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# Racial and ethnic disparities in treatment and survival of pediatric sarcoma

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ABSTRACT

*Background:* Childhood sarcomas are rare and require complex interdisciplinary care including surgery, chemotherapy, and radiation. The goal of this study was to determine if racial or ethnic disparities exist for pediatric sarcoma patients in the United States.

*Methods:* The United States' National Cancer Institute's Surveillance, Epidemiology, and End Results database was used to identify patients aged 0-21 diagnosed with primary sarcomas from 1973 to 2012. Patients were considered by race and ethnicity. Survival curves were computed using the Kaplan-Meier method and the log-rank test.

*Results:* A total of 11,502 patients were included in this study. When stratified by race, non-Hispanic black and Hispanic patients were significantly more likely to present with advanced stage disease than white patients. White patients were more likely to receive radiation therapy than black and Hispanic patients ($P = 0.01$). There was no significant difference between patients who underwent surgery ($P = 0.21$). Overall survival was better for white patients than black or Hispanic ones. Despite the overall 5-year survival improvement during the study period (56.2%-70.3%), survival disparities between race and ethnicity have grown.

*Conclusions:* Racial and ethnic disparities do exist with respect to stage, treatment, and survival of these rare tumors. Black and Hispanic patients are presenting at more advanced stage and have overall worse survival. This survival disparity has widened over the past 4 decades.



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## Introduction

Pediatric sarcomas comprise a rare group of heterogeneous tumors that affect a small subset of the population. There are approximately 1700 children diagnosed with sarcomas every year, representing approximately 15% of all pediatric tumors.[1] About one-third of patients will succumb to their disease. In general, treatment involves chemotherapy, surgery, and radiation, or a combination thereof.

Sarcomas are categorized according to their tissue origin, either soft-tissue sarcoma (STS) or bony sarcoma (BS). The STS group is further divided into rhabdomyosarcoma (RMS) and nonrhabdomyosarcoma (NR-STS). RMS represents approximately 40% of STS. Patients with RMS are more likely to undergo radiation and less likely to have surgical intervention.[2] BSs are divided into osteosarcoma (OS), Ewing sarcoma (ES), chondrosarcoma (CS), and not otherwise specified (NOS). OS (56%) and ES (34%) make up the great majority of these cases. ES is the only type that is considered particularly radiosensitive.[3,4]

Racial and ethnic disparities in sarcoma care among adult patients have been well documented.[5,6] Evolving literature has documented socioeconomic disparities in childhood cancers as well, although the impact of race and ethnicity is less clear.[7] A SEER analysis of ES found significant disparities in characteristics and outcomes for patients of different ethnicities.[5]

Efforts to identify the causative factors responsible for these disparities have most often suggested that there are likely multiple factors at play.[5] Tumor biology has been found to differ between races, which may explain differences in therapy response.[8] Nonbiological factors, however, have been a subject of much study and are thought to likely influence outcome as well.

Established in 1973, the National Cancer Institute's Surveillance, Epidemiology, and End Results database (SEER) has continuously collected data on cancers diagnosed in the United States to provide the medical and research community the ability to study cancers at a population level. Despite its known limitations, SEER provides validated survival data for patients through a cross section of the United States' diverse population.[9,10]

The purpose of this study was to determine if racial and ethnic disparities exist in the treatment and outcomes of pediatric sarcoma patients in the United States through an analysis of the SEER database. In addition, we sought to identify overall 5-year survival trends throughout the decades for these children.

**Table 1 – Demographics and clinical characteristics of the study population.**

| Characteristics | *n* | % |
|---|---|---|
| Overall | 11,502 | |
| Age | | |
| 0-5 | 2229 | 19.4 |
| 6-10 | 1899 | 16.5 |
| 11-17 | 4875 | 42.4 |
| 18-21 | 2499 | 21.7 |
| Sex | | |
| Male | 6517 | 56.7 |
| Female | 4985 | 43.3 |
| Ethnicity-race | | |
| NH-white | 6682 | 58.1 |
| Hispanic | 2462 | 21.4 |
| NH-black | 1490 | 13.0 |
| NH-Other | 868 | 7.5 |
| Decade | | |
| 1973-1979 | 852 | 7.4 |
| 1980-1989 | 1363 | 11.9 |
| 1990-1999 | 2275 | 19.8 |
| 2000-2012 | 7012 | 61.0 |
| Tumor | | |
| Bone | 4625 | 40.2 |
| Soft tissue | 6877 | 59.8 |
| Stage | | |
| Localized | 4245 | 36.9 |
| Regional | 3538 | 30.8 |
| Distant | 2176 | 18.9 |
| Unknown | 1543 | 13.4 |
| Tumor size | | |
| <5 cm | 2419 | 21.0 |
| ≥5 cm | 4559 | 39.6 |
| Unknown | 4524 | 39.3 |
| Surgery | | |
| Yes | 8830 | 76.8 |
| No | 2486 | 21.6 |
| Unknown | 186 | 1.6 |
| Radiation therapy | | |
| Yes | 4129 | 35.9 |
| No | 7178 | 62.4 |
| Unknown | 195 | 1.7 |

## Materials and methods

The publically available SEER database was queried to identify patients aged 0-21, diagnosed with primary sarcomas from 1973-2012. STSs were grouped into RMS and NR-STS. Bony tumors were grouped into OS, CS, ES, and NOS.

By convention, race and ethnicity are distinct variables in SEER. Although this is accurate from an anthropological standpoint, as race describes one's skin color and ethnicity describes one's heritage, it can be misleading when applied to a discussion of health care disparities in the United States. Certain regional databases, such as the Texas Children's Cancer Registry consider race and ethnicity as a single variable.[11,12] Race and ethnicity are considered as a compound variable in this analysis with the following distinctions: non-Hispanic white (white), non-Hispanic black (black), or Hispanic.

Statistics for this retrospective analysis were performed utilizing R (*R Foundation for Statistical Computing, Vienna,*