Journal Pre-proof

Age estimation in the living: a scoping review of population data for skeletal and dental methods

Marco Cummaudo (Writing - original draft) (Investigation) (Visualization), Danilo De Angelis (Writing - review and editing), Francesca Magli (Investigation), Giulia Minà (Visualization), Vera Merelli (Investigation), Cristina Cattaneo (Supervision) (Project administration)

PII: S0379-0738(21)00009-8

DOI: https://doi.org/10.1016/j.forsciint.2021.110689

Reference: FSI 110689

To appear in: *Forensic Science International*

Accepted Date: 11 January 2021

Please cite this article as: Cummaudo M, De Angelis D, Magli F, Minà G, Merelli V, Cattaneo C, Age estimation in the living: a scoping review of population data for skeletal and dental methods, *Forensic Science International* (2021), doi: https://doi.org/10.1016/j.forsciint.2021.110689

Age estimation in the living: a scoping review of population data for skeletal and dental methods

Marco Cummaudo[* 1,2], Danilo De Angelis[1,2], Francesca Magli[1,2], Giulia Minà[1], Vera Merelli[1,2], Cristina Cattaneo[1,2]

[*]Corresponding author, marco.cummaudo@gmail.com

Affiliations: [1] LABANOF, Laboratorio di Antropologia e Odontologia Forense, Dipartimento di Scienze Biomediche per la Salute, Università degli Studi di Milano - Milan, Italy

[2] Centro Servizi MSNA Zendrini, via Bernardino Zendrini, 15 - 20147, Milano

Corresponding author: Marco Cummaudo - LABANOF (Laboratorio di Antropologia e Odontologia Forense) Dipartimento di Scienze Biomediche per la Salute, Via Mangiagalli n.37, 20133 University of Milan, Italy.

Phone number: +393408009986; email address: marco.cummaudo@gmail.com

ORCID ID: 0000-0002-1173-9041

Highlights

- Methods for age estimation in the living should be tested on different populations
- A scoping review on population data for age estimation methods was conducted
- Two hundred studies on the rate of skeletal maturation were found
- Four hundred thirty-nine studies on the rate of dental maturation were found
- For most of western and central African countries there are currently no population data

Abstract

Age estimation of living individuals has become a crucial part of the forensic practice, especially due to the global increase in cross-border migration. The low rate of birth registration in many countries, hence of identification documents of migrants, especially in Africa and Asia, highlights the importance of reliable methods for age estimation of living individuals. Despite the fact that a number of skeletal and dental methods for age estimation have been developed, their main limitation is that they are based on specific reference samples and there is still no consensus among researchers on whether these methods can be applied to all populations. Though this issue remains still unsolved, population information at a glance could be useful for forensic practitioners dealing with such issues.

This study aims at presenting a scoping review and mapping of the current situation concerning population data for skeletal (hand-wrist and clavicle) and dental methods (teeth eruption and third molar formation) for age estimation in the living.

Two hundred studies on the rate of skeletal maturation and four hundred thirty-nine on the rate of dental maturation were found, covering the period from 1952 and 2020 for a total of ninety-eight countries.

For most of the western and central African countries there are currently no data on the rate of skeletal and dental maturation. The same applies to the countries of the Middle East, as well as the eastern European countries, especially as regard the skeletal development.

Keywords: age estimation; living individuals; population data; skeletal maturation; dental eruption; clavicle ossification

Introduction

In recent decades, age estimation of living individuals has become a crucial part of the forensic practice, especially due to the global increase in cross-border migration. Moreover, age estimation is increasingly requested by judicial authorities for establishing imputability, as well as by the Juvenile Court if the age of adopted minors is not ascertained [1]. In many countries, in fact, the date of birth is still not routinely recorded.

A report [2] by the ©United Nations Children's Fund (UNICEF) highlighted how in 2012 across the world there were approximately 230 million children under five whose birth had not been recorded.

In 2017, in sub-Saharan Africa, the births of around 95 million children have never been recorded [3]. The countries with the lowest rate of birth registration are: Somalia (3%), Liberia (4%), Ethiopia (7%), Zambia (14%), Chad (16%), United Republic of Tanzania (16%), Yemen (17%), Guinea-Bissau (24%), Pakistan (24%) and Democratic Republic of the Congo (28%). However, India had the highest number of children under five whose birth had not been registered (71 million), followed by Nigeria (17 million), Pakistan (16 million), Ethiopia (13 million) and Bangladesh (10 million). Moreover, even registered children may have no proof of registration. Indeed, in Eastern and Southern Africa approximately 50% of the registered children does not possess a birth certificate [2]. Furthermore, existing documents are often lost during migration. These data stress the importance of age estimation in the living and the need for reliable methods.

In 2008, the *Study Group on Forensic Age Diagnostic* (AGFAD) provided updated recommendations for age estimation in the living [4], with a three-step procedure consisting in a physical examination (anthropometric data, assessment of sexual maturation and identification of potential age-relevant developmental disorders), an assessment of the dental status along with X-ray examinations of the dentition and of the left hand. If the bones of the hand and wrist have completed their development, clavicle sternal end radiographic examination should be carried out.

Despite a number of skeletal [5-34] and dental methods [35-70] for age estimation have been developed, their main limitation is that they are based on specific reference samples and there is still no consensus among researchers on whether these methods can be applied to all populations.

Some authors, such as Zhang and colleagues [71] argue that ethnic variability in skeletal growth pattern exist at certain ages, whereas others [72-73] ascribe the differences betweeen the rates of development to the socio-economic level of the individuals rather than their ethnicity. With regard to dental development, the effects of ethnicity on teeth eruption is still poorly understood. Liversidge [74] found similarity in dental maturation in White and Bangladeshi children in London, whereas the maturation of mandibular third molar occurred earlier in South African black children [50]. Olze and colleagues [68] examined wisdom tooth eruption in German, Japanese and black South African populations and found significant population differences. Wisdom tooth emergence occurred at earlier ages in the South African population and at later ages in the Japanese population, with Germans ranked in the middle. However, whatever the reasons behind these differences, each method commonly used for age estimation should be tested on different populations in order to guarantee its reliability in the forensic context: first of all, even if, in the end, ethnicity were not to have such a large weight on age assessment, this statement is better supported if backed up by population studies; secondly, in many parts of Europe, lawyers, prosecutors and judges frequently ask specifically

whether ethnicity may have an effect on age determination, and a more thorough answer can be given if methods have been tested on specific populations of interest.

This study aims at presenting a scoping review and mapping of the current situation concerning population data for skeletal (hand-wrist and clavicle) and dental methods (teeth eruption and third molar formation) for age estimation in the living. It does not have the ambition of providing proof or not of whether there are significant differences among populations, and where they are, but it has as its main goal to provide a tool for forensic practioners concerning which populations in the world have been assessed by the more common methods, a task, to our knowledge, never attempted previously.

Methods

Publications were collected from three electronic databases: PubMed, Scopus and Database of Open Access Journals. The search strategy had no restrictions of date or language and included MeSH terms and keywords related to age estimation, skeletal and dental development. Concerning the inclusion criterion, any study regarding the hand and wrist or dental development, or related to the ossification of the medial end of the clavicle was taken into consideration. Keywords were used with Boolean operators (AND, OR) to combine searches. All eligible studies published before March 1st, 2020 were collected. For each article, the reference list was manually checked in order to identify any additional relevant paper which may have not been found in the initial search. In order to standardize data collection, an electronic spreadsheet was created. The following information were collected: sample size, age group, population investigated, method/atlas, author(s) and year of publication.

Population data for skeletal methods

Overall, a total of 200 papers on the rate of skeletal development in different populations were found. Of these, eighty-two relate to the three versions of the method developed by Tanner and Whitehouse (TW, TW2, TW3) [6-8], whereas eighty investigations were performed in different populations to test the radiographic atlas by Greulich and Pyle [5]. Concerning the clavicle, the method developed by Schmeling and colleagues [24] was utilized in twenty-five papers, whereas the method by Kellinghaus and colleagues [28] was tested in ten studies.

Africa

Concerning the African continent, a total of twenty-three papers on skeletal maturation have been found. The majority of them relates to the development of the hand and wrist, whereas data on the ossification of the medial end of the clavicle have been published only for Egypt, Ghana, Kenya and South Africa. However, as shown in Fig. 1, population data are present for only eleven countries out of fifty-four. Except for South Africa, which has ten papers, the remaining countries have one or two studies each (Table 1). There is a lack of population data especially concerning western and southern countries. Indeed, for several African countries with extremely low levels of birth registration, such as Somalia, Nigeria, Liberia, Zambia, Chad [2-3], there are currently no publications on the rates skeletal maturation.

Europe

Although population data exist for the western Europe, there is a lack of data for most of the eastern European countries (Figure 1). However, except for Germany and Italy with fourteen studies each, and Denmark with seven papers, the remaining western European countries showed less than five studies each. Most of the investigations concerning Germany assessed the ossification of the medial end of the clavicle, whereas most of the population data on the other European countries regard the development of the hand and wrist (Table 2).

Asia

With regard to Asia, fifty-eight out of eighty studies on population data regard four countries: China, India, Japan and Turkey (Table 3). Most of the papers focus on the development of hand and wrist; however, nine studies report data regarding the rate of ossification of the medial end of the clavicle. Nonetheless, for many countries, especially those on the Caspian Sea (e.g. Georgia, Kazakhstan, Turkmenistan), there is still no data on skeletal development (Figure 1). Moreover, for Bangladesh,

which is one of the countries of the Asian continent with the lowest level of birth registration [2], there are currently no publications on the rate of skeletal maturation.

America

Aproximately half of the papers on American populations relate to United States (Table 4). There is a lack of population data for most of the Central American countries (except for Mexico, Guatemala and Jamaica), whereas concerning South America, a few papers exist for Brazil, Argentina and Chile (Figure 1). Overall, population data relate almost exclusively to the skeletal development of the hand and wrist.

Oceania

Concerning Oceania, all the available literature regards Australia, whereas no data exist for New Zealand and New Guinea. Most of the studies relate to the development of the hand and wrist, however, two investigations focus on the ossification of the medial end of the clavicle (Table 5).

Population data for dental methods

A total of 439 papers on dental development were found. Of these one hundred and nineteen assessed the time of teeth eruption without following a specific method/atlas, whereas the method developed by Demirjian and colleagues [35] and its following revision by Willems and colleagues [48] were utilized in one hundred and sixty-eight and forty-five studies respectively. The method by Cameriere and colleagues based on the measurement of open apices [52,55-57] was tested in seventy-nine investigations, whereas the methods developed by Kvaal and colleagues [42], Häävikko [39-40], Moorrees and colleagues [38], Nolla [41] and Köhler and colleagues [45], were utilized in twenty-three, sixteen, thirteen, twelve and ten studies respectively. With regard to the study samples, the average of individuals per study is around one thousand on each continent.

Africa

With regard to the African continent, the studies on dental development are more than twice as many as those on skeletal development. However, most of these investigations relate to North, East and South African countries. At present, there is a paucity of data concerning West and Central Africa.

As highlighted in the reports by the ©United Nations Children's Fund [2-3], several African countries have extremely low rates of birth registration. If on the one hand, literature provide population data for Somalia, Zambia, Tanzania and Nigeria (Table 6), on the other hand, there are currently no publications on the rate of dental developement for Liberia, Ethiopia, Chad, Democratic Republic of Congo and many other African countries (Figure 2).

Europe

As shown in Figure 2, literature provides a higher number of studies on dental development, including the Balkan peninsula for which data on skeletal development are extremely scarce. However, for some eastern European countries, such as Belarus, Ukraine, Moldova, Latvia and Estonia, there is currently no population data. As shown in Table 7, despite a high number of studies on dental development in European populations, just over a third provides data on individuals around 18 years of age.

Asia

The current situation of population data on dental development in Asia is similar to that of skeletal development, with India, Turkey, China and Japan having the highest number of studies. However, as shown in Figure 2, the countries of the Middle East, show a better coverage of population data compared to that of the skeletal development. Indeed, for each country there are at least one or two studies assessing the rate of dental development. Luckily, for the countries of the Asian continent with the lowest rate of birth registration, such as Pakistan, Bangladesh and Yemen [2], literature provide data on dental development. However, the studies on Pakistan and Yemen do not include individuals around 18 years of age.

America

As for skeletal development, the countries with the highest number of studies on dental development are United States and Brazil. Similarly, there is a lack of population data for most of the Central and South American countries. However, it has to be taken into account that the average rate of birth registration in Latin America and the Caribbean is 92%, with Bolivia and Paraguay having the lowest level (76%) [2].

Oceania

Concerning Oceania, most of the studies on dental development relate to Australia, although few studies on New Zealand and Papua New Guinea are present. Nonetheless, most of the the studies do not include individuals around 18 years of age.

Discussion

The global increase in cross-border migration along with a low rate of birth registration in many countries, especially in Africa and Asia, highlight the importance of reliable methods for age estimation of living individuals. It is well known that ethnicity [50,68,687], as well as socioeconomical status [73] and chronic malnutrition [94] can influence the rate of skeletal and dental development. For this reason, testing the commonly utilized methods on individuals across the world is paramount in order to ascertain for each population, whether these methods can be applied straightforwardly or whether they should be standardized according to the specific population. This is of the utmost importance especially for the countries most affected by the migratory phenomenon which is taking place nowadays.

The present scoping review of the current situation concerning population data for skeletal and dental development stresses the need for more research, especially on the African continent given the extremely low rate of birth registration. For most of the western and central African countries (e.g. Liberia, Chad, Guinea-Bissau, Democratic Republic of Congo) there are currently no data on the rate of skeletal and dental maturation. The same applies to the countries of the Middle East, as well as the eastern European countries, especially as regards the skeletal development.

Moreover, there is the need to test each method especially on individuals between 16 and 22 years, since in many countries, the age thresholds of relevance to criminal prosecution lie in such a range. Similarly, in the case of unaccompanied minors, ascertaining whether the individual is still under 18 is fundamental in order to establish special protective measures. Indeed, for many countries (e.g.

Zambia, Tunisia, Gambia, Syria) literature still provides data solely on individuals under 18 years of age.

Declarations

Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors

Conflict of interest: The authors declare that they have no conflict of interest

CRediT authorship contribution statement

Marco Cummaudo: Writing – Original Draft, Investigation, Visualization. **Danilo De Angelis:** Writing - Review & Editing. **Francesca Magli:** Investigation. **Giulia Minà:** Visualization. **Vera Merelli:** Investigation. **Cristina Cattaneo:** Supervision, Project administration

References

[1] Schmeling A, Reisinger W, Geserick G, Olze A (2006) Age estimation of unaccompanied minors. Part I. General considerations. Forensic Sci Int 159:61-64. https://doi.org/10.1016/j.forsciint.2006.02.017

[2] United Nations Children's Fund (2013) Every child's birth right: inequities and trends in birth registration. https://www.unicef.org/media/files/Embargoed_11_Dec_Birth_Registration_report_low_res.pdf (accessed April 2020)

[3] United Nations Children's Fund (2017) A snapshot of civil registration in Sub-Saharan Africa. https://www.unicef.org/media/files/Embargoed_11_Dec_Birth_Registration_report_low_res.pdf (accessed April 2020)

[4] Schmeling A, Grundmann C, Fuhrmann A, Kaatsch HJ, Knell B, Ramsthaler F, Reisinger W, Riepert T, Ritz-Timme S, Rösing FW, Rötzscher K, Geserick G (2008) Criteria for age estimation in living individuals. Int J Legal Med 122:457-460

[5] Greulich WW, Pyle SI (1959) Radiographic atlas of skeletal development of hand and wrist. Stanford University Press, California

[6] Tanner JM, Whitehouse RH, Healy MJR, Goldstein H (1972) Standards for skeletal age. Centre International de l'Enfance, Paris

[7] Tanner JM, Whitehouse RH, Marshall WA, Healy MJR, Goldstein H (1975) Assessment of skeletal maturity and prediction of adult height (TW2 method). London: Academic Press

[8] Tanner JM, Healy MJR, Goldstein H, Cameron N (2001) Assessment of skeletal maturity and prediction of adult height (TW3 method). WB Saunders, London

[9] Fishman LS (1982) Radiographic evaluation of skeletal maturation. A clinically oriented method based on hand-wrist films. Angle Orthod 52:88-112

[10] Roche AF, Chumlea WMC, Thissen D (1988) Assessing the skeletal maturity of the hand-wrist: FELS method. Springfield, IL: CC Thomas

[11] Gilsanz V, Ratib O (2005) Hand bone age: a digital atlas of skeletal maturity. Berlin: Springer

[12] Girdany BR, Golden R (1952) Centers of ossification of the skeleton. Am J Roentgenol Radium Ther Nucl Med 68:922-942

[13] Cameriere R, Ferrante L, Mirtella D, Cingolani M (2006a) Carpals and epiphyses of radius and ulna as age indicators. Int J Legal Med 120(3):143-146

[14] Thodberg HH, Kreiborg S, Juul A, Pedersen KD (2009) The BoneXpert method for automated determination of skeletal maturity. IEEE Trans Med Imaging 28(1):52-66

[15] Flory CD (1936) Osseous development in the hand as an index of skeletal development. Monogr Soc Res Child Dev 1(3). National Research Council, Washington

[16] Beresowski A, Lundie JK (1952) Sequence in the time of ossification of the carpal bones of 705 African children from birth to 6 yrs of age. S Afr J Med Sci 17:25-31

[17] Acheson RM (1954) A method of assessing skeletal maturity from radiographs; a report from the Oxford child health survey. J Anat 88(4):498-508

[18] Eklöf O, Ringertz H (1967) A method for assessment of skeletal maturity. Ann Radiol 10(3):330-336

[19] Björk A (1972) Timing of interceptive orthodontic measures based on stages of maturation. Trans Eur Orthod Soc:61-74

[20] Helm S, Siersbæk-Nielsen S, Skieller V, Björk A (1971) Skeletal maturation of the hand in relation to maximum puberal growth in body height. Tandlægebladet 75:1223-1234

[21] Grave KC, Brown T (1976) Skeletal ossification and the adolescent growth spurt. Am J Orthod 69:611-619

[22] McKern TW, Stewart TD (1957) Skeletal age changes in young American males, analysed from the standpoint of age identification. Headquarters Quartermaster Research and Development Center, Technical Report EP-45. Natick, Massachussets:89-97

[23] Gök Ş, Erölçer N, Özen C (1985) Adli Tip'ta yaş tayini (Age determination in forensic medicine), TC, Adalet Bakanlığı Adli Tıp Kurumu Yayınları, İstanbul:1-26

[24] Schmeling A, Schulz R, Reisinger W, Mühler M, Wernecke KD, Geserick G (2004) Studies on the time frame for ossification of the medial clavicular epiphyseal cartilage in conventional radiography. Int J Legal Med 118(1):5-8

[25] Schmidt S, Mühler M, Schmeling A, Reisinger W, Schulz R (2007) Magnetic resonance imaging of the clavicular ossification. Int J Legal Med 121(4):321-324. https://doi.org/10.1007/s00414-007-0160-z

[26] Schulz R, Zwiesigk P, Schiborr M, Schmidt S, Schmeling A (2008) Ultrasound studies on the time course of clavicular ossification. Int J Legal Med 122:163-167. https://doi.org/10.1007/s00414-007-0220-4

[27] Schulz R, Muhler M, Mutze S, Schmidt S, Reisinger W, Schmeling A (2005) Studies on the time frame for ossification of the medial epiphysis of the clavicle as revealed by CT scans. Int J Legal Med 119(3):142-145. https://doi.org/10.1007/s00414-005-0529-9

[28] Kellinghaus M, Schulz R, Vieth V, Schmidt S, Pfeiffer H, Schmeling A (2010a) Enhanced possibilities to make statements on the ossification status of the medial clavicular epiphysis using an amplified staging scheme in evaluating thin-slice CT scans. Int J Legal Med 124(4):321-325

[29] Wittschieber D, Schulz R, Vieth V, Küppers M, Bajanowski T, Ramsthaler F, Püschel K, Pfeiffer H, Schmidt S, Schmeling A (2014) The value of sub-stages and thin slices for the assessment of the medial clavicular epiphysis: a prospective multi-center CT study, Forensic Sci Med Pathol 10:163-169

[30] Wang YH, Wei H, Ying CL, Wan L, Zhu GY (2013) The staging method of sternal end of clavicle epiphyseal growth by thin layer CT scan and imaging reconstruction. Fa Yi Xue Za Zhi 29(3):168-171

[31] Jit I, Kulkarni M (1976) Times of ossification appearance and fusion of epiphysis at the medial end of the clavicle. Indian J Med Res 64:773-782

[32] Owings Webb PA, Myers Suchey J (1985) Epiphyseal union of the anterior iliac crest and medial clavicle in a modern multiracial sample of American males and females. Am J Phys Anthropol 68:457–466

[33] Bacetti T, Franchi L, Mc Namara JA (2002) An improved version of the cervical vertebral maturation (CVM) method for the assessment of mandibular growth. Angle Orthod 72:316-323

[34] Hassel B, Farman AG (1995) Skeletal maturation evaluation using cervical vertebrae. Am J Orthod Dentofacial 107:58-66

[35] Demirjian A, Goldstein H, Tanner JM (1973) A new system of dental age assessment. Hum Biol 45(2):211-227

[36] Demirjian A, Goldstein H (1976) New systems for dental maturity based on seven and four teeth. Ann Hum Biol 3:411-421

[37] Mincer HH, Harris EF, Berryman HE (1993) The A.B.F.O. study of third molar development and its use as an estimator of chronological age. J Forensic Sci 38(2):379-390. https://doi.org/10.1520/JFS13418J

[38] Moorrees C, Fanning E, Hunt E (1963) Age variation of formation stages for ten permanent teeth. J Dent Res 42(6):1490-1502. https://doi.org/10.1177/00220345630420062701

[39] Haavikko K (1970) The formation and the alveolar and clinical eruption of the permanent teeth. An orthopantomographic study. Dissertation, University of Helsinki, Finland

[40] Haavikko K (1974) Tooth formation age estimated on a few selected teeth. A simple method for clinical use. Proc Finn Dent Soc 70(1):15-19

[41] Nolla CM (1960) Development of the permanent teeth. ASDC J Dent Child 27:254-266

[42] Kvaal SI, Kollveit KM, Thomsen IO, Solheim T (1995) Age estimation of adults from dental radiographs. Forensic Sci Int 74:175-185

[43] Gleiser I, Hunt EE (1955) The permanent mandibular first molar: its calcification, eruption and decay. Am J Phys Anthropol 13(2):253-283

[44] Gustafson G (1950) Age determination on teeth. J Am Dental Ass 41:445-54

[45] Köhler S, Schmelzle R, Loitz C, Puschel K (1994) Development of wisdom teeth as a criterion of age determination. Ann Anat 176(4):339-345. https://doi.org/10.1016/s0940-9602(11)80513-3

[46] AlQahtani SJ, Hector MP, Liversidge HM (2010) Brief communication: The London atlas of human tooth development and eruption. Am J Phys Anthropol 142(3):481-490. https://doi.org/10.1002/ajpa.21258

[47] Mörnstad H, Staaf V, Welander U (1994) Age estimation with the aid of tooth development: a new method based on objective measurements. Scand J Dent Res 102(3):137-143. https://doi.org/10.1111/j.1600-0722.1994.tb01169.x

[48] Willems G, Van Olmen A, Spiessens B, Carels C (2001) Dental age estimation in belgian children: Demirjian's technique revisited. J Forensic Sci 46(4):893-895. https://doi.org/10.1520/JFS15064J

[49] Willems G, Thevissen PW, Belmans A, Liversidge HM (2010) Willems II. Non-gender-specific dental maturity scores. Forensic Sci Int 201:84-85. https://doi.org/10.1016/j.forsciint.2010.04.033

[50] Liversidge HM (2008) Timing of human mandibular third molar formation. Ann Hum Biol 35(3):294-321. https://doi.org/10.1080/03014460801971445

[51] Cameriere R, Ferrante L, Cingolani M (2004) Variations in pulp/tooth area ratio as an indicator of age: a preliminary study. J Forensic Sci 49(2):317-319. https://doi.org/10.1520/JFS2003259

[52] Cameriere R, Ferrante L, Cingolani M (2006b) Age estimation in children by measurement of open apices in teeth. Int J Legal Med 120:49-52. https://doi.org/10.1007/s00414-005-0047-9

[53] Cameriere R, Ferrante L, Belcastro MG, Bonfiglioli B, Rastelli E, Cingolani M (2007a) Age estimation by pulp/tooth ratio in canines by peri-apical X-rays. J Forensic Sci 52:166–170.

[54] Cameriere R, Ferrante L, Belcastro MG, Bonfiglioli B, Rastelli E, Cingolani M (2007b) Age estimation by pulp/tooth ratio in canines by mesial and vestibular X-rays. J Forensic Sci 52:1151–1155

[55] Cameriere R, De Angelis D, Ferrante L, Scarpino F, Cingolani M (2007c) Age estimation in children by measurement of open apices in teeth: a European formula. Int J Legal Med 121(6):449-453. https://doi.org/10.1007/s00414-007-0179-1

[56] Cameriere R, Brkic H, Ermenc B, Ferrante L, Ovsenik M, Cingolani M (2008a) The measurement of open apices of teeth to test chronological age of over 14-year olds in living subjects. Forensic Sci Int 174:217-221. https://doi.org/10.1016/j.forsciint.2007.04.220

[57] Cameriere R, Ferrante L, De Angelis F, Scarpino F, Galli F (2008b) The comparison between measurement of open apices of third molars and Demirjiian stages to test chronological age of over 18 years old in living subjects. Int J Legal Med 122(6):493-497

[58] Roberts GJ, Parekh S, Petrie A, Lucas VS (2008) Dental age assessment (DAA): a simple method for children and emerging adults. Br Dent J 204(4):E7. https://doi.org/10.1038/bdj.2008.21

[59] Blenkin MRB, Evans W (2010) Age estimation from the teeth using a modified Demirjian system. J Forensic Sci 55(6):1504-1508. https://doi.org/10.1111/j.1556-4029.2010.01491.x

[60] Schour I, Massler M (1944) Development of huma dentition chart. 2_{nd} edition. Chicago: American Dental Association

[61] Chaillet N, Willems G, Demirjian A (2004) Dental maturity in Belgian children using Demirjian's method and polynomial functions: new standard curves for forensic and clinical use. J Forensic Odonto-Stomatol 22(2):18-27

[62] Chaillet N, Demirjian A (2004) Dental maturity in South France: A comparison between Demirjian's method and polynomial functions. J Forensic Sci 49(5):1059-1066

[63] Liliequist B, Lundberg M (1971) Skeletal and tooth development. A methodologic investigation. Acta Radiol Diagn (Stockh) 11:97-112

[64] Björk A, Krebs AA, Solow B (1964) A method for epidemiological registration of malocclusion. Acta Odontol Scand 22:27-41

[65] Drusini AG, Toso O, Ranzato C (1997) The coronal pulp cavity index: a biomarker for age determination in human adults. Am J Phys Anthropol 103:353-363

[66] Gat H, Sarnat H, Bioratn K, Dayan D (1984) Dental age evaluation: a new 6-development stage method. Clin Prev Dent 6:18-22

[67] Hayes RL, Mantel N (1958) Procedures for computing the mean age of eruption of human teeth. J Dent Res 37:938-947

[68] Olze A, van Niekerk P, Ishikawa T, Zhu BL, Schulz R, Maeda H, Schmeling A (2007a) Comparative study on the effect of ethnicity on wisdom tooth eruption. Int J Legal Med 121(6):445-448. https://doi.org/10.1007/s00414-007-0171-9

[69] Olze A, Hertel J, Schulz R, Wierer T, Schmeling A (2012) Radiographic evaluation of Gustafson's criteria for the purpose of forensic age diagnostics. Int J Legal Med 126(4):615-621. https://doi.org/10.1007/s00414-012-0701-y

[70] Peterson LJ, Indresano AT, Marciani RD, Roser SM (1992) Principles of Oral and Maxillofacial Surgery. Philadelphia: Lippincott-Raven

[71] Schmeling A, Reisinger W, Loreck D, Vendura K, Markus W, Geserick G (2000) Effects of ethnicity on skeletal maturation: consequences for forensic age estimations. Int J Legal Med 113:253-258

[72] Zhang A, Sayre JW, Vachon L, Liu BJ, Huang HK (2009) Racial differences in growth patterns of children assessed on the basis of bone age. Radiology 250(1):228-235

[73] Schmidt S, Koch B, Schulz R, Reisinger W, Schmeling A (2008a) Studies in use of the Greulich-Pyle skeletal age method to assess criminal liability. Legal Med 10(4):190–195

[74] Liversidge HM (2011) Similarity in dental maturation in two ethnic groups of London children. Ann Hum Biol 38(6):702–715. https://doi.org/10.3109/03014460.2011.609565

[75] Santoro V, Marini C, Fuzio G, Introna, F, De Donno A (2019) A comparison of 3 established skeletal age estimation methods in an African group from Benin and an Italian group from southern Italy. Am J Forensic Med Pathol 40(2):125–128. https://doi.org/10.1097/paf.0000000000000472

[76] Agossou-Voyeme AK, Fachehoun CR, Boco V, Hounnou GM, Biaou O (2005) Âge osseux du noir Béninois. Morphologie 89(285):64–70. https://doi.org/10.1016/s1286-0115(05)83240-0

[77] El Morsi DA, Abo El-Atta HM, ElMaadawy M, Tawfik AM, Batouty NM (2015) Age Estimation from Ossification of the Medial Clavicular Epiphysis by Computed Tomography. Int J Morphol 33(4):1419–1426. https://doi.org/10.4067/s0717-95022015000400038

[78] Tsehay B, Afework M, Mesifin M (2017) Assessment of reliability of Greulich and Pyle (GP) method for determination of age of children at Debre Markos Referral Hospital, East Gojjam Zone. Ethiop J Health Sci 27(6) https://doi.org/10.4314/ejhs.v27i6.8

[79] Hailu S, Fikre R, Yohannes H, Admassie D, Wamisho BL (2011) Age Determination at Tikur Anbessa Specialized Hospital. East Cent Afr J Surg 16(2):80–86. https://doi.org/10.1017/CBO9781107415324.004

[80] Brown AA, Derkyi-Kwarteng L, Amonoo-Kuofi HS (2013) Study on the Time Frame for Ossification of the Medial Clavicular Epiphyseal Cartilage by X-ray in Ghanaian Students. Int J Morphol 31(2):491–496. https://doi.org/10.4067/s0717-95022013000200021

[81] Marera DO, Satyapal KS (2018) Fusion of the medial clavicular epiphysis in the South African and Kenyan populations. Int J Morphol 36(3):1101–1107. https://doi.org/10.4067/S0717-95022018000301101

[82] Mackay DH, (1952) Skeletal maturation in the hand: A Study of development in East African Children. Trans R Soc Trop Med Hyg 46(2):135-50. https://doi.org/10.1016/0035-9203(52)90086-2

[83] Lewis CP, Lavy CBD, Harrison WJ (2002) Delay in skeletal maturity in Malawian children. J Bone Joint Surg Br 84(5):732–734. https://doi.org/10.1302/0301-620X.84B5.12642

[84] Garamendi PM, Landa MI, Ballesteros J, Solano MA (2005) Reliability of the Methods Applied to Assess Age Minority in Living Subjects around 18 Years Old: A Survey on a Moroccan Origin Population. Forensic Sci Int 154(1):3–12

[85] Massé G, Hunt EE, (1963) Skeletal maturation of the hand and wrist in west African children. Hum Biol (35)1:3-25

[86] Govender D, Goodier M (2018) Bone of contention: The applicability of the Greulich–Pyle method for skeletal age assessment in South Africa. S Afr J Radiol 22(1):1–6. https://doi.org/10.4102/sajr.v22i1.1348

[87] Cole TJ, Rousham EK, Hawley NL, Cameron N, Norris SA, Pettifor JM (2015). Ethnic and sex differences in skeletal maturation among the Birth to Twenty cohort in South Africa. Arch Dis Child 100(2):138–143. https://doi.org/10.1136/archdischild-2014-306399

