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Asine III

Supplementary Studies on the Swedish Excavations 1992–1930

Fasc. 2

Anne Ingvarsson-Sundström

Children Lost and Found

A bioarchaeological study of Middle Helladic children in Asine with a comparison to Lerna

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by

Anne Ingvarsson-Sundström

with an appendix by Helena Soomer

STOCKHOLM 2008

To Felicia and Love

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Abstract

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This study focuses on children's living conditions during the Middle Helladic period in Greece. The primary material comprises disarticulated skeletal remains found in a stratigraphic context during the Swedish excavations of Asine in 1926: 4,583 fragments/complete bones. These made up 103 subadults and 36 adults by means of Minimum Number of Individual (MNI) calculations. It was possible to assign subadult skeletal remains to 39 of the 105 already published graves in the Lower Town of Asine. In addition, children's graves and skeletal remains from the neighbouring site of Lerna (periods IV–VI) are considered for comparisons of demography, health and mortuary treatment. The wider archaeological context, i.e., the published mortuary material from the settlements and cemeteries, is also examined and used to describe the community's perception of children.

It is necessary to consider children in past cultures as active and constantly changing individuals, possessing different social roles during the course of their life. Given that a culture's perception and definition of children are dependent on age or physical development, for example, the physical remains of these individuals must be given adequate attention; only by including these data also can one hypothesise on a culture's image of a child as well as on their age specific morbidity and mortality. I argue that neonatals, and even foetuses were regarded as individuals who were afforded the same type of mortuary treatment as older children and adults in the intramural cemetery of Asine. However, it is likely that the elite groups of the community had other customs, possibly preventing the burial of foetuses and neonatals in the extramural cemetery used by them.

The examination of children's growth and analysis of the teeth suggest that their morbidity was aggravated by periods of malnutrition at both sites. The presence of prenatal disturbances on the teeth combined with normal length of the long bones during the infants' first months points in different directions: it is therefore likely that different types of physiological stress affected different parts of the skeleton during the individuals' development. The skeletal growth profiles of children indicate that growth started to be affected after three months of age, and after two years of age many children could probably be considered short for their age in comparison with modern Western children. The neonatal mortality at both Asine and Lerna was probably increased by women's poor health which seems to have begun already in childhood.

Significant amounts of foods other than breast-milk were probably given to the infants at around four months of age, as reflected by the Bourgeois-Pichat biometric analysis. Demographic variables derived from contemporary pre-industrial populations suggest that older siblings were likely to have been important care-givers for infants and young children, a practice which would also be consistent with an early introduction of other nutrients than breast milk.

Keywords: children, archaeology, osteology, bioarchaeology, Asine, Lerna, Middle Helladic, skeletons, age, subadults, graves, growth, health, weaning, mortality, foetuses, infants, mortuary ritual, Bronze Age.

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PREFACE AND ACKNOWLEDGEMENTS

This book is a slightly revised version of my PhD dissertation, defended in March 2003. My work on the lives and deaths of prehistoric children was initiated in the early 1990s when the archaeology of childhood, and the bioarchaeology of children were scarcely more than emerging study areas; now they have become well-established fields of research. As a result, the direction of this book shifted during those years and would of course have been different had I written it today. In the revised version some recent interesting research in these fields had to be omitted, or could only be mentioned very briefly.

The archaeology of children can be characterized as one branch of gender oriented archaeology, and just as many of the early gender studies concentrated chiefly on women's lives, several studies (like this one) are now focussing on different phases of the life-course. Even if this compartmentalisation may sometimes be counterproductive, I nevertheless think that it is an indispensable research which is developing into an integrated archaeology where persons of all ages, all genders and both sexes are acknowledged as individuals shaping the past.

One of my objectives with this book was to combine archaeology with osteology in such way that it would be useful to scholars within both fields. This, I realized, was not as easy as I first thought. While I have aimed at explaining basic methodologies and terminology as extensively as possible, there are still terms which are left for the reader to explore. While the bioarchaeological approach sometimes impeded detailed discussions of specific osteological or archaeological questions, I hope that in the end the study will to some degree gain in breadth what it loses in depth.

I must admit that the journey towards completing the book was never an easy one, but by now I have almost forgotten the bad moments when I nearly gave up. On the other hand, I will not forget all the people that supported me in various ways along this journey: I would like to thank all of you! Even if everyone cannot be mentioned here by name, it does not mean that you have slipped my mind.

First of all I like to thank the Montelii fund (The Royal Academy of Letters, History and Antiquities) for their generous contribution that made this publication possible. Further, generous financial support from various funds has made it possible for me to carry out my research both in Sweden and in Greece, enabled me to take part in courses at departments outside Sweden, covered expenses for equipment I needed as well as expenses in connection with my work with scientists from different countries. I am grateful for scholarships from the following foundations: Helge Ax:son Johnsons Foundation, Aili Ahlholms donation, Axel W. Persson's Fund, The Gunvor and Josef Anér Foundation, The Faculty of Arts, Uppsala University, The Jacob Letterstedt Foundation, Sven Kristenssons Foundation, The Swedish Institute and Uddeholms Foundation of Värmlands Nation.

My warmest thanks to my supervisors: Prof. Gullög Nordquist whose enthusiasm and encouragement made me complete this work; Prof. em. Tullia Linders and Prof. em. Pontus Hellström also took great interest in my research, and were particularly helpful during the early stage of my studies; my external supervisor, Dr. Tarja Formisto kindly helped me with osteological matters.

I owe much gratitude to the staff at the Swedish institute at Athens who always made my study periods there very pleasant. I thank the former director Berit Wells and the secretary Bodil Nordström Karydaki for their assistance especially in communications with the Greek Ministry of Culture and with other departments I needed to contact; staff at the Nordic library in Athens for all their help; Helena Soomer, DDS, who offered her expert knowledge and lot of time in performing the analysis of the teeth from Asine and Lerna; the people of the 4th Ephorate of Prehistoric and Classical Antiquities in Greece, who generously gave me permission to study skeletal materials from the Argolid, and granted me space to work in the storerooms of Leonardo in Nauplion; Dr. Martha Wiencke who gave me permission to re-examine the Lerna skeletal material and the staff at the Archaeological museum in Argos who generously offered me a place to work; Dr. Sherry Fox, director at the Wiener laboratory (American School of Classical studies at Athens) for welcoming Helena Soomer and me and letting us work at the laboratory during our stay in Athens; Dr. Robert Hoppa who generously gave me access to his raw data of the skeletal material from the Raunds Cemetery and took time in reading and commenting parts of my drafts.

I would also like to thank Mrs. Katrin Moberg for detecting and systematically removing all human bones she found mixed up with the animal bones from Asine during her examination of them. She called my attention to the remarkable number of subadult remains, and suggested that I should take some time to examine them. Without her work on the animal bones, many of the children from Asine would probably have been lost forever.

My sincere thanks also to friends and colleagues at the Department of Archaeology and Ancient History in Uppsala for providing stimulating discussions as well as good advice on my manuscript. I am especially grateful to Dr. Erika Weiberg, Dr. Susanne Carlsson, Dr. Kerstin Höghammar and Dr. Michael Lindblom, who also helped with photographs and scanning; the librarians at the Karin Boye library: Britt-Marie Eklund, Lena Hallbäck and Christina Swedberg; Dr. Viktoria Laeben-Rosén for the excellent drawing on the cover page; Dr. Brita Alroth for kind advice and patient help with the bibliography and layout; Dr. Carole Gillis for revising my English for the first manuscript version, and Dr. Neil Price for correcting my changes to the printed version. Finally, I am also grateful to the anonymous reviewer for suggestions and comments which improved the manuscript in various ways. Despite the help from all these people I remain of course solely responsible for any errors or muddle-headed thinking that may appear in this book.

Lastly, I want to thank my family for their never-ending support and encouragement during all these years: my mother Sonja Ingvarsson who never stopped believing that I would finish this book, my husband Anders Sundström who also improved my work in various ways by reading drafts, helping me with statistics, language, databases and not at least shouldering large responsibility for our two children, Felicia and Love. I want to thank you Felicia and Love for being so patient and giving lots of hugs when I needed them most. Without your cheer and compassion my darlings, the Asine children would have remained but skeletons in my closet.

Uppsala, May 2008 *Anne Ingvarsson-Sundström*

ABBREVIATIONS

Neol	Neolithic
BA	Bronze Age
EH	Early Helladic
MH	Middle Helladic
LH	Late Helladic
G	Geometric
Arch	Archaic
Class	Classical
Hell	Hellenistic
Rom	Roman
LT	Lower town of Asine
AS	Asine (no.)
'Grave Concordance'	G.C. Nordquist, 'Grave concordance, Asine 1922–1930', in *Asine* III. *Supplementary studies on the Swedish excavations 1922–1930*, fasc. 1 (ActaAth-4°, 45:1), R. Hägg, G.C. Nordquist & B. Wells, eds., Stockholm 1996, 117–120.
'New Information'	G.C. Nordquist, 'New information on old graves', in *Asine* III. *Supplementary studies on the Swedish excavations 1922–1930,* fasc. 1 (ActaAth-4°, 45:1), R. Hägg, G.C. Nordquist & B. Wells, eds., Stockholm 1996, 19–38.
MNI	Minimum Number of Individuals
SGP	skeletal growth profile
transv.	transversal
sagitt.	sagittal
lm	lunar months
m	months
y	years
MT I	metatarsal no. 1
ED	enamel defects
I	incisor
C	canine
PM	premolar
M	molar

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I IDENTIFICATION OF PREHISTORIC CHILDREN

The child is father of the Man
Wordsworth 1807

1.1 AIMS AND OUTLINE OF THE STUDY

This study is the result of a longtime wish on my part to give a voice to the prehistoric children of the Greek mainland, discussing their lives and deaths in prehistoric Greece during the Middle Helladic period (*c*. 2050–1680 B.C.[1]). The absence of material evidence for this large part of the community is striking, despite the number of excavations that have been carried out on sites from this period, and despite the fact that the excavated material has been extensively studied from various aspects. In particular, many studies have focussed on mortuary behaviour as evidence of local or regional social organization, and on how different social identities are represented and emphasized through the mortuary remains.[2] Yet, the identities and social status of children are rarely touched upon. In fact, the investigation of children's living conditions, or how children of different ages were perceived by the contemporaneous community has never been a main objective in earlier studies. The most important reason for this lack of attention is probably that only a few, dispersed child graves have had their skeletal remains examined, and few of these graves contain any finds except sometimes very fragmentary skeletons. Accordingly, the absence or presence of child graves is often mentioned only in excavation reports in connection with statements about their under- (or over-) representation, but further analyses are seldom undertaken. Thus, prehistoric children have remained evasive and difficult to get a grip on by means of archaeology. Nevertheless, a great deal of skeletal material from earlier excavations is stored in museums and magazines around Greece. Much is incompletely published (or not published at all), possibly due to the lack of proper field documentation which makes further analyses difficult and time consuming. In spite of these problems, I considered it important to study selected parts of this material, as it constitutes a large, and often immediately available source of information with the potential to increase our knowledge about prehistoric children. The bulk of the present material from the Lower Town of Asine, was found in the form of disarticulated bones without a clear grave context, during the Swedish excavations there in 1926: it represents precisely such a source.

The material from the 1926 Asine excavations is now deposited in Sweden through an exchange agreement with the Greek government, and contains approximately 6000 boxes of various sorts of finds, mostly pottery sherds but also metal, slag, seashells, animal and human bones. The material, which is still largely unpublished, is now kept in the Asine collection at Uppsala University.[3] In most cases the bones had earlier been removed from the boxes with other finds from the excavations, but a few boxes with grave numbers written on them were found to still contain skeletal material belonging to the MH graves published in *Asine* I.[4] These fragmentary human bones (found within and without clear grave contexts) deriving largely from subadults, are to my knowledge the only skeletal material preserved today from the early Asine excavations of the area called the Lower Town.

Based primarily upon my examinations of this skeletal material, I find it possible to present an interpretation of children's living conditions in the Middle Helladic village of Asine.[5] The wider archaeological context and the published mortuary material from the settlement and its cemeteries are also examined for the purpose of discussing the community's perception of children. My aim is to merge the data obtained from both osteological and archaeological remains in order to fill some of the gaps in our knowledge of the elusive children in an MH community. To obtain a larger material for

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1 Rutter 2001, 106, tab. 2.

2 For example, Blackburn 1970; Cavanagh & Mee 1998, esp. 23–35; Nordquist 1987; 1990, 35–41; 2002, 119–135; Protonotariou-Deilaki 1990, 69–83.

3 The finds from Chamber Tomb I:1 and some other complete vases are now on deposit at the Museum of Mediterranean and Near Eastern Antiquities in Stockholm (Nordquist & Hägg 1996, 13). For information about the excavations and collections, see Nordquist & Hägg 1996, 11–19; Wells 2002, 9–22, esp. 13–17.

4 During my examination of the stratigraphic skeletal material, some more bones were found to belong to previously identified and published graves. For a discussion about these cases see 3.4. For a general discussion about the MH graves from *Asine*, see Asine I; Nordquist 1996a, 19–38 and 1996b, 117–119; Nordquist 1987.

5 Work notes from this examination were presented during the celebration of the fiftieth anniversary of the Swedish Institute at Athens 1998. Ingvarsson-Sundström 2002, 49–56.

comparison, I decided to include the material from Lerna, belonging to approximately the same period and geographical area as Asine. The graves and skeletal material from Lerna IV–VI thus serve as reference material primarily in the analysis of children's health status and their mortuary treatment. The decision to include Lerna as a comparison is partly based on its proximity to Asine, but mainly on the large number of child graves excavated there. In fact, there is no other site which has both a fair number of child graves and osteologically examined skeletons from this period.

Throughout this study, relatively modern ethnographic sources, often from small-scale societies and developing countries, are cited as single analogies to the MH material. In light of the criticism that has been directed against the use of analogies in archaeology, this approach could be seen as strange or even faulty.[6] Yet, my intention of including discussions about diverse cultural phenomena, related mainly to mortuary customs and childcare practices is to call attention to the large variability which is known to exist in these situations. Thus, the purpose of using analogies is not to prove my hypotheses, even if speculations about similar beliefs or practices are sometimes expressed, but instead to illustrate cultural diversity. In most cases I have refrained from using ancient historical sources, since the societies producing them often seem to have been more different (for instance, regarding socioeconomic factors) from MH Asine than many of the, admittedly varied, small-scale societies which are used as exemplifications.[7]

The study is divided into seven chapters. In the following sections of the first chapter I will first give a short introduction to Asine and Lerna and highlight some of the earlier studies focussing on mortuary analysis from these sites. Thereafter, the problem of defining and categorising individuals as children is discussed. The cultural and biological definitions are addressed in relation to different types of archaeological material—cultural and skeletal remains. Chapter two comprises my definitions and terminology, as well as a description of the methods used or not used during the examination of the skeletal material. Chapter three, also a methodological chapter, describe how the largely disarticulated skeletal material was structured into units for analysis. These units form the base for calculations of the Minimum Number of Individuals (MNI), a method necessary to use since clearly defined grave contexts were seldom discernable. The catalogue of these units contains information about the find context extracted from the excavation diaries[8] and related sources, as well as a summary of which parts of the skeleton were found in each MNI unit. Chapter four deals with the limitations and difficulties involved in inferences about past populations' demography using osteological remains. The demographic composition of Asine and Lerna is discussed, and its applicability for inferences of mortality and morbidity are considered. I review some of the earlier debate and controversies regarding palaeodemographic reconstructions, and discuss their relevance for the present study. Chapter five provides the osteological analysis of the subadult material from Asine (103 individuals) in comparison to Lerna (137 individuals). Data from other archaeological populations as well as from modern, Western children are sometimes used for comparative purposes. The chapter deals with subadult health status by examining skeletal growth, age specific mortality and morbidity. Since the subadult health status is intimately connected to the maternal health, the last section addresses this question in connection with discussions about the infants' nutrition. A biometric analysis of the weaning age for Asine and Lerna is also presented. In chapter six, the cultural child is examined, and questions of how children in different ages were perceived by the communities of Asine and Lerna is investigated primarily from the mortuary treatment of them. The last section of the chapter is an attempt to stretch beyond the mortuary material and utilize multiple analogies from demographic anthropology. Hypothetical inferences about how childcare could have functioned in a MH village are based on modern data from small-scale societies. In the last chapter, I attempt to merge the osteological and cultural reflections of children and present my interpretation of how their short lives were shaped. There are finally two appendices: in Appendix I, Helena Soomer (DDS) presents her age determinations and pathological findings of the teeth from Asine and Lerna, and in Appendix II, I summarise my data on the remains of adult individuals identified in the Asine material.

Thus, this work, in reality a pilot study, can be seen as consisting of two types of material, the osteological and archaeological, complementing each other. My hope is that synthesising them can serve as a starting point, and be the subject of revision during subsequent systematic investigations of Bronze Age children in the Aegean in general, and MH children in particular.

1.2 INTRODUCTION TO THE MATERIAL

The ancient site of Asine is situated on the eastern shores of the Argolid Bay, *c.* 8 km S.E. of the modern town of Nauplion. The rocky promontory projecting out in the sea is known as Kastraki, and the main part of the MH settlement was situated on its N.W. slope, i.e, the so-called Lower Town (*Fig. 1*).[9] The settlement probably spread out over the lowest slope of the neighbouring Barbouna hill[10] where remains of two houses have been found, but most of the MH material in this area belongs to graves.[11] On the plain east of the Kastraki, an area used only for MH burials has been excavated.[12]

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6 For criticism of ethnographic analogy in archaeology, see, for instance, Gould 1980. For support of analogical reasoning, see Wylie 1985, 63–111; 2002, 136–153.

7 Another type of analogy, i.e., what is termed multiple analogies, is used for the discussion about childcare practices. Since this type of analogy derives from more general observations of cultures with divergent demographic composition choosing different childcare strategies, I have granted it more credence and use it in a somewhat different way (see section 6.5).

8 When excavation diaries are quoted in the text, the English translations are my own.

9 For a detailed investigation of the MH settlement, see Nordquist 1987. For a comprehensible outline of the site and its excavation (in Swedish and English), see Styrenius 1998 with further references to earlier investigations.

10 For excavations in the Barbouna area, see Hägg & Hägg 1973; 1978; 1980; Hägg & Nordquist 1992.

11 Nordquist 1987, 21, 29.

12 See *Asine* II:2, for details about the graves and their excavation.

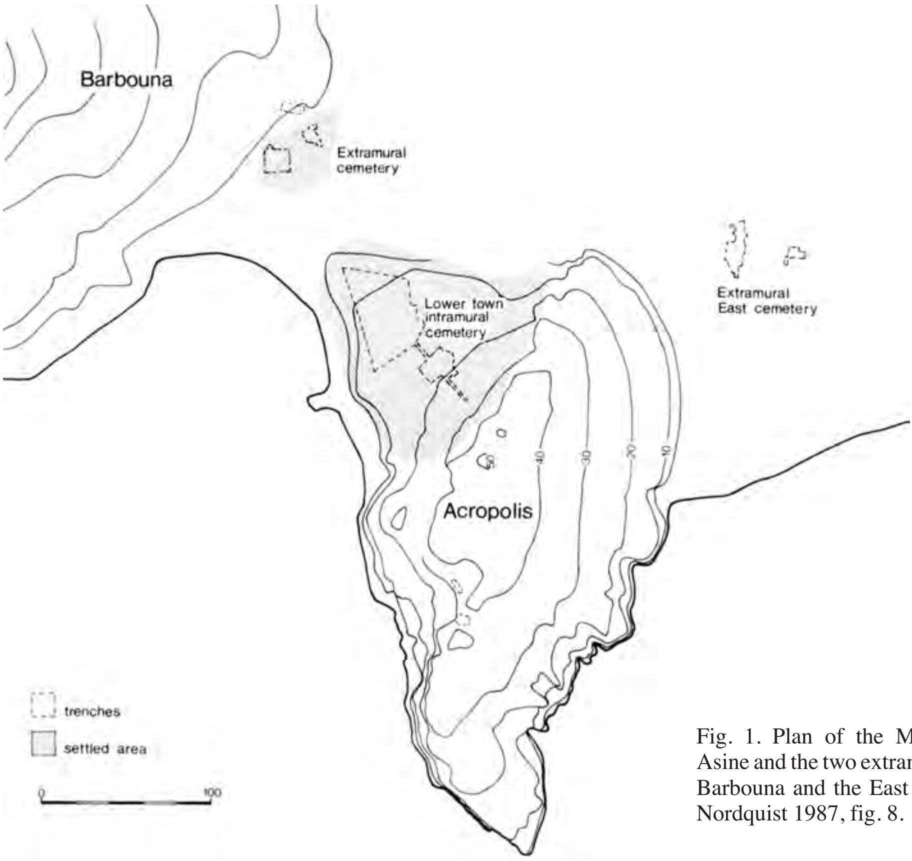

Fig. 1. Plan of the MH settlement at Asine and the two extramural cemeteries, Barbouna and the East Cemetery. After Nordquist 1987, fig. 8.

During the Swedish excavations in 1922–1930, 111 Middle Helladic graves were excavated in the Lower Town and on the Acropolis of Asine (*Fig. 2*). Of these graves, at least 108 were found to contain skeletal remains.[13] Among the graves excavated in the Lower Town, at least 54% belonged to children, and these were also included in the publication. Even more graves originally existed, but Otto Frödin points out that several children's graves were probably overlooked by the investigators, and never reported.[14] This omission is partly understandable, given the fact that many graves during the MH period were simple pits lacking finds apart from the sometimes very fragmentary skeletal remains. Nevertheless, it should be pointed out that these early excavations were remarkable in the sense that all categories of excavated material (for instance, animal bones, slag and shells) were saved. A list of human skeletons was probably kept during the excavations,[15] but some of the skeletal remains which were not found in an obvious grave context seem to have been noted only in the diaries, or not at all.

The main part of the skeletal material from the excavations was badly preserved, and no osteological investigation of the entire human material was carried out. However, some of the better preserved skeletons from the excavations of 1926 were transported to Sweden and examined here by the anthropologist Prof. Carl M. Fürst.[16] Of these, 25 skeletons belonged to graves dated to the MH period, but of these, only one individual was classified as a child.[17] Of course, this exclusion of children's bones can be due to the poor state of preservation of the bones, but a more possible explanation is that the skeletons of children in general were considered to be less informative than the skeletons of adults. Thus, the fairly 'anonymous' appearance and circumstances of children's bones probably gave them a low priority at the time of excavation. Secondly, it is also very likely that many of the small graves had been disturbed or destroyed already in ancient times and turned into disarticulated stratigraphic material. This is interesting since it tells us something about the attitudes towards the dead and their graves. A third complication during the Asine excavations was probably the difficulty for archaeologists, with no training in osteology, to distinguish between bones from a small animal and from a human child. All these factors could explain why many of the children's bones have been mixed with the animal bones, and were often just partly collected.

In 1938–1939 Lawrence J. Angel restudied most of the skeletons examined by Fürst, and presented partially different age and sex determinations for the sample. At a later date (1982), he published these results together with his examination of the 84 skeletons from the 1970's excavations of the cemetery east of the Asine village (the East Cemetery), as well as the cemetery on the south-eastern slope of the Barbouna hill (the Barbouna Cemetery).[18] These skeletons date

[13] *Asine* I, 40–45, 116–128; Nordquist 1987, 128–134.
[14] Asine I, 115, 146.
[15] Nordquist 1996b, 117.
[16] Fürst 1930. The information given by Fürst is also abbreviated in the final publication of the graves. Asine I, 116–141.
[17] Fürst 1930, esp. 12–37, 40–61.
[18] Angel 1982a, 105–138.

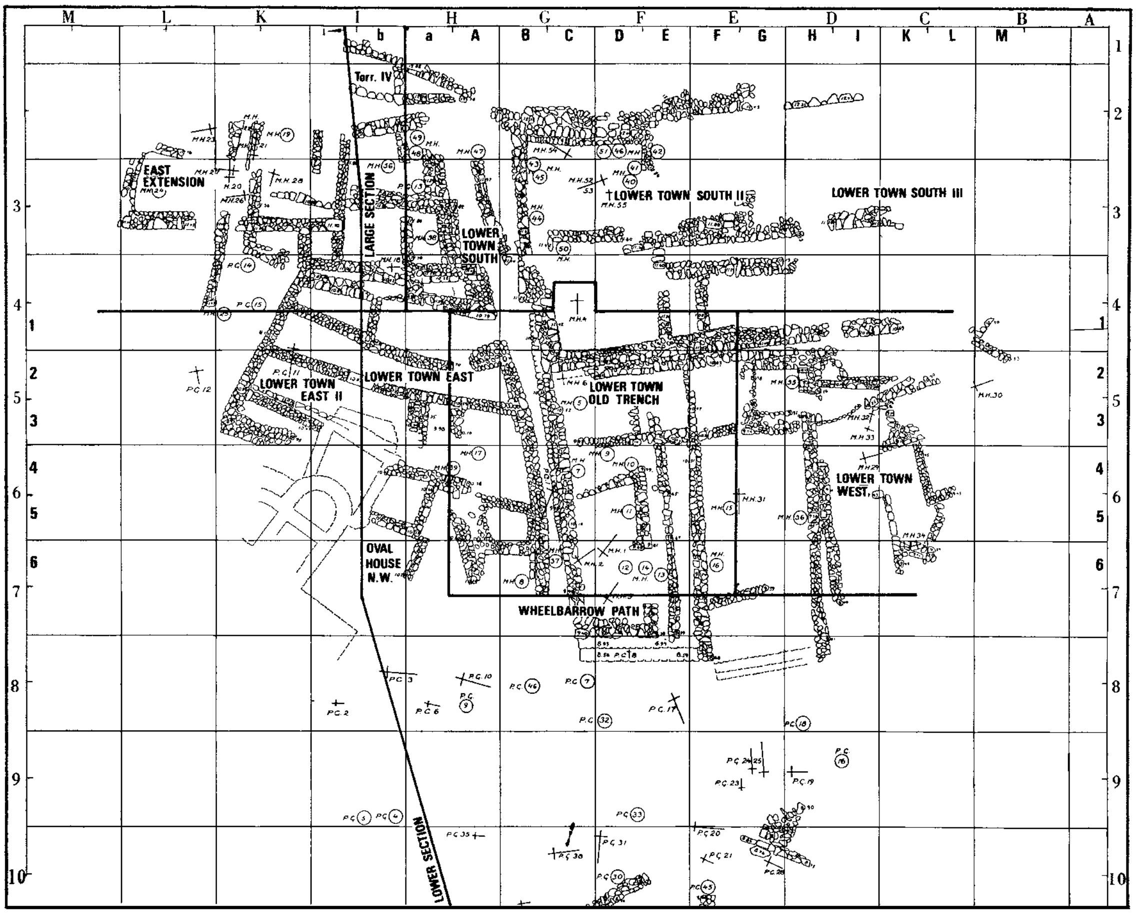

Fig. 2. Plan of the Lower Town of Asine. Grid system of 1924–26 is marked along the borders and the trenches are outlined with bold lines. After Nordquist 1987, fig. 5.

from the MH to the Hellenistic period, and of the 84 skeletons, 25 (30%) were children, 15 of them belonging to the MH period. Unfortunately, Angel's publication is not extensive and no details (like, for instance, descriptions of the different individuals and their preserved bones), of the subadult skeletons are provided. In the present study, the graves from the Barbouna area will only be treated briefly since the find circumstances of the graves have not yet been published. However, I have re-examined the available skeletal remains from subadults from both Barbouna and the East Cemetery, materials which are presently kept in the Nauplion archives.

Finally, in 1986 Katrin Moberg examined the preserved skeletal contents of Mycenaean chamber tomb 1:7 located in the Mycenaean necropolis on the Barbouna hill, as well as a portion of the stratigraphic human bones from the Lower Town, which are present in the Asine collection.[19] Her study focussed on the animal remains but she was also able to identify a minimum number of ten humans from the stratigraphic material, Middle Helladic in date: of these, five were subadults of different ages.[20]

The primary skeletal material included in this study, as already mentioned, derives from graves in the Lower Town of Asine, and it has not been published earlier. It consists of 3,702 bones/fragments which I have attributed to 103 subadults and 36 adults[21] through a calculation of Minimum Number of Individuals. Since not all bones could be related to individuals from the published graves in *Asine* I, it is likely that these disarticulated bones belong to disturbed graves, or graves that were unnoticed during excavation. The different examinations of MH skeletons from Asine are listed below (*Table 1*).

Lerna is situated in the Argolid plain at the foot of Mount Pontinus. The site lies close to the sea on the western side of the Argos bay, directly across from Asine and *c.* 10 km south of Argos. The houses and graves from the MH settlement, Lerna V, were excavated by the American School of Classical Studies under the leadership of J. L. Caskey between 1952 and 1958. The findings were published annually in preliminary reports in *Hesperia* from 1954–1959. So far, the final publication of the graves and houses has not appeared, but Angel's monograph on the human remains includes also a more general discussion about the history and ecology of the site.[22] The other monograph on the excavated material is Nils-Gustaf Gejvall's study of the animal bones from Lerna.[23] The more than 200 intramural MH graves have been the subject of care-

[19] Moberg 1986 (unpublished essay).
[20] The remains of these subadults were re-studied by the author and included in the catalogue 3.6.
[21] It should be noted that some of the 17 adults assigned to previously identified graves (Asine I), were remains of the skeletons published by Fürst (1930) and Angel (1982a), see Appendix II.
[22] Angel 1971.
[23] Gejvall 1969.

Table 1. Examinations of MH human skeletal material from Asine

Area	Material and excavation year	Examination	Examiner
LT	Selected skeletons (mostly adults) 1922–1930	First examination	Fürst 1930
LT	Selected skeletons (mostly adults) 1922–1930	Re-examination	Angel 1982
LT	Some skeletons (Grave nos. MH 16, MH 58, MH 60, MH 67, and some bones belonging to individuals from unknown grave contexts) 1926	First examination	Moberg 1986
LT	Subadult skeletons (≤15 years) and some adult skeletons 1926	First examination (including a re-examination of the five subadults studied by Moberg)	Ingvarsson-Sundström 1994–2003
Barbouna Cemetery	All skeletons 1970–1978	First examination	Angel 1982
Barbouna Cemetery	Subadults 1970–1978	Re-examination	Ingvarsson-Sundström 1994–2003
East Cemetery	All skeletons 1972–1974	First examination	Angel 1982
East Cemetery	Subadults 1972–1974	Re-examination	Ingvarsson-Sundström 2003

ful study in two unpublished dissertations focussing specifically on mortuary treatment.[24]

Angels' osteological study of the skeletons from Lerna remains one of the most important and groundbreaking investigations of a prehistoric population. Apart from the fact that it included a fairly large number of individuals, his investigation differed in many respects from the traditional reports on human remains which usually consisted of endless lists of skeletal measurements and descriptions of skull forms. Angel was anxious to relate the osteological information to its cultural and physical environment: "the demographic and physical aspects of a population also greatly affect the performance of individuals and hence influence the culture and its control over environment, both qualitatively and quantitatively."[25] Although some of his conclusions have been criticised and revised, his intention to make an integrated study of people and their environment was none the less commendable. The total number of skeletons from the period considered by Angel as Middle Bronze Age (Lerna IV–VI), consists of 234 individuals, of which 132 were termed subadults (<15 years).[26]

The age estimations made by Angel precluded a more detailed examination of the subadults for the purpose of the present study, and aims at important contribution to the study of physical remains of Bronze Age people. Since Angel's interests were mainly palaeopathological in nature and specific studies of, for instance, skeletal growth was not undertaken, his age estimations was based on a combination of criteria from bones and teeth.[27] To be able to evaluate the growth of the Lerna children, it was necessary to make a reexamination of the remains. Thus, in the autumn of 1999 the forensic odontologist Helena Soomer[28] and I carried out a new age determination of the Lerna individuals up to 15 years of age. Soomer made an examination of the teeth considering age and also pathology. I re-examined the skeletal remains and measured all complete long bones.[29] During this investigation I found parts of more individuals than originally reported by Angel. Thus, my sample comprised a total of 137 subadults[30] of which 95 had teeth preserved.

1.3 WHO IS A CHILD—PROBLEMS OF DEFINITION

What do we mean by the word 'child'? The question is asked by almost everyone who tries to investigate any aspect of young individuals in a society.[31] The answer is indeed central to the research strategy as well as to the final result of the investigation. Two basic groups of definitions can be distinguished: the physiological and the cultural.[32] In archaeological terms they correspond to the physical remains (skeletons), and the material culture (often graves) which are of particular importance for linking children to the society in which they belonged.

The archaeological problem of linking biology (skeleton) with culture (artefacts) has been discussed by Sofaer Derevenski. Alluding to the ethnographic work of Place[33] about children in a pediatric ward, she uses the terms 'child data' and 'data child' to explain the connection between the body and material culture:

[24] Blackburn 1970; Nordquist 1979.
[25] Angel 1971, 5f.
[26] More than a half of the subadult sample consisted of infants (0–1 year). Angel 1971, 70, 73.
[27] Angel (1971) did not include measurements of all long bones from subadults.
[28] Soomer had previously examined the teeth found in the stratigraphic skeletal material from Asine.
[29] For the methods of age determinations by measurements of long bones, see sections 2.4–2.5. The data from bones and teeth was successively entered into a database and used for comparison with the Asine data.
[30] Including also individuals with an age of 15 years.
[31] According to the Convention of the Rights of the Child, Article 1, a child is a person under 18 years of age.
[32] For examples of the two perspectives, see, for instance, Bogin 1998 and James 1998.
[33] Place 2000, 172–194.

> 'Child data' can be regarded as the information derived from the study of the skeleton (the internal remains of the corporeal body). In other words, that physiological data generated through the study of the child as an artefact. Thus, physical anthropology is given its own distinct role in the study of the child. By contrast, 'data child' is the recognition of the physical and social corporeality of the child – living and dead – through the construction of the grave and the artefacts deposited in association with the child. 'Data child' can therefore be regarded as the material manifestation of the interaction between child and society.[34]

1.3.1 'Data child'—the cultural child

It is clear that the maturity of children of different ages varies according to genetic disposition, culture and environment, but the ultimate decision of the maturity of the individual is decided on by the society. Thus, there are large cultural variations in the conceptions of children and adults. Most scholars within the field of archaeology agree that it is the cultural definition made by the society that is central for who should be defined as a child. Hence, it is obvious that this definition varies over time and space. A similar issue is the determinatives of infants (0–1 years). Scott argues that infants are often perceived as different, and therefore treated differently from children and adults because of social constructions originating in the infants' biological difference.[35] Some cultures do not even recognize the newborn as a human being until after a naming ceremony has been performed at some interval after birth.[36]

The cultural definition of a child and the various stages recognized within this term are based upon decisions made by adults who also, to a large extent, create the child's world and living conditions.[37] Of course, adults are also bound by cultures' ideologies and conventions, which govern how children are perceived. The individual adult's understanding of children and his/her actions towards them are not always founded in the adult's own conscious choices. Knowledge of exactly what factors that influenced the adults' perception of children is not within the immediate reach of archaeology, but the possibility of their presence are nevertheless important to bear in mind when conducting research about children in the past.

Anthropological and psychological studies indicate that the physiological development is involved in definitions of 'child', as well as different stages incorporated within this term, and it is therefore not possible to disregard the impact of biology in the cultural constructions of children. Under certain circumstances, the cultural age definitions can actually coincide with a physiological age interval: for example, the time of menarche can mark an important change from being perceived as a child to incorporation among the adults in a society.[38]

Another way of determining maturity is by testing the behaviour of the individual, sometimes in ceremonies involving practical tasks (often connected to gender roles) which have to be carried out in a proper manner, or the endurance of different sorts of pain, to enable the child to pass from one stage/status to another, or to adulthood.[39]

The cultural and biological factors are interwoven and cannot be separated if definitions of a child should be made. Therefore, the conception of childhood can be compared to the conception of gender: in the same way as gender roles are cultural constructions but often connected to biological sex,[40] the concept of a child is culturally constructed but connected to physiological age, although not determined by it.[41] Moreover, gender and age are also connected since a gendered behaviour is learnt during the life course.[42]

The childhood period can be characterized as a period of learning about the world and the values of the society. When children are growing up, playing and learning about the material world and the conventions of the society, they are also in a position to challenge the ideas and techniques of the adult world and change them into something different. Thus, children's play can be regarded as important for the way culture changes.[43]

Cognitive development, here hypothetically discussed as autonomous from physiological development, also plays a part in judging of the border between child and adult, or other defined stages during a life course. In modern Western societies, children are often defined through chronological age-groups connected to the learning processes: a child passes through primary, intermediate and secondary school and is then considered mature enough to choose his or her subsequent career. Similar ideas of maturity decide when a person is mature enough to vote, marry, buy alcohol or be sentenced as an adult by a court of justice. The way of defining the cognitive development and physiological maturity of children varies between culture and time. For example, in 7th-century A.D. Anglo-Saxon society, children were regarded as legally adult from the age of ten.[44] Today, in many developing countries children start to engage in production much earlier than ten years of age, and they have large responsibilities for contributing to the subsistence of their families. Children's involvement in non-domestic work is often criticized by modern Western society. There are many difficulties in defining 'work', since even work within the family may be as hard, and hazardous as contract work.[45] The participation of quite young children in house-

[34] Sofaer Derevenski 2000, 10.
[35] Scott 1999, 9–11.
[36] Trevathan 1987, 142f.
[37] For instance, Article 38 in the Convention of the Rights of the Child makes it possible for children of 15 years of age to be soldiers. However, recently (January 2002) an optional protocol was added which slightly modified this article, stating that States Parties shall take all feasible measures to ensure that children under 18 not take direct part in hostilities.
[38] Roodt argues that Zulu girls were secluded for initiation rites at the time of menarche. Roodt 1992, 9–14.
[39] Sofaer Derevenski 1997a, 198.
[40] Kulick 1987, 11.
[41] See Scott 1999, 9f.; Sofaer Derevenski 1994, 10; Kamp 2001, 3; James 1998, 62.
[42] Sofaer Derevenski 1997b, 876.
[43] Sillar 1994, 49; Scott 1999, 8; Lillehammer 1989, 95.
[44] Crawford 1991, 17.
[45] See James, Jenks & Prout 1998, 105f.; Johnson, Hill & Ivan-Smith 1995, 43–60.

hold work is documented for most historic periods; for example, in 18th-century A.D. Iceland, children around 6–7 years of age shouldered responsible roles in the household economy.[46]

Scholars within anthropological and psychological research fields are now paying attention to the fact that there is no 'universal child' since the experience of children may vary between gender groups and cultures.[47] As formulated by James,

> The expectations of what a 10-year-old is able to achieve vary enormously between different cultures, offering us conflicting images: as child soldier, factory worker, head of household, school child and dependent offspring or, indeed any combination of these.[48]

Turning to the archaeological material; without knowledge about the cultural conceptions concerning children in past societies, how can we identify these individuals in an archaeological material? Is it necessary to find the material expressions of culturally constructed thresholds between immature and mature, child and adult or other stages to be able to discuss children's lives? Such thresholds may indeed not be possible to find, but it should not deter us from trying. If, after analysing an archaeological material, no such obvious signifiers marking a clear difference between children and adults are present, should it be taken as an indication that childhood or any different stages within it were non-existent?[49]

In earlier mortuary analysis, children were included only as factors in understanding the adult society which their graves were thought to mirror; the child was not considered interesting in its own right.[50] Children's graves were often treated as only reflecting the parents'/families' status or social identity, and the child was not interpreted as an individual whose grave could indicate something about the child's *own* social identity. This categorisation made it impossible to see ageing as a process which may have been important for the mortuary treatment.[51] Crawford has focussed on this problem in an article about childhood in Anglo-Saxon society.[52] She argues that we must keep in mind that children's mortuary ritual may be different from the adults just because they are children. Another possibility is that the mortuary ritual followed by the persons which constructed the grave conformed to a more stylized pattern, and therefore the grave did not reflect the 'social persona' or the identity of the child. It should not be forgotten that different groups within a society (for example, elite groups/low status groups) may have different mortuary rituals, and possibly different conceptions of age and maturity. However, it is difficult to predict if individuals were treated differently because of age before the mortuary data is analysed. It is therefore important to be aware of age as a possible confounder, which should be investigated through a stratified analysis. Crawford states that if children were not assigned individual identities in the burial ritual, no age-specific signifiers would exist in the mortuary record since the ritual would only reflect the adults' status.[53] Nonetheless, even if the child was seen just as an object or, to cite Crawford, an 'economic process' of the parents, I still believe that the burial procedure of this 'object' would contain some information about the nature of its distinction, or 'otherness' in relation to burials of mature individuals. The possibility that a burial of a child could reflect the 'social persona' of its guardian should of course not be disregarded. During the examination of children's graves there are a number of questions that need to be asked, some of which have been formulated by Crawford, namely:

> 1. Does the mortuary ritual as applied to juveniles reflect ascribed status?
> 2. Can the burial objects be considered as personal possessions?
> 3. Does the ritual, conversely, reflect only the status of the adult buriers?
> 4. May the ritual have imposed a theoretical adult status on the juvenile as a confirmation of the ritual order, or as a ritual defusing of the implicit threat to the social order on the death of the child?[54]

Other important questions are of course whether and how gender roles are expressed, since these roles can also influence what mortuary treatment was considered appropriate for the individual.

1.3.2 'Child data'—the biological/osteological child

I agree with Kamp's assertion that the optimal way of examining children in the past would be by first trying to determine cultural age categories,[55] but we must take into consideration that this is not always possible. In some cases, age determinations from the skeleton can prove to be useful since the physiological ages may illuminate details about the cultural age which otherwise would have been impossible to discern. Confined to prehistoric periods, culturally constructed perceptions and treatment of children are perhaps most visible in the mortuary record. It is, of course, unfortunate that children in the past have to be studied through the adults' conception of them, as well as through the sample of dead children.[56] Nevertheless, since the way adults interact with children influences their lives and deaths to some degree, this fact should not discourage further research.

Most psychological and anthropological research indicates that different physiological stages of childhood *are* acknowledged by every culture as a universal component of human society.

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46 Lillehammer 1989, 93.
47 See Panter-Brick 1998a, 2f.; Sofaer Derevenski 2000, 11.
48 James 1998, 62.
49 Cf. Ariès' opinion that childhood was not recognized during the Medieval period. Ariès 1962, 128. Concerns about modern children 'losing their childhood' or not having a childhood (i.e., in developing countries) pinpoints the discussion of childhood as a social construct. James 1998, 51f., 56, 58; See Sofaer Derevenski (2000, 8) about different experiences of childhoods.
50 Sofaer Derevenski 2000, 8.
51 See Scott 1999, 98.
52 Crawford 1991, 17–24.
53 Crawford 1991, 18.
54 Crawford 1991, 18.
55 Kamp 2001, 4f.
56 Welinder 1998, 188; Sofaer Derevenski 1997b, 875; Lillehammer 1989, 90.

> Every culture has a conceptual division of the life course into stages linked roughly or precisely to age and imputed maturational capacities, with associated social responsibilities and stereotypical psychological characteristics. Something equivalent to infancy and childhood stages seem to be universal, although the number of age-linked partitions and their meanings vary considerably.[57]

Certain obvious biological characteristics can be associated with children: for example, the newborn infant's inability to feed itself and speak, the emerging ability to crawl and walk, the toothing enabling solid food to be chewed, development of a language, etc. During adolescence (often defined as beginning with puberty) secondary sexual characteristics gradually develop as well as a growth spurt of the skeletal tissues.[58] At least some of the physiological stages most likely had implications for these societies' cultural perceptions of development and maturity, even if they did not recognize chronological age as a hallmark for certain maturation stages. Recognition of physiological maturation stages also affects the adults' treatment of children.

In archaeological studies, the terms 'children' and 'adults' are frequently used as fixed oppositions. As has been shown above, however, it must be kept in mind that children are not a homogeneous group that can be expected to act and develop in one specified way: rather, they are individuals with different experiences and abilities. In the same way that adults do not constitute a uniform category, children also have different social identities: they belong to different social categories, ethnic groups, genders and ages which are not static but can change throughout the life course. These factors tends to be lost in many archaeological studies, partly because of the unreflected use of this binary dichotomous terminology.

Determinations of the skeleton's biological age with as accurate and narrow limits as possible is important for a stratified mortuary analysis, and as a base for further discussions about the cultural conception of children. Naturally, it is also important to have a clear picture of the age profile of a skeletal sample in order to be able to discuss questions such as the age-specific mortality and health status.

When trying to accomplish this, the different applications of terms like infant, child and juvenile automatically lead to interpretative problems: the age limit covered by these categories varies considerably between different excavators and sites. Since the skeletal remains from grave populations have seldom been examined by an osteologist, the excavators wanting to describe approximate age groups in a cemetery have to estimate them from the size of the bones. When this classification according to approximate size is made, an arbitrary use of terms like infant and child is often the outcome. Even in osteological reports the terminology is not always explicit as to what age limits have been used.[59] When Crawford examined the age categories from samples in Anglo-Saxon cemetery reports, she found that the upper age limit for the term infant varied between 3 and <12 years.[60] Additional terms used for the description of age also showed similar variability. This lack of consistency of terminology makes comparisons of age profiles between different cemeteries impossible: an individual who was designated adult at one site would perhaps have been classified as juvenile or child at another site. Classification problem like these may distort patterns within the mortuary record and make them seem uninterpretable. Moreover, individuals in certain age groups may 'disappear' in the analysis.

The same dilemma occurs in the Asine material. In the descriptions of the graves in *Asine* I, the terms child and infant are not explicitly defined as to what approximate age limits were used during the 1920's excavations.[61] Angel—in his osteological report of some of the Asine skeletons—defined an 'infant' as an individual less than one year of age,[62] but in the description of graves in *Asine* I, no osteological examination was carried out of immature skeletal remains,[63] even if a rather arbitrary division based on the size of the skeleton was probably done. The unspecified use of these terms makes a discussion about the possible differential mortuary treatment of individuals in Asine of different ages difficult.

Further, the age limit for an individual to be classified as an adult is also subject to variation. Angel defines individuals from Asine with a physiological age 15 years as adults, while many osteologists set the beginning of adulthood to >18 or >20 years.[64] Therefore, I find a closer definition and general agreement of the age terminology of utmost importance for future archaeological and osteological studies. Until then, a careful stating of the terminology used should be presented (the terminology used in the present work is presented in 2.1).

Several factors affect the timing of skeletal development. Of these, the most important are variations in environment, genetic background, sex, diet, nutritional status and diseases.[65] A problem when dealing with archaeological populations is that it is difficult to correlate the relationship between the skeletal development of past and modern populations. The standard procedure in osteological analysis is to compare the bones under study with skeletons of known chronological age and sex. These reference skeletons are usually modern, and may therefore differ in developmental aspects from the ones from archaeological sites.

A further complication is the often unknown discrepancy

[57] Levine 1998, 113.

[58] Bogin 1998, 19, 22f. 'Puberty' and 'adolescence' are often used interchangeably to describe the period between 10–16 years of age, but the period commonly occurs earlier in girls (10–13) than in boys (12–16). Scheuer & Black 2000, 469.

[59] See, for example, Triantaphyllou (1998), who uses the terms Infant A, Infant B, child, etc.

[60] Crawford 1991, 19f.

[61] *Asine* I, 116–128.

[62] Angel 1982a, 105.

[63] Only one child from these early excavations was examined by an osteologist, see Fürst 1930, 24.

[64] During the recent decades a better nutrition of people in the Western world has caused certain biological maturity indicators (menarche, final stature and epiphyseal fusion in the skeleton) to occur at an earlier chronological age. Therefore, Angel (1971, 17) makes allowance for the presumed later epiphyseal fusion in earlier populations, and groups which he terms 'subadults' (15–18 years) together with adults (>18 years), as the later maturation otherwise could result in an underestimation of the true chronological age if archaeological skeletons are compared to a modern reference skeleton.

[65] Brothwell 1972, 57; Johnston & Zimmer 1989; Sundick 1978, 228–232; Ubelaker 1989, esp. 64.

between chronological and physiological age. The only thing the skeletons can tell us is in fact the level of the physiological development. Even if the chronological age in itself was not relevant during the prehistoric periods (as already discussed, other maturation stages would have been important, and perhaps connected to the physiological age), osteological studies have to substitute the physiological age with chronological age; the discrepancy between them causes problems. There may be considerable differences between the chronological age of the reference skeletons (with both chronological and physiological age known) and the studied skeleton. The skeleton studied may have a similar physiological age as its referent one, but it may in reality be of a very different chronological age. This difference could, for example, be a consequence of a poor nutritional status in the latter (or the former), which is known to result in a later maturation and bone development.[66]

At present there is no apparent way to deal with these problems. In order to reduce potential errors, it has been recommended that the reference material should be as close as possible to the studied population with regards to the environment and, preferably also, the genetic background. What factor has the greatest impact on the differences in growth among children has been discussed, and it has been shown that the environment affects the children most.[67] Therefore the environment should be considered first when looking for a suitable reference material. The fact that archaeological populations are seldom completely preserved and often consist of fragments instead of whole skeletons naturally makes the situation even worse. All these factors have to be kept in mind because they can introduce systematic as well as random errors in the age estimations.[68]

1.3.3 Summary

The term 'child' is dangerous since it might mislead us to regard it in an ethnocentric way based on our own childhood.[69] For scholars from the Western world, there is a risk for ethnocentric assumptions based upon the modern Western way of regarding children as an immature group of unproductive individuals lacking influence and power, and needing protection.[70] This view is relatively recent and, as stated by Kamp, perhaps the most difficult thing is to disregard our own perceptions of childhood.[71]

Skeletons and material culture complement each other and only make sense when studied together. It is important to emphasize that skeletons are artefacts for the archaeologist, but at the same time the result of cultural and biological processes which are largely unknown to us.[72] In the same way as ancient texts must be regarded as artefacts which need to be interpreted in their context, information from the skeleton cannot simply be read uncritically.[73] There is a risk for narrow-minded interpretations if only one group of archaeological data is considered in a mortuary analysis: detailed osteological reports or examinations of archaeological artefacts are rather useless if they are not interpreted in conjunction with each other.

To conclude, physical changes that develop over the individual's life course affect the behaviour of the individual, as well as how the individual is treated by the society. Therefore, the physiological age should be considered as one important variable for the cultural investigation of children. Since children are *both* biological and cultural beings, both factors are important and neither can take priority over the other. Through an analysis that merges both factors, we may be able to access children of past societies.

[66] Johnston & Zimmer 1989, 12.
[67] Buikstra & Mielke 1985, 363; Johnston & Zimmer 1989, 19.
[68] Johnston & Zimmer 1989, 17.
[69] See Sofaer Derevenski 1994, 8; Lillehammer 1989, 91.
[70] Sofaer Derevenski 1997a, 193f.; Kamp 2001, 2; James 1998, 50.
[71] Kamp 2001, 26.
[72] When the skeletal remains are discussed by archaeologists merely as a kind of 'biological product', there is often a demand to look for an objective 'truth' behind the skeleton and, for instance, to find the markers of modification or disease (i.e., a kind of demand for objectivity which is common in the natural sciences). This has been argued as impossible (cf. Wood *et al*. 1992) since the factors influencing, for example, mortality and morbidity are extremely complex and often difficult to understand even in living populations. If the choices made in connection with the burial by the contemporaneous society are regarded as well, it becomes obvious that all we can (and should) do is to offer interpretations of the biological events in the same way as the cultural ones. Neither groups of data are more exact than the other. In skeletal studies it is equally important to remember the cultural factors that often influence, for instance, estimations of infant mortality. These simple facts may be seen as obvious, but none the less, they are often not fully regarded in discussions about prehistoric children and their mortality.
[73] See Scott 1999, 12.

II OSTEOLOGICAL MATERIAL AND METHODS

2.1 TERMINOLOGY

In this study I have chosen to include all individuals with a physiological age up to15 years of age. As a consequence of the previous discussion about the various ways to define children in different cultures, it could of course be argued that no predefined limits concerning age should be made by the investigator if a society's cultural definitions of children are one of the questions at issue. However, since there are already immanent limitations in the material, there are arguments in favour of this division: the decision to adopt approximately the same age limit as many other osteological studies is made for the sake of comparability between those studies and my own analysis.[74] Also, the study focuses on a very fragmentary skeletal material where the only (physiologically) adult individuals who could be age-determined more precisely are the ones with preserved teeth, and they are few. In my opinion, they would not add much to the attempted discussion about the concept of children. Nevertheless, the adults who were identified in the stratigraphic material from Asine have been included in the MNI units of the catalogue,[75] since their presence is relevant for the assessment of the general taphonomy at the site, the nature of the stratigraphic material and, of course, the mortuary treatment of children in comparison to adults. I have also decided to record separately the basic demographic data of adult skeletal remains (see Appendix II).[76]

Yet, it must be emphasized that the individuals included are not to be considered as an age group that conforms to the Middle Helladic societies' conception of children or, for that matter, my own perception of what that age group was. A modern terminology which determines different age groups for children is necessary to use for analytical purposes, and I use a set of terms which can be more or less precisely defined (*Table 2*).

As a consequence of my osteological examination of the Asine material every individual was given, when possible, three age estimations (see 2.5): the first, and also the one most accurately corresponding to chronological age, was based on the teeth, if these were present. This type of age estimation is recognized in the tables and the catalogue as a precise age followed by a parenthesis with the margin of error stated. If the teeth were absent but skeletal elements were complete enough to be measured, the age generated by these measurements is given in numerals (often an interval). When neither teeth nor measurable bones were present, the age was estimated from the fusion of growth centres and size, and the approximate age is indicated by the age categories (Infans I, Infans II, etc.) or by describing the possible age (for instance 'newborn'). Thus, if only the age category is stated, this indicates that no closer age determination was possible in that particular case.

The wide categories Infans I, Infans II are those recommended by Sjövold, and his classifications are modified from Martin's (1914, 1928) system of age groups.[77] Martin's groups were originally based on dental and cranial developmental stages (tooth eruption and suture closure), and since those stages can occur at slightly different chronological ages, the system of Sjövold was made to comprise overlapping chronological limits.[78] As a consequence of my definition of the subadult category, adults are defined as being more than 15 years of age. In practice, the individuals categorised as adults in Appendix II are often much older than 15 years.

2.2 TAPHONOMY

'Children are frequently under-represented in skeletal samples'—this statement is often put forward as an inevitable fact at the beginning of many archaeo-osteological reports dealing with cemetery analysis, or palaeodemography. An increasing interest has emerged in the underlying causes behind this specific situation.[79] The processes that constantly act on the sample, from the time of death until the moment of skeletal analysis, are called taphonomic processes, and it is important to take them into consideration in connection with statements about under-representation. I will argue that a

[74] See, for instance, Angel 1971; Saunders, Hoppa & Southern 1993; Saunders 1992; Stloukal & Hanáková 1978.
[75] See chapter III for definitions of MNI units.
[76] This decision is made since some of the individuals could not be assigned to identified graves and accordingly were probably not previously published.
[77] Sjövold 1978, 99–114.
[78] Sjövold 1978, 100–103.
[79] See, for example, Guy, Masset & Baud 1997; Saunders 1992.

Table 2. The age terminology used.

Term	Period	Reference
foetus	from nine weeks to birth, expressed in lunar months (< 10 lunar months*)	Scheuer & Black 2000, 468.
stillbirth	those born dead after 24 weeks (*c.* 6 lunar months)	Scheuer & Black 2000, 468.
perinatal	around birth, from 24 weeks gestation – 7 postnatal days	Scheuer & Black 2000, 468.
neonatal, neonate	birth – 27 postnatal days	Saunders, Herring & Boyce 1995, 72.
post-neonatal	28 days – 364 days	Saunders, Herring & Boyce 1995, 72.
Infant	birth – 1 year of age	Scheuer & Black 2000, 468.
'Infans I'	birth – 7 years of age (birth to eruption of first permanent molar)	Sjövold 1978.
'Infans II'	5 – 14 years of age (complete eruption of first to complete eruption of second permanent molar)	Sjövold 1978.
adult	>15 years of age	modified from Angel 1971, 71.
subadult	≤15 years of age	modified from Angel 1971, 71.

* According to Ubelaker (1987, 1259) "most refer to 'lunar months' computed from the onset of the last menstrual period and calculated on a 28-day monthly interval."

careful consideration of the taphonomic factors is central to the study of prehistoric children.[80] These *post mortem* processes could produce severe biases in the interpretation of age distribution, as well as in the identification of pathological conditions in the studied population. Nawrocki identifies three major classes of taphonomic processes that are relevant for the study of human remains: environmental, individual and cultural factors.[81]

To the *environmental factors* belongs the effects of living organisms such as bacteria, worms, insects and rodents which often cause disarticulation and dispersal as well as fractures of buried skeletal remains.[82] In the case where the burial was shallow and without a protecting coffin, the exposure to animals would be even greater. Roots from plants can either disturb or protect the skeletons in various ways.[83] The root-marks can resemble pathological conditions (pseudo-pathology) and thus cause misinterpretations of disease frequency.[84] The amount of water and the rate of its circulation in the burial area is another very important factor.[85] Water causes an interruption of the protein-mineral bond in the tissue and it can also bring destructive chemicals into the bone. Furthermore, soaked bones frequently crack open as a result of too rapid evaporation after exhumation.[86] The soil types and their pH values often have severe effects on preservation. Unfortunately it is difficult to determine what the best combination for good preservation is. The main constituents of bone are an organic part (collagen) and a mineral part (hydroxyapatite) and these two components are preserved at opposing pH.[87] It is generally believed that neutral or alkaline soils are better for preservation than acidic soils.[88] Gordon and Buikstra has demonstrated a statistically significant correlation between age and pH-value, in finding that the preservation of subadults is more severely affected by a decreasing pH than that of the adults.[89] However, pH alone could explain only 23% of preservational variation. The sample included a wide age range, and they were also able to show that the bone density accounts for a large part of the variation. These scholars emphasize the significance of pH values for the preservation of immature individuals and caution, "… at marginal pH ranges all or most of the infants and children may be systematically eliminated from the mortuary sample by preservational bias."[90] There is also a disagreement between some researchers about which soil type is best for skeletal preservation: calcareous soils are often thought of as a favourable environment for bone but the opposite has also been reported.[91] Extreme milieus such as dry sand, permanently frozen grounds or peat-bogs often preserve bodies very well. Acidic peat bogs preserve skin and hair well, but the bones and teeth become soft when the mineral part of the bone is dissolved.[92]

Variation in temperature which accounts for the expansion or contraction of the earth is another devastating factor which causes breakage/fragmentation of bone. These effects seem to be particularly influential on bones from small children: in

80 Waldron (1994, 12, fig. 2.1) has recognized four main factors that affect what is actually left of the originally dead population. What has to be considered is that only a proportion of the population were: (1) buried on the site, (2) preserved, (3) discovered, (4) excavated and finally identified.
81 Nawrocki 1995, 49–55.
82 Nawrocki 1995, 51.
83 Nawrocki (1995, 51f.) suggests that roots also can have a protective effect as they "… draw water away from the bone surface."
84 Wells 1967a, 5–19.
85 Henderson 1987, 46.
86 Nawrocki 1995, 52.
87 Cronyn 1990, 277.
88 Henderson 1987, 46.
89 Gordon & Buikstra 1981, 566–571.
90 Gordon & Buikstra 1981, 569.
91 Henderson 1987, 46; Brothwell 1972, 9.
92 Chamberlain 1994, 42f.

Table 3. The frequency of preserved subadult (≤ 15 years) skeletal parts: complete parts and fragments by bone element.*

Bone element	Fragment	Complete	% Complete	Total
Neurocranium	1009	–		1009
Frontal	52	1	1.89	53
Parietal	56	–		56
Temporal	15	40	72.73	55
Incus	2	–		2
Malleus	2	1	33.33	3
Occipital	25	41	62.12	66
Zygomatic	7	19	73.08	26
Sphenoid	23	24	51.06	47
Maxilla	28	6	17.65	34
Vomer	1	–		1
Mandible	47	14	22.95	61
Vertebrae	80	295	78.67	375
Clavicle	27	7	20.59	34
Scapula	25	6	19.35	31
Ribs	542	13	2.34	555
Sternum	2	–		2
Humerus	51	28	35.44	79
Radius	29	20	40.82	49
Ulna	36	17	32.08	53
Carpal/tarsal	1	4	80.00	5
Metacarpals/metatarsals	10	73	87.95	83
Phalanges (hand+foot)	4	33	89.19	37
Sacrum	7	–		7
Innominate	30	24	44.44	54
Femur	77	34	30.63	111
Patella	1	–		1
Tibia	64	29	31.18	93
Fibula	25	10	28.57	35
Total	2278	739		3017

* Because the major part of the bones come from neonatal and post-neonatal individuals (<1 year of age), few of the different bone elements have fused. On these grounds they are counted as complete if one of their different parts are present. For example, the vertebrae consist of three parts at birth: centrum or body, and the two halves of the neural arch. If one of the two halves of the neural arch is found undamaged, it is counted as one complete specimen.

the Anglo-Saxon cemetery of Raunds in Northamptonshire, England, 70% of the neonates, but only 10% of the adolescents, were crushed as a result of the movements in the clay.[93]

Many of these environmental factors are unknown for the Asine bones. Owing to the long history of building activity in the area in ancient times, and because the excavators recorded their depth measurements from the ground surface, it is difficult to know at what depth the graves were located when the settlement was in use. However, I have found rootmarks on a number of bones thus indicating that they were not situated very deeply, at least not during a part of their history. The extensive erosion on the terraces and in the Lower Town of Asine probably also led to an easier exposure of the bones. The soils found in the Argolid are mainly of two types: a flysch which is rich in calcium and retains water well, and as a stony Pleistocene soil.[94] Unfortunately the soil samples that were taken during the excavation were never analysed, or at least not published.[95] As most of the bones in my sample are generally in a good state of preservation, the lime-rich soil seems to have had an advantageous effect, at least in this particular case.

Individual factors such as age, sex, the amounts of soft tissue and bone type are other important determinants for preservation. It is generally agreed that the fragile skeletons of subadult individuals are more susceptible to rapid and severe decay than the skeletons of adults. Factors which aggravate their preservation are, for instance, their different bone composition—bones from subadult individuals have a lower mineral content and lower density than bones from adults.[96] Differences in the size of the bones may also play an important role. Variations in the preservation of different bones from the same skeleton have been attributed to their different structure. For example, the different amount of cortical (dense) and trabecular (spongy) bone tissue is of importance: the long bones have a larger part of cortical bone than, for instance, the vertebrae and ribs, and should therefore be better preserved.[97] Waldron made a quantitative study of what parts of the adult skeletons that was most frequently preserved at a Romano-British site in London.[98] He concluded that the density and size of the bone were of vital importance for the preservation. The dense long bones and the compact parts of the cranium were present in 40–59% of the expected score,[99] but also the ribs (which are both thin and spongy) were found to be preserved to the same percentage. The best preserved bones (60–79% of expected) included the vertebrae, which consist to a great extent of trabecular bone (i.e. the vertebral bodies). Bones which were present in less than 20% of the expected score included many of the small bones such as carpals and the phalanges. This study thus indicates better preservation of the big and dense parts of the skeleton, such as the long bones of the arms and legs. However, I find it questionable to draw any definite conclusions about a absolute relationship between preservation and bone structure, as many contradictions to this correlation seem to exist. Waldron points out that the picture seen in this study is not necessarily valid for other sites with, for instance, different soil conditions.

Comparisons between subadult and adult skeletons concerning what bones and/or part of bones are best preserved ought to be difficult as a growing skeleton is not fully ossified and therefore not similar to the adult skeleton. Despite this fact, it is interesting to see which parts from the subadult Asine skeletons are most frequently represented (*Table 3*).[100] The condition of the bones examined by me is fairly good: for example, 28.6% of the long bones are complete enough

93 Boddington 1987, 30f. In this study, the bones from the area which had less stones mixed with the clay were those most frequently crushed.
94 Nordquist 1987, 18.
95 Prof. Gullög Nordquist, personal communication.
96 Saunders 1992, 1f.
97 Nawrocki 1995, 53; Runia 1987, 46.
98 Waldron 1987, 57–63.
99 Waldron calculated the ‘expected score’ as the number of the given skeletal element that would normally exist in any single skeleton and multiplied this number by the 88 skeletons.
100 For an illustration of the bone elements and their names, see *Plate 1*.

for measurements to be taken (i.e. enabling age estimations).[101] The relationship between size and density in this material is interesting: the bone elements that were most frequently found in a complete state were the bones of the hands and feet which consist of compact but very tiny bones (neonatal metacarpal = *c*. 1 cm) and the vertebrae (arches). Some compact parts of the cranium (the petrous part of the temporal bone, and zygomatic) were also often completely preserved (*Fig. 3*). These proportions do in fact agree very well with Waldron's study, although they differ in the preservation of the phalanges, which are often found complete in this material.

The presence of certain pathological conditions and injuries is also known to hasten the decomposition of buried bone.[102] When the bone tissue is damaged it becomes easier for microorganisms to enter, thus, speeding up the decomposition.[103] The same may be valid for individuals with infectious conditions and blood poisoning. On the other hand, certain pathologies such as the osteophytic outgrowths (very common in adults) of the vertebral bodies seen in osteoarthritis are actually better preserved than a 'normal' vertebral column. In the Asine material few bones exhibiting pathology were found; this scarcity may have contributed to their good preservation.

Cultural factors could be described as the alterations of bone that are due to human impact. The treatment of the body after death[104] and the type of burial (i.e. inhumation or cremation) is of course very important: in a cremation the bones become friable and cracked as a result of the disappearance of the organic portion, although the extent depend on a number of factors such as the length of cremation, the temperature, the amount of body fat and body position.[105] In the cases where inhumation was practised, the preservation may be influenced by the mortuary treatment. The presence of a wooden coffin could protect the bones from a destructive environment even after it has collapsed, but it can also retain percolating water (and delay evaporation), which could cause destruction of bone.[106] Therefore, it is difficult to know whether the presence of mortuary structures preserve the skeleton better than the use of simple pits. When secondary burials are practised the major problem is that many small bones are lost during the gathering of the remains: this is especially important for the identification of small children. If many of their bones disappear, it jeopardizes their chance of being discovered as individuals in the archaeological material. When the burials are performed inside the settlement there is a risk for the graves to be disturbed by various constructions connected to the buildings, as well as later graves. In the Lower Town of Asine the most common grave type used for children is the pit grave. Such graves were, of course, easier to overlook than built graves, especially if no grave markers were found above ground. I believe that these cultural factors are the most important ones for the preservation of this material.

