

The association between race/ethnicity, socioeconomic status and stage of diagnosis among
sarcoma patients between 2004-2022 in the United States

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Abstract

The association between race/ethnicity, socioeconomic status and stage of diagnosis among sarcoma patients between 2004-2022 in the United States

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Individuals of racial/ethnic minorities and lower socioeconomic status are vulnerable to advanced stage sarcoma diagnosis which can impact their survival of the disease. However, little work has been done to determine whether the association of these sociodemographic factors and advanced stage sarcoma diagnosis vary by the major sarcoma types of soft tissue and bone as well as age of diagnosis. The 2000-2022 Incidence SEER Research Limited-Field Data was used for this study. The primary exposures were race/ethnicity and county level median household income. The primary outcome was stage of sarcoma diagnosis. Multinomial logistic regression models were used to present odds ratios (OR) with 95% confidence intervals (CI). The ORs were adjusted for age, sex, year, and sarcoma type. Hispanic, NH Black, NH A/PI, and NH AI/AN soft tissue and bone sarcoma patients had 1.12 to 1.33-fold higher risk of advanced stage sarcoma compared with NH White patients. Compared with bone sarcoma patients, soft tissue sarcoma patients with low and middle median household income had 1.06-fold higher odds of advanced stage sarcoma than those in high median household income. There were very few significant associations between race/ethnicity, socioeconomic status, and advanced stage sarcoma diagnosis when stratified by age. These findings emphasize the importance of community resources to improve overall health outcomes such as detection, treatment, and survival.

Introduction

Sarcoma is a rare and aggressive form of cancer making up 1% of all adult cancer diagnoses.¹ Sarcoma can develop and metastasize quickly in the bone or connective tissue such as muscles, fat, nerves, and blood vessels. Sarcoma can lead to worsened physical health outcomes including bone and muscle pain, mobility issues, and lower survival rates when diagnosed at later stages of the disease.² Early-stage sarcoma (i.e., Stage I-III) is defined by smaller tumors that have not spread to distant regions of the body. Advanced stage sarcoma (i.e., Stage IV) is characterized by the presence of distant tumor metastases.³ Sarcoma subtypes are grouped based on the tissue of origin leading to the two major sarcoma subtypes being bone and soft tissue sarcomas.⁴ Among adults, soft tissue sarcomas are more frequent than bone sarcomas, but among children and adolescents bone sarcomas are more common due to their bone growth and development. Symptoms of bone sarcoma include pain and swelling while soft tissue sarcoma more often presents as a painless lump.⁵

Established risk factors for sarcoma include chemical and radiation exposures, lymphedema, and genetic disorders.⁵ However, research has also shown that multiple sociodemographic factors such as race/ethnicity and socioeconomic status impact when a patient is diagnosed with sarcoma.⁶ The populations disproportionately affected by metastasis at diagnosis and increased risk of death are Black, Hispanic, American Indian/Alaska Native patients, patients with low income, and limited access to healthcare.⁷ However, there is little research that has been carried out assessing whether associations between race/ethnicity and socioeconomic status and risk of advanced stage cancer varies by sarcoma type.

The primary aim of this study is to examine whether there are racial/ethnic and socioeconomic disparities in stage at diagnosis among newly diagnosed sarcoma patients and if these disparities vary by sarcoma type. We hypothesize that racial/ethnic and socioeconomic disparities will be more pronounced in Stage IV sarcoma compared with

earlier stages and that the magnitudes of these disparities are more pronounced for soft tissue sarcoma than for bone sarcomas. Soft tissue sarcomas progress more slowly and are detected at more advanced stages compared with bone sarcomas.⁸ **The secondary aim is to assess whether the association between race/ethnicity, socioeconomic status, and sarcoma stage at diagnosis differ by age of diagnosis** with the hypothesis that the associations between race/ethnicity, socioeconomic factors, and sarcoma stage are more pronounced among younger adults diagnosed with sarcoma. Many older adults are insured through Medicare which can provide greater access to healthcare and increase the potential for being diagnosed in a more timely manner compared with younger people. Identifying whether sociodemographic factors impact stage at diagnosis and if they vary based on sarcoma type is important because it will assist public health professionals in determining populations at greatest risk of late-stage disease and suggest future strategies to accurately diagnose individuals at earlier stages therefore improving patient's treatment and overall survival outcomes.