[88] Hawley NL, Rousham EK, Johnson W, Norris SA, Pettifor JM, Cameron N (2012) Determinants of relative skeletal maturity in South African children. Bone 50(1):259–264. https://doi.org/10.1016/j.bone.2011.10.029

[89] Dembetembe KA, Morris AG (2012) Is Greulich-Pyle age estimation applicable for determining maturation in male Africans? S Afr J Sci 108(9–10):1–6. https://doi.org/10.4102/sajs.v108i9/10.1036

[90] Dembetembe KA (2010) Age estimation using epiphyseal closure at the wrist joint: an investigation of individuals of African origin, age 14 to 22. Dissertation, University of Cape Town

[91] Hawley NL (2009): Skeletal maturation and its variation in South African children. Dissertation, Loughborough University

[92] Hawley NL, Rousham EK, Norris SA, Pettifor JM, Cameron N (2009) Secular trends in skeletal maturity in South Africa: 1962-2001. Ann Hum Biol 36(5):584–594. https://doi.org/10.1080/03014460903136822

[93] Levine E (1972) The Skeletal Development of Children of Four South African Populations. Hum Biol 44(3):399–412

[94] Beresowski A, Lundie JK (1952) Sequence in the time of ossification of the carpal bones in 705 African children from birth to six years of age. S Afr J Med Sci 17(1):25-31

[95] Elamin F, Abdelazeem N, Elamin A, Saif D, Liversidge HM (2017) Skeletal maturity of the hand in an East African group from Sudan. Am J Phys Anthropol 163(4):816–823. https://doi.org/10.1002/ajpa.23247

[96] Wenzel A, Droschl H, Melsen B (1984) Skeletal maturity in austrian children assessed by the GP and the TW-2 methods. Ann Hum Biol 11(2):173–177. https://doi.org/10.1080/03014468400007041

[97] Beunen G, Lefevre J, Ostyn M, Renson R, Simons J, Van Gerven D (1990) Skeletal maturity in Belgian youths assessed by the Tanner-Whitehouse method (TW2). Ann Hum Biol 17(5):355–376. https://doi.org/10.1080/03014469000001142

[98] Malina RM, Beunen G, Wellens R, Claessens A (1986) Skeletal maturity and body size of teenage belgian track and Field athletes. Ann Hum Biol 13(4):331–339. https://doi.org/10.1080/03014468600008511

[99] Beunen G, Malina RM, Ostyn M, Renson R, Simons J, Van Gerven D (1982) Fatness and skeletal maturity of Belgian boys 12 through 17 years of age. Am J Phys Anthropol 59(4):387–392. https://doi.org/10.1002/ajpa.1330590408

[100] Tangmose S, Jensen KE, Villa C, Lynnerup N (2014) Forensic age estimation from the clavicle using 1.0T MRI-Preliminary results. Forensic Sci Int 234(1):7–12. https://doi.org/10.1016/j.forsciint.2013.10.027

[101] Lynnerup N, Belard E, Buch-Olsen K, Sejrsen B, Damgaard-Pedersen K (2008) Intra- and interobserver error of the Greulich-Pyle method as used on a Danish forensic sample. Forensic Sci Int 179(2–3):242.e1-242.e6. https://doi.org/10.1016/j.forsciint.2008.05.005

[102] Helm S (1990) Relationship between dental and skeletal maturation in Danish schoolchildren. Eur J Oral Sci 98(4):313–317. https://doi.org/10.1111/j.1600-0722.1990.tb00978.x

[103] Jensen BL, Dahl E, Kreiborg S (1983) Longitudinal study of body height, radius length and skeletal maturity in Danish boys with cleft lip and palate. Eur J Oral Sci 91(6):473–481. https://doi.org/10.1111/j.1600-0722.1983.tb00848.x

[104] Wenzel A, Melsen B (1982) Skeletal maturity in 6-16-year-old Danish children assessed by the Tanner-Whitehouse-2 method. Ann Hum Biol 9(3): 277–281. https://doi.org/10.1080/03014468200005761

[105] Helm S (1979) Skeletal maturity in Danish schoolchildren assessed by the TW2 method. Am J Phys Anthropol 51(3):345–351. https://doi.org/10.1002/ajpa.1330510305

[106] Andersen E (1971) Comparison of Tanner- Whitehouse and Greulich- Pyle methods in a large scale Danish survey. Am J Phys Anthropol 35(3):373–376. https://doi.org/10.1002/ajpa.1330350312

[107] Varkkola O, Ranta H, Metsäniitty M, Sajantila A (2011) Age assessment by the Greulich and Pyle method compared to other skeletal X-ray and dental methods in data from Finnish child victims of the Southeast Asian Tsunami. Forensic Sci Med Pathol 7(4):311–316. https://doi.org/10.1007/s12024-010-9173-x

[108] Houpert T, Rérolle C, Savall F, Telmon N, Saint-Martin P (2016) Is a CT-scan of the medial clavicle epiphysis a good exam to attest to the 18-year threshold in forensic age estimation? Forensic Sci Int 260:103.e1-103.e3. https://doi.org/10.1016/j.forsciint.2015.12.007

[109] Zabet D, Rérolle C, Pucheux J, Telmon N, Saint-Martin P (2014) Can the Greulich and Pyle method be used on French contemporary individuals? Int J Legal Med 129(1):171–177. https://doi.org/10.1007/s00414-014-1028-7

[110] Schmidt S, Ottow C, Pfeiffer H, Heindel W, Vieth V, Schmeling A, Schulz R (2017) Magnetic resonance imaging-based evaluation of ossification of the medial clavicular epiphysis in forensic age assessment. Int J Legal Med 131(6):1665–1673. https://doi.org/10.1007/s00414-017-1676-5

[111] Gonsior M, Ramsthaler F, Birngruber C, Obert M, Verhoff MA (2016) The completely fused medial clavicular epiphysis in high-frequency ultrasound scans as a diagnostic criterion for forensic age estimations in the living. Int J Legal Med 130(6):1603–1613. https://doi.org/10.1007/s00414-016-1435-z

[112] Wittschieber D, Ottow C, Schulz R, Püschel K, Bajanowski T, Ramsthaler F, Pfeiffer H, Vieth V, Schmidt S, Schmeling A (2016) Forensic age diagnostics using projection radiography of the clavicle: a prospective multi-center validation study. Int J Legal Med 130(1):213–219. https://doi.org/10.1007/s00414-015-1285-0

[113] Wittschieber D, Ottow C, Vieth V, Küppers M, Schulz R, Hassu J, Bajanowski T, Püschel K, Ramsthaler F, Pfeiffer H, Schmidt S, Schmeling A (2015) Projection radiography of the clavicle: still recommendable for forensic age diagnostics in living individuals? Int J Legal Med 129(1):187–193. https://doi.org/10.1007/s00414-014-1067-0

[114] Vieth V, Schulz R, Brinkmeier P, Dvorak J, Schmeling A (2014) Age estimation in U-20 football players using 3.0 tesla MRI of the clavicle. Forensic Sci Int 241:118–122. https://doi.org/10.1016/j.forsciint.2014.05.008

[115] Kellinghaus M, Schulz R, Vieth V, Schmidt S, Schmeling A (2010b) Forensic age estimation in living subjects based on the ossification status of the medial clavicular epiphysis as revealed by thin-slice multidetector computed tomography. Int J Legal Med 124(2):149–154. https://doi.org/10.1007/s00414-009-0398-8

[116] Schmidt S, Nitz I, Schulz R, Schmeling A (2008b) Applicability of the skeletal age determination method of Tanner and Whitehouse for forensic age diagnostics. Int J Legal Med 122(4):309–314. https://doi.org/10.1007/s00414-008-0237-3

[117] Kreitner KF, Schweden FJ, Riepert T, Nafe B, Thelen M (1998) Bone age determination based on the study of the medial extremity of the clavicle. Eur Radiol 8(7): 1116–1122. https://doi.org/10.1007/s003300050518

[118] Magnússon, TE (1979) Skeletal maturation of the hand in Iceland. Acta Odontol Scand 37(1):21–28. https://doi.org/10.3109/00016357909004681

[119] De Luca S, Mangiulli T, Merelli V, Conforti F, Palacio LAV, Agostini S, Spinas E, Cameriere R (2016a) A new formula for assessing skeletal age in growing infants and children by measuring carpals and epiphyses of radio and ulna. J Forensic Leg Med 39:109-116. https://doi.org/10.1016/j.jflm.2016.01.030

[120] Pinchi V, De Luca F, Focardi M, Pradella F, Vitale G, Ricciardi F, Norelli GA (2016a) Combining dental and skeletal evidence in age classification: pilot study in a sample of Italian sub-adults. Legal Med 20:75-79. https://doi.org/10.1016/j.legalmed.2016.04.009

[121] Pinchi V, De Luca F, Ricciardi F, Focardi M, Piredda V, Mazzeo E, Norelli GA (2014) Skeletal age estimation for forensic purposes: A comparison of GP, TW2 and TW3 methods on an Italian sample. Forensic Sci Int 238:83–90. https://doi.org/10.1016/j.forsciint.2014.02.030

[122] De Donno A, Santoro V, Lubelli S, Marrone M, Lozito P, Introna F (2013) Age assessment using the Greulich and Pyle method on a heterogeneous sample of 300 italian healthy and pathologic subjects. Forensic Sci Int 229(1–3):157.e1-157.e6. https://doi.org/10.1016/j.forsciint.2013.03.002

[123] Cameriere R, De Luca S, De Angelis D, Merelli V, Giuliodori, A, Cingolani M, Cattaneo C, Ferrante L (2012a) Reliability of Schmeling's stages of ossification of medial clavicular epiphyses and its validity to

assess 18 years of age in living subjects. Int J Legal Med 126(6):923–932. https://doi.org/10.1007/s00414-012-0769-4

[124] Santoro V, Roca R, De Donno A, Fiandaca C, Pinto G, Tafuri S, Introna F (2012) Applicability of Greulich and Pyle and Demirijan aging methods to a sample of Italian population. Forensic Sci Int 221(1–3):153.e1-153.e5. https://doi.org/10.1016/j.forsciint.2012.04.014

[125] Tisè M, Mazzarini L, Fabrizzi G, Ferrante L, Giorgetti R, Tagliabracci A (2011) Applicability of Greulich and Pyle method for age assessment in forensic practice on an Italian sample. Int J Legal Med 125(3):411–416. https://doi.org/10.1007/s00414-010-0541-6

[126] Vignolo M, Naselli A, Magliano P, Di Battista E, Aicardi M, Aicardi G (1999) Use of the new US90 standards for TW-RUS skeletal maturity scores in youths from the Italian population. Horm Res 51(4):168-172. https://doi.org/10.1159/000023352

[127] Vignolo M, Milani S, Cerbello G, Coroli P, Di Battista E, Aicardi G (1992) FELS, Greulich- Pyle, and Tanner- Whitehouse bone age assessments in a group of Italian children and adolescents. Am J Hum Biol 4(4):493–500. https://doi.org/10.1002/ajhb.1310040408

[128] Vignolo M, Milani S, DiBattista E, Naselli A, Mostert M, Aicardi G (1990) Modified Greulich-Pyle, Tanner-Whitehouse, and Roche-Wainer-Thissen (knee) methods for skeletal age assessment in a group of Italian children and adolescents. Eur J Pediatr 149(5):314–317. https://doi.org/10.1007/BF02171555

[129] Passone C, Pastorin L, Rota A, Fabio MT, Benso L (1981) Skeletal maturation of the school population of Turin. Comparison between of TW2 and Greulich-Pyle methods. III. 7 and 9-year-old males. Minerva Pediatr 33(9):436-7.

[130] Pastorin L, Stasiowska B, Rota A, Benso L (1977) Skeletal maturity of school age population in Turin: comparison between TW2 and Greulich and Pyle methods. Note II. 6-8 year old females. Minerva Pediatr 29(38):2343-4

[131] van Rijn RR, Lequin MH, Robben SGF, Hop WCJ, van Kuijk C (2001) Is the Greulich and Pyle atlas still valid for Dutch Caucasian children today? Pediatr Radiol 31(10):748–752. https://doi.org/10.1007/s002470100531

[132] Post GB, Kemper HC (1993) Nutrient intake and biological maturation during adolescence. The Amsterdam growth and health longitudinal study. Eur J Clin Nutr 47(6):400-8

[133] van Venrooij-Ysselmuiden ME, van Ipenburg A (1978) Mixed longitudinal data on skeletal age from a group of Dutch children living in Utrecht and surroundings. Ann Hum Biol 5(4):359–380. https://doi.org/10.1080/03014467800003001

[134] Santos C, Ferreira M, Alves FC, Cunha E (2011) Comparative study of Greulich and Pyle Atlas and Maturos 4.0 program for age estimation in a Portuguese sample. Forensic Sci Int 212(1–3): 276.e1–276.e7. https://doi.org/10.1016/j.forsciint.2011.05.032

[135] Freitas D, Maia J, Beunen G, Lefevre J, Claessens A, Marques A, Rodrigues A, Silva C, Crespo M, Thomis M, Sousa A, Malina R (2004) Skeletal maturity and socio-economic status in Portuguese children and youths: The Madeira Growth Study. Ann Hum Biol 31(4):408–420. https://doi.org/10.1080/03014460410001713050

[136] MacLaughlin SM (1990) Epiphyseal fusion at the sternal end of the clavicle in a modern portuguese skeletal sample. Antropol Port 8:59-68

[137] Khaĭrullina TP, Kosourov AK (1997) Dynamics of morphometric parameters of skeletal bone in inhabitants of Saint-Petersburg. Morfologiia 112(6):74-8

[138] Milenkovic P, Djuric M, Milovanovic P, Djukic K, Zivkovic V, Nikolic S (2014) The role of CT analyses of the sternal end of the clavicle and the first costal cartilage in age estimation. Int J Legal Med 128(5):825–839. https://doi.org/10.1007/s00414-014-1026-9

[139] Bernasovský I, Biros I, Stollárová N, Jurícková J (1992) Bone age of preschool children in Eastern Slovakia. Cesk Pediatr 47(7):391-4

[140] Bernasovský I, Mahel'ová O, Biros I, Stollárová N (1990) Bone age of preschool-age children in the Eastern Slovakia Region. Cesk Pediatr 45(12):738-41

[141] Bernasovský I, Bernasovsà K, Mahel'ová O (1986) Skeletal Age in Gipsy School Children from the East Slovakian Region. Anthropologie (Brno) 24(2-3):119-123

[142] Cameriere R, Ferrante L, Ermenc B, Mirtella D, Štrus K (2008b) Age estimation using carpals: Study of a Slovenian sample to test Cameriere's method. Forensic Sci Int 174(2–3):178–181. https://doi.org/10.1016/j.forsciint.2007.04.212

[143] Benito M, Muñoz A, Beltrán I, Labajo E, Perea B, Sánchez JA (2018) Assessment of adulthood in the living Spanish population based on ossification of the medial clavicle epiphysis using ultrasound methods. Forensic Sci Int 284:161–166. https://doi.org/10.1016/j.forsciint.2018.01.007

[144] Bueno ML, Sarría A, Bueno SM (1996) Bone maturation in obese Aragonese children of both sexes. An Esp Pediatr 45(1):29-32

[145] Jiménez-Castellanos J, Carmona A, Catalina-Herrera CJ, Viñuales M (1996) Skeletal maturation of Wrist and Hand Ossification Centers in Normal Spanish Boys and Girls: A Study using the Greulich-Pyle Method. Acta Anat 155:206-211

[146] Sarriá A, Moreno L, Bueno M (1986) Analysis of the Greulich-Pyle atlas using the TW2 and TW2-A method. An Esp Pediatr 24(2):105-10.

[147] Taranger J, Karlberg J, Bruning B, Engström I (1987) Standard deviation score charts of skeletal maturity and its velocity in swedish children assessed by the Tanner-Whitehouse method (TW2-20). Ann Hum Biol 14(4):357–365. https://doi.org/10.1080/03014468700009141

[148] Hackman L, Black S (2013) The reliability of the Greulich and Pyle atlas when applied to a modern scottish population. J Forensic Sci 58(1):114–119. https://doi.org/10.1111/j.1556-4029.2012.02294.x

[149] Savaridas SL, Huntley JS, Porter DE, Williams L, Wilkinson AG (2007) The rate of skeletal maturation in the Scottish population: A comparison across 25 years (1980-2005). J Pediatr Orthop 27(8):952–954. https://doi.org/10.1097/bpo.0b013e31815b12f4

[150] Kristmundsdottir F, Burwell RG, Marshall WA, Small P (1984) Cross-sectional study of skeletal maturation in normal children from Nottingham and London. Ann Hum Biol 11(2):133–139. https://doi.org/10.1080/03014468400006981

[151] Zhang J, Lin F, Ding X (2016) Maturation disparity between hand-wrist bones in a chinese sample of normal children: An analysis based on automatic bonexpert and manual greulich and pyle atlas assessment. Korean J Radiol 17(3):435–442. https://doi.org/10.3348/kjr.2016.17.3.435

[152] Zhang K, Chen XG, Zhao H, Dong XA, Deng ZH (2015) Forensic Age Estimation Using Thin-Slice Multidetector CT of the Clavicular Epiphyses Among Adolescent Western Chinese. J Forensic Sci 60(3):675–678. https://doi.org/10.1111/1556-4029.12739

[153] Lin FQ, Zhang J, Zhu Z, Wu YM (2015) Comparative study of Gilsanz-Ratib digital atlas and Greulich-Pyle atlas for bone age estimation in a Chinese sample. Ann Hum Biol 42(6):523–527. https://doi.org/10.3109/03014460.2014.977346

[154] Wei H, Wan L, Ying C, Wang Y, Zhu GY (2013) Mathematical models for teenager's living age evaluation based on CT image of medial clavicular epiphysis. Fa yi xue za zhi 29:248-51. https://doi.org/10.3969/j.issn.1004-5619.2013.04.003

[155] Zhang SY, Liu G, Ma CG, Han YS, Shen XZ, Xu RL, Thodberg HH (2013) Automated Determination of Bone Age in a Modern Chinese Population. ISRN Radiol 1–8. https://doi.org/10.5402/2013/874570

[156] Zhao H, Dong X, Zheng T, Qing S, Deng Z, Zhu G. (2011) Skeletal age estimation of steral end of clavicle in Sichuan Han nationality youth using thin-section computed tomography. Fa yi xue za zhi 27:417-20. https://doi.org/10.3969/j.issn.1004-5619.2011.06.005

[157] Zhang SY, Liu LJ, Han YS, Liu G, Ma ZG, Shen XZ, Xu RL, Hua JQ (2008a) Reference values of differences between TW3-C RUS and TW3-C Carpal bone ages of children from five cities of China. Zhonghua Er Ke Za Zhi 46(11):851-5

[158] Zhang SY, Liu LJ, Wu ZL, Liu G, Ma ZG, Shen XZ, Xu RL (2008b) Standards of TW3 skeletal maturity for Chinese children. Ann Hum Biol 35(3):349–354. https://doi.org/10.1080/03014460801953781

[159] Griffith JF, Chemg JCY, Wong E (2007) Are western skeletal age standards applicable to the Hong Kong Chinese population? A comparison of the Greulich and Pyle method and the Tanner and Whitehouse method. Hong Kong Med J 13(Suppl 3):S28-32

[160] Ashizawa K, Kumakura C, Zhou X, Jin F, Cao J (2005) RUS skeletal maturity of children in Beijing. Ann Hum Biol 32(3):316–325. https://doi.org/10.1080/03014460500087725

[161] Ye YY, Wang CX, Cao LZ (1992) Skeletal maturity of the hand and wrist in Chinese children in Changsha assessed by TW2 method. Ann Hum Biol 19(4):427–430. https://doi.org/10.1080/03014469200002282

[162] So LLY, Yen PKJ (1990) Secular trend in skeletal maturation in Southern Chinese girls in Hong Kong. Z Morphol Anthropol 78(2):145–153

[163] Zhen O, Baolin L (1986) SHORT REPORT Skeletal maturity of the hand and wrist in Chinese school children in Harbin assessed by the TW-2 method. Ann Hum Biol 13(2):183-187

[164] Waldmann E, Baber FM, Field CE, Billewicz WZ, Thomson AM (1977) Skeletal maturation of Hong Kong Chinese children in the first five years of life. Ann Hum Biol 4(4):343–352. https://doi.org/10.1080/03014467700002271

[165] Low WD (1972) Relation between socio-economic status and skeletal maturation of Chinese children. Z Morphol Anthropol 64(1):1–11

[166] Keny SM, Sonawane DV, Pawar E, Saraogi AA, Singh V, Khan F, Bande PP, Chandanwale A (2018) Comparison of two radiological methods in the determination of skeletal maturity in the Indian pediatric population. J Pediatr Orthop Part B 27(4):362–365. https://doi.org/10.1097/BPB.0000000000000475

[167] Patel P, Chaudhary A, Dudhia B, Bhatia P, Jani Y, Soni N (2015) Accuracy of two dental and one skeletal age estimation methods in 6-16 years old Gujarati children. J Forensic Dent Sci 7(1):18. https://doi.org/10.4103/0975-1475.150298

[168] Mohammed RB, Rao DS, Goud AS, Sailaja S, Thetay AAR, Gopalakrishnan M (2015) Is Greulich and Pyle standards of skeletal maturation applicable for age estimation in South Indian Andhra children? J Pharm Bioallied Sci 7(3):218–225. https://doi.org/10.4103/0975-7406.160031

[169] Chalasani S, Kumar J, Prasad M, Kumar Shetty BS, Ashok Kumar T (2013) An Evaluation of Skeletal Maturation by Hand-Wrist Bone Analysis and Cervical Vertebral Analysis: A Comparitive Study. J Indian Orthod Soc 47:433–437. https://doi.org/10.5005/jp-journals-10021-1201

[170] Makkad R, Balani A, Chaturvedi S, Tanwani T, Agrawal A, Hamdani S (2013) Reliability of panoramic radiography in chronological age estimation. J Forensic Dent Sci 5(2):129. https://doi.org/10.4103/0975-1475.119781

[171] Patil ST, Parchand MP, Meshram MM, Kamdi NY (2012) Applicability of Greulich and Pyle skeletal age standards to Indian children. Forensic Sci Int 216(1–3):200.e1-200.e4. https://doi.org/10.1016/j.forsciint.2011.09.022

[172] Singh J, Chavali KH (2011) Age estimation from clavicular epiphyseal union sequencing in a Northwest Indian population of the Chandigarh region. J Forensic Leg Med 18(2):82–87. https://doi.org/10.1016/j.jflm.2010.12.005

[173] Bala M, Pathak A, Jain RL (2010) Assessment of skeletal age using MP3 and hand-wrist radiographs and its correlation with dental and chronological ages in children. J Indian Soc Pedod Prev Dent 28(2):95-99. https://doi.org/10.4103/0970-4388.66746

[174] Bogin B, Sullivan T, Hauspie R, Macvean RB (1989) Longitudinal growth in height, weight, and bone age of Guatemalan Ladino and Indian schoolchildren. Am J Hum Biol 1(1):103–113. https://doi.org/10.1002/ajhb.1310010115

[175] Prakash S, Cameron N (1981) Skeletal maturity of well-off children in Chandigarh, North India. Ann Hum Biol 8(2):175–180. https://doi.org/10.1080/03014468100004921

[176] Soegiharto BM, Cunningham SJ, Moles DR (2008) Skeletal maturation in Indonesian and white children assessed with hand-wrist and cervical vertebrae methods. Am J Orthod Dentofacial Orthop 134(2):217–226. https://doi.org/10.1016/j.ajodo.2006.07.037

[177] Hedayati Z, Khalafinejad F (2014) Relationship between body mass index, skeletal maturation and dental development in 6- to 15- year old orthodontic patients in a sample of Iranian population. J Dent Shiraz Univ Med Sci 15(4):180-186

[178] Moradi M, Sirous M, Morovatti P (2012) The reliability of skeletal age determination in an Iranian sample using Greulich and Pyle method. Forensic Sci Int 223(1–3):372.e1-372.e4. https://doi.org/10.1016/j.forsciint.2012.08.030

[179] Ghotbi N, Abdorrahim A, Gharib SM, Anvar E (2010) Assessment of bone age in Kurdish children in Iran. Pak J Med Sci 26(1):36-39

[180] Torimitsu S, Makino Y, Saitoh H, Ishii N, Inokuchi G, Motomura A, Chiba F, Yamaguchi R, Hoshioka Y, Urabe S, Iwase H. (2019) Age estimation based on maturation of the medial clavicular epiphysis in a Japanese population using multidetector computed tomography. Legal Med 37:28–32. https://doi.org/10.1016/j.legalmed.2018.12.003

[181] Kumagai A, Willems G, Franco A, Thevissen PW (2018) Age estimation combining radiographic information of two dental and four skeletal predictors in children and subadults. Int J Legal Med 132:1769-1777. https://doi.org/10.1007/s00414-018-1910-9

[182] Murata M. (1997) Population-specific reference values for bone age. Acta Paediatr Suppl 423:113–114. https://doi.org/10.1111/j.1651-2227.1997.tb18388.x

[183] Ashizawa K, Asami T, Anzo M, Matsuo N, Matsuoka H, Murata M, Ohtsuki F, Satoh M, Tanaka T, Tatara H, Tsukagoshi K (1996) Standard RUS skeletal maturation of Tokyo children. Ann Hum Biol 23(6):457–469. https://doi.org/10.1080/03014469600004682

[184] Ashizawa K, Takahashi H, Ero M (1995) Individual TW2 Skeletal maturity in Tokyo girls. Anthropol Sci 103(1):61-86. https://doi.org/10.1537/ase.103.61

[185] Matsuo N (1993) Skeletal and Sexual Maturation in Japanese Children. Clin Pediatr Endocrinol 2(1):1–4. https://doi.org/10.1297/cpe.2.Supple1_1

[186] Takai S (1993) Velocities for the Tanner-Whitehouse 2 Skeletal Maturity in Northwest Japanese Children. Okajimas Folia Anat Jpn, 70 (2-3):119–126. https://doi.org/10.2535/ofaj1936.70.2-3_119

[187] Murata M (1992) Characteristics of Pubertal Growth in Japanese Children from the Standpoint of Skeletal Growth. Pediatr Int 34(2):236–242. https://doi.org/10.1111/j.1442-200X.1992.tb00953.x

[188] Takai S (1990) Smoothed skeletal maturity curve of Japanese children by Tanner-Whitehouse 2 (TW2) method and its application. Kaibogaku Zasshi 65(6):436-47

[189] Takai S, Akiyoshi T, Fuchigami A (1984) Skeletal maturity of Japanese children in Amami-Oshima Island. Ann Hum Biol 11(6):571–575. https://doi.org/10.1080/03014468400007491

[190] Kimura K (1984) Studies on growth and development in Japan. Am J Phys Anthropol 27:179–213. https://doi.org/10.1002/ajpa.1330270509

[191] Takai S, Akiyoshi T (1983) Skeletal Maturity of Japanese Children in Western Kyushu. Am J Phys Anthropol 62:199-204 https://doi.org/10.1080/03014468400007491

[192] Kimura K (1977a) Skeletal maturity of the hand and wrist in Japanese children in Sapporo by the TW2 method. Ann Hum Biol 4(5):449-53. https://doi.org/10.1080/03014467700002431

[193] Kimura K (1977b) Skeletal maturity of the hand and wrist in Japanese children by the TW2 method. Ann Hum Biol 4(4):353-356. https://doi.org/10.1080/03014469200002282

[194] Kimura K (1976) On the skeletal maturation of Japanese- American White hybrids. Am J Phys Anthropol 44(1):83–89. https://doi.org/10.1002/ajpa.1330440111

[195] Kimura K (1976) Skeletal maturation of children in Okinawa. Ann Hum Biol 3(2):149–155. https://doi.org/10.1080/03014467600001261

[196] Kimura K (1972a) Skeletal Maturation in Japanese – a new analytical method. J Anthrop Soc Nippon 80(4):319-336

[197] Kimura K (1972b) Skeletal maturation in Japanese as assessed by the Oxford and Tanner-Whitehouse methods. Acta Anat Nippon 47:358-372

[198] Greulich WW (1957) A comparison of the physical growth and development of American- born and native Japanese children. Am J Phys Anthropol 15(4):489–515. https://doi.org/10.1002/ajpa.1330150403

[199] Yoon SH, Yoo HJ, Yoo RE, Lim HJ, Yoon JH, Park CM, Lee SS, Yoo SH (2016) Ossification of the medial clavicular epiphysis on chest radiographs: Utility and diagnostic accuracy in identifying Korean adolescents and young adults under the age of majority. J Korean Med Sci 31(10):1538–1545. https://doi.org/10.3346/jkms.2016.31.10.1538

[200] Kim JR, Lee YS, Yu J (2015) Assessment of bone age in prepubertal healthy korean children: Comparison among the korean standard bone age chart, Greulich-Pyle method, and Tanner-Whitehouse method. Korean J Radiol 16(1):201–205. https://doi.org/10.3348/kjr.2015.16.1.201

[201] Oh Y, Lee R, Kim HS (2012) Evaluation of skeletal maturity score for Korean children and the standard for comparison of bone age and chronological age in normal children. J Pediatr Endocr Met 25(3–4):279–284. https://doi.org/10.1515/jpem-2012-0028

[202] Kim HJ, Song HR, Shyam A, Heon SS, Unnikrishnan R, Song SY (2010) Skeletal age in idiopathic short stature: An analytical study by the TW3 method, Greulich and Pyle method. Indian J Orthop 44(3):322–326. https://doi.org/10.4103/0019-5413.65144

[203] Modi, H. N., Modi, C. H., Suh, S. W., Yang, J. H., & Hong, J. Y. (2009). Correlation and comparison of Risser sign versus bone age determination (TW3) between children with and without scoliosis in Korean population. J Orthop Surg Res 4(1):1–8. https://doi.org/10.1186/1749-799X-4-36

[204] Yeon KM (1997) Standard bone-age of infants and children in Korea. J Korean Med Sci 12(1): 9–16. https://doi.org/10.3346/jkms.1997.12.1.9

[205] Saadé A, Baron P, Noujeim Z, Azar D (2017) Dental and Skeletal Age Estimations in Lebanese Children: A Retrospective Cross-sectional Study. J Int Soc Prev Community Dent 7(3):90–97. https://doi.org/10.4103/jispcd.JISPCD_139_17

[206] Chen ST, Jee FC, Mohamed TB (1990) Bone age of Malaysian children aged 12 to 28 months. J Singapore Paediatr Soc 32(3-4):97-101

[207] Nadir K, Khurshid Nadir*, Qamar N, Azeem MA, Tirmizi SZA, Ahmed R, Nauman, Nadir S (2014) Cutoff Age and Gender Difference for Various Schmeling's Staging System of Clavicular Ossification. Journal of Rawalpindi Medical College 19(1):37–40

[208] Awais M, Nadeem N, Husen Y, Rehman A, Beg M, Khattak YJ (2014) Comparison between Greulich-Pyle and Girdany-Golden methods for estimating skeletal age of children in Pakistan. J Coll Physicians Surg Pak 24(12):889–893. https://doi.org/12.2014/JCPSP.889893

[209] Zafar AM, Nadeem N, Husen Y, Ahmad MN (2010) An appraisal of Greulich-Pyle atlas for skeletal age assessment in Pakistan. J Pak Med Assoc 60(7):552–555

[210] Rikhasor RM, Qureshi AM, Lal Rathi S, Channa NA (1999) Skeletal maturity in Pakistani children. J Anat 195(2):305–308. https://doi.org/10.1017/S0021878299005142

[211] Hsieh CW, Liu TC, Jong TL, Tiu CM (2013) Long-term secular trend of skeletal maturation of Taiwanese children between agricultural (1960s) and contemporary (after 2000s) generations using the Tanner-Whitehouse 3 (TW3) method. J Pediatr Endocr Met 26(3–4):231–237. https://doi.org/10.1515/jpem-2012-0213

