Age distribution of deaths and average age at death among adult skeletons from Copan, Honduras: a comparison of methods using the auricular surface of the pelvis.

ABSTRACT

An important problem for paleodemography is determining a reasonable estimation of the age-distribution of deaths in the population. However, it is clear that present methods for skeletal aging of adults over 30 years old at death are problematic. Various methods have been suggested to improve age estimations. Several Bayesian methods and seriation from youngest to oldest are compared, using age-related changes in the auricular surface of the pelvis. A Precolumbian Maya skeletal population of adults from Copan, Honduras, was employed for this test. These skeletons were expected, based on archaeological context, to proceed from a population in decline, and all methods do reveal an older adult population (mean age > 40), as would be expected from fertility effects upon age at death distributions. However, as usual, "the devil is in the details," and the implications of the similarities and differences for paleodemographic inference among the methods will be discussed.

EXTENDED ABSTRACT

For paleodemography, the age distribution of deaths of a skeletal population is potentially one of the useful demographic information available about past populations. However, it has also been obvious to researchers that one of the most important problems that must be solved to allow valid investigation of the past is determining with some accuracy this age distributions of deaths. Skeletons can be aged fairly accurately, with well-defined estimates of error, as juveniles and young adults younger than 30 (Cox 2001). Beyond 30 years at death, however, present methods tend to overage and then underage dramatically older individuals (Molleson and Cox 1993). There is also the problem that age distributions for skeletons tend to mimic the underlying age distribution of reference populations (Bocquet-Appel and Masset 1982), and one is not even going to worry about whether contemporary populations are good models for aging individuals from very different environments and lives, as that one is not possible of a realistic answer at this point. The result is that most paleodemography has resulted in past populations that are probably aged too young, with too low proportion of individuals over 50 years of age at death. While various suggestions have been made about dealing with this problem, one that is gaining popularity is to use Bayesian methods comparing age-related morphological stages of an indicator from a reference population to those of a skeletal sample (Ackroyd et al. 1999). The pubic symphysis has been forwarded as providing such an indicator (Chamberlain 2001). While a Bayesian method does not necessarily mitigate the problem of mimicry of the reference population, perhaps of more import is that the pubic symphysis is likely a poor indicator of advanced adult age (Lovejoy et al. 1997), and thus, its use only exacerbates the underlying problem of drastic underaging, and thus underestimation of the proportion, of old adults. The auricular surface of the pelvis has always promised to provide a better method for estimating adult age, because it

appears to track age changes into old age, and because it tends to be better preserved in most archaeological collections.

The original description of the aging method for the auricular surface (Lovejoy et al. 1985) relied on an overall age designation based on several separate characteristics that change with age. It is, however, usually forgotten, that before assigning an age, it was to be refined through the use of seriation, an ordering of all individuals in a skeletal sample available from youngest to oldest. Thus, an age estimation reflected also the place of an individual within its sample. Researchers have found this original method and its age stages hard to apply and to apply consistently. A recent article (Buckberry and Chamberlain 2002) proposed a revised method that turns the various characteristics into morphological stages, which are then combined into a composite score for seven stages. These seven stages can then be used easily with a Bayesian method with a variety of prior age probabilities to determine posterior probabilities of age. At this point, all suggested methods result in wide age estimates, especially the older the actual age of an individual at death, and that reflects the poor state of our knowledge of the processes of aging as they relate to our modern counting of birthdays.

While solving the overall problem of estimating skeletal adult ages over the age of 30 at death cannot certainly be done here, it is possible to investigate exactly what kind of age distribution of deaths do result when various techniques are applied to the auricular surfaces of the adults of a skeletal population, in this case, from the Precolumbian Maya of Copan, Honduras. As taught by the Lovejoy and Meindl, these auricular surfaces were seriated from youngest to oldest, most of them more than once. Buckberry and Chamberlain's (2002) composite scoring method was also recently applied to these surfaces. I will compare two seriation estimations with those obtained by using the composite score method with the priors suggested by the Spitalfields collection used by Buckberry and Chamberlain (2002), with uniform priors as most recently suggested by Chamberlain 2000 and earlier suggested by J-P Bocquet-Appel), and with priors derived from a reasonable model life table (suggested by Chamberlain 2001). The similarities and differences among the different resulting age distributions are instructive. Even though the underlying true age distribution for the adults is unknown, archaeological context suggests a population undergoing decline and soon to collapse. Thus, if the underlying fertility of the living population is a main determinant of the resulting age distribution of death of the skeletons, one should expect an older population. That, at least, is exactly what the seriation technique has always revealed. The question to be asked is what more is possible or legitimate to conclude?

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