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## A77 Feature Analysis of the Pubic Bone for Estimation of Age-at-Death

Julia D. Chmaj, BA\*, 5010 Creekside Preserve Drive, Hixson, TN 37343; and Kristen Hartnett, PhD, OCME, Forensic Anthropology, 520 1st Avenue, New York, NY 10016

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After attending this presentation, attendees will better understand which features of the pubic bone have the strongest correlation with age-at-death.

This presentation will impact the forensic science community by providing attendees with an in-depth evaluation of features from the most preferred region for age-at-death estimation. This information may assist the forensic anthropologist in producing a more accurate and reliable estimation of age-at-death.

During an individual's lifetime, the pubic symphysis will go through phases of epiphyseal formation, quiescence, and secondary changes related to age; it is these changes that are used in estimating age. The value of the pubic symphysis as an age indicator lies in the changes it continues to undergo when the rest of the skeleton has ceased to grow.

Assessment of a given morphological pattern and its age distribution is a difficult and challenging task when the individual features of the pubic symphysis express different age stages. In 1998, Suchey and Katz hoped that "studies of single traits will help produce narrower age ranges."<sup>1</sup> By observation and analysis of each feature individually, there may be a way to facilitate placement into the correct phase or age range.

The purpose of this research is to evaluate certain individual morphological features on the pubic bone to determine which are most strongly correlated with age-at-death. A known-age sample consisting of 156 female and 168 male pairs of pubic bones from the Forensic Science Center in Phoenix, AZ, was evaluated. Nine separate features of the pubic bone were scored on all specimens. Both left and right sides were examined and the oldest score was used. At the time of scoring, sex was known but age was not. The features scored were: (1) ridges and furrows (RID); (2) dorsal lipping (DOR); (3) bone quality (BONE); (4) rim formation (RIM); (5) the pubic tubercle (PUB); (6) depression of the symphyseal face (SYM); (7) ossific nodules (OSS); (8) ventral ligamentous outgrowths (VENT); and, (9) the ventral hiatus (HIAT). Features were scored according to a specific scoring system developed. Inter-observer and intra-observer error of the scoring system was assessed by four volunteers with different levels of experience from graduate students in physical anthropology to forensic anthropologists with PhDs.

Comparison of the results from the Pearson's correlation, Analysis of Variance (ANOVA), and simple regression analyses indicate that the nine features chosen for analysis are significantly correlated with age-at-death in the combined-sex sample. However, the Pearson's  $r$  values 0.762 (BONE), 0.731 (RIM), and 0.677 (VENT) and the  $F$  coefficients from the ANOVA 155.83 (BONE), 99.68 (RIM), and 90.13 (VENT) indicate that bone quality, rim formation, and ventral ligamentous outgrowths are more strongly associated with age-at-death than the other features.  $R$ -values for these specific features in the female sample were .819 (BONE), .790 (RIM), and .735 (VENT);  $r$ -values for the male sample were .701 (BONE), .696 (RIM), and .647 (VENT). The  $F$  coefficients for the female sample and the male sample were 110.09 (BONE), 68.17 (RIM), 59.68 (VENT) and 54.54 (BONE), 40.88 (RIM), 40.12 (VENT), respectively. The largest adjusted  $R^2$  values for the total sample are from bone quality, rim formation, and ventral ligamentous outgrowths, respectively explaining 58%, 53%, and 46% of the variation over what would be expected by chance. The adjusted  $R^2$  values of bone quality, rim formation, and ventral ligamentous outgrowths in the female sample are 67%, 62%, and 54% and 49, 48, and 42% in the male sample. These findings suggest that these three features are the best predictors of age-at-death in the total sample, as well as by sex.

Inter-observer error is low for most features, except dorsal lipping and ossific nodules, which were scored inconsistently across observers. Intra-observer test results indicate the majority of features are easy to evaluate, the exceptions being ossific nodules and dorsal lipping in the male sample.

The results of this study highlight bone quality, rim formation, and ventral ligamentous outgrowths as the features on the pubic bone that are most strongly correlated with age. In addition, the evaluation of bone quality of the overall pubic bone places the focus beyond the symphyseal surface and provides a means to assess older individuals previously thought impossible to age. Future studies should emphasize bone quality and analyze other collections in and out of the United States.

### Reference:

1. Suchey JM, Katz D. 1998. Applications of pubic age determination in a forensic setting. In: Reichs KJ, editor. *Forensic osteology: advances in the identification of human remains*, 2<sup>nd</sup>ed. Springfield, IL: Charles C. Thomas. p 204–236.

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### Pubic Bone, Age Estimation, Forensic Anthropology

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