Disparities in Adolescent and Young Adult Sarcoma Survival: Analyses of the Texas Cancer Registry and the National SEER Data

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Purpose: Examine disparities in survival for adolescents and young adults (AYAs) diagnosed with bone and soft tissue sarcomas in Texas compared with national estimates.

Methods: AYAs with sarcomas diagnosed between 1995 and 2012 at ages 15–39 years were identified from the Texas Cancer Registry (TCR) and Surveillance, Epidemiology, and End Results (SEER) program. Patient demographic, treatment, and clinical characteristics were compared between TCR and SEER using chi-squared tests. Five-year survival was computed using the Kaplan–Meier method. Cox proportional hazards (CPH) models evaluated the factors associated with the risk of mortality between and within the two datasets.

Results: Sarcoma patients in TCR were more likely to be Hispanic, uninsured, diagnosed at late stage, and have lower rates of surgery as the first line of treatment than those in SEER. In Texas, 5-year survival was 68.7% versus 72.2% in SEER ($p < 0.001$). However, after including surgery in our fully adjusted CPH model, survival differences between the two datasets were no longer observed. In these models, males, and those living in nonmetropolitan areas were more likely to die than their counterparts in both datasets. In TCR, those who lived in the U.S. and Mexico border had higher mortality. In SEER, Hispanics and non-Hispanic blacks had higher mortality.

Conclusion: The adjusted AYA sarcoma survival in Texas was similar to that of SEER, but patients in Texas were more likely to be uninsured and have lower surgery rates. Those living in the U.S. and Mexico border in Texas faced lower survival. These results are important for delineating effective care for this high-risk patient group.

Keywords: sarcoma, survival analysis, SEER, Texas cancer registry

Introduction

ALTHOUGH SARCOMAS are a rare group of cancers that account for 1% of all malignancies in the United States, they account for roughly 10% of all invasive cancers among patients diagnosed during adolescent and young adult (AYA) ages, that is, between 15 and 39 years of age.¹ Importantly, over half of all sarcoma diagnoses occur in the AYA age group.¹ Sarcomas can arise in soft tissues (STS) or bones, with STS being more common (87.3%) than bone sarcomas (12.7%).^{1,2} Bone sarcomas have a peak incidence in the AYA age group,² whereas the incidence of STS increases with age and is highest among older adults.³

Sarcoma survival among AYAs is inferior to younger patients but is better than older adults for most types of

sarcomas.^{1,4} Sarcoma-related survival is low compared with other cancers in AYAs, and AYAs diagnosed with late stage sarcomas have poorer survival.¹ However, there have been few reports on variations in sarcoma survival by patient characteristics such as demographics (i.e., race and ethnicity),⁵ and patient's county/state of residence.

Texas, the second largest U.S. state, is a minority-majority state with 50% of population belonging to minority race and ethnicity (i.e., Hispanics and non-Hispanics blacks).⁶ Further, Texas has the highest proportion of uninsured adults nationwide;^{7,8} therefore, young adults with cancer in Texas may face a greater risk for delayed care. Previous studies show that delay in care is often associated with late stage cancer diagnoses and poorer prognosis.^{9,10} Yet, to our knowledge no study has examined demographic factors that

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influence survival for AYAs with sarcomas in Texas compared with the national statistics.

We undertook this study to examine survival disparities among AYAs with bone and STS sarcomas in Texas Cancer Registry (TCR) compared with the Surveillance, Epidemiology, and End Results (SEER) Program data. While AYAs with cancer are known to be an at-risk population with inferior survival outcomes, we hypothesized that AYAs with sarcoma in the TCR would have lower survival rates compared with SEER due to unique population demographics and, in particular, the health disparities faced by patients living in border communities in Texas. Understanding the disparities between AYAs with sarcoma in TCR versus SEER may yield insight into challenges facing the larger AYA cancer population.

Methods

Data

We used the TCR and SEER data to identify patients diagnosed with sarcomas from 1995 to 2012. AYAs were defined as those diagnosed between 15 and 39 years of age.^{1,11} TCR is a gold standard registry with at least 95% complete cancer surveillance data.¹² In SEER, we used data from 18 registries—of these, 13 registries have data for all cancer cases diagnosed 1992 onward and the remaining 5 registries have cases diagnosed 2000 onward.¹³ SEER covers ~28% of the U.S. population, and is 99% complete.¹⁴ Both TCR and SEER data are de-identified and publicly available; therefore, prior Institutional Review Board approval for conducting the current research was not required. Data use agreements were signed to access both TCR and SEER data.

