

Towards a Bioarchaeology of Care:

**A contextualised approach for identifying
and interpreting health-related care
provision in prehistory.**

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Towards a Biotechnology of Care:

A contextualised approach for identifying
and integrating health-related care
provision in practice

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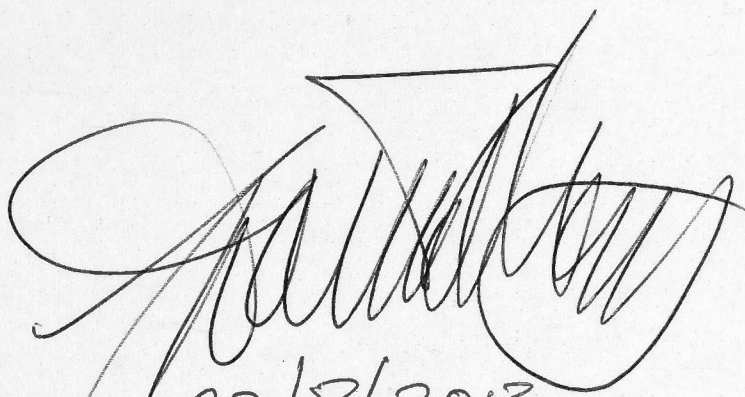


AUTHOR'S DECLARATION

I hereby affirm that all the intellectual content in this thesis is my original work. All sources of information and practical assistance are clearly identified in the 'Acknowledgements' section and/or in the main text, as appropriate.

Lorna Tilley

Dated:



22/8/2013

I dedicate this work to my partner, Tony Cameron,
and to the memory of my parents, Gwyneth Tilley and Derek Tilley.

ABSTRACT

Characteristics of the care given to those experiencing disability provide a window into important aspects of community and culture. In archaeology, health-related care provision is inferred from physical evidence in human remains indicating survival with, or recovery from, a disabling pathology, in circumstances where, without support, the individual may not have survived to actual age at death. Despite its potential to provide a valuable perspective on past behaviour, caregiving is a topic that has been overlooked by archaeologists. This thesis presents the 'bioarchaeology of care' - an original, fully-theorised and contextualised case study-based approach for identifying and interpreting disability and health-related care practices within their corresponding lifeways, and one that seeks to reveal elements of past social relations, socioeconomic organisation and group and individual identity which might otherwise be inaccessible. The applied methodology comprises four stages of analysis: (i) description and diagnosis; (ii) establishing disability impact and determining the case for care; (iii) deriving a 'model of care'; and (iv) interpreting the broader implications of care given. Each stage builds on the contents of preceding one(s), facilitating scrutiny of the analytical process.

This dissertation first discusses the treatment of healthcare provision in archaeological research, considering where, and why, this has fallen short. Successive chapters establish a context and a conceptual foundation for undertaking archaeological research into health-related caregiving, which includes operationalising terminology surrounding issues of 'disability' and 'care'; exploring the social and biological evolutionary origins of caregiving and the implications of these for understanding prehistoric care practice; and presenting a framework for deconstructing the decision-making involved in giving and receiving care. The thesis then details the stages of the methodology and introduces the Index of Care, a computer-based instrument designed to support bioarchaeology of care analysis and interpretation. Three chapters examine, respectively, the care given to M9 (Neolithic Vietnam), La Chapelle-aux-Saints 1 and La Ferrassie 1 (European Upper Middle Palaeolithic), and Lanhill Burial 7 (early British Neolithic), illustrating the variety, richness and immediacy of insights attainable through application of the methodology. These case studies demonstrate that the bioarchaeology of care's focus on caregiving as an expression of collective and individual agency allows an engagement with the past that brings us closer to those who inhabited it.

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CHAPTER 1. Introducing a Bioarchaeology of Care

The willingness to care for those who are in some way disabled is widely regarded as one of the characteristics that define what it is to be human (Gould 1988; Green 2003). Experience of disease is a constant of our existence, and the provision of health-related care appears to be such a universal and well-established response that some have even claimed an evolved genetic component for this practice (Fábrega 1997, 2011; Hill et al 2009; Sugiyama 2004a).

In archaeology, healthcare provision is inferred from physical evidence in a set of human remains indicating survival with, or recovery from, a disabling pathology in circumstances where, without such support, the individual may not have survived to actual age at death. However, while there is a rich literature documenting individual examples of serious pathology, including reports in which the likelihood of care is explicitly acknowledged, although not elaborated (see, for example, Dickel and Doran 1989; Hawkey 1998; Luna et al 2008; Trinkaus and Zimmerman 1982), and exploring interactions between the evolution of disease, social and environmental variables, and population health status (e.g. Larsen 2000; Roberts and Manchester 2005; Steckel and Rose 2002a,b), archaeology has largely overlooked health-related caregiving as a specific focus of analysis.

This has resulted in the neglect of a potentially valuable source of information on past behaviour. Care provision is a conscious, purposive, interaction involving care-giver(s) and care recipient(s), and it does not take place in a void. In any community, at any time, the understanding of what constitutes 'health' and 'disease', and the related response to the healthcare requirements of individual group members, is shaped by a combination of cultural norms, values and belief systems; traditions; collective knowledge, skills and experience; political, social and economic organisation; environmental variables; and access to resources (e.g. Bates and Linder-Pelz 1990; Hardey 1998; Hofrichter 2003; Mishler 1981; Pol and Thomas 2001). In turn, and within physiological constraints, the way an individual responds to the experience of a congenital disorder or an acquired disease or injury reflects not only the treatment they receive from others, but their own personality characteristics, beliefs and behaviours formed within a specific socio-cultural environment (Bowling 2002; Garro 2006; Lieban 1977). It follows that where health-related care practice can be identified in the

archaeological record it may offer unique insights into aspects of contemporary life and identity.

The goal of the research undertaken for this thesis was to develop and trial a 'bioarchaeology of care' - a comprehensively-theorised, structured approach for analysing archaeological evidence for receipt of health-related care within the context of the lifeways environment in which this care was given. The thesis first seeks to establish a practical and conceptual framework for addressing questions of healthcare provision in prehistory; based on this, it constructs a staged methodology for identifying and interpreting instances of care; and it then applies this methodology to three very different examples of past caregiving, in order to demonstrate both the process of implementation and the range and quality of results that can be achieved.

1.1 Setting the scene

This first section of Chapter 1 provides abbreviated definitions of key terms and concepts employed in this thesis, and notes some of the limitations to previous research into past care practice; clarifies the parameters of thesis research; and presents a short introduction to the applied bioarchaeology of care methodology. The second section describes thesis structure and content, and the final section looks at some of the challenges faced by all archaeological research that deals with subject matter as contested as that of 'disability' and 'care' - and offers a personal response to these.

1.1.1 *Definitions, qualifications and provisos*

Pathology experienced during life may leave evidence of its presence after death in the form of anomalies in bone or preserved soft tissue; these anomalies may enable either diagnosis of a specific disease or, where certainty in diagnosis is not possible, an indication of likely clinical impact(s). Health-related care provision is inferred from this evidence when it suggests that an individual survived with, or recovered from, a pathology likely resulting in a disability significantly affecting aspects of physical, psychological and/or behavioural functioning.

'Disability' refers to a state (temporary or long-term) arising from an impairment in body function or structure that is associated with activity limitations and/or participation

restrictions. This state is given meaning by both the individual and the community in relation to the lifeways in which it is experienced.

The terms 'healthcare provision', 'health-related care', 'caregiving' and 'care' are used interchangeably in this thesis, and are defined in terms of the provision of assistance to an individual experiencing short, medium or long term disability as an outcome of pathology. What healthcare comprised will have depended on the nature of disability, the lifeways context in which it occurred and individual care-recipient characteristics. In bioarchaeology of care research, healthcare is loosely divided into 'direct support' - for example provisioning, nursing, physical therapy - or 'accommodation' - such as strategies enabling a level of participation in social and/or economic activity which might otherwise not be attainable. One of the implications of this is that to qualify for bioarchaeology of care analysis a pathology need not have been completely disabling or ultimately fatal, but when considered in the context of contemporary lifeways demands it should be possible to conclude that, on the balance of probabilities, the 'disabled' individual would not have been able to function at a culturally appropriate level, and would as a result have been unlikely to attain age at death without some form of care.

There are obvious provisos in inferring care. Health, disease and disability are perceived very differently in different cultures, and caregiving can *only* be inferred with reference to what is known about the contemporary social, cultural, economic and physical environments, and *only* when indicators of a serious challenge to functioning capability are present. Furthermore, everybody experiences disease in their own way - disability for one person may not be a disability (or not the *same* disability) for another. Assumption of the need for care - as well as the conclusion that care was provided - must always err on the side of caution.

Finally, the bioarchaeology of care approach is usually restricted to individual case studies. For a variety of reasons, many experiences of pathology will not manifest in bone and may not be discernible in preserved tissue. This means that in any prehistoric population the full burden of disease and the frequency and features of caregiving response will remain unknown.

1.1.2 *Parameters of thesis research*

Research for this thesis observed certain limitations. The process of developing and refining the bioarchaeology of care approach focused exclusively on skeletal remains, and all iterations of the methodology were tested on a diverse range of curated skeletal materials, of varying states of preservation and completeness, and dating from the Upper Middle Palaeolithic to the early Bronze Age. The principles of bioarchaeology of care analysis are held to be equally applicable to evidence from preserved soft tissue, however, and the justifications for this osteological focus were entirely pragmatic. Chief among these was the pressure to produce a timely dissertation; the fact that the majority of prehistoric human remains are recovered in skeletal form; and the comparative ease and affordability of access to, and macroscopic examination of, skeletal materials.

Selection of the skeletal materials employed in this research was largely opportunistic, based on the existence of published reports of pathologies evidenced in either individual remains or sets of remains; the willingness of museum authorities to grant access; and time and budgetary concerns. These factors resulted in most of the materials used in bioarchaeology of care development coming from western and middle European sites (although one of the most powerful case studies in this thesis is based on an individual recovered in a recent excavation in South-East Asia in which the author was involved). This had distinct benefits, not the least being that the archaeology of these regions is well documented, facilitating contextualisation of analyses. It also allowed first-hand examination of (possible) care practices among *Homo neandertalensis* as well as among *Homo sapiens*; this helped inform thinking on the role of health-related caregiving in evolution, which in turn contributed to the conceptual framework proposed for interpreting agency in care provision.

While in principle the bioarchaeology of care approach is applicable to human remains from any period of the archaeological past (where these meet the evidentiary criteria for receipt of care), in the research for this thesis tests of the methodology were restricted to examples of care provision dating no later than the early to middle Neolithic. What constitutes 'early Neolithic' is a moveable feast, with chronology and characteristics of early Neolithic culture varying considerably across location. To suit thesis requirements 'early Neolithic' was operationally defined as the period around the adoption of agriculture; a time of increasing sedentism, but still characterised by forms of activity and organisation typical of small and technologically unsophisticated groups

(Cohen 1989:16-20), and before the establishment of economically and administratively more sophisticated settlements with larger, concentrated populations.

Although this restriction reduced the number and type of archaeological examples of care available for analysis, it also removed the need to account for the multiple and potentially confounding variables associated with the operation of more complex economies - for example, the influence and responsibilities of institutions in caregiving, the relationship between rank, health status and access to care, and so on. To expand on this, it is assumed that in cases in which health-related caregiving occurred within a small subsistence community of maximally 50 to 100 members the care-recipient would have been known to everyone in the group. It is likely that most group members had some level of involvement - by providing assistance directly, by providing support to those responsible for care or, at a minimum, by not opposing care - thereby making care provision possible, particularly over an extended time. Such a scenario should make it easier to identify the range of opportunities and costs likely involved in care provision. It must be noted, however, that when communities are very small in size this introduces a complication of its own; the likelihood that group members share a single, if extended, family relationship - another factor to be considered. This issue, and all others identified here, are addressed in later chapters of this thesis.

1.1.3 An overview of the bioarchaeology of care methodology

The bioarchaeology of care methodology comprises four sequential stages of analysis, each building on the information, observations and conclusions of the previous one(s), and all originally deriving from a set of remains displaying evidence of survival with, or following, disabling pathology. The ordering of these stages describes a progression from straightforward recording of osteological and archaeological data (Stage 1), through increasing levels of deduction and inference (Stages 2 and 3), to interpretation (Stage 4). The importance of conservatism in inference and interpretation is emphasised throughout, and the structure of the methodology facilitates scrutiny and replication of each step of the analytical process.

The bioarchaeology of care methodology is supported by the 'Index of Care'. This is a non-prescriptive computer application designed to assist in organising and recording evidence, observations and ideas throughout the research process.

Two fundamental principles are embodied in the bioarchaeology of care approach.

Firstly, the set of remains at the centre of the study is viewed as simultaneously representing 'subject' - the person who experienced disability and is an active player in their own care - and 'object' - a collection of bones bearing indicators that reflect survival and that only exist because of the caregiving interventions of others.

Secondly, this 'caregiving' is perceived in terms of actions performed as the result of decisions made by those directly and indirectly involved in providing care. In other words, evidence for healthcare provision is understood as an expression of agency.

The four stages of the bioarchaeology of care methodology are summarised below.

- Stage 1 records the subject's remains (detailing all information relating to the pathology) and describes their mortuary and general lifeways contexts. The information in Stage 1 is the foundation for all subsequent analyses.
- Stage 2 considers the possible clinical and functional impacts of the pathology, to establish whether the individual likely experienced a disability requiring care. Modern clinical sources are used to assess the former; assessment of the latter examines the demands, obstacles and opportunities characterising the lifeways environment, and evaluates the probable effects of clinical symptoms on the individual's ability to perform basic tasks of daily living and/or to participate 'normally' within the group. If there is likely to have been a significant functional impact then disability requiring provision of care - 'direct support' and/or 'accommodation' - is inferred, and bioarchaeology of care analysis is continued. If functional impact is likely to have been minimal, or is impossible to assess, then a bioarchaeology of care analysis cannot be sustained.
- Stage 3 identifies what - in broad terms - healthcare likely comprised, producing a 'model of care' based on health-related requirements associated with the clinical and functional pathology outcomes posited in Stage 2, and on what is possible and probable given what is known of the lifeways context. Construction of this model also considers questions such as duration of care and costs of caregiving (e.g. labour requirements, resources). The fine detail of healthcare will be unattainable, but it should be possible to deduce basic components of this care from conclusions on the likely clinical and functional impacts of disease reached in Stage 2.

- Stage 4 unpacks and interprets the Stage 3 model of care. Continuously referring back to the information and observations of Stages 1, 2 and 3, Stage 4 explores what the constituent parts of the model of care - singly and in combination - suggest about contemporary social practice, social relations and group and individual (care-recipient) identity.

The case study of care can be conceived in terms of a narrative. Stripped to its essence, the case study recounts the history of individuals (the caregivers and the care-recipient) who are engaged in the complicated, inter-related, continuously-refined and negotiated behaviours that go into providing and receiving care, and who operate in a particular lifeways environment over a defined period of time. The 'care narrative' has its central character in the subject who experiences disability. It has a beginning - the point at which the individual requires care and this need is recognised and responded to; a middle - the period during which care is given; and an end - the point at which (for whatever reason, be it recovery, death, or abandonment) care is no longer provided. Robb (2001) suggests that 'drama' may be a useful systematising concept for undertaking archaeological interpretation because 'it incorporates intentionality, emotional engagement and experience, while recognizing the structuring power of context' (Robb 2001:1). In the bioarchaeology of care, 'narrative' fulfils this role.

1.2 Thesis structure and content

Including the Introduction, this thesis contains eleven chapters.

Chapters 2, 3, 4 and 5 provide the background to, detail the reasoning behind, and establish the potential scope and the boundaries of the bioarchaeology of care. Chapter 2 critically reviews past and present treatment of healthcare provision in archaeological research, and discusses possible explanations for the general lack of interest (sometimes hostility) shown towards this topic.

Chapter 3 loosely corresponds to Stages 1, 2 and 3 of the bioarchaeology of care methodology. It defines and operationalises key terms and concepts; reviews obstacles to identifying experience of disability and care in the past; considers likely demand for healthcare in prehistory; proposes certain 'constants' of caregiving practice for use in developing a model of care in individual studies; and clarifies some of the conditions for undertaking bioarchaeology of care analysis.

Chapters 4 and 5 correspond to Stage 4 of the bioarchaeology of care methodology, contributing a theoretical platform for interpreting the behaviours involved in provision *and* receipt of care. Chapter 4 considers the possible biological and/or social evolutionary origins for healthcare behaviours, and how these may relate to questions of motivation. Chapter 5 invokes the archaeologies of agency and identity to propose ways of understanding the decision-making practices and interpersonal relationships that underlie the giving and receiving of health-related care.

Chapters 6 and 7 describe and explain all elements of each stage of the bioarchaeology of care methodology in detail, and introduce the Index of Care; Chapter 6 corresponds to Stages 1, 2 and 3, and Chapter 7 corresponds to Stage 4.

Chapters 8, 9 and 10 present case studies illustrating application of the bioarchaeology of care methodology. Chapter 8 reports the case of a young male from Neolithic Vietnam who survived for around a decade with quadriplegia; Chapter 9 considers what evidence for healthcare practice in the remains of two Neandertals indicates about behavioural complexity in the European Palaeolithic; and Chapter 10 explores the implications of evidence suggesting that care, in the form of 'accommodation', was received by multiple individuals from the same British Early Neolithic community.

Chapter 11, the Conclusion, revisits the aims and claims of the bioarchaeology of care, identifies where this new approach fits in relation to wider archaeological theory and practice, proposes ways for refining the bioarchaeology of care methodology and the Index of Care, and suggests directions for future bioarchaeology of care research.

1.3 Objective vs. subjective: challenges to a bioarchaeology of care

The proposal that care provision, let alone the characteristics of this care, may be identifiable from evidence in the prehistoric record has provoked a negative response from some archaeologists and anthropologists. The main objection - or at least the one most often articulated - is that retrospective analysis of such complex behaviour will invariably result in the researcher ascribing modern (western) understandings of disability and modern (western) values and motivations to the actions and actors of the past. Interpretations may be accurate, or partly accurate, or completely erroneous, but we can never know whether they are right or wrong, because it is impossible to achieve this level of intimacy with past lives and societies when there is nothing to base it on other than human remains and remnants of material culture. It is held that analysis of

care will at best be speculative, and at worst reflect no more than the researcher's own cultural and ideological biases.

It is freely acknowledged that, in modern western culture, the most basic term used in this thesis - 'care' - is value-laden, and in combination with the sensitive (and often disputed) term 'disability' it takes on an even greater ideological signification. This is illustrated in the opening statement of this chapter, which reflects the assumption that caring for someone who is disabled is unquestionably a 'good' thing to do - in fact, something which is integral to our status as human beings. Clearly the reality is often more nuanced than this. For example, sometimes care will unnecessarily prolong a life of pain and misery, or compromise the survival of others, or is bestowed primarily because it benefits the provider rather than the recipient, meaning that in certain instances caregiving (or elements of caregiving) may actually be a 'bad' course of action to take. This and similar concerns are discussed in the following chapters.

But just because a topic is controversial is no reason to avoid it. When Wylie (2002) observes that

[h]owever pervasive and influential the rhetoric of (unmitigated) objectivity may be among professional archaeologists, the practice and products of archaeology ... reflect the standpoint and interests of its makers (Wylie 2002:186)

she is stating the obvious. No archaeologist (and certainly not one who, like the author, is middle-aged, has worked in a diverse range of occupations and has travelled widely) comes to their work with a *tabula rasa*; any pretence that this is possible, or possibly desirable, for someone with the remit of studying past behaviour is to deny 'our essential integrity as social persons living in social worlds' (Shanks and Tilley 1987:65), and ultimately is simply intellectually dishonest.

Regardless of best efforts to control preconceptions and prejudices, all readings of the past will be shaped and constrained by the researcher's experience, ideology, aims and values (Tilley 1998). The best safeguard against misrepresenting the past, and thereby misleading others, is to make these influences explicit (Shanks and Tilley 1987:67).

Kintz (2001:47) goes further, arguing that '[i]dentifying implicit or hidden agendas has become an ethical imperative' in archaeological practice.

For this reason - and because in the following chapter I discuss the possible contribution of ideology and experience to previous rejection of care as a subject for archaeology, and in Chapters 5 and 7 I again raise the issue of subjectivity in interpreting care in

relation to agency and identity - it seems appropriate to give a quick résumé of my own background.

This is done with the caveat that despite the preceding justification the intrusion of personal detail into a dissertation contravenes established custom, and I find it an uncomfortable exercise. Nevertheless, my background *does* help to explain what I bring philosophically and empirically to the study of past health-related care provision from outside the archaeological discipline, as well as why I fall into the camp of those who believe 'caregiving' is generally to be regarded as a 'good' - as a behaviour with intrinsic value. In summary, before and during study in the 1970s for my undergraduate university degree in behavioural and social psychology I worked as a nurse for a total of 18 months to two years, on wards in public and private hospitals and in nursing homes, in areas including those of general nursing, care of the intellectually disabled, rehabilitation and aged care. I did not go on to qualify as a registered nurse, nor did I work as a behavioural psychologist on graduation, but jobs undertaken subsequently included development and management of public health and occupational health and safety policy and programs, and for almost a decade prior to beginning my dissertation my work included advising on, monitoring and disseminating research on aspects of health outcomes assessment and health status measurement. The original idea for, and much of the form and content of, the approach to analysing care presented in this thesis emerge from the knowledge, experiences, observations and impressions acquired over my own life course.

In a partial defence to the challenge paraphrased at the beginning of this section, it is pointed out that the bioarchaeology of care approach is intended as a flexible framework - emphatically *not* a formula - for thinking about the practices and wider implications of a particular past behaviour. It is inevitable that in some cases what emerges from this process will have considerable resonance with issues prominent in modern social and political debate. However, the applied methodology aspires to manage overt and covert effects of researcher bias (to the extent this is ever possible) by building a transparency into each of the four stages of analysis that ensures all steps in reasoning are open to critical examination. The following chapters aim for the same transparency in laying out the logic underpinning the bioarchaeology of care.

CHAPTER 2. The status of archaeological research into care

Over a century and a half of documenting pathology in prehistoric human remains has produced many examples of individuals surviving potentially serious and disabling pathologies for longer than could reasonably have been expected without some sort of intervention. Yet studies directly addressing the issues of how and why these individuals survived, and whether survival may have been contingent on receipt of health-related care, are few and far between. Overall, more energy may have been expended on arguing why it is *not* possible to identify care in the archaeological record than has been spent on considering what any such care may have comprised and what it may reveal about the society providing it.

This chapter looks at what the archaeological literature has to say about prehistoric healthcare provision. The first section reviews studies in which likely provision of care is identified and discusses instances in which care might justifiably have been proposed - but was not. The second section reviews research into specific medical interventions, and considers how such research might align with a research focus on caregiving - again, this has rarely occurred. The third section engages with general and specific criticisms levelled against the archaeological inference of care. The fourth section examines how archaeology has approached health-related caregiving at the level of theory; this section is tightly focused, excluding consideration of healthcare and related theory from disciplines other than archaeology, even where this is potentially relevant to an archaeological understanding of care. The final section briefly considers where archaeology currently stands - and why - on the subject of caregiving in prehistory.

2.1 Identification of health-related caregiving in the archaeological literature.

Reports explicitly considering the possibility of healthcare provision based on archaeological evidence are scarce, but combined they cover a diverse range of health conditions, span a chronology extending from early human evolution to mediaeval times, and come from most parts of the world. Almost all comprise case studies that have as their principal purpose description and diagnosis of one or more pathologies evidenced in an individual set of human remains. In all reports the identification of care is a secondary concern, and in many it presents as little more than an afterthought.

Comments relating to the likelihood of care and the implications of this behaviour are often relegated to a few lines in a concluding paragraph.

Table 2.1 presents a list of archaeological reports which suggest that health-related care was likely provided to one or more individuals in response to a particular pathology. An expanded version of this Table provided in Appendix A provides more detail in relation to likely pathology impact, and reproduces (where feasible in full) authors' comments on the nature of the care inferred. Neither Table 2.1 nor Appendix A includes reports of discrete treatment interventions - such as invasive surgery or fracture reduction - unless these are specifically discussed in terms of caregiving; although direct medical intervention unarguably constitutes 'healthcare provision', archaeological analyses tend to preference issues of procedure and technology and pay little attention to the wider context in which the treatment occurs. Lastly, although this thesis focuses on health-related caregiving in prehistoric communities prior to adoption of complex forms of social organisation, later-period case studies in which care provision is inferred from osteological evidence alone are included in Table 2.1 to allow a comprehensive survey.

It was not easy to find many of the archaeological reports referred to here, and no claims for exhaustive coverage are made. Building a database of case studies of care remains a work in progress. In all but two instances (Bower 1994; Shea 2003) only primary sources are referenced, with reports identified through standard formal and informal means: keyword searches of the archaeological literature on academic and popular search engines; secondary references gleaned from a wide range of (bio)archaeological and palaeopathological sources; requests for information from other (bio)archaeologists; and serendipity. Searches using variations on terms such as 'care', 'healthcare', 'survival' and 'disability' should have been the primary source of material for this review, but most reports noting likelihood of caregiving fail to note this in nominated 'keywords', and in-text use of care-related terms were not always automatically identified. Searches on specific pathologies and/or symptoms and on specific (categories of) treatment (e.g. 'surgery', 'trepanation') were also undertaken, but provided few additional examples. Reports reviewed are overwhelmingly from English language sources; a survey of non-English language literature might be productive.

A point of clarification is necessary. The following discussion omits the paper by Tilley and Oxenham (2011), which analyses care provided to a paralysed individual from

Neolithic Vietnam. This paper was written for the purpose of introducing the bioarchaeology of care approach, and this case study is presented in Chapter 8.

TABLE 2.1 Archaeological reports explicitly identifying likely health-related care provision*

Case No.	PERIOD LOCATION	AUTHOR(S), SUBJECT OF CASE STUDY, AND PATHOLOGY.
1	1.77 million BP <i>Georgia</i>	Lordkipanidze et al., 2005, 2006. <i>Homo erectus</i> / <i>Homo georgicus</i> Dmanisi 3444/3900, adult male, edentulism.
2	1.5-1.7 million BP <i>Kenya</i>	Walker et al. (1982); Walker and Shipman (1996). <i>Homo ergaster</i> KNM-ER 1808, adult female, hypervitaminosis A.
3	530,000 BP <i>Spain</i>	Gracia et al. (2009). Cranium SH14, child, 5-12.5 years, lambdoid single suture craniosynostosis with severe endo- and ecto-cranial deformities.
4	400,000 BP <i>Morocco</i>	Hublin (1985; 2009), Bower (1994). <i>Homo erectus</i> , young adult ?female, cranial distortion, muscular trauma from congenital torticollis.
5	180,000 BP <i>France</i>	Lebel et al. (2001); Lebel and Trinkaus (2002). Neandertal Aubesier 11, older adult ?female, edentulism.
6	150,000 BP <i>Sudan</i>	Spoor et al. (1998). Late archaic hominid/early modern human Singa calvaria (unsexed, no age status), extensive labyrinthine ossification in right temporal region, associated with hereditary anaemia or acquired blood disease.
7	95,000 BP <i>Israel</i>	Shea (2003), Tillier (1995), Tiller et al. (2001). Ancient <i>Homo sapiens</i> <u>Qafzeh 11</u> , adolescent, healed severe head injury; <u>Qafzeh 12</u> , ~3 years, congenital/early acquired hydrocephalous, related post-cranial morbidity.
8	45,000–60,000 BP <i>Iraq</i>	Solecki (1971); Trinkaus 1978; Trinkaus 1983; Trinkaus and Zimmerman (1982). Neandertal <u>Shanidar 1</u> , male, 35-50 years, healed pathologies include severe cranial trauma; right arm paralysis; two fractures of right humerus; amputation of the right humerus at elbow; osteomyelitis of right clavicle; fracture of right foot; severe arthritis of right knee and ankle. <u>Shanidar 3</u> ,

		male, 35-50 years, possibly immobilising degeneration of right foot; survived weeks following penetrating injury to the thorax.
9	40,000 BP <i>Germany</i>	Schultz (2006). Neandertal 1, male, 50+years, severe chronic sinusitis, recovery from meningeal disease, malaligned healed fracture of left elbow, osteoclastic processes in upper and lower limb compact bone.
10	36,000 BP <i>France</i>	Zollikofer et al. (2002). Neandertal St Césaire 1, young adult male, healed severe cranial trauma.
11	26,600 BP <i>Czech Republic</i>	Formicola et al. (2001); Trinkaus et al. (2001). Gravettian DV15, female, 21-25 years, X-linked dominant form of chondrodysplasia calcificans punctata.
12	11,000 BP <i>Italy</i>	Formicola et al. (1990). Arene Candide 2, male, ~25 years, bilateral absence of the lesser trochanters likely resulting from avulsion fractures.
13	11,000 BP <i>Italy</i>	Fruyer et al. (1987, 1988) Mesolithic Romito 2, male ~17 years, chondrodystrophic dwarfism, musculoskeletal restrictions.
14	~6800-4900 BC <i>Russia</i>	Lieverse et al. (2008). Early Neolithic Shamanka 29.1, male, 20-30 years, congenital/long-term paralysis of right arm, hand.
15	7,500 BP <i>USA</i>	Dickel and Doran (1989). 'Windover boy', ~15 years, symptomatic, severe spina bifida aperta, atrophy of upper and lower limbs, infection.
16	7000 BP <i>Portugal</i>	Lubell and Jackes (1985); Lubell et al. (2004). Mesolithic <u>Samouqueira 1</u> , adult male, malaligned, healed compound fracture of right humerus, pathological right third metatarsal. <u>Samouqueira 2</u> trauma-induced arthritis both wrists.
17	5000-4900 BC <i>Germany</i>	Orschiedt et al. (2003). Early Neolithic male, 40-50 years, four healed cranial lesions suggesting minimally two incidents of severe trauma.
18	4900-4700 BC <i>France</i>	Buquet-Marcon et al. (2007). Neolithic older male, healed surgical amputation left forearm, edentulism, arthritis of lower limb and spine.
19	4200-4000 BC <i>Bulgaria</i>	Zäuner et al. (2011). Late Chalcolithic female (No. 105), 60+ years, healed amputation of right hand.

