



## Physical Anthropology Section - 2013

### H85 Sex Estimation in a Modern Thai Sample Using Non-Metric Traits of the Innominate

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After attending this presentation, attendees will understand that a popular non-metric method using traits from the innominate cannot be applied reliably to other ancestries.

This presentation will impact the forensic science community by demonstrating that any sex estimation techniques must be used with caution and that the source and nature of the samples must be taken into account.

Sex estimation is a vital part of constructing the biological profile of an unknown individual. Following the *Daubert* decision (*Daubert vs. Merrell Dow Pharmaceuticals, Inc.* 1993), in order to be considered admissible in court, scientific conclusions must be based on reliable and valid methods with estimated error rates.<sup>1</sup> Not all methods used to construct a biological profile that are derived from one group or population are necessarily applicable to another group, and should be tested for external validity, as has been repeatedly demonstrated in metric studies of the cranium and post-cranium. This study examines how well a recent method published by Klaes *et al.* (2012), which used modified Phenice (1969) traits of the innominate, performs when applied to a sample of modern Thai individuals.<sup>2,3</sup> The three characteristics of the innominate (medial aspect, ventral arc, and subpubic concavity) were scored on 76 Thai individuals from Khon Kaen University Hospital and were compared to the scores of modern Americans in the UTK Forensic Anthropology Center. Because the observations were recorded as ordinal data, the American and Thai groups were compared using several non-parametric tests including the Shapiro-Wilkes test, Wilcoxon signed-rank test, and the Freeman-Halton test. The Thai individuals were classified using logistic regression and linear discriminant function analysis. Statistical analyses were conducted using R (R Development Core Team 2012) and FORDISC 3 (Jantz and Ousley 2010).<sup>4,5</sup> In group comparisons, the modern Thai sample was found to have significantly lower scores compared to the modern American sample in all three traits. Using the discriminant function analysis and logistic regression equations developed by Klaes *et al.* (2012) based on a modern American sample, the modern Thai sample classified very poorly: the correct classification rates of the modern Thai males were as low as 27% using the logistic regression and only 43% using discriminant function analysis.<sup>2</sup> The Thai females were classified more accurately, indicating that the overall scores of both the males and females are lower (more feminine) than those of the modern Americans. However, sex estimation equations derived from the Thai sample itself also showed low accuracy rates, indicating they are simply less sexually dimorphic in these traits than the American groups. Thus, the Thai sample is both more feminine and less sexually dimorphic in these traits than either the Phenice (1969) or the Klaes *et al.* (2012) samples.<sup>2,3</sup> Therefore, these traits must be thoroughly tested before being applied to any other group or population other than the American White and Black from which the equations were derived.

#### References:

1. *Daubert v. Merrell Dow Pharmaceuticals*. 1993. U.S. Supreme Court 509.U.S.579,113S.Ct.2786, 125L. Ed.2d 469.
2. Klaes AR, Ousley SD, Vollner JM. A revised method of sexing the human innominate using Phenice's nonmetric traits and statistical methods. *Am J Phys Anthropol* 2012;149(1):104-14.
3. Phenice TW. A newly developed visual method for sexing the os pubis. *Am J Phys Anthropol* 1969;30:297-302.
4. R Development Core Team. R: a language and environment for statistical computing. R Foundation for Statistical Computing. Retrieved from: <http://www.R-project.org>, 2012.
5. Jantz RL, Ousley SD. FORDISC 3.1: personal computer forensic discriminant functions. Knoxville (TN): The University of Tennessee, 2010.

#### Non-Metric, Sex Estimation, Thai