Participants

There were a total of 101,423 AYA patients diagnosed with any malignant cancer in TCR, and 303,136 in SEER from 1995 to 2012. The Histologic International Classification of Diseases (ICD) codes (ICD-O-3) and primary site were used to identify bone sarcomas and STS in these data following the 2008 site recode recommendation for AYAs.¹⁵ Bone sarcomas were osteosarcoma, chondrosarcoma, Ewing tumor, and other specified and unspecified bone sarcoma.

STS sarcomas were fibromatous neoplasms, rhabdomyosarcoma, and other specified and unspecified STS sarcoma. We excluded Kaposi sarcoma. ICD-O-3 and primary site codes used for identifying these sarcomas are listed in Table 1.

We identified 4707 individuals with histologically confirmed malignant bone sarcoma and STS as their primary cancer in TCR and 14,798 in SEER. Of these, 231 were excluded from TCR and 719 from SEER if data on survival were missing. The final sample consisted of 4347 patients in TCR, and 13,742 patients in SEER. TCR and SEER data on these patients were appended to conduct the pooled analyses.

Outcome

We first examined all-cause 5-year survival. Survival time was defined as the time between diagnosis and death or December 31, 2013 (i.e., the end of study date, which allowed us to have at least 1 year follow-up on all patients), whichever came first. We also investigated the risk of survival according to demographic characteristics.

Covariates

Demographics. Demographic characteristics were selected based on availability in the TCR and SEER data and included sex, age at diagnosis, year of diagnosis, race and ethnicity, place of residence at diagnosis (metropolitan county vs. nonmetropolitan county), and primary payer at diagnosis (uninsured vs. insured; available only from 2007 to 2013). County of residence in the U.S. and Mexico border (y/n) was additionally investigated for TCR.

Clinical and treatment-related variables. We included two disease variables—cancer stage and sarcoma type. Cancer stage was defined based on the SEER summary stage variables (1977 and 2000, original and derived), as recommended by the North American Association of Central Cancer Registries.¹⁶ Early stage was defined if cancer was localized, regional (direct extension and/or regional lymph nodes), and regional not specified. Late stage was defined as metastatic cancer. We also included sarcoma type (bone vs. STS).

TABLE 1. PRIMARY SITE AND ICD-O-3 CODES FOR BONE AND SOFT TISSUE SARCOMAS

Primary site		ICD-O-3
Bone Sarcoma		
Osteosarcoma	C000–C809	9180–9187, 9192–9194
Chondrosarcoma	C000–C809	9220–9221, 9230–9231, 9240, 9242–9243
Ewing Tumor	C000–C809	9260, 9364–9365
Other specified and unspecified bone sarcoma	C000–C809, C400–C419	8812, 9250, 9261, 9370–9372, 8000–8005, 8800–8803, 8805–8806, 9200
Soft tissue sarcoma		
Fibromatous neoplasms	C000–C809	8810–8811, 8813–8815, 8820–8824, 8830, 8832–8833, 8835–8836, 9252
Rhabdomyosarcoma	C000–C809	8900–8904, 8910, 8912, 8920–8921, 8991
Other specified and unspecified STS sarcoma	C000–C809, C000–C699, C730–C750, C754–C809, C000–C399, C420–C809	8804, 8825, 8840–8897, 8982–8983, 8990, 9040–9044, 9120–9139, 9141–9150, 9170, 9251, 9561, 9580–9581, 9540, 9560, 9571, 8800–8803, 8805–8806

ICD, International Classification of Diseases; STS, soft tissues.

We included the first line of treatment (surgery [y/n]). Radiation and chemotherapy information were not included due to the high missing data and unequal availability of these data between TCR and SEER.

Statistical analysis

Summary statistics of demographic variables and clinical covariates were compared between TCR and SEER using chi-squared tests. Survival (5-year survival estimates) between TCR and SEER was compared using the Kaplan-Meier method and log-rank test.