[212] Chiang KH, Chou ASB, Yen PS, Ling CM, Lin CC, Lee CC, Chang PY (2005) The reliability of using Greulich-Pyle method to determine children's bone age in Taiwan. Tzu Chi Medical Journal 17(6):15–18

[213] Benjavongkulchai S, Pittayapat P (2018) Age estimation methods using hand and wrist radiographs in a group of contemporary Thais. Forensic Sci Int 287:218.e1-218.e8. https://doi.org/10.1016/j.forsciint.2018.03.045

[214] Pattamapaspong N, Madla C, Mekjaidee K, Namwongprom S (2015) Age estimation of a Thai population based on maturation of the medial clavicular epiphysis using computed tomography. Forensic Sci Int 246:123.e1-123.e5. https://doi.org/10.1016/j.forsciint.2014.10.044

[215] Ramadan SU, Gurses MS, Inanir NT, Hacifazlioglu C, Fedakar R, Hizli S (2017) Evaluation of the medial clavicular epiphysis according to the Schmeling and Kellinghaus method in living individuals: A retrospective CT study. Legal Med 25:16–22. https://doi.org/10.1016/j.legalmed.2016.12.012

[216] Ufuk F, Agladioglu K, Karabulut N (2016) CT evaluation of medial clavicular epiphysis as a method of bone age determination in adolescents and young adults. Diagn Interv Imaging 22(3):241–246. https://doi.org/10.5152/dir.2016.15355

[217] Gurses MS, Inanir NT, Gokalp G, Fedakar R, Tobcu E, Ocakoglu G (2016) Evaluation of age estimation in forensic medicine by examination of medial clavicular ossification from thin-slice computed tomography images. Int J Legal Med 130(5):1343–1352. https://doi.org/10.1007/s00414-016-1408-2

[218] Gungor OE, Celikoglu M, Kale B, Gungor AY, Sari Z (2015) The reliability of the Greulich and Pyle atlas when applied to a Southern Turkish population. Eur J Dent 9(2):251–254. https://doi.org/10.4103/1305-7456.156846

[219] Ekizoglu O, Hocaoglu E, Inci E, Can IO, Aksoy S, Sayin I (2015) Estimation of forensic age using substages of ossification of the medial clavicle in living individuals. Int J Legal Med 129(6):1259–1264. https://doi.org/10.1007/s00414-015-1234-y

[220] Ekizoglu O, Hocaoglu E, Inci E, Sayin I, Solmaz D, Bilgili MG, Can IO (2014) Forensic age estimation by the Schmeling method: computed tomography analysis of the medial clavicular epiphysis. Int J Legal Med 129(1):203–210. https://doi.org/10.1007/s00414-014-1121-y

[221] Cantekin K, Celikoglu M, Miloglu O, Dane A, Erdem A (2012) Bone Age Assessment: The Applicability of the Greulich-Pyle Method in Eastern Turkish Children. J Forensic Sci 57(3):679–682. https://doi.org/10.1111/j.1556-4029.2011.02035.x

[222] Büken B, Şafak AA, Büken E, Yazici B, Erkol Z, Erzengin ÖU (2010) Is the Tanner–Whitehouse (TW3) method sufficiently reliable for forensic age determination of Turkish children? Turk J Med Sci 40(5):797–805. https://doi.org/10.3906/sag-0808-6

[223] Büken B, Erzengin ÖU, Büken E, Şafak AA, Yazici B, Erkol Z (2009) Comparison of the three age estimation methods: Which is more reliable for Turkish children? Forensic Sci Int 183(1–3):103.e1-103.e7. https://doi.org/10.1016/j.forsciint.2008.10.012

[224] Büken B, Şafak AA, Yazici B, Büken E, Mayda AS (2007) Is the assessment of bone age by the Greulich-Pyle method reliable at forensic age estimation for Turkish children? Forensic Sci Int 173(2–3):146–153. https://doi.org/10.1016/j.forsciint.2007.02.023

[225] Kanbur NÖ, Kanli A, Derman O, Eifan A, Ataç A (2006) The relationships between dental age, chronological age and bone age in Turkish adolescents with constitutional delay of growth. J Pediatr Endocr Met 19(8):979–985. https://doi.org/10.1515/JPEM.2006.19.8.979

[226] Uysal T, Sari Z, Ramoglu S, Basciftci F (2004) Relationships between dental and skeletal maturity in Turkish subjects. Angle Orthod 74:657-64. https://doi.org/10.1043/0003-3219(2004)074<0657:RBDASM>2.0.CO;2

[227] Koc A, Karaoglanoglu M, Erdogan M, Kosecik M, Cesur Y (2001) Assessment of bone ages: Is the Greulich-Pyle method sufficient for Turkish boys? Pediatr Int 43(6):662–665. https://doi.org/10.1046/j.1442-200X.2001.01470.x

[228] Berdikulov GB (1980) X-ray data on the times of synostosis of the bones in the hand and distal portion of the forearm in girls and young women of Uzbek nationality from 11 to 19 years of age. Sud Med Ekspert 23(2):23-5. https://doi.org/10.4103/1305-7456.156846

[229] Alqadi MA, Abuaffa AH (2019) Validity of the demirjian and fishman methods for predicting chronological age amongst yemeni children. Sultan Qaboos Univ Med J 19(1):e26–e31. https://doi.org/10.18295/squmj.2019.19.01.006

[230] Lejarraga H, Guimarey L, Orazi V (1997) Skeletal maturity of the hand and wrist of healthy Argentinian children aged 4-12 years, assessed by the TWII method. Ann Hum Biol 24(3):257–261. https://doi.org/10.1080/03014469700004982

[231] Gulmarey LM, Szakalicki OA, Cusmlnsky M (1988) Maduración esquelética de niños sanos de la ciudad de La Plata. Arch Arg Pediatr 86:149-155

[232] Machado MA, Daruge Júnior E, Fernandes MM, Lima IFP, Cericato GO, Franco A, Paranhos LR (2018) Effectiveness of three age estimation methods based on dental and skeletal development in a sample of young Brazilians. Arch Oral Biol 85:166–171. https://doi.org/10.1016/j.archoralbio.2017.10.014

[233] Ortega AI, Haiter-Neto F, Ambrosano GMB, Bóscolo FN, Almeida SM, Casanova MS (2006) Comparison of TW2 and TW3 Skeletal age differences in a Brazilian population. J Appl Oral Sci 14(2):142–146. https://doi.org/10.1590/S1678-77572006000200014

[234] Holderbaum RM, Veeck EB, Oliveira HW, Silva CL, Fernandes Â (2005) Comparison among dental, skeletal and chronological development in HIV-positive children: a radiographic study. Braz Oral Res 19(3):209–215. https://doi.org/10.1590/s1806-83242005000300010

[235] Pose Lepe G, Villacrés F, Fuente-Alba CS, Guiloff S (2018) Correlation in radiological bone age determination using the Greulich and Pyle method versus automated evaluation using BoneXpert software. Rev Chil Pediatr 89(5):606–611. https://doi.org/10.4067/S0370-41062018005000705

[236] Pickett KE, Haas JD, Murdoch S, Rivera JA, Martorell R (1995) Early Nutritional Supplementation and Skeletal Maturation in Guatemalan Adolescents. J Nutr 125 (4):1097S–1103S. https://doi.org/10.1093/jn/125.suppl_4.1097S

[237] Himes JH, Huang Z, Haas JD, Rivera R, Pineda O (1993) Serum alkaline phosphatase activity and skeletal maturation in Guatemalan adolescents. Ann Hum Biol 20(1):39–46. https://doi.org/10.1080/03014469300002482

[238] Bogin B, Sullivan T, Hauspie R, Macvean, RB (1989) Longitudinal growth in height, weight, and bone age of Guatemalan Ladino and Indian schoolchildren. Am J Hum Biol 1(1):103–113. https://doi.org/10.1002/ajhb.1310010115

[239] Bogin B, MacVean RB (1983) The relationship of socioeconomic status and sex to body size, skeletal maturation, and cognitive status of Guatemala City schoolchildren. Child Dev 54(1):115–128. https://doi.org/10.1111/j.1467-8624.1983.tb00340.x

[240] Marshall WA, Ashcroft MT, Bryan G (1970) Skeletal maturation of the hand and wrist in Jamaican children. Hum Biol 42(3):419–435

[241] Malina R, Little B (1981) Comparison of Tw-1 and Tw-2 Skeletal Ages in American Black and White, and in Mexican Children 6 Through 13 Years of Age. Am J Phys Anthropol 54(2):246–246

[242] Malina RM, Himes JH, Stepick CD (1976) Skeletal maturity of the hand and wrist in Oaxaca school children. Ann Hum Biol 3(3):211-219 https://doi.org/10.1080/03014467600001371

[243] Caballero Zúñiga ME (2005) Evaluación de los estadíos de maduración ósea carpal según Fishman y su relación con la edad cronológica en niños de 7 a 15 años de edad atendidos en la Clínica Odontológica de la UNMSM. Dissertation, Universidad Nacional Mayor de San Marcos

[244] Johnston FE (2014) Skeletal age and its prediction in Philadelphia children. Hum Biol 35(2):192–202

[245] Langley-Shirley N, Jantz RL (2010) A bayesian approach to age estimation in modern Americans from the clavicle. J Forensic Sci 55(3):571–583. https://doi.org/10.1111/j.1556-4029.2010.01089.x

[246] Tanner J, Oshman D, Bahhage F, Healy M (1997) Tanner-Whitehouse bone age reference values for North American children. J Pediatr 131(1 I):34–40 https://doi.org/10.1016/S0022-3476(97)90000-7

[247] Loder RT, Estle DT, Morrison K, Eggleston D, Fish DN, Lou Greenfield M, Guire KE (1993) Applicability of the Greulich and Pyle Skeletal Age Standards to Black and White Children of Today. Am J Dis Child 147(12):1329–1333. https://doi.org/10.1001/archpedi.1993.02160360071022

[248] Malina RM, Skrabanek MF, Little BB (1989) Growth and maturity status of black and white children classified as obese by different criteria. Am J Hum Biol 1(2):193–199. https://doi.org/10.1002/ajhb.1310010208

[249] Webb PAO, Suchey JM (1985) Epiphyseal union of the anterior iliac crest and medial clavicle in a modern multiracial sample of American males and females. Am J Phys Anthropol 68(4):457–466. https://doi.org/10.1002/ajpa.1330680402

[250] Roche AF (1976) Skeletal maturity of youths 12-17 years. National Health Survey 11(160):1–90

[251] Roche AF, Roberts J, Hamill PVV (1974) Skeletal maturity of children 6-11 years. Vital Health Stat 11(140):1-62

[252] Garn SM, Sandusky ST, Nagy JM, McCann MB (1972). Advanced skeletal development in low-income Negro children. J Pediatr 80(6):965–969. https://doi.org/10.1016/S0022-3476(72)80008-8

[253] Malina, RM (1970) Skeletal maturation studied longitudinally over one year in American whites and negroes six through thirteen years of age. Hum Biol 42(3):377–390

[254] Maggio A, Flavel A, Hart R, Franklin D (2016) Skeletal age estimation in a contemporary Western Australian population using the Tanner–Whitehouse method. Forensic Sci Int 263:e1–e8. https://doi.org/10.1016/j.forsciint.2016.03.042

[255] Franklin D, Flavel A (2015) CT evaluation of timing for ossification of the medial clavicular epiphysis in a contemporary Western Australian population. Int J Legal Med 129(3):583–594. https://doi.org/10.1007/s00414-014-1116-8

[256] Maggio A (2014) Age estimation using the hand-wrist: morphological assessment of skeletal development in Western Australia. Dissertation, University of Western Australia

[257] Bassed RB, Drummer OH, Briggs C, Valenzuela A (2011) Age estimation and the medial clavicular epiphysis: Analysis of the age of majority in an Australian population using computed tomography. Forensic Sci Med Pathol 7(2):148–154. https://doi.org/10.1007/s12024-010-9200-y

[258] Ranjitkar S, Lin NH, Macdonald R, Taylor JA, Townsend GC (2006) Stature and skeletal maturation of two cohorts of Australian children and young adults over the past two decades. Aust Orthod J 22(1):47-58

[259] Lin NH, Ranjitkar S, Macdonald R, Hughes T, Taylor JA, Townsend GC (2006) New growth references for assessment of stature and skeletal maturation in Australians. Aust Orthod J 22(1):1-10

[260] Abbie AA, Adey WR (1953) Ossification in a central Australian tribe. Hum Biol 25(4):265-278

[261] Cavrić J, Galić I, Vodanović M, Brkić H, Gregov J, Viva S, Rey L, Cameriere R (2016a) Third molar maturity index (I3M) for assessing age of majority in a black African population in Botswana. Int J Legal Med 130:1109–1120. https://doi.org/10.1007/s00414-016-1344-1

[262] Cavrić J, Vodanović M, Marušić A, Galić I (2016b) Time of mineralization of permanent teeth in children and adolescents in Gaborone, Botswana. Ann Anat 203:24–32. https://doi.org/10.1016/j.aanat.2015.08.001

[263] Johannessen AC, Bjorvatn K, Myklebust D (1989) Oral health in children attending church-afflicted schools in Northern Cameroon: tooth development and dental caries. Odontostomatol Trop 12:67–68

[264] Moness Ali AM, Ahmed WH, Khattab NM (2019) Applicability of Demirjian's method for dental age estimation in a group of Egyptian children. BDJ Open 5:1–6. https://doi.org/10.1038/s41405-019-0015-y

[265] Azzawi A, El Hosary A, Ezzat A (2016) Dental age assessment among a group of children in Tanta city. Tanta Dent J 13:89. https://doi.org/10.4103/1687-8574.188906

[266] El Morsi DA, Rezk HM, Aziza A, El-Sherbiny M (2015) Tooth coronal pulp index as a tool for age estimation in Egyptian population. J Forensic Sci Criminol 3(2):201. https://doi.org/10.15744/2348-9804.2.501

[267] Zaher JF, Fawzy IA, Habib SR, Ali MM (2011) Age estimation from pulp/tooth area ratio in maxillary incisors among Egyptians using dental radiographic images. J Forensic Leg Med 18:62–65. https://doi.org/10.1016/j.jflm.2010.12.004

[268] Soliman NL, El-Zainy MA, Hassan RM, Aly RM (2011) Timing of deciduous teeth emergence in Egyptian children. East Mediterr Heal J 17:875–881. https://doi.org/10.26719/2011.17.11.875

[269] El-Bakary AA, Hammad SM, Mohammed F (2010) Dental age estimation in egyptian children, comparison between two methods. J Forensic Leg Med 17:363–367. https://doi.org/10.1016/j.jflm.2010.05.008

[270] Billewicz WZ, Mcgregor IA (1975) Eruption of permanent teeth in West African (Gambian) children in relation to age, sex and physique. Ann Hum Biol 2:117–128. https://doi.org/10.1080/03014467500000661

[271] McGregor IA, Thomson AM, Billewicz WZ (1968) The development of primary teeth in children from a group of Gambian villages, and critical examination of its use for estimating age. Br J Nutr 22:307–314. https://doi.org/10.1079/bjn19680037

[272] Houpt MI, Adu-Aryee S, Grainger RM (1967) Eruption times of permanent teeth in the Brong Ahafo Region of Ghana. Am J Orthod 53:95–99. https://doi.org/10.1016/0002-9416(67)90224-2

[273] Kihara EN, Gichangi P, Liversidge HM, et al (2017) Dental age estimation in a group of Kenyan children using Willems' method: a radiographic study. Ann Hum Biol 44:614–621. https://doi.org/10.1080/03014460.2017.1371794

[274] Manji F, Mwaniki D (1985) Estimation of median age of eruption of permanent teeth in Kenyan African children. East Afr Med J 62(4):252-259

[275] Hassanali J, Odhiambo JW (1982) Estimation of calendar age from eruption times of permanent teeth in Kenyan Africans and Asians. Ann Hum Biol 9(2):175-177

[276] Hassanali J, Odhiambo JW (1981) Ages of eruption of the permanent teeth in Kenyan African and Asian children. Ann Hum Biol 8:425–434. https://doi.org/10.1080/03014468100005251

[277] Dardouri AAK, Cameriere R, De Luca S, Vanin S (2016) Third molar maturity index by measurements of open apices in a Libyan sample of living subjects. Forensic Sci Int 267:230.e1-230.e6. https://doi.org/10.1016/j.forsciint.2016.07.020

[278] Garamendi PM, Landa MI, Ballesteros J, Solano MA (2005) Reliability of the methods applied to assess age minority in living subjects around 18 years old: A survey on a Moroccan origin population. Forensic Sci Int 154:3–12. https://doi.org/10.1016/j.forsciint.2004.08.018

[279] Liversidge HM, Peariasamy K, Folayan MO, Adeniyi AA, Ngom PI, Mikami Y, Shimada Y, Kuroe K, Tvete IF, Kvaal SI (2017) A radiographic study of the mandibular third molar root development in different ethnic groups. J Forensic Odontostomatol 35:97–108

[280] Ifesanya JU, Adeyemi AT (2012) Accuracy of age estimation using Demirjian method among Nigerian children. Afr J Med Sci 41(3):297-300

[281] Denloye O (2008) Eruption sequence of first permanent teeth in some Nigerian children. Pediatr Dent J 18:1–4. https://doi.org/10.1016/s0917-2394(08)70114-9

[282] Folayan M, Owotade F, Adejuyigbe E, Sen S, Lawal B, Ndukwe K (2007) The timing of eruption of the primary dentition in Nigerian children. Am J Phys Anthropol 134:443-448

[283] Otuyemi OD, Ugboko VI, Ndukwe KC, Adekoya-Sofowora CA (1997) Eruption times of third molars in young rural Nigerians. Int Dent J 47:266–270. https://doi.org/10.1002/j.1875-595X.1997.tb00787.x

[284] Enwonwu CO (1973) Influence of socio-economic conditions on dental development in Nigerian children. Archs Oral Biol 18:95-107

[285] Metsäniitty M, Waltimo-Sirén J, Ranta H, et al (2019) Dental age estimation in Somali children and sub-adults combining permanent teeth and third molar development. Int J Legal Med 133:1207–1215. https://doi.org/10.1007/s00414-019-02053-w

[286] Metsäniitty M, Waltimo-Sirén J, Ranta H, et al (2018) Dental age estimation in Somali children using the Willems et al. model. Int J Legal Med 132:1779–1786. https://doi.org/10.1007/s00414-018-1926-1

[287] Davidson LE, Rodd HD (2001) Interrelationship between dental age and chronological age in Somali children. Community Dent Health 18:27-30

[288] Angelakopoulos N, De Luca S, Palacio LAV, Coccia E, Ferrante L, Pinchi V, Cameriere R (2019) Age estimation by measuring open apices in teeth: a new formula for two samples of South African black and white children. Int J Legal Med 133(5):1529-1536. https://doi.org/10.1007/s00414-019-02096-z

[289] Angelakopoulos N, De Luca S, Velandia Palacio LA, Coccia E, Ferrante L, Cameriere R (2018) Third molar maturity index (I3M) for assessing age of majority: study of a black South African sample. Int J Legal Med 132:1457–1464. https://doi.org/10.1007/s00414-018-1818-4

[290] Willems G, Lee SS, Uys A, Bernitz H, Cadenas de Llano-Pérula M, Fieuws S, Thevissen P (2018) Age estimation based on Willems method versus new country-specific method in South African black children. Int J Legal Med 132(2):599–607. https://doi.org/10.1007/s00414-017-1686-3

[291] Esan TA, Schepartz LA (2018a) Accuracy of the Demirjian and Willems methods of age estimation in a Black Southern African population. Legal Med 31:82–89. https://doi.org/10.1016/j.legalmed.2018.01.004

[292] Esan TA, Schepartz LA (2018b) The WITS Atlas: A Black Southern African dental atlas for permanent tooth formation and emergence. Am J Phys Anthropol 166:208–218. https://doi.org/10.1002/ajpa.23424

[293] Uys A, Fabris-Rotelli I, Bernitz H (2014) Estimating age in black South African children. SADJ 69(2):56-61

[294] Phillips VM, Van Wyk Kotze TJ (2009a) Dental age related tables for children of various ethnic groups in South Africa. J Forensic Odontostomatol 27:29–44

[295] Phillips VM, Van Wyk Kotze TJ (2009b) Testing standard methods of dental age estimation by Moorrees, Fanning and Hunt and Demirjian, Goldstein and Tanner on three South African children samples. J Forensic Odontostomatol 27:20–28

[296] Olze A, van Niekerk P, Schulz R, Schmeling A (2007b) Studies of the chronological course of wisdom tooth eruption in a Black African population. J Forensic Sci 52(5):1161-1163

[297] Olze A, van Niekerk P, Schmidt S, Wenecke KD, Rösing FW, Geserick G, Schmeling A (2006) Studies on the progress of third-molar mineralisation in a Black African population. Homo 57:209-217

[298] Blankenstein R, Cleaton-Jones PE, Luk KM, Fatti LP (1990) The onset of eruption of the permanent dentition amongst South African Black children. Archs oral Biol 35(3):225-228

[299] Elamin F, Hector MP, Liversidge HM (2017) The timing of mandibular tooth formation in two African groups. Ann Hum Biol 44:261–272. https://doi.org/10.1080/03014460.2016.1213313

[300] Ayad CE, Hamid HM, Abdalla EA, Kayoak SA (2014) Estimation of Age for Sudanese Adults using Orthopantomographs. Glob J Med Res 14(1):7-14

[301] Eid EA, Affan AHA (2014) Time and sequence of eruption of primary teeth in relation to breastfeeding in sudanese children. Braz Dent Sci 17(3):67-73. https://doi.org/10.14295/bds.2014.v17i3.1025

[302] Eskeli R (2015) Eruption pattern and occlusal development of the permanent dentition among different population and ethnic groups. Dissertation, University of Eastern Finland

[303] Mugonzibwa EA, Kuijpers-Jagtman AM, Laine-Alava MT, Van't Hof MA (2002) Emergence of permanent teeth in Tanzanian children. Community Dent Oral Epidemiol 30:455–462. https://doi.org/10.1034/j.1600-0528.2002.00020.x

[304] Mugonzibwa EA, Rugarababu PGM (1996) Eruption pattern of permanent teeth in Tanzania children and adolescents in Dar es Salaam. Tanzan Dent J 6(1):39-46

[305] Nemsi H, Ben Daya M, Salem NH, Masmoudi F, Bouanène I, Maatouk F, Aissaoui A, Chadly A (2018) Applicability of Willems methods and Demirjian's four teeth method for dental age estimation: cross sectional study on Tunisian sub-adults. Forensic Sci Int 291:281.e1-281.e9. https://doi.org/10.1016/j.forsciint.2018.08.007

[306] Aissaoui A, Salem N, Mougou M, Maatouk F, Chadly A (2016) Dental age assessment among Tunisian children using the Demirjian method. J Forensic Dent Sci 8(1):47-51. https://doi.org/10.4103/0975-1475.176956

[307] Bambach M, Saracci R, Young HB (1973) Emergence of deciduous teeth in Tunisian children in relation to sex and social class. Hum Biol 45:435–444

[308] Kutesa A, Nkamba EM, Muwazi L, Buwembo W, Rwenyonyi CM (2013) Weight, height and eruption times of permenent teeth of children aged 4-15 years in Kampala, Uganda. BMC Oral Health 13:15. https://doi.org/10.1186/1472-6831-13-15

[309] Krumholt L, Roed-Petersen B, Pindborg JJ (1971) Eruption times of the permanent teeth in 622 Ugandan children. Archs Oral Biol 16:1281-1288

[310] Chagula WK (1960) The age at eruption of third permanent molars in male East Africans. Am J Phys Anthropol 18(2):77-82

[311] Gillett RM (1998) Permanent Tooth Emergence among Zambian Schoolchildren: A Standard for the Assignment of Ages. Am J Hum Biol 10:45–51. https://doi.org/10.1002/(SICI)1520-6300(1998)10:1<45::AID-AJHB6>3.0.CO;2-B

[312] Gillett RM (1997) Dental emergence among urban Zambian school children: An assessment of the accuracy of three methods in assigning ages. Am J Phys Anthropol 102:447–454. https://doi.org/10.1002/(SICI)1096-8644(199704)102:4<447::AID-AJPA2>3.0.CO;2-P

[313] Gillett RM (1995) Development of a dental emergence ageing standard applicable to Zambian populations: A comparison of the accuracy of three methods. Am J Phys Anthropol, Suppl. 20:98–99

[314] Cameriere R, Santoro V, Roca R, Lozito P, Introna F, Cingolani M, Galić I, Ferrante L (2014) Assessment of legal adult age of 18 by measurement of open apices of the third molars: Study on the Albanian sample. Forensic Sci Int 245:05.e1-205.e5. https://doi.org/10.1016/j.forsciint.2014.10.013

[315] Widek T, Genet P, Merkens H, Boldt J, Petrovic A, Vallis J, Scheurer E (2019) Dental age estimation: The chronology of mineralization and eruption of male third molars with 3T MRI. Forensic Sci Int 297:228–235. https://doi.org/10.1016/j.forsciint.2019.02.019

[316] Meinl A, Tangl S, Pernicka E, Fenes C, Watzek G (2007a) On the applicability of secondary dentin formation to radiological age estimation in young adults. J Forensic Sci 52(2):438–441. https://doi.org/10.1111/j.1556-4029.2006.00377.x

[317] Meinl A, Tangl S, Huber C, Maurer B, Watzek G (2007b) The chronology of third molar mineralization in the Austrian population-a contribution to forensic age estimation. Forensic Sci Int 169(2–3):161–167. https://doi.org/10.1016/j.forsciint.2006.08.014

[318] Thevissen PW, Galiti D, Willems G (2012) Human dental age estimation combining third molar(s) development and tooth morphological age predictors. Int J Legal Med 126(6):883–887. https://doi.org/10.1007/s00414-012-0755-x

[319] Star H, Thevissen P, Jacobs R, Fieuws S, Solheim T, Willems G (2011). Human Dental Age Estimation by Calculation of Pulp-Tooth Volume Ratios Yielded on Clinically Acquired Cone Beam Computed Tomography Images of Monoradicular Teeth. J Forensic Sci 56(S1). https://doi.org/10.1111/j.1556-4029.2010.01633.x

[320] Leroy R, Cecere S, Lesaffre E, Declerck D (2008) Variability in permanent tooth emergence sequences in Flemish children. Eur J Oral Sci 116(1):11–17. https://doi.org/10.1111/j.1600-0722.2007.00505.x

[321] Yang F, Jacobs R, Willems G (2006) Dental age estimation through volume matching of teeth imaged by cone-beam CT. Forensic Sci Int 159(1):78–83. https://doi.org/10.1016/j.forsciint.2006.02.031

[322] Bosmans, N., Ann, P., Aly, M., & Willems, G. (2005). The application of Kvaal's dental age calculation technique on panoramic dental radiographs. Forensic Sci Int 153(2–3): 208–212. https://doi.org/10.1016/j.forsciint.2004.08.017

[323] Vandevoort FM, Bergmans L, Van Cleynenbreugel J, Bielen DJ, Lambrechts P, Wevers M, Peirs A, Willems G (2004) Age Calculation Using X-ray Microfocus Computed Tomographical Scanning of Teeth: A Pilot Study. J Forensic Sci 49(4):1–4. https://doi.org/10.1520/jfs2004069

[324] Gunst K, Mesotten K, Carbonez A, Willems G (2003) Third molar root development in relation to chronological age: A large sample sized retrospective study. Forensic Sci Int 136(1–3):52–57. https://doi.org/10.1016/S0379-0738(03)00263-9

[325] Willems G, Moulin-Romsee C, Solheim T (2002). Non-destructive dental-age calculation methods in adults: Intra- and inter-observer effects. Forensic Sci Int 126(3):221–226. https://doi.org/10.1016/S0379-0738(02)00081-6

[326] Galić I, Vodanović M, Janković S, Mihanović F, Nakaš E, Prohić S, Galić E, Brkić H (2013) Dental age estimation on Bosnian-Herzegovinian children aged 6-14 years: Evaluation of Chaillet's international maturity standards. J Forensic Leg Med 20(1):40–45. https://doi.org/10.1016/j.jflm.2012.04.037

[327] Galić I, Vodanović M, Cameriere R, Nakaš E, Galić E, Selimović E, Brkić H (2011) Accuracy of Cameriere, Haavikko, and Willems radiographic methods on age estimation on Bosnian-Herzegovian children age groups 6-13. Int J Legal Med 125(2):315–321. https://doi.org/10.1007/s00414-010-0515-8

[328] Galić I, Nakaš E, Prohić S, Selimović E, Obradović B, Petrovečki M (2010) Dental age estimation among children aged 5-14 years using the demirjian method in Bosnia-Herzegovina. Acta Stomatol Croat 44(1):17–25

[329] Ilieva EL, Veleganova VK, Belcheva AB (2002) Eruption of first permanent molars in 4- to 8-year-old children in Plovdiv. Folia Med (Plovdiv) 44(1-2):70-3

[330] da Luz LCP, Anzulović D, Benedicto EN, Galić I, Brkić H, Biazevic MGH (2019) Accuracy of four dental age estimation methodologies in Brazilian and Croatian children. Sci Justice 59(4):442–447. https://doi.org/10.1016/j.scijus.2019.02.005

[331] Bedek I, Dumančić J, Lauc T, Marušic M, Čuković-Bagić I (2019) New model for dental age estimation: Willems method applied on fewer than seven mandibular teeth. Int J Legal Med 134(2):735-743. https://doi.org/10.1007/s00414-019-02066-5

[332] Galić I, Lauc T, Brkić H, Vodanović M, Galić E, Biazevic MGH, Brakus I, Badrov J, Cameriere R (2015) Cameriere's third molar maturity index in assessing age of majority. Forensic Sci Int 252:191.e1-191.e5. https://doi.org/10.1016/j.forsciint.2015.04.030

[333] Brkić H, Vodanović M, Dumancić J, Lovrić Z, Cuković-Bagić I, Petrovecki M (2011) The chronology of third molar eruption in the Croatian population. Coll Antropol 35(2):353–357

[334] Legović M, Sasso A, Legović I, Brumini G, Ćabov T, Šlaj M, Vančura I, Lapter M (2010) The reliability of chronological age determination by means of mandibular third molar development in subjects in croatia. J Forensic Sci 55(1):14–18. https://doi.org/10.1111/j.1556-4029.2009.01238.x

[335] Rajić Z, Rajić-Meštrović S, Verzak Ž (2000) Chronology, dynamics and period of permanent tooth eruption in Zagreb children (part II). Coll Antropol 24(1):137–143

[336] Rajić, Z, Meštrović SR, Vukušić N (1999) Chronology, dynamics and period of primary tooth eruption in children from Zagreb, Croatia. Coll Antropol 23(2):659–663

[337] Šindelářová R, Broukal Z (2019) Polymorphism in sequence of permanent tooth emergence in Czech children. Cent Eur J Public Health 27(2):165-169. https://doi.org/10.21101/cejph.a5238

[338] Šindelárová R, Žáková L, Broukal Z (2017) Standards for permanent tooth emergence in Czech children. BMC Oral Health 17(1):1–8. https://doi.org/10.1186/s12903-017-0427-9

[339] Štepanovský M, Ibrová A, Buk Z, Velemínská J (2017) Novel age estimation model based on development of permanent teeth compared with classical approach and other modern data mining methods. Forensic Sci Int 279:72-82

[340] Arge S, Boldsen JL, Wenzel A, Holmstrup P, Jensen ND, Lynnerup N (2018) Third molar development in a contemporary Danish 13–25 years old population. Forensic Sci Int 289:12–17. https://doi.org/10.1016/j.forsciint.2018.05.005

[341] Helm S (1990) Relationship between dental and skeletal maturation in Danish schoolchildren. Eur J Oral Sci 98(4):313–317. https://doi.org/10.1111/j.1600-0722.1990.tb00978.x

[342] Helm S, Seidler B (1974) Timing of permanent tooth emergence in Danish children. Community Dent Oral Epidemiol 2:122–129

