

The Bioarchaeology of Children

Perspectives from Biological and Forensic Anthropology

Mary E. Lewis



SBEA

CAMBRIDGE

CAMBRIDGE

www.cambridge.org/9780521836029

This page intentionally left blank

The Bioarchaeology of Children

This book is the first to be devoted entirely to the study of children's skeletons from archaeological and forensic contexts. It provides an extensive review of the osteological methods and theoretical concepts of their analysis. Non-adult skeletons provide a wealth of information on the physical and social life of the child from their growth, diet and age at death, to factors that expose them to trauma and disease at different stages of their lives. This book covers non-adult skeletal preservation; the assessment of age, sex and ancestry; growth and development; infant and child mortality including infanticide; weaning ages and diseases of dietary deficiency; skeletal pathology; personal identification; and exposure to trauma from birth injuries, accidents and child abuse, providing new insights for undergraduates and postgraduates in osteology, palaeopathology and forensic anthropology.

MARY E. LEWIS is a lecturer at the University of Reading and has taught palaeopathology and forensic anthropology to undergraduate and postgraduate students for over 10 years. Mary is also an advisor to the police and has served as a registered forensic anthropologist for the Ministry of Defence.

Cambridge Studies in Biological and Evolutionary Anthropology

Series editors

HUMAN ECOLOGY

C. G. Nicholas Mascie-Taylor, University of Cambridge

Michael A. Little, State University of New York, Binghamton

GENETICS

Kenneth M. Weiss, Pennsylvania State University

HUMAN EVOLUTION

Robert A. Foley, University of Cambridge

Nina G. Jablonski, California Academy of Science

PRIMATOLOGY

Karen B. Strier, University of Wisconsin, Madison

Also available in the series

- 21 *Bioarchaeology* Clark S. Larsen 0 521 65834 9 (paperback)
- 22 *Comparative Primate Socioecology* P. C. Lee (ed.) 0 521 59336 0
- 23 *Patterns of Human Growth*, second edition Barry Bogin 0 521 56438 7 (paperback)
- 24 *Migration and Colonisation in Human Microevolution* Alan Fix 0 521 59206 2
- 25 *Human Growth in the Past* Robert D. Hoppa & Charles M. FitzGerald (eds.)
0 521 63153 X
- 26 *Human Paleobiology* Robert B. Eckhardt 0 521 45160 4
- 27 *Mountain Gorillas* Martha M. Robbins, Pascale Sicotte & Kelly J. Stewart (eds.)
0 521 76004 7
- 28 *Evolution and Genetics of Latin American Populations* Francisco M. Salzano &
Maria C. Bortolini 0 521 65275 8
- 29 *Primates Face to Face* Agustín Fuentes & Linda D. Wolfe (eds.)
0 521 79109 X
- 30 *Human Biology of Pastoral Populations* William R. Leonard & Michael H.
Crawford (eds.) 0 521 78016 0
- 31 *Paleodemography* Robert D. Hoppa & James W. Vaupel (eds.)
0 521 80063 3
- 32 *Primate Dentition* Daris R. Swindler 0 521 65289 8
- 33 *The Primate Fossil Record* Walter C. Hartwig (ed.) 0 521 66315 6
- 34 *Gorilla Biology* Andrea B. Taylor & Michele L. Goldsmith (eds.)
0 521 79281 9
- 35 *Human Biologists in the Archives* D. Ann Herring & Alan C. Swedlund (eds.)
0 521 80104 4

- 36 *Human Senescence – Evolutionary and Biocultural Perspectives* Douglas E. Crews 0 521 57173 1
- 37 *Patterns of Growth and Development in the Genus Homo* Jennifer L. Thompson, Gail E. Krovitz & Andrew J. Nelson (eds.) 0 521 82272 6
- 38 *Neandertals and Modern Humans – An Ecological and Evolutionary Perspective* Clive Finlayson 0 521 82087 1
- 39 *Methods in Human Growth Research* Roland C. Hauspie, Noel Cameron & Luciano Molinari (eds.) 0 521 82050 2
- 40 *Shaping Primate Evolution* Fed Anapol, Rebella L. German & Nina G. Jablonski (eds.) 0 521 81107 4
- 41 *Macaque Societies – A Model for the Study of Social Organization* Bernard Thierry, Mewa Singh & Werner Kaumanns (eds.) 0 521 81847 8
- 42 *Simulating Human Origins and Evolution* Ken Wessen 0 521 84399 5
- 43 *Bioarchaeology of Southeast Asia* Marc Oxenham & Nancy Tayles (eds.) 0 521 82580 6
- 44 *Seasonality in Primates* Diane K. Brockman & Carel P. van Schaik 0 521 82069 3
- 45 *Human Biology of Afro-Caribbean Populations* Lorena Madrigal 0 521 81931 8
- 46 *Primate and Human Evolution* Susan Cachel 0 521 82942 9
- 47 *The First Boat People* Steve Webb 0 521 85656 6
- 48 *Feeding Ecology in Apes and Other Primates* Gottfried Hohmann, Martha Robbins & Christophe Boesch (eds.) 0 521 85837 2
- 49 *Measuring Stress in Humans: A Practical Guide for the Field* Gillian Ice & Gary James (eds.) 0 521 84479 7

The Bioarchaeology of Children

*Perspectives from Biological and
Forensic Anthropology*

Mary E. Lewis
University of Reading



CAMBRIDGE
UNIVERSITY PRESS

cambridge university press
Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo

Cambridge University Press
The Edinburgh Building, Cambridge CB2 2RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org

Information on this title: www.cambridge.org/9780521836029

© Cambridge University Press 2007

This publication is in copyright. Subject to statutory exception and to the provision of relevant collective licensing agreements, no reproduction of any part may take place without the written permission of Cambridge University Press.