Cox proportional hazards (CPH) models were estimated to provide the hazard ratio (HR: hazard of death in one group compared with other) and their 95% confidence intervals (CI). We first estimated pooled CPH regressions to compare the risk of mortality between TCR and SEER. To understand and identify variables that could explain the difference in the risk of mortality between the two datasets, we estimated the following three models:

- Model 1 included demographic variables as covariates (excluding insurance, which is only available from 2007 to 2013, and within this time frame has over 22% missing observations in TCR);
- Model 2 included demographic variables as covariates and was adjusted by cancer stage and sarcoma type (disease variables); and
- Model 3 included demographic variables as covariates and was adjusted by disease variables and surgery.

Further, to identify patient characteristics associated with higher mortality in Texas and SEER, we estimated CPH models separately within TCR and SEER. These models were adjusted by all variables, that is, demographic covariates, cancer stage, sarcoma type, and surgery.

The proportional hazards assumption (PHA) was tested in all CPH models using Schoenfeld residuals and log-log plots.¹⁷ If a variable did not meet the PHA, a CPH model stratified by this variable was estimated.^{17,18} Variables that did not meet the PHA are listed in each table footnote.

TABLE 2. CHARACTERISTICS OF SARCOMA PATIENTS IN THE TEXAS CANCER REGISTRY AND SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS PROGRAM

	TCR		SEER		p
	N	%	N	%	
Total	4347		13,742		
Sex					
Male	2300	52.9	7326	53.3	0.64
Female	2047	47.1	6416	46.7	
Age at diagnosis, years					
15–19	892	20.5	2663	19.4	0.16
20–29	1509	34.7	4736	34.5	
30–39	1946	44.8	6343	46.2	
Race and ethnicity					
Non-Hispanic white	2023	46.7	7301	53.9	<0.001
Hispanic	1542	35.6	2970	21.9	
Non-Hispanic black	601	13.9	2102	15.5	
Non-Hispanic others	165	3.8	1176	8.7	
Primary payer at diagnosis ^a					
Uninsured	253	20.8	367	7.3	<0.001
Insured	964	79.2	4686	92.7	
Place of residence					
Metropolitan county	3925	90.3	12,387	90.9	0.26
Nonmetropolitan county	422	9.7	1246	9.1	
County in the U.S.-Mexico border ^b					
No	3916	90.1	NA	NA	
Yes	431	9.9	NA	NA	
Year at diagnosis					
1995–2000	1325	30.5	3117	22.7	<0.001
2001–2005	1231	28.3	4464	32.5	
2006–2009	1043	24.0	3579	26.0	
2010–2012	748	17.2	2582	18.8	
Vital status ^c					
Dead	1485	34.2	4042	29.4	<0.001
Alive	2862	65.8	9700	70.6	

^aData available from 2007 to 2012 only. Near 22% missing observations in TCR and 4.7% in SEER.

^bBorder counties are applicable to TCR only.

^cVital status as of December 31, 2013.

SEER, surveillance, epidemiology, and end results; TCR, Texas Cancer Registry.

TABLE 3. CLINICAL CHARACTERISTICS OF SARCOMA PATIENTS IN THE TEXAS CANCER REGISTRY AND SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS PROGRAM

	TCR		SEER		p
	N	%	N	%	
Sarcoma type					
Bone sarcoma	1418	32.6	4072	29.6	<0.001
Osteosarcoma	587	13.5	1570	11.4	
Chondrosarcoma	273	6.3	864	6.3	
Ewing tumor	378	8.7	1193	8.7	
Others	180	4.1	445	3.2	
Soft tissue sarcoma	2929	67.4	9670	70.4	
Fibromatous neoplasms	849	19.5	3343	24.3	
Rhabdomyosarcoma	210	4.8	662	4.8	
Others	1870	43.0	5665	41.2	
Cancer stage ^a					
Early	2833	80.2	10,602	83.2	<0.001
Late	701	19.8	2149	16.9	
Surgery ^b					
No	1089	26.0	1877	15.2	<0.001
Yes	3099	74.0	10,460	84.8	

^a18.7% missing observations in TCR and 7.2% in SEER.

^bProcedure to remove and/or destroy tissue of the primary site performed as part of first course of treatment.

All analyses were conducted with Stata14.0 (College Station, TX). *p* Value <0.05 was considered significant for all analyses.

