



## G21 The Dental Age Research London Information Group (DARLInG) Development of a Database of Dental and Related Data to Enable Logical Dental Age Estimation (DAE)

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**Learning Overview:** After attending this presentation, attendees will understand the techniques involved in developing a database for dental age estimation, and the advantages of the referential integrity a database confers by ensuring robust data output to Microsoft® Excel® and Stata statistical software. Attendees will see that the integration of the DARLInG database output with Draft Age Estimation Quick Sheets™ completes a program of innovative database and spreadsheet work that enables quick and reliable estimates of age in children, adolescents, and young adults.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community through the combination of the DARLInG database and the Draft Age Estimation Quicksheets™ to achieve rapid dental age estimation based on a dental panoramic tomograph.

**Introduction:** Data processing of Ages at Assessment (AaA) of Tooth Development Stages (TDS) becomes unwieldy when several thousand cases are included in the Reference Data Set (RDS). This is the main difficulty limiting numerical data management to Microsoft® Excel®. The Microsoft® Access® database overcomes this problem by enabling the use of specially fabricated forms that enables data entry in a convenient way. There are four components to the Microsoft® Access® database.

**Access Tables:** These form the principal component of the data management process. A single table for personal data is defined within the DARLInG database. This uniquely identifies every subject from whom data are derived. A feature of the database is that all the data are cross-sectional. Thus, bias from canalization does not enter the processing of dental age estimation assessments.<sup>1</sup>

The individual fields for data are defined within the table. This is important as once the data are exported for statistical analysis, the field definition is exported with it. The consequence of this is that a categorical field that defines gender must be created with this in mind, so when exported to a statistical software package, the definition of female or male is immediately apparent. Similarly, with data for ages or measurements, the fields are defined as numerical values so that statistical computations can be carried out appropriately.

Crucial to the importance of the Tables is the use of a Primary Key. In the DARLInG database, this is the field that enables the data from subjects to be uniquely and precisely linked. The field name used is "idno" (Identity Number). When data for a new subject is entered, the Primary Key definition generates a random number from -1,00,000,000 to +1,000,000,000. This ensures that the idno cannot be duplicated and is irrevocably linked to all the data for a single case. This is the principle of Referential Integrity.

**Access Forms:** These are created using the data fields present in the tables related to the database. The use of forms enables the 128 fields from the Demirjian TDS to be presented as a box matrix on one single computer screen. Thus, accurate and quick data entry are possible.

**Access Queries:** This is held in the databases and is extracted to enable meaningful data sets to be created. For example, the gender and age of a subject from one table, TDS from a separate table, and perhaps Stages of Development of the wrist bones from a third table. All of these are tightly linked by the idno, which is the primary key.

**Access Reports:** Data selected from the database are presented in an easily comprehended form. The DARLInG database does not use Reports, as the queries are exported to Microsoft® Excel® because the exported data is linked into Draft Age Estimation Quick Sheets™.

This serendipitous collaboration means that the two software-developed procedures can be used to provide immediate and reliable estimates of dental age.

To date, there are 15,411 cases in the DARLInG database utilizing information from data on Demirjian, Haavikko, and Moorrees TDS, Cervico Vertebral Maturation, root canal width, root pulp visibility, and periodontal ligament visibility, and data from hand wrist X-rays, sterno-clavicular joint radiographs, and measurements from cone beam computed tomographs.

There are Demirjian TDS data from five different ancestral groups.<sup>2</sup> This enables comparison of DAE assessments using *exactly* the same methodology.

### Reference(s):

<sup>1</sup>. Cameron N. Human Growth and Development. 2002 Academic Press. Pages 15 to 17. London. ISBN 0-12-156651-X

<sup>2</sup>. <http://www.dentalage.co.uk/+R> (to access Reference Data Sets)

### DARLInG, DAE Database, Dental Age Estimation