The Incidence, Mortality, and Survival of Malignant Chondrosarcoma in the United States: A Surveillance, Epidemiology, and End Results (SEER) 2000-2022 Database Analysis

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INTRODUCTION

- Chondrosarcomas are a rare heterogeneous group of malignant bone neoplasms that produce cartilaginous matrix [1]
- It is the second most common primary malignancy of bone after osteosarcoma, accounting for over 20% of primary bone neoplasms [1]
- Majority of chondrosarcomas have a good overall survival after local treatment, but in unresectable or metastatic disease, the outcome is poor, and treatment options are limited [2]

OBJECTIVES

- Exploring the disease burden and patient profiling of malignant chondrosarcoma in the US using the updated Surveillance, Epidemiology, and End Results (SEER) database released in April 2025

METHODS

- Data from 17 US cancer registries (SEER Research Database, 2000-2022) were retrieved and analyzed using SEER*Stat software
- The target population included malignant chondrosarcoma patients identified with the International Classification of Diseases for Oncology, 3rd edition (ICD-O-3) codes [3] (Table 1)

Table 1. ICD-O-3 codes used in the patient selection process

ICD-O-3 code	Description
9220/3	Chondrosarcoma, not otherwise specified
9221/3	Juxtacortical chondrosarcoma
9222/3	Chondrosarcoma, grade 1
9231/3	Myxoid chondrosarcoma
9240/3	Mesenchymal chondrosarcoma
9242/3	Clear cell chondrosarcoma
9243/3	Dedifferentiated chondrosarcoma

- The main study outcomes were crude incidence and mortality rates (per 100,000 population) and survival rates (at 1-year to 5-year endpoints)
- Trends analysis reported changes in incidence and mortality rates over the years as annual percent change (APC)
- All available variables describing demographics of the final sample were reported, including age, sex at birth, race/ethnicity, rural status of area of residence, marital status, and annual household income (AHI)
- The results were also explored among demographic subgroups to reflect the impact of patient characteristics on disease burden and prognosis

REFERENCES

1. *Gazendam et al. (2023). DOI: 10.3390/jcm12072506*
2. *van Maldegem et al. (2014). DOI: 10.1186/2045-3329-4-11*
3. *WHO. Available at: www.iris.who.int/bitstream/handle/10665/96612/9789241548496_eng.pdf*

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KEY FINDINGS

- Most patients had unspecified chondrosarcoma subtype (73.5%), while the myxoid chondrosarcoma was the most common specified subtype (13.4%) (Figure 1)
- The incidence of malignant chondrosarcoma was 0.322, with the highest rate observed among patients with the unspecified chondrosarcoma subtype (Figure 2)
- Incidence trends showed a significantly increasing rate of dedifferentiated subtype (2.5 APC, p<0.05) and a decreasing rate of mesenchymal subtype (-1.6 APC, p<0.05)
- Per demographic subgroups, the highest incidence was reported for elderly (0.790), males (0.364), non-Hispanic Whites (0.417), and those with <$40,000 AHI (0.402)

Figure 1. Chondrosarcoma subtypes distribution

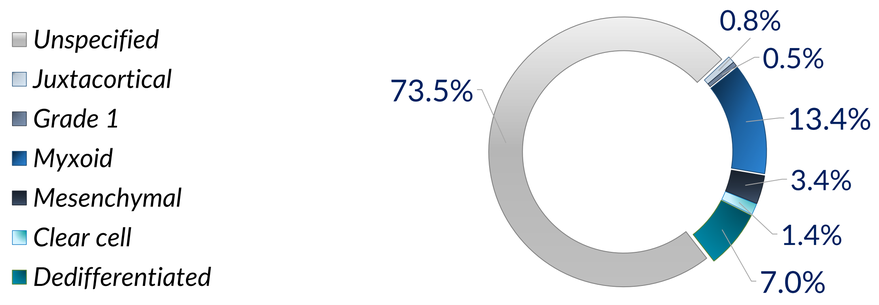
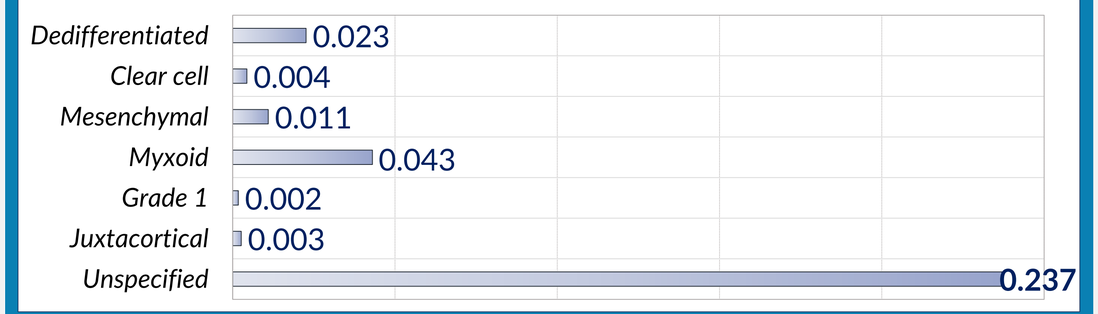