When human impact is considered, the archaeologists must not be forgotten. Their experience in excavating human remains could affect what skeletal parts are recovered, and sometimes also the condition of the bones at the time of analysis. As mentioned earlier, excavators are not usually trained

Fig. 3. Bones from a 8-lunar-month-old foetus probably belonging to grave MH 87.

in osteology, and osteologists are seldom present during excavations. This could result in difficulties in distinguishing small animal bones from those of a human child (*Fig. 4*). The methods used at the excavation are also important: for instance, the use of a fine-meshed sieve could promote the identification of the small bones from newborn children as well as their teeth. When a careful collecting of all bones has been carried out at the excavation, it is not unusual to find remains of more individuals than the one at first noted in the grave.[107]

It is obvious that the identification of bones from small children would benefit from careful and competent excavations. It is thus very likely that cultural factors are as influential as both the environmental and individual circumstances,

[101] Of the 138 fairly complete long bones listed in *Table 3*, only 120 allowed measurements for age estimation. Those having only slightly eroded metaphyses possibly affecting the result were excluded. The measurements and age estimations are presented in *Table 4*.
[102] Henderson 1987, 45.
[103] Garland & Janaway 1989, 16.
[104] The time interval between death and burial, and the practice of excarnation can also influence the bone preservation but these effects will not be treated here.
[105] McKinley 1989, 65–67.
[106] Garland & Janaway 1989, 27; Nawrocki 1995, 54.
[107] This situation is likely to account for some of the unidentified subadults found in relation to adult graves in the Asine material. See further discussion in 6.2.

Fig. 4. Bones from an infant and a chicken (the two bones to the right).

sometimes even more important as shown by the following study. Saunders conducted an investigation of a cemetery in Ontario, Canada, where a careful excavation was done, to study the difference between adult and subadult (15 years) preservation.[108] The cemetery was in use between 1821–1874 and all burials were recorded in parish records. The general bone preservation was considered excellent and intra-cemetery variations in the soil was minimal. When comparisons was made between the burial records and the identified skeletons, it was discovered that they matched very well: only 4% of the subadults who were recorded could not be identified in the skeletal material. The age indicators (for subadults: diaphyseal and/or dental calcification data) were even better preserved in the subadults than in the adult skeletons.

Thus, it seems like subadult skeletons *may have* the potential to be as well preserved as adult skeletons and the problem is rather the archaeological identification of these individuals. There is also the issue of differential treatment of the deceased infants, and this is intimately connected to the cultural definition of when life begins.[109] If a part of the population did not receive formal burial treatment within archaeologically identifiable locations, for instance in settlements or cemeteries, they are probably never found.

There is no easy way to solve these problems, and the information about taphonomic factors are often limited, but by calculating the probability for the effects of different taphonomic disturbances that *can* be accounted for, it could be possible to avoid at least some demographic pitfalls. For example, if the neonates of site A are absent due to a differential burial practices, and the neonates at site B are few owing to the amount of percolating water and acid soil of the burial area, the interpretation could be that site B had a low fertility/neonatal mortality, and site A had none, even if the reverse was true, and the mortality of this age group was substantial at both sites. If the taphonomic factors are allowed for, it could be possible to evaluate, for instance, if it is all sensible to compare the frequency of neonates at different sites, and thus reduce the risk for serious misinterpretations.

There are also other problems connected with negative taphonomic impact. If the presence of pathological conditions usually contribute to a more rapid destruction of the bone, how can we calculate the prevalence of disease? It is obvious that all taphonomic factors should be considered before such examinations are made. Secondly, some knowledge of the clinical picture (i.e. exposure, development and outcome) of the studied disease must be aimed at. It is also crucial that the calculation of prevalence are based on the number of bones that is present, and not on the calculated number of individuals (except in the cases where the whole skeleton becomes involved and complete skeletons are found).[110] From the above-mentioned problems with disease in relation to taphonomic processes, it seems obvious that there is a risk for constant underestimation of disease frequency in all palaeoepidemiological studies.[111] The fact that disease only can be investigated in a sample of dead individuals makes the risk for underestimation even greater.[112]

2.3 QUANTIFICATION

Osteologists working with human remains from periods when single burials are the customary burial practice, seldom have the same problems of quantification as those experi-

108 Saunders 1992, 2f.
109 Saunders 1992, 2. See also 6.3 in this study.
110 Waldron 1994, 52–55.
111 The problem with representativity of skeletal samples in connection with the study of morbidity and mortality is discussed in 4.1 and 4.3.
112 The reverse has also been argued for by Wood *et al*. 1992.

enced by osteologists working with animal bones. The animal bone materials usually consist of several animals from different species that are spread out over an area as the result of butchering and/or food and tool preparation. It is often the relative number of animals from each species and their different frequencies that are of main interests for the analysis. For this reason various methods of quantification have been developed: for example, MNI (minimum number of individuals), PNI (probable number of individuals), TNF (total number of fragments), bone weight or bone volume.[113]

However, when human skeletal remains from graves of what is thought to be single burials are analysed, it is also common to find traces from more than one individual within the context. These individuals are seldom noticed by the archaeologist during excavation since they are often only represented by some small fragments, a single bone or tooth. There are several possibilities that could account for these cases: for instance, disturbed burials, secondary burials, burial of several individuals at the same time, taphonomic processes. But these more isolated finds are usually not handled in any specific way: usually, their presence is noted but no more is done.

In the present case, however, when a stratigraphic material consisting almost entirely of disarticulated and incomplete remains is being investigated, it is absolutely necessary to apply some kind of quantification method. The main difficulty is to decide *which* method is best adapted for the material in question. At present, variants of the MNI method are predominant within the field of human osteology, and I regard it as a suitable method also for the present material.

The basic procedure of in this method is based on the counting of the bones from the most frequent bone element that could be determined to either side (if they are paired). The procedure is perhaps best illustrated by a hypothetical example:

3 upper parts of right femurs
3 complete right femurs
2 lower parts of left femurs
1 complete right tibia
4 lower parts of left tibias

In this sample the MNI = 6

The three upper parts of right femurs are added to the three complete right femurs, giving a total of six individuals. The two lower left parts of left femurs could belong to either of the six individuals represented by the right femurs and thus are not counted as belonging to additional individuals. The complete tibia and the four lower parts of left tibias could likewise belong to the six individuals represented by the femurs: accordingly, none of these bones is counted as belonging to additional individuals

If variables like age, sex, size and idiosyncratic variation are regarded, the result would most likely be a higher MNI. For instance:

3 upper parts of right femurs (newborn)
3 complete right femurs (adults: three males)
2 lower parts of left femurs (adults: male and female)
1 complete right tibia (newborn)
4 lower parts of left tibias (newborn)

In this sample the MNI = 8

When age was considered, at least four newborn individuals were found (represented by the tibias). Since the sex of the adults were accounted for, they could be divided into three males and one female.

This type of MNI count *comes closer* to what can be called the 'probable number of individuals' (PNI), even if I still consider it to be a form of MNI.[114] For the intentions of the present study, it is desirable to identify and distinguish every individual (and preferably also their relations to identified graves). Consequently, I have regarded all the variables (i.e. age, sex, size, idiosyncratic variation) for the MNI count (see chapter 3).

The definition of the archaeological units forming the base for MNI counts is a decisive factor for the results of these quantification calculations. How these units should be defined is a question of 'sample interdependence', i.e. the probability of fragments from one individual to being found in two or more different places. In the analysis of human remains, the chosen units are usually smaller than for animal bones. It is more likely that animal bones are spread out over a larger area as they are often processed in some way and therefore disarticulated. Nevertheless, the size of these units depends in the end on the horizontal as well as the vertical (i.e. chronological) conditions at the site.[115]

2.4 MEASUREMENTS

The majority of the measurable bones belong to very young individuals, and few bones belonging to children older than six months were preserved well enough to be measured. As mentioned earlier, subadult skeletons are poorly mineralized—that is, they contain a larger portion of the organic substance and less of the mineral component—and this promotes a more rapid destruction of these bones.[116] However, the mineral content remains at its lowest during the post-neonatal period and does not reach the same level as in a newborn until the end of the second year. Thereafter the level steadily increases until the adult level is reached. Furthermore, the trabecular bone type is known to decay more rapidly than does the cortical bone, and the long bones of infants contain a lesser portion of trabecular bone than older individuals.[117]

113 Hesse & Wapnish 1985, 109–118. Useful summaries of different quantification methods can also be found in: Chaplin 1971, esp. 53–75; Ringrose 1993, 121–157.
114 The same view is expressed by Hesse & Wapnish 1985, 114.
115 Hesse & Wapnish 1985, 114.
116 Guy, Masset & Baud 1997, 225.
117 Mays 1998, 22.

Table 4. Age estimations from diaphyseal lengths. A comparison between the ages obtained using six different referent studies (lm = lunar months (foetal months), m = months, y = years).

Bone	N	Measure-ment	cm	Fazekas & Kósa	Scheuer *et al.*	Sundick	Johnston	Merchant & Ubelaker	Stloukal & Hanáková
CLAVICLE	1	length	4.5	10 lm	No data	0–6 m	No data	No data	No data
CLAVICLE	2	length	4.6	–	No data	0–6 m	No data	No data	No data
FEMUR	1	length	6.1	8.5 lm	8.4 lm	–	Foetal	–	–
FEMUR	3	length	6.4	9.0 lm	8.7 lm	–	Foetal	0–6 m	–
FEMUR	1	length	6.5	9.0 lm	8.8 lm	–	Foetal	0–6 m	–
FEMUR	1	length	6.8	9.5 lm	9.0 lm	–	Foetal	0–6 m	–
FEMUR	1	length	7	9.5 lm	9.2 lm	–	Foetal	0–6 m	–
FEMUR	5	length	7.1	9.5 lm	9.3 lm	–	0–6 m	0–6 m	–
FEMUR	2	length	7.2	10 lm	9.3 lm	–	0–6 m	0–6 m	–
FEMUR	5	length	7.3	10 lm	9.4 lm	–	0–6 m	0–6 m	–
FEMUR	1	length	7.4	10 lm	9.5 lm	–	0–6 m	0–6 m	–
FEMUR	1	length	7.5	10 lm	9.6 lm	–	0–6 m	0–6 m	0–6 m
FEMUR	4	length	7.6	10 lm	9.7 lm	–	0–6 m	0–6 m	0–6 m
FEMUR	4	length	7.7	10 lm	9.7 lm	0–6 m	0–6 m	0–6 m	0–6 m
FEMUR	1	length	7.8	10 lm	9.8 lm	0–6 m	0–6 m	0–6 m	0–6 m
FEMUR	1	length	8	–	10 lm	0–6 m	0–6 m	0–6 m	0–6 m
FIBULA	1	length	5.2	9.0 lm	No data	–	Foetal	–	–
FIBULA	1	length	5.6	9.5 lm	No data	–	Foetal	–	–
FIBULA	1	length	5.8	9.5 lm	No data	–	0–6 m	–	–
FIBULA	2	length	5.9	9.5 lm	No data	–	0–6 m	–	–
FIBULA	1	length	6	10 lm	No data	–	0–6 m	0–6 m	–
HUMERUS	1	length	5.5	9.0 lm	8.5 lm	0–6 m	Foetal	–	–
HUMERUS	3	length	5.8	9.0 lm	8.8 lm	0–6 m	Foetal	–	–
HUMERUS	4	length	5.9	9.5 lm	8.9 lm	0–6 m	Foetal	–	–
HUMERUS	2	length	6	9.5 lm	9.0 lm	0–6 m	Foetal	–	–
HUMERUS	6	length	6.1	9.5 lm	9.2 lm	0–6 m	Foetal	–	–
HUMERUS	2	length	6.2	9.5 lm	9.3 lm	0–6 m	Foetal	–	–
HUMERUS	1	length	6.3	9.5 lm	9.4 lm	0–6 m	0–6 m	–	–
HUMERUS	1	length	6.4	10 lm	9.5 lm	0–6 m	0–6 m	0–6 m	0–6 m
HUMERUS	2	length	6.5	10 lm	9.6 lm	0–6 m	0–6 m	0–6 m	0–6 m
HUMERUS	1	length	6.7	10 lm	9.8 lm	0–6 m	0–6 m	0–6 m	0–6 m
HUMERUS	2	length	6.8	10 lm	10 lm	0–6 m	0–6 m	0–6 m	0–6 m
HUMERUS	1	length	7.5	–	10.5 lm	0–6 m	0–6 m	0–6 m	0–6 m
HUMERUS	1	length	10.4	–	–	6–15 m	1.5–2.5 y	6–18 m	12–18 m
HUMERUS	1	length	17.0	–	–	5.5–6.5 y	–	4.5–5.5 y	6–7 y
MT I	1	length	1.3	10 lm	No data	0–6 m	No data	No data	No data
MT I	2	length	1.4	10 lm	No data	0–6 m	No data	No data	No data
MT I	1	length	1.9	–	No data	6–15 m	No data	No data	No data
MT I	1	length	2.3	–	No data	15–24 m	No data	No data	No data
MT I	1	length	3.2	–	No data	5.5–6.5 y	No data	No data	No data
RADIUS	2	length	4.6	9.0 lm	8.7 lm	0–6 m	Foetal	–	–
RADIUS	2	length	4.7	9.0 lm	8.8 lm	0–6 m	Foetal	–	–
RADIUS	4	length	4.8	9.5 lm	8.9 lm	0–6 m	Foetal	–	–
RADIUS	1	length	5	9.5 lm	9.2 lm	0–6 m	Foetal	0–6 m	–
RADIUS	1	length	5.2	10 lm	9.5 lm	0–6 m	0–6 m	0–6 m	–
RADIUS	1	length	5.3	10 lm	9.7 lm	0–6 m	0–6 m	0–6 m	–
RADIUS	1	length	5.4	10 lm	9.8 lm	0–6 m	0–6 m	0–6 m	–
RADIUS	1	length	5.5	10 lm	10 lm	0–6 m	0–6 m	0–6 m	–
RADIUS	1	length	5.6	10 lm	10.1 lm	0–6 m	0–6 m	0–6 m	0–6 m
RADIUS	1	length	6.9	–	–	6–15 m	6–18 m	0–6 m	6–12 m
RADIUS	1	length	12.4	–	–	4.5–5.5 y	4.5–5.5 y	4.5–5.5 y	6–7 y
TIBIA	1	length	5.5	9.0 lm	8.7 lm	–	Foetal	–	–
TIBIA	2	length	5.6	9.0 lm	8.8 lm	–	Foetal	–	–
TIBIA	1	length	5.9	9.5 lm	9.1 lm	–	Foetal	–	–
TIBIA	3	length	6	9.5 lm	9.2 lm	–	Foetal	0–6 m	–
TIBIA	3	length	6.1	9.5 lm	9.3 lm	–	Foetal	0–6 m	–
TIBIA	1	length	6.2	9.5 lm	9.4 lm	–	Foetal	0–6 m	–
TIBIA	1	length	6.3	10 lm	9.5 lm	–	0–6 m	0–6 m	–
TIBIA	4	length	6.4	10 lm	9.6 lm	–	0–6 m	0–6 m	–
TIBIA	1	lenght	6.5	10 lm	9.7 lm	–	0–6 m	0–6 m	–
TIBIA	2	lenght	6.6	10 lm	9.8 lm	0–6 m	0–6 m	0–6 m	0–6 m
TIBIA	1	length	6.7	10 lm	9.9 lm	0–6 m	0–6 m	0–6 m	0–6 m
TIBIA	1	length	6.8	10 lm	10 lm	0–6 m	0–6 m	0–6 m	0–6 m
TIBIA	1	length	7	10 lm	10.2 lm	0–6 m	0–6 m	0–6 m	0–6 m
TIBIA	1	length	7.1	10 lm	10.3 lm	0–6 m	0–6 m	0–6 m	0–6 m
TIBIA	1	length	7.3	–	10.5 lm	0–6 m	0–6 m	0–6 m	0–6 m
ULNA	3	length	5.4	9.5 lm	8.8 lm	0–6 m	Foetal	–	–
ULNA	2	length	5.5	9.5 lm	8.9 lm	0–6 m	Foetal	–	–
ULNA	1	length	5.6	9.5 lm	9.1 lm	0–6 m	Foetal	–	–
ULNA	4	length	5.7	9.5 lm	9.2 lm	0–6 m	Foetal	–	–
ULNA	1	length	5.8	10 lm	9.3 lm	0–6 m	Foetal	–	–
ULNA	1	length	5.9	10 lm	9.4 lm	0–6 m	Foetal	–	–
ULNA	2	length	6.2	10 lm	9.8 lm	0–6 m	0–6 m	0–6 m	–
ULNA	1	length	6.7	–	10.5 lm	0–6 m	0–6 m	0–6 m	0–6 m

Accordingly, I find the biological difference between newborn infants and older individuals to be the main cause for the low number of measurable bones from the older children.

Measurements of the subadult bones are important for the estimation of age. The volume by Fazekas & Kósa includes foetal measurements of a large number of different skeletal elements, not only the long bones: therefore, all elements which were possible to measure were considered for the age estimation.[118] Unfortunately few bones were complete enough for this information to be collected. Only *c.* 8% of the 3,017 identified bones/fragments from subadult individuals was sufficiently intact to be measured.

Only the greatest length of the diaphysis was recorded for the long bones. Other measurements on the foetal bones were taken following the directions in Fazekas & Kósa.[119] Since the customary procedure is to record measurements of the bones from the left side, this is also followed here. However, when bones from the left side were missing or damaged, the bones from the right side were measured instead. Only complete bones were used and in the cases where minor erosion occur, these measurements were not used for the estimations of age or growth.

2.5 AGE ESTIMATIONS OF SUBADULTS

Age estimations of subadult individuals are considered more accurate than of adults.[120] The skeleton of young individuals develops rapidly and different changes take place with short intervals in the different bones and teeth, which can be observed on the skeleton.[121] For young children, the most accurate criterion in ageing is the tooth formation which starts during the foetal period. Dental charts give the approximate ages for the various stages in development, and these charts are frequently used by osteologists as a main criterion for age estimation of children.[122] In this study the age estimation from teeth was based on the tooth development presented in the Schour & Massler chart.[123]

For skeletons in which teeth are absent (lost either *ante* or *post mortem*), and when the epiphyseal fusions have not yet started, the development, size and fusion of ossification centres can be used as an indicator of age.[124] Another frequently used method is to measure the different skeletal elements (often the long bones which most accurately correlate with age) without epiphyses, as there is a relationship between age and bone length. Numerous studies have been carried out based on this correlation, on modern as well as archaeological populations.[125] The problem of choosing which study to use in this analysis is the paucity of investigations including data for foetal, newborn and older children. It was thus necessary to use two studies, one for the foetal-newborn and another for newborn-older children.[126] Most of the available material of this type comes from modern Caucasian or prehistoric/historic Native Americans. It can of course be questioned what relationship there is between these populations and the prehistoric Mediterranean population from Asine. In an article about children from the Romano-British site Poundbury Camp, Theya Molleson states the opinion that the biological timing of maturity indicators in the skeleton would have been almost the same as for modern children.[127] She uses the modern data of Fazekas & Kósa to establish state of maturity on her skeletal material, dating from the 1st to the 5th centuries A.D. In her case, the comparisons is perhaps more reasonable since the time period separating the two populations is not as large as the one between the modern reference materials and the Middle Helladic Asine sample, approximately 3800 years. However, human biological evolution is a slow process, and any differences in the skeletal development is not likely to be easily detected in archaeological samples. The comparison between historic and/or modern skeletal samples is one of the most important and frequently used methods for age determinations in archaeological samples. The perhaps more important differences between prehistoric and modern samples are the often unknown environmental and nutritional differences which are known to affect the skeletal development.

I have applied the modern autopsy data given by Fazekas & Kósa for the foetal material and Stloukal & Hanáková's data on the ancient Slavonic populations (9th century A.D.) for the newborn-older children.[128] The Fazekas & Kósa study has the advantage of including both data for the age-related development of cranial and post-cranial bones and correlation between bone length and age on almost all the skeletal bones, not just the extremities. It is also based on a fairly large sample of 138 foetuses ranging from the third to tenth lunar month. The limitation, on the other hand, is that the ages are based on the correlation between body length and age of the foetuses, i.e. not the direct correlation of age and bone length. The mean values are given for each half month interval, although the error margin has been proven to exceed a half lunar month.[129] To check if the results in this study differed from one obtained by a direct regression on bone length, I

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118 Fazekas & Kósa 1978.
119 Fazekas & Kósa 1978, 43–51.
120 Brothwell 1972, 57; Johnston & Zimmer 1989, 14.
121 For a useful summary of the development of the most common bones to consider in age determinations, see Ferembach, Schwidetzky & Stloukal 1980, 517–549, esp. 527–532.
122 Some of the most common are Schour & Massler 1941, 1153–1160; Gustafson & Koch 1974, 297–306; Massler, Schour & Poncher 1941, 33–67; Moorrees, Fanning & Hunt 1963a, 1490–1502; 1963b, 205–213; Ubelaker 1989, 64, fig. 71.
123 For further information about the methods used in the analysis of the teeth, see Soomer, Appendix I.
124 See Scheuer & Black 2000 for an excellent review.
125 For instance, Anderson & Green 1948, 279–290; Fazekas & Kósa 1978; Hoffman 1979, 461–469; Johnston 1962, 249–254; Kósa 1989, 21–53; Maresh 1955, 725–742; Merchant & Ubelaker 1977, 61–72; Scheuer, Musgrave & Evans 1980, 257–265; Stloukal & Hanáková 1978, 53–69; Sundick 1978, 228–232.
126 Presently, there are some studies which incorporate both foetal measurements and data for older ages, but these studies were unfortunately not available to me at the time of examination. For a useful overview on growth studies, their sample size and age range, see Saunders 2000, 150f., table 5.4.
127 Molleson 1989, 27–38, esp. 31.
128 Fazekas & Kósa 1978; Kósa 1989, 21–53; Stloukal & Hanáková 1978, 53–69.
129 Ubelaker 1989, 67.

compared my ages derived from Fazekas & Kósa with the regression equations constructed by Scheuer *et al*. (*Table 4*).[130] As the age differences obtained by the two methods were found to be small and not exceeding approximately half a lunar month, I regarded the Fazekas & Kósa method to be the better one to use in my study. The slightly lower ages derived from the regression equation could possibly be explained by the fact that the material comes from hospital records (radiographs) of sick children. Fazekas & Kósa's skeletons derive from foetuses with at least documented healthy parents, which would indicate that maternal health would not have affected the growth of these foetuses in a negative way.

The age group newborn to older children, as mentioned above, was based on data from an ancient Slavonic population. In connection to the discussion about the importance of a similar environment and genetic background for the reference skeleton and the studied one, I also compared the ages derived from three studies of Native American populations (often used as reference for archaeological populations) with Kósa's and with Stloukal & Hanáková's studies (*Table 4*).[131] The age estimations yielded by the various studies were very similar apart from three long bones that gave a slightly higher age (about six months) using the Stloukal & Hanáková study. Under these circumstances I preferred to use the Slavonic population. The skeletal growth of the Native Americans is proved to be slower than that of the Caucasian individuals.[132] In the final age determination of the subadults, the age criteria are ranked in the following way:

(1) Presence of teeth from which the age can be inferred.
(2) Presence of complete measurable bones that can be correlated with age.
(3) General skeletal development: appearance and union of centres of ossification and epiphyseal fusion can give a rough estimation if the individual is over or under a certain age.
(4) General size of the bones in comparison to reference skeletons.[133]

Criteria three and four are often used to complement each other, and together they give a closer age interval than just one of them alone. For older subadults (>10 years), the fusion of the epiphysis with the diaphyses can sometimes be a useful criterion in estimating age. Yet, most epiphyses do not start to fuse before puberty, and the process takes place at different times in different bones during a quite long time span.[134] One should be aware of the difference between the sexes in the timing of formation and development of the bones. Girls usually are a few years earlier than boys in their skeletal maturation. When such a wide age category as 'subadults' is used though, the difference between the sexes is not evident. The age obtained from the epiphyseal fusion of the different bones just gives an estimation of the individual being over or under a certain age. When this criterion was possible to use, the variation according to sex was always taken into account.

2.6 SEX DETERMINATIONS OF SUBADULTS

Developments in the field of sex determination techniques are extremely important for bioarchaeological studies, since it will have bearing on discussions about the emergence of gender roles, possible differences in health status and feeding practices of girls and boys.

No attempts were, however, made to determine the sex of the subadults in this study mainly because of two reasons. Firstly, at present there are no morphometric standards for determining sex in subadults which are regarded acceptable by most osteologists,[135] and secondly, the Asine material is not suitable for the methods that nevertheless exist because of the largely commingled contexts and the fragmentary nature of the sample (see chapter 3.2–3.5).

Several interesting studies have explored different aspects of sexual dimorphism on the subadult skeleton, to discern metric and morphological criteria that may be used for sex determinations of subadult bones and teeth.[136]

Presently, the chief criticism against these methods is that most of them have not been tested on different large and well documented samples (with known age and sex) and therefore their accuracy is commonly regarded as unsatisfactory.[137] The growth process accounts for a majority of the morphological variability in the subadult skeleton of which sexual dimorphism is only a fairly small part; it is therefore difficult to pinpoint which elements directly reflect sexual dimorphism.[138] Biomolecular techniques for sexing subadults do also exist; these methods, however, have their own problems and it is expensive to have samples tested.[139]

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130 Scheuer, Musgrave & Evans 1980, 257–265.
131 Fazekas & Kósa 1978; Johnston 1962, 249–254; Kósa 1989, 21–53; Merchant & Ubelaker 1977, 61–72; Stloukal & Hanáková 1978, 53–69; Sundick 1978, 228–232.
132 Ubelaker 1989, 69.
133 The reference skeletons used belong to the Department of Anatomy, University of Uppsala.
134 Ubelaker 1989, 69.
135 Buikstra & Ubelaker 1994, 16; Baker, Dupras & Tocheri 2005, 10; Pinhasi *et al*. 2005, 471; Scheuer 2002, 302; cf. Lewis 2007, 48.
136 For example, Cardoso 2008; Loth & Henneberg 2001; Wilson, MacLeod & Humphrey 2008; see also Lewis 2008, 47–55 for an updated review of methods and further references.
137 Humphrey 2000, 196; Scheuer & Black 2000, 15–17.
138 Mays & Cox 2000, 126.
139 Saunders 2000, 141; Brown 2000; Stone 2000.

III THE MNI UNITS

The calculation of Minimum Number of Individuals (MNI) will be described in this chapter. This method attributes the dispersed and fragmented osteological material to its archaeological context, and assigns the bone fragments to different individuals. The procedure is crucial for determining how many individuals comprise the skeletal material, and which individuals may be parts of the published graves from the 1926 excavations.

3.1 DATING

As previously mentioned, the skeletal material analysed here consists mainly of stratified finds, and for this reason the bones could not always be attributed to already dated graves. These circumstances made it necessary to use the dating generated by the potsherds that were found in the same context as the bones.[140] Owing to the nature of the site, there were often intrusive sherds from more than one period in each context. For a majority of the find contexts, only a rough dating of the bulk of the sherds was possible. There were also occasions when the sherds were of such a mixed character that not even a rough dating could be made of the find context. These cases are recorded as 'mix' in the catalogue. The datings, of course, only provide a *terminus post quem* for the bones. Despite this fact, the general datings produced by these sherds seemed to be in accordance with the dating of the published graves in different areas of the site. For instance, the bulk of the graves found in Terrace 3 was published as Middle Helladic (*c*. 2050–1680 B.C.), and the same general dating was usually rendered by the examined sherds. On these grounds, I find it reasonable to assume that when the datings agreed with the site context, they can be used as fairly reliable indications of the current period. It should, of course, be noted that some of the identified individuals could belong to destroyed burials which were earlier or later than the Middle Helladic period, but at present there is no way to deal with this uncertainty. To use the datings derived from the sherds is often the only possibility for the classification and analysis of this type of stratigraphic material. For the cases when the bones could be attributed to graves published in *Asine* I, these datings were, of course, followed.

3.2 ARCHAEOLOGICAL CONTEXT

The next step was to identify on the plan of the site the different locations noted on the bags containing the bones.[141] This was done mainly by using the information found in the field diaries together with the publication and related sources.[142] The level and quality of detail of the information found in the diaries were rather varied, partly owing to the different persons that had written them. Frequently, the locations noted on the bags were not explicitly mentioned in the diaries and therefore it was not always possible to locate the exact find spots. Sometimes only the approximate area could be defined. One of the first trenches to be dug in the area of the Lower Town was the so-called 'Old Trench'. This area covered 144 m^2 and was divided into a grid of 2-m squares (these were later divided into 4 × 4-m squares in the publication).[143] The trench was excavated in artificial layers, approximately 10–20 cm deep. The remaining area of Asine was not excavated with the same technique. When the natural stratification could be determined it was probably preferred, but the trenches were often irregular due to the surroundings, and sometimes artificial layers were used. The depth was frequently measured from the level of the ground surface, but this information was not always included in the description of the location. Even if these differences in method present many problems, it was still possible to obtain much information. For instance, when no depth was given it was sometimes possible to determine that the bones were found in connection with a specified floor level. In such a case, a calculation of the approximate depth in relation to other defined levels could be made.

140 The examination and dating of these sherds were done by Gullög Nordquist. I am very grateful for her patience and kindness in helping me in dating all of the over three hundred boxes of sherds that once also contained many of the bones.

141 This field plan was constructed by the excavators during the course of the excavation, together with more detailed field drawings (stone plans). It served as a model for the plans found in the publication.

142 Angel 1982a; *Asine* I; Diary nos. 3, 4, 5, 7, 8, 9, 15; Fürst 1930; 'Grave Concordance'; 'New Information'; Nordquist & Hägg 1996, 11–18.

143 Nordquist & Hägg 1996, 11–12, fig. 1.

3.3 FORMATION OF MNI UNITS

The bones were packed in more than two hundred bags of different sizes, some of them containing only one bone or just a few bone fragments. The same information that was found on the boxes had been entered on the bags: i.e. inventory number, date, the name of the trench, locations (or coordinates), sometimes also the layer or depth below the surface, occasionally a grave number was registered.

I examined the contents of each bag separately. The bones were cleaned with a brush if necessary, and classified according to bone element and body side. Comparisons were made with the reference collection of the Department of Anatomy, University of Uppsala, in order to facilitate the identification of bone element. Finally measurements were taken. Pathology was noted if present and described. All bones were compared with each other to enable an identification of elements belonging to the same individual on morphological grounds, and fragments that could be joined together were glued. The following variables were then recorded and stored in a database:[144] bone elements, part of bone, number of fragments, side, measurements, age, (sex, in case of adult bones enabling such estimation) and pathology. Complete bones were also measured and recorded in the same way. Finally, I made a preliminary calculation of the MNI from each bag in order to get a rough idea of the size of the material. Since every bone element was registered, even the bags containing only one fragment generated a preliminary MNI number. At a later stage, however, the MNI numbers were often recalculated into larger units. The material consists of 4,583 fragments/complete human bones of which I was able to identify 3,702 fragments/complete bones to skeletal element. Of the identified fragments, 3,017 fragments belong to subadults.[145]

When the archaeological contexts were found to be the same for a number of bags (the original MNI units), these were turned into one final MNI unit. Bags noted as having come from approximately the same location but different layers had not always been separated; where I found it reasonable to assume that bones from the same individual could be mixed up in another layer (for instance, when a single bone or a few fragments are found in a corresponding layer), these locations were treated as one unit. If all the bags (containing just a few fragments) from different layers had been separated, I felt that the risk of overestimating the MNI would be too large.

There are also cases where one bag containing only one or a few bone fragments (mostly deriving from subadults) could not be added to other locations. These cases had to be regarded as final MNI-units on their own. This decision is based on the presumed effects of destructive taphonomic factors that are particularly influential on the skeletons from subadults. It is likely that a large part of the tiny bones from a young individual would have been scattered or destroyed due to prehistoric building activities at the site, missed during excavation or perhaps even partly decayed due to environmental factors. The fact that the number of children from archaeological sites is often underrepresented (see discussions in chapter 2.2), could depend partly on the fact that a few small bones or fragments are rarely considered as evidence for individual/s. In my opinion, to consider also these cases of single bones with a different context as evidence for unique individuals would lead to a correction of the figures to a more appropriate level.

The datings given by the sherds were always taken into consideration, but they were seldom the only decisive factor for the inclusion or exclusion of a particular bag in a MNI unit. For instance, if the context or specific locations of the bags refer to a grave that was identified as being Middle Helladic in the publication, and the information about location seemed to fit with the notes in the diaries, then a possibly divergent dating given by the sherds has been disregarded.

The units from the ‘Old Trench’ have been constructed in a somewhat different way. Since the diaries gave very little information about the finds, I could not evaluate the context and make the divisions that way. Thus I decided to follow the artificial divisions that were used in the excavation.[146]

When the bones and teeth of what is presumed to be a single individual give slightly different age estimations, then the context (i.e. information about location and notes in the diaries) is given first priority. For instance, if the diary notes that two children were found on the current find spot, then the remains are regarded as coming from two individuals of different ages. If nothing is known about the number of individuals, or if the diary only mentions one skeleton, the remains are regarded as two individuals *only* if the mean ages rendered by the bones remain outside the margin of error of the age given by the teeth.[147]

As the creation of final MNI units was made after the basic investigation of the bones, problems could appear on account of the bone size. For example, an MNI unit consists of two bags, each of them containing a complete humerus from different sides, both giving an age of ten lunar months while lengths diverge five mm. In this case the bones were unpacked and examined together in order to determine whether they could belong to the same individual on morphological grounds or not. Random controls of all MNI units were also carried out in the same manner.

The accuracy of the different MNI units varies considerably. Sometimes several graves are equally likely candidates to have housed a specific individual. In these cases the possible graves have all been mentioned in the catalogue. When they are brought into the final analysis and only one of them is chosen, this is motivated in each specific case.

To sum up, the selection of boxes/bags with skeletal ma-

[144] Corel Paradox 8.

[145] Since the intention of the present work is to focus on the remains of subadults, the adult bone material will be presented only in tabular form (Appendix II). Further, the adults will be referred to in the text only where they are considered relevant for the discussion about subadults.

[146] The size of the units in most cases is 8 m^2 (sometimes 4 and 16 m^2) and the depth 10 cm (sometimes 20 cm). The exceptions depend on the information noted on the bags. The bones come from a limited area covering 36 m^2 (i.e., below house D, rooms IX and XX) of the 144-m^2-big trench.

[147] The age estimated from the development of the teeth is considered closest to the chronological age. See discussion in chapter 2.5.

Table 5. The identified graves and the age determination of the skeletal remains belonging to them. (lm = lunar months, m = months, y = years)

Grave number (*Asine* I)	Age	MNI unit	Age according to *Asine* I
MH 14?	5–7 y or (newborn?)	LT 06 (cf. LT 03)	possibly child
MH 19?	4 m or 9–10 lm	E07	fragmentary skeleton
MH 22?	9.5–10 lm	E02	infant
MH 29?	8.5–9.0 lm	W05	man
MH 33?	Infans I	W06	infant/child
MH 35	4 m (± 6 m) and/or 9–10 lm	W03	child
MH 36	9–9.5 lm	W05	child
MH 40	9–9.5 lm	S03	small infant
MH 41	5 m (± 6 m)	S03	child
MH 43	8.5–9 lm	S04	child
MH 44	4 m (± 2 m)	S04	child
MH 45	Infant (*c.* 0–2 m)	S05	child
MH 46	9–9.5 lm	S07	very small infant
MH 48	6 lm (± 2 lm) or 9 lm (± 1 m)	S06	infant
MH 49	6 lm (± 2 lm) or 9 lm (± 1 m)	S06	infant
MH 50	4 y (± 6 m)? or (6–15 m?)	S08	child
MH 56?	*c.* 1–3 y	T4:01	child
MH 60?	adult + 1 Infant and/or 1 Infans II?	T3:15	adult woman
MH 62	39–44 y male, + 10 lm	T3:14	30–40-year-old male
MH 63	5.5 y (± 6 m)	T3:22	child
MH 64	5.5 m (± 6 m) and/or 8.5–10 lm	T3-2:04	infant
MH 65	8.5–10 lm and/or 5.5 m	T3-2:04	infant
MH 66	5 y (± 6 m)	T3:13	child
MH 67	9–10 lm	T3-2:05	infant
MH 70	6 m (± 2 m)	T3:04	very small infant
MH 72?	newborn	T3-2:07	infant (+ two crania)
MH 76	6 m (± 6 m)	T3:05	child
MH 77	9–10 lm	T3:06	child
MH 78?	9.5–10 lm	T3-2:09	skeleton
MH 82?	11 y (± 1 y)	T3:08	8-year-old child
MH 85	9–10 lm	T3:06	child
MH 86	9–10 lm	T3:06	spoiled cranium
MH 87	8 lm (± 2 m)	T3:23	child
MH 88a	newborn	T3-2:12	child
MH 88b	9.5–10 lm	T3-2:03	child
MH 89	8.5–10 lm and/or 5.5 m	T3-2:04	child
MH 98?	adult + 9–9.5 lm and/or 1–2 m and/or 1–5 m and/or 1–3 y	T2:01	woman
MH 101?	9–10 lm ?	T2:09	woman
MH 102	1 y (± 3 m)	T2:09	child
MH 103	9–10 lm	T2:09	infant
Grave 1 (East)	4 m (± 6 m) and/or 9–10 lm and/or 6 lm	E07	–
Grave 2 (East)	4 m (± 6 m) and/or 9–10 lm and/or 6 lm	E07	–
Not published: Grave 96 (terr.III)	9.5 lm and/or Infans I (*c.* 1–2 y)?	T3:21	–
Grave 130?	9 y (± 6 m)	T3:27	–

terial to be analysed together has been based on a careful investigation of several factors, these being, find-location, information given in the field diaries and other related sources and dating as well as the original basic osteological investigation. It is impossible to rank the features with the highest priority in every case since the ranking varies on account of the accessibility of the various factors. However, the ultimate decisions have almost always rested on the context given in the diaries.

This is a very heterogeneous material, where both bones from clearly defined graves and bones found without a grave context coexist. This problem raises the question, of whether or not it is reasonable to use the same method of quantification for both types of finds. In other words, can the bones that are found without a clearly defined context be treated in the same way as the individuals from the identified graves? Perhaps the bones from identified graves should be separated from the other ones? A separation of the two categories would run the risk of overestimating the MNI: the skeletons from a discernible grave context are seldom complete, which makes it possible that the bones without context from a nearby location in fact are parts of the same individual.[148] Thus, this forms a typical case of 'sample interdependence'. It could, however, be argued that the disarticulated bones found in stratigraphic contexts are impossible to use and should not be included at all in an analysis. In my opinion, the most discrete

[148] The main reason for the incompleteness of these skeletons from identified graves is probably the circumstances during excavation. Even if the main parts of the skeleton from a grave were kept together, the diaries indicate that it was quite common that graves were not immediately noticed. Consequently, some bones could have been deposited elsewhere together with finds from another context as sometimes mentioned in the diaries. Furthermore, even after a skeleton had been taken up, a few bones or fragments could have been missed. Since some bones could be attributed only to already published skeletons, this seems to be the most reasonable explanation.

graves (for instance, pit-graves without markers above the ground) are the ones most likely to have been disturbed or destroyed. When these graves (which in most cases belong to subadults) were destroyed due to the building of new houses or the construction of new graves, it is very likely that some bones were left, and it is these bones that now turn up without grave contexts. To exclude them from an investigation that strives for a more thorough understanding of how children were regarded by the society (as well as their living conditions and physiological profile) would undoubtedly lead to very erroneous conclusions. The most favourable circumstance of the material is that these remains have in fact been collected and included among the other finds. It enables interpretations of what ages-groups and how many individuals were treated in this way.

3.4 THE DISTRIBUTION OF INDIVIDUALS IN IDENTIFIED GRAVES

In the list of MH tombs in *Asine* I, 57 (54%) of the 105 published MH graves from the Lower Town were referred to as belonging to infants or children.[149] I have been able to identify individuals from 32 (56%) of these 57 graves.[150] I have also included four graves which were never published in *Asine* I, but which were nevertheless mentioned in the excavation diaries and given a grave number (summarised in *Table 5*).[151] Another eight graves to which I think subadults should be assigned were described in the publication as having contained adults or unspecified skeletal remains.

Some individuals could not be linked to a certain grave and in some cases more than one grave could *equally possibly* have held a certain individual—in these cases all the graves that most likely could come into question are listed, followed by a question mark.[152] When there is uncertainty about the grave attributed to the child/ren, the grave number is followed by a question mark. In several instances it was not possible to assign a specific individual to a specific grave: on these occasions, the age estimations for each of the equally possible individuals are given in the table. Many of these difficulties are due to the fact that the identified individuals never have their skeletons completely preserved—only one reasonably complete post-cranial skeleton was found in the present material, an adult male (MH 62).[153]

There are a few examples where I find it likely that subadults were buried in the same grave as an adult. These children are represented by a few bones only. At the time of excavation, the remains of these subadults were probably never noticed owing to poor preservation. Accordingly, the excavators reported only the adult skeletons which seemed to be the single occupants of the grave (see, for instance, MH 60). In the excavation diary no. 3 of MH 98 and MH 62 the excavators actually mention 'some other bones/animal bones', which may well be the parts of subadult skeletons.[154] The practice of interring children and adults in the same grave seems to have been occurring sporadically during the Middle Helladic period, but not many certain cases from the Argolid are attested in the literature.[155]

3.5 THE DISTRIBUTION OF INDIVIDUALS WITH PRESERVED TEETH

Determining whether a given set of bones and a given set of teeth belong to the same individual constitutes a major problem. Even when the available information about the find spot of the bones refers to a specific grave, remains of more than one individual are frequently found. The only possible approach is to evaluate both the find circumstances and the morphology of the bones in each different case. The approach followed here is to regard bones and teeth as belonging to one individual if the information about the find circumstances found in the diary supports this interpretation and the age determination generated from the bones remains within the error margin of the age determined by the teeth. The individuals with preserved teeth and their correlation to the associated bones in the MNI units are illustrated in *Table 6*. In unit T3:22, seq. no. 10, only the mandibula, maxilla and teeth were found. If the bones from other seq. no. in the same unit were regarded as coming from this individual, the result would be in a close correlation of the age obtained from the two estimation techniques. Age determined from the teeth is 5.5 years (± 6 months) and age from the diaphyseal length 6–8 years according to Stloukal & Hanáková.[156] A strange thing is that the calculation from the bones gives a slightly higher mean age than the teeth. This occurrence is unusual but certainly possible considering the much more variable and ambiguous correlation between chronological age and bone growth. Another example where the bones yield a slightly higher age estimation than the teeth is unit T3:23. In this case too, I find it likely that teeth and bones belong to the same individual.

One purpose of a comparison between age determined from teeth and that from bone is to examine the health status

[149] *Asine* I, 116–128. In several cases the buried individuals are termed only 'skeletal remains' or 'skeleton', and no specification as to approximate age group is given.
[150] It should be noted that the main part of the identified individuals in this material was not possible to assign to any of the published grave.
[151] The unpublished grave 2 is most likely to have held the 4-month-old infant but there is also a possibility that it might have held one of the 6-lunar-month–10-lunar-month-old infants which were identified in this unit.
[152] This applies to the adults and their graves in Appendix II, *Table 10*. In this appendix, there are also occasions when I find one out of several possible graves to be more likely to have contained the individual in question. In this case, it has been indicated by placing the numbers of the less possible graves within parenthesis.
[153] See Appendix II.
[154] In the case of MH 98 there are four infants/Infans I who could come into question if the bones that the diary mention as being 'possibly human' did indeed belong to a human being. Since bones from small infants could be difficult to distinguish from animal bones, I think that one/some of these infants will be the most likely one/s.
[155] Asine: Dietz 1980, 75–77; Nordquist 1987, 99, 105; Lerna: Blackburn 1970, 291.
[156] Stloukal & Hanáková 1978.

Table 6. The individuals with preserved teeth (subadults). Correlation between age determinations from the teeth and age determinations from diaphyseal length or skeletal development
(lm = lunar months, m = months, y = years, length = diaphyseal length).

MNI unit	Grave no.	Seq. no./Inv. no.[a]	Age – teeth[b]	Age – bone[c]	No. indiv.
E02	?	295/2931	2 y (± 6 m)	? [length: 10 lm]	2
E07	grave 2 (or grave 1 or MH 19)	265/?	4 m (± 6 m)	length: 9,5–10 lm	1
E07	grave 1 (or grave 2 or MH 19)	266/2930	6 lm (± 1 m?)	? [length: 9–10 lm?]	2
LT07	?	95/3055	4.5 y (± 6 m)	Infans I–II *c.* 15–24 m	1
LT07	?	98/3076	4.5 y (± 6 m)		
S01	?	211/4258	6 y (± 2 y)	?	1
S03	MH 41	15/3264	5 m (± 6 m)	? [length: 9–9.5 lm]	2
S04	MH 44	256/?	4 m (± 2 m)	length: 9.5–10 lm	1
S06	MH 49 or MH 48	9/5290:2	9 lm (± 1 lm)	length: 9–10 lm	2
S06	MH 49 or MH 48	42/5290:2	6 lm (± 1 m)	<newborn, *c.* 9 lm	
S08	MH 50	258/?	4 y (± 6 m)	? [length: 6–12 m?]	2
T2:09	?	234/2803	10 y (± 6 m)	*c.* five to ten years	1
T2:09	MH 102	267/2878	1 y (± 3 m)	length: 6–15 m	1
T3-2:04	MH 64?	8/2838	5.5 m (± 6 m)	< 9 m	1
T3-2:06	?	264/2860	9 lm (± 6 m)	length: 9.5–10 lm	1
T3:04	MH 70?	261/4692	6 m (± 6 m)	length: 0–6 m	1
T3:05	MH 76	19/2696	6 m (± 6 m)	length: 10 lm	1
T3:08	MH 82?	302/5232b	11 y (± 1 y)	?	1
T3:11	?	293/2244	9 y (± 6 m)	Infans II	1
T3:13	MH 66?	36413	5 y (± 6 m)	*c.* two to three years	1
T3:13	MH 66?	296/2124	5 y (± 6 m)	*c.* two to three years	
T3:22	MH 63	10/1052	5.5 y (± 6 m)	length: 6–8 y	1
T3:23	MH 87	12/4687	8 lm (± 2 m)	length: 9–10 lm	1
T3:27	grave 130?	247/5231	9 y (± 6 m)	Infans II	1
W03	MH 35?	262/3451	4 m (± 6 m)	length: 9–10 lm	1

[a] The combined sequence number and inventory number allows a unique identification for all bags of bones which were entered into the database.
[b] The teeth were analysed by H. Soomer, see Appendix I.
[c] Question mark followed by age estimation within brackets [ ] indicates that this age estimation probably belongs to another individual in the same unit.

of subadults. As a rule, individuals with short bones for their age (as determined by the teeth) are regarded as suffering from a stunted growth.[157] If the individuals in S03 were regarded as one person, this would be an indication of an infant who suffered from such stunted growth. Since the age determined from the bones is within the margin of error of that determined from the teeth, this might well be a plausible situation. However, the information given in the diary (see Catalogue MNI unit S03) makes it more likely that the teeth and bones belong to two different individuals.

There is also a number of cases when the find circum-

[157] Growth is further discussed in 4.2 and 5.1.

stances speak in favour of an interpretation of bones and teeth as belonging to the same individual: units E07, S04, T2:09, T3-2:04, T3:04, T3:05, T3:13, and W03. These individuals were possibly short for their age.

The individuals in LT07 are also regarded as one, possibly a stunted individual. The age from the teeth is determined to 4.5 years and the age determined from the skeleton is estimated to 15–24 months. However, since no long bones were found to be complete, this age estimation rests on an overall skeletal development as well as the measurement of the first metacarpal which makes the age estimation for the bones far from secure. Even if the information in the diary is scarce and the age given by the bones range outside the margin of error for the teeth, I have regarded bones and teeth as belonging to one individual also in this case.[158]

3.6 MNI CATALOGUE[159]

Each MNI unit is demarcated by bold lines and contains the following information:
* **Designation of MNI units** is the abbreviation that refers to the general area from which the bones derive. No particular order exists *within* each group, as the units are listed in the same sequence as they were constructed. The following abbreviations are used:

LT	– Lower Town, Old Trench	T3–2	– Terrace III up to Terrace II
S	– Lower Town South	T4	– Terrace IV
T1	– Terrace I	W	– Lower Town West
T3	– Terrace III	E	– Lower Town East
T2	– Terrace II	LS	– Large Section

Each bag belonging to the unit is placed within a frame and contains the following information:

* **Sequence numbers** are my own and are included here since they serve as a identification number for each bag of bones which are sometimes referred to in the following chapters. These numbers could also be useful for anyone wishing to make a query in the database.[160]

* **Inventory numbers** refer to the numbers that are found on the find-boxes in the Asine collection.

* **Date** is the date of excavation (yy/mm/dd).

* **Location** refers to the description given on the boxes, i.e. names of the trench, grid or other specification, depth below the surface.

* **MNI** the preliminary minimum number of individuals that was calculated for each bag of bones.

* **Dating** the period to which the majority of the sherds belongs. Parentheses refer to the periods that are represented by intrusive sherds.

* **The comments** found below the list of bags are meant to give an explanation as to why the bones should be analysed together and discuss the circumstances for attributing them to a particular grave. I use the same numbering system as the one found in *Asine* I. When another grave number is found on a bag, it is given within parentheses.[161]

* The heading **Parts of** is found below comments. The description summarises which part of the skeleton the fragments and/or complete specimens in the MNI unit derive from. If remains of both subadults and adults are found, these have been separated.

Finally the total **MNI** for the unit is given together with a more detailed specification of age. The **references** given at the end of each unit sometimes include the abbreviation FA or As, these are the numbering systems used by Fürst and Angel respectively, for the skeletons published by them.[162] The other references refer to the excavation diary as well as to other sources used during the formation of MNI units. Angel 1982a is referred to as Angel.

[158] This case should be regarded as particularly tentative and it is possible that the teeth and bones belong to two individuals. Thus, no conclusion about the growth process could be made.
[159] Terms in the MNI-catalogue are not included in the index.
[160] This database contains all the information extracted from the skeletal material by me, and as has been mentioned earlier, I will make it available on a public database or on the Internet.
[161] For cross-references, see ‘Grave Concordance’.
[162] When Angel made a re-examination of the skeletons published by Fürst, he adopted the FA numbers given by him. Angel 1982a; Fürst 1930.

MNI unit E01

Seq. no. 112 **Inv. no.** AS 4338 **Date :** 260316	**Location:** LT, east upper part, "the chest" 50 cm
MNI: 1 adult	Dating: MH

Seq. no. 113 **Inv. no.** AS 4346 **Date :** 260316	**Location:** LT, east upper part, "the chest" 75 cm
MNI: (1 adult), see AS 4338	Dating: EH/MH

These bone fragments (three fragments glued together to one piece of a humerus) cannot be related to any identified grave. No finds of bone were recorded in the diary for this day.

Parts of: Upper extremities.

MNI: 1 adult

References: Diary 4, 16th March 1926.

MNI unit E02

Seq. no. 49 **Inv. no.** AS 3424 **Date :** 260625	**Location:** LT, east extension, c.1 m below wall A's upper level.
MNI: 1 infant	Dating: MH II (EH II, LH?)

Seq. no. 51 **Inv. no.** AS 4153 **Date :** 260625	**Location:** LT, east extension around wall A, c. -175 cm
MNI: 1 infant	Dating: mixed (MH, LH, Hell)

Seq. no. 55 **Inv. no.** AS 3797 **Date :** 260623	**Location:** LT, east extension east of wall C, c. 175 cm
MNI: 1 infant	Dating: MH/LH (SubM/PG)

Seq. no. 86 **Inv. no.** AS 3784 **Date :** 260623	**Location:** LT, east extension around wall A, c. 175 cm
MNI: 1 infant, 1 adult	Dating: MH/LH (Hell, G)

Seq. no. 100 **Inv. no.** AS 3457 **Date :** 260624	**Location:** LT, east extension, around graves 5 and 6
MNI: 1 adult	Dating: MH II

Seq. no. 110 **Inv. no.** AS 4310 **Date :** 260625	**Location:** LT, east extension, -175 cm below wall A
MNI: 1 adult, 1 infant	Dating: EH III/MH (Neol, EH II)

Seq. no. 124 **Inv. no.** AS 3432 **Date :** 260624	**Location:** LT, east extension around graves 5 and 6
MNI: 1 adult	Dating: MH (EH II)

Seq. no. 155 **Inv. no.** AS 4301 **Date :** 260625	**Location:** LT, east extension, 100 cm below the upper level of wall A.
MNI: 1 adult	Dating: MH II-III

Seq. no. 197 **Inv. no.** AS 4278 **Date :** 260622	**Location:** LT, east extension, upper part, c. 100 cm
MNI: 1 adult	Dating: mixed (LH, G, Arch)

MNI unit E02

Seq. no. 295	**Inv. no.** AS 2931	**Date :** 260623	**Location:** LT, east extension c. 175
MNI: 2 infants			Dating: MH

Fragments of the extremities from at least one adult individual are probably part/s of **MH 20** (grave 4), **MH 21** (grave 5), **MH 23** (grave 6) and/or **MH 24** (grave 7). **MH 24** was excavated on 25th June, and it is noted that only parts of a fairly disturbed skeleton were found. **MH 21** and **23** were found and excavated on 24th June, close to **MH 24**. **MH 20** was excavated on 23rd June. The remains of three infants and one infans I cannot be assigned to any identified grave. However, it seems likely that one of these newborn infants belongs to **MH 22** (grave 5), i.e., the infant who was found at the feet of the adult in **MH 21.**

Parts of: Subadult: Skull, teeth, upper and lower extremities, pectoral girdle, thorax, vertebral column. Adult: upper and lower extremities, skull vault and pelvic girdle.

MNI: 1 adult (male?), 3 infants (two newborn, one 9.5-10 lunar months), 1 infans I (2 years +/- 6 months)

References: Angel, 112-127, table 4 (18-20FA); *Asine* I, 117-118; Diary 5, 23rd-26th June 1926; Fürst, 27-30, fig.16, pls. 9-10; 'Grave concordance', 118; 'New information', 22-23, fig. 5.

MNI unit E03

Seq. no. 65	**Inv. no.** AS 4396	**Date :** 260324	**Location:** LT, east, upper part -200
MNI: 1 infant			Dating: MH III

Seq. no. 306	**Inv. no.** AS 3442	**Date :** 260323	**Location:** LT, east, upper part -200
MNI: 1 infant			Dating: MH III

These bones cannot be assigned to any identified grave. No finds of bone are mentioned in the diary apart from some small fragments of burnt (animal?) bones. A collection of burnt clay, clay lining and bricks was found at a depth of about 170-180 cm; these were supposed to be the remains of a hearth. In the soil there was also a thin layer of white ash and charcoal fragments together with the bone fragments. The remains of the infants do not show any traces of burning.

Parts of: Lower extremities.

MNI: 2 infants (both 10 lunar months)

References: Diary 4, 23-24th March 1926.

MNI unit E05

Seq. no. 25	**Inv. no.** AS 3177	**Date :** 260415	**Location:** LT, east II, above the Oval House wall, towards the Large Section
MNI: 1 infant			Dating: MH (LH, G)

These badly preserved remains of an infant could not be attributed to any known grave. The richly furnished child graves **MH 18** and **PG 11** were found the preceding day, 14th April. None of these graves could belong to the present infant: **PG 11** contained an adult and **MH 18** seems to belong to an older child judging from the photograph.

Parts of: Skull, upper and lower extremities.

MNI:1 infant (10 lunar months)

References: *Asine* I, 117, 131, figs. 92, 113; Diary 4, 15th April, 10th May 1926; 'Grave concordance',118-119; ' New information', 22.

MNI unit E07

Seq. no. 265	**Inv. no.** ?	**Date :** 260622	**Location:** LT, east extension, grave 2
MNI: 1 infant (4 months +/- 6 months)			Dating: MH

MNI unit E07

Seq. no. 266 **Inv. no.** AS 2930 **Date :** 260623	**Location:** LT, east [??] grave 1 or on paper around bones: N/a/ LT "Tholos" (?) grav 2 (?).
MNI: 2 infants (9-10 lunar months) 1 fetus 6 lunar months old (+/- 1 month)	Dating: No sherds

The bones from seq. no. 265 (grave 2) could represent one or two individuals: the skeletal remains give an age of 9.5-10 lunar months, i.e., newborn, but the estimation of the teeth indicate an age of 4 months +/- 6 months. Since the age determined from the bones remains within the margin of error of the teeth, I will regard them as belonging to one individual. It should also be noted that the length of both femurs and tibias are within the range of variation for the age newborn - 6 months. The remains in seq. no. 266 (grave 1) could perhaps be mixed with some fragments from the infant in seq. no. 265 since these graves were found (close to each other?) at the same depth, but here are the remains of three infants: the bones represent at least two infants 9-10 lunar months old, but according to the teeth there are also remains of a 6-lunar-month-old fetus. Since the ages indicated by the bones and teeth do not overlap, I regard the remains as coming from three different individuals. At least one of these three infants probably belongs to grave 1 as the location on the box indicates. The diary notes that two graves of children were found on 22nd June (graves 1 and 2). They were not published in *Asine* I. These graves were found at a depth of c.150 cm and were of a simple type without any traces of coffins. One skeleton was covered with some coarse sherds which the excavators could not date: "... the sherds are probably not Hellenistic, possibly Geometric." The skeletons were very fragmentary, and they did not consider it worthwhile drawing them. The next day (23rd June) two more graves were found. Only one of them (**MH 20**) is noted to have belonged to an adult. The other one is noted only as belonging to a "very fragmentary skeleton" (**MH 19**). The sherds in connection to the infants' graves are noted to be very mixed (MH, LH, G and Hell) but **MH 19** and **20** were found in a layer of MH/LH-sherds (these graves seem to have been found in the same shaft and possibly at the same depth(?) as the infants.) Thus, I find it reasonable to attribute these skeletons to the MH period but it should be noted that they may as well be Geometric. To sum up, I regard the three infants as belonging to the unpublished graves 1-2 and **MH 19**. Unfortunately it is impossible to relate the graves to a specific skeleton.

Parts of: Skull, teeth, upper and lower extremities, pectoral girdle, thorax, vertebral column.

MNI: 3 infants (one 4 months +/- 6 months, two 9-10 lunar months), 1 fetus (6 lunar months old +/- 1 month).

References: Angel, 112-127, table 4, (18FA); *Asine* I, 117; Diary 5, 22nd-23rd June 1926; Fürst, 27, pl. 8; 'Grave Concordance', 118; 'New information', 22-23, fig. 5.

MNI unit E09

Seq. no. 17 **Inv. no.** AS 3271 **Date :** 260625	**Location:** LT, east extension between graves 5 and 6, c.50 cm below the level of the graves
MNI: 1 infant	Dating: MH II (EH III?, LH)

Seq. no. 159 **Inv. no.** AS 3271 **Date :** 260625	**Location:** LT, east extension between graves 5 and 6, c.50 cm below the level of the graves
MNI: 1 infant	Dating: MH (EH III?, LH)

It is tempting to see these bones as remains from the infant who was found in **MH 22** (grave 5). This grave was discovered at the foot of **MH 21** (grave 5) which contained an adult male. According to the excavators, "the two tombs need not have any relation with each other." But as the bones obviously were found 50 cm below the level of the graves, this is probably another infant from an undiscovered or destroyed grave (cf. E02).

Parts of: Upper and lower extremities, thorax, vertebral column, pelvic girdle.

MNI: 1 infant (9.5-10 lunar months)

References: Angel, 112-127, table. 4 (19FA); *Asine* I, 117; Diary 5, 24th-25th June 1926; Fürst, 27-30, fig. 16, pls. 9-10; 'Grave Concordance', 118; 'New information', 23, fig. 5.

MNI unit E10

Seq. no. 23 **Inv. no.** AS 3441 **Date :** 260628	**Location:** LT, east extension around the graves 10 and 11
MNI: 1 infant, 1 adult	Dating: MH (EH II)

Seq. no. 40 **Inv. no.** AS 4366 **Date :** 260628	**Location:** LT, east extension lower part, c. 300
MNI: 1 infant, 1 adult	Dating: MH II (LH, G, Hell)

Seq. no. 114 **Inv. no.** AS 2932 **Date :** 260630	**Location:** LT, east extension, c. 300 (N?)
MNI: 1 adult < 21 y	Dating: MH II (EH, G)

Seq. no. 164 **Inv. no.** AS 3407 **Date :** 260628	**Location:** LT, east extension below wall C and around the big vessel
MNI: 1 adult	Dating: MH (EH II, EH III)

Seq. no. 179 **Inv. no.** AS 4304 **Date :** 260626	**Location:** LT, east extension lower part, level of the oval house
MNI: 1 adult	Dating: MH II (EH II, Hell/Rom)

Seq. no. 181 **Inv. no.** AS 3796 **Date :** 260628	**Location:** LT, east extension below wall C (?)
MNI: 1 adult	Dating: MH (EH III?)

The remains of at least one adult can belong to **MH 20, 25, 26** (grave 10), **27** (grave 11) and/or **28,** as the diary gives no information of the specific locations noted on the bags containing the bones. It is possible that these remains should be regarded as two individuals, since one bone fragment seem to have been cremated and could represent a second skeleton. The individuals in **MH 20**, **MH 26-27** have been analysed by Fürst and Angel: they were determined to be adults 25-40 years old. In that case either **MH 25** or **MH 28** contained this individual (< 20 years old since caput femoris had not fused). It is also possible that the individual/s were part of graves that were destroyed and/or not identified. As the various possibilities could not be more than speculations, I have preferred a more strict MNI-count that results in one adult individual. The bones from an infant cannot be related to any identified grave and no finds of child bones were noted in the diary. A possibility is that these bones were mistaken for animal bones that, according to the diary, were found in a small black cup inside the big hydria under **MH 20**. This grave was excavated on 26/6-26.

Parts of: Subadult: Skull, upper and lower extremities. Adult: Upper and lower extremities, vertebral column, pelvic girdle.

MNI: 1 adult (< 20 years), 1 infant (c. 10 lunar months)

References: Angel, 112-127, table 4 (17-18FA, 21FA); *Asine* I, 117-119, figs. 93-94; Diary 5, 25th-30th June 1926; Fürst, 26-27,30-31, fig. 17, pls. 8-9; 'Grave Concordance', 118; 'New information', 22-24, figs. 5-7b.

MNI unit E11

Seq. no. 270 **Inv. no.** AS 5639 **Date :** 260625	**Location:** LT, east extension, grave 8
MNI: 1 adult	Dating: MH/LH

According to the lable these remains from an adult individual should belong to grave 8 (this grave was not published in *Asine* I) that was found on 25th June but excavated on 26th June. However, in the diary it is mentioned that the grave was found empty by the excavators.

Parts of: Lower extremities.

MNI: 1 adult.

References: Diary 5, 25th-26th June 1926.

MNI unit LT01

Seq. no. 45	**Inv. no.** AS 3021A	**Date :** 260317	**Location:** LT: CVI (outside the wall 170-190)
MNI: 1 infans I			Dating: MH (EH, LH)

This diaphysis fragment is not possible to relate to any identified grave or skeleton. No finds of bone are mentioned in the diary from this day.

Parts of: Lower extremities.

MNI: 1 infans I (0-7years)

References: Diary 4, 17th March 1926.

MNI unit LT02

Seq. no. 118	**Inv. no.** AS 3217B	**Date :** 260317	**Location:** LT: EVI 180-200
MNI: 1 adult			Dating: MH (LH)

Seq. no. 191	**Inv. no.** AS 3031	**Date :** 260317	**Location:** LT: DV-EVI 190-200
MNI: 1 infans I, 1 adult			Dating: MH

These bone fragments are not possible to relate to any identified grave or skeleton. No finds of bone are mentioned in the diary from this day.

Parts of: Subadult: Skull. Adult: pectoral girdle.

MNI: 1 infans I (c. 2-3 years), 1 adult (female?)

References: Diary 4, 17th March 1926.

MNI unit LT03

Seq. no. 64	**Inv. no.** AS 3021B	**Date :** 260318	**Location:** LT: CV-VI, DV-VI 230-240
MNI: 1 infant			Dating: MH (EH)

Seq. no. 82	**Inv. no.** AS 3059	**Date :** 260317	**Location:** LT: DVI-DV, CVI-CV 230-240
Mind: 1 infant			Dating: MH (EH II/III)

These bone fragments could not be related to any identified grave or skeleton. There is however a *possibility* that they belong to **MH 14** (see also LT06) as the diary notes (18th March) say "... some bones that could possibly belong to a child skeleton were found in E VI (220-230) on the border to D VI. These bone fragments were so few and decayed that nothing could be known for sure about them. The position of these bones could not be determined." As the bones are referred to as belonging to a child, it is more likely that the individual in LT06 belongs to this grave. Accordingly, these bones could not be assigned to any identified grave.

Parts of: Skull, lower extremities, pectoral girdle.

MNI: 1 infant (newborn)

References: *Asine* I, 116; Diary 4, 17th-18th March 1926; 'Grave concordance', 118.

MNI unit LT04

Seq. no. 192	**Inv. no.** AS 3172	**Date :** 260318	**Location:** LT: DVI, DV, CVI, CV 240-250
MNI: 1 infans I			Dating: EH II/III - MH

These two cranial fragments could not be assigned to any identified graves or skeletons.

Parts of: Skull.

MNI unit LT04

MNI: 1 infans I (c. 1-2 years).

References: Diary 4, 18th March 1926.

MNI unit LT05

Seq. no. 27	**Inv. no.** AS 3032	**Date :** 260317	**Location:** LT: EV, EVI 200-210
MNI: 2 infants, 1 infans I			Dating: MH (LH)

Seq. no. 63	**Inv. no.** AS 3371	**Date :** 260410	**Location:** LT: EV, EVI 200-210
MNI: 1 infant			Dating: MH (EH II/III)

Seq. no. 72	**Inv. no.** AS 2537	**Date :** 260317	**Location:** LT: EV, VI 200-210
MNI: 1 infant			Dating: MH (EH, LH, G)

Seq. no. 171	**Inv. no.** AS 3187	**Date :** 260318	**Location:** LT: EVI, EV 210-220
MNI: 3 indet. fragments			Dating: MH (EH, LH)

These bones could not be assigned to any known graves or skeletons. The diary from 10th April (see also 8th April) mentions a skeleton (from an adult?) that could not be dated. However, a Geometric bowl was found in connection with the pelvis, and a polished and pierced tooth from a boar (of the type found in Mycenaean helmets) was found under the skeleton's head. In connection to the above-stated locations the diary from 17th March remarks that "... the soil was almost empty of sherds and also very rich in clay." Could this perhaps be remains from a "brick cist" (i.e., cist with walls of clay/weakly fired clay)?

