

Reference curves for Bone Health Index in twelve populations, representing five ethnicities across four continents

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BoneXpert



The BoneXpert method for automated bone age assessment also performs digital radiogrammetry of the cortical thickness (T), the bone width (W) and the bone length (L) in metacarpals 2-4. Cortical area:

$$A = \pi W T (1 - T/W)$$

Bone Health Index (BHI):

$$BHI = A / (W^{4/3} L^{1/3})$$

BHI was designed to obtain the lowest relative variation (7.5%) at a given bone age and gender.

The aim of this study was to present reference curves for BHI versus bone age for twelve different populations representing five ethnicities across four continents.

Results

All data were prospective studies of children representative of the normal populations. Data were collected from published study data, e.g. a study from Pune by Oza 2023, and from a new study in Mexico. Caucasian data were obtained from the Netherlands, Switzerland, Johannesburg and Los Angeles (LA); east-Asians from Japan, China and LA; Hispanics from Mexico and LA; blacks from Johannesburg and LA; and south-Asians from Pune in India.

The reference curves (see figures) displayed approximately the same shape, and the variation between populations could be described well by a scaling factor for each

population, common for the two genders. The scaling factor was defined to be 100% on average for the four LA populations. The observed scaling factors are shown in the bar plot, ranging from 95 to 103%, with the exception of 87% for Pune.

Conclusions

(1) The average BHI was remarkably similar across the populations with the dramatic exception that Indian children had 13% lower BHI than LA children.

(2) Radiogrammetry is effective to study variations of (size-corrected) bone mass across many sites, due to the simplicity of recording X-rays, and the objective reading by BoneXpert.

(3) The BHI reference curves have clinical value for the computation of population-adjusted Z-scores (BHI SDS) for children aged 0-19.

Reference: C. Oza et al, *BoneXpert-derived bone health index reference curves constructed on healthy Indian children and adolescents*, *Pediatric Radiology*, online December 2023