20	4000 BC <i>Italy</i>	Formicola et al. (1987). Early Neolithic Arene Candide 5, male, ~15 years, severe late stage tuberculosis.
21	6000-5500 BP <i>China</i>	Hernandez (2011). Neolithic M53, unsexed, 26-33 years, hypopituitarism.
22	3500 BC <i>England</i>	Galer 2007. Early Neolithic isolated elements (fused first and second cervical vertebrae), adult, survival following displacement injury to axis.
23	4820 BP <i>Southern Africa</i>	Pfeiffer and Crowder (2004). SAM-AP 6060, ~5 months, hypertrophic (hyperplastic) rickets.
24	2125-1880 BC <i>England</i>	Anderson (2002). Bronze Age male (No. 5605), ~45 years, healed fracture right tibial plateau and lateral portion of proximal tibial shaft.
25	3500-3000 BP <i>Japan</i>	Suzuki et al. (1984). Late Jomon Irie 9, unsexed, 17-20 years, poliomyelitis anterior acuta (infantile spinal paralysis).
26	(Late) Holocene <i>Australia</i>	Webb and Thorne (1985); Webb (1995). Pre-contact female, ~20 years, congenital meningocoele with complete perforation of cranial table. Other individuals with disabilities including e.g. amputations, cleft palate.
27	400-600 AD <i>England</i>	Cox (1999). Early Anglo Saxon female 2BA466 (G114), 17-25 years, asymmetrical paralysis following a stroke.
28	550-800AD <i>Sudan</i>	Kilgore and Van Gerven (2010). Mediaeval Nubian male (S-16), 20-25 years, extreme congenital scoliosis.
29	500-1000 AD <i>USA</i>	Phillips and Sivilich (2006). Late Woodland male, 20-30 years, bilateral full cleft of the hard palate.
30	800-1100 AD <i>USA.</i>	Lovejoy and Heiple (1981). Analysis of successful healing of long bone fractures in a Late Woodland population.
31	1030-370 BP <i>Argentina</i>	Luna et al. (2008). Burial 12, male, 40-50 years, late-stage metastasis secondary to unknown cancer (likely lung, kidney, thyroid or bowel).
32	1200-1400 AD <i>USA.</i>	Mann et al. (1998). Moundville female, 20-30 years, extreme congenital malformation of right arm.

33	1200-1468 AD <i>England</i>	Stirland 1997. Mediaeval cemetery, mature adult male <u>No.439</u> , juvenile-onset polyepiphyseal disease. Adult male <u>No. 235</u> , severe neuromuscular disorder (congenital or acquired) resulting in paraplegia.
34	1300-1500 AD <i>USA</i>	DiGangi et al. (2010). Mississippian Burial 50, female, 29-51 years, cartilaginous dysplasia resulting in significant length differences between right and left humeri and femora.
35	1550-1672 AD <i>USA</i>	Hawkey (1998). Gran Quivira 391, male, ~40 years, systemic juvenile chronic arthritis.

* Dates reflect original dating protocols. Studies are ordered on the basis of earliest to most recent

Although the reports listed in Table 2.1 differ in content, overall they are very similar in approach to, and scope of, analysis and interpretation of care. In all studies, inference of caregiving is based on osteological evidence suggesting survival with, or following, serious disease or injury. All but two reports address evidence of pathology in identified individuals (usually one, but occasionally more - for example see Cases 8, 16 and 33); the exceptions are Lovejoy and Heiple (1981, Case 30) with a community-level analysis of care in relation to long-bone fracture, and Webb (1995, Case 26), who list multiple examples in proposing caregiving as a cultural feature of (unspecified) pre-contact Australian Aboriginal groups. Despite the critique that follows, it is emphasised that all the reports identified in Table 2.1 have the potential to enrich our understanding of past behaviour, and from a bioarchaeology of care perspective are valued accordingly.

In most reports, description and diagnosis of the central pathology (and to a lesser extent documentation of typical clinical symptoms) are detailed and of high quality, but focus is on the disease rather than on any care-related behaviours that the experience of disease might elicit. A typical report moves from lengthy discussion of pathology to an unelaborated assertion of 'care'; in few instances do authors go beyond broad generalisations to talk about the likely effects of disease, or effects of changes in disease state over time, to the individual's functioning capability within their lifeways environment, or to consider what the 'likely care' identified may have actually comprised (exceptions include Cases 8 [specifically Solecki, 1971], 28 and 35).

Even less frequently are the actions of caregiving analysed in terms of broader contemporary practice. While in-principle comments on the potential for care provision

to shed light on lifeways features are common, illumination most often consists of a short statement to the effect that care of a disabled individual reveals an environment of social tolerance and inclusion, or an observation about community economic capacity to bear the cost of an unproductive member, but offers no further insight (for example see Cases 1, 5, 15, 18, 20, 29 and 32).

There is only minimal cross-referencing - and usually none at all - between studies in which likely caregiving is identified (cross-referencing appears slightly more common in recent studies - e.g. Hernandez 2011, Case 21; Zäuner et al. 2011, Case 19). Possibly this absence of cross-referencing is justified by the singularity of each case of care, although when cases share aspects of pathology, disability impact and/or lifeways context, some comparison of the features of the care response might prove rewarding. The scarcity of reports in the 'care' category and the difficulty in finding these may be sufficient explanation for failure in this area, but this failure more likely reflects the low priority given to health-related care as a research focus.

Only three authors, Formicola (Cases 11, 12 and 20), Frayer (Cases 12 and 13) and Trinkaus (Cases 5, 8 and 11), identify the likelihood of healthcare provision in more than one report (problems with identifying reports mentioning care may mean this is an underestimate). While it is conceivable other authors fail to encounter more than one case of likely caregiving in their palaeopathology research, this is unlikely given plentiful evidence of serious disease in the past (likely levels of prehistoric demand for healthcare are addressed in Chapter 3). Again, this circumstance most probably illustrates the lack of importance placed on caregiving as a topic of archaeological interest.

From a different perspective, in most case studies addressing care the once-living subject of research remains anonymous, identified only in terms of age and sex. While it is impossible to 'know' an archaeologically-recovered individual in the same way we 'know' members of our own social group, extrapolation from the osteobiographical work of writers such as Robb (2002), Sofaer (2006) and, most recently, Martin and Potts (2012) suggests that evidence of severe pathology, considered in the lifeways context, provides scope to investigate aspects of the individual's personal experience of disease and of their social identity in the role of 'care' recipient'. A few reports comment briefly on aspects of social status suggested by healthcare provision and/or mortuary treatment (e.g. Cases 18, 24, 28 and 34), and one comments on an aspect of personality, noting that a woman's survival to adulthood despite a congenital malformation reflects her

'ability to adapt to ... handicap' (Mann et al. 1998:296, Case 32), but the potential for seeking the individual through evidence for disability *and* care has not yet been thoroughly explored.

There are some notable exceptions to the very general observations made above. For example, Hawkey's (1998, Case 35) article, describing the progressive impact of juvenile-onset chronic arthritis, combines skeletal evidence of pathology with musculoskeletal stress marker data to produce a detailed, holistic analysis of pathology impact that is informed by modern clinical experience and that very clearly establishes the stages of Gran Quivira 391's disablement and corresponding levels of dependence on others. While unequivocally concluding that care was essential for Gran Quivira 391's survival, Hawkey (1998) unfortunately gives only superficial consideration to what care likely consisted of, and what this care might suggest about the society providing it. The only specific assistance mentioned is food provision, yet Gran Quivira 391's severely restricted mobility must minimally have required a range of basic services (such as toileting and other hygiene maintenance), and both type and intensity of care must have evolved to match the increasing demands of the disease process that Hawkey (1998) so meticulously documents. Hawkey's (1998) elegant, rigorous and systematic account of the encroachment of disease provides a model for identifying disability from skeletal evidence. While perhaps Gran Quivira 391's disease lends itself to this form of longitudinal analysis more readily than most, the broader principles espoused are applicable across a much wider range of pathologies.

Fruyer et al.'s (1987, 1988 Case 13) study is valuable for the manner in which likely clinical manifestations of pathology are used to drive a socially and economically-contextualised analysis of the impact of Romito 2's condition - which was activity-limiting but not completely disabling - on his ability to function in the mountainous Mesolithic Calabrian environment. The authors also consider the implications of Romito 2's survival, in terms not only of (largely unspecified) care provided, but of possible insights into wider Upper Palaeolithic society; while this discussion lacks detail, it is a promising beginning. (It is interesting that Fruyer, the lead author on both publications claiming caregiving for Romito 2 [Fruyer et al. 1987, 1988], more recently retreated from this conclusion in an interview given to a journalist writing a 'popular science' article, on the basis that 'because apes and monkeys show so many skeletal signs of surviving major illnesses and injuries ... "[I may] have been guilty of jumping to conclusions"' (Bower 2002:330). Alternatively, Fruyer may have been influenced by

the vocal opposition to the archaeological inference of caregiving - a phenomenon discussed at some length later in this chapter.)

In Case 11, Formicola et al. (2001) and Trinkaus et al. (2001) present a comprehensive account of DV15's likely experience of disease and disability (spanning infancy to adulthood) that is firmly located in the Gravettian socioeconomic and physical environment. Although offering no detail of likely care provided, Formicola et al. (2001) observe that successful caring for DV15 was dependent on pre-existing therapeutic knowledge - a potential insight into early Upper Palaeolithic lifeways they do not pursue. Trinkaus et al. (2001) ingeniously use skeletal evidence for DV15's post-childhood participation in lifeways activities (despite likely physical limitations) to test hypotheses of Upper Palaeolithic imperatives relating to mobility and burden-carrying behaviours - as a by-product of this illustrating how a focus on the individual receiving care can contribute to knowledge of contemporary lifeways.

Solecki's (1971, Case 8) discussion of the sociocultural significance of the long-term survival of the severely disabled Neandertal Shanidar 1, and to a lesser extent of the short-term survival of the injured Shanidar 3, also stands out (Solecki's observations are among the few summarised in Appendix A rather than reproduced). Solecki (1971), one of the first archaeologists to explicitly infer provision of care from skeletal evidence, is still one of very few to have seriously considered the wider ramifications of this conclusion. In three different sections of the Shanidar excavation report Solecki (1971: 195-196, 258, 268) considers Shanidar 1's disability in relation to type and level of participation in normal lifeways activities; the likely social and economic consequences of providing care within the contemporary environment; and the significance of both for achieving a more nuanced understanding of Neandertal cultural practice.

Even in the studies highlighted above, however, there is only partial consideration of the implications of care. Health-related care provision is yet to be treated as the primary focus of analysis in its own right.

2.1.1 Failure to infer care despite evidence of likely disability

Not only is identification of health-related caregiving rare in the archaeological literature, but it can also appear arbitrary. The reports listed in Table 2.1 represent a miniscule proportion of the thousands that document human remains displaying

evidence of living with severe and likely disabling pathology - an observation borne out by reference to cases explored in general texts such as those by Aufderheide and Rodriguez-Martin (1998), Barnes (1994), Brothwell and Sandison 1972, Ortner (2003), Roberts and Manchester (2005) and Zimmerman and Kelly (1982), as well as cases covered in innumerable articles in journals such as the *International Journal of Osteoarchaeology*, and the *American Journal of Physical Anthropology*, very few of which explore the impact of disease on individual functioning capability, and even fewer the possible part played by care in enabling survival.

Failure to consider how people survived with disability is particularly puzzling when authors reference a report of a similar pathology in which possible caregiving has been identified, yet ignore the implications of this for their own analysis. Canci et al. (1996) provide an apposite example. In 1987, Formicola et al. (Case 20) described advanced tuberculosis in an adolescent Neolithic male from northern Italy, concluding that his survival to around 15 years was predicated on receipt of care. In 1996, Canci et al. describe an almost identical case - evidence of advanced tuberculosis in the remains of a woman of around 30 years, dating to the same period and from the same geographic region. Despite referencing Formicola et al.'s (1987) study in pointing out cultural and economic similarities of the communities to which these two individuals belonged, as well as noting likely similarities in disease symptoms, Canci et al. (1996) do not acknowledge the care-related implications of their subject's survival.

It is also difficult to explain instances where researchers who identify caregiving in some studies fail to mention possible care provision in others where the evidence appears equally compelling. Trinkaus, for example, has authored a number of reports suggesting that healthcare prolonged survival for certain disabled individuals (see Cases 5, 8 and 11). Yet the potential role of care is overlooked in reporting on other remains displaying evidence suggestive of survival with disabling pathology. The Neandertal La Ferrassie 1's remains display evidence of healed skeletal trauma and (unrelated) acquired systemic disease (Trinkaus 1985; Fennell and Trinkaus 1997), and the remains of the Neandertal La Chapelle-aux-Saints 1 display evidence of severe pathology of the spine and left hip joint (Dawson and Trinkaus 1997; Trinkaus 1985). Both individuals almost certainly experienced periods of significantly reduced mobility, during which survival depended on timely group support. Yet the likelihood of care is not discussed in Trinkaus' reports detailing their respective morphology and pathology, despite arguments for care provision in both cases appearing more robust than those made by

Trinkaus in relation to the Neandertal Aubesier 11 (Lebel et al. 2001; Lebel and Trinkaus 2002 - Case 5), which have, in fact, been challenged (DeGusta 2002, 2003). In a much later 'popular' article on Neandertal activity, stress and survival, Trinkaus (2007:135) *does* name La Chapelle-aux-Saints 1 as one of three individuals likely receiving healthcare at some stage, but discussion of the Neandertal's pathology and its implications is limited to a paragraph. (La Ferrassie 1 and La Chapelle-aux-Saints 1 are the subjects of the case study presented in Chapter 9.)

Further to this, in two papers on Neandertal morbidity and mortality published in 1995 (Trinkaus 1995; Berger and Trinkaus 1995), as well as in his latest article on Neandertal mortality patterns (Trinkaus 2011a), Trinkaus substantially qualifies his previous observations of social support among Neandertals. He suggests that the dearth of recovered older adult remains and of remains with signs of disabling lower limb pathology reflects a practice of abandoning individuals no longer able to keep up:

although many have argued that the Neandertals took care of their elderly and seriously injured ... we would argue ... that these hominids did not sacrifice the survival of the social group as a whole when it was threatened by an immobile individual (Berger and Trinkaus 1995:849).

Significantly, Trinkaus is not cited amongst those 'many' making the argument for Neandertal caregiving behaviours, although he could justly be regarded as in the forefront of this company (Trinkaus 1978; Trinkaus and Zimmerman 1982). Reviewing relatively high levels of Neandertal morbidity as early as 1978, he had suggested

[t]he presence of so many injuries in a prehistoric human group, many of which were debilitating and sustained years before death, shows that individuals were taken care of long after their economic usefulness to the social group had ceased. It is perhaps no accident that among the Neanderthals, for the first time in human history, people lived to a comparatively old age (Trinkaus 1978:145).

While the 1995 articles (Trinkaus 1995; Berger and Trinkaus 1995) do not explicitly deny Neandertal caregiving, they *do* dilute Trinkaus' earlier level of commitment to this concept. How is such a reversal of opinion explained? Presumably, once the hypothesis of abandoning the elderly and immobile had been advanced, observations of caregiving were perceived as undermining this. What is not clear is *why* the hypothesis of abandonment was proposed in the first place. The validity of such a sweeping conclusion from demographic analyses based on 206 individuals, mostly represented by

very fragmentary remains from 77 sites and spanning 65 millennia, is difficult to defend, as Trinkaus (1995:136-137) himself acknowledges. The motivation for giving the behaviour of 'abandonment' prominence over the behaviour of 'caregiving' in explaining aspects of Neandertal lifeways in 1995 may reflect modern rather than prehistoric factors - an issue returned to in this chapter.

2.2 Treatments and technologies

Interventions such as surgery, reduction and stabilisation of limb fracture, pharmacology and dentistry are important elements in the repertoire of responses to health challenges, and practices in these areas potentially offer information not only about contemporary medical knowledge, technical expertise and available medical technologies, but also about the sociocultural environment within which health and disease are constituted and treatment occurs.

As noted earlier, evidence for 'discrete' interventions is rarely examined from the perspective of caregiving, and yet the very existence of such treatment strategies surely reflects a level of priority afforded to health-related care by prehistoric communities which, when closely examined, should increase our appreciation of the past. This section briefly reviews archaeological research into medical interventions, with a focus on the implications of this research for addressing broader issues of caregiving behaviour.

Only a very small proportion of treatments will ever be accessible from the archaeological record, although ethnography suggests that in most pre-industrial cultures existence of specific remedies for a range of different pathologies is standard (e.g. chapters in Ingstad and White 1995; chapters in Whitaker 2006; Winkelman 2009). There is a rich literature on theory and practice of medicine dating to early historic times, and some of the earliest extant sources incorporate detailed reference to aspects of disease, diagnosis and treatment. These include Mesopotamian cuneiform tablets, which offer, among other medical texts, the remnants of a diagnostic and prognostic handbook (Scurlock 2005); the Egyptian medical papyri (5000 - 3,500 BP) (Nunn 1996); and the Indian Rigveda and Arthavaveda (conservatively ~3500 BP and 3000BP respectively) (Wujastyk 2003). That many of the earliest preserved texts contain reference to medicine systems clearly already well-established, suggests that they are

documenting practices originating considerably before the invention of writing - a fertile proposition for further consideration, but beyond the scope of this thesis.

2.2.1 Surgery

Prehistoric surgery for which there is direct skeletal evidence includes trepanation (trephination), dating back to 12,000 BP (Dastugue 1959; Lillie 2003), and surgical amputation, the earliest example of which may date to the middle Upper Palaeolithic (Trinkaus and Zimmerman 1982), but more certainly to the European early Neolithic (Buquet-Marcon et al. 2007; Zäuner et al. 2011), Old Kingdom Egypt (Dupras et al. 2010), Pre-Columbian America (Friedmann 1972; Padula and Friedmann 1987; Verano et al 2000), and pre-contact Australia (Webb 1995:212-214). Early beginnings for invasive dentistry are suggested by evidence for tooth-drilling in association with dental disease found in Megalithic Pakistan (Coppa et al. 2006), Neolithic Europe (Bennike 1985, cited White et al. 1997:413), the Pre-Columbian American southwest (White et al. 1997) and pre-contact Alaska (Schwartz et al. 1995).

Trepanation is by far the most commonly observed prehistoric procedure, evidenced in Europe, the Middle East, Africa, most of Asia, the South Pacific, Australia and (in great quantities) the Americas (Arnott et al. (Eds.) 2003; Crubézy et al. 2001; Erdal and Erdal 2011; Martin 2011; McCurdy 1923; Sankhyan and Weber 2001; Webb 1988). In some cultures it may have been a relatively popular procedure, with evidence for trepanation found in up to 2 to 8 per cent of crania recovered from some regions of Neolithic Europe (e.g. Piggott 1940; Piek et al. 1999; Robb 2002), and very large numbers of trepanned crania reported across South American Pre-Columbian sites (McCurdy 1923; Verano 2003). There is an extensive body of archaeological literature on trepanation, but this concentrates on aspects such as location of surgery, detail of wound(s), technique employed, and survival outcomes and, with few exceptions, fails to engage with the broader sociocultural aspects of this medical procedure.

The general consensus is that most (but not all) trepanations were probably performed with therapeutic intent in response to biomedical conditions. Although Verano (2003:232-234) notes that evidence for cranial injury may be removed by trepanation, Andrushko and Verano (2008) report that 80 per cent of trepanations in their Pre-Columbian sample are associated with cranial trauma; while this is at the upper end of estimates, many texts identify trauma as the principle motive for surgery (Arnott et al.

(Eds.) 2003; Erdal and Erdal 2011; McCurdy 1923). Ethnomedical research suggests that other conditions likely treated by trepanation include neurological disorders, migraine, epilepsy and 'mental illness' (Gross 2003). Practice of trepanation was not necessarily consistent across neighbouring cultures or, over time, within the same culture (Brothwell 2003; Crubézy et al. 2001). The geographic isolation of some populations practising trepanation suggests this surgery developed independently in very different societies, raising interesting - although unaddressed - questions about consistency in cross-cultural and cross-temporal perceptions of, and responses to, disease. (Chapter 3 considers this general issue in more detail.)

Trepanation involves removing a portion of the skull of a living individual. It is a procedure demanding caution, speed and precision to avoid damaging underlying soft tissue and/or introducing infection; it requires control of the sometimes significant blood loss associated with scalp injuries; and it leaves an open wound that must be protected from infection and trauma until the scalp regenerates (Capasso et al. 2002; Ortner 2003:169-174; Weber and Wahl 2006). Scalp and periosteal incisions are very painful when performed without anaesthetic (although cutting through the bone itself is relatively painless), leading some researchers to suggest that analgesics may have been used (Weber and Wahl 2006) and raising the question of how patients may have managed where these were not available. Based on osteological indicators of post-operative healing, studies consistently report trepanation survival rates of between 50 - 90 per cent (e.g. Andrushko and Verano 2008; Roberts and McKinley 2003; Stone and Miles 1990). Many crania exhibit indicators of survival of two or more trepanations, usually undertaken at different times (e.g. Gross 2003; McCurdy 1926; Verano 2003).

Sophisticated anatomical, surgical and nursing knowledge and skills were essential to achieving this level of success. Although this has been recognised by some authors (McCurdy 1923; Powers 2005; Roberts and McKinley 2003; Weber and Wahl 2006), there has been little consideration of what this might suggest about the lifeways in which such knowledge and skills were developed and refined, and in which this intrusive, and potentially lethal, surgery was found acceptable. Dastugue (1980) relates how evidence for trepanation in Mesolithic Taforalt led him

to consider the mental development and the social behaviour of that poor population of snail eaters. Achievement of such a technique involves skilled hands, and observing and reasoning gifts that are generally considered as the essential part of the "scientific genius". Besides, performing such an operation

requires between patient and operator, the existence of bonds of mutual trust indicating an already elaborate social organization (Dastugue 1980:4)

but unfortunately takes his musing no further. Andrushko and Verano (2008) suggest increasing survival rates over time in their Peruvian sample may reflect ‘improvements in trepanation technique through experimentation and practical experience’ (Andrushko and Verano 2008:4), although offer no ideas about social systems or structures that might have supported such learning. Robb (2002) speculates that trepanation in Neolithic Italy ‘would have been a social event, possibly a public one, rather than merely a medical intervention, and may have entailed specific social relationships between trepanner and trepannee’ (Robb 2002:165), but provides no additional discussion to enhance this reading.

Evidence of trepanation reflects community social and economic investment in the health of its members and - as Dastugue (1980) notes - bonds of trust between all involved. Consideration of what this investment and trust might signify can only add to an appreciation of corresponding community values and behaviours more generally.

2.2.2 Medical technologies and medicines

Technologies such as splints, casts, bandages and ties used in tractioning or setting broken bone, and crutches to assist mobility, are typically constructed from perishable materials, and although examples from prehistory are only occasionally preserved there can be little doubt that such aids were used (Kirkup 2006; Majno 1991; Martin and Horowitz 2003; Moodie 1923; Thorwald 1963). Evidence of reduction and healing of complex limb fractures supports the use of the former (e.g. Lovejoy and Heiple 1981; Redfern 2010; Wentz 2011), and osseous changes in the shoulder girdle combined with lower limb indicators may suggest use of latter. Although osteological evidence for the use of crutches has only been reported in historic and protohistoric remains (e.g. Darton 2010; Knüsel 1999), the earliest depiction of the use of crutches comes from Egypt and dates to around 2,500 BC (Loebl and Nunn 1997). In Egypt again, remnants of casts and splints have been preserved in direct association with skeletal elements and date to around 2,500 BC (Moodie 1923:440), and although these come from a more socially complex period than that dealt with in this thesis, they suggest a longstanding tradition of orthopaedic treatment.

Sophisticated prostheses from proto-historic times have been recovered (Finch 2011; Thurston 2007), among them a prosthetic eye found *in situ* in the remains of a young woman from Burnt City, Iran, dating to around 4800 BP (Sajjadi 2007). Material examples such as this, combined with depictions of prostheses from early historic cultures (Kirkup 2005; Thurston 2007), may also indicate a long timeline for this technological (and sometimes aesthetic) response to disability. While it is difficult to assert that artefacts from early prehistoric contexts were specific to medicine (blades employed in surgery, for example, may have had multiple uses), dedicated medical instruments from late prehistoric and early historic periods have been confidently identified (Hsu 2002; Kirkup 2005; Majno 1991). Ethnographic research suggests that from the earliest times a range of tools (special purpose or otherwise) would have been employed in treating various conditions, and appropriate instruments would obviously have been essential for surgical and dental procedures (Kirkup 2005).

Pharmaceuticals are an important component of medical care, and use of plant, animal and/or mineral remedies in disease-management is found in all documented pre-industrial cultures (Forrest 1982; Halberstein 2005; Winkelman 1995). Common-sense suggests that most prehistoric communities had their own pharmacopoeia (Guerra Doce 2006; Guerra Doce and López Sáez 2006; Halberstein 2005), and it has been hypothesised that flower pollens from plants with known medicinal applications found in the Shanidar 4 burial may indicate herbal remedies employed as early as the middle Upper Palaeolithic (Leroi-Gourhan 1975; Lietava 1992). However, recovery of direct evidence for ingestion or application of medicines from the archaeological record is problematic, given issues of poor preservation and constraints on proving specifically pharmacological (as opposed to e.g. culinary) use (Hsu 2002). As a consequence, most of the evidence presented for pharmaceutical treatment in prehistory is circumstantial, relying on presence of residues in archaeologically-recovered containers, site proximity to plants known to have medicinal and/or psychotropic properties, and, most commonly, the historically or ethnographically recorded medicinal use of plants or other materials available in the local geographic area (Guerra Doce and López Sáez 2006; Martin and Horowitz 2003; Torres 1995).

Objections are obvious; presence and proximity alone prove nothing, and assumptions that substances with potentially medical properties were put to medical use (as we would define this) demand qualification. For example, cannabis was present in China 7000 years ago, and opium cultivated in Mesopotamia around 5500 years ago

(Adamson 1991; Lee et al. 2007). In Europe, evidence of plants with psychoactive properties (including cannabis and the opium poppy) dates to 5000-6000BP (Guerra Doce 2006; Guerra Doce and López Sáez 2006). In Pre-Columbian America and the Caribbean there is evidence of a long tradition of psychoactive substance use (Torres 1995; Winkelman 1995). Were these drugs used medicinally (including in shamanism) to treat diseases such as stress, mental disorders, pain, loss of appetite; were they used in religious ceremonies to induce trances or visions; or were they used recreationally? In some cultures there may have been no distinction between these applications; in others, the purpose for which the drug was used, and the status of those taking it, may have been restricted (Guerra Doce and López Sáez 2006; Halberstein 2005; Hsu 2002; Winkelman 1995, 2002).

There are some cases in which plant material with medicinal properties has been preserved in direct association with the remains of individuals shown to have been suffering a disease potentially responsive to such an agent, and these support the contention of the early use of pharmaceuticals in medical treatment. For example, charcoal, still a common remedy for intestinal problems, was found in the colon of the Italian Copper Age middle-aged male, Ötzi, whose mummified remains also contain evidence of intestinal parasites. Ötzi was also carrying bracken fungus, a traditional treatment for abdominal distress known to have purgative and antibiotic properties (Capasso 1998). Wentz's (2012) research at the 8000 year old Windover site (USA) recovered remains of a number of plants with known medicinal properties from the abdominal regions of individuals displaying skeletal indicators of different, likely painful and in some cases possibly disabling pathologies.

Neither medical technologies nor pharmaceuticals lend themselves to analysing the sociocultural implications of healthcare to the same extent as 'invasive treatments' (although Wentz [2012] might differ on this point), but nevertheless have potential to help us reflect on the individual and the culture to which they correspond. For example, what might the fact that a young woman once endured a prosthetic eye wired into her left orbit, despite osteological evidence of severe irritation and infection (Sajjadi 2007), suggest about her status and character? What does the 'designer' eyeball, complete with pupil and gold capillaries, not to mention the skill involved in fixing it into place, suggest about craft practice and its relationship to medical procedure, or about prevailing social values? Questions such as these have yet to be explored.

2.3 Challenges to the inference of care.

Archaeological research into health-related care provision has met resistance - or at least reservations - from some quarters. Challenges to the inference of care fall into two main categories: general or specific warnings against exaggerating the likely need for, and role of, care in surviving pathology; and objections to inference of human caregiving, particularly in response to certain pathologies, based on non-human primate comparison. Examples in each category are considered below.

Dettwyler (1991), the most influential critic of archaeological research into care, inhabits a category of her own - that of an all-encompassing repudiation of archaeology's capacity to assess individual disability, to infer care provision, or - if the probability of care is too strong to be denied - to identify the motivation underlying it. Because Section 2.3.3 examines Dettwyler's (1991) arguments in detail, her views are not referred to in any detail in the discussion preceding this.

2.3.1 *Dangers of exaggerating the role of care*

This particular 'challenge' to the archaeological inference of care is, in most instances, more accurately described in terms of 'a caution'. In the clinical context it is well established that people with the same disease may suffer different symptoms, encounter different complications, possess different abilities to cope with both of these, and have correspondingly different health-related needs (Bowling 2002; Jylhä 2009).

Reconstructing the sum total of individual disease experience from osteological evidence alone is impossible, and palaeopathologists consistently warn against attempting such an exercise (Ortner 2009; Roberts 1999, 2000; Waldron 2009). However, the key words here are 'sum total'; very few archaeologists deny the possibility of identifying *some* level of pathology impact - the question is at what point the evidence is sufficient to support a judgement that care was required.

Keenleyside (2003) uses a report on an unreduced traumatic dislocation of the mandible in an older Alaskan Eskimo male (AD 1400-1850) to articulate her concern that archaeological analysis of disease has the potential to exaggerate the amount of care needed to enable survival. She describes skeletal changes and likely functional impacts (minimally difficulty in chewing and swallowing) resulting from this man's injury; while Keenleyside (2003) does not deny that he likely received care following trauma, at issue is whether he *continued* to require and receive support. She concludes that

while he may have received some assistance in procuring and eating food, particularly during the first few weeks after his injury, it is also possible that over time, he adapted very well to his injury and was able to function with little or no assistance from other members of his group. The fact that this individual survived to an advanced age in the harsh environment of the Arctic is a testament to the body's remarkable ability to compensate for and survive with physical disabilities (Keenleyside 2003:387).