Results

Summary statistics

In Table 2, TCR and SEER patients had comparable gender and age distribution. Patients in TCR were more likely to be Hispanic (35.6% vs. 21.9%, *p* < 0.001), and uninsured (20.8% vs. 7.3%, *p* < 0.001) than that of SEER. Further, 9.9% of patients in TCR lived in the U.S. and Mexico border counties.

In Table 3, bone sarcomas were slightly more prevalent in TCR (32.6% vs. 29.6% in SEER, *p* < 0.001) while the remaining STSs were more prevalent in SEER. Patients in TCR were more likely to be diagnosed with late stage sarcomas than in SEER (19.8% and 16.9%, *p* < 0.001, respectively). Those in TCR were less likely to receive surgery as the first course of treatment compared with those in SEER (74.0% vs. 84.8%, *p* < 0.001).

In Figure 1, 5-year survival was significantly lower in TCR compared with SEER (68.7% vs. 72.2%, *p* < 0.001, respectively).

CPH regression models

In our pooled analyses (Table 4), after adjusting for demographics (Model 1), we observed that patients in TCR were at a higher risk of mortality than those in SEER (HR: 1.12; 95% CI: 1.05–1.19, *p* = 0.01). In Model 2, after cancer stage and sarcoma type were included in the model, the difference in mortality between TCR and SEER was still evident (HR: 1.08, 95% CI: 1.01–1.15, *p* = 0.03). However, the difference in mortality between TCR and SEER was not significant after the CPH model was adjusted for surgery in Model 3 (HR: 0.96, 95% CI: 0.90–1.03, *p* = 0.25).

Separate CPH analysis for TCR and SEER are presented in Table 5. In TCR, males were more likely to die than females

(HR: 1.27, 95% CI: 1.13–1.43, *p* < 0.001) and those living in nonmetropolitan counties were more likely to die than those in metropolitan counties (HR: 1.24, 95% CI: 1.03–1.49, *p* = 0.02). Patients living in U.S./Mexico border counties had a higher risk of death (HR: 1.25, 95% CI: 1.03–1.51, 9, *p* = 0.02).

In SEER (Table 5), males were more likely to die than females (HR: 1.15, 95% CI: 1.07–1.23, *p* < 0.001); older AYAs were more likely to die than younger ones (HR: 1.07, 95% CI: 1.02–1.12, *p* = 0.004); Hispanics and non-Hispanic blacks were more likely to die than non-Hispanic whites (HR: 1.21, 95% CI: 1.11–1.32, *p* < 0.001 and HR: 1.25, 95% CI: 1.13–1.37, *p* < 0.001, respectively); and those who

FIG. 1. Kaplan–Meier survival curves for sarcoma patients in the TCR and SEER. Five-year survival: 68.7% in TCR (95% CI: 67.2%–70.1%) and 72.2% in SEER (95% CI: 71.4%–73.0%), *p* < 0.001 on the log-rank test. The Y axis ranges from 0 to 1, but it was trimmed for clarity. SEER, surveillance, epidemiology, and end results; TCR, Texas Cancer Registry.

TABLE 4. POOLED MULTIVARIATE COX PROPORTIONAL HAZARDS REGRESSION ANALYSIS OF SARCOMA PATIENTS IN THE TEXAS CANCER REGISTRY AND SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS PROGRAM

	<i>Pooled analyses</i>								
	<i>Model 1^a</i>			<i>Model 2^b</i>			<i>Model 3^c</i>		
	<i>HR</i>	<i>95% CI</i>	<i>p</i>	<i>HR</i>	<i>95% CI</i>	<i>p</i>	<i>HR</i>	<i>95% CI</i>	<i>p</i>
Dataset									
SEER	1.00	Ref.		1.00	Ref.		1.00	Ref.	
TCR	1.12	1.05–1.19	<0.001	1.08	1.01–1.15	0.03	0.96	0.90–1.03	0.25
Sex									
Female	1.00	Ref.		1.00	Ref.		1.00	Ref.	
Male	1.39	1.32–1.47	<0.001	1.21	1.15–1.29	<0.001	1.18	1.11–1.25	<0.001
Age at diagnosis, years ^d	0.91	0.88–0.94	<0.001	1.03	0.99–1.07	0.11	1.06	1.02–1.11	0.003
Year at diagnosis ^d	1.03	1.00–1.06	0.04	0.99	0.96–1.02	0.47	0.99	0.95–1.02	0.36
Race and ethnicity									
Non-Hispanic white	1.00	Ref.		1.00	Ref.		1.00	Ref.	
Hispanic	1.23	1.16–1.32	<0.001	1.18	1.10–1.26	<0.001	1.17	1.09–1.26	<0.001
Non-Hispanic black	1.27	1.18–1.37	<0.001	1.27	1.17–1.38	<0.001	1.23	1.13–1.33	<0.001
Non-Hispanic others	1.11	1.00–1.24	0.06	1.09	0.98–1.22	0.11	1.10	0.98–1.23	0.12
Place of residence									
Metropolitan county	1.00	Ref.		1.00	Ref.		1.00	Ref.	
Nonmetropolitan county	1.20	1.10–1.31	<0.001	1.15	1.05–1.26	0.003	1.15	1.04–1.27	0.01

