



Physical Anthropology Section – 2007

H22 A Reevaluation and Revision of the Suchey-Brooks and Loth and Iscan Aging Methods

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After attending this presentation, attendees will learn about revisions made to two existing adult aging techniques as well as about a new collection of skeletal elements available for analysis.

This presentation will impact the forensic community and/or humanity by providing revisions to two of the more commonly used methods for estimating age at death in adult skeletons. The new revisions should increase the accuracy of age at death estimates so that age ranges given in reports will be more precise.

Determining age at death is a critical step in the process of establishing positive identification of human skeletal remains. While forensic anthropologists utilize a number of skeletal aging techniques, two of the most commonly used standards include those for the pubic symphysis on the pelvis and the sternal ends of the fourth rib. These techniques are widely accepted and are applied to both modern and ancient human skeletal remains around the globe. The three objectives of this research are (1) to evaluate the current standards on a large, modern, and diverse sample, (2) propose revisions that increase the accuracy of each method, and (3) establish a new, documented sample for future research and education.

From January 11, 2005, through June 30, 2006, skeletal specimens were collected from decedents of known age, sex, and race during examination at the Maricopa County Forensic Science Center (FSC) in Phoenix, Arizona. Consent from next of kin was obtained in compliance with the protocol previously submitted to and approved by the Arizona State University Human Subjects' Institutional Review Board, and was recorded. Thousands of phone calls were placed, but due to a variety of factors including language barriers, 1123 individuals were actually contacted. Of those, 725 consented to participate in this study, while 398 declined participation. Unfortunately, due to reasons such as disease, examination conditions, and other restrictions, the bone segments of 165 decedents for which permission was granted were not removed during examination and are not included. The sample also includes bone segments that were retained in Forensic Anthropology cases and unidentified individuals (N = 44), and from Barrow Neurological Institute (N = 24). Ultimately, viable bone segments from 630 individuals were obtained.

The collection amassed consists of pubic symphyses and fourth rib ends from 419 males and 211 females, ranging in age from 18 to 99 years of age at death. The average age at death of the females in the sample is 59.1 years and the average age of the males is 52.6 years. Individuals classified by the medico-legal system at the FSC as Asian, Black, Caucasian, and Native American are represented. A comprehensive database was created in Microsoft Excel that contains the pertinent biological information about each specimen (age, sex, race, etc.), drug and alcohol abuse history when available, and any other important information.

Age was estimated using the Suchey-Brooks and Yıpcan and Loth methods. Correlation and contingency table comparisons between actual ages and estimated ages were performed as well as comparisons between the accuracy of the rib and pubic symphysis, and inter- and intraobserver error. The correlation results indicate that there are significant differences in the observed vs. actual ages in both the ribs ($r = 0.75329$, $p < 0.001$) and pubic symphyses ($r = 0.68169$, $p < 0.001$). Two volunteers with differing levels of experience also scored a subset of the whole sample (N = 100). These correlation results suggested that there were significant differences in the observed vs. actual scores for the two volunteers (vol. 1 pubic symphysis $r = 0.58048$, $p < 0.001$ and rib $r = 0.72027$, $p < 0.001$; vol. 2 pubic symphysis $r = 0.69936$, $p < 0.001$ and rib $r = 0.65517$, $p < 0.001$). A CROSSTABS analysis was conducted to determine how many individuals were under- or over-aged using both phase methods. Intraobserver tests did not produce significant results.

Next, the pubic symphyses and rib ends were seriated and sorted separately based on morphological characteristics without prior knowledge of the age at death. The female and male ribs were each placed into seven distinct morphological groups. New descriptions and age ranges were created and tested. The male and female pubic symphyses were also segregated into seven phases. A late phase, phase seven, was described for both males and females, and is comprised of individuals over 70 years of age at death. Summary statistics were calculated for each phase and descriptions for each phase were created.

Based on the samples collected during the grant period, this study will build on the innovative work of earlier anthropologists who established the accepted aging standards utilized in forensic anthropology



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and bioarchaeology today. The current standards were developed after a great deal of effort and scientific insight on the part of the researchers. Although adequate, the methods are problematic due to sample size and statistical issues. Furthermore, the research collections from which the aging standards were developed are not easily accessible. Thus, this research has created a new, large, and modern documented sample that will be available for study and retesting.

Pubic Symphysis, Sternal End of Fourth Rib, Aging