[343] Helm S (1969) Secular trend in tooth eruption: A comparative study of Danish school children of 1913 and 1965. Arch Oral Biol 14(10):1177–1191. https://doi.org/10.1016/0003-9969(69)90157-5

[344] Birchler FA, Kiliaridis S, Combescure C, Julku J, Pirttiniemi PM, Vazquez L (2019) Dental age assessment on panoramic radiographs: comparison between two generations of young Finnish subjects. J Int Med Res 47(1):311-324. https://doi.org/10.1177/0300060518801437

[345] Varkkola O, Ranta H, Metsäniitty M, Sajantila A (2011) Age assessment by the Greulich and Pyle method compared to other skeletal X-ray and dental methods in data from Finnish child victims of the Southeast Asian Tsunami. Forensic Sci Med Pathol 7(4):311–316. https://doi.org/10.1007/s12024-010-9173-x

[346] Nyström ME, Ranta HM, Peltola JS, Kataja JM (2007) Timing of developmental stages in permanent mandibular teeth of Finns from birth to age 25. Acta Odontol Scand 65(1):36–43. https://doi.org/10.1080/00016350600965900

[347] Korhonen M, Larmas M (2003) Dental age and dental health determined longitudinally from patient records in three towns in Finland. Acta Odontol Scand 61(2):105–109. https://doi.org/10.1080/00016350310001460

[348] Nyström M, Kleemola-Kujala E, Evälahti M, Peck L, Kataja M (2001) Emergence of permanent teeth and dental age in a series of Finns. Acta Odontol Scand 59(2):49–56. https://doi.org/10.1080/000163501750157072

[349] Nyström M, Peck L, Kleemola-Kujala E, Evälahti M, Kataja M (2000) Age estimation in small children: Reference values based on counts of deciduous teeth in Finns. Forensic Sci Int 110(3):179–188. https://doi.org/10.1016/S0379-0738(00)00167-5

[350] Eskeli R, Laine-Alava MT, Hausen H, Pahkala R (1999) Standards for permanent tooth emergence in Finnish children. Angle Orthod 69(6):529–533. https://doi.org/10.1043/0003-3219(1999)069<0529:SFPTEI>2.3.CO;2

[351] Virtanen JI, Bloigu RS, Larmas MA (1994) Timing of eruption of permanent teeth: Standard Finnish patient documents. Community Dent Oral Epidemiol 22(5PT1):286–288. https://doi.org/10.1111/j.1600-0528.1994.tb02052.x

[352] Pahkala R., Pahkala A, Laine, T (1991) Eruption pattern of permanent teeth in a rural community in northeastern Finland. Acta Odontol Scand 49(6):341–349. https://doi.org/10.3109/00016359109005930

[353] Kataja M, Nyström M, Aine L (1989) Dental maturity standards in southern Finland. Proc Finn Dent Sco 85(3):187-197

[354] Nyström M, Haataja J, Kataja M, Evalahti M, Peck L, Kleemola-Kujala E (1986) Dental maturity in finnish children, estimated from the development of seven permanent mandibular teeth. Acta Odontol Scand 44(4):193–198. https://doi.org/10.3109/00016358608997720

[355] Nyström M, Ranta R, Kataja M, Silvola H (1988) Comparisons of dental maturity between the rural community of Kuhmo in northeastern Finland and the city of Helsinki. Community Dent Oral Epidemiol 16(4):215–217. https://doi.org/10.1111/j.1600-0528.1988.tb01757.x

[356] Tafrount C, Galić I, Franchi A, Fanton L, Cameriere R (2019) Third molar maturity index for indicating the legal adult age in southeastern France. Forensic Sci Int 294:218.e1-218.e6. https://doi.org/10.1016/j.forsciint.2018.10.013

[357] Chaumoitre K, Saliba-Serre B, Adalian P, Signoli M, Leonetti G, Panuel M (2016) Forensic use of the Greulich and Pyle atlas: prediction intervals and relevance. Eur Radiol 27(3):1032-1043. https://doi.org/10.1007/s00330-016-4466-4

[358] Tardivo D, Sastre J, Catherine JH, Leonetti G, Adalian P, Foti B (2014) Age determination of adult individuals by three-dimensional modelling of canines. Int J Legal Med 128(1):161–169. https://doi.org/10.1007/s00414-013-0863-2

[359] Urzel V, Bruzek J (2013) Dental age assessment in children: a comparison of four methods in a recent French population. J Forensic Sci 58(5):1341-1347. https://doi.org/10.1111/1556-4029.12221

[360] Tardivo D, Sastre J, Ruquet M, Thollon L, Adalian P, Leonetti G, Foti B (2011) Three-dimensional modeling of the various volumes of canines to determine age and sex: A preliminary study. J Forensic Sci 56(3):766–770. https://doi.org/10.1111/j.1556-4029.2011.01720.x

[361] Chaillet N, Demirjian A (2004) Dental Maturity in South France: A Comparison Between Demirjian's Method and Polynomial Functions. J Forensic Sci 49(5): 1059-66. https://doi.org/10.1520/JFS2004037. ISSN 0022-1198

[362] Khdairi N, Halilah T, Khandakji MN, Jost-Brinkmann PG, Bartzela T (2019) The adaptation of Demirjian's dental age estimation method on North German children. Forensic Sci Int 303:109927. https://doi.org/10.1016/j.forsciint.2019.109927

[363] Halilah T, Khdairi N, Jost-Brinkmann PG, Bartzela T (2018) Age estimation in 5–16-year-old children by measurement of open apices: North German formula. Forensic Sci Int 293:103.e1-103.e8. https://doi.org/10.1016/j.forsciint.2018.09.022

[364] Wolf TG, Briseño-Marroquín B, Callaway A, Patyna M, Müller VT, Willershausen I, Ehlers V, Willershausen B (2016) Dental age assessment in 6- to 14-year old German children: Comparison of Cameriere and Demirjian methods. BMC Oral Health 16(1):1–8. https://doi.org/10.1186/s12903-016-0315-8

[365] Streckbein P, Reichert I, Verhoff MA, Bödeker RH, Kähling C, Wilbrand JF, Schaaf H, Howaldt HP, May A (2014) Estimation of legal age using calcification stages of third molars in living individuals. Sci Justice 54(6):447-450. https://doi.org/10.1016/j.scijus.2014.08.005

[366] Friedrich RE, Leist A, Scheuer HA (2008) Eruption times of permanent teeth in children and adolescents in the German state of Saarland. Arch Kriminol 222(3-4):73-104

[367] Friedrich RE, Katerji H, Wedl JS, Scheuer HA (2006) Eruption times of permanent teeth in children and adolescents of Paderborn, Westphalia, Germany. Arch Kriminol 217(1-2):20-35

[368] Paewinsky E, Pfeiffer H, Brinkmann B (2005) Quantification of secondary dentine formation from orthopantomograms - A contribution to forensic age estimation methods in adults. Int J Legal Med 119(1):27–30. https://doi.org/10.1007/s00414-004-0492-x

[369] Wedl JS, Schoder V, Friedrich RE (2004) Tooth eruption times of permanent teeth in male and female adolescents in Niedersachsen. Arch Kriminol 213(3-4):84-91

[370] Frucht S, Schnegelsberg C, Schulte-Mönting J, Rose E, Jonas I (2000) Das Zahnalter im südwestdeutschen Raum: Eine röntgenologische Studie. J Orofac Orthop 61(5):318–329. https://doi.org/10.1007/PL00001902

[371] Wedl JS, Danias S, Schmelzle R, Friedrich RE (2005) Eruption times of permanent teeth in children and young adolescents in Athens (Greece). Clin Oral Investig 9(2):131–134. https://doi.org/10.1007/s00784-004-0295-y

[372] Tóth ZO, Udvar O, Angyal J (2014) Chronological age estimation based on dental panoramic radiography. Fogorvosi Szemle 107(3):93-8

[373] Magnusson TE (1982) Emergence of primary teeth and onset of dental stages in Icelandic children. Community Dent Oral Epidemiol 10(2):91–97. https://doi.org/10.1111/j.1600-0528.1982.tb00370.x

[374] Magnusson TE (1976) Emergence of permanent teeth and onset of dental stages in the population of Iceland. Community Dent Oral Epidemiol 4(1):30–37 https://doi.org/10.1111/j.1600-0528.1976.tb00966.x

[375] Bagattoni S, D'Alessandro G, Gatto MR, Piana G (2019) Applicability of Demirjian's method for age estimation in a sample of Italian children with Down syndrome: A case-control retrospective study. Forensic Sci Int 298:336–340. https://doi.org/10.1016/j.forsciint.2019.03.015

[376] Spinas E, De Luca S, Lampis L, Velandia Palacio LA, Cameriere R (2018) Is the third molar maturity index (I3M) useful for a genetic isolate population? Study of a Sardinian sample of children and young adults. Int J Legal Med 132(6):1787–1794. https://doi.org/10.1007/s00414-018-1933-2

[377] Galić I, Pacifici A, Carbone D, Pacifici L, Jerončić A, Cameriere R (2017) Age estimation by the Cameriere's normalized measurements (CNM) of the single permanent mandibular tooth on a panoramic radiograph. Legal Med 26:65-72. https://doi.org/10.1016/j.legalmed.2017.03.007

[378] Pinchi V, Pradella F, Vitale G, Rugo D, Nieri M, Norelli GA (2016b) Comparison of the diagnostic accuracy, sensitivity and specificity of four odontological methods for age evaluation in Italian children at the age threshold of 14 years using ROC curves. Med Sci Law 56(1):13–18. https://doi.org/10.1177/0025802415575416

[379] De Luca S, Pacifici A, Pacifici L, Polimeni A, Fischetto S G, Velandia Palacio LA, Vanin S, Cameriere R (2016b) Third molar development by measurements of open apices in an Italian sample of living subjects. J Forensic Leg Med 38:36–42. https://doi.org/10.1016/j.jflm.2015.11.007

[380] Pinchi V, Pradella F, Buti J, Baldinotti C, Focardi M, Norelli GA (2015) A new age estimation procedure based on the 3D CBCT study of the pulp cavity and hard tissues of the teeth for forensic purposes: A pilot study. J Forensic Leg Med 36:150–157. https://doi.org/10.1016/j.jflm.2015.09.015

[381] De Angelis D, Gaudio D, Guercini N, Cipriani F, Gibelli D, Caputi S, Cattaneo C (2015) Age estimation from canine volumes. Radiol Med 120(8):731–736. https://doi.org/10.1007/s11547-015-0521-5

[382] Cameriere R, De Luca S, Egidi N, Bacaloni M, Maponi P, Ferrante L, Cingolani M (2015) Automatic age estimation in adults by analysis of canine pulp/tooth ratio: Preliminary results. Journal of Forensic Radiology and Imaging 3(1):61–66. https://doi.org/10.1016/j.jofri.2014.10.001

[383] Azevedo AC, Michel-Crosato E, Biazevic MGH, Galić I, Merelli V, De Luca S, Cameriere R (2014) Accuracy and reliability of pulp/tooth area ratio in upper canines by peri-apical X-rays. Legal Med 16(6):337–343. https://doi.org/10.1016/j.legalmed.2014.07.002

[384] Pinchi V, Norelli GA, Pradella F, Vitale G, Rugo D, Nieri M (2012) Comparison of the applicability of four odontological methods for age estimation of the 14 years legal threshold in a sample of Italian adolescents. J Forensic Odontostomatol 30(2):17–25

[385] Santoro V, Roca R, De Donno A, Fiandaca C, Pinto G, Tafuri S, Introna F (2012) Applicability of Greulich and Pyle and Demirijan aging methods to a sample of Italian population. Forensic Sci Int 221(1–3):153.e1-153.e5. https://doi.org/10.1016/j.forsciint.2012.04.014

[386] Cameriere R, Ferrante L (2011) Canine pulp ratios in estimating pensionable age in subjects with questionable documents of identification. Forensic Sci Int 206(1–3):132–135. https://doi.org/10.1016/j.forsciint.2010.07.025

[387] Spada E, Butti AC, Ferraroni M, Milani S (2009) Adapting Häävikko's dental age for the assessment of Italian children: use of LMS and other models based on smoothing splines. Stat Med 28:3554–3561. https://doi.org/10.1002/sim.3717

[388] Butti AC, Clivio A, Ferraroni M, Spada E, Testa A, Salvato A (2009) Häävikko's method to assess dental age in Italian children. Eur J Orthod 31:150–155 https://doi.org/10.1093/ejo/cjn081

[389] Cameriere R, Brogi G, Ferrante L, Mirtella D, Vultaggio C, Cingolani M, Fornaciari G (2006c) Reliability in age determination by pulp/tooth ratio in upper canines in skeletal remains. J Forensic Sci 51(4):861–864. https://doi.org/10.1111/j.1556-4029.2006.00159.x

[390] Kelmendi J, Cameriere R, Koçani F, Galić I, Mehmeti B, Vodanović M (2018a) The third molar maturity index in indicating the legal adult age in Kosovar population. Int J Legal Med 132(4):1151–1159. https://doi.org/10.1007/s00414-017-1761-9

[391] Kelmendi J, Vodanović, Koçani F, Bimbashi V, Mehmeti B, Galić I (2018b) Dental age estimation using four Demirjian's, Chaillet's and Willems' methods in Kosovar children. Legal Med 33:23-31. https://doi.org/10.1016/j.legalmed.2018.04.006

[392] Almonaitiene R, Balciuniene I, Tutkuviene J (2012) Standards for permanent teeth emergence time and sequence in Lithuanian children, residents of Vilnius city. Stomatologija 14:93-100

[393] Ambarkova V, Galić I, Vodanović M, Biočina-Lukenda D, Brkić H (2014) Dental age estimation using Demirjian and Willems methods: Cross sectional study on children from the former yugoslav republic of macedonia. Forensic Sci Int 234:187.e1-187.e7. https://doi.org/10.1016/j.forsciint.2013.10.024

[394] Alsaffar H, Elshehawi W, Roberts G, Lucas V, McDonald F, Camilleri S (2016) Dental age estimation of children and adolescents: validation of the Maltese reference data set. J Forensic Leg Med 45:29-31. https://doi.org/10.1016/j.jflm.2016.11.008

[395] Antunovic M, Galic I, Zelic K, Nedeljkovic N, Lazic E, Djuric M, Cameriere R (2018) The third molars for indicating legal adult age in Montenegro. Legal Med 33:55–61. https://doi.org/10.1016/j.legalmed.2018.05.006

[396] Boyacıoğlu Doğru H., Gulsahi A, Burçak Çehreli S, Galić I, van der Stelt P, Cameriere R (2018) Age of majority assessment in Dutch individuals based on Cameriere's third molar maturity index. Forensic Sci Int 282:231.e1-231.e6. https://doi.org/10.1016/j.forsciint.2017.11.009

[397] Leurs IH, Wattel E, Aartman IHA, Etty E, Prahl-Andersen B (2005). Dental age in Dutch children. Eur J Orthod 27(3):309–314. https://doi.org/10.1093/ejo/cji010

[398] Nykänen R, Espeland L, Kvaal SI, Krogstad O (1998) Validity of the Demirjian method for dental age estimation when applied to Norwegian children. Acta Odontol Scand 56(4):238–244. https://doi.org/10.1080/00016359850142862

[399] Różyło-Kalinowska I, Kalinowski P, Kozek M, Galić I, Cameriere R (2018) Validity of the third molar maturity index I3M for indicating the adult age in the Polish population. Forensic Sci Int 290:352.e1-352.e6. https://doi.org/10.1016/j.forsciint.2018.06.034

[400] Lorkiewicz-Muszyńska D, Przystańska A, Kulczyk T, Hyrchała A, Bartecki B, Kociemba W, Glapiński M, Łabęcka M, & Świderski P (2015) Application of X-rays to dental age estimation in medico-legal practice. Arch Med Sadowej Kryminol 1(1):1–16. https://doi.org/10.5114/amsik.2015.51602

[401] Van Vlierberghe M, Bołtacz-Rzepkowska E, Van Langenhove L, Łaszkiewicz J, Wyns B, Devlaminck D, Boullart L, Thevissen P, Willems G (2010) A comparative study of two different regression methods for radiographs in Polish youngsters estimating chronological age on third molars. Forensic Sci Int 201:86-94. https://doi.org/10.1016/j.forsciint.2010.04.019

[402] Różyło-Kalinowska I, Kiworkowa-Rączkowska E, Kalinowski P (2008) Dental age in Central Poland. Forensic Science International 174(2-3):207-216. https://doi.org/10.1016/j.forsciint.2007.04.219

[403] Anastácio AC, Serras C, Vargas de Sousa Santos RF, Palmela Pereira C (2018) Validation of Cameriere's medical-legal age estimation method using seconds premolars in a Portuguese population. J Forensic Leg Med 60:30–34. https://doi.org/10.1016/j.jflm.2018.09.005

[404] Pavlović S, Palmela Pereira C, Vargas de Sousa Santos RF (2017) Age estimation in Portuguese population: The application of the London atlas of tooth development and eruption. Forensic Sci Int 272:97–103. https://doi.org/10.1016/j.forsciint.2017.01.011

[405] Carneiro JL, Caldas IM, Afonso A, Cardoso HFV (2015) Is Demirjian's original method really useful for age estimation in a forensic context? Forensic Sci Med Pathol 11(2):216–221. https://doi.org/10.1007/s12024-015-9656-x

[406] Cameriere R, Cunha E, Wasterlain SN, De Luca S, Sassaroli E, Pagliara F, Nuzzolese E, Cingolani M, Ferrante L (2013) Age estimation by pulp/tooth ratio in lateral and central incisors by peri-apical X-ray. J Forensic Leg Med 20(5):530–536. https://doi.org/10.1016/j.jflm.2013.02.012

[407] Cameriere R, Cunha E, Sassaroli E, Nuzzolese E, Ferrante L (2009) Age estimation by pulp/tooth area ratio in canines: Study of a Portuguese sample to test Cameriere's method. Forensic Sci Int 193(1–3):128.e1-128.e6. https://doi.org/10.1016/j.forsciint.2009.09.011

[408] Landa MI, Garamendi PM, Botella MC, Alemán I (2009) Application of the method of Kvaal et al. to digital orthopantomograms. Int J Legal Med 123(2):123–128. https://doi.org/10.1007/s00414-008-0268-9

[409] Ogodescu AE, Tudor A, Szabo K, Daescu C, Bratu E, Ogodescu A (2011a) Up-to-date standards of permanent tooth eruption in Romanian children. Jurnalul Pediatrului 14(53):10–16

[410] Ogodescu AE, Alexandru O, Szabo K, Tudor A, Bratu E (2011b) Dental maturity- A biologic indicator of chronological age: Digital radiographic study to assess dental age in Romanian children. Int J Biol Biomed Eng 1(5):32–39

[411] Feraru IV, Rãducanu AM, Feraru SE, Herteliu C (2011) The Sequence and Chronology of the Eruption of Permanent Canines and Premolars in a Group of Romanian Children in Bucharest. Ohdm 10(4):193–198

[412] Khatskevich GA, Bogomolova IA (2004) Time of permanent teeth eruption in schoolchildren of Saint-Petersburg. Stomatologiia 83(3):53-7

[413] Marinkovic N, Milovanovic P, Djuric M, Nedeljkovic N, Zelic K (2018) Dental maturity assessment in Serbian population: A comparison of Cameriere's European formula and Willems' method. Forensic Sci Int 288:331.e1-331.e5. https://doi.org/10.1016/j.forsciint.2018.04.019

[414] Zelic K, Galic I, Nedeljkovic N, Jakovljevic A, Milosevic O, Djuric M, Cameriere R (2016) Accuracy of Cameriere's third molar maturity index in assessing legal adulthood on Serbian population. Forensic Sci Int 259:127–132. https://doi.org/10.1016/j.forsciint.2015.12.032

[415] Djukic K, Zelic K, Milenkovic P, Nedeljkovic N, Djuric M (2013) Dental age assessment validity of radiographic methods on Serbian children population. Forensic Sci Int 231(1–3):398.e1-398.e5. https://doi.org/10.1016/j.forsciint.2013.05.036

[416] Melo M, Ata-Ali J (2017) Accuracy of the estimation of dental age in comparison with chronological age in a Spanish sample of 2641 living subjects using the Demirjian and Nolla methods. Forensic Sci Int 270:276.e1-276.e7. https://doi.org/10.1016/j.forsciint.2016.10.001

[417] Bruna del Cojo M, Gallardo López NE, Mourelle Martínez MR, De Nova García MJ (2013) Time and sequence of eruption of permanent teeth in spanish children. Eur J Paediatr Dent 14(2):101–103

[418] Cameriere R, De Luca S, Alemán I, Ferrante L, Cingolani M (2012b) Age estimation by pulp/tooth ratio in lower premolars by orthopantomography. Forensic Sci Int 214(1–3):105–112. https://doi.org/10.1016/j.forsciint.2011.07.028

[419] Feijóo G, Barbería E, De Nova J, Prieto JL (2012) Permanent teeth development in a Spanish sample. Application to dental age estimation. Forensic Sci Int 214(1–3):213.e1-213.e6. https://doi.org/10.1016/j.forsciint.2011.08.024

[420] Cruz-Landeira A, Linares-Argote J, Martínez-Rodríguez M, Rodríguez-Calvo MS, Otero XL, Concheiro L (2010) Dental age estimation in Spanish and Venezuelan children. Comparison of Demirjian and Chaillet's scores. Int J Legal Med 124(2):105–112. https://doi.org/10.1007/s00414-009-0380-5

[421] Martin-de las Heras S, García-Fortea P, Ortega A, Zodocovich S, Valenzuela A (2008) Third molar development according to chronological age in populations from Spanish and Magrebian origin. Forensic Sci Int 174(1):47–53. https://doi.org/10.1016/j.forsciint.2007.03.009

[422] Hernández M, Espasa E, Boj JR (2008) Eruption Chronology of the Permanent Dentition in Spanish children. J Clin Pediatr Dent 32(4):347–350. https://doi.org/10.17796/jcpd.32.4.r1gp36615p54w642

[423] Teivens A, Mörnstad H (2001) A comparison between dental maturity rate in the Swedish and Korean populations using a modified Demirjian method. J Forensic Odontostomatol 19:31-35

[424] Teivens A, Mörnstad H, Reventlid M (1996) Individual variation of tooth development in Swedish children. Swed Dent J 20(3):87-93

[425] Hägg U, Taranger J (1986) Timing of tooth emergence. A prospective longitudinal study of Swedish urban children from birth to 18 years. Swed Dent J 10(5):195-206

[426] Birchler FA, Kiliaridis S, Combescure C, Vazquez L (2016) Dental age assessment on panoramic radiographs in a Swiss population: a validation study of two prediction models. Dentomaxillofac Radiol 45(1):20150137. https://doi.org/10.1259/dmfr.20150137

[427] Knell B, Ruhstaller P, Prieels F, Schmeling A (2009) Dental age diagnostics by means of radiographical evaluation of the growth stages of lower wisdom teeth. Int J Legal Med 123:465-469. https://10.1007/s00414-009-0330-2

[428] Chudasama PN, Roberts GJ, Lucas VS (2012) Dental age assessment (DAA): a study of a Caucasian population at the 13 year threshold. J Forensic Leg Med 19:22-28. https://doi.org/10.1016/j.jflm.2011.09.008

[429] Yadava M, Roberts GJ, Lucas VS (2011) Dental age assessment (DAA): reference data for British children at the 10-year-old threshold. Int Legal Med 125:651-657. https://doi.org/10.1007/s00414-010-0491-z

[430] Elmes A, Dykes E, Cookson MJ (2010) A cross-sectional survey to determine the ages of emergence of permanent teeth of Caucasian children of the Colchester area of the UK. Br Dent J 209(6):E10–E10. https://doi.org/10.1038/sj.bdj.2010.672

[431] Mitchell JC, Roberts GJ, Donaldson AN, Lucas VS (2009) Dental age assessment (DAA): reference data for British caucasians at the 16 year threshold. Forensic Sci Int 189(1-3):19-23. https://doi.org/10.1016/j.forsciint.2009.04.002

[432] Peiris TS, Roberts GJ, Prabhu N (2009) Dental age assessment: a comparison of 4- to 24-year-olds in the United Kingdom and an Australian population. Int J Paediatr Dent 19:367-376. https://doi.org/10.1111/j.1365-263X-2009.00984.x

[433] Maber M, Liversidge HM, Hector MP (2006) Accuracy of age estimation of radiographic methods using developing teeth. Forensic Sci Int 159(1):68–73. https://doi.org/10.1016/j.forsciint.2006.02.019

[434] Liversidge HM, Speechly T (2001) Growth of permanent mandibular teeth of British children aged 4 to 9 years. Ann Hum Biol 28(3):256-262. https://doi.org/10.1080/030144601300119070

[435] Liversidge HM, Speechly T, Hector MP (1999) Dental maturation in British children: are Demirjian's standards applicable? Int J Paediatr Dent 9(4):263-269. https://doi.org/10.1046/j.1365-263x.1999.00144.x

[436] Kochhar R, Richardson A (1998) The chronology and sequence of eruption of human permanent teeth in Northern Ireland. Int J Paediatr Dent 8(4):243–252. https://doi.org/10.1046/j.1365-263x.1998.00092.x

[437] Lavelle CLB (1976a) The timing of tooth emergence in four population samples. J Dent 4(5):231–236. https://doi.org/10.1016/0300-5712(76)90054-3

[438] Lavelle CLB (1976b) Study of Tooth Emergence in British Blacks and Whites. J Dent Res 55(6):1128. https://doi.org/10.1177/00220345760550062201

[439] Clements EMB, Davies-Thomas E, Pickett KG (1953) Time of eruption of permanent teeth in british children in 1947-8. BMJ 1(4825):1421–1424. https://doi.org/10.1136/bmj.1.4825.1421

[440] Liversidge HM, Marsden PH (2010) Estimating age and the likelihood of having attained 18 years of age using mandibular third molars. Br Dent J 209:406–407. https://doi.org/10.1038/sj.bdj.2010.951

[441] Holman DJ, Jones RE (1998) Longitudinal analysis of deciduous tooth emergence: II. Parametric survival analysis in Bangladeshi, Guatemalan, Japanese, and Javanese children. Am J Phys Anthropol 105:209–230. https://doi.org/10.1002/(SICI)1096-8644(199802)105:2<209::AID-AJPA8>3.0.CO;2-P

[442] Khare P, Li J, Velandia Palacio LA, Galić I, Ferrante L, Cameriere R (2020) Validation of the third molar maturity index cut-off value of <0.08 for indicating legal age of 18 years in Eastern Chinese region. Legal Med 42:101645. https://doi.org/10.1016/j.legalmed.2019.101645

[443] Si XQ, Chu G, Olze A, Schmidt S, Schulz R, Chen T, Pfeiffer H, Guo YC, Schmeling A (2019) Age assessment in the living using modified Gustafson's criteria in a northern Chinese population. Int J Legal Med 133:921–930. https://doi.org/10.1007/s00414-019-02024-1

[444] Li MJ, Chu G, Han MQ, Chen T, Zhou H, Guo YC (2019) Application of the Kvaal method for age estimation using digital panoramic radiography of Chinese individuals. Forensic Sci Int 301:76–81. https://doi.org/10.1016/j.forsciint.2019.05.015

[445] Wang J, Bai X, Wang M, Zhou Z, Bian X, Qiu C, Li C, Yang Z, Chen G, Ji F, Tao J (2018) Applicability and accuracy of Demirjian and Willems methods in a population of Eastern Chinese subadults. Forensic Sci Int 292:90–96. https://doi.org/10.1016/j.forsciint.2018.09.006

[446] Jayaraman J, Roberts GJ, Wong HM, King NM (2018) Dental age estimation in southern Chinese population using panoramic radiographs: validation of three population specific reference datasets. BMC Med Imaging 18(1):5. https://doi.org/10.1186/s12880-018-0250-z

[447] Jayaraman J, Roberts GJ (2018) Comparison of dental maturation in Hong Kong Chinese and United Kingdom Caucasian populations. Forensic Sci Int 292:61–70. https://doi.org/10.1016/j.forsciint.2018.09.005

[448] Chu G, Wang Y hui, Li M jia, et al (2018) Third molar maturity index (I 3M) for assessing age of majority in northern Chinese population. Int J Legal Med 132:1759–1768. https://doi.org/10.1007/s00414-018-1907-4

[449] Ge ZP, Yang P, Li G, Zhang JZ, Ma XC (2016) Age estimation based on pulp cavity/chamber volume of 13 types of tooth from cone beam computed tomography images. Int J Legal Med 130:1159–1167. https://doi.org/10.1007/s00414-016-1384-6

[450] Zhai Y, Park H, Han J, Wang H, Ji F, Tao J (2016) Dental age assessment in a northern Chinese population. J Forensic Leg Med 38:43–49. https://doi.org/10.1016/j.jflm.2015.11.011

[451] Wong HM, Wen YF, Jayaraman J, Li J, Sun L, King NM, Roberts GJ (2016) Northern Chinese dental ages estimated from southern Chinese reference datasets closely correlate with chronological age. Heliyon 2:e00216. https://doi.org/10.1016/j.heliyon.2016.e00216

[452] Jayaraman J, Wong HM, King NM, Roberts GJ (2016) Development of a Reference Data Set (RDS) for dental age estimation (DAE) and testing of this with a separate Validation Set (VS) in a southern Chinese population. J Forensic Leg Med 43:26–33. https://doi.org/10.1016/j.jflm.2016.07.007

[453] Ge ZP, Ma RH, Li G, Zhang JZ Ma XC (2015) Age estimation based on pulp chamber volume of first molars from cone-beam computed tomography images. Forensic Sci Int 253:133.e1-133.e7. https://doi.org/10.1016/j.forsciint.2015.05.004

[454] Qing M, Qiu L, Gao Z, Bhandari K (2014) The chronological age estimation of third molar mineralization of Han population in southwestern China. J Forensic Leg Med 24:24–27. https://doi.org/10.1016/j.jflm.2014.03.004

[455] Guo YC, Yan CX, Lin XW, Zhou H, Pan F, Wei L, Tang Z, Liang F, Chen T (2014) Studies of the chronological course of third molars eruption in a northern Chinese population. Arch Oral Biol 59(9):906-911. https://doi.org/10.1016/j.archoralbio.2014.05.018

[456] Ye X, Jiang F, Sheng X, Huang H, Shen X (2014) Dental age assessment in 7-14-year-old Chinese children: comparison of Demirjian and Willems methods. Forensic Sci Int 244:36-41. https://doi.org/10.1016/j.forsciint.2014.07.027

[457] Li G, Ren J, Zhao S, Liu Y, Li N, Wu W, Yuan S, Wang H (2012) Dental age estimation from the developmental stage of the third molars in western Chinese population. Forensic Sci Int 219:158-164. https://doi.org/10.1016/j.forsciint.2011.12.015

[458] Jayaraman J, Roberts GJ, King NM, Wong HM (2012) Dental age assessment of southern Chinese using the United Kingdom Caucasian reference dataset. Forensic Sci Int 216:68-72. https://doi.org/10.1016/j.forsciint.2011.08.019

[459] Wang Y, Huang S, Liu H (2011) Use of Haavikko's method to asseess dental age in Chinese children. Community Dent Health 28:160-164

[460] Chen JW, Guo J, Zhou J, Liu RK, Chen TT, Zou SJ (2010) Assessment of dental maturity of western Chinese children using Demirjian's method. Forensic Sci Int 197:119.e1-119.e4. https://doi.org/10.1016/j.forsciint.2009.12.009

[461] Davis PJ, Hägg U (1994) The accuracy and precision of the "Demirjian system" when used for age determination in Chinese children. Swed Dent J 18(3):113-116

[462] Billewicz WZ, Thomson AM, Baber FM, Field CE (1973) The development of primary teeth in Chinese (Hong Kong) children. Hum Biol 45(2):229-241

[463] Lee MMC, Low WD, Chang KSF (1965) Eruption of the permanent dentition of southern Chinese children in Hong Kong. Arch Oral Biol 10:849-861

