



A6 Evaluating Sexual Dimorphism Among South African Groups Using Dentition

Goodness P. Shakoane, BS, University of Pretoria, Anatomy, Pretoria 0084, SOUTH AFRICA; Ericka N. L'Abbe, PhD*, University of Pretoria, Pretoria 00084, SOUTH AFRICA; Marie Christine Dussault, PhD, Brampton, ON L6Z 4B6, CANADA

Learning Overview: After attending this presentations, attendees will have gained knowledge of sexual dimorphism in dentition among South African groups and the use of dentition, particularly canines, for sex estimation. Sex estimation is an important component of the biological profile as other parameters, such as age-at-death, ancestry, and stature, are dependent on it. This presentation illustrates how teeth are a good source of information on sex for extremely fragmented remains, owing to their postmortem longevity.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by contributing to the application of knowledge of sexual dimorphism among three major South African groups. A more in-depth knowledge of sexual dimorphism within and between South African populations can assist in the creation of biological profiles for unidentified persons with the use of large dental databases and statistical software, as well as for improving dental implants and orthodontic treatment.

Human variation is a core component of an accurate biological profile from a heterogeneous population. South Africa is a poly-linguistic society with more than 49 million people and is ideal for evaluating human variation, particularly sexual dimorphism, among diverse populations. Within the last 500 years, various groups, such as the Dutch, French, Malaysian, and Indian, have migrated to the country. Apartheid segregation laws affected gene flow among indigenous and migrated groups, which contributed to distinct social/political designations including Black, White, "Colored," and Indian South Africans. Today, approximately 80% of the population identify themselves as Black; 9% "Colored"; 8% White; and 3% Indian. "Colored" refers to a social group primarily from the Western Cape who are descendants of slaves from Indonesia, India, Malaysia, and Asia, and who were mixed with Europeans and indigenous Khoi and San. The purpose of this study was to examine sexual dimorphism among the dentition of modern South African populations and to assess whether observed dental variations were useful for developing population-specific sex estimation formulae for Black, "Colored," and White South Africans.

All available teeth (excluding third molars) were used from 906 adult crania with a known demographic profile (526 males, 380 females, 318 Black, 312 White, and 276 "Colored" South Africans). Data was obtained from three large modern 20th-century skeletal collections in South Africa (the Pretoria Bone Collection, the Raymond A. Dart Collection, and the Kirsten Skeletal Collection). Four permanent crown dimensions were taken: maximum mesiodistal, maximum buccolingual, and two molar diagonal diameters (mesiobuccal-distolingual and mesiolingual-distobuccal).¹ Technical Error of Measurement (TEM), Analysis of Variance (ANOVA), sympercents, and Linear Discriminant Analysis (LDA) were computed in R (R. Core Team, 2014) to describe the data and to generate population-specific sex estimation formulae.

All dental dimensions are highly repeatable with low inter- and intra-observer errors. All dimensions show statistically significant differences between sexes, with males possessing larger dimensions than females. All dimensions and all groups exhibited sexual dimorphism. Canines had the highest degree of sexual dimorphism, followed by molars, premolars, and incisors. Black and "Colored" South Africans presented with more sexual dimorphism than White South Africans for all variables. LDA provided cross-validated correct classification rates up to 87%. Mandibular models performed best for Black South Africans (79.45% to 87.50%) and White South Africans (60.71% to 85.71%), while models including upper and lower canines and premolars performed best for "Colored" South Africans (73.68% to 83.33%).

Despite much research into sex and ancestry estimation among South Africans, less attention has been paid to human variation in the dentition within and among these groups.² While all teeth were sexually dimorphic, the best multivariate combinations yielded accuracies similar to those of the cranium (<90%). The long bones, scapula, and pelvis outperform the skull and dentition.³ In any forensic investigation, the pelvis and long bones, respectively, take preference over teeth. However, the dentition can be useful in circumstances of extreme fragmentation, burning, and/or commingling.

Reference(s):

1. Hillson S. *Teeth*. Cambridge University Press; 2005. Jul 21.
2. Krüger G.C., L'Abbé E.N., Stull K.E. Sex Estimation from the Long Bones of modern South Africans. *Inter J Leg Med*. 2017 Jan 1; 131(1):275-85.
3. Spradley M.K., Jantz R.L. Sex Estimation in Forensic Anthropology: Skull versus Postcranial elements. *J For Sci*. 2011 Mar; 56(2):289-96.

Linear Discriminant Analysis, Human Dentition, Biological Profile