^aModel 1 included sex, age at diagnosis, year at diagnosis, race and ethnicity, and place of resident as covariates.

^bModel 2 included Model 1 covariates. Further, Model 2 was stratified by sarcoma diagnosis and cancer stage as both these variables did not meet the PHA.

^cModel 3 included Model 1 covariates. Further, Model 3 was stratified by surgery, sarcoma diagnosis, and cancer stage as these variables did not meet the PHA.

^dIncluded as a continuous variable.

HR, hazard ratio; 95% CI, 95% confidence interval; PHA, proportional hazards assumption.

TABLE 5. MULTIVARIATE COX PROPORTIONAL HAZARDS REGRESSION ANALYSIS OF SARCOMA PATIENTS IN THE TEXAS CANCER REGISTRY AND SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS PROGRAM

	<i>TCR^a</i>			<i>SEER^b</i>		
	<i>HR</i>	<i>95% CI</i>	<i>p</i>	<i>HR</i>	<i>95% CI</i>	<i>p</i>
Sex						
Female	1.00	Ref.		1.00	Ref.	
Male	1.27	1.13–1.43	<0.001	1.15	1.07–1.23	<0.001
Age at diagnosis, years ^c	1.05	0.97–1.14	0.19	1.07	1.02–1.12	0.004
Year at diagnosis ^c	1.03	0.97–1.09	0.30	0.96	0.93–1.00	0.06
Race and ethnicity						
Non-Hispanic white	1.00	Ref.		1.00	Ref.	
Hispanic	1.04	0.91–1.19	0.57	1.21	1.11–1.32	<0.001
Non-Hispanic black	1.18	0.99–1.40	0.07	1.25	1.13–1.37	<0.001
Non-Hispanic others	0.99	0.72–1.35	0.94	1.13	0.99–1.28	0.07
Place of residence						
Metropolitan county	1.00	Ref.		1.00	Ref.	
Nonmetropolitan county	1.24	1.03–1.49	0.02	1.13	1.00–1.26	0.04
County in the U.S/Mexico border						
No	1.00	Ref.		NA		
Yes	1.25	1.03–1.51	0.02			

^aTCR model included sex, age at diagnosis, year at diagnosis, race and ethnicity, place of resident, sarcoma diagnosis, and surgery as covariates. Further, this model was stratified by cancer stage as it did not meet the PHA.

^bSEER model included sex, age at diagnosis, year at diagnosis, race and ethnicity, and place of resident as covariates. Further, this model was stratified by sarcoma diagnosis, surgery, and cancer stage as these did not meet the PHA.

^cIncluded as a continuous variable.

NA, not applicable.

lived in nonmetropolitan counties were more likely to die than those in metropolitan counties (HR:1.13, 95% CI:1.00–1.26, $p=0.04$). In both TCR and SEER, there was no difference in survival according to sarcoma type (bone vs. STS).

Discussion

We found that AYA sarcoma patients in Texas were more likely to be Hispanic, uninsured, have a late stage diagnosis, and have lower rates of surgery as the first line of treatment compared to those in the SEER program. The 5-year survival in TCR was lower than that of SEER. We observed no significant difference in the risk of mortality between TCR and SEER once receipt of surgery was included in the model, highlighting the contribution of this variable to the differences in mortality. Further, AYA patients in Texas who lived in the U.S. and Mexico border faced a greater risk of mortality than their counterparts. These results will be crucial for future clinical strategies targeted at early detection and effective treatment of sarcomas and may be relevant to AYAs with other types of cancer.