[464] Hegde S, Patodia A, Shah K, Dixit U (2019) The applicability of the Demirjian, Willems and Chaillet standards to age estimation of 5-15 year old Indian children. J Forensic Odontostomatol 1:40–50

[465] Mohanty I, Panda S, Dalai RP, Mohanty N (2019) Predictive accuracy of Demirjian's, modified Demirjian's and India specific dental age estimation methods in Odisha (Eastern Indian) population. J Forensic Odontostomatol 37(1):32-39

[466] Balla SB, Banda TR, Galic I, Madhuri N, Naishadham PP (2019a) Validation of Cameriere's third molar maturity index alone and in combination with apical maturity of permanent mandibular second molar for indicating legal age of 14 years in a sample of South Indian children. Forensic Sci Int 297:243–248

[467] Balla SB, Chinni SS, Galić I, Alwala AM, Machani P, Cameriere R (2019b) A cut-off value of third molar maturity index for indicating a minimum age of criminal responsibility: older or younger than 16 years? J Forensic Leg Med 65:108-112. https://doi.org/10.1016/j.jflm.2019.05.014

[468] Chaitanya P, Reddy JS, Suhasini K, Chandrika IH, Praveen D (2018) Time and eruption sequence of permanent teeth in Hyderabad children: a descriptive cross-sectional study. Int J Clin Pediatr Dent 11(4):330-337

[469] Sharma P, Wadhwan V, Sharma N (2018) Reliability of determining the age of majority: a comparison between measurement of open apices of third molars and Demirjian stages. J Forensic Odontostomatol 36:2–9

[470] Hegde S, Patodia A, Dixit U (2017) A comparison of the validity of the Demirjian, Willems, Nolla and Häävikko methods in determination of chronological age of 5–15 year-old Indian children. J Forensic Leg Med 50:49–57. https://doi.org/10.1016/j.jflm.2017.07.007

[471] Pratyusha K, Prasad MG, Radhakrishna AN, Saujanya K, Raviteja NV, Chandrasekhar S (2017) Applicability of demirjian's method and modified cameriere's methods for dental age assessment in children. J Clin Diagnostic Res 11:ZC40–ZC43. https://doi.org/10.7860/JCDR/2017/21474.9342

[472] Jain S, Nagi R, Daga M, Shandilya A, Shukla A, Parakh A, Laheji A, Singh R (2017) Tooth coronal index and pulp/tooth ratio in dental age estimation on digital panoramic radiographs—A comparative study. Forensic Sci Int 277:115–121. https://doi.org/10.1016/j.forsciint.2017.05.006

[473] Balla SB, Galic I, Karunakar P, Vanin S, De Luca S, Cameriere R (2017) Validation of third molar maturity index (I3M) for discrimination of juvenile/adult status in South Indian population. J Forensic Leg Med 49:2–7. https://doi.org/10.1016/j.jflm.2017.05.003

[474] Macha M, Lamba B, Avula JSS, Muthuneni S, Margana PGJS, Chitoori P (2017) Estimation of correlation between chronological age, skeletal age and dental age in children- A cross sectional study. J Clin Diagnostic Res 11:ZC01–ZC04. https://doi.org/10.7860/JCDR/2017/25175.10537

[475] Hegde S, Shah K, Dixit U (2016a) A comparative evaluation of the applicability of two adapted Häävikko Methods for age estimation of 5-15 year old Indian children. J Forensic Odontostomatol 34:21–34

[476] Hegde S, Patodia A, Dixit U (2016) Willems I vs Willems II: a comparative study of accuracy in 5-15 year old Indian children. Forensic Sci Int 266:117-122. https://doi.org/10.1016/j.forsciint.2016.05.012

[477] Rajpal P, Krishnamurthy V, Pagare S, Sachdev G (2016) Age estimation using intraoral periapical radiographs. J Forensic Dent Sci 8:56. https://doi.org/10.4103/0975-1475.176955

[478] Mittal S, Nagendrareddy SG, Sharma ML, Agnihotri P, Chaudhary S, Dhillon M (2016) Age estimation based on Kvaal's technique using digital panoramic radiographs. J Forensic Dent Sci 8:115. https://doi.org/10.4103/0975-1475.186378

[479] Balla SB, Venkat Baghirath P, Hari Vinay B, Vijay Kumar J Babu DBG (2016) Accuracy of methods of age estimation in predicting dental age of preadolescents in South Indian children. J Forensic Leg Med 43:21–25. https://doi.org/10.1016/j.jflm.2016.07.004

[480] Kumar NN, Panchaksharappa MG, Annigeri RG (2016) Digitized morphometric analysis of dental pulp of permanent mandibular second molar for age estimation of Davangere population. J Forensic Leg Med 39:85–90. https://doi.org/10.1016/j.jflm.2016.01.019

[481] Ravindra S, Mamatha G, Sunita J, Balappanavar AY, Sardana V (2015) Morphometric analysis of pulp size in maxillary permanent central incisors correlated with age: An indirect digital study. J Forensic Dent Sci 7:208-214. https://doi.org/10.4103/0975-1475.172438

[482] Gandhi N, Jain S, Kumar M, Rupakar P, Choyal K, Prajapati S (2015) Reliability of third molar development for age estimation in Gujarati population: A comparative study. J Forensic Dent Sci 7(2):107-113. https://doi.org/10.4103/0975-1475.156197

[483] Bajpai M, Pardhe N, Kumar M, Agrawal S (2015) A Comparative Evaluation of Gustafson's Formula and New Formula for Age Estimation in India--A Forensic Study. Prague Med Rep 116:203–209. https://doi.org/10.14712/23362936.2015.59

[484] Patel PS, Chaudhary AR, Dudhia BB, Bhatia PV, Soni NC, Jani YV (2015) Accuracy of two dental and one skeletal age estimation methods in 6-16 year old Gujarati children. J Forensic Dent Sci 7(1):18-27. https://doi.org/10.4103/0975-1475.150298

[485] Gupta S, Mehendiratta M, Rehani S, Kumra M, Nagpal R, Gupta R (2015) Age estimation in Indian children and adolescents in the NCR region of Haryana: A comparative study. J Forensic Dent Sci 7(3):253-258. https://doi.org/10.4103/0975-1475.172453

[486] Mohammed RB, Sanghvi P, Perumalla KK, Srinivasaraju D, Srinivas J, Kalyan US, Rasool SM (2015) Accuracy of four dental age estimation methods in Southern Indian children. J Clin Diagnostic Res 9:HC01–HC08. https://doi.org/10.7860/JCDR/2015/10141.5495

[487] Mohammed RB, Krishnamraju PV, Prasanth PS, Sanghvi P, Lata Reddy MA, Jyotsna S (2014) Dental age estimation using Willems method: a digital orthopantomographic study. Contemp Clin Dent 5(3):371-376. https://doi.org/10.4103/0976-237X.137954

[488] Patil SK, Mohankumar KP, Donoghue M (2014) Estimation of age by Kvaal's technique in sample Indian population to establish the need for local Indian-based formulae. J Forensic Dent Sci 6:166–170. https://doi.org/10.4103/0975-1475.137050

[489] Patnana AK, Vabbalareddy RS, V Vanga NR (2014) Evaluating the Reliability of Three Different Dental Age Estimation Methods in Visakhapatnam Children. Int J Clin Pediatr Dent 7:186–191. https://doi.org/10.5005/jp-journals-10005-1262

[490] Joseph CC, Reddy BHS, Cherian NM, Kannan SK, George G, Jose S (2013) Intraoral Digital Radiography for Adult Age Estimation: A Reliable Technique. J Indian Acad Oral Med Radiol 25:287–290. https://doi.org/10.1111/j.1467-9280.2006.01819.x

[491] Makkad R, Balani A, Chaturvedi S, Tanwani T, Agrawal A, Hamdani S (2013) Reliability of panoramic radiography in chronological age estimation. J Forensic Dent Sci 5(2):129-133. https://doi.org/10.4103/0975-1475.119781

[492] Parikh N, Dave G, Barad J, Patel N, Mansata A (2013) Application of Kvaal's dental age estimation technique on orthopantomographs on a population of Gujarat – A short study. Bhavnagar University's Journal of Dentistry 3(3):18-24

[493] Limdiwala PG, Shah JS (2013) Age estimation by using dental radiographs. J Forensic Dent Sci 5(2):118-122

[494] Sarkar S, Kailasam S, Mahesh Kumar P (2013) Accuracy of estimation of dental age in comparison with chronological age in Indian population-A comparative analysis of two formulas. J Forensic Leg Med 20:230–233. https://doi.org/10.1016/j.jflm.2012.09.007

[495] Agarwal N, Ahuja P, Sinha A, Singh A (2012) Age estimation using maxillary central incisors: A radiographic study. J Forensic Dent Sci 4(2):97-100. https://doi.org/10.4103/0975-1475.109897

[496] Malik P, Saha R, Agarwal A (2012) Applicability of Demirjian's method of age assessment in a North Indian female population. Eur J Paediatr Dent 13:133–135

[497] Chandramala R, Sharma R, Khan M, Srivastava A (2012) Application of Kvaal's Technique of Age Estimation on Digital Panoramic Radiographs. Dentistry 2:6–10. https://doi.org/10.4172/2161-1122.1000142

[498] Kanchan-Talreja P, Acharya AB, Naikmasur VG (2012) An assessment of the versatility of Kvaal's method of adult dental age estimation in Indians. Arch Oral Biol 57:277–284. https://doi.org/10.1016/j.archoralbio.2011.08.020

[499] Jeevan MB, Kale AD, Angadi PV, Hallikerimath S (2011) Age estimation by pulp/tooth area ratio in canines: Cameriere's method assessed in an Indian sample using radiovisiography. Forensic Sci Int 204:209.e1-209.e5. https://doi.org/10.1016/j.forsciint.2010.08.017

[500] Babshet M, Acharya AB, Naikmasur VG (2011) Age estimation from pulp/tooth area ratio (PTR) in an Indian sample: A preliminary comparison of three mandibular teeth used alone and in combination. J Forensic Leg Med 18:350–354. https://doi.org/10.1016/j.jflm.2011.07.003

[501] Jagannathan N, Neelakantan P, Thiruvengadam C, Ramani P, Premkumar P, Natesan A, Herald JS, Luder HU (2011) Age estimation in an indian population using pulp/tooth volume ratio of mandibular canines obtained from cone beam computed tomography. J Forensic Odontostomatol 29:1–6

[502] Saxena S (2011) Age estimation of Indian adults from orthopantomographs. Braz Oral Res 25:225–229. https://doi.org/10.1590/S1806-83242011005000009

[503] Saxena S, Tiwari S, Bhambal A (2011) Variations in Morphological Variables of Canine as Indicators of Age Among Indian Adults. Indian J Stomatol 2(1):18–20

[504] Gaur R, Boparai G, Saini K (2011) Effect of under-nutrition on permanent tooth emergence among Rajputs of Himachal Pradesh, India. Ann Hum Biol 38:84–92. https://doi.org/10.3109/03014460.2010.497499

[505] Lakshmappa A, Guledgud MV, Patil K (2011) Eruption times and patterns of permanent teeth in school children of India. Indian J Dent Res 22:755–763. https://doi.org/10.4103/0970-9290.94568

[506] Kaur I, Singal P, Bhatnagar DP (2010) Timing of permanent teeth emergence and dental caries among Jatsikh children of public and government schools of Patiala district. Anthropologist 12:141–148. https://doi.org/10.1080/09720073.2010.11891144

[507] Sharma R, Srivastava A (2010) Radiographic evaluation of dental age of adults using Kvaal′s method. J Forensic Dent Sci 2(1):22-26. https://doi.org/10.4103/0974-2948.71053

[508] GunaShekhar M, Tenny J (2010) Longitudinal study of age and order of eruption of primary teeth in Indian children. J Clin Exp Dent 2(3):e113-116

[509] Rai B, Kaur J, Cingolani M, Ferramte L, Cameriere R (2010) Age estimation in children by measurement of open apices in teeth: An Indian formula. Int J Legal Med 124:237–241. https://doi.org/10.1007/s00414-010-0427-7

[510] Shetty R, Ashok L, Sujatha GP (2010) Age estimation in adults using intra oral periapical radiographs in Indian population using Kvaal's method. Medico-Legal Update 10(2):73-77

[511] Babshet M, Acharya AB, Naikmasur VG (2010) Age estimation in Indians from pulp/tooth area ratio of mandibular canines. Forensic Sci Int 197:125.e1-125.e4. https://doi.org/10.1016/j.forsciint.2009.12.065

[512] Singaraju S, Sharada P (2009) Age estimation using pulp/tooth area ratio: A digital image analysis. J Forensic Dent Sci 1(1):37-41. https://doi.org/10.4103/0974-2948.50888

[513] Agarwal KN, Gupta R, Faridi MMA, Kalra N (2004) Permanent dentition in Delhi boys of age 5-14 years. Indian Pediatr 41:1031–1035

[514] Prabhakar AR, Panda AK, Raju OS (2002) Applicability of Demirjian's method of age assessment in children of Davangere. J Indian Soc Pedod Prev Dent 20:54–62

[515] Koshy S, Tandon S (1998) Dental age assessment: The applicability of Demirjian's method in South Indian children. Forensic Sci Int 94:73–85. https://doi.org/10.1016/S0379-0738(98)00034-6

[516] Jaswal S (1983) Age and sequence of permanent- tooth emergence among Khasis. Am J Phys Anthropol 62:177–186. https://doi.org/10.1002/ajpa.1330620207

[517] Holman DJ, Jones RE (1991) Longitudinal analysis of deciduous tooth emergence in Indonesian children. I. Life table methodology. Am J Hum Biol 3:389-403

[518] Dehghani M, Shadkam E, Ahrari F, Dehghani M (2018) Age estimation by canines' pulp/tooth ratio in an Iranian population using digital panoramic radiography. Forensic Sci Int 285:44–49. https://doi.org/10.1016/j.forsciint.2018.01.016

[519] Khosronejad A, Navabi M, Sakhdari S, Rakhshan V (2017) Correlation between chronological age and third molar developmental stages in an Iranian population (Demirjian method). Dent Res J 14(2):143-149

[520] Sakhdari S, Mehralizadeh S, Zolfaghari M, Majid MM (2015) Age Estimation from Pulp / Tooth Area Ratio Using Digital Panoramic Radiography. J Islam Dent Assoc Iran 27:19–23

[521] Javadinejad S, Sekhavati H, Ghafari R (2015) A comparison of the accuracy of four age estimation methods based on panoramic radiography of developing teeth. J Dent Res Dent Clin Dent Prospects 9(2):72-78. https://doi.org/10.15171/joddd.2015.015

[522] Abesi F, Haghanifar S, Sajadi P, Valizadeh A, Khafri S (2013) Assessment of dental maturity of children aged 7-15 years using Demirjian method in a selected Iranian population. J Dent Shiraz Univ Med Sci 14(4):165-169

[523] Bagherian A, Sadeghi M (2011) Assessment of dental maturity of children aged 3.5 to 13.5 years using the Demirjian method in an Iranian population. J Oral Sci 53:37–42. https://doi.org/10.2334/josnusd.53.37

[524] Rai B, Kaur J, Jafarzadeh H (2010) Dental age estimation from the deveelopmental stage of the third molars in Iranian population. J Forensic Leg Med 17:309-311. https://doi.org/10.1016/j.jflm.2010.04.010

[525] Bagherpour A, Imanimoghaddam M, Bagherpour MR, Einolghozati M (2010) Dental age assessment among Iranian children aged 6-13 years using the Demirjian method. Forensic Sci Int 197:121.e1-121.e4. https://doi.org/10.1016/j.forsciint.2009.12.051

[526] Elham F, Adhamy S (2010) Age and sequence of permanent canine and premolar teeth eruption in 102-174 months old children in Kerman province. Curr Res Dent 1(1):6-10

[527] Friedrich RE, Kamalwand N, Jürgen SW, Scheuer HA (2007) Eruption times of permanent teeth in male children and adolescents of Tehran (Iran). Arch Kriminol 219(5-6):145-168

[528] Moslemi M (2004) An epidemiological survey of the time and sequence of eruption of permanent teeth in 4-15-year-olds in Tehran, Iran. Int J Paediatr Dent 14:432–438. https://doi.org/10.1111/j.1365-263X.2004.00586.x

[529] Abdulhammed MK, Sood LI, Altaee Z (2016) Eruption time estimation of permanent 1st molar, central & lateral incisors in 5.5-10 years age children at Al Ramadi City / Iraq. Tikrit J Dent Sci 4:123-127

[530] Sahib WW (2008) Permanent teeth emergence for Iraqi students in Hilla and Najaf cities (a cross-sectional study). Kufa Med Journal 11(1):25-40

[531] Baghdady VS, Ghose LJ (1981) Eruption time of primary teeth in Iraqi children. Community Dent Oral Epidemiol 9:245-246

[532] Ghose LJ, Baghdady VS (1981) Eruption time of permanent teeth in Iraqi school children. Archs oral Biol 26:13-15

[533] Sarnat H, Kaffe I, Porat J, Amir E (2003) Developmental stages of the third molar in Israeli children. Pediatr Dent 25:373–377

[534] Kumagai A, Takahashi N, Palacio LAV, Giampieri A, Ferrante L, Cameriere R (2019) Accuracy of the third molar index cut-off value for estimating 18 years of age: Validation in a Japanese samples. Legal Med 38:5–9

[535] Ramanan N, Thevissen P, Fieuws S, Willems G (2012) Dental age estimation in Japanese individuals combining permanent teeth and third molars. J Forensic Odontostomatol 30:34–39

[536] Holman DJ, Yamaguchi K (2005) Longitudinal analysis of deciduous tooth emergence: IV. Covariate effects in Japanese children. Am J Phys Anthropol 126:352–358. https://doi.org/10.1002/ajpa.10420

[537] Höffding J, Maeda M, Yamaguchi K, Tsuji H, Kuwabara S, Nohara Y, Yoshida S (1984) Emergence of permanent teeth and onset of dental stages in Japanese children. Community Dent Oral Epidemiol 12:55-58

[538] Eveleth PB, De Souza Freitas JA (1969) Tooth eruption and menarche of Brazilian-born children of Japanese ancestry. Hum Biol 41(2):176-184

[539] Al-Batayneh OB, Shaweesh AI, Alsoreeky ES (2015) Timing and sequence of emergence of deciduous teeth in Jordanian children. Arch Oral Biol 60:126–133. https://doi.org/10.1016/j.archoralbio.2014.08.014

[540] Shaweesh AI (2013) Polymorphisms in sequence of permanent tooth emergence: A cross-sectional study on Jordanian children and adolescents. Acta Odontol Scand 71:32–37. https://doi.org/10.3109/00016357.2011.647068

[541] Shaweesh AI, Alsoleihat FD (2013) Association between body mass index and timing of permanent tooth emergence in Jordanian children and adolescents. J Stomat Occ Med 6:50-58. https://doi.org/10.1007/s12548-013-0075-x

[542] Shaweesh AI (2012) Timing and sequence of emergence of permanent teeth in the Jordanian population. Arch Oral Biol 57:122–130. https://doi.org/10.1016/j.archoralbio.2011.08.014

[543] Shaweesh AI, Al-Omiri MK, Alsoleihat FD (2011) Variation in time of emergence of permanent teeth among urban and rural Jordanian school children. Saudi Med J 32:1066–1072

[544] Roh BY, Lee WJ, Ryu JW, Ahn JM, Yoon CL, Lee SS (2018) The application of the Kvaal method to estimate the age of live Korean subjects using digital panoramic radiographs. Int J Legal Med 132:1161–1166. https://doi.org/10.1007/s00414-017-1762-8

[545] Lee JH, Lee C, Battulga B, Na JY, Hwang JJ, Kim YH, Han SS (2017a) Morphological analysis of the lower second premolar for age estimation of Korean adults. Forensic Sci Int 281:186.e1-186.e6. https://doi.org/10.1016/j.forsciint.2017.10.005

[546] Lee SM, Oh S, Kim J, Kim YM, Choi YK, Kwak HH, Kim YI (2017b) Age estimation using the maxillary canine pulp/tooth ratio in Korean adults: a CBCT buccolingual and horizontal section image analysis. Journal of Forensic Radiology and Imaging 9:1-5. https://doi.org/10.1016/j.jofri.2016.12.001

[547] Kim C, Hong Y, Han DH, Hong HK, Kim YN, Bae KH (2011) A prospective cohort study on emergence of permanent teeth and caries experience in Korean children. Int J Paediatr Dent 21:254–260. https://doi.org/10.1111/j.1365-263X.2011.01114.x

[548] Lee SS, Kim D, Lee S, Lee UY, Seo JS, Ahn YW, Han SH (2011) Validity of Demirjian's and modified Demirjian's methods in age estimation for Korean juveniles and adolescents. Forensic Sci Int 211:41–46. https://doi.org/10.1016/j.forsciint.2011.04.011

[549] Lee SH, Lee JY, Park HK, Kim YK (2009) Development of third molars in Korean juveniles and adolescents. Forensic Sci Int 188:107-111. https://doi.org/10.1016/j.forsciint.2009.03.033

[550] Lee SE, Lee SH, Lee JY, Park HK, Kim YK (2008) Age estimation of Korean children based on dental maturity. Forensic Sci Int 178:125–131. https://doi.org/10.1016/j.forsciint.2007.12.010

[551] Choi NK, Yang KH (2001) A study on the eruption timing of primary teeth in Korean children. ASDC J Dent Child 68(4):244-249

[552] Yun DJ (1957) Eruption of primary teeth in Korean rural children. Am J Phys Anthropol 15:261-268

[553] Qudeimat MA, Behbehani F (2009) Dental age assessment for Kuwaiti children using Demirjian's method. Ann Hum Biol 36:695–704. https://doi.org/10.3109/03014460902988702

[554] Bunyarit SS, Jayaraman J, Naidu MK, Ying RPY, Danaee M, Nambiar P (2017) Modified method of dental age estimation of Malay juveniles. Legal Med 28:45–53. https://doi.org/10.1016/j.legalmed.2017.07.009

[555] Kumaresan R, Cugati N, Chandrasekaran B, Karthikeyan P (2016) Reliability and validity of five radiographic dental-age estimation methods in a population of Malaysian children. J Investig Clin Dent 7:102–109. https://doi.org/10.1111/jicd.12116

[556] Cugati N, Kumaresan R, Srinivasan B, Karthikeyan P (2015) Dental age estimation of growing children by measurement of open apices: A Malaysian formula. J Forensic Dent Sci 7:227. https://doi.org/10.4103/0975-1475.172445

[557] Yusof MY, Cauwels R, Deschepper E, Martens L (2015a) Application of third molar development and eruption models in estimating dental age in Malay sub-adults. J Forensic Leg Med 34:40–44. https://doi.org/10.1016/j.jflm.2015.05.004

[558] Yusof MY, Cauwels R, Martens L (2015b) Stages in third molar development and eruption to estimate the 18-year threshold Malay juvenile. Arch Oral Biol 60:1571–1576. https://doi.org/10.1016/j.archoralbio.2015.07.017

[559] Yusof MY, Thevissen PW, Fieuws S, Willems G (2014) Dental age estimation in Malay children based on all permanent teeth types. Int J Legal Med 128:329-333. https://doi.org/10.1007/s00414-013-0825-8

[560] Johan NA, Khamis MF, Abdul Jamal NS, Ahmad B, Mahanani ES (2012) The variability of lower third molar development in Northeast Malaysian population with application to age estimation. J Forensic Odontostomatol 30(1):45-54

[561] Nik-Hussein NN, Kee KM, Gan P (2011) Validity of Demirjian and Willems methods for dental age estimation for Malaysian children aged 5-15 years old. Forensic Sci Int 204(1-3):208.e1-6. https://doi.org/10.1016/j.forsciint.2010.08.020

[562] Abu Asab S, Noor SN, Khamis MF (2011) The accuracy of Demirjian method in dental age estimation of Malay children. Singapore Dent J 32(1):19-27. https://doi.org/10.1016/S0377-5291(12)70012-3

[563] Mani SA, Naing L, John J, Samsudin AR (2008) Comparison of two methods of dental age estimation in 7-15-year-old Malays. Int J Paediatr Dent 18:380–388. https://doi.org/10.1111/j.1365-263X.2007.00890.x

[564] Hussin AS, Mokhtar N, Naing L, Taylor JA, Mahmood Z (2007) The timing and sequence of emergence of permanent teeth in Malay schoolchildren in Kota Bharu, Malaysia. Archives of Orofacial Sciences 2:36-40

[565] Nizam A, Naing L, Mokhtar N (2003) Age and sequence of eruption of permanent teeth in Kelantan, north-eastern Malaysia. Clin Oral Investig 7:222–225. https://doi.org/10.1007/s00784-003-0228-1

[566] Baral P, Bhattacharya S, Hiremath SS, Niraula SR, Banstola D (2016) A comparative study on emergence pattern of permanent teeth among four communities of Nepal. J Pak Dent Assoc 25(1):9-15

[567] Upadhyay S, Shrestha R, Shrestha D, Poudyal S (2016) Permanetn teeth emergence time and sequence in children of Kavre District, Nepal. Kathmandu Univ Med J 55(3):269-273

[568] Gupta A, Hiremath SS, Singh SK, Poudyal S, Niraula SR, Baral DD, Singh RK (2007) Emergence of primary teeth in children of Sunsari district of Eastern Nepal. McGill J Med 10:11–15

[569] Al Balushi S, Thomson WM, Al-Harthi L (2018) Dental age estimation of Omani children using Demirjian's method. Saudi Dent J 30:208–213. https://doi.org/10.1016/j.sdentj.2018.04.005

[570] Khan N, Khan H, Baloch MR, Abbasi SA (2019) Time of emergence of permanent teeth of the children of Peshawar, Pakistan. J Pak Dent Assoc 28(4):154-161. https://doi.org/10.25301/JPDA.284.154

[571] Rathore E, Nadeem M, Salahuddin B (2017) First Primary Tooth Eruption; a survey of its timing in Pakistani children and factors affecting its chronology. Prof Med J 24:205–209. https://doi.org/10.17957/tpmj/17.3780

[572] Khoja A, Fida M, Shaikh A (2015) Validity of different dental age estimation methods in Pakistani orthodontic patients. Australian J Forensic Sci 47(3):283-292. https://doi.org/10.1080/00450618.2014.957347

[573] Khan N (2011) Eruption time of permanent teeth in Pakistani children. Iranian J Publ Health 40(4):63-73

[574] Saleemi MA, Hägg U, Jalil F, Zaman S (1996) Dental development, dental age and tooth counts. A prospective longitudinal study of Pakistani children. Swed Dent J 20(1-2):61-67

[575] Saleemi MA, Hägg U, Jalil F, Zaman S (1994) Timing of emergence of individual primary teeth. A prospective longitudinal study of Pakistani children. Swed Dent J 18(3):107-112

[576] Saleemi MA, Hägg U, Jalil F (1992) The validity of estimated age in rural Pakistani children based on interviews with mothers and tooth counts of primary teeth. Swed Dent J 16(5):211-215

[577] Alsudairi DM, AlQahtani SJ (2018) Testing and comparing the accuracy of two dental age estimation methods on saudi children: measurements of open apices in teeth and the London Atlas of Tooth Development. Forensic Sci Int 295:226.e1-226.e9. https://doi.org/10.1016/j.forsciint.2018.11.011

[578] AlQahtani S, Kawthar A, AlAraik A, AlShalan A (2017) Third molar cut-off value in assessing the legal age of 18 in Saudi population. Forensic Sci Int 272:64–67. https://doi.org/10.1016/j.forsciint.2017.01.004

[579] Al-Dharrab AA, Al-Sulaimani FF, Bamashmous MS, Baeshen HA, Zawawi KH (2017) Radiographic evaluation of dental age maturity in 3-17-years-old saudi children as an indicator of chronological age. J Orthod Sci 6(2):47-53. https://doi.org/10.4103/jos.JOS_1_17

[580] Alshihri AM, Kruger E, Tennant M (2016) Dental age assessment of 4-16 year old Western Saudi children and adolescents using Demirjian's method for forensic dentistry. Egypt J Forensic Sci 6:152–156. https://doi.org/10.1016/j.ejfs.2015.03.003

[581] Nour El Deen REH, Alduaiji HM, Alajlan GM, Aljabr AA (2016) Development of the Permanent Dentition and Validity of Demirjian and Goldstein Method for Dental Age Estimation in Sample of Saudi Arabian Children (Qassim Region). Int J Health Sci (Qassim) 10:21–28. https://doi.org/10.12816/0031213

[582] Baghdadi ZD (2014) Testing international dental maturation scoring system and population-specific Demirjian versions on Saudi sub-population. J Clin Exp Dent 6(2):e138-144. https://doi.org/10.4317/jced.51373

[583] Baghdadi ZD (2013a) Dental maturity of Saudi children: role of ethnicity in age determination. Imaging Sci Dent 43(4):267-272. https://doi.org/10.5624/isd.2013.43.4.267

[584] Baghdadi ZD (2013b) Dental maturity in saudi children using the Demirjian method: a comparative study and new prediction models. ISRN Dent 2013:390314. https://doi.org/10.1155/2013/390314

[585] Baghdadi ZD, Pani SC (2012) Accuracy of population-specific Demirjian curves in the estimation of dental age of Saudi children. Int J Paediatr Dent 22(2):125-131. https://doi.org/10.1111/j.1365-263X.2011.01179.x

[586] Khan N, Chohan AN (2010) Age estimation of female school children by number of permanent teeth erupted; a study from Riyadh, Saudi Arabia. J Pak Dent Assoc 19(3):180-183

[587] Al-Emran S (2008) Dental age assessment of 8.5 to 17 year-old Saudi children using Demirjian's method. J Contemp Dent Pract 9(3):64-71

[588] Khan N, Chohan AN, Al Nasser F, Al Shahrani D, Al Jorais R, Al Salehi R, Al Youssed T (2008) Statistical presentation of eruption age of permanent second molars, premolars and canines in female school children living in Riyadh, Saudi Arabia. Saudi Dent J 20(3):140-149

[589] Chohan AN, Khan NB, Al Nahedh L, Hassan MB, Al Sufyani N (2007) Eruption time of permanent first molars and incisors among female primary school children of Riyadh. J Dow Univ Health Sci 1(2):53-58

[590] Al-Jasser NM, Bello LL (2003) Time of eruption of primary dentitionin children from Saudi Arabia. J Contemp Dent Pract 4(3):65-75

[591] Ranasinghe S, Perera J, Taylor JA, Tennakoon A, Pallewatte A, Jayasinghe R (2019) Dental age estimation using radiographs: towards the best method for Sri Lankan children. Forensic Sci Int 298:64-70. https://doi.org/10.1016/j.forsciint.2019.02.053

[592] Vithanaarachchi VSN, Nawarathne LS, Wijeyeweera RL (2018) Eruption times and patterns of permanent teeth in Sri Lankan school children in Western province. Sri Lanka Dent J 48(1):25-31

[593] Dashash M, Al-Jazar N (2018) Timing and sequence of emergence of permanent teeth in Syrian schoolchildren. J Investig Clin Dent 9(2):e12311. https://doi.org/10.1111/jicd.12311

[594] Friedrich RE, Habib S, Scheuer HA (2009) Eruption times of permanent teeth in children and adolescents in Latakia (Syria). Arch Kriminol 223(3-4):84-97

[595] Duangto P, Janhom A, Prasitwattanaseree S, Mahakkanukrauh P, Iamaroon A (2016a) New prediction models for dental age estimation in Thai children and adolescents. Forensic Sci Int 266:583.e1-583.e5. https://dx.doi.org/10.1016/j.forsciint.2016.05.005

[596] Duangto P, Iamaroon A, Prasitwattanaseree S, Mahakkanukrauh P, Janhom A (2016b) New models for age estimation and assessment of their accuracy using developing mandibular third molar teeth in a Thai population. Int J Legal Med 131(2):559-568. https://doi.org/10.1007/s00414-016-1467-4