First published in print format 2006

isbn-13 978-0-511-25473-4 eBook (Adobe Reader)

isbn-10 0-511-25473-3 eBook (Adobe Reader)

isbn-13 978-0-521-83602-9 hardback

isbn-10 0-521-83602-6 hardback

Cambridge University Press has no responsibility for the persistence or accuracy of urls for external or third-party internet websites referred to in this publication, and does not guarantee that any content on such websites is, or will remain, accurate or appropriate.

Contents

<i>Acknowledgements</i>	<i>page</i> x
1 The bioarchaeology of children	1
1.1 Children in archaeology	1
1.2 A history of childhood	2
1.3 Children in biological anthropology	10
1.4 Children in forensic anthropology	13
1.5 Summary	19
2 Fragile bones and shallow graves	20
2.1 Introduction	20
2.2 Fragile bones?	23
2.3 Little people . . . little things . . .	26
2.4 The marginalised child?	30
2.5 Obstetric deaths	33
2.6 Summary	37
3 Age, sex and ancestry	38
3.1 Non-adult ageing	38
3.2 Sex determination	47
3.3 Ancestry	55
3.4 Summary	58
4 Growth and development	60
4.1 Introduction	60
4.2 Skeletal development and ossification	61
4.3 Prenatal and postnatal growth	62
4.4 Puberty and the growth spurt	64
4.5 Factors affecting growth	66
4.6 Growth studies: methods and concerns	68
4.7 Interpretations of past growth	74
4.8 Bone density	76
4.9 Estimations of stature	77
4.10 Summary	79

5	Difficult births, precarious lives	81
5.1	Introduction	81
5.2	Infant mortality rates	81
5.3	Reconstructing child mortality	86
5.4	Infanticide	87
5.5	Summary	96
6	Little waifs: weaning and dietary stress	97
6.1	Introduction	97
6.2	Properties of human breastmilk	97
6.3	Weaning and infection	99
6.4	Ancient feeding practices	100
6.5	The osteological evidence	103
6.6	Weaning and bone chemistry analysis	115
6.7	Specific diseases of malnutrition	119
6.8	Summary	132
7	Non-adult skeletal pathology	133
7.1	Introduction	133
7.2	Non-specific infections	134
7.3	Endocranial lesions	141
7.4	Infantile cortical hyperostosis	143
7.5	Tuberculosis	146
7.6	Congenital syphilis	151
7.7	Skeletal pathology and personal identification	159
7.8	Summary	162
8	Trauma in the child	163
8.1	Introduction	163
8.2	Properties of paediatric trauma	163
8.3	Types of fracture	165
8.4	Birth trauma	168
8.5	Non-adult trauma in the archaeological record	169
8.6	Physical child abuse	175
8.7	Clinical features of child abuse	176
8.8	Child abuse in the archaeological record	181
8.9	Summary	183
9	Future directions	184
9.1	Is absence of evidence evidence of absence?	185
9.2	Failure to adapt: children as non-survivors	186

<i>Contents</i>	ix
9.3 Tom, Dick or Harriet? Sexing non-adults	187
9.4 The future	188
<i>References</i>	189
<i>Index</i>	248

Acknowledgements

Many friends and colleagues have provided advice and encouragement in the preparation and writing of this book. In particular, Charlotte Roberts, Keith Manchester and Jenny Wakely were instrumental in first introducing me to human remains, and Charlotte Roberts has continued to provide invaluable advice and support throughout my career. I am indebted to many who provided unpublished data, assistance, access to images and comments on drafts of the text: Kristine Watts, Anthea Boylson, Louise Loe, Hella Eckardt, Louise Humphrey, Roberta Gilchrist, Margaret Cox, Rebecca Gowland, Rebecca Redfern, Gundula Müldner, Luis Rios, Bill White, Donald Ortner and Richard Steckle. I also thank the team at Cambridge University Press, Tracey Sanderson, Dominic Lewis, Emma Pearce and Anna Hodson.

I am thankful to all my friends and colleagues at the Department of Archaeology in Reading for making it such a stimulating place to work and who have allowed me the time and funds needed to finish this book. Finally, I am grateful to my family for their continued support.

Figures 6.4, 8.4 and 8.5 are from the research slide collection of D. J. Ortner, Department of Anthropology, Smithsonian Institution, Washington, DC, digitised and made available through funds supporting National Science Foundation grant SES-0138129 by R. H. Steckel, C. S. Larsen, P. W. Sculli and P. L. Walker (2002), *A History of Health in Europe from the Late Paleolithic Era to the Present* (Mimeo, Columbus, OH). These images are reprinted with their kind permission. Figures 6.9–6.11, 7.1, 7.2 and 8.6 are of specimens from the Human Remains Collection, Biological Anthropology Research Centre, Department of Archaeological Sciences, University of Bradford. Many of these photographs were taken by Jean Brown, to whom I am very grateful. Every effort has been made to acknowledge copyright holders, but in a few cases this has not been possible. Any omissions brought to my attention will be remedied in future editions.

1 *The bioarchaeology of children*

1.1 Children in archaeology

This book reviews the current status of children's skeletal remains in biological and forensic anthropology. Child skeletons provide a wealth of information on their physical and social life from their growth and development, diet and age at death, to the social and economic factors that expose them to trauma and disease at different stages of their brief lives. Cultural attitudes dictate where and how infants and children are buried, when they assume their gender identity, whether they are exposed to physical abuse, and at what age they are considered adults. Similarly, children may enter the forensic record as the result of warfare, neglect, abuse, murder, accident or suicide and the presence of young children within a mass grave has powerful legal connotations. The death of a child under suspicious circumstances is highly emotive and often creates intense media coverage and public concern, making the recovery and identification of their remains more pressing. In forensic anthropology, techniques used to provide a biological and personal identification as well as the cause and manner of death provide particular challenges.