Parts of: Skull, upper and lower extremities, thorax, vertebral column.

MNI: 2 infants (9-10 lunar months), 1 infans I (4-5 years old)

References: Diary 4, 17th-18th March, 10th April 1926.

MNI unit LT06

Seq. no. 91	**Inv. no.** AS 3056	**Date :** 260318	**Location:** LT: EVI, EV 230-240
MNI: 1 infans I			Dating: MH

Seq. no. 152	**Inv. no.** AS 3181	**Date :** 260318	**Location:** LT: EVI - EV 230-240
MNI: 1 adult			Dating: MH

Seq. no. 221	**Inv. no.** AS 2538	**Date :** 260322	**Location:** LT: EV, EVI 230-240
MNI: 1 infans I			Dating: MH (EH II/III)

According to the diary from 18th March, some bone fragments that possibly could belong to child skeleton **MH 14** were found. These fragments were few and badly preserved and not much could be known about them (see LT03). Another skeleton (adult?) was found in a stone enclosure. The excavators found traces of charcoal and very clayey soil everywhere in this area. No information about excavations in the above mentioned locations could be found in the diary from the 22nd of March. The notes from the 19th of March mention a small stone enclosure resembling a cist grave (240-250 cm below ground) but it was found to be empty. However, the bones from a child probably belong to **MH 14**.

Parts of: Subadult: Skull, upper extremities, thorax. Adult: Lower extremities.

MNI: 1 infans I (c. 5-7 years), 1 adult

References: Diary 4, 18th-19th March 1926.

MNI unit LT07

Seq. no. 90	**Inv. no.** AS 2524	**Date :** 260519	**Location:** LT: EV-EVI 250-260
MNI: 1 infans I/II			Dating: MH (EH, LH)
Seq. no. 95	**Inv. no.** AS 3055	**Date :** 260318	**Location:** LT: EV, EVI 250-260
MNI: 1 infans I			Dating: MH (EH, LH)
Seq. no. 98	**Inv. no.** AS 3076	**Date :** 260519	**Location:** LT: EV, EVI 250-260 (UPL)
MNI: 1 infans II			Dating: MH (EH, LH, G, Class)
Seq. no. 225	**Inv. no.** AS 3065	**Date :** 260509	**Location:** LT: EV-VI 250-260
MNI: 1 infans I			Dating: MH (EH)

No published grave could be attributed to this individual. The diary from 18th March mentions a much destroyed skeleton that was found on the border of square DVI, lying partly in the trench wall. It could possibly be the child found in the above-mentioned locations. Unfortunately no remarks about grave type or number are available in the diary, nor is there any information about the excavation of this area from the 9th and 19th of May. The notes from the 19th of March mention a small stone enclosure resembling a cist grave (240-250 cm below ground) but it was found to be empty.

Parts of: Skull, teeth, lower extremities, pelvic girdle.

MNI: 1 infans I (4.5 years +/-6 months)

References: Diary 4, 18th-19th March 1926.

MNI unit LT08

Seq. no. 167	**Inv. no.** AS 3473	**Date :** 260319	**Location:** LT: EV-EVI 260-270
MNI: 1 adult			Dating: MH (EH II/III)
Seq. no. 170	**Inv. no.** AS 3189	**Date :** 260319	**Location:** LT: EV-EVI 270-280
MNI: 1 adult			Dating: MH (EH, LH)

These bone fragments could not be related to any identified grave. No annotations about bone are found in the diary.

Parts of: Lower extremities.

MNI: 1 adult

References: Diary 4, 19th March 1926.

MNI unit LT10

Seq. no. 28	**Inv. no.** AS 3171	**Date :** 260317	**Location:** LT: FIV-VI 200-210
MNI: 2 infants			Dating: MH (EH, LH, G)
Seq. no. 84	**Inv. no.** AS 3241	**Date :** 260319	**Location:** LT: FV -210, cleaning
MNI: 1 infant			Dating: MH (EH III, LH)

These individuals could not be attributed to any identified grave.

Parts of: Skull, upper and lower extremities, pelvic girdle.

MNI: 2 infants (9.5-10 lunar months)

References: Diary 4, 17th and 19th March 1926.

MNI unit LT11

Seq. no. 24	**Inv. no.** AS 3217A	**Date :** 260317	**Location:** LT: FIV- FVI 210-220
MNI: 1 infant, 1 adult			Dating: MH (LH, G)

Seq. no. 222	**Inv. no.** AS 3057	**Date :** 260318	**Location:** LT: FIV- FV-FVI 210-220
MNI: 1 adult, 2 infants			Dating: MH (EH, LH)

These bones could not be assigned to any known grave or individual.

Parts of: Subadult: upper and lower extremities, pectoral girdle. Adult: Upper and lower extremities, thorax, pectoral girdle, vertebral column.

MNI: 2 infants (9-10 lunar months), 1 adult

References: Diary 4, 17th-18th March 1926.

MNI unit LT12

Seq. no. 7	**Inv. no.** AS 3048	**Date :** 260318	**Location:** LT: FIV-FVI 220-230
MNI: 1 adult, 1 infant			Dating: MH (EH)

These bones could not be attributed to any known grave or individual.

Parts of: Subadult: Skull, lower extremities. Adult: Upper and lower extremities, thorax, pectoral girdle.

MNI: 1 infant (10 lunar months), 1 adult

References: Diary 4, 18th March 1926.

MNI unit LT13

Seq. no. 87	**Inv. no.** AS 3027	**Date :** 260317	**Location:** LT: FIV, FV, FVI 230-240
MNI: 1 infant, 1 infans I, 1 adult			Dating: MH (EH)

Seq. no. 131	**Inv. no.** AS 3026	**Date :** 260318	**Location:** LT: FIV-FV 230-240
MNI: 1 adult, 1 infans I			Dating: MH (EH)

Seq. no. 133	**Inv. no.** AS 3077	**Date :** 260317	**Location:** LT: FVI, V, IV 230-240
MNI: 1 infans I (c. 2-3 years), 1 adult			Dating: MH (EH)

These bones could not be attributed to any known grave or skeleton.

Parts of: Subadult: Skull, upper and lower extremities, pelvic girdle. Adult: Skull, thorax, vertebral column, lower extremities.

MNI: 1 infant (newborn), 1 infans I (c. 1-3 years), 1 adult.

References: Diary 4, 17th-18th March 1926.

MNI unit LT14

Seq. no. 99	**Inv. no.** AS 3235	**Date :** 260318	**Location:** LT: FV-FVI 240-250
MNI: 1 adult female? (20 +/- 2 years), 1 infans I (1-4 years)			Dating: EH/MH

Seq. no. 128	**Inv. no.** AS 3036	**Date :** 260318	**Location:** LT: FV-FVI 240-250
MNI: 1 adult			Dating: EH/MH (G)

MNI unit LT14

Seq. no. 130	**Inv. no.** AS 4180	**Date :** 260319	**Location:** LT: FV-VI 240-250
MNI: 1 adult, 1 infant			Dating: EH/MH
Seq. no. 135	**Inv. no.** AS 3533	**Date :** 260319	**Location:** LT: FV, FVI 240-250
MNI: 1 adult			Dating: EH/MH
Seq. no. 215	**Inv. no.** AS 3235	**Date :** 260318	**Location:** LT: FV-FVI 240-250
MNI: 1 infans I			Dating: EH/MH
Seq. no. 223	**Inv. no.** AS 3469	**Date :** 260319	**Location:** LT: FV 250-270
MNI: 1 adult			Dating: EH/MH (Hell)
Seq. no. 224	**Inv. no.** AS 2536	**Date :** 260319	**Location:** LT: FV, FVI 240-250
MNI: 1 adult, 1 infans I			Dating: EH/MH (G)
Seq. no. 226	**Inv. no.** AS 3389	**Date :** 260318	**Location:** LT: FV-VI 240-250
MNI: 1 infans I, 1 adult			Dating: EH/MH
Seq. no. 227	**Inv. no.** AS 3186	**Date :** 260319	**Location:** LT: FV-VI 240-250
MNI: 2 adults			Dating: MH

The remains from one adult individual should probably belong to **MH 15** that was found on this day. The diary states, "FV, FVI 240-250 were sieved. EV, EVI 250-260 together with the cleaning of the wall. A skeleton was found in the trench wall in FV. The skull was crushed by the pick and the remaining bones were situated in the trench wall, they were very damaged and the outline of the skeleton could not be followed. It is presumed that the skeleton lies longitudinally in the shaft." The remaining individuals could not be attributed to any known graves or skeletons.

Parts of: Subadult: Skull, upper and lower extremities, thorax, vertebral column, pelvic girdle. Adult: Skull, teeth, upper and lower extremities, pectoral girdle, thorax, vertebral column, pelvic girdle.

MNI: 1 infant (newborn), 1 infans I (c. 1-4 years), 2 adults (one female? 20 years +/- 2 years)

References: Diary 4, 18th-19th March 1926.

MNI unit S01

Seq. no. 38	**Inv. no.** AS 4298	**Date :** 260401	**Location:** LT, south -150 cm
MNI: 1 infant			Dating: MH II (EH)
Seq. no. 69	**Inv. no.** AS 4300	**Date :** 260401	**Location:** LT, south -150 cm
MNI: 1 infant			Dating: MH II (LH)
Seq. no. 102	**Inv. no.** AS 3336	**Date :** 260329	**Location:** LT, south in the road
MNI: 1 adult			Dating: MH (LH, G, Hell)
Seq. no. 119	**Inv. no.** AS 4380	**Date :** 260329	**Location:** LT, south -15 cm
MNI: 1 adult			Dating: MH (Hell)
Seq. no. 132	**Inv. no.** AS 3104	**Date :** 260329	**Location:** LT, south surface layer
MNI: 1 adult, 1 infant			Dating: MH

MNI unit **S01**

Seq. no. 134	**Inv. no.** AS 3786	**Date :** 260329	**Location:** LT, south c. 100 cm
MNI: 1 adult			Dating: MH
Seq. no. 154	**Inv. no.** AS 3337	**Date :** 2603??	**Location:** LT, south upper part, -50 cm
MNI: 1 adult			Dating: MH/LH (G, Hell)
Seq. no. 165	**Inv. no.** AS 3398	**Date :** 260326	**Location:** LT, south cleaning and surface layer
MNI: 1 adult			Dating: mix
Seq. no. 211	**Inv. no.** AS 4258	**Date :** 260330	**Location:** LT, south -100 cm
MNI: 1 infant I/II			Dating: MH II (EH?, MH, LH, G)
Seq. no. 241	**Inv. no.** AS 3278	**Date :** 260331	**Location:** LT, south, lower part - 50 cm
MNI: 1 infant			Dating: mix (MH/LH, G, Hell)
Seq. no. 301	**Inv. no.** AS 4335	**Date :** 260330	**Location:** LT, south -100 cm
MNI: 1 infant			Dating: MH II-III (LH, R)

The bones from one adult individual are probably remains from **MH 38** which was found 29th March and excavated the following day. According to the diary, the skeleton was found in a very strange, contracted position. The preserved leg was drawn up towards the face "20 cm from the nose". The remains from two more individuals, a newborn infant and a child, could not be assigned to any identified graves.

Parts of: Subadult: Skull, teeth, upper and lower extremities. Adult: Skull, upper and lower extremities, thorax, vertebral column, pectoral girdle.

MNI: 1 adult, 1 infant (newborn), 1 infans I/II (6 years +-2 years)

References: *Asine* I,120f., fig. 98; Diary 4, 26th March -1st April 1926; 'Grave concordance', 118; 'New information', 27, fig.10

MNI unit **S03**

Seq. no. 15	**Inv. no.** AS 3264	**Date :** 260420	**Location:** LT, south II B, -75 cm
MNI: 2 infants			Dating: mixed (MH/LH, G, Hell)
Seq. no. 57	**Inv. no.** AS 3265	**Date :** 260421	**Location:** LT, south II B, lower part
MNI: 1 infant			Dating: mixed (MH/LH, G, Hell)
Seq. no. 129	**Inv. no.** AS 3545	**Date :** 260420	**Location:** LT, south II C, -75 cm
MNI: 1 adult			Dating: MH/LH (EH II/III)
Seq. no. 161	**Inv. no.** AS 4265	**Date :** 260420	**Location:** LT, south II B, lower part, -75
MNI: 1 adult			Dating: mixed (EH?, MH, LH, G, Arch?)

Remains from a fetus and an infant (represented by two teeth) probably belong to **MH 40** and **MH 41**. Both graves were found quite close to each other at the same depth on the same day (20th April). **MH 40** contained a "very small infant" and **MH 41** held a "child skeleton". The fragments of an adult individual could not be assigned to any identified grave.

Parts of: Subadult: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle. Adult: Upper extremities.

MNI: 2 infants (9-9.5 lunar months and 5 months +/- 6 months), 1 adult

MNI unit S03

References: *Asine* I,121; Diary 9, 20th April 1926; 'Grave concordance', 118; Nordquist 1987,130.

MNI unit S04

Seq. no. 67	**Inv. no.** AS 3101	**Date :** 260421	**Location:** LT, south II A, south of ashlar wall, 25 cm
MNI: 1 infant			Dating: MH (LH)

Seq. no. 256	**Inv. no.** ?	**Date :** 260421	**Location:** LT, south II B, grave 5
MNI: 1 infant, 1 adult			Dating: LH

Seq. no. 257	**Inv. no.** ?	**Date :** 260421	**Location:** LT, south II B, child skeleton no. 4
MNI: 1 infant			Dating: MH

Here are the remains of two infants: one should probably belong to **MH 43** (child skeleton no. 4 = grave 4) and the other infant (teeth and bones give different age estimations, i.e., 4 months +/- 2 months and 9.5-10 lunar months) were found in seq. no. 256 (= grave 5). The publication mentions only one individual ("child") in **MH 44** (grave 5). Both graves were found and excavated 21st April. On the same day **MH 42** was found, so there is a possibility that some fragments from this skeleton could be mixed up here. Immediately above **MH 43** was found a floor of clay and sherds. Not far from the skeleton in **MH 44** the excavators found a pierced bone splinter, but no burial gifts are mentioned in the publication.The diary mentions that the infant in **MH 44** has an open fontanelle but does not specify *which* fontanelle is meant; this makes any statement about the age from this criterion impossible. The fragment of an adult individual cannot be attributed to any identified grave.

Parts of: Subadult: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle. Adult: Upper extremities.

MNI: 2 infants (8.5-9 lunar months, 4 months +/- 2 months), 1 adult

References: *Asine* I,121; Diary 9, 21st April 1926; 'Grave Concordance', 118; 'New information', 27.

MNI unit S05

Seq. no. 48	**Inv. no.** AS 3377	**Date :** 260424	**Location:** LT, south II,3 vessel in bothros/grave
MNI: 1 infant			Dating: MH

These fragments are probably remains of the infant found in a pithos from the bothros excavated 24th April.This grave is probably **MH 45**.

Parts of: Skull, upper and lower extremities, vertebral column.

MNI: 1 infant (0-2 months)

References: *Asine* I, 121, fig. 99; Diary 9, 24th - 27th April 1926; 'Grave Concordance', 118; 'New information', 27, fig. 10.

MNI unit S06

Seq. no. 9	**Inv. no.** AS 5290:2	**Date :** 260427	**Location:** LT, south II A, child skeleton no. 11
MNI: 2 infants			Dating: Missing box

Seq. no. 42	**Inv. no.** AS 5290:2	**Date :**	**Location:** LT, south II A 2, jaw section child skeleton no.11?
MNI: 2 fetuses/infants			Dating: Missing box

MNI unit **S06**

Seq. no. 46	**Inv. no.** AS 3375	**Date :** 260427	**Location:** LT, south II A -150
MNI: 1 infant			Dating: MH (LH)

Seq. no. 122	**Inv. no.** AS 3496	**Date :** 260427	**Location:** LT, south II A -150
MNI: 1 adult, 1 infant			Dating: MH (LH, G)

Seq. no. 147	**Inv. no.** AS 4202	**Date :** 260427	**Location:** LT, south II B "bathtub"
MNI: 1 adult			Dating: MH/LH (PG, Hell)

Seq. no. 195	**Inv. no.** AS 3363	**Date :** 260427	**Location:** LT, south II A -150
MNI: 1 adult			Dating: MH

Seq. no. 205	**Inv. no.** AS 4269	**Date :** 260427	**Location:** LT, south II A "street of oval house" -150 cm
MNI: 1 adult			Dating: MH (EH, G)

Two subadults should probably belong to **MH 48** (grave 10) and **MH 49** (child skeleton no. 11 = grave 11) which were situated very close to each other, and were also excavated on the same day. According to the diary, some MH sherds (one matt-painted and one red coarse sherd) were found immediately under the head of the fetus/infant in **MH 49**, but the publication states that no burial gifts were found. The fragments of an adult individual probably belong to **MH 47** which was found on the 27th April in connection with the cleaning of the walls in A. The diary note:"... a skeleton was found, ... the head was probably oriented to the north. The only thing that could be discerned from the fragments is that the skeleton was placed in hocker position. Only a lower leg and the feet were left when I arrived."

Parts of: Subadult: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle. Adult: Skull, upper and lower extremities, pectoral girdle, pelvic girdle.

MNI: 2 fetuses (9 lunar months +/-1 lunar month, 6 lunar months +/- 2 lunar months), 1 adult

<u>References</u>: *Asine* I, 121; Diary 9, 27th April 1926; 'Grave Concordance', 118.

MNI unit **S07**

Seq. no. 259	**Inv. no.** ?	**Date :** 260428	**Location:** LT, south II B, child skeleton no. 7
MNI: 1 infant			Dating: No sherds

These fragments belong to the infant in **MH 46** (child skeleton no.7 = grave 7). The diary reports that the length of the skeleton was 28 cm. This length would correspond to an approximate age of 5.5-6 lunar months (Kosa 1989). As the skeleton was slightly contracted, it is most likely that the measurement is too low. The age estimates from the measured bones give an age of 9-9.5 lunar months that is probably more accurate.

Parts of: Skull, upper and lower extremities, thorax.

MNI: 1 infant (9-9.5 lunar months)

<u>References</u>: *Asine* I, 121; Diary 9, 28th April 1926; 'Grave Concordance', 118.

MNI unit S08

Seq. no. 258 **Inv. no.** ? **Date :** 260429	**Location:** LT, south II B, child skeleton no. 12
MNI: 2 infans I	Dating: No sherds

The fragments of one infant probably belong to **MH 50** (child skeleton no.12 = grave12). According to the diary the orientation could not be determined as it seems likely the original position of the bones had been altered. There are some problems with the interpretation related to the age determination of this individual: the teeth yield a much higher age than the long bones. This means that these remains could represent either two individuals, or one that suffered from serious malnutrition or disease. As the age determined from the bones does not fall within the margin of error of the age determination from the teeth, I regard the remains as coming from two individuals. Since the diary notes, "This skeleton belongs to a somewhat older child (compared to MH 46)" and the publication refers to a "child", I have attributed the older individual to this grave. The other infant could not be attributed to any identified grave.

Parts of: Skull, teeth, upper and lower extremities, thorax.

MNI: 2 infans I (4 years +/- 6 months and 6-12 months)

References: *Asine* I, 121-122, fig.100; Diary 9, 27th-29th April 1926; 'Grave concordance', 118; 'New information', 27.

MNI unit S09

Seq. no. 83 **Inv. no.** AS 4270 **Date :** 260424	**Location:** LT, south II A, cleaning around and under walls?
MNI: 1 adult	Dating: MH/LH (EH II, Hell)

Seq. no. 123 **Inv. no.** AS 3379 **Date :** 260424	**Location:** LT, south II B - 100 lower part
MNI: 1 adult	Dating: MH/LH

These remains could not be assigned to any identified individual or skeleton.

Parts of: Upper extremities.

MNI: 1 adult

References: Diary 9, 24th April 1926.

MNI unit S10

Seq. no. 145 **Inv. no.** AS 5398a **Date :** 260429	**Location:** LT, south II B, bones from double grave
MNI: 1 adult	Dating: MH

The fragments from at least one adult individual are probably a part of the skeletons (a man and a woman) in the double grave **MH 52/53**. No sex determination was possible on these few remains.

Parts of: Skull, pelvic girdle.

MNI: 1 adult

References: Angel, 112-127, table 4 (14-15FA); *Asine* I, 121-122, fig.100; Diary 9, 29th April-7th May 1926; 'Grave concordance', 118; 'New information', 27.

MNI unit T1:01

Seq. no. 108 **Inv. no.** AS 5087 **Date :** 260319	**Location:** LS, terr. I, lower part
MNI: 1 adult	Dating: EH II (EH III)
(some fragments join to AS 5213)	

MNI unit T1:01

Seq. no. 109 **Inv. no.** AS 5213	**Date :** 260319	**Location:** LS, terr. I, lower part	
MNI: 1 adult, 1 infans I		Dating: EH II (MH)	

Seq. no. 214 **Inv. no.** AS 5146	**Date :** 260317	**Location:** LS, terr. I, lower part
MNI: 1 adult		Dating: MH (LH, Hell.)

Seq. no. 233 **Inv. no.** AS 5141	**Date :** 260318	**Location:** LS, terr. I, lower part
MNI: 1 adult		Dating: EH II, MH I-II

These bones could not be assigned to any identified skeleton/grave. No information about the excavations on terrace I during the 1926 season could be found in the diaries. This terrace seems to have been investigated during the 1922 season but the information is scanty and no graves or bones are mentioned.

Parts of: Subadult: Upper extremities, thorax, pectoral girdle, pelvic girdle. Adult: Upper and lower extremities, thorax, vertebral column, pelvic girdle.

MNI: 1 infans I (12-18 months), 1 adult

MNI unit T2:01

Seq. no. 229 **Inv. no.** AS 2242	**Date :** 260422	**Location:** LS, terr. II, below wall 4
MNI: 1 adult (40 +/- 5 years)		Dating: MH (EH II, LH, Hell?)

Seq. no. 235 **Inv. no.** AS 2270	**Date :** 260326	**Location:** LS, terr. II, layer 8, above the middle wall
MNI: 1 adult, 1 infant		Dating: EH III/MH (EH II, LH)

Seq. no. 236 **Inv. no.** AS 2149	**Date :** 260327	**Location:** LS, terr. II, cleaning around the middle wall
MNI: 1 infans I, 2 infants		Dating: MH (LH, G)

Seq. no. 237 **Inv. no.** AS 2198	**Date :** 260316	**Location:** LS, terr. II, layer 5, above the middle wall
MNI: 1 infant, 1 adult		Dating: MH (EH III)

Seq. no. 238 **Inv. no.** AS 2282	**Date :** 260326	**Location:** LS, terr. II, layer 8, above the middle wall
MNI: 1 adult		Dating: EH III/MH

Seq. no. 240 **Inv. no.** AS 5086	**Date :** 260326	**Location:** LS, terr. II, layer 7, above the middle wall
MNI: 1 adult		Dating: MH

Seq. no. 249 **Inv. no.** AS 5066	**Date :** 260316	**Location:** LS, terr. II, layer 6, above the middle wall
MNI: 1 adult		Dating: MH (LH)

Seq. no. 250 **Inv. no.** AS 2144	**Date :** 260422	**Location:** LS, terr. II, below wall 4
MNI: 1 infant, 1 infans I, 1 adult		Dating: MH (EH II?)

MNI unit **T2:01**

Seq. no. 275 **Inv. no.** AS 2275 **Date :** 260424	**Location:** LS, terr. II, grave 8
MNI: 1 adult	Dating: EH III/MH

The fragments from at least one adult individual in seq. nos. 235-238 could belong to **MH 96, MH 97**or **MH 98**. All of these graves contained an adult and it is possible that the fragments belong to more than one grave. The information in the diary is relevant for the context of the bones: 22nd April, "**MH 96** (grave 6) that contained a pelvis, a lower leg, a hand and a piece of the spine, was taken up/collected. To be able to reach **MH 98** (grave 8) the so-called wall 4 ... was removed. The box was marked 'Below wall 4' but it contained some more. Some bones that could possibly belong to **MH 96** (grave 6) were found. A large piece of obsidian and a big pierced stone that I believe is a club, but the boss says it is a sinker for a net. MH. 'Neck Kamares'." 24th April: "**MH 98** was excavated. It contained a female in hocker position, a bronze earring, MH and EH sherds. She holds a jug in her hands and nearby there were three bones (one probably from an animal, two possibly human), they lay on top of each other with a few centimetre spaces between (these bones were placed in a special packet. A drawing was made but they were not photographed)." The remains from an adult in seq. no. 275 probably belong to **MH 98** (grave 8). There are also remains of four children of different ages. I find it possible that at least some of these bones belong to **MH 98** that contained a woman and *two bones that were "possibly human"* - perhaps the children were buried together with the woman but the main part of their skeletons disintegrated. It is impossible to know which of the children that could come into question. The bones from at least one adult individual in seq. nos. 229 and 250 most probably belong to **MH 96** (grave 6). **MH 98** is reported by Angel to have contained a young woman c. 18 years old and the information about the different locations seems to indicate that the remains from both grave **MH 96** and MH **98** are present here. I have decided to regard the 40-year-old individual as probably belonging to grave MH **96** as this seems most likely.

Parts of: Subadult: Upper and lower extremities. Adult: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 2 adults (one 40 +/- 5 years), 3 infants (9-9.5 lunar months, c. 1-2 months, c. 1-5 months), 1 infans I (c. 1-3 years).

References: Angel, 112-127, table 4 (1-2 FA); *Asine* I, 126-127, 139, fig. 106; Diary 3, 16th-27th March, 22nd-24th April 1926; Fürst, 12-16, fig. 9, pls. 1-2; 'Grave Concordance', 118; 'New information', 34-35, 37, figs. 21-22a.

MNI unit **T2:06**

Seq. no. 6 **Inv. no.** AS 2289 **Date :** 260517	**Location:** LS, terr. II, above bothros 1, no. 4
MNI: 1 infant	Dating: MH (G?)

Seq. no. 26 **Inv. no.** AS 5208 **Date :** 260517	**Location:** LS, terr. II, above ?
MNI: 1 infant, 1 infans I	Dating: MH (EH II, LH)

Seq. no. 94 **Inv. no.** AS 2364 **Date :** 260518	**Location:** LS, terr. II, above bothros 1, no. 6
MNI: 1 infans I	Dating: MH (EH)

Seq. no. 153 **Inv. no.** AS 2363 **Date :** 260518	**Location:** LS, terr. II, above bothros ..., no. 6
MNI: 1 infans I	Dating: MH (G)

Seq. no. 220 **Inv. no.** AS 5214 **Date :** 260517	**Location:** LS, terr. II above bothros, no. 5
MNI: 1 infant	Dating: MH II

These bones cannot be attributed to any identified graves. In the diary a note is made about "bones" in the location "Above bothros 1, no. 5". No notes could be found from 18th May.

Parts of: Skull, upper and lower extremities.

MNI: 1 infant (9.5-10 lunar months), 1 infans I (1-4 years).

References: Diary 3, 17th May 1926.

MNI unit T2:07

Seq. no. 232 **Inv. no.** AS 2203 **Date :** 260514	**Location:** LS, terr. II, around grave 7
MNI: 1 adult	Dating: mixed

Seq. no. 239 **Inv. no.** AS 2265 **Date :** 260514	**Location:** LS, terr. II, above grave 11
MNI: 1 adult	Dating: MH III/LH (EH?, Hell)

These bones can probably be assigned to either **MH 97** (grave 7) or **MH 101** (grave 11). They were found close to one another and were also excavated on the same day. According to Angel and Fürst, **MH 97** contained a man and **MH 101,** a woman. No sex determination of these fragments was possible.

Parts of: Skull, upper and lower extremities.

MNI: 1 adult

References: Angel, 112-127, table 4 (1FA, 5FA); *Asine* I, 126-127, figs.105, 108; Diary 3, 14th May 1926; Fürst, 12, 17-18, pl. I; 'Grave Concordance', 118; 'New information', 34, 38, figs. 21-22a, 24.

MNI unit T2:09

Seq. no. 234 **Inv. no.** AS 2803 **Date :** 260626	**Location:** LS, terr. II, around grave 12 (authors' comment: + grave 13)
MNI: 1 infant (9-10 lunar months), 1 infans II (10 years +/- 6 months)	Dating: MH? (G)

Seq. no. 254 **Inv. no.** AS 5152 **Date :** 260601	**Location:** LS, terr. II, grave 11
MNI: 2 infants, 1 infans II (5-10 years)	Dating: MH (LH)

Seq. no. 255 **Inv. no.** AS 2171 **Date :** 260517	**Location:** LS, terr. II, grave 12
MNI: 1 infant (9.5 lunar months), 1 Infans I (6-12 months)	Dating: MH

Seq. no. 267 **Inv. no.** AS 2878 **Date :** 260517	**Location:** LS, terr. II, grave 12
MNI: 1 infans I (1 year +/- 3 months)	Dating: No sherds

The graves **MH 101-103** (graves 11-13) were found near each other and they were excavated during the same time period.Two of five subadults can be assigned to published graves: the one-year-old child probably belongs to **MH 102** (grave 12) since the skeleton was refered to as "child" in the publication. This age also seems to be in accordance with the sizes of the tibia on the published drawing of the skeleton (see 'New information' fig.24). One of the infants (most certainly the one in seq. no. 234) probably belongs to **MH 103** (grave 13) since the skeleton from this grave is designated "infant" in the publication. The diary notes, "just above the rock lay a small child covered with something strange. More was found later on (box. marked around grave 12) ... daub would be the most suitable description of the cover." According to the location noted in seq. no. 254, these bones should be part of **MH 101** (grave 11), but since this grave contained a young woman (probably over twenty years old because Fürst note that "Die Epiphysen sind in sämtlichen langen Knochen mit den Diaphysen zusammengeschmolzen.") it is probably not the case. However, I find it possible that at least one of the infants could have been buried in the same grave as the woman but not noticed if only a few bone fragments were preserved. Some of the individuals in this bag could most certainly have been mixed with the individual in **MH 103**. This means that one(?) infant and one 10-year-old child could not be attributed to any known grave.

Parts of: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 3 infants (one infant: 9-10 lunar months, two infants: c. birth), 1 infans I (1 year +/- 3 months), 1 infans II (10 years +/- 6 months)

MNI unit T2:09

References: Angel, 105-138, table 4 (5FA); *Asine* I, 127-128, fig. 108; Diary 3, 17th May - 30th June 1926; Fürst, 17-18; 'Grave Concordance', 118; 'New information', 38, figs. 24-25.

MNI unit T2:10

Seq. no. 115	**Inv. no.** AS 2959:5	**Date :** 260330	**Location:** LS, terr. II, grave 9
MNI: 1 adult			Dating: BA

These bones probably belong to **MH 99** (grave 9) in accordance with the location. The skeleton was a 30-40-year-old male according to Fürst.
No sex or age determination was possible from these few fragments.

Parts of: Lower extremities.

MNI: 1 adult

References: Angel, 112-127, table 4 (3FA); *Asine* I, 126; Diary 3, 30th March 1926; Fürst, 14-16, 121-122; 'Grave Concordance', 118; 'New information', 37, figs. 21, 22b.

MNI unit T3-2:01

Seq. no. 30	**Inv. no.** AS 5100	**Date :** 260514	**Location:** LS, terr. III north up to terr. II, layer 23
MNI: 1 infant			Dating: MH (LH)

No information about graves or human bones is found in the diary from this context. However, there is one short note "bones", but this remark may as well refer to animal bones. Accordingly, this infant could not be assigned to any identified grave.

Parts of: Skull, upper extremities, thorax.

MNI: 1 infant (newborn)

References: Diary 3, 14th May 1926.

MNI unit T3-2:02

Seq. no. 150	**Inv. no.** AS 5226	**Date :** 260519	**Location:** LS, terr. III up to terr. II, layer 26
MNI: 1 adult			Dating: MH (EH?)
Seq. no. 182	**Inv. no.** AS 4618	**Date :** 260515	**Location:** LS, terr. III north up to terr. II, layer 26
MNI: 1 adult			Dating: MH

The description of location and layer correspond to the diary's notation, but the only information about the findings consists of a short note: "MH, bones". Accordingly no identified grave could be assigned to these remains.

Parts of: Teeth, upper extremities.

MNI: 1 adult (25 +/- 5 years)

References: Diary 3, 15th May 1926.

MNI unit T3-2:03

Seq. no. 4	**Inv. no.** AS 5109	**Date :** 260518	**Location:** LS, terr. III to II, layer 34
MNI: 1 infant			Dating: MH (II?)

MNI unit T3-2:03

Seq. no. 62	**Inv. no.** AS 4960	**Date :** 260518	**Location:** LS, terr. III towards north up to terr. II, layer 34
MNI: 1 infant			Dating: MH

These bones probably belong to **MH 88b** (grave 104) since it was found in this layer on the same day. In 'Grave Concordance' **MH 88** is listed together with both graves 103 and 104, but according to the diary these are separate graves. I will therefore refer to them as **MH 88a** and **b** in the following chapters.

Parts of: Lower extremities, pelvic girdle.

1 infant (9.5-10 lunar months)

References: *Asine* I, 125; Diary 3, 18th May; 'Grave Concordance', 118.

MNI unit T3-2:04

Seq. no. 3	**Inv. no.** AS 2797	**Date :** 260518	**Location:** LS, terr. III north up to terr. II
MNI: 1 infant			Dating: MH (EH II)

Seq. no. 8	**Inv. no.** AS 2838	**Date :** 260519	**Location:** LS, terr. III towards north up to terr. II, grave 15
MNI: 2 infants			Dating: ? (1 LH)

Seq. no. 13	**Inv. no.** AS 2838	**Date :** 260519	**Location:** LS, terr. III towards the north up to terr. II, grave 16
MNI: 2 infants			Dating: Not possible to date

Seq. no. 54	**Inv. no.** AS 4947	**Date :** 260518	**Location:** LS, terr. III up to terr. II, layer 35
MNI: 1 infant			Dating: EH/MH (LH, G, Hell?)

Seq. no. 202	**Inv. no.** AS 4947	**Date :** 260518	**Location:** LS, terr. III towards the north up to terr. II, layer 35
MNI: 1 infant			Dating: MH (LH, G, Hell?)

These bones probably belong to **MH 64** (grave 15), **MH 65** (grave 16) and **MH 89** (grave 106).They were all found very close to each other in layer 35. The diary notes, "A child skeleton shall be drawn, i.e., grave 15. Another one (grave 16?) was partly destroyed by the pick and partly squeezed by fallen stones, it was taken up. Maybe they were twins or triplets that lay in a terrible mess. MH. A third child skeleton waits for a drawing to be made (grave 106?)." The individuals from these graves have probably been mixed up in the different bags so it is difficult to sort out which individual belongs to which grave. The oldest individual probably belongs to **MH 64.**

Parts of: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 3 infants (5.5 months +/- 6 months, two individuals: 8.5-10 lunar months)

References: *Asine* I, 124-125; Diary 3, 18th-19th May 1926; 'Grave Concordance', 118; 'New information', 29, fig. 15.

MNI unit T3-2:05

Seq. no. 213	**Inv. no.** AS 5176	**Date :** 260519	**Location:** LS, terr. III towards the north up to terr. II, layer 38
MNI: 1 infant			Dating: MH I (EH, LH, G)

MNI unit T3-2:05

Seq. no. 268 **Inv. no.** ?	**Date :** 260519	**Location:** LS, terr. III, grave 18= MH 67	
MNI: 1 infant		Dating: No sherds	

These bones probably belong to **MH 67** (grave 18) which was found in layer 38. A whorl was also found.

Parts of: Skull, upper and lower extremities, thorax, vertebral column.

MNI: 1 infant (9-10 lunar months)

References: *Asine* I, 124; Diary 3, 19th May 1926; 'Grave Concordance', 118; 'New information', 29, fig.15.

MNI unit T3-2:06

Seq. no. 31	**Inv. no.** AS 2371	**Date :** 260522	**Location:** LS, terr. III towards north up to terr. II above house A
MNI: 1 infant			Dating: MH (EH)

Seq. no. 264	**Inv. no.** AS 2860	**Date :** 260522	**Location:** LS, terr. III up to terr. II, above the house
MNI: 1 infant			Dating: BA (MH)

The bones from two infants cannot be assigned to any published graves. The diary notes that two child skeletons were found, but the find boxes were filled with fragments of an EH vessel at the expense of these skeletons.

Parts of: Skull, teeth, upper extremities, thorax, vertebral column, pectoral girdle.

MNI: 2 infants (9 lunar months +/- 6 months; 9.5-10 lunar months)

References: Diary 3, 22nd May 1926.

MNI unit T3-2:07

Seq. no. 81	**Inv. no.** AS 4852	**Date :** 260601	**Location:** LS, terr. III towards the north up to terr. II, above the house
MNI: 1 infant			Dating: MH (LH, HeII)

Two fragments from *at least* one infant probably belong to **MH 71** and/or **MH 72** which were found close together/on top of each other. As one of the skeletons in **MH 72** is designated "Infant" it seems most probable that the fragments belong to that grave.

Parts of: Skull, thorax.

MNI: 1 infant (newborn)

References: *Asine* I, 124; Diary 3, 1st June 1926; 'Grave Concordance', 118; 'New information', 29, figs.17b, 18.

MNI unit T3-2:09

Seq. no. 39	**Inv. no.** AS 5242	**Date :** 260626	**Location:** LS, terr. III north up to terr. II, above the "MH house", bothros 14
MNI: 1 infant			Dating: mixed (MH, LH)

Seq. no. 231	**Inv. no.** AS 4898	**Date :** 260615	**Location:** LS, terr. III north, square 16, layer 12
MNI: 1 infant			Dating: MH

MNI unit T3-2:09

There are several possible graves that these bones could have belonged to: **MH 78, MH 80-83** and **LH 11** were all excavated or discovered on this date. **MH 80-81** were adult graves so these are excluded as possible candidates. **MH 82** contained a child c. 8 years old and the child in **LH 11** appears at least older than the newborn in the photograph.The individual in **MH 78** is designated infant or child ('New information') and this grave was found in squares 15-17 layer 10. It was excavated on 26th June and it is noted in the diary that it was a small grave. **MH 83** contained child or infant (according to 'New information') and on top of the cover slabs lay the skeletal remains belonging to the fragmentary **MH 79** which was a defective child skeleton (c. 10 years old, see diary 3, 15th June). To conclude, possible graves that this newborn child could have belonged to are: **MH 78, MH 79** or **MH 83**. I find **MH 78** to be the most likely candidate.

Parts of: Upper and lower extremities.

MNI: 1 infant (9.5-10 lunar months)

References: Angel, 112-127, table 4 (12FA, 26FA); *Asine* I, 124-125, 129, figs.103-104; Diary 3, 15th June and 26th June 1926; Fürst, 22-24, 35-37, figs.11-12 pls. 4, 11; 'Grave Concordance', 118-119; 'New information', 33, figs.19, 20a-b.

MNI unit T3-2:10

Seq. no. 273 **Inv. no.** AS 4677	**Date :** 260515	**Location:** LS, terr. III north up to terr. II, layer 27
MNI: 1 infant		Dating: MH (LH, Hell?)

No identified grave could be assigned to these bones. The description of location and layer correspond to the notations in the diary. The excavators note: "... Obsidian. Bone (from a bird?)" . These bird bones could possibly be the remains of a newborn infant.

Parts of: Upper and lower extremities, thorax.

MNI: 1 infant (newborn)

References: Diary 3, 15th May 1926.

MNI unit T3-2:11

Seq. no. 196 **Inv. no.** AS 2430	**Date :** 260517	**Location:** LS, terr. III towards north up to II, layer 33
MNI: 1 infans I		Dating: MH (EH)

The location could be found in the diary but the only information is a short note, "MH. Bone, obsidian." Consequently, no identified grave could be assigned to this individual.

Parts of: Skull.

MNI: 1 infans I (c. 1-2 years old)

References: Diary 3, 17th May 1926.

MNI unit T3-2:12

Seq. no. 297 **Inv. no.** AS 2125	**Date :** 260517	**Location:** LS, terr. III north up to terr. II, layer 31
MNI: 1 infant (newborn)		Dating: MH

This fragment of a tibia probably belongs to **MH 88a** (grave 103) which was found on 15th May in layer 30. The diary from this day notes, "... the pick brought up the head and ribs from a child skeleton, it was therefore taken up - the sherds are MH." The notations from layer 31, 17th May are simply: "MH. Obsidian. A needle of bone."

Parts of: Lower extremities.

MNI: 1 infant (newborn)

References: Diary 3, 15th-17th May 1926; 'Grave Concordance', 118.

MNI unit T3-2:13

Seq. no. 5	**Inv. no.** AS 4833	**Date :** 260512	**Location:** LS, terr. III north to terr. II, cleaning of stones
MNI: 1 infant			Dating: MH

This fragment could not be assigned to any identified grave. The location is noted in the diary but no remarks have been made about any finds.

Parts of: Upper extremities.

MNI: 1 infant (newborn)

References: Diary 3, 12th May 1926.

MNI unit T3-4:01

Seq. no. 53	**Inv. no.** AS 5060	**Date :** 260423	**Location:** LS, terr. III down to IV, south of profile, layer 4
MNI: 1 infant			Dating: MH

Seq. no. 68	**Inv. no.** AS 5059	**Date :** 260423	**Location:** LS, terr. III down to IV, south of profile, layer 4
MNI: 1 infant			Dating: MH

Seq. no. 190	**Inv. no.** AS 4975	**Date :** 260423	**Location:** LS, terr. III down to IV, south of profile, layer 3
MNI: 1 infant			Dating: mixed (according to the diary mainly MH sherds but also LH and Hell.)

The descriptions of locations and layers correspond to the diary's notation, but no remarks about graves or skeletons are found. The exception is the bothros (no. 4) found on 24th April: it is noted to have contained finds of "stones, sherds, soft soil and bone" but it may as well have been animal bones. The so-called bothros no. 4 is later questioned. According to the diary from 26th April, "it looks strange and a semi-circle of stones was found above it ...". Could it be possible that this *bothros* in fact was a disturbed grave to which the bones could have belonged?

Parts of: Skull, upper extremities.

MNI: 1 infant (9 lunar months)

References: Diary 3, 23rd-26th April 1926.

MNI unit T3-4:03

Seq. no. 44	**Inv. no.** AS 5051	**Date :** 260424	**Location:** LS, terr. III down to IV, south of profile, layer 10
MNI: 1 infant			Dating: MH

This fragment could not be assigned to any identified skeleton or grave.

Parts of: Upper extremities.

MNI: 1 infant (newborn)

References: Diary 3, 24th April 1926.

MNI unit T3:01

Seq. no. 137	**Inv. no.** AS 4965	**Date :** 260313	**Location:** LS, terr. III, layer 4
MNI: 1 adult			Dating: mixed

Seq. no. 283	**Inv. no.** AS 5094	**Date :** 260312	**Location:** LS, terr. III, layer 3
MNI: 1 adult (39-44 years, male)			Dating: MH I-II (G)

Seq. no. 288	**Inv. no.** AS 4856	**Date :** 260312	**Location:** LS, terr. III, layer 4, below the middle wall
MNI: 1 adult			Dating: MH I-II

Seq. no. 300	**Inv. no.** AS 4801	**Date :** 260313	**Location:** LS, terr. III, layer 5
MNI: 1 adult			Dating: MH I-II

These bones are probably remains from the skeleton in **MH 58** that appears to have been found as disarticulated bones (sometimes noted only as bones without any specific reference to the grave) on the above locations. This individual was determined to be an adult male according to both Fürst and Angel (6FA). The age determinations carried out by the two scholars differ slightly: Fürst considered the skeleton to be c. 50 years old and Angel determined the age to 44 years. My own sex and age estimation is based only on the pubic symphys and yields a similar age: 40-45 years, male.

Parts of: Upper and lower extremities, pelvic girdle.

MNI: 1 adult male (40-45 years old)

References: Angel, 112-127, table 4 (6FA); *Asine* I, 123; Diary 3, 12th-13th March 1926; Fürst, 18; 'Grave Concordance', 118; 'New information', 27.

MNI unit T3:04

Seq. no. 261	**Inv. no.** AS 4692	**Date :** 260605	**Location:** LS, terr: III, towards the north, grave 20 (in bothros in the MH house)
MNI: 1 infant			Dating: EH

This is probably the remains of the infant from **MH 70** (grave 20) which was found in bothros 7. The publication states that the infant was "very small".

Parts of: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle.

MNI: 1 infant (6 months +/- 2 months)

References: *Asine* I, 124; Diary 3, 22nd May, 5th June 1926; 'Grave Concordance', 118; 'New information', 29, fig. 15.

MNI unit T3:05

Seq. no. 19	**Inv. no.** AS 2696	**Date :** 260608	**Location:** Small section above house III, towards north-upward II
MNI: 1 infant			Dating: EH III/MH I

These are most probably the remains of the infant in **MH 76** who was found in this location. The diary mentions that only the head of the child was found, but these remains also include some ribs and vertebrae fragments as well as a tibia and clavicula fragments. Since these remains are very small and fragmentary it is likely that they were not noted by the excavators.

Parts of: Skull, teeth, lower extremities, thorax, vertebral column, pectoral girdle.

MNI: 1 infant (6 months +/- 6 months)

References: *Asine* I, 124; Diary 3, 8th June 1926; 'Grave Concordance', 118.

MNI unit T3:06

Seq. no. 230 **Inv. no.** AS 2897 **Date :** 260614	**Location:** LS, terr. III, north of extension, squares 15-17, surface layer
MNI: 3 infants (9.5 lunar months-newborn)	Dating: MH/LH (EH?)

Seq. no. 242 **Inv. no.** AS 4868 **Date :** 260614	**Location:** LS, terr. III, north, squares 15-17, layer 3
MNI: 1 infant (newborn)	Dating: LH (MH, G)

Seq. no. 243 **Inv. no.** AS 4860 **Date :** 260614	**Location:** LS, terr. III, north, squares 15-17, layer 2
MNI: 1 infant (newborn)	Dating: MH (EH, LH)

Seq. no. 245 **Inv. no.** AS 5181 **Date :** 260614	**Location:** LS, terr. III, north, squares 15-17, layer 9
MNI: 3 infants (10 lunar months)	Dating: MH (EH, LH)

Seq. no. 246 **Inv. no.** AS 4872 **Date :** 260614	**Location:** LS, terr. III, north, squares 15-17, layer 5, 3a
MNI: 1 infant (newborn)	Dating: MH (EH, LH)

Seq. no. 248 **Inv. no.** AS 4463 **Date :** 260614	**Location:** LS, terr. III, north, squares 15-17, layer 2
MNI: 1 infant (9 lunar months)	Dating: MH/LH (EH)

Here are the skeletal remains of at least four infants. They seem to belong to **MH 77, MH 85-86** and **LH 9,** which were all excavated close to each other in the above listed locations on 14th June: **MH 85-86** were found in layer 3, **LH 9** in layer 6 and **MH 77** in layer 9 (?). It was not possible to attribute the bones to specific graves as the locations do not refer to a grave number and there seems to have been a mix-up of the skeletons from the different graves in these find-boxes.

Parts of: Skull, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 4 infants (9-10 lunar months)

References: *Asine* I, 124-125, 129; Diary 3, 14th June 1926; 'Grave Concordance', 118-119.

MNI unit T3:08

Seq. no. 252 **Inv. no.** AS 5179 **Date :** 260616	**Location:** LS, terr. III, square 17, layer 15
MNI: 1 adult	Dating: EH/MH

Seq. no. 302 **Inv. no.** AS 5232b **Date :** 260630	**Location:** LS, terr. III north, upper part of EH-house.
MNI:1 infans II (c. 11 +/- 1 year), 1 adult (c. 30 +/- 5 years)	Dating: Mixed (EH III, MH, LH, G, Hell)

Seq. no. 308 **Inv. no.** AS 4577 **Date :** 260629	**Location:** LS, terr. III, towards the north, upper part of EH house, below walls 34 and 35
MNI: 1 adult (30 +/-5 years)	Dating: EH, LH, G

MNI unit **T3:08**

It is difficult to determine to which graves these individuals belong since a lot of graves situated close to each other were worked on during the current days.The adult individual could belong to **MH 74** or **MH 80,** which were the adult graves worked on 16th June. **MH 80** is also reported to be located in square 17 (possibly layer 14?). No finds of bone are reported in the diary from 30th June. However, a hollow in the rock of the EH house is thought to be a possible grave. Unfortunately the diary is finished after this notice so no further information about the possible grave is available. During the preceding day, 29th June, the excavation of **MH 80** and **81** (adult graves) is reported to have been finished. The three individuals from these graves (**MH 74, 80** and **81**) were examined by Fürst and Angel: **MH 74** (11 FA) was a woman 40-50 years old according to Fürst, and a 38-year-old woman according to Angel. Both scholars agree on the age and sex of the individual in **MH 80** (12 FA) a c. 40-year-old woman. Angel determines **MH 81** (26 FA) to belong to a 33-year-old male but Fürst states woman, c. 30 years old. Since the adult individual is represented only by seven teeth which indicate an age of 30 years, it seems most likely that they belong to the skeleton in **MH 81**.The child could belong to **MH 82, LH 9** or **LH 11** which were mentioned in the diary from 30th June. **MH 82** is determined by Fürst and Angel to have contained a child c. 8 years old. This grave shares one wall with **LH 11**, which is also reported to have held a child. The child in **LH 11** is probably younger than **MH 82** judging from the drawing of the two skeletons in *Asine* I, i.e., it is more likely that these teeth from an eleven-year-old child belong to **MH 82** (**LH 9** is also reported to have belonged to a child, see T3:06).

Parts of: Subadult: teeth. Adult: teeth, lower extremities.

MNI: 1 infans II (c. 11 +/- 1 year), 1 adult (c. 30 +/- 5 years)

References: Angel, 105-138, table 4 (11FA, 12FA, 26FA); *Asine* I, 124-125, 129, figs. 103-104; Diary 3, 16th, 29th-30th June 1926; Fürst, 21-24, figs.11-14,18, pls. 4, 6,11; 'Grave Concordance', 118-119; 'New information', 33, figs. 18, 20a-b.

MNI unit **T3:09**

Seq. no. 103 **Inv. no.** AS 2395 **Date :** 260628	**Location:** LS, terr. III, around and under graves 30 and 32
MNI: 1 adult	Dating: MH (EH)

According to the diary, the bones from this location should belong to **MH 84** (grave 34) that was found under grave 32 (**LH 11**). Fürst identified the skeleton in **MH 84** as possible remains from a young woman. Angel reported the skeleton to be a young man, 24 years old. No sex determination was possible from the bones examined by me. (**MH 82** (grave 30) and **LH 11** (grave 32) were children's graves.)

Parts of: Upper and lower extremities, pelvic girdle.

MNI: 1 adult

References: Angel, 112-127, table 4 (13FA, 27 FA); *Asine* I, 125; Diary 3, 28th June 1926; Fürst, 35-37, pl. 13; 'Grave Concordance', 118; 'New information', 34.

MNI unit **T3:11**

Seq. no. 29 **Inv. no.** AS 4536 **Date :** 260610	**Location:** LS, terr. III, towards north, below wall 18
MNI: 1 infant	Dating: EH/MH

Seq. no. 293 **Inv. no.** AS 2244 **Date :** 260609	**Location:** LS, terr. III towards north, below wall 18
MNI: 1 infans II (9 years +/- 6 months)	Dating: MH (EH, LH)

No finds of bones are mentioned in the diary from this location and no identified graves could be attributed to the skeletal remains. The diary mentions two bone pins that were found on 9th June below wall 18. It is possible that they should be connected to the buried infants.

Parts of: Skull, teeth, lower extremities.

MNI: 1 infant (c. birth), 1 infans II (9 years +/- 6 months)

References: Diary 3, 9-10th June 1926.

MNI unit T3:13

Seq. no. 11 **Inv. no.** AS 2313 **Date :** 260520	**Location:** LS, terr. III towards north, square 11, grave 17, the skull
MNI: 1 infans I (5 years +/- 6 months and/or c. 2-3 years)	Dating: No sherds

Seq. no. 66 **Inv. no.** AS 4612 **Date :** 260519	**Location:** LS, terr. III, north, square 11, layer 6
MNI: 1 infans I (c. 4-5 years)	Dating: MH II

Seq. no. 296 **Inv. no.** AS 2124 **Date :** 260520	**Location:** LS, terr. III, north, grave 17
MNI: 1 infans I (2-3 years and/or 4-5 years)	Dating: LH

These bones should belong to **MH 66** (grave 17), found 19th May in layer two but photographed and excavated on 20th May 1926. A small obsidian knife was found below the grave but the excavators do not mention if it has any connection to the burial. This individual's age determined from the teeth does not agree with the age estimated from the bones (length of long bones and general development). There are two possibilities here: the teeth and bones could belong to different individuals, or they could belong to a child with a stunted growth, i.e., small stature and poor development for age (estimated from the teeth) as a result of disease and/or malnutrition. I believe the latter possibility to be the more likely since the left jaw (with teeth *in situ*) visible on the photograph seems to be the same as the one analysed by me. The sizes of the long bones depicted on the plan also agree with the measurements taken by me. It should be noted that the variation ranges of the length of the long bones in Stloukal & Hanáková's study (see chapter 2.5) are wide, and could be consistent with a four-year-old child in the cases of femur and humerus.

Parts of: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 1 infans I (5 years +/- 6 months)

References: *Asine* I, 124; Diary 3, 19th-20th May, 'Grave Concordance', 118; 'New information', 29, figs. 15, 16b.

MNI unit T3:14

Seq. no. 33 **Inv. no.** AS 2138 **Date :** 260320	**Location:** LS, cleaning around grave 6
MNI: 1 infant	Dating: MH

Seq. no. 50 **Inv. no.** AS 2207 **Date :** 260320	**Location:** LS, cleaning around grave 6
MNI: 1 infant	Dating: MH

Seq. no. 117 **Inv. no.** AS 4969 **Date :** 260318	**Location:** LS, terr. III, cleaning surface layer
MNI: 1 adult	Dating: mixed

Seq. no. 158 **Inv. no.** AS 5091 **Date :** 260318	**Location:** LS, terr. III, cleaning surface layer
MNI: 1 adult	Dating: mixed

Seq. no. 178 **Inv. no.** AS 4621 **Date :** 260316	**Location:** LS, terr. III, cleaning in the south part of profile, between walls 1 and 2.
MNI: 1 adult	Dating: LH

MNI unit T3:14

Seq. no. 292	**Inv. no.** AS 5224	**Date :** 260329	**Location:** LS, terr. III, grave 6
MNI: 1 adult male 39-44 years old			Dating: MH/G

These bones from an almost complete skeleton (skull is missing) probably belong to the adult male who was found in **MH 62** (grave 6). Fürst has determined the age to 30-40 years and Angel states more precisely 40 years. My own estimation is based only on the pubic symphysis and the age interval is 40-45 years according to Todd's phases (see Appendix II). I have also included seq. nos. 117 and 178 in this unit since the grave (and probably parts of the skeleton: "bones" are noted in the diary) was found on 16th March. To which grave the remains of a newborn infant belong is more difficult to know: the diary from 29th March gives the following information: "... the rest of **MH 62** (grave 6) and the entire **MH 61** (grave 4) were taken up; the latter was very badly preserved, it contained a not fully grown human being.." On the other hand the publication as well as the osteological report by Fürst state that the individual from **MH 61** was " a woman, not young." The field drawing of the skeleton (see 'New information') appears to depict an adult person (at least not an infant). This seems to imply that the bones from the infant could hardly belong to grave 4. However, in the description of grave **MH 62** (*Asine* I) it says that some small animal bones were found close to the skeleton - it is most likely that bones from a small infant could have been mistaken for the animal bones. Accordingly, I find it possible that this infant belongs to grave **MH 62**.

Parts of: Subadult: Lower extremities. Adult: Upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 1 adult (30-45 years) male, 1 infant (10 lunar months)

References: Angel, 112-127, table 4 (10FA); *Asine* I, 123; Diary 3, 16th-29th March 1926; Fürst, 19-21, fig. 10, pl. 5; 'Grave Concordance' 118; 'New information', 28, figs. 13b, 14.

MNI unit T3:15

Seq. no. 20	**Inv. no.** AS 2134	**Date :** 260323	**Location:** LS, terr. III, grave 3
MNI: 1 infant, 1 infans II			Dating: MH

Seq. no. 166	**Inv. no.** AS 2389	**Date :** 260409	**Location:** LS, terr. III, around grave 3
MNI: 1 adult			Dating: MH I (EH III)

Seq. no. 289	**Inv. no.** AS 4701	**Date :** 260407	**Location:** LS, terr. III, grave 3, down to the rock
MNI: 1 adult			Dating: EH III/MH

The fragments from an adult individual are probably parts of **MH 60** (grave 3) in accordance with the field description, but the remains of an older child is more difficult to assign to an identified grave. The diary mentions that the cleaning from the borders of grave **MH 60** was placed in the same box as the finds from the grave. It is thus possible that the distal part of a humerus from a child were mixed up with the animal bones that were found there. Further, I find it equally likely that the small bones from the infant could belong to the same grave as the adult skeleton (a woman according to Fürst). The publication mentions two layers of soil in the grave: one layer of loose sand with small lumps of clay, and on top of that, another layer of hard-packed clay and sand. Both were found above the skeleton. Perhaps the bones from the infant were found in these layers?

Parts of: Subadult: Skull, upper and lower extremities, thorax, vertebral column, pectoral girdle. Adult: Pectoral girdle, vertebral column, lower extremities.

MNI: 1 adult, 1 infans II (5-14 years), 1 infant (newborn)

References: Angel, 112-127, table 4 (8FA); *Asine* I, 123, fig.102; Diary 3, 23rd March-9th April 1926; 'Grave concordance', 118; 'New information', 28, fig.13a.

MNI unit T3:16

Seq. no. 97 **Inv. no.** AS 4508	**Date :** 260431	**Location:** LS, terr. III, 4 m north of profile, square 1, layer 9
MNI: 1 adult (35 years +/-5 years)		Dating: mixed (EH, MH, LH, G)
Seq. no. 206 **Inv. no.** AS 2711	**Date :** 260401	**Location:** LS, terr. III, 4 m north of profile, square 1, layer 9
MNI: 1 adult		Dating: MH/LH
Seq. no. 284 **Inv. no.** AS 2711	**Date :** 260401	**Location:** LS, terr. III, 4 m north of profile, square 1, layer 9
MNI: 1 adult		Dating: MH/LH
Seq. no. 285 **Inv. no.** AS 2836	**Date :** 260401	**Location:** LS, terr. III, 4 m north of profile, square 1, layer 9
MNI: 1 adult		Dating: MH/LH
Seq. no. 286 **Inv. no.** AS 2767	**Date :** 260402	**Location:** LS, terr. III, 4 m north of profile, square 1-2, layer 15
MNI: 1 adult		Dating: MH I-II
Seq. no. 291 **Inv. no.** AS 4565	**Date :** 260401	**Location:** LS, terr. III, 4 m north of profile, square 4, layer 13
MNI: 1 adult (30 years +/-5 years)		Dating: MH (EH, LH)

These bones from an adult could not be assigned to any published grave. However, the diary mentions that a burial was identified, "... in the wall up to terrace two were found some bones in a terrible state of disorder: legs, head and ribs together, maybe once a human being." (A metatarsal from layer 15 has been included in this unit as no bones or teeth are mentioned from the diary in this entry, and I find it possible that it could belong to the skeleton.)

Parts of: Skull, teeth, upper extremities, thorax.

MNI: 1 adult (35 +/-5 years).

References: Diary 3, 1st-2nd April 1926.

MNI unit T3:17

Seq. no. 304 **Inv. no.** AS 4571	**Date :** 260401	**Location:** LS, terr. III, 4 m north of profile, square 1, layer 10
MNI: 1 infant (9 lunar months)		Dating: MH II
Seq. no. 305 **Inv. no.** AS 4723	**Date :** 260401	**Location:** LS, terr. III, 4 m north of profile, square 1, layer 12
MNI: 1 infant (newborn)		Dating: MH II (HeII)

These bones from two infants could not be attributed to identified graves. In square 1, layer 10, the diary notes a rectangle of about a square meter with earth of a different colour (red) that was thought to belong to a hearth. However, no traces of charcoal or ash were found. Could this have been clay from a cist grave?

Parts of: Lower extremities.

MNI: 2 infants (newborn and 9 lunar months)

References: Diary 3, 31st March-1st April 1926.

MNI unit T3:18

Seq. no. 201	**Inv. no.** AS 2902	**Date :** 260331	**Location:** LS, terr. III, 4 m north of profile, square 2, layer 5
MNI: 1 infans I			Dating: EH/MH (EH II, LH)

This fragment could not be attributed to an identified grave. The only information from this location is a short note: "drill core, mainly MH. Nail of iron."

Parts of: Skull.

MNI: 1 Infans I (c. 2-3 years)

References: Diary 3, 31st March 1926.

MNI unit T3:20

Seq. no. 177	**Inv. no.** AS 5000	**Date :** 260519	**Location:** LS, terr. III, north, square 11, layer 5
MNI: 1 adult			Dating: MH/LH

This fragment could not be assigned to any identified grave. The only note from this location is "LH. MH. Obsidian"

Parts of: Upper extremities.

MNI: 1 adult

References: Diary 3, 19th May 1926.

MNI unit T3:21

Seq. no. 74	**Inv. no.** AS 4548	**Date :** 260427	**Location:** LS, terr. III, towards north, square 8, layer 2
MNI: 1 infant, 1 infans I			Dating: MH/LH

Of these two bones that represent two children of different ages, at least one (perhaps both?), should belong to grave number 96 (no publication number exists). The diary gives the following information for the location: "... in the middle of square 7 and on the border of square 8 (layer 2), depth 35-45 cm lay an MH cup with one handle, some Black Minyan [sherds?] and some bones that could be human. As it was impossible to find a coffin or put the bones into order, the whole lump of soil containing the much crushed cranium was taken up."

Parts of: Upper extremities.

MNI: 1 infant (9.5 lunar months), 1 infans I (1-2 years)

References: Diary 3, 27th April 1926.

MNI unit T3:22

Seq. no. 10	**Inv. no.** AS 1052	**Date :** 260506	**Location:** LS, terr. III towards north, square 8, layer 4
MNI: 1 infans I (5.5 years +/- 6 months)			Dating: MH/LH

Seq. no. 260	**Inv. no.** AS 4984	**Date :** 260508	**Location:** LS, terr. III, grave 9
MNI: 1 infans II (6-8 years)			Dating: MH

Seq. no. 269	**Inv. no.** AS 4981	**Date :** 260508	**Location:** LS, terr. III, plundering of grave, grave 9
MNI: 1 infans II (6.5-8 years)			Dating: No date is possible, one piece of mudbrick.

MNI unit T3:22

In the location "square 8, layer 4" the following information is found: " ... on the border of square 7 towards the north a small head was crushed; it was excavated and placed together with some other bones of different origin. Afterwards the (post-cranial) skeleton (**MH 63**) was excavated... (from the same layer)" On the 8th of May **MH 63** (grave 9) was photographed and taken up. Thus, it seems probable that this child should belong to **MH 63.**

Parts of: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 1 infans II (5.5 years +/- 6 months)

References: *Asine* I, 123-124; Diary 3, 6th May, 8th May 1926; 'Grave Concordance', 118; 'New information', 28, figs. 15, 16a.

MNI unit T3:23

Seq. no. 12	**Inv. no.** AS 4687	**Date :** 260510	**Location:** LS, terr. III towards north, squares 6-8, layer 8
MNI: 1 infant			Dating: EH/MH

Seq. no. 76	**Inv. no.** AS 4785	**Date :** 260511	**Location:** LS, terr. III, north, square 8, layer 12
MNI: 1 infant			Dating: MH

These bones probably belong to **MH 87** (grave no. 99?) that was found in location, "squares 6-8, layer 8". From layer 12 came a fragment of a tibia that I have included here since it may well belong to the same individual. I do not think that it is motivated to count it as coming from a second individual. There is no information about bones from layer 12 but a stone axe of "greenstone" and a big MH pithos were noted here.

Parts of: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle.

MNI: 1 infant (8 lunar months +/- 2 months).

References: *Asine* I, 125; Diary 3, 10th-11th May 1926; 'Grave Concordance', 118.

MNI unit T3:24

Seq. no. 88	**Inv. no.** AS 4905	**Date :** 260318	**Location:** LS, terr. III, the section, layer 4
MNI: 1 juvenilis, 1 infant			Dating: MH

Seq. no. 121	**Inv. no.** AS 4983	**Date :** 260319	**Location:** LS, terr. III, the section, layer 4
MNI: 1 infant, 1 infans I			Dating: MH II

Seq. no. 263	**Inv. no.** AS 2193	**Date :** 260319	**Location:** LS, terr. III, section around 4 m south of profile border, upper half 2
MNI: 1 adult, 1 infant			Dating: MH (EH?)

These bones from four individuals of different ages could not be assigned to any identified graves. The diary from the 18th of March gives information about a grave that was found on the preceding day but unfortunately two pages from this day are lost from the diary. However, this grave is most probably **MH 62,** which contained an adult male (cf. T3:14). The locations in seq. nos. 88, 121 are found in the diary and there are noted finds of bones and also the cover of the grave. Also the location in seq. no. 263 is mentioned in connection with the excavation of the grave. From this information it seemed reasonable to believe that at least one adult individual belonged to **MH 62** and accordingly should be joined with unit T3:14 but this is probably not the case; this kind of calculation would still result in three adult individuals and two infants (10 lunar months). Accordingly, these individuals could not be assigned to any identified graves.

Parts of: Subadult: Lower extremities, thorax, pelvic girdle. Adult: Upper and lower extremities, thorax, pelvic girdle.

MNI: 1 infant (10 lunar months), 1 infans I (3.5-5.5 years), 2 adults (one < 20 years of age)

MNI unit T3:24

References: Diary 3, 18th-19th March 1926.

MNI unit T3:26

Seq. no. 298 **Inv. no.** AS 2223	**Date :** 260604	**Location:** LS, terr. III to II north, wall 22, layer 42	
MNI: 1 infant (newborn)		Dating: MH I (MH II)	

This bone fragment from a newborn child could not be attributed to any identified grave. No finds of bone are mentioned in the diary in connection with the location.

Parts of: Lower extremities.

MNI: 1 infant (newborn)

References: Diary 3, 4th June 1926.

