



Physical Anthropology Section - 2013

H83 A Test of Formulas Used to Estimate Stature in Modern Chileans

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After attending this presentation, attendees will understand some of the problems with previously reported stature equations developed to aid identification efforts for the “disappeared” from Pinochet-era and modern medicolegal cases in Chile.

This presentation will impact the forensic science community by providing new and more accurate equations for estimating the statures of modern Chileans.

Populations throughout history have differed in body dimensions. Modern populations are not exempt from normal variation in biological traits, both within and between various groups. Anthropologists have attempted to quantify this variability, and standards used to measure traits such as stature have been created for European and North American populations. Standards derived from European and American populations have produced mixed results when applied to Latin American skeletal samples, where there is a lack of local data that can be used to determine ancestry, sex, and stature. Creating new stature estimation equations has become increasingly important for countries such as Chile, where a legacy of human rights violations has resulted in unidentified remains.

In Chile, quantifying population variability has been difficult since living stature is not regularly recorded on official documents. To aid the Chilean government in this matter, Ross and Manneschi created equations using substituted population means from studies conducted in the 1970s and used long bone lengths from North American populations to calibrate these equations.¹ As long as these population means are similar to those of the Chilean target skeletal population, they should be effective substitutes. However, the obtained population parameters (means, variances, and shapes of the variance distributions) for these other reference groups do not match the values for local Chilean populations, introducing systematic errors when estimating stature.

This study tests Ross’ and Manneschi’s previously-published Chilean stature equations using a new sample of 34 males from the Cementario General Collection at the Universidad de Chile and modern forensic cases from the Servicio Medico Legal in Santiago, Chile. In lieu of recorded living statures, skeletal height was calculated for each specimen using Raxter’s Revised Fully’s Anatomical Method.² These data were substituted into Ross’ and Manneschi’s and Trotter’s published equations for the femur and tibia, and success was evaluated using mean error statistics (inaccuracy and bias).³ In addition, new equations were generated for comparison.

Mean stature for the Chilean test sample (161cm) is significantly different from the mean values used by Ross and Manneschi (170cm and 174cm). Mean femur length for the Chilean test sample (43.29cm) is also significantly different from the mean values used by Ross and Manneschi (46.91cm). Mean tibia length does not follow the same pattern and the values obtained for the current study (36.40cm) are not statistically different than those used by Ross and Manneschi (36.85cm). Trotter’s equations for the femur and tibia perform reasonably well (inaccuracies=3.69cm and 8.59cm, respectively). However, Ross’ and Manneschi’s equation for the femur does not perform well, with the majority of specimens being severely underestimated (inaccuracy=20.28cm, bias=-20.78cm). Ross’ equation for the tibia performs even worse, with some specimens falling well outside of Ross’ published error intervals (inaccuracy=43.51cm, bias=-43.51cm). New stature equations generated from the current sample have inaccuracy values of 2.86cm (femur) and 2.31cm (tibia).

North American stature data does not appear to be an adequate proxy for modern Chileans. Researchers should avoid the temptation to substitute data from other populations when documentation of local skeletal samples is incomplete. Although limited data is available, this study emphasizes the importance of collecting all the data required to create accurate and reliable regression equations.

References:

1. Ross AH, Manneschi MJ. New identification criteria for the Chilean population: estimation of sex and stature. *Forensic Sci Int* 2011;204:206.e1–206.e3.
2. Raxter MH, Ruff CB, Auerbach BM. Technical note: use of revised Fully stature estimation technique. *Am J Phys Anthropol* 2007;133:817–8.
3. Trotter M. Estimation of stature from intact long bones. In: Stewart TD, editor. *Personal identification in mass disasters*. Washington (DC): Smithsonian Institution Press, 1970; 71-83.

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