

The Natural History of Benign Bone Tumors of the Extremities in a Longitudinal Radiographic Study of Asymptomatic Children



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Background

Benign bone tumors are common incidental findings in the pediatric population during radiographic evaluation. Counselling these patients requires reassurance and raises questions about the natural history of these tumors over time.

Questions and purposes

This study therefore asked:

- What is the prevalence of benign childhood bone tumors of the extremities in an asymptomatic population?
- What is the natural history of these tumors over time?

Methods

A historical, longitudinal radiographic collection of healthy children was reviewed, which included comprehensive left-sided radiographs of the extremities at yearly intervals. 262 subjects with 25555 radiographs were screened for benign bone tumors at a median age of 8 years (range, 0 to 18). All potential tumors were reviewed by a multidisciplinary panel, which confirmed the radiographic diagnosis of each lesion, the age it first appeared, and the age it was last seen. Prevalence rates were calculated based on the number of distinct subjects available for each location and age.

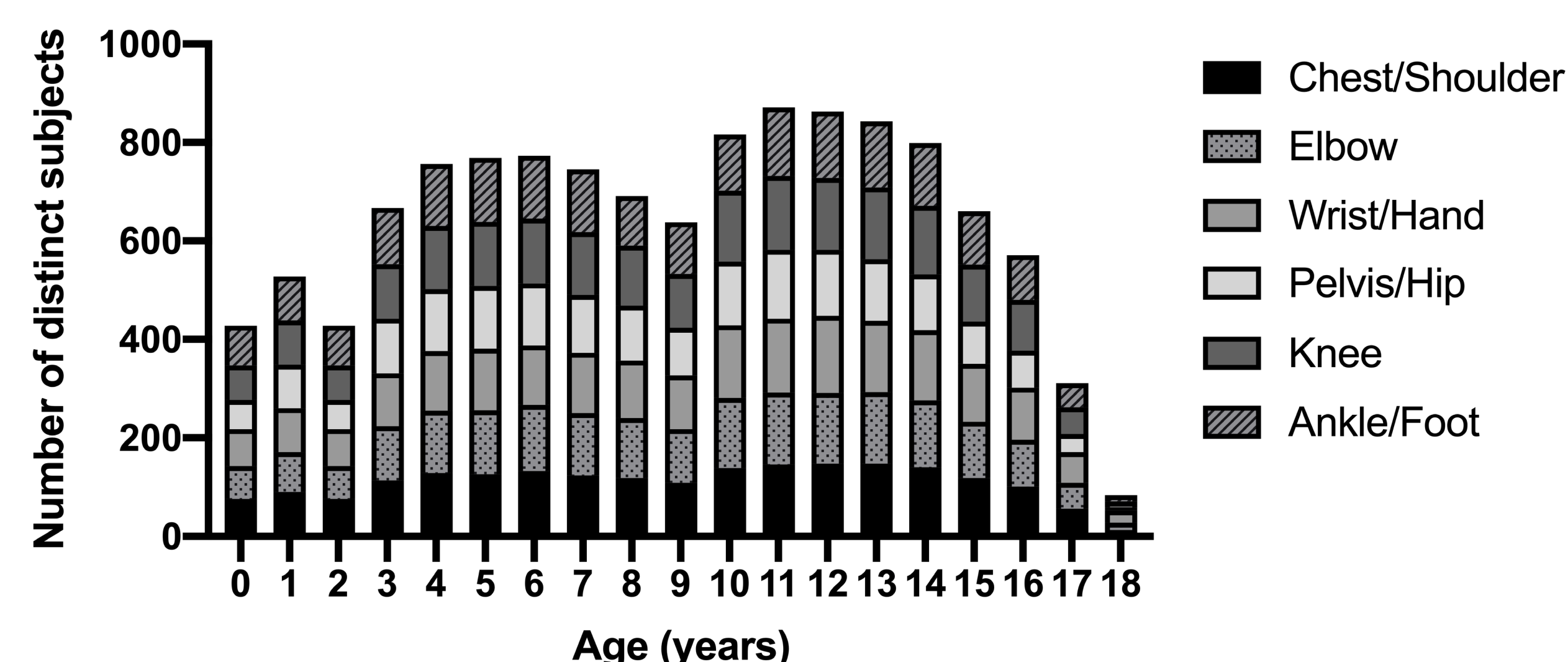


Figure 1. Number of distinct subjects screened at each age by location.

