


Racial and Rural Disparities in Financial Toxicity and Healthcare Transitions Among Adolescent and Young Adult Cancer Survivors in Kentucky: A Cross-Sectional Study

Cancer Control
Volume 32: 1–13
© The Author(s) 2025
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/10732748251339251
journals.sagepub.com/home/ccx



Jean S. Edward, PhD, RN^{1,2} , Brent J. Shelton, PhD^{2,3}, Lauren Corum, MPH², Haafsa Fariduddin, BS², Katie Brown, BS², John A. D'Orazio, MD, PhD^{2,4}, and Kimberly D. Northrip, MD, MPH⁴

Abstract

Introduction: Adolescent and young adult cancer survivors, especially racial/ethnic minorities and rural residents are particularly vulnerable to financial toxicity due to limited healthcare access, socioeconomic disparities, and cultural/language barriers. These social determinants of health compound financial hardship and contribute to poor healthcare transitions from pediatric to adult care, leading to worse outcomes and higher mortality rates.

Methods: Our cross-sectional survey study examined racial (Black vs White) and geographic (rural vs urban) disparities in financial toxicity and healthcare transition outcomes among 260 adolescent and young adult cancer survivors through the Kentucky Cancer Registry. Survey data were collected on financial toxicity, healthcare transitions, and health-related quality of life. Financial toxicity was measured under three domains: psychological response, material conditions (e.g., loss of income, debt), and coping behaviors.

Results: Results revealed moderate levels of financial toxicity and healthcare transition readiness across the sample, with strong associations between financial toxicity and anxiety, depression, and long-term effects of cancer treatment. Black participants showed higher levels of anxiety and coping behaviors compared to Whites, while urban participants experienced lower financial toxicity (as measured by material conditions) than their rural counterparts. Racial disparities were observed in global health and anxiety, even after adjusting for financial toxicity, but the relationship between financial toxicity and healthcare transitions outcomes did not vary by race or geography.

Conclusion: This study highlights the importance of developing tailored strategies to mitigate the impact of cancer-related financial toxicity on the health outcomes and quality of life of underserved adolescent and young adult cancer survivors.

Keywords

cancer, financial toxicity (FT), healthcare transitions (HCT), quality of life (QOL), adolescent and young adult survivors

Received: 12 November 2024; revised: 21 March 2025; accepted: 14 April 2025.

¹College of Nursing, University of Kentucky, Lexington, KY, USA

²Markey Cancer Center, University of Kentucky, Lexington, KY, USA

³College of Medicine, University of Kentucky, Lexington, KY, USA

⁴Department of Pediatrics, College of Medicine, University of Kentucky, Lexington, KY, USA

Corresponding Author:

Jean S. Edward, PhD, RN, College of Nursing, University of Kentucky, 751 Rose Street, Lexington, KY 40536, USA.

Email: jean.edward@uky.edu



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits non-commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and

Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

Introduction

Adolescent and young adult cancer patients (AYAs; diagnosed between the ages of 15-39 years) are particularly vulnerable to financial toxicity (FT), which includes the psychological (e.g., increased anxiety or stress), material (e.g., increased debt, housing or food insecurity, or loss of income or employment), and behavioral aspects (e.g., delaying or forgoing treatment or follow-up care) of financial hardship.^{1,2} AYAs are especially susceptible to FT due to the critical developmental life stages that increase their financial responsibilities, such as entering higher-education and/or the workforce, experiencing long-term and late effects of cancer treatment, and healthcare transitions (HCTs) from pediatric and/or specialty oncology care to adult and/or primary follow-up care.^{3,4} Unique social determinants of health that impact racial/ethnic minorities, as well as rural residents, such as limited access to quality healthcare, cultural and/or language barriers, low socioeconomic status and educational attainment, heighten their vulnerability to FT and its associated negative health and financial outcomes.⁵

Despite the significant medical needs stemming from the late and long-term effects of their original cancer, many AYA cancer survivors face barriers to participating in cancer-related follow-up care.⁶ Poor HCTs can result in serious medical, psychological and financial repercussions, such as reduced treatment adherence, healthcare utilization, and higher hospitalization rates.⁷ HCTs are especially challenging for AYA cancer survivors due to a variety of factors, including patient-related issues (e.g., psychosocial functioning, financial barriers, knowledge gaps, and self-efficacy),⁸⁻¹⁰ provider-related challenges (e.g., insufficient knowledge and training)^{11,12} and system-related obstacles (e.g., lack of appointment coordination or navigation support).⁹ Race and rurality further complicate these transitions, as systemic inequalities often result in limited access to specialized care, lower health literacy, and greater geographic barriers to consistent treatment. Given these complex factors, AYA cancer survivors, particularly racial minorities and rural residents represent a critical target population for interventions aimed at promoting successful HCTs, maintaining engagement in adult/primary healthcare systems, and enhancing overall quality of life (QOL).¹³

Although research in the field is expanding, racial and geographic disparities in FT remain poorly defined.^{4,8} The lack of comprehensive research on how these disparities specifically impact AYA cancer survivors underscores critical gaps in understanding the intersection of race, rurality, and social determinants of health in these vulnerable populations.¹³ To address these gaps, we examined racial (Black vs White) and geographic (rural vs urban) disparities in FT and HCTs among AYA cancer survivors using data from the Kentucky Cancer Registry. We hypothesized that survivors who identify as Black and/or reside in rural regions will be more likely to experience greater FT and have poorer HCT

outcomes compared to survivors who identify as White and/or reside in urban regions. Kentucky leads the nation in both cancer incidence and mortality across cancer sites with Black residents face a notably higher cancer mortality rate compared to both White residents and the overall state population, especially in breast, colorectal, prostate, liver, myeloma, endometrial and uterus cancers.¹⁴ From 2010 to 2019, approximately 7621 White and 531 Black AYAs in Kentucky were diagnosed with cancer, with the most common primary sites being blood and bone, breast, thyroid, testis, and skin.