MNI unit T3:27

Seq. no. 247 **Inv. no.** AS 5231	**Date :** ?	**Location:** LS, terr. III mix: square 18, layer 12; square 6-7, layer 23; square 18, layer 2
MNI: 1 infans II		Dating: EH/MH (LH, G)

Seq. no. 290 **Inv. no.** AS 5656	**Date :** ?	**Location:** LS, terr. III
MNI: 1 adult		Dating: EH/MH

These bags have been regarded as a unit since they come from mixed locations on terrace III. They have both been given the same approximate date which might justify the procedure. The diary does not give any information about any finds of bones in the three locations from seq. no. 247. However, a child was found c. 115 cm from surface level in square 18, layer 3 that was excavated on 19th June.This grave was given number **130** in the list of graves, but it was never included in the publication. I find it possible that at least some of the fragments of the child skeleton found here are part of this individual. The fragments from an adult individual could not be assigned to an identified skeleton as a precise location and date is missing.

Parts of: Subadult: Teeth, upper extremities. Adult: Upper and lower extremities.

MNI: 1 infans II (9 years old +/- 6 months), 1 adult

References: Diary 3, 11th May, 15th May, 18th June 1926

MNI unit T4:01

Seq. no. 36 **Inv. no.** AS 5041	**Date :** 260317	**Location:** LS, terr. IV, layer 12
MNI: 1 infant		Dating: MH

Seq. no. 73 **Inv. no.** AS 5034	**Date :** 260317	**Location:** LS, terr. IV, layer 11
MNI: 1 infant		Dating: MH

Seq. no. 75 **Inv. no.** AS 2217	**Date :** 260317	**Location:** LS, terr. IV, layer 12
MNI: 1 infant		Dating: MH

Seq. no. 89 **Inv. no.** AS 2192	**Date :** 260317	**Location:** LS, terr. IV, cleaning layer 13, lower part, towards the Lower Town
MNI: 1 infans I		Dating: MH

MNI unit T4:01

These bones belong to two individuals of different ages but only one skeleton is mentioned in the diary, the individual in **MH 56** (grave 133) who was found in layers 11-12 on 17th March. However, the diary mentions that "traces of a skeleton (i.e., **MH 56**) were found under a large sherd." The day after it is noted that "the skeleton was contracted on the right side without cover." This could indicate that the "traces of a skeleton" represent another individual (probably the newborn infant). It seems most likely that the older child belongs to **MH 56** since the drawing of this skeleton fits well with a 1-3-year-old child. The publication states that no burial gifts were found in this earth-cut grave, but the diary make some interesting remarks about the observations made during excavation: "... when the rocks (i.e., the rocks that were situated above the skeleton) were removed, a small bone needle (that broke during excavation) was found among LH and MH sherds close to the surface ..." " ... the other parts of the skeleton became visible and in close connection to it was found another small bone needle/drill core.

Parts of: Skull, lower extremities, pelvic girdle.

MNI: 1 infant (10 lunar months), 1 infans I (c. 1-3 years).

References: *Asine* I, 122; Diary 8, 17th-19th March 1926; 'Grave Concordance', 118; 'New information', 27, fig.10.

MNI unit T4:02

Seq. no. 2	**Inv. no.** AS 5037	**Date :** 260311	**Location:** LS, terr. IV, layer 3
MNI: 1 infant			Dating: MH/LH

Seq. no. 77	**Inv. no.** AS 5019	**Date :** 260312	**Location:** LS, terr. IV, lower part, layer 7
MNI: 1 infant			Dating: MH (G, Hell)

Seq. no. 106	**Inv. no.** AS 5005	**Date :** 260312	**Location:** LS, terr. IV, layer 6
MNI: 1 adult			Dating: LH

Seq. no. 107	**Inv. no.** AS 5011	**Date :** 260311	**Location:** LS, terr. IV, layer 3
MNI: 1 adult			Dating: MH/LH

Seq. no. 207	**Inv. no.** AS 5022	**Date :** 260312	**Location:** LS, terr. IV layer 7
MNI: 1 adult			Dating: MH/LH

The skeletal fragments from these layers are analysed together since they were excavated in the same area on the same days. The datings also seem to fit in. No remarks about bone finds were made in any of the locations or layers that were excavated. Accordingly, the remains from an adult and infant could not be attributed to any known graves.

Parts of: Subadult: Skull, upper extremities. Adult: Teeth, upper extremities, thorax.

MNI: 1 adult (25 +/-5 years), 1 infant (9.5 lunar months)

References: Diary 8, 11th-12th March 1926.

MNI unit W01

Seq. no. 203	**Inv. no.** AS 3023	**Date :** 260402	**Location:** LT, west G1. H1. - 0,70 m
MNI: 1 infant			Dating: MH/LH (EH II, G)

This skull fragment from an infant cannot be assigned to any identified grave. No finds of bone are recorded in the diary.

Parts of: Skull.

MNI: 1 infant (newborn)

References: Diary 7, 2nd April 1926.

MNI unit W03

Seq. no. 262 **Inv. no.** AS 3451 **Date :** 260506	**Location:** LT, west, H. J. K. 3 and 4, -150, child skeleton in H3
MNI: 2 infants	Dating: mixed (MH, LH, G, Hell?)

Most of these fragments probably belong to the infant in **MH 35,** but one more infant is present here. Both infants are 9-10 lunar months old according to bone length but the teeth from one infant gave an age of 4 months (+/- 6 months). It is difficult to know whether both individuals were buried in the same grave or whether one of them is part of a unidentified grave. The skeleton is reported to have been very badly preserved so it is possible that it was never noticed that the fragmented bones belonged to two individuals. Since the publication mentions a child skeleton, at least the older infant should probably belong to this grave. This infant is 'small for age'.

Parts of: Skull, teeth, upper and lower extremities, thorax, vertebral column, pectoral girdle.

MNI: 2 infants (9-10 lunar months and 4 months +/- 6 months)

References: *Asine* I, 120; Diary 7, 6th May 1926; 'Grave concordance', 118; 'New information', 27.

MNI unit W05

Seq. no. 16 **Inv. no.** AS 3060 **Date :** 260528	**Location:** LT, west, G [H?], 5-6, c. 180
MNI: 2 infants	Dating: MH/LH

Seq. no. 79 **Inv. no.** AS 3215 **Date :** 260512	**Location:** LT, west, grave I
MNI: 1 infant	Dating: mixed (EH II, MH, LH/G, Hell)

Seq. no. 127 **Inv. no.** AS 2542 **Date :** 260527	**Location:** LT, west, G 5-6
MNI: 1 adult	Dating: MH (Hell)

Seq. no. 307 **Inv. no.** AS 3087 **Date :** 260427	**Location:** LT, west GH 5, -160
MNI: 1 adult, 1 infant	Dating: mixed (MH, LH, Hell)

The fragments of an adult individual probably belong to **MH 29** or **MH 30** that were discovered earlier (8th-15th May): the excavation went on very close to those graves on the 27th of May, so this is probably remains from either of the two graves, very likely **MH 30,** as this grave contained a woman: a fragment from coxae in the present sample indicates a female. The individual in **MH 29** was an adult male (22FA). Some bone fragments from one infant are labelled grave 1 (**MH 29**) and it is possible that these few fragments belong to a badly preserved infant skeleton originally buried with the adult. The other infant probably belong to **MH 36**. According to both the diary and the publication this grave contained a child skeleton that was very defective and spoiled before it was noticed. The three fragments from seq. no. 307 have been added here as they may well be parts from the individuals discussed above.

Parts of: Subadult: Skull, upper and lower extremities, thorax, vertebral column, pectoral girdle, pelvic girdle. Adult: Skull, pelvic girdle.

MNI: 2 infants (c. 8.5-9.0 lunar months and c. 9.0-9.5 lunar months), 1 adult

References: Angel,112-127, table 4 (22-23FA); *Asine* I, 119-120, fig. 95; Diary 7, 8th-15th May, 27th-28th May 1926; Fürst, 32, pl. 11; 'Grave concordance', 118; 'New information', 24, figs. 8-9.

MNI unit W06

Seq. no. 173 **Inv. no.** AS 4216 **Date :** 260626	**Location:** LT, west, southern part, cleaning, human bone
MNI: 1 infans I	Dating: MH (EH II/III, Hell)

MNI unit W06

This fragment is difficult to assign to a particular grave. Lots of graves(**PG 20, 28, 29, 31**) were worked on during this day but none of them was designated "LT, west". They were all PG graves that were located "above the fig-tree" which is not the same area. This bone fragment from an older child could possibly belong to **MH 32-34** which were worked on 29th June-5th July. The most probable graves are **MH 33** or **MH 34,** which are reported to have contained children. **MH 32** is attributed to an infant. **MH 33** is situated in the southern part of LT, west so I consider this grave to be the most likely alternative.

Parts of: Lower extremities.

MNI: 1 infans I

References: *Asine* I, 120, 132 135f.; Diary 7, 26th June- 5 July; 'Grave Concordance', 118f.; 'New Information', 24-27.

IV GENERAL LIMITATIONS

4.1 REPRESENTATIVITY OF THE SAMPLE—PROBLEMS IN DEMOGRAPHIC RECONSTRUCTIONS

Calculating morbidity and mortality from cemetery populations is a problematic task. To begin with, all skeletal samples are unrepresentative of the original living population just because of the fact that they are dead.[163] Secondly, the sample is never randomly selected from the total number of deaths occurring during a given time at a site, since a lot of factors contribute to the composition of the skeletal sample. Waldron suggests that some checks on the sample's composition should be made in advance of any further study to see if the sample conforms to the expectations: the age distribution should be roughly U-shaped and the sex distribution should be fairly balanced unless there are any special contradictory reasons known in advance.[164] If we look at the Asine sample it seems like these expectations are met to some extent. The age/sex distribution of the individuals >15 years of age (*Fig. 5*)[165] shows that there are 20% more males than females in this sample but it could probably be explained by the recognized problem of making correct sex determinations of mature and elderly women as well as the sometimes worse preservation of female skeletons.[166] Perhaps the number of sex-determined adults in this sample should be considered too small to enable any analyses about the sex distribution, but the trend with slightly more males than females seems to be valid also for a number of other Bronze Age sites in Greece.[167] The age distribution resembles the expected U-shape, and it is possible to discern an unusually

[163] Wood *et al.*1992, 344 n. 2.

[164] Waldron 1994, 22f. Many palaeodemographers expect mortality of prehistoric people to be comparable with the developing countries today: i.e., most deaths occur in the very young and old age groups.

[165] The age and sex of the adult individuals is based on Fürst (1930) and Angel (1982).

[166] It has been shown that women sometimes has been misclassified as men due to the tendency of the cranium to develop more male characteristics with growing age. Walker 1995, 31–47.

[167] Lerna, Kirrha, Mycenae and Athens Agora (Late Bronze Age) have all slightly more males than females in the sex-determined adult samples. Blackburn 1970; Angel 1971, 70, table 2. The same slightly skewed proportion is found in many Romano-British materials, Waldron 1994, 23, table 2.1, and in Swedish prehistoric populations, Welinder 1979, 70. See also Brothwell 1971, 120, fig. 5.

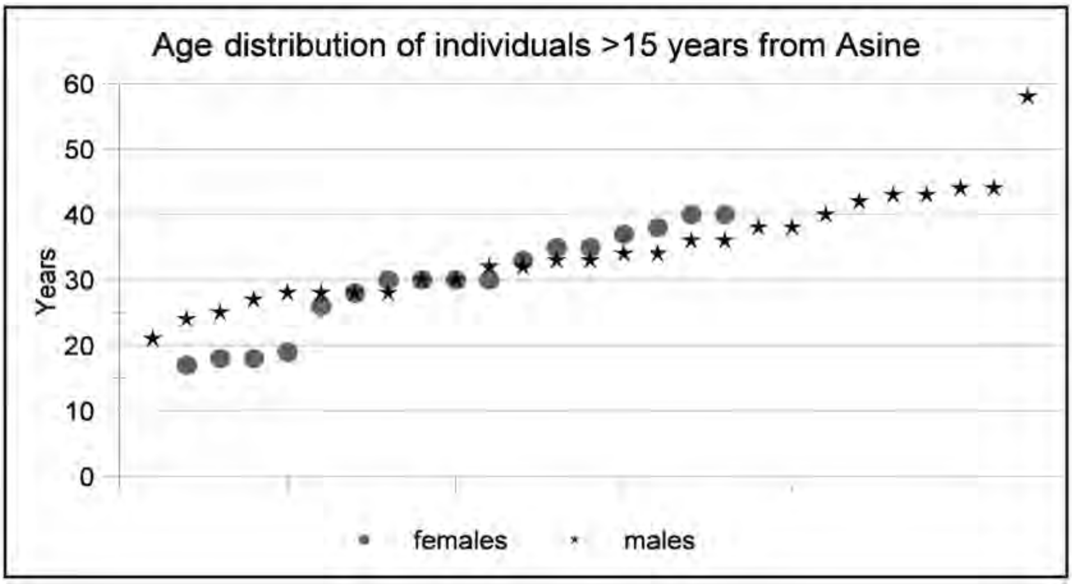

Fig. 5. Age and sex distribution of individuals >15 years of age at Asine.

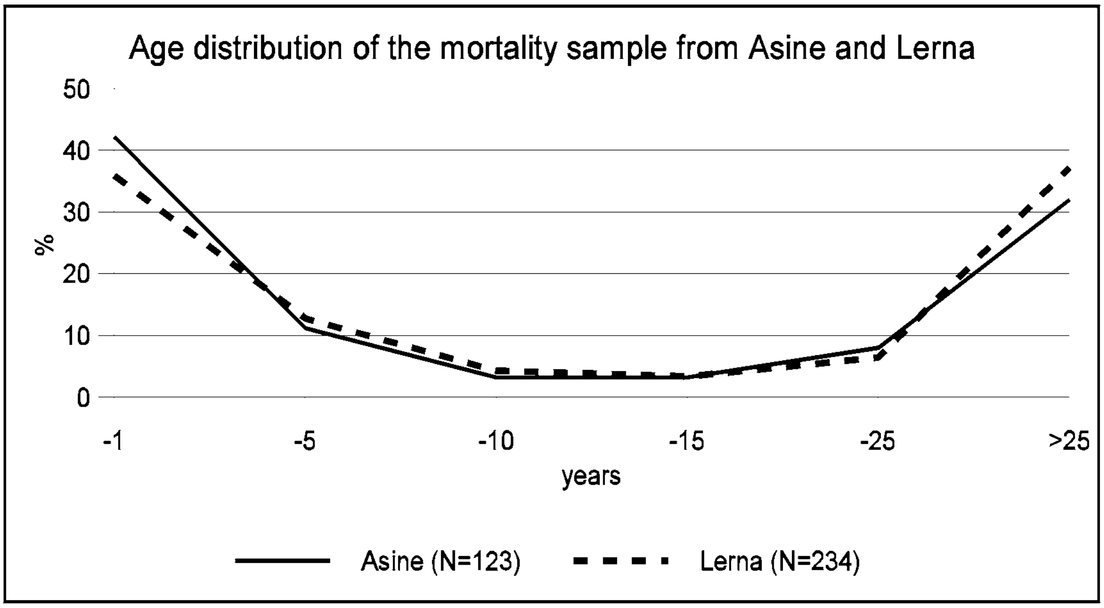

Fig. 6. Age distribution of the mortality sample from Asine and Lerna

high representation of the very young individuals in the Asine sample (*Fig*. 6).[168]

This situation is rare in archaeological populations, since it is commonly assumed that infants are likely to be underrepresented due to taphonomic factors or differential burial treatment.[169] In pre-industrial societies a *c*. 30% infant mortality is often mentioned as a plausible figure for a society with high infant mortality.[170] The identification of such a large amount of subadults could *partly* be explained by the fact that I considered an MNI calculation necessary for the part of the Asine population I analysed. When the MNI procedure used in this analysis is added to the already identified individuals, there is a better chance of obtaining a more realistic estimate of the subadult portion of the grave population than otherwise would be the case.

The large number of infants in Lerna is commonly referred to as a very high figure and possibly linked to the heavy death toll caused by malaria.[171] There is a larger percentage of infants in the Asine sample than in Lerna, while the adults more than 25 years of age make up 32% of the population at Asine. The U-shaped age curve agrees fairly well with that of the mortality samples from developing countries like Peru, and to some extent Brazil.[172] The early deaths of four women (16–20 years of age) could perhaps represent deaths in childbirth (*Fig*. 5). In short, this sample seems to correspond to what could be expected from the composition of a 'dead population' in a non-industrialised country.

An often posed question before undertaking a study of a skeletal material is whether the sample is sufficiently large. Unfortunately there seems to be no straightforward answer to this question, as the answer depends on *which* questions are put to the material. If the main purpose is to obtain an accurate demographic profile and no 'magic number' is available, common sense and a quick look at the age and sex distribution of the data is recommended by Waldron.[173] If the question is how many observations it takes to obtain, for instance, an accurate mean measurement of some variable, a statistical formula could be used to get an indication of a reasonable sample size.[174] The Asine material consists of 103 subadults, which can be regarded as a fairly comprehensive sample in relation to other excavated material from the Mediterranean area. As a comparison, the 137 subadults from Lerna are often considered as a 'large' sample and are often used in palaeodemographic comparisons.[175] Of course, a 'small' sample should not be disregarded on purely numeric grounds if the material is considered important and worth studying from other aspects.[176]

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168 The age distribution in the Asine sample was calculated using the age determinations made by Fürst (1930) and Angel (1982), and adding the 'new' age-determined individuals (subadults and adults) which had been identified during my analysis (i.e., the MNI). Only the individuals which were not attributed to published graves were used to prevent already identified individuals from being counted two times. The data for the Lerna sample was estimated from Angel's (1971, 70, table 2) age determinations.

169 See previous discussion about these variables in chapter 1.3.2 and chapter 2. Walker 1995, 31–47.

170 Waldron 1994, 23.

171 Angel 1971, 71–72; Brothwell 1971, 117.

172 Waldron 1994, 18, fig. 2.4.

173 Waldron 1994, 24.

174 $n = (Z_\alpha x\ s/d)^2$ n = the number of cases required, Z_α = the value of the *t*-distribution corresponding to a p-value ≤ 0.025 (two-sided), i.e., a 95% probability that the observed mean is reflecting the underlying population mean. It is usually taken at $Z_\alpha = 1.96$ (for large samples; Z_α decreases with smaller sample sizes), s = the standard deviation of the parameter, d is arrived at as an arbitrary decision. Waldron 1994, 24.

175 Brothwell 1971; Henneberg 1977; McCaa 1998.

176 The effect of a small sample is usually a low precision of the study (precision = absence of random errors). The relation between the precision and sample size is often explored in modern epidemiological studies by means of so-called 'power calculations' (i.e., the relation between the cost and precision in a study). Norell 1987, 36f. See also Waldron 1994, 81f.

A serious problem for the Asine material is the incomplete preservation of the individuals. Since some of them are represented by only one or two bones, it is difficult to obtain a sufficient number of bones to make statements about certain anthropometric variables, as for instance growth of the long bones. By using the formula for calculation of a suitable sample size recommended by Waldron, it can be noted that 100 femurs are needed for a correct estimation of the mean femur length of newborn infants.[177] Unfortunately only 31 were complete enough to enable accurate measurements.

There is also a problem that concerns the time period of the study: due to the nature of the Asine material it cannot be divided into narrow chronological periods; instead, the bones from the Middle Helladic period must be analysed as a single cohort.[178] This means that possible fluctuations in the age-dependent deaths over time will be unknown. The only thing that could be calculated in this case is the mean death age over a period of approximately four hundred years. Any peaks in the mortality of a certain age group during this time span will only cause a slightly raised mean in that particular group.

Given all the problems of the analysis of skeletal populations in general, it is evident that a good comparability between different samples is most important if we should be able to use them for inference of bio-cultural changes over time and between different sites. An analysis of several materials is often crucial since most collections of human remains from the eastern Mediterranean area are scanty samples of less than a hundred individuals, often only some ten.[179] Unfortunately, the different methods used in for instance age determinations as well as the innumerable ways of recording pathological changes make it very difficult to compare the data gathered by different scholars. In my opinion, the lack of comparability is one of the biggest problems in osteological analysis. To obtain an optimal comparability between the different materials, they should be analysed with the same methods and preferably also by the same investigator. This is almost never the case even if efforts in the right direction have been made to develop standards for methods of recording.[180] Also the current work suffers from the discussed limitations regarding comparability and small sample size, and this does of course have unknown implications for the study. Despite these circumstances I have compared my data on the subadults from Asine with the sample from Lerna. I think that by bearing these weaknesses in mind and combining the investigations of the skeletal remains with other archaeological evidence one can justify such comparisons, and indeed even make them indispensable.

4.2 GROWTH AND THE 'BIOLOGICAL MORTALITY BIAS' IN SUBADULTS

Stature in relation to age has long been used as an important assessment of nutrition in modern healthcare studies on contemporary populations.[181] It has also been used as a measurement of the general health of archaeological populations. Since a good correlation between stature and the length of the long bones is known to exist, the measurements of the different bones are often plotted as 'growth curves' on a graph where the chronological age is a known variable.[182] The curves obtained from populations in non-industrialised countries are often compared to a reference group of healthy individuals from industrialized countries. To compare an archaeological population with a modern one is perhaps hazardous since we do not know how the environment and the genetic composition might have affected the growth of the children in past societies.[183] However, modern studies of children from different cultures and environments have shown that the effects of the genetic differences on growth are small before puberty. In the pre-puberty years nutrition (and the synergistic relationship with disease) has the greatest impact on the growth process of the long bones.[184] The general opinion seems to be that it is possible to use modern data for comparison with earlier cultures under the condition that the populations are similar in respect to environment and in some cases also genetics.[185]

Some problems are connected with the measurements of health through comparisons of skeletal growth: a much debated problem in biological reconstructions of past populations is whether the stature calculated from subadult skeletons is representative of the contemporary living children of that community. In other words, if most of the skeletons from children in a sample have short bones for their age, is it rea-

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177 The standard deviation used is 10.2 mm as calculated by Stloukal & Hanáková (1978) for the Slavonic child skeletons dated to 700–800 A.D. I defined the tolerated margin of error to 2 mm of the population mean. However, if the margin of error is allowed to be greater, for instance 4 mm, only 25 individuals are needed.

178 The same holds true for Lerna as well, see Angel 1971, 69.

179 See Triantaphyllou 2001 for an excellent example of a bioarchaeological study combining data from several sites (Northern Greece) and chronological contexts.

180 In 1988 Dr. Jerome Rose was appointed by the Paleopathology Association, (fifteenth annual gathering at Kansas City, Missouri), to chair a committee for the work on standards concerning recording and reporting human remains. The result was the volume *Standards for data collection from human skeletal remains*, which is commonly consulted. Buikstra & Ubelaker 1994.

181 Stature or height is just one of several anthropometric measurements that is considered useful for determining the nutritional status in children: the most frequently used are weight-for-age, height-for-age, weight-for-height, arm circumference. Gopalan 1992, 35.

182 As emphasized by Saunders (2000, 148), these curves are not true longitudal growth curves since they derive from a sample of dead individuals whose bone length could be measured only once. When the chronological age is unknown in the archaeological sample, the physiological age estimated from tooth development is often used instead.

183 See further discussion in chapter 5.1. Another problem is that the long-bone measurements of contemporary populations are obtained through roentgenographic examination whereas the bones from archaeological excavations are direct measurements of dry bones. The different procedures make the magnitude of error large and thus the comparability of the two measurements difficult to evaluate.

184 Larsen 1997, 8.

185 Johston & Zimmer 1989, 11–21; Larsen 1997, 9; Saunders 1992, 1–20. However, some scholars argue for the opposite opinion: see, for instance, Ribot 1992.

sonable to assume that the same pattern is applicable for the children who were alive under the same period, or is there a difference between the dead and the living? Saunders and Hoppa have focussed on the issue of this so-called 'biological mortality bias' and examined the literature on studies of subadult mortality and morbidity in relation to survivors/non-survivors.[186] They found that most modern studies indicate that a biological mortality bias exists, resulting in a slightly lower stature for the children in the mortality sample. These differences become bigger with increasing age but still do not exceed three mm of the total femoral length at twelve years of age.[187] The reason for this mortality bias could depend partly on the synergistic effects of nutrition and infection that are primary factors in subadult mortality: i.e. they cause poorer growth in children who are malnourished and/or sick and die at an earlier age compared to the healthy children in the surviving population.[188] The connection between reduced longitudal growth and mortality is believed to be greatest in the first three years of life.[189]

Wood and co-workers regard a deficit or 'stunted growth' in children as a poor measurement of population health of past societies since we do not know the level of mortality or the relationship between frailty and stature.[190] They argue that a high mortality rate would include both frail individuals with short stature and 'healthy' individuals with a higher stature. This scenario would lead to a relatively high mean stature of the mortality sample. In periods of low mortality, only the frail, i.e. short, individuals would be exposed to an early death, and this would lead to a lowered mean stature. They claim that a short stature would *not* be connected to poor health but would instead be an effect of a low mortality which acted selectively to the already 'frail'. The view of Wood *et al*. has been criticised since their argument seems to equate a short stature in general with an increased risk of dying. Their critics mean that small stature is not by itself connected to a higher risk of dying, but the stressful environmental factors influencing growth can also affect stature and mortality.[191] This is certainly true even if it is difficult to disregard the fact that we do not know what impact the different levels of mortality had on the outcome of the sample.

At present, the prevailing opinion seems to be that the differences between the dead and the living children are small and probably a minor problem compared to other problems of method, for instance adequate sample sizes and accurate age determinations.[192] Other types of errors such as those introduced by cultural mortality bias and environmental mortality bias are also important and potentially more dangerous for the studies of subadults from archaeological sites.[193]

Even if a possible biological mortality bias could be considered as a minor problem in relation to other sources of error, it could also have effects on, for instance, the accuracy of the age determinations. One of the major problems in this sample is that most of the individuals had to be age determined through the measurement of the diaphyseal length, since few individuals had their teeth preserved. If a biological mortality bias exists, there is a risk that the age of these individuals will be underestimated if they are compared to another mortality sample because of all the unknowns. Only a few have both long bones and teeth preserved, and when both variables are found, it is still difficult to know with certainty whether the long bones and the teeth belong to the same individual as discussed above.[194] In the cases when bones and teeth could be determined to belong to one individual, the age estimations from the teeth often fall within a wide margin of error (between one month and two years) which is explained by the unknown sex of the individual and the often incomplete (and differential) number of teeth from each individual. Likewise the age determinations from diaphyseal length are often presented as age intervals since it is hazardous to determine a precise age, at least for older individuals. Even when there is an overlap between the age intervals calculated from the teeth and long bones, it is still difficult to know whether the growth process should be considered as normal, and a mean age for both variables is necessary to use for examinations of the skeletal growth.[195]

At present we have to realize that we cannot define or measure any difference that may exist between the living and dead population. This makes any attempt to extrapolate data from the skeletons to the living individuals difficult. Despite this awareness, I will include a discussion about bone length and growth for the cases where it can be observed (see 5.1). This information is one piece of the puzzle which, when it is used together with other variables, is useful for the interpretation of prehistoric children's lives.

4.3 THE PROBLEM OF INTERPRETING SUBADULT MORBIDITY AND MORTALITY

Since criticism of palaeodemographic analysis based on skeletal material began to appear in the 1980's, much of the debate now seems to have focussed on the three 'osteological paradoxes' discussed by Wood and colleagues: the demographic non-stationarity, the selective mortality and the unknown frailty of the individuals in an archaeological popula-

186 Saunders & Hoppa 1993, 127–151.
187 Saunders & Hoppa 1993, 143, table 4.
188 Saunders & Hoppa 1993, 134.
189 There are also studies that show that the growth of the long bones seemed to continue at the expense of the cortical thickness. If the growth in length were slowed down for a short period, a 'catch up' growth could take place later on in life if the diet was improved at an early stage. This compensation could not be found in the thickness of the cortices. Hummert 1983, 174.
190 Wood *et al*. 1992. Frailty is a term for the persistent biological differences in different individuals relative risk of disease and/or death. See Vaupel 1990, 220.
191 Goodman 1993, 283–284; Saunders & Hoppa 1993, 145.
192 Larsen 1997, 336; Saunders & Hoppa 1993.
193 Saunders & Hoppa 1993.
194 See chapter 3.3.
195 As already mentioned, I have decided to regard the bones and teeth which do not overlap in age as belonging to different individuals. See further discussion in chapter 3.3.

tion to become ill or die.[196] I will not try to recapitulate this debate here but instead discuss some of the aspects that have become emphasized in this discussion and which are vital for the current analysis and interpretation.

A commonly used technique in demographic investigations is the construction of life-tables.[197] In a palaeodemographic context the life tables are computed from the age-at-death distribution in the skeletal sample. This procedure presupposes a representative sample which is free from observational biases such as, for instance, incorrect age determinations. Further, to be useful (i.e. to yield information on the growth rate of the population and thereby also mortality) they are compared to other demographic models principally of two types: (1) mathematical calculations of hypothetical populations with low life expectancy calculated from modern populations with high life expectancy (the uniformitarian approach). (2) models constructed from data from premodern populations.[198] The use of model populations gives us an opportunity to make comparison with big samples and should in theory be an excellent way of testing different (mortality and fertility) scenarios for prehistoric populations. Unfortunately life tables are not suitable to use on small samples. It should also be born in mind that life tables, as any statistical/analytical methods, are not free from errors and the results depend heavily on the quality of the data entered.

To a certain degree, I agree with McCaa's assertion that palaeodemographic conclusions depend on the fulfilment of too many favourable conditions (i.e. a representative sample of a stationary population with correctly determined ages) to be relied on its own, and therefore other types of data, for instance settlement patterns and cultural and biological settings, need to be considered in connection with the demographic data.[199] Yet, it must be realized that the purely demographic approach, and the bioarchaeological one are two different methods for analysing the osteological material.

Perhaps the most important question before any attempts to analyse osteological data of subadults are initiated must be what does a high proportion of dead children mean in any given society? The level of infant mortality is usually regarded as a marker of the general health of a population since that part of the population is the most sensitive.[200] Diagrams showing the distribution of age at death in skeletal populations can sometimes demonstrate high frequencies in the newborn category, as in the case of Asine (*Fig. 6*), and this has often been interpreted as evidence for high infant mortality. The prevailing opinion now seems to have shifted towards regarding the presence of numerous infant skeletons as evidence for high fertility (i.e. an increasing population by more births).[201] Most demographers mean that fertility has a greater impact on the age distribution than the effects of mortality.[202] McCaa has convincingly proven this paradox to be valid by testing different scenarios of fertility and mortality on stable populations.[203] The resulting graphs show that when fertility is constant but mortality varies, the impact on the age structure is marginal, but when fertility varies and the life expectancy is constant (twenty or fifty years is assumed), the effects on the age distribution are prominent.[204] This holds true especially for the ages above twenty years, but for the age group 0–5 years, no great variations are noticed in either of the hypothesised cases.

I believe that a high proportion of infants in skeletal material is an indirect proof of both fertility and mortality: high fertility can be considered a prerequisite for the presence of a lot of dead infants and since the numbers of newborns 'at risk' cannot be determined from skeletal populations, and because the time period under study is long enough to accommodate several fluctuations in both death and birth ratios, fertility and infant mortality are difficult to separate. On the other hand, the *age-specific* mortality of these young individuals who are influenced by different factors and may vary in time and environment, is possible to explore given the condition of a representative age distribution. Considering these types of questions, the proportion of infants and children to adults could still provide information on the environment and social factors affecting the subadult mortality. However, comparisons of the infant mortality rate between sites are of course not possible. I think that the best way of handling the skeletal data must be to integrate both archaeological and demographic evidence in the analyses and try to estimate the quality of the different variables in each particular case.

The main disagreement that stands between different researchers concerns whether the age distribution of skeletal samples should be regarded as evidence for mortality, fertility or simply as a main source of cultural practice rather than yielding reliable demographic information. This controversy is well illustrated by the two opposing views of Morris and Sallares concerning the interpretation of the changing quantity of subadult burials during the Geometric period: Morris interprets the low frequency of subadult burials in Athens during the EG period and the subsequent increasing number in LG II (around 725 B.C.) as a change in ritual practice concerning the burial customs for children. He regards the burial record as too skewed by the various expressions of ritual beliefs to be useful for demographic purposes: "… no amount of juggling with life tables can obscure the fact that a 200-year period when infant and child mortality combined never rose above 5–10% is absolutely unparalleled in world history."[205] Sallares, taking the more demographic standpoint, believes that an increasing population growth through changing fertility should be reflected

[196] For criticism, see Bocquet-Appel & Masset 1982; Wood *et al*. 1992, 343–370; Wood & Milner 1994, 631–637.
[197] Life table is a method to examine the mortality at given ages in a defined cohort. For a useful description of the history and nature of life table calculations, see Acsádi & Nemeskéri, 1970. For life tables constructed from palaeodemographic, data see also Welinder 1979; Sallares 1991.
[198] Sallares 1991, 112; Welinder 1979, 67f.
[199] McCaa 1998, 14.
[200] Wills & Waterlow 1958, 167; Roth 1992, 177.
[201] Larsen 1997, 339. This implies a stationary population (not growing or declining), which is often assumed in palaeodemographic analysis.
[202] McCaa 1998; Sattenspiel & Harpending 1983; Johansson & Horowitz 1986; Sallares 1991, 125f.
[203] McCaa uses the data on females derived from Coal & Demeny (1983) series 'region west'.
[204] McCaa 1998, fig. 1.
[205] Morris 1992, 80.

as an increasing number of child (particularly infant) graves since the fertility affects the age distribution more than (does) mortality.[206] Thus, the amount of infant skeletons/graves should be an expression of a low or high fertility and not of the infant mortality. Morris criticizes this mode of application. "By not taking the full range of the evidence into account, he [Sallares] leaves no space for ritual action, and moves directly from excavation to demography."[207]

This is perhaps the heart of the matter: how can we distinguish between the cultural factors and demography? Is it at all possible to use skeletal material for demographic purposes? I find it plausible that an increasing number of subadult graves may in fact be a combination of changing fertility/mortality *and* ritual practices, but it is problematic to separate which factors had the larger impact on the mortuary record. In the present work, a part of the discussion will focus on the interaction between cultural and biological factors which may be responsible for the age-specific subadult mortality.

Even if the presence of nonspecific indicators of stress (i.e. growth disruption and disease) seems to be correlated with increased mortality for specific age categories in subadult samples, these stress markers are seldom found, or associated with, the high mortality found in the perinatal period.[208] The mortality in the perinatal age group is believed to reflect primarily prematurity, congenital defects, complications in connection to birth, and acute diseases occurring immediately after birth.[209] If the high mortality of this age group is due to acute causes, it is also highly unlikely that any 'biological mortality bias' causing a stunting in long-bone growth is found in this age group. In a study of the subadults in two British mediaeval materials, Ribot and Roberts found no (absolute) correlation between the frequency of nonspecific stress indicators and the growth of long bones.[210] However, there are indications that point to a synergistic relationship between the maternal health, foetal malnourishment and diseases occurring in the infant immediately after birth.[211] This relationship and other probable causes of death during the subadult period will be discussed in sections 5.1–5.3.

Actual identification of pathology in subadults is a problem even in well preserved assemblages. Unfortunately, not all diseases leave traces in the skeleton and most of them that actually do are often of a nonspecific origin: i.e. many different diseases leave similar traces which makes the primary cause difficult to distinguish. There are mainly three ways that a bone can react to a disease process: formation of new bone tissue, resorption of bone, or a mixture of bone formation and resorption.[212] Furthermore, the disease often has to be of long duration and usually in the final stage, before the skeleton becomes involved.

The bone tissues of subadults are different from those of adults due to the continuing growth process of the child. The infant skeleton consists of fibre bone (also called woven bone), which is more porous than the mature bone that consists of so-called lamellar bone. The normal growth process, which implies an apposition of new bone, can sometimes be mistaken for the type of bone deposited as a response to an infection or trauma.[213] Also, the fragile nature of bones from small children makes them susceptible to changes from the soil which may resemble pathological conditions. The problem of separating a pathological change from normal bone growth in subadults has not yet been solved.[214] Owing to these difficulties of interpretation, many studies do not include children under the age of 1–2 in their examinations: this situation makes it impossible to get an impression of the true frequency of subadult bone pathology.[215] There is certainly a need for more research on this topic and further discussions of the possible cases is also important. For this reason I have chosen to describe and illustrate the uncertain cases of bone pathology from Asine where the appearances of the bone seem abnormal (5.3). There are of course several other conditions which are not that complicated to identify, given a well-preserved material, since it is often the distribution of affected bones that is one of the major clues to the aetiology.[216] Yet, most diseases that affect the skeleton are relatively rare among archaeological samples of subadult individuals. This situation makes an examination of a substantial and complete skeletal material necessary to enable an accurate interpretation of the particular pathology and its frequency.

The nature of the Asine sample is not very suitable for making inferences about the prevalence of different markers of stress and disease. Nevertheless, I will discuss the prevalence of some nonspecific markers of stress (i.e. enamel hypoplasia and Harris lines) in the Asine material as it might constitute a useful contribution for future needs, when more subadult materials have been investigated and reported.

Another problem connected to the questions of morbidity is the interpretation of active and healed lesions. Some researchers argue that healed lesions are evidence of a low frailty, i.e. these individuals were fit enough to survive a stress episode, but this does of course depend on the kind of lesion that is observed.[217] How an active lesion should be interpreted is not conclusive, and it has to be considered whether the lesion could be the direct cause of death, a contributing factor or not affect it at all. Unfortunately, this is seldom possible to evaluate.

The lesions most commonly found in subadults are, as mentioned above, often of nonspecific origin. The lesions are by themselves seldom a cause of death even if they could possibly be associated to this outcome. The question of interpretation is certainly related to the problem of the unknown individual frailty that has been stressed by Wood *et al*. These scholars argue that diseases connected to nutritional stress tend to be connected with an earlier death even if the lesions are healed, while other pathologies, like, for instance, healed

206 Sallares 1991, 24f.
207 Morris 1992, 80.
208 The peak age interval for the non-specific lesions, Harris lines and enamel defects, is reported to be between *c*. one to three years. Clarke 1980, 79–85; Ribot & Roberts 1996, 67–79; Rose, Armelagos & Lallo 1978, 511–516.
209 Mensforth *et al*. 1978, 12.
210 Ribot & Roberts 1996, 67–79.
211 Saunders & Hoppa 1993, 138; Higgins 1989, 175–204.
212 Roberts & Manchester 1997, 4f.
213 Lewis & Roberts 1997, 584.
214 Ribot 1992, 83.
215 Ribot 1992.
216 Roberts & Manchester 1997, 6.
217 Wood *et al*. 1992, 353.

periostitis, do *not* seem to predispose individuals to an earlier death.[218] Thus, the etiology of the observed pathology is crucial for the interpretation as well as for the understanding of the individual frailty. It must also be remembered that the absence of pathology does not presuppose a healthy individual. Subadults are always more susceptible to disease than adult individuals, and may run a greater risk of dying before the skeleton becomes affected. In most cases skeletal lesions do not develop until the disease is chronic or has reached its last stage. It is of course impossible to know for sure if the children without lesions died of causes unrelated to disease or if they died of acute illnesses before the skeletons were affected.[219] This problem can only be approached by looking at the aggregate death age distribution in relation to the investigated lesion, but *also* by taking into consideration the find circumstances and other archaeological variables.

Wood *et al*. also discusses the risk of an over-representation of different conditions that either contributed to, or were a direct cause of death. They mean that the selective mortality of these individuals could give rise to an interpretation of a too high prevalence of the disease in the living population. Both pathological changes given special attention in this study (enamel defects and Harris lines) are of a kind that indicate survival and recovery for some time after the event. These lesions also form a more or less permanent record of the stress period which caused them to develop.[220] This make enamel hypoplasia and Harris lines suitable for investigation even if, given their nonspecific nature, they are difficult to interpret.

In my opinion the problem of low sensitivity does not make as great an impact on these cases as with other lesions.[221] If the sample is representative and the investigation carefully performed it should at least be possible to *identify the prevalence* of these conditions in the skeletal population since the lesions are usually clearly visible. It has also been found that even minor illnesses (as for instance influenza) of short duration might cause Harris lines to develop. Other diseases like, for instance, tuberculosis more rarely cause skeletal lesions and then only in advanced cases. Thus, the sensitivity of palaeoepidemiological studies of Harris lines can be regarded as good.

However, this is true only if the investigation focuses directly on the *specific lesion*. If the aim is to identify the underlying causes for the lesion, the sensitivity must, as several scholars note, be disappointingly low since the conditions that make the lesions develop are multiple and not yet fully understood. Accordingly, the individuals at risk for developing the lesions cannot be predetermined.

To sum up, the most important point to be made here is that the frequencies of skeletal lesions in the death assemblage and the prevalence of disease in the living population are not analogous.[222] Therefore the skeletal populations have to be *compared with each other* and their correspondence to morbidity and mortality in contemporary living populations must be explored. Furthermore, because of the unknown individual heterogeneity and frailty, multiple possibilities of interpretation must always be considered and additional evidence (such as, for instance, archaeological and anthropological aspects) taken into account.

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218 Wood *et al*. 1992, 353f.

219 Wood *et al*. 1992, 365. On the other hand, the cause of death is seldom of primary interest for palaeoepidemiologists since it usually tells little about the health of past populations. Goodman 1993, 282.

220 There are indications that Harris lines can be remodelled in adult individuals: thus, they could not be considered as definitely permanent. The mechanisms behind this selective remodelling are not clear enough to avoid this problem; investigations should be restricted to subadult individuals. Hummert & van Gerven 1985, 297–306; Lewis & Roberts 1997, 581–586.

221 Sensitivity is an epidemiological term for the probability of an ill individual to become classified as ill, cf. specificity = the probability for the healthy to become classified as healthy.

222 Ubelaker 1992, 364; Wood *et al*. 1992, 365.

V THE OSTEOLOGICAL CHILD

5.1 GROWTH

The comparison between age estimated from teeth development and age estimated from the diaphyseal length of the long bones is a delicate matter.[223] The main intention of studies focussing on this type of comparisons has often been to establish the relation between age determined from the teeth and the length of the long bones, or to examine the health of subadults.[224] As a rule, individuals with short bones relative to the chronological age (as defined by the development of the teeth) are considered to have suffered from arrested growth.[225] This inference is not as straightforward as it seems, since the growth rate and the final length of the long bones vary between individuals, as well as between populations with different living conditions and genetic composition. One question that must be asked before discussing the growth of children is whether it is possible to use longitudinal growth of the long bones as a point of departure for theories about the general health of subadults of all age categories. It has been argued that the most common diseases which affect small children are acute, and would not last long enough to impair the growth of the skeleton: i.e. growth would not be a reliable measurement of the health of *all* children in a given population.[226] In spite of these difficulties, growth continues to be used as one of the most important variables available for measuring the general level of health in both modern and ancient populations.[227]

One obstacle is that it is difficult to find an adequate reference standard for comparison of growth between populations.[228] Unfortunately, there are only two options: the archaeological sample which, merely by being a skeletal sample, represents children who died, and the modern sample which often consists of healthy living children measured by radiographic techniques.[229] In this study, I find it useful to look at both types since they might respond to different questions. It seems inevitable to use the modern data from healthy children as a reference for the purpose of examining the health, but it is also necessary to look at other archaeological populations which are probably more close to the Greek Bronze Age children regarding environmental factors, in order to discern any similarities or differences in growth.

Different methods have been used to compare bone length and age. The most traditional way is to construct so-called skeletal growth profiles (SGP)[230] from the mean measurements of the long bones compared to age intervals given by the teeth. This enables SGPs to be constructed, which make comparisons easier between different samples. As has been pointed out by Hoppa and others, the limitations of these cross-sectional data are that they do not give any indications of the variation within the sample.[231] In the cases of small samples Hoppa and Johnston recommend the plotting of complete distributions instead of curves.[232] Further, the importance of illustrating the sample variance, preferably by calculating confidence intervals, is stressed.[233]

The usefulness of presenting the data in the form of percentage of mean adult bone length has also been emphasized.[234] The advantage of this procedure is that it enables different populations with different limb proportions and different mean adult statures to be compared with each other—this might give some insight into the different modes of growth during the subadult period.[235] This procedure can also be used to examine whether the difference in mean adult stature between different samples is responsible for observed differ-

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223 The problem of age determinations from diaphyseal length has also been discussed in relation to a possible 'biological mortality bias' in chapter 4.2.

224 See, for example, Hoppa & Fitzgerald 1999, 1–31, with further references; King & Ulijaszek 1999, 161–182; Larsen 1997, 6–61; Saunders 1992, 1–20; Saunders, Hoppa & Southern 1993, 265–281.

225 In contrast to skeletal development and growth, the timing of tooth formation (in contrast to eruption and exfoliation) is not sensitive to negative environmental factors like disease and malnutrition. Larsen 1997, 23f.

226 Lovejoy *et al*. 1990, 533–541; Sundick 1978, 229–247.

227 Johnston & Zimmer 1989, 12f.; Panter-Brick 1998b, 67f.

228 Johnston & Zimmer 1989, 12; Saunders & Hoppa 1993, 136.

229 The most frequently-used study is Maresh's (1955) examination of long-bone growth in (Caucasian) American children. The measurements given in this article have been taken directly from roentgenograms where no corrections of the soft-tissue distortion introduced by the camera was made.

230 Despite the fact that no real skeletal growth profiles can be constructed from archaeological populations, this term will be used to describe a graphic illustration of diaphyseal length.

231 Hoppa 1992, 281–283.

232 Hoppa 1992, 283. Johnston cautions against using small population samples (<1000) for growth analysis. In such cases it is better to look at the individual data separately than force them into either too small or too large categories. Johnston 1968, 58–59.

233 Saunders, Hoppa & Southern 1993, 276.

234 Hoppa 1992, 281; Hoppa & FitzGerald 1999, 8.

235 Hoppa 1992, 284.

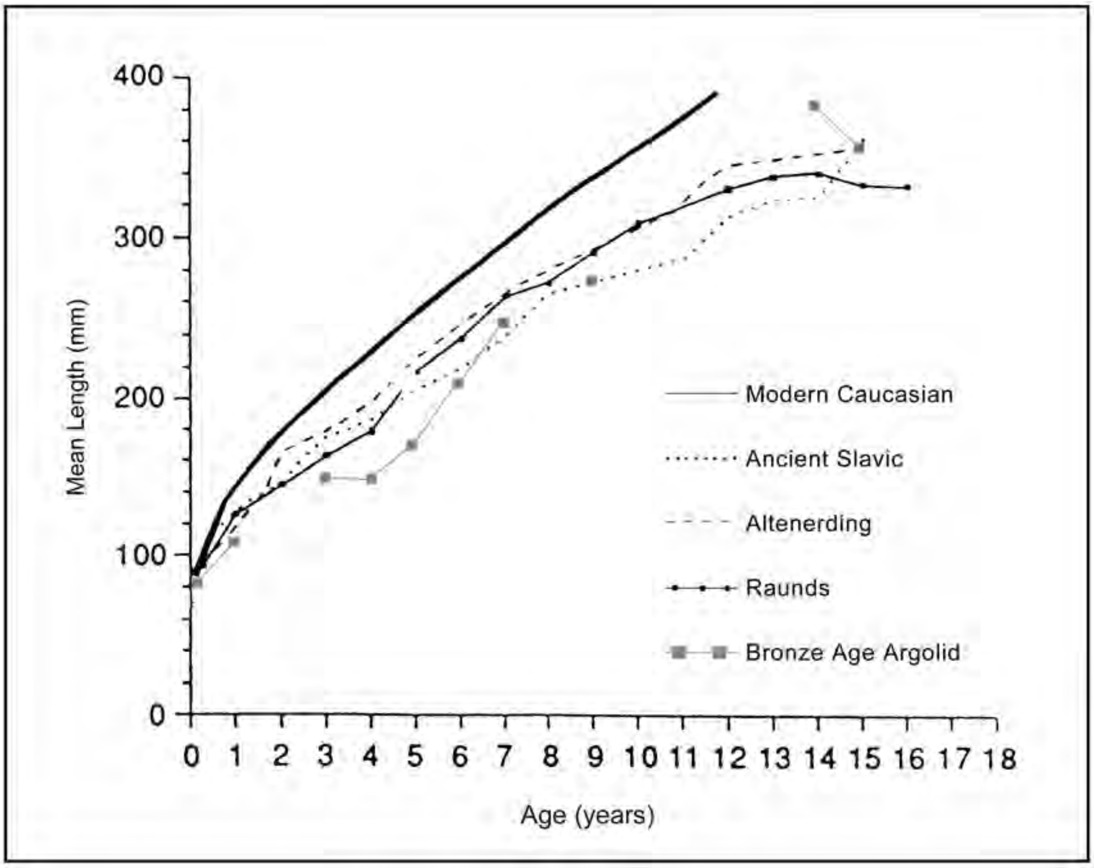

Fig. 7a. SGPs for diaphyseal length of femur for Modern Caucasians (N = 175), ancient Slavic (N = 249), Altenerding (N = 52), Raunds (Anglo-Saxon) (N = 60) and Bronze Age Argolid samples (N = 71). Adapted from Hoppa 1992, 280.

ences in subadult bone length between populations. The limitations of this method are, of course, that an adult sample consisting of individuals who experienced growth disturbances during their childhood would not have reached their optimal terminal height, and this could result in an underestimation of the subadult growth disturbances. However, few studies have used this approach and accordingly, there are not many groups of material for comparison.

As mentioned before, observations of long-bone growth could be made in only a few cases of the Asine sample since teeth and long bones were seldom preserved at the same time in the same individual. The sample from Lerna was larger and contained more individuals with both teeth and long bones preserved. In this study, the observations available from the two Argive samples have been compared to SGPs of three European samples,[236] and a sample of modern American children as used by Hoppa in a study (*Fig. 7a–b*).

The comparison shows that the Argive children may be considered small for their age if compared to the American sample. Moreover, many of them also seem to be smaller than the European archaeological samples, at least up to *c.* six years of age.[237] The curves used for comparison are smoothed mean curves deriving from small samples: therefore, indication of the actual variation could not be obtained.[238] To avoid the possible errors introduced by matching these SGP curves, I plotted the complete distribution of femur and humerus measurements from Asine and Lerna in a graph showing also the modern American max/min curve as well as an Anglo-Saxon sample from the cemetery of Raunds (*Figs. 8a–b* and *9a–b*).[239]

A first look at the femur diagram showing all ages (*Fig. 8a*) suggests that the Argolid children lag behind the children in the modern sample, and to some extent also those in the Anglo-Saxon one. However, the diagram in *Fig. 8b* (and *9b*) showing only the first twelve months demonstrate that some children actually succeed in reaching the modern interval, and these individuals all belong to the Lerna sample. The ma-

[236] The dating of the skeletal materials used for comparison are Raunds: tenth century A.D. (Hoppa 1992, 275–288); Slavic: ninth century A.D. (Stloukal & Hanáková 1978, 53–69); Altenerding: sixth and seventh centuries A.D. (Sundick 1978, 228–229). The study of modern American children was published by Maresh 1955, 725–742.
[237] It is possible that more individuals (from Asine) with a stunted bone growth could be added to this sample, but to minimize the risk of over-interpretation I have decided to regard uncertain cases (for instance MNI-unit S08), where the age from bones and teeth does not overlap, as two individuals, instead of one stunted individual.
[238] Hoppa 1992, 279, 281.
[239] Hoppa 1992, 275–288; Maresh 1955, 725–742. The min. and max. values for each age category were presented in sex-specific tables but I have combined these values in my graphic illustrations.

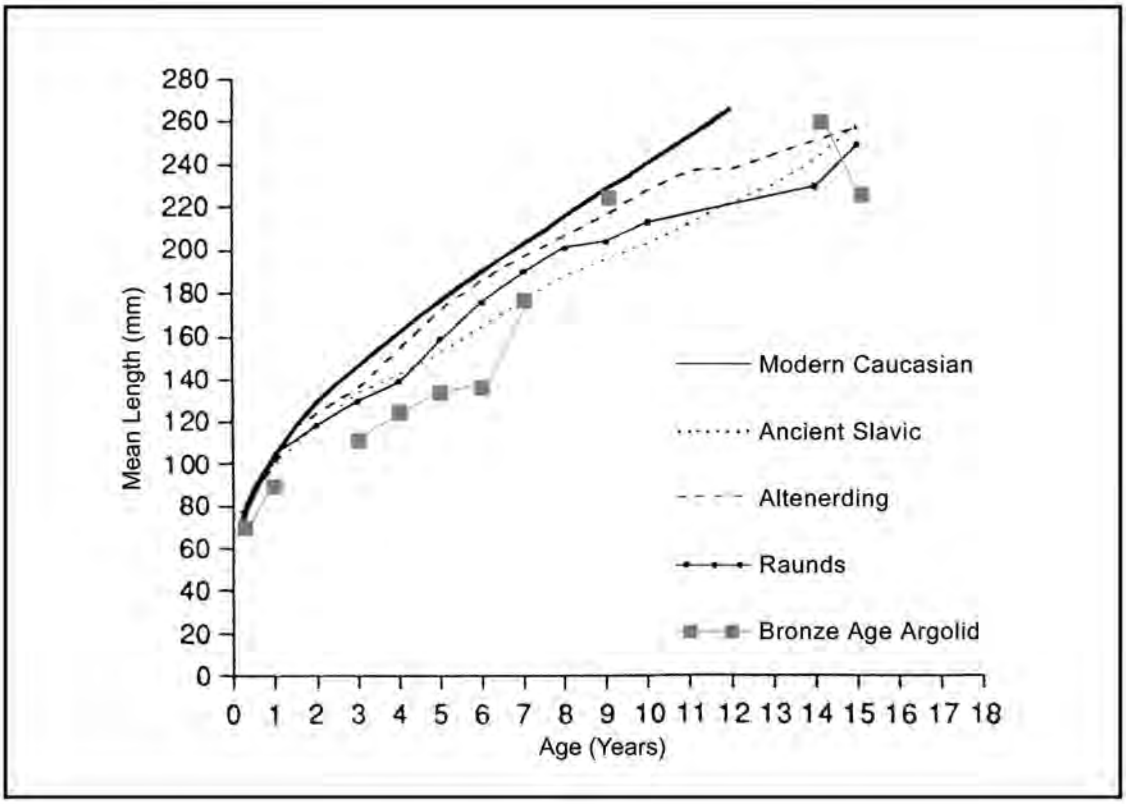

Fig. 7b. SGPs for diaphyseal length of humerus for Modern Caucasians (N = 175), ancient Slavic (N = 222), Altenerding (N = 40), Raunds (Anglo-Saxon) (N = 52) and Bronze Age Argolid samples (N = 74). Adapted from Hoppa 1992, 280.

jority of the children lie under the American interval, which may indicate individual differences in the nutrition and/or disease during the first months—perhaps some children were rapidly weaned or not breast-fed at all (supplemented with cow or goat milk?).

The growth of the humerus corresponds to the femur but a few more individuals seem to reach the American level when this bone is considered (*Fig. 9a–b*).[240] Even if the American data starts at the age of two months, it looks as if the possible growth retardation in the Argive children begins some time interval after birth: the individuals who fall below the modern interval are all aged three months or older, regardless of which bone is studied. It is difficult to know how long after birth the growth of the infants could be connected with the effects of bad maternal health. According to Saunders *et al.*, a reduced growth in children less than two years can be associated with poor maternal health.[241] If the health of the Argive foetuses was affected already in the womb, one might assume that they would show a reduced growth during the first three months after birth as well, which they do not. On the other hand, these comparisons comprise individuals who were measured only one time, after death. It is not possible to know if they were small for their age already at birth. It has been argued that adequate nutrition provided by breast-milk during the first 3 months can give rise to a 'catch-up growth' in infants who were born small for their age (or born pre-term?). During these first months they can be expected to reach up to (and even exceed) the modern norms.[242] The decreased growth in the infants *after* three months could possibly be indirectly associated with the mothers health, since it has been claimed that severe undernutrition in lactating mother's could limit the quantity of breast-milk after the first three months.[243] However, more recent studies show that undernutrition in lactating women has very little effect on the quality and quantity of their breast-milk.[244] In any case it is reasonable to assume that weaning off breast-milk, or at least the introduction of some complementary food was commenced after a few months which exposed the children to new sources of infections and perhaps also malnutrition, thus leading to a reduced growth. Another possibility is that a normal bone length (a few

240 The reason for illustrating only the graphs of femur and humerus is due to the fact that these bones accounted for most observations of length and dental age in the Lerna sample. However, when the other long bones were examined, the result did not differ from the humerus and femur pattern in any marked degree.
241 Saunders, Herring & Boyce 1995, 84.
242 King & Ulijaszek 1999, 175.
243 Chávez & Martinez 1980, 274–284.
244 Prentice & Prentice 1995, 391–400.

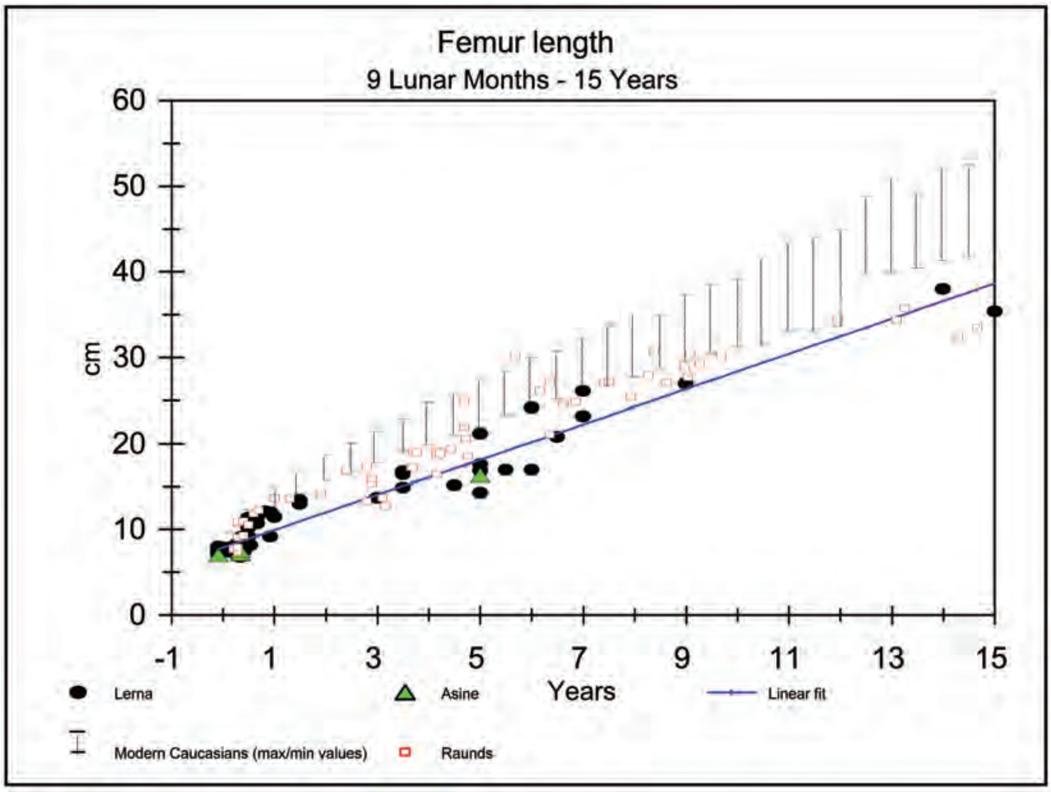

Fig. 8a. Diaphyseal length of femur in subadults (9 lunar months to 15 years of age).

months after birth) could have been maintained at the expense of the cortical thickness, as the cortices are known to be affected first, before the length.[245] Since no examination of the bone mass has been made on these bones, this possibility should not be excluded. Nevertheless, the diagrams (*Figs. 7a–9b*) show a concentration of longitudinal measurements below both the American and Raunds intervals, and it will be argued that this is an indication of the severity of the physiological stress imposed on the children in this material.

It is difficult to know how much of the divergence in growth might be explained by the fact that the mean adult stature of the population from MH Asine/Lerna is lower that of the modern American population. To control for this possible source of error I calculated the percentage of achieved adult femur length for the Argive and American samples (*Fig. 10*).[246]

It is evident that the growth performance of the ancient Greek children is similar to the American sample up to *c.* two/three years, and it is also around three years of age that their plotted distribution of femur/humerus measurements shows a more definite digression from the American interval (*Figs. 8a, 9a*).

Since the different methods of looking at the growth data seem to indicate the same course of events, any possible genetic differences between the Greek Bronze Age samples and the modern American samples (as well as other archaeological materials) should not be the major cause for the observed differences in subadult growth. These individuals undoubtedly form far too small a sample to allow any definite conclusions, but the pattern might indicate that the health of these Argive children deteriorated with increasing age and that the stunted growth of some infants originated in malnutrition/disease-related causes which became discernible after three months of age, and grew even more pronounced around three years of age. This picture seems to fit the pattern of what is previously known about growth and nutrition: most scholars seem to consider environmental effects as a main cause for stunting in archaeological populations and it is also known that children less than six years of age are most sensitive to malnutrition.[247] No large differences in growth seem to occur between populations during the first year of life, and this has been explained by the frequent practice of breast-feeding during this period.[248] One of the commonly observed differences

245 It should be noticed that the bone width is affected first, but if the stress period is severe and long lasting the length might be affected. Goodman *et al.* 1984a, 19. Mays (1999, 307f.) found that the long-bone growth of medieval children from Wharram Percy (northern England) was maintained at the expense of cortical bone apposition.

246 Maresh 1955. The figures of the American data calculated from Maresh are the male and female average from the 50th percentile (from 12.6 years the measurements that included epiphysis have been used). No adult bone length is reported but Maresh states that full length is attained at 16/17 years for girls and 17/18 years for boys (>18 for a few slow-maturing boys). In consequence, these lengths have been used as a base for calculation of percentage of the adult length. Tanner (1981, 29) notes that the growth is virtually complete at 16.5 ± 2 years of age in modern populations of North America and western Europe.

247 Cook 1984, 237; Larsen 1997, 8.

248 Hoppa 1992, 283. A separate study (using chemical or stable isotope methods) of the breast-feeding practices of Bronze Age children from Asine is currently being projected.

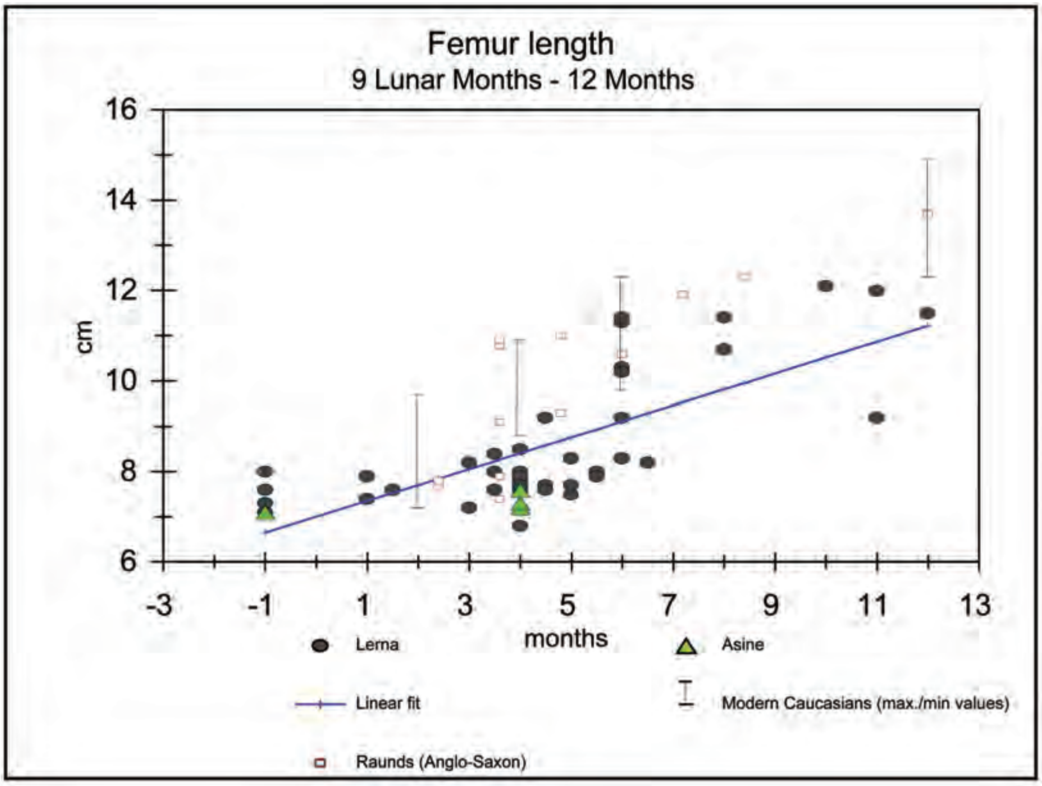

Fig. 8b. Diaphyseal length of femur in subadults (9 lunar months to 12 months of age).

between modern and prehistoric populations is a reduced growth in length between 2–5 years of age in the prehistoric populations.[249] This reduction in growth is often interpreted as caused by undernutrition, i.e. a poor weaning diet.[250]

The observation of a modern and an ancient population where the difference in growth between them increases by age is also seen in a Swedish study of three samples of children from the 18th century.[251] The discrepancy between the populations in the Swedish study is ascribed chiefly to two factors: the living conditions of the individuals which become more variable with increasing age, and the difficulties in making accurate age determinations of older individuals leading to wider age intervals. It is possible that these wide age intervals cause an overestimation in age for some of the individuals, and thereby increase the variability in bone length.[252]

Saunders *et al*. explain the differences between their archaeological samples and the modern one which become more visible after two years of age as caused by methodological problems during the age determinations.[253] Other factors which might bring about the observed differences are: smaller sample size in the older age groups, as well as a genetically determined individual variation which becomes more visible with increasing age.[254] It is possible that sexual dimorphism could add to the observed differences in growth which are visible from six months of age. As has been pointed out by Humphrey, the same biological age in individuals will include males of an older chronological age.[255] The effect is likely to be that these individuals exhibit longer bones than their female counterparts and that this difference will increase with growing age. However, this difference usually develops in the adolescence and is probably not very prominent in lower age groups. As far as this data is concerned, the effect of sexual dimorphism is considered minimal, although of course difficult to ascertain.

