



G45 Dental Age Estimation: The 18-Year Threshold — A Source of Error Explored

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The goal of this presentation is to demonstrate how the use of simple probability without age stratification can lead to errors in age assignment at the 18-year threshold. Attendees will learn that a subject in the 17.00 to 18.99 age bracket will as likely be assigned an age *under 18* as to be assigned an age *over 18*. A method for overcoming this difficulty will be explored.

This presentation will impact the forensic science community by explaining the rationale for this cause for concern and, with audience participation, by exploring a way of overcoming this rationale.

Introduction: Since the publication of the probability thresholds in the study of third molar development the process of age assessment for emerging adults has been greatly simplified.¹ This seminal paper did not fully take into account the phenomenon of “censoring” the Age at Attainment (AaA) of Stage H.² This has resulted in datasets for Stage H being top heavy. The consequence is that the mean AaA is erroneously elevated. This results in age assignments that are too harsh on subjects in the 17.500 to 18.499 age range. Hence children are unfairly assigned adult status.

Materials and Methods: The DARLInG data base comprising 2,986 UK Caucasian cases was used as the Reference Data Set. The validation set for this study comprised a balanced sample of Dental Panoramic Tomographs (DPTs) of 1,000 females and 1,000 males in the 16.00 to 25.99 age range. For each six month age span a convenience sample of 50 females and 50 males at each six month age interval were examined. These were derived from the radiographic archives of Guy's and St Thomas' National Health Service Trust. Only Dental Panoramic Tomographs with at least one third molar were used.

The stage of development is defined using the anatomical descriptions from 1973.³

The estimated age was compared to the chronological age and the accuracy of the age assignment designated as correct or incorrect to give simple counts. These simple counts were then used to calculate the probability of a subject of unknown age being correctly assigned to childhood or adulthood.

Results:

Age Band	<18 Correct		<18 Incorrect		>18 Correct		>18 Incorrect	
	n	%age	N	%age	n	%age	N	%age
17.5 to 17.99 f	35	70%	15	30%				
17.5 to 17.99 m	41	82%	9	18%				
18.00 to 18.499 f					24	48%	26	52%
18.00 to 18.499 m					25	50%	25	50%

Conclusion: There is a 50% risk (0.5 probability) that a child will be assigned adult status. This, ethically is unacceptable.

References:

1. Mincer HH, Harris EH, Berryman HE, The ABFO study of third molar development and its use as an estimator of chronological age. *J For Sci.* 1993; 38(2): 379-390.
2. Boonpitaksathit T, Hunt N, Roberts GJ, Petrie A, Lucas VS. Dental age assessment of adolescents and emerging adults in UK Caucasians using censored data for stage H of third molar roots. *European Journal of Orthodontics.* 2011; 33(5): 503 – 508.
3. Demirjian A, Goldstein H, Tanner JM. A New System of Dental Age Assessment. *Human Biology.* 1973; 45(2): 211-227

Stage H Errors, Age at Attainment (AaA), Probability Values at 18