

#### **4. Dental calcification stages of the permanent M1 and M2 in U.S. children of African-American and European-American ancestry born in the 1990s**

**J. MONGE**

*Department of Anthropology  
Museum of Anthropology and Archaeology  
University of Pennsylvania  
Philadelphia, PA 19104  
jmonge@sas.upenn.edu*

**A. MANN**

*Department of Anthropology  
Princeton University  
Princeton, New Jersey 08544  
mann@Princeton.edu*

**A. STOUT**

*Temple University School of Dentistry  
3223 North Broad Street  
Philadelphia, PA 19140  
angela.stout@temple.edu*

**J. ROGÉR**

*Marquette University School of Dentistry  
P.O. Box 1881  
Milwaukee, WI 53201  
james.roger@mu.edu*

**R. WADENYA**

*University of Pennsylvania School  
of Dental Medicine  
240 South 40th Street  
Philadelphia, PA 19104  
wadenya@dolphin.upenn.edu*

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## Abstract

Reported here are the preliminary results of an ongoing study undertaken to determine if there are significant changes from the results obtained in the middle of the 20th Century in the range of variation in dental development in American children of European and African ancestry. Several thousand orthopantomographic radiographs, available from the Dental Clinics of Temple University and the University of Pennsylvania, in Philadelphia, Pennsylvania will eventually be incorporated into this study. The 170 radiographs that have thus far been analyzed document significant changes in the maturation and development of the first and second permanent lower molars. Children in this study have dentitions that are maturing earlier than those in the samples published by Moorrees et al. (1963) and Demirjian et al. (1973). If the results of this preliminary analysis are confirmed by the incorporation of additional teeth and a larger sample of children, as has been reported elsewhere, it will be necessary to reconsider the characterization of dental development in living humans. Confirmation would also require re-evaluation of the range of inherent plasticity in human dental development. These preliminary results, along with the work by Zihlman et al. (2004), suggest that current concepts of what constitutes "normal" dental development in living humans and chimpanzees may have to be reconsidered; there are also marked implications for the way in which the developing dentition in fossil hominins is characterized.

## Introduction

This research began in 2002 when dentists at two independent clinical pediatric practices (Temple University and the University of Pennsylvania, Philadelphia, Pennsylvania) remarked that it was difficult if not impossible to use the staging patterns of teeth traditionally reproduced in countless dental reference volumes used in US dental schools. The children in their practices were developing their teeth at significantly younger ages (e.g., Nadler, 1998). Considering the paucity of available data on dental development in US children in the late 20th and early 21st Centuries, the need for a critical evaluation of the efficacy of these standards to the dental growth patterns in the current cohort of children in the United States was apparent. This same question has been addressed by Rousset et al. (2003) and applied to clinical practice in France.

As evidence has accumulated over the past 35 years, it has become increasingly clear that different populations appear to follow different trajectories in the formation and eruption/emergence of individual teeth (Loevy, 1983; Harris and McKee, 1990; Simpson and Kunos 1998; Liversidge et al., 1999; Rousset et al., 2003). Further, data is now available for quantitative analysis

of this trend; this results from the now routine procedure for youngsters entering private and public dental clinics to undergo orthopantomographic radiographs, both at the initiation of dental evaluation and at various milestones through the course of dental care. In concert with our clinical colleagues, we have begun to examine and analyze these radiographic materials. This preliminary report details the analysis of 170 American children, 105 of European-ancestry and 65 of African ancestry. The data presented here are cross-sectional and limited to the examination of the first and second lower permanent molars; it is expected that along with the information from a larger sample of children and from other teeth, this data set will be augmented with at least one additional panoramic radiograph as these children continue their dental care.

From an evolutionary perspective, it is of importance to document the range of human variation in the formation and emergence of the dentition. Although in comparison to other maturational events leading to adulthood [e.g., age of menarche (Herman-Giddens et al., 2004), various determinants of skeletal maturation (Eveleth and Tanner, 1990)], the dentition may be one of the least environmentally sensitive developmental complexes, they are subject to environmental influences