

A TEST OF UBELAKER'S METHOD OF ESTIMATING SUBADULT AGE FROM THE DENTITION

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In forensic anthropology and dentistry, the age at death of an unknown individual must sometimes be estimated from the teeth. Various charts are utilized to age subadult human remains by comparing the teeth present with the standardized pictures to obtain a target age estimate. The two main charts used today were published by Schour and Massler (1944) and Ubelaker (1978; 1989). Each of these charts includes pictures of the teeth at different ages and are very similar in their illustrations, primarily because the latter is derived from the former.

The purpose of this study is to determine whether Schour and Massler's and Ubelaker's charts are appropriate for estimating the ages of modern children, to ascertain which one is more accurate, and to see if their target age and associated error ranges are still applicable. Since these charts are used regularly by osteologists, it seems appropriate to subject them to rigorous testing with a known-age sample. Unfortunately, no such tests have been conducted, so the present study fills a void in the literature. In addition, with the increased use of DNA techniques, it has become easier to determine sex from subadult remains. Therefore, it may no longer be justified to combine males and females if indeed there are significant sex differences in dental development. Failure to separate the sexes would result in greater aging errors for both. Thus, a secondary purpose of this study is to determine if dividing the sample by sex would increase the overall accuracy of the charts.

The study sample is composed of 419 modern European American children aged 5-15 years. These children were randomly selected and approximately equal numbers of males and females were chosen for each year of age. Panoramic radiographs were examined to assign a stage of formation and eruption to the teeth as a whole. The target age given by each chart for a particular dental stage became the predicted age for each child, which was then compared with the known chronological age.

Various summary statistics were calculated for each chart, including mean age and observed age range per stage. Measures of mean error (bias and inaccuracy) were calculated for each stage and for each chart as a whole. The percentage of individuals correctly falling within the predicted ± 2 standard deviation interval for each stage was also calculated. The data were then evaluated for sex differences using t-tests and analysis of covariance (ANCOVA). New target ages and 95% prediction intervals were calculated for each stage for each chart.

This study found that Schour and Massler's and Ubelaker's charts are equally effective at determining age when the new target ages and associated error ranges are applied. Mean ages per stage are about half a year higher than the whole years provided on both charts, meaning that the charts tend to underestimate age at death. Ubelaker's chart is slightly better with respect to the robusticity of its error ranges, but Schour and Massler's chart has slightly lower inaccuracy and bias values. Not

surprisingly, the narrow error ranges originally provided by Schour and Massler do not work. Additionally, there are small but significant sex differences in age for some of the later dental stages, which can affect the overall accuracy of age estimation.

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