In my opinion the differences between the Argive and American samples cannot solely be explained by methodo-

[249] Goodman *et al*. 1984a, 18; Saunders, Hoppa & Southern 1993, 273.
[250] Goodman *et al*. 1984b, 297; Hoppa 1992, 283; Saunders, Hoppa & Southern 1993, 273.
[251] Isaksson *et al*. 1998, 135f.
[252] Isaksson *et al*. 1998, 135f.; Saunders, Hoppa & Southern 1993, 274.
[253] Unfortunately, the age determinations in most studies are based on different standards of tooth formation and/or eruption. This makes the comparability difficult to determine, and there is also a risk for the over-interpretation of stunting. Saunders, Hoppa & Southern (1993, 273) have shown that what seemed to be a stunted 2–4-year-old cohort in fact lies close to the modern values of healthy children when they changed the methodology (from the standards of Anderson *et al*. to Moorrees *et al*.) for estimation of chronological age. However, the risk for similar over-interpretations of the variation in the Argolid sample is minimal since the age determinations from the teeth were based primarily on Schour and Massler's dental development chart (reproduced by the American Dental Association, 1982). Hillson (1996, 142) states that when the 'Schour and Massler method' was tested on children of known age it generally performed well in comparison to alternative aging methods. For further information about the dental age estimations in the present study, see Appendix I by H. Soomer.
[254] Saunders, Hoppa & Southern 1993, 274.
[255] Skeletal and dental maturation occurs earlier in females and therefore a sample including both sexes will contain males of an older chronological age. Humphrey 2000, 196.

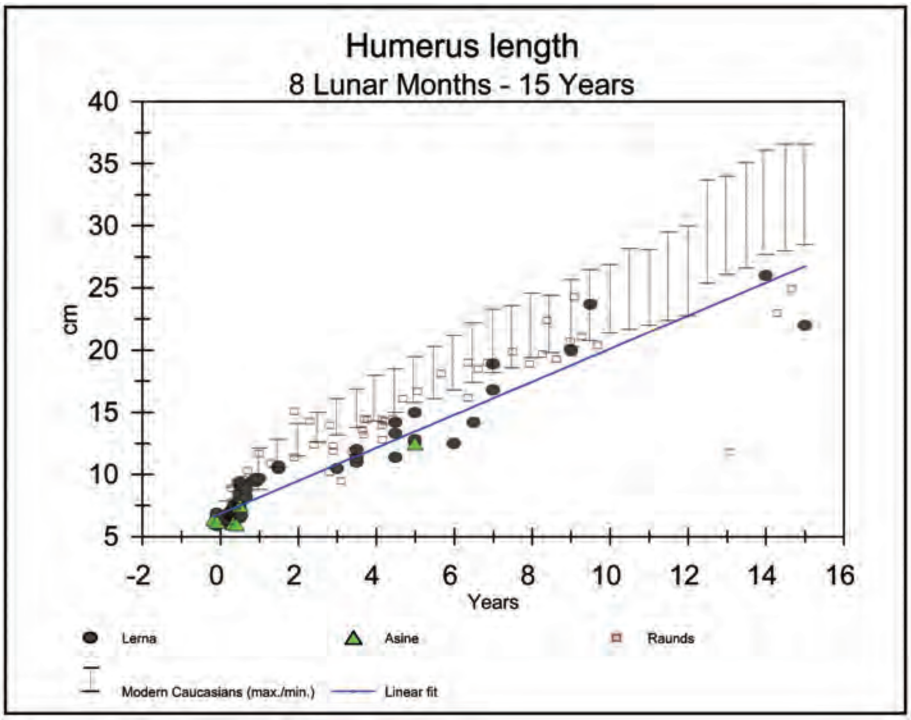

Fig. 9a. Diaphyseal length of humerus in subadults (8 lunar months to 15 years of age).

logical factors. An observed discrepancy between skeletal age (determined from the length of the long bones) and dental age may, by itself, be an indication of reduced growth, since the skeleton will be the first to react to a stress period. Nor should the difference be dismissed as a purely genetic one: I agree with Saunders & Hoppa's interpretation that the main cause for archaeological populations to exhibit generally shorter bones for age than the modern ones' is because of environmental discrepancies (like exposure to nutritional and disease-related factors) rather than genetic differences.[256] It is also evident that the length of exposure to stress will influence the extent of the reduced growth, i.e. the discrepancy between chronological age (here substituted by dental age) and skeletal age will be greater in older children.[257] Certain infections and their synergistic relationship with malnutrition are known to be influential causes for a reduced linear growth in children.[258] Yet, the identification and separation of causes for a reduced bone length are complex, and several factors related to the term 'stress' need to be considered. Also, more factors of the children's life (for instance the sociocultural effects) should be taken into account.[259]

It should be possible to link a reduced adult stature to the arrested growth of the long bones during childhood, in which case no 'catch-up growth' could have taken place. The mean stature at Asine is slightly lower than in the rest of Greece during the Middle Helladic period (159.1 cm compared to 159.8 cm).[260] According to Angel, adult skull base height and pelvic brim index would also be indicative of childhood health—in the Asine individuals these indices are lower than in the rest of Greece during the same period. Angel argues that the combination of these low index values together with a low stature would indicate a lack of meat protein and calories during childhood.[261] The Lerna data demonstrate a slightly different picture: the mean stature (160.5 cm) is higher than in Asine and the data from other parts of Greece. Also the pelvic brim index (80.7) reaches a bit over the values from the rest of Greece (78.8). If the data from Asine and Lerna are combined and compared to the rest of Greece the stature is equal (159.8 cm) but the pelvic brim index is lower (77.8 compared to 78.8) at these Argolid sites. If these two measurements are evaluated, the pelvic brim index is probably a better indication of childhood health since the adult stature could be influenced by genetic differences to some degree.

The other approach to the study of long-bone length considers the utilization of diaphyseal length as an age-estimation technique for subadult materials. This method is frequently used when teeth are missing. In the light of the above discussion about generally smaller bone lengths in archaeological populations, it seems reasonable to assume that using diaphyseal length as a sole criterion constitutes a risk for under-ageing subadult individuals. This has also been confirmed by a study of children with documented ages from a British crypt.[262] If children in archaeological materials are

256 Saunders 1992, 15
257 Ribot 1992, 9.
258 Saunders & Hoppa 1993, 140; King & Ulijaszek 1999.
259 The importance of psychological and cultural factors associated with weaning should not be underestimated since they may have impact on the chosen time of weaning as well as the physical response of the child. Bush 1991, 16–18.
260 Angel 1982a, 107.
261 Angel 1982a, 107, 111.
262 Bowman, MacLaughlin & Scheuer 1992, 216.

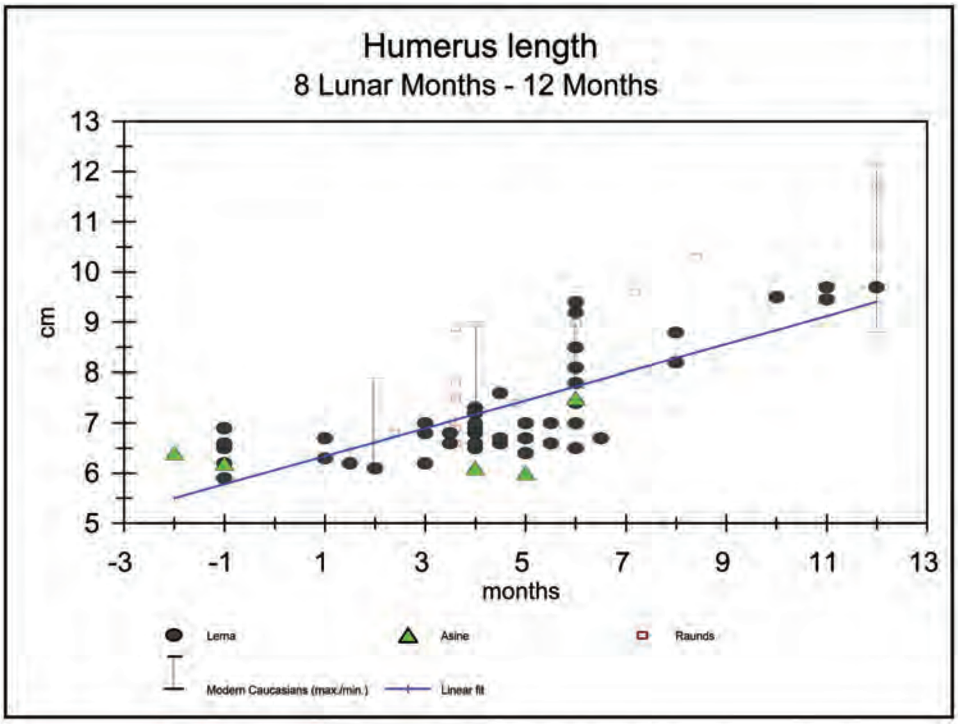

Fig. 9b. Diaphyseal length of humerus in subadults (8 lunar months to 12 months of age).

systematically under-aged, there will be a risk for serious misrepresentations of the factors behind the age-specific mortality. Of course, the magnitude of the underestimation should vary between different sites owing to the state of health at that particular site.[263] However, the relationship between bone and dental age in the current study is not clear-cut. A comparison between the mean ages estimated from long bones and teeth shows a general underestimation of the bone age, but when the error margins are considered, the ages will overlap in the majority (66%) of cases.[264] There are also some examples (26%) where the dental age is actually lower than the bone age: of these 23 individuals there are only three examples where the dental age and bone age do not overlap.

To get an idea about the size of the probable underestimation of the bone age in the Argive sample (n = 90), I have examined the discrepancy between age estimated from diaphyseal length and dental development by means of a linear (least square) regression, also using a 95% confidence interval for the method (*Fig. 11*).

The regression equation indicates a general underestimation of diaphyseal age by two days (95% C.I. 0.3–3.3) for every lunar month the dental age increases. This result would imply that infants determined to be 10 lunar months (i.e. full term foetus/newborn) from diaphyseal length will in fact have a chronological age of 20 days (95% C.I. 3–33 days).[265] Certainly, *c.* three weeks underestimation in age would have important consequences for the interpretation of the large number of neonatal deaths in this material.[266]

The picture of growth in the Argolid children is difficult to interpret, but the general trend is that even if some of the infants less than one year of age reach the modern American interval (and most of them do not), the tendency to fall below

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[263] Bowman and co. workers found that the underestimation of age determined from bone length could be as much as up to 5 years in their English material. Bowman, MacLaughlin & Scheuer 1992, 216.

[264] The error margins of the teeth are those provided by Soomer (see Appendix I) in her analysis of the dental remains. The interval of the long bones derives from the fact that when several long bones from the same individual yielded different age estimations (Fazekas & Kósa (1978) present precise age estimations for the foetal skeletons) they were pooled together, thus forming an age interval rather than a more exact estimation. For further information about the age estimation, see section 2.4.2.

[265] In this case, the regression was performed on the age interval *c.* 0 to 15 years of age, and the mean tooth age was set as the independent variable since the dental development is most closely related to chronological age. It must be emphasized, however, that other methods than linear regression and/or other age intervals give other results. For instance, a reduced major axis (RMA) regression on the same age interval (as in the linear regression) indicates that bone age actually overestimates the tooth age by 1 day per month. This result is probably an effect of the overestimation by bone age as seen in the linear regression in children 5 years (70 lm) of age. Yet, since the vast majority of individuals in this sample are very young (88.4% at Asine, and 82.5% at Lerna are younger than 3 years of age), it would perhaps be more relevant to consider only the age group 0–3 years. In this case, the age determined from diaphyseal length seems to underestimate age with *c.* 7 days per month in the RMA analysis, and by *c.* 12 days per month when a linear regression was applied. However, only the results from the linear regression in *Fig. 11* will be regarded in the following discussion since it seems to be the most conservative estimate of the likely underestimation of age determined from diaphyseal length.

[266] A strange thing is that the age estimation from diaphyseal length over-aged an eight-lunar-month foetus by 1.5–2 months. If this relation based on one individual was generalized to be valid for the whole sample, it might be motivated to regard the long bones that were found together with the two six-lunar-month-old foetuses from E07 and S06, as in fact belonging to these individuals.

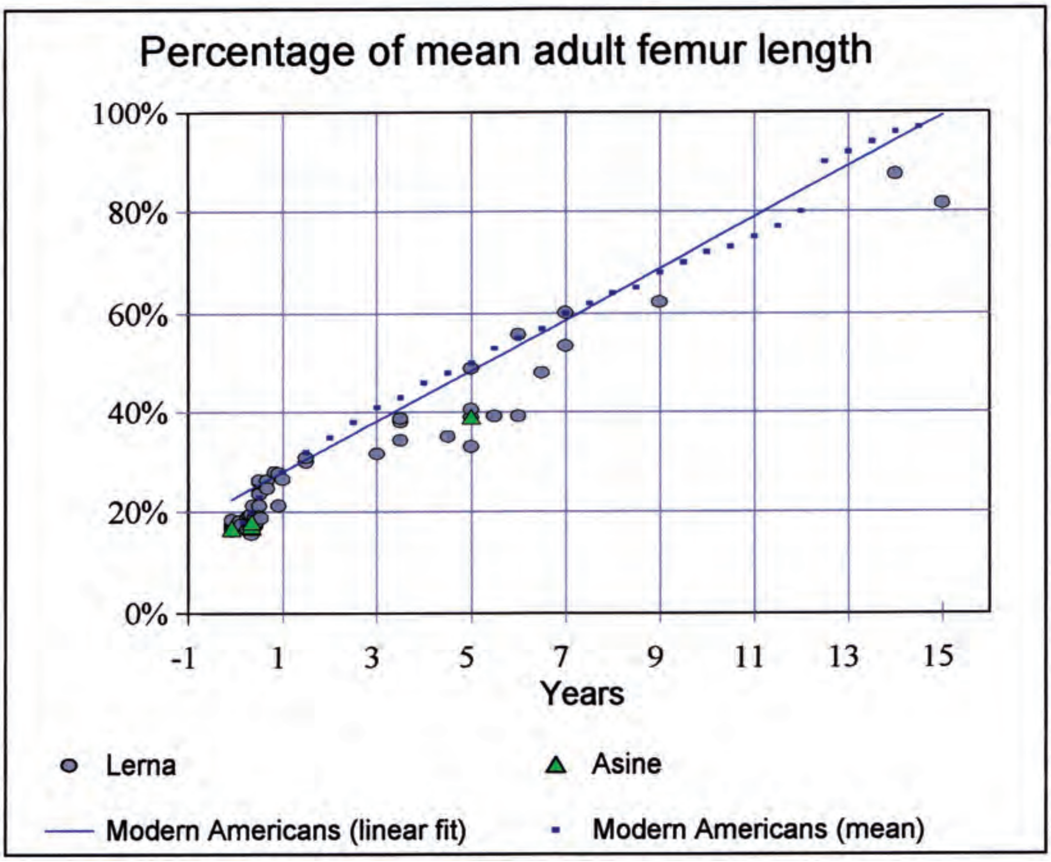

Fig. 10. Percentage of achieved femur length.

the American interval becomes more pronounced after three months of age. After this period even fewer individuals will reach the modern level. The pattern corresponds to the path followed by other archaeological populations used for comparison.

I think that two possible scenarios could be the most likely explanations for this picture: the first scenario would be that the foetuses experience poor growth during the development in the womb and the cortices of the long bones are affected first, whereas the longitudinal growth continues at a normal rate during the first months after birth (since no measurements of cortical thickness have been done on the bones from the MH children, this would not be detectable). After a few months the length of the long bones starts to be affected: this scenario presupposes that the maternal health was extremely bad during pregnancy and that the mother did not fully breastfeed the infant during at least the first three months after delivery. It is commonly accepted that mother's milk will offer good protection from infections and satisfy the baby's nutritional demands allowing a normal growth during the first six months after birth.

The second scenario is that most infants experience sufficient growth during the foetal period as well as some time after birth when they are fully lactated. After three months, the diet of the infant changes. The introduction of other types of food or cow/goat milk as a complement to breast-milk causes a raised risk for infection and/or undernutrition of the infant. This leads to a poorer growth of the long bones of these infants, which becomes even more pronounced when the infant is finally weaned. In both scenarios, it is also likely that some mothers died in childbirth-related complications during, or some time after delivery, and their children would have been confined to being fed and cared for by someone else.

I believe that the second scenario is more likely given that parallels with modern small-scale societies are possible to make, and that infants who are born prematurely or very small can experience a 'catch-up' growth during the first months of life.[267] Yet, I will argue that some children were treated differently already from the beginning, regarding feeding practices.

Given all the unknown factors that are involved in studies of subadult growth in archaeological populations, it is important to note that the results from the Argolid samples should be viewed merely as tendencies which are not conclusive on their own. Other methods to estimate the chronological age are required to in order to be more confident about the differences in children's growth, but this task falls outside the scope for the present study.[268]

[267] Tanner 1964, 348.
[268] See, for instance, the method advocated by Koningsberg & Holman 1999, 264–289. The authors stress the need for sufficiently large samples to be able to discern differences between them.

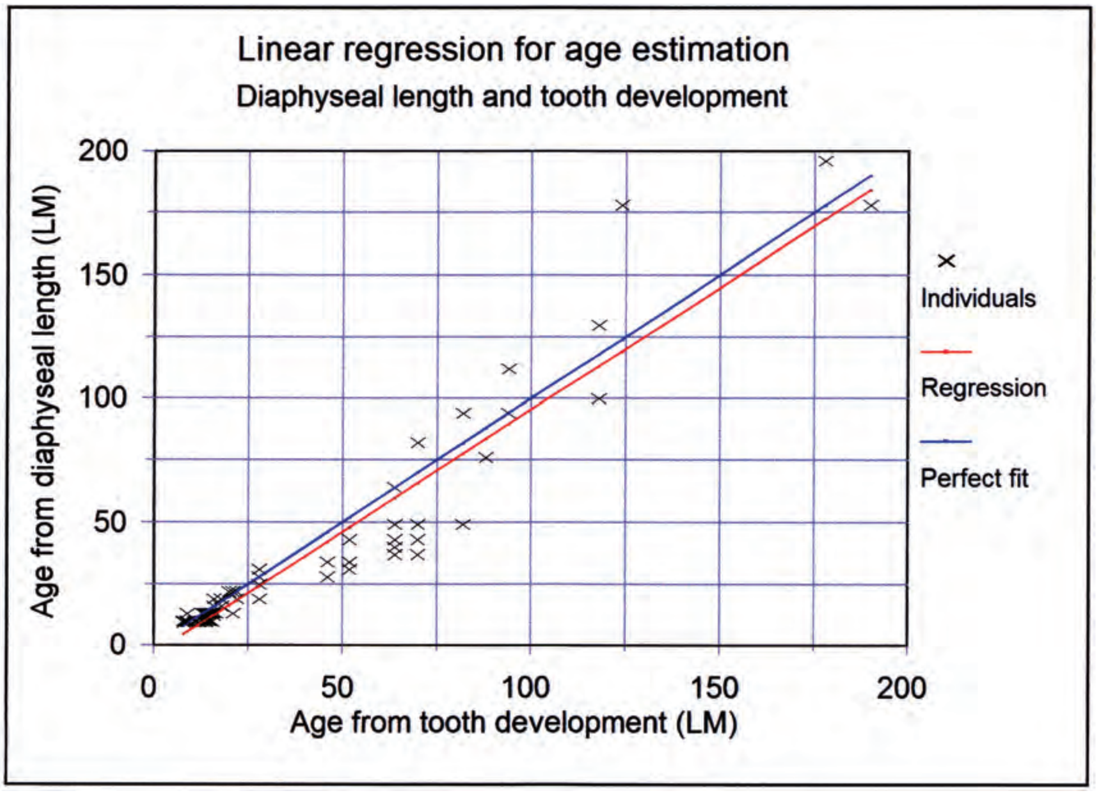

Fig. 11. Linear regression for underestimation of subadult age (diaphyseal length/tooth development).

5.2 MORTALITY

Researchers dealing with prehistoric burials or demographic profiles often assume that child mortality in prehistoric populations was high, and likely comparable to that of modern developing countries. However, the age-specific differences and the reasons for this early mortality are seldom discussed; in most cases a more detailed level of classification than the usual rough division 'infant/child mortality' is needed. If it can be accepted that the cemetery proportion of children and adults can reflect the mortality as well as the fertility (see discussion about fertility and mortality in chapter 4.3) of the population, it is important to look more closely at the different factors connected to the possible cause of the age distribution (see *Fig. 12*).[269]

The general picture of the subadult age distribution of the Asine and Lerna children conforms to what could be expected for an early society where many individuals die in early infancy, and it is interesting to note that the mortality pattern of Asine and Lerna follows a similar trend: there are a small number of probable stillbirths at both sites, and most deaths occur around birth.[270] According to Jantz and Owsley the demographic custom is to regard the newborn infants in a 'normal' subadult category as having the greatest risk of dying.[271] Saunders, Herring and Boyce have a different opinion and state "There is a broad but mistaken assumption that mortality rates among infants will be highest at birth and will slowly decline thereafter, leading us to expect mostly newborn deaths in any mortality sample."[272] They argue that the post-neonatal mortality exceeds the neonatal mortality in developing countries, and these conditions could be extrapolated to prehistoric and early historic societies. They conclude, however, "… when stillbirth mortality is added to neonatal mortality, the rates almost always exceed those of post-neonatal mortality."[273] In the case of Asine and Lerna the neonatal mortality is highest even without adding the possible stillbirth mortality (i.e. the 6–8-lunar-month interval).

Considering the likely underestimation of age, given by (age) estimations based on diaphyseal length, it is likely that this could account for the large number of neonatal deaths at both sites. At Asine 79% (Lerna 31%) of the subadults could

[269] The age groups of the Asine and Lerna individuals illustrated in *Fig. 12* are based on the age determinations using primarily skeletal age (i.e., diaphyseal length, bone development and size).The age given by teeth development has been used only when no skeletal age could be obtained (Asine 10%, Lerna 9%). This procedure was necessary since the individuals for which a "dental age" could be determined were too few to enable a correct picture of the mortality on their own. In the case where only an age interval could be assigned to the individual, the mean ages of these intervals were used to enable the division of the individuals into as homogeneous and narrow categories as possible.
[270] For the terminology used for different age categories, see 1.2.
[271] Jantz & Owsley 1994, 249
[272] Saunders, Herring & Boyce 1995, 80.
[273] Saunders, Herring & Boyce 1995, 80.

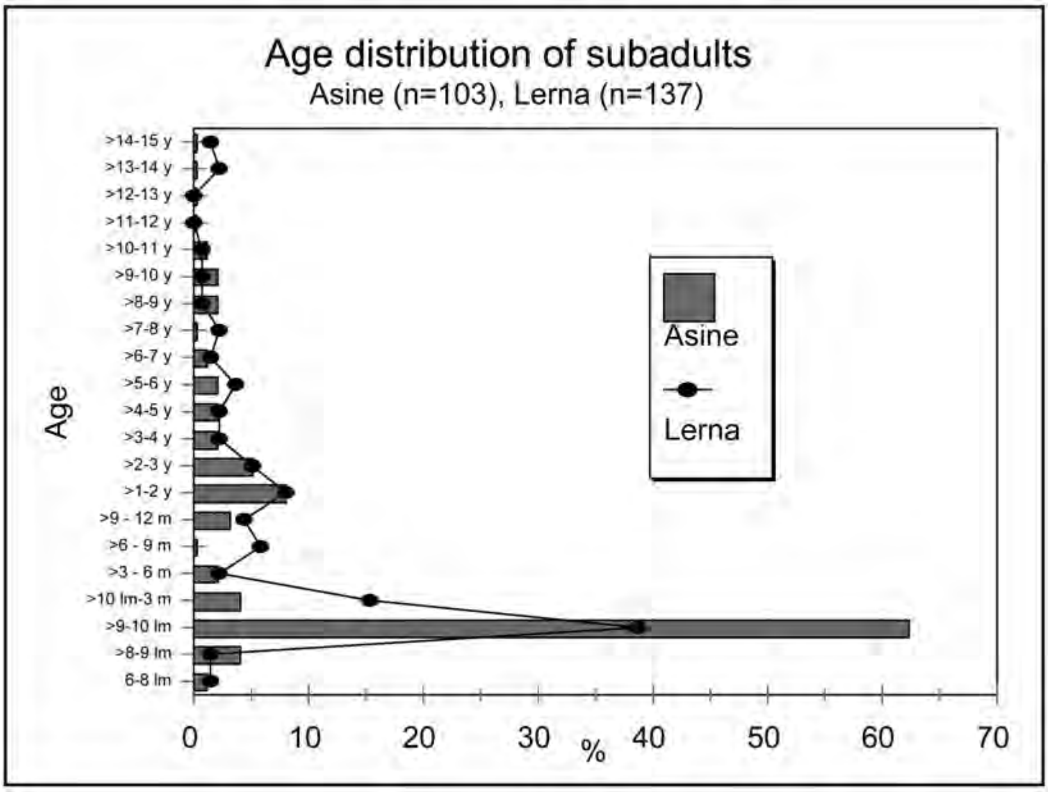

Fig. 12. Age distribution of subadults from Asine and Lerna.

be age estimated only from their skeletal remains since no teeth were available. To control for the possible underestimation, I have adjusted the ages determined from the skeleton by adding two days/lunar month (*Fig. 13*), which was the likely underestimation according to the linear regression. Since neonatal and post-neonatal deaths are induced by different factors, it is important to be able to distinguish between the two categories. Therefore, I have also made a more detailed division of the age intervals up to three months (*Fig. 13*).[274]

As can be observed from the diagram, the highest number of deaths at Asine can be found in the interval 10 lunar months to 27 days. At Lerna the age intervals 10 lm to 27 days, and >3 to 6 months have an equal number of deaths (23.5%). However, when the neonatal and post-neonatal mortality is compared, it is evident that the post-neonatal mortality at Lerna (40.4%) is higher than the neonatal mortality (23.5%), while the opposite conditions are present for Asine (post-neonatal mortality 13.6%, neonatal mortality 63.1%). The most common causes for the neonatal mortality are considered to be genetic and/or developmental anomalies, birth trauma and poor maternal health status during pregnancy, whereas the post-neonatal mortality mainly reflects stressful environmental conditions.[275] Further, the perinatal mortality also indicates the quality of pregnancy and newborn care. The neonatal mortality has also been related to breast-feeding patterns, where the absence of breast-feeding or early weaning could cause especially high mortality in this age group.[276]

It is not surprising that Lerna with its potential problems concerning malaria and other diseases flourishing in the swampy area close to the settlement shows high post-neonatal mortality.[277] In the Asine case, it is possible that poor maternal health along with weaning (of some infants?) prior to one month could account for the higher neonatal mortality found there.[278] However, not only biological factors play a role in the neonatal mortality. Cultural factors such as inadequate care for the newborn, neglect or even practice of infanticide must be regarded. It is certainly difficult to prove if deficient care for the infants was most influential for the cause of death, since these things could not be discerned from the skeletal material (with the exception of severe fractures). Nevertheless, Mays argues that the age at death distribution could indicate whether or not infanticide has been practised.[279] He asserts that a peak in the death distribution around time of birth would indicate that infanticide was practised, since the act is most often committed around this time—deaths from 'natural' biological causes would result in a flatter distribution of age at death. Mays has compared the age

[274] One Lerna individual is excluded from the diagram since the age will exceed 15 years when 2 days/lunar month is added to the age. This gives a total of 136 individuals instead of 137 (see *Fig. 12*).
[275] Saunders & Barrans 1999, 187, 197.
[276] Saunders & Barrans 1999, 188.
[277] See Angel 1971, for a discussion about malaria in Lerna.
[278] Since poor maternal health also contributes to more maternal deaths, this could most certainly account for a part of the high neonatal mortality. This will be further discussed in section 5.4.
[279] Mays 1993, 883–888.

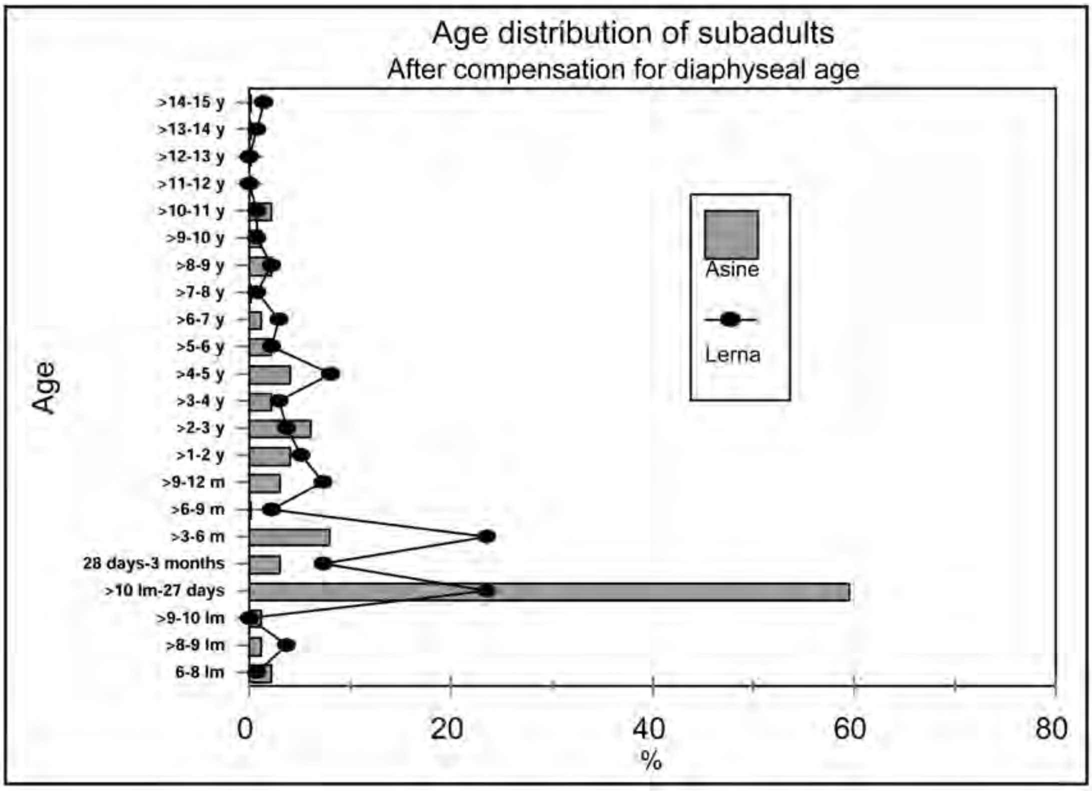

Fig. 13. Age distribution after compensating for underestimation in age.

distribution at some Romano-British cemeteries/non-cemetery sites and medieval sites as well as the age distribution of modern deaths. He found that the age at death distribution at the Roman sites shows a peak around full-term whereas the medieval and the modern data display a flatter distribution. This picture is explained by Mays as infanticide being practised at the Romano-British sites.

Yet, I do not find the infanticide theory to be applicable to Asine (and Lerna). As Scott points out, both the presence and absence of infants have been interpreted as evidence of infanticide in discussions about neonates in archaeological contexts.[280] There is no consensus about the interpretation of infant burials in the literature, and it seems too easy to explain either a large number or absence of infant skeletons in the archaeological material in terms of infanticide. I think that some more factors related to methodology and health status needs to be regarded:

1. As already discussed, the age estimation by long-bone length could underestimate the age of infants by several weeks. Since Mays uses long-bone length for his age estimations, it is likely that the large number of full-term foetuses were in fact several weeks old. In that case the Roman data would possibly resemble the medieval data where no peaks could be found in 38–40 weeks (i.e. full-term) interval. While the main part of the Roman infants would probably still remain within the neonatal period, they would not fit in to the picture as victims of infanticide which was carried out immediately after birth. When the underestimation in age was compensated for on the present materials from Asine and Lerna, the large number of newborns (i.e. 10 lunar months/40 intra uterine weeks) were converted to *c*. three-week-old infants.
2. Assuming that the age at death distribution at Asine and Lerna gives a correct picture of the age-specific mortality, the possibility of a differential burial practice must also be regarded. It is possible that the practice of burying infants within the settlement instead of at the cemeteries could account for the large number of infants at the two sites (this possibility will be further discussed in 6.1).
3. A high neonatal mortality indicates high fertility but is also consistent with poor maternal health. Since the women at Asine and Lerna seem to have suffered from health problems, this would certainly aggravate a 'natural' mortality around birth.[281] Harris and Ross state, "Poor maternal nutritional status increases the risk of premature births and low birth-weights, both of which increase foetal and infant mortality; poor maternal nutrition also diminishes the quantity, if not the quality of breast-milk, which lowers infant survival chances still further"[282] The connection between women's health and the outcome of pregnancy will be further discussed in section 5.4.

Looking further at the possible causes behind the subadult mortality as illustrated by the diagram (*Fig. 13*), it can be seen

[280] Scott 1999, 90.
[281] Angel 1982a, 105–138; Calnan 1992, 336–339.
[282] Harris & Ross 1987, 7 (quoting Hamilton *et al.*); Roth 1992, 178; Saunders & Barrans 1999, 197.

that the proportion of individuals drops rapidly after the first month in both Asine and Lerna. It is possible that the protecting effects of breast-feeding would account for this decrease. The peak in the >3–6-month interval may well reflect an early introduction of semi-solid food or even an early weaning practice, which would increase the exposure to infectious diseases like gastroenteritis, and make such diseases even more fatal to the infants. It should be noted that the largest threat to the lives of infants in the age one to twelve months is known to be infectious diseases. The period six to twenty-four months is characterized by the synergistic stress inflicted by nutritional deficiency and infectious disease, and after approximately two until four years, malnutrition alone is the major risk factor.[283] As can be seen in the diagram, a small peak in mortality can be found a little earlier in Lerna (>9 m–1 y) than in Asine (>2–3 y), but since the samples in these age groups are very small, no inference regarding a possible cause for the difference is possible. However, it can be speculated that disease would have played a larger part in the Lerna mortality, whereas malnutrition could have been a bigger problem for the Asine children. Nevertheless, since the synergistic relationship which is known to exist between malnutrition and infection is a complex one even in studies dealing with living populations, no attempts to examine the mechanisms behind the two factors, and how they influence the age-specific mortality pattern independent of each other will be made in the current study. It is enough to point out that the combination of nutrition and infection is most likely the primary component in the post-neonatal mortality.[284] Another small peak in the mortality can be found in the >4–5-year interval and it is also during this period when children start to be more active and participate in the society's daily activities. The immediate environment can be hazardous in many ways. At this age children can contribute to the household economies, and ethnographic studies show that children in this age are often engaged in carrying out tasks like guarding smaller children, collecting firewood and perhaps also working in the fields.[285] Certainly, many diseases would have been lethal also to this age group even if I think that accidents during participation in work as well as play probably played a larger part in this age group's mortality.

5.3 MORBIDITY

In the past decade, palaeopathologists have directed their interest to the disease processes of children. It has been realized that the physiological stress imposed on subadult individuals constitutes an important factor in the health of past populations.[286] Yet, the morbidity of subadults can only to some extent be approached through the identification of pathological lesions of the skeleton. Most acute diseases, for example infections, are often fatal for young children, and they were probably responsible for a large part of the infant deaths during prehistoric times. Unfortunately, these diseases cannot be identified in skeletal material since the pathogenic agents responsible for the diseases often kill the individuals quickly before leaving any discernable traces on the bones.[287] Thus, it is not surprising to find a general lack of pathologies on the skeletal remains of the neonatal individuals. Goodman states that mortality is the ultimate indicator of adaptive failure,[288] and therefore a sample of infant skeletons without any noticeable pathologies cannot be seen as 'healthy', although we do not know exactly what caused the infants' death. Another problem is of course that diseases which only affect the skeleton after long duration cannot be identified in the subadult skeletal sample.[289]

Despite the questions of identifying disease in subadult skeletons, there is a range of pathological reactions which can be used as markers of disease and/or nutritional inadequacy during childhood. Some of the most frequently discussed are: cribra orbitialia, porotic hyperostosis, endocranial lesions, enamel defects, Harris lines, periosteal lesions and trauma. As discussed earlier, it is not realistic to make inference about the disease frequency in the living population. Moreover, even an attempt to estimate disease frequency in this particular skeletal population would be questionable since the Asine individuals belong to a disarticulated material subjected to MNI-calculations. Therefore, I will describe only the different lesions affecting individuals of different ages, and when possible give the percentages of the MNI in each age group; this kind of calculation would yield a sort of minimum number of affected individuals.

5.3.1 Pathology

Periodontal disease

The resorption of bone tissue in the alveolar part of the jaw is often (but not always) caused by a periodontal disease.[290] The disease often starts with an inflammation of the soft tissues which sometimes continues into the bone. The alveolar bone starts to recess and exposes the roots of the teeth, finally resulting in tooth loss.[291] Various factors might contribute to this condition. Often mentioned as one of the main causes is the mineralized mixture of food particles, microorganisms and protein which is termed calculus or tartar deposits, commonly found as a hard crust on the teeth.[292] The calculus is often localized in the crevices between the tooth and soft tis-

283 Mensforth *et al*. 1978, 12; Gordon *et al*. 1967, 121–144.
284 Saunders & Hoppa 1993, 134. Saunders, Herring and Boyce (1995, 80) also consider environmental factors such as poor sanitation as responsible for post-neonatal mortality.
285 See, for example, Panter-Brick 1998b, 66–101, esp. 85f.
286 Lewis & Roberts 1997; Ribot 1992.
287 Larsen 2002, 123; Saunders & Hoppa 1993, 134.
288 Goodman 1991, 33.
289 Waldron 1994, 48f.
290 Ortner & Putschar 1985, 443. Unfortunately, there is no scholarly consensus about the term 'periodontal disease'. I have used it to describe cases where an alveolar resorption has taken place *ante mortem*.
291 Roberts & Manchester 1997, 56.
292 Ortner & Putschar 1985, 442.

sue and the bone, thus causing an irritation of the gingival tissues resulting in inflammation.[293] However, there are many factors which could contribute to this lesion: for instance, bad oral hygiene, poor diet leading to lowered resistance of the tissue, age, dental anomalies, pregnancy, stress.[294] One individual was found to exhibit periodontal disease:

MNI-unit T3:22, seq. no. 10, AS 1052: The left part of the maxilla (upper jaw) from a 5.5 (± 6 m)-year-old individual with teeth *in situ* (m^1-M^1). There is horizontal bone loss at the alveolar margin for the first permanent molar.

Non-specific periosteal and endocranial lesions

Periosteal lesions found on the bones are often the result of an inflammatory process which may cause, or be caused by, an infection. These lesions can also derive from trauma. Most infections seen in archaeological material are often induced by bacteria entering into the bone, in the case of an injury, for instance penetrating the skin and the soft tissues, or by bacteria carried from the primary source (as, for instance, the mouth or sinuses) through the blood stream to other parts of the body.[295] It is seldom possible to identify the responsible microorganism in order to find the etiology, and rarely is the distribution of infection distinct enough to enable a diagnosis: thus, most cases must be termed non-specific infections.[296]

One of the most common responses to infections is the so-called periosteal lesions. Generally speaking, these lesions are characterized by a fine pitting and striation of the cortical bone followed by the formation of a new layer of bone on the surface.[297] When the infection is active, the bone formation consists of an irregular porous layer of so-called ‘woven bone’ which is later replaced by the more compact ‘lamellar bone’ which signifies that the lesion has healed.[298] It is usually impossible to find the etiology of periosteal reactions in newborn infants because of the problematic identification of these lesions on subadult skeletons (see 4.3) and the many causes of the condition: newborn infants are particularly susceptible to infection and deficiencies.[299] Further, injuries acquired during birth might result in periosteal reactions.

Endocranial lesions are those found on the inside of the cranium, they can be seen as either diffuse or isolated patches of new bone formation on the original cortical surface, as indications of porosity, as ‘capillary lesions’ with vascular depressions or with the ‘hair-on-end’ appearance of the diploë.[300] The lesions are probably caused by haemorrhage or inflammation, but the precise aetiologies are still debated among scholars. In a recent study of subadult endocranial lesions among children from medieval/post-medieval England, Lewis has argued that the ‘hair-on-end’ formation of the diploë is more likely a result of inflammation, whereas new bone formations are caused by haemorrhage. In her review of possible etiologies suggested for endocranial lesions several causes are mentioned including: meningitis, trauma, neoplasia, anemia, venous drainage disorders and nutritional deficiencies. At present, it is recommend that these lesions are categorised as non-specific indicators of haemorrhage or infection.[301] Angel describes similar cases of endocranial lesions on subadults, but associates these with hereditary anaemia (thalassemia) or erythroblastosis.[302] Three, possibly four, individuals were found to exhibit periosteal and/or endocranial lesions:

MNI-unit T3-2:04, seq. no. 3, AS 2797 (*Pl. 2:1–2*). A skull fragment (from a 9.5–10-lunar-month-old infant) exhibits wormlike endocranial depression, probably resulting from epidural haematoma following a possible birth trauma.[303]

MNI-unit T3-2:04 (Possible case), seq. no. 8, AS 2838 and 13, AS 2838 (*Pl. 2:3*). Upper extremities (right + left humerus, right + left ulna, left radius) from an 8.5–10-lunar-month-old infant (could possibly be two infants). There seems to be woven, disorganized bone irregularly distributed on the cortex along the diaphysis and metaphysis of all these bones. The proximal metaphysis of the radius has a pitted and marked porous area on the anterior side. It should be noted that the described changes might be a part of the normal appositional growth of the bones. These bones may belong to the individual with a possible birth trauma as described above.

MNI-unit T3-2:05, seq. no. 268, AS ? (*Pl. 2:4*). Two parietal fragments from a 9–10-lunar-month-old foetus/infant which exhibit partly unremodelled periosteal reaction and hypervascularity.

5.3.2 Skeletal markers of growth disruption

Harris lines or lines of arrested growth are terms frequently used for lines that may be visible on X-ray pictures of the long bones in particular. These lines may reflect periods of inadequate nutrition and/or diseases that occurred during the bone development.[304] If one of these stressors is imposed on the body, it may stop the longitudinal growth. When the nutrition is improved or the disease has passed, growth is resumed and the period can be reflected in a dense line at the end of the bones. These lines are visible in bones from both adults and children but are more frequently found in bones from children, especially in the age group two to seven years of age.[305] The peak in line frequency is found by several scholars to occur in the age group one to four years of age. This peak is

[293] Roberts & Manchester 1997, 56. The role of calculus formation in periodontal disease is not clear: some scholars mean that it might be a response to the disease itself. See, for instance, Hillson 1986, 310.
[294] Brothwell 1972, 149; Hillson 1986, 311f.; Roberts & Manchester 1997, 56.
[295] Ortner & Putschar 1985, 132; Roberts & Manchester 1997, 127.
[296] Mays 1998, 123–125; Roberts & Manchester 1997, 126.
[297] Ortner & Putschar 1985, 129–131; Roberts & Manchester 1997, 129f.
[298] Mays 1998, 123; Mensforth *et al*. 1978, 23–26.
[299] Ribot 1992, 43f.
[300] Lewis & Roberts 1997, 584; Lewis 2004, 82, 89.
[301] Lewis 2004.
[302] Angel 1971, pl. 23, third row.
[303] Prof. Michael Shultz (Zentrum Anatomie, University of Göttingen), personal communication.
[304] Steinbock 1976, 46f. Other causes such as trauma, lead poisoning, etc. have also been associated with the formation of Harris lines. Larsen 1997, 40.
[305] Goodman & Clarke 1981, 35–46; Wells 1967b, 390–404.

often interpreted as a reaction to the stress experienced by the children in connection to weaning.[306] Even if lines are rare in children less than one year of age, they have been found also in foetuses whose mothers suffered from malnutrition.[307] However, the interpretation of the presence or absence of Harris lines is problematic: studies of living children have shown that in cases when the medical history does not reveal any known stress, several lines are found, whereas in cases when children are below normal weight for age (i.e. probably malnourished) lines are not present.[308] In archaeological populations, the connection between Harris lines and other skeletal and dental indicators of stress are inconclusive.[309]

In her study of the health status of Bronze Age Greek women, Calnan claims: "… the primary cause for the earlier mortality of Bronze Age Greek females is rooted in chronic malnutrition …"[310] Since this was probably valid also for the women of Asine (see 5.4), this malnutrition could perhaps result in Harris lines formation of their foetuses.

To investigate if Harris lines could in fact be observed in the subadult material from Asine,[311] a radiographic examination was carried out.[312] All the long bones that were not classified as belonging to adults were selected. Of these, only the ones that had both ends reasonably well preserved were included, and the final sample comprised a total of 152 bones. The ages of the children from whom the bones derive were very low, most of them were foetuses or newborn and just three were more than six months old.

The result of this study was negative—only two bones proved to have lines: one radius from a child 6–7 years old showed three lines at the distal end and a femur from a child of approximately 10 lunar months showed a faint line in the distal part. The scarce occurrences of Harris lines is in agreement with the evidence of normal growth of the long bones which could be observed in infants up to approximately three months of age (see 5.1). It is therefore likely that in the majority of cases, poor maternal health did not affect the skeletal growth of their foetuses. Yet, the size of the sample examined so far is in reality too small to allow interpretations about the low frequency of Harris lines or perceptions about this indicator's applicability and accuracy for bioarchaeological studies on morbidity.

5.3.3 Dental evidence for growth disruption

Physiological stress causing disruption and disturbance of the enamel formation can be seen microscopically or macroscopically. The so-called pathological striae of Retzius (or accentuated striae of Retzius), which can be seen through the microscope in longitudinally sectioned teeth, are usually thought to reveal shorter periods of stress (one to several days).[313] It has recently been proposed that the main cause of these pathologic striae is acute dehydration probably resulting from severe diarrhoea or vomiting.[314] Further, these abnormal histological changes are often, but not always, associated with enamel hypoplasia, although the connection between them is not yet fully understood.[315]

Enamel hypoplasia, which can be identified macroscopically, is seen as horizontal (more rarely vertical) bands or pits (single or multiple) of decreased enamel thickness.[316] Areas completely void of enamel (aplasia) are also classified as enamel hypoplasia, and they represent the most severe type of the defect. The other major group of enamel defects is called hypocalcification. This term involves differences in the quality and hardness of enamel manifested as changes in colour and opacity on the surface.[317] Both groups of defects, which are an indication of non-specific physiological stress, develops when enamel formation (amelogenesis) is disrupted.

A large number of causes can lead to the formation of hypoplasia, but three main types can be distinguished; hereditary abnormalities, localized trauma and systemic metabolic stress. The two first groups are extremely rare in archaeological material, but the third group, which fits a chronological pattern of systemic stress, is often evidenced in teeth from archaeological populations.[318] During tooth formation, the enamel is particularly responsive to metabolic stress from environmental factors like malnutrition and disease, and therefore enamel defects are suitable indicators of childhood health.[319] Since enamel does not remodel, any defects are permanent records of periods of stress in the subadult period.[320] Also in modern populations, a high frequency of linear enamel hypoplasia has been correlated to periods of malnutrition and/or infection.[321] However, genetic factors are involved in the individuals' susceptibilities to physiological stress although the degree to which these factors contribute to the etiology of enamel defects is presently not understood.[322] Socio-economic factors have also been found to correlate with the prevalence of enamel defects in both modern and archaeological populations. Children in low socio-economic classes or from developing countries usually have more hypoplasia than wealthy classes/nations.[323]

[306] Clarke & Gindhart 1981, 574f., esp. 574; Goodman & Clarke 1981, 35–46; Larsen 1987, 339–445 esp. 374. According to Clarke & Gindhart (1981, 574), "The greatest number of lines occurs during the one-to-three-year age interval, with a peak at approximately two years of age."
[307] Steinbock 1976, 47.
[308] Larsen 1997, 43.
[309] Roberts & Manchester 1997, 177; Clarke 1980; Larsen 1997, 43.
[310] Calnan 1992, 338f.
[311] The subadults from Lerna have not yet been examined for Harris lines.
[312] I want to express my gratitude to Dr. Tarja Formisto who arranged this examination at the Department of Forensic Medicine, University of Helsinki.
[313] Larsen 2002, 126.
[314] Simpson 1999, 259.
[315] Goodman & Rose 1990, 66.
[316] Skinner & Goodman 1992, 157.
[317] Goodman & Rose 1990, 64.
[318] Goodman & Rose 1990, 64f.
[319] Larsen 1997, 44; Goodman & Rose 1990.
[320] The tooth enamel (deciduous + permanent teeth) is formed from the second foetal trimester to *c.* 10 years of age. Goodman & Rose 1990, 61.
[321] Goodman & Rose 1990, 60.
[322] Goodman & Rose 1990, 74.
[323] Larsen 1997, 50.

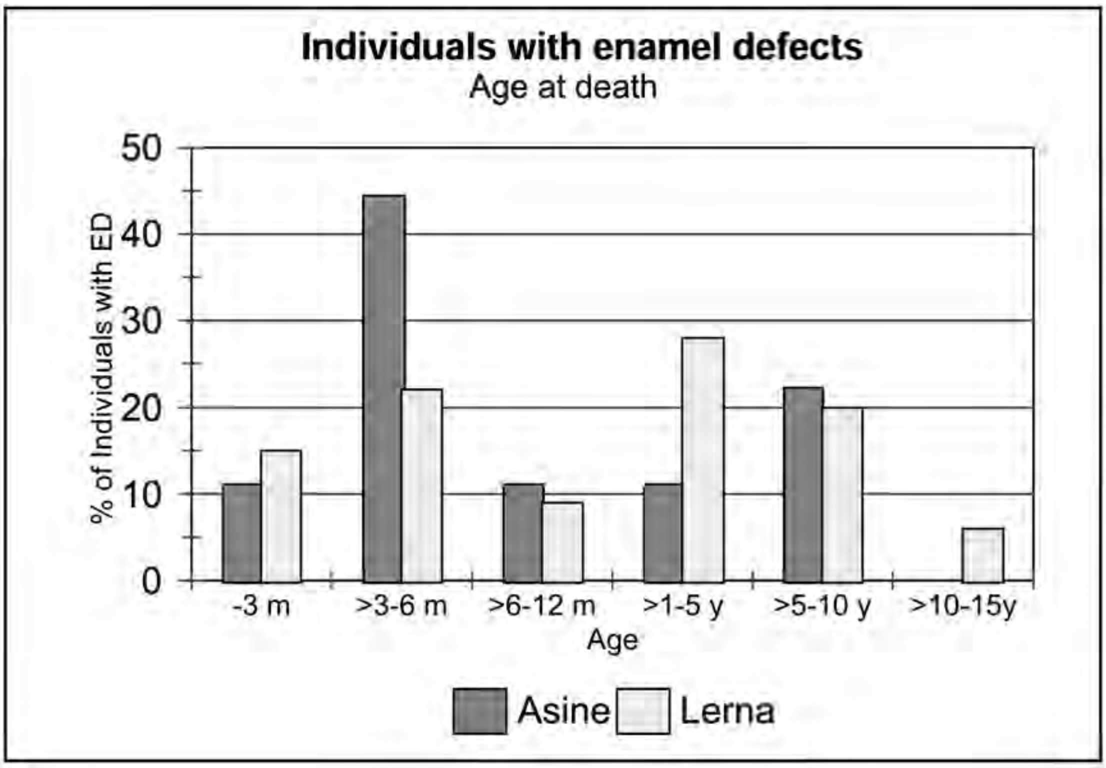

Fig. 14. Correlation between age of death and ED.

The individuals available for an examination of dental defects in Asine and Lerna are only sub-samples of the original materials because few individuals had preserved teeth. The Asine material consists of 29 individuals (both subadults and adults) while the material from Lerna composes 95 individuals (only subadults), the number of teeth from each individual varies considerably. The term hypoplasia is problematic since the type of lesions incorporated within this term is defined in slightly different ways by different scholars.[324] Therefore, I will discuss only the frequency of enamel defects in general (i.e. pathological striae of Retzius, enamel hypoplasia and hypocalcification) without further subdivision.[325]

It has been shown that specific teeth are more susceptible to growth disruption—the anterior teeth seem to be predisposed to enamel hypoplasia and are therefore thought to yield the most representative picture of stress.[326] However, when stress is severe and of long duration, hypoplasia can be seen on several teeth.[327] In the present materials, dental defects were frequently found on all types of teeth. This makes an underestimation of the frequency likely to be minor but of course unknown. Several types of dental defects are found in Asine and Lerna: pathological striae of Retzius, hypocalcification (opacities) and both types of hypoplasia (linear, pits).

There is a relatively good concordance in the frequency of enamel defects (ED) between the two Argive samples. In Asine 41% of the 29 individuals (39% of 23 subadults) with preserved and analysed teeth had enamel defects, and in the Lerna sample (15 years of age or less) 48% of the 95 individuals with preserved teeth had defects (*Fig. 14*).

A correlation between enamel defects and early age at death is found in many populations.[328] This difference in death age for affected/non-affected individuals suggests that individuals who experienced physiological stress at an early age will be predisposed to an early death or that individuals who are genetically susceptible to stress will have both an increased risk for dental defects and an early death.[329] Neither of the possibilities can be ruled out here, and in the present samples the correlation between age at death and ED is slightly ambiguous, as can be seen in *Table 7*.[330]

The median age is probably the accurate measurement since it is less affected by the extreme values in the two samples. The Lerna median conforms to the expected differences in age at death between individuals with/without ED but in Asine, on the other hand, a reverse (but minor) difference is found. If the minor differences between the median ages at Asine are at all possible to evaluate, they could possibly be explained by the low proportion of individuals which were experiencing stress during foetal life. In Asine only 2 (40%) of 5 perinatal/neonatal

[324] Soomer (Appendix I) uses the term hypoplasia to describe pits, groves and discolouration of the enamel, while the working group commissioned by le Féderation Dentaire International (FDI), which is the standard used by most scholars, classifies discolouration as hypocalcification/opacities (Goodman & Rose 1990, 64f.).

[325] For a more detailed description of the different defects, see Appendix I.

[326] Larsen 1997, 46.

[327] Williams 1994, 101.

[328] See Larsen (1997, 52f.) for examples of these studies.

[329] Goodman & Armelagos 1988, 941.

[330] Prenatal disturbances in the enamel formation were found in 22% of all subadults both at Asine and Lerna.

Table 7. Differences in age at death of subadults exhibiting ED or no ED.

Age at death	No ED	ED
Asine (min/max) total N = 23	(6 lunar months/11 years) N = 14	(9 lunar months/6 years) N = 9
Asine mean	3.5 years	2 years
Asine median	5.5 months	6 months
Lerna (min/max) total N = 95	(9 lunar months/15 years) N = 49	(8 lunar months/15 years) N = 46
Lerna mean	1.5 years	3.5 years
Lerna median	5 years	33 months

individuals exhibit prenatal dental defects, while 6 (75%) of the 8 Lerna individuals in the same age group show prenatal disturbances in enamel formation.[331] Even if both perinatal/neonatal samples are laughably small and could be regarded as impossible to use, let alone compare, it can be speculated that more Lerna foetuses/neonates were experiencing severe physiological stress already *in utero* which made them predisposed to early death, whereas a lesser number of Asine neonates were exposed to this stress during foetal life. If this is true, many of the Asine subadults died of acute causes before the enamel formation was affected.

5.3.4 Discussion

In the examined skeletal material from the Lower Town of Asine, the neonatal infants make up 63% (n = 65) of all subadults. Only three (or possibly four) of these individuals show any lesions of the skeleton which could be linked to a disease process affecting the skeleton. Infants are found to be particularly vulnerable at birth, especially if they are born with a low birth weight as a result of chronically deficient maternal health.[332] As have been discussed earlier, I find this cause as very likely responsible for many of the late foetal/neonatal deaths in Asine and Lerna. The three or four foetal/neonatal individuals showing possible lesions are within the interval 8.5–10 lunar months. The skeletal lesions included non-specific periosteal reaction on upper extremities, endocranial raying and new bone formation in the skull vault, endocranial depressions from possible birth trauma and a trace of Harris line at the distal end of the femur. Of course, no conclusions about general neonatal morbidity are possible to make from these few lesions.

The bones from post-neonatal individuals were not found to show any obvious signs of pathology, and it is not until the age >5–6 years that any skeletal evidence of disease was found. In this age group (consisting of only two individuals) one individual had lesions. The child showed several pathologies: Harris lines at the end of one radius and also periodontal disease in the maxilla together with linear enamel hypoplasia and pathological striae of Retzius of the teeth. Thus, the child managed to survive until *c.* 5.5 years of age but was probably experiencing some kind of metabolic disturbance throughout its life as indicated by the pathologic features of the teeth.[333] What is remarkable is that this individual, despite the experienced stress, was not short for its age but on the contrary had a bone length consistent with that of an older individual *c.* 7 years of age.[334] It is possible that the child was particularly well cared for, but it is also possible that this individual was not 'frail' (see 4.3), and thus able to survive a long period of stress even without special care.

Enamel defects are regarded as non-specific indicators of stress in a way similar to impaired growth of the long bones or Harris lines, but the different indicators of stress do not always seem to be correlated.[335] In the present sample only the individual just discussed showed both Harris lines *and* enamel hypoplasia out of 12 possible individuals with both teeth and at least one long bone preserved.[336] It can be concluded that the different indicators of stress are variable and their etiology not completely understood, and therefore the connection between them is presently not possible to interpret.

The skeletal material from Barbouna and the East Cemetery was examined by Angel who reported only one newborn infant (105 AS) from the Barbouna cemetery exhibiting notable pathology, i.e. porotic hyperostosis.[337] The term 'porotic hyperostosis' is used to describe porous (often symmetric)

331 In modern samples, prenatal dental defects have been found to have some correlation with hearing loss and idiopathic brain damage. Goodman & Rose 1990, 84f.

332 Higgins 1989, 179f.; Goodman & Armelagos 1989, 226f.

333 For information of the dental lesions, see Soomer in Appendix I (individual AS 1052); for a description of the bone pathology, see 2.4.3.

334 It should be pointed out that it is possible that the skull fragments (including teeth) and the post-cranial bones belong to two different stressed individuals, since the excavator mentions that the skull was placed together with 'bones of different origin'. See MNI catalogue, MNI unit T3:22.

335 Mays (1995, 511–520) found a correlation between the existence of Harris lines and enamel hypoplasia in his juvenile sample (age 2–17 years) from British medieval sites, whereas only cortical thickness, and not femur length was correlated to the occurrence of Harris lines. In a study of another sample of subadults from British medieval sites, Ribot & Roberts (1996, 67–79) found the highest frequency of Harris lines in the age group 2–4 years but no correlation between this, other stress indicators (enamel hypoplasia, orbital and vault lesions and subperiosteal new bone formation) and the growth of the long bones. Clarke (1980, 81f.) found a relationship between enamel defects and Harris lines although the peak age at formation of these lesions differed slightly. Clarke, referring to personal communication with Rose, finds it likely that Harris lines derive from initial infection whereas the enamel defects are due to subsequent malnutrition and diarrhoea.

336 The newborn individual showing a very faint Harris line in the femur did not have any teeth preserved.

337 Angel 1982a, 109.

lesions in the outer compact layer of the vault bones and thickening of the diploë. This lesion is commonly viewed as caused by either inherited anaemia (thalassemia or sickle cell anaemia), or acquired iron-deficiency anaemia. The causes for the acquired anaemia, subject to intensive discussions, are thought to be responses to a high pathogen load (often malaria), malnutrition, other diseases or a combination of these factors.[338] When the orbital roofs are affected, the lesion is called 'cribra orbitalia' which is thought to be a milder form of iron deficiency or of different etiology.[339] These much discussed lesions, porotic hyperostosis and cribra orbitalia, are commonly found in the Lerna material, but since their etiologies are complex enough to merit a separate study, they can only be briefly mentioned here. Angel regarded these lesions as a result of the inherited anaemia, so-called thalassemia.[340]

In the summer of 1998, I re-examined the fragmentary subadult skeletal material from Barbouna and the East Cemetery which is currently kept in Nauplion. I found and examined the remains of the six subadults from the East Cemetery: of these a 3–4-year-old child (42 AS) exhibits traces of cribra orbitalia in both orbits. An older child (62 AS), approximately 11–13 years old, has endocranial lesions on the left temporal (infection?) as well as hypoplasia in the left canine in the maxilla (only two teeth were preserved).

During the re-examination of the Barbouna sample of subadults, I was able to find six of the nine individuals[341] originally examined by Angel, and of these six, one newborn had pathologic lesions. Noted also by Angel, 105 AS has slightly thickened diploë and there are slight raying with porous lesions on the endocranial surface of the occipital and parietal fragments.

The investigated material from Lerna consists of 137 subadult individuals of which the neonatal individuals make up 28% of the total number. Angel, who examined and published all the Lerna skeletons,[342] found porotic hyperostosis in various degrees on 25% of the 84 subadults (whose skulls were complete enough to judge this pathology).[343] During my re-examination of the subadult individuals, I found fewer cases (22.6%) than Angel did, and sometimes also a lesser degree of severity than reported by him. However, it cannot be doubted that some type of severe anaemia (inherited or acquired) was affecting the young individuals in Lerna. Infections of the ear also seem to have been plaguing children in Lerna, as it was found on three individuals aged 4.5–5 years.[344]

The picture of morbidity in the Asine and Lerna subadults is difficult to determine, since the samples examined so far are too small and fragmentary.

5.4 THE CONNECTION BETWEEN THE MOTHER'S AND THE CHILD'S HEALTH STATUS—IMPLICATIONS FOR THE SOCIETY

The close bond that exists between mother and child during the foetal stage will influence the outcome of birth, as well as the later health of the mother and child. Maternal malnutrition is a serious threat to the foetus since it can reduce the placental size and thereby hamper or reduce the nutrition exchange with the foetus.[345]

As already mentioned, the investigation by Calnan of the health of Bronze Age women (including Lerna *i.a.*) has demonstrated that the lower death age of women could be attributed to chronic malnutrition and there are indications that the deficient diet begun at an early age when the skeleton was developing.[346] The women at Asine and Lerna show several characteristics that could be linked to a possibly impaired obstetrical performance. As previously discussed, the pelvic inlet index is an indication of a diet deficient in protein during childhood which is also linked to short stature. For example, a study of English rural women has showed that the presumably better diet of children during peace time, compared to those who were children during World War I, accounted for a clearly improved pelvic index.[347] Social inequalities in modern populations have been proven to account for this difference in the pelvic morphology.[348] The women at Asine had significantly flatter pelvises (index: 73.4) than the rest of Middle Bronze Age women in Greece (79.2) whereas the women at Lerna had slightly better values (80.6) compared to the rest.[349] However, in comparison to modern white Americans (91.6) and even Greeks from the historic period (84.8), the index of the Lerna women must be regarded as rather low.[350] The combination of pelvic flattening and short stature could most certainly cause difficulties in connection with childbirth.[351]

Several studies have claimed that women with short stature have the highest rate of perinatal deaths.[352] However, it should be noticed that the mother's short stature reveals undernutrition *in the past*, and need not to be associated with the health state during pregnancy.[353] The mean female stature at Asine and Lerna can perhaps not be regarded as exception-

338 Stuart-Macadam 1992, 151–170; Garn 1992, 33–61; Lewis & Roberts 1997, 583. Mensforth *et al*. 1978, 1–59. See Angel (1971) for a discussion of these lesion and their possible relation to malaria.
339 Lewis & Roberts 1997, 583.
340 Angel 1982a, 109.
341 Sequence numbers from Angel (number followed by 'As'): 93, 93a, 105, 106, 106a and 109. See Angel 1982a, 106, table 1.
342 For a more detailed account on the individuals from Lerna, see Angel 1971.
343 Sequence numbers from Angel (number followed by "Ler"): 90, 102, 71, 116, 117, 119, 121, 132 and 241. I follow my and Soomer's age estimates which may differ from the ones made by Angel. Angel 1971.
344 These individuals are: 5 Ler (not noted by Angel), 130 and 203, Angel 1971, 55, 61.
345 Saunders & Hoppa 1993, 137.
346 Calnan 1992, 319, 338f.
347 Nicholson 1945, 131–135.
348 Angel 1982b, 297.
349 Angel 1972, 85; Angel 1982a, 108.
350 Angel 1982a, 107.
351 Angel 1971, 85.
352 Martorell *et. al*. 1981, 303–312.; Thomson & Billewicz 1963, 58.
353 Fogel 1986, 264. The same problem is connected to other signs of malnutrition i.e., it is only the stress episodes during the period when the skeleton is developing (and the teeth are formed) which can be reflected in the skeletal material.

ally short (Asine 153.6 cm, Lerna 154.2 cm) though it was more than 5 cm less than for the upper class Mycenaeans at the end of the period.[354] Angel argues that the difference in stature between social classes and the reduced bone growth in the skull base and pelvic inlet at Asine and Lerna must be due to nutritional causes.[355] Accordingly, the high neonatal mortality reflects the general state of bad health and seems to fit the picture of maternal health problems which is likely to have been more severe at Asine.

There are numerous examples of different forms of food taboos for pregnant and lactating females: for instance, among the Wamira of New Guinea pregnant and lactating women are not permitted to eat salty or greasy food (seafood, pork, coconut cream) which are highly valued, since they believe that it can make the foetus slip (the same food taboo applies to men during the cultivation of taro).[356] This taboo probably functions as a way to control women (pregnancy and lactation continues over a much longer time than taro cultivation) when there are social contestations between the genders.[357]

Factors like the mother's age and number of pregnancies also affect the outcome of birth. A very low or high age is considered risky for both the mother and foetus. Angel estimated the average age for first pregnancy of the Lerna women to be approximately 19 years of age.[358] This age may not seem very low, but a survey carried out in Bangladesh has shown that girls aged 15–19 had twice as high maternal mortality as women aged 20–24 years.[359] A high number of births are also considered more dangerous than the second and third births, and an interval between births which are less than 18 months or over 3 years are connoted with excess risk.[360] An effect of high perinatal mortality is also that the intervals between births may be shortened, leading to depleted resources of already malnourished mothers. This in turn will inevitably cause even worse conditions for the next infant.

Under certain circumstances breast-feeding can act as a form of birth control. The hormone prolactin which is produced during pregnancy and lactation serves to produce milk and inhibit menstruation. It should be noted that ovulation is only postponed as long as complete breast-feeding is carried out on demand from the infant; when other food is introduced and breast-feeding is reduced, fertility will increase.[361] When a baby dies, the level of prolactin is lowered and the so-called *post partum amenorrhoea* (acting as a contraceptive) is interrupted, allowing the woman to become pregnant again.[362] The increase in fertility as a result of infants dying during or in connection to birth is also reflected in the high neonatal mortality at Asine.

If the mother is too sick to breastfeed or dies at or shortly after birth, the infant's chances of survival are naturally diminished. Even if the baby can be cared for by another person, a wet-nurse was perhaps not always accessible. When no one could nurse the infant, it was probably fed milk from an animal or some sort of gruel. The high neonatal mortality at Asine seems to indicate that apart from resulting from developmental anomalies, poor health of the mother and problems arising during birth, the introduction of a supplementary diet as early as during the first weeks after birth may have contributed to *some* deaths in this age group. Even if this was not the case for the majority of infants, it is plausible that certain circumstances necessitated the practice, and that some children might have been more likely to have been treated this way than others.