Methods

The SEER program assures data quality through conducting quality assurance during data collection prior to submission and a quality audit plan after data submission. The quality audit plan assesses data elements, verifies that data acquisition and utilization are aligned with the scope of data elements, and identify corrective action plan recommendations if data errors have been identified.⁹

Study Design and Setting

This study used a population-based cohort design based on the 2000-2022 Incidence SEER Research Limited-Field Data file to examine whether the association of race/ethnicity, socioeconomic disparities, and sarcoma stage differ by sarcoma type and age at diagnosis. The SEER program collected existing information obtained from population-based registries on

patient demographics, primary tumor site, tumor morphology, stage at diagnosis, follow up status, and mortality rate in order to track cancer incidence, cancer prevalence, and survival data. SEER covers approximately 45.9% of the United States population.¹⁰ The data collected in this study covered patients in 21 geographic areas across the United States from January 1, 2004, to December 31, 2022. The geographic areas included were Alaska Natives, Atlanta (Metropolitan), California excluding San Francisco/San Jose-Monterey/Los Angeles (SF/SJM/LA), Connecticut, Greater Georgia, Hawaii, Idaho, Illinois, Iowa, Kentucky, Louisiana, Los Angeles, New Jersey, New Mexico, New York, Rural Georgia, San Francisco-Oakland Standard Metropolitan Statistical Area (SMSA), San Jose-Monterey, Seattle (Puget Sound), Texas, and Utah.

Study Subjects

This study focused on all sarcoma patients diagnosed with Stage I, Stage II + III, and Stage IV disease. Patients diagnosed with “In situ” or with unknown stage were excluded. Patients with unknown race/ethnicity, median household income, and age were also excluded. The dataset included patients from 2000-2022, however staging information was only collected among patients diagnosed between 2004-2022 which were the diagnosis years analyzed in this study.

Data Collection

Outcome. The primary outcome of interest was stage at sarcoma diagnosis using the SEER combined summary stage with expanded regional codes (2004+) variable. Sarcoma stages were classified into three categories, “Stage I”, “Stage II/III” and “Stage IV”. Stage II and Stage III were combined because of the low number of Stage III patients.

Exposures. There were two primary exposures of interest in this study. Race/ethnicity was obtained from the race and origin recode variable and classified patients into 5 mutually

exclusive categories: “Non-Hispanic White” (NH White), “Non-Hispanic Black” (NH Black), “Non-Hispanic American Indian/Alaska Native” (NH AI/AN), “Non-Hispanic Asian or Pacific Islander” (NH A/PI), and “Hispanic (All Races)”. The second exposure of interest was county level median household income which was used as a proxy for socioeconomic status (SES). These data were obtained from the county attributes - time dependent median area-level household income inflation adjusted to 2023 year values. This variable was classified into 3 categories of median county household income: <\$54,999, \$55,000 to \$94,999, and \$95,000+. This classification was determined based on the 2022 US Census Bureau income report.¹¹

Covariates. There were four covariates assessed in this study. The main covariate for the primary aim was sarcoma type which was categorized into two groups: bone sarcoma and soft tissue sarcoma. Osteosarcoma, Chondrosarcoma, Bone Sarcoma, Chordoma, Giant Cell Sarcoma, and other bone tumors were classified as bone sarcomas. Soft tissue, Fibromatous Neoplasms, Liposarcoma, Synovial, Leiomyosarcoma, Rhabdomyosarcoma, Gastrointestinal Stromal Tumor Malignant, Epithelioid Sarcoma, Desmoplastic Small Round Cell Tumor, Spindle Cell Sarcoma, and Other Soft Tissue Sarcomas were classified as soft tissue sarcomas. The covariate for the secondary aim was patient age at sarcoma diagnosis. Age was categorized into four groups: <20, 20-49, 50-64, 65+. Sex was categorized as male or female as reported in the SEER dataset. Diagnosis year was categorized into four groups: “2004-2008”, “2009-2013”, “2014-2018”, “2019-2022”.

