Reinecke J, Schear R, Levine J. Financial assistance for fertility preservation among adolescent and young adult cancer patients: a utilization review of the Sharing Hope/LIVESTRONG Fertility Financial Assistance Program. *J Adolesc Young Adult Oncol*. 2019;8:554-559.
42. Siegel RD, Slough RG, Crosswell HE, et al. Drug recovery and copay assistance program in a community cancer center: charity and challenges. *J Oncol Pract*. 2019;15:e628-e635.