The custom of very early introduction of semi-solid food, often in the form of some kind of gruel, is well attested in many different cultures: Gussler have summarized the evidence from several studies in less developed countries and found that many infants are fed semi-solids as early as the first to second week after birth as a complement to breast-milk, while others do not receive any breast-milk at all.[363] Further, Brändström reports that breast-feeding was almost absent in some Swedish regions during the nineteenth century. In these regions sour milk from cows or gruel was the regular diet of infants.[364] The reasons for this practice was probably both (regional) cultural tradition, as referred to by the local inhabitants, and the workload connected to the household, as referred to by the district medical officers.

Also, delayed breast-feeding patterns are attested: a study of child nutrition in the Lao PDR in Indochina shows that breast-feeding there is delayed between one and three days after birth.[365] In this case, the children are deprived of the so-called colostrum, which is extremely rich in antibodies and very nutritious.[366] The colostrum differs from mature breast-milk in colour and consistency and its avoidance is widely testified from many cultures differing in time and geographical location: in ancient India, the newborns were given a mixture of clarified butter, honey and Ana rots on the first day.[367] Soranus of Ephesus (first century A.D.) recommended boiled honey or a mixture of honey and goat's milk as the first food to be given to a newborn infant, since he considered the first mother's milk to be unwholesome.[368] Gussler mentions that many traditional societies believe colostrum to be a poisonous substance or even pus or old milk which are left over from an older child. In these cases the newborns are given liquids as, for instance, honey, syrup, herbal tea or animal milk.[369] In pre-industrial Europe, colostrum was often considered harmful for the child, and many medical writers recommended that the first milk should be discarded—in the

354 Angel 1982a, 108; Angel 1971, 85.
355 Angel 1971, 84f.; Angel 1982a, 107.
356 Kahn 1986, 116; Hastorf 1991, 136.
357 Hastorf 1991, 136.
358 Angel 1971, 78.
359 Belsey & Royston 1978, 13.
360 Belsey & Royston 1978, 13; Royston & Armstrong 1989, 38f., 187.
361 Belsey & Royston 1978, 15.
362 Higgins 1989, 182.
363 Gussler 1987, 160f.
364 Brändström 1984, 180f.
365 PDR (Lao People's Democratic Republic). Kachondham & Dhanamitta 1992, 81.
366 Fildes 1995, 117.
367 Fildes 1995, 116.
368 Soranus 88f.
369 Gussler 1987 159. Among certain groups in Ghana, colostrum is believed to be dirty and causing the infant's head to be big and ugly (Gyimah 2002, 4). Also in Indonesia the colostrum is often discarded (Iskandar *et al*. 1998, 110).

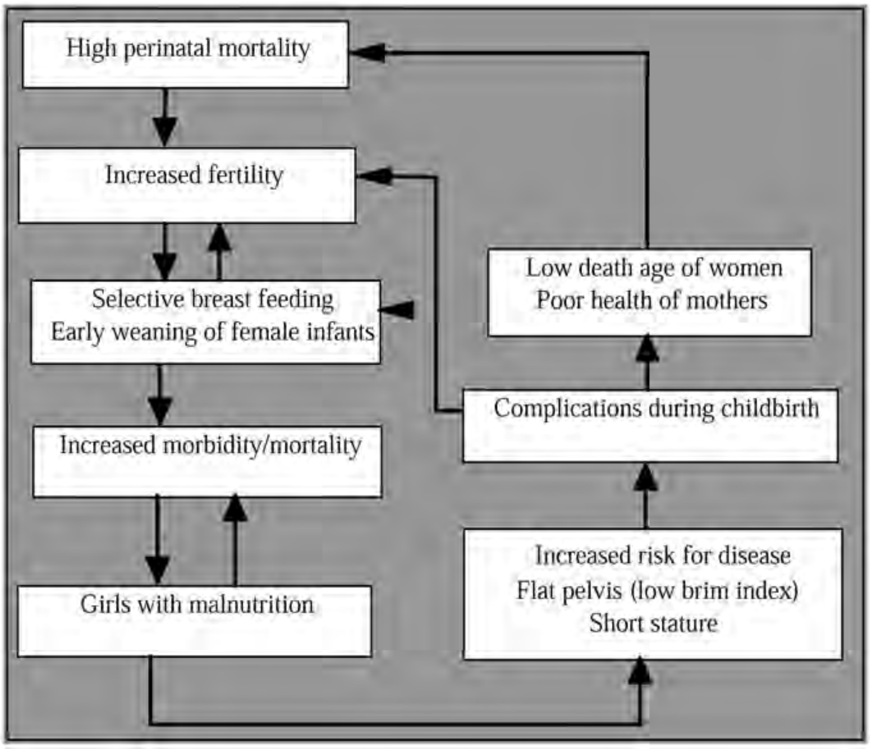

Fig. 15. The connection between infant mortality and poor female health.

meantime the infant could be suckled by a woman with 'older' breast-milk.[370] Kitzinger thinks that this practice could reinforce the relationship between women, since it would make other women engaged in the mother and infant.[371] It is possible that a similar taboo against colostrum (which influenced the neonatal infant's chances of surviving) existed in some villages during the Middle Helladic period, for instance in Asine, where it could have been a contributing cause to the high neonatal mortality found there.

Even if the food given to infants as a complement to breast-milk is nourishing, it also exposes the children to a broad spectrum of infectious agents.[372] Evidence from Tiryns suggest that the seeds of wheat also contained a high percentage of seeds from the weed *Lolium remulentum,* which can hold parasites that are hazardous for humans.[373] Food that contains sufficient dietary iron may also contain chemicals that prevent the body from absorbing the iron.[374] This applies, for instance, to whole cereals (or flour made of whole cereals). Thus, if the supplementation given to infants is gruel made of cereals such as barley, it can inhibit the iron absorption and cause iron deficiency. In Lerna and Asine, the most important cereal seems to have been barley, but also wheat was cultivated to some extent.[375] Makler proposes that barley gruel was used as a supplement to breast-milk in ancient Greece since the Hippocratic corpus places such high value on barley.[376] Further, he suggests that bladder stones mentioned in the Hippocratic works arose from protein deficiency which was caused by a high dependence on cereals.

Anaemia is also a serious threat to maternal health. In fact, it is considered as one of the most important causes to maternal mortality after haemorrhage which in turn will be more severe if the woman is anaemic.[377] It is likely that the skeletal changes named 'porotic hyperostosis' which was found on several individuals in Lerna, represents some type of anaemia developing as a response to a high pathogen load. However, it cannot be determined whether the adult individuals were suffering from anaemia at the time of their death since these bony changes persist from childhood to adult age. Active lesions are often restricted to children.[378]

Given the indications of malnutrition for women in Asine and Lerna (i.e. lower age at death, pelvic flattening, shorter stature and worse dental health), it seems reasonable to assume that the food was not equally distributed between the sexes. The same conclusion is also reached by Calnan.[379] I find it possible that the presumed difference in diet began immediately after birth with a selective breast-feeding practice and earlier weaning of female infants.

In the eminent work of Eleanor Scott on the archaeology of infancy and infant death, she points out "… we must be

370 Fildes 1986, 83–85; Fildes 1995, 117.
371 Kitzinger 1995, 390.
372 King & Ulijaszek 1999, 170.
373 Nordquist 1987, 32; Kroll 1982, 467–485.
374 Sallares 1991, 275.
375 Nordquist 1987, 32f.
376 Makler 1980, 317–319.
377 Belsey & Roystone 1978, 11.
378 Larsen 1997, 32f.; Sallares 1991, 276.
379 Calnan warns about conclusions being made without studying equal numbers of skeletons from females and males and also incorporating the indicators of nutrition and development in the analysis. Calnan 1992, 328–332.

aware that in many communities there are social controls in place which determine an infant diet which may not be acting in the best survival interest of the infants."[380] It is possible that when a mother with many children gave birth to a female infant, it was likely to be given some kind of semi-solid food already after some weeks to allow others than the mother to care for it under periods of heavy workload. As a consequence, some of these infants probably died of infections and/or malnourishment before reaching the age of one month while others managed to survive, but, if the deficient diet continued, suffered from ill health and growth disturbances. Of course, this hypothesis cannot be proven until a reliable method to determine the sex from infant bones is available.

A much simplified picture of the interacting factors which might lead to the observed malnutrition in women is illustrated in *Fig. 15*.[381] I agree with Calnan's opinion that the lower death age of Bronze Age women was primarily caused by malnutrition and should not be related solely to the hazards of childbirth.[382] The maternal mortality was most certainly raised by poor health, but it should not be forgotten that childbirth *is* hazardous in the absence of antenatal and obstetric care even if women are well-nourished.[383] It is not very likely that such care was provided for the Bronze Age women. Women's poor health must have had considerable consequences for the society, since many women most likely had diminished working capacity due to malnourishment and/or complications from repeated childbirths. At times during the advanced stage of pregnancy their productivity could be limited. The fact that infants had to be carried, nursed and cared for during the periods when work had to be carried out in the fields at some distance from the settlement, or the animals needed to be taken to pasture would have increased the maternal burden. This situation might be a contributing cause for introducing quite large amounts of supplementary food for *the majority* of infants as early as between three and six months, as indicated by the peak in the death-age distribution (section 5.2, *Fig. 13*). It is also likely that weaning time varied according to when in the year the child was born, and the summer months were probably most dangerous regarding infections. Belsey and Royston have presented an overview of the health of women and children in Africa, South-east Asia and the Eastern Mediterranean and they state,"Even in traditional agrarian societies where women are actively involved in agricultural production, certain seasonal patterns in the work load of women can lead to a decrease in feeding frequency which is reflected in the nutritional status of young children. In such circumstances traditional support systems may consist of nothing more than a slightly older sibling, usually a girl, being left in charge of the youngest children, everyone else participating in the work in the fields."[384] The same practice is reported from some regions in northern Sweden and Finland during the nineteenth century where horn-feeding were practised; the medical officers mention that infants were left in the care of older siblings and usually had the teat in their mouth whether they were sleeping or awake. The invention of a special sling for the feeding horn which was mounted over the cradle made it easier for the infants to feed themselves.[385]

However, there is also evidence that lactation patterns need not be affected by the parents' work—for instance among the Tamang agro pastoralists of Nepal, the women participate full time in the subsistence work, and also have the main responsibility for the children.[386] They handle this demanding situation by carrying their children with them to the fields and breastfeed them on demand. The children are nursed for about three years and then shoulder the responsibility as care-takers for younger siblings.[387] It is perhaps too easy to see childcare as an activity that needs to take place in the home, but this is not the case in a number of societies.[388] Integrating the infant in the families' daily activities may also be a way to speed up the process of socialization. Yet, it must be emphasized that lactation and time of weaning are often surrounded by specific cultural beliefs which are strong enough to overshadow practical aspects.

Since both practical and cultural considerations can affect both when and what food are given to infants and children, it is impossible to know for certain what causes lay behind the prehistoric weaning practices. The prehistoric evidence for the age of introduction of food other than breast-milk goes back to approximately 3000 B.C. and comprises the Near Eastern civilizations: for instance, Babylonian records mention wet-nurse contracts which stipulate breast-feeding for 2 to 3 years.[389]

A survey of studies utilizing bone chemistry on archaeological skeletal material also points towards the age interval 18 months–3 years as the predominant period for the introduction of food other than breast-milk, and ethnographic evidence from non-industrialized societies partly present a similar picture.[390] Yet, there are also studies indicating that infants in some societies were introduced to other food than breast-milk at a very early age: Herring *et al.* conducted a combined biometric and stable nitrogen isotope analysis on the material from the 19th-century cemetery of St. Thomas in Belleville (Canada), where they found that 5-month-old infants received such quantities of non-breast-milk food that the cumulative mortality increased as a consequence of the process.[391] The authors believe that weaning diarrhoea caused by gastrointestinal infection was the most likely cause

380 Scott 1999, 60.
381 The figure is a modification of the model proposed by Higgins (1989, 178).
382 Calnan 1992, 338f.
383 One female skeleton which had small bones present in the pelvic area was found in tumulus Γ at Argos. These bones would indicate that she died during pregnancy. Lambropoulou 1991, 188.
384 Belsey & Royston 1987, 34.
385 Brändström 1984, 96, 180f.
386 Panter-Brick 1995, 174–188.
387 Panter-Brick 1995, 182, 184.
388 Sofaer Derevenski 1994, 11.
389 Fildes 1995, 113; Stuart-Macadam 1995, 82.
390 Stuart-Macadam 1995, 77–85.
391 Herring *et al.* 1998, 425–439.

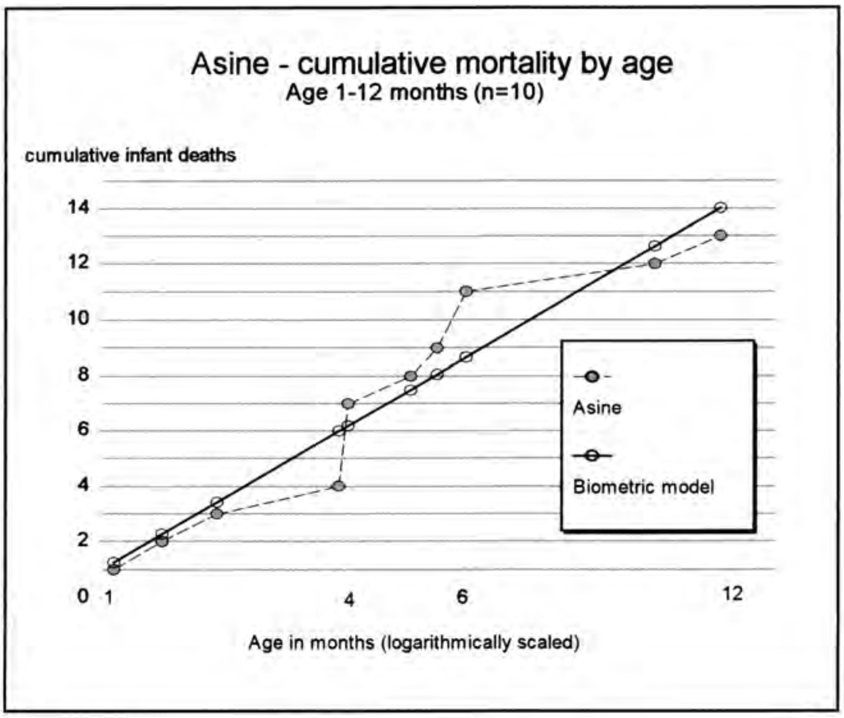

Fig. 16. Biometric model for weaning age in Asine.

of death for these infants.[392] There is also evidence from 18th-century Europe indicating that infants were weaned before they had any teeth or could sit up at a table: since the first tooth often erupts around six months of age, it means that these infants would have been the same age as the Canadian children.[393] Variations in the timing of weaning according to the sex of the child is also attested: in Britain (18th century) and France (14th century) girls were often weaned six to twelve months earlier than boys.[394]

It must be emphasized that weaning practices in the past often took place during a long period with a gradual introduction of semi-solid food such as gruel, pap, fruit juices, etc. The combination of breast-milk and other food could be sustained for several years and had the advantage of giving the mothers greater flexibility so they could leave the child in someone else's care for some hours. In discussing the introduction of food other than breast-milk some definitions are perhaps in place. Scott and Duncan point out the important fact that the term 'weaning' may have two different meanings, "… the first meaning is when it is used in the sense of an infant being weaned on to some solid foods, and the second meaning is when it is used in the sense of an infant being weaned off breast-milk (or formula milk). Only in some societies are the two events carried out simultaneously."[395] For the purpose of this study, 'weaning' is taken to indicate the introduction of other food to any extent.

The feeding practices as well as the length of time weaning children off breast-milk are found to have profound effects on the level of mortality.[396] I have attempted to test whether a weaning age could be distinguished by applying the Argolid mortality data to the Bourgeois-Pichat biometric model described by Knodel & Kinter, among others. This model, which has been widely accepted and applied to both historic and modern materials, is based on the linear relationship that often exists between age on a logarithmic scale and the cumulative mortality in the interval 1–12 months of age.[397] As already discussed in section 5.2, the mortality between birth and one month (endogenous mortality) often results from inherent problems and birth trauma, as well as other factors connected to the delivery and the mother's health status. These deaths should therefore be separated from the ones occurring during the post-neonatal period (exogenous mortality), which are caused more often by the environment (poor

[392] The early introduction of supplementary food is a major problem for the children's health in many contemporary African communities. A study of the relation between breast-feeding habits and infant/child mortality in the Amagoro Division, western Kenya, shows that 70% of the 3–4-month-old infants were fed other diets in addition to breast-milk. This habit, together with environmental factors, such as poor nutritional quality of the substitute food, contaminated food preparation utensils and unsanitary conditions, diminish the child's chances of survival. Under better environmental circumstances, a supplementary diet (after 4 months of age) may improve the infant's health and chances of survival. See Akwara 1994. Also, in Malawi complementary food is introduced at an early age. Exclusive breast-feeding was exceptional among infants less than 4 months of age: more than 90% of these infants got some kind of supplementation and almost 50% of the 0–4-month-old infants had started to receive solid or mushy food. Inappropriate feeding practices contribute to malnutrition which is one important factor for the high level of infant mortality. Madise & Mpoma 1997.
[393] Fildes 1995, 120.
[394] Fildes 1986, 48, 367.
[395] Scott & Duncan 1999, 59.
[396] Brändström 1984; Knodel & Kinter 1977, 391–409; Saunders, Herring, Boyce 1995, 69–89; Scott & Duncan 1999, 37–60.
[397] Knodel & Kinter 1977, 391.

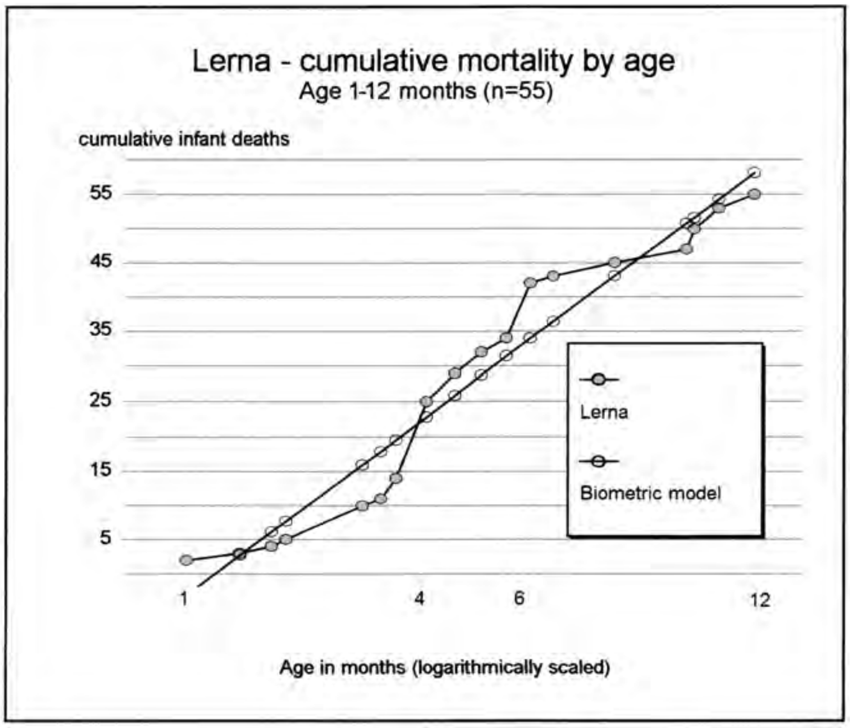

Fig. 17. Biometric model for weaning age in Lerna.

hygiene, malnutrition, acquired diseases, etc.).[398] If excess mortality occurs at some point during the post-neonatal period, the straight line between one and twelve months would be crossed by a higher mortality at that age.[399] Scholars using this method have concluded that a steeper rise of the slope indicates the time of weaning.[400]

The biometric model has also been used to identify non-nursed children from those who were breast-fed: a convex curve has been shown to indicate excess mortality during the early months of the first year following artificial feeding practices in circumstances when the hygiene is poor, while a concave or straight curve signifies breast-fed children where the mortality rises more steeply during the later part of the first year.[401] This method is not without problems since it postulates that the normal post-neonatal mortality is constant across time and culture, and the method is probably best suited to materials where the analysed deaths span a period shorter than several centuries.[402] However, Stuart-Macadam emphasizes that this method could be useful for the investigation of feeding practices in prehistoric materials where the infant category is not believed to be under-represented. The Bourgeois-Pichat method is described by Scott and Duncan among others, "The biometric model depends upon two features of infant mortality: first that virtually all endogenous mortality occurs within the first month of life and, second, that cumulative exogenous mortality is proportional to $[\log (n+1)]^3$, where n is the age in days."[403]

The result of applying this method to Asine and Lerna is depicted in *Figs. 16* and *17*.[404] The curves obtained in the figures are not smoothed or fitted as is usually the case in studies utilizing this method, but nevertheless a trend is immediately apparent—both curves of the infant death distribution indicate that the infants were largely breast-fed until approximately four months, when there is a sharp rise of the cumulative death-age distribution at both places. The patterns should indicate that quite substantial amounts of foods other than breast-milk was given to infants at this age. Given the nature of the sample at hand for this investigation, the analysis can be regarded as rather speculative, but I want to argue that the strikingly similar results obtained from the two sites (despite a fairly small sample) are indicative of events leading to death which apparently affected the infants at the same age. During this period of the infant life it is difficult to find other factors that could have such profound effects on the patterns of mortality as the feeding practice.

A good example of the different patterns of mortality for infants that were breast-fed/not breast-fed, is found in the

398 It should be noted that the endogenous mortality (which often take place during the first week of life) is not totally biological/genetic in nature and could be influenced by environmental factors such as, for instance, the mother's health during pregnancy and economic, cultural and social factors. Naturally, these factors most certainly affect the mothers, to whom the foetus is closely connected. For a thorough discussion of this view and factors influencing the endogenous mortality, see Lalou 1997, 201–215.
399 Stuart-Macadam 1995, 90.
400 See Scott & Duncan 1999, 37–60, and Stuart-Macadam 1995, 89–92 with further references.
401 Brändström 1984, 108–142.
402 Stuart-Macadam 1995, 90–92.
403 Scott & Duncan 1999, 42.
404 The age determinations which were based on the bones are adjusted (two days/lunar month) to compensate for the underestimation discussed in section 5.2.

study of Knodel and Kinter.[405] They have examined the impact of breast-feeding practices on infant mortality for eight Bavarian provinces in Germany in the early twentieth century. In this case it was known from the beginning that sharp differences existed in the breast-feeding practices between the regions. The applied biometric model of Bourgeois-Pichat showed that both the *level* and *pattern* of infant mortality differed in respect to the divergent feeding practises in these regions: in the three regions where breast-feeding was common, the age patterns followed close to the predicted line of the model, but in the three regions where few mothers nursed their infants, the mortality rose more steeply during the one-to-six months interval. In the two regions where breast-feeding was practised on a limited scale, the early mortality in the first half of the year was higher than expected, although it was not as high as in the not-breast-fed category.

The conclusion of this section must be that the nutritional status of the mothers as well as the cultural and economic situations in these Middle Helladic villages must have had an enormous impact on the fate of the newborn children. In a time when sanitary conditions were poor, the introduction of food other than breast-milk at four months of age (or earlier) was probably a crucial cause of infant mortality.

[405] Knodel & Kinter 1977, 391–409.

VI THE CULTURAL CHILD

Individuals communicate with each other through their bodies as well as through speech and they are also judged by their physical appearances and behaviour: therefore the remains of children's bodies are important for the interpretation of their lives. In the Asine material, the graves are the primary sources for linking the physical bodies of children to the material culture and therefore I will begin with the burial itself and its result: the grave.

The symbolic functions of the grave and the possible grave finds within it have been discussed intensely during the last decades. Scholars seem to agree that graves carry symbolic messages as well as express the beliefs and relations of the living society, which can be mirrored in the mortuary treatment, sometimes in an idealized form. Nordquist has discussed the MH graves in Asine, and to some extent also the symbolic aspects of the material found in them.[406] For this reason, I will restrict my discussion to highlighting *some* aspects of children's graves which can be seen as relevant for the discussion about how children were looked upon by the contemporaneous society.

6.1 LOCATION OF GRAVES

When MH burial customs are discussed, children are often referred to as primarily buried within the settlement, sometimes under floors or in the courtyards of inhabited houses. In contrast, the burials of adults are regarded as having taken place extramurally, or within houses not occupied at the time of burial.[407]

Children of different ages were found within the settlement, i.e. the Lower Town (LT) of Asine. They were buried under floors in the houses, in the backyards and among abandoned houses. Many of their graves were disturbed through building activities during the course of the MH period as well as in later times. Only few graves could be dated more closely, and their relationship to the period of habitation in the houses is often difficult to establish. Nordquist discusses the problem of determining what graves in the LT that can possibly be attributed to the habitation phase of the houses.[408] She finds it likely that several graves were contemporaneous with the houses of the settlement even if conclusive evidence is often difficult to find.

Some burials are more likely than others to belong to the period of occupation, these being: MH 4 (house E), MH 9 (house D), MH 11–12 (in house D? occupation of house sC and E), MH 20 and 23 (house C, perhaps later), MH 24 (house C, perhaps earlier?), MH 29 (court of house D), MH 31–33 (in house D? occupation of houses C and E), MH 35 (house D), MH 52/53 (house E). Most graves in house E are probably contemporary with its period of use except for MH 54, MH 56 (perhaps house A?) and MH 70 (house T).[409]

If these graves belong to the occupation phases of the houses, it appears that an equal amount of children and adults are present. Eight graves contained adults and eight graves belonged to children.[410] However, it is possible that MH 29 contained both a middle-aged male and an infant.[411] Even discounting the four least securely attributed graves (MH 20, MH 23–24, MH 56)[412] and with only 12 graves regarded as connected to the habitation period with a reasonable amount of security, the fact that 42% of them belong to adults is noteworthy. In fact, it reflects the general situation in the LT where *c*. 36% of the buried were adults.[413]

Unfortunately, only three or four of the children's graves, which were most certainly connected to the habitation of the houses, could be associated with the individuals identified in the present skeletal material. MH 29 is reported to have contained an adult male, but I find it possible that also a foetus belongs to the same grave.[414] MH 33 is problematic since only one bone fragment (diaphysis of a tibia) from a child in the Infans I group (0–7 years) could be associated with this

406 Nordquist 1987; Nordquist 1990; Nordquist 2002.

407 Cavanagh & Mee (1998, 24) point out that MH graves that are contemporary with the use of a house normally belong to children. (Contrary to Blackburn 1970, 283)

408 Nordquist 1987, 95f.

409 Nordquist 1987, 83f., 95f.

410 Nordquist 1987, 128–132. It is not entirely clear if the person buried in MH 24 was an adult, as no information is given in *Asine* I, 117f. I follow Nordquist's work and have thus classified the skeleton as 'Adult?'.

411 See the catalogue in section 3.6, unit W05.

412 Nordquist 1987, 96.

413 Nordquist 1987. Four of these five adults were age determined to be 34, 35, 43 and 58 years old. Three of the individuals were men and one was a woman.

414 The foetus was 8.5–9 lunar months old. See the catalogue in section 3.6, unit W05.

grave.[415] MH 35 probably belongs to a four-month-old child and it is possible that also one more individual, a newborn infant, belongs to the same grave.[416] MH 70 was dug down into a *bothros* and contained a 6-month-old infant.[417]

Two extramural cemeteries are found close by the settlement of Asine: the so-called East Cemetery and another situated on the Barbouna slope.[418] The East Cemetery is perhaps the only 'real' extramural burial ground since this area seems to have been set aside for burials, and was never used for habitation in the MH period.[419] This cemetery comprises 21 graves, of which at least five contained skeletal remains of children. The Barbouna cemetery is often referred to as an extramural burial place, but Nordquist suggests that this area might be somewhat intermediate between the two groups since the graves in this area were dug down in houses which were no longer inhabited.[420] In this area 15 burials were excavated: they contained the remains of 10 children of different ages and seven adults.

In the intramural cemetery of Lerna, the same problem as in Asine arises of relating the graves to contemporary houses. In Blackburn's investigation of MH burial customs, at least some of the graves from Lerna are considered to be contemporary with floors, i.e. the habitation phase of the houses.[421] The majority of these graves belong to children, but adults of different ages were found as well. Blackburn argues that both adults and children were buried inside settlements during the MH period, and she believes that the idea of intramural burial places as pertaining mainly to children could derive from the evidently high infant mortality.[422]

In contrast to the opinion of Cavanagh and Mee, I think that the evidence discussed above reinforces Blackburn's view that also mature individuals were buried within the settlement.[423] Even if children's graves are over-represented intramurally, some of them may equally well have been dug down in houses not inhabited at the time of burial thus being less connected to the sphere of the living. It is difficult to speculate about reason for the absence of some age groups in the intramural cemetery, since not all skeletons were age determined. For instance, none of the individuals in the LT who could be more exactly age determined was found to be between 12–17 years of age.

6.2 GRAVE TYPES AND MORTUARY RITUAL

The grave types used for children in Asine were mostly earth-cut pits. In the LT, 48 pit graves, 11 cist graves and six pot burials belonging to children have been excavated. The same types were also used for adults of different ages, with the exception of pot burials.[424]

The children in the Barbouna cemetery are buried in pits or cists which were sunk into destroyed houses, the adults are buried in cists or small shaft graves.[425] With the exception of the three shaft graves, no features pointing to any real difference between the cemeteries of LT and Barbouna are found (the grave types of the different burial locations are summarized in *Table 8*). The East Cemetery differs from the two other burial locations in many ways: for one thing, a tumulus was found with graves situated in and at its periphery. Among the graves associated with the tumulus, two held the remains of children.[426] Also, two double pot burials containing adults were found, whereas pot burials of children are lacking here.[427] It should be noted that children are not as numerous in the East Cemetery as within the LT or on the Barbouna slope.[428] The youngest children found in the East Cemetery are two infants who are both older than six months.[429]

The East Cemetery does not include any pit graves, which were otherwise the most common type used for children in LT and on the Barbouna slope, and the different forms of cists and pot graves found here are often more furnished and the expenditures spent on the graves are generally higher than in the other cemeteries. It can therefore be argued that the few children buried here belonged to a special group of people. In agreement with Nordquist, I find it likely that these people represented a more wealthy group within the society.[430] Yet, it may seem strange that no perinatal infants were found in the East Cemetery, in contrast to the LT and to some extent also the Barbouna cemetery, since even wealthy groups must have been subject to high perinatal mortality.[431] The age distribution in the East Cemetery is skewed in favour of young

415 The attribution of this bone fragment to MH 33 must be regarded as quite uncertain owing to the find circumstances. Section 3.6, unit W06; *Asine* I, 120.
416 See catalogue, section 3.6, unit W03.
417 See catalogue, section 3.6, unit T3:04.
418 The terminology concerning intra- and extramural burial places discussed in this work refers to if the graves were placed inside or outside the settlement. I will regard the graves which were dug outside the houses but inside the contemporaneously inhabited settlement as still being intramural burials. See also Cavanagh & Mee (1998, 24–26) for a discussion about intra- and extramural cemeteries during the MH period.
419 Nordquist 2002 125f.
420 Nordquist 1987, 100; Nordquist 2002, 125.
421 For instance: grave nos. B 4, DE 71 and 72, DE 64, etc. Blackburn 1970, 38, 43, 55.
422 Blackburn 1970, 283.
423 Cavanagh & Mee 1998, 24.
424 Nordquist 1987, 128–136.
425 Nordquist 1987, 98f., 135f.
426 These are: grave 1971–12, *c*. 9–11-year-old child and grave 1972–5, woman of 30 years and a child of *c*. 6–11 months. *Asine* II:2, 24–26.
427 Pithoi/jar burials used for adults are also found in Argos in tumuli A and Γ. Lambropoulou 1991, 182f., 186.
428 Angel 1982a, 106; Nordquist 1987, 134–136.
429 These infants are referred to by Angel as numbers 58 AS and 67 AS. Angel 1982a, 105f. My own examination of these bones agrees with Angel: I estimate the age of 58 AS to 12–18 months and 67 AS as being 6–12 months old.
430 Nordquist 1987, 109.
431 For a discussion about the mortality and its causes, see 5.2–5.4. It should be noted that the working conditions during excavation were difficult owing to ground water percolating into the graves, and it is possible that small bones from infants and young children were destroyed or overlooked. Nordquist 1987, 99. Furthermore, since the East Cemetery has not been completely excavated, the possibility that neonates could have been buried there should not be excluded.

Table 8. Distribution of children's graves in Asine. (The stratigraphic finds of children's bones in adult graves were not included in this table.)

Location \ Grave type	Pot	Pit	Cist	Shaft	N infants	Total N graves
Lower Town	6	48	11	–	36	65
Barbouna	–	5	3	–	9	8
East cemetery	–	–	5	–	1	5

adults (mean age 25 years), and the fact that no newborn individuals at all were found here makes it likely that the people using this cemetery buried their infants elsewhere. I find it possible that elite groups within the society would have had other rules concerning a more 'formal' incorporation of an infant into the family (probably a later inclusion), and therefore may have considered the burial of a newborn to be more appropriate within the more domestic sphere of the settlement.[432] One may speculate that the reason behind a later inclusion of infants into the group may have been concern for the lineage: perhaps elite groups were more cautious before acknowledging, and thereby emotionally investing, future expectations in a neonate that may not survive his or her first months.

In the cemeteries of Asine, it was not possible to determine any pattern for the directions of graves or the position and direction of the dead within them.[433] Nordquist finds it likely that the ground as well as the surrounding structures were decisive for how the graves were situated, and she finds it unlikely that the burial position or orientation had any particular meaning. Most skeletons were contracted on either side, but it is interesting to note that of the five skeletons which were found contracted on their backs, four of them were reported to be children.[434] In many cases of child burials, the information about the side was omitted in the publication but information is sometimes given in the excavation diaries and field drawings.[435] However, many of them seem to have been too fragmentary to reveal which side they were laying on.

In Lerna most graves containing children are simple pits, but also cists of various types are common, and the pot burials make up *c*. 6% of all child graves.[436] The vessels used for burials (in both Asine and Lerna) are of different forms: pithoi and other jars as well as hydrias are found.[437] Most vessels are of a coarse undecorated type, but also one decorated example is present in Asine (MH 17).[438]

The graves in both Asine and Lerna were often single interments, but there are also a number of graves containing the combination of a subadult and an adult.[439] In the Lower Town, three graves (MH 21–22, MH 79–83, MH 90) possibly contained the remains of a supposedly mature individual together with a child.[440] In the East Cemetery the graves 1972–5 and 1972–7 contained a similar combination.[441] However, it is possible that more graves originally contained this combination as indicated by the skeletal material investigated here.[442] Burials of children together with adults do not necessarily mean that they were relatives, but since kin groups seem to have been the basic organizing principle of the MH society, I find it likely that family ties could occasionally have been emphasized through the mortuary treatment of individuals as well as by the location of the grave.[443] On the other hand, if two deaths took place at approximately the same time, there may have been practical reasons behind this practice. It should be noted that in some cases one of the individuals was buried on the cover of the grave, and in these cases there need not even be a time connection between the interments.[444] The combination of child and adult was apparently not restricted to one sex since both women and men are found together with children.

In Asine, four of the pit graves (MH 64, 65, 67 and 103) on terraces II and III contained fragments of some sort of packing material, found around and on the small skeletons.[445] Similar fragments were also identified in the Mycenaean chamber tomb I:7 in Asine. Mårtensson has studied these so-called 'packings' from the chamber tomb, and she found the fragments to be made of a volcanic ash, mainly consisting of quartz and feldspar and probably mixed with a resin as a binder.[446] Impressions of wood were found on the packing fragments, and it is likely that they had been used to seal rectangular cists or boxes and possibly also round containers which may have been used for burials.[447] Mårtensson estimated the

[432] Since few children were found in LH chamber tombs, a similar practice has been suggested to exist during this period (Wells 1990, 139).
[433] There may have been a slight tendency to avoid a N–S position for the graves (Nordquist 1987, 98; 1990, 40 n. 32).
[434] Nordquist 1987, 98.
[435] This information were included in Nordquist's article (Nordquist 1996a, 19–38).
[436] No pot burials belonging to adults have been found here.
[437] Only pithoi are used for burials in Lerna (Blackburn 1970, 36–86).
[438] *Asine* I, 276, fig. 191.
[439] Cf. *Asine* II:2, 75f. This combination was also found at Mycenae, see Alden 2000, 21.
[440] Only in MH 21–22 the adult and child combination is certain. In MH 79–83 there is no indication as to the age of one of the skeletons (MH 83), and in MH 90 a child and an 'older individual' is mentioned, but if it is indeed an 'adult' individual is difficult to know (*Asine* I, 117, 124f., 342).
[441] *Asine* II:2, 75–77.
[442] It is likely that MH 98, MH 101 and grave 96 contained the adult/child combination, and it is possible in the case of MH 60, MH 62, (MH 72). For a discussion about these matters, see catalogue (3.6), units T2:01, T2:09, (T3-2:07), T3:14, T3:15, T3:21.
[443] Cf. Nordquist & Ingvarsson-Sundström 2005, 161–163.
[444] See, for example, MH 79/83, *Asine* I, 124f.
[445] *Asine* I, 124, 127; Mårtensson 2002, 47 n. 19; Nordquist 1987, 132, 134.
[446] Mårtensson 2002, 47.
[447] Mårtensson does not rule out the possibility that the boxes could have been used as containers for grave offerings of food or liquids. Mårtensson 2002, 45, 48.

sides or diameters of the boxes to between 15 and 40–50 cm.[448] This size seems to be suitable for holding a small infant.[449] It is likely that the packing fragments found in the MH graves in LT were of the same type as in the chamber tomb. In the field diary from the excavations it is mentioned that the fragments could have belonged to wooden coffins, and it can therefore be assumed that they had the same type of wooden impression as the ones in the chamber tomb.[450] Unfortunately, these fragments were not kept by the excavators and could not be included in Mårtensson's analysis.

Similar fragments of packing materials seem to have been found in many more graves: in connection with the excavations on terrace III (and particularly relating to the graves MH 64–67 and MH 89) the following conditions during excavations are mentioned in the diary, as Knudtzon states:

> A child skeleton is waiting to be drawn, i.e. field no. 15 [grave no. 105 = MH 64]. Another one [grave no. 106 = MH 89] was partly destroyed by the pick and it was also squeezed by fallen stones, it was excavated; perhaps there could have been twins or triplets which lay in a heap in a terrible mess. A third child skeleton is now waiting to be drawn [grave no. 107 = MH 65].[451]

Included in this passage in the diary was a footnote with the following comment:

> Around all these small skeletons the earth was clayey and some pieces could have been clay-lining, possibly from a wooden coffin—unfortunately I did not save them.

Given this background, it should be considered that similar fragments could have existed also in MH 89, even if it is not mentioned in the publication. Perhaps they were not found exactly around the skeleton/s since the bones apparently were found in disorder. Another example of lining fragments which may be similar to the ones under discussion was found in the Eastern part of LT:

> Close to the walls were found large pieces of fired clay that were unevenly lumped, these pieces were probably traces of clay lining[452]

The excavators believed that these remains belonged to a hearth since pieces of fired mud brick and faint traces of ash were also found in the same area. However, during the same day and in the same area were also found bones from a newborn infant.[453] It is uncertain whether these bones were found in direct connection to the lining fragments since no comments about graves or human bones were made in the diary. It is possible that also cist grave MH 60[454] could have contained lining fragments, and Frödin gives the following remark:

> On top of the skeleton there was an approximately 0.04 m thick layer of loose sea-sand with lumps of clay, on top of that, a 0.03 m thick, firm (dried) layer of sand mixed with clay, on top of that the cist was empty up to the cover slab.[455]

It is conceivable that the 'lumps of clay' could be traces of lining, plausibly deriving from a wooden box containing a small infant. An infant (and more uncertainly also an older child) seems to belong to the same grave, and it can be speculated that the infant was buried in a box above the adult skeleton at a later occasion. Since only small bone fragments from this infant were preserved, they could easily have escaped the excavators' notice.

As also argued by Mårtensson, I find it likely that wooden boxes were sometimes used for infant burials. The children in Asine are found in all grave types including pots of various shapes, and I think that wooden boxes could be seen as alternative coffins considered appropriate for some infants. However, there are many examples of infants being buried just in simple pits, so a container for the body does not seem to have been necessary in every case.[456] It could be speculated that infants buried in boxes were regarded as special in some way, and that they were therefore given a different and more time- and effort-consuming burial treatment. The bones from the four cist graves in question belong to infants with an age of 5.5 months (MH 64), 8.5–10 lm (MH65), 9–10 lm (MH 67) and 9–10 lm (MH 103).[457] I find it possible that this special type of burial could have been used by a wealthier group in the society, to indicate special status for their infants. Mårtenson's results are certainly interesting for the discussion about mortuary rituals for children since her findings might indicate that more energy was spent on the burial of a small infant than was previously assumed.

Burials of small children within the settlements are attested throughout the Greek Bronze Age, even in periods when most graves are placed outside the settled area. The tradition goes as far back as the Neolithic period and the custom still prevails in some contemporary small-scale societies. Wright finds parallels in ritual beliefs concerning birth and death between the cultures of Neolithic/Chalcolithic Cyprus and what he calls 'primitive societies' attested during the last three cen-

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[448] Mårtensson forthcoming. The excavator Otto Frödin found the fragments to be clustered in groups, and two of them seemed to form some kind of pattern: they appeared to suit boxes of different sizes. He estimated the size of two of the boxes to be approximately 11. 5 × 17 cm and 17. 2 × 18. 8 cm. *Asine* I, 186f.

[449] It should also be mentioned that a white substance was found on several lining fragments. The conservator consulted by Mårtensson reports that the substance consisted mainly of lime and phosphates which possibly derive from bone. This finding gives further support to the theory that the boxes once contained a corpse. Mårtenson forthcoming.

[450] Knudtzon 1926, Diary no. 3, 18th May.

[451] Knudtzon 1926, Diary no. 3, 18th May.

[452] Nilsson 1926, Diary no. 4, 23rd March.

[453] Section 3.6, catalogue unit E03.

[454] The grave contained a woman (and possibly two children). See section 3.6, catalogue unit T3:15.

[455] *Asine* I, 123.

[456] The grave types used for adults also show a similar variability: pits, different types of cists, shaft graves and pot burials as well as stone enclosures. Nordquist 1987, 91–93.

[457] See section 3.6, catalogue units T3:04, T3-2:05, T2:09. The children's fragmentary skeletal remains do not indicate any skeletal deformity or pathology, but special circumstances during birth or a different appearance, such as infants born with a caul, twins, or children with a rare eye colour are known to be regarded as special in many cultures. See Douglas 2000 (1966), 40. Another possibility is that these infants were feared, perhaps because of some clearly visible disability or disease which did not affect the skeleton.

turies.[458] In these anthropologically described societies the burial of infants under house floors, thresholds and in walls, are made to enable the child to enter the womb of women passing by—in that way the dead child is thought to become reborn.[459] Wright argues that the house burials of Chalcolithic Cyprus should be seen as similar 'continued interrelation of the living and the dead'.[460] However, even if some connection between death and birth seems probable here, the nature of this supposed interrelation is debated since the question of simultaneity of the Cypriot burials and habitation is uncertain.[461] Also, other ideas may lay behind burials in houses, for instance beliefs in protection of dead family members may be an equally possible explanation. Transcendental beliefs in rebirth are interesting to consider, but they are difficult to address given the limited archaeological evidence at hand.

In the cases of Asine and Lerna it could be argued that the presence of adults as well as older children and infants buried side by side makes a connection between death and the rebirth only of infants less likely. Owing to the stratigraphic conditions in Asine it is difficult to obtain any reliable pattern for the age distribution according to burial location among the houses of LT, but four clusters of graves are associated with Houses A, C, D and E. These groups contain both adults and children.[462] When the architectural remains of Lerna V are published, it will be interesting to see whether certain places in or near the houses can be linked to the age of the deceased. But until then, it will remain unclear if special areas, for instance for the dead infants, were preferred. However, the practice of burying the dead under house floors could also be seen as a way to emphasize ownership and strengthen the right to houses and land.

Nordquist mentions the fact that children were often buried in very simple graves within the settlement, and she sees this as indicating that 'children' in general had a lower status than adults even if they probably could inherit their parents' status.[463] I do not agree with this interpretation. It is true that the simple pit graves, which are dominant for young individuals, are indeed not at all monumental (as far as we know them now at least) but I find it possible that graves were not always the direct focus of mortuary ritual. If this were the case, it is likely that the actual body of the deceased, and thereby his/her physical appearance became all the more important. Thus, the physical maturation of the child could have been important for determining where it should be buried, and the place of the burial may have been significant for the 'reading' of the burial by the contemporaneous society. If the intention was, for instance, to emphasize the domestic character of an individual, elaborate grave goods may not have been necessary.[464] There are no general indications that children had a *lower status* than the mature individuals of the society. Hierarchical status differences most certainly existed, but they were probably not always dependent on age. Given the lack of infants and the under-representation of children in the East Cemetery together with sporadic finds of wealthy child graves, I find it more likely that individuals who were not considered mature (for example neonates) had another type of status which was not necessarily 'lower' than the adults, only considered more domestic in nature.

6.3 REACTIONS TO DEATH

When mortuary treatment of prehistoric children is discussed, one particular question is often addressed: did past people mourn when their children died? This question may not be as absurd as it sounds, since poor social and economic circumstances can sometimes affect the parents' attitudes and feelings towards their children in a negative way.[465] It has been put forward by some scholars that since the mortality of children was high in many historical, pre-industrial societies, the parents did not invest much emotion in their newborn.[466] This attitude should imply that the parents' grief was not very deep when a child died, and that they did not spend a lot of energy on the burial of an infant who died soon after birth. Also the opposite opinion has been put forward: some scholars argue that even if many children died at an early age and their mortuary ritual sometimes resulted in simple graves with fewer objects compared to what is found in the tombs of adults, this should not be taken as evidence for less affection to the children or an indifference to their death.[467]

We must consider whether personal feelings of grief can really be interpreted directly from the burial treatment of the deceased. However, I find it strange that the question about feelings in relation to death arises only in discussions about children, and moreover, that it is only in connection with children that these feelings are regarded as capable of influencing the mortality as well as the burial treatment. As others have noted, the 'archaeology of compassion' is complicated since it is far too easy to transfer our own conceptions and feelings about emotionally charged topics such as the death of children to earlier societies.[468] Archaeology may never be able to answer questions about the feelings of prehistoric people, and it is also risky to confuse the parents' personal feelings with social conventions and other rules (for instance, gender differences) which might influence the appearance of the archaeological record. It is difficult to identify and separate cer-

458 Wright 1999, 141–146.

459 The aborigines of Goote Eylandt believe that dead infants go to a store of spirit children who will be reborn. Scott 1999, 105f.

460 Wright 1999, 143.

461 Niklasson 1991, 124, 176f., esp. 237.

462 Nordquist & Ingvarsson-Sundström 2005, 161.

463 Nordquist 1987, 109.

464 A similar argumentation has been put forward by Thomas (1991, 40) in the case of the funerary practice of the Beaker culture in Britain. In this case the previous monumentality of some of the tombs makes the situation somewhat different from the graves under discussion.

465 See, for instance, Scheper-Hughes' (1992) account of Brazilian mothers' reactions to child death. Here it is evident that the severe economic situations and social distress sometimes force mothers to cease caring for their infants who have small chances of surviving. In the Brazilian slum districts early infants and children deaths are extremely common, and this is sometimes emotionally handled as indifference to their death.

466 For example, Ariès 1962, esp. 38f. Nevertheless, he (p. 128) points out that the absence of childhood as a special phase in life did not mean that children in general were neglected or despised; Stone 1977, esp. 82.

467 Cavanagh & Mee 1998, 128–130; Golden 1988; Nordquist 1987, 104.

468 Parker-Pearsson 1999, 104.

tain cultural beliefs by which newborn infants are regarded as not having a separate existence from their mother (if they were regarded as 'nonpersons', they could not be grieved for), from those where social and economic circumstances prevent some children from being raised and should therefore not be mourned. As has been pointed out by Golden, feelings towards the death of children are affected by many factors and cannot be regarded as a simple response to demography (i.e. many infant burials are reflections of high infant mortality and vice versa).[469] I argue that the mortuary remains of children can be used to investigate what rituals were considered appropriate for children of different ages, and in what way they can be related to the children's social roles in the society that they once were a part of.

Another facet of this issue is the treatment of miscarriages and stillborn babies (and sometimes early neonatal deaths). As Lovell has noted, this situation is complicated—since there is no evident dying process, the event can be regarded as a conflict between birth and death.[470] These early deaths often pass in silence, also in modern Western societies, and they are seldom afforded an ordinary burial. Van Gennep's research shows that beliefs in some kind of afterlife are common in most societies, but it necessitates that a transition is involved and that the individual was incorporated into the society.[471] In the case of stillborn and early neonatal death the individuals remain in a transitional zone, and they are often regarded as not possessing a soul— in these cases burial ceremonies and mourning are often kept to a minimum.[472] From Gittings' work on pre-industrial England, it is evident that stillborn babies were scarcely considered as human beings, and since they had not received baptism their corpses could be abandoned at the wayside.[473] Gittings argues that infants' deaths were generally less mourned than in modern England, but if the infant died *after* baptism, at least their funerals were similar to those of adults.[474]

It can be concluded that different biological and cultural factors affect the picture of mortality for the various ages and that the norms of a society can be largely responsible for an observed age-specific mortality and burial pattern. These norms should not be underestimated when factors influencing infant and child mortality are discussed. The cultural attitudes towards children can be demonstrated through actions that are either active (for instance, infanticide or burying the infant alongside other members of the family/society) and/or passive (as neglect and exclusion from burial ceremonies and/or the main cemetery). Examples of the latter regarding dead children are common and could easily be found also within our own society—very few stillbirths and newborns are found in modern British cemeteries and because these deaths often occur in hospitals, they are seldom included in the regular community of the dead.[475] Also in Sweden the rules regarding the treatment of miscarried and aborted foetuses have been controversial.[476] Even if our own society can exclude these foetuses from regular mortuary treatment, few people would assume that they would not be regarded as human beings, or that they were not missed and mourned.

Concerning the MH period these situations are extremely difficult to approach. Even if there is numerous evidence of foetuses/neonatal children being buried, we cannot know for sure if the pits, empty of finds, were ordinary graves and ceremonies were performed, or if they were dug just for disposal. Nevertheless, since we have evidence of 6-lunar-month-old foetuses[477] buried in the same way and location as many adults, I believe that they were regarded as embodied persons already at this time. Since no indications of extreme poverty or social distress have been found in these instances, I find it most probable that they were also mourned by the family. The act of burying a person is a deliberate one, and it is possible that ceremonies that left no clearly recognizable trace were performed on these occasion. If the babies had merely been disposed of, it is likely that no traces of them would have been left in the archaeological record. Rites for incorporating a newborn child into the group at some time interval after birth are found in the majority of pre-industrial societies, even if the way that these rites are expressed varies largely.[478] I find it likely that also in MH Asine and Lerna, some kind of initiation rite was performed when a newborn infant was formally taken into and accepted by the family and society.

6.4 MORTUARY EVIDENCE OF WORK, PLAY AND GENDER ROLES

When children are discussed in archaeology, for a long time the focus has been placed on the remains of children's playthings from both settlement and burial contexts.[479] However, this one-sided approach has changed, and objects associated with children are now afforded interpretations other than an immediate association with toys. Lillehammer among others states that since the play is often associated with a learning process, the objects could function in the adult world as well.[480] As known by most parents, the objects used by adults in their daily activities are often adopted by children and used as much appreciated 'toys'. Moreover, there is not always a

[469] Golden 1988, 160.
[470] Lovell 1997, 35.
[471] van Gennep 1960, 152f.
[472] van Gennep 1960, 153; Trevathan 1987, 142; Bendann 1930, 204.
[473] Gittings 1984, 83.
[474] Gittings 1984, 80–82.
[475] Scott 1999, 26.
[476] In Sweden foetuses born before the termination of the 12th pregnancy week are regarded as biological waste products and accordingly burnt. Between the 13th and the 28th week, foetuses is cremated under the supervision of the cemetery administration. The cremation is followed by a anonymous interment without religious ceremony. If the parents have other wishes these should be followed/met if possible, SOSFS 1990:8 (M). Foetuses born before the termination of the 28th week are allowed to be buried without an ordinary death certificate/cause of death, provided that a special form made out by a doctor is supplied (SOSFS1996:29 (M)).
[477] See, for example, the catalogue (3.6), unit S06, MH 48 or MH 49. At this age the foetuses could be regarded as likely cases of stillbirths/miscarriages.
[478] van Gennep 1960.
[479] Lillehammer 1989, 97.
[480] Lillehammer 1989, 100; Sofaer Derevenski 1994, 10; 2000, 7.

sharp dividing line between work and play. Since play is an important part of the development of all mammals, children who are engaged in work often integrate this with play. Therefore, it is often difficult to distinguish distinctive objects as related specifically to children. Neither can play be associated only with children since adults play as well; here the play serves several purposes, for instance as a social unifier.[481] In a way, the performance of rituals can also be seen as a sort of play. As stated earlier, I think it is dangerous to impose our own conceptions about 'childhood' on past societies, since it may trick us into seeking special groups of material remains which can be related exclusively to children as a homogeneous group. In our own society, the number of objects produced only for children's care and children's play is extremely abundant and the range is growing continuously. This production is partly deriving from the late 20th century Western conception of children as 'innocent pets' who need to be entertained and taken care of in special ways that also require special accessories. The existence of objects made especially for children (of certain ages) is not applicable to every culture, and hardly valid for the prehistoric period.[482]

Objects which can be interpreted as toys from settlement as well as grave contexts are lacking in both Asine and Lerna during the MH period. This fact should not be taken as evidence that children did not play, only that objects produced solely as toys (in our modern Westernised meaning of the term) may not have been very common. If such objects indeed existed, they were probably made (perhaps by the children themselves) of perishable materials, such as wood, textiles, reeds, basketry, etc. I find it more likely that children's play even here was often interwoven with regular tasks that needed to be done, as well as with the process of learning a skill. This learning process, which in many agrarian societies often begin at home, can start as early as around two to three years of age.[483] An interesting point made by Kamp is that in milieus where the emphasis is on playing with other children, the frequency of toys is less than where children are isolated from other playmates. When children are devoid of playmates, toys can serve a purpose of lessening feelings of loneliness.[484] A modern example could be the high values put into personal toys (such as stuffed animals and dolls) by hospitalized children.

An article by Marangou is one example of an archaeological study treating the objects found in children's graves.[485] She examines the finds of miniature metal tools in children's graves from the Chalcolithic period/Early Bronze Age. The examples discussed by her come from different parts of the Eastern Mediterranean (Leukas, Samos) as well as from Bulgaria (Varna region). Even if these regions and cultures are different in many aspects, Marangou argues that the rare examples of small metal tools found in certain child graves within a cemetery where wealth varies among people of different age and sex might indicate that these societies were organized in different kinship groups/clans or classes, where the craft specialisation is indicated in the funerary record. Marangou proposes that whether or not the metal tools found in these tombs can be considered as 'miniature', their presence with children around the age of five to fourteen years could indicate the age when children started to be productive and thereby attained a kind of status connected to the craft inherited by their family. Nevertheless, she does not rule out the possibility that these metal objects could have been used as amulets or toys. However, a clear association between miniature objects and children is not always possible, as adults also can use miniatures, but in some societies the interpretation of miniatures as toys is supported by ethnographical evidence. One example is Park's study of the Thule cultures of Canada and Greenland in which he finds parallels to the Inuit societies.[486] The rich archaeological finds of numerous miniatures from domestic contexts are often interpreted as toys used by children to imitate the adult's world.[487] Full-sized objects of the same type as the miniatures have also been found. Park argues that this can be taken as evidence that the children were looked upon as 'small adults' in much the same way as they were in the Inuit societies.[488]

Children's connection to work is an important question which is now beginning to receive some attention. Many of the studies focussing on this topic are based on ethnographic evidence as, for instance, the Maori children on New Zealand. In traditional Maori society children were gradually socialised into the community by acquiring skills in the household as well as different crafts. The children began to be socially useful for the community at an early age by collecting firewood or fetching water.[489] In his account of the children in Andean societies, Sillar emphasizes the dangers of the very recent Western way of considering childhood as a period free from work, and children as totally dependent on adults.[490] In many cultures the work performed by children is an important contribution to the subsistence, for instance herding or textile manufacture.[491] In the Andean society children learn different skills, such as pottery making and weaving, by observing their parents. It is only after the children start making small clay vessels copying the traditional forms, that the adults help them until the vessels acquire the right shape.[492] Children's play and learning are interwoven here, and the play is believed to be a medium for communication with the gods.

As in many other pre-industrial (and some industrial) societies, it is almost certain that the MH children contributed to the household as well as to the community in large. However, when prehistoric archeological reports address the questions of economy and production, they seldom take into account that a lot of work could have been, and most probably was, done by children.[493] Our failure to recognize children as part of the workforce could be related to a modern, cultural feeling that childhood should only be a time of play and learn-

481 Kamp 2001, 18f.
482 Scott 1999, 65.
483 Levine 1998, 116.
484 Kamp 2001, 19.
485 Marangou 1991, 211–225.
486 Park 1998, 269–281.
487 Lillehammer 1989, 100.
488 Park 1998, 280.
489 Ballantyne 1994, 105f.
490 Sillar 1994, 48f.
491 Sillar 1994, 49; Sofaer Derevenski 1997a, 193.
492 Sillar 1994, 49–52.
493 Kamp 2001, 14–16.

ing. Since this view has been debated (regarding children's workload in developing countries),[494] a slow change is beginning to appear also in the literature about children of the past. The nature and importance of children's work have always been dependent on many factors such as societies' different ways of subsistence (agriculture, foraging, etc.), social class, gender roles, family composition, parents' workload, health and disease, etc. Panter-Brick has summarised some cross-cultural studies concerning the dimensions of children's work.[495] The data from these studies indicate that children are often involved in domestic work and wage labour from a very early age. In Bangladesh, children were productive from *c.* 6 years of age, and at an age of 13 they spent more time (or as much) as adults working. The Kipsingis children in Kenya spent more time working than resting and playing. In agricultural societies children's work seemed to be of greater importance than among hunter-gatherers,[496] although this is by no means always true.

Even if younger children are seldom as 'productive' as adult members of the society, many tasks can be performed well by very young children. Their handling of tasks like caring for siblings, collecting wood for fuel or tending to the animals would also free some time for the adults to engage in other duties, perhaps at some distance from the settlement. As in many countries today, it is also likely that adults sometimes were dependent on the work carried out by children.[497] However, it has been proposed that their contribution in strictly economic terms would not be more than, or even equal to, what was invested in them (food and care, etc.) until they reached adolescence.[498] On the other hand, children reaching adult age could be seen as an insurance for their parents, since they could provide economic support for the parents in their old age.[499] Therefore, the death of older children would result in a larger economic (but not necessarily larger emotional) loss. The research by Gaines and Gaines provides a quantitative analysis of the impact of household size and short-term environmental fluctuations on the vitality of small populations.[500] By data simulation models of small prehistoric populations in the American Southwest practising a subsistence economy (primarily cultivation of maize, but also animal husbandry and hunting), they were able to show that the birth spacing and the number of children in each household would be one critical factor for the risk of nutritional stress in the population. When the number of non-productive children increases, the ability to produce the surplus which is needed for emergency storage (30% is assumed in this model) is reduced, with a subsequent decline in self-sufficiency.[501] When the nutritional requirements and the labour/energy potential of the household were simulated for a period of 18–20 years, there is one period when the household labour cannot supply its own needs under a period of eight years. This critical point for self sufficiency seems to begin at a household size with an average of approximately three children and a maximum of four children (supposing two or three years between births of the children surviving). As is also pointed out by Gaines and Gaines, large families may not have been desirable for prehistoric populations since a healthy survival for the family (especially the children) may be at risk.[502] The high infant mortality rates assumed for the prehistoric period may in part have been a self-regulating process: if the infant mortality decreases, the frequency of living children increases: this increase will add to a higher risk of nutritional stresses while the children are small which in turn will increase the infant mortality.[503] (Yet, it is important to point out once again that infant mortality is dependent on more factors than just nutrition: also cultural conceptions as well as the disease load are components which act together, cf. chapter 5.) The economics of children during the prehistoric periods is complicated since the ideology of the society must also have played a part in decisions about the composition of the working force and its time allocation.

The gender constructions which could be related to the work and production performed by children in the MH period are interesting, but presently unexamined. The accomplishment of such a study would require an investigation of the excavated material associated with individuals of both sexes and in all ages, since, as stressed by Sofaer Derevenski, gender is not equal to biological sex but rather linked to it as a cultural construction which in turn changes with age throughout the life course.[504] Further, such an analysis would of course imply a belief that grave goods could symbolize the social structures in the society, as well as reinforce which assignments and functions were considered appropriate for the deceased, by the individuals conducting the burial.[505] The interpretation is further complicated by the fact, stressed by Nordquist, that it is difficult to know which objects were considered suitable for deposition in the grave, and how these differed from the ones used at the site.[506] Nordquist's study of the ceramic material found in MH tombs in the Argolid, Corinthia and Eleusis demonstrates that certain sets of pottery were deposited in the graves (these vessel types were also abundant in the settlement contexts), and that the combination of vase forms and sets of pottery is taken as an indication of drinking ceremonies related to status which became increasingly important during the end of MH and culminated during the Mycenaean period.[507] Her study suggests a certain amount of equality in social status between men and women (and to some extent also children) in the elite group, in terms of investment in type and frequency of the pottery sets de-

[494] In the debate about the 'Declaration of the Rights of the Child', it has been put forward that universal needs of children cannot be uncritically applied to all cultures since the children's position in specific cultural settings must be taken into consideration. For a summary of parts of this discussion, see James 1998, 52.
[495] Panter-Brick 1998b, 66–101, esp. 83–89 with further references. See also Kamp 2001, for both modern and historic references.
[496] Harris & Ross 1987, 39f.
[497] See, for instance, Boserup 1990, esp. 162, 182–185.
[498] Reher 1995, 520.
[499] Chamberlain 2000, 209.
[500] Gaines & Gaines 2000, 103–130.
[501] At 12 years of age children is assumed to contribute effectively to the household economy. Gaines & Gaines 2000, 117f.
[502] Gaines & Gaines 2000, 119.
[503] Gaines & Gaines 2000, 120.
[504] Sofaer Derevenski 1997b, 887.
[505] Sofaer Derevenski 1997b, 875; Welinder 1998, 188.
[506] Nordquist 2002, 120.
[507] Nordquist 2002, 119–135.

posited in their graves.[508] However, Nordquist cautions that a different picture could appear if all types of grave goods were taken into consideration.

A survey of the published graves at Asine reveals that only 14 graves where the adult skeletons had been sex determined (9 males and 6 females) contained any grave goods other than pottery.[509] Of these 14 graves the skeletons had been age determined in 13 of the graves (range 18–58 years). The most frequently found objects (excluding pottery) were whorls (5), weapons/tools (3) and jewellery (3). The objects were found together with both sexes. However, larger materials need to be incorporated into a more detailed analysis before any conclusions can be made.

At Asine and Lerna, most children's graves were empty of finds but a few lavishly furnished graves can be noted at both sites.[510] At Asine, the graves containing something more than only a skeleton most frequently held a vessel or a whorl, and, as have been noted above, these objects are also found in the graves of adults of both sexes. It can be speculated that children's connections to certain types of work were sometimes indicated in the grave. For instance, the 5–6-year-old child (also showing skeletal and dental pathologies) buried in MH 63 was accompanied by a bone awl which could be used for piercing, boring, and for scraping and incising.[511] At Lerna, four graves of children were associated with bone awls or bone pins.[512] As noted by Nordquist, many tools found at Asine could have been suitable for working a soft material such as bone, for instance, knives of metal but also obsidian or chert blades.[513] It is interesting to note that obsidian blades or flakes were sometimes associated also with children's graves. At Lerna 29% of the children's graves were associated with obsidian (often blades), and in Asine obsidian flakes are sometimes found in association with bones from children, but here the find context is even more ambiguous.[514] Nevertheless, I find it possible that children's work could have included tools in bone, obsidian and stone, but if these objects in fact were placed in connection to graves on purpose, their function may as well have been ritual.

At Lerna, a larger percentage of the children's burials than at Asine contained objects: the most common objects were vessels or jewellery.[515] The vessel types found in the graves do not differ from those found in adults graves: cups, jars, jugs and bowls are all common types. Miniature vessels are also found but they are not restricted to children.[516] It is not possible to elucidate any clear correlation between the child's physical age and the type of objects found in the graves, neither were objects unique to children found, but a general impression is that newborn infants sometimes received a pot or a whorl,[517] while older infants and children more often got jewellery (often beads) of different kinds.[518] It can be noted that infants as young as around one year of age were sometimes buried with earrings and/or necklaces, but it is difficult to know if small children wore these jewels in life (perhaps at special occasions), or if they were used only for decoration of the corpse.[519] Yet, I find it likely that relatively simple finger rings, earrings and necklaces of bronze could have been worn by children also in life. The presence of similar items (i.e. four beads, possibly from a necklace or bracelet found in a grave of a four-month-old infant at Lerna[520]), indicates that at least by that age, the infant was assigned some kind of status which was acknowledged by the individuals engaged in the burial of the corpse.