The study of children and childhood in social archaeology emerged out of gender theory in the 1990s, and has gradually increased in its sophistication, moving children out of the realm of women's work, to participating and active agents in the past, with their own social identity, material culture and influence on the physical environment around them. Children who were once invisible in the archaeological record are slowly coming into view. The primary data for the archaeology of childhood are the children themselves, and in order to progress this new discipline, it is important to examine how bioarchaeologists derive the data from which social interpretations are made, and the limitations that are inherent in the methods and nature of immature skeletal material, including the impact of the burial environment on their recovery.

Comparative studies of children from archaeological contexts have been complicated by the eclectic use of terminology that both describes the skeleton as a child and prescribes an age for the individual. For example, the use of the term 'infant' properly assigned to those under 1 year of age, has been used to describe children aged up to 5 years, whereas 'juvenile' can be divided into 'juvenile I'

Table 1.1 *Age terminology used in this volume*

Term	Period
Embryo	First 8 weeks of intra-uterine life
Fetus	From 8 weeks of intra-uterine life to birth
Stillbirth	Infant born dead after 28 weeks gestation
Perinatal, perinate	Around birth, from 24 weeks gestation to 7 postnatal days
Neonatal, neonate	Birth to 27 postnatal days
Post-neonatal	28–346 postnatal days (1 year)
Infant	Birth to 1 year
Non-adult	≤17 years
Child	1–14.6 years
Adolescent	14.6–17.0 years
Adult	>17 years

or ‘juvenile II’ with a variety of ages assigned. One of the most popular terms used by osteologists to describe children is ‘sub-adult’. This term is problematic as it has been used to define a specific age category within the childhood period. More fundamentally, sub-adult implies that the study of these remains is somehow less important than that of the adults (i.e. sub = below). Throughout this book children are described as ‘non-adults’ encompassing all children recovered from the archaeological record up to the age of 17 years. Additional terms divide this overarching category into critical physiological periods of the child’s life (Table 1.1). These terms are used for ease of reference and provide a biological basis for discussion; they are not intended to describe the complex social experience of the youngest members of every society, past or present.

This book is divided into nine chapters, covering the development of childhood archaeology and the osteological study of non-adult remains; factors affecting preservation; assessment of their age, sex and ancestry; growth and development; infant and child mortality including infanticide; weaning ages and diseases of dietary deficiency; skeletal pathology; and exposure to trauma from birth injuries, accidents and child abuse. The final chapter considers some future directions for the study of children in bioarchaeology. The following sections explore the gradual development of childhood theory in archaeology and the rise of research into non-adult skeletal remains in both biological and forensic anthropology.

1.2 A history of childhood

Studies of the history of childhood began in 1960 when Philip Ariès published *Centuries of Childhood: A Social History of Family Life*. Ariès argued that

the 'childhood' we know today, which may perhaps be described as a period of 'cosseted dependency' (Derevenski, 2000:4), did not exist until the early modern period. Prior to this, parents were unsympathetic and detached from their children, dressing them and expecting them to behave as miniature adults. Such indifference was considered a coping mechanism to the constant threat of infant mortality (Ariès, 1960). In the past, we were led to believe, a child's upbringing was a combination of neglect and cruelty. Further debates in the 1970s developed the theme (De Mause, 1974; Shorter, 1976; Stone, 1977), while later discourses began to challenge this traditional view (Attreed, 1983; Hanawalt, 1986, 1993; Swanson, 1990; Shahar, 1992). Historians and social archaeologists have now updated and revised our impressions of childhood. In past societies, stages of life that correspond to childhood were recognised and marked by social events or burial practices. Many parents loved their children, sometimes to distraction. For example, Finucane (1997) concentrated on the 'miracle' texts of the medieval period which contained numerous tales of family and village reactions to a child's death or illness, with parents crippled by grief or friends and relatives praying by a riverbank for the recovery of a drowned child. Although important, these studies focussed on the attitude of adults towards children, rather than viewing the past through a child's eyes.

The study of children and childhood in archaeology emerged out of gender theory in the 1990s (Derevenski, 1994, 1997; Moore and Scott, 1997). Previously, children had been considered 'invisible' in the archaeological record, but a feminist reassessment of the past placed specific emphasis on gender and age and with this, on the nature of childhood. Lillehammer (1989) was one of the first to address the role of children in archaeology. She suggested that through the use of burial, artefacts, ethnography and osteology we could gain insight into the relationship the child had both with its physical environment and the adult world. This was followed by an examination of documentary and archaeological evidence for the child in the Anglo-Saxon and medieval periods (Coulon, 1994; Crawford, 1999; Orme, 2001), with Scott (1999) providing a multicultural view on aspects of infancy and infanticide. Crawford (1991) studied the Anglo-Saxon literature for clues as to when children were subject to adult laws. Beausang (2000) expanded this theory of childhood to incorporate the concepts and practice of childbirth in the past, with the recognition of birthing artefacts in the archaeological record. Although a promising start, these studies have been criticised for maintaining the idea that children were passive recipients in their communities, invariably linked to the activities of women (Wilkie, 2000). Furthermore, the category of 'child' is often used in order to investigate the construction of 'adult' (Derevenski, 2000). Neither approach allows us to explore the role of the child as an independent agent in the past. Wilkie (2000) went some way to redress this balance when she used evidence

of the toy industry in the eighteenth and nineteenth centuries to illustrate how, through their own material culture, children displayed their sense of identity and defined their own distinctive social networks and liaisons.

