



## Physical Anthropology Section - 2013

### H40 Estimating Adult Stature From Metatarsal Length in a Galician Population (NW of Spain)

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After attending this presentation, attendees will understand the potential contribution of new formulas to estimate adult stature from metatarsal length in a Galician population.

This presentation will impact the forensic science community by presenting new formulas and demonstrating how they can increase the accuracy of adult stature estimation, especially when long bones are not present or are fragmented.

While it is accepted that long bones provide a more accurate estimation of stature, in practice fragmentary remains make the task difficult. However, small bones, such as those of the hands or feet, are very often well preserved in a variety of contexts and, for this reason, it is necessary to develop methods for estimating stature from these elements. Although the formulas developed by Byers et al. have been used in the forensic arena for more than 20 years, it is clear that it is the reference population from which they were derived which limits their utility for use with other populations.<sup>1</sup> To verify the use of the dimensions of the metatarsals as estimators of adult height in our population, a method for estimating the stature of Spanish adults using radiologically determined metatarsal lengths has been developed.

**Method:** The present research is based on a study of 101 (36 males and 65 females) healthy Caucasoid volunteers, over the age of 25 years from Galicia (NW of Spain). All persons with skeletal deformities, pathologies, or fractures which could preclude accurate measurements were excluded from the study. Height was determined with a measuring rod, placing the volunteer barefoot, erect, and looking up, with the back against a graduated ruler. The first and second metatarsals of the left foot of the 101 volunteers were measured by a dorso-plantar X-ray using a digital medical image viewer- with a Radiological Archive and Image Management (RAIM) application 1607 JAVA from UDIAT, commonly used in hospitals. Although digital measurement is calibrated by the system itself, in order to minimize errors, a metallic ruler was used to confirm precision. All measurements were obtained twice and registered in millimeters. Statistical analysis of the data was carried out using the R environment ([www.r-project.org](http://www.r-project.org)).

Description of the measurements:

- M1—Maximum length of 1<sup>st</sup> metatarsal—the distance between the tip of the tuberosity and the most distal point of the head.
- M2—Maximum length of 2<sup>nd</sup> metatarsal—the distance between the proximal tip and the most distal point of the head.

**Results:** The highest correlation obtained ( $R=0.755$ ) was with the maximum length of the 1st metatarsal for males. The corresponding regression equation is as follows:  $S=756.336 + 13.686 \cdot M1$ . When the equation is applied to both the first and second measurements, no significant differences in the correlation coefficients were detected. Additional formulas and summary performance statistics will be presented. It is important to note that participants in the study were adults and, thus, these formulas should not be used for estimation of stature for individuals younger than 19 years old.

The addition of metatarsal data for the estimation of stature has proved to be a valuable contribution in assessing the biological profile of Spanish adults. Additionally, because the equations are based on radiographic measurements of the fleshed foot, they may be of use for mass disaster, dismemberment, or other non-skeletonized cases where the soft tissue of the foot is still present.

**Reference:**

- <sup>1</sup>. Byers S, Akoshima K, Curran B. Determination of adult stature from metatarsal length. *Am J Phys Anthropol* 1989; 79(3):275-9.

**Estimating Adult Stature, Metatarsal Lengths, Dorso-Plantar X-Ray**