



Physical Anthropology Section – 2008

H87 A Test of an Age-at-Death Method Using the First Rib

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Attendees of the presentation will understand that the first rib has potential as an additional tool in the age-at-death toolkit available to anthropologists.

This presentation will impact the forensic community by demonstrating that forensic anthropologists working domestically and on human rights issues in locations outside of the United States can improve their efforts by refining methods used to estimate age-at-death. Results from this research indicate that the first rib can be used to estimate age-at-death as an isolated element or as a component in a multifactorial approach.

The purpose of this study was to determine whether a method developed by DiGangi *et al.*^[1] for estimating age-at-death from the first rib is an effective age-at-death method. The method was based on a revision of Kunos *et al.*^[2] and originally was developed using a Balkan population as the reference population. There are a number of issues involved with applying age-at-death methodologies developed using one reference population to another population of differing ethnic background and age structure.^[3] Among these is the concern that different populations age at slightly different rates and in different ways, and that this leads to the possibility of bias when applying age-at-death methods to populations on which the method was not developed.^[3] These questions become especially critical when accurately aging a skeleton has medico-legal significance, whether it is small-scale, as with an isolated forensic case, or large-scale, as with human rights investigations. Numerous researchers have reported on the significance of developing population-specific standards in human rights contexts (e.g.,^[4], among others). These anthropologists have demonstrated that identification in human rights cases is improved when localized standards are developed.

While the fourth rib has been used for some time in age-at-death estimation, Kunos and coworkers^[2] indicate several limitations with the element. Oftentimes, the fourth rib is misidentified in unarticulated skeletons or damage to the sternal aspect precludes its use as an age indicator. Moreover, Kunos *et al.* indicate methods that rely solely on morphological changes of the costal face do not utilize other aspects of the rib that change throughout life, particularly the head and tubercle. These authors argue that the first rib is unambiguously identifiable in addition to its prolonged span of remodeling into the eighth decade and beyond. In addition, the fact that this method incorporates only two observations should make it simpler to learn and apply than other available methodologies that incorporate multiple observations.

In order to determine if the first rib aging method developed using a Balkan reference population could be effectively used as an age-at-death method in the United States, the first ribs from known-aged males from the William M. Bass Donated Skeletal Collection were scored using the technique developed by DiGangi *et al.* Specifically, texture of both the rib head and tubercle facet were scored categorically. Categorical scores were then transformed to age-at-death estimates in the manner of DiGangi *et al.*

A total of 114 individuals were scored, including right and left sides, when available. Ages at death for the test sample ranged from 19 to 96 years for males (with a mean age of 57.7 years). In addition, both authors scored 50 individuals for the purpose of inter-observer testing. The correlation between best age and real age was tested for both left and right sides. Correlation coefficients were .490 and .687, respectively. Such results indicate while asymmetry is present between sides, the method developed by DiGangi and colleagues does capture age-related change. Moreover, 56% of the target sample was accurately aged within ± 10 years of real age. These results indicate that the method developed DiGangi *et al.* can help with age at death estimation in forensic contexts and can be incorporated into multifactorial age-at-death assessment.

References:

- 1 DiGangi EA, Bethard JD, Kimmerle E, Konigsberg LW. A New Method for Estimating Age-at-Death from the First Rib. Paper presented at 57th annual American Academy of Forensic Sciences Meeting, 2005.
- 2 Kunos CA, Simpson SW, Russell KF, Hershkovitz I. First rib metamorphosis: its possible utility for human age-at-death estimation. *AJPA* 1999; 110:303-323.
- 3 Schmitt A. Age at death assessment using the os pubis and the auricular surface of the ilium: a test on an identified Asian sample. *Int J Osteoarcheol* 2004; 14:1-6.
- 4 Jantz RL, Kimmerle E. Variation in Size and Dimorphism in Eastern European Femora. Paper presented at 56th Annual American Academy of Forensic Sciences Meeting, 2004.

Forensic Anthropology, Age-at-Death, First Rib