## A5    Estimation of Sex Based on Postcranial Elements in North American and Latin American Populations

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**Learning Overview:** After attending this presentation, attendees will have gained a better understanding of the potential use of postcranial elements for sex determination in North American and Latin American populations.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by illustrating the usefulness of the ulna and humerus for sex estimation with high accuracies.

Sex estimation is one of the first components to be assessed toward the determination of the biological profile in skeletal remains. Classically, the visual analysis of the pelvis is the preferred indicator of sex with a high degree of reliability. However, different scenarios render incomplete skeletons, leading to the examination of various parts of the body and the application of different techniques for the correct assessment of this parameter.

Although different studies pointed out that the skull is the second best estimator of sex through visual assessment, when applied to statistical models, it was not possible to reach the same accuracies as the pelvis. In fact, some studies indicated that postcranial sex estimates are generally superior to skull estimates. Consequently, several studies have been focused on the analysis and measurement of long bones toward this purpose, including, in some of them, the clavicle and scapula, and on increasing the accuracies of sex estimation. Although these studies indicated an improvement in sex estimation when using postcranial elements, an issue is the scarce work on Latin American populations, since the majority of these studies were developed on African- and European-Americans.

Previously described metric traits (maximum length of clavicle; cranial-caudal diameter of clavicle; diameter of humerus head; humerus condylar breadth; scapular height; scapula breadth; femur epicondylar breath; and ulna minimum breadth of the olecranon) and a new one (olecranon-coronoid distance from ulna) were measured from 72 North American individuals (41 males and 31 females) and 59 Latin American individuals (32 males and 27 females) from the American Museum of Natural History Collections in New York City and the Texas State University Collections in San Marcos, TX. Statistical analyses was performed using the Statistical Package for Social Science (SPSS) version 15. Comparison between groups was conducted using parametric or non-parametric tests. Discriminant function analysis models were performed to develop specific formulas for sex estimation.

Three independent measurements in three independent days were taken. After statistically corroborating that there was not intra-observer error, the average of these three independent measurements was calculated and used to analyze their significance between males and females. In both populations, all parameters showed significant differences between these two groups. However, when these measurements were introduced into discriminant function analysis in the North American population, only the minimum breadth of the olecranon correctly classified 91.3% of individuals and through cross-validation 89.9% of individuals. When this parameter was combined with the diameter of the humeral head, 98% of individuals were correctly classified and 98% through cross-validation.

In the Latin American population, the introduction of all parameters into discriminant function analysis retrieved the same results, although with lower classification accuracies. Again, the minimum breadth of the olecranon provided the highest classification accuracies (82.4% of individuals) and through cross-validation (80.4%). In contrast, in this case the diameter of the humeral head correctly classified 79.4% of individuals, with the same through cross-validation. This discrepancy with respect to the North American population could be due to the reduced number of analyzed individuals (71 vs. 59).

These results are in agreement with previous studies, which pointed out the humerus as one of the potential bones to take into consideration for sex estimation based on its accuracy. In addition, the minimum breadth of the olecranon in the ulna showed a high accuracy toward this purpose, rising in combination with the diameter of humeral head, at least in the North American populations. Thus, these two anatomical regions could be used alone or in combination with other methodologies for sex estimation, which is particularly important in situations of fragmentary remains. Future research may be able to expand on these results, increasing the number of individuals to improve the estimation accuracies.

**Postcranial Elements, Sex Estimation, Ulna**