A54 An Assessment of Ancestry and Sex Estimation Using FORDISC® 3.1

John Albanese, University of Windsor, Dept of Sociology, Anthropology and Criminology, 401 Sunset Avenue, Windsor, ON N9B 3P4, CANADA; Abegail Dagdag, University of Windsor, Dept of Sociology, Anthropology and Criminology, 401 Sunset Avenue, Windsor, ON N9B 3P4, CANADA; Carmen Skalic, BA, University of Windsor, Dept of Sociology, Anthropology and Criminology, 401 Sunset Avenue, Windsor, ON N9B 3P4, CANADA; and Hugo Cardoso, PhD, Simon Fraser University, Dept of Archaeology, 8888 University Drive, Burnaby, BC V5A 1S6, CANADA*

After attending this presentation, attendees will better understand the problems with estimating ancestry from skeletal remains and the problems resulting from the approach of linking sex estimation to ancestry estimation.

This presentation will impact the forensic science community by discussing: (1) how cranial measurements are used to illustrate problems with ancestry estimation methods; (2) how a change in terminology from race to ancestry has not solved any underlying problems with the methods; and, (3) how linking sex to ancestry severely compromises the accuracy of sex estimation.[1]

Thomas and colleagues found an "accuracy rate" of 90.9% for ancestry estimation for a sample derived from an historical review of Federal Bureau of Investigation (FBI) records.[2] One of their goals with the historical review was to assess how various methods have provided information that was potentially useful in a forensic investigation; however, as they noted, methodological issues with how they included/excluded cases for analysis (n=99) have likely resulted in the inflation of the true allocation accuracy. In the research presented here, an experimental approach was pursued using FORDISC® 3.1 to provide a better estimate of expected allocation accuracy. A realistic scenario was created for the Detroit-Windsor boarder area to address one question: How often would FORDISC® provide estimates of ancestry and sex that would be useful in a forensic investigation?

Nine standard cranial measurements that are resistant to taphonomic changes were used from a test sample of 105 documented cases from the Terry and Coimbra Collections that reflect the demographic composition of the region and potentially real forensics cases: Western European-born individuals, European Americans, and African Americans. One additional provenienced (Late Archaic) First Nations (Amerindian) cranium from this region was also assessed. Cases were selected by one researcher and analyzed blind by another. The estimated ancestry matched pre-mortem records only 48% of the time and sex was estimated correctly 75% of the time; however, FORDISC® 3.1 does not allow for the separation of ancestry from sex estimation and the software provided correct estimates of sex and ancestry in only 39% of the cases. Thus, in 61% of the cases, FORDISC® provided erroneous information that would have compromised efforts for identification. Furthermore, a well-known problem with discriminant function analysis, the statistical approach used by FORDISC® and other methods, is that it will force an allocation into one of the selected groups even if the unknown is not a member of any of those groups. Posterior and typicality probabilities are intended to deal with this lack of "none of the above" problem by flagging these cases with probability scores of less than 0.05. The results from this research indicated that in most of the erroneous cases, the variously calculated probabilities failed to flag these cases and instead suggested confidence in the erroneous allocations. For example, the 4,000-year-old Late Archaic cranium was classified as "Black Male" with a posterior probability of 0.314, and three variously calculated typicality probabilities ranging from 0.960 to 0.963.

The results from this research indicate that renaming of race as ancestry methods does not solve any problems with these methods and linking sex estimation to ancestry undermines sex estimation.

Reference(s):

1. Albanese J., Saunders S.R. Is it Possible to Escape Racial Typology in Forensic Identification? In: Schmitt A., Cunha E., Pinheiro J. (eds). *Forensic Anthropology and Medicine: Complementary Sciences From Recovery to Cause of Death*. Totowa, NJ: Humana Press. 2006, p 281-315.
2. Thomas R.M., Parks C.L., Richard A.H. Accuracy Rates of Ancestry Estimation by Forensic Anthropologists Using Identified Forensic Cases. *J Forensic Sci*. 2017; 62:971-974.

Biological Profile, Ancestry Estimation, Sex Estimation