1.2.1 *Defining childhood*

BOREDOM !!! SHOOTING!!! SHELLING!!! PEOPLE BEING
KILLED!!! DESPAIR!!! HUNGER!!! MISERY!!! FEAR!!! That's my
life! The life of an innocent eleven-year-old schoolgirl!! . . . A child without
games, without friends, without sun, without birds, without nature, without
fruit, without chocolate or sweets . . . In short, a child without a childhood.

Extract from the diary of a child in the Sarajevo conflict, 1992; from Cunningham
(1995:1)

As this entry from the diary of a child in war-torn Sarajevo testifies, children have an expectation of what childhood should be. No matter what period we are examining, childhood is more than a biological age, but a series of social and cultural events and experiences that make up a child's life. Childhood can be defined as a period of socialising and education, where children learn about their society, gender roles and labour through play. The initial dependence on their parents for nourishment and protection slowly diminishes as the child ages and becomes an independent member of society. The time at which these transitions take place varies from one culture to another, and has a bearing on the level of interaction children have with their environment, their exposure to disease and trauma, and their contribution to the economic status of their family and society. The Western view of childhood, where children do not commit violence and are asexual, has been challenged by studies of children that show them learning to use weapons or being depicted in sexual poses (Derevenski, 2000; Meskell, 2000). What is clear is that we cannot simply transpose our view of childhood directly onto the past.

Bogin (1997, 1998) takes an evolutionary approach to childhood theory. Childhood is a period in the human life cycle not found in any other mammal, and for Bogin this is defined as a period of time between the ages of 3 and 7 years, when 'the youngster is weaned from nursing but still depends on older people for feeding and protection' (Bogin, 1997:64). The child is constrained by its immature dentition, small digestive system and calorie-demanding brain, which influence the type and amounts of food it can consume. 'Juvenility' occurs with the eruption of the permanent dentition, and when children are able to procure and consume their own foods, as the brain and body growth diminish to less than 50% of total energy needs, and they undergo a cognitive shift. This period begins at the age of 7 and ends with the onset of puberty (*c.*10 years

in girls, c.12 years in boys). Bogin (1998) asserts that in humans, childhood performs several functions: an extended period for brain growth, time to acquire technical skills, time for socialisation and an aid to adult reproduction. That is, that the childhood period allows the mother to wean the child and produce other offspring, by passing the energy expenditure of feeding and caring for the child onto siblings and post-reproductive members of society, such as grandparents (Key, 2000). This urge to care for the child is manipulated through the child's retention of its infantile appearance (large cranium, small face and body); that is to say, children are 'cute'. As the body and brain slow in their growth during this period, they require less energy expenditure to feed but are protected during times of hardship (Bogin, 1998). Many would object to this purely biological view of childhood, as it ignores social theories of when a child becomes an 'adult' and a fully fledged member of a society, something that is culturally defined. Hanawalt (2002) argues that in order for a child to survive, it must not only be nursed, fed and kept warm (biological survival), but also be played with and talked to (cultural survival).

1.2.2 Defining the child: biological versus cultural age

One of the resounding issues with the definition of a 'child' in archaeological contexts is the use of physiological age to determine a social category (Gowland, 2001; Baxter, 2005). Physiological age is a biological reality, whereas 'child' is a culturally loaded term. The age at which an individual leaves the world of dependency, learning and play, and takes on roles of work and social responsibility is neither distinct nor universal. That there are three types of age category, 'biological', 'chronological' and 'social', is not denied, but in order to examine the past life-course we need to have consistency in the raw data (the skeletal remains), and use accurate osteological assessments of age and physiological development as a marker from which to base our interpretations of the social understanding of age in the past. Biological age is not irrelevant in the way in which society treats a child. It affects children's connection to their physical and social environment, from total dependency during infancy, to when they begin to crawl, walk, talk and communicate with the adults and children around them (Table 1.2). These abilities are physiologically determined and they dictate how the child interacts. In particular, the misuse of the term 'infant' to refer to children between the ages of 1 and 3 years or 1 and 5 years in studies that use skeletal evidence as their data misses this point. As an infant (under 1 year), the child is particularly vulnerable to disease and death, and its chances of survival significantly increase after the first year. Children who die at around 2 years of age may be reflecting inadequate weaning methods or

Table 1.2 *Child development milestones from birth to 5 years*

Birth to 8 months	8 months to 1.5 years	1.5 to 3 years	5 years
Lifts and holds up head	Begins to crawl and may stand aided by furniture	Stands on one foot or on tiptoe	
Turns over unaided (7 months)	Can throw without losing balance	Can run, skip, climb and has a developed sense of balance	Dresses and undresses
Reaches towards objects	Handles finger-foods Uses spoons and cups Becomes anxious when separated from loved ones	Imitates others Understands people and objects still exist when they cannot be seen	
Smiling and gazing	Shows affection by kissing and hugging Responds to name Explores environment Interacts with other children	Expresses pride, pleasure, embarrassment and shame Listens to stories Understands the future and the past	Tells stories Social interaction and role-playing
Gurges and babbles to communicate	Forms simple sentences Has no understanding of 'male' and 'female'	Uses sentences to communicate feelings and needs Understands 'male' and 'female' through dress and over time, but not changing situations	Asks questions about the meaning of words Understands 'male' and 'female' through time and situations: 'gender consistency'

Source: Collated from Berhrman *et al.* (1996) and Kohlberg (1966).

unsanitary conditions, and those that make it to 3 years are talking, playing and actively mobile. By 5 years they are capable of contributing to the household with minor chores. To categorise this most vital developmental period into one age category, 'infant', will mask important physiological and, hence, social advancements.