Overall, 5-year survival for AYAs with bone and STS was 68.7% in TCR and 72.2% in SEER, a lower survival than the one observed in a separate study with the SEER data (79% for those 20–29 years old, and 74% for those 30–39 year old).¹⁹ However, these differences may be explained in part due to different patient samples. Unlike Ferrari et al.,¹⁹ we excluded Kaposi sarcoma, included bone sarcomas (peak incidence in the AYA age group) and restricted our analyses to malignant and primary sarcoma cases only.

In our CPH models adjusted for demographics and clinical characteristics, we observed a statistically significant difference in hazard rates between TCR and SEER. However, when surgery was added to this model, the difference in mortality disappeared. This implies that treatment differences between TCR and SEER account for the observed differences in survival.

We observed that patients in TCR were less likely to receive surgery as the first line of treatment than those in SEER irrespective of their cancer stage suggesting that surgery may be an important measure of survival disparity between the two datasets. Early detection and proper cancer treatment in the AYA population may be emphasized as important targets to reduce the survival disparity between TCR and SEER. Together, our analyses suggest that the inferior outcomes in TCR may be accounted for by disease and treatment-related variables as opposed to patient demographics alone.

Patients living in nonmetropolitan counties were more likely to die than their counterparts in both datasets as were patients living in the U.S. and Mexico border in TCR. Disparities in cancer mortality exist between rural and urban areas in the United States.²⁰ Patients living in metropolitan counties have better access to healthcare facilities^{20,21} and AYAs with cancer in these counties may be more likely to be seen in a centralized and/or advanced care setting. Similarly, in Texas, residents in the U.S./Mexico border counties are more likely to be Hispanic, and have lower socioeconomic status (e.g., lower income and lack of insurance) and poorer access to healthcare,²¹ which can contribute to lower AYA sarcoma-related survival.

In SEER, minority patients (Hispanic and non-Hispanic black) faced a higher risk of mortality than non-Hispanic white patients. In a previous study with SEER, adult non-

Hispanic blacks with STS had higher cancer-specific mortality than their white counterparts, and this racial difference was mainly explained by differences in treatment as non-Hispanic blacks were less likely to receive both surgery and radiation.⁵ Due to these results, these minority groups should represent an important target for future surveillance and more emphasis should be placed on improving screening and treatment of sarcomas among these patients.

Our study has a few limitations. We included surgery as a treatment variable, whereas sarcoma treatment is a combination of several treatment modalities (i.e., surgery, radiation, and chemotherapy) that can affect overall survival. However, data on radiation and chemotherapy in the TCR and SEER data are incomplete. Further, nearly 20% of stage information for TCR was missing, which may cause some bias.

The inclusion of insurance status was also limited. We did not include insurance in the regression analysis as this information was available from 2007 to 2012 only, and within this period, 22% of data on insurance was missing in TCR.

Our analysis was not stratified by sarcoma type as there was no difference in survival by the broad sarcoma categories (bone vs. STS). Analysis by more refined diagnosis categories (e.g., osteosarcoma, chondrosarcoma, Ewing tumor, etc.) was not possible due to sample size restrictions.

Our study was based on all-cause mortality, which is a measure easy to understand/apply and may provide a reliable picture of real-world survival, especially for the young adult population that has few competing factors for mortality.²² Youn and colleagues²³ showed that main cause of death among survivors of AYA bone and soft tissue sarcoma was their primary diagnosis (88%), indicating that cause-specific survival may not differ compared to overall survival.²³ We recommend that future studies evaluate cause-specific mortality among AYAs with sarcomas in Texas to provide additional evidence on disparities.

In conclusion, this study demonstrates disparities in AYA sarcoma survival in Texas and SEER. We observed a high proportion of uninsured AYAs and late stage diagnoses in Texas compared to SEER. While we observed 5-year survival differences between TCR and SEER, the difference disappeared in our fully adjusted CPH models after surgery was included in the model. This suggests that surgery may be an important driver of AYA sarcoma mortality differences between TCR and SEER datasets. Further, patients living in the U.S. and Mexico border in Texas were at a significant higher risk for sarcoma mortality. The inclusion of Texas, one of the largest U.S. states, as a comparison to the national cancer registry evidences demographic and clinical disparities is important to understand the cancer care of AYAs with sarcoma.

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