H15 A Bayesian Approach to Calculating Age Using Pubic Symphyseal Data

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The learning objectives of this presentation are as follows. First, to understand how the ages of victims are used in the investigative and evidentiary processes of criminal proceedings. Second, to determine whether population-specific aging criteria are needed for the Balkans. Third, to demonstrate how a Bayesian approach to the construction of age profiles for unidentified victims produces the most accurate and precise age ranges possible, thereby meeting the criteria of *Daubert v. Merrell Dow Pharmaceuticals*, 509 US 579 (1993) for the presentation of scientific evidence in court.

This study makes an important impact both on the field of forensic science and on humanity by providing new aging criteria for the Balkans that meets requirements for the presentation of scientific evidence in court; by establishing criteria that are the most reliable thereby ensuring the best chances for positive identifications to be made for victims; by providing insight into long-standing paleodemographic questions about population variation in aging; and by contributing to our understanding of the effects of individual inter-observer variation in the formulation of new methodology and successful identification.

The ages of victims plays an important role in determining the minimum number of individuals recovered from a mass grave, in individual identification, and in constructing the demographic profile of victims. The demographic profile of victims is one of the central issues in the prosecution of individuals indicted by International Criminal Tribunal for the Former Yugoslavia. The case of The Prosecutor of the Tribunal against Radislav Krstic (Case No. IT-98-33) was a landmark case because it was the first conviction of genocide in Europe and relied on forensic evidence. It was also a precedent setting case for forensic anthropology in that the methods used to construct demographic profiles of victims based on American and Balkan reference samples were questioned in court. The defense team questioned the anthropological expert witness as to why American (Katz and Suchey 1986) and Balkan (Simmons et al., 1999) aging methods differed and which were the most reliable for use in the former Yugoslavia.

The purpose of this study was to determine whether a Bayesian analysis using an informative prior for the age-at-death profile derived from a large non-Bosnian reference sample could produce the most accurate ages for unidentified victims from the Balkans. A reference sample of identified genocide victims from Kosovo, Bosnia, and Croatia (n=876) was used to determine the age structure of genocide victims. The pubic symphyses were scored in the manner of Suchey-Brooks for a subset of the Balkan sample (n=298), as well as, from various American anatomical reference collections (n=1517). The GompertzMakeham hazard model was used to calculate the informative prior for age. The informative prior was combined with the likelihood of being a particular age conditional on a given pubic symphyseal phase that then was compared to the empirical survivorship model by phase. We found that the survivorship model accurately predicts age for each pubic symphyseal phase, indicating the problem with the current methodologies is based on statistical methodology, not biological variation in the aging processes of American and Balkan populations. A revised calibration of pubic symphyseal methodology using a Bayesian approach does provide the most precise and accurate age ranges possible. Finally, four observers scored each pubic symphysis for the Balkan sample independently to determine the effect of inter-observer variation. Correlations among the four observers varied for both pubic symphysis-scoring systems. Correlations for the Todd system ranged from .80-.92 among females (n=83) and .24-.66 among males (n=108). Correlations among observers for the Suchey-Brooks system ranged from .77-.95 among females and .63-.85 among males.

Katz D, Suchey J. Age determination of the male os pubis. Amer J Physical Anthrop 1986;80:167-172.

Simmons T, Tuco V, Kesetovic R, Cihlarz Z. Evaluating age estimation in a Bosnian forensic population: Age-at-Stage vs Probit Analysis.

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Bayesian Analysis, Aging Methods, Inter-Observer Variation

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