Keenleyside (2003) is not challenging the inference of care provision in principle, but emphasising the importance of not underestimating human resilience in coping with disease. Indeed, in her discussion she makes a point of referring to ethnohistoric descriptions of Alaskan lifeways documenting 'considerable care and respect' (2003:387) given to disabled and elderly group members, and a culture of 'remarkable self-sacrifice and patience in caring for a crippled member of the family' (Howe 1909:453, cited Keenleyside 2003:387).

Some archaeologists have directly challenged the presumption of disability (and consequently of any receipt of care) in specific case studies, and examples of this include DeGusta (2002, 2003), Tappen (1985), Roberts (2000) and Dettwyler (1991). The articles by DeGusta (2002; 2003) and Tappen (1985) are particularly interesting, because although the arguments presented differ significantly in quality, the primary agenda behind the challenge in each case appears quite similar - and has little to do with caregiving *per se*.

Tappen (1985) challenges the assertion that the Neandertal La Chapelle aux Saints 1 was missing so many teeth prior to death he would have been unable to masticate efficiently and therefore relied on group members for obtaining pre-processed foods necessary for survival. The only reference he cites as claiming care (on the basis of edentulism) for La Chapelle aux Saints 1 is an introductory anthropology text by Jolly and Plog (1982:266), who devote just over 50 words to considering the implications of La Chapelle aux Saints 1's missing teeth. Tappen (1985) uses their words as the basis for an eight page article urging against accepting Neandertals as being 'directly ancestral to anatomically modern humans' (Tappen 1985:50).

DeGusta (2002, 2003) similarly disputes claims by Lebel et al. (2001) and Lebel and Trinkaus (2002) that the Neandertal Aubesier 11 suffered a mandibular pathology which rendered 'mastication painful and mechanically ineffective' (Lebel et al. 2001:11100, Case 5) and left her dependent on preferential allocation of soft foods or provision of

pre-masticated foods. He argues that non-human primate data indicate unaided primate survival with similar or greater tooth loss (see discussion in the following section); that there is no valid basis for extrapolating functional edentulism from tooth loss in Aubesier 11's preserved incomplete mandible to the remaining dental array; and that there is no reason why Aubesier 11 could not have independently procured and processed her own food (DeGusta 2002, 2003).

Like Tappen (1985), DeGusta is explicit in his opposition to general 'ongoing efforts to "humanize" Neandertals and their kin by attributing to them behaviours such as conspecific care' (DeGusta 2002:1437), and this may explain his scathing observations that, in inferring care provision to Aubesier 11, Lebel et al. (2001) and Lebel and Trinkaus (2002) have misrepresented non-human primate tooth loss data, thereby 'artificially minimizing the amount of tooth loss seen in wild apes' (DeGusta 2003:93), and have omitted 'published data and interpretations that challenge their claims' (DeGusta 2003:94). Given the paucity of osteological evidence available, DeGusta (2002, 2003) has a more reasonable case than Tappen (1985) for questioning assertions of care and associated social support mechanisms in the case of the particular Neandertal individual in contention.

The importance of extreme conservatism in identifying health-related care in the archaeological context is axiomatic. Where practicable, people *do* adapt to constraints imposed by pathology and remain participating members of their community to the extent possible, sometimes showing great ingenuity in achieving this. Disease is rarely static - people recover, they learn to live with disease or they succumb to it; health improves, stabilises or deteriorates, and the type and duration of care required to meet physical, social and psychological needs vary accordingly.

However, even where osteological evidence suggests care was likely required only on a limited basis, or for a limited period, this nevertheless constitutes grounds for the inference of health-related care. Failure to acknowledge the likelihood of care is ultimately as egregious an error as exaggerating its practice, because both misrepresent the past.

2.3.2 *Non-human primate comparison: the case against inference of care*

Some writers suggest that care cannot be inferred in relation to human survival of pathology when non-human primate survival of equivalent pathologies - presumably without the benefit of healthcare intervention - can be demonstrated:

even the most serious illnesses and injuries can sometimes be survived by wild primates. The occasional survival of similarly serious diseases by Pleistocene hominids cannot therefore be taken as evidence for conspecific care (DeGusta 2002:1437).

Schultz (1939) reviews evidence of developmental and acquired pathologies experienced by human and non-human primates. In relation to traumatic injury, he notes that among non-human primates 'not many fractures can end fatally and that they do not, as a rule, incapacitate the apes sufficiently to lead to death by starvation or through capture by their many enemies' (1939:579), concluding that evidence of well-healed fractures in human remains does not automatically reflect receipt of care. Fifty years later, Lovell (1991) repeats this warning: 'it may be premature to evaluate the health effects of cultural and technological changes throughout prehistory without reference to baseline data obtained from nonhuman primates' (Lovell 1991:149).

Observing there are 'no documented cases of the provisioning of injured or ill animals by conspecifics' other than maternal care for disabled infants, she suggests that evidence for non-human primates' ability to survive serious injury unaided undermines arguments of 'medical knowledge and social support for injured or ill group members' in human populations (Lovell 1991:149).

Cuozzo and Sauter (2004) and Millette, Sauter and Cuozzo (2009) present related studies designed to refute proposals that edentulate hominids relied on conspecific assistance to acquire nutrition. Both compare rates of tooth loss in late archaic *Homo* with those of non-human primates, concluding that these are essentially similar. They observe that ringtail lemurs can survive considerable tooth loss, and that health is associated with resource availability rather than dental status. Lemur survival despite missing teeth suggests they are processing food even 'without the aid of stone tools available to archaic humans' (Cuozzo and Sauter 2004:628). Millette et al. (2009) report coping strategies for tooth loss comprising extensive 'gumming', extended foraging, and coprophagy. They propose these as 'alternatives to conspecific care-based models for the extended survival of fossil hominins with extensive tooth loss'

(Millette et al. 2009:312), but do not explain how this might realistically work given the very different lifeways of both parties.

Both studies conclude that the survival of non-human primates with tooth loss is not unusual. Cuzzo and Sauter (2004:630) go further: '[o]ur data ... call into question the validity of inferring conspecific care in fossil hominids based on the presence of even severe antemortem tooth loss in hominid specimens'. However, it may rather be the validity of these studies' conclusions that requires interrogation. Of Millette et al.'s (2009) sample of eight lemurs with tooth loss, one had tooth loss of 44 per cent, one of 22 per cent and the remaining six of between 3 to 19 per cent, making highly suspect comparisons between these particular primates and those hominids suffering extreme or complete edentulism for whom care is inferred (e.g. Lordkipanidze et al., 2005, 2006; Lebel et al. 2001; Lebel and Trinkaus 2002).

More recently, Turner (2011) reports on research in the Awajishima Monkey Centre (AMC) examining high rates of survival and associated adaptation strategies of Japanese macaques with (sometimes severe) congenital limb malformations. Turner (2011) finds little evidence for conspecific care, and notes that although not all monkeys surviving with these malformations in the environment of the Centre would probably survive in the wild, 'I think that many of them would survive, and survive better than would usually be assumed' (Turner 2011:6). While not denying the possibility of healthcare practice among early humans, she implies that claims for care may be overblown: 'the potential abilities of disabled ... ancestral hominids [to survive without care] should not be underestimated' (Turner 2011:6). Again, however, Turner's (2011) research design renders her conclusions questionable. She notes that, at around 17 per cent of the population, the 'percentage of disabled individuals at AMC is very high ... since rates of primates [with congenital limb malformations in the wild] are usually well under 1% if any are reported at all' (Turner 2011:3). It appears the disabled macaques in this study survived principally because of the supportive (or 'caring') - but artificial - environment of the Awajishima Centre, invalidating any extrapolation to early human experience.

The objections raised to inferring care provision based on supposed non-human primate success in surviving pathology have been challenged from different perspectives. On the one hand, Bulstrode (1990) suggests that past analyses of healed long bone fractures in non-human primates have been compromised by failure to accurately estimate age at acquisition of injury and by bias deriving from the use of specimens taken from

museum collections (also see Buikstra 1975). Noting that modern field observations of primates report very few long bone fractures, Bulstrode (1990) re-analyses Schultz's (1939) museum-provenanced sample, concluding that, contrary to Schultz's (1939) claims, long bone fractures are rare in wild primates; they are most likely to occur in juveniles (facilitating healing) rather than adults; and 'when they do occur, they are [usually] fatal' (Bulstrode 1990:22).

On the other hand, some primatologists (e.g. Boesch 1991; Boesch and Boesch-Ackerman 2000; de Waal 1996; Silk 1992) describe non-human primates assisting kin and non-kin conspecifics suffering diseases ranging from blindness to paralysis. Silk (1992; 2004) reports behaviours among non-human primates that 'demonstrate that the capacity to provide care for temporarily or permanently disabled individuals is present among nonhuman primates' (Silk 1992:228), suggesting the origin of care 'antedates the origins of the hominid lineage' and concluding 'we must have serious reservations about the claim that caregiving is unique to *Homo sapiens*' (Silk 1992:229). If Silk (1992, 2004) and others are right, then arguments against inference of care among humans based on 'lack of evidence for care' among non-human primates are demolished. Certain pathologies - such as edentulism - may not attract care provision from all species, but no form of care provision is out of contention simply because some species do not engage in that particular behaviour.

In drawing parallels between human and non-human primates in relation to caregiving (or any other behaviour) there is a more fundamental issue. Comparisons rest on assertion of a substantive and direct relationship between the behaviours of non-human primates and *Homo sapiens* extending over millions of years - predating emergence of the first hominids. This assumption suggests that although human cognition and behaviours have changed dramatically over the last five million years those of non-human primates have remained stationary since evolutionary divergence, allowing non-human primate behaviours observed today to be taken as directly analogous to those of past hominids up to, and including, prehistoric modern humans. It is a difficult position to sustain when subjected to scrutiny. For example, examining the challenges of (human and non-human) primate cross-species comparison, Boesch (2007, 2008) argues that the fact of significant variations in cognitive abilities and behaviours between modern humans as the result cultural affiliation alone means that attempting to compare human behaviour with that of other species is meaningless.

The question of whether study of non-human primate behaviour can contribute to unravelling the origins of human caregiving is discussed at greater length in Chapter 4. For the present, it is simply argued that non-human primate analogies do not provide a reliable basis for assessing the likelihood of human healthcare provision in prehistory at either a case study or a more general level. That some non-human primates are capable of surviving some pathologies without conspecific support says nothing about human capacity to do the same. Ethnographic comparison, particularly where some of the features of lifeways past and present (such as environment and economy) can be matched, is a far more appropriate approach, and this is discussed in the following chapter.

2.3.3 *Dettwyler, and the impossibility of identifying care and compassion in the archaeological record*

Just over 20 years ago Katherine Dettwyler (1991) wrote a paper titled *Can paleopathology provide evidence for compassion?* Its central message was simple: archaeology cannot tell anything meaningful about individual experience of disability from skeletal evidence alone. It cannot tell whether, or how, disease impact was experienced as disability. Even where indicators of severe pathology suggest care was integral to prolonging life, archaeology cannot tell how much or what sort of care was required. Finally, archaeology cannot tell whether any care that *may* have been provided was 'compassionate' - whether the disabled individual was treated with kindness or cruelty.

Dettwyler's (1991) article, frequently referred to as 'seminal' (Metzler 1999:62) or 'ground-breaking' (Knudson and Stojanowski 2008:409), has had a paralysing effect on archaeological research into health-related care out of all proportion to the quality of its content. Most subsequent opposition to archaeological inference of caregiving cites this publication as the primary supporting reference. This section examines and evaluates Dettwyler's (1991) thesis.

Dettwyler (1991) focuses on three studies in which the case for prehistoric healthcare provision is made - Shanidar 1 (Solecki 1971; Trinkaus 1983; Trinkaus and Zimmerman 1982), Romito 2 (Frayer et al. 1987) and the Windover Boy (Dickel and Doran 1989) (Cases 8, 13 and 15, Appendix A). From these she identifies five assumptions

underlying archaeological inference of care and compassion for the disabled which 'can be refuted by ethnographic analogy' (Dettwyler 1991:379).

Dettwyler (1991) argues that these assumptions, detailed in section 2.2.3.1 (c) below, arise from applying modern western values (i.e. the notion that care and compassion for disabled individuals is 'morally good') to prehistory. In attributing care and compassion to prehistoric actors

the normally self-imposed constraints on archaeological interpretation have been disregarded and otherwise careful scholars have overstepped the boundaries of reasonable inference (Dettwyler 1991:376).

Moreover, such interpretations

have equally strong roots in modern (albeit unconscious) prejudice against the disabled, by assuming that disabled people could not contribute to society and that they survived only because of the "compassion" of non-disabled members of the population (Dettwyler 1991:376-7).

Dettwyler's (1991) paper has escaped critical scrutiny. Although Knüsel (1999) and Hawkey (2003) question certain (different) points raised, neither engages in any sustained consideration of the paper's rationale or substance. Admittedly, some authors citing Dettwyler (1991) appear cautious, referencing only very specific aspect(s) of her argument either without comment (e.g. Lovell 1991:149; Keenleyside 2003:387) or in a way that is potentially ambiguous (e.g. Redfern 2010: 444). Many referencing Dettwyler's (1991) article, however, do so as if it were simply received wisdom, requiring no further discussion (e.g. Berkson 2004:222; Boyd 1996:216; DeGusta 2002:1435; DeGusta 2003:94; Metzler 1999:62; Tarlow 2000:726-727). Yet others refer to Dettwyler's (1991) paper with seemingly limited understanding of its content because it has become a *de facto* requirement to do so whenever the subject of disability in prehistory is raised, and these authors may actively - if innocently - misrepresent Dettwyler's views (e.g. DiGangi et al. 2009:425; Gargett 1999:28; Hill et al. 2009:196; Luna et al. 2008:499; Sugiyama 2004a:373). This inappropriate referencing of Dettwyler's (1991) paper perhaps best illustrates its mythic status - long overdue for closer inspection.

Here it is argued that Dettwyler's (1991) paper is often confused, confusing, and sometimes just plain wrong.

2.3.3.1 Deconstructing Dettwyler

(a) Abuse of terminology

Dettwyler (1991) does not provide clear, accurate definitions of concepts central to her arguments. 'Handicap', for example, is referred to as a purely social phenomenon throughout the paper, allowing her to claim that what constituted handicap in prehistory must always be unknowable because social values determining handicap are not accessible through archaeological analysis. Dettwyler's (1991) definition of handicap is taken from a secondary source (Scheer and Groce 1982:23-24, cited Dettwyler 1991:376) and actually misrepresents the much broader World Health Organisation (WHO) definition referred to, which defines handicap in terms of cultural, economic and physical limitations as well as social disadvantage (Wood 1980). Dettwyler's (1991) premise that we cannot know whether a prehistoric individual was 'handicapped' by their disease experience is therefore not necessarily true. Discerning social disadvantage may be problematic, but given contextual information it is feasible to identify likely barriers to participation in cultural, economic and physical activities.

Dettwyler (1991) does not define 'compassion' at all; a crucial omission given the article's explicit focus is whether compassion can be identified in the archaeological record. Colloquially translated as sympathy for, and desire to alleviate, the suffering of another (Oxford English Dictionary 1997), compassion may be understood in terms of disposition or motivation. Neither does Dettwyler (1991) define 'care', an omission that leads her to overlook the fact that health-related caregiving takes many forms, spanning crisis intervention to accommodation of difference.

Most troubling is Dettwyler's conflation of 'caregiving', a behaviour with potential to effect material change, with 'compassion', one motivation (among many possible motivations) potentially driving this behaviour (e.g. Dettwyler 1991:376, 377, 378, 379). This is more than semantics - it is a source of confusion with detrimental consequences for an archaeological focus on care. Furthermore, compassion is sometimes used interchangeably with 'moral decency', a quality embodying notions of 'goodness' and 'rightness' (e.g. Dettwyler 1991:376-77, 379, 384). Moral decency is a value judgement, and attribution of this to action undertaken in the archaeological past is undeniably inappropriate. In the scholarly context, by equating compassion with moral decency, and care with compassion, Dettwyler (1991) devalues the concepts of both care and compassion and, inevitably, the work of researchers she identifies as guilty of inferring one or both of these.

Dettwyler (1991) concedes, albeit with caveats, that in certain cases survival with extreme pathology does suggest care was given (Dettwyler 1991:383). Nonetheless, the continual juxtaposition of 'care' and 'compassion', together with the assertion that the 'handicap' with which care is associated is unknowable because social in origin and the uncompromising rejection of inferred compassion, has led some to wrongly interpret Dettwyler (1991) as also rejecting the potential for identifying *any* healthcare provision in the archaeological record (e.g. Metzler 1999).

Dettwyler's (1991) discomfort with the concepts of 'handicap', 'compassion' and 'moral decency' mirrors elements of modern disability rights discourse which deny the individual-focussed medical model of disability and cast disability as a predominantly social construct (Reid-Cunningham and Fleming 2009; Shakespeare 1999, 2006).

(b) Inflated claims of 'compassion' and 'moral decency'

Dettwyler asserts that overblown inferences of prehistoric caregiving 'have been used to justify claims in the popular media that the survival of disabled individuals in the past provides evidence for the existence of "compassion" and "moral decency" in these populations' (Dettwyler 1991:379, see also pp376-7, 384).

No primary source used by Dettwyler (1991) is guilty of exaggerating the implications of inferred caregiving; in fact, the original observations, reproduced in Cases 8, 12 and 15, Appendix A, are uniformly conservative. None uses the term 'moral decency', nor implies an equivalent value judgement. The only primary source using the term 'compassion' is Solecki (1971:195 Case 8), and this is in a restricted context. Solecki (1971:268) and Dickel and Doran (1989) use evidence of caregiving to explicitly question then-prevailing stereotypes of prehistoric life (Cases 8 and 15). Paradoxically, in her introduction, Dettwyler (1991:376) praises Gargett (1989) for willingness to challenge fixed assumptions about behaviour in one area of archaeological research (Neandertal mortuary practice), making her negativity towards researchers challenging similarly fixed ideas about behaviour in another field appear inconsistent.

Most of the secondary sources (which include a novel [Auel 1980] and a mention in National Geographic [Putnam 1988:452]) accused of inflated inference of compassion and moral decency similarly fail to stand up to scrutiny. More fundamentally, it is hard to understand the relevance of using secondary sources in judging the merits of the conclusions of primary research.

(c) Assumptions, fallacies and straw men ...

Based on analyses of the Shanidar 1, Romito 2 and Windover Boy case studies, Dettwyler identifies five 'implicit and unwarranted' assumptions used to support claims of 'compassion' and 'moral decency' (Dettwyler 1991:379). Dettwyler (1991) is initially equivocal as to whether these assumptions are attributable to primary sources or to the popular media, but subsequent discussion implies both are guilty.

- i. *Assumption 1: The vast majority of a population's members are productive and self-sufficient most of the time (i.e., nonproductive members are rare in most population and, therefore, represent a major strain on the population.)* (Dettwyler 1991:379)

Dettwyler (1991) argues that at any time societies have 'non-productive' members whom they support (e.g. young children, frail elderly, women around childbirth), and therefore inference of compassion in relation to 'special' health-related care cannot be justified. This is a *non sequitur*. That many individuals over their lifespan require support does not mean compassion is necessarily present or absent during these periods.

Dettwyler (1991) also neglects to mention that in each case study cited the circumstances of care represent a marked departure from standard nurturing practice, possibly incurring significant costs for the community. In such situations caregiving may, indeed, reflect a different level of commitment.

- ii. *Assumption 2: Individuals who do not show skeletal / fossil evidence of impairments were not disabled.* (Dettwyler 1991:380)

Dettwyler (1991) implies archaeologists naively suppose that only individuals whose remains display pathology experienced disability. The source of this assumption is unclear, as no examples of this claim are presented. All archaeologists recognise that evidence of disease in human remains significantly under-represents true rates of pathology (references predating Dettwyler 1991 include Brothwell 1961, 1972; Buikstra and Cook 1980; and Manchester 1983). The impossibility of inferring disability in human remains without physical evidence of disease explains archaeologists' inevitable focus on cases where osteological evidence exists. By failing to acknowledge this imperative, Dettwyler (1991) misrepresents the research process.

- iii. *Assumption 3: A person with a physical impairment is, necessarily, non-productive*
(Dettwyler 1991:380)

Dettwyler (1991) implies that archaeologists regard physical abilities as the sole source of productive capacity, and that a person with physical disability is somehow viewed as inferior. The subtext of discussion seems to be that acknowledging someone's need for healthcare diminishes that person's worth, which possibly reveals more about the perceptions of people with disabilities operating in certain social contexts than it does about research into prehistoric caregiving. Although studies may observe that a disability compromises 'normal' economic participation, Dettwyler (1991) does not cite any research in which the subject is labelled 'non-productive'.

- iv. *Assumption 4: "Survival" of disabled individuals is indicative of "compassion"*
(Dettwyler 1991:382)

In the text Dettwyler (1991) equates 'compassion' with 'treating kindly' (a logical extension of equating compassion with 'moral decency'). Clearly, keeping someone alive and treating them kindly are not synonymous, and survival with disability, on its own, does not give any insight into quality of life - but none of the case studies claims 'nice' treatment. Solecki (1971:195-6) comes closest, in discussing community tolerance of the disabled Shanidar 1.

- v. *Assumption 5: Providing for, caring for, and facilitating the survival of a disabled individual is always the "compassionate" thing to do* (Dettwyler 1991:382).

Assumption 5 is a rhetorical device allowing discussion of why it is sometimes kinder to let a disabled person die. Even if archaeologists wanted to conclude that in any instance failure to provide care 'evinces a lack of moral decency' (Dettwyler 1991:382) it would be impossible; archaeological evidence cannot differentiate between those receiving and those *not* receiving care around time of death (this point is discussed further in Chapter 3).

The morality of keeping severely disabled people alive is a modern ethical issue that may have been equally relevant in prehistory, but we will never know this. While Dettwyler (1991) suggests that

those who claim disabled people received care are proposing 'a certainty about these moral issues ... which as "objective" scientists we are not justified in claiming. ... Speculation about the moral qualities of people who lived

thousands of years ago, based on paleopathological analyses of archaeological remains, is particularly inappropriate (Dettwyler 1991:383).

she does not provide any example of primary research in which such an assumption is voiced.

(d) Countering 'exaggerations' of disability and care

To illustrate distortions arising under the influence of the five assumptions, Dettwyler (1991:383) returns to the Shanidar 1, Romito 2 and Windover Boy case studies. She offers alternative interpretations of the extent of each individual's disability, in each instance suggesting that level of care likely required for survival is exaggerated, or that level of handicap experienced is significantly overstated, or both.

Structural flaws in Dettwyler's (1991) analysis include her failure to take lifeways context into account when challenging assessments of pathology impact on functioning, and her tendency to either understate severity of pathology evident in skeletal remains or to ignore aspects of pathology for which evidence exists.

Failure to consider context allows Dettwyler (1991:383) to offer examples of modern individuals coping with apparently equivalent functional constraints without resort to care. These comparisons are intrinsically invalid because they attempt to equate experiences occurring in widely differing cultural, technological and physical environments. Understating or ignoring evidence of pathology allows Dettwyler (1991) to minimise the likely amount of care required.

2.3.3.2 Explaining the Dettwyler factor

Had Dettwyler (1991) simply urged archaeologists to be cautious about proposing specific motivations for prehistoric caregiving this would have been uncontentious. She did not, and her article contains serious errors in fact and logic; definitions (when provided) are either partial or incorrect; referenced sources are misrepresented; and assumptions are unsupported by evidence. Despite this, her paper has stood unchallenged.

Dettwyler cannot be held responsible for this lack of critical engagement, but *why* did her paper fail to elicit the forensic examination it cries out for? The most credible answer is that subject-matter sensitivity inhibited - and possibly continues to inhibit -

dissent. The disability rights movement has justifiably protested systemic discrimination against people with disabilities for over 40 years (Shakespeare 2006; Whyte and Ingstad 1995). Possibly it was feared that contesting Dettwyler's (1991) arguments against inference of care in the past could be interpreted as complicity with 'prejudice against the disabled' (Dettwyler 1991:376) in the present. It is also possible that Dettwyler's publicly acknowledged personal stake in disability rights concerns (Bower 2002:330) has added to the reluctance to challenge her views.

Regardless of how it is explained, Dettwyler's (1991) article has had an inordinately powerful and negative impact on archaeological research into the complex, but rewarding, areas of disability and care.

2.4 Treatment of caregiving in archaeological theory.

Focus on prehistoric healthcare provision can contribute to a broader theoretical framework for interpreting past social practice; as already discussed, however, this subject has received little substantive attention to date. It is indisputable that identifying and interpreting evidence for care poses practical and conceptual challenges. But having said this, the neglect of care provision as an intentional behaviour has occurred in a context in which behaviours as diverse and complex as ritual observance and mortuary practice; trade and exchange; systems of social stratification and governance; and production of parietal, mobiliary and monumental art have all been exhaustively theorised (Renfrew and Bahn 2001; Trigger 2006).

The neglect may be partly understood as resulting from the divide between the disciplines of archaeology and osteology (Sofaer 2006), in many ways still unbridged despite the increasing profile of bioarchaeological theory and practice (Buikstra and Beck 2006; Knudson and Stojanowski 2008). 'Traditional' archaeology has as its goal the identification and explanation of past human behaviours based on the 'systematic recovery and analysis of material culture' (Bahn 2001:27), where 'material culture' is defined as 'the physical remains of humanly made traces of past societies' (Bahn 2001:281). The use of skeletally-derived information in archaeological research and writing is usually limited to consideration of basic demographic data: age, sex, and latterly, with the availability of increasingly sophisticated techniques, diet, birthplace, and travel and migration patterns. A potential archaeological theory of care falls victim to a broader failure to position human remains as 'material culture' in their own right,

representing the product as well as the producer of the corresponding lifeways environment (Sofaer 2006). It is ironic that although archaeologists have been willing to theorise highly esoteric behaviours from mortuary treatment of human remains (e.g. Shanks and Tilley 1982; Thomas 1988, 1999) this approach has not extended to the behavioural implications of evidence from the bones themselves.

For its part, osteological (including palaeopathological) research practice has focused on description and analysis of the physical features of human remains, but typically has not ventured into more theoretical considerations of behaviour and motivation of the once-living individuals examined under the microscope of 'hard science'. Sofaer (2006) provides a comprehensive, and still very relevant, discussion of philosophical and applied differences - or dichotomies - in the disciplinary approaches of archaeology and osteology. It is impossible to do justice to Sofaer's (2006) arguments here, but her thesis provides one possible explanation for why health-related care has flown under the radar in these two historically separate areas of professional practice.

Bioarchaeology's failure to give serious consideration to healthcare provision as a subject for theory and research is harder to explain. This relatively recent discipline (the term was coined by Buikstra in 1976 [Buikstra 1977]) explicitly combines biological, osteological and archaeologically-contextualised analyses of remains, and issues around health and disease - spanning palaeopathology case studies at one end of the continuum to the impact of cultural and environmental variables on population health status at the other - have been prime subject matter for research focus.

In their recent review of past and future directions for bioarchaeology, Knudson and Stojanowski (2008) note that 'by focusing on the social construction of human experience, the study of archaeological human remains can make unique contributions to our understanding of social life in the past' (Knudson and Stojanowski 2008:409). They include the experience of disability as one of a list of phenomena possibly capable of shedding light on aspects of identity (which they define in terms of the personally and socially constructed image of self), but take this observation no further (Knudson and Stojanowski 2008:398). Important as identity is, however, it is only one part of the story potentially retrievable from remains meeting the 'living with disability' criterion. As argued throughout this dissertation, a focus on the caregiving that enabled the individual to survive with disability in the first place may reveal a depth of insight into the skills, socioeconomic practice, daily behaviours and even - *pace* Dettwyler (1991) - motivations of the community in which the recipient of care lived that is not accessible

through other means. Lack of mention of caregiving, in an otherwise comprehensive overview, may simply reflect the increasingly popular post-processual interest in an archaeology of identity (see Chapter 5), but may also reflect wider sensitivity - as previously hypothesised - concerning how to manage the issue of 'disability' without causing offense.

If the process for inferring healthcare from evidence in human remains is visualised as comprising firstly, identification of one or more pathological anomalies in the skeleton; secondly, the determination that the associated disease impact likely constituted a disability serious enough to require support in one or more areas of daily living; and thirdly, the conclusion that survival of the individual experiencing this disability indicates that support was forthcoming, then (with some exceptions) bioarchaeology has stalled at the second step.

2.4.1 If not an archaeology of care, then an archaeology of disability?

Establishing the presence of disability severe enough to compromise aspects of functioning is a prerequisite for inferring health-related care. The topic of disability *has* attracted some archaeological interest at a theoretical level over the past 15 years, principally centred on the issue of whether, and how, the state of being 'disabled' can, or should, be defined, understood and identified within past lifeways' contexts. It is premature to suggest that an 'archaeology of disability', even as a 'relatively recent field of study' (Roberts 2000:57; Battles 2009), exists in the sense of this being a well-demarcated area of research with an explicated methodology, although a number of basic theoretical and practical concerns have been problematised.

Roberts (1999, 2000) must take credit for initiating discussion on the prospects for the archaeological study of disability, although she is not particularly positive about these. Her 1999 article is the first to provide informed discussion at a conceptual level of the potential role and scope of archaeology in this area, and she proposes two basic methodological principles: firstly, reference to modern clinical knowledge as an evidence base for assessing the range of possible health impacts of an identified palaeopathology - a procedure advocated in earlier publications (Roberts 1991; Grauer and Roberts 1996); and secondly, the need to interpret all information relating to the likely experience of pathology within its archaeological context (Roberts 1999, 2000). Roberts (1999, 2000) considers the implications for archaeology of defining 'disability'

in terms of a qualitative social model as opposed to a quantitative medical one, and lists the limitations of osteological data (discussed in Chapter 3) for identifying range and impacts of disabilities experienced in the past, regardless of the model adopted.