Analysis

Table 1 includes baseline characteristics of all newly diagnosed sarcoma patients in SEER from 2004-2022 which included age, sex, diagnosis year, and stage. All characteristics were stratified by sarcoma type. Multinomial logistic regression models were used to examine racial/ethnic and socioeconomic disparities among newly diagnosed sarcoma patients and whether these disparities varied by sarcoma type. Three models were stratified by all sarcomas,

soft tissue sarcoma, and bone sarcoma. Multinomial logistic regression models were also used to assess whether the association differed by age group when diagnosed. Four models were stratified by age group. The results were reported using odds ratios (OR) with 95% confidence intervals (CI). The reported ORs were adjusted for age, sex, and year; results focused on all sarcoma types combined were additionally adjusted for sarcoma type. Significance was determined based on $p < 0.05$. The reference groups for the exposures were Non-Hispanic White patients and patients with a median household income of \$95,000+ while patients with Stage I were the reference group for the outcome. RStudio 2026.01.1+403 was used for all statistical analysis.

Results

There were 176,377 sarcoma patients included in this study. The majority of sarcoma patients in this study were Non-Hispanic White patients (61.4%), followed by Hispanic patients (17.4%), Non-Hispanic Black patients (13.6%), Non-Hispanic Asian or Pacific Islander patients (7.1%), Non-Hispanic American Indian/Alaska Native patients (0.5%). Few (7.7%) patients lived in counties with a median household income of <\$54,999 while 65.5% of all sarcoma patients had a median household income of \$55,000 to \$94,999, and 26.8% had a median household income of \$95,000+. Most patients (80.2%) were diagnosed with soft tissue sarcoma and 19.8% were diagnosed with bone sarcoma.

Hispanic patients (OR = 1.29, 95% CI: 1.25-1.33), NH Black patients (OR = 1.33, 95% CI: 1.29-1.38), NH A/PI patients (OR = 1.13, 95% CI: 1.08-1.19), and NH AI/AN patients (OR = 1.27, 95% CI: 1.07-1.50) had increased risks of Stage IV sarcoma compared with non-Hispanic White patients (Table 2). When stratified by sarcoma type, similar associations were observed for both soft tissue sarcomas and bone sarcomas. Low median household income (OR = 1.06, 95% CI: 1.01-1.11) and middle median household income (OR = 1.05, 95% CI: 1.02-1.08) patients had higher odds of stage IV sarcoma compared with patients with a high median

household income. Associations with household income were similar for soft tissue sarcomas, but were not statistically significant for bone sarcomas.

In general, the associations between race and ethnicity and risk of advanced stage sarcoma did not vary appreciably when results were stratified by age at diagnosis (Table 3) though there was some variation in the magnitudes of the association. For example, the highest risk among NH AI/AN patients for stage IV disease were among those <20 (OR = 1.83, 95% CI: 1.14-2.95) and the highest risk among NH Black patients for stage IV disease was among those 50-64 years of age (OR = 1.40, 95% CI: 1.32-1.49). With respect to county-level median household income, the only age group in which those living in the lowest median household income counties had an elevated risk of stage IV cancer were those 50-64 years of age and no other age groups showed statistically significant associations.

Discussion

Hispanic patients, NH Black patients, NH A/PI patients, and NH AI/AN patients as well as patients living in low and middle median county-level household income regions all demonstrated greater odds of being diagnosed with advanced stage sarcoma compared with NH White patients and patients living in the highest median county-level household income regions, respectively. The findings from this study are consistent with prior studies that have observed that race/ethnicity and socioeconomic status are associated with risk of advanced stage diagnosis across multiple cancers including sarcoma.^{12,13} Specifically, prior studies have shown that Hispanic sarcoma patients had a 1.2 to 1.3-fold,^{6,7} NH Black patients had a 1.1 to 5.0-fold,^{6,7}, and NH A/PI patients had a 1.2-fold⁷ higher risks of presenting with metastases at diagnosis compared with non-Hispanic White patients. Prior studies have not assessed NH AI/AN patients as a separate category.⁶ With respect to SES, previous studies have assessed the association between insurance status and late-stage sarcoma diagnosis. They found that patients with Medicaid had a 1.4 to 2.1-fold higher risk of presenting with metastases at

