



## Physical Anthropology Section – 2011

### H75 Morphometric Evaluation of Nasal Characteristics in 20th Century White and Black South Africans

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After attending this presentation, attendees will gain a variation of knowledge in mid-facial characteristics of black and white South Africans, and will understand the statistical framework used to describe similarities and/or differences within these groups.

This presentation will impact the forensic science community in contributing to knowledge of human variation within a modern South African population, in providing a more scientific evaluation of this variation, and in presenting a mathematical approach to the classification of population groups.

With more than 49 million people of various social identities, languages, and belief systems, South Africa is an ideal country in which to evaluate human variation and the statistical relationship between social identity and biological characteristics. With the world's highest rate of homicide and a large number of unidentified persons, a need exists for accurate and reliable methods to assess ancestry from skeletal remains of sub-Saharan Africans. Since patterns of variation within and between populations are shaped by culture, language, geography and secular change, it is necessary to define the effect these parameters on the reliability and accuracy of our methods for estimating ancestry as well as sex, stature, and age at death.

With a large database of population groups, FORDISC 3 has addressed problems regarding osteometric differences among populations. However, the accuracy of non-metric features, such as inter-orbital breadth and nasal aperture width, in describing variation among black and white groups outside of North America has not been adequately described. In North American populations, mid-face and nasal morphology has been shown to be the most accurate region of the cranium from which to sort population groups.

The purpose of this study was to assess variation in mid-facial shape, namely nasal bone structure, interorbital breadth and nasal shape, among black and white South Africans using Elliptical Fourier Analysis, Discriminant Function Analysis (DFA) and Geometric Morphometrics (GM).

The mid-facial region of 151 crania of black and white South Africans (75 males; 76 females) from the Pretoria Bone and Raymond A. Dart research collections were photographed in the Frankfort plane, at a distance of 46 cm, using an Olympus 305 digital camera. Standard landmarks, which include subspinale, inferior point of nasal borders,

alare, nasale inferius, dacryon, nasal superius, nasion and glabella, along with three nasal arcs were digitized using a MicroScribe G2. Inter- and intra-observer error was evaluated.

Geometric Morphometric (GM) analyses including Procrustes fit and Elliptical Fourier analysis (EFA) were used to obtain shape variables. These variables as well as linear measures were imported into FORDISC 3.1 for linear discriminant function analysis (DFA). Statistical significance was assessed within and between ancestral groups. Each group was tested for normality and each was proven to be normally distributed. Outliers were identified through box plots. Student's *t*-test between whites and blacks were performed for each measurement and each proved to be statistically significant. A two-way analysis demonstrated 95% correct cross-validated classification. The differences observed between these groups may be used as a tool for estimating ancestry among South Africans.

To approach the evaluation of ancestry from unknown skeletal remains, the relationship between social and biological race has to be examined, understood, and continually evaluated on modern groups. Large databases are needed, and an understanding of the cultural history of the population is crucial for the interpretation of these differences. **Morphometrics, Nasal Aperture, South Africans**