Results

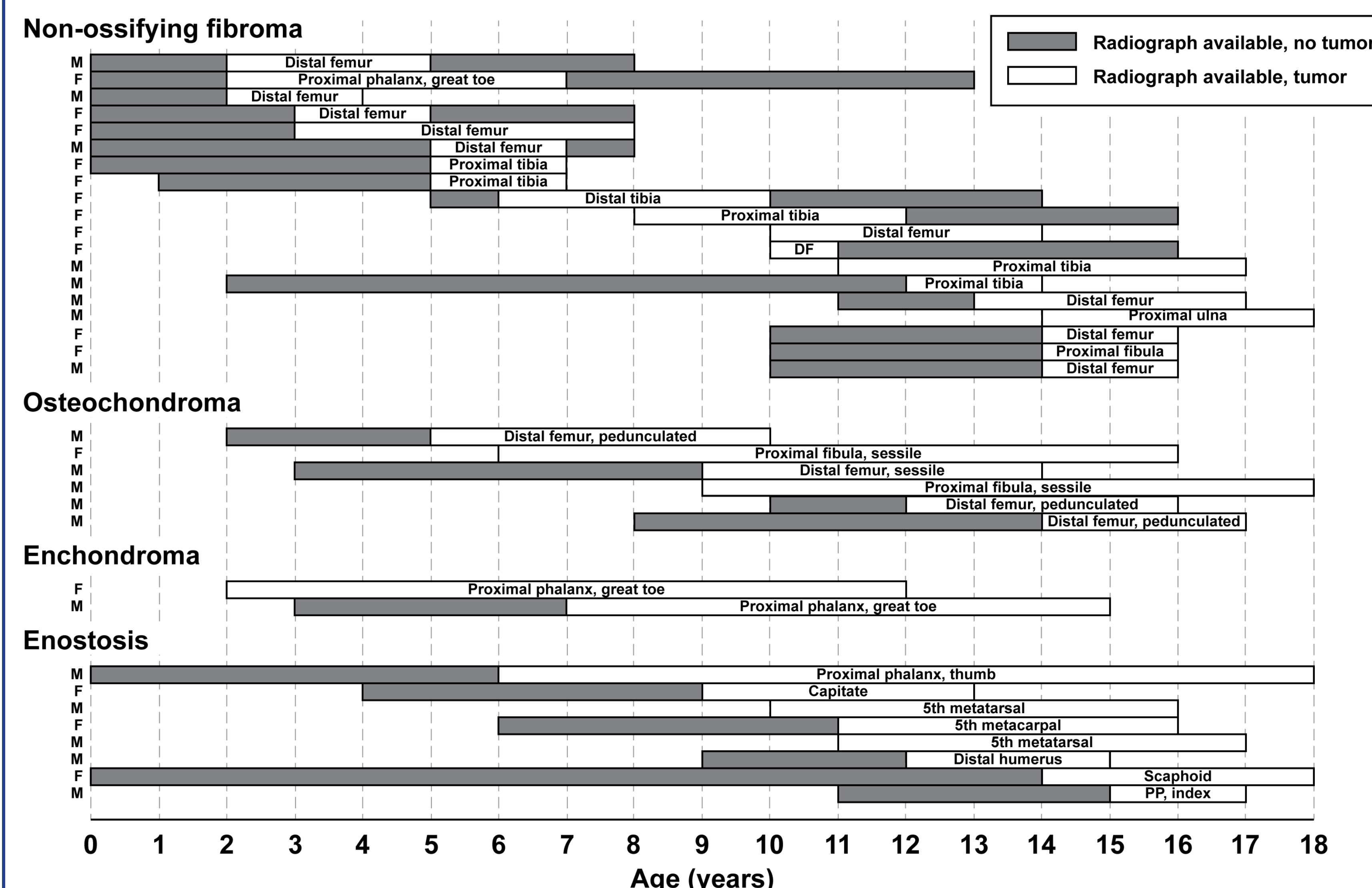


Figure 2. Natural history of the benign childhood tumors identified in this study over time. Bars represent individual subjects. The position and length of each bar along the x-axis describes the availability of radiographs at each age. The shading of each bar describes the presence or absence of tumor. Sex is indicated on the left side for males (M) and females (F). DF indicates distal femur; PP, proximal phalanx.