diagnosis compared with patients with other insurance types.^{6,14} Patients without insurance had 0.9 to 2.4-fold different risk compared to patients with private insurance^{6,14}. Two prior studies examined small-area SES which assessed multiple SES factors (i.e., median household income, median house value, median rent) within small geographic areas. One of these studies reported no association between small-area SES and advanced stage sarcoma diagnosis⁶ and the other study reported that higher small-area SES was associated with lower odds of advanced stage sarcoma at diagnosis.¹⁵ Race/ethnicity and SES are likely associated with advanced stage diagnosis due to multiple factors including systemic issues, access to healthcare and insurance status.^{6,16} Both racial/ethnic minority patients and those from a lower SES may have more limited access to specialized care which can contribute to late-stage detection and delayed diagnosis.⁷ These patients are also more likely to experience greater distrust and dismissal in the healthcare system which discourages patients from seeking care and can lead to worsening health outcomes due to delayed care and treatment.¹⁶ Additionally, patients with no insurance or public insurance are often less able to access timely medical care and specialized treatment as quickly as patients with private insurance due to the financial cost. This can result in patients postponing care until symptoms become more severe.¹⁶

When focusing only on soft tissue sarcomas we observed more pronounced disparities among racial/ethnic minority patients and patients living in regions with low or middle county-level median household incomes. A prior study that evaluated racial/ethnic disparities in stage at diagnosis among soft tissue sarcoma patients found that Hispanic, NH Black, NH A/PI & NH AI/AN patients had 1.31 to 1.59-fold greater odds of advanced stage soft tissue sarcoma diagnosis.⁶ Another study that examined NH Black patients compared to NH White patients reported that NH Black patients were more likely to be diagnosed with advanced stage soft tissue sarcoma (HR=5.47).¹⁷ These studies are consistent with our results as we observed elevated risks of Stage IV soft tissue sarcoma across all racial/ethnic minority groups. With

respect to SES, one study found that soft tissue sarcoma patients with Medicaid and uninsured patients were more likely to be diagnosed at later stages compared with privately insured patients⁶, which is consistent with our findings related to median county-level household income.

Two previous studies assessed racial and ethnic disparities related to the diagnosis of Stage IV bone sarcoma. One study which focused on Hispanic patients observed that they had a 1.3-fold elevated risk of advanced stage bone sarcoma,¹⁴ while the other did not observe any disparities across Hispanic, NH Black, and NH A/PI patients ($p = 0.536$).¹⁸ The inconsistencies between these findings and our observation that Hispanic, NH Black, and NH A/PI patients all had greater odds of advanced stage bone sarcoma diagnosis may be attributable to a our study's larger sample size for our study and greater statistical power. Related to SES, one prior study observed that patients with Medicaid or no insurance had higher risks of Stage IV bone sarcoma,¹⁴ but in our study, we did not observe any associations between median county-level household income levels and risk of stage IV bone sarcomas. The inconsistencies among these studies may be attributable to our study only having data on county-level median household income which can introduce exposure misclassification as those values may not represent each patient's individual-level SES.

There have been very few studies that examined whether the association between race/ethnicity, socioeconomic factors, and stage of diagnosis vary by age. One study observed that pediatric and older NH Black patients were more likely to present with advanced stage sarcoma.¹⁸ Another study found that Hispanic and NH Black pediatric patients had increased risk of metastatic disease.¹⁹ We found that Hispanic, NH Black, and NH A/PI, NH AI/AN patients had increased odds of advanced stage sarcoma diagnosis across age groups, when compared with non-Hispanic White patients. Related to SES and stage at diagnosis, a previous study reported that advanced stage sarcoma diagnosis was not associated with SES across all age groups.¹⁵ Although multiple studies have found elevated odds of advanced stage diagnosis

among patients 65+ compared to younger adults,^{6,18} prior studies have not evaluated the joint interactions of race/ethnicity, socioeconomic status, and age at diagnosis in relation to risk of advanced stage sarcoma. The results from our study showed the association did not differ greatly when stratified by age. Reasons for no appreciable differences may be due to many factors such as healthcare cost, access to care, and quality of care similarly impacting patients of different racial and ethnic groups across all ages.

