H34 Nonmetric Trait Frequencies and the Attribution of Ancestry

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After attending this presentation, attendees will understand the value of nonmetric trait frequencies in attributing ancestral group to human skeletal remains.

Forensic anthropologists and other scientists will realize the complexity of using nonmetric traits to attribute ancestry.

A study was performed to explore the possibility of attributing ancestry to human skeletal remains from nonmetric trait frequencies. Since the attribution of ancestral group (e.g., race) is one of the four major demographic characteristics used by law enforcement agencies to begin the process of matching skeletal remains to missing persons files, any method that aids in the correct determination of this trait is of no small importance to forensic anthropologists.

Published statistics of ancestral groups in the United States (e.g., White, Black, Asian, American Indian, and Hispanic) were gathered both from the general population and from population subgroups (e.g., state, local statistics) as well as from US crime statistics. Also, the frequency of nonmetric traits of the teeth (e.g., shovel-shaped incisors, Bushman canine), skull (e.g., os japonium, Inca bones), and postcranium in these groups also were gathered. Using simple mathematical (e.g., combinatorics) and statistical techniques (e.g., Bayes' Theorem), these data were analyzed several different ways to determine their value in attributing ancestry. First, the occurrence of a trait was used to compute the probabilities of ancestral grouping using raw frequencies of individual characteristics. Next, these frequencies were combined to determine the value of the occurrence of multiple traits to attribute ancestral group; at this stage, methods were used to combine these traits assuming both independence and dependence of trait occurrence (e.g., the probability of shovel-shaped incisors and incisor winging). Finally, these data were entered into Bayes' Theorem to estimate ancestry from the occurrence of a trait or suite of traits given the breakdown of ancestral groups both in the general population and within smaller demographic areas (e.g., state, county) as well as statistics on deaths due to murder, suicide, and accident.

Some surprising, and even unlikely, results were obtained. For example, although shovel-shaped incisors are much more common in people of Asian ancestry (including Native American) than those descended from native people of Europe and Africa, the occurrence of this trait in a skeleton gives only a probability of p=.345 that the person was of Asian ancestry. This is due to the small portion of people in this group (approximately 4.5%) in the general US population. The probability of White ancestry with the occurrence of this trait is approximately p=.526 while it is p=.129 for Black ancestry. This result is surprising considering the weight given by forensic anthropologists to the appearance of such features. With this and similar findings in mind, a number of questions emerge from this study. First, how accurate are the published frequencies of these traits? (Hrdlicka reported a frequency of 8.8% for U.S. Whites with shovel-shaped incisors.) Second, how representative of the general population of the United States are these frequencies? Third, should the frequencies in the general population be used in these calculations or are local and even death statistics (particularly, criminal deaths) more appropriate? Given the complexity of this situation, it appears that considerable judgment must be used when employing nonmetric traits in the attribution of ancestry.

Nonmetric Traits, Ancestry, Bayes' Theorem

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