



## Physical Anthropology Section – 2010

### H56 A Radiographic Assessment of Age Using Distal Radius Epiphysis Presence in a Modern Subadult Sample

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After attending this presentation, attendees will be presented new standards for the appearance of the distal radius epiphysis as an age indicator for subadult remains.

This presentation will impact the forensic community by suggesting an age-at-death estimation approach by means of radiographic assessment that provides better predictions than the currently accepted standards. In conjunction with other methods, further research in this area may ultimately lead to more identifications of subadult remains by providing more precise age ranges.

Due to the increasing number of missing children in the United States and the *Daubert* standards, better age estimation techniques are necessary for a forensic anthropologist presented with a set of unidentified subadult remains. The age indicators traditionally used include dental development, long bone length, and appearance of ossification centers and epiphyseal fusion. For instance, according to Greulich and Pyle (1959), the epiphysis of the distal radius first appears at 13.2 months  $\pm$  5.4 months (S.D.) in White males, and in White females at 9.8 months  $\pm$  4.1 months. Scheuer and Black (2000) report that the same epiphysis appears, on average, during the first year and is present in all individuals by three-and-a-half years old. However, currently used age standards for subadults derive from data that are at least sixty years old. With today's children maturing faster, age estimations based on data from the early 20<sup>th</sup> century will overage individuals. Additionally, most of the growth standards were based on middle- to upper-class White children, while forensic anthropologists are faced with a range of populations. Skeletal collections with large enough samples of modern subadults are difficult to obtain, but radiographic analysis of bone is more than manageable and can be used for research. This preliminary study examines the presence of the distal radius epiphysis as a means to estimate age.

The sample consists of 160 radiographs with Black, White, Asian, Hispanic, and Native American populations represented. All individuals were positively identified. For the purposes of this preliminary study, children of different sex and ancestry were pooled. To ensure a modern subadult sample, all were born between 1998 and 2008 and were between 0 and 156 weeks (approximately 3 years old) at the time of death. In order to provide statistically appropriate age estimates, logistic regression using R (R Development Core Team, 2008) version 2.8.1 was employed. Naturally, the probability of having the distal radius epiphysis present increases as the individual ages. It was reasoned that age estimates should be qualified with a certain confidence level and provide, for example, the minimum or maximum age at death given the presence or absence of the epiphysis, respectively.

In this preliminary study, it was determined with 95% probability that, if the epiphysis is present, the individual is older than 34 weeks (7.8 months), and if the epiphysis is absent, the individual is less than 72 weeks (16.5 months) old. These findings are significant because not only are they younger and narrower than the standards currently in place, but in using a statistical model, estimates with an explicit confidence level can be used.

This research will be expanded to incorporate the appearance of other secondary ossification centers and epiphyseal union times to infer how much earlier modern populations are maturing and allow for better age estimates. In addition, sex and ancestry will be tested to evaluate their effects.

#### Age-at-Death Assessment, Subadults, Secular Change