Methods

Study Design, Setting and Sample

We used a cross-sectional survey design, guided by the Social-ecological Model of AYA Readiness for Transition (SMART).⁸ AYA cancer survivors residing in Kentucky were recruited from February 2022 to February 2023 through the population-based Kentucky Cancer Registry (KCR) using established recruitment procedures.¹⁵ Recruitment began after the KCR team identified survivors who matched our inclusion criteria: (1) initial cancer diagnosis between the ages of 15 and 39, (2) 18 years or older at the time of recruitment, (3) residing in Kentucky, (4) able to read and write in English. The KCR used purposive sampling to identify a representative sample of cancer survivors categorized by Black and White race and rural and urban geographic regions. Letters were sent to 800 eligible cancer survivors notifying them of their eligibility for the study and requesting consent to release their contact information for research purposes. A total of 376 survivors agreed to be contacted; 200 completed online REDCap (Research Electronic Data Capture) surveys and 60 completed mailed surveys (surveys were identical). Along with obtaining written consent to gather and analyze survey data, participants also agreed to the release of their individual, record-level data from KCR. This study received approval from the University of Kentucky Institutional Review Board (#74682). The reporting of this study conforms to STROBE guidelines.¹⁶

Data Collection

Participant-specific characteristics were obtained from individual KCR records, including sex, date of birth, race/ethnicity, county of residence, date of diagnosis, and age since diagnosis. County of residence was categorized as urban or rural using the 2013 rural-urban continuum codes¹⁷; counties with codes from 1 to 3 were considered urban, while those in the 4-9 range were scored as rural. Participants filled out a descriptive survey that covered topics such as their education, income, health insurance coverage, employment status, marital status, and household size, which was used to assess their federal poverty level (FPL). Household income was categorized based on the 2024 FPL guidelines published by the U.S. Department of Health and Human Services.

Financial toxicity was measured as a total score and 3 subscores corresponding with each domain: 1) psychological response, 2) material conditions and 3) coping behaviors.¹⁸ Psychological response was measured using the 11-item FACIT-COST (Comprehensive Score for Financial Toxicity; Cronbach $\alpha = .92$).¹⁸ To assess material conditions of FT, four items from the *Medical Expenditure Panel Survey Experiences with Cancer Survey (MEPS-ECS)*¹⁹ were utilized to determine if participants had borrowed money or went into debt, filed for bankruptcy, unable to cover share of medical care costs, or made other financial sacrifices because of cancer. Coping behaviors were assessed using a single item from the MEPS-ECS, which asked whether participants had delayed, skipped, or made other changes to any of the following cancer care such as medications, specialist visits, treatment, follow-up care, or mental health services due to costs. A total FT score was created using the 3 domain scores with a reverse-coded COST-FACIT to give the psychological response domain the same polarity as the other FT measures where higher scores indicate greater financial toxicity.²⁰ These tools and scoring mechanisms have been used in previous studies.^{15,20,21}

Healthcare Transitions outcomes were measured using 3 survey tools assessing four sets of variables: 1) transition readiness, 2) number of medical issues experienced by the participant, 3) follow-up care for cancer, and 4) health-related QOL. Transition readiness was measured using the 18-item *Self-Management in Adulthood with Rx = Treatment (STARx)* questionnaire, a validated (Cronbach $\alpha = .80$) tool, focusing on three key areas: communication with providers, disease knowledge, and self-management.²² Information on medical issues and follow up care were collected using a 39-item checklist on late/long-term effects of cancer treatment from the NCI's *Follow-Up Care Use and Health Outcomes of Cancer Survivors (FOCUS) Survey*.²³ Tools from the Patient-Reported Outcomes Measurement Information System (PROMIS) including the 10-item Global Health measure,²⁴ the 4-item Anxiety Short Form (Cronbach $\alpha = .98$),²⁵ and the 6-item Depression Short Form (Cronbach $\alpha = .98$).²⁶ Scoring for PROMIS was performed using HealthMeasures, with standardized t scores applied for analysis. Higher scores on PROMIS Global Health indicate greater quality of life and higher scores on PROMIS Anxiety and Depression indicate greater severity of anxiety and depression.

Data Analysis

Survey data were downloaded from REDCap directly into SAS²⁷ and summarized using descriptive statistics, including means, standard deviations, and ranges or frequency distributions (n , %). Bivariate analyses were conducted to examine the associations amongst indicators of FT, and indicators of HCTs with Black and White as well as rural and urban participants using two-sample t -tests. Bivariate analyses between indicators of FT and indicators of HCTs were assessed using simple linear regression with estimated slopes and standard

errors as well as the P -value assessing whether the slope was significantly different from zero. Finally, two-way ANCOVA modeling was used to assess whether associations between FT indicators (predictor variable) and HCT indicators (outcome) differed between the two sociodemographic variables of interest (race and rurality). The two-way interaction between the FT indicator and either race or rurality were used to test the hypothesis of whether the HCT/FT associations differed by race or rurality. This is essentially a test of whether race or rurality are effect modifiers. Separate two-way ANCOVAs were fitted for the unique FT variable and race as well as FT variable and rurality combinations. Hypothesis testing was conducted using a Type I error rate for each comparison made of 5%. All analyses were conducted using SAS.²⁷ We have deidentified all patient details in this report. An a priori power analysis was conducted using nQuery Advisor (v. 8) to ensure sufficient statistical power. With a sample size of 180, and at least 25% Black participants, the power of the two-sample t -test to detect a medium effect size was estimated to be at least 82%. With a sample of at least 180 subjects, up to 10 predictors, and an alpha level of .05, the power of the multiple linear regression F test to detect R^2 as small as 0.1 was estimated to be at least 87%.

Results

Table 1 provides descriptive data on the sample of 260 AYA cancer survivors that were enrolled in this study (a 69% response rate). Ages of participants ranged from 15 to 39 years (mean age: 31.7 ± 5.95). Seventy-four percent were females and 73% identified as White and 27% as Black. A high number (78%) reported having at least some college background (only 3% reported having less than a high school education). Most (75%) resided in an urban location, married or in a domestic partnership (52%), employed (73%), reported an annual income at or above \$50,000 (60%), and living at or above the FPL (85%). Fifty-nine percent reported having private (employer affiliated) health insurance with 27% having Medicaid or Medicare. Eighty percent were at or within 10 years of their cancer diagnosis with 68% reporting having a caregiver during and/or after cancer treatment.

Financial Toxicity. The reversed COST-FACIT mean score was $18.8 (\pm 7.60)$, range: 0 to 44; higher scores indicate greater FT), with a material conditions mean score of $1.7 (\pm 1.34)$, range: 0 to 5), a coping behavior mean score of $0.9 (\pm 1.66)$, range: 0 to 9). The total FT mean score was $0.26 (\pm 0.11)$, range: 0.04 to 0.59) (see **Table 1**). Regarding household income, 47% indicated they were “getting by” with 21% reporting “finding it difficult or very difficult”. 31% indicated that they had gone into debt because of cancer treatment.

