H102   Validation of a Method of Sex Determination Based on Sterna From a Sample of Modern Colombian Mestizos

Carolina Puerto Valdivieso, BA*, Calle 147 # 99-52 Interior 2 Apartamento 401, Bogotá, Cundinamarca 111161, COLOMBIA; Andres D. Granados, BA, Manzana I Casa, 20 Urbanizacion Santa Lucia, Santa Marta, Magdalena 470001, COLOMBIA; and Maria A. Lopez, BA, University of Tennessee, Knoxville, TN 37996

The goal of this presentation is to demonstrate the applicability of a method of sex determination using discriminant function analysis developed in 2001 by Puerto based on osteometrics of the sternum of a modern Colombian sample.1 The study presented tested the method using a new sample from a different region of the country to validate its use in widespread forensic contexts in Colombia.

This presentation will impact the forensic science community by demonstrating the necessity of testing sex determination methods based on osteometrics. The results of the formula applied do not support the use of this method in forensic practice.

The method developed by Puerto used a sample of 100 sterna (50 females and 50 males) from medicolegal cases from the National Institute of Legal Medicine in Colombia. All the individuals with age-at-death of 20 to 65-years-old were born in the Andean region of the country. Five measurements were obtained: manubrium length (X_1); manubrium width (X_2); body length (X_3); combined length of manubrium and body (X_4); and, width of body in 1st sternebrae (X_7). Using multivariate analysis with the simultaneous equations method and the stepwise method, Puerto developed two main discriminant function equations for sex determination: (1) $Z= (0.119*X_2) + (0.060*X_7) + (0.064*X_4) – 15.841$; and, (2) $Z= \{(0.0640*X_2) + (0.040*X_3) + (0.182*X_1)\} – 15.360$.

In each of the previous equations, the sectioning point was 0, with females falling below 0 and males falling above 0. Results after applying the formulas to the sample were as follows: the first equation had a success rate of 90% and second equation had a success rate of 87%.

With the aim of testing the method developed by Puerto, this research used a sample of 50 sterna (25 females and 25 males) from a modern skeletal collection from the Prosecutor General's Office in Colombia. Age-at-death was 20 - 65 years old, and all individuals were born on the Caribbean coast of the country. Measurements were taken following Puerto and were considered as independent variables. Using the sex as the dependent binomial variable, an Analysis of Variance (ANOVA) test was conducted using the statistical software Statgraphic® 5.1. Sex of the individuals was estimated using the above discriminant functions, and subsequently real sex was compared to estimated sex. Results indicate that the first equation classified correctly 71% of the females and 46% of the males, which means a success rate of 52%. The second equation classified correctly 100% of the females and 46% of the males, which means a success rate of 50%. These results are lower than the ones presented by Puerto. This shows that these formulas are not dependable for identification purposes in Colombia.

This study indicates that population heterogeneity may be at play here, given the metric differences in the sterna of individuals from different parts of the country, although this hypothesis remains to be tested. Also, while this method needs to be subjected to further scrutiny, it presents the necessity to investigate the influence of factors such as migration and secular change among other factors, to understand how these are affecting the osteometric sex expression of Colombian sub-populations. This research expects to contribute to the standardization process of methods in Colombia, which ultimately will improve the quality of forensic analyses in a country that still has thousands of victims to be identified.

Reference:
1.   Puerto, VC. Sex determination based on osteometrics from the sterna of a population of the morgue of the National Institute of Legal Medicine and Forensic Sciences in Santa Fe de Bogotá. Master's Thesis. Universidad Nacional de Colombia: 2001.

Sex Determination, Sternum, Colombian Population Standards