H84   A Radiographic Database for Forensic Anthropology

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After attending this presentation, attendees will understand the need for updated aging standards in subadults and learn of a resource for age estimation methods in subadults.

This presentation will impact the forensic community by informing practitioners of a future resource for researching skeletal development and methods of aging subadults.

There are large numbers of children who are murdered or go missing every year in the United States. In analyzing modern subadult remains, it is surprising that few *Daubert*-compliant standards exist for skeletal or dental age estimation. Instead, forensic anthropologists estimating age in children rely uncritically on data that may have been collected over 80 years ago or from historic archaeology contexts. For instance, Scheuer and Black (2000), the standard anthropological reference text used in evaluating immature skeletal remains, provides average bone lengths by age, citing Maresh (1970). Although Maresh's work was published in 1970, it was based on data collected in the 1930's, as are most aging methods based on dental eruption and development. It has been well documented that American populations, and many others, have shown significantly greater early childhood growth, earlier development and maturation, and larger stature than in previous generations, so estimates for modern individuals using older data will be biased upwards. Further, growth and development varies by ancestry. The reference data come overwhelmingly from middle-class white children, while substantially more and more forensic casework involves non-whites. Therefore, the validity of current methods is in doubt.

Additionally, statistical approaches using dental or skeletal indicators have rarely been employed, and anthropologists have instead used published mean bone lengths by age, as in Scheuer and Black (2000). Such age estimates are merely reasonable guesses based on subjecting weighing of indicators and an arbitrary age estimation range. Because the error rate of such a method can't be reliably estimated, it also falls short under *Daubert*. Statistical approaches, including transition analysis and logistic regression, provide explicit confidence intervals, allowing errors to be controlled for, and address *Daubert* requirements for errors in estimation.

Recognizing that methods for constructing the biological profile in modern adults were based on nineteenth century samples, the Forensic Data Bank (FDB) at the University of Tennessee, Knoxville, was started in 1986 with a grant from the National Institute of Justice. Similarly, because the current methods used to estimate age in subadults are also outdated, funding was awarded for the creation of a digital radiographic database in October 2008. In the absence of modern subadult skeletal collections, forensic anthropologists must turn to radiographs.

Data were collected from files in medical examiners' and coroners' offices and were limited to positively identified individuals born after 1990 and less than 20 years old. Most medical examiner's offices practice radiography in their daily protocol, and full body surveys are often performed on all infants. As of July 1, 2009, over 7,000 radiographs had been scanned from over 1,500 children, and some offices will continue to contribute digital radiographs. The sampling method has produced samples that are geographically and ethnically diverse. Demographic information, including age, sex, ancestry, ethnicity, date of birth, date of death, and cause of death were collected, along with other routinely collected data (height, weight, other measurements, and other information) and entered into an electronic database. The scans and demographic information will be made available for online access in a manner similar to the National Biomedical Imaging Archive (http://ncia.nci.nih.gov/) thanks to additional funding. Making the database available online will allow researchers to develop new methods for identifying subadult remains and allow contributors to submit digital resources remotely.

Some preliminary results have already revealed important benefits to collecting modern data and analyzing them in a statistical framework. For instance, as suspected, the initial appearance of certain epiphyses on radiographs occur earlier in the modern data, and using a ninety-five percent confidence interval produces narrower age predictions than previous estimates, which were apparently most often based on ages of earliest and latest appearance. Further research involves establishing new bone length standards, investigating changes in bone proportions during maturation, and adjusting for magnification and distortion effects when measuring radiographs.

Subadult Age Estimation, Daubert, Secular Changes