In her 1999 paper Roberts proposes four scenarios for categorising community response to individual experience of disability: (i) disability viewed as acceptable and care given; (ii) disability viewed as weakness / unacceptable and care withheld; (iii) disability seen as conferring special status and care given; and (iv) disability accepted as long as it has no impact on performance (Roberts 1999:82). She offers no guidance as to how these might be amenable to archaeological analysis, however. Notably, provision or denial of care is central to the first three of these, but other than commenting that '[i]n the archaeological record the direct evidence for treatment is restricted to the treatment of injury (e.g. fractures and head injuries by splinting and trepanation respectively), amputation (surgical as opposed to accidental/traumatic) and dentistry' (Roberts 1999:93), caregiving is not discussed in any detail.

Acknowledging that sometimes physical impairments discernible in skeletal material are so significant that common sense dictates they were associated with temporary or permanent disability, Roberts (1999, 2000) tempers this by emphasising the primacy of social factors in determining disability experience: 'although such interpretations may be correct, it is important to be cautious in presenting any interpretation of this kind' (Roberts 2000:54). This discomfort in inferring disability from skeletal evidence may arise from the failure to make a clear choice between competing medical and social models of disability (Cross 1999) - or rather, failure to develop a new model compatible with an archaeological focus. This is a gross oversimplification of a very complex issue, and there are many more models of disability than these two (Barnes and Mercer 2010:14-41; Reid-Cunningham 2009; Reid-Cunningham and Fleming 2009); however, at the time Roberts was writing, disability studies were achieving increased academic and political recognition, and pressure to accept 'disability' as an (almost) exclusively social construct was very strong in these circles (Shakespeare 1999).

Roberts (1999, 2000) provides a valuable service in clarifying the issues to be confronted in developing an archaeology of disability, but unfortunately does not go on to consider how these might be addressed. Nor have researchers since. The default position has been an author-by-author approach to what 'disability' means and how it might be identified, largely limited to consideration of immediate and measurable physical manifestations of disease. Absence of an agreed - or even a contested -

archaeological model of disability means there is no shared framework for analysis or discussion, leaving the way open to challenges regarding both validity and reliability of conclusions relating to individual disability.

The need for an archaeological model of disability is emphasised by Cross (1999) and Shakespeare (1999) in the *Archaeological Review from Cambridge* (1999) volume produced to stimulate archaeological discourse and research on disablement (Metzler 1999). Cross (1999) argues that, to be relevant to modern society, archaeologists need to create an archaeology of disability because '[a]rchaeology ... serves the function once served by origin myths - the creation and explanation of identity' (Cross 1999:8), and analysing past disability experience has the potential to contribute to this. Shakespeare (1999), a sociologist in the field of disability studies, also embraces the potential for an archaeology of disability. He deplores the artificial distinction between medical and social models of disability as the product of an unrealistic sociopolitical focus in disability research and advocacy at the expense of biology: 'disability studies ... has largely turned its back on matters of anatomy, physiology and pathology' (Shakespeare 1999:99; Shakespeare 2006). Shakespeare (1999) suggests archaeology can make an important contribution to modern disability studies; situated at the 'crossover between the sciences and the humanities ... archaeology has the capacity to revisit and problematise issues of the human body in time, and to connect the physical to the sociocultural' (Shakespeare 1999:99). He also notes that there is a long way to go before this potential is realised.

Consideration of Shakespeare's (1999) observations returns discussion to the imperative of developing an archaeological model of disability, and highlight the fact that, over a decade after the publication of the 1999 *Archaeological Review from Cambridge* issue dedicated to promoting this, archaeology is no closer to this goal than it was then.

Archaeologists have certainly been sensitised to the pitfalls of claiming 'disability' in their research, but for the most part have not actively sought solutions. What has never been explicitly acknowledged is that a specifically archaeological model of disability will have its own archaeological identity. Of necessity it will draw on concepts and definitions from existing areas of disability studies, and position itself in relation to archaeological and broader social science theories of agency, identity and embodiment. While there is no argument that social context shapes (within certain parameters) the experience of disease, an archaeology of disability has to take as its starting point

evidence of likely loss of some level of physical functioning capability before the question of disablement - in *any* context - can be considered.

Furthermore, the now tired insistence on the exclusive primacy of social context in the construction of disability needs to be challenged (Shakespeare 2006). In archaeology, knowledge of the sociocultural or sociopolitical circumstances in which pathology occurred will always be less than ideal, but consideration of disease impact in relation to more easily identifiable aspects of lifeways context, such as physical environment, settlement features and economic practice, offers a foundation from which to extrapolate features of the likely disability experienced. In turn, this opens the door to considering the less immediately accessible social and behavioural aspects of the experience of disablement that are possibly of even greater interest in exploring the past.

2.5 The current status of 'care' as a subject for archaeological research.

To sum up the current state of play in relation to archaeological research into prehistoric health-related care: there has been sporadic interest despite a generally negative climate, but no follow-through.

Each study of caregiving listed in Table 2.1 flags the potential contribution of a 'care' focus to improving our understanding of the past, and the quality of palaeopathology analysis in most of this research provides a ready-made base on which to build. Taken together, these studies suggest a ubiquitous pattern of human behaviour which deserves a systematic attention that it has not yet received. Currently, identifying likely healthcare provision where evidence suggests survival with disability appears arbitrary, reflecting researchers' personal interests rather than the frequency with which such evidence occurs, and cross-referencing between cases of caregiving is rare. There is no consensus on the definition of 'disability', and there are no agreed principles or criteria for either establishing the likely experience of disability from evidence in human remains or determining what constitutes a disability severe enough to have required care. Where health-related care provision *is* deemed likely to have occurred, there are no guidelines for inferring what, in any given set of circumstances, basic care needs - and care responses to these needs - may have encompassed. In a nutshell, there is neither commitment to, nor consistency in, approaches to identifying, analysing or interpreting healthcare behaviours in prehistory.

As noted earlier, the literature on prehistoric care is fragmented, and many of the reports identifying care provision reviewed in this chapter were discovered by guided chance rather than through standard search techniques. Despite this, the case studies that *are* known provide sufficient critical mass to justify developing a theoretical framework for archaeological research on this subject. Before attempting this, a fundamental question remains - why has archaeology given so little attention to the study of health-related care provision?

Some possible reasons have already been canvassed. Researchers are discouraged by difficulties associated with accurate diagnosis of pathology in often less than perfectly preserved human remains, and even when there is confidence in a diagnosis, individual variability in response to disease makes many researchers reluctant to speculate on level of disability and requirements for care.

In return, however, it could be pointed out that palaeopathologists are rightly trained to be both rigorous and conservative in diagnosing disease and in inferring its impacts. This self-imposed restraint makes it far more probable that frequency of pathology and associated disability will be substantially underestimated, and examples of care go undetected, than that false 'positives' (identification of caregiving where none exists) will proliferate.

The implications of all this for a bioarchaeology of care are discussed in detail in the following chapter. It is simply noted here that (bio)archaeologists always have to rely on the material available, imperfectly preserved though it may be - if perfect remains were a prerequisite for analysis, little research would be undertaken. Further, recognising individuals differ in experience of pathology means that only minimum disease impact can ever be assumed - but this still leaves plenty of material worthy of consideration in relation to likely caregiving. Finally, while the scope for accurate inference of disability is enriched by diagnosis of specific pathology with known signs and symptoms, where observable disease indicators or other anomalies suggest restrictions on physical activity it may be possible to identify a level of handicap, even though primary causation remains unknown.

Another explanation for the lack of attention may lie in the fact that trends in bioarchaeology and palaeopathology over the last 20 years have favoured research emphasising patterns of health and disease within and across populations. This is particularly the case in the United States (e.g. Armelagos and Van Gerven 2003; Larsen and Walker 2005; Mays 2012; Park et al. 2010; Steckel 2003; Steckel et al. 2001),

which exerts a strong influence on the agenda for archaeological research in the English-speaking world. As will be elaborated in Chapter 3, research into prehistoric caregiving is limited to individual case studies by virtue of its evidentiary base, and in the competitive world of academia this may mean that funding (and kudos) may be harder to obtain.

Other possible reasons for the lack of research focus on caregiving are less clear - or perhaps just less clearly articulated. Some researchers may be uncomfortable in inferring behaviour of *any* sort from skeletal remains, believing it travels too far into the realm of non-testable interpretation. Some (particularly archaeologists from a post-processualist background) may be comfortable exploring the social and behavioural implications of caregiving, but lack the skills for interpreting osteological data. The dissonance between the descriptive, quantitative nature of osteological analysis of human remains and the interpretive, qualitative nature of behavioural inference from this same evidence may be too great an obstacle to easily overcome for others, and Sofaer (2006) provides an exhaustive discussion of intellectual tensions across different archaeological disciplines. Despite all this, it could be argued that boundaries have been blurred over recent decades. For example, there is a substantial literature exploring associations between bone morphology, musculoskeletal markers and mobility patterns and occupational activities (e.g. Eshed et al. 2004; Holt 2003; Weiss 2003, 2007), between health status indicators and changing lifeways demands (e.g. Larsen 1988, 2000; McMichael 2001; Ubelaker 2003) and between bone lesions and interpersonal and systemic violence (e.g. Guilaine and Zammit 2005; Jackes 2004; Lessa and de Souza 2004; articles in the theme issue of Volume 2 of the *International Journal of Paleopathology* 2012) - yet health-related care has still received little attention.

Perhaps a final part of the answer lies in the disincentive to the archaeological study of care arising from political and personal sensitivities associated with the topic of disability, so passionately enunciated by Dettwyler (1991) and subsequently reinforced by others (see *Archaeological Review from Cambridge* 1999). The effect of this factor in discouraging research into caregiving is impossible to calculate, but no less real for that.

Obstacles to research into health-related care need to be confronted. Quantitative research into disease and health status of past populations provides valuable data for reconstructing aspects of human social and biological evolution, but qualitative research

into individual cases of survival as a result of care provides an *invaluable* entrée into the small corners of human existence. It is time the simple observation that 'care was likely given and reflects social tolerance' is taken further. The proposed bioarchaeology of care methodology outlined in the following chapters of this thesis proposes a theoretical and practical framework for analysing evidence for caregiving in prehistory.

CHAPTER 3. Context for a Bioarchaeology of Care

Recapitulating the conclusion of Chapter 2, while there is compelling evidence for health-related caregiving in the archaeological record, its potential for increasing our understanding of the past has not been exploited. This is almost certainly because the topic of prehistoric care provision lacks both an applied and a theoretical framework within which to situate research and analysis. There are no generally accepted definitions of what constitutes either 'disability' or 'health-related care' in the archaeological context; there are no established criteria for identifying possible indicators of caregiving, or for determining what the care given might comprise; and there are no guidelines for deciphering the broader significance of care provision.

The following three chapters attempt to fill this void. The current chapter presents the conceptual and contextual bases for the first three stages of the bioarchaeology of care methodology: Stage 1, describing the individual, their pathology and their lifeways; Stage 2 assessing likely experience of disability and determining whether care was required for survival; and Stage 3 constructing a model of the care likely provided. Chapters 4 and 5 (the latter corresponding directly to Stage 4 of the methodology) focus on what interpretation of caregiving practice may offer for understanding contemporary prehistoric behaviour and identity.

Chapter 3 begins by examining current definitions of health, disease and disability, and considers which are relevant to exploring the topic of caregiving in prehistory. It then reviews obstacles facing palaeopathology in identifying disease and disability in human remains, and the implications of these for inferring healthcare provision. The third section considers the likely level of demand for health-related care in prehistory, drawing on findings from palaeopathology and modern epidemiological and ethnographic studies of health. The fourth section looks at the possibility of distinguishing 'constants' of healthcare practice applicable across human history. The final section draws out the implications of all the above for a bioarchaeology of care approach.

3.1 Defining Health, Disease and Disability.

It is important to acknowledge the problems inherent in retrospectively applying modern western concepts of 'health', 'disease' and 'disability' to experience in the prehistoric past, given that the consequences of *not* doing so in part underlie the paralysis in archaeological research into healthcare provision. The following introduction to the continuing debate over what these terms signify provides the background for the operational definitions adopted in the bioarchaeology of care methodology.

3.1.1 *Health and disease*

In 1946 the WHO proposed that health should be understood as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' (WHO 1946:1), positioning health as the sum of multiple, interacting variables rather than a single domain, and as a positive rather than a default condition. In most areas of modern western health discourse, the once-dominant biomedical model, described as 'a dehumanising focus on body parts, malfunctions and lesions ... [which] inappropriately medicalises behaviours ranging from pregnancy to alcoholism' (Leslie 2006:7), has been rejected in favour of a more holistic approach, in which health is understood as an outcome of the relationship between physical, psychological and social characteristics of individuals and the features of the cultural and physical environments they inhabit.

Within this holistic perspective, different models emphasise different concerns. For example, social cognition models locate health beliefs and behaviours in the sociocultural context, although still focus on individual experience; political models explain health and disease in terms of differential access to resources (wealth, power and social status) with 'the state' as the ultimate source of control; population models take the group (however defined) as the unit of analysis, conceptualising health as a dynamic system constantly changing in line with community understanding, expectations and aspirations; and biocultural and ecological models define health in terms of human adaptation within the environment, using a framework that integrates biological, cultural and environmental factors (Bumstead et al. 1994; Foucault 1973; Levin and Browner 2005; Lock 2004; Martin and Horowitz 2003; McDowell et al. 2004; McElroy 1990; Winkelmann 2009). Yet despite an over-arching in-principle

agreement on positioning health as a 'positive', most health policies and interventions are still centred on eliminating, reducing or ameliorating disease: it is hard to escape our 'pathology-based way of thinking' (Levin and Browner 2005:746).

Extending consideration to how health is understood both in non-western and in pre-modern cultures underlines the enormous diversity in this area. To begin with, there are some cultures which have no specific term corresponding to 'health' - although there are words to describe its absence (Adams et al. 2003; Atkinson 2002). Many cultures emphasise the importance of 'harmony' or 'balance' to the maintenance of health, although what harmony consists of can vary considerably; spiritual well-being may be indistinguishable from physical wellbeing, although in western clinical literature spiritual health rarely rates a mention; in some cultures the health of the relationship between people and land may be integral to both spiritual *and* physical health; and in others the health of the group as a whole may be the major determinant of individual health - the individual cannot be 'healthy' unless the group is functioning as it should (e.g. Adams et al. 2003; Bloom 2005; Coulehan 2005; Garro 2006; King et al. 2009; Levin and Browner 2005). The relative nature of health is illustrated by the phenomenon that, in a number of communities in which western medicine has achieved quantifiable improvements in biological health, these changes are associated by group members with the experience of a *reduction* in health status (Izquierdo 2005).

'Disease' is an easier concept for archaeology to deal with, but discussion requires first differentiating between the different perspectives from which this topic can be approached. From a biomedical viewpoint, 'disease' is a pathophysiological process in body structure, chemistry or function, characterised by identifiable signs or symptoms (Steadman's Medical Dictionary 2010). 'Illness' is often used synonymously with 'disease', but refers to the individual's *experience* of pathology - illness is the personal 'experience of disvalued changes in the states of being and in social function' (Kleinman et al. 1978:252) produced as a consequence of pathophysiological changes (Carrillo et al. 1990; Winkelman 2009:35-36). Illness reflects individual variability in response to disease; clinically, 'similar degrees of organ pathology may generate different reports of pain and distress ... [and] illness may occur in the absence of disease' (Kleinman et al. 1978:252). 'Sickness', on the other hand, alludes to the way in which a particular disease and the 'illness response' are perceived - and *received* - by others in society, and 'sick role' refers to society's expectations of behaviours appropriate for the person with this disease (Winkelman 2009:36). These distinctions,

adopted in this thesis, are valuable reminders that the biomedical expression of disease does not necessarily dictate its subjective experience, and that 'illness' must be understood as a sociocultural as well as physiological phenomenon.

Certain features of disease experience will always be culturally constructed, and these include explanation of aetiology (from cosmological rationale to scientific rationalism); the design and delivery of healthcare (and the initial decision to provide care); expectations of (and desire for) recovery; the status and social treatment of the individual with the disease; community and personal acceptance of disability, and, where relevant, social and economic (re)integration within the community (e.g. Berger 1998; Sobo 2004; chapters in Whitaker (Ed.) 2006; Winkelman 2009). Some theorists go further, discussing disease as a predominantly social construct rather than a biological dysfunction; what is labelled 'disease' in one society may not necessarily be viewed as disease (in terms of detrimental effect on health) and, more significantly, may not necessarily be experienced as an 'illness', in another (Arrizabalaga 2002; Brown 1995; Garro 2006; Harley 1999).

Archaeology is restricted to a pathology-based approach to health, and relies on the assumption that where physical evidence of disease is found in human remains then, minimally, a biological component of the individual's health came under challenge - regardless of how that particular individual responded to this challenge, and regardless of social context. If 'disease' were purely, or even predominantly, a social construct then the implications for archaeological identification and understanding of disease, and therefore for a bioarchaeology of care, would be grim. Fortunately, it is not. Observing that the dichotomisation of social and medical models of disease threatens to disenfranchise the contributions of osteological analysis to understanding behaviour in the past, Fay (2009) enumerates the deficiencies of a purely social model of disease, concluding that it is, after all, the 'physical experience [of pathology] that prompted the cognitive framing of diseases in the first place' (Fay 2009:206).

Clinical experience bears this out, providing the basis for sometimes savage critiques of too-literal socio-political interpretations of disease. Anderson (1995), for example, asserts that 'although the gangrenous limb in a diabetic body ... is a clinical entity constructed within a particular set of social relations, I would want to argue that it is also, more straightforwardly, an experience of vision, smell and pain' (Anderson 1995:67-68). He goes on to contend that 'delimiting the body to that which is social ... needlessly "socialises" the experience of [quantifiable] phenomena such as pain,

bleeding or pus' (Anderson 1995:80) and is not sustainable in terms of disease treatment.

Ethnographic and ethnohistoric research supports a fundamental universality in physiological responses to disease stimuli, here illustrated in three reports on health and disease in pre-agricultural subsistence groups in Papua New Guinea compiled just after these communities first experienced European contact. Based on fieldwork among the Huli, Frankel (1986) rejects suggestions that in pre-modern societies certain diseases - such as yaws, pinta, parasites and schizophrenia - may have been regarded as 'normal' (or, in relation to schizophrenia, a sign of shamanic power) rather than pathological states. While acknowledging culture's role in determining both the meaning of a disease and the voluntary behaviours that characterise 'illness', Frankel (1986) concludes that where pathology is associated with non-trivial, biologically-mediated, physical or behavioural impacts, reports of personal experience of disease are sufficiently similar across cultures to allow meaningful comparison. Lewis (1975) makes the same point in relation to the Gnau, who explain (most) pathology in terms of spirit action: 'I would emphasise that the range of words [used to explain disease] reveals a perceptual awareness of pain, weakness, nausea and so forth, which is in its essentials like our own' (Lewis 1975:135). In the 1950s Gajdusek first documented kuru among the South Fore, who explained this prion disease in terms of sorcery (Spark 2005). The experience of kuru in Papua New Guinea and that of Creutzfeldt-Jakob disease in Europe, decades later, are virtually identical in physiological impact. Cultural differences in ascribed aetiology made no difference to the effects of pathology on physical and cognitive functioning; nor to the way that signs and symptoms were factually described by the South Fore; nor to the basic measures taken in trying to make sufferers comfortable (Spark 2005; Thomas 2012).

Foreshadowing discussion later in this chapter, it is interesting to note that 'universality' in biological response to a disease is often mirrored in the basic principles of hands-on nursing care (obviously medical intervention technologies vary greatly). In Kleinman's (1980) words, 'the problem with most ethnomedical studies is not that they impose an alien category on indigenous materials, *but rather that they fail to apprehend a profound cross-cultural similarity in clinical interest and practice*' (Kleinman 1980:83, emphasis added).

It will never be possible to know the detail of what 'health' meant for a particular prehistoric community. However, cross-cultural and cross-temporal consistency in physiological disease impact permits interpretation of skeletal evidence of pathology to go beyond documenting lesions to canvassing the possible, and even likely, biological responses to the effects of pathology. The individual's actual experience of disease ('illness') will be in part a product of the pathology itself and the way it affects body function, organ, system or structure; in part a product of the individual's physical and psychological ability to overcome or adapt to disease stressors; and in part a product of lifeways variables. In most cases it will be impossible to identify with confidence the full range or severity of symptoms experienced by a particular person. The challenge for a bioarchaeology of care is to interpret skeletal evidence of pathology in terms of the individual's *likely* disease experience, and then to assess whether this experience may have resulted in a disability likely to have required care.

3.1.2 *Disability*

'Disability is complex, dynamic, multidimensional, and contested' (WHO 2011a:3).

Difficulties in reaching consensus in defining health and disease pale in comparison with those of defining 'disability'. In western culture alone there are multiple models of disability in operation and, often, in opposition (Barnes and Mercer 2003; Bickenback et al. 1999; Reid-Cunningham and Fleming 2009; Shildrick 2009; Stone 2001; WHO 2011). While it is simplistic to suggest that these can be reduced (again) to the dichotomy of medical versus social, to some extent this is true (Anderson and Carden-Coyne 2007). Passions run high in relation to how disability is defined; understandably, since the potential implications affect personal identity and self-esteem, development and implementation of social policy, and access to rights and resources for those living with disability (Shildrick 2009; Stone 2001; WHO 2011). A similar passion is manifest in attempts to define and discuss disability in relation to those long dead (Chapter 2).

The level of correspondence between past and present assessments of what it is to be 'disabled' may be unclear in certain cases, because a disease state that is incapacitating in one social setting may be of negligible impact in another and *vice versa*. For example, high frequencies of deafness in Martha's Vineyard (USA) have led to a situation where signing is a *de facto* second language in the community, and lack of

hearing no longer considered a major limitation (Scheer and Groce 1988). Knüsel (1999) describes a male with microcephaly and associated intellectual deficits who would be considered disabled in a post-industrial context, but who, in his *pre-industrial* horticultural community, is perceived as superior to many of his cohort because of his unwavering focus on repetitive tasks. Tarlow (2000) suggests that in prehistory infertility may have been considered more disabling than pathology affecting immediate aspects of physical performance; in post-industrial society infertility is seen as a problem for those who wish to conceive, but not in itself a 'disability'. Formicola and Buzhilova (2004) note the elaborate mortuary treatment afforded certain the mid-Upper Palaeolithic individuals, and suggest that abnormal physical appearance, which might today be regarded in terms of deformity to be remedied, may have been specially valued within contemporary belief systems. (Chapters in Ingstadt and White (Eds.) 1995 and Priestly (Ed.) [2001] provide further illustrations of disability as a culturally-contingent state.)

The WHO defines disability as

... an umbrella term, covering impairments, activity limitations, and participation restrictions. An impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. Thus disability is a complex phenomenon, reflecting an interaction between features of a person's body and features of the society in which he or she lives' (WHO 2011b).

This definition establishes disability as comprising biological, psychological and social elements, and as being produced through interaction between physical and/or cognitive dysfunction and the cultural and physical environment (Bickenbach et al. 1999; Imrey 2004; WHO 1997, 2011a, b).

This 'biopsychosocial' model provides a conceptual framework within which experience of disability can be operationalised, and is the core of the WHO International Classification of Functioning, Disability and Health (ICF) (Bickenbach et al. 1999; WHO 1980, 1997, 2001, 2003). The ICF is the globally-accepted standard for describing and measuring health and disability, and it focuses on functioning capability rather than on disability *per se* (Bickenbach et al. 1999; Imrie 2004). It is based around a three-part checklist documenting (i) impairment in body structure and function, and level of disruption caused by this impairment in daily life; (ii) limitations experienced in

undertaking a number of specified activities, ranging from basic task learning and communication through to involvement in community, social and civic life; and (iii) participation restrictions resulting from physical, social and attitudinal barriers encountered in the daily environment (WHO 2003). Despite calls for further development of theoretical aspects of the biopsychosocial model there is general agreement with the principles driving ICF design (Badley 2008; Hemmingsson and Jonsson 2005; Imrie 2004), which have produced an instrument in which 'the three dimensions [of disability - impairment, activity and participation] are co-equals in significance and indeed are ... different facets or manifestations of a single emergent phenomenon of disablement' (Bickenbach et al. 1999:1184; Imrie 2004).

To identify possible cases of healthcare provision for further analysis, Stage 1 of the bioarchaeology of care approach relies on evidence of survival suggesting significant body structure or system impairment. Stage 2 addresses the likely clinical and functional impacts of this pathology, with the goal of determining probable need for, and receipt of, care. In addressing likely functional impacts the bioarchaeology of care methodology borrows substantially from the ICF (and similar instruments), adapting the checklist categories and domains of experience and activity to make these relevant to past lifeways (this is elaborated in Chapter 6). The information elicited from assessment of often poorly preserved prehistoric remains, recovered from only partially accessible cultural and physical contexts, will always be inferior to the information gained from administering the ICF to living subjects - the purpose for which it is designed. Nevertheless, the structure provided by the ICF, which dictates an understanding of disability as a context-specific state produced through the interactions of multiple factors, provides a practical and cross-culturally-validated foundation from which to undertake systematic examination of what the actual experience of disability may have entailed for specific individuals in the past.

3.2 Practical limitations of palaeopathology analysis in identifying disability.

Some of the practical obstacles encountered in identifying and interpreting evidence of disease in prehistoric human remains are summarised below, and the consequences of these obstacles for inferring health-related caregiving are highlighted.

3.2.1 *Constraints in analysis*

The most fundamental constraints in palaeopathology analysis revolve around distinguishing and diagnosing disease. With the exceptions of bone fracture, various stressors encountered in childhood, dental diseases and degenerative joint conditions, very few pathologies have the potential to register in bone, and those that do have this potential affect bone on average only 10 to 20 per cent of the time (Ortner 2009:328). In relation to some infectious diseases, frequency of osteological involvement is even lower: in tuberculosis sufferers it is less than five per cent, in leprosy sufferers it is between three and five per cent, and in those with a trepanematoses it is between one and five per cent (with the exception of yaws, where skeletal involvement is around 15 per cent) (Ortner 2003:112-115). Relationships between environment, disease and osseous expression are complex, and this is nicely illustrated in Wilbur et al.'s (2008) recent review of the multiple factors determining the likelihood of tuberculosis manifesting in bone. (For further general and disease-specific discussion of the points above see, for example, Aufderheide and Rodriguez-Martin 1998; Brothwell 1961, 1972; Buckley and Tayles 2003; Buikstra and Cook 1980; Lovell 2000; Roberts 2002; Roberts and Buikstra 2003; Waldron 2009.) To add to this, other than in relation to trauma, most skeletal involvement occurs in the advanced or chronic stage of disease, meaning that those who suffer a disease but either recover or die before bone is affected cannot be identified in the archaeological record as having experienced pathology (Brothwell 1961; Ortner 2003, 2009; Wood et al. 1992; Wright and Yoder 2003).

Further, bone is limited in its range of possible responses to disease. Certain pathologies (such as tuberculosis, treponematoses, leprosy) may be associated with specific types and/or locations of skeletal lesions, and these features assist in diagnosis; other diseases have less distinctive response patterns or none at all, or there may be significant morphological overlap in expression between diseases, and confident diagnosis may be difficult to achieve (Miller et al. 1996; Ortner 2003, 2009; Waldron 1994, 2009). Some congenital disorders leave clear skeletal indicators (Barnes 1994), but others, unlikely to leave physical traces (such as blindness, mental retardation, deafness, organ dysfunction), may also have involved significant disability (Berkson 2004; Scheer and Groce 1988). Even experience of trauma originally involving bone may be osteologically invisible if remodelling has removed evidence of this, possible if injury occurred either during childhood or a long time before death (Grauer and Roberts 1996). Other than in relation to congenital disease, diseases affecting childhood

development, (possibly) traumatic injury, some degenerative diseases or pathology occurring perimortem, it may be difficult to assess approximate age at which a specific pathology was acquired, making duration of disease experience difficult or impossible to calculate. Finally, reliance on macroscopic examination of skeletal remains may result in disease indicators being overlooked; Rothschild and Rothschild (1995), for example, suggest this practice has led to a significant underestimation of cancer incidence in past populations. Ancient DNA analysis, refinements in isotope analysis, x-ray computed tomography scanning and magnetic resonance imaging holds promise for improving the reliability of diagnoses of disease in skeletal and mummified remains, but the preservation status of remains, access to technologies, and cost are - variously - barriers to their adoption (Cohen and Kramer Crane 2003; Lovell 2000; Ortner 2009).

The physical condition of archaeological human remains, potentially vulnerable to a wide range of interacting taphonomic variables (see chapters in Haglund and Sorg [Eds.] 2010; Lyman 1994; Neilsen-Marsh et al 2007), may pose problems for diagnosis of pathology (Buikstra and Ubelaker 1994:95-106; Jans et al. 2002). Prehistoric skeletal remains are frequently incomplete, remaining elements are often poorly preserved, and in some instances it may be hard to distinguish between the effects of disease and taphonomy (Buikstra and Ubelaker 1994:95-106; Moraitis and Spiliopoulou 2006; Ubelaker 2000). The impact of taphonomic factors is not necessarily uniform. Bello et al. (2006), for example, suggest that as a rule of thumb adult male remains are the best preserved, infant and elderly remains the worst, and remains of adult females and adolescents fall in between; Walker et al. (1988), analysing documented remains from an early 19th century Californian cemetery, found age rather than sex to be the major influence on quality of preservation, with male and female young adult remains significantly better preserved than those of infants, children and the elderly; but Stojanowski et al. (2002) found neither age nor sex explained differences in preservation of the remains recovered from Windover Pond. Within the same site, and even within the same set of remains, there may be differential preservation of skeletal elements (Lyman 1994:223ff; Neilsen-Marsh et al. 2000); often - although not invariably - larger bones preserve better and/or are more likely to be recovered than smaller ones (such as hand and foot bones), which might provide diagnostic information (Roberts 2000). Areas weakened by pathological lesions can be the first part of the element to erode, removing potential evidence of disease (Waldron 1987). Age and/or sex can influence acquisition and course of certain diseases, so in cases where these

characteristics are impossible to ascertain this will be an obstacle both to diagnosis and to assessment of possible disease impact on function (Ortner 1998, 2003). Pattern of skeletal involvement is not only important for diagnosis, as earlier noted, but may also be critical to achieving the fullest possible understanding of likely duration and impact of a disease once this is diagnosed (Ortner 2003; Waldron 1996, 2009). At a minimum, absence or poor preservation of skeletal elements must always introduce uncertainty as to whether the full extent of pathology has been observed.

