H45 Stature Estimation From Long Bone Lengths Among the Adult Colombian Population

Angelica Guzman, BA, National Institute of Legal Medicine & Forensic, Calle 7A No. 12A- 51, Bogota, DC , COLOMBIA; Megan K. Moore, PhD, Univ of Michigan-Dearborn, Dept of Behavioral Science, 4901 Evergreen Rd, Dearborn, MI 48128; Cesar Sanabria, PhD, Calle 7a #12-61, Segundo Piso, Bogota, COLOMBIA; and Juan M. Guerrero, BA, and Carlos A. Villalobos, BA, National Institute of Legal Medicine and Forensic, Cra. 7A Nº 12-61, Bogota, COLOMBIA*

After attending this presentation, attendees will be made aware of a new modern Colombian skeletal collection from which population-specific stature formulas for adult Colombian males and females are recently derived. The educational objectives are to present these new formulas and to compare the accuracy of these new formulas compared to previously published formulas.[1,2]

This presentation will impact the forensic science community by helping to develop population standards in Colombia that could potentially play a role in the identification of thousands of unidentified human remains from the ongoing conflicts in Colombia.

The aim of this study is to develop general formulas for stature estimation using inverse regression of long bone lengths (humerus, radius, ulna, femur, tibia, and fibula) of Colombian adult males and females. Previous studies to estimate stature of individuals from the Colombian population made by Mantilla Hernández (2009) using tabias demonstrate that these population-specific formulas are more precise than those developed by Trotter and Gleser and Genovés.[1-3] This new collection will provide modern population-specific equations using a known modern skeletal collection to improve the accuracy of stature estimation. For this study, a new skeletal sample is used called the Human Skeleton Collection of Colombia, which is curated at the Institute of Legal Medicine and Forensic Sciences (INML y CF) and was developed under the supervision of Dr. César Sanabria. The Human Skeleton Collection of Colombia consists of individuals of known age, sex, and stature (stature from ID cards and/or cadaver stature) and offers a unique opportunity to develop and test stature formulas specific to the Colombian population. The individuals have dates of death from 2005. The study was conducted on 140 skeletons, 99 males and 41 females, aged 19 years and above, with an average age of 47 years. The collection and this research project have been part of a bigger collaboration to develop standards from this new sample with the help of the International Criminal Investigative Training and Assistance Program (ICITAP). By convention, the left bones in each skeleton were measured. Nine parameters (maximum lengths of humerus, radius, ulna, femur, tibia (without the intercondyloid eminence), and fibula)) were recorded. The current study uses measurement of the tibia that includes the malleolus, which has become standard for stature estimation. For the statistical analysis, linear and multivariate regression equations were generated for all bones for each sex separately. Only regressions with highly significant F values ($p<0.01$) were accepted. All of the long bones of the upper and lower limbs are included in univariate inverse regression formulas and the best multivariate regression equations are calculated using a stepwise procedure. All of the equations are significant for males and females ($p<0.01$). The equation from the femur for males (Stature=(Femur*2.46) + 5.9004 +/- 3.760) has a high correlation (r=0.857). The equation from the femur for females (Stature=(Femur*1.787) + 83.592 +/- 4.951) has a much lower correlation (r=0.692). The best multivariate equation for males was from the femur and tibia combined (Stature=(Tibia*1.592) + (Femur*0.967) +67.348 +/- 3.091; r = 0.891, adjusted R^2 =0.784). The best equation for the females was a univariate equation from the fibula (Stature=(Fibula*2.183) + 93.170 +/- 5.065; r=0.697; adjusted R^2=0.460). These results indicate that the sample size for the males is sufficiently large for reliable stature equations, but the sample size for the females should be larger to improve the correlations for reliability in forensic stature estimation. Since this study was first conducted, the Human Skeleton Collection of Colombia sample has since grown in size to be several hundred individuals, which will enable improved equations of females and the ability to test the validity of the male equations on an independent sample.

References:

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2. Trotter M, Gleser G. A re-evaluation of estimation of stature based on measurements of stature taken during life and of long bones after death. *Am J Phys Anthropol* 1958;16:79-123.
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Stature Estimation, Femur, Tibia

 ** Presenting Author*