Healthcare Transitions. The mean transition readiness score was $60.2 (\pm 12.9)$, range: 14 to 80) (see **Table 1** for domain

Table 1. Descriptive Summary of Demographics and Clinical Variables for Total Sample

Variable	Descriptives of relevance
Demographic data	
Female gender, n (%)	193 (74%)
Age in years, mean (SD); range	31.7 (± 5.95), 15-39
Race/ethnicity, n (%)	
White, Hispanic	5 (2%)
White, non-Hispanic	180 (69%)
White, missing ethnicity	6 (2%)
Black (AA)/Hispanic	2 (1%)
Black (AA)/non-Hispanic	65 (25%)
Black, missing ethnicity	2 (1%)
Education, n (%)	
Less than high school (≤ 8 years)	3 (1%)
Some high school (9-11 years)	6 (2%)
Completed high school or GED	29 (11%)
Vocational/technical	15 (6%)
Some college credit	54 (21%)
College graduate	98 (38%)
Postgraduate	49 (19%)
Missing	6 (2%)
Place of residence, n (%)	
Rural (Beale code > 3)	64 (25%)
Urban (Beale code between 1-3)	196 (75%)
Marital status, n (%)	
Single	81 (31%)
Married/domestic partner	136 (52%)
Widowed	0 (0%)
Divorced/separated	37 (14%)
Missing	6 (2%)
Employment status, n (%)	
Employed (full-time)	189 (73%)
Unemployed	20 (8%)
Homemaker	12 (5%)
Student	4 (2%)
Retired	1 ($< 1\%$)
Disabled	25 (10%)
Other (instacart shopper)	2 ($< 1\%$)
Missing	7 (3%)
Annual household income, n (%)	
$< \$10,000$ (USD)	13 (5%)
$\$10,000$ - $\$19,999$ (USD)	21 (8%)
$\$20,000$ - $\$49,999$ (USD)	43 (17%)
$\$50,000$ - $\$74,999$ (USD)	48 (18%)
$\$75,000$ - $\$99,999$ (USD)	40 (15%)
$> \$100,000$ (USD)	88 (34%)
Missing	7 (3%)
At or below FPL, n (%)	
At or below FPL	31 (12%)
Above FPL	222 (85%)
Missing	7 (3%)
Health insurance type, n (%)	
Private (employer/union)	154 (59%)
Bought on your own	9 (3%)

(continued)

Table 1. (continued)

Variable	Descriptives of relevance
Medicare/Medicaid	70 (27%)
Tricare	5 (2%)
Other	3 (1%)
None	12 (5%)
Unsure	1 (<1%)
Missing	6 (2%)
Years since cancer diagnosis, n (%)	
[0-5] yrs	55 (21%)
(5-10] yrs	153 (59%)
>10 yrs	52 (20%)
Missing	
Had a caregiver during/after cancer treatment, n(%)	
Yes	176 (68%)
No	77 (29%)
Missing	7 (3%)
Caregiver relationship to patient, n (%)	
Spouse/partner	102 (58%)
Family member (e.g., parent, sibling, children)	62 (35%)
Friend	10 (6%)
Home nurse	1 (<1%)
Unspecified	1 (<1%)
Outcome variables	
Total FT score, n, M(SD); range (higher scores indicate greater FT : 0-3 theor range)	246, M = 0.26 (± 0.108); 0.04-0.59
Reversed COST-FACIT, N, M (SD); range	246, M = 18.8 (± 7.60); 0-44
Material domain (FT), N, M (SD); range	255, M = 1.7 (± 1.34); 0-5
Coping behaviors domain (FT), N, M (SD); range	N = 260, M = 0.9 (± 1.66); 0-9
Feelings about your household's income, N (%)	
Living comfortably	76 (29%)
Getting by	123 (47%)
Finding it difficult	40 (15%)
Finding it very difficult	15 (6%)
Missing	6 (2%)
Going into debt because of cancer treatment, N (%)	
Yes	81 (31%)
No	172 (66%)
Missing	7 (3%)
Transition readiness score, N, M (SD); range	N = 241, M = 60.2 (± 12.89); 14-80
Communication with medical provider	N = 233, M = 24.7 (± 5.52); 5-35
Disease knowledge	N = 237, M = 12.5 (± 3.10); 2-15
Self-management	N = 235, M = 24.6 (± 4.98); 5-30
Number of medical issues (of 39 examined), N, M (SD); range	N = 260, M = 1.75 (± 2.26); 0-13
PROMIS global health, N, M (SD); range	N = 243, M = 27.3 (± 8.73); 9-52
PROMIS anxiety, N, M (SD); range	N = 240, M = 56.3 (± 9.38); 40.3-81.6
PROMIS depression, N, M (SD); range	N = 240, M = 53.1 (± 10.07); 38.4-80.3
Any follow-up care sought for your cancer? N (%)	
Yes	225 (87%)
No	12 (5%)
Missing	23 (9%)
Any follow-up care for cancer in last 2 years? N (%)	
Yes	206 (79%)
No	19 (7%)
Missing	35 (14%)

Note: Household income was categorized based on the 2024 FPL guidelines published by the U.S. Department of Health and Human Services.

Table 2. Bivariate Associations of Financial Toxicity Measures With Race and Place of Residence

	Race			Place of residence		
	White	Black	P-value	Urban area	Rural area	P-value
	Mean(se)	Mean(se)		Mean(se)	Mean(se)	
Total FT score (stdized)	0.24 (0.008)	0.25 (0.014)	0.5390	0.24 (0.008)	0.26 (0.014)	0.2895
Reversed COST-FACIT	19.0 (0.562)	18.2 (0.958)	0.4366	19.2 (0.556)	17.6 (0.979)	0.1590
Coping	0.79 (0.119)	1.25 (0.198)	0.0500	0.84 (0.118)	1.14 (0.207)	0.2033
Material conditions	1.63 (0.098)	1.85 (0.162)	0.2301	1.58 (0.096)	2.02 (0.180)	0.0237

Bolded values indicates statistical significance or p values of <.05.

scores). The average number of medical issues reported was 1.8 (± 2.26 , range: 0 to 13) with nearly 87% of study participants reported having sought follow-up care for cancer at some point in time, 79% within the last two years. The global health mean score was 27.3 (± 8.73 , range: 9 to 52) with a mean anxiety score of 56.3 (± 9.38 , range: 40.3 to 81.6), and a mean depression score of 53.1 (± 10.07 , range: 38.4 to 80.3).

Association With FT, Race and Geography. Table 2 contains data on the bivariate associations between the 4 FT variables and race as well as place of residence (rural vs urban). There was no statistically significant association between the total FT score or the reversed COST-FACIT variable with either race or rurality. However, coping behaviors were higher ($P = 0.05$) for Blacks ($M = 1.3$, $SE = 0.20$) than for Whites ($M = 0.8$, $SE = 0.12$). Mean scores for material conditions were higher ($P = 0.0237$) for urban participants ($M = 2.0$, $SE = 0.18$) compared to for rural participants ($M = 1.6$, $SE = 0.10$).