Regardless of state of preservation, diagnosis of disease in prehistoric remains is often problematic, and the reliability of retrospective diagnosis has been challenged. Waldron (2009:2-7), for example, points out that diagnosing disease in the *living* is often as much intuition as science; Jacobi and Danforth (2002) examine accuracy in palaeopathology diagnoses undertaken in controlled conditions, and find low levels of scorer-accuracy and inter-scorer agreement in disease classification and diagnosis. However, even certainty in diagnosis does not necessarily provide meaningful information about the individual sufferer's experience, and this latter aspect, which might in part be addressed in terms of potential for disease complications and common comorbidities, is largely ignored (although not invariably; see for example Berkson 2004; Buckley and Tayles 2003; Byers and Roberts 2003; Grauer and Roberts 1996; Hawkey 1998).

Wood et al. (1992) review some of the complexities of palaeopathology analysis in outlining the 'osteological paradox'. Given that disease does not typically express in bone until the chronic phase, the presence of lesions indicates a level of immune response to pathology even if eventually the individual dies (whether from the disease responsible for the lesions or from unknown causes). Where there are no lesions visible in the remains of an individual who died at an early age and in circumstances where exposure to health stressors might be expected, this may indicate an inferior immune response. Reliance on aggregation in extrapolating from skeletal data to health trends oversimplifies (and potentially distorts) the relationship between the contemporary patterns of morbidity and mortality.

Taking Wood et al.'s (1992) observations to their logical conclusion, an increasing population frequency of skeletal lesions (such as those found in remains from the period of the transition to agriculture) might equally well reflect improving as deteriorating health. Such a contention is refuted by consistent evidence to the contrary, however. Overall, the consensus is that while skeletal lesions must be read with caution, it is valid to interpret these as indicators of disease burden (Goodman 1993; Steckel and Rose

2002c; Steckel et al. 2002). Nevertheless, Wood et al.'s (1992:356) proposition that 'better health makes for worse skeletons' is a constant reminder of the importance of caution in interpreting disease experience at the individual as well as at the population level.

Wood et al. (1992) also argue that palaeopathology research has largely ignored demographic non-stationarity (constant change within population number and structure), selective mortality (the sample comprises only the dead, not those of the whole population 'at risk'), and hidden heterogeneity in risk (individual variability in frailty) (Wood et al. 1992:344). Taking these concerns together with the other problems confronting palaeopathology analysis, what emerges is the difficulty of achieving a representative population for palaeoepidemiological purposes. While sophisticated statistical modelling may overcome some difficulties (e.g. Paine and Boldsen 2002) and, *contra* Wood et al. (1992), aggregation is now a well-accepted approach for identifying large-scale trends in population health status in later periods of prehistory (chapters in Steckel and Rose 2002a; Steckel et al. 2001), with most researchers agreeing that uncertainty regarding representativeness is inevitable when working with prehistoric small to medium-size samples (e.g. Ortner 2009; Waldron 1994).

3.2.2 *Implications for identifying cases of healthcare provision in the archaeological record*

The problems faced in recognising, diagnosing, interpreting and quantifying pathologies in skeletal remains have clear consequences for identifying potential cases of healthcare provision in prehistory and, where inference of caregiving is possible, for determining the likely characteristics of that care.

Inference of care derives from osteological indicators suggesting survival with, or following, disability, but many diseases with the power to cause serious functional impairment will affect soft tissue only - regardless of their potential to affect bone. Some pathologies only register in bone once chronic, but clinical experience suggests that impact on functioning capability is likely to have manifested well before this; the challenge lies in estimating the period for which the individual may have required care before the disease developed to this stage - and in assessing how health-related needs and caregiving responses likely developed over time. An individual displaying skeletal indicators of debilitating pathology acquired shortly before death may have received

care, but this can only be inferred if bone remodelling indicates a minimum period of survival; the result is that most perimortem care will be indiscernible. Incomplete or poorly preserved remains mean that even where sufficient evidence exists to identify and diagnose pathology, evidence relevant to inference of care may have been lost. Where there is osteological evidence of health stress, but a specific diagnosis is not forthcoming, then reference to commonly associated symptoms and complications to assist in understanding the likely range of disease impacts is not possible. The need to acknowledge individual variability in disease response - 'heterogeneity in frailty' - when assessing possible need for healthcare is again noted, and this consideration limits inference of receipt of care to those individuals whose remains display evidence of severe pathology.

Variants on the osteological paradox (Wood et al. 1992) apply to inference of healthcare provision. What if an individual received care for a disabling infectious disease and recovered, or died, before pathology became chronic and registered in bone? Or an individual received care for a disease that does not impact bone - or at least not in the case under consideration? Or an individual suffered traumatic injury, received immediate care, but died before bone remodelling became apparent? Or care was provided for trauma, with subsequent erasure of the signs of injury by bone remodelling? None of these examples provides the skeletal evidence necessary for the inference of caregiving, but many prehistoric individuals falling into these categories will have received care from others.

There can be no doubt that experience of disability has always been a 'universal human phenomenon' (Bickenbach et al. 1999:1179; WHO 2011). Much of this experience will be invisible in the archaeological record, however, and this means that, in turn, the level of healthcare activity in response to disability will always be underestimated.

3.3 The demand for healthcare in prehistory

'Disability is a constant, regularly occurring condition in all human groups'
(Scheer and Groce 1988:26).

The ubiquity of disease and its potential impact on hominid reproductive fitness has led some researchers to argue that a symbiotic relationship between the experience of pathology and the behaviour of care was critical to achieving the increased longevity essential for human evolution (Sugiyama 2002, 2004a,b; Hill et al. 2007, 2009; Kaplan

et al. 2000). Many of the acute and chronic bacterial and viral infections afflicting humans today have an antiquity that predates hominid evolutionary divergence (Cohen and Crane-Kramer 2003; Nataro et al. 2003), and although it is generally agreed that small group size, isolation and mobility prior to the transition to agriculture constrained both variety and virulence of pathogens reliant on human transmission (e.g. Drake and Oxenham 2012; McMichael 2001; Martin 2003), life in earlier prehistory was by no means disease free. Most pathologies usually associated with the establishment of larger, sedentary groups likely existed well before sedentism, albeit with possibly lower levels of pathogenicity - sufficient to cause disease while not killing off the human host (Ewald 2003). Groube (1996) argues that both high mortality diseases (such as cholera, measles, typhus and malaria) and lower mortality, but potentially high morbidity, diseases (such as respiratory and gastrointestinal infections) can be sustained in small group settings, and evolved immunological responses suggest many such pathologies date to at least the Upper Palaeolithic. Martin (2003) notes that, well before animal domestication, humans were exposed to zoonoses (and zoonotic disease vectors) through hunting and scavenging activities.

Evidence for systemic health stressors, degenerative joint disease, localised and systemic infections, congenital pathologies and trauma has been recovered from the earliest hominid remains (e.g. Berger and Trinkaus 1995; Hublin 1985; Walker et al. 1982) onwards (e.g. Cohen and Armelagos 1984; Steckel and Rose 2002a). Rothschild (2003; Rothschild et al. 1995) suggests treponemal diseases date back more than 15,000 years; the earliest known cases of tuberculosis in humans dates to 9000 BP (Hershkovitz et al. 2008; Rothschild 2003 reports evidence of tuberculosis in animals dating to 17,000 BP); and human experience of malaria may extend back at least 10,000 years (Ewald 2003). Allison (1984) found evidence of a high prevalence of respiratory tract infection in South American mummies dating from 8000BP to early colonial times, noting 'it would be no exaggeration to say that for the past 8000 years most Americans have died of the same causes, acute and chronic respiratory diseases' (Allison 1984:521). Ewald (2003) points out that infectious agents now implicated in a range of chronic pathologies including certain cancers, Alzheimer's disease and schizophrenia were very likely active in the past as well. There can be little doubt that there was substantial demand for health-related care in prehistory.

The last section of this chapter concluded that disease and disability in prehistory must always be underestimated. Nevertheless, despite the limitations of osteological

evidence, Ortner (2003) is able to report that

... [i]n typical archaeological human skeletal samples about 15 per cent of burials will show evidence of significant disease. Between 80 and 90 per cent of the pathological burials will be included in varying proportions of three major categories of pathology: (1) trauma, (2) infections and (3) arthritis (Ortner 2003:112, emphasis added).

What Ortner (2003) means by 'significant' is not defined. Not all - perhaps not even most - individuals experiencing 'significant disease' will have been dependent on caregiving for survival - although many likely received a level of support regardless. However, as argued in Chapter 2, the palaeopathology literature contains sufficient evidence of remains displaying indicators of such severe pathology that the need for some sort of assistance cannot be doubted, supporting the premise of a constant, and certainly not *insignificant*, need for care in the past.

Ethnographic studies in communities with lifestyles comparable to those of the pre-industrial past can contribute to the consideration of past health-care requirements by providing examples of what these needs consist of in practice - always recognising that the experience of modern subsistence economy groups, however isolated, cannot be automatically transposed to that of prehistoric communities. Sugiyama (2001, 2002, 2004a,b; Sugiyama and Chacon 2000), for example, examines health risk and community response in two Amazonian horticultural/forager communities, explicitly using these group members' experiences and behaviours as proxies for those of early humans. Sugiyama (2004a:382-384) recorded high rates of both reported and observed illness and injury; of those reporting illness, 88 per cent experienced disability (defined as inability to participate in normal duties and activities) of 14 days or more, and 65 per cent reported disability of over 30 days. Sugiyama (2004a) concludes that without healthcare provisioning most of those in the two latter groups would not have survived. Proximate causes of reported disability include pathologies potentially evident in skeletal remains, such as broken bones and systemic infection associated with untreated dental abscess, but for the most part comprise predominantly soft tissue pathologies such as snake, insect and animal bites; parasitic infestations; bacterial infections associated with lacerations and puncture wounds; childbirth-related trauma; burns; unknown infections; and acute but non-attributable pain (disability resulting from malaria, respiratory disease and stroke was observed during the study period, but not included in frequency calculations) (Sugiyama 2004a:382). Sugiyama (2004a) argues

that, allowing for the fact that different health stressors correspond to different ecological contexts, these findings provide a valid approximation of the disease burden endured by prehistoric communities, and illustrate the importance of healthcare provision to individual *and* group survival throughout human evolution.

Studies of different populations present a similar picture. Kaplan et al. (2000:173-175) report comparable findings to those of Sugiyama (2004a,b; Sugiyama and Chacon 2000) from hunter-gatherer groups in Africa and other regions of the Americas. Lewis (1975) details pathologies observed in a Papua New Guinea subsistence community over a year, including malaria, respiratory, cardiovascular and gastrointestinal diseases (likely invisible in the skeletal record), as well as accident and occupation-related trauma. Almost 12 per cent of incidents involved withdrawal from usual activities for over 14 days, and one-third of these involved withdrawal for over 30 days (two cases received care for over 220 days) (Lewis 1975:115). In over 10 per cent of cases disability was so severe that 'to walk unaided would have been impossible or a great hardship' (Lewis 1975:112). Lewis (1975:112) noted that in 13 per cent of cases individuals presented in distress but without physical signs of inability to function, and were cared for until they felt capable of returning to their normal occupations. Frankel (1986) documents similar experience of, and response to, disease within an unrelated Papua New Guinea community. Hewitt (2003) examines the health status of individuals in present-day pre-industrial communities (ranging from hunter-gatherer to early agriculturalist) in Paraguay, Brazil, the Sudan, Malaysia and India, again reporting patterns of morbidity resembling those above.

While it is impossible to extrapolate directly from present day burden of disease to prehistoric experience, modern population health data also provide an interesting reference point. In the WHO (2004) report on the global burden of disease, the ten leading causes of morbidity (and, with the exception of the last of the conditions listed below, mortality as well) in the developing world included lower respiratory tract disease, diarrhoeal disease, cardiovascular disease and psychological depression (WHO 2004:12, 44). None of these diseases (with the possible exception of certain respiratory pathologies under certain conditions) is likely to produce diagnostic skeletal markers, yet all would have been present in prehistory. The WHO *World Report on Disability* (2011a) estimates that at any one time approximately 15 per cent of adults experience 'significant [severe or extreme] functioning difficulties in their everyday lives', with 2.2 per cent of adults experiencing 'very significant [extreme] functioning difficulties'

(WHO 2011a:27, 289) - proportions very similar to those adults described as either 'severely disabled' or as suffering a 'moderate long-term disability' in the earlier WHO report (WHO 2004:33).

There is no basis for supposing different rates of disability in the past. Average life expectancy in most periods of prehistory was significantly lower than it is in developed countries today, although no lower than that in some of the poorer modern developing nations (WHO 2004; Steckel and Rose 2002b). (Age attribution in prehistoric adult skeletal remains is the subject of controversy, with evidence increasingly suggesting persistent underestimation of age at death [e.g. Aykroyd et al. 1999; Bello et al. 2006]). The WHO (2004:33) notes that disability prevalence increases with age, and lower life expectancy in prehistory means that frequencies of age-related morbidities and associated disabilities, such as cardiovascular disease and related impact on functioning capability, were likely much lower than they are today. It is also the case that certain 'modern' diseases, such as some cancers, are associated with exposure to environmental agents unlikely to be present in prehistory (McMichael 2001). Countering this is the general prehistoric experience (depending on context) of greater levels of exposure to risk of physical injury and to debilitating health stressors associated with lifeways variables, together with lack of recourse to effective medical therapies.

In summary, the evidence from palaeopathology, ethnography and epidemiology reviewed above supports the assumption of a rough equivalence in frequency and level of disability - and therefore need for care - between prehistoric and modern times.

3.4 Identifying 'constants of care'

Although ways of understanding, explaining and, to some extent, experiencing health, disease and disability may be culturally determined, human biology dictates a fundamental uniformity across time and culture in physical expressions of, and physiological reactions to, specific pathologies. Logically, the next step is to consider whether there are characteristics of basic healthcare practice that are equally universal in their nature.

In both prehistoric and modern contexts, the fine detail of care will be shaped by lifeways variables (Leininger 1988). Here it is argued, however, that where a pathology is reliably associated with a continuum of clinical signs and symptoms there will be certain practical requirements so fundamental to effective healthcare as to constitute

'universals' or 'constants' of care - even taking into account individual heterogeneity in response to disease. In other words, some conditions will generate certain requirements for care which are so essential that, if they are not met, the individual with the pathology will most likely not survive - or be unlikely to survive for the length of time necessary to produce skeletal indicators meeting the criteria for inclusion in a bioarchaeology of care analysis.

In the bioarchaeology of care methodology a pragmatic and inclusive definition of 'health-related care provision' divides this behaviour into two broad categories of action - 'direct support' and 'accommodation'. 'Direct support' refers to applied, practical assistance given to an individual experiencing a pathology rendering them temporarily or permanently incapable of performing one or more functions necessary for survival, and it extends from the uncomplicated provision of nourishment and shelter to specific, sometimes sophisticated, and sometimes potentially costly (in terms of allocated resources) interventions to manage disease impact in the short, medium or long term.

'Accommodation' is a slightly more nuanced concept, referring to adjustments made to group normative expectations, demands and practices to enable someone compromised in functioning capability to participate within the community at some level. In an archaeological context, 'accommodation' would usually be apparent in situations of medium to longer term or permanent disability, a disability not severe enough to require 'direct support' but likely to have significantly restricted the individual in lifeways activities typical of their demographic cohort.

The distinction drawn between 'direct support' and 'accommodation' is an artificial one, proposed as an heuristic device for structuring analysis and interpretation of inferred healthcare. Neither domain is exclusive of the other, and many cases of caregiving will involve elements of both - simultaneously or sequentially.

3.4.1 Care as 'direct support'

Constraints operating on the expression of disease in bone mean that in many instances where provision of direct support can be inferred this will likely have taken place over a period of time, and in all probability will have comprised activities which, in western society, now fall under the heading of 'nursing' (e.g. Henderson 1964, 1978; Kim 2010; Watson 1999). Even where evidence suggests 'specialist' intervention such as surgery, the subsequent care (wound management) critical for survival falls into this category.

Successful nursing of those experiencing disease requires an array of highly-developed cognitive skills (Kim 2010:51ff) to deliver ‘culturally congruent care’ (Leininger 1988:158), and the relevance of these observations to the interpretation of prehistoric healthcare provision will become apparent in Chapter 5. In arguing that there are identifiable ‘constants’ of care, the following text examines the nature and scope of what are today regarded as ‘nursing’ practices and suggests that, with some modification, these correspond to the range of practices likely to have been required of, and feasible for, carers in prehistory.

Henderson (Henderson 1964, 1966, 1978; Henderson and Harmer 1955), one of the earliest and most influential nursing theorists, identified 14 areas of universal human physiological and psychological need that provide the focus for, and define the functions of, nursing care (Henderson 1964), and these are reproduced in Table 3.1. In many aspects, Henderson’s 14 ‘components of nursing practice’ (Henderson 1964:65) reference Maslow’s (1943) theory of a universal ‘hierarchy of needs’ (needs to which everyone is subject, and which begin with the need for sustenance and safety and progress towards the need for self-actualisation) (Current Nursing 2011). While Henderson’s writings reflect the demarcation between roles of doctor and nurse standard for the time (Harmer and Henderson 1955; Henderson 1964, 1966), the areas she identifies as essential to health and as comprising the core of nursing responsibility incorporate an holistic understanding of health and healthcare, and are axiomatic in nursing practice today (e.g. Kim 2010 chap 1; Current Nursing 2011). The 14 components of nursing practice were developed on the basis of Henderson’s extensive healthcare experience, and provide an empirical foundation for teasing out possible ‘constants’ of care practice.

TABLE 3.1 Henderson's 14 components of nursing practice *

1. Breathe normally.	8. Keep the body clean and well groomed and protect the integument.
2. Eat and drink adequately.	9. Avoid dangers in the environment and avoid injuring others.
3. Eliminate body wastes.	10. Communicate with others in expressing emotions, needs, fears, <i>et cetera</i> .
4. Move and maintain desirable posture.	11. Worship according to one's faith.
5. Sleep and rest.	12. Work in such a way that there is a sense of accomplishment.
6. Select suitable clothes [both for the environment and to allow mobility etc.] - dress and undress.	13. Play, or participate in various forms of recreation.
7. Maintain body temperature within normal range by adjusting clothing and modifying the environment.	14. Learn, discover or satisfy the curiosity that leads to "normal" development and health, and use the available health facilities.

*From Henderson, V. 1964 The nature of nursing. *The American Journal of Nursing* 64:62-68 (p65).

Henderson's (1964) components 1 - 9 can be understood as addressing physical and physiological requirements for survival (components 10 - 14 are discussed later in this section of the chapter). If the individual cannot function in one or more of these areas, these needs must be met by carers - and this will involve the sort of assistance defined in bioarchaeology of care terminology as 'direct support'.

The actions necessary to compensate for dysfunction in the domains identified can be elaborated to produce a list of 'constants of care' practices that are relevant to *all* periods of human history, including the very earliest. This is attempted in Table 3.2. Notably, the contents of this Table do not correspond to Henderson's (1964) components in every detail, because while the essentials of biological response to disease and the basic healthcare practices required to address these have not changed over time, the context in which caregiving is undertaken *has* changed - and context determines how care is provided (Leininger 1988; 2002). Henderson was writing for nurses working in teams comprising different medical professionals operating in

institutional environments; the caregiving explored in this thesis occurs in mobile, semi-sedentary or only recently settled, small-group, subsistence environments, and the brief commentaries accompanying each care constant proposed in Table 3.2 reflect this.

One further point must be made. The experience of pathology and associated disability is rarely a static one, and the type and level of need for care varies accordingly (e.g. Caron and Bowers 2003). Although almost certainly all prehistoric individuals identified in a bioarchaeology of care approach as likely receiving 'direct support' at some stage would have required more than one of the forms of care outlined in Table 3.2, and many may have required most or even *all* of these forms of support over a short period (for example, during the acute phase of disease), only those suffering the most severe pathology would have required the full complement of support activities on a long-term basis.

TABLE 3.2 'Constants of care' (direct support) *

1.	<p>Provision of food and water [<i>Henderson component 2</i>]</p> <p>Adequate nourishment and hydration are fundamental to survival, and relatively non-problematic to achieve. Problems with nutrient absorption (e.g. edentulism, complications of immobility) may require a special diet and/or additional food processing. Some pathologies (e.g. cleft palate, paralysis affecting upper body function) may require assistance with feeding/drinking.</p>
2.	<p>Maintaining body temperature within normal range / protection from the elements [<i>Henderson components 6 and 7</i>]</p> <p>At its most simple this involves protection from adverse climatic impact, through provision of shelter, shade and/or an independent source of warmth. This latter might comprise fire and/or manufactured covering (e.g. animal hide, textile). Dependent on functioning capability this 'constant' might include assistance in dressing.</p> <p>At a higher level of complexity, maintaining normal body temperature may require intervention to reduce temperature (e.g. controlling fever) or to raise core temperature.</p>

3.	<p>Facilitation of rest and sleep [<i>Henderson component 5, partial component 4</i>]</p> <p>Adequate rest and sleep are integral to disease management, and interventions to achieve these are often specific elements of therapy (e.g. postural adjustment to reduce discomfort [Henderson component 4, and [8] below]; provision of pain relief).</p> <p>Archaeological inference of interventions to assist rest and sleep is limited to instances in which the individual (i) would have been incapable of achieving a position conducive to these outcomes unaided (e.g. paralysis) or (ii) experienced a pathology for which rest may be assumed essential (e.g. head injury, lower limb fracture).</p>
4.	<p>Ensuring physical safety [<i>Henderson component 9</i>]</p> <p>This might include protection against external environmental hazards (ranging from humans, animals, reptiles or insects to unknowable demons or elements of a hostile cosmos) as well as domestic ones (e.g. open hearths or passages over rough, steep terrain posing dangers for someone with impaired mobility or vision).</p> <p>Further, individuals suffering pathology leading to loss of control over behaviour may attempt injury to themselves or others, and may require restraint. In some cases, ensuring a disabled person's physical safety requires a level of monitoring (see [6] below) that makes this care 'constant' difficult and demanding.</p>
5.	<p>Maintaining / assisting mobility [<i>Henderson partial component 4</i>]</p> <p>If independent mobility is significantly compromised the individual may require support in most basic tasks (e.g. maintenance of personal hygiene - [7] below). Mobility may be an integral element in recovery from and/or management of disease; the physiological consequences of medium to long-term immobility can be fatal.</p> <p>A mobility-challenged individual in a mobile community may require assistance to keep up. This might range from concessions for disability (e.g. slower progress, exemption from load carrying) to providing transport (e.g. portage). The former end of the spectrum more accurately falls into the category of 'accommodation'.</p>
6.	<p>Monitoring health status [<i>no Henderson equivalent</i>]</p> <p>In many diseases, health status monitoring is essential to allow timely response to physiological needs and to avoid health crises; such monitoring is particularly critical in relation to the requirements described in the care 'constants' [7], [8] and [9] below.</p> <p>[Henderson (1964) does not identify monitoring as a 'component', possibly because it is integral to professional nursing practice. In a non-institutional context, with 'non-professional' carers, monitoring must be specifically acknowledged as essential for effective care.]</p>

7.	<p>Maintenance of personal hygiene and protection of the integument [<i>Henderson component 8</i>]</p> <p>Where an individual is not capable of maintaining personal hygiene, then establishing and maintaining a state of general cleanliness (e.g. removal of body wastes, regular bathing) is essential to preserving skin integrity and preventing and treating surface infection. Preservation of integumentary integrity is critical in preventing development of potentially lethal pressure sores in immobile individuals.</p>
8.	<p>Physical manipulation: 'move and maintain desirable posture' [<i>Henderson component 4</i>]</p> <p>Physical manipulation includes activities such as rolling, turning, lifting, positioning, stretching, massage and percussion, and is fundamental to the successful care of semi-mobile and immobilised individuals. Regular repositioning is critical to minimising risk of pressure sores and facilitating recovery from these (see [7]). Helping the individual achieve and maintain a comfortable posture is important for physical <i>and</i> psychological reasons (see [3]).</p> <p>Over a range of conditions, physical manipulation may help maintain or improve physiological functioning (e.g. positioning, massage and percussion assist respiratory functioning; positioning and massage assist gastrointestinal and circulatory functioning) - see [9] below.</p>
9.	<p>Maintenance of physiological functioning [<i>Henderson components 1 and 3</i>]</p> <p>Timely response to challenges affecting metabolic, respiratory, gastrointestinal, circulatory and urinary function is essential to survival. Physical interventions ([8]) may assist. Appropriate diet and maintenance of hydration may avert or alleviate metabolic, gastrointestinal and urinary complications ([1]). Although management of internal haemorrhage would be beyond prehistoric capability, staunching external haemorrhage (tourniquet, pressure, cauterisation, wound-stitching) would likely have been achievable.</p>

*This Table builds on Henderson's components of nursing practice, Henderson, V. 1964 The nature of nursing. *The American Journal of Nursing* 64:62-68 (p65).

All Henderson's (1964) components 1-9 are retained in Table 3.2, although some may have been more broadly interpreted than Henderson intended. However, even where Henderson's (1964) components of nursing practice are adopted with minimal or no change, they have been reordered along what is best described as a continuum of 'basic' to 'advanced' care. This distinction does not imply that various tasks were carried out in

any particular order, or by different people, or at different times, or are of different levels of importance. Caring for a disabled individual is an integrated activity, with all aspects of care contributing to preserving life, and all combining to determine the effectiveness of the care provided. The elements of care outlined in Table 3.2 are best conceived of as pieces in a jigsaw puzzle, with even the smallest piece necessary to complete the picture. The reordering of components simply recognises that some forms of care may be more intimate, more sophisticated, and/or more labour-intensive than others, possibly offering insights into levels of skill and commitment involved.

Analysing likely components of health-related care in relation to the resources available in the contemporary lifeways setting may help to identify some of the material characteristics of the care provided (for example, by what means might *this* paralysed individual have been transported in a mobile society? What did the diet of *that* edentulate or immobilised individual comprise?), as well as some of the likely costs, in terms of labour and material resources incurred in the caregiving process. Such details inform both the development of a model of care and interpretation of the wider sociocultural implications of caregiving, and are discussed in these contexts in Chapters 5, 6 and 7.

The last five of Henderson's (1964) components of nursing practice apply to both 'direct support' and 'accommodation', and address chiefly psychological requirements: variously, communication; religious expression; feelings of accomplishment; play; and self-actualisation. Researchers in psychology, public health, anthropology and sociology unanimously acknowledge the importance of social engagement and inclusion to both health-related quality of life and increased survival rates among individuals limited in their potential for community participation by disability (e.g. Broadhead et al. 1983; Paradies 2006; Strine et al. 2008), and there is no reason to suppose that these areas of human need were less significant in the past than they are in the present. Identifying whether and what practices may have been undertaken to meet these needs in prehistory is indisputably speculative, but - as will be argued in Chapter 6 and illustrated in the case studies in Chapters 8, 9 and 10 - not wholly impossible.

3.4.2 *Care as 'accommodation'*

Care in the form of 'accommodation' does not lend itself to the same process of deconstruction as care in the form of direct support. Adaptations made to allow a disabled person to function within their community will always differ, because each individual's circumstances - their abilities and handicaps, personality, family relations, domestic arrangements and general lifeways environment - are unique.

To extract the maximum information possible, analysis of the likely characteristics of accommodation requires contextualisation. For example, as raised in relation to [5] in Table 3.2 above, individuals with restricted mobility in a mobile society will require some form of special arrangement to enable them to keep pace with the group, and where the terrain is arduous, the need for special concessions or practical assistance will be correspondingly greater (see discussion relating to the needs of the Mesolithic dwarf Romito 2 [Dettwyler 1991; Frayer et al. 1987] in Chapter 2). In a hunter-gatherer economy, mobility-challenged individuals may be unable to take up the 'normal' productive role of others in their cohort, and by referring to lifeways variables it may be possible to identify a range of potential non-traditional roles available, although we are rarely likely to be able to identify what precise role was actually allocated or adopted. Individuals with normal lower body mobility, but with compromised upper body function or general constitutional weakness, may be unable to carry out activities such as carrying, lifting, digging, hunting or foraging - or at least unable to perform these efficiently. Taking into account cultural, economic and physical environments, it may be possible to identify a realistic range of alternative tasks the individual possibly engaged in, although exact correspondence will almost certainly be impossible (Chapter 10 case study illustrates this point).

In some instances it may also be possible to look at the other side of the accommodation equation; exploring not only how the individual's needs and (different) abilities may have been accommodated, but also what this accommodation may have meant in terms of costs for the community. For example, where an individual was incapable of carrying out 'normal' duties, would they have been able to free-up the labour of others by taking on alternative (non-normative) work, or would group members have had to compensate for the individual's reduced productivity by taking on additional responsibilities without any such relief? Again, such interrogation will help inform broader interpretation of case study material, and is discussed in Chapter 5.

3.5 Implications for a bioarchaeology of care.

The issues covered in this chapter have fundamental implications for scope and structure of a bioarchaeology of care approach, and these are summarised below.

Firstly, limitations to archaeological research into healthcare provision need to be acknowledged. Although the presence of disease is established as a constant of human existence, restrictions inherent in reliance on often poorly preserved osteological data to identify pathology in prehistoric remains mean that many instances of likely disability will never be retrievable from the archaeological record. Even when experience of pathology is discernible in the skeleton, diagnosis of specific disease and/or identification of the extent of disease impact may not be possible, and as a result of this information potentially available from consideration of commonly associated clinical signs and symptoms is inaccessible for analysis.

The criteria for inferring healthcare provision from evidence in skeletal remains are difficult to meet. They require osteological evidence of survival with, or following, a particular disease or disease impact that, on the balance of probability, is likely to have caused a level of disability which, in the contemporary lifeways context, would have required caregiving by others.

This burden of proof means that both the level of disability in prehistory and the extent of health-related care practice in prehistory will always be significantly underestimated.

