A93 Metric Assessment of the Pubic Bone to Determine the Accuracy of Known and Novel Data Points for Sex Estimation

Kathleen A.S. Blake, PhD, State University of NY at Oswego, Dept of Anthropology, Mahar 441, Oswego, NY 13126; Hallie Gaffney*, State University of New York at Oswego, Mahar Hall, Anthroplogy Dept, Oswego, NY 13126; and Kristen Hartnett-McCann, PhD*, Office of the Chief Medical Examiner, Forensic Anthropology, 11 Shuttle Road, Farmington, CT 06032*

After attending this presentation, attendees will understand the variation of 13 metric and 3 non-metric traits on the pubic bone from an adult skeletal sample with known demographic data.

This presentation will impact the forensic science community by: (1) evaluating pubic bone dimorphism between adult males and females from metric and non-metric traits; (2) providing landmarks and measurements that demonstrate reduced error and increased reliability of sex assessment of the pubic bone to allow for comparison by future researchers; and, (3) assessing novel data points that suggest additional sex determination methodologies than previously used. This presentation adds to the research on reliability and repeatability of forensic anthropological sex determination methods through other analysis of adult skeletal samples with known age and sex compared to previously published rates. Additionally, this research quantifies shape differences in the pubic bone of males and females, adding to the growing list of studies undertaken to meet the rigorous *Daubert* ruling scientific standards.[1]

The determination of the biological sex of skeletal remains is an important early step in forensic and archaeological analyses. Not only does it eliminate roughly half of the population from the search in forensic cases, but components of a biological profile, such as stature, ancestry, and age at death, are based on that initial sex assessment.[2] While distinctions exist between male and female skeletons before birth, the more visible skeletal dissimilarities manifest at puberty, when hormones stimulate secondary sex characteristic development.[3] Anthropologists use the pelvis as it is the most sexually dimorphic element of the human skeleton, both morphologically and metrically, due to functional requirements of both bipedality and safe parturition in females.[4,5] Phenice first recognized that the ventral arc, subpubic concavity, and medial border of the inferior pubic ramus were all highly sexually dimorphic.[6] Moreover, the pubic bone shape can be used to visually assess sex; in females, the body of the pubis is larger and more rectangular, while male pubic bones are somewhat triangular in shape.[7]

This study examines a modern, diverse sample from the Maricopa County Forensic Science Center (FSC) in Phoenix, AZ. A subset of the FSC collection, n=400, (120 females and 280 males) was examined by three observers. All measurements were taken from the left side when available; if damaged or missing, the right side was substituted. A total of 13 measurements from both previously identified and novel points were taken and included height and breadth of face, several measurements of the pubic body from the obturator foramen, and ischiopubic ramus thickness. In addition, three non-metric features were visually evaluated: the ventral arc, the subpubic concavity, and the overall shape of the pubic body.

This research determined that a relationship exists between 12 measurements and biological sex. Between males and females, no significant differences were found in the variances for the measurements taken, with nearly all normally distributed. Independent t-tests showed significant differences in the means for 12 of the 13 measurements, with most at the p=.000 level. All but one measurement showed correlations to sex at either a significance level of 0.01 or 0.05, with pubic body width and perpendicular inferior pubic body width the strongest at .550 and .531, respectively. Non-metric traits also correlated to sex; for example, the ventral arc correlated to sex at the 0.01 significance level with a correlation coefficient of 0.792. Inter-observer reliability was tested using intra-class correlation. For the two most significantly correlated traits, pubic body width and perpendicular inferior pubic body width, both supported the reliability of these measures, with the pubic body width intra-class correlation the highest at 0.962, with a 95% Confidence Interval (CI) (0.954, 0.969).

In forensic anthropology today, sex determination methods must meet forensic legal standards of reliability and repeatability and be developed from samples of known age and sex; however, current methods provide limited accuracy, as many methods are subjective, non-metric, and developed on non-modern skeletal populations.[8] The creation of standardized, repeatable, metric sex determination methods from modern populations is essential. Considerable variation was present in the shape and size of pubic bones in this population skeletal sample and landmark determination was more difficult for some measurements than others; however, once identified, these measurements were reliable and they show promise as metric determinants of sex on the pubis.

*Presenting Author

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Sex Determination, Pubic Bone, Metric Assessment