Table 3 contains data on the bivariate associations between the HCT variables and race as well as place of residence. None of the HCT variables were associated with rurality. Transition readiness and number of medical issues were also not associated with race (all $P > 0.05$). Among the 3 PROMIS health-related QOL variables, global health scores were higher ($P = 0.0148$) among Blacks ($M = 30$, $SE = 1.09$) than Whites ($M = 26.5$, $SE = 0.64$), but did not differ by rurality. Anxiety scores also differed ($P = 0.0398$) between Blacks ($M = 58.4$, $SE =$

1.19) and Whites ($M = 55.5$, $SE = 0.70$) but not by rurality. Depression scores did not differ by race or rurality.

Association of FT With HCT Outcomes. Table 4 contains data that describes the bivariate associations between the HCT outcomes and the 4 FT variables. None of the 4 FT variables were found to be associated with Transition Readiness (all $P > 0.05$). Total FT ($\beta = 5.27$, $SE = 1.17$, $P < 0.0001$), coping behaviors ($\beta = 0.21$, $SE = 0.08$, $P = 0.0129$), and material conditions ($\beta = 0.52$, $SE = 0.10$, $P < 0.0001$) scores were significantly associated with number of medical issues. In this case, the estimated β coefficient represents unit change in medical issues for each unit increase in the FT variable under consideration. Therefore, a one unit increase in the total FT score resulted in a nearly 5.3 unit increase in the number of medical issues score. Global health and anxiety scores were both strongly and positively associated with total FT, coping behaviors and material conditions scores (all at $P < 0.0001$). Additionally, the depression score was also strongly and positively associated with total FT ($P = 0.0022$), coping behavior ($P = 0.0003$) and material conditions ($P < 0.0001$) scores.

Race Differences in FT Associations With HCT Outcomes. Table 5 contains results that examine whether race modifies the association between HCT outcomes and FT variables. This effect modification was assessed by a two-way interaction term between race and the four FT variables in four separate

Table 3. Bivariate Associations of HCT Measures With Race and Place of Residence

	Race			Place of residence		
	White	Black	P-value	Urban area	Rural area	P-value
	Mean(se)	Mean(se)		Mean(se)	Mean(se)	
Transition readiness score	59.4 (0.957)	62.6 (1.645)	0.0938	59.7 (0.954)	61.5 (1.694)	0.3670
Number of medical issues	1.69 (0.164)	1.93 (0.272)	0.4573	1.66 (0.161)	2.03 (0.282)	0.2587
PROMIS						
Global Health	26.5 (0.644)	29.6 (1.089)	0.0148	27.1 (0.643)	27.8 (1.148)	0.5800
Anxiety (t-score)	55.5 (0.697)	58.4 (1.193)	0.0398	56.3 (0.697)	56.2 (1.235)	0.9227
Depression (t-score)	52.6 (0.751)	54.6 (1.287)	0.1892	53.0 (0.748)	53.3 (1.324)	0.8449

Bolded values indicates statistical significance or p values of <.05.

Table 4. Bivariate Associations of Financial Toxicity Measures (Covariate) With HCT Outcomes Using Simple Linear Regression

Covariate	Total FT score (standardized)			Reversed COST-FACIT score			Coping behavior score			Material conditions score		
	β	SE	P	β	SE	P	β	SE	P	β	SE	P
Transition readiness	8.35	7.653	0.2763	0.01	0.11	0.9260	-0.38	0.490	0.4444	1.16	0.614	0.0608
# Medical issues	5.27	1.167	<0.0001	-0.02	0.019	0.3129	0.21	0.084	0.0129	0.52	0.102	<0.0001
PROMIS global	31.15	4.789	<0.0001	-0.02	0.075	0.8159	1.85	0.310	<0.0001	2.62	0.383	<0.0001
PROMIS anxiety (t-score)	25.22	5.386	<0.0001	-0.07	0.081	0.3870	1.54	0.343	<0.0001	2.30	0.426	<0.0001
PROMIS depression (t-score)	18.30	5.922	0.0022	-0.13	0.086	0.1225	1.38	0.373	0.0003	1.86	0.469	<0.0001

Bolded values indicates statistical significance or p values of <.05.

models. There was no effect modification present in any of the 4 ANCOVA models (corresponding to the 4 FT variables of interest) fitted over the five HCT outcomes analyzed. This indicates that the relationship between FT variables and HCT outcomes does not differ by race. Therefore, the two-way interactions were eliminated from further consideration and the ANCOVA models were used to provide race effect adjustments for FT variables and FT effect adjustments for race. It should be noted that Table 5 results essentially are ‘adjusted’ analyses that were presented in Tables 2-4 for each of the 3 HCT tools used with the PROMIS tool for QOL broken into its 3 parts (global health, anxiety and depression).

In all four models with transition readiness as the outcome, neither race nor any of the 4 FT variables (total FT, COST-FACIT, material conditions and coping behaviors) were significantly associated. For the number of medical issues, total FT ($P < 0.0001$), coping behavior ($P = 0.0159$), and material conditions ($P < 0.0001$) scores were significantly associated adjusting for race.

In the models with global health as the outcome, total FT and material conditions scores were significantly associated with the outcome when race was included in the models. The mean total FT score in Blacks ($M = 29.1$, $SE = 1.01$) differed ($P = 0.0364$) from Whites ($M = 26.6$, $SE = 0.60$) with each unit increase in the total FT score resulting in a 30.3 unit increase in the global health score ($\beta = 30.3$) ($P < 0.0001$). Similarly, the mean material conditions score in Blacks ($M = 29.0$, $SE = 1.00$) differed ($P = 0.0464$) from Whites ($M = 26.6$, $SE = 0.59$) ($\beta = 2.5$). The model that contained race and COST-FACIT revealed a race difference ($P = 0.0154$) but not a COST-FACIT association ($P = 0.9189$). Similarly, the model with race and coping behavior indicated an association of global health scores with coping behavior ($P < 0.0001$) but not race ($P = 0.0745$).

The models for anxiety showed a significant ($P < 0.0001$) increase in anxiety for each unit increase in total FT ($\beta = 24.4$, $SE = 5.38$), coping behavior ($\beta = 1.5$, $SE = 0.35$) and material conditions ($\beta = 2.2$, $SE = 0.43$) scores when adjusting for race. The only significant race difference was observed with the model involving reversed COST-FACIT and race. The mean anxiety score in Blacks was estimated to be 58.4 ($SE = 1.20$) and in Whites was 55.6 ($SE = 0.70$; $P = 0.0441$).

For the depression outcome, there were no significant differences in race in any of the 4 models, but the total FT ($\beta = 17.7$, $SE = 5.94$, $P = 0.0031$), coping behavior ($\beta = 1.3$, $SE = 0.38$, $P = 0.0005$) and the material conditions ($\beta = 1.8$, $SE = 0.47$, $P = 0.0002$) scores were all positively associated with this outcome adjusting for race.