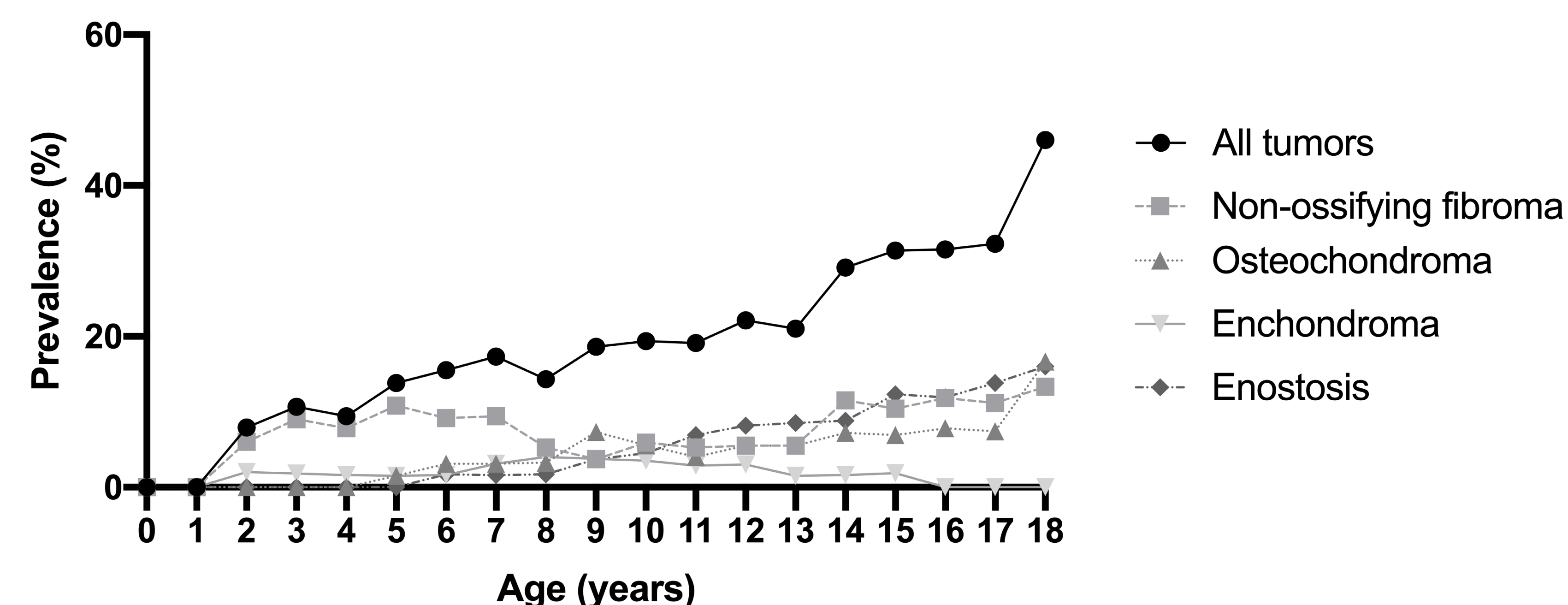


Figure 3. Prevalence of benign childhood tumors by age and tumor type. Rates were doubled to account for the contralateral extremities since only left-sided radiographs were reviewed.

Results

- The overall prevalence of benign childhood bone tumors of the extremities was **18.9%** in a historical asymptomatic population:
 - ◇ Non-ossifying fibromas - 7.5%
 - ◇ Enostoses - 5.2%
 - ◇ Osteochondromas - 4.5%
 - ◇ Enchondromas - 1.8%
- The prevalence of tumors and the most common tumor type was location-specific, and the overall prevalence increased with age.
- Median age of first appearance for subjects with previously negative radiographs was **9 years** (range, 2 to 15 years) for all tumors combined:
 - ◇ Non-ossifying fibromas - 5 years (2 to 14)
 - ◇ Enostoses - 10.5 years (6 to 15)
 - ◇ Osteochondromas - 10.5 years (5 to 14)
 - ◇ Enchondromas - 7 years (no range)
- NOFs were the only tumor type that resolved in this population with available radiographs.

Conclusions

- Study is limited by use of a historical collection, missing or poor quality radiographs, limited view of the diaphysis, and possibility of missed events.
- Despite these limitations, this study is strengthened by using a large, longitudinal, and truly observational cohort of subjects that could not be repeated in modern times due to the now recognized risks of radiation exposure in children.

In summary, this study describes the natural history of benign childhood bone tumors of the extremities, in a historical asymptomatic population. **These findings provide useful evidence to answer many commonly encountered questions when counselling patients and their family members on benign bone tumors.**