[597] Verochana K, Prapayasatok S, Janhom A, Mahasantipiya PM, Korwanich N (2016) Accuracy of an equation for estimating age from mandibular third molar development in a Thai population. Imaging Sci Dent 46:1-7. https://doi.org/10.5624/isd.2016.46.1.1

[598] Thevissen PW, Pittayapat P, Fieuws S, Willems G (2009) Estimating age of majority on third molars developmental stages in young adults from Thailand using a modified scoring technique. J Forensic Sci 54(2):428-432. https://doi.org/10.1111/j.1556-4029.2008.00961.x

[599] Krailassiri S, Anuwongnukroh N, Dechkunakorn S (2002) Relationships between dental calcification stages and skeletal maturity indicators in Thai individuals. Angle Orthod 72(2):155-166. https://doi.org/10.1043/0003-3219(2002)072<0155:RBDCSA>2.0.CO;2

[600] Kamalanathan GS, Hauck HM (1960) Dental development of children in a Siamese village, Bang Chan, 1953. J Dent Res 39:455-461. https://doi.org/10.1177/00220345600390030601

[601] Bijjaragi SC, Sangle VA, Saraswathi FK, Patil VS, Ashwini Rani SR, Bapure SK (2015) Age estimation by modified Demirjian's method (2004) and its applicability in Tibetan young adults: a digital panoramic study. J Oral Maxillofac Pathol 19:100-105

[602] Ozveren N, Serindere G, Meric P, Cameriere R (2019) A comparison of the accuracy of Willems' and Cameriere's methods based on panoramic radiography. Forensic Sci Int 302:109912. https://doi.org/10.1016/j.forsciint.2019.109912

[603] Apaydin BK, Yasar F (2018) Accuracy of the Demirjian, Willems and Cameriere methods of estimating dental age on turkish children. Niger J Clin Pract 21:257-263. https://doi.org/10.4103/1119-3077.226966

[604] Ozveren N, Serindere G (2018) Comparison of the applicability of Demirjian and Willems methods for dental age estimation in children from the Thrace region, Turkey. Forensic Sci Int 285:38-43. https://doi.org/10.1016/j.forsciint.2018.01.017

[605] Boyacıoğlu Doğru H, Avcu N, Akkaya N, Ozge H, Goksuluk D (2017) Applicability of Cameriere's and Drusini's age estimation methods to a sample of Turkish adults. Dentomaxillofac Radiol 46(7):20170026. https://doi.org/10.1259/dmfr.20170026

[606] Gulsahi A, De Luca S, Cehreli SB, Tirali RE, Cameriere R (2016) Accuracy of the third molar index for assessing the legal majority of 18 years in Turkish population. Forensic Sci Int 266:584.e1-584.e6. https://dx.doi.org/10.1016/j.forsciint.2016.04.034

[607] Altan HO, Altan A, Bilgiç F, Sözer OA, Damlar I (2016) The applicability of Willems' method for age estimation in southern Turkish children: a preliinary study. J Forensic Leg Med 38:24-27. https://dx.doi.org/10.1016/j.jflm.2015

[608] Oznurhan F, Ekci ES, Ozalp S, Deveci C, Delilbasi AE, Bani M, Oztas N (2016) Time and sequence of eruption of permanent teeth in Ankara, Turkey. Pediatr Dent J 26:1-7. https://dx.doi.org/10.1016/j.pdj.2015.09.002

[609] Gulsahi A, Tirali RE, Cehreli SB, De Luca S, Ferrante L, Cameriere R (2015) The reliability of Cameriere's method in Turkish children: a preliminary report. Forensic Sci Int 249:319.e1-319.e5. https://dx.doi.org/10.1016/j.forsciint.2015.01.031

[610] Gungor OE, Kale B, Celikoglu M, Gungor AY, Sari Z (2015) Validity of the Demirjian method for dental age estimation for Southern Turkish children. Niger J Clin Pract 18(5):616-619

[611] Misirliogle M, Nalcaci R, Adisen MZ, Yilmaz S, Yorubulut S (2014) Age estimation using maxillary canine pulp/tooth area ratio, with an application of Kvaal's methods on digital orthopantomographs in a Turkish sample. Australian J Forensic Sci 46(1):27-38. https://doi.org/10.1080/00450618.2013.784357

[612] Celik S, Zeren C, Çelikel A, Yengil E, Altan A (2014) Applicability of the Demirjian method for dental assessment of southern Turkish children. J Forensic Leg Med 25:1-5. https://dx.doi.org/10.1016/j.jflm.2014.04.006

[613] Karataş OH, Öztürk F, Dedeoğlu N, Çolak C, Altun O (2013) Radiographic evaluation of third-molar development in relation to the chronological age of Turkish children in the southwest eastern Anatolia region. Forensic Sci Int 232:238.e1-238.e5. https://dx.doi.org/10.1016/j.forsciint.2013.07.023

[614] Erdem AP, Yamac E, Erdem MA, Sepet E, Aytepe Z (2013) A new method to estimate dental age. Acta Odontol Scand 71:590-598

[615] Kırzıoğlu Z, Ceyhan D (2012) Accuracy of different dental age estimation methods on Turkish children. Forensic Sci Int 216:61-67. https://doi.org/10.1016/j.forsciint.2011.08.018

[616] Erbudak HO, Özbek M, Uysal S, Karabulut E (2012) Application of Kvaal et al.'s age estimation method to panoramic radiographs from Turkish individuals. Forensic Sci Int 219:141-146. https://doi.org/10.1016/j.forsciint.2011.12.012

[617] Tunc ES, Koyuturk AE (2008) Dental age assessment using Demirjian's method on northern Turkish children. Forensic Sci Int 175:23-26. https://doi.org/10.1016/j.forsciint.2007.04.228

[618] Orhan K, Ozer L, Orhan AI, Dogan S, Paksoy CS (2007) Radiographic evaluation of third molar development in relation to chronological age among Turkish children and youth. Forensic Science International 165(1):46-51. https://doi.org/10.1016/j.forsciint.2006.02.046

[619] Kanbur NO, Kanli A, Derman O, Eifan A, Ataç A (2006) The relationships between dental age, chronological age and bone age in turkish adolescents with constitutional delay of growth. J Pediatr Endocrinol Metab 19:979-985

[620] Wedl JS, Schoder V, Blake FAS, Schmelzle R, Friedrich RE (2004) Eruption times of permanent teeth in teenage boys and girls in Izmir (Turkey). J Clin Forensic Med 11:299-302. https://doi.org/10.1016/j.jcfm.2004.04.007

[621] Uysal T, Sari Z, Ramoglu SI, Basciftci FA (2004) Relationships between dental and skeletal maturity in Turkish subjects. Angle Orthod 74(5):657-664

[622] Altalie S, Thevissen P, Fieuws S, Willems G (2014) Optimal dental age estimation practice in United Arab Emirates' children. J Forensic Sci 59(2):383-385. https://doi.org/10.1111/1556-4029.12351

[623] Alqadi MA, Abuaffan AH (2019) Validity of the Demirjian and Fishman methods for predicting chronological age amongst Yemeni children. Sultan Qaboos Univ Med J 19(1):e26-e31. https://doi.org/10.18295/squmj.2019.19.01.006

[624] Muñiz B (1988) Chronology of permanent tooth eruption in Argentinian children. Rev Asoc Odontol Argent 76(6):222-228

[625] Nóbrega JBMD, Protasio APL, Ribeiro ILA, Valença AMG, Santiago BM, Cameriere R (2019) Validation of the third molar maturation index to estimate the age of criminal responsibility in Northeastern Brazil. Forensic Sci Int 304:109917. https://doi.org/10.1016/j.forsciint.2019.109917

[626] Lopes LJ, Nascimento HAR, Lima GP, Santos LAN, Queluz DP, Freitas DQ (2018) Dental age assessment: which is the most applicable method? Forensic Sci Int 284:97-100. https://doi.org/10.1016/j.forsciint.2017.12.044

[627] Mazzilli LEN, Melani RFH, Lascala CA, Palacio LAV, Cameriere R (2018) Age estimation: Cameriere's open apices methodology accuracy on a southeast Brazilian sample. J Forensic Leg Med 58:164–168. https://doi.org/10.1016/j.jflm.2018.06.006

[628] Benedicto EN, Azevedo ACS, Michel-Crosato E, Biazevic MGH (2018) Validity and accuracy of three radiographic dental age estimation methods in Brazilians. Forensic Sci Int 283:128–135. https://doi.org/10.1016/j.forsciint.2017.12.014

[629] Lavez GP, Terada ASSD, Dezem TU, Galo R, da Silva RHA (2017) Age estimation using Olze's method in an adult Brazilian population. J Forensic Leg Med 52:241–244. https://doi.org/10.1016/j.jflm.2017.10.003

[630] Porto LVMG, Celestino Da Silva Neto J, Anjos Pontual A Dos, Catunda RQ (2015) Evaluation of volumetric changes of teeth in a Brazilian population by using cone beam computed tomography. J Forensic Leg Med 36:4–9. https://doi.org/10.1016/j.jflm.2015.07.007

[631] de Souza RB, da Silva Assunção LR, Franco A, Zaroni FM, Holderbaum RM, Fernandes A (2015) Dental age estimation in Brazilian HIV children using Willems' method. Forensic Sci Int 257:510.e1-510.e4. https://doi.org/10.1016/j.forsciint.2015.07.044

[632] Deitos AR, Costa C, Michel-Crosato E, Galić I, Cameriere R, Biazevic MGH (2015) Age estimation among Brazilians: Younger or older than 18? J Forensic Leg Med 33:111–115. https://doi.org/10.1016/j.jflm.2015.04.016

[633] Azevedo A de CS, Alves NZ anin., Michel-Crosato E, Rocha M, Cameriere R, Biazevic MGH (2015) Dental age estimation in a Brazilian adult population using Cameriere's method. Braz Oral Res 29:1–9. https://doi.org/10.1590/1807-3107BOR-2015.vol29.0016

[634] Lopez TT, Arruda CP, Rocha M, Rosin AS, Michel-Crosato E, Biazevic MG (2013) Estimating ages by third molars: stages of development in Brazilian young adults. J Forensic Leg Med 20(5):412-418. https://doi.org/j.jflm.2012.12.001

[635] Franco A, Thevissen P, Fieuws S, Souza PHC, Willems G (2013) Applicability of Willems model for dental age estimations in Brazilian children. Forensic Sci Int 231:401.e1-401.e4. https://doi.org/10.1016/j.forsciint.2013.05.030

[636] de Oliveira FT, Capelozza AL, Lauris JR, de Bullen IR (2012) Mineralization of mandibular third molars can estimate chronological age – Brazilian indices. Forensic Sci Int 219(1-3):147-150. https://doi.org/10.1016/j.forsciint.2011.12.013

[637] Fernandes MM, Tinoco RLR, de Braganca DPP, de Lima SHR, Franceschini Junior L, Daruge Junior E (2011) Age estimation by measurements of developing teeth: Accuracy of cameriere's method on a brazilian sample. J Forensic Sci 56:1616–1619. https://doi.org/10.1111/j.1556-4029.2011.01860.x

[638] Maia MCG, Martins M da GA, Germano FA, Neto JB, da Silva CAB (2010) Demirjian's system for estimating the dental age of northeastern Brazilian children. Forensic Sci Int 200:177.e1-177.e4. https://doi.org/10.1016/j.forsciint.2010.03.030

[639] Bastos JL, Peres MA, Peres KG, Barros AJD (2007) Infant growth, development and tooth emergence patterns: A longitudinal study from birth to 6 years of age. Arch Oral Biol 52:598–606. https://doi.org/10.1016/j.archoralbio.2006.12.001

[640] Holderbaum RM, Veeck EB, Oliveira HW, da Silva CL, Fernandes A (2005) Comparison among dental, skeletal and chronological development in HIV-positive children : a radiographic study. Braz Oral Res 19:209–215

[641] Costa W (1999) Cronologia de mineralização do primeiro molar inferior permanente e sua relação com a idade cronológica em crianças da região de Belém. Dissertation, FOP, Unicamp

[642] Gilbert C, Fairgrieve SI, Keenan SC (2014) A Test of the Demirjian method of dental ageing using a mixed population sample from Northern Ontario. J Can Soc Forensic Sci 47:1–19. https://doi.org/10.1080/00085030.2014.885698

[643] Demirjian A, Levesque GY (1980) Sexual Differences in Dental Development and Prediction of Emergence. J Dent Res 59:1110–1122. https://doi.org/10.1177/00220345800590070301

[644] Mayhall JT, Belier PL, Mayhall MF (1978) Canadian Eskimo permanent tooth emergence timing. Am J Phys Anthropol 49:211–216. https://doi.org/10.1002/ajpa.1330490209

[645] Sapoka AA, Demirjian A (1971) Dental development of the French Canadian child. J Can Dent Assoc (Tor) 37:100–104

[646] Cameriere R, Palacio LAV, Pinares J, Bestetti F, Paba R, Coccia E, Ferrante L (2018) Assessment of second (I2M) and third (I3M) molar indices for establishing 14 and 16 legal ages and validation of the Cameriere's I 3M cut-off for 18 years old in Chilean population. Forensic Sci Int 285:205.e1-205.e5. https://doi.org/10.1016/j.forsciint.2017.12.043

[647] Rivera M, De Luca S, Aguilar L, Palacio LAV, Galić I, Cameriere R (2017) Measurement of open apices in tooth roots in Colombian children as a tool for human identification in asylum and criminal proceedings. J Forensic Leg Med 48:9–14. https://doi.org/10.1016/j.jflm.2017.03.005

[648] De Luca S, Aguilar L, Rivera M, Palacio LAV, Riccomi G, Bestetti F, Cameriere R (2016c) Accuracy of cut-off value by measurement of third molar index: Study of a Colombian sample. Forensic Sci Int 261:160.e1-160.e5. https://doi.org/10.1016/j.forsciint.2016.01.026

[649] Costa J, Montero J, Serrano S, Albaladejo A, López-Valverde A, Bica I (2014) Accuracy in the legal age estimation according to the third molars mineralization among Mexicans and Columbians. Aten Primaria 46:165–175. https://doi.org/10.1016/S0212-6567(14)70086-1

[650] Gómez Jiménez L, Velandia Palacio LA, De Luca S, Ramirez Vasquez Y, Corominas Capellán M, Cameriere R (2019) Validation of the third molar maturity index (I_{3M}): study of a Dominican Republic sample. J Forensic Odontosomatol 37(3):27-33

[651] Garciá-Godoy F, Díaz AN, Del Valle JM, Arana EJ (1982) Timing of permanent tooth emergence in a Southeastern Dominican schoolchildren population sample. Community Dent Oral Epidemiol 10:43–46. https://doi.org/10.1111/j.1600-0528.1982.tb00359.x

[652] Psoter W, Gebrian B, Prophete S, Reid B, Katz R (2008) Effect of early childhood malnutrition on tooth eruption in Haitian adolescents. Community Dent Oral Epidemiol 36:179–189. https://doi.org/10.1111/j.1600-0528.2007.00386.x

[653] De Luca S, De Giorgio S, Butti AC, Biagi R, Cingolani M, Cameriere R (2012) Age estimation in children by measurement of open apices in tooth roots: Study of a Mexican sample. Forensic Sci Int 221:155.e1-155.e7. https://doi.org/10.1016/j.forsciint.2012.04.026

[654] De Luca S, Bautista J, Alemán I, Cameriere R (2011) Age-at-Death Estimation by Pulp/Tooth Area Ratio in Canines: Study of a 20th-Century Mexican Sample of Prisoners to Test Cameriere's Method. J Forensic Sci 56:1302–1309

[655] Quispe Lizarbe RJ, Solís Adrianzén C, Quezada-Márquez MM, Galić I, Cameriere R (2017) Demirjian's stages and Cameriere's third molar maturity index to estimate legal adult age in Peruvian population. Legal Med 25:59–65. https://doi.org/10.1016/j.legalmed.2017.01.003

[656] Cameriere R, Flores-Mir C, Mauricio F, Ferrante L (2007c) Effects of nutrition on timing of mineralization in teeth in a Peruvian sample by the Cameriere and Demirjian methods. Ann Hum Biol 34:547–556. https://doi.org/10.1080/03014460701556296

[657] Moze K, Graham R (2012) Dental age assessment (DAA) of Afro-Trinidadian children and adolescents. Development of a Reference Dataset (RDS) and comparison with Caucasians resident in London, UK. J Forensic Leg Med 19:272-279. https://doi.org/10.1016/j.jflm.2011.12.033

[658] Kasper KA, Austin D, Kvanli AH, Rios TR, Senn DR (2009) Reliability of third molar development for age estimation in a Texas hispanic population: A comparison study. J Forensic Sci 54:651–657. https://doi.org/10.1111/j.1556-4029.2009.01031.x

[659] Harris EF (2007) Mineralization of the mandibular third molar: a study of American Blacks and Whites. Am J Phys Anthropol 132:98-109

[660] Blankenship JA, Mincer HH, Anderson KM, Woods MA, Burton EL (2007) Third molar development in the estimation of chronologic age in American blacks as compared with whites. J Forensic Sci 52:428–433. https://doi.org/10.1111/j.1556-4029.2006.00356.x

[661] Harris EF, McKee JH (1990) Tooth Mineralization Standards for Blacks and Whites from the Middle Southern United States. J Forensic Sci 35(4):859-872. https://doi.org/10.1520/jfs12898j

[662] Smith BH, Garn SM (1987) Polymorphisms in eruption sequence of permanent teeth in American children. Am J Phys Anthropol 74:289–303. https://doi.org/10.1002/ajpa.1330740303

[663] Savara BS, Steen JC (1978) Timing and sequence of eruption of permanent teeth in a longitudinal sample of children from Oregon. J Am Dent Assoc 97:209–214. https://doi.org/10.14219/jada.archive.1978.0277

[664] Medina AC, Blanco L (2014) Accuracy of dental age estimation in Venezuelan children: comparison of Demirjian and Willems methods. Acta Odontol Latinoam 27(1):34-41

[665] Marroquin TY, Karkhanis S, Kvaal SI, Vasudavan S, Castelblanco E, Kruger E, Tennant M (2017) Determining the effectiveness of adult measures of standardised age estimation on juveniles in a Western Australian population. Australian J Forensic Sci 49(4): 459-467. https://doi.org/10-1080/00450618.2016.1177593

[666] Franklin D, Karkhanis S, Flavel A, Collini F, DeLuca S, Cameriere R (2016) Accuracy of a cut-off value based on the third molar index: validation in an Australian population. Forensic Sci Int 266:575.e1-575.e6

[667] Karkhanis S, Mack P, Franklin D (2015) Dental age estimation standards for a Western Australian population. Forensic Sci Int 257:509.e1-509.e9. https://doi.org/10.1016/j.forsciint.2015.06.021

[668] Karkhanis S, Mack P, Franklin D (2013) Age estimation standards for a Western Australian population using the coronal pulp cavity index. Forensic Sci Int 231:412.e1-412.e6

[669] Flood SJ, Franklin D, Turlach BA, McGeachie J (2013) A comparison of Demirjian's four dental developement methods for forensic age estimation in South Australian sub-adults. J Forensic Leg Med 20:875-883. https://doi.org/10.1016/j.jflm.2013.07.002

[670] Blenkin M, Taylor J (2012) Age estimation charts for a modern Australian population. Forensic Sci Int 221(1-3):106-112. https://doi.org/10.1016/j.forsciint.2012.04.013

[671] Woodroffe S, Mihailidis S, Hughes T, Bockmann M, Seow WK, Gotjamanos T, Townsend G (2010) Primary tooth emergence in Australian children: timing, sequence and patterns of asymmetry. Aust Dent J 55:245-251. https://doi.org/10.1111/j.1834-7819.2010.01230.x

[672] Diamanti J, Townsend GC (2003) New standards for permanent tooth emergence in Australian children. Aust Dent J 48(1):39-42

[673] McKenna CJ, James H, Taylor JA (2002) Tooth development standards for South Australia. Aust Dent J 47(3):223-227

[674] Farah CS, Booth DR, Knott SC (1999) Dental maturity of childen in Perth, Western Australia, and its application in forensic age estimation. J Clin Forensic Med 6:14-18

[675] Hitchcock NE, Gilmour AI, Gracey M, Kailis DG (1984) Australian longitudinal study of time and order of eruption of primary teeth. Community Dent Oral Epidemiol 12:260-263

[676] Brown T (1978) Tooth emergence in Australian aboriginals. Ann Hum Biol 5(1):41-54

[677] Roche AF, Barkla DH, Maritz JS (1964) Deciduous eruption in Melbourne children. Aust Dent J 9(2):106-108. https://doi.org/10.1111/j.1834-7819.1964.tb0270.x

[678] Gates RE (1964) Eruption of permanent teeth of New South Wales school children. Part I. Ages of eruption. Aust Dent J 9(3):211-218. https://doi.org/10.1111/j.1834-7819.1964.tb05737.x

[679] Ulijaszek SJ (1996) Age of eruption of deciduous dentition of Anga children, Papua New Guinea. Ann Hum Biol 23(6):495-499

[680] Friedlaender JS, Bailit HL (1969) Eruption times of the deciduous and permanent teeth of natives on Bougainville island, territory of New Guinea: a study of racial variation. Hum Biol 41(1):51-65

[681] Bailey KV (1964) Dental development in new guinean infants. J Pediatr 64(1):97-100

[682] Baylis S, Bassed R (2017) Precision and accuracy of commonly used dental age estimation charts for the New Zealand population. Forensic Sci Int 277:223-228. https://doi.org/10.1016/j.forsciint.2017.06.011

[683] Timmins K, Liversidge H, Farella M, Herbison P, Kieser J (2012) The usefulness of dental and cervical maturation stages in New Zealand children for Disaster Victim Identification. Forensic Sci Med Pathol 8:101-108. https://doi.org/10.1007/s12024-011-9251-8

[684] Kanagaratnam S, Schluter PJ (2012) The age of permanent tooth emergence in children of different ethnic origin in the Auckland region: a cross-sectional study. N Z Dent J 108(2):55-61

[685] Moananui RT, Kieser JA, Herbison GP, Liversidge HM (2008a) Estimating age in Maori, Pacific Island, and European children from New Zealand. J Forensic Sci 53(2):401-404. https://doi.org/10.1111/j.1556-4029.2007.00643.x

[686] Moananui RT, Kieser JA, Herbison P, Liversidge HM (2008b) Advanced dental maturation in New Zealannd Maori and Pacific Island children. Am J Hum Biol 20:43-50. https://doi.org/10.1002/ajhb.20670

[687] Zhang A, Sayre JW, Vachon L, Liu BJ, Huang HK (2009) Racial differences in growth patterns of children assessed on the basis of bone age. Radiology 250(1):228-235

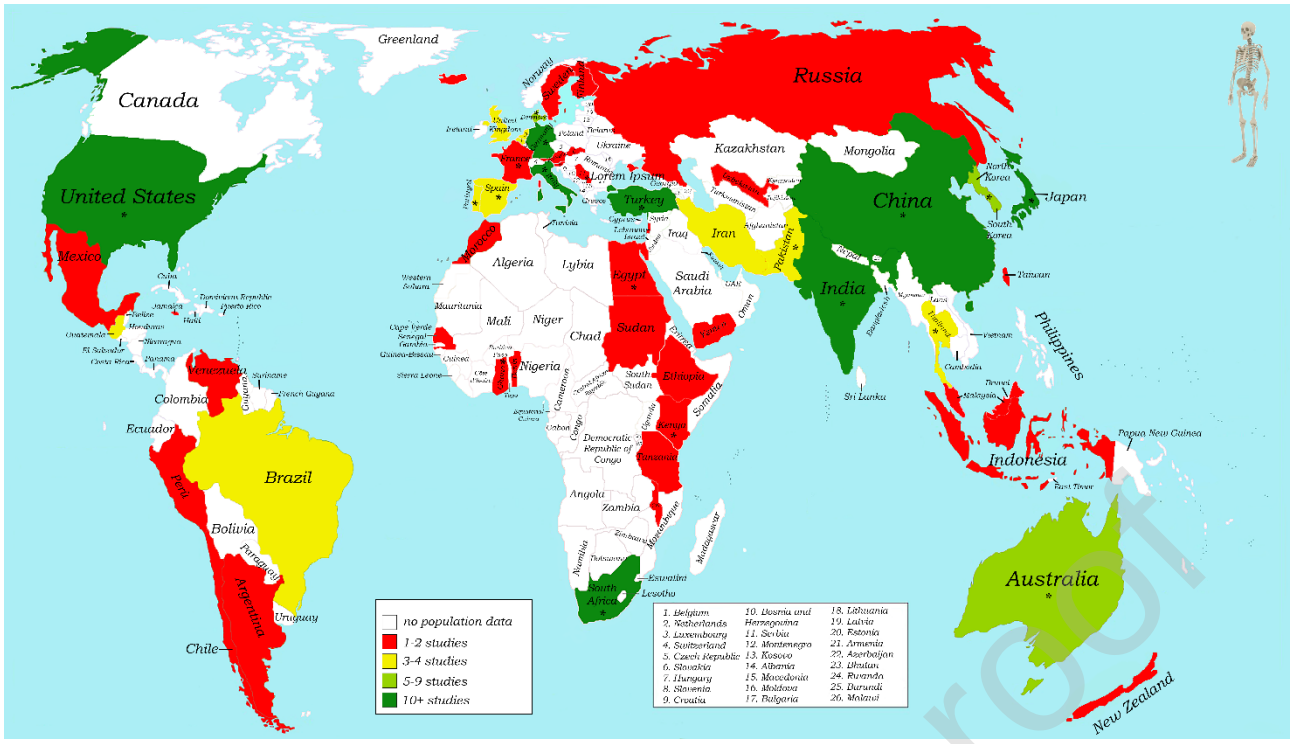

Figure 1- World map showing the current situation concerning population data for skeletal methods for age estimation in the living. The symbol "*" on the map indicates the presence of data also on the ossification of the medial end of the clavicle.

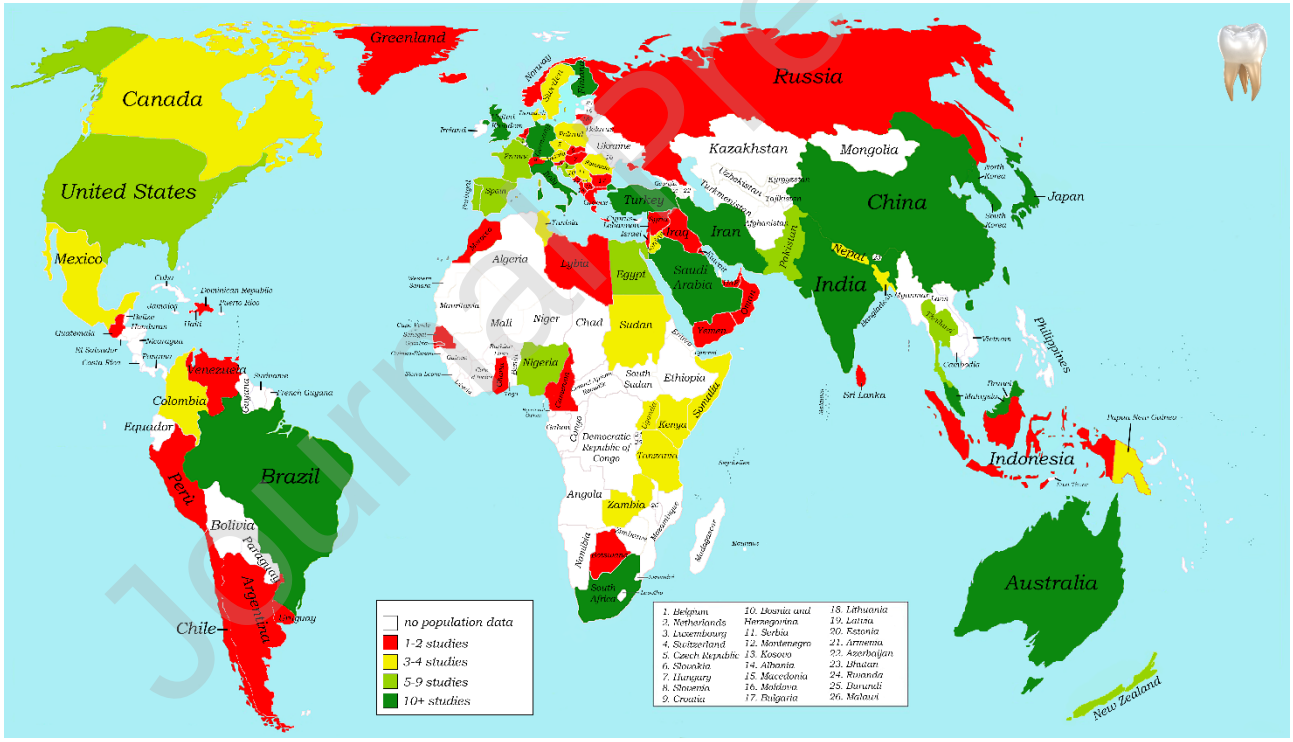

Figure 2- World map showing the current situation concerning population data for dental methods for age estimation in the living

Table 1 – Africa - list of papers reporting population data for skeletal methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
Benin	G&P; TW2; FELS	102	4-19	Santoro *et al*. 2019 [75]
Benin	TW2	600	9-18	Agossou-Voyeme *et al*. 2005 [76]
Egypt	Kellinghaus *et al*. 2010	142	8-30	El Morsi *et al*. 2015 [77]
Ethiopia	G&P	108	10-22	Binalfew *et al*. 2017 [78]
Ethiopia	TW3; G&P	976	5-22	Hailu *et al*. 2011 [79]
Ghana	Schmeling *et al*. 2004	1035	16-32	Brown *et al*. 2013 [80]
Kenya	Schmeling *et al*. 2004	1605	14-30	Marera and Satyapal 2018 [81]
Kenya	Flory 1936	1360	0-18	Mackay *et al*. 1952 [82]
Malawi	G&P	139	1-29	Lewis *et al*. 2002 [83]
Morocco	G&P	114	13-25	Garamendi *et al*. 2005 [84]
***Senegal**	G&P	300	0-15	Massè and Hunt 1963 [85]
South Africa	Schmeling *et al*. 2004	1605	14-30	Marera and Satyapal 2018 [81]
South Africa	G&P	102	0-21	Govender and Goodier 2018 [86]
South Africa	TW3	607	9-20	Cole *et al*. 2015 [87]
South Africa	TW3	244	9-10	Hawley *et al*. 2012 [88]
South Africa	G&P	131	13-21	Dembetembe and Morris 2012 [89]
South Africa	G&P	163	13-21	Dembetembe 2010 [90]
South Africa	TW3; G&P	683	9-14	Hawley 2009 [91]
South Africa	G&P	603	9-11	Hawley *et al*. 2009 [92]
South Africa	G&P	305	6-11	Levine 1972 [93]
South Africa	hand & wrist	705	0-6	Beresowski and Lundie 1952 [94]
Sudan	G&P	1683	3-25	Elamin 2017 [95]
Tanzania	Flory 1936	1360	0-18	Mackay *et al*. 1952 [82]