Rurality Differences in Associations of FT With HCT Outcomes. Table 6 contains results that assess whether rurality modifies the significant associations between FT variables and HCT outcomes. There was no significant effect modification of rurality for any of the models fitted (all interaction P -values > 0.05). Additionally, there is no rurality effect on any of the 5 HCT outcomes across the 4 sets of models involving the 4 FT variables. However, there are significant associations ($P < 0.05$) between 3 of the 4 FT variables (excluding reversed COST-FACIT) and 4 of the 5 HCT outcomes (excluding transition readiness) adjusting for rurality.

Discussion

The purpose of this study was to examine racial (Black vs White) and geographic (rural vs urban) disparities in FT and HCTs among AYA cancer survivors. Our sample of 260 AYAs from the Kentucky Cancer Registry was composed of 73% participants who identified as White and 27% as Black, 75% were urban residents, and 60% reported an annual income at or above \$50,000. To put this into the context of Kentucky’s broader population, the state is composed of approximately 87% White residents and 9% Black residents, more than half of the state population resides in urban areas, and the median annual household income in 2023 was \$62,417.^{28,29} Our sample had moderate COST-FACIT, coping behavior and material conditions scores. They also had moderate transition readiness scores, experienced fewer long/late term effects of treatment, and had higher rates of seeking cancer-related follow-up care compared to similar samples in existing studies. Strong and positive associations were found between total FT scores and long/late term effects of treatment, global health, anxiety and depression. Our findings that higher FT

Table 5. Analysis of Covariance: Transition Readiness, # Medical Issues, PROMIS: Global Health, Anxiety, Depression Relationships With RACE and FT Variable

Outcome	Transition readiness		# medical issues		Promis global health		Promis anxiety (t-score)		Promis depression (t-score)	
	Mean(se)	P-value	Mean(se)	P-value	Mean(se)	P-value	Mean(se)	P-value	Mean(se)	P-value
ANCOVA model 1 with covariates										
Race										
White	59.4 (0.96)	0.1132	1.7 (0.16)	0.5494	26.6 (0.60)	0.0364	55.7 (0.67)	0.0813	52.6 (0.75)	0.215
Black	62.4 (1.65)		1.9 (0.26)		29.1 (1.01)		58.0 (1.15)		54.5 (1.28)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Total FT score (stdized)	7.3 (7.66)	0.3449	5.2 (1.17)	<0.0001	30.3 (4.77)	<0.0001	24.4 (5.38)	<0.0001	17.7 (5.94)	0.0031
Total FT by race IA		0.0663		0.3650		0.2928		0.5819		0.7593
ANCOVA model 2 with covariates										
Race										
White	59.4 (0.96)	0.0933	1.8 (0.17)	0.3238	26.5 (0.65)	0.0154	55.6 (0.70)	0.0441	52.6 (0.75)	0.2150
Black	62.6 (1.65)		2.1 (0.29)		29.6 (1.09)		58.4 (1.20)		54.4 (1.28)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Reversed Cost-FACIT score	0.02 (0.1100)	0.8649	-0.02 (0.0190)	0.3377	-0.008 (0.074)	0.9189	-0.06 (0.080)	0.4426	-0.1 (0.09)	0.1384
Reversed COST- FACIT by RACE IA		0.3980		0.9779		0.1005		0.4507		0.9664
ANCOVA model 3 with covariates										
Race										
White	59.3 (0.96)	0.0703	1.7 (0.16)	0.6527	26.7 (0.61)	0.0745	55.8 (0.67)	0.1377	52.8 (0.74)	0.4203
Black	62.8 (1.66)		1.9 (0.27)		28.8 (1.03)		57.8 (1.16)		54.0 (1.27)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Coping behavior	-0.5 (0.49)	0.3029	0.2 (0.08)	0.0159	1.8 (0.31)	<0.0001	1.5 (0.35)	<0.0001	1.3 (0.38)	0.0005
Coping by RACE IA		0.6692		0.4087		0.9999		0.9374		0.6040
ANCOVA model 4 with covariates										
Race										
White	59.4 (0.95)	0.1309	1.8 (0.16)	0.7169	26.6 (0.59)	0.0464	55.7 (0.66)	0.0937	52.7 (0.73)	0.3231
Black	62.3 (1.64)		1.9 (0.26)		29.0 (1.00)		57.9 (1.14)		54.2 (1.26)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Material conditions	1.1 (0.62)	0.0840	0.5 (0.10)	<0.0001	2.5 (0.38)	<0.0001	2.2 (0.43)	<0.0001	1.8 (0.47)	0.0002
Material by RACE IA		0.3070		0.1360		0.2900		0.3643		0.8860

Bolded values indicates statistical significance or p values of <.05.

Table 6. Analysis of Covariance: Transition Readiness, Number of Medical Issues, PROMIS: Global Health, Anxiety, Depression Relationships With Place of Residence and FT Variable

Outcome	Transition readiness		# medical issues		Promis global health		Promis anxiety (t-score)		Promis depression (t-score)	
	Mean(se)	P-value	Mean(se)	P-value	Mean(se)	P-value	Mean(se)	P-value	Mean(se)	P-value
ANCOVA model 1 with covariates										
Rural status										
Urban	59.8 (0.95)	0.4134	1.7 (0.16)	0.3814	27.2 (0.60)	0.9448	56.4 (0.67)	0.6471	53.1 (0.74)	0.9717
Rural	61.4 (1.70)		2.0 (0.27)		27.3 (1.06)		55.8 (1.19)		53.1 (1.30)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Total FT score (stdized)	7.8 (7.7)	0.3081	5.2 (1.17)	<0.0001	31.1 (4.81)	<0.0001	25.4 (5.41)	<0.0001	18.3 (5.95)	0.0023
Total FT by rural IA		0.4277		0.1941		0.8716		0.6572		0.9459
ANCOVA model 2 with covariates										
Rural status										
Urban	59.7 (0.96)	0.3625	1.8 (0.17)	0.2572	27.1 (0.64)	0.5919	56.3 (0.70)	0.8645	53.1 (0.75)	0.9475
Rural	61.5 (1.70)		2.1 (0.30)		27.8 (1.15)		56.1 (1.24)		53.2 (1.32)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Reversed COST facit score	0.02 (0.111)	0.8688	-0.02 (0.019)	0.3662	-0.01 (0.075)	0.8486	-0.07 (0.081)	0.3818	-0.13 (0.087)	0.126
Reversed COST facit by rural IA		0.5187		0.1860		0.2822		0.5875		0.7113
ANCOVA model 3 with covariates										
Rural status										
Urban	59.7 (0.95)	0.3356	1.7 (0.16)	0.3444	27.2 (0.60)	0.9035	56.4 (0.67)	0.6601	53.1 (0.75)	0.9369
Rural	61.6 (1.70)		2.0 (0.28)		27.4 (1.08)		55.8 (1.19)		53.0 (1.29)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Coping behavior	-0.4 (0.49)	0.4031	0.2 (0.08)	0.0162	1.8 (0.31)	<0.0001	1.6 (0.34)	<0.0001	1.4 (0.37)	0.0003
Coping by rural IA		0.1688		0.4345		0.2983		0.2953		0.3312
ANCOVA model 4 with covariates										
Rural status										
Urban	59.9 (0.95)	0.5168	1.8 (0.16)	0.6551	27.4 (0.59)	0.7255	56.6 (0.66)	0.3925	53.2 (0.73)	0.7271
Rural	61.1 (1.70)		1.9 (0.28)		26.9 (1.06)		55.4 (1.17)		52.7 (1.29)	
	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Material conditions score	1.10 (0.62)	0.0778	0.5 (0.10)	<0.0001	2.6 (0.39)	<0.0001	2.3 (0.43)	<0.0001	1.9 (0.47)	<0.0001
Material by rural IA		0.7793		0.1851		0.3654		0.8852		0.6036