Secondly, it is clear that even when osteological indicators of severe pathology are incontestable, interpretation of these in terms of impact on functioning must be undertaken with great caution. Although it is valid to assume basic uniformity in the range of potential physiological responses to a specific pathology, understandings of health and disease are shaped by cultural context. Individual variability in manifestation of disease signs and in experience of disease symptoms is well established, and only the minimum disease impact corresponding to skeletal evidence can be assumed.

Further, because disability is as much a social as a biological construct, analysis of disability must always be situated within the corresponding lifeways setting, and this requires knowledge of prehistoric context, which in many cases may be limited. The WHO ICF (2003) offers a well-validated methodology for operationalising disability in a modern context. Adapting elements of this and related instruments in Stage 2 of the bioarchaeology of care methodology (Chapter 6) enables integration of sociocultural,

economic and environmental variables in assessing clinical and functional impacts of disease in prehistory, but for all the reasons canvassed above analysis will inevitably be based on imperfect information. Nevertheless, this contextualised strategy provides a systematic approach to identifying prehistoric disability status that is open to review.

These observations emphasise the need for researcher conservatism in interpreting disability impact and inferring healthcare provision.

Thirdly, while the specifics of health-related care will always differ in accordance with lifeways variables and the personal characteristics of the disabled individual, broad categories of applied care practice ('care constants') are another matter. The uniformity of basic, biologically-mediated responses to specific disease stimuli extends to the basic healthcare required to address various categories of disease impact. For example, although it will usually be impossible to tell whether any individual was treated with religious invocations, pharmaceuticals or myriad other remedies, anyone unable to fend for themselves will minimally require provisioning with food and water, and possibly protection against hostile aspects of their environment as well; anyone who is bedridden will require shelter, assistance with hygiene maintenance, physical therapies and monitoring to minimise complications; and anyone who is mobility-challenged, particularly in a non-sedentary lifeways, will require assistance and/or accommodation to keep up with their group.

Similarly, it is likely that individuals living with disability in the past experienced psychological and social support needs as well as physical ones, although admittedly it is controversial to suggest that 'social support' as a form of caregiving can be inferred from the archaeological record (see discussion Chapter 2). As previously noted, the possible contribution of a positive social environment to survival with severely disabling pathology will be discussed in Chapter 5 (and Chapter 7), but is again foreshadowed here.

In conclusion, while there will have been considerable variation in the detail of prehistoric healthcare, shared human physiology means that fundamental elements of care practice (detailed in Table 3.2) are constant across all lifeways. Identifying the likely biomedical consequences of a particular disease state will allow inference of some of the care practices likely employed to achieve survival - in turn enabling construction of a basic 'model of care'. Stage 3 of the bioarchaeology of care methodology is dedicated to this task, and the process involved is fully explained in Chapter 6.

Finally, while it will be argued in Chapter 5 that both the decision to give care and the type of care provided offer valuable clues to broader aspects of community identity, limitations to expression of disease in bone, combined with the lottery of preservation, mean that individual examples of care cannot be claimed as 'typical' of either attitudes to disability, or care practices more generally, within the corresponding social group. And the converse applies: the fact that no skeletal evidence for caregiving is forthcoming at a particular site does not mean that this community denied care to disabled members, nor that members of this community enjoyed freedom from disability.

Given this, it would be invalid to aggregate essentially randomly-recovered, discrete examples of prehistoric care in an attempt to identify population-level patterns of healthcare provision or to predict the likelihood of giving (or withholding) care under a particular set of circumstances - making questions such as 'was early Neolithic culture more caring towards those with disabilities than the later Neolithic culture?' or 'were men with disabilities more likely to receive care than women with disabilities?' impossible to resolve. Where there are multiple examples of caregiving within a contemporary, localised group it may be possible to identify behavioural consistencies, however, and the ramifications of this are explored in the case study in Chapter 10.

The fundamental principle arising from this is that each instance of prehistoric healthcare provision must be analysed individually. The bioarchaeology of care methodology must, by definition, be case study-based.

This chapter has focused on establishing conceptual and empirical contexts for archaeological identification and analysis of healthcare provision in prehistory. But what explains caregiving behaviour in the first place? What makes caregiving a possible, acceptable, or desirable response to another's experience of disease? The following chapter draws on debate surrounding the origins of care-related aspects of behaviour to address this question at a theoretical level.

CHAPTER 4. The Origins of Care

If the process of analysing prehistoric health-related care can be understood as a narrative, as suggested in the Introduction, then the previous chapters have focused on unpicking the elements of what, when, where and how. Chapters 4 and 5 respectively untangle the why and the who.

Identifying what the behaviour of caregiving may reveal about social praxis and identity is simultaneously the most important and the most controversial goal of the bioarchaeology of care approach. To attempt this level of inference without considering the role of motivation - the 'why' - in driving care provision is clearly impossible. Equally clearly, the motivation for providing care in each individual case will comprise a unique combination of factors, the fine detail of which will be inaccessible to archaeologists. Yet there are a number of questions that go to fundamental aspects of motivation for care, and considering these can help in developing a theoretical foundation for the archaeological interpretation of this complex behaviour.

There is evidence for human engagement in health-related caregiving from at least the middle upper Palaeolithic onwards - evidence, moreover, that much of this care was provided in circumstances which likely rendered it challenging to initiate and difficult to sustain (see Table 2.1). Therefore the most basic question of all is why did 'care' develop as a behavioural response to the impact of pathology in the first place? Why was this behaviour frequently maintained in situations that either placed care-providers from subsistence economy lifestyles under additional stress, or in which recovery of the disabled individual was unlikely or impossible, or both? What benefits did caregiving offer that compensated for its costs - emotional as well as economic?

This chapter explores the origins of care. It considers the components of care and the possible drivers of caregiving; whether caregiving evolved as a biological or a cultural solution to conspecific experience of disease; and whether it is even possible to distinguish between the processes of biological and cultural selection in relation to care. It then addresses what the views held on the origins and underlying motivations of healthcare provision imply for a bioarchaeology of care approach.

As a topic, the 'origins of healthcare' deserves its own thesis; in this one it receives a single chapter. This is unavoidable given dissertation constraints, but it results in an important, inherently complex subject, integral to constructing the 'big picture' of caregiving, receiving an abbreviated coverage.

4.1 Healthcare as the product of biological selection.

If healthcare is an intrinsically human behaviour selected for through biological evolutionary processes, then one might expect evidence of healthcare practice in the behaviour of close non-human primate relatives as well as in that of early *Homo*.

4.1.1 Non-human primates and health-related care.

There is an extensive literature documenting non-human primate experience of pathology, some which describes - although rarely attempts to explain - survival following serious acquired injury including long bone and other postcranial fractures, (partial) limb amputations, and cranial trauma (Degusta and Milton 1998; Jurmain 2000; Lovell 1990 a, b; Lovell 1991; Nakai 2003; Schultz 1939; Stokes and Byrne 2001), and survival with acute and chronic diseases including osteomyelitis (Lovell 1990 a, b; Lovell 1991), polio (Goodall 1971:199ff) and severe osteoarthritis (Lovell 1990a, b; Jurmain 2000). Yet despite such observations there appears little evidence of health-related care provision. In a wide-ranging assessment of disease and injury among non-human primates Lovell (1991) not only fails to find evidence of conspecific healthcare, but uses this failure to warn against reading care practice into *human* primate behaviour (citing Dettwyler [1991] to support this). Long before Lovell (1991), Schultz (1939) had reached a similar conclusion.

De Waal (1996) documents a few exceptions in which non-human primate individuals with either a congenital abnormality or an acquired pathology appear to gain group acceptance, expressed in protection from (usually with-in group) aggression, and assistance in overcoming environmental obstacles. However, he ascribes this to a default 'tolerance of difference' rather than purposeful provision of care (de Waal 1996:47-53). Describing instances of primate concern (soothing and stroking) for injured group members, de Waal also documents cases in which diseased or injured primates are ignored or attacked by group members, apparently in direct response to

their disability (de Waal 1996:47-53), and similar manifestations of fear and/or aggression towards disabled conspecifics has been noted by other researchers (e.g. Goodall 1971; Shimada and Matamula 2004).

Most of de Waal's (1996) observations involve primates in protected environments or in captivity, making interpretation of behaviour in an evolutionary framework equivocal. Mozu, a macaque born without hands or feet which nevertheless survived for more than 18 years, successfully rearing five offspring and ultimately winning acceptance by the alpha group is one of the most frequently cited instances of primate compassion reported by de Waal (1996:6-9). However, Mozu inhabited a conservation park, where monkeys received daily rations from attendants and were not in competition for survival, and Mozu received twice as much food as other monkeys to compensate for her handicap (de Waal 1996:7). Mozu's was not a natural environment, and this example illustrates the need for caution in extrapolating from animal studies.

There are some instances in which healthy chimpanzees have intervened to protect a disabled group member from aggressive conspecifics. Goodall (1971:200-3) reports that the chimpanzee Hector shadowed the terminally ill chimpanzee Mr Macgregor, occasionally intervening to discourage aggression by other group members. When Mr Macgregor failed to keep up with the group, Hector fell back too; behaviour interpreted as protective. Hector was not observed providing Mr Macgregor with food, nor assisting him in any other capacity (such as building a sleeping nest). Attempting to explain the obvious bond between the apes, Goodall (1971) suggests that Hector was probably close kin to Mr Macgregor. Similarly, Shimada and Matamula (2004) report that on several occasions when a diseased chimpanzee was treated aggressively various group members intervened to protect her. In this case, aggressors and protectors were a mixture of kin and non-kin, with no particular pattern observed (Shimada and Matamula 2004).

In both the above examples the diseased chimpanzees were likely attacked because they were sick, and in Mr Macgregor's case, possibly because polio had reduced a once-dominant male to extreme vulnerability. It is impossible to assess whether protective interventions were a response to the fact that the victims were disabled or a generalised response to aggression towards a vulnerable group member (in other words, the defender chimpanzees may have intervened in the same manner if healthy, but weaker, members had been similarly threatened). In neither case was there a systematic approach to protecting the diseased chimpanzees, and although it could be argued that

the protective behaviour corresponds to number 4 of the care ‘constants’ proposed in Table 3.2, it is a stretch to classify these responses as evidence of predominantly healthcare-driven activity.

Despite the dearth of evidence for health-related care among non-human primates, there are examples suggesting care provision is not completely unknown. In some groups high levels of support are provided to severely disabled infant conspecifics, not only, although most often, by their mothers, but also by extended kin and by (usually female) non-kin members of the group (e.g. Silk 1992; Turner 2011). This is usually explained as an extension of maternal nurturing instinct rather than healthcare provision, and it does not appear that this behaviour is consistent within different groups of the same species. Nonetheless, when it does occur, this behaviour goes beyond normal nurturing given to healthy dependent juveniles, and might be judged atypical when provided by those who are not close family members. Silk (1992) uses instances of non-human primate care for disabled infants (as well as Hector’s concern for Mr Macgregor) to argue that ‘we must have serious reservations about the claim that caregiving is unique to *Homo sapiens*’ (Silk 1992:229).

The most compelling example of non-human primate care provision involves Ivory Coast Tai Forest chimpanzees (Boesch 1991; Boesch and Boesch-Ackerman 2000). Tai chimpanzees commonly suffer injury resulting from disputes between conspecifics or leopard predation. When a member of the group is injured, care from

other group members is characteristic and results in the rapid healing of wounds not accessible to the victim, e.g. on the head ... or on the back ... All the dirt particles and blood are removed with the fingers or the mouth, and the wounds are licked clean by adding plenty of saliva. This care is provided as long as needed and, in the case of Falstaff [an adult male], was still being provided two months after the [leopard] attack (Boesch 1991:225).

Boesch and Boesch-Ackerman (2000) emphasise that among the Tai chimpanzees this care response is ‘very common, and provided to and by all group members, and not limited to close kin’ (Boesch and Boesch-Ackerman 2000:247).

Neither the support of disabled infants among certain ape and monkey species nor the singular example of the Tai chimpanzees by themselves constitute evidence for an innate predisposition to healthcare provision in non-human primates. The ‘care’ given to disabled non-human primate infants is not in itself distinguishable from normal

nurturing practice, and is perhaps best understood as an extension or generalisation of parental instinct rather than a focused response to the impact of pathology.

The Taï chimpanzees' response to injury unarguably falls into the category of healthcare. Boesch himself, however, is unlikely to suggest a pre-hominid ancestral basis for this behaviour, being scathing of what he labels a widespread tendency to draw unsubstantiated links between the conduct of non-human primates and '[w]hite middle-class Western free-ranging' humans (Boesch 2008:453, 2007). Lycett et al. (2007, 2010) have demonstrated that many chimpanzee behaviours are the result of social learning rather than biology, and the focused, consistent healthcare practice observed among Taï chimpanzees, but not recorded in other chimpanzee groups, appears better explained by the former than the latter.

4.1.2 A biological basis for human healthcare behaviours?

Although primate studies do not support a pre-hominid hereditary basis for healthcare provisioning, the issue remains of whether evidence exists for a biological evolutionary basis to health-related caregiving among humans following species divergence.

Indicators suggesting health-related care provision by *Homo Neanderthalensis* and early *Homo sapiens* populations (see Table 2.1, Cases 5-11) leave open the question of whether this care was (i) a behavioural trait inherited from a common ancestor; (ii) independent learning or independent biological evolution of a useful behaviour in (in)directly related species; or (iii) one species adopting a useful behaviour from observation of this behaviour in another species. Sugiyama (2004a:386) suggests that if healthcare provisioning can be identified in *Homo erectus* this would support an evolutionary origin for this behaviour, and urges further research. As noted in Chapter 2, instances of care practice can be inferred in pre-Neandertal hominins (Table 2.1, Cases 1-4), but this alone does not constitute 'proof' that human healthcare behaviours are hard-wired. The relatively developed reasoning capacity attributed to the early stage of hominid development (e.g. Lycett 2008; Simão 2002) suggests that any care provision is just as likely to have been the product of learned response as those practices displayed by the Taï chimpanzees (Boesch 1991; Boesch and Boesch-Ackerman 2000).

Evolutionary selection for intelligence (larger brains), combined with the reproductive restrictions of bipedalism (smaller birth canal restricting cranial size), resulted in the birth of human offspring with substantially increased altricial requirements from at least

Homo ergaster onwards, and sustaining reproductive fitness required development of uniquely human cooperative behaviours that supported longer periods of dedicated child rearing as well as increased investment in female welfare during and following pregnancy (Aiello and Key 2002; Bogin 1997; Burkart et al. 2009; Key 2000; Plummer 2004). The Grandmother Hypothesis, for example, suggests that human female survival post-menopause evolved to enable women past the age of reproduction to assist in provisioning their (female) offspring's children, thereby enhancing prospects of gene survival (Hawkes 2003; O'Connell et al. 1999; for modification of the hypothesis see Hill and Hurtado 2012). For those seeking an exclusively biological origin for healthcare provision, it might seem logical to explain the human practice of health-related care as an evolved specialisation of parental (maternal) nurture.

Fábrega (1999:68ff), whose arguments for an evolutionary basis of healthcare are discussed below, does just this. It does not appear to be a widely expressed view, however - and for good reason. Under normal circumstances the state of pregnancy and period of infant dependency are not pathological. Undeniably, some of the skill sets used in healthcare overlap with some of those employed in assisting healthy women around pregnancy and in raising dependent infants, and activities in the latter sphere may have informed activities in the former (Burkart et al. 2009). Nevertheless, caring for an individual with a specific, continuing disability entails qualitatively different sets of actions and motivations, and this is illustrated by comparing non-pathology-related maternal and infant care requirements (Barlow and Chapin 2010, and other articles on this theme in *Ethos* 2010 [Volume 38(4)]; Haas et al. 2004; Hueston and Kasik-Miller 1998) with the 'care constants' outlined in Table 3.2. This is not to deny that some mothers and probably many infants may be candidates for focused healthcare at times. However, to explain healthcare provision as merely an extension of infant nurture is to ignore the cognitive complexity involved in caring for an individual suffering the impacts of disability.

Furthermore, although there is often unquestioning acceptance of 'maternal instinct' as a biologically-determined behaviour, this cornerstone assumption has been challenged. Coe (2003a), for example, argues that behaviours associated with altruism and compassion are modelled on 'maternal roles' (2003a:10). While not underplaying the influence of biology in women's response to maternity she is adamant that '[h]uman mothering behaviours are [predominantly] learned, taught, supported and reinforced' through social and cultural mechanisms (Coe 2003:11; also see e.g. Beausang 2000;

Dettwyler 1995). If even maternal skills can be understood, in great part, as produced through learning, then the same interpretation must surely be applied in explaining the specialised interventions required in response to disabling pathology.

Fábrega (1999; 2011) is perhaps the most extreme proponent of an unmediated evolutionary basis for health-related care. Both caregiving and the expression of the 'sickness' that elicits this care consist of the 'operation of an inherited biological adaptation to show, interpret and respond to disease and injury' (Fábrega 1999:35). While acknowledging the importance of cultural factors in determining both how pathology is explained and the form that care takes in any given society, Fábrega (1999) views the expression of sickness, and the healing provided in a reaction to this sickness, as 'natural adaptive responses based on specialised neural mechanisms' (Fábrega 1999:30). '[S]omething "hard" and "wired-in" in the human organism produces SH [sickness and healing] responses "naturally"' (Fábrega 1999:35). In a recent monograph that ranges from self-medication among the higher apes to the role of social emotions in the design of modern medicine, Fábrega (2011) focuses on the potential of the evolution of 'sickness' and 'healing' to contribute to a theory of mind:

behavioural response to [an] observable condition of disease involves mediation of complex brain/behavior or body/mind relationships ... [and] healing of self and healing of a group mate ... represent adaptive response patterns ... the function of which is to counteract an evolutionary costly condition of sickness (Fábrega 2011:161)

It is impossible to address the detail of Fábrega's arguments presented in his major work, *The Evolution of Sickness and Healing* (1997), but overall they fail to convince. To begin with, there are conceptual contradictions: for example, at one stage Fábrega (1999) proposes that the sickness and healing adaptation 'may have provided conditions [underpinning] the establishment of culture itself' (Fábrega 1999:54), while elsewhere he identifies a range of social and cultural conditions necessary for the selection of the sickness and healing adaptation that includes some of the cultural outcomes of these 'adaptations' listed ten pages earlier (Fábrega 1999:66-68). Fábrega's insistence that healthcare practice is a behaviour programmed into the human genome is particularly questionable when he attempts to reconcile the roles attributable to culture and biology in relation to his hypothesised sickness and healing adaptation by the existence of 'heal memes' and 'sick memes' (Fábrega 1999:184-189). As with much of the original work on concept and role of the meme (Dawkins [1976] 2006:189ff), Fábrega's (1999) memes are characterised by an inclusiveness that enables everything and anything to be

attributed either to the biological meme, or to the culturally-realised products of this biological entity, and leave no potential for falsification. Yet despite these criticisms Fábrega (1999) provides an interesting discussion of both the cognitive skills - courtesy of specifically human, and indisputably evolved, cognitive capabilities - required for care provision, and the likely biological and social rewards of caregiving which may reinforce its practice.

Bloom (2005) also argues that biological evolutionary processes play a direct role in shaping certain aspects of healthcare behaviours, although in ways far more generalised than those proposed by Fábrega (1999; 2011). Bloom's (2005) conclusions are based on cross-cultural research in medical ethnography, with occasional reference to non-human primate behaviour. Although difficult to separate from the contribution of cultural learning, he suggests there may be a biological evolutionary basis to (i) the 'body language of illness' (Bloom 2005:256), perceived as an adaptive behaviour by which the person with a pathology signals their requirement for care; (ii) the role of physical touch, which is 'part of the healing process universally' (Bloom 2005:256) that engenders a sense of calm and well-being of physical and psychological benefit to the care-recipient; and (iii) the rhythmic movement, chants and other hypnotic behaviours that are adopted to 'promote an altered state of consciousness ... universally recognised by the groups observing the healing rituals' (Bloom 2005:257) and that are known to stimulate neuroimmunological activity.

There are many more researchers, particularly from the disciplines of evolutionary psychology and biology, who write about health-related care in terms of biological evolutionary mechanisms. However, where Fábrega (1999) and Bloom (2005) posit that certain features of healthcare behaviours are the direct result of genetic coding, these other researchers frame caregiving as the outcome of more generalised, and perhaps deeper-seated, behavioural tendencies.

4.2 Altruism

Healthcare 'altruism', often characterised as a critical enabling factor in human evolution, is a case in point. Sugiyama (2004a, b, c) argues that health-related care provision served as a buffer against health risk, with reduced rates of early mortality helping to establish an environment capable of supporting delayed infant attainment of maturity, enabling selection for larger brains; delayed reproduction, enabling increased

energy expenditure on nurturing existing offspring, leading to better health and survival rates for juveniles; and greater longevity, facilitating transmission of knowledge and skills between adults and between adults and juveniles. 'Understanding why humans experience relatively low mortality is therefore central for understanding [both] human evolution and an important set of basic evolved human traits' (Sugiyama 2004a:373). Similarly, Kaplan et al. (2000) suggest that healthcare behaviours evolved with the move to increasingly energy-rich diets, which made possible accumulation of food resources beyond individual consumption requirements, facilitating the successful management of extended periods of juvenile dependency and the achievement of increased human lifespan. Hill et al. (2009) endorse these views, suggesting that 'provisioning of disabled adults ... [was] critical for the evolution of long life spans and the emergence of a post-reproductive phase' (Hill et al. 2009:196).

Altruism and caregiving are closely linked both in research into the motives and practice of healthcare provision (e.g. Gormley 1996; Green 1982; Hanson 2008; Ponthière 2011) and in the popular psyche (Green 2003; Mattis et al. 2009). The literature on aspects of altruism is extensive, spanning evolutionary biology and evolutionary psychology, through economics, to social psychology, medical sociology and philosophy (e.g. Basu 2010; Batson 2010; Bierhoff and Rohmann 2004; Boyd et al. 2003; Boehm 2007; Fehr and Fischbacher 2003; Gintis et al. 2003; Jensen 2010; Kitcher 1993, 2010; Post 2005).

But what does 'altruism' consist of? Colloquially it is defined as 'the principle or practice of unselfish concern for or devotion to the welfare of others' (Random House Dictionary, 2011), and is used to describe actions consciously undertaken with the selfless goal of 'doing good' (Carr 1999). In the biological sciences the term 'altruism' signifies something fundamentally different, however. It is an '[i]nstantive cooperative behavior that is detrimental or without reproductive benefit to the individual but that contributes to the survival of the group to which the individual belongs' (The American Heritage Science Dictionary 2011) or, even more uncompromisingly, a 'behavior that benefits others at the cost of the lifetime production of offspring by the altruist' (Wilson and Hölldobler 2005:13367). By sleight of hand altruism is translated from the sphere of individual free will to the domain of biological determinism, and this semantic opposition is repeated in a question central to exploring the origins of healthcare. If altruism is to be considered one of the major drivers of caregiving (as it is frequently

claimed to be), then should it be understood as the product of genes, or culture, or a mixture of both?

Among humans, there are innumerable examples of individuals disadvantaging themselves for the benefit of both family members and unrelated members of their community (Brown and Brown 2006; Melis and Semmann 2010; Smith 2002:154ff). Ostensibly self-sacrificing behaviours are also observed in other species: in bee, ant and termite colonies some insects refrain from reproduction so that those that breed have preferential resource access; when resources are scarce, subordinate members of wolf packs refrain from breeding and will help to raise the cubs of dominant pack members; at the end of a hunting foray, vampire bats provide blood to colony members unsuccessful in obtaining food; and in some bird species individuals will warn flock members of the presence of an aerial predator, although this draws the attention of the predator to themselves (e.g. de Waal 1996; DeNault and MacFarlane 1995; Hamilton 1964; Hölldobler and Wilson 1990:179ff; Rushton 1991; Smith 2002; Wilson and Wilson 2007). In evolutionary terms, individuals engaging in costly acts for the benefit of others are likely to compromise their reproductive potential, so altruism presents a paradox for the theory of natural selection (Hamilton 1964; Trivers 1971). If the group rather than the individual is seen as the evolutionary organism, however, then close kin relationships within communities ensure a level of redundancy in gene representation. Continued group functioning (rather than individual member well-being) becomes essential to maintaining long-term inclusive fitness for all concerned. In this configuration, an 'altruistic' behaviour that directly or indirectly strengthens the community can be explained as a 'selected-for' trait (Hamilton 1964; Ridley 1997:17 - 21; Sober and Wilson 2000:90ff; Tooby and Cosmides 1996; Sober and Wilson 2000:90ff).

Using a slightly different vocabulary, Brown and Brown (2006) explain the paradox of human altruism by selective investment theory. The evolution of social bonds, or 'over-arching emotion regulating mechanisms ... [was] primarily to motivate [otherwise hard to explain] costly long-term investment' (Brown and Brown 2006:1) of energy and resources in the welfare of group members in activities such as raising offspring (including those outside the immediate family); readiness to go into battle to protect the group; and 'render[ing] long-term assistance to a terminally ill mate' (Brown and Brown 2006:1). Costly long-term investment (a term translating altruism into economically-acceptable terminology for the twenty-first century) takes place between

individuals dependent on each other for survival, or who, in these researchers' parlance, share 'fitness interdependence' (Brown and Brown 2006:13-15).

4.2.1 Altruism, reciprocity and healthcare.

Altruism is potentially open to exploitation by those who are its focus, and theorists from the sociobiological end of the spectrum seek to explain the existence of altruism in terms of expectations of reciprocity that invariably accompany, and sometimes forcefully regulate, its practice (e.g. Allen-Aravea et al. 2008; Boyd et al. 2003; Bowles et al. 2003; Bowles and Gintis 2004; Hill et al. 2009; Sugiyama et al. 2002; Trivers 1971; note, however, the beginnings of a less formulaic approach to reciprocity suggested in Brosnan and Bshary 2010). The concepts of 'reciprocal altruism' (in which willingness to return this altruism is expected) and 'strong reciprocity' (in which behaviour 'reciprocating' received altruism is, if necessary, enforced through disciplinary action) are pivotal for those seeking to explain evolutionary selection for health-related care behaviours that might otherwise be perceived as too costly to be sustained (Hill et al. 2009; Sugiyama 2002, 2004a, b; Sugiyama and Chacon 2000).

The early practice of healthcare referred to by Hill et al. (2009), Kaplan et al. (2000) and Sugiyama (2002, 2004a, b; Sugiyama and Chacon 2000) is ill-defined but, from context, understood as comprising provisioning of temporary and long-term disabled adult and juvenile kin and non-kin group members. Within a framework of reciprocal altruism, this caregiving is premised on the recipient understanding that they have entered into a contract to support the provider (or an equivalent) in a comparable situation, and then meeting this obligation as required. If too many recipients default, then group stability and ultimately survival are compromised; defaulters may be punished by others in the group for breaching their obligations. Sugiyama (2004a, b; Sugiyama et al. 2002), an evolutionary psychologist, contends that the ability to identify 'non-reciprocators' is found in all human cultures; foragers in the Amazon are as skilled at this as college students in the United States. Following Trivers (1971), he argues that altruism is only possible because 'the mind has [evolved] a system functionally specialised for cheater-detection ... [which] cuts to the heart of debates on the nature of human reasoning and rationality' (Sugiyama 2004c:1; Sugiyama et al. 2002).

Both Hanson (2007), an economist, and Sugiyama (2004a) identify the importance to the caregiver of establishing a 'reputation for generosity or unique abilities' (Hanson

2007:15; Sugiyama 2004a). Hanson (2007) actually attributes the development of health-related care provision, or 'deep medical habits' (Hanson 2007:2), to the importance of creating allegiances in the uncertain environment in which humans evolved. The cost of care provided to an ally signals caregiver reliability; where the carer is willing to bear significant costs, this strengthens the alliance. Summing up the evolutionary benefits of altruism generally, Kaplan et al. (2000) refer to healthcare as an example of contingent giving, arguing 'this type of reciprocity ... is the basis of all human economy, division of labour and specialisation, and ... its critical development in the hominid line distinguishes us from our ape relatives' (Kaplan et al. 2000:173).

Explanations for caregiving that rely on a hypothetical biologically-determined mechanism of reciprocal altruism are often unsatisfactory when applied to actual instances of care practice. As demonstrated in Chapter 2 (Table 2.1), there are enough examples of healthcare provision in prehistory to suggest that caregiving was frequently undertaken under circumstances in which there was no possibility of equivalent return, and in some circumstances where there was a possibility that caregiving would result in disadvantage to group members. What principles should be applied to explaining the provision of care to individuals more likely to die or to remain severely disabled than to recover, or to individuals possibly capable of resuming a level of independent functioning, but not of attaining full productivity (e.g. Dickel and Doran 1989; Hawkey 1998; Pfeiffer and Crowder 2004; Spoor et al. 1998; Tilley and Oxenham 2011; Trinkaus and Zimmerman 1982; Trinkaus et al. 2001)? Constant exposure to injury and disease would enable group members to realistically assess a disabled individual's chances of recovery. Providing expensive long-term care in marginal circumstances may compromise group quality of life, and yet some of the evidence cited above suggests that people did just this in cases with little hope of positive health outcome. Of course it is possible to postulate either that obligations incurred in the treatment of 'hopeless' cases were transferred to family members or extended across generations of kin, or that under certain conditions expression of unlikely-to-be reciprocated 'altruistic care' provided an intrinsic benefit to the community through promoting community-level cooperation and cohesion (see following discussion of cooperation). It seems tenuous to posit a biological evolutionary mechanism for management of such debts, however. Systems of reciprocity may have been (and may still be) a factor in healthcare provision, but what 'reciprocity' consisted of, and how these systems operated, is far from clear.

4.2.2 *Altruism, social learning, and healthcare.*

The definition of altruism in purely sociobiological terms has been challenged. Wesson (1991) asserts that extrapolation from 'gene sharing' and 'inclusive fitness' to group level cooperation is of dubious validity, particularly when generalising from animal to human behaviour. These concepts are primarily useful in enabling 'apparent altruism [to] be interpreted as indirect self-interest and thus reconciled with natural selection' (Wesson 1991:129), but human behaviour is too complex for such reductionism. Supporting this position, Kitcher (1993, 2010) argues that the biological definition of altruism as a strategy for promoting reproductive success is both limited and limiting; altruism is multi-dimensional and purposeful, realised in behaviours that reflect complex psychological and social motivations.