Derevenski (1997) refers to Kohlberg's (1966) work on a child's understanding of gender roles. Before the age of 2, a child has no concept of male or female but after 2 years of age, they begin to recognise males and females by

visual prompts such as clothing. Between the ages of 3 and 4 years, a child's concept of gender becomes stable, and is understood through time. Hence, if you are male when you are young, the child understands that you will be male as an adult, but if a male begins to perform what the child perceives as female roles, the male would become female. A stage of 'gender consistency' through time and situation is not reached until the child is 5 (Table 1.2). Wiley and Pike (1998) suggested the use of developmental stages rather than chronological age to devise child mortality rates to take into account the activity of the child (crawling, weaning, walking), which is often related to their cause of death through exposure to disease and accidental injury. Although they propose this method for use in modern communities where calendar age is rarely recorded, the application of such developmental age categories into archaeological studies has the advantage of placing the child at the centre of the study by examining the environment from their vantage point.

Although biological age categories provide data from which interpretations are made, adult perceptions of the ability, maturity and responsibilities of children at each age are culturally determined, and must be considered when trying to ask questions about past child activity and health. In the later medieval period, the ages of 8–12 years represented a time when children would begin their apprenticeships (Cunningham, 1995), and children as young as 12 and 14 years could be married in ancient Egypt and Rome respectively, leaving the realm of child for that of wife and mother. Childbirth is not a common interpretation for the cause of death for older children within the burial record. Today in the UK, children reach adulthood by degrees. At 16 they can legally have sex, at 17 they can learn to drive, at 18 they can drink, get married and vote, reflecting their status as full members of society. Crawford (1991) rightly criticises archaeologists for their inconsistency in choosing the cut-off point for children in archaeological reports, which vary from 15 years to 25 years in some cases. These inconsistencies have a great impact on the way in which a cemetery is interpreted. Moving an individual from one age category to another can fundamentally change the profile of a cemetery when attempting to evaluate the pattern of adult and non-adult burials, and to understand the significance of their grave inclusions.

Attempts to define periods of transition in childhood have been carried out by examining the burial of children and the engendered nature of their grave-goods at certain ages. Gowland (2001, 2002) noted that at Romano-British Lankhills in Hampshire, children were buried with gravegoods from the age of 4 and the quantity of artefacts peaked between 8 and 12 years. Gowland (2001) suggests that in these communities at least, age thresholds appear at infancy (where perinates are interred outside of the cemetery area), at 4 years and between 8 and 12 years where the quantity and wealth of gravegoods

increases. Stoodley (2000) examined the presence of certain gravegoods within burials from a large number of Anglo-Saxon graves in England. He noted that 'masculine' spears began to appear more frequently in male graves after the age of 10–14 years, whereas 'female' beads and dress adornments appeared in 'girl's' graves at between 10 and 12 years. This study suffers from a common circular argument which stems from our inability to provide a biological sex for non-adults, and a Westernised view of what is 'masculine' and what is 'feminine'. This circle was partially broken in Rega's (1997) study of burials from Bronze Age Mokrin in Yugoslavia, where children were sexed using canine tooth-crown dimensions. Using these data, Rega revealed that all children were provided with the same feminine engendered artefacts found in adult female graves until around 17 years of age, when individuals sexed as male began to be buried with artefacts associated with the male adult graves. Stoodley's (2000) age bracket in the Anglo-Saxon childhood life-course is supported by Crawford's (1991) analysis of contemporary records revealing that children as young as 10 years could inherit property and be prosecuted under adult laws. Kamp (2001) provides an excellent review of the development of childhood studies and argues that the age categories employed by osteologists are often selected and compared without reference to the society in which the children lived. Biological or physical development and social markers of childhood are not always related. This was demonstrated in Van Gennep's (1960) *The Rites of Passage* in which physical puberty did not always coincide with the rites of passage that marked the adolescents' entry into the adult world. Archaeological evidence from the Anglo-Saxon period also attests to this, with male adult-type gravegoods only appearing once an individual has reached 20–25 years (Stoodley, 2000), some 6 years after they would have reached puberty. While the study of childhood has come some way in elucidating a particular section of the human life-course, Gilchrist (2004) calls attention to the fact that other age categories are still neglected, among them, what it was to be an adolescent in the past.

1.2.3 *Children in the archaeological record*

Some artefacts have provided tangible links to children in the past. Footprints (Roveland, 2000), death masks (Coulon, 1994), fingerprints on pots (Baart, 1990) and tooth marks in resin (Aveling, 1997) all prove that a child was there. Wilkie's (2000) discussion of toys that were designed, manufactured and sold with children in mind forced historical archaeologists to acknowledge them as actors in past society, but this concept has been slow to catch on in time periods where the material evidence is not so rich. It may be that our association with children and toys is based on Western ideals of what childhood should be, and

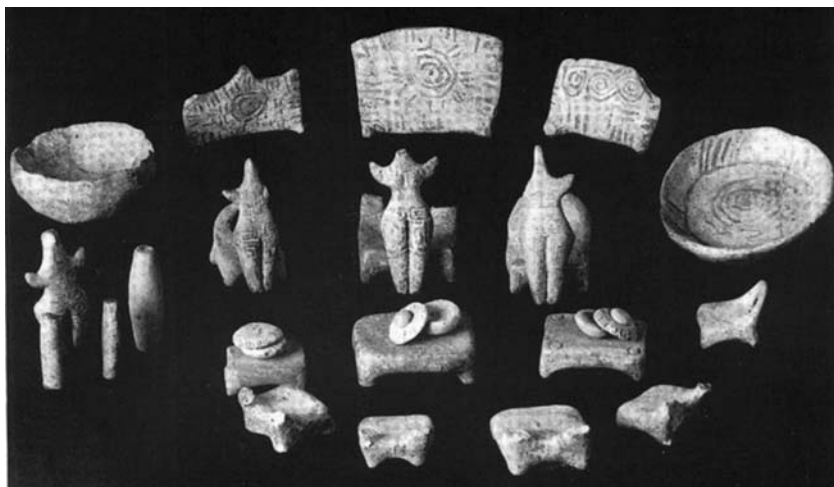


Figure 1.1 Possible toys from the Ovcharovo 'cult scene'. From Whittle (1996:94), reproduced with kind permission from Cambridge University Press.

this has led some scholars to avoid toys as a route to the activities of children (Derevenski, 1994). Nevertheless, humans learn through play, trial and error and it is conceivable that small items or badly drawn or sculpted figures in the archaeological record were used and created by children. Just as female engendered space is now recognised in the past, it is time to start considering the potential of identifying childhood spaces, where 'women and children' are no longer seen as one entity and children are viewed as independent agents within their own social space (Wilkie, 2000). Children have the imagination to make toys out of sticks, stones and everyday household objects that will be invisible in the archaeological record. In this way, children may influence the formation processes of a site, perhaps by the movement of artefacts from their original site of deposition (e.g. a midden), and the physical alteration of household objects. A small pile of stones or an unusual collection of post-holes may indicate a child was at play, and this possibility should be taken into account when interpreting a site. Until recently, child activity in the archaeological record has been seen as detracting from the real issues of adult behaviour (Bonnichsen, 1973; Hammond and Hammond, 1981), rather than being viewed as informative of the child's interaction with its physical environment.

Possible toys have been recovered from various sites throughout Europe. Of particular note are the small decorated clay figures, miniature furniture and tiny bowls found at Ovčarovo, Bulgaria (Fig. 1.1), and the clay house and figurines located in a house at Platia Magoula Zarkou, northern Greece, both finds dating to the Neolithic (Whittle, 1996). Rossi (1993) identified two ivory dolls in the

grave of a Roman child from Yverdon-les-Bains, Switzerland. Such items were traditionally interpreted as 'cult' objects or foundation offerings, rather than as a child's playthings. On the other hand, the idea that all miniaturised items represent toys is overly simplistic. Sillar (1994) noted that in the Andes, while children will play with miniature pots, mimicking adult household practices such as cooking and trade, such pots were also used by adults as donations at shrines. In lithics analysis, small cores have been interpreted as being made by children mimicking the adult knappers. Finlay (1997) suggests that inconsistently made lithic artefacts may be the work of young apprentices, learning the trade and that, as producers, children would make lithics in keeping with the adult norms, rather than on a miniature scale. Bird and Bird (2000:462) argue that differences between adult and child foraging patterns are not always about the learning process, and that 'children are not always practicing to be good adults . . . but are predictably behaving in ways that efficiently solve immediate fitness trade-offs'. If this pattern is predictable then we should be able to identify it in the archaeological record. In particular, Bird and Bird (2000) examined the different adult and child patterns of shellfishing in the Eastern Torres Strait on the Great Barrier Reef. Due to their inexperience, children tended to collect a wider variety of less valuable shellfish, which they proceeded to eat, leaving them in small middens outside the settlement. Adults were able to exclusively collect the most profitable and difficult-to-gather shellfish, avoiding the types the children collected. In the archaeological record, two forms of shell midden in different locations should be evident, with the more diverse and marginal middens representing the foraging patterns of the children.

1.3 Children in biological anthropology

The study of children in biological anthropology has earlier beginnings than in social archaeology, but they were no less focussed. Most studies were stimulated by an interest in fertility levels, or the information that child survival could provide on adult adaptation to their changing surroundings. These endeavours were constantly being frustrated by the perceived notion that infant and child remains could not survive the burial environment. It was only in the 1990s that the study of non-adult skeletons began to concentrate on the information that could be provided on the growth and health of the children themselves, providing information on their activities and risk of infection or injury in contrasting environments. Examination of the physical remains of children provides us with the most direct and intimate evidence for them in the past. This section outlines the development of the study of child skeletal remains in biological anthropology and palaeopathology up until the present day.

Before the 1980s, studies of non-adult skeletal remains concentrated on devising ageing and sexing methods based on medical studies (e.g. Schour and Massler, 1941; Hunt and Gleiser, 1955). For example, Balthazard and Dervieux (1921), Scammon and Calkins (1923) and later Olivier and Pineau (1960) provided data for fetal ageing using diaphyseal lengths, while Boucher (1955, 1957) assessed the use of the sciatic notch for sexing infant remains. In the 1960s studies on the physical growth of past populations began to emerge, and would dominate research in non-adult remains for the next 40 years. The most prolific researcher in this area at the time was Francis Johnston, who examined the growth of children from Indian Knoll in Kentucky (Johnston and Snow, 1961; Johnston, 1962, 1968). Following Johnston's example, by the late 1970s the majority of studies that included child remains were focussed on diaphyseal length measurements to estimate growth attainment (Armelagos *et al.*, 1972; Y'Edynak, 1976; Merchant and Ubelaker, 1977). With the increasing interest in palaeodemography, researchers began to assess the impact of under-representation of child remains on life tables (Moore *et al.*, 1975), but only a few were interested in what these data could contribute to our understanding of perinatal and child mortality (Brothwell, 1971; Henneberg, 1977; Mulinski, 1976). In palaeopathology, iron-deficiency anaemia as the underlying cause of cranial porous lesions (porotic hyperostosis) was under increasing discussion, with several studies examining its prevalence in non-adult crania (El-Najjar, 1977a; Lallo *et al.*, 1977). However, the association of enamel hypoplasias and Harris lines with childhood stress was indirectly determined using adult skeletal and dental material (McHenry, 1968; McHenry and Schulz, 1976; Rose *et al.*, 1978). In 1978, Mensforth and colleagues heralded a way forward when they examined the prevalence of anaemia and infection (i.e. porotic hyperostosis, periostitis and endocranial lesions) in 452 infants and children from the Late Woodland ossuary sample from the Libben site in Ottawa County, Ohio. For the first time, the health of children in the past was the primary focus of study (Mensforth *et al.*, 1978). This research also demonstrated the importance of healed and active lesions in determining the precise age at which children were most at risk; the kind of detail not available when using adult evidence. In the same year, Fazekas and Kósa (1978) published their detailed study of Hungarian fetal skeletal remains, raising awareness of the number and morphology of these tiny bones.