Bolded values indicates statistical significance or p values of <0.05.

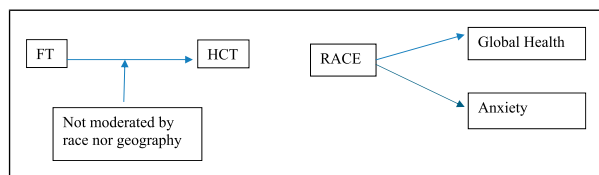


Figure 1. Main Findings

levels were associated with higher rates of long/late term effects of treatment, anxiety, and depression strengthens existing literature, which links high FT with decreased treatment compliance³⁰ and diminished QOL.³¹ Similarly, our sample bolstered evidence from previous studies with the finding that higher levels of depression and anxiety were associated with higher material conditions and coping behavior scores.³² When adjusting for race, our findings showed significant associations between FT, coping behaviors, and material conditions to global health, anxiety, and depression (Figure 1). These associations further reinforce previous findings^{5,8} that FT may impact patient outcomes, particularly levels of psychological distress.

The sampled AYA cancer survivors experienced moderate levels of FT and transition readiness, and had higher levels of healthcare utilization/follow up care. These outcomes contradict previous studies that have documented high levels of FT³³ and low transition readiness, and healthcare utilization among AYAs.³⁴ This discrepancy may be influenced by factors such as time since diagnosis, suggesting that financial burden may decrease as survivors move further away from their initial treatment. Another potential explanation for these findings may be related to the sample's relatively higher level of education and employment as previous studies have associated low educational attainment and income with an increase in financial burden.^{35,36} Participants in this study indicated self-reported difficulties with living on their current income and going into debt due to cancer treatment, which reflects and compounds upon established evidence of the material hardship experienced by AYAs in other studies.³⁷ The discrepancies between our sampled participant responses and existing literature underscores the need for future research with larger samples to better consider these variables in relation to subsets of age groups and time since diagnosis. Such an approach may provide a more nuanced understanding of the FT experienced by AYA cancer survivors and further delineate its relationship with HCTs. Our study highlights the importance of ongoing efforts to address the diverse needs of AYA cancer survivors across different contexts.

Our study found that Black participants demonstrated higher anxiety levels and increased reliance upon coping behaviors compared to White participants, even after adjusting for FT. These findings align and add to prior research demonstrating greater QOL disparities among Black cancer survivors (i.e., increased psychological distress, reduced healthcare access, and social isolation).^{38,39} These disparities often lead to the use of negative coping habits like treatment

avoidance or disengagement, which may worsen the emotional and financial burdens they may already be experiencing.⁴⁰ The racial disparities expanded upon here stem from structural inequities surrounding access to care, income levels, and insurance coverage.^{1,2,41,42} Our findings highlight the need for tailored interventions targeted at improving access to care with a focus on reducing anxiety and other psychological impacts of FT.

Beyond the finding that urban residing participants had higher material conditions scores when compared to rural counterparts, our study did not find significant differences in FT and HCT outcomes between rural and urban AYA cancer survivors. However, these findings should be interpreted with caution, as they may be influenced by limitations in our study's sampling of rural residents. Existing literature highlights rural disparities in cancer care compliance,⁴³ FT experience,⁴⁴ and psychosocial outcomes⁴⁵ necessitating tailored interventions in these areas.⁴⁶ Cancer centers should remain cognizant of unique FT experiences such as limited healthcare infrastructure, access barriers, and lower cost-related health literacy³⁶ of rural AYA cancer survivors in the design and implementation of financial navigation efforts.

Our study findings show the need for targeted interventions focused on mitigating the impact of FT on underserved AYA cancer survivors. Oncology financial navigation is one evidence-based approach that has demonstrated reductions in FT among cancer patients.^{20,47} Financial navigators help patients and caregivers navigate the costs of cancer care by ensuring they have access to appropriate health insurance coverage and connect individuals to financial assistance programs.^{20,21} While not established as standard of care, financial navigation services have been incorporated across cancer centers in the U.S. Barriers to implementing navigation services include lack of funding and other resources, which could be a driving implementation factor in under resourced cancer centers serving vulnerable populations. Additional research is needed on tailoring financial navigation interventions to expand their reach and accessibility in racially diverse and rural populations.

Limitations. Findings from our study should be interpreted with caution due to limitations in sampling. Our sample was limited in number of Black and rural residing participants, which may have influenced our multivariate analyses. Race was limited to Black and White groups due to constraints related to recruiting other racial/ethnic groups from the KCR. The inclusion of only English-speaking participants for our study was an additional limitation reducing generalizability of our findings to non-English speaking populations. Use of cross-sectional design and lack of longitudinal data limits understanding of FT among AYAs across the trajectory of their cancer experience and at corresponding developmental milestones. Most of our sample had higher levels of education, income, and insurance coverage, which limits our understanding of FT experiences among underserved cancer

survivors. Despite these limitations, recruitment via KCR provided us the most comprehensive access to Black and rural-residing cancer survivors, offering an unparalleled opportunity to capture a relatively diverse racial and geographically diverse sample.

Conclusions

Our study highlights the connection between FT, HCTs, and racial and geographic disparities faced by AYA cancer survivors. We found that Black participants experienced higher anxiety and relied more on coping strategies compared to White participants, while urban residents had better material conditions than those in rural areas. Although FT was associated with anxiety, depression, and long-term treatment effects, these associations did not differ by race or location. These findings emphasize the need to address financial barriers to care, and by considering race and geography, we may gain clearer insights into how social determinants of health impact QOL and HCTs. Future research should focus on designing and implementing culturally tailored interventions for Black and rural communities to address gaps in existing literature. Implementing financial and legal navigation services could help reduce FT and improve access to care, which may ultimately enhance health outcomes for AYA cancer survivors.