Batson (2010) points out that altruism can 'at least as plausibly be a product of socialisation and cultural evolution ... [as] based on a genetic predisposition' (Batson 2010:151-152), and challenges the 'adequacy of current popular accounts of the genetic basis for psychological altruism' (Batson 2010:149). He urges the distinction between evolutionary altruism, defined in terms of action to enhance inclusive fitness (and perhaps better described as 'evolutionary egoism' [Batson 2010:150]) from the altruism manifested in human caring and compassion. Other researchers have long observed that the nuanced and variable expression of altruism reflects the dominant influences of cultural and social variables and individual personality (Krebs 1970; Krebs and Van Hesteren 1994). Further, it is clear that the content and practice of altruistic behaviours are, as one would expect, strongly associated with the immediate context in which assistance is required, and with cultural expectations and personal understanding of the social responsibility of the actors involved (Bierhoff and Roman 2004).

In 1968 Aronfreed carried out psychological experiments examining altruism as a learned behaviour, concluding that altruism can be taught and that it is acquired by young children through behaviour-contingent or observational learning under conditions where the only reward is the well-being of another (Aronfreed 1968:138-149). He notes that experience of affective reward becomes self-reinforcing, and that altruism is practised even when the consequences are negative for the altruist (Aronfreed 1968: 138-139). He concludes that simplistic application of evolutionary theory is incapable of explaining the 'highly internalised' altruistic acts of which humans are capable (Aronfreed 1968:140). Almost 40 years later, Post's (2005) comprehensive review of altruism research (focusing on altruistic behaviours of adults) similarly concludes that

'it's good to be good' (Post 2005:66); altruism provides a wide range of psychological benefits, and biological studies show a positive correlation between engagement in altruistic behaviours and improved immunocompetence. Post (2005:70) suggests that '[i]t is entirely plausible, then, to assert that altruism enhances [the practitioner's] mental and physical health'. In light of such rewards it might perhaps be possible to postulate an evolutionary basis for altruism, albeit one far removed from the conventional understanding of 'reciprocity'.

Findings from recent studies of the impact of 'informal' (as opposed to professional) caregiving on carer-health status are also of interest. Received wisdom has been that the health of informal care-givers, usually partners or other family members, is likely to be compromised by the physical and emotional demands of providing care (e.g. Vitaliano et al. 2003). Brown et al. (2009) found, to the contrary, that active care provision for a spouse (consisting of 14 or more dedicated hours per week) is often associated with reduced levels of mortality among carers. Poulin et al. (2010) found that active caregiving of disabled loved-ones promotes increased carer well-being. In research involving over 10,000 respondents, Buyck et al. (2011) confirmed that caregiving can have positive health outcomes for carers. Kramer's (1997) meta-review of carers' experience of providing informal healthcare services to relatives and others provides even more detailed insights, describing the positives of caregiving as

an aspect of care provision that is reported by many caregivers and one that caregivers seem to want to talk about. Recognition of positive experiences in caregiving initially surfaced from anecdotal and qualitative reports of caregivers who indicated that giving care increased their feelings of pride in their ability to meet challenges, improved their sense of self-worth, led to greater closeness in relationships, and provided an enhanced sense of meaning, warmth, and pleasure (Kramer 1997:219).

This finding has been confirmed more recently by Cohen et al. (2002) and Schulz and Sherwood (2008). All studies note that the quality of the personal (not necessarily 'kin') relationship between carers and cared-for influences how the act of caregiving is experienced, and that where the psychological and/or physical burden of care borne by the non-professional carer is excessive, the experience of providing care is likely to be negative regardless of any other factors. With these provisos, however, the experience of helping to meet the health-related needs of another individual was perceived in a surprisingly positive light. This phenomenon could be taken to confirm Post's (2005)

thesis that altruism - in this context expressed through the provision of care - is its own reward.

Schulz et al. (2007:9) note that '[t]o date, motivational issues in [informal] caregiving are relatively unexplored', and it is true that the research cited above does not query the detail of what motivates the behaviour of healthcare provision. Nevertheless, there appears to be general agreement in both the clinical and psychological literature that, at the level of individual care-giver, drivers of care are likely to include both altruistic and egoistic components, often simultaneously (Schulz et al. 2007).

When altruism is expressed in a behaviour as complex as healthcare provision, seeking an explanation for this trait which goes beyond genetic determinism is not a rejection of evolutionary theory. On the contrary, the expression of altruism at such a level of sophistication is understood as only made possible through the operation of more generalised evolved capabilities. In the case of health-related care provision these comprise the ability to empathise with another's experience of disease (to the extent that the need for care is understood and justified at an emotional as well as an intellectual level), and the cognitive capacity to identify, process and respond appropriately to specific indicators of pathology. Empathy, defined as the 'direct identification with, understanding of, and vicarious experience of, another person's situation, feeling and motives' (Stedman's Medical Dictionary 2010) and considered further in the following sections, is proposed as one of the proximate motivations for directed altruism (de Waal 2008).

4.3 Cooperation, empathy and care

While there is little to support the proposition that a specifically healthcare-oriented reciprocal altruism is hardwired into the human genome, there is convincing evidence to indicate humans *do* possess an innate predisposition for interpersonal cooperation - a characteristic which paves the way for the practice of health-related caregiving, as well as for the multitude of other prosocial behaviours which enable and sustain community living (Bowles and Gintis 2003; Cosmides and Tooby 1992; Gächter et al., 2010; Rilling et al. 2007).

There is an obvious relationship between cooperation and altruism, but these terms are not synonymous in either vernacular or scientific usage although they are frequently - and confusingly - used interchangeably in the literature (Brosnan and Bshary 2010; for

an example see Melis and Semman 2010). Cooperation involves working with others to achieve a common purpose or benefit (in the biological context this translates to increasing the reproductive fitness of participants), whereas altruism involves acting to further the interests of another at the (potential) sacrifice of one's own. The implications of this difference are conceptually important in considering the ubiquity of care provision in prehistory. Put simply, it is suggested that healthcare activities enabled through group-level cooperation may be understood as bringing with them 'benefits' quite apart from those associated with any relief experienced by the care-recipient. Such activities would tend to provide a continuing, positive reinforcement of those aspects of group beliefs, customs and values which led to care being given in the first place, thus strengthening group identity and cohesion (also see discussion in Fábrega 1997:46ff).

Over the last few decades the dominance of sociobiology and its more overtly political variant, economic rationalism, has seen human evolution presented in terms of (the elimination of) competition, popularly summarised as the 'survival of the fittest'. Bird and O'Connell (2006) epitomise this approach in their comprehensive application of evolutionary and behavioural ecology theory to human life history. Competition is purported to underlie most if not all behaviours, to the extent that this 'instinctive' drive is sometimes called upon to explain and even (implicitly) excuse behaviours which in modern society are considered unacceptable - such as unsanctioned forms of violence, including rape; sometimes politically-sanctioned violence, such as war; and gender and racial discrimination (e.g. Archer 2009; Daly and Wilson 1990; Ronay and von Hippel 2010; chapters in Barkow et al. (Eds) 1995. For critical review and discussion see e.g. Gould 2000; Rose 2000; and other chapters in Rose and Rose (Eds.) 2000).

As if to balance this, the role of cooperation as an integral feature of human and non-human primate ontogeny has also received increased attention. Recent studies of non-human primate behaviour challenge entrenched assumptions that competition is the dominant strategy in within-group interactions. De Waal and colleagues' work over the past 15 to 20 years repeatedly shows that cooperation is the preferred strategy for most species (Brosnan and de Waal 2002; de Waal 1996; de Waal and Berger 2000; de Waal and Suchet 2010). Garber's (1997) study of Tamarin monkeys finds the ratio of cooperative to agonistic behaviour is 52:1. Silk (2004) identifies high rates of within-group cooperative behaviours across a range of primate species. Finally, in a meta-review of 81 studies of non-human primate behaviour in the wild across a large number

of different species, Sussman et al. (2005) find an average 93.2% of within-group interactions are cooperative. They critique the dominant competitive models of primate activity, and propose 'neurological and endocrinal mechanisms [which] seem to have evolved to reinforce and facilitate unselfish cooperative behaviours' (Sussman et al. 2005:86). This is a difficult proposition to reconcile with arguments for hypothetical 'neural cheater-detection mechanisms' being fundamental for understanding altruistic practice in the evolutionary context (Sugiyama 2004c; Sugiyama and Chacon 2002; Sugiyama et al. 2002; Trivers 1971).

Research into human infant and early childhood behaviour is equally suggestive of a predisposition for cooperation. Hamlin et al. (2007) report that infants aged between 6 to 10 months show a significant preference for cooperative behaviour, and an ability to distinguish and select between those who help under certain circumstances and those who do not. Working with infants aged up to 18 months, Warneken and Tomasello (2006; Warneken et al. 2007) find a willingness to cooperate with others without expectation of extrinsic reward. However, a review of research in this field finds that the early predisposition for cooperation declines in the transition from infancy to childhood; cooperation is freely given until around the age of three years, when demands for reward in exchange for cooperation emerge (Hay 1994). Warneken and Tomasello's (2009) more recent research generally agrees with Hay's (1994) analysis, although they suggest that the transition from freely-given cooperation to expectations of reward or 'reciprocity' may not take place until six or seven years of age. There is general consensus that this transition is attributable to social learning - children may be born with a natural inclination to cooperate, but as they grow older they are influenced by parents, other family members, peers and general normative pressures to place greater importance on personal advantage, and are actively discouraged from behaviours that may disadvantage them in some way (Hay 1994; Warneken and Tomasello 2009). Experimental studies suggest that even among adults cooperation is by far the most common default behavioural strategy, and that cognitive effort is required to override this tendency (Rilling et al. 2007).

Continuing this theme, research into prosocial behaviours carried out among a range of age groups in different cultural and social environments often produces quite fundamentally different results, which are impossible to explain through evolutionary mechanisms alone (Boesch 2007, 2008; Gächter et al. 2010; Rilling 2008). Gächter et al. (2010), for example, demonstrate significant variations in cooperative styles and

behaviours between groups of adult individuals belonging to different religions and ethnicities, concluding that

holding everything else constant, differences in cultural background can lead to differences in behaviour in otherwise identical environments. Thus accounting for individual and implied group-level differences is not enough to understand the whole breadth of variation in cooperation. Culture needs to be accounted for (Gächter et al. 2010:2658).

Empathy, defined as the ‘direct identification with, understanding of, and vicarious experience of, another person’s situation, feeling and motives’ (Stedman’s Medical Dictionary 2011) is often claimed as an evolved trait, found not only in humans but also in non-human primates and in a wide range of other animals, which serves to establish and maintain strong, long-lasting, and interdependent bonds between group members and to facilitate cooperative social behaviour (de Waal 2008; de Waal and Suchet 2010; Iacoboni 2009). Empathy is thought to operate through neural mechanisms that allow one individual’s emotional experience to be ‘mirrored’ at an instinctual level by another, activating the latter’s recognition of, and appropriate response to, the state in which the former finds themselves (Iacoboni 2009; Preston and de Waal 2002). As already noted, empathy has been proposed as a proximate mechanism of directed altruism, including health-related caregiving (de Waal 2008). Coulehan (2005:261) suggests that empathy is ‘a generic aspect of [successful] healing practice’, and it is easy to appreciate how intuitive identification with someone affected by significant pathology could motivate the desire to alleviate suffering, and how this same capacity for empathy, in concert with a predisposition for cooperation, could provide a basis for caregiving over a longer duration.

Hay (1994) notes that evidence for a link between empathy and cooperation is stronger in adulthood than in childhood, and interprets this as suggesting that the capacity to empathise, despite its genetic basis, requires social learning to realise its potential. Along similar lines, Warneken and Tomasello (2009) observe that parental encouragement of empathy plays an important role in increasing and focusing prosocial (cooperative) behaviour. A recent meta-analysis by Konrath et al. (2011) supports conclusions regarding the impact of external factors on levels of empathy in individuals, finding a significant decline in empathy among American college/university students over the last thirty years (particularly the last decade and a half), which they attribute directly to sociocultural phenomena.

Hill et al. (2009) draw direct links between cooperation, healthcare, and early human evolution. Although acknowledging non-human primates are capable of cooperative behaviours, they propose that the capacity for sophisticated, sustained, within-group cooperation is a uniquely human trait. Hill et al. (2009) argue that cooperation became the preferred human strategy for survival through a process of gene-culture coevolution, in which cultural selection on the basis of phenotypic expression (cooperative behaviour) gave cooperative genes an evolutionary advantage. This position is shared by growing number of authors (e.g. Bowles and Gintis 2003; Chudek and Henrich 2011; Laland et al. 2010).

We are still far from understanding how the most basic elements of behaviours that go to making up the provision of care actually work together. Although a predisposition to cooperate, combined with the ability to empathise, is highly likely to be an important enabling factor for initiating and maintaining health-related caregiving in both the past and the present, 'healthcare provision' and 'cooperation' are no more synonymous than 'co-operation' and 'altruism' or 'cooperation' and 'empathy'. As will be illustrated in the succeeding chapters, unravelling the significance of acts of caregiving involves much more than establishing the existence or otherwise of a genetic template.

4.4 Emotion and the origins of care.

Emotions provide the impetus for actions, making an understanding of emotion essential to an understanding of behaviour (Barrett 2004; Izard 2007; Keltner and Gross 1999; Power and Dalgliesh 2008; Tooby and Cosmides 1990). Despite the affective demands that characterise caregiving, however, there is little in the literature examining the role of emotions in initiating and sustaining health-related care provision in modern society, and little that directly addresses the role of emotion in the origins of care (Fábrega 2011 touches on this question indirectly). What follows extrapolates from general research in this field.

4.4.1 *Defining emotions and their origins*

Emotion is commonly understood as an affective state of consciousness, or 'feeling', but there consensus ends. There is fundamental disagreement as to whether there exist core or 'basic' emotions which are instinctive responses to certain stimuli, or whether

all emotional responses, however apparently unsophisticated, are cognitively-mediated (e.g. see discussion Tooby and Cosmides 1990; Izard 1992, 2007; Ortony and Turner 1990; Power and Dalgliesh 2008).

For those belonging to the former school of thought 'basic' emotions are defined as

specific neuropsychological phenomena, shaped by natural selection, that organize and motivate physiological, cognitive and action patterns that facilitate adaptive responses to the vast array of demands and opportunities in the environment' (Izard 1992:561)

and correspond to specific neurophysiological and anatomical substrates (Izard 1992, 1993, 2007; Tooby and Cosmides 1990). Lists of emotions designated as 'basic' vary widely, but are likely to comprise a selection from the following: anger, rage, disgust, contempt, despair, depression, sadness, fear, panic, joy, happiness, love, surprise, curiosity and interest (see Table 1, Ortony and Turner 1990:316; Izard 1992, 1993, 2007; Power and Dalgliesh 2008). Basic emotions serve as the building blocks for more 'complex' (i.e. cognitively-mediated) ones. Izard (2007) proposes that basic emotions become functional over the period from birth to 24 months, but are subject to developmental modification from an early age.

Those from the latter group argue that all emotions are cognition-dependent, in the sense that they rely on psychological processing to translate external or internal (e.g. hormonal) stimuli into context-appropriate 'feelings'; emotions as such have not been 'selected' through evolutionary processes, although the cognitive mechanisms through which they are given form and expressed are (Barrett 2004; Ortony and Turner 1990). Emotion is a response produced through the (not necessarily conscious) application of experience to a particular circumstance, which explains how an emotion can be recognised, understood and contextualised by both the person experiencing it and those observing it, and how emotions can be controlled, managed and manipulated (Barrett 2004; Ortony and Turner 1990; Russell 2003).

A third perspective advocates analysis of emotions in terms of functional properties rather than affective characteristics (see articles in the dedicated issue of *Cognition and Emotion* Volume 13 (5) 1999). Emotions are presented as immediate, 'episodic, relatively short-term [period unspecified], biologically-based' (Keltner and Gross 1999:468) evolved adaptive responses to social and physical challenges to survival,

where relevant providing longer-term direction for cognitively-based, functionally-adaptive response strategies.

4.4.2 Emotions, their relation to empathy, and their role in care

Provenance of emotion aside, there is broad agreement that '[e]motions regulate the individual's relation[ship] to the external environment' (Keltner and Gross 1999:468; Izard 2007; Power and Dalgleish 2008; Tooby and Cosmides 1990). Izard (1993:86) notes '[m]ost major theories of emotion agree that ... emotions constitute a powerful motivational system that influences perception, cognition, coping and creativity'.

In terms of understanding health-related care, the characterisation of 'emotion as motivation' (or source of motivation) and/or 'emotion as regulating response to external stimuli' supports what common sense - and often personal experience - suggests: individuals actively involved in caregiving will experience emotions, and these emotions will influence how caregiving is performed. However, whether there exists a causal relationship between emotion and the evolution - biological or social - of caregiving behaviour is less easy to resolve.

One way forward may be to consider how 'empathy' and 'altruism' relate to 'emotion'. Empathy and altruism have already been discussed in relation to origins of, and motivations for, care provision, but both intersect at some level with the concept of emotion; empathy consisting of the ability to 'feel' (identify with) the emotions of another, and altruism being the desire (an emotion) to alleviate the distress (an emotion) of another, stimulated, in part at least, by the ability to empathise.

There is not much in the literature on this question, and again there is little unanimity. For example, de Waal (2008) suggests that empathy, combined with high emotional arousal, can lead to acts of potentially costly directed altruism among non-human primates. In this article empathy and emotion are effectively undifferentiated, but both are drivers of the outcome 'altruism' (de Waal 2008). Izard (2007:267), in a section entitled 'Empathy as emotion', suggests

[k]nowledge of specific discrete emotions or emotion schemas is necessary for empathy, which is usually defined as the ability to respond to the unique emotion experience of another person ... Empathy may provide the emotion and motivation that drives altruistic behaviour observable in human toddlers and chimpanzees.

Despite the section title Izard (2007) fails to clarify whether empathy is an emotion in its own right or a parallel, independent, innate ability to 'know' and respond to emotion. Altruism is again presented as an outcome. Given restriction of altruism to 'human toddlers and chimpanzees', Izard (2007:267) may intend the reader to understand this behaviour as an instinctive, rather than reasoned, response as well. Omdahl (1995:15ff) argues that the relationship between empathy and emotion is complicated and multi-layered, suggesting that in complex situations explicit communication of emotion (e.g. speech, touch) may be required for an appropriate empathic response; in this context empathy becomes the product of cognitive processing of emotional cues. Finally, Smith (2006) differentiates between 'emotional empathy' and 'cognitive empathy'. The former is a selected-for behaviour evolved to operate in conditions where empathy for the circumstances of 'close kin, loyal reciprocators and in-group members' (Smith 2006:5) is called for. The latter is a strategy for 'negotiat[ing] one's way in the complex social world of humans' (Smith 2006:6). Smith (2006) sees both types of empathy as complementary and their integration as producing a mentally healthy state, enabling the most adaptive and least costly responses to situations requiring action.

Before attempting to tease out what all this signifies for the origins of care, two points must be made. Firstly, much of the literature addresses 'emotion' as a single response to a discrete stimulus. This fails to reflect the complexity of many emotionally-arousing situations confronted in real life - such as suddenly learning that someone with whom one is close is suffering serious and disabling pathology. The initial response to such a scenario will likely canvass a range of emotions - love, compassion, distress, sadness, panic - in close sequence.

This leads to the second, closely-related point. The literature largely fails to consider the role of emotion in maintaining long-term behaviour. Emotions may drive the immediate reaction to a stimulus; even in the context of activity as complex as healthcare provision, emotions are likely to be among the primary movers of the initial care response. But what sustains a difficult and demanding behaviour like caregiving over the duration for which it is required? There will be changes over time in healthcare

requirements; caregiver and care recipient characteristics; and in aspects of the lifeways context in which care is provided. Emotions will inevitably change over this period as well. Caregiving generates emotional rewards (for example, the person cared for improves, or at a minimum their condition does not deteriorate) and emotional costs (despair and depression due to the failure of the care-recipient to recover, or resentment, irritation or anger over the demands associated with care); emotion may continue to motivate care provision or, reversing the initial emotion-driven response, may undermine it. In any event, maintaining care beyond the initial establishment phase requires emotions to be consciously channelled and controlled.

Returning to the origins of care, it is suggested that emotion and empathy be envisaged as components of a continuous, positive reinforcement feedback loop (much as suggested in a different context by de Waal [2008]). The empathy experienced by one individual as a response to pathology-related distress in another is made possible by the previous emotional experience ('knowledge') of the former. Empathy stimulates the very emotion that in turn enables and drives the immediate empathic response. In the caregiving context, 'altruism' is likely to be an important product of the emotion/empathy relationship, and the material outcome of this altruism may be initiation of care. Altruism will feed back into the emotion-empathy circuit, perhaps by reinforcing or modifying the emotions being experienced. Further, the caregiver's expression of altruism (through care), and possibly even the caregiver's experience of an altruistic desire-to-be-good, may directly stimulate emotional rewards (e.g. Aronfreed 1968; Post 2005) that in turn reinforce both altruistic intent and actual caring behaviours.

Regardless of how emotion, empathy and altruism interact, all appear to have very deep roots in the history of the human species and, in relation to caregiving, all appear inextricably related. All are critical components in the production of care, and whether one is the precursor of another seems of little relevance in this context. The proposed model of an emotion-empathy-altruism feedback loop transcends the need to ascertain which of these elements may be the oldest in relation to the origins of health-related care.

The extent to which these elements (singly or as a unit) have been selected through biological rather than social evolutionary processes remains an issue. In relation to emotions it can be agreed that these play a major role throughout the process of caregiving; that in so doing, they help to drive a biological, social and economic

functionally-adaptive behavioural strategy of benefit to the wider group; and that regardless of whether the very first emotional response to a situation requiring care comprises a 'basic' as opposed to 'cognitively-mediated' emotion, subsequent responses building on this initial reaction undoubtedly fall into the latter category.

4.4.3 *Archaeology and the recovery of emotion*

Emotionless archaeologies are limited, partial, and sometimes hardly human at all. (Tarlow 2000:720)

While there have been no moves towards a specific archaeology of cooperation, empathy or altruism, the last decade has seen growing interest in prospects for identifying emotion in the archaeological record (see the special issue of *Archaeological Dialogues* Volume 17(2) 2010). Although assumption of emotional experience has always been integral to phenomenological analyses of landscape and monument (e.g. Tilley 2004, 2008), and emotional state has occasionally been raised in discussion of prehistoric experience of likely affective events (e.g. Mithen 1991), emotion was first substantively theorised as a topic for archaeological research by Tarlow (2000).

Acknowledging that emotion is enabled and expressed through biological mechanisms, Tarlow (2000, 2010) emphasises the critical importance of context in analysis of emotion, urging against an essentialism that assumes a universality of emotional meaning and experience and might be used to make claims of 'knowing' the intimate feelings of actors from a largely *unknowable* past. She suggests that it is more productive to focus on the concept of socially constructed 'emotional value' rather than on 'emotion' *per se*; 'at a social level, members of social groups can agree broadly on how different emotions are valued and what they might mean' (Tarlow 2000:728).

'Emotional values' may be reflected in material artefacts and material practices, theoretically making social emotional values accessible to archaeological identification (Tarlow 2000). Concluding that 'the realization of the pervasiveness of emotional values and understandings will enable more imaginative construals of archaeological data' (Tarlow 2000:729), Tarlow (2000; 2010) offers no guidance as to how this might be achieved.

Ironically, Tarlow (2000) dismisses the notion that evidence for health-related care may provide the opportunity to explore emotion or emotional values, uncritically reproducing Dettwyler's (1991) objections to the identification of 'care and compassion

in the archaeological record' (Tarlow 2000:726-7). Indeed, this is the *only* area of behaviour that is specifically ruled out in terms of archaeological consideration (see the critique of Dettwyler's [1991] arguments in Chapter 2). This is unfortunate because, as briefly noted in the following section, evidence for healthcare provision may provide one of the more profitable contexts for considering how 'emotional value' might influence action.

Harris and Sørensen (2010) expand on Tarlow's (2000) observations, suggesting that emotions 'are produced through people's material engagement with the world, at the same time as [they] are productive of that engagement; indeed these processes are inseparable' (Harris and Sørensen 2010:148). Emotions are generated through 'affective fields', which are defined in turn as

the relationship between agents where something or somebody is stimulating an emotional response in a causal set of events. As such, affective fields are dynamic and generative because they are about the ways in which emotions are produced, triggered or provoked, changing the state of affairs in a given situation (Harris and Sørensen 2010:150).

Harris and Sørensen (2010) go on to produce an 'emotional history' of activity during the life of an English Neolithic henge site (albeit one that draws significantly from phenomenology).

Harris and Sørensen's (2010) attempts to operationalise emotion in a way that captures the role of the relationships that produced it in the first place is their major contribution in this field. Where their work falls down is in its failure to be explicit as to how they see the 'visceral experience' (Harris and Sørensen 2010:150) of emotion (by necessity a short term response) intersecting with the longer-term embodiment of 'emotion-as-meaning' in material culture. This is not a trivial point. As discussed earlier when considering emotion and its role in care, unmediated 'visceral' emotional responses to stimuli are likely to become subject to cognitive control very rapidly. It is this cognitive processing of emotion that is responsible for what Tarlow (2000) describes as the socially-produced 'emotional value' that may be (partially) accessible through archaeological analysis and which, although unacknowledged, is what Harris and Sørensen (2010) rely on in their deconstruction of emotions in the henge life-cycle.

4.5 Implications for a bioarchaeology of care.

This chapter has incorporated theory and research from so many disparate disciplines that it is difficult to come up with a coherent synthesis. The origins of health-related care are not often directly considered, although this question does receive some attention - mostly from a biological perspective, as in discussion of the evolutionary role of caregiving in extending the longevity of early *Homo* (e.g. Hill et al. 2009; Kaplan et al. 2000), the positioning of 'sickness' and 'healing' as evolved adaptive responses (Fábrega 1997, 2011), or consideration of caregiving as a practice made possible through the selected mechanism of 'reciprocal altruism' (e.g. Sugiyama 2004 a, b; Sugiyama and Chacon 2000).

What are the implications of the material discussed in this chapter for a bioarchaeology of care? Critically, all the evidence reviewed indicates that provision of healthcare, when defined as a consistent and purposive response to the impact of pathology, is an exclusively human behaviour. Health-related caregiving involves identifying problems and possible solutions, and entails commitment in both originating and maintaining behaviours that may be economically and emotionally costly. Further, in the small group, subsistence economy characteristic of early prehistory, care provision may have necessitated a level of either short or long-term modification of lifeways activities to support the activity of care itself and/or to minimise negative impacts of caregiving on the well-being of other members. Although the initial encounter with another's pathology-related distress may stimulate an immediate 'instinctive' empathic/emotional response that then activates altruism, commitment to care and undertaking all subsequent activities are reliant upon the operation of sophisticated neurocognitive processes and acquired knowledge and skills.

So far there is unlikely to be much disagreement. Differences arise when considering whether, and to what extent, the primary drivers of caregiving behaviour are to be found in nature or nurture. Theories of a specific biological basis for health-related care find no support in comparative nonhuman primate research, and sit uneasily in the realm of common sense, given that even the most basic of caregiving behaviours is too complex to be satisfactorily explained in terms of specifically 'hardwired' responses selected to ensure species survival. Attempts to depict the development of complex caregiving behaviours as mediated or 'enabled' through an evolved imperative of reciprocal altruism - a construct in part based on anthropomorphic interpretation of observed behaviours in a limited number of animal species - are equally unsatisfactory in their

failure to explain why care is often provided in situations where the prospects for reciprocity are unlikely.

The most plausible explanation for the origins of care resides in a gene-culture co-evolved human predisposition for cooperation combined with the (possibly) initially instinctual, but then cognitively-driven, 'emotion-empathy-altruism' feedback loop proposed earlier. The sophisticated mechanisms of the human brain, the products of evolutionary selection, enable human cognition. The outputs of cognitive and psychological processes, produced through social learning and expressed within a particular cultural context, drive and sustain motivation for, and development and implementation of, healthcare strategies at all levels. Within this simple model, nature provides the infrastructure that makes human health-related caregiving possible in a technical sense; nurture provides the engine that controls whether, and how, this potential will be employed.

In terms of interpreting a specific case of caregiving within a specific lifeways environment the considerations summarised above may appear to have little practical relevance. The bioarchaeology of care approach takes as a given that in certain instances care provision can be reliably inferred, and analysis then centres on what this care may signal and signify about the circumstances in which it took place. Whether the early origins of care are attributable to biology or culture hardly seems to matter in this process. Yet in order to approach questions of motivation, and to appreciate the sophistication of the behaviour under study, it is important to establish a conceptual understanding of where health-related caregiving fits into the wider human repertoire.

At least two points that are instrumental to achieving this goal can be taken from this chapter. Firstly, everything in the cross-disciplinary sample of literature consulted indicates that the skills, motivations and predispositions that make healthcare not only possible but perhaps, under the right conditions, *probable*, have a long pedigree in the human species. Secondly, the conclusion to be drawn from this is that cases of health-related care practice detected in the archaeological record are not anomalies, but rather examples of a common practice that is difficult to discern from skeletal and cultural remains alone. Taken together these observations 'normalise' the behaviour of healthcare provision, and further validate it (were validation necessary) as a substantive focus for bioarchaeological research.

Does it matter if caregiving is thought of as the result of nature rather than the result of nurture - or *vice versa*? For Stages 1 to 3 of the bioarchaeology of care methodology,

which follow a straightforward sequence of steps (detailed in Chapter 6) in ascertaining diagnosis of disability and likely need, type and nature of care provision in any specific instance, the answer is 'no'.

In the fourth and final stage of bioarchaeology of care analysis, which attempts to interpret the wider meaning of the care provided, the answer is not as clear.

Consciously or unconsciously, the position taken on questions of biological determinism versus cultural learning in relation to caregiving behaviours may shape the way evidence of healthcare provision is approached. Chapter 5 considers what insights into areas of agency and identity may be available from bioarchaeological inference of care, and it does so based on the theoretical understanding of care origins outlined earlier in this section.

4.5.1 Emotions and the bioarchaeology of care - a final observation

Of the various topics covered in this chapter, consideration of the role of emotion in motivating and maintaining care may be most directly relevant for a bioarchaeology of care analysis.