In 1980, Buikstra and Cook summed up child studies as being hindered by poor preservation, lack of recovery and small sample sizes, despite, they argued, many researchers becoming aware of their importance in determining the overall success of a population (Buikstra and Cook, 1980). Instead, there was a proliferation of papers on the lack of preservation of non-adult remains compared to adults (Gordon and Buikstra, 1981; Von Endt and Ortner, 1984;

Walker *et al.*, 1988), an assumption that still prevails today. The prevalence of stress indicators in children became more popular as researchers began to assess the impact of agriculture, colonisation and urbanisation on child health (Blakey and Armelagos, 1985; Storey, 1986, 1988). Jantz and Owsley (1984; Owsley and Jantz, 1985) demonstrated changes in child health of the Arikara between AD 1600 and AD 1835 as a result of malnutrition and maternal stress brought about by contact with European settlers. Goodman and Armelagos (1989) highlighted the importance of children under 5 as the most sensitive members of society to environmental and cultural insults, whose stress experience would impact on the overall population's ability to rally from disease in adulthood. Schultz (1984, 1989) began to examine the health of non-adults from around the world, employing histological analysis for evidence of scurvy and tuberculosis. In Egypt, Brahlin and Fleming (1982) reported on the health of child skeletal and mummified remains, reporting the presence of tuberculosis, spina bifida and osteogenesis imperfecta, while commenting on the lack of evidence for rickets. Our inability to diagnose rickets in skeletal remains was about to come under scrutiny (Stuart-Macadam, 1988).

By the 1990s, non-adults were becoming incorporated into biocultural studies of different populations (e.g. Stuart-Macadam, 1991; Grauer, 1993; Higgins, 1995; Ribot and Roberts, 1996). These studies were encouraged by the increase in the non-adult material available. Children of known age and sex from Christ Church Spitalfields and St Bride's Church in London became accessible (Molleson and Cox, 1993), and data began to be published on non-adults from Wharram Percy (Mays, 1995) and St Thomas' Church in Belleview, Ontario (Saunders *et al.*, 1993a; 1995). These samples encouraged a revival of methods to estimate the sex of non-adults (De Vito and Saunders, 1990; Mittler and Sheridan, 1992; Schutkowski, 1993; Loth and Henneberg, 1996; Molleson *et al.*, 1998). Saunders (1992) carried out a review of non-adult growth studies, outlining their advantages and limitations, particularly the issue of comparing deceased children to living healthy modern populations (Saunders and Hoppa, 1993), while others began to highlight the potential and extent of pathological evidence that could be derived from their study (Anderson and Carter, 1994, 1995; Lewis and Roberts, 1997). Nearly 10 years after Stuart-Macadam (1988) had raised the issue, Ortner and colleagues began to address the diagnosis of rickets and scurvy (Ortner and Ericksen, 1997; Ortner and Mays, 1998; Ortner *et al.*, 1999), while others identified sickle-cell anaemia, juvenile rheumatoid arthritis (Still's disease) and leprosy (HersHKovitz *et al.*, 1997; Rothschild *et al.*, 1997; Lewis, 1998). By the end of the decade, dental microstructure was being used to refine ageing techniques (Huda and Bowman, 1995) and stable isotope analyses to address the age of weaning in contrasting past populations throughout the world were beginning to dominate the literature (Katzenberg

and Pfeiffer, 1995; Katzenberg *et al.*, 1996; Schurr, 1997; Wright and Schwartz, 1997; Herring *et al.*, 1998; Wright, 1998).

Today, studies of infant and child skeletal remains are receiving much more attention. The publication of texts on non-adult osteology has increased the number of researchers familiar with their identification and anatomy (Scheuer and Black, 2000, 2004; Baker *et al.*, 2005). Children are routinely included in wide-ranging studies of health in the past (Steckel and Rose, 2002; Cook and Powell, 2005), while the analysis of children themselves from sites all over the world continues (Baker and Wright, 1999; Buckley, 2000; Lewis, 2002a; Bennike *et al.*, 2005; Blom *et al.*, 2005). As we refine our ageing techniques and statistical methods (Gowland and Chamberlain, 2002; Tocheri and Molto, 2002; Fitzgerald and Saunders, 2005) our understanding of the importance of childhood diseases and their diagnosis is becoming more advanced and widely publicised (Glencross and Stuart-Macadam, 2000; Ortner *et al.*, 2001; Santos and Roberts, 2001; Lewis, 2002b, 2004; Piontek and Kozlowski, 2002). New understanding of trauma in the child has meant we can now reassess the evidence for physical abuse and occupational injury, to gain a fuller understanding of the child's life experience in past society.