ORCID iD

Jean S. Edward  <https://orcid.org/0000-0001-9184-1048>

Ethical Statement

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study. The University of Kentucky Institutional Review Board approved all research activities (#74682).

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by the UNITE (United in True Racial Equity) Research Priority Area and Markey Cancer Center grant mechanism at the University of Kentucky. This study was supported by the Kentucky Cancer Registry and the Patient Oriented and Population Science Shared Resource Facility, University of Kentucky Markey Cancer Center (P30CA177558); HF was supported by American Cancer Society grant No. IRG-22-152-34-IRG and American Cancer Society Center for Diversity in Cancer Research grant No. POST-BACC-22-1042000-01-DPBACC. KB was supported by the University of Kentucky's ACTION (Appalachian Career Training in Oncology) Program (NCI R25 CA221765).

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

References

1. Kent EE, Morris RA, Largent JA, Ziogas A, Sender LS, Anton-Culver H. Socioeconomic impacts on survival differ by race/ethnicity among adolescents and young adults with non-Hodgkin's lymphoma. *J Cancer Epidemiol.* 2010;2010: 824691. doi:[10.1155/2010/824691](https://doi.org/10.1155/2010/824691)
2. Robbins AS, Lerro CC, Barr RD. Insurance status and distant-stage disease at diagnosis among adolescent and young adult patients with cancer aged 15 to 39 years: national cancer data base, 2004 through 2010. *Cancer.* 2014;120(8):1212-1219. doi:[10.1002/cncr.28568](https://doi.org/10.1002/cncr.28568)
3. Kirchhoff AC, Spraker-Perlman HL, McFadden M, et al. Sociodemographic disparities in quality of life for survivors of adolescent and young adult cancers in the behavioral risk factor surveillance system. *J Adolesc Young Adult Oncol.* 2014;3(2): 66-74. doi:[10.1089/jayao.2013.0035](https://doi.org/10.1089/jayao.2013.0035)
4. 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(7):e27660. doi:[10.1002/pbc.27660](https://doi.org/10.1002/pbc.27660)
5. Meropol NJ, Schrag D, Smith TJ, et al. American society of clinical oncology guidance statement: the cost of cancer care. *J Clin Oncol.* 2009;27(23):3868-3874. doi:[10.1200/JCO.2008.27.3580](https://doi.org/10.1200/JCO.2008.27.3580)
6. Nathan PC, Greenberg ML, Ness KK, et al. Medical care in long-term survivors of childhood cancer: a report from the childhood cancer survivor study. *J Clin Oncol.* 2008;26: 4401-4409.
7. Otth M, Denzler S, Koenig C, Koehler H, Scheinemann K. Transition from pediatric to adult follow-up care in childhood cancer survivors-a systematic review. *J Cancer Surviv.* 2021; 15(1):151-162. doi:[10.1007/s11764-020-00920-9](https://doi.org/10.1007/s11764-020-00920-9)
8. Schwartz LA, Tuchman LK, Hobbie WL, Ginsberg JP. A social-ecological model of readiness for transition to adult-oriented care for adolescents and young adults with chronic health conditions. *Child Care Health Dev.* 2011;37(6):883-895. doi:[10.1111/j.1365-2214.2011.01282.x](https://doi.org/10.1111/j.1365-2214.2011.01282.x)
9. Quillen J, Bradley H, Calamaro C. Identifying barriers among childhood cancer survivors transitioning to adult health care. *J Pediatr Oncol Nurs.* 2017;34(1):20-27.
10. Rosenberg-Yunger ZR, Klassen AF, Amin L, et al. Barriers and facilitators of transition from pediatric to adult long-term follow-up care in childhood cancer survivors. *J Adolesc Young Adult Oncol.* 2013;2(3):104-111.

11. Sharma N, O'Hare K, Antonelli RC, Sawicki GS. Transition care: future directions in education, health policy, and outcomes research. *Acad Pediatr*. 2014;14(2):120-127. doi:10.1016/j.acap.2013.11.007
12. Casillas J, Kahn KL, Doose M, et al. Padres Contra El Cáncer. Transitioning childhood cancer survivors to adult-centered healthcare: insights from parents, adolescent, and young adult survivors. *Psychooncology*. 2010;19(9):982-990.
13. Zafar SY. Financial toxicity of cancer care: it's time to intervene. *J Natl Cancer Inst*. 2016;108(5):djv370.
14. National Cancer Institute. *State Cancer Profiles*. Bethesda, MD: National Cancer Institute. <https://statecancerprofiles.cancer.gov/map/map.withimage.php?00&state&001&001&00&0&01&0&1&5&0#results> (2017).
15. Edward JS, Rayens MK, Zheng X, Vanderpool RC. The association of health insurance literacy and numeracy with financial toxicity and hardships among colorectal cancer survivors. *Support Care Cancer*. 2021;29(10):5673-5680. doi:10.1007/s00520-021-06036-9
16. von Elm E, Altman DG, Egger M, et al. STROBE Initiative. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann Intern Med*. 2007;147:573-577.
17. U.S. Department of Agriculture, Economic Research Service. *Rural-Urban Continuum Codes*. Washington, DC: U.S. Department of Agriculture, Economic Research Service; 2024. <https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx#.U0VBhleG-HsAccessed>
18. de Souza JA, Yap BJ, Hlubocky FJ, et al. The development of a financial toxicity patient-reported outcome in cancer: the COST measure. *Cancer*. 2014;120:3245-3253.
19. Medical Expenditure Panel Survey (MEPS). *Content last reviewed July 2024*. Rockville, MD: Agency for Healthcare Research and Quality. <https://www.ahrq.gov/data/meeps.html>.
20. Edward JS, McLouth LE, Rayens MK, Eisele LP, Davis TS, Hildebrandt G. Coverage and cost-of-care links: addressing financial toxicity among patients with hematologic cancer and their caregivers. *JCO Oncol Pract*. 2023;19(5):e696-e705. doi:10.1200/OP.22.00665
21. Edward J, Northrip KD, Rayens MK, et al. Financial-legal navigation reduces financial toxicity of pediatric, adolescent, and young adult cancers. *JNCI Cancer Spectr*. 2024;8(3):pkae025. doi:10.1093/jncics/pkae025
22. Ferris M, Cohen S, Haberman C, et al. Self-management and transition readiness assessment: development, reliability, and factor structure of the STARx questionnaire. *J Pediatr Nurs*. 2015;30(5):691-699.
23. National Cancer Institute. *Follow-Up Care Use Among Survivors (FOCUS) Survey*. Bethesda, MD: National Cancer Institute. <https://cancercontrol.cancer.gov/ocs/resources/researchers/FOCUS> 24 September 2020.
24. Hays RD, Bjorner JB, Revicki DA, Spritzer KL, Cella D. Development of physical and mental health summary scores from the patient-reported outcomes measurement information system (PROMIS) global items. *Qual Life Res*. 2009;18(7):873-880. doi:10.1007/s11136-009-9496-9
25. Pilkonis PA, Choi SW, Reise SP, et al. Item banks for measuring emotional distress from the Patient-Reported Outcomes Measurement Information System (PROMIS®): depression, anxiety, and anger. *Assessment*. 2011;18(3):263-283. doi:10.1177/1073191111411667
26. Pilkonis PA, Yu L, Dodds NE, Johnston KL, Maihoefer CC, Lawrence SM. Validation of the depression item bank from the Patient-Reported Outcomes Measurement Information System (PROMIS) in a three-month observational study. *J Psychiatr Res*. 2014;56:112-119. doi:10.1016/j.jpsychires.2014.05.010
27. SAS Institute Inc. *MarketLine Company Profile*. Cary, NC: SAS Institute Website; 2014. <https://search.ebscohost.com/login.aspx?direct=true&db=plh&AN=101476231&site=eds-live>
28. United States Census Bureau QuickFacts Kentucky. Census.gov. <https://www.census.gov/quickfacts/fact/table/KY#>
29. Kentucky League of Cities Information Central Population. Klc.org. <https://www.klc.org/InfoCentral/Detail/1/population>
30. Neugut AI, Subar M, Wilde ET, et al. Association between prescription co-payment amount and compliance with adjuvant hormonal therapy in women with early-stage breast cancer. *J Clin Oncol*. 2011;29(18):2534-2542. doi:10.1200/JCO.2010.33.3179
31. Zafar SY, McNeil RB, Thomas CM, Lathan CS, Ayanian JZ, Provenza D. Population-based assessment of cancer survivors' financial burden and quality of life: a prospective cohort study. *J Oncol Pract*. 2015;11(2):145-150. doi:10.1200/JOP.2014.001542
32. Nipp RD, El-Jawahri A, Fishbein JN, et al. The relationship between coping strategies, quality of life, and mood in patients with incurable cancer. *Cancer*. 2016;122(13):2110-2116. doi:10.1002/cncr.30025
33. Di GG, Pagalan L, Jetha A, Pechlivanoglou P, Pole JD. Financial toxicity among adolescent and young adult cancer survivors: a systematic review of educational attainment, employment, and income. *Crit Rev Oncol Hematol*. 2023;183:103914. doi:10.1016/j.critrevonc.2023.103914
34. Prussien KV, Barakat LP, Darabos K, et al. Sociodemographics, health competence, and transition readiness among adolescent/young adult cancer survivors. *J Pediatr Psychol*. 2022;47(10):1096-1106. doi:10.1093/jpepsy/jsac039
35. Bhatia S, Landier W, Paskett ED, et al. Rural-urban disparities in cancer outcomes: opportunities for future research. *J Natl Cancer Inst*. 2022;114(7):940-952. doi:10.1093/jnci/djac030
36. Zahnd WE, Davis MM, Rotter JS, et al. Rural-urban differences in financial burden among cancer survivors: an analysis of a nationally representative survey. *Support Care Cancer*. 2019;27(12):4779-4786. doi:10.1007/s00520-019-04742-z
37. Parsons SK, Murphy-Banks R, Rodday AM, et al. Financial distress and medical financial hardship among young adult survivors of blood cancer. *JNCI Cancer Spectr*. 2024;8(5):pkae071. doi:10.1093/jncics/pkae071
38. Lake PW, Conley CC, Pal T, Sutton SK, Vadaparampil ST. Anxiety and depression among Black breast cancer survivors:

- examining the role of patient-provider communication and cultural values. *Patient Educ Counsel*. 2022;105(7):2391-2396. doi:[10.1016/j.pec.2021.12.020](https://doi.org/10.1016/j.pec.2021.12.020)
39. Matthews AK, Tejeda S, Johnson TP, Berbaum ML, Manfredi C. Correlates of quality of life among African American and white cancer survivors. *Cancer Nurs*. 2012;35(5):355-364. doi:[10.1097/NCC.0b013e31824131d9](https://doi.org/10.1097/NCC.0b013e31824131d9)
 40. Binkley JM, Gabram S, Finley J, Fowler D, VanHoose L, McCullough LE. Racial disparity in breast cancer survivorship: themes from a series of four national healthcare provider live virtual forums. *J Cancer Surviv*. 2023;17(4):1008-1016. doi:[10.1007/s11764-023-01373-6](https://doi.org/10.1007/s11764-023-01373-6)[published correction appears in *J Cancer Surviv*. 2024 Oct;18(5):1504. doi: 10.1007/s11764-023-01393-2].
 41. Davis ES, Poulson MR, Yarbrow AA, Franks JA, Bhatia S, Kenzik KM. Understanding racial differences in financial hardship among older adults surviving cancer. *Cancer*. 2024; 130(20):3487-3495. doi:[10.1002/cncr.35437](https://doi.org/10.1002/cncr.35437)
 42. Hastert TA, Kyko JM, Reed AR, et al. Financial hardship and quality of life among African American and white cancer survivors: the role of limiting care due to cost. *Cancer Epidemiol Biomarkers Prev*. 2019;28(7):1202-1211. doi:[10.1158/1055-9965.EPI-18-1336](https://doi.org/10.1158/1055-9965.EPI-18-1336)
 43. Edward J, Bowling W, Chitwood H, Vanderpool R. Availability and accessibility of cancer care delivery approaches to reduce financial toxicity of rural and urban cancer patients in Kentucky. *J Oncol Navig Surviv*. 2022;13(5):156-164.
 44. Odahowski CL, Zahnd WE, Zgodic A, et al. Financial hardship among rural cancer survivors: an analysis of the medical expenditure panel survey. *Prev Med*. 2019;129S:105881. doi:[10.1016/j.ypmed.2019.105881](https://doi.org/10.1016/j.ypmed.2019.105881)
 45. Miller MF, Olson JS, Doughtie K, Zaleta AK, Rogers KP. The interplay of financial toxicity, health care team communication, and psychosocial well-being among rural cancer patients and survivors. *J Rural Health*. 2024;40(1):128-137. doi:[10.1111/jrh.12779](https://doi.org/10.1111/jrh.12779)
 46. Halverson J, Martinez-Donate A, Trentham-Dietz A, et al. Health literacy and urbanicity among cancer patients. *J Rural Health*. 2013;29(4):392-402. doi:[10.1111/jrh.12018](https://doi.org/10.1111/jrh.12018)
 47. 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(5 Suppl):S74-S79.