In the small groups of early prehistory, members would have been interdependent in most of the personal, social and economic activities making up daily life. If one group member were to suffer the distress of pathology serious enough to require care, most other members would likely experience emotion in response - although not necessarily the same emotion, nor the same intensity of emotion. Where care was provided we cannot know with certainty how individuals felt about the person for whom they cared; nor how individuals felt about the act of caring. However, the high levels of interpersonal engagement between carers and care recipient, and carers and carers, which produces the 'affective field' of care provision, means that experience of emotion(s) by all involved would have been inevitable.

Recognising that all instances of caregiving in the past are invested with social emotional value of some description is hardly provocative. As explained in the following chapter, in bioarchaeological analysis the set of human remains from which the inference of care is drawn may from one perspective be considered as much an item of material culture as Harris and Sørensen's (2010) henge, in the sense that the evidence for care is the product of others' actions. If it is possible to accept the potential for emotion and/or social 'emotional value' to be produced by the relationships between

people and objects (which it is), the presence of emotion in caregiving relationships is surely beyond dispute.

Tarlow (2000, 2010) repeatedly asserts that emotions can only be understood with reference to the social and cultural contexts in which they exist, and of course she is right. The bioarchaeological analysis of care is dependent on the detailed contextualisation of its subject matter. This same contextualisation offers the possibility of combining what is known of the lifeways in which care was given with what may be deduced about the duration, demands and likely outcomes of care, with the goal of identifying which social emotional values may have been operating to support the provision of care - or at least which emotional values may have been more likely than others. Consciousness of emotional values as variables in the analysis of caregiving behaviours will not only help underscore the general humanity of the subjects of study (an outcome Tarlow [2000:720] identifies as desirable), but should also help to inform analysis of the agency and identity of those involved - the focus of the next chapter.

CHAPTER 5. Agency, identity and the bioarchaeology of care

Whatever its origins, health-related care provision is indisputably the product of conscious, purposeful, goal-directed behaviour. Healthcare is not a default option. In each case of caregiving both the individuals involved in the giving and receiving of care, and the specific circumstances in which care takes place, are unique. What all cases have in common is that regardless of the way health and disease are defined, or the content and quality of care provided, or the ultimate outcome of care, every substantive attempt at caregiving is based on observation, analysis and decision-making triggered by a perceived challenge to health status, and reflects the design and implementation of strategies - successful or not - to address needs arising from this challenge.

Stage 4 of bioarchaeology of care analysis seeks to elicit a deeper understanding of past lives and lifeways through interpretation of evidence for care, and the concept of agency is integral to this process. This chapter discusses the application of agency theory to the bioarchaeology of care, and in doing so provides the theoretical foundation for the final stage of the proposed methodology.

5.1 The embodiment of agency

The physical evidence in human remains that allows inference of health-related care can be re-envisioned at a more abstract level as evidence of sophisticated cognitive processes applied to the demands of a certain type of problem; specifically, how to manage the experience of particular disease signs and symptoms within the parameters of the social, economic, cultural, historical, physical and personal contexts in which the disease occurs.

Logically, therefore, where survival of pathology is attributable to care, the skeletal evidence that leads to this conclusion can be viewed (at least in part) as the creation of those responsible for care provision in much the same way as artefacts such as ceramic pots, stone tools, roundhouses or megalithic tombs are understood to be the result of deliberate and dedicated labour undertaken within, and given meaning by, the context in which, and by which, they were produced.

In this sense, the set of human remains bearing evidence of caregiving literally

embodies the collective agency of those involved in providing care. This agency corresponds directly to the period during which healthcare was provided; in recalcitrant pathologies this comprises the time between the individual's actual age at death and probable age of death had care not been forthcoming. In relation to cases in which there is evidence suggesting survival following a recovery that allowed care to be dispensed with, the question is more complicated. At a functional level the period corresponding to 'embodied agency' could be taken to consist only of the time during which the individual likely received active care. At a conceptual level, it might be argued that the whole of the lifespan (and associated skeletal changes) attributable to the period following inception of healthcare reflects the application of agency

The set of human remains demonstrating receipt of care can be seen as both actor and artefact, and this understanding is critical to bioarchaeology of care Stage 4 analysis. In some ways, viewing remains as archaeological 'artefact' is the more intuitive approach. However, the individual receiving care is also an 'actor'. Archaeologists are typically reluctant to deal with questions of 'the individual', and in studies in which caregiving is inferred this usually results in subjects of this intervention being treated as if they were nothing *but* items of material culture. This reification has undoubtedly contributed to the discomfort of some who question the validity of archaeological identification of disability and/or care provision (e.g. Dettwyler 1991; Roberts 1999, 2000; see Chapter 2), and this practice is both wrong and unnecessary.

While it is impossible to achieve a finely-drawn portrait of a prehistoric individual's personality, under some circumstances it may be possible to attain a broad-brush sketch. The impact of serious pathology on an individual is central to bioarchaeology of care analysis (without establishing impact there is no basis for inferring care provision), and there is nothing more personal than the experience of a disabling disease. It is now accepted that people receiving healthcare (other than those incapable of cognitive function) must be viewed as active agents in shaping the course and outcome of their treatment; they are 'subjects' who are formally and informally involved in negotiating care activities which affect them, rather than 'objects' upon which care is imposed (Kim 2010:155ff; Lupton 1997; Lussier and Richard 2008; McCance et al. 2008; Salmon and Hall 2003).

Archaeological remains allowing inference of care provide an unparalleled opportunity to explore collective and individual agency practiced in prehistory. Every example of caregiving stands alone, and interpretation must always be anchored in the

corresponding lifeways context. But with these principles as givens, examining the agency intrinsic to each case of giving and receipt of care may provide an intimate picture of past group and individual identity.

5.2 Defining agency for a bioarchaeology of care.

“When I use a word,” Humpty Dumpty said in a rather scornful tone, “it means just what I choose it to mean - neither more nor less.”

“The question is,” said Alice, “whether you can make words mean so many different things.” (Lewis Carroll 1875:87)

Agency has received increasing attention in archaeology over the last 15 years (e.g. David 2004; Dobres and Robb 2005; Dornan 2002; Johnson 2006; Joyce and Lopiparo 2005; Kristiansen 2004; Robb 2010), reflecting the realisation that neither the description of the cultural history tradition nor the determinism of the succeeding processualist approach is capable of adequately unravelling ‘the relationship between material culture and people [which] is complicated, context specific, and dialectical’ (Dobres and Robb 2005:161).

In the archaeological literature (and more generally) there exists a plethora of definitions for agency, but common to all is the central role assigned to the intentionality of the actors involved. The major difference in definition revolves around what constitutes expression of this intentionality. Some archaeologists maintain that the constraints of power, capital, institution and custom inherent in the structure and operation of a society mean that only behaviours identifiable as challenging established social practice demonstrate ‘true’ agency (Miller and Tilley 1984: Chapter 1; Thomas 2002; see discussion Hodder 2000, Moore 2000, Robb 2010). Other archaeologists would see such a definition as indefensibly narrow, failing to consider possible motivations, explanations and rationalisations of actors (and interplays between these) when considering whether particular areas of activity display agency. Established processes and mechanisms of social reproduction will inevitably influence form and content of behaviour (Bordieu 1990; Joyce and Lopiparo 2005; Robb 2008, 2010), and it is self-evidently true that people tend to operate within the boundaries of their knowledge and experience; arguments for observing custom can be compelling, and the consequences of not doing so can be literally ‘unthinkable’, unpleasant or even disastrous. However, unless proof to the contrary exists, there is little logic in

suggesting that a decision to conform to established social process shows *per se* less awareness or intent than a decision to defy it (Giddens 1979:59; Moore, 2000; Robb 2008, 2010).

From an archaeological viewpoint, it is impossible to sustain any contention that activities in the archaeological record consistent with what is known of established norms are based on an unthinking adherence to the status quo, thereby lacking conscious intent. As Robb (2008) points out, even activity that appears to conform to tradition can, on critical examination, reveal purposeful (re)creation and manipulation of that same tradition's constituent elements. This observation is particularly relevant when considering evidence of complex behaviours, such as the intellectually, emotionally, and practically demanding requirements of healthcare. Established values, beliefs and customs may well exert a powerful influence on decisions regarding whether, what, and by whom, care is to be given, but all decisions made regarding care practice will invariably require deliberation.

5.2.1 Principles for approaching agency in care provision

The variety of definitions in agency discourse makes it essential to be explicit about the one adopted for use in the bioarchaeology of care approach (see Joyce and Lopiparo 2005:372). As with all definitions, the requirement of intentionality lies at the core of the bioarchaeology of care understanding of this concept. There are four additional principles that refine the definition of agency in relation to health care provision.

The first reflects Moore's (2000) dictum that agency is not the action that is being observed, nor the result of this action, but the 'socially significant *quality* of action' (Moore 2000:206, emphasis added). In the context of the bioarchaeology of care, agency is neither the care provided, nor the evidence of care outcomes. Agency refers to the conscious intent that drives the decision to initiate and maintain care and determines what sort of care is provided.

Secondly, agency is usually expressed in a sequence of related activities intended to achieve an end purpose, rather than in a single act (Dobres 2000; Giddens 1979; Robb 2010). The final result may differ from the original purpose, but where changes are consciously adopted this outcome is no less a product of agency. Giddens (1979:55) argues that

agency ... does not refer to a series of discrete acts combined together but to a continuous flow of conduct. We may define [action invested with agency] ... as involving a stream of actual or contemplated causal interventions in the ongoing process of events-in-the-world.

From the bioarchaeology of care perspective the conceptualisation of agency as a continuous - and flexible - flow of conduct is important. The nature of any healthcare amenable to archaeological inference will rarely be limited to a single act, or necessarily comprise a predictable course of action. Caregiving practices and goals often have to be reconfigured to respond to changes in health status (Henderson and Harmer 1955; Kim 2010; Watson 1999), and bioarchaeological interpretation of agency in care provision must acknowledge this.

Thirdly, it must be possible to identify the potential for choice between two or more options before assigning agency to action undertaken in an archaeological context. Where only one possible course of action can be identified, it is impossible to assert intentionality. In reality, choice almost always exists in any situation, even if only along the simple divide of 'choose to act' versus 'choose not to act' (Giddens 1979:56). Where healthcare is inferred, interpretation of agency rests on the premise that, before care was initiated, choices existed for care-givers to *not* provide care, or for the recipient to not *accept* care, but that the presence of skeletal indicators of care indicates these options were not selected. Beyond these initial decisions, the process of caregiving would have presented a series of options to those involved (at each stage one of these would have been to withdraw, or withdraw from, care), and interpreting agency and its implications rests, in part, on identifying what choices were likely made in response.

The final principle in defining agency for a bioarchaeology of care is that agency only makes sense in relation to the lifeways context in which it is expressed (Gillespie 2001; Moore 2000; Robb 2010). Harder to come to terms is the proposition that agency and context operate in a recursive relationship (Giddens 1979:69ff). While the expression of agency will be shaped by the context in which it occurs, the behavioural expression of agency in turn acts upon aspects of context (however subtly) and goes on to influence future behaviours (Dobres and Robb 2005). The effects of this dialectic are unlikely to register archaeologically in cases of caregiving, but they undoubtedly occurred. For example, in a small group, the decision to dedicate resources to caring for a disabled member may result in modifying existing economic and social practice, affecting (positively or negatively) within-group relationships, which in turn reinforce or dilute

initial caregiving resolve. Even the creation of categories of 'care-giver' and 'care-recipient' may influence the group dynamic (see Chapman 2000 and 'dynamic nominalism'). If nothing else, the survival of an individual who might otherwise have died will alter the group demographic profile and any associated activities (Robb 2002).

'Context' and 'lifeways' are terms employed as a shorthand for the totality of what is known or surmised about the economic, social, cultural and physical environments in which care takes place, including the institutions and practices of social reproduction that provide the framework within which community identity is located. 'Context' can also refer to the individual circumstances of an instance of care. For example, how was the pathology acquired - was it congenital, the result of an accident or of interpersonal violence (if the latter, was it incurred in defence of the group, possibly associated with special kudos and influencing the decision to provide care), or a disease of old age? Was the pathology frequent or rare in the community?

Examining the collective and individual agency involved in instances of caregiving against the backdrop of lifeways context is standard operating procedure. Reversing this focus by foregrounding questions of context against the backdrop of the agency revealed through the analysis of care provision may enable access to otherwise inaccessible aspects of social practice and social relations. The following sections explore this proposition.

5.3 Deconstructing care through the lens of agency

Introducing the special issue of the *Journal of Archaeological Method and Theory* dedicated to the topic of agency, Dobres and Robb (2005) observe that

[f]ew concepts are so widely considered essential to making sense of the past while still remaining woefully under-theorised. And few ideas so popular in 21st century archaeology have led to such sparse methodological developments. Indeed, while many of us now feel comfortable (or even compelled) to talk about agency in the past, few of us are explicit about how we are "doing" agency (Dobres and Robb 2005:159).

Rather than striving for an overarching 'theory of agency' in prehistoric healthcare, the bioarchaeology of care methodology proposes two related frameworks for probing the operation of collective and individual agency in cases of care practice. The aim of these frameworks is to make transparent the underlying assumptions and reasoning on which

the identification and interpretation of agency are based, and to encourage a broad consistency in analytical approach to the widely varying examples of caregiving recoverable from the archaeological record.

The first of these frameworks deconstructs the end product of care (skeletal evidence of survival with pathology), identifying and comparing the likely choices available to, and the choices likely made by, those involved. This provides a platform for considering what the likely features of care given may suggest about the collective identity of those responsible for providing it. There are obvious problems with this process. For example, the availability of information will differ greatly between case studies, and the quality of information available is unlikely to allow precision. There is also the ever-present spectre of equifinality; different treatments may produce the same health outcome, although as argued in Chapter 3, there are certain ‘constants of care’ which dictate broad categories of treatment in response to certain disease symptoms. By referring to what is known of context, it is often possible to deduce in general terms what options existed for care provision, and which among these were most likely implemented to achieve care-recipient survival.

The importance of considering agency from the perspective of those receiving care as well as from the perspective of those giving has already been urged. The second framework for analysis focuses on the individual care-recipient. The person who was both the subject and object of care can never be incontrovertibly ‘known’. However, the assumption that most individuals for whom care-provision is inferred most likely elected to collaborate in their own care, where physically and intellectually capable of doing so, is justified from clinical observation (Larsson et al. 2007; Longtin et al 2010; Sahlsten et al. 2008; Young and Klinge 1996), and on this basis it may be possible to speculate on other aspects of the individual's behaviour and, possibly, character.

Section 5.5 considers this proposition in more detail.

The two sections immediately following deal with questions of agency associated with the healthcare-provider side of the equation. To recapitulate: the fundamental premise of the bioarchaeology of care is that health-related caregiving is a conscious response to a perceived need that takes place in a specific context. The physical evidence of this care resides in a set of skeletal remains displaying indicators of survival with, or following, a disabling pathology. To explore the choices made in the process of caregiving or, in other words, to deconstruct the agency of care, the bioarchaeology of care methodology borrows directly from that of cognitive archaeology.

5.3.1 Cognitive archaeology and agency in caregiving

Recognising that the production and use of material culture reflects intentional behaviour is the central tenet of cognitive archaeology (Hill 2000; Renfrew 2012; Segal 2000; Whitley 1998). Analysis of material culture in relation to the opportunities and constraints in the contemporary lifeways environment allows the archaeologist

to infer a great deal about [these object's] role in society and the intelligence that was necessary to create them ... [Thus a] cognitive archaeologist can study the objects and structures found at archaeological sites with an eye toward answering questions about the knowledge, purposes, practices and skills of the people who produced them (Segal 2000:22).

The usual approach involves focusing on a particular artefact, or set of related artefacts, and unpacking the individual components that make up the whole to identify the likely decision-making points and/or influences (Hill 2000; Whitley 1998). Although not undertaken specifically under the heading of cognitive archaeology, Dobres' (2000) use of a *chaîne opératoire* methodology in analysing the dynamic relationships between technological practice and social agency illustrates how a cognitive-based approach can be applied to questions of agency.

In certain ways, bioarchaeological evidence for health-related care is tailor-made for this systematic, deconstructionist method of analysing meaning and intent. This process entails adopting the perspective outlined earlier: understanding the skeletal remains displaying indicators of care as the product of deliberate modification by (caring) others, and conceptualising health-related caregiving as the goal-directed, problem-solving, multifaceted set of behaviours responsible for this transformation (see Segal 2000:24-26 for discussion of the problem-solving focus in cognitive science). Care-related behaviours take place over a period of time, and play out within a specific lifeways context which shapes, and is in turn shaped by, caring strategies and their outcomes - although this latter process may well be archaeologically invisible (e.g. Leone 1998). Healthcare provision involves a sequence of often overlapping decisions, including the determination of whether the need and/or potential for care exists in the first place (initial identification and analysis of a health-related problem); whether care is to be given or withheld; the type and level of care to be provided; whether and what changes to existing social and economic practice are required to enable caring to take place; whether care practice once underway is optimal or requires adjustment, and if so what this should be; and, finally, whether it is appropriate to cease care.

The bioarchaeology of care model assumes that in small prehistoric communities care provision was a collective activity involving most or all members, directly or indirectly. An essential part of the decision-making process at most stages, particularly in relation to care for disabled individuals with high levels of dependency, would have included consideration of costs likely to be incurred by care provision; the likely outcomes - positive and negative - of the commitment to care; and the acceptability and affordability of caregiving to the group as a whole. Put crudely, this could be described as a continuous process of cost-benefit analysis, but in this context both costs and benefits go far beyond simple economic categorisation. Some or all benefits gained through the act of caring may have been independent of the ultimate health status of the care-recipient; caring may have had a symbolic as well as practical significance that compensated for some sacrifice of material quality of life. The rewards of care may simply have been the continued presence of someone who was loved (see discussion in Chapter 4).

None of the above 'benefits' is mutually exclusive, and nor is any likely to be archaeologically identifiable. Nonetheless, it may be particularly revealing to analyse decisions to provide care in circumstances where there was apparently little likelihood of recovery and/or in the face of likely significant practical difficulties in meeting complex and resource intensive care requirements. The provision of care under adverse conditions indicates powerful motivations, whatever their source, and all such instances will have involved a level of debate counter-posing 'acts of care' with 'obstacles to care'. Consideration of these variables has the potential to illuminate aspects of group and individual identity.

Figure 5.1 depicts basic decision points likely to have been visited by a small prehistoric community over the duration of care provision. The generic decision path presented can be seen as recapitulating Stages 2 and 3 of bioarchaeology of care analysis, but from the standpoint of those who gave care rather than from that of the researcher. So the first step, 'Identify need for health-related care', corresponds effectively to Stage 2 - potential caregivers would have to assess the clinical and functional implications of the individual's pathology, and additionally have to assess considerations operating for and against providing the care required. A decision to provide care would require developing a plan of action - a Stage 3 'model of care', which might have had to go through a number of revisions before a care strategy that suited both individual and group needs and abilities was achieved (if indeed it was).

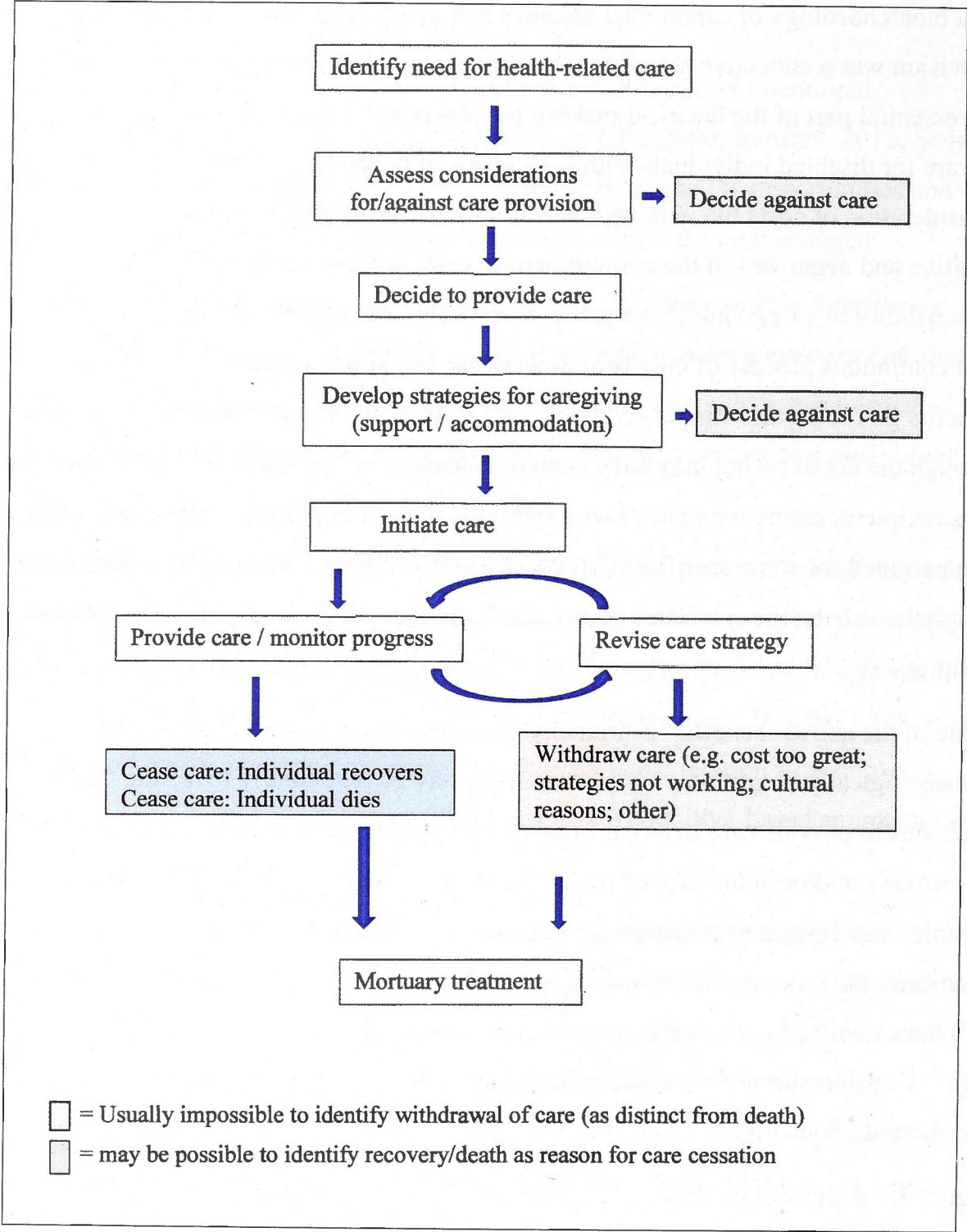


Figure 5.1 Generic decision path for health-related care provision

Bioarchaeology of care analysis can only be applied to those cases where caregiving can be inferred with confidence; it is impossible to distinguish unsuccessful care (in the sense of care that failed to save life) from *absence* of care. This means that a decision to withhold or withdraw care will almost certainly be impossible to identify. Despite this, an agency-based analysis of caregiving should consider all possibilities, both to make better sense of choices that appear to have been made, and to clarify where it is impossible to determine what choice was adopted. For this reason, Figure 5.1 identifies steps at which a decision to deny care was an option.

The final step in the decision path - treatment of the care-recipient after death - requires some comment. Mortuary treatment of remains manifesting signs of difference (pathological or otherwise) is often used as the basis for inference about the status of the individual during life (Fay 2009; Formicola and Buzhilova 2004; Shay 1985), but this correspondence is not automatic (Hodder and Hutson 1986:2-6; Pankowska 2009; Pearson 1982, 1999; Rautman 2000). Neither can mortuary treatment of an individual likely receiving care at time of death be regarded as a seamless transition from 'care of the living' to 'care of the dead'. Having said this, where evidence of mortuary treatment is available, and where this can be compared to the treatment of others from the same cohort, it may be rewarding to test mortuary data against an understanding of the likely practices of care and the agency underlying these. Results may contribute additional insights into group custom and behaviour.

In Figure 5.1 decision steps are presented as discrete and sequential, but this is only a device. In real life, decision-making about healthcare is an organic process; one that can be logically ordered, but is equally likely to contain elements that are regressive, contradictory, emotionally-driven and completely out-of-left-field. This detail will be invisible to archaeologists, and the irony in arguing for an interpretive methodology that acknowledges the agency inherent in the choice to give care, while proposing what might appear as a mechanistic approach to analysing the decision-making processes involved, is acknowledged. Despite this, most if not all areas of decision-making identified in this schematic are likely to have been relevant at some point in the course of care, a claim supported by ethnographies of healthcare provision in pre-modern societies (e.g. Bloom 2005; Cohen 1989; Frankel 1986; see Lewis 1975:250 and flow-chart 'Paths in the interpretation and treatment of illness' among the Gnau).

5.4 Caregiving, agency and group identity

Considering the decisions likely taken by a community in providing healthcare to one of their own opens the way to examining what the choices made - and the agency embedded in these choices - may reveal about nature and motivations of the caregivers themselves. The approach proposed consists of asking the same basic question at each of the points identified in the likely decision path corresponding to the case of care under analysis: given what is known about the context in which this particular option was selected, what does this aspect of the caregiving process reveal about the group and its lifeways?

Interrogating this combination of archaeological information and inference has the potential to provide insights into the group and their lifeways at a number of different levels. For example, what do the facts that the decision to care was made in the first place, that care was persevered with for some period, and that for a time, at least, the demands for care were successfully negotiated, suggest about the group in terms of 'personhood' or 'relations between (and constituting) persons' (Fowler 2001:139)? Closely related to this, what does the decision to provide care, particularly in circumstances where there are likely significant costs with possibly uncertain outcomes, suggest about established community norms, customs and values - for example in relation to the rights and responsibilities of group members (the elements of social reproduction encapsulated in Bordieu's [1990] concepts of *doxa* and *habitus*)? Returning to discussion in Chapter 4 on the origins of care, and in particular on the possible role of emotions in care, what does the likely care provided suggest about motivations driving this behavioural choice?

Moving to aspects of community more easily operationalised, what does the management of time and labour associated with either specific therapy or more general nursing care provision indicate about the social and economic organisation of the group? Given lifeways context, what might 'accommodation' of an individual with reduced functioning capability comprise, and what might this reflect about group socioeconomic practice more generally? What does the ability to provide care at all suggest about the group's economic circumstances - including the range of demands on, and/or ease of access to, resources? What does the range of skills and knowledge likely utilised in providing the particular type of care required suggest about group exposure to pathology in the past; previous experience in healthcare provision; and ability to apply past learning to possibly new situations? And at the most straightforward level of consideration, what do the practical requirements of care suggest about the primary resources and technologies available to the community - for example, what type of covering might be used to ensure warmth; how might a person with mobility problems be assisted in a mobile society; what foods might provide nutrition to someone unable to manage a 'normal' diet?

Every case study of care has its own storyline. The starting point for bioarchaeological analysis - evidence for health-related care provision - is the only element shared by all. There can be no one-size-fits-all formula for converting hypotheses about a likely 'decision path' for care giving to conclusions about group identity and lifestyle, and

ultimately any conclusions drawn will reflect the judgement of the individual researcher, with all the potential for bias inherent in this (Chattoo 2009; Shanks and Tilley 1987; Tilley 1998; Wylie 2002). However, the value of bringing together fact and inference to interpret caregiving more than compensates for the difficulties inherent in this process, because when this analysis works it brings us that much closer to understanding how a particular group of people, from a particular time, managed their lives.

5.5 Individual identity

The individual - in this context defined as a single person, distinct from all others - is produced through continuing, multiple and complex interactions between the influences of, and experiences within, social, cultural, psychological and biological domains (Doise and Palmonari 1984; Fiske 2004; Lerner and Steinberg 2009; for discussion specific to archaeology see Meskell 2000). There are very few events more personal, powerful, intimate and immediate than the experience of pathology severe enough to be disabling and of sufficient duration to leave evidence in bone. If any phenomenon in prehistory is capable of providing insight into aspects of the life experience and character of a specific individual, then surely this is it.

This section discusses the prospects for an 'archaeology of the individual' more broadly, and then considers whether, and how, it might be possible to achieve some understanding - however limited and provisional - of the identity of the individual at the heart of a case study of care.

5.5.1 *The individual in archaeology: still searching.*

'[M]ost archaeological studies on the body leave their bodies uninhabited and without materiality' (Meskell 2000: 20).

Archaeology's interest in 'the individual' has grown exponentially in the last 15 to 20 years (Knapp and van Dommelen 2008). Identifying the individual is an explicit focus in areas of post-processual theory and practice (Hodder 2000; Knapp and van Dommelen 2008; Meskell 2000; Thomas 2002) and is central to a number of edited volumes (e.g. Hamilakis et al. 2002; Insoll 2007; Rautman 2000; Stodder and Palkovich 2012). Despite this, the search for an *actual* prehistoric individual, in the sense of

someone who might be (partially) recognisable if they walked into the room, has been generally unsuccessful - although Robb's (2002) osteobiography-based account of the life of an older woman from the Italian Neolithic is one notable exception, Hodder's (2000) exploration of the life-experience of an older man from Çatalhöyük, although brief, is another, and Stodder and Palkovich's (Eds) (2012) recent publication is a third - *The bioarchaeology of individuals* comprises a collection of very detailed osteobiographies, some of which can almost be described as 'portraits' (see, among others, chapters by Boudin; Geller; Heathcote et al; Lozada et al.; Martin and Potts; and Walker et al.).

Generally, however, there is little shared understanding of what constitutes 'individual identity' for archaeological purposes, and there is not even consensus as to whether the concept of 'the individual', in the pre-modern context, is a valid one to begin with (Thomas 2000, 2008; Knapp and van Dommelen 2008). Too often, what is presented as the individual (re)produced through the analytical process is no more than a stereotype - the anonymous everyman-or-woman representing a generic inhabitant of an homogenised community. As Meskell (2000) observes, in archaeology 'the body has been cast as an object, a thing, a metaphor for society or a product of semantics' (Meskell 2000:13).

The overall failure of archaeology to extract convincing individuals from prehistory may be, in large part, an outcome of reluctance to engage with the physical evidence of human remains in any depth; a phenomