



Physical Anthropology Section – 2011

H26 An Evaluation of the Chen et al. Pubic Aging Method on a North American Sample

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After attending this presentation, attendees will understand the Chen et al. (2008) pubic bone aging method and its application for estimating age-at-death for a North American population.

This presentation will impact the forensic science community by exploring the utility of the Chen et al. (2008) aging method for males of European ancestry.

Accurately assessing the age-at-death of adult human skeletons is fundamental in creating biological profiles for unidentified remains. There are many methods available to forensic anthropologists to estimate age-at-death; the most widely used and generally accepted involve analysis of the pubic bones. Numerous aging methods using the pubic bones are available, including Chen et al. (2008) which is the focus of this study.

Chen and colleagues assessed age-at-death for Chinese Han males based on multiple pubic bone features. The features were scored for 262 pubic bones and were subjected to four types of statistical equations to estimate age: multiple regression analysis (MRA) and gradual regression analysis (GRA), with quantification theory model-I (QMI) and GRA to compare with MRA. One goal of the Chen et al. (2008) study was to improve upon the Suchey-Brooks method, which is currently the most accepted technique for estimating age from the pubic bone. For the Han sample Chen and colleagues claim that with the use of their statistical formulae, a large sample, evaluating males only, and subdividing each feature, age-at-death can be quantitatively estimated with a high degree of accuracy.

The objective of this research is to evaluate the Chen et al. (2008) method to determine if it can accurately evaluate age-at-death for individuals outside the original study population. This research addressed two primary questions: (1) Will the Chen et al. (2008) method accurately assess age-at-death for non-Chinese males?; and, (2) Will the revised Chen et al. (2008) method accurately assess age-at-death for males of European ancestry?

This research is based on a known sample of modern pubic bones curated at the Maricopa County Forensic Science Center (FSC) in Phoenix, Arizona. A sample of 296 left male pubic bones of European ancestry, between the ages of 18 and 70, was selected from the larger collection. These bones were scored based on nine morphological indicators (e.g. ridges and furrows on the symphyseal surface, ossific nodules, and bone density). Each pubic bone was scored blind by four

observers with osteological experience ranging from 20+ years to 2 years.

This research generated statistical data concerning the accuracy, rates of error, and significance of the Chen et al. (2008) model's utility for aging male populations of European ancestry. The original Chen et al. (2008) equations were tested and then four revised equations were generated from the FSC scores. Accuracy for the revised equations was evaluated via the percentage correct within brackets of one, five, ten, and fifteen years from the actual ages. A higher percentage per bracket translates to higher accuracy.

Results indicate that the Chen et al. (2008) method is fully replicable for males of European ancestry. The most accurate equation varies by bracket—one year from actual age: original Chen et al. MRA+GRA (10.8%); five years: revised QMI+GRA (38.6%); ten and fifteen years: revised MRA+GRA (65.7% and 87.3%). The revised model demonstrates only incremental gains over the original model (revised model MRA+GRA $R^2 = .491$ and original model MRA+GRA $R^2 = .440$), and on average the revised model tends to slightly over-age the specimens. The revised model has an average error of 8 years from actual ages. Both the original and revised models have lower predictive values for the FSC sample than Chen and colleagues report for their sample (Chen et al. MRA+GRA $R^2 = .978$). All Pearson's correlations for inter- and intra-observer error were statistically significant indicating low error rates between observers.

The Chen et al. (2008) method is challenging and requires proficient knowledge of the nine pubic bone features and their development before implementation; however, the model does explain almost 50% of the variability in the FSC sample. An average error of eight years from actual age is acceptable for a forensic biological profile, and the model accurately estimates age within 15 years for over 87% of individuals. Therefore, this is a viable method for estimating age-at-death for males of European ancestry. Future research is required to determine if this method is more or less accurate than others, such as Suchey-Brooks.

Pubic Bone, Age Estimation, Male