In biological anthropology, we still wrestle with the issue of children in the archaeological sample representing the 'non-survivors' from any given population. Their pattern of growth or frequency of lesions might not reflect that of the children that went on to survive into adulthood (Wood *et al.*, 1992; Saunders and Hoppa, 1993). The early death of these individuals provides other challenges in the study of non-adult palaeopathology. Chronic diseases need time to develop on the skeleton, but the children that enter the archaeological record have usually died in the acute stages of disease before the skeleton has had time to respond (Lewis, 2000). At the present time, studies that concentrate on non-adult material are hindered by the inability to make reliable sex estimations, due to absence of the secondary sexual characteristics evident on the adult skull and pelvis. Although sexual dimorphism has been identified in utero, there is still a disagreement about the validity of identifying morphological traits indicative of sex in the non-adult skeleton (Saunders, 2000). However, the application of ancient DNA analysis in determining the sex of non-adult skeletal material holds promise for the future.

1.4 Children in forensic anthropology

Forensic anthropology is the application of biological anthropological techniques to the study and identification of skeletal remains recovered from a crime scene. Forensic anthropologists frequently work in conjunction with forensic

pathologists and odontologists to suggest the age, sex, ancestry, stature (biological identification) and unique features (personal identification) of the deceased individual from the skeleton. Forensic anthropologists also contribute to the understanding of skeletal trauma to aid in the determination of the cause and manner of death. The data collected from the analysis constitute evidence to be presented in a court of law. Children may enter the forensic record through warfare (e.g. as child soldiers), abuse, murder, accident, suicide or neglect, but the presence of young children within a mass grave has powerful legal connotations and is highly emotive. The death of a child under suspicious circumstances creates intense media coverage and public concern, making the recovery and identification of the remains more pressing and objectivity more difficult to maintain (Lewis and Rutty, 2003).

The biological and personal identification of children's remains in forensic anthropology is hindered by the paucity of techniques usually employed to provide such identification in adults (Kerley, 1976). Features that denote ancestry and sex usually develop after puberty, when hormone levels increase and sexual dimorphism becomes more apparent in the skull and pelvis. For example, racial differences of the mid-facial projection and the appearance of the nasal root develop during puberty, as do brow ridges used in sexing the skull. Estimations of ancestry and sex are crucial to provide an accurate assessment of both age and stature in skeletal remains, as they have an effect on the rate of growth and development (see Chapter 3). An estimation of the minimum number of individuals (MNI) is often easier to obtain in children, as sizes vary with age and between individuals. However, in some cases children of similar age may be recovered and size may not be a useful distinguishing feature, especially where the epiphyses and developing dentition are concerned. Young children seldom visit the dentist, or have major surgery, and their abuse or neglect can hamper the one technique in which anthropologists are most confident when examining child remains: age estimation.

Probably one of the greatest limiting factors in the development of standards for child identification stems from the lack of modern non-adult skeletal collections. Parents rarely choose to donate their children's bodies to medical science, a situation not aided by events in England in 1999 (Burton and Wells, 2002). The case of the Royal Liverpool Children's Hospital (Alder Hey) drew out parental feelings towards the remains of their children when it was discovered that pathologists had been 'systematically stripping dead children of their organs at autopsy and storing them, ostensibly for research purposes' (Carvel, 2002:55). Large collections of modern infant and child skeletal remains of known age, sex, ancestry and cause of death are rare, although some collections of paediatric skulls exist (Shapiro and Richtsmeier, 1997).

1.4.1 The child and the law

In 1998, the number of missing children in the UK was reported at 80 000 by the International Centre for Missing and Exploited Children (ICMEC). Cases of child murder in the USA have risen by 50% in the last 30 years and between 40 and 150 forensic cases involving children are handled annually (Morton and Lord, 2002). In England and Wales, children less than 1 year of age are most at risk of homicide (82 offences per million), compared to the overall risk of 15 per million in the total population (Intelligence and Security Council, 2000). Humanitarian investigations, such as those carried out by the Argentine Forensic Anthropology Team (EAAF) have recovered children's remains from mass graves in Guatemala and Argentina. An investigation of the Dos Rs massacre, in El Peten (1982), revealed that 47.3% of the listed victims were children, with the youngest victim only a few days old. During the excavation of a mass grave in Kibuye in Rwanda 202 (44%) of the 460 bodies recovered were of children (17% under 5 years; 14% 5–10 years; 13% 10–15 years) most showing evidence for blunt force trauma. However, the figures are considered to be an underestimate as decomposition and disarticulation of the remains meant that many smaller bones could have been missed (Schmitt, 1998). Identification of victims using DNA analysis is futile if no family members survive (EAAF, 1995). It is against the International Labour Organisation (ILO) Convention of 1982 for children under the age of 18 years to undergo compulsory recruitment in state armies. Nevertheless, voluntary recruitment is legal for those of 15 years and over under the Optional Protocol to the Convention on the Rights of the Child on the Involvement of Children in Armed Conflict, which came into force in 2002 (Harvey, 2003). Despite these rulings, in some conflicts child soldiers are as young as 8 (Dufka, 1999). The presence of children younger than 15 years in a mass grave argues against claims that these graves represent soldiers killed during legitimate conflict.

Another way in which children may enter the forensic record is as the result of suicide. Suicides of children and adolescents are rare, but when they occur, they generally involve 'fail-safe' methods such as hanging, running in front of a train or jumping from a height (Schmidt *et al.*, 2002). Motives include a break-up of a relationship, conflicts at school or in the home, mental illness or chronically disturbed family structures. Most at risk are usually males between 10 and 15 years, with cases rising into late adolescence and young adulthood. In Turkey, Ağritmiş and colleagues (2004) reported 43 cases of suicides in which 72% comprised females, perhaps as a result of the social status of females and their early marriage. Psychology studies have shown that children do not have a distinct perception of death until the age of 7 or 8 years, and do not develop