Figure 2. Incidence (per 100,000 population) by chondrosarcoma subtype



- The mortality of malignant chondrosarcoma was 0.119, with the highest rate among patients with unspecified chondrosarcoma subtype (Figure 3)
- A significant change in mortality over the years was shown only for the unspecified chondrosarcoma subgroup with an increasing trend (5.2 APC, p<0.05)
- Per demographics, the highest mortality was reported for the elderly (0.562), males (0.149), non-Hispanic Whites (0.164), and patients with <$40,000 AHI (0.165)
- The worst prognosis was observed for dedifferentiated chondrosarcoma, with the lowest survival rates at all study endpoints (Figure 4)

Figure 3. Mortality (per 100,000 population) by chondrosarcoma subtype

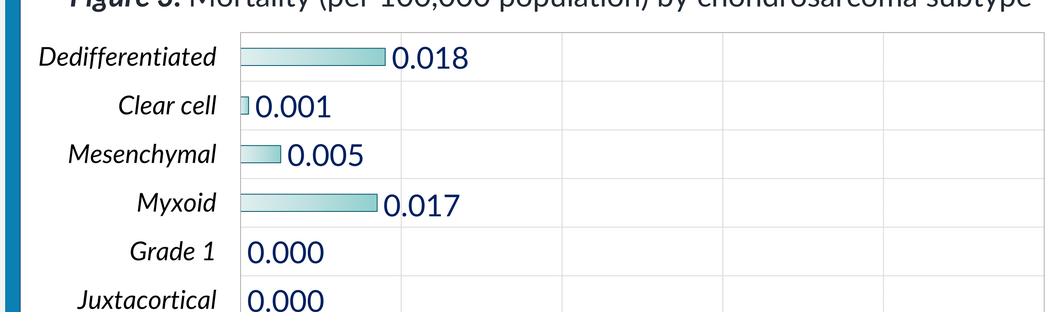
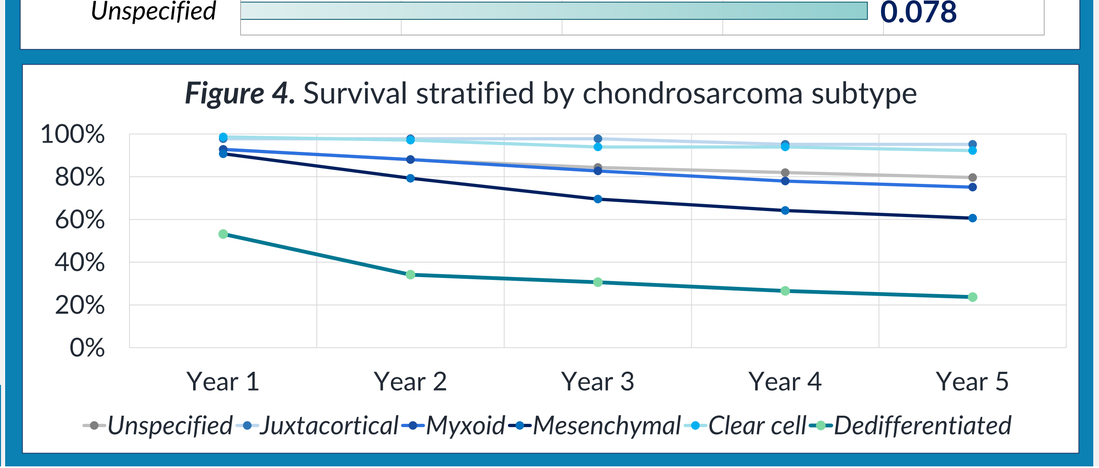


Figure 4. Survival stratified by chondrosarcoma subtype



RESULTS

- According to the updated SEER data, there were 6,117 unique patients diagnosed with a malignant chondrosarcoma in the US (2000-2022)
- A slightly higher proportion of patients in the final study population were males (55.9% vs. 44.1% of females)
- Most patients were 20-64 years old (64.9%), while 31.6% were elderly (older than 65 years), and 3.5% were less than 20 years of age
- Regarding race/ethnicity groups, the most frequent were non-Hispanic White patients (70.3%), followed by 15.8% of Hispanics (any race), non-Hispanic Blacks (7.1%), and non-Hispanic Asian/Pacific Islanders (5.3%)
- 0.9% of patients had unknown race/ethnicity, while the least common were non-Hispanic American Indians/Alaska Natives (0.6%)
- The majority of patients resided in the metropolitan counties (89.1%), with only 10.7% of patients from the non-metropolitan areas and 0.2% of patients with unknown rural status of residence
- More than half of patients were married (56.8%), while 23.6% were single, 6.7% were divorced, 6.6% were widowed, 5.3% had unknown marital status, 0.8% were separated, and 0.3% were unmarried or had a domestic partner
- The distribution of patients across AHI categories:
  - Less than $40,000 represented 1.0%
  - $40,000 to $65,000 represented 15.9%
  - $65,000 - $90,000 represented 47.8%
  - $90,000 - $120,000 represented 27.8%
  - More than $120,000 represented 7.5%

CONCLUSION

- The findings of this study may indicate an alarming malignant chondrosarcoma burden in the US
- Although most patients had an undetermined chondrosarcoma subtype, dedifferentiated chondrosarcoma was the second most common specified subtype with a high incidence rate, increasing incidence trend over the years, and the lowest survival rates at all study endpoints
- These results point out an urgent need for equal healthcare access and novel effective treatments in malignant chondrosarcoma management

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DISCLOSURES

- FS, DG, and VZ are employees of ZRx Outcomes Research Inc.