Also Protonotariou-Deilaki, who discusses funerary rites in the Argolid, offers several examples of richly furnished child graves mainly found in the tumuli of Argos.[521] There is evidence of children buried with jewellery, different types of vessels (for example, amphoras), and also weapons.[522] The presence of a sword of a size that would fit a 'mature warrior' buried with a child of approximately six years of age is interesting, since it would indicate an affinity with a wealthy group in the society.[523] It can be speculated that the sword symbolized a warrior status which should have been bestowed on the child later in life, but I find it likely that it sym-

[508] Nordquist 2002, 126f.
[509] One grave, MH 52/53 contained two individuals. Nordquist 1987, 128–136.
[510] For instance, MH 18 and B15 at Asine; Lerna: DC 2 and DE 21. Blackburn 1970, 160–164, 174f.; Nordquist 1987, 129,135; Nordquist 1996a, 22; Nordquist & Ingvarsson-Sundström 2005.
[511] *Asine* I, 123f., 254f.; Nordquist 1987, 38f.
[512] D 19, D 14, DE 15 and DE 27. Blackburn 1970, 57f., 93f., 127f., 131f.
[513] Nordquist 1987, 38.
[514] Lerna graves associated with obsidian: DE 6, DE 27, DE 68, D 14, BC 1, DC 2, DC 4, BE 9, BE 13+14, A 5, A 7, A 9, A 11, BF 1 (found during the author's examination of the skeletons). Blackburn 1970.
[515] In LT Asine, 14% of the children's graves contained objects compared to 28% of the children's graves in Lerna.
[516] The definition and function of miniatures are seldom uncomplicated since they are found in many different contexts like graves and ritual spaces. Miniatures are not exclusively found together with individuals of certain ages and can therefore not be used to identify children. Rohlin (1999) found that only one of the published vessels from Lerna (cup L.981from grave BD 6) and no vessel from Asine could be called miniature. In her essay, Rohlin defined the criteria for a miniature as a size 2/3 of the mean size (following Buck) of normal sized vessel of the same shape, and a height not exceeding 14 cm. Zerner (1990, 33) and Nordquist (2002, 126) mention that in Lerna, for instance children's graves D 5 and DC 2 contained miniatures. Further, Nordquist (2002, 126) defines the three vessels from the child grave B12 at Asine as miniatures.
[517] It should be noted that the whorl could have been attached to the clothes or shroud of the deceased. Nordquist 1987, 56.
[518] Small objects like beads are easily overlooked in excavations: thus, it is likely that they were more frequent. Nordquist 1987, 39.
[519] Decorations made of sheet of gold are sometimes found in tombs. Protonotariou-Deilaki believes that this kind of jewellery or decoration was made especially for the dead, since pieces from the production were found in a tholos tomb at Kazarma. As far as I know only one child grave from this period has been found to contain similar gold bands (i.e., shaft grave Ξ of Grave Circle B at Mycenae) in the form of a diadem. Protonariou-Deilaki 1990, 79f.; Mylonas 1957, 146f.
[520] Grave BE 10, Blackburn 1970, 151. It should be noted that I use my own and H. Soomer's age determinations of the skeletons from Lerna. These may differ slightly from the ones made by J.L. Angel.
[521] Protonotariou-Deilaki 1990, 69–83.
[522] Protonotariou-Deilaki 1990, 79 n.10.
[523] Grave 5 (92) in Tumulus E. Protonotariou-Deilaki 1990, 77, fig. 17b, 79 n. 10.

bolized a status which was also already attained.[524] Thus, the sword would symbolize both the class or rank which the child was born into, and the power he or she was intended to have or had, in life.[525]

Seashells are commonly found in connection with children's graves. These shells are sometimes pierced at one end, and in those cases interpreted as belonging to a necklace, but also unpierced shells of different types are common. At Lerna, no seashells were recorded as 'finds' from children's graves, but in some cases they are noted as 'associated finds', some more likely than others to have belonged to the grave.[526] Unfortunately, it is often difficult to know whether the seashells were placed in the grave on purpose, or whether they were accidentally mixed with the fill of the grave and thus not associated with it.[527] At Asine, four children's graves contained seashells: in two of them the shells were unpierced.[528] During my re-examination of the Barbouna skeletons, I found seashells which may be associated with two of the children's burials (B 29 and B 33). Further, in the LT I found various cases of stratigraphic finds of human bones (in most cases those of children) together with seashells, as well as animal bones.[529]

I believe that the seashells found in or in connection with graves could have had many functions: since shells are easy to find and collect along the shoreline, inexpensive necklaces or other decorations could be made of them by children as well as by adults. It is likely that children could have been responsible for collecting sea molluscs, and that shell jewellery therefore became common belongings of small children. Secondly, molluscs may have had a symbolic function in the funerary ritual[530] and it is possible that their shells could have served as amulets. In Inuit societies children (also foetuses) are regarded as vulnerable to harmful supernatural forces, and therefore had to wear amulets (for example, pieces of deer's flesh or broken spearhead etc.) in leather cases around their necks.[531] It is possible that the high infant mortality of MH Asine and Lerna created similar needs for 'amulets of child protection', and that seashells could have had this function. I would like to point out that seashells are not exclusively associated with children's graves even if this relationship/connection is noteworthy.[532] Since seashells and animal bones are often found in association with graves (sometimes also those of adults), it is indeed possible that they did have some connection to the mortuary ritual. However, since most of these correlations are found in settlement contexts, a careful study of the stratigraphy is needed before it can be determined whether the connection between (children's) burials and seashells/animal bones is accidental, or whether it is conceivable that some kind of ritual relationship existed.[533]

In an article about Greek Neolithic and Early Bronze Age rituals, Marangou has shown that prehistoric rituals were not only connected to sacred spaces and buildings, but were also often connected to profane public settings such as storage spaces, squares and wells.[534] Also in Asine and Lerna the same connection is evidenced by the presence of graves under house floors, and the finds of household objects within the graves. Marangou argues that during the EBA III-MBA, children were connected to rites related to water, since especially drinking and pouring vessels are found in their graves, as well as in streets, squares and around wells possibly corresponding to their assignments in life.[535] However, the drinking and pouring vessels must not only have functioned for water but also for any other liquid or semi-liquids contents.[536] That children's activities included fetching, transporting and pouring of water seems very likely, though, and these tasks may perhaps be ascribed to the children in the MH society as well. In this case the presence of shells in relation to children's graves may also have had a symbolic meaning related to water.

During the Mycenaean period it is likely that some differences existed between the tasks supposed to have been performed by girls and boys of different ages. As discussed by Olsen, the Linear B tablets record working groups consisting of men and women and children of both sexes.[537] At both Pylos and Knossos the boys and girls are grouped together with the women, but at Knossos the children are also differentiated

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524 Sofaer Derevenski among others have discussed the connection between children and weapons. She argues that when children are found together with weapons, children are seldom regarded as powerful in the same sense as adults. This reluctancy towards assigning power and control to children would be rooted in the modern Westernised view in which children are regarded as powerless and dependent, and thereby devoid of action and authority. Sofaer Derevenski 2000, 6f. It can be added that, whether we like it or not, the existence of child soldiers is a reality in many parts of the world today, so examples of children who not only possess weapons as a symbol of status, but in fact use their weapons are by no means unknown. According to Lillehammer (1989, 98), in Scandinavia prior to AD 1000, boys of 12 years of age were considered to be grown up and could wear armour. Also Gräslund who discusses children buried with weapons asks the question whether the sword buried with a nine-year-old boy in Birka symbolized a posthumous right for the child, or if the grave in fact reflected the living society (Gräslund 1998, 288).

525 Cf. Cavanagh & Mee (1998, 109). They find it unlikely that the sword would have been used by the child in life, and argue for an interpretation of the sword as a symbol for 'the warrior he would have become'.

526 In the following children's graves shells are noted as associated: D 14, DE 21, DE 27, DE 30, DE 51. Blackburn 1970, 87f., 93f., 131–134, 160–164.

527 During the re-examination of the children's skeletons from Lerna I found several cases where molluscs were present among the children's bones. These were not recorded in Blackburn's study.

528 The published graves containing shells are: MH 18, 1971–12, B12 and B15, Nordquist 1987, 129, 135; Reese 1982, 139.

529 It is interesting to note that MH 29, which is likely to have been a double burial of a man and foetus/infant (see catalogue unit W05), also contained many shells. *Asine* I, 119.

530 Animal bones and shells were found below the centre of one of the shaft graves in Mycenae (I in circle B) where a child and adult were buried. In this case the remains have been interpreted as a remnant of a funerary meal. Mylonas 1973, 110.

531 Park 1998, 273.

532 Three adults' graves from Lerna contained seashells among other objects: G2, J4 and H1. Blackburn 1970, 67f., 81f., 116f.

533 Children's funerary rituals and their relation to developing gender roles (from the Greek Bronze Age to the Geometric period) will be explored in a separate article by the author.

534 Marangou 2001, 139–155.

535 Marangou 2001, 153f.

536 Cf. Nordquist 2002,131f.; Tzedakis & Martlew 1999.

537 Olsen 1998, 383f.

into 'younger' and 'older' children, as well as by sex.[538] There is also a category of 'older boys' who is recorded together with the men, and these individuals have been interpreted as boys which were undergoing a period of apprenticeship into a trade.[539] Yet, this evidence of gendered tasks involving children cannot be uncritically applied to the MH society since the same hierarchical organization, possibly influencing the structure of gender roles, is not likely to have existed during this period. I am not suggesting that different gender roles did not exist in the MH society, or that children were not aware and gradually taking part in these roles, but as emphasized by Sofaer Derevenski, sexual division of labour and gender roles are not interchangeable terms.

Gender identity, as well as conventions of speech and emotional control, are acknowledged by children at an early age, and the period between two and three years is especially rapid in this sense:

> This is also a period when children form stable gender identities and begin to organise their culturally constructed experience around the concept of being male and female. Furthermore, we know that by 3 years of age children have learned rules reflecting the moral values of their society and have strong feelings about those rules. In other words, the first 3 years of life are extraordinarily busy ones for the child's socialisation and acquisition of culture.[540]

As has already been stressed elsewhere, child development is not a process based solely upon biology, but varies between and within different cultures. Therefore, it is not possible to identify the time when children began to perceive a gendered behaviour from the evidence of skeletal or archaeological material. Caution should also be taken in the exploration of prevailing gender categories from the grave goods. In her analysis of gender roles in the traditional Inuit societies, Crass has evaluated the evidence from early ethnographic sources as well as the archaeological material to see whether it was possible to discern different gender roles in these societies.[541] She found that the fluid gender identities described by the ethnographers were mirrored in the burials where no gender-specific burial goods were found.[542] I find it possible that a similar type of fluid gender conception existed in the MH society. However, it will only be after more accurate and thoroughly tested osteological methods for sex determinations of children's skeletons have been developed that we can start investigating how the gender roles were constructed, when they were acquired and how they changed with age.

6.5 CHILDCARE

In modern Western societies the word 'childcare' often evokes pictures of mothers interacting with their children, while fathers are seldom seen as present in caring situations. This view seems to have influenced research in history and archaeology and made studies on childcare in prehistory seem superfluous. Perhaps because issues concerning childcare were considered as being exclusive of men or even irrelevant for them, they were seldom addressed. Yet the focus on gender studies has begun to change this notion. In Bolen's article on the prehistoric construction of mothering, she emphasizes the danger of justifying the prevailing static gender roles and inequality between the sexes in the Western nuclear family, by referring to biology and history as inevitable facts which are believed to have existed already in prehistory.[543] A similar view is expressed by Olsen in her article about the difference in Minoan and Mycenaean constructions of gender. Olsen focuses on the different ways that women and children are portrayed in Mycenaean and Minoan society, respectively.[544] She shows that the differences are mainly seen in the iconographic sources which give different emphasis to the child-rearing role of women: there is no artistic representation of women together with children in a Minoan context before the LM IB destructions and subsequent Mycenaean influence on Crete. In contrast, there are several examples of women with children from the Mycenaean mainland, mostly in the form of the so-called Kourotrophoi figurines, where women are portrayed as holding infants. The literary evidence in the form of Linear B tablets from Pylos and Knossos

538 This is interesting since it could imply that children were also active in production outside the household economy, perhaps not surprising, bearing in mind today's child workers in factories, a phenomenon which is still quite prevalent in some countries.

539 Further evidence of apprenticeship comes from Knossos where Sjöquist and Åström suggest that children were involved in manufacturing Linear B tablets. They have found papillary line impressions indicating that children in the age of 8–12 years were working as tablet manufacturers, perhaps preparatory for later work as scribes. Sjöquist & Åström 1991, 28–30, 119.

540 Levine 1998, 111.

541 Crass 2001, 105–118.

542 The Inuits believe that the personal names given to a person contain the qualities/characteristics of a recently deceased individual with the same name, therefore a male child could be called 'aunt' by his mother and 'stepmother' by his father if they believed that this person was partially reincarnated in the child. The same lack of firm gender roles is also found in the activity pattern where most subsistence tasks such as hunting and domestic tasks could be carried out by both sexes. However, gender identities are confirmed in outer attributes such as clothing where even children's dresses give an indication of their sex. However, not even the clothing could always be reliable indication of sex since transvestism was sometimes practised especially by shamans, but also by other adults and children: for instance, a male child with a female name would dress in female clothes. The same complex and fluid gender roles could be observed in the archaeological record where no specific gendered burial goods were found. Although some goods were more often found with one sex they could also be found in the burials of the opposite sex. As evident from the ethnographic data, many tombs were looted and their goods sometimes exchanged. The ethnographic sources are not entirely consistent with the archaeological data: the cause for the discrepancy is attributed to the different background of individual ethnographers whose purposes were usually economic, religious or political. Yet, the fragmentary pattern of burial goods could not have been interpreted or understood without these ethnographic sources: without them, an incomplete picture of the Inuit society would remain. Crass 2001, 105–118. See also Welinder (1998, 194) about the Middle Neolithic 'Battle axe culture' where some boys were buried wearing similar dress as adult women.

543 Bolen 1992, 49–62.

544 Olsen 1998, 380–392.

indicates that women on the Mycenaean mainland and on Mycenaean Crete had the primary responsibility for the caring of children. The conclusion reached by Olsen is that there were significant differences between the Minoan and Mycenaean societies in their approach to a gendered social role, where the Minoans had no interest in depicting women in childcare situations. Olsen regards the iconographic sources as strengthening the Mycenaean societies' conceptualisation of women's association within the domestic sphere. Unfortunately, there are no literary or iconographic representations of children either alone or together with adults from the MH period. Nor is it possible to simply apply the Mycenaean structure to the MH community, since the highly stratified societies, where gender roles were possibly more rigid, are not likely to have existed at this time, or at least not until the later part of it.

Bolen argues that the ethnographic cross-cultural research shows numerous examples of different types of childcare behaviour by others than the biological mother, and she underscores the importance of differentiating between the conceptions of 'biological mothering' and 'social mothering'.[545] I think she is essentially right in her criticism of the mothering concept, but how can we approach the upbringing and care of children in the MH societies when no written sources or artifacts which can be directly linked to childcare situations are identifiable? Cross-cultural approaches are useful since they can show us the large variation in these areas, and provide a better understanding of the social factors which influence how the care and upbringing of children were performed.[546]

In an article about the relationship between different demographic structures and childcare practices in anthropologically described pre-industrial societies, Hewlett shows that some facts are possible to elucidate if knowledge about demographic factors (such as total fertility rate, infant/child mortality, sex and age distribution, etc.) in different groups of hunter-gatherer, horticulturalists and farmers is explored.[547] He was able to collect data on demography and child development in 57 anthropologically described populations with a bias towards populations in the tropics. Seven hypotheses were tested against this anthropological data which I will discuss in connection to the present MH material:[548]

> *Multiple and "Polymatric" Care of Infants*
> *Hypothesis 1*: If the number of adult women in a population without children increases, the level of multiple care will increase.
> *Hypothesis 2*: The greater the density or compactness of the settlement, the greater the level of multiple care.
>
> *Indulgent Care of Infants*
> *Hypothesis 3*: Fertility and mortality patterns influence the nature of "indulgent" care of infants.
>
> *Play Groups, Adult Supervision, and Fathers' Role*
> *Hypothesis 4*: The sex-age distribution and compactness of the camp or settlement influence the makeup of a child's play group and whether young children will be supervised by adults or older children.
> *Hypothesis 5*: Father involvement will be greater in societies with low population densities or in isolated (i.e. island) societies.[549]
>
> *Stepparenting and Fostering*
> *Hypothesis 6*: Seldom does a child in pre-industrial societies stay with his/her natural parents throughout the dependency period because adult mortality and divorce rates are usually high, which leads to frequent stepparenting, and intracultural fertility rates are variable (e.g., some parents have five or more children while others have one or none), which contributes to fostering (i.e. those with more children foster out, while those with fewer children foster in).
>
> *Differential Investment in Male and Female Children*
> *Hypothesis 7*: Male-biased juvenile sex ratios will exist in societies where the cost of raising males is less than or equal to that of raising females, or where males contribute more calories to the diet than females, or where male mortality is high due to frequent warfare or risky subsistence tasks.[550]

Hewlett found many similarities between the populations under study concerning their demographic structure: they were closer to each other than to populations in industrialised societies. Further, he found that a large inter-cultural variability in fertility and mortality rates existed among these populations.[551]

Since the necessary demographic parameters of the living population of MH Asine and Lerna are beyond reach here, this information must be based on the tentative knowledge we have of the demography of the skeletal population. Admittedly, this is not a particularly good point of departure as comparisons have to be made between living, anthropologically described societies and prehistoric, dead ones. However, I think that the present information about the skeletal demography may be used as a basis at least for a hypothetical discussion about the prehistoric childcare practices, which would have been otherwise impossible to conduct.[552] As has already been pointed out, societies' cultural conceptions of how infants should be cared for are strong enough to overcome purely biological variables such as fertility and mortality.[553] But it should be kept in mind that culture, environment and human biology were all important in the shaping of children's lives even if presently difficult to define and distinguish from the skeletal assemblage. In the following, I will take up each hypothesis as formulated by Hewlett, and then give a summary of his conclusions made from the anthropological sample. After that I will discuss the possible relevance for the MH material.

545 Bolen 1992, 49f., 52.
546 Cf. Lillehammer 1989, 93.
547 Hewlett 1991.
548 Hewlett 1991, 9, 15, 18f., 23.
549 This hypothesis is based on the work of Alcorta 1982.
550 'The cost of raising males' was not explored by Hewlett, and in consequence, it will not be included in the following discussion.
551 Hewlett 1991, 6, 9.
552 The importance of demographic analysis for the understanding of children in past societies is also stressed by Chamberlain, although his approach is a different one concentrating mainly on the use of model stable populations. Chamberlain 2000, 206–212.
553 See, for example, the different trends in breast-feeding practice already discussed in section 5.4.

(1) *If the number of adult women in a population without children increases, the level of multiple care will increase.*

A multiple childcare system, where adults (often women) other than the biological mother take a large part in caring for the infant, has often been regarded as a characteristic trait for foraging and farming societies.[554] The anthropological sample shows that this practice is particularly pervasive among two foraging populations: Efe pygmies (Africa) and the Ongee (India). For instance, among the Efe pygmies the infant was frequently nursed by other women in the camp during its early infancy, and the biological mother was not even the first one to nurse the baby. A four-month-old infant spent only around 40% of its time with the biological mother, the rest of the time it was taken care of by others in the camp. These two populations were also the only examples in the sample where women other than the mother engaged in the nursing of the infant. Otherwise the practice was reported to occur only if something happened to the biological mother. Hewlett argues that since the two societies exhibit exceptionally low fertility rates as well as an age distribution where there are twice as many adults as children, this situation will explain the high level of multiple care giving in these populations.

Asine/Lerna: At both sites a high infant mortality is likely. But, as earlier discussed, the presence of a large number of infants in the archaeological material is often regarded as mirroring high fertility.[555] The low death age of women at both places suggests that few adult women without children would have been accessible for childcare tasks and accordingly, the level of polymatric care would have been rather low. Undoubtedly, there must have been individuals other than adult women (i.e. older children and men), who could have engaged in childcare, but this practice will be discussed later.

(2) *The greater the density or compactness of the settlement, the greater the level of multiple care.*

One of the differences found between farming/herding populations and foragers is that the farming/herding mothers often seem to have the complete responsibility for the childcare of young infants, while foraging mothers often share this responsibility with other adults (mainly women) at the site.[556] This practice is explained by Hewlett as partly relating to the larger settlements of farming/herding populations. Forager camps are often very compact where about five to nine households live within a 10–15-metre radius. In contrast, usually only 1–2 farming families live within the same area.

Asine/Lerna: Both sites are farming/herding villages but the size of the settlements is difficult to estimate since neither of them was totally excavated. Furthermore, several habitation phases occurring over a long time period are recorded in both Asine and Lerna, and these circumstances makes it complicated to calculate which buildings were inhabited during a special time interval in the history of the site. At Asine, Nordquist estimated the settled area during MH to $1^1/_2$–2 hectare based on the distribution of the excavated material.[557] At least 9–12 houses have been excavated and attributed to the MH period not but all of them were probably inhabited at the same time, and some spaces within the settlement were left open.[558] Nordquist describes the site planning of the LT in Asine as 'urban' in character, with courtyards and lanes surrounding the houses, which seem to be individually designed and irregular in plan. Some houses are large and free standing while others are smaller and conglomerated.[559] The number of households probably varied according to the size of the house; some would have suited just one household while others (for example House B in LT) could have been used by at least two households as indicated also by the number of hearths.[560] Naturally, it is impossible to know exactly how the houses were used and how many people composed a household. Angel estimated the average household size for MH Lerna (which had site planning similar to Asine) to range from 4.5 to 5.7 individuals from calculations of the skeletal material.[561] By extrapolating these figures to the probable size of the settlement, he derived at a population size of between 570 to more than 800 individuals. Assuming a similar household size for Asine, Nordquist calculated the population to a maximum of 285–530 individuals based on how many people the land could support.[562] A more likely estimate would be around 200 individuals.[563] Unfortunately, the demographic calculations by Angel presuppose that his identification of the number of births based on the female pelvises is correct. Since it is now considered as impossible to estimate this frequency from changes found in the pubic bone, the scientific basis for this estimation must be regarded as uncertain. The general character of Asine is a quite densely populated village, but some houses nevertheless had fairly isolated courtyards or were situated on the border of an open area. None of the sites could probably compare to the small and dense forager camps discussed by Hewlett: instead, they seem to be more close to the farming populations of the sample. Therefore, it can be assumed that Asine and Lerna would not have had the same high level of multiple childcare as is common in forager bands. The forager mother and infant would be more exposed to the other members of the society and their existence more collective, whereas the farming families of Asine and Lerna could live a more sheltered life. Yet this is not to say that only mothers were involved in childcare.

(3) *Fertility and mortality patterns influence the nature of 'indulgent' care of infants.*

An 'indulgent' type of childcare has often been regarded as typical for foragers and farmers in anthropological work.[564] This behaviour can be characterized as the degree and fre-

[554] Hewlett 1991, 13.
[555] See previous discussion about fertility and mortality estimates in prehistoric populations, section 4.3.
[556] Hewlett 1991, 15.
[557] Nordquist 1987, 24.
[558] Nordquist 1987, 26–29.
[559] Nordquist 1987, 28f.
[560] Nordquist 1987, 108.
[561] Angel 1971, 74f.
[562] Nordquist 1987, 24.
[563] Nordquist personal communication, 2002.
[564] Hewlett 1991, 15f.

quency of adults' attention to children. In the indulgent childcare practice, children are almost constantly held, immediately attended to when they cry, breast-fed on demand, rarely punished, treated with affection, etc. Contrary to LeVine's hypothesis that this behaviour is a parental response to high infant mortality (and a desire to have many children) and therefore characteristic of agrarian, in contrast to urban industrial populations,[565] Hewlett argues that the difference in infant mortality alone cannot fully explain the variable parental care among pre-industrial societies. When he contrasted pre-industrial cultures with different levels of infant mortality, no difference in the 'indulgency' of parental behaviour could be noted.[566] Judging from the cultural sample, Hewlett considers this type of infant care to be in part also a response to fertility rates i.e. most populations with low fertility also have low mortality. When fertility is low people seem to be more indulgent towards their children—for example, the indulgent childcare practised by modern American mothers compared to the not very indulgent childcare behaviour of the 1940's and 1950's when the infant mortality was higher, but mothers had twice as many infants as in the 1980' s. Hewlett concludes that fertility rates may be as important as mortality rates in predicting patterns of indulgent childcare, but he emphasis that also the mother's workload and the ideology of the particular society will influence the type of infant care practised. Different societies' responses to infant mortality show an enormous variation: some cultures increase the indulgent care of infants to improve their chances of survival, while others, under severe economic/social circumstances, may neglect infants whose chances of survival are low.[567]

Asine/Lerna: The high fertility and infant mortality assumed for Asine and (to a lesser degree) Lerna would predict that the type of infant care practised at both sites would not be an indulgent one. Since nothing is known of the general ideology of the MH societies, nor of the women's workload, the possibility that an indulgent care was practised should not be excluded, but it is likely that these societies were not very indulgent towards their children.

(4) *The sex-age distribution and compactness of the camp or settlement influence the makeup of a child's play group and whether young children will be supervised by adults or older children.*

Subsistence patterns have been noted by anthropologists to influence the composition of children's play groups and the degree of adult supervision.[568] In forager populations the children are often supervised by the parents and their play groups consist of individuals of different ages. Among farmers/herders older siblings often care for the younger children. Hewlett explains these differences as depending partly on the demographic composition of the population. Forager camps are often small—in this sample the average camp consisted of approximately 25 individuals—which means that few playmates of the same age are available. Since the foragers often live in dense settlements in close contact with each other, the cultural transmission is characterized as the 'parent to child' type, and adults are often within earshot of the children. The settlements of farmers are often larger, both in habitation area and population, so it is easier for children to find playmates in the same age category. As the adults cannot always follow the young children around the settlement, older sibling care is common.

Asine/Lerna: Since both sites could be referred to the farming/herding type of society consisting of perhaps a few hundred individuals, it is likely that playmates within the same age (and sex) groups could be found. I find it also very likely that older siblings were, to a large degree, responsible for the care of younger brothers and sisters (perhaps caring also for young infants as indicated by the low weaning age) since the adult duties could have involved activities at some distance from the settlement. If sibling care was common at these sites, the older children's contribution to the socialisation of infants would have been fairly extensive.

(5) *Father involvement will be greater in societies with low population densities or in isolated (i.e. island) societies.* (Based on the work of Alcorta 1982)

Alcorta's cross-cultural work of supports the theory that peoples in high density populations (for instance farmers/herders) are more competitive for available resources (as land and cattle) and therefore the males seem to develop a reproductive strategy that involves polygyny and low involvement in childcare. Men in low density populations (for instance foragers) are usually more interested in cooperation within the group, they are often monogamous and are to a larger degree involved in childcare.

Asine/Lerna: Since nothing is mentioned about the approximate dividing line between low and high population densities (as earlier discussed, this would be difficult to calculate anyway), all that can be inferred about the fathers' involvement in these cases is at best a qualified guess. There is no indication of a shortage in natural defendable resources such as land. Nordquist argues that since the MH villages in the Argive plain were widely spaced and surrounded by land which was largely uncultivated and little used by humans, there would have been no need for conflicts over these resources.[569] Still, animal husbandry was also important for subsistence and animal poaching could certainly have provoked some fighting. Nothing found in MH Asine can be related to war or larger conflicts: neither destruction levels, numerous weapons nor fortifications have been found at the site. However, the presence of wounds which could have arisen from interpersonal conflicts is documented at both Asine and Lerna.[570] On the basis of the skeletal material and the distribution of fractures, Angel finds it likely that violence was common, especially among males in Asine. But, as pointed out by Nordquist, the sample is far too small to enable interpretations about possible sex differentiations.[571] In Lerna,

565 Hewlett 1991, 16, referring to several works by LeVine.
566 Hewlett 1991, 16f.
567 Chamberlain 2000, 208; Scheper-Hughes 1992.
568 Hewlett 1991, 18f.
569 Nordquist 1987, 108.
570 Angel 1971, 91; 1982, 109, 111.
571 Nordquist 1987, 21f.

equal numbers of both sexes exhibited healed wounds in the head which possibly had arisen from interpersonal conflicts.[572] At both places it is likely that some kind of elite group/s was/were present, at least during the latter part of the period. At Asine, the East Cemetery held more male, high expenditure burials than the female graves, indicating that males possibly were afforded a higher social status within this local elite.[573] It is likely that the males within these elite groups showed competitive behaviour, but did this behaviour make them less likely to engage in childcare? As also indicated by ethnographic and sociological cross-cultural studies, adult females are often the primary caregivers for infants and toddlers, followed (in frequency) by the care given by older siblings of the child.[574] For this reason, I find it likely that the adult males were not the primary caregivers of *infants* in the MH societies, but nothing indicates that fathers were not engaged in raising and caring for their children. If the breastmilk given to the infant was complemented by additional foodstuff as early as below six months of age as discussed earlier, there is at least a theoretical possibility that even feeding of infants could have been done by fathers to some extent.

(6) *Seldom does a child in pre-industrial societies stay with his/her natural parents throughout the dependency period because adult mortality and divorce rates are usually high, which leads to frequent stepparenting, and intracultural fertility rates are extremely variable (e.g., some parents have five or more children while others have one or none), …*

The role of step-parenting or fostering in the socialisation of children is seldom discussed in anthropological literature, and it is almost absent in archaeological/historical studies on family structure in earlier societies. According to Hewlett, fostering and step-parenting are common features in the foraging and farming societies included in his sample.[575] The step- parenting/fostering situations frequently occur as the result of either one of the parents dies, parents divorce/separate and form new families, or the parents decide to foster in or out a child as a result of having few, or too many, children.[576] With the exception of disease, the male adult deaths during the reproductive years is often violent and caused by warfare or risky subsistence tasks, while females relatively often die of complications during childbirth. Data on divorce/separation rates are seldom collected in anthropological studies, but when information is provided it seems that separation is fairly common in many pre-industrial populations. Hewlett found a large inter-cultural variability in total fertility rates (TFR) among these 'natural fertility populations', as opposed to the industrial 'controlled fertility populations' where the TFR is often both stable and low, and fostering uncommon.[577] This means that where there are large variations in the TFR, families with many children seem to foster out one or more of their children while families with few or no children can foster in a child. The fostering appears to be flexible, and the natural parents seldom break off contact with their child. The fostering period can last a few years to a lifetime. Hewlett points out that other factors like age at first birth, birth intervals, the sex ratio of children, etc., interact in the practice of fostering.[578]

Asine/Lerna: The low death age of adults at both sites (especially females in Asine), suggests that fostering would have been common. It is unfortunately impossible to discern if there was a large variability in the TFR during this period, but since Hewlett's data suggests that this rate is almost always variable in natural fertility populations, it is likely to be valid also for Asine and Lerna. If separation existed or was common is also impossible to explore since we know nothing about the family structure at this time, but given the general cross-cultural occurrence of the behaviour in both pre-industrial and industrial populations, the existence of it in Asine and Lerna cannot be dismissed.

(7) *A male-biased juvenile sex ratio will exist in societies where the cost of raising males is less than equal to that of raising females, or where males contribute more calories to the diet than females, or where male mortality is high due to frequent warfare or risky subsistence tasks.*

The frequency of preferential female infanticide has been shown to be largely exaggerated in the anthropological and archaeological literature.[579] However, there is no doubt that it has existed and still exists in some cultures. Also cultures where preferential male infanticide or infanticide of both sexes was practised are known. Hewlett has examined cultures where there is no bias in sex ratios of the newborn infants, but where the juvenile sex ratios change to show a bias in favour of one sex. He found that in cultures where females contribute more, or equal amounts of calories as males to the diet, either no difference or a predominance of female juveniles existed. When males contribute more calories to the diet (as, for example, in a number of forager societies), a male-biased juvenile sex ratio existed. Hewlett also found a number of societies where females contributed more to the diet's calories but where the juvenile sex ratios still showed a male bias. In these societies the adult males frequently engaged in warfare or risky subsistence tasks like open sea voyages. Hewlett interpreted this habit as explaining why parents invested more care in their sons at the expense of daughters. However, the actual treatment of the infants (i.e. parental neglect or active infanticide) was not accounted for by Hewlett's data.[580]

Asine/Lerna: For reasons already discussed (chapter 2.6), no attempts to determine the sex of the subadults from Asine and Lerna have been made. Therefore we do not know if the

572 Angel 1971, 91.
573 Nordquist 1987, 109. A LH I burial in the East Cemetery contained a bronze dagger with a limestone pommel comparable to the one's found in grave circle A, and MH 58 in LT contained a spearhead, both graves belonged to middle-aged males. Nordquist 1987, 43, 46.
574 Levine 1998, 114.
575 Cf. Levine 1998, 114.
576 Hewlett 1991, 19–23.
577 Adoption is more common in highly stratified societies, and it is characterized by a termination of the legal and natural bond between the biological parents and the child. Hewlett 1991, 20.
578 Hewlett 1991, 22.
579 Scott 2001, 1–21.
580 Hewlett 1992, 28.

sub-adult sex ratios at Asine and Lerna show any bias in either a female or a male direction. Neither is it of course possible to speculate on which sex provided more calories to the diet, since no ethnographical observation is feasible. It seems to be a common opinion among anthropologists that women in agricultural societies usually are subordinate to, and controlled by men, but I think that this is too simplistic a view.[581] There are many forms of cultivation but a simple separation of horticulture from agriculture is usually the anthropological praxis: horticulturalists use only hand tools, while agriculture involves the use of plough or irrigation—thus, cultivation in agricultural communities is usually more intense.[582] At Asine (and presumably also at Lerna) agriculture that involves the use of ploughs was probably practised.[583]

Like Hewlett, Martin and Voorhies argue that the amount of contribution of crops to the total diet affects the division of labour between the sexes, as well as an economic dominance of one sex.[584] In horticulture both sexes are involved in cultivating activities, even if men are often responsible for the physically heavy work. Further, Martin and Voorhies assert that because agricultural societies are usually largely dependent on crops for their diet, this involves a great amount of strenuous activity usually performed by men.[585] The larger contribution of male labour in cultivation activities would therefore lead to an increased male control, and a reduced social status of women. I argue that physically heavy work is not always restricted to men, for instance in Finland during the 19th century, women were responsible for the farming, and even young girls did ploughing.[586]

It is not known how large the dependence of crops was in the Middle Bronze Age societies, although Nordquist states that agriculture and animal husbandry were the most important methods for supplying food in Asine at this time. Fishing probably played a minor role.[587] Asine seems to have been a family-based society with no evidence of a central authority.[588] Nevertheless, it is likely that some families had higher status and/or power as indicated by the different architectural units of the Lower Town as well as by the existence of an extramural cemetery with a tumulus; Lerna is also supposed to have been organized in a similar way.[589] It seems to me that the settlements of Asine and Lerna lay somewhere in between a horticultural and agricultural society; the majority of horticultural communities consist of uni-lineal kinship (usually patrilineal descent) groups which are non-centralized and live in non-urban villages, the average community size is usually less than 400 individuals.[590] It has been argued that in these horticultural communities women are frequently responsible for the predominant part of cultivation but are often excluded from crucial extra-domestic activity as trade or exchange of goods.[591] The Argolid villages seem to have been organized in much the same way. I find it likely that women took part in this more intense farming, but their social roles may also have been directed towards other types of work (for instance, pottery making, weaving and perhaps also trading of goods) than in horticultural societies. There are many different types of power and all of them need not to be connected to production and the control of production.[592] Even if the osteological examination finds evidence of the poor health of women (related to their diet), it does not *necessarily* indicate that their food was subordinate because it was restricted by men. As Hodder points out "… ultimately food too has its symbolic components and food associations do not provide a direct insight into who controlled food distribution."[593] On the other hand, I think that an inferior diet for women cannot be explained only in terms of symbolic restrictions, and above all, symbolic values are not necessarily separated from power and control. As already discussed, there are indications of an inferior treatment of females at both sites, resulting in a poorer nutrition during childhood and a deficient health in adulthood.[594] However, it is difficult but necessary to separate the evidence for an inferior treatment which may or may not lead to a child's death, with the practice of neglecting a child to provoke its death. In archaeological material, this separation is largely unfeasible but, as stated elsewhere, the burial treatment of infants can give some indications.[595] There is no evidence for active or passive infanticide of either sex in these materials, but some motive behind the suspected inferior diet of girls must have existed. Although recognizing the need for comprehensive explanations in discussions concerning connections between the societies' general demographic parameters and their different cultural expressions, I find it difficult to believe that the existence of active or passive infanticide was *only* a matter of which sex contributed most calories to the diet, or the presence of a risky behaviour of adult males. In my opinion, there must also have been other factors governing whether one sex (in this case males) was preferentially cared for over the other—for instance, a patriarchal structure affecting inheritance rules in favour of males.

There is no way of proving that the Middle Helladic communities were patrilineal, but the main part of the agricultural societies in the world, modern as well as historical, in fact places a higher value on men.[596] These views are often established through economic, cultural or religious ideas.[597] Research has shown that the preferred sex is often given better food and care, and I think that this might also have been the

581 Bar-Yosef & Meadow 1995, 53; Martin & Voorhies 1975, 331f.
582 Martin & Voorhies 1975, 213.
583 Nordquist 1987, 34.
584 Martin & Voorhies 1975, 216.
585 Martin & Voorhies 1975, 216.
586 Lithell 1981, 66.
587 Nordquist 1987, 30–32. Chemical analysis of skeletons from Mycenae (Grave Circle B and the chamber tombs) indicate that people ate almost no marine foods. Tzedakis & Martlew 1999, 223, 231.
588 Nordquist 1987, 108.
589 Angel 1971, 34; Nordquist 1987, 108.
590 Martin & Voorhies 1975, 218, 220.
591 Martin & Voorhies 1975, 240.
592 Hodder 1992, 258.
593 Hodder 1992, 258.
594 See previous discussion in section 5.4.
595 Runnels and van Andel (1987, 325) believe that in an agricultural society there is an increased demand for labour which result in children (especially male children) possibly being highly desired, and there would not have been any need for a practice of infanticide.
596 Martin & Voorhies 1975, 331f.
597 Belsey & Royston 1987, 31.

case in Asine and Lerna.[598] In a recent article about the misleading supposition of the commonality and universality of female infanticide, Scott proposes that when female infanticide, or neglect, takes place, it is often related to the ownership of wealth and how this is transferred across generations.[599] Without going into a discussion about the specific mechanisms behind this transference, I find it likely that similar reasons could lie behind the postulated neglect which resulted in poorer nutrition of girls in Asine and Lerna. It remains to be investigated whether this behaviour towards females was a more prominent feature among the elite groups in the society.

To sum up, the high fertility and low death age of women as well as the site plan of the settlements indicate a low level of adult multiple childcare. Older siblings probably took a large part in the care of infants and younger children. Accordingly, the older children helped in transmitting the values of the society, as well as knowledge about gender roles and subsistence tasks. The presupposed size of the settlements would ensure that children had access to playmates of the same age. The character of the MH societies makes it less likely that adult males were the primary caregivers of infants, although the possibility could not be ruled out. Without knowledge of the family structure in the societies, it is difficult to know if fostering/step-parenting existed, although the low death age of adults could have generated comparable family patterns. It is likely that female children were more neglected than the male ones, at least in terms of their diet, which seem to have been inferior. Local rules or traditions (perhaps predominant in elite groups of the society?), concerning ownership and the transference of wealth is the most plausible explanation for this behaviour toward female children.

598 Saunders & Barrans 1999, 189f.
599 Scott 2001, 7.

VII THE CONCEPT OF CHILDHOOD: CONCLUSIONS

The living conditions for Middle Helladic children and the societies' perception of children are focussed upon in this study. My intention has been to raise and regard in depth a number of questions concerning how children's lives and deaths were shaped by society, even if conclusive answers to all questions can not always be presented. The questions concerning children's physical development, their health and their social roles are reflected against the current knowledge about contemporary, small-scale societies. A consciousness about the large cultural variations of children's lives is essential for the archaeological approach to prehistoric children. I think that it is absolutely necessary that we free ourselves from the typical modern Western way of regarding children as dependent on adults, and as a non-influential 'group' in the society. Cross-cultural studies may help us to find other ways of perceiving children, not as a static group, but as active and constantly changing individuals. These individuals have different social roles, capacities and experiences, and moreover, their existence and activities are often vital for the existence of their families, and thus for the whole society. Whatever the contemporaneous societies' definition of 'children' may have been, individuals of all ages were once active participants of the societies we study.

Our own society focuses on chronological age as an important criterion for defining individuals from the moment they are born, but this concept cannot be taken as valid for the prehistoric periods. The physiological development, which is rapid during the early years, most certainly formed a part of the ways to differentiate individuals, but since humans are social beings, culturally imposed ideas of identity and maturity were doubtlessly decisive also for the Middle Helladic societies' concept of children. Perhaps it is not necessary to define prehistoric children in other ways than as a purely hypothetical and constructed category, where our modern labels/terminologies are of importance only during the archaeological analysis. That the concept of children and childhood can change rapidly within the same society is evident. We need only to look at our own societies' perception fifty years ago of how small children should be raised to find that today's prevailing opinions were definitely not valid at that time. If other variations pertaining to the geographical area, social class and the gender of the child are taken into account, very different pictures of the concept of children and their lives will emerge. It is therefore likely that these concepts were variable in the past as well. Since this is a cross-sectional study of the children from Asine during the Middle Helladic period, changes or trends over time cannot be identified, although it is important to bear in mind that they most certainly existed.

The remains of children as well as the material culture connected to children's graves are important sources of information which needs to be interpreted together. I have integrated analyses of both sources— the osteological and the grave material—in the hopes of being able to present a better picture of Middle Helladic children and their lives at Asine in comparison to Lerna during the Middle Helladic period.

THE CHARACTER OF A DEAD SOCIETY OR THE CHARACTER OF THE MATERIAL?

It is frequently stated that children (and particularly infants) are often under-represented at excavations due to unfavourable preservation of their skeletons in contrast to the more robust bones of adults. This is not the case in Asine and Lerna. The compact bones of the infant skeleton are potentially as well preserved as the adult skeleton, and the general lack of children at other excavated cemeteries is perhaps due to the fact that they were buried elsewhere. Another explanation could be that, at least at most older excavations, an osteological investigation was rarely considered, and therefore interest in the finds of bones would have been minimal.[600] In these cases, the small bones from infants could easily have been mistaken for bones from small animals and included (or excluded) among them. The present material is an excellent example of the fortuitous awareness of the excavators and the preservation of subadult skeletal remains; further, it indicates the potential of utilizing materials from old excavations for new analysis.

The nature of the examined material tells us something about the Middle Helladic societies' attitudes to death: stratigraphic finds of human bones are found throughout the settlement of Asine and, as can be concluded from the excavation

[600] See also discussion about other taphonomic factors acting on skeletal samples in 2.2.

diaries, in many cases they probably derive from graves which were disturbed already during the habitation phase of the settlement. The continuous rebuilding of houses would frequently have brought to light many graves, some of them probably 'ancient' already at this time, others perhaps recent enough to have been preserved in the collective memory by the people living on top of them. Nevertheless, the graves which were uncovered by accident do not seem to have been avoided or left in peace: instead, they were partially or totally destroyed by subsequent construction activities. This applies to the graves of people of all ages, as evidenced by the disarticulated stratigraphic finds of adult bones of both sexes. The higher frequency of stratigraphic finds of bones from foetuses/ infants would be in accordance with the higher frequency of infant graves within the settlement, and their presence could not be explained by any less degree of respect for these graves. The careless treatment of older graves indicate that the fleshed dead body (and the acts performed around it) were regarded as more important than the physical grave, and later, the skeleton within it. This treatment of the skeletons provides a clue about their religious ideas concerning death and also aids somewhat in our reconstructions of the spiritual life of that time.

A MATTER OF LIFE AND DEATH

Children cannot be considered as an isolated group uninfluenced by environmental and cultural factors. At the moment of conception, the developing individual is affected by the genetics and health status of his or her biological parents, but after this moment, the foetus is totally dependent on its mother's body alone. Therefore, the maternal health status setts the scene for the foetus' chances to begin its life as a healthy baby.

In the samples from the Argolid, our evidence for the foetuses' environment is full of inconsistencies: the skeletal growth of the long bones (which is a good measurement of subadult health) seems to agree with that of modern, healthy samples during the foetal period, as well as in the first months after birth. On the other hand, the examinations of the teeth indicate that some foetuses suffered from metabolic disturbances during their development.[601] The causes for the nonspecific indicators of physiological stress are not fully understood, but it seems likely that disturbances in the development of teeth and in the skeletal growth are provoked by different factors affecting different parts of the body. In general, the foetuses seem to have been fairly well protected from many external stressors, in spite of the poor health evidently experienced by their mothers.

The time around birth was often critical for the infants, and many of them died within a few weeks. The high proportion of neonatal infants found in the mortality sample at Asine reflects high fertility at this site, but also severe health problems for the mothers and their newborns. I argue that it mirrors a physiological stress linked to the synergistic effects of nutrition and disease which were imposed on some individuals at, and around, birth. The causes for the neonatal mortality as indicated by the skeletal material, were undoubtedly similar to many developing countries today: i.e. prematurity, poor health of the mothers, birth trauma, genetic and developmental anomalies as well as immediately acquired infections.

The skeletal samples further indicate that parents often had to deal with miscarriages and deaths of their newborn babies. Whether or not 'miscarriage' was a known concept can of course only be speculated on, but the physical appearance of a dead foetus (which would vary according to the pregnancy month the foetal death occurred in) is very different from that of a live-born, full-term baby. Therefore, I find it possible that these deaths for them were different from the ones where life, or a 'normal' dying process could be observed. Given the possible 'otherness' of the dead foetuses, the fact that they were buried in a way similar to other members of the society is fairly unique for many (pre)historic cultures. For example, one of the youngest foetuses (six lunar months) found in Asine was buried in a pit grave in connection to the walls of house A in the Lower Town. The grave was simple, without any signs of additional objects accompanying the burial, but the grave was located within the settled area, and it must be regarded as a 'normal' burial, comparable to the other pit graves within the Lower Town, which were often found to be empty of finds, apart from the skeleton. An example from Lerna is the 9-lunar-month-old foetus (apparently stillborn since a neonatal line was missing) who was buried in a cist grave found under the floor of one of the houses.

In my opinion, there can be no doubt that even the dead foetuses/newborns were acknowledged as individuals who warranted an interment in the same area as the rest of the group; they were not just disposed of like rubbish. This is not to say, however, that a more formal inclusion of an infant into the family group and/or society was not performed at a later stage.

BABIES BLUES: TRYING TO COPE WITH LIFE

Almost every society uses rituals for marking a transition from one state to another, and childbirth can be viewed as one such evident transition. Unfortunately, we have no archaeological evidence for the kind of rites performed on this occasion. The large quantity of infant graves found among, and in the houses of, the two settlements makes it likely that newborns were regarded as human beings, and also included into the family. Yet, in most societies other rites are often performed some time after birth, when the 'social birth' of the infant who had survived its first critical months is celebrated. A naming ceremony, or something equivalent to it, is believed to be such an occasion, one which also marks the rec-

[601] These disturbances are especially common in Lerna, but the small samples of teeth from Asine do not allow any conclusions of the observed variation between the sites.

ognition of the child's 'identity'.[602] This kind of more official rite underscores the expectations of roles to be fulfilled by the individuals later in life. Since no newborn infant was found in the extramural East Cemetery of Asine, it is possible that at least the social elite group/s using this burial place practised a more formal (and perhaps public?) initiation of the infant during the latter part of its first year. The 'high status' infant dying before this age was probably buried within the settlement among the houses of the LT. If these local elite groups marked their distinction by performing other rites and/or by burying their dead newborns in a different way than the 'ordinary people' is difficult to know. Yet, it can be speculated that the wooden boxes, probably functioning as coffins for infants, could have been used by these individuals, perhaps to emphasize their dead babies unique descent.

The environment outside the mother's womb is challenging for infants: care giving, pathogen load and the physical milieu are all important factors which influence the infant's development. We do not have any direct archaeological evidence for how the Middle Helladic infants were cared for, but anthropological parallels indicate that a large variation in the behaviour towards newborns and older infants exists cross-culturally, and that this behaviour can be correlated to demographic factors.

The relatively slow growth of the long bones *c*. three months after birth suggests that an interaction between malnutrition and disease during the early months had increasing effects on the infant's health. Evidence from the adult skeletons shows that also their growth had been compromised due to bad health and nutrition during childhood, which makes it likely that the individuals who in fact survived into adult age had been subjected to the same environmental difficulties as the deceased infants. Thus, a mortality bias could not be the only explanation for the observed pattern of growth. The type of nutrition given to infants is extremely important since it may protect or expose them: in the latter case, to gastrointestinal infections, for instance, which can be fatal. Breast-milk, which is the best food (until approximately six months of age), is readily available and easy to administer. But does this mean that all the Asine and Lerna infants were breast-fed to the same extent? Since cultural beliefs/conventions are not immediately linked to biological needs, the breast-feeding practices are extremely variable between different societies. Cross-cultural research implies that many past and present cultures believe colostrum (first milk) to be poisonous, and it is often discarded (see earlier discussion in chapter 5.4). It can therefore be speculated that the colostrum, which is very rich in antibodies from the mother, was withheld from the infants, thus making them even more vulnerable to infections.

It is likely that most infants were fully breast-fed during their first months, but possibly not all infants were treated equally in terms of access to, or equal amounts of, breast-milk. In accordance with the poor health of women which began already in childhood, I find it likely that female infants were treated differently from male infants. However, it is not until the sex of subadults can be reliably determined that we can postulate that boys were in fact prioritised for breast-feeding. A biometric analysis of the breast-feeding pattern shows that substantial amounts of supplemental foods were likely to have been given to most infants at around four months of age. This practice would have increased their vulnerability to infections/malnutrition, which caused the elevated mortality at around this age. The same pattern can be seen at Lerna, where the post-neonatal mortality was higher than the neonatal mortality (in contrast to Asine). The post-neonatal mortality is more related to environmental factors like a high pathogen load and early introduction of nourishments other than breast-milk, which I believe would account for the higher mortality of this age group at Lerna. Whatever the reasons for an early weaning on to other nutritives may have been, the infants were given foodstuffs which were believed to be as good as breast-milk. Examples of weaning food from both modern and historic small-scale societies make it likely that some kind of gruel (in these cases probably made of barley), animal milk, fruit juice or pap made of legumes was given to the infants as a substitute.

Demographic factors of mortality and fertility together with factors such as group size and modes of subsistence are related to childcare patterns. From an analysis of these factors it is proposed that females were likely to have had the major responsibility for the infants' care, but that large responsibility for the care was also shouldered by the infants' older siblings. Early introduction of nourishment other than breast-milk would have facilitated the sibling care and also freed mothers for other types of work. This practice is consistent with a high fertility, which could have been seen as desirable in order to manage the workload imposed by a subsistence based on a mixture of agriculture and animal husbandry. The infants' specific needs were perhaps not acknowledged by their families, a situation which can be observed in communities where larger commitment to the group/family as a whole, rather than to the individual, is stressed.[603] In these cases the infant, lacking the ability to express its needs and being totally dependent on others for its survival, often suffers from insufficient care. The poor health of women would have raised the maternal mortality, thus leaving surviving infants to be cared for by someone other than the biological mother. Since there is prehistoric evidence for breast-feeding customs in the form of so-called 'wet nurse contracts' from the Near East, I find it possible that also in the Middle Helladic society other lactating women could have functioned as wet nurses for motherless infants. If no one was available or could shoulder the responsibility, other types of nourishment would have been used instead.

Even if the demographic factors influencing childcare patterns make it likely that polymatric childcare was not normally practised in the Middle Helladic societies, some kind of step-parenting situation would have arisen in this case. Exactly what kinds of 'families' existed in these villages is of course impossible to know. Since it has been argued that high

[602] Most societies celebrate the naming ceremony several weeks or months after the birth, although in our own society there are many examples of parents also naming the foetus. Clearly, there is large cultural variability.

[603] Kamp 2001, 10.

fertility goes hand-in-hand with a non-indulgent behaviour towards infants, I believe that a degree of neglect for whatever reason would have affected these infants' lives in a unfortunate way. However, given that high infant mortality can influence the parental behaviour towards either extreme (indulgent or negligent behaviour), the possibility that infants' needs could have been prioritised should not be dismissed.

Infant graves are often empty apart from the skeleton, but there are also several infants who received a vessel. The corpse was probably buried in some sort of dress or shroud, to which buttons and/or small weights were attached. Remarkably often the infants in Lerna were also adorned with jewellery (often beads) such as necklaces, and more rarely earrings. This adornment expresses the infants' individuality, which was recognized by the persons conducting the burial. To conclude, I argue that the infants' biological immaturity was not synonymous with social immaturity, i.e. an infant was probably regarded as a person in his/her own right. Factors such as early weaning, burial of infants in the same way and within the same area as adults indicate their rapid inclusion into the society. Local elite groups could possibly have had slightly different customs.

GROWING UP: LEARNING, WORKING AND PLAYING

Different childhoods are often experienced by boys and girls within the same society. The course of the socialisation process for boys and girls differs according to the social roles they will shoulder as adults, and therefore the adults' expectations of them vary. It must be asked whether the graves and their finds can be indicative of gender identities of the buried. If they are, can these roles be linked to different stages during the life course which can be physiologically correlated, or were these roles linked to other qualifications or principles that have nothing to do with the aging body? In most societies, the individual's gender identity changes with age: a young girl is usually perceived differently from an old woman. However, there are no clear indications of gender roles in the examined materials. The reason for this absence could be that gender was not emphasized in the mortuary record for some reason. Another possibility is that we cannot simply interpret this variability from the archaeological material or from our limited frames of reflection. Research in the field of psychology has demonstrated that quite young children have a perception of gender roles, and gradually use gender stereotypes in their thinking about the world. How this knowledge will be acted out depends on the society's way of signaling different gender roles to children. Even if gender is not always connected to a division of labour, girls and boys are often expected to carry out different tasks. Yet if craft specialisation can be indicated in the adults' graves, and if the number of children's graves associated with shells, animal bones and obsidian blades could be related to their activities, to the mortuary ritual, or simply by chance remains to be investigated in a larger study. As discussed in chapter 6.4, anthropological investigations show that large similarities in the types of work carried out by children exist cross-culturally. Tasks like fetching water, caring for younger siblings, collecting firewood and fodder for animals, digging and planting as well as animal care is often performed by children less than twelve years of age in most small-scale societies. The gendered division of these tasks differs, but childcare is almost always carried out by girls. Given that cross-cultural parallels are possible to make, I find it likely that a similar picture of children's work could be applied to Asine and Lerna. Children are part of the complex social and economic structures they are being shaped by, but also are active in shaping. Since the individual's gender role(s), regardless of age, does not seem to have been emphasized in the mortuary treatment, it is also possible that they were rather fluid in life.

The different stages of a life course are also connected with the material culture of the society in which individuals interact. There are no remains of a material culture which can be specifically related to children in these villages, and I think that this absence derives from the fact that children often utilized the same objects as adults. A search for 'children's objects' is doomed to failure because children's play, learning and work would have been much more integrated than it is in the modern, Western society. Children may of course have constructed their own material culture (probably more directly related to play) from perishable materials which are now lost. The high degree of sibling care which is suggested here would imply that not only adults were responsible for teaching children about ethics as well as practical matters: this knowledge would also, to a large part, have been passed on from older to younger children. Therefore, a child's world, which to a certain degree was separated from the adults, is likely to have existed in the Middle Helladic society in a similar way as it does among modern children. This 'world of children' is governed by its own rules and hierarchies, but in the same way that it is often invisible to contemporaneous adults, it will also remain invisible for the archaeologist.

This study suggests that children's lives were severely constrained by environmental challenges like diseases and periods of food shortage. Since the developing body is sensitive to these factors, children would of course have suffered more far-reaching complications than the adults. It is also possible that cultural restriction of food could have added to the periods of stress in an unfortunate way.[604] Children would have been exposed to diseases relating to poor sanitation (for example, domestic animals which were possibly kept within/among the houses), and to pathogens like the malaria mosquito, hookworm, etc. The growth of the long bones falls considerably below the modern standards at around two–three years of age, suggesting increasing health problems as the children grew older. The skeletal material

[604] In some societies the connection between food and growth is not acknowledged: therefore children are allotted less food than the adults, since it is believed that younger individuals do not need food of the same quality and quantity as adults. Kamp 2001, 10.

indicates that apart from the possibly earlier weaning of female infants, girls were given less access to nutrition in form of animal protein—this deficiency acted negatively on their health as adult women.

CHANGING IDENTITIES: GROWING INTO ADULTHOOD

Even if the subadult skeletal material, by its very nature, constitutes the evidence of children who were not able to survive the cultural and biologic stressors, it is evident that many of them succeeded in growing up and eventually had children of their own. Somewhere along the way, the social roles of the individual would have changed from being a child to having children. We cannot know if this was a slow or a sudden change, but rites of passage are almost always performed in a society to mark when an individual more formally reaches a higher level of responsibility and/or equality among the members. When and how these rites were performed is not indicated in the grave material that we are aware of, but the physical changes during puberty could have been seen as important hallmarks although by no means always synonymous with social maturity. As discussed, for instance, by van Gennep, physical puberty does in fact only rarely coincide with a social passage from childh ood to adolescence. For example, in many societies the age when girls have their menarche and the age when they are legally marriageable often differ.[605] Yet, it is possible that the physical signs of growing maturity were noted and perhaps celebrated. It is likely that at these occasions, some changes to the body (hair cutting, shaving, scarring, decorating, etc.) were practised to publicly mark the occasion, but (unfortunately for the archaeologist) it does not seem to have affected the skeleton in any recognisable way. In the Lower Town of Asine few individuals in their adolescence were found. Even if this age group is slightly outside the scope of the study, I think their absence should be interpreted as resulting from the taphonomic processes of excavation and osteological analysis, and not as any deliberate exclusion at the time of burial.

If, in fact, the change from adolescence to 'adulthood' was marked in any way, perhaps the largest change, both to the individual and to the larger group, would have been the time when a girl or boy moved from their own family, either physically or theoretically, and started their own family. Since the Middle Helladic family structures are beyond our reach here, we cannot know if something similar to 'marriage' was practised. Nevertheless, I believe that at a certain point during the individuals life course, the transference of property between generations was manifested through the formation of a new or modified family into which new members were born.

It is important that future archaeological research take into account the presence of children in analyses of not only mortuary data, but also of past peoples economies, material culture and religion. There have always been children in the settlements under study, and their importance for cultural and economic development should not be forgotten. Even if scattered skeletal remains from children are what is left of them at many sites, the systematic collection and analysis of this evidence will eventually contribute to a more profound understanding of life and death during the prehistoric period.

[605] Van Gennep 1960.

APPENDIX I

THE DENTAL REMAINS FROM ASINE AND LERNA

by Helena Soomer

STATE OF PRESERVATION

The state of preservation of dental remains describes the *condition* as well as the *amount* in which the remains are found. The *amount* of the dental remains is a quantitative measure describing the actual number of teeth present in relation to the predicted number of teeth. For example, a 3-year-old child should have 20 deciduous teeth present in his/her mouth. However, in an archaeological excavation, a child's skeleton at approximately similar age may have only 10 teeth present because some teeth may have fallen out of their sockets in the jaws and gotten lost *post mortem*. Alternatively, some teeth may have been lost *ante mortem* due to disease or trauma.

The *condition* of the dental remains is assessed by the quality of the remains; for example, teeth may have been fractured *post mortem* or may be intact. A brief explanation about the structure of dental enamel is now necessary in order to better understand the concept of the 'condition of the dental remains' as well as other dental conditions such as enamel hypoplasia that will be discussed later in this appendix.

Dental enamel, the outmost layer of a tooth crown, is the hardest tissue of human body. Enamel consists largely of inorganic calcium phosphate in the form of small crystals. The same type of crystalline material is found in both bones and teeth. Dental enamel, however, has a more perfect crystal pattern because the crystals are packed closer to each other, forming a strong hexagonal system. By weight, enamel consists of 96 to 97 percent inorganic material (such as calcium), 1 percent organic material, and 2 to 3 percent water. Therefore, even if the teeth are buried in soil for centuries, autolytic processes, caused by bacteria or fungi, do not affect the inorganic material in the dental enamel. Dental enamel is also resistant to breaking forces due to its strong physical structure. In addition to the more favourable physical structure, teeth possess a more favourable calcium metabolism as well. Once a tooth is calcified, which occurs prior to its eruption, there will never be any calcium withdrawal from the dental tissues. This very unique feature allows teeth to resist any kind of systemic disease or metabolic disturbance that occurs at any time in life after the tooth has formed and calcified. Bones, on the other hand, are in a continuous process of calcification and calcium withdrawal and are therefore subject to resorption under certain pathological conditions such as osteomalacia, hyperactivity of the parathyroid glands, vitamin D deficiency or simply because of old age.

In conclusion, teeth are harder, denser, and less sensitive to inner and outer adverse environmental changes than are bones and therefore, we can expect the condition of the teeth (fractured vs. intact), even in dental remains of archaeological materials dating back 4000 years, to be rather excellent.

State of preservation in Asine teeth

The number of teeth found versus expected in Asine dental materials is presented in *Table 1*. There were 29 individuals with preserved teeth. Of those, 22 individuals of ages ranging from 6 lunar months to 10 years had deciduous teeth present. In addition to the data shown in *Table 1*, the box plot in *Fig. 1* demonstrates that there are more mandibular teeth (mean 36.6%) found in this material as compared to the maxillary teeth (mean

Table 1. Deciduous tooth data for Asine subjects.

	Maxilla: 22 individuals			Mandibula: 22 individuals		
Tooth type	Teeth found	Teeth expected*	%	Teeth found	Teeth expected	%
First incisor	11	36	30.5%	12	36	33.3%
Second incisor	4	36	11.1%	9	36	25%
Canine	4	44	9%	19	44	43.1%
First molar	13	42	31%	19	42	45.2%
Second molar	7	44	16%	16	44	36.4%

* Of note in the table, four of the 22 subjects were more than six years of age. Because the first and second incisors should have been physiologically lost (and replaced by permanent teeth), we expected 36 incisors for the twenty subjects (2 incisors per individual x 18 individuals (22-4 (more than 6 years of age) = 18) equals 36 individuals). As one of the 22 subjects is 10 years old, the deciduous first molar should have been similarly replaced, leaving 42 expected first molars. Given the subjects ages, 40 deciduous canine and second molar teeth were expected.

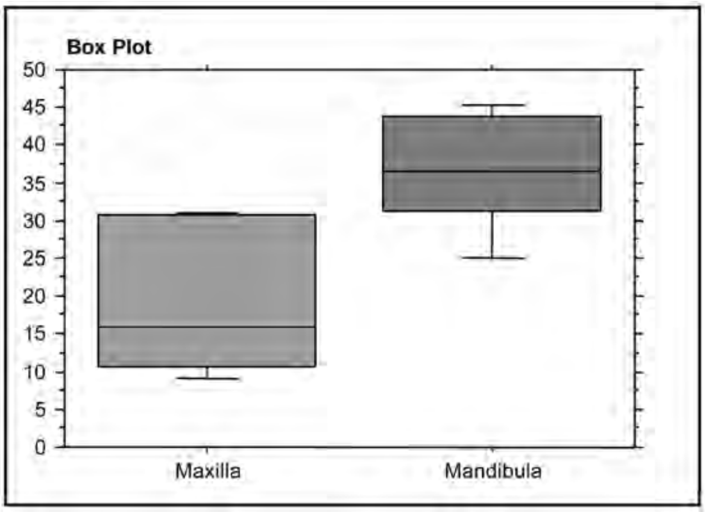

Fig. 1. Box Plot of maxillary vs. mandibular teeth present in Asine materials.

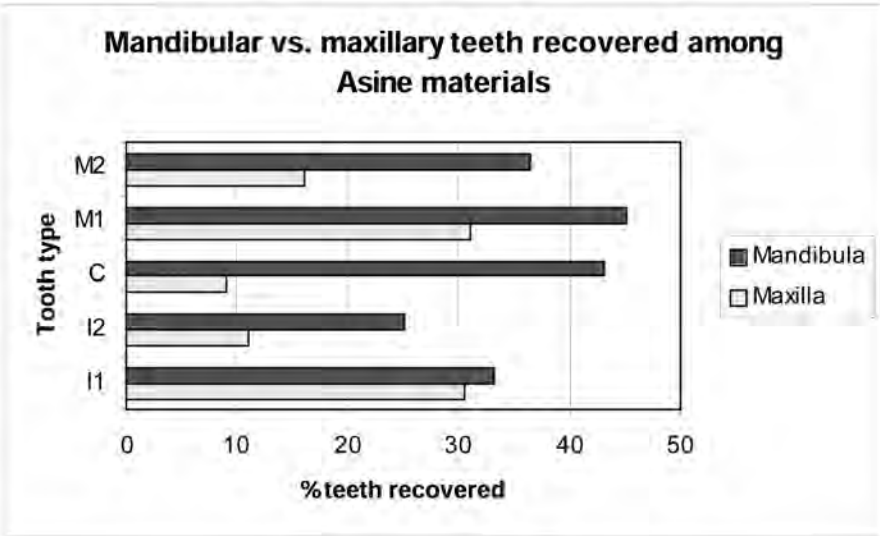

Fig. 2. Maxillary vs. mandibular teeth in Asine materials. M2 – second molar, M1 – first molar, C – canine, I2 – second incisor, I1 – first incisor.

19.52%). Students' t test showed that this difference is statistically significant (t = –3.340; p = 0.0288). *Fig. 2* shows that the most frequently found teeth are first molars, followed by mandibular canines and second molars. These findings can be explained by the fact that the structure of the maxilla differs from that of the mandible. The mandible is a very compact and dense bone compared to the maxilla and therefore, retains teeth better. The maxilla, in contrast, is a lighter bone that contains a number of air pockets (maxillary sinuses, etc.) and is therefore less resistant to *post mortem* environmental conditions. As a result, the maxilla tends to retain teeth less effectively. Another factor favouring the preservation of mandibular teeth is that they develop and erupt slightly ahead of the maxillary teeth. They are therefore larger and probably more likely to be recovered during the excavation. There were more molar teeth (mean = 32%) found in the Asine materials than incisor teeth (mean = 25%). This difference is statistically significant, Student's t test = –2.621, p = 0.0789). The fact that molar teeth were more frequently found can be explained because molar teeth are multi rooted and are therefore more firmly attached to the jaw. Consequently, molar teeth are less likely than single rooted teeth, such as incisors or canines, to drop out and become lost in *post mortem* conditions.

As regards to the condition of the recovered deciduous teeth (fractured vs. intact) it should be said that they were in an excellent condition. *Post mortem* crown fractures were detected in only one individual out of 22 individuals (4.5%) with deciduous teeth. This is due to the uniquely strong structure of dental enamel that is resistant to breaking forces.

State of preservation among Lerna materials

There were 96 individuals with age ranging from 8 lunar months to 30 years. Of these teeth, 88.5% (85 cases) had no evidence of *post mortem* fractures, while the remaining

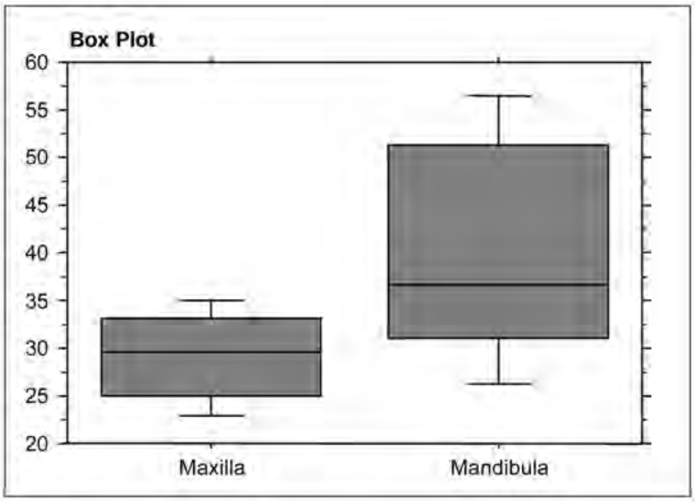

Fig. 3. Box Plot of maxillary vs. mandibular teeth in Lerna materials.