Table 2 – Europe - list of papers reporting population data for skeletal methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
***Austria**	G&P; TW2	637	7-16	Wenzel *et al*. 1984 [96]
Belgium	TW2	21174	12-20	Beunen *et al*. 1990 [97]
Belgium	TW2	76	15-18	Malina *et al*. 1986 [98]
Belgium	TW1; TW2	14259	12-17	Beunen *et al*. 1982 [99]
Denmark	Schmidt *et al*. 2007	102	12-33	Tangmose *et al*. 2014 [100]
Denmark	G&P	165	11-19	Lynnerup *et al*. 2008 [101]
Denmark	TW2	2744	7-14	Helm 1990 [102]
Denmark	TW2	48	6-20	Jensen *et al*. 1983 [103]
Denmark	TW2	1100	6-16	Wenzel and Melsen 1982 [104]
Denmark	TW2	3817	7-18	Helm 1979 [105]
Denmark	G&P; TW1	1009	7-18	Andersen 1971 [106]
***Finland**	G&P	47	0-17	Vakkola *et al*. 2011 [107]
France	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	319	15-30	Houpert *et al*. 2016 [108]
France	G&P	190	10-19	Zabet *et al*. 2014 [109]
Germany	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	669	12-24	Schmidt *et al*. 2017 [110]
Germany	Schultz *et al*. 2008	410	14-26	Gonsior *et al*. 2016 [111]
Germany	Schmeling *et al*. 2004	418	15-30	Wittschieber *et al*. 2016 [112]
Germany	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	572	10-40	Wittschieber *et al*. 2015 [113]
Germany	Schmeling *et al*. 2004	418	15-30	Wittschieber *et al*. 2014 [29]
Germany	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	152	18-22	Vieth *et al*. 2014 [114]
Germany	Schmeling *et al*. 2004	185	13-26	Kellinghaus *et al*. 2010a [28]
Germany	Schmeling *et al*. 2004	502	10-35	Kellinghaus *et al*. 2010b [115]
Germany	Owings Webb and Suchey 1985	84	12-30	Schulz *et al*. 2008 [26]
Germany	G&P	649	1-18	Schmidt *et al*. 2008a [73]
Germany	TW2; TW3	92	12-16	Schmidt *et al*. 2008b [116]

Germany	Schmeling *et al*. 2004	556	15-30	Schulz *et al*. 2005 [27]
Germany	Schmeling *et al*. 2004	699	16-30	Schmeling *et al*. 2004 [24]
Germany	Owings Webb and Suchey 1985; Jit and Kulkarni 1976	380	0-29	Kreitner *et al*. 1998 [117]
Iceland	Helm *et al*. 1971	1426	5-17+	Magnússon 1979 [118]
Italy	G&P; TW2; FELS	102	4-19	Santoro *et al*. 2019 [75]
Italy	Cameriere *et al*. 2006a	332	1-16	De Luca *et al*. 2016a [119]
Italy	G&P; TW3	274	6-17	Pinchi *et al*. 2016a [120]
Italy	G&P; TW2; TW3	307	6-20	Pinchi *et al*. 2014 [121]
Italy	G&P	300	14-18	De Donno *et al*. 2013 [122]
Italy	Schmeling *et al*. 2004	274	12-25	Cameriere *et al*. 2012a [123]
Italy	G&P	535	7-15	Santoro *et al*. 2012 [124]
Italy	G&P	484	11-19	Tisè *et al*. 2011 [125]
Italy	Cameriere *et al*. 2006a	150	5-17	Cameriere *et al*. 2006a [13]
Italy	TW2	1831	8-16	Vignolo *et al*. 1999 [126]
Italy	G&P; TW2; FELS	327	1-17	Vignolo *et al*. 1992 [127]
Italy	G&P; TW2	221	4-16	Vignolo *et al*. 1990 [128]
Italy	G&P; TW2	/	7-9	Passone *et al*. 1981[129]
Italy	G&P; TW2	/	6-8	Pastorin *et al*. 1977 [130]
Netherlands	G&P	572	5-19	Van Rijn *et al*. 2001 [131]
Netherlands	TW2	200	13-22	Post and Kemper 1993 [132]
Netherlands	TW1; TW2	1132	8-17	Van Venrooij-Ysselmuiden and van Ipenburg 1978 [133]
Portugal	G&P	230	12-20	Santos *et al*. 2011 [134]
Portugal	TW2	507	8-18	Freitas *et al*. 2004 [135]
Portugal	Ossification of the clavicle	32	11-39	MacLaughlin 1990 [136]
Russia	TW2	/	/	Khaĭrullina and Kosourov 1997 [137]
Serbia	Schmeling *et al*. 2004; Schulz *et al*. 2005	154	15-35	Milenkovic *et al*. 2014 [138]
***Slovakia**	TW2	579	1-5	Bernasovský *et al*. 1992 [139]
Slovakia	TW2	579	??	Bernasovský *et al*. 1990 [140]
Slovakia	TW2	300	7-15	Bernasovský *et al*. 1986 [141]
***Slovenia**	TW3	158	6-16	Cameriere *et al*. 2008b [142]
Spain	Schulz *et al*. 2008	221	5-30	Benito *et al*. 2018 [143]
Spain	TW2	86	/	Bueno *et al*. 1996 [144]
Spain	G&P	239	0-14	Jiménez-Castellanos *et al*. 1996 [145]
Spain	TW2	/	/	Sarrià *et al*. 1986 [146]
Sweden	TW2	212	0-18	Taranger *et al*. 1987 [147]
United Kingdom	G&P	406	0-21	Hackman and Black 2013 [148]
United Kingdom	TW2	207	1-14	Savaridas *et al*. 2007 [149]
United Kingdom	TW2	293	1-15	Kristmundsdottir *et al*. 1984 [150]

Table 3 – Asia - list of papers reporting population data for skeletal methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
China	G&P; BoneXpert	397	2-14	Zhang *et al*. 2016 [151]
China	Muhler *et al*. 2006	752	15-25	Zhang *et al*. 2015 [152]
China	G&P; Gilsanz and Ratib 2005	618	0-13	Lin *et al*. 2014 [153]
China	Wang *et al*. 2013	684	15-25	Wei *et al*. 2013 [154]
China	Wang *et al*. 2013	460	15-25	Wang *et al*. 2013* [30]
China	G&P; TW3	6026	2-20	Zhang *et al*. 2013 [155]
China	Schmeling *et al*. 2004	565	15-25	Zhao *el al*. 2011 [156]
China	TW3	9408	1-13	Zhang *et al*. 2008a [157]
China	TW3	17401	1-20	Zhang *et al*. 2008b [158]
China	G&P; TW3	1020	1-18	Griffith *et al*. 2007 [159]
China	TW3	1273	6-18	Ashizawa *et al*. 2005 [160]
China	TW2	2122	2-20	Ye *et al*. 1992 [161]
China	G&P	1454	11-12	So and Yen 1990 [162]

China	TW2	572	7-17	Zhen and Baolin 1986 [163]
China	TW1	492	0-3	Waldmann *et al*. 1977 [164]
China	G&P	33990	0-20	Low 1972 [165]
India	G&P; MacKays *et al*. 1952	106	1-15	Keny *et al*. 2018 [166]
India	G&P	180	6-16	Patel *et al*. 2015 [167]
India	G&P	660	9-20	Mohammed *et al*. 2015 [168]
India	Hassel and Farman 1995; Fishman 1982	48	7-18	Chalasani *et al*. 2013 [169]
India	G&P	270	17-25	Makkad *et al*. 2013 [170]
India	G&P	375	1-19	Patil *et al*. 2012 [171]
India	McKern and Stewart 1957	343	17-75	Singh *et al*. 2011 [172]
India	G&P	160	8-14	Bala *et al*. 2010 [173]
India	G&P	261	5-17	Bogin *et al*. 1989 [174]
India	TW2	298	6-14	Prakash and Cameron 1981 [175]
***Indonesia**	Fishman 1982; Bacetti *et al*. 2002	2167	8-17	Soegiharto *et al*. 2008 [176]
Iran	Bacetti *et al*. 2002	95	6-15	Hedayati and Khalafinejad 2014 [177]
Iran	G&P	425	6-18	Moradi *et al*. 2012 [178]
Iran	G&P	228	7-14	Ghotbi *et al*. 2010 [179]
Japan	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	207	12-30	Torimitsu *et al*. 2019 [180]
Japan	G&P; Hassel and Farman 1995	256	4-20	Kumagai *et al*. 2018 [181]
Japan	TW2	1457	2-18	Murata 1997 [182]
Japan	TW2	1457	3-18	Ashizawa *et al*. 1996 [183]
Japan	TW2	44	5-18	Ashizawa *et al*. 1995 [184]
Japan	G&P	1304	1-19	Matsuo 1993 [185]
Japan	TW2	6300	7-17	Takai 1993 [186]
Japan	TW2	1902	7-18	Murata 1992 [187]
Japan	TW2	8800	6-17	Takai 1990 [188]
Japan	TW2	723	7-16	Takai *et al*. 1984 [189]
Japan	/	/	/	Kimura 1984 [190]
Japan	TW2	985	4-15	Takai and Akiyoshi 1983 [191]
Japan	TW2	258	6-18	Kimura 1977a [192]
Japan	TW2	713	0-18	Kimura 1977b [193]
Japan	TW1	90	3-18	Kimura 1976a [194]
Japan	TW1; Kimura 1972	264	7-15	Kimura 1976b [195]
Japan	G&P	920	0-18	Kimura 1972a [196]
Japan	TW1; Oxford	/	/	Kimura 1972b [197]
Japan	G&P	898	6-18	Greulich 1957 [198]
Korea	/	1151	16-30	Yoon *et al*. 2016 [199]
Korea	G&P; TW3	212	7-12	Kim *et al*. 2015 [200]
Korea	TW3	378	8-15	Oh *et al*. 2012 [201]
Korea	G&P; TW3	186	4-18	Kim *et al*. 2010 [202]
Korea	TW3	674	9-17	Modi *et al*. 2009 [203]
Korea	TW2	3407	0-16	Yeon 1997 [204]
***Lebannon**	G&P; Fishman 1982	260	8-17	Saadé *et al*. 2017 [205]
Malaysia	G&P	112	12-18	Chen 1990 [206]
Pakistan	Schmeling *et al*. 2004	500	16-32	Nadir *et al*. 2014 [207]
Pakistan	G&P; Girdany-Golden 1959	283	0-18	Awais *et al*. 2014 [208]
Pakistan	G&P	889	0-18	Zafar *et al*. 2010 [209]
Pakistan	G&P	750	1-18	Rikhasor *et al*. 1999 [210]
Taiwan	TW3	1290	7-9	Hsieh *et al*. 2013 [211]
Taiwan	G&P	370	0-18	Chiang *et al*. 2005 [212]
Thailand	G&P; TW3; Fishman 1982	365	8-20	Benjavongkulchai and Pittayapat 2018 [213]
Thailand	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	409	11-29	Pattamapaspong *et al*. 2015 [214]
Turkey	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	601	10-35	Ramadan *et al*. 2017 [215]
Turkey	Schmeling *et al*. 2004	354	10-30	Ufuk *et al*. 2016 [216]
Turkey	Schmeling *et al*. 2004; Kellinghaus *et al*. 2010	725	10-35	Gurses *et al*. 2016 [217]
Turkey	G&P	535	10-18	Gungor *et al*. 2015 [218]
Turkey	Kellinghaus *et al*. 2010	193	13-28	Ekizoglu *et al*. 2015 [219]
Turkey	Schmeling *et al*. 2004	503	10-35	Ekizoglu *et al*. 2014 [220]
Turkey	G&P	767	7-17	Cantekin *et al*. 2012 [221]
Turkey	TW3	324	11-16	Büken *et al*. 2010 [222]
Turkey	G&P; TW3; Gök *et al*. 1985	333	11-16	Büken *et al*. 2009 [223]

Turkey	G&P	492	11-19	Büken *et al*. 2007 [224]
Turkey	G&P	33	10-16	Kanbur *et al*. 2006 [225]
Turkey	Björk 1972; Grave and Brown 1976	500	7-20	Uysal *et al*. 2004 [226]
Turkey	G&P	225	7-17	Koc *et al*. 2001 [227]
Uzbekistan	/	/	11-19	Berdikulov 1980 [228]
***Yemen**	Fishman 1982	358	8-16	Alqadi and Abuaffan 2019 [229]

Table 4 – America - list of papers reporting population data for skeletal methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
***Argentina**	TW2	775	4-12	Lejarraga *et al*. 1997 [230]
Argentina	TW1	778	4-12	Guimarey *et al*. 1988 [231]
***Brazil**	Cameriere *et al*. 2006a	234	5-14	Machado *et al*. 2018 [232]
Brazil	TW2; TW3	240	7-16	Ortega *et al*. 2006 [233]
Brazil	G&P; Eklöf and Ringertz 1967	60	5-15	Holderbaum *et al*. 2005 [234]
***Chile**	G&P	1500	0-15	Pose Lepe *et al*. 2018 [235]
Guatemala	TW2	663	11-18	Pickett *et al*. 1995 [236]
Guatemala	TW2	873	11-25	Himes *et al*. 1993 [237]
Guatemala	G&P	499	5-17	Bogin *et al*. 1989 [238]
Guatemala	G&P	144	7-12	Bogin and MacVean 1983 [239]
***Jamaica**	TW2	812	1-15	Marshall *et al.* 1970 [240]
Mexico	TW1; TW2	354	6-13	Malina and Little 1981 [241]
Mexico	TW2	394	5-18	Malina *et al*. 1976 [242]
***Perù**	Fishman 1982	194	7-15	Caballero Zùniga 2005 [243]
USA	G&P	120	7-17	Johnston 2014 [244]
USA	McKern and Stewart 1957	1289	11-33	Langley-Shirley and Jantz 2010 [245]
USA	TW2	450	8-16	Tanner *et al*. 1997 [246]
USA	G&P	841	0-18	Loder *et al*. 1993 [247]
USA	TW2	1236	6-12	Malina *et al*. 1989 [248]
USA	Epiphyseal union of the anterior ilac crest and medial clavicle	859	11-40	Webb and Suchey 1985 [249]
USA	TW1; TW2	2208	6-13	Malina and Little 1981 [241]
USA	TW1	90	3-18	Kimura 1976 [194]
USA	G&P	6768	12-17	Roche *et al.* 1976 [250]
USA	G&P	6962	6-11	Roche *et al.* 1974 [251]
USA	/	4988	1-7	Garn *et al*. 1972 [252]
USA	TW1	806	6-13	Malina 1970 [253]
USA	G&P	898	6-19	Greulich 1957 [198]

Table 5 – Oceania - list of papers reporting population data for skeletal methods

Country	Method/atlas	No. of individuals	Age range (years)	Study
Australia	TW2; TW3	360	3-15	Maggio *et al*. 2016 [254]
Australia	Schmeling *et al*. 2004	388	10-35	Franklin and Flavel 2015 [255]
Australia	G&P; TW2; TW3	360	0-24	Maggio 2014 [256]
Australia	Schmeling *et al*. 2004; Schulz *et al*. 2005	674	15-25	Bassed *et al*. 2011 [257]
Australia	G&P	2497	9-18	Lin *et al*. 2006 [258]
Australia	G&P	5122	9-18	Ranjitkar *et al*. 2006 [259]
Australia	G&P	58	3-16	Abbie and Adey 1953 [260]

Table 6 – Africa - list of papers reporting population data for dental methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
Botswana	Cameriere *et al.* 2008a	1294	13-23	Cavrić *et al.*2016a [261]
Botswana	Demirjian *et al.* 1973	1760	6-23	Cavrić *et al.*2016b [262]
Cameroon	Teeth eruption	\	\	Johannessen *et al.* 1989 [263]
Egypt	Demirjian *et al.* 1973	160	3-10	Moness Ali *et al.* 2019 [264]
Egypt	Demirjian *et al.* 1973	400	5-13	Azzawi *et al.* 2016 [265]
Egypt	Drusini *et al*. 1997	234	8-74	El Morsi *et al.* 2015 [266]
Egypt	Cameriere *et al.* 2007a	144	12-60	Zaher *et al.* 2011 [267]
Egypt	Teeth eruption	1132	0-3	Soliman *et al.* 2011 [268]
Egypt	Willems *et al.* 2001; Cameriere *et al.* 2006b	286	5-16	El-Bakary *et al.* 2010 [269]
***Gambia**	Teeth eruption	635	4-14	Billewicz and McGregor 1975 [270]
Gambia	Teeth eruption	3051	0-3	McGregor *et al.* 1968 [271]
Ghana	Teeth eruption	715	4-18	Houpt *et al.* 1967 [272]
***Kenya**	Willems *et al.* 2001	401	3-17	Kihara *et al.*2017 [273]
Kenya	Teeth eruption	6914	5-14	Manji and Mwaniki 1985 [274]
Kenya	Teeth eruption	2847	4-14	Hassanali and Odhiambo 1982 [275]
Kenya	Teeth eruption	1683	4-14	Hassanali and Odhiambo 1981 [276]
Libya	Cameriere *et al.* 2008a	307	14-22	Dardouri *et al.* 2016 [277]
Morocco	Demirjian *et al.* 1973	114	13-25	Garamendi *et al.* 2005 [278]
Nigeria	Moorrees *et al.* 1963	1374	10-25	Liversidge *et al.* 2017 [279]
Nigeria	Demirjian *et al*. 1973	93	4-16	Ifesanya and Adeyemi 2012 [280]
Nigeria	Teeth eruption	94	4-7	Denloye 2008 [281]
Nigeria	Teeth eruption	1657	0-3	Folayan *et al.* 2007 [282]
Nigeria	Teeth eruption	1071	11-21	Otuyemi *et al.* 1997 [283]
Nigeria	Teeth eruption	872	0-7	Enwonwu 1973 [284]
Senegal	Moorrees *et al.* 1963	1374	10-25	Liversidge *et al.* 2017 [279]
Somalia	Demirjian *et al.* 1973; Köhler *et al.* 1994	803	3-23	Metsäniitty *et al.* 2019 [285]
Somalia	Willems *et al.* 2001	635	4-18	Metsäniitty *et al.* 2018 [286]
Somalia	Demirjian *et al.* 1973	81	3-15	Davidson and Rodd 2001 [287]
South Africa	Cameriere *et al.* 2007a	970	6-14	Angelakopoulos *et al.* 2019 [288]
South Africa	Cameriere *et al.* 2008a	833	14-24	Angelakopoulos *et al.* 2018 [289]
South Africa	Willems *et al.* 2001	986	4-15	Willems *et al.* 2018 [290]
South Africa	Demirjian *et al.* 1973; Willems *et al.* 2001	540	5-16	Esan and Schepartz 2018a [291]
South Africa	Demirjian *et al.* 1973	642	5-20	Esan and Schepartz 2018b [292]
South Africa	Moorrees *et al.* 1963	1374	10-25	Liversidge *et al.* 2017 [279]
South Africa	Demirjian *et al*. 1973	838	6-18	Uys *et al*. 2014 [293]
South Africa	Moorrees *et al.* 1963; Demirjian *et al.* 1973	1476	3-17	Phillips and van Wyk Kotze 2009a [294]
South Africa	Moorrees *et al.* 1963; Demirjian *et al.* 1973	914	3-16	Phillips and van Wyk Kotze 2009b [295]
South Africa	Moorrees *et al.* 1963	1476	5-24	Liversidge 2008 [50]
South Africa	Teeth eruption (wisdom teeth)	516	12-26	Olze *et al.* 2007b [296]
South Africa	Demirjian *et al.* 1973	595	10-26	Olze *et al.* 2006 [297]
South Africa	Teeth eruption	1024	3-9	Blankenstein *et al.* 1990 [298]
Sudan	Moorrees *et al.* 1963	1248	2-23	Elamin *et al.* 2017 [299]
Sudan	Cameriere *et al.* 2007a	99	15-30	Ayad *et al.* 2014 [300]
Sudan	Teeth eruption	563	0-3	Eid and Affan 2014 [301]

Tanzania	Teeth eruption	869	3-16	Eskeli 2015 [302]
Tanzania	Teeth eruption	869	3-16	Mugonzibwa *et al.* 2002 [303]
Tanzania	Teeth eruption	858	3-18	Mugonzibwa and Rugarababu 1996 [304]
***Tunisia**	Willems *et al*. 2001; Willems *et al*. 2010; Demirjian *et al.* 1973	500	5-15	Nemsi *et al.* 2018 [305]
Tunisia	Demirjian *et al.* 1973	280	2-16	Aissaoui *et al.* 2016 [306]
Tunisia	Teeth eruption	2617	0-3	Bambach *et al.* 1973 [307]
Uganda	Teeth eruption	1041	4-15	Kutesa *et al.* 2013 [308]
Uganda	Teeth eruption	622	2-15	Krumholt *et al.* 1971 [309]
Uganda	Teeth eruption	990	6-26	Chagula 1960 [310]
***Zambia**	Teeth eruption	543	4-14	Gillett 1998 [311]
Zambia	Teeth eruption	721	6-14	Gillett 1997 [312]
Zambia	Teeth eruption	\	\	Gillett 1995 [313]

Table 7 – Europe - list of papers reporting population data for dental methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
Albania	Cameriere *et al.* 2008a	286	15-22	Cameriere *et al.* 2014 [314]
Austria	Demirjian *et al.* 1973; Moorrees *et al.* 1963; Olze *et al.* 2007	316	13-24	Widek *et al.* 2019 [315]
Austria	Kvaal *et al.* 1995	44	13-24	Meinl *et al.* 2007a [316]
Austria	Demirjian *et al.* 1973	610	12-24	Meinl *et al.* 2007b [317]
Belgium	Gleiser and Hunt, 1955; Köhler *et al.* 1994; Kvaal *et al.* 1995	25	15-23	Thevissen *et al.* 2012 [318]
Belgium	Pulp/tooth volume ratio	111	10-65	Star *et al.* 2011 [319]
Belgium	Teeth eruption	4,351	7-12	Leroy *et al.* 2008 [320]
Belgium	Pulp/tooth volume ratio	19	23-70	Yang *et al.* 2006 [321]
Belgium	Kvaal *et al.* 1995	197	19-75	Bosmans *et al.* 2005 [322]
Belgium	Pulp/tooth volume ratio	25	24-66	Vandevoort *et al.* 2004 [323]
Belgium	Köhler *et al.* 1994	2513	15-23	Gunst *et al.* 2003 [324]
Belgium	Kvaal *et al.* 1995	100	20-87	Willems *et al.* 2002 [325]
Belgium	Demirjian *et al.* 1973	2523	1-18	Willems *et al.* 2001 [48]
***Bosnia-Herzegovina**	Demirjian *et al.* 1973; Chaillet *et al.* 2004	1772	6-14	Galić *et al.* 2013 [326]
Bosnia-Herzegovina	Cameriere *et al.* 2008a	1089	6-13	Galić *et al.* 2011 [327]
Bosnia-Herzegovina	Demirjian *et al.* 1973	1106	5-14	Galić *et al.* 2010 [328]
***Bulgaria**	Teeth eruption	928	4-8	Ilieva *et al.* 2002 [329]
Croatia	Cameriere *et al.* 2006b; Nolla 1960; Liliequist and Lundberg 1971	924	8-14	da Luz *et al.* 2019 [330]
Croatia	Willems *et al*. 2001	1868	5-16	Bedek *et al*. 2019 [331]
Croatia	Cameriere *et al*. 2008b	1416	14-23	Galić *et al*. 2015 [332]
Croatia	Teeth eruption	1249	10-25	Brkić *et al.* 2011 [333]
Croatia	Nolla, 1960	979	6-15	Legović *et al.* 2010 [334]

Croatia	Cameriere *et al.* 2006b	146	12-16	Cameriere *et al.* 2008a [56]
Croatia	Cameriere *et al.* 2006b	268	4-16	Cameriere *et al.* 2007a [53]
Croatia	Teeth eruption	2768	5-14	Rajić *et al.* 2000 [335]
Croatia	Teeth eruption	1288	0-3	Rajić *et al.* 1999 [336]
Czech Republic	/	1370	4-15	Šindelářová and Broukal 2019 [337]
Czech Republic	Teeth eruption	1370	4-15	Šindelářová *et al.* 2017 [338]
Czech Republic	Moorrees *et al*. 1963	976	2-20	Štepanovský *et al*. 2017 [339]
Denmark	Gleiser and Hunt, 1955; Köhler *et al.* 1994; Kvaal *et al.* 1995	1302	13-25	Arge *et al.* 2018 [340]
Denmark	Teeth eruption	2744	7-14	Helm, 1990 [341]
Denmark	Bjork *et al*. *1964*	8377	3-17	Helm and Seidler 1974 [342]
Denmark	Bjork, Krebs and Solow 1964	15982	7-17	Helm, 1969 [343]
Finland	Demirjian *et al.* 1973; Roberts *et al*. 2008	200	7-13	Birchler *et al*. 2019 [344]
Finland	Teeth eruption	1579	3-16	Eskeli 2015 [302]
Finland	Demirjian *et al.* 1973; Mincer *et al.* 1993	56	0-17	Varkkola *et al.* 2011 [345]
Finland	Demirjian *et al.* 1973	2795	0-25	Nyström *et al.* 2007 [346]
Finland	Teeth eruption	1910	4-18	Korhonen and Larmas 2003 [347]
Finland	Teeth eruption	187	1-16	Nyström *et al.* 2001 [348]
Finland	Teeth eruption	129	0-1	Nyström *et al.* 2000 [349]
Finland	Teeth eruption	1577	5-16	Eskeli *et al.* 1999 [350]
Finland	Teeth eruption	911	3-21	Virtanen *et al.* 1994 [351]
Finland	Teeth eruption	1008	5-15	Pahkala *et al.* 1991 [352]
Finland	Demirjian *et al.* 1973; Demirjian and Goldstein 1976	353	2-17	Kataja *et al*. 1989 [353]
Finland	Demirjian and Goldstain, 1976	90	4-15	Nyström *et al.* 1988 [354]
Finland	Demirjian *et al.* 1973; Demirjian and Goldstein 1976	248	2-16	Nyström *et al.* 1986 [355]
France	Cameriere *et al.* 2008a	339	14-22	Tafrount *et al.* 2019 [356]
France	G&P	2614	1-20	Chaumoitre *et al*. 2016 [357]
France	pulp volume/total volume ratio	210	15-85	Tardivo *et al.* 2014 [358]
France	Demirjian and Goldstein 1976; Willems *et al*. 2001; Willems *et al*. 2010; Chaillet *et al*. 2005	743	4-15	Urzel and Bruzek 2013 [359]
France	pulp volume/tooth volume ratio	58	14-74	Tardivo *et al.* 2011 [360]
France	Demirjian *et al.* 1973	1031	2-18	Chaillet and Demirjian 2004 [361]
Germany	Demirjian *et al*. 1973	1260	5-17	Khdairi *et al*. 2019 [362]
Germany	Cameriere *et al.* 2006b	1000	5-16	Halilah *et al.* 2018 [363]
Germany	Demirjian *et al.* 1973; Cameriere *et al.* 2006b	479	6-14	Wolf *et al.* 2016 [364]
Germany	Demirjian *et al*. 1973	2360	15-22	Streckbein *et al*. 2014 [365]
Germany	Teeth eruption	1856	4-24	Friedrich *et al.* 2008 [366]
Germany	Cameriere *et al.* 2006b	500	4-16	Cameriere *et al.* 2007a [53]
Germany	Teeth eruption	1535	3-24	Friedrich *et al.* 2006 [367]
Germany	Kvaal *et al.* 1995	168	14-81	Paewinsky *et. al* 2005 [368]

Germany	Teeth eruption	664	3-24	Wedl *et al.* 2004 [369]
Germany	Demirjian *et al.* 1973	1003	2-20	Frucht *et al.* 2000 [370]
Greece	Demirjian *et al.* 1973	2304	3-24	Wedl *et al.* 2005 [371]
Hungary	Demirjian *et al.* 1973	199	2-20	Tóth *et al.* 2014 [372]
Iceland	Bjork *et al*. 1964	927	0-7	Magnusson 1982 [373]
Iceland	Bjork *et al*. 1964	1641	5-17+	Magnusson 1976 [374]
Italy	Demirjian *et al.* 1973	146	6-16	Bagattoni *et al.* 2019 [375]
Italy	Cameriere *et al.* 2008a	336	15-23	Spinas *et al.* 2018 [376]
Italy	Cameriere *et al*. 2006b	2731	4-15	Galić *et al*. 2017 [377]
Italy	Demirjian *et al*. 1973; Demirjian and Goldstein 1976; Willems *et al*. 2001	274	6-17	Pinchi *et al*. 2016a [120]
Italy	Demirjian *et al.* 1973; Cameriere *et al.* 2008a; Willems *et al.* 2001; Häävikko 1974	501	11-15	Pinchi *et al.* 2016b [378]
Italy	Cameriere *et al.* 2008a	975	9-22	De Luca *et al.* 2016b [379]
Italy	pulp volume/tooth volume ratio	148	10-80	Pinchi *et al.* 2015 [380]
Italy	pulp chamber volumes / teeth volumes	91	17-80	De Angelis *et al.* 2015 [381]
Italy	Cameriere *et al.* 2008a	70	20-70	Cameriere *et al.* 2015 [382]
Italy	Cameriere *et al.* 2008a	81	19-74	Azevedo *et al.* 2014 [383]
Italy	Demirjian *et al.* 1973; Cameriere *et al.* 2008a; Willems *et al.* 2001; Häävikko 1974	501	11-15	Pinchi *et al.* 2012 [384]
Italy	Demirjian *et al.* 1973	535	7-15	Santoro *et al.* 2012 [385]
Italy	Cameriere *et al.* 2007a	90	50-79	Cameriere and Ferrante 2011 [386]
Italy	Häävikko 1974	492	5-14	Spada *et al.* 2009 [387]
Italy	Häävikko 1974	500	5-15	Butti *et al.* 2009 [388]
Italy	Cameriere *et al.* 2006b	169	12-16	Cameriere *et al.* 2008a [56]
Italy	Cameriere *et al.* 2006b	473	4-16	Cameriere *et al.* 2007a [53]
Italy	pulp/tooth area ratio	100	20-79	Cameriere *et al.* 2007b [54]
Italy	pulp/tooth area	33	21-60	Cameriere *et al.* 2006c [389]
Italy	pulp/tooth area	100	18-72	Cameriere *et al.* 2004 [51]
Kosovo	Cameriere *et al.* 2008a	1221	12-23	Kelmendi *et al.* 2018a [390]
Kosovo	Demirjian *et al*. 1973; Demirjian and Goldstein 1976; Willems *et al*. 2001; Chaillet *et al*. 2005	1022	5-14	Kelmendi *et al*. 2018b [391]
Kosovo	Cameriere *et al.* 2006b	326	4-16	Cameriere *et al.* 2007a [53]
***Lithuania**	Teeth eruption	3596	4-16	Almonaitiene *et al.* 2012 [392]
***Macedonia**	Demirjian *et al.* 1973; Willems *et al.* 2001	966	6-13	Ambarkova *et al.* 2014 [393]
Malta	Demirjian *et al. 1973;* Roberts *et al*. 2008	200	4-26	Alsaffar *et al*. 2016 [394]
Montenegro	Nolla 1960; Cameriere *et al*. 2008b	683	13-24	Antunovic *et al.* 2018 [395]
Netherlands	Cameriere *et al.* 2008a	360	14-22	Boyacıoğlu Doğru *et al.* 2018 [396]
Netherlands	Demirjian *et al.* 1973	451	3-17	Leurs *et al.* 2005 [397]
***Norway**	Demirjian *et al.* 1973	261	6-12	Nykänen *et al.* 1998 [398]
Poland	Cameriere *et al.* 2008a	982	15-24	Różyło-Kalinowska *et al.* 2018 [399]