Strengths and Limitations

It is important to recognize the limitations of this study. Related to SES, we only had access to a county-level measure of socioeconomic status which is subject to misclassification of individual level SES. In contrast, we had individual level data on race/ethnicity, stage at diagnosis, sarcoma type, and age at diagnosis. In terms of the generalizability of our findings, while the SEER and general US populations have similar distributions of age, race/ethnicity, and proportion of individuals below the poverty level, the SEER population includes a higher proportion of foreign-born individuals and individuals who live in urban areas.²⁰ The primary strength of this study is its comparatively large sample size which increased the precision of our risk estimates and enabled us to assess differences by race and ethnicity and median county-level household income.

Implications

This study identified sociodemographic disparities associated with stage of diagnosis which highlights the need for resources directed toward underserved communities, such as providing health insurance and improving access to health care, that could potentially mitigate these disparities. Future research is also needed to better understand how individual level measures of socioeconomic status contribute to disparities in sarcoma diagnosis and outcomes.

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Table 1: Characteristics among newly diagnosis sarcoma patients in the United States from 2004-2022 (n = 176,377)

	All Sarcomas (n=176377)	Soft Tissue Sarcoma (n=141411)	Bone Sarcoma (n=34966)
Age			
<20	14500 (8%)	7854 (6%)	6646 (19%)
20-49	43241 (25%)	34003 (24%)	9238 (26%)
50-64	49392 (28%)	41734 (30%)	7658 (22%)
65+	69244 (39%)	57820 (40%)	11424 (33%)
Sex			
Male	90311 (51%)	70420 (49%)	19891 (57%)
Female	86066 (49%)	70991 (51%)	15075 (43%)
Diagnosis Year			
2004-2008	37806 (21%)	30774 (22%)	7032 (20%)
2009-2013	43565 (25%)	35108 (25%)	8457 (24%)
2014-2018	49036 (28%)	38876 (27%)	10160 (29%)
2019-2022	45970 (26%)	36653 (26%)	9317 (27%)
Stage			
Stage I	106483 (60%)	88319 (62%)	18164 (52%)
Stage II /III	35031 (20%)	25035 (18%)	9996 (29%)
Stage IV	34863 (20%)	28057 (20%)	6806 (19%)

Table 2: Odds ratios and confidence intervals assessing associations between race/ethnicity, socioeconomic status, and stage at diagnosis for soft tissue sarcomas and bone sarcomas

Exposure	All Sarcomas									
	Stage I		Stage II/III				Stage IV			
	n	%	n	%	OR*	95%CI	n	%	OR*	95%CI
Race and Ethnicity										
Non-Hispanic White	66,686	62%	21,809	20%	1.00	ref	19,777	18%	1.00	ref
Hispanic (all races)	17,552	57%	6,377	21%	1.12	1.08, 1.15 [†]	6,817	22%	1.29	1.25, 1.33 [†]
Non-Hispanic Black	14,187	59%	4,197	18%	0.97	0.93, 1.01	5,602	23%	1.33	1.29, 1.38 [†]
Non-Hispanic Asian or Pacific Islander	7,558	60%	2,485	20%	1.07	1.02, 1.13 [†]	2,478	20%	1.13	1.08, 1.19 [†]
Non-Hispanic American Indian/Alaska Native	500	59%	163	19%	1.01	0.84, 1.21	189	22%	1.27	1.07, 1.50 [†]
Median County Level Household Income										
\$95,000+	29,186	62%	9,173	19%	1.00	ref	8,954	19%	1.00	ref
\$55,000-\$94,999	69,198	60%	23,235	20%	1.04	1.01, 1.07 [†]	23,105	20%	1.05	1.02, 1.08 [†]
<\$54,999	8,099	60%	2,623	19%	1.01	0.96, 1.06	2,804	21%	1.06	1.01, 1.11 [†]
Exposure	Soft Tissue Sarcomas									
	Stage I		Stage II/III				Stage IV			
	n	%	n	%	OR*	95%CI	n	%	OR*	95%CI
Race and Ethnicity										
Non-Hispanic White	54,522	64%	15,463	18%	1.00	ref	15,690	18%	1.00	ref
Hispanic (all races)	14,311	60%	4,399	18%	1.12	1.08, 1.17 [†]	5,315	22%	1.29	1.24, 1.33 [†]
Non-Hispanic Black	12,576	61%	3,225	15%	0.94	0.90, 0.98 [†]	4,855	24%	1.32	1.28, 1.38 [†]
Non-Hispanic Asian or Pacific Islander	6,487	62%	1,837	18%	1.05	0.99, 1.11	2,046	20%	1.12	1.06, 1.18 [†]

Non-Hispanic American Indian/Alaska Native	423	62%	111	16%	0.95	0.77, 1.17	151	22%	1.24	1.03, 1.49 [†]
Median County Level Household Income										
\$95,000+	24,154	64%	6,617	17%	1.00	ref	7,183	19%	1.00	ref
\$55,000-\$94,999	57,401	62%	16,532	18%	1.03	1.00, 1.07	18,605	20%	1.06	1.03, 1.09 [†]
<\$54,999	6,764	62%	1,886	17%	1.00	0.94, 1.06	2,269	21%	1.06	1.01, 1.12 [†]

Exposure	Bone Sarcomas									
	Stage I		Stage II/III				Stage IV			
	n	%	n	%	OR*	95%CI	n	%	OR*	95%CI
Race and Ethnicity										
Non-Hispanic White	12,164	54%	6,346	28%	1.00	ref	4,087	18%	1.00	ref
Hispanic (all races)	3,241	48%	1,978	30%	1.09	1.02, 1.17 [†]	1,502	22%	1.28	1.19, 1.38 [†]
Non-Hispanic Black	1,611	49%	972	29%	1.10	1.01, 1.20 [†]	747	22%	1.33	1.21, 1.47 [†]
Non-Hispanic Asian or Pacific Islander	1,071	50%	648	30%	1.16	1.05, 1.29 [†]	432	20%	1.20	1.06, 1.35 [†]
Non-Hispanic American Indian/Alaska Native	77	46%	52	31%	1.23	0.86, 1.75	38	23%	1.41	0.95, 2.09
Median County Level Household Income										
\$95,000+	5,032	54%	2,556	27%	1.00	ref	1,771	19%	1.00	ref
\$55,000-\$94,999	11,797	51%	6,703	29%	1.07	1.01, 1.13 [†]	4,500	20%	1.03	0.96, 1.09
<\$54,999	1,335	51%	737	28%	1.03	0.93, 1.15	535	21%	1.04	0.93, 1.17

* All odds ratios (OR) are adjusted for age, sex, and year. Additionally, ORs for all sarcomas are also adjusted for sarcoma type.

[†] p<0.05

Table 3: Odds ratios and confidence intervals assessing associations between race/ethnicity, socioeconomic status, and stage at diagnosis by age at sarcoma diagnosis

Exposure	<20									
	Stage I		Stage II/III				Stage IV			
	n	%	n	%	OR*	95%CI	n	%	OR*	95%CI
Race and Ethnicity										
Non-Hispanic White	3,335	48%	1,899	27%	1	ref	1,765	25%	1	ref
Hispanic (all races)	2,065	46%	1,146	25%	0.98	0.90, 1.08	1,308	29%	1.19	1.09, 1.30 [†]
Non-Hispanic Black	925	48%	516	27%	1.01	0.89, 1.14	488	25%	1.00	0.88, 1.13
Non-Hispanic Asian or Pacific Islander	410	43%	278	29%	1.24	1.05, 1.46 [†]	272	28%	1.27	1.08, 1.50 [†]
Non-Hispanic American Indian/Alaska Native	35	38%	24	26%	1.23	0.73, 2.09	34	36%	1.83	1.14, 2.95 [†]
Median County Level Household Income										
\$95,000+	1,758	49%	895	25%	1	ref	945	26%	1	ref
\$55,000-\$94,999	4,461	46%	2,652	27%	1.17	1.06, 1.28 [†]	2,594	27%	1.09	0.99, 1.19
<\$54,999	551	46%	316	26%	1.14	0.97, 1.34	328	28%	1.12	0.95, 1.31

Exposure	20-49									
	Stage I		Stage II/III				Stage IV			
	n	%	n	%	OR*	95%CI	n	%	OR*	95%CI
Race and Ethnicity										
Non-Hispanic White	13,889	64%	4,271	20%	1	ref	3,441	16%	1	ref
Hispanic (all races)	6,581	61%	2,118	19%	1.09	1.02, 1.16 [†]	2,161	20%	1.34	1.26, 1.43 [†]
Non-Hispanic Black	4,395	63%	1,153	17%	0.93	0.86, 1.00	1,429	20%	1.34	1.25, 1.44 [†]
Non-Hispanic Asian or Pacific Islander	2,197	62%	707	20%	1.12	1.02, 1.23 [†]	613	18%	1.15	1.04, 1.27 [†]
Non-Hispanic American Indian/Alaska Native	191	67%	51	18%	0.89	0.65, 1.22	44	15%	0.92	0.67, 1.29
Median County Level Household Income										
\$95,000+	7,166	64%	2,113	19%	1	ref	1,930	17%	1	ref

\$55,000-\$94,999	18,045	63%	5,602	19%	1.06	1.00, 1.12	5,185	18%	1.04	0.98, 1.11
<\$54,999	2,042	64%	585	18%	1.00	0.90, 1.11	573	18%	1.00	0.90, 1.12

Exposure	50-64									
	Stage I		Stage II/III				Stage IV			
	n	%	n	%	OR*	95%CI	n	%	OR*	95%CI
Race and Ethnicity										
Non-Hispanic White	18,317	61%	5,954	20%	1	ref	5,568	19%	1	ref
Hispanic (all races)	4,561	58%	1,588	20%	1.14	1.07, 1.22 [†]	1,770	22%	1.26	1.19, 1.35 [†]
Non-Hispanic Black	4,471	58%	1,281	17%	0.97	0.90, 1.04	1,965	25%	1.40	1.32, 1.49 [†]
Non-Hispanic Asian or Pacific Islander	2,229	60%	678	18%	1.01	0.92, 1.10	757	21%	1.13	1.03, 1.23 [†]
Non-Hispanic American Indian/Alaska Native	146	58%	48	19%	1.09	0.78, 1.51	59	23%	1.31	0.97, 1.78
Median County Level Household Income										
\$95,000+	8,154	61%	2,591	20%	1	ref	2,562	19%	1	ref
\$55,000-\$94,999	19,367	60%	6,281	19%	1.00	0.95, 1.05	6,686	21%	1.06	1.00, 1.11
<\$54,999	2,203	59%	677	18%	0.94	0.85, 1.04	871	23%	1.17	1.07, 1.28 [†]

Exposure	65+									
	Stage I		Stage II/III				Stage IV			
	n	%	n	%	OR*	95%CI	n	%	OR*	95%CI
Race and Ethnicity										
Non-Hispanic White	31,145	62%	9,685	20%	1	ref	9,003	18%	1	ref
Hispanic (all races)	4,345	58%	1,525	21%	1.18	1.11, 1.26 [†]	1,578	21%	1.26	1.19, 1.35 [†]
Non-Hispanic Black	4,396	60%	1,247	17%	0.97	0.91, 1.04	1,720	23%	1.34	1.26, 1.42 [†]
Non-Hispanic Asian or Pacific Islander	2,722	62%	822	19%	1.04	0.96, 1.13	836	19%	1.08	1.00, 1.17
Non-Hispanic American Indian/Alaska Native	128	58%	40	18%	1.00	0.70, 1.43	52	24%	1.40	1.01, 1.93 [†]
Median County Level Household Income										
\$95,000+	12,108	63%	3,574	19%	1	ref	3,517	18%	1	ref
\$55,000-\$94,999	27,325	61%	8,700	20%	1.04	1.00, 1.09	8,640	19%	1.05	1.00, 1.10

<\$54,999	3,303	62%	1,045	19%	1.03	0.95, 1.11	1,032	19%	1.00	0.93, 1.09
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* All odds ratios (OR) are adjusted for sex, year and sarcoma type.

† p<0.05