11.5% (11 cases) had some post mortem crown fractures. Among the 96 Lerna subjects, deciduous teeth were present in the age groups of up to $9^1/_2$ years (86 individuals). The deciduous tooth data is presented in *Table 2*.

The box plot shown in *Fig. 3* demonstrates that there are more mandibular teeth present (mean = 40.3%) than maxillary teeth (mean = 29.12%) among the Lerna materials. According to Student's t test, this difference is statistically significant ($t = -2.781$, $p = .049$).

DENTAL FORMATION STAGES, NEONATAL LINE AND AGE ESTIMATION

Prenatal period

During the prenatal period, the crowns of the deciduous teeth grow and calcify within the jaws. The formation and calcification of enamel and dentin begin first in the central incisors, at about $4^1/_2$ to 5 months *in utero*, and proceed in fairly regular sequence in the adjacent teeth, the second deciduous molar beginning its formation at about 6 months *in utero*. (See *Fig. 5*. Development chart of human dentition.)

Layers of enamel and dentin are deposited one upon another until the crown is completed and root formation begins. The enamel and dentin formed during the prenatal period are usually of good quality, probably because of the favourable environment and nutrition of the developing foetus.

Birth

At the time of birth, root formation has not yet started and the deciduous teeth are not yet erupted. Within the jaws, however, the crowns of the deciduous incisors are about five sixths completed. At birth, the deciduous canine crowns are about half completed, and the cusps of the first deciduous molars are just completed and have coalesced. The cusps of the deciduous second molars are only half formed and are still isolated. The mesio-buccal cusp of the first permanent molar begins its formation at about the time of birth.

Table 2. Deciduous tooth data for Lerna subjects.

	Maxilla: 86 individuals			Mandibula: 86 individuals		
Tooth type	Teeth found	Teeth expected*	%	Teeth found	Teeth expected	%
First incisor	48	162	29.6%	53	162	32.7%
Second incisor	38	166	22.9%	61	166	36.7%
Canine	44	172	25.6%	45	172	26.2%
First molar	60	172	34.9%	97	172	56.4%
Second molar	56	172	32.6%	85	172	49.4%

* Among the 86 individuals, 5 should have physiologically lost their first deciduous incisors and thus, these teeth were not expected to be found within the Lerna materials (86–5 = 81 individuals, 2 first incisors per individual = 2×81 = 162 incisors). Similarly, 3 individuals out of 86 had physiologically lost their second incisors and thus, we expected to find 166 second incisors (86–3 = 83×2 = 166). The remaining tooth groups—canines, first and second molars—were expected to be present in the Lerna materials, i.e., 86 individuals, 2 teeth (left and right) per individual.

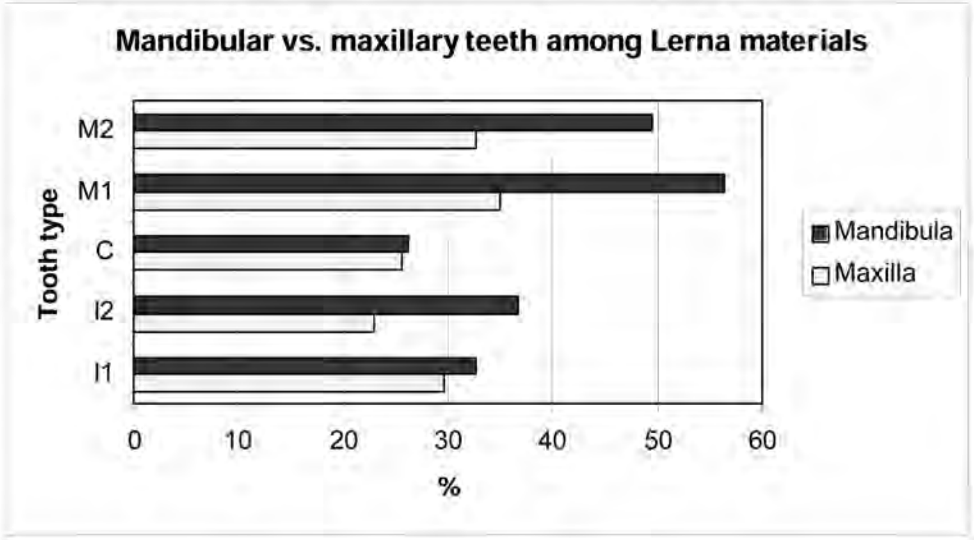

Fig. 4. Maxillary vs. mandibular teeth in Lerna materials.

Neonatal line

The birth experience, with its concomitant trauma and neonatal adjustments to the new environment and mode of nutrition, produces a distinctly accentuated incremental line within the enamel (band of Retzius) and dentin (Owen's line of contour) of these teeth, indicating a lower level of calcification at the time of birth. These are called the *neonatal lines* and they are found in children's deciduous teeth and sometimes in permanent first molars. The position of these lines is characteristic for each tooth type and corresponds to the surface of the enamel and dentin that obtains at the time of birth (*Fig. 6*, see *Pl. 2*). If the birth trauma has been excessive or the neonatal adjustment very difficult, an accentuation of the neonatal line will occur in the form of an acute neonatal hypoplastic defect, which can be seen after the teeth have erupted.

Infancy period

The early infancy period (birth to 6 months of age) is characterized by the beginning of growth and calcification of the first permanent molars and all the anterior deciduous teeth, within the jaws, with the exception of the upper lateral incisors.

The first permanent molar is the first of the permanent teeth to develop. It begins to form and calcify at birth. The permanent anterior teeth begin their formation from 4 to 6 months of age in regular order from central incisor to canine. The upper lateral incisor, the exception of the rule, begins to form at 10 to 11 months of age. This fact is important when performing age estimation, because if only upper lateral incisor is available, then age estimate becomes less precise. Hypoplasia due to metabolic disturbances occurring during the early infancy period, may therefore not affect the upper lateral incisor. This fact is useful in establishing clinically the chronological incidence of enamel hypoplasia.

The first year of life is a period of postnatal adjustment for the developing infant and, in many respects, is a continuation of the neonatal (newborn) adjustment period. Any difficulties in feeding or nourishment may cause hypoplastic defects in the enamel of the teeth forming at that time—that is, in the first permanent molars and the permanent anterior teeth—but may miss the upper lateral incisors because the latter begin formation at the end of the infancy period. About three-fourth of the total number of cases of enamel hypoplasia develops during this period. The defects can be seen clinically only after the permanent teeth erupt (after the sixth year), or before that time in intra-oral X-ray films, or in this study: *post mortem*. No amount of dietary regulation or calcium therapy will ever correct these enamel defects once they occur.

The late infancy period (6 months to about 1 year of age) is characterized by the eruption of the deciduous incisors into the oral cavity. The deciduous central incisors usually appear in the oral cavity at about the seventh month, the lower before the upper, and are soon followed by the lateral incisors. The first deciduous molars appear next, toward the end of the first year.

Childhood period

This period is characterized by:

1. The presence of the complete deciduous dentition within the oral cavity.
2. The functional attrition or physiologic wear of these deciduous teeth.
3. The gradual resorption of the roots of the deciduous teeth.
4. The continued growth and calcification of the crowns and roots of the permanent first molar and anterior teeth.
5. The beginning of the growth and calcification of the crowns of the permanent premolars and second molars.

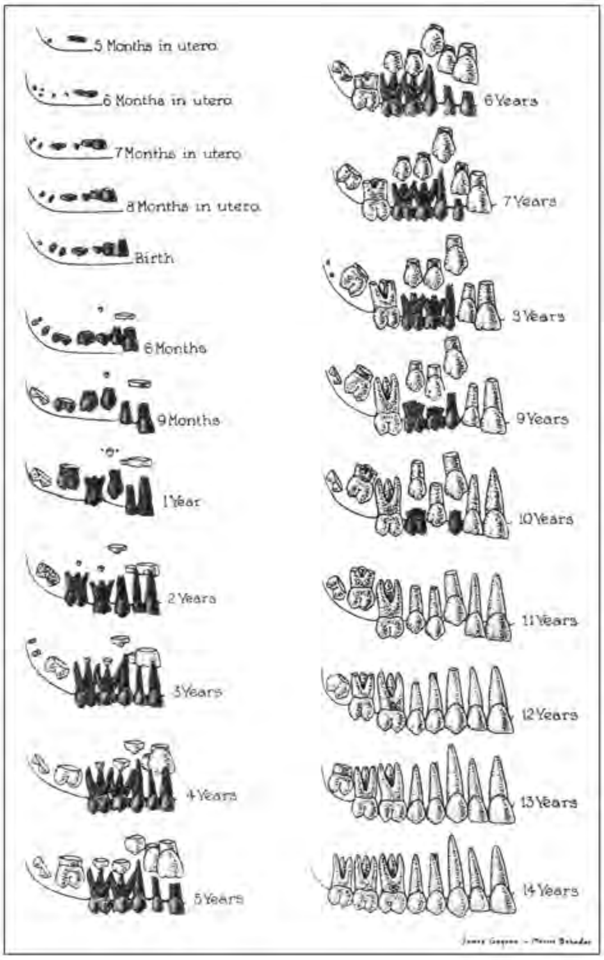

Fig. 5. Development chart of human dentition.

By the end of the second year, all the deciduous teeth have erupted and are in functional occlusion. Continued function plus a more solid diet produces a functional wearing or attrition of these teeth.

At the beginning of the second year, also, the permanent premolars and second molars begin to grow and calcify. In the meantime, the permanent anterior teeth are developing, and with their development the jaw is growing. As a result, and to accommodate the larger, permanent successors, the deciduous anterior teeth usually become spaced at the fourth or fifth year (physiologic spacing of the deciduous anterior teeth).

Concomitantly with the growth and intra-osseous eruption of the permanent teeth, the roots of the deciduous teeth become resorbed.

Mixed-dentition period

The mixed-dentition period, from 6 to 12 years of age, is characterized by the resorption and shedding of the deciduous teeth and the eruption of the permanent dentition.

This period is divisible into two parts:

1. The early grade-school period, from 6 to 10 years of age
2. The pre pubertal period, from 10 to 12 years of age.

The early grade-school period begins with the eruption of the first permanent molar, at sixth year of age. This event is soon followed by the appearance of the incisors, at from 7 to 8 years of age. Dental development in girls is slightly ahead of boys; also, the lower teeth precede the upper in eruption.

The pre-pubertal period starts at age 10 with the eruption of first premolars. They are followed by the second premolars and the canines, at 11 to 12 years. Soon after that the second molars will erupt. The pre-pubertal period is characterized by completion of the permanent dentition, except for the third molars.

AGE ESTIMATION METHODS

Atlas method

Atlas method uses photographs and radiographs of different mineralization stages of teeth of known age. These published stages of dental development allow age estimation by direct comparison with teeth of unknown age. A classic example of an atlas method is the 'Development Chart of Human Dentition' (Schour 1940). Schour and Massler described 21 stages of dental development starting from 5 months *in utero* until 14 years of age, *Fig. 5*.

This method was easy to apply on the Asine and Lerna materials. The age range (from 5 months *in utero* until 14 years of age) was appropriate and direct comparisons with Schour's 'Development Chart of Human Dentition' were successfully made from the teeth as well as from their radiographs.

Moorrees *et al*. also published an atlas type method of dental age estimation. Their method divided dental maturation of the permanent dentition into 14 different stages ranging from 'initial cusp formation' up to 'apical closure complete' and designed different tables for males and females.

Anderson *et al*. further developed Morrees's method by including the third molars and this expanded the age range for age estimation. However, these two methods were not as beneficial to apply for the Asine and Lerna materials because they did not include deciduous teeth and there were separate tables for males and females. It was impossible, however, to distinguish between males and females among the Asine and Lerna dental remains.

Scoring method

A classic example of a scoring method is that of Demirjian *et al*. This method examines seven permanent teeth from the lower left quadrant, assesses eight dental development stages, gives them maturity scores of 'A' through 'H', and provides corresponding chronological ages from 3 years until 16 years.

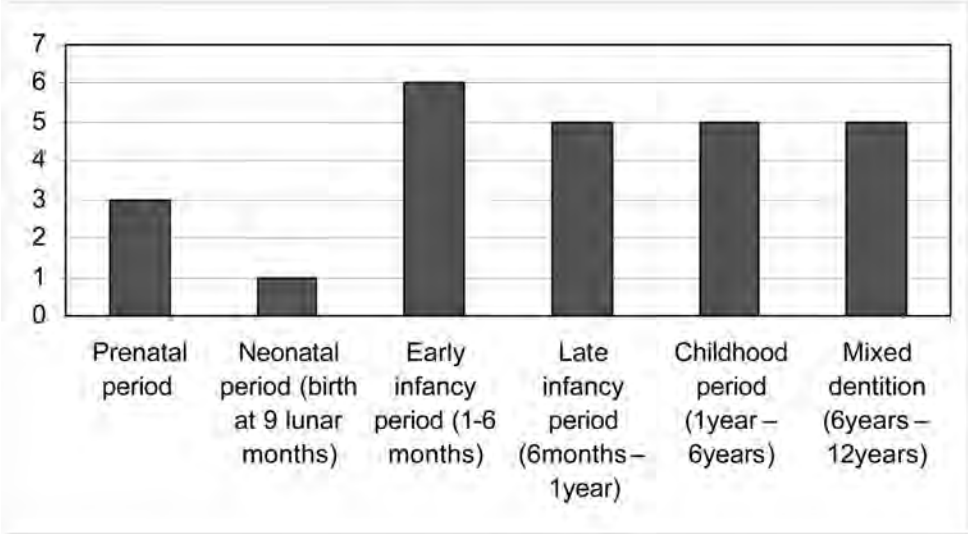

Fig. 7. Estimated ages based on dental developmental stages for Asine materials.

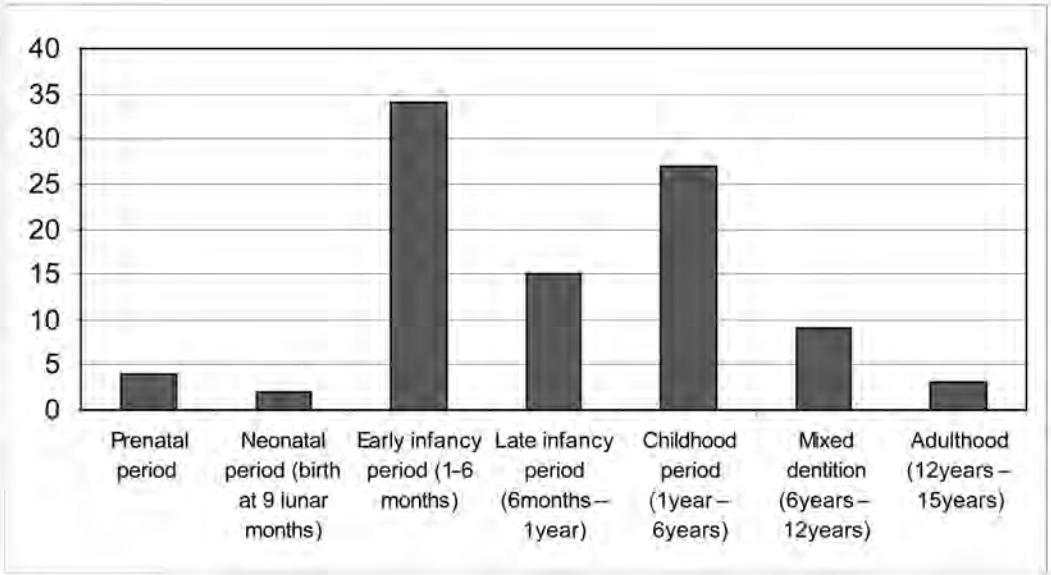

Fig. 8. Estimated ages based on dental developmental stages for Lerna materials.

The maturity scores are differentiated for boys and girls, and published in tables. When performing age estimation the maturity scores of the seven selected teeth of unknown age have to be assessed and added up for an overall maturity score. The overall maturity score is then looked up at the table and its corresponding age becomes the estimated age of the unknown individual.

There are several problems with using the Demirjian's method on Asine and Lerna materials. One problem is that the method requires the presence of seven permanent teeth from the lower left quadrant. In Asine and Lerna materials, however, these selected teeth were often unavailable (e.g., lost *post mortem*, for explanation see 'State of preservation') and thus the method could not be applied. Another problem is that the chronological stages of dental development started from 3 years of age. It was therefore impossible to use the method for younger individuals. Finally, the method has different tables with different scores for boys and girls. In Asine and Lerna material, however, sexes could not be differentiated. In Asine and Lerna materials the method of Schour and Massler was most frequently utilized. However, the other three methods were also applied when possible. Estimated ages for Asine are presented in *Fig. 7* and for Lerna in *Fig. 8*.

ENAMEL HYPOPLASIA

Various clinical and experimental studies have confirmed that a growing tooth is a biologic recorder of both health and disease. The growing enamel and dentin provide accurate, prompt, and permanent records of both normal fluctuations

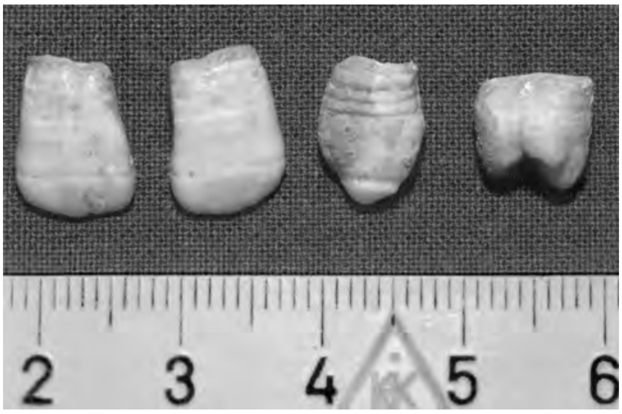

Fig. 9. Multiple teeth demonstrating linear enamel hypoplasia.

and pathologic accentuations of mineral and general metabolism. During dental development, incremental layers of enamel and corresponding layers of dentin are apposed, one on top of another until tooth is formed. The occurrence of a sufficiently severe systemic disturbance (disease) at any time during the appositional development of the crown arrests the activity of specific cells that produce enamel (ameloblasts) and dentin (odontoblasts). When the cells' activity is arrested, they cannot develop fully and as a result, we witness lacking enamel in tooth crown. The enamel is lacking in only these portions of crown that were formed and calcified during the disease period. On the bases of severity and duration of the disease, the enamel hypoplasia may be microscopic (accentuated striae of Retzius in *Fig. 6*, see *Pl. 2*) or macroscopic (linear enamel hypoplasia in *Fig. 9*). Growing long bones also may serve as recorders of systemic disturbances. Transverse lines of increased density, which correspond to the period of altered metabolism, can be seen in the roentgenograms. The enamel, however, has certain distinct advantages over bone: (1) it is not subject to resorption and its record is therefore immutable; (2) its chronology of development is more precise, and (3) it can be more readily studied on a clinical and histological basis.

Literature review for enamel hypoplasia

An early reference to enamel defects dates back to 1743, when Bunon described 'erosion' of teeth due to rickets, measles and scurvy. The next report came in 1785 from Sanchez who reported dental alteration in relation to syphilis. In 1858, Hutchinson described certain dental findings to be characteristic of hereditary syphilis. Gottlieb described enamel hypoplasia in rickets, while Parrot considered the combination of syphilis and rickets as the principal etiologic agent. Other causative factors for enamel hypoplasia include heredity, toxicity, tetany and vitamin-A deficiency. Berten, Black and Calteux, however, placed the etiology on an even broader basis, believing that any disturbance severe enough to interfere seriously with nutrition would be reflected in the tooth.

The term 'enamel hypoplasia' was first used by Zsigmondy in 1893 and is the most generally accepted term. *Table 3* summarizes the historical review of enamel hypoplasia. General types of enamel hypoplasia:

Table 3. Historical review of enamel hypoplasia.

Author	Date of publ.	Terminology	Classification according to		
			Chronology	Morphology	Etiology
Bunon	1743	Erosion		Sulciform, cup-shaped	Rickets, measles, scurvey
Sanchez	1785	Premature caries (black decay of teeth)			Hereditary syphilis
Hutchinson	1858	'Notched incisor'	'Infancy'	Notched or crescent incisors	Hereditary syphilis
Zsigmondy	1893	Congenital defects of enamel, enamel hypoplasia		Furrows, pits	
Berten	1895	Enamel hypoplasia, congenital enamel defects, erosion	Mainly first year of life	Diversified	Nutritional disturbances
Black	1904	Atrophy, hypoplasia, contemporaneous accretional dystrophy	First five years of life	Pitted groove, inverted fingernail scar, etc.	Serious nutritional disturbances
Cavallaro	1908	Dental erosion	Intra-uterine	Pitted, sulcate, cup-shaped, etc.	Hereditary syphilis
Karnosh	1926	Enamel hypoplasia	Early childhood	Honeycomb sleeve-cuff, terrace type, corn-kernel, corrugated form	Nutritional upset
Calteux	1934	Enamel hypoplasia	Mainly first year of life	Multifarious pits, grooves, band	Disturbances in calcium metabolism
Sarnat	1941	Chronologic enamel aplasia	Approx.: 65% infancy 33% early childhood 2% late childhood	a. Single zones of enamel aplasia 1. narrow 2. wide b. Mutiple zones of enamel aplasia	Non-specific, severe metabolic upset

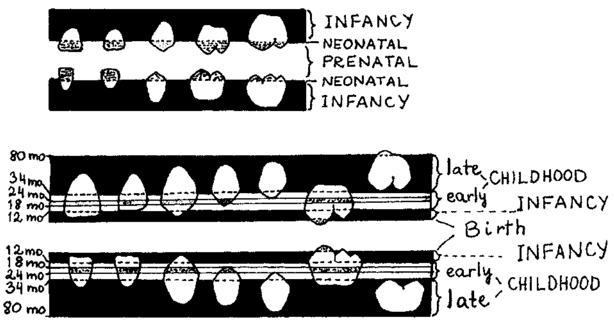

Fig. 10. Chronological ages at which enamel hypoplasia frequently occurs. Deciduous dentition (above) and permanent dentition (below).

(1) Single zones of missing enamel
  (*a*) Narrow defects:
    (i) Pitted
    (ii) Smooth
  (*b*) Wide defects:
    (i) Pitted
    (ii) Smooth
(2) Multiple zones of missing enamel

A narrow zone is indicative of enamel formation affected for a shorter time (acute), while a wide zone shows enamel formation that has been affected for a longer time (chronic). Multiple zones indicate that enamel formation was affected on more than one occasion. See *Fig. 10* for chronologic ages at which enamel hypoplasia frequently occurs.

Hypoplasia among Asine teeth

This paragraph describes the hypoplasia findings—their severity and chronology—among Asine materials. There are 16 individuals with notable enamel hypoplasia lesions: the first one is AS 1052, an individual with estimated age of $5\frac{1}{2}$ years (± 6 months). This individual features brownish hypoplasia spots over the entire area of crown in all deciduous teeth. This is an indication of chronic illness over the periods of early and late infancy as well as early childhood (from 9 lunar months until 2 years of age). Microscopically, the deciduous teeth feature normal tissue structure within prenatal enamel and dentin but accentuated striae of Retzius within the postnatal enamel and dentin. Accentuated striae of Retzius are considered a pathological feature, which show that the enamel and dentin are poorly mineralized. Poor mineralization is a consequence of body's disturbed metabolism (due to illness). In addition, the permanent teeth of our individual show multiple (3) sharp linear enamel hypoplasia (LEH) lines that are results of multiple (3) episodes of acute metabolic disturbance. The acute linear hypoplasia lines within the permanent teeth have developed during the following age periods:

(1) 6 months of age (duration: 3–4 weeks)
(2) 1 year (duration 2–3 weeks)
(3) 5 years (duration 3–4 weeks)

Our next hypoplasia affected individual is AS 2838 with estimated age of $5\frac{1}{2}$ months (± 6 months). This individual has died quite early and hence had no permanent teeth available. The six deciduous teeth present feature white hypoplastic spots spread over crown enamel. This is an indication of mild metabolic disturbance that has occurred from birth until the early death of the individual. The enamel doesn't reflect any specific episodes of more severe illnesses that would be expressed by lack of enamel in a specific area, with the exception of the microscopic neonatal line, which is a physiological feature due to the stress of birth. The hypoplasia seen is rather chronic and has occurred in same severity level throughout the infant's life.

AS ? (seq. no. 265) is an individual with estimated age of 4 months (± 6 months). This individual has nine deciduous teeth available and all of those have white hypo-mineralization spots spread over the entire crowns. The individual has therefore suffered from mild metabolic disturbances throughout his/her short life.

AS 3451 is an individual with 8 deciduous teeth and an estimated age of 4 months (± 6 months). All of the teeth have white hypo-mineralized spots spread over the crown enamel. Again, this individual has had mild metabolic disturbance (illness) throughout his or her life (from birth until approximately 4 month of age).

AS 2860 is an individual with estimated age of 9 lunar months and has only two deciduous teeth available. These two teeth are covered by brownish hypoplasia spots, indicating a moderate type of hypoplasia that has lasted from approximately 7 months *in utero* until the time of birth (9 lunar months). The microscopic analyses revealed no visible neonatal line, which means that the individual was either stillborn or died shortly after birth (lived up to 3 weeks). The microscopic analyses further revealed that the prenatal enamel and dentin was poorly mineralized, probably due to a chronic disease of the mother (causing *in utero* metabolic disturbances).

AS 2313 is an older individual, with an estimated age of 5 years (± 6 months). This individual has five deciduous teeth and nine permanent teeth available. These teeth represent a severe case of enamel hypoplasia shown in several areas of crown. The development of these hypoplastic areas correspond to the following age periods:

(1) 6 months of age (duration approx. 5–6 weeks)
(2) 1 year of age (duration approx. 2–3 months)
(3) 2 years of age (duration approx. 1 month).

AS 4258, an individual with estimated age of 6 years (± 2 years). This individual has only one permanent tooth available. The entire crown enamel, except for the cusps, are covered by light brown hypoplasia spots, indicating mild hypoplasia, which is due to a milder metabolic disturbance that has occurred from 9 months until 4 years of age.

AS 2878, an individual with estimated age of 1 year (± 3 months). This individual has 17 deciduous and three permanent teeth available. The teeth present have dark-brownish discoloration spread over the entire crown enamel. This is an indication of a moderate enamel hypoplasia that is due to a metabolic disturbance that has occurred from birth until 1 year of age. In addition, the lower part of each crown's surface (towards the roots) in all deciduous teeth demonstrates a darker (brownish-black) horizontal hypoplasia line, which indicates that at about 6 months of age the individual has suffered from a more severe metabolic disturbance that has lasted for 5 to 6 weeks causing serious damage to the process of ameloblasts formation and leading to these brownish-black lines seen in all deciduous teeth.

AS ? (seq. no. 274), an individual with estimated age of 1 year (± 3 months). This individual has 19 deciduous and nine permanent teeth available. All the teeth present have dark-brownish discolouration throughout the crown enamel indicating moderate hypoplasia that is due to a chronic metabolic disturbance that has occurred from birth until 1 year of age. (Late Helladic)

AS 5232b and 4577, an individual with estimated age of 30 years (± 5 years). This individual has 3 permanent teeth available. The crown enamel of these teeth has multiple pits in the lower quadrant of the crown (towards the roots). This is an indication of a mild to moderate hypoplasia that has occurred firstly at 3 years of age (for the first incisor tooth) and then secondly at about 5 years of age (for the canine and first premolar). Both episodes had lasted for approximately a period of 6 months.

AS 5005, an individual with estimated age of 25 years (± 5 years). This individual has only one permanent tooth (lower right first molar) available. There is a ring-like brownish hypoplasia line running through the centre of the crown indicating acute metabolic disturbance that has occurred at about 2 years of age and has lasted for about 5–6 weeks.

AS 2199, an individual with estimated age of 25 years (± 5 years). This individual has only one permanent tooth (upper right second molar) available. The crown enamel shows a light brown discolouration that is distributed throughout the crown surface indicating that the individual has suffered from chronic metabolic disturbance that has lasted for 2 years: from 5 years until 7 years of age. (Late Helladic)

AS 2918, an individual with estimated age of 35 years (± 5 years). This individual has only one permanent tooth (lower left second premolar) available. The tooth has brownish discolouration and pits equally distributed throughout the crown enamel. This is an indication of a chronic metabolic disturbance that has occurred between ages of 5 to 7 years. (Late Helladic)

AS 2696, an individual with estimated age of 6 months (± 6 months). This individual has two deciduous teeth available (left and right lower second molar). Both teeth have hypoplasia shown by brown discolouration throughout the crown indicating chronic metabolic disturbance that has occurred from birth until 6 months of age.

AS 2242, an individual with estimated age of 40 years (± 5 years). This individual has two permanent teeth available (lower left second premolar and first molar). Both teeth have brown discolouration throughout the entire crown area indicating chronic metabolic disturbance that has lasted at least from 9 month until 6 years of age.

AS 5276, an individual with estimated age of 8 years (± 2 years). This individual has only one permanent tooth (lower left first molar) available. The tooth has ring-like discolouration (light-brown) and pits around the middle part of the crown indicating moderate enamel hypoplasia due to metabolic disturbance that has occurred between ages of 1 to 2 years. (Late Helladic)

Hypoplasia among Lerna teeth

This section will describe the chronology and severity of dental hypoplasias among Lerna teeth. First affected individual is LER 5, with an estimated age of $4^1/_2$ years (± 8 months). One deciduous and two permanent teeth are available from this subject. All the teeth have white hypoplasia spots in the enamel throughout the entire crown area. This finding is an indication of a mild chronic dysfunction or disturbance that has occurred at least during the developmental period of these three teeth; from birth until $4^1/_2$ years.

Next affected individual is LER 51, with estimated age $3^1/_2$ years (± 6 months). This individual has three deciduous and seven permanent teeth available for study. The crowns of the three deciduous teeth are covered with brownish hypoplastic spots (except for the lower quadrant of the crown) indicating moderate type of chronic disturbance that has occurred during the period of birth until 2 years of age. The microscopic analysis of tooth number 75 (the lower left second deciduous molar) showed accentuated striae of Retzius in the areas that had developed from birth until 2 years of age. The fact that the seven permanent teeth (incisors and molars) are not affected by hypoplasia can be explained because the crowns of these teeth have developed in most part between two and four years of age.

The specimen LER 49 was estimated to be of age 6 months (± 2 months). This individual has 16 deciduous teeth and two permanent teeth available. All of the 16 deciduous teeth have light-brown hypoplastic spots in crown indicating mild to moderate hypoplasia. The hypoplastic spots cover wide rather than focussed area of crown, which is an indication that the individual has suffered from a chronic metabolic disturbance that occurred at the same severity level throughout the individual's life (from birth until 6 months of age). The microscopic analyses also confirm these dental findings by showing the accentuated striae of Retzius in the postnatal enamel.

LER 53 has an estimated age of 11 years (± 6 months). This individual has 22 permanent teeth available. The first permanent molars (d. 16, d. 26, d. 46) have carious lesions on the occlusal surfaces. In addition, all the teeth have brownish hypoplastic spots spread over entire crown area. Also, there are three areas where hypoplasia is more severe: leaving a groove-like hypoplastic line in the crown at three different levels. The timing of the first groove's development (in first incisors and first molars) corresponds to 2 years of age, in the other words, at age 2 this particular individual had an acute and severe metabolic disturbance that had lasted for at least 6 months (based on the width of the groove). The next two grooves seen in the teeth (incisors, canines, premolars and molars) probably developed at ages 3 and 4 and the causative metabolic disturbance has again lasted about 6 months. Microscopically, these grooves are marked as ring-like hypoplastic lines or accentuated striae of Retzius—representing areas of missing enamel. Besides these three more severe and acute hypoplastic lesions found in the teeth; all of the 22 permanent teeth are affected by mild to moderate chronic hypoplasia, that is in the form of equally distributed brownish hypoplasia spots. This means that the individual in question has had poor nutritional and or health conditions for his/her entire life.

LER 47 has an estimated age of 5 years (± 6 months). This individual has 10 deciduous teeth and 6 permanent teeth available. Metabolic disturbance has occurred during the late infancy period (6 months–1 year of age) leaving multiple equally distributed hypoplastic spots in the enamel of all the deciduous teeth. Moreover, there has been a single acute and more serious metabolic disturbance incident around age 9 months that has lasted for about 3–5 weeks of time. This metabolic incident has caused the dental enamel of lower deciduous canine to be completely unformed (aplasia). Microscopic analysis on the lower canine further reveals that the tooth has been poorly mineralized in general and more specifically during age period of 9th months (lasting for about 3–5 weeks) the mineralization of enamel has not occurred at all due to an acute metabolic disturbance. The 6 permanent teeth present do not show evidence of hypoplasia, because these permanent teeth have been developed after the metabolic disturbance.

LER 41, estimated age 9 lunar months (± 1 month). This individual has two deciduous teeth present, and both of those have dark discolouration throughout the crown. Microscopic analysis shows defective enamel and dentin tissues, which is due to poor mineralization represented by accentuated striae of Retzius. Neonatal line is not visible indicating that the individual was a stillborn or had died shortly after birth. The foetus has suffered from severe metabolic disturbances throughout the *in utero* period.

LER 78, estimated age $4^1/_2$ years (± 6 months). This individual has 11 deciduous teeth and four permanent teeth available. The deciduous teeth have brownish discolouration throughout their crowns and microscopically accentuated striae of Retzius. This is an indication of chronic metabolic disturbance. The four permanent teeth, particularly the upper left first molar, have white discolouration in the cusps. Cusps of permanent molar teeth develop from birth until about 6 months of age, and since the cusps are affected by hypoplasia lesion, it is reasonable to assume that an acute metabolic disturbance has occurred during that time—the early infancy period.

LER 79, estimated age 2 months (± 2 months). This individual has only one tooth present—lower left deciduous first molar. The tooth is at its early developmental stage where the crown is three-quarters complete. The entire crown enamel has brownish discolouration and hypoplasia spots indicating moderate metabolic disturbance. The microscopic analysis shows neonatal line (evidence of live birth) and accentuated striae of Retzius within the postnatal enamel. This individual has suffered from some kind of metabolic disturbance throughout his/her short life. The metabolic disturbance had already started during the *in utero* period, because the prenatal enamel was also of a poor quality (poorly mineralized).

LER 80, estimated age $1^1/_2$ years (± 6 months). This individual has five deciduous and two permanent teeth available. The deciduous teeth have grooves in the lower quadrant of the crowns that essentially represent hypoplastic lines. This is an indication of incidents of multiple metabolic disturbances that have occurred during the late infancy period (from 6 months to 1 year of age). In addition, the deciduous teeth have brownish spots spread over the crown indicating moderate hypoplasia that is due to chronic metabolic disturbance that has occurred throughout the individual's life.

LER 63, estimated age 7 years (± 6 months). This individual has 10 deciduous teeth and 11 permanent teeth available. All the deciduous and permanent teeth have brownish hypoplasia spots spread over the crowns, indicating chronic metabolic disturbance that has occurred throughout the individual's life. In addition, there are groove like hypoplastic lines located in the lower quadrants of the deciduous teeth and upper quadrants of the permanent teeth. These lines indicate that during the late infancy period (from 6 months until 1 year of age) there was a more serious episode of acute metabolic disturbance that had lasted for at least 3 weeks. Microscopic analysis further confirms this finding because the overall accentuated striae of Retzius is especially strong (leaving a wide hypo-mineralization line into the upper quadrant of the permanent molar tooth under investigation (tooth 26)).

LER 75, estimated age $9^1/_2$ (± 6 months). This individual has one deciduous and six permanent teeth available. All the teeth present have multiple hypoplasia lines and spots as well as brownish discolouration in the crown surface. The hypoplasia lines have developed during late infancy (from 6 months to 1 year of age) and early childhood period (from $1^1/_2$ to 2 years of age) due to a severe and acute metabolic disturbance.

The overall discolouration and hypoplasia spots are indicators of chronic metabolic disturbance that has occurred throughout the individual's life.

LER 22, estimated age 9 lunar months (± 1 month). This individual has two deciduous teeth available. These two teeth have brownish discolouration. Microscopic analysis of tooth number 72 (lower left second incisor) shows no neonatal line (evidence of stillbirth) but accentuated striae of Retzius within the prenatal enamel. However, there are no specific locations or areas that show more severe hypoplasia lesions. This means that the foetus has suffered from chronic metabolic disturbance during the entire *in utero* period.

LER 26, estimated age 4 months (± 2 months). There are four deciduous teeth available for this individual. All of the four teeth have dark-brown discolouration as well as hypoplastic spots spread over the crowns. This is an indication of a moderate hypoplasia lesion that is due to a chronic metabolic disturbance that has occurred throughout the individual's life.

LER 90, estimated age 9 lunar months (± 1 month). This individual has four deciduous teeth available. All of the teeth show brownish discolouration. Microscopic analysis of tooth number 74 (lower left first molar) shows no neonatal line (evidence of stillbirth or death soon after birth). The accentuated striae of Retzius are present throughout the prenatal enamel. This indicates that the foetus has suffered from chronic metabolic disturbance during the entire *in utero* period.

LER 84, estimated age 1 year (± 3 months). This individual has four deciduous teeth and one permanent tooth available. All of the five teeth have brownish discolouration, indicating moderate hypoplasia lesion. The microscopic analysis shows accentuated striae of Retzius within the postnatal enamel. The structure of the prenatal enamel, however, appears normal. Therefore, this individual has suffered from chronic metabolic disturbance standing from birth until one year of age (until the individual's death).

LER 93, estimated age 15 years (± 1 year). This individual has 18 permanent teeth available. Light-brownish hypoplasia spots cover all of the teeth present — an indication of a chronic metabolic disturbance that has occurred during the developmental period of these permanent teeth (from late infancy period until 7–8 years of age and 10 to 12 years for the third molars). In addition, the canine teeth have been more strongly affected by the enamel hypoplasia lesion. There is a remarkably deep hypoplastic groove in the upper quadrant of both upper canines. Microscopic analysis demonstrates lack of enamel tissue around this groove in addition to the overall accentuated striae of Retzius visible within the postnatal enamel. The hypoplastic groove has formed around age of 5 years and is caused by severe metabolic disturbance that has lasted for about 6 months.

LER 103, estimated age 5 years (± 6 months). This individual has eight deciduous teeth and one permanent tooth available. All of the deciduous teeth have brownish hypoplasia spots equally spread over the crowns. The permanent tooth (upper left first premolar) has dark-brown discolouration and microscopic analysis demonstrates accentuated striae of Retzius and disruption of enamel forming cells (ameloblasts). This finding confirms that a metabolic disturbance has occurred while this permanent tooth was developing — in between 3 to 5 years of age. In relation to the deciduous teeth, the equally distributed hypoplastic spots indicate moderate metabolic disturbance that has occurred from birth until 1 year of age and has been chronic in nature.

LER 204, estimated age $1^1/_2$ years (± 6 months). This individual has one deciduous and one permanent tooth available. Both teeth have multiple hypoplastic spots spread over their crowns, indicating that the individual has suffered from a chronic metabolic disturbance that had lasted during the late infancy period (6 months – 1 year). The microscopic analysis also indicates based on the poorly mineralized enamel that the individual has suffered from nonspecific metabolic disturbance during the late infancy period.

LER 86, estimated age 8 months (± 2 months). This individual features 12 deciduous teeth and one permanent tooth. All the teeth have dark-brown hypoplasia spots in the crowns and microscopic analysis shows accentuated striae of Retzius. These findings indicate that the individual has had a metabolic disturbance during the entire infancy period (from the birth until death in age 8 months).

LER 113A, estimated age 9 lunar months (± 1 month). This subject has two deciduous teeth available. Microscopic analysis confirm on the basis of missing neonatal line that this foetus has been stillborn or has died soon after birth. The microscopic analysis of accentuated striae of Retzius together with macroscopic findings of enamel's brownish discolouration further confirms that the foetus has suffered from chronic metabolic disturbance from 7–9 months *in utero*.

LER 102, estimated age 1 month (± 1 month). This individual has three deciduous teeth available and dark-brown hypoplasia spots cover them throughout. Microscopic analyses reveal that neonatal line is visible, but the amount of postnatal enamel is too short to be conclusively analysed. Macroscopically, however, the affected teeth are evidence of poor metabolic condition that has lasted from age 7 months *in utero* until 1 months of age (until the death of the individual).

LER 30, estimated age 8 lunar months (± 1 month). This subject has three deciduous teeth present. The teeth are discoloured and have brownish-black hypoplasia spots on the partly developed crowns. Microscopic analysis does not show evidence of neonatal line and the prenatal enamel is poorly mineralized. The foetus has therefore suffered from metabolic disturbance that has occurred from 5 months *in utero* until its death in 8 lunar months of age.

LER 27, estimated age 6 months (± 1 month). This individual has 15 deciduous and two permanent teeth available. The teeth have light-brownish hypoplasia spots on them indicating that the individual has suffered from metabolic disturbance during the time the crowns of these deciduous teeth have developed—7 months *in utero* until about 4 months of age.

LER 99, estimated age 7 1/2 (± 1 year). This individual has nine deciduous and 13 permanent teeth available. The occlusal surfaces (biting surface) of the deciduous teeth have porous enamel and hypoplastic spots and are consequently excessively worn. This finding indicates that the individual has suffered from metabolic disturbance during early and late infancy period (from birth until 1 year of age).

LER 109, estimated age 8 months (± 1 month). This individual has four deciduous and three permanent teeth available. One of the four deciduous teeth (the lower left second molar) shows missing enamel in the entire buccal side of the crown, indicating that this individual has had a severe metabolic disturbance during the late infancy period (from 6 months until the death of the individual at age 8 months). In addition, all the remaining teeth have light-brownish hypoplasia spots spread over the crown, indicating mild to moderate enamel hypoplasia caused by chronic metabolic disturbance that has occurred from birth until the death of the individual.

LER 123, estimated age 9 years (± 1 year). This individual has six permanent teeth available. The teeth have opaque white discolouration indicating that the individual has suffered from mild metabolic disturbance that has occurred during the period of 4 to 5 years of age.

LER 130, estimated age 4 1/2 years (± 6 months). This individual has 16 deciduous and ten permanent teeth available. The deciduous teeth appear to have a normal structure, but pathologies are seen among the permanent teeth. The first incisors and first molars have missing enamel— *amelogenesis imperfecta*—on the cusps and biting edges of the crowns. As these areas of crown have developed during the late infancy period, it is reasonable to assume that the individual has suffered from serious metabolic disturbance during the late infancy period (from 6 months until 1 year of age). The metabolic disturbance has been severe enough to leave the enamel on the cusps of first molars and on the biting edges of the first incisors undeveloped.

LER 151, estimated age 6 months (± 2 months). This individual has 13 deciduous teeth available. All of the deciduous teeth present have brownish discolouration and in addition, the biting edges in incisors and tips of the cusps in molar teeth have porous, partly missing enamel indicating more severe type of metabolic disturbance that has occurred around 8 lunar months until time of birth. The overall discolouration is due to less severe but chronic metabolic disturbance that has occurred during the early infancy period (birth until 6 months of age).

LER 152, estimated age 5 1/2 months (± 2 months). This individual has eight deciduous teeth available. All of the teeth have dark-brown discolouration as well as hypoplasia spots on the crown surface. This is an indication of a moderately severe metabolic disturbance that has occurred throughout the early infancy period and has started around 7th lunar month.

LER 153, estimated age 4 1/2 months (± 2 months). This individual has 9 deciduous teeth available. The crowns of the incisors and first molars show dark-brownish discolouration and hypoplastic spots indicating that this individual has had moderate metabolic disturbance throughout the early infancy period (from birth until the death of the individual at age 4 1/2 months).

LER 157, estimated age 2 years (± 6 months). This individual has three deciduous teeth and one permanent tooth available. The three deciduous teeth have pink-brownish discolouration and hypoplastic spots in the enamel, indicating mild to moderate enamel hypoplasia lesion. This lesion is due to a chronic metabolic disturbance that has occurred during the early and late infancy period (from birth until 1 year of age).

LER 171, estimated age 4 months (± 2 months). This individual has five deciduous teeth available. These teeth have dark-brown discolouration as well as hypoplastic spots in the dental enamel, indicating moderate enamel hypoplasia. This is due to chronic metabolic disturbance that has occurred from 7th lunar month until the death of the individual (at age 4 months).

LER 173, estimated age 6 1/2 years (± 6 months). This individual has seven deciduous and 16 permanent teeth available. All of the deciduous teeth have brownish discolouration indicating moderate enamel hypoplasia that is due to a metabolic disturbance that has occurred during the late infancy period (from 6 months until 1 year of age). In addition, the permanent canine teeth show hypoplastic groove (linear enamel hypoplasia) located horizontally on the upper third of the crown (towards the cusp). This is an indication that the individual has suffered from a severe metabolic disturbance at 4 years of age and the disturbance has been acute and lasted about 3–5 weeks.

LER 177, estimated age 3 years (± 6 months). This individual has 17 deciduous and 6 permanent teeth available. The upper right deciduous second molar has a carious lesion in the distal cusp. All teeth present have light-brownish discolouration and small hypoplastic spots spread over the crowns indicating mild enamel hypoplasia that is due to chronic metabolic disturbance that has lasted during the late infancy period (from 6 months until 1 year of age) and probably continued in a milder version throughout the individual's life (until the death at 3 years of age). This is because the enamel hypoplasia is more severe in the biting edge of the permanent incisor and in the cusps of the permanent molars (these areas develop during the late infancy period).

LER 179, estimated age 3 1/2 months (± 2 months). This individual has 12 deciduous teeth available. The teeth present have brownish discolouration as well as hypoplastic spots equally spread in the crowns (except for *occlusal* surfaces). This is an indication of moderate enamel hypoplasia that is due to chronic metabolic hypoplasia that has occurred during the early infancy period (from birth until the death of the individual at age 3 1/2 months).

LER 184, estimated age 6 1/2 years (± 6 months). This individual has nine deciduous teeth and 16 permanent teeth available. The deciduous teeth have brownish discolouration as well as areas of missing enamel in the crowns. The overall brown discolouration is an indicator of a chronic metabolic disturbance that has mostly occurred during the late infancy period (from 6 months until 1 year of age). The areas of missing enamel indicate two acute episodes of metabolic disturbance. The first episode has occurred at birth (lasting about 3–4 weeks), and the second episode at about 9th months (again lasting about 3–4 weeks of time). Among the permanent teeth evidence has been found of an acute episode of severe metabolic disturbance. The episode has most likely taken place at age 3 years and lasted for 4–6 weeks and caused hypoplastic grooves into the dental enamel of the permanent teeth (canines and incisors).

LER 186, estimated age 5 years (± 6 months). This individual has 17 deciduous and 4 permanent teeth available. All of the deciduous teeth are quite strongly affected by *amelogenesis imperfecta*, a disease that leaves parts of enamel undeveloped. The causative reason may well be a severe metabolic disturbance that has occurred during the late infancy period (from 6 months until 1 year of age) and has adversely influenced the development of these deciduous teeth. The enamel of the permanent teeth, however, shows normal structure and it is therefore reasonable to assume that the metabolic disturbance ceased in the early childhood period.

LER 190, estimated age 4 1/2 years (± 6 months). This individual has 13 deciduous and eight permanent teeth available. The upper left deciduous canine tooth has medium size carious lesion in the *bucco-mesial* side of the crown. All of the deciduous teeth have dark-brown discolouration in the enamel indicating chronic metabolic disturbance that has occurred throughout the entire infancy period (from birth until 1 year of age). In addition, the cusps of the deciduous molars have dark hypoplastic spots in the enamel indicating more severe metabolic disturbance that has occurred during the early infancy period (from birth until 6 months of age). The permanent teeth also show hypoplasia defects in a form of a groove and located near the occlusal surface of the crown. This is also an evidence of metabolic disturbance that has occurred in an acute fashion at age 2 and lasted for about 4–6 weeks of time.

LER 214, estimated age 14 years (± 6 months). This individual has 12 permanent teeth available. All of the teeth have dark-brownish discolouration as well as hypoplastic spots in the enamel indicating moderate enamel hypoplasia due to a chronic metabolic disturbance that has occurred during the childhood period (from 2 years until 7 years of age). In addition, the upper left canine tooth shows a distinct line of linear enamel hypoplasia located two thirds down from the tip of the crown. This hypoplastic line is a consequence of an acute and severe metabolic disturbance that has occurred at approximately 5 years of age and the disturbance has lasted for about 4–5 weeks.

LER 215, estimated age 6 years (± 6 months). This individual has six deciduous and two permanent teeth available for examination. All of the deciduous teeth present have hypoplastic spots and brownish discolouration indicating moderate enamel hypoplasia due to a chronic metabolic disturbance that occurred during the late infancy period (from 6 months of age until 1 year). In addition, the lower canine and first molar have more distinctive linear enamel hypoplasia in the middle part of the crown. These tooth parts are normally developed at around 6 months of age and the defects in these areas are indicators of severe metabolic disturbance that has occurred at similar time frame.

In addition to these Lerna individuals with enamel hypoplasia lesions described above, there are six more individuals (LER 6, 8, 9, 10, 11, 17) who show chronic hypoplasia in the entire dentition. This is an indicator of a chronic metabolic disturbance that has occurred throughout the individuals' lifetime.

SUMMARY AND CONCLUSIONS

In conclusion, both the Asine and Lerna teeth were in good condition. *Post mortem* fractures in crowns were detected in only 4.5% of the Asine materials and 11.5% of the Lerna materials. However, the total number of teeth found was less than expected for the number of subjects: only 21.5% of Asine subjects' expected teeth were found and only 35% of expected Lerna teeth were found. This study primarily used Schour and Massler's method for age estimation. This method was selected because it is accurate, easy to apply, covered the expected age range, and is not dependent upon knowing the sex of the individual. It therefore matched the requirements of the present study well. A number of Asine (16 individuals, 55%) and Lerna (45 individuals, 47%) showed hypoplastic lesions consistent with malnutrition or disease. The details are summarized for each case in the preceding section. The high prevalence of hypoplastic lesions indicates that malnutrition and disease was widespread in these individuals.

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APPENDIX II

THE SKELETAL MATERIAL OF ADULT INDIVIDUALS FROM ASINE

The skeletal material from adult individuals consists of 685 skeletal elements (fragments and complete bones). Of these bones, the most abundant elements are those belonging to the thorax (25%), with the long bones (20%) and bones of the hands and feet (18%) following in frequency. Only 14% of the material consists of skull bones/fragments. The MNI for the adult remains are 36 individuals, of which 17 individuals were possible to assign to already published graves (*Table 10*).[606]

Age determinations

Age estimations of adult skeletons are seldom as accurate as on subadult skeletons. These difficulties depend on the fact that most skeletal changes related to the chronological age takes place before *c*. 20 years of age.[607] Owing to these circumstances, often only larger age spans are possible, and the accuracy of the determinations depends on how well preserved the skeleton is. Different methods, as, for instance, the closure of the cranial sutures, the metamorphosis of the pubic symphysis, the morphology of the auricular surface of the ilium and the morphology of the sternal end of the fourth rib are frequently utilized criteria in these cases.[608] In young adults the gradual fusion of the epiphyses is a useful criterion since it indicates whether an individual is over or under a certain age. Another method which is useful if reasonably complete long bones are present is an examination of cross sections of the limb bones to reveal the age changes in internal bone structure. In this material the adults are represented by single bones or bone fragments. As a result most of the adult bones had to be classified into one single age category, >15 years. When possible, an approximate age interval is mentioned: the morphology of the pubic symphysis as well as the degree of epiphyseal fusion were the most suitable criteria to use in these cases.[609] The only individuals who are given a more precise age determination are those represented by preserved teeth (see *Table 11* and Appendix I).

Sex determinations

The accuracy of sex determinations depends on how well preserved the skeleton is, and preferably the whole skeleton should be taken into account. The pelvis and the cranium are the parts where sexual dimorphism is most pronounced.[610] Also, the metrics of the skeletal elements display certain differences between males and females, and these criteria are useful in the case of fragmentary remains. In this material very few individuals could be determined according to sex. When it was possible, only single criteria, as, for example, a measurement of the *caput femoris* or the morphology of parts of the pelvis, could be used to give an *indication* of the sex of the individual.[611] These indications can be useful when attempting to relate the individual bones to an already published grave where the skeleton was already osteologically examined.[612]

Measurements

The bones from adults were in a fragmentary state of preservation and few measurements were possible to take. There was no complete cranium, and just a few of the bones in the post-cranial skeleton were complete enough to enable some general measurements. These are listed below in anatomical order (*Table 9*).

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606 See *Asine* I.
607 Ubelaker 1989, 63.
608 Mays 1998, 50f.; Buikstra & Ubelaker 1994.
609 The criteria for age estimations are the ones recommended and depicted in Buikstra & Ubelaker 1994.
610 Mays 1998, 33–38; Buikstra & Ubelaker 1994.
611 When measurements are used for indication of sex, the ones published in Bass 1987 have been used.
612 See, for example, catalogue unit W05: the bones could belong to MH 29 or MH 30 but as the fragments of a right coxa have female characteristics, it is more likely to belong to the skeleton in MH 30 which has been described as female by C.M. Fürst and J.L. Angel. The skeleton in MH 29 was identified as male by the same scholars.

Table 9. Measurements of adult skeletons (mm).

Grave no.	MH 62		MH 20 or MH 21 or MH 23 or MH 24		Grave 8 (not published)		MH 96 (and/or MH 97 and/or MH 98)		?		MH 15		?		?	
Seq. no.	292		110		270		275		118		227		7		24	
MNI unit	T3:14		E02		E11		T2:01		LT02		LT14		LT12		LT11	
Approximate age	Adult (40–45 years)		Adult		Adult		Adult		Adult		Adult (20 years ± 2 years?)		Adult		Adult	
Sex	Male		Male?		Male?		Female?		Female?		Female?		?		?	
Side	L	R	L	R	L	R	L	R	L	R	L	R	L	R	L	R
Clavicle																
circumference	49	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
length	141	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Scapula																
length of cavitas glenoidalis	40	–	–	–	–	–	–	–	33	–	–	–	–	–	35	–
Humerus																
max. transv. caput diam.	43	43	–	–	–	–	–	–	–	–	–	–	–	–	–	–
max. sagitt. caput diam.	45	46	–	–	–	–	–	–	–	–	–	–	–	–	–	–
max. mid-shaft diam.	21	22	–	–	–	–	–	23	–	–	–	–	–	–	–	–
min. mid-shaft diam.	17	18	–	–	–	–	–	19	–	–	–	–	–	–	–	–
min. diaphyseal circumference	90	92	–	–	–	–	–	69	–	–	–	–	–	–	–	–
epicondylar breadth	62	63	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Radius																
transv. diam. of shaft	17	17	–	–	–	–	–	–	–	–	–	–	–	–	–	–
sagittal diam. of shaft	12	12	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Metacarpus I																
length	–	–	–	–	–	–	–	–	–	–	–	–	–	40	–	–
Metacarpus III																
length	–	–	–	–	–	–	–	–	–	–	–	–	57	–	–	–
Femur																
vertical diam. of caput femoris	–	–	–	–	–	–	–	–	–	–	38	–	–	–	–	–
upper transv. diaphyseal diam.	31	31	–	32	–	29	–	–	–	–	–	–	–	–	–	–
upper sagitt. diaphyseal diam.	26	26	–	26	–	24	–	–	–	–	–	–	–	–	–	–
mid-shaft sagitt. diam.	28	30	–	32	–	23	–	–	–	–	–	–	–	–	–	–
mid-shaft transv. diam.	25	24	–	27	–	24	–	–	–	–	–	–	–	–	–	–
mid-shaft circumference	90	89	–	121	–	106	–	–	–	–	–	–	–	–	–	–
Tibia																
max. mid-shaft diam.	32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
max. mid-shaft diam. at foramen nutr.	36	36	–	43	35	–	–	–	–	–	–	–	–	–	–	–
transv. mid-shaft diam.	21	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
transv. mid-shaft diam. at foramen nutr.	24	24	–	22	–	–	–	–	–	–	–	–	–	–	–	–
Talus																
width	–	–	–	–	–	–	–	–	–	–	–	–	39	–	–	–

Table 10. Graves of identified adults.

Grave number (Asine I)	Age	MNI unit	Age and sex according to Asine I
MH 15	adult female? (20 ± 2 years?)	LT 14	skeleton
MH 20 or 21 or 23 or 24?	adult	E02	woman, man, man, skeleton
MH 25 or 28?	adult <20 years	E10	woman, skeleton, skeleton, man, skeleton
MH 30 (MH 29?)	adult (female?)	W05	woman (man)
MH 38	adult	S01	skeleton
MH 47	adult	S06	skeleton
MH 52/53	adult	S10	man/woman
MH 58	40–45 years male	T3:01	44–50, male
MH 60	adult (+ 1 infant and 1 infans II?)	T3:15	adult woman
MH 62	30–45 years male, (+ 10 lm?)	T3:14	30–40 male
MH 81 (or MH 74 or MH 80)	adult (30 ± 5 years)	T3:08	woman *c.* 40 years (MH 74: woman *c.* 38/40–50 years, MH 81: 33 years male/30-year- old woman)
MH 84?	adult	T3:09	young woman
MH 96 (and/or 97 and/or 98?)	40 years (± 5 years)	T2:01	skeleton, man, woman
MH 97 and/or 101?	adult	T2:07	man, woman
MH 98?	adult (+ possibly child <3 years old)	T2:01	woman
MH 99	adult	T2:10	male 30–40 years
Not published: Grave 8	adult	E11	empty

Table 11. Individuals with preserved teeth.

MNI unit	Grave no.	Seq. no./AS no.	Age from teeth	No. indiv.
LT14	MH 15	99/3235	20 y (± 2 y)	1
T2:01	MH 96	229/2242	40 y (± 5 y)	1
T3-2:02	?	182/4618	25 y (± 5 y)	1
T3:08	MH 81? (or MH 74 or MH 80)	308/4577	30 y (± 5 y)	1
T3:08	MH 81? (or MH 74 or MH 80)	302/5232b	30 y (± 5 y)	
T3:16	?	97/4508	35 y (± 5 y)	1
T3:16	?	291/4565	35 y (± 5 y)	
T4:02	?	106/5005	25 y (± 5 y)	1

Palaeopathology

Periodontal disease

MNI unit LT 14, seq. no. 99, AS 3235: A fragment of the left part of the maxilla (upper jaw) from an adult individual (20 years ± 2 y). The preserved part includes the sockets for I^{1-2}, C, PM^{1-2} and M^1. Only the premolars and the molar remain *in situ*. The alveolar margin at the canine socket shows evidence of resorption but there is no evidence of new bone formation within the socket. Accordingly, it is not possible to determine whether the canine was lost *ante mortem*.

MNI unit LT 14, seq. no. 135, AS 3533: A fragment of the horizontal body of the mandibula (lower jaw) from an adult individual. No teeth were found *in situ*. The mandibula is broken (*post mortem*) at the place of the socket for the right canine, and the remaining part of the horizontal ramus extends approximately to the place of the first left molar. The sockets for the right canine and incisors are broken *post mortem* and the sockets for left I_1-C has started to be filled in with new bone. The remaining parts of the sockets at the left side were remodelled: i.e. the teeth were lost *ante mortem*.

MNI unit T2:01, seq. no. 250, AS 2144: A fragment from the horizontal body of the mandibula (lower jaw) from an adult (possibly 40 years ± 5 years[613]). No teeth were found *in situ* and the sockets had been remodelled.

Non-specific periosteal lesions

MNI unit LT06, seq. no. 152, AS 3181: Fragment of the distal diaphysis of a fibula from the right side, belonging to an adult individual. There is an area (*c.* 1 cm) of woven bone formation on the lateral side indicating that the lesion was active at the time of death.

613 See catalogue unit T2:01, where two adults have been identified, one of whom being 40 years old.

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Diary 4 — N. Nilsson, *Diary* 4. *Lower Town: Old Trench, East, East II, South*, 1924–26.

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PLATE 1

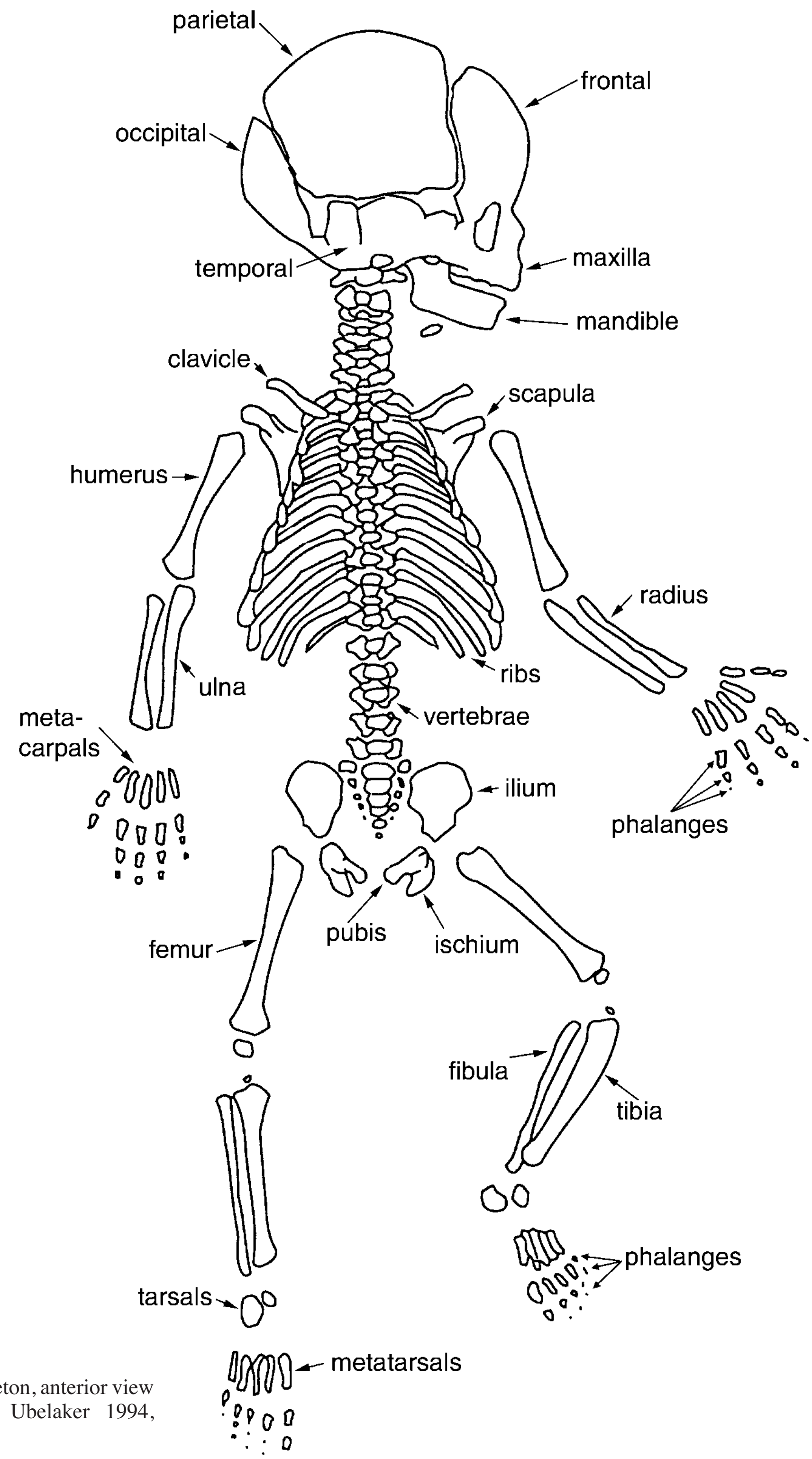

Plate 1. Foetal (newborn) skeleton, anterior view (modified from Buikstra & Ubelaker 1994, attachment 5b).

PLATE 2

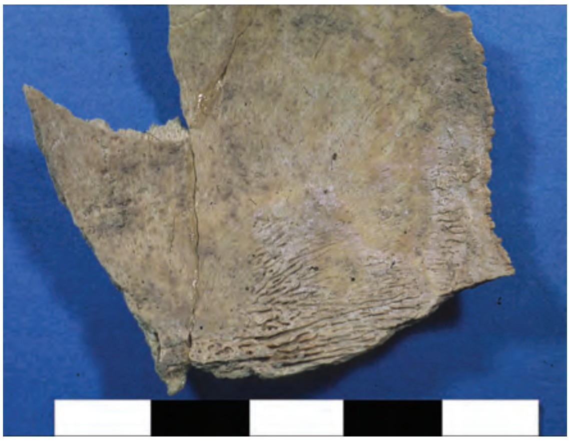

Fig. 1. Cranium fragment with endocranial depressions from a possible birth trauma (MNI unit T3-2:04, seq. no 3, AS 2797).

Fig. 2. Enlargment of the fragment in *Fig. 1*.

Fig. 3. Possible case of periosteal lesions on upper extremities (MNI unit T3-2:04, seq. no. 8, AS 2838 and seq. no. 13, AS 2838).

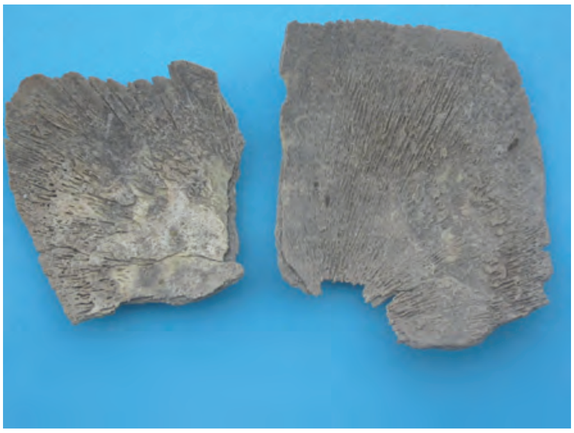

Fig. 4. Cranium fragments with partly unremodelled periosteal reactions and hypervascularity (MNI unit T3-2:05, seq. no. 268, AS ?).

Appendix I, Fig. 6. Microscopic section of an upper left deciduous second molar demonstrating the neonatal line and accentuated striae of Retzius (see enlargement).