Poland	Kvaal *et al.* 1995; Liversidge 2008	/	/	Lorkiewicz-Muszyńska *et al.* 2015 [400]
Poland	Köhler *et al*. 1994	1048	12-26	Van Vlierberghe *et al*. 2010 [401]
Poland	Demirjian *et al*. 1973	994	6-16	Różyło-Kalinowska *et al.* 2008 [402]
Portugal	Cameriere *et al.* 2004	100	15-35	Anastácio *et al.* 2018 [403]
Portugal	AlQahtani *et al.* 2010	736	3-24	Pavlović *et al.* 2017 [404]
Portugal	Demirjian *et al.* 1973	564	6-16	Carneiro *et al.* 2015 [405]
Portugal	Cameriere *et al.* 2008a	116	18-74	Cameriere *et al.* 2013 [406]
Portugal	Cameriere *et al.* 2007a	258	20-84	Cameriere *et al.* 2009 [407]
Portugal	Kvaal *et al.* 1995	100	14-60	Landa *et al.* 2009 [408]
***Romania**	Teeth eruption	382	3-15	Ogodescu *et al.* 2011a [409]
Romania	Demirjian *et al.* 1973	467	3-16	Ogodescu *et al.* 2011b [410]
Romania	Teeth eruption	2081	8-13	Feraru *et al.* 2011 [411]
***Russia**	Teeth eruption	909	7-15	Khatskevich and Bogomolova [412]
Serbia	Willems *et al.* 2001; Cameriere *et al.* 2006b	423	5-15	Marinkovic *et al.* 2018 [413]
Serbia	Cameriere *et al.* 2008a	589	13-24	Zelic *et al.* 2016 [414]
Serbia	Demirjian *et al.* 1973; Willems *et al*. 2001	686	4-15	Djukic *et al.* 2013 [415]
***Slovenia**	Cameriere *et al.* 2006b	132	12-16	Cameriere *et al.* 2008a [56]
Slovenia	Cameriere *et al.* 2006b	307	4-16	Cameriere *et al.* 2007a [53]
Spain	Demirjian *et al*. 1973; Nolla 1960	2641	7-21	Melo and Ata-Ali 2017 [416]
Spain	Teeth eruption	752	5-15	Bruna del Cojo *et al.* 2013 [417]
Spain	Cameriere *et al.* 2004	606	18-75	Cameriere *et al.* 2012b [418]
Spain	Demirjian *et al.* 1973	1010	2-16	Feijóo *et al.* 2012 [419]
Spain	Demirjian *et al.* 1973; Chaillet *et al.* 2004	308	2-18	Cruz-Landeira *et al.* 2010 [420]
Spain	Demirjian *et al.* 1973	572	14–22	Martin-de las Heras *et al.* 2008 [421]
Spain	Hayes and Mantel 1958	1123	5-15	Hernández *et al.* 2008 [422]
Spain	Cameriere *et al.* 2006b	462	4-16	Cameriere *et al.* 2007a [53]
Sweden	Demirjian *et al*. 1973; Demirjian and Goldstein 1976	485	2-17	Teivens and Mörnstad 2001 [423]
Sweden	Demirjian *et al*. 1973	197	5-12	Teivens *et al*. 1996 [424]
Sweden	Teeth eruption	212	0-18	Hägg and Taranger J 1986 [425]
Switzerland	Demirjian *et al*. 1973; Roberts *et al*. 2008	50	8-15	Birchler *et al*. 2016 [426]
Switzerland	Demirjian *et al*. 1973	1260	15-22	Knell *et al*. 2009 [427]
United Kingdom	Demirjian *et al*. 1973; Roberts *et al*. 2008	5187	11-15	Chudasama *et al*. 2012 [428]
United Kingdom	Moorrees *et al.* 1963; Liversidge (2008b)	537	2-22	Liversidge 2011 [74]
United Kingdom	Demirjian *et al*. 1973; Roberts *et al*. 2008	100	9-11	Yadava *et al*. 2011 [429]
United Kingdom	Teeth eruption	11770	4-15	Elmes *et al.* 2010 [430]
United Kingdom	Demirjian *et al*. 1973; Roberts *et al*. 2008	1722	4-24	Mitchell *et al*. 2009 [431]
United Kingdom	Demirjian *et al*. 1973; Roberts *et al*. 2008	77	4-24	Peiris *et al*. 2009 [432]
United Kingdom	Cameriere *et al.* 2006b	316	4-16	Cameriere *et al.* 2007a [53]
United Kingdom	Demirjian *et al.* 1973; Nolla 1960; Häävikko 1974	469	3-16	Maber *et al.* 2006 [433]
United Kingdom	Demirjian *et al*. 1973	521	4-9	Liversidge and Speechly 2001 [434]

United Kingdom	Demirjian *et al.* 1973	256	4-9	Liversidge *et al.* 1999 [435]
United Kingdom	Teeth eruption	276	5-15	Kochhar and Richardson 1998 [436]
United Kingdom	Teeth eruption	4000	5-14	Lavelle 1976a [437]
United Kingdom	Teeth eruption	1800	5-13	Lavelle 1976b [438]
United Kingdom	Teeth eruption	1916	5-19	Clements *et al.* 1953 [439]

Table 8 – Asia - list of papers reporting population data for dental methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
Bangladesh	Moorrees *et al.* 1963	513	2-22	Liversidge 2011 [74]
Bangladesh	Demirjian *et al.* 1973; Moorrees *et al.* 1963	127	11-25	Liversidge and Marsden 2010 [440]
Bangladesh	Demirjian *et al.* 1973; Willems *et al.* 2001; Nolla 1960; Haavikko 1974	477	3-17	Maber *et al.* 2006 [433]
Bangladesh	Demirjian *et al.* 1973	265	4-9	Liversidge *et al.* 1999 [435]
Bangladesh	Teeth eruption	397	0-2	Holman and Jones 1998 [441]
China	Cameriere *et al*. 2008b	450	14-22	Khare *et al*. 2020 [442]
China	Olze *et al.* 2012	1300	15-40	Si *et al.* 2019 [443]
China	Kvaal *et al.* 1995	360	20-65	Li *et al.* 2019 [444]
China	Demirjian *et al.* 1973; Willems *et al.* 2001	1622	11-19	Wang *et al.* 2018 [445]
China	Demirjian *et al*. 1973	266	2-21	Jayaraman *et al*. 2018 [446]
China	Demirjian *et al.* 1973	2306	2-24	Jayaraman and Roberts 2018 [447]
China	Cameriere *et al.* 2008a	840	12-25	Chu *et al.* 2018 [448]
China	Pulp cavity/chamber volume	240	16-63	Ge *et al.* 2016 [449]
China	Demirjian *et al.* 1973; Willems *et al.* 2001	1004	11-18	Zhai *et al.* 2016 [450]
China	Demirjian *et al.* 1973	437	3-21	Wong *et al.* 2016 [451]
China	Demirjian *et al.* 1973	2306	2-25	Jayaraman *et al.* 2016 [452]
China	Demirjian *et al.* 1973	403	12-69	Ge *et al.* 2015 [453]
China	Demirjian *et al*. 1973	2192	8-25	Quing *et al.* 2014 [454]
China	Olze *et al*. 2007	1135	11-26	Guo *et al*. 2014 [455]
China	Demirjian *et al*. 1973; Willems *et al*. 2001	941	7-14	Ye *et al*. 2014 [456]
China	Demirjian *et al*. 1973	2078	5-23	Li *et al*. 2012 [457]
China	Demirjian *et al*. 1973	266	2-21	Jayaraman *et al*. 2012 [458]
China	Haavikko 1970	613	3-12	Wang *et al.* 2011 [459]
China	Demirjian *et al.* 1973	445	8-16	Chen *et al.* 2010 [460]
China	Demirjian *et al*. 1973	204	5-7	Davis and Hägg 1994 [461]
China	Teeth eruption	542	0-3	Billewicz *et al.* 1973 [462]
China	Teeth eruption	6332	6-16	Lee *et al.* 1965 [463]
India	Demirjian *et al.* 1973; Willems *et al.* 2001; Chaillet *et al*. 2004	1200	5-15	Hegde *et al.* 2019 [464]
India	Demirjian *et al*. 1973	522	3-18	Mohanty *et al*. 2019 [465]
India	Cameriere *et al.* 2008a	804	10-17	Balla *et al.* 2019a [466]
India	Cameriere *et al.* 2008a	1078	11-20	Balla *et al*.2019b [467]

India	Teeth eruption	1654	5-15	Chaitanya *et al.* 2018 [468]
India	Cameriere *et al.* 2006b; Cameriere *et al.* 2007a; Demirjian *et al.* 1973	1062	14-23	Sharma *et al.* 2018 [469]
India	Demirjian *et al.* 1973; Willems *et al.* 2001; Nolla 1960; Haavikko 1970	1200	5-15	Hegde *et al.* 2017 [470]
India	Demirjian *et al.* 1973; Cameriere *et al.* 2006b	60	9-14	Pratyusha *et al.* 2017 [471]
India	Tooth coronal index; pulp/tooth area ratio	180	15-70	Jain *et al.* 2017 [472]
India	Cameriere *et al.* 2008a	216	14-21	Balla *et al.* 2017 [473]
India	Demirjian *et al.* 1973	900	6-14	Macha *et al.* 2017 [474]
India	Häävikko 1970; Häävikko 1974	1200	5-15	Hegde *et al.* 2016a [475]
India	Willems *et al*. 2001; Willems	1200	5-16	Hegde *et al*. 2016b [476]
India	Kvaal *et al.* 1995	50	15-57	Rajpal *et al.* 2016 [477]
India	Kvaal *et al.* 1995	152	14-60	Mittal *et al.* 2016 [478]
India	Cameriere *et al.* 2007a; Willems *et al.* 2001; Demirjian *et al.* 1973	150	7-15	Balla *et al.* 2016 [479]
India	Pulp/tooth area ratio	400	14-60	Kumar *et al.* 2016 [480]
India	Pulp area	308	9-68	Ravindra *et al.* 2015 [481]
India	Demirjian *et al.* 1973	30	10-30	Gandhi *et al.* 2015 [482]
India	Gustafson 1950	228	21-70	Bajpai *et al.* 2015 [483]
India	Demirjian *et al.* 1973; Willems *et al.* 2001	180	6-16	Patel *et al.* 2015 [484]
India	Demirjian *et al.* 1973; Willems *et al.* 2001	70	9-16	Gupta *et al.* 2015 [485]
India	Demirjian *et al.* 1973; Willems *et al.* 2001; Nolla 1960; Haavikko 1974	660	6-16	Mohammed *et al.* 2015 [486]
India	Willems *et al*. 2001	332	6-16	Mohammed *et al*. 2014 [487]
India	Kvaal *et al.* 1995	100	20-50	Patil *et al.* 2014 [488]
India	Demirjian *et al.* 1973; Haavikko 1974; Willems *et al.* 2001	102	6-14	Patnana *et al.* 2014 [489]
India	Pulp/tooth area ratio	120	20-70	Joseph *et al.* 2013 [490]
India	Demirjian *et al.* 1973; Peterson *et al.* 1992	270	17-25	Makkad *et al.* 2013 [491]
India	Kvaal *et al.* 1995	30	15-60	Parikh *et al.* 2013 [492]
India	Kvaal *et al.* 1995	150	20-55	Limdiwala and Shah 2013 [493]
India	Demirjian *et al.* 1973	100	5-24	Sarkar *et al.* 2013 [494]
India	Kvaal *et al.* 1995	50	20-70	Agarwal *et al.* 2012 [495]
India	Demirjian *et al.* 1973	100	8-14	Malik *et al.* 2012 [496]
India	Kvaal *et al.* 1995	100	20-70	Chandramala *et al.* 2012 [497]
India	Kvaal *et al.* 1995	100	25-77	Kanchan-Talreja *et al.* 2012 [498]
India	Cameriere *et al.* 2007a	240	16-72	Jeevan *et al.* 2011 [499]
India	Cameriere *et al.* 2004	61	21-71	Babshet *et al.* 2011 [500]
India	Yang *et al.* 2006	140	10-70	Jagannathan *et al.* 2011 [501]
India	Cameriere *et al.* 2007a	120	21-60	Saxena 2011 [502]
India	Pulp/tooth area ratio	160	21-60	Saxena *et al.* 2011 [503]
India	Teeth eruption	509	5-14	Gaur *et al.* 2011 [504]
India	Teeth eruption	5007	5-14	Lakshmappa *et al.* 2011 [505]
India	Nolla 1960	160	8-14	Bala *et al*. 2010 [173]

India	Teeth eruption	1648	5-16	Kaur *et al.* 2010 [506]
India	Kvaal *et al.* 1995	50	15-60	Sharma and Srivastava 2010 [507]
India	Teeth eruption	135	0-2	GunaShekhar and Tenny 2010 [508]
India	Cameriere *et al.* 2006b	480	3-15	Rai *et al.* 2010 [509]
India	Kvaal *et al.* 1995	100	20-70	Shetty *et al.* 2010 [510]
India	Cameriere *et al.* 2007a	143	20-70	Babshet *et al.* 2010 [511]
India	Pulp/tooth area ratio	200	18-72	Singaraju and Sharada 2009 [512]
India	Teeth eruption	1800	5-14	Agarwal *et al.* 2004 [513]
India	Demirjian *et al.* 1973	151	6-15	Prabhakar *et al.* 2002 [514]
India	Demirjian *et al.* 1973	184	5-15	Koshy and Tandon 1998 [515]
India	Teeth eruption	1263	5-15	Jaswal 1983 [516]
***Indonesia**	Teeth eruption	468	0-2	Holman and Jones 1998 [441]
Indonesia	Teeth eruption	468	0-2	Holman and Jones 1991 [517]
Iran	Pulp/tooth area ratio	271	16-64	Dehghani *et al.* 2018 [518]
Iran	Demirjian *et al*. 1973	150	15-25	Khosronejad *et al*. 2017 [519]
Iran	Pulp/tooth area ratio	120	>12	Sakhdari *et al.* 2015 [520]
Iran	Demirjian *et al*. 1973; Willems *et al*. 2001; Cameriere *et al*. 2006b; Moorrees *et al*. 1963	537	3-14	Javadinejad *et al*. 2015 [521]
Iran	Demirjian *et al*. 1973	95	6-15	Hedayati and Khalafinejad 2014 [177]
Iran	Demirjian *et al*. 1973	168	7-15	Abesi *et al*. 2013 [522]
Iran	Demirjian *et al.* 1973	519	3-13	Bagherian and Sadeghi 2011 [523]
Iran	Demirjian *et al*. 1973	1200	10-27	Rai *et al*. 2010 [524]
Iran	Demirjian *et al.* 1973	311	6-13	Bagherpour *et al.* 2010 [525]
Iran	Teeth eruption	2602	8-14	Elham and Adhamy 2010 [526]
Iran	Teeth eruption	952	4-24	Friedrich *et al.* 2007 [527]
Iran	Teeth eruption	3744	4-15	Moslemi 2004 [528]
***Iraq**	Teeth eruption	786	5-10	Abdulhammed *et al.* 2016 [529]
Iraq	Teeth eruption	27340	4-16	Sahib 2008 [530]
Iraq	Teeth eruption	1017	0-3	Baghdady and Ghose 1981 [531]
Iraq	Teeth eruption	2843	4-15	Ghose and Baghdady 1981 [532]
***Israel**	Gat *et al.* 1984	693	7-16	Sarnat *et al.* 2003 [533]
Japan	Cameriere *et al.* 2008a	276	14-24	Kumagai *et al.* 2019 [534]
Japan	Demirjian *et al*. 1973; Köhler *et al.* 1994	256	4-20	Kumagai *et al*. 2018 [181]
Japan	Demirjian *et al.* 1973; Willems *et al.* 2001; Köhler *et al.* 1994	1877	1-23	Ramanan *et al.* 2012 [535]
Japan	Teeth eruption	114	0-2	Holman and Yamaguchi 2005 [536]
Japan	Teeth eruption	114	0-2	Holman and Jones 1998 [441]
Japan	Teeth eruption	1819	6-15	Höffding *et al.* 1984 [537]
Japan	Teeth eruption	689	4-14	Eveleth and De Souza Freitas 1969 [538]
***Jordan**	Teeth eruption	1988	0-4	Al-Batayneh *et al.* 2015 [539]
Jordan	Teeth eruption	2650	4-16	Shaweesh 2013 [540]
Jordan	Teeth eruption	2498	4-16	Shaweesh and Alsoleihat 2013 [541]
Jordan	Teeth eruption	2672	4-16	Shaweesh 2012 [542]
Jordan	Teeth eruption	2672	5-16	Shaweesh *et al.* 2011 [543]
Korea	Kvaal *et al.* 1995	266	21-69	Roh *et al.* 2017 [544]

Korea	Cameriere *et al.* 2004	402	20-78	Lee *et al.* 2017a [545]
Korea	Pulp/tooth area ratio	205	20-77	Lee *et al*. 2017b [546]
Korea	Teeth eruption	539	6-15	Kim *et al.* 2011 [547]
Korea	Demirjian *et al.* 1973; Demirjian and Goldstein 1976; Willems *et al.* 2001; Chaillet *et al.* 2005	1483	3-16	Lee *et al.* 2011 [548]
Korea	Demirjian *et al*. 1973	3301	4-26	Lee *et al* 2009 [549]
Korea	Demirjian *et al.* 1973	2706	1-20	Lee *et al.* 2008 [550]
Korea	Demirjian *et al*. 1973; Demirjian and Goldstein 1976	310	3-17	Teivens and Mörnstad 2001 [423]
Korea	Teeth eruption	1070	0-3	Choi and Yang 2001 [551]
Korea	Teeth eruption	1800	0-3	Yun 1957 [552]
***Kuwait**	Demirjian and Goldstein 1976	509	3-14	Qudeimat and Behbehani 2009 [553]
***Lebannon**	Demirjian *et al.* 1973; Willems *et al.* 2001	260	8-16	Saadé *et al.* 2017 [205]
Malaysia	Demirjian *et al.* 1973	1236	5-16	Bunyarit *et al.* 2017 [554]
Malaysia	Demirjian *et al.* 1973; Nolla 1960; Willems *et al.* 2001; Haavikko 1974; Cameriere *et al.* 2006b	426	5-15	Kumaresan *et al.* 2016 [555]
Malaysia	Cameriere *et al.* 2007a	421	5-16	Cugati *et al.* 2015 [556]
Malaysia	Köhler *et al.* 1994; Olze *et al.* 2007	705	14-24	Yusof *et al.* 2015a [557]
Malaysia	Köhler *et al.* 1994; Olze *et al.* 2007	714	14-24	Yusof *et al.* 2015b [558]
Malaysia	Willems *et al.* 2001	1403	4-24	Yusof *et al.* 2014 [559]
Malaysia	Demirjian *et al*. 1973	1080	14-25	Johan *et al*. 2012 [560]
Malaysia	Demirjian *et al*. 1973; Willems *et al*. 2001	991	5-15	Nik-Hussein *et al*. 2011 [561]
Malaysia	Demirjian *et al*. 1973	905	6-16	Abu Asab *et al*. 2011 [562]
Malaysia	Demirjian *et al.* 1973; Willems *et al.* 2001	428	7-15	Mani *et al.* 2008 [563]
Malaysia	Teeth eruption	1386	5-19	Hussin *et al.* 2007 [564]
Malaysia	Teeth eruption	2382	5-17	Nizam *et al.* 2003 [565]
***Nepal**	Teeth eruption	857	3-16	Baral *et al.* 2018 [566]
Nepal	Teeth eruption	623	5-14	Upadhyay *et al.* 2016 [567]
Nepal	Teeth eruption	501	0-5	Gupta *et al.* 2007 [568]
***Oman**	Demirjian *et al.* 1973	485	4-16	Al Balushi *et al.* 2018 [569]
***Pakistan**	Teeth eruption	2000	4-15	Khan *et al.* 2019 [570]
Pakistan	Teeth eruption	170	0-13	Rathore *et al.* 2017 [571]
Pakistan	Demirjian *et al*. 1973; Nolla 1960; Willems *et al*. 2001	403	8-16	Khoja *et al*. 2015 [572]
Pakistan	Teeth eruption	4370	2-17	Khan 2011 [573]
Pakistan	Teeth eruption	443	\	Saleemi *et al.* 1996 [574]
Pakistan	Teeth eruption	\	\	Saleemi *et al.* 1994 [575]
Pakistan	Teeth eruption	\	0-2	Saleemi *et al.* 1992 [576]
Saudi Arabia	AlQahtani *et al.* 2010; Cameriere *et al.* 2006b	400	6-16	Alsudairi and AlQahtani 2018 [577]
Saudi Arabia	Cameriere *et al.* 2008a	300	14-22	AlQahtani *et al.* 2017 [578]
Saudi Arabia	Demirjian *et al.* 1973	1902	3-17	Al-Dharrab *et al.* 2017 [579]
Saudi Arabia	Demirjian *et al.* 1973	198	4-16	Ashihri *et al.* 2016 [580]
Saudi Arabia	Demirjian *et al.* 1976	400	4-14	Nour El Deen *et al.* 2016 [581]

Saudi Arabia	Demirjian *et al*. 1973	252	4-14	Baghdadi 2014 [582]
Saudi Arabia	Demirjian *et al*. 1973	452	4-14	Baghdadi 2013a [583]
Saudi Arabia	Demirjian *et al*. 1973	422	4-14	Bahdadi 2013b [584]
Saudi Arabia	Demirjian *et al*. 1973	176	4-14	Baghdadi and Pani 2012 [585]
Saudi Arabia	Teeth eruption	1599	4-16	Khan and Chohan 2010 [586]
Saudi Arabia	Demirjian *et al*. 1973	490	8-17	Al-Emran 2008 [587]
Saudi Arabia	Teeth eruption	889	8-16	Khan *et al.* 2008 [588]
Saudi Arabia	Teeth eruption	612	5-9	Chohan *et al.* 2007 [589]
Saudi Arabia	Teeth eruption	728	0-3	Al-Jasser and Bello 2003 [590]
***Sri Lanka**	Teeth eruption	234	5-12	Ranasinghe *et al.* 2019 [591]
Sri Lanka	Demirjian *et al.* 1973; Willems *et al.* 2001; Blenkin and Evans 2010	688	8-17	Vithanaarachchi *et al.* 2018 [592]
***Syria**	Teeth eruption	1211	5-13	Dashash and Al-Jazar 2018 [593]
Syria	Teeth eruption	1000	5-13	Friedrich *et al.* 2009 [594]
Thailand	Demirjian *et al.* 1973	1134	6-15	Duangto *et al.* 2016a [595]
Thailand	Demirjian *et al*. 1973	1867	8-23	Duangto *et al*. 2016b [596]
Thailand	Gat *et al*. 1984	1153	9-24	Verochana *et al*. 2016 [597]
Thailand	Köhler *et al.* 1994	1199	15-24	Thevissen *et al.* 2009 [598]
Thailand	Demirjian *et al.* 1973	361	7-19	Krailassiri *et al.* 2002 [599]
Thailand	Teeth eruption	226	7-14	Kamalanathan and Hauck 1960 [600]
Tibet	Chaillet and Demirjian 2004	300	8-18	Bijjaragi *et al*. 2015 [601]
Turkey	Willems *et al*. 2001; Cameriere *et al*. 2006b	636	6-15	Ozveren *et al*. 2019 [602]
Turkey	Demirjian *et al.* 1973; Willems *et al.* 2001; Cameriere *et al.* 2006b	330	5-16	Apaydin and Yasar 2018 [603]
Turkey	Demirjian *et al.* 1973; Willems *et al.* 2001	766	6-15	Ozveren and Serindere 2018 [604]
Turkey	Drusini *et al*. 1997; Cameriere *et al*. 2004	200	20-75	Boyacıoğlu Doğru *et al*. 2017 [605]
Turkey	Cameriere *et al.* 2008a	293	14-22	Gulsahi *et al.* 2016 [606]
Turkey	Willems *et al.* 2001	756	5-15	Altan *et al.* 2016 [607]
Turkey	Teeth eruption	890	5-15	Oznurhan *et al.* 2016 [608]
Turkey	Cameriere *et al.* 2006b	573	8-15	Gulsahi *et al.* 2015 [609]
Turkey	Demirjian *et al.* 1973	535	10-18	Gungor *et al.* 2015 [610]
Turkey	Kvaal *et al.* 1995	114	17-72	Misirlioglu *et al.* 2014 [611]
Turkey	Demirjian *et al.* 1973	932	4-18	Celik *et al.* 2014 [612]
Turkey	Demirjian *et al.* 1973	832	6-16	Karataş *et al.* 2013 [613]
Turkey	Demirjian *et al*. 1973	756	5-13	Erdem *et al*. 2013 [614]
Turkey	Demirjian *et al.* 1973; Nolla 1960; Haavikko 1970	425	7-13	Kırzıoğlu and Ceyhan 2012 [615]
Turkey	Kvaal *et al.* 1995	123	14-57	Erbudak *et al.* 2012 [616]
Turkey	Demirjian *et al.* 1973	900	4-12	Tunc and Koyuturk 2008 [617]
Turkey	Demirjian *et al*. 1973	1134	4-20	Orhan *et al*. 2007 [618]
Turkey	Demirjian *et al.* 1973	33	10-16	Kanbur *et al.* 2006 [619]
Turkey	Teeth eruption	2101	4-25	Wedl *et al.* 2004 [620]
Turkey	Demirjian *et al.* 1973	500	7-20	Uysal *et al.* 2004 [621]
United Arab Emirates	Demirjian *et al.* 1973; Köhler *et al.* 1994	1900	4-23	Altalie *et al.* 2014 [622]
***Yemen**	Demirjian *et al.* 1973	358	8-16	Alqadi and Abuaffan 2019 [623]

Table 9 – America - list of papers reporting population data for dental methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
Argentina	Teeth eruption	4735	\	Muñiz 1988 [624]
Brazil	Cameriere *et al*. 2008b	3785	14-23	Nóbrega *et al*. 2019 [625]
Brazil	Cameriere *et al*. 2006b; Nolla 1960; Liliequist and Lundberg 1971	930	8-15	da Luz *et al.* 2019 [330]
Brazil	Demirjian *et al*. 1973; Nolla 1960	403	7-13	Lopes *et al*. 2018 [626]
Brazil	Cameriere *et al.* 2006b	612	4-16	Mazzilli *et al.* 2018 [627]
Brazil	Cameriere *et al.* 2006b	468	5-14	Machado *et al.* 2018 [232]
Brazil	Liliequist and Lundberg 1971; Haavikko 1974; Mornstad *et al.* 1994	1009	8-16	Benedicto *et al.* 2018 [628]
Brazil	Olze *et al.* 2012	306	20-70	Lavez *et al.* 2017 [629]
Brazil	Pulp cavity volume; pulp cavity/toot volume ratio	118	20-70	Porto *et al.* 2015 [630]
Brazil	Willems *et al.* 2001	160	4-15	de Souza *et al.* 2015 [631]
Brazil	Cameriere *et al.* 2008a	444	14-22	Deitos *et al.* 2015 [632]
Brazil	Cameriere *et al.* 2007a	443	20-70	Azevedo *et al.* 2015 [633]
Brazil	Demirjian *et al*. 1973; Kohler *et al.* 1994	659	15-22	Lopez *et al*. 2013 [634]
Brazil	Willems *et al.* 2001; Kohler *et al.* 1994	1357	5-23	Franco *et al.* 2013 [635]
Brazil	Demirjian *et al*. 1973	407	6-25	de Oliveira *et al*. 2012 [636]
Brazil	Cameriere *et al.* 2006b	160	5-15	Fernandes *et al.* 2011 [637]
Brazil	Demirjian *et al.* 1973	1491	7-13	Maia *et al.* 2010 [638]
Brazil	Teeth eruption	359	0-6	Bastos *et al.* 2007 [639]
Brazil	Nolla 1960	60	5-15	Holderbaum *et al.* 2005 [640]
Brazil	Nolla 1960; Haavikko 1974	293	3-13	Costa 1999 [641]
Canada	Demirjian *et al.* 1973	245	5-16	Gilbert *et al.* 2014 [642]
Canada	Demirjian *et al.* 1973	5437	2-19	Demirjian and Levesque 1980 [643]
Canada	Teeth eruption	368	<22	Mayhall *et al.* 1978 [644]
Canada	Demirjian *et al.* 1973	2928	2-20	Demirjian *et al.*1973 [35]
Canada	\	\	\	Sapoka and Demirjian 1971 [645]
Chile	Cameriere *et al.* 2006b	822	11-22	Cameriere *et al.* 2018 [646]
Colombia	Cameriere *et al.* 2006b	526	6-14	Rivera *et al.* 2017 [647]
Colombia	Cameriere *et al.* 2008a	288	13-22	De Luca *et al.* 2016c [648]
Colombia	Demirjian *et al.* 1973	171	8-25	Costa *et al.* 2014 [649]
Dominican Republic	Cameriere *et al*. 2008b	513	14-22	Gómez Jiménez *et al*. 2019 [650]
Dominican Republic	Teeth eruption	900	5-14	Garciá-Godoy *et al.* 1982 [651]
***Guatemala**	Teeth eruption	1271	0-2	Holman and Jones 1998 [441]
***Haiti**	Teeth eruption	498	11-13	Psoter *et al.* 2008 [652]
Mexico	Demirjian *et al.* 1973	145	8-25	Costa *et al.* 2014 [649]
Mexico	Cameriere *et al.* 2006b	502	5-15	De Luca *et al.* 2012 [653]
Mexico	Cameriere *et al.* 2007a	85	18-60	De Luca *et al.* 2011 [654]
Perù	Demirjian *et al.*1973; Cameriere *et al.* 2008a	208	14-22	Lizarbe *et al.* 2017 [655]
Perù	Cameriere *et al.* 2006b; Demirjian *et al.* 1973	287	9-16	Cameriere *et al.* 2007c [656]

***Trinidad and Tobago**	Demirjian *et al*. 1973	878	7-15	Moze and Graham 2012 [657]
USA	Demirjian *et al.* 1973	950	12-22	Kasper *et al.* 2009 [658]
USA	Moorrees *et al.* 1963	4010	3-25	Harris 2007 [659]
USA	Demirjian *et al.* 1973	1200	14-24	Blankenship *et al.* 2007 [660]
USA	Moorrees *et al.* 1963	655	3-13	Harris and McKee 1990 [661]
USA	Teeth eruption	5867	1-17	Smith and Garn 1987 [662]
USA	Teeth eruption	287	4-15	Savara and Steen 1978 [663]
Venezuela	Demirjian *et al.* 1973; Willems *et al.* 2001	238	5-13	Medina and Blanco 2014 [664]
Venezuela	Demirjian *et al.* 1973; Chaillet *et al.* 2004	200	2-18	Cruz-Landeira *et al.* 2010 [420]

Table 10 – Oceania - list of papers reporting population data for dental methods. Asterisks indicate the presence of data only under 18 years of age.

Country	Method/atlas	No. of individuals	Age range (years)	Study
Australia	Kvaal *et al.* 1995	74	12-28	Marroquin *et al.* 2017 [665]
Australia	Cameriere *et al.* 2008	143	14-22	Franklin *et al.* 2016 [666]
Australia	Moorrees *et al*. 1963	392	4-25	Karkhanis *et al*. 2015 [667]
Australia	Drusini *et al.* 1997	450	9-60	Karkhanis *et al.* 2013 [668]
Australia	Demirjian *et al*. 1973	408	4-14	Flood *et al*. 2013 [669]
Australia	Schour and Massler 1944	204	0-22	Blenkin and Taylor 2012 [670]
Australia	Teeth eruption	216	0-3	Woodroffe *et al.* 2010 [671]
Australia	Demirjian *et al*. 1973	77	4-24	Peiris *et al*. 2009 [432]
Australia	Teeth eruption	8676	4-16	Diamanti and Townsend 2003 [672]
Australia	Demirjian and Goldstein 1976	615	4-17	McKenna *et al.* 2002 [673]
Australia	Demirjian and Goldstein 1976	1450	4-16	Farah *et al.* 1999 [674]
Australia	Teeth eruption	164	0-4	Hitchcock *et al.* 1984 [675]
Australia	Teeth eruption	125	5-11	Brown 1978 [676]
Australia	Teeth eruption	513	0-4	Roche *et al.* 1964 [677]
Australia	Teeth eruption	5660	6-15	Gates 1964 [678]
***New Guinea**	Teeth eruption	135	0-2	Ulijaszek 1996 [480]
New Guinea	Teeth eruption	947	0-12	Friedlaender and Bailit 1969 [680]
New Guinea	Teeth eruption	1121	0-2	Bailey 1964 [681]
New Zealand	AlQahtani *et al*. 2010; Schour and Massler 1944; Blenkin and Taylor 2012	875	5-18	Baylis and Bassed 2017 [682]
New Zealand	Demirjian *et al.* 1973; Cameriere *et al.* 2006	200	7-17	Timmins *et al.* 2012 [683]
New Zealand	Teeth eruption	3466	5-13	Kanagaratnam and Schluter 2012 [684]
New Zealand	Demirjian *et al.* 1973	1383	3-14	Moananui *et al.* 2008a [685]
New Zealand	Demirjian *et al.* 1973	1343	2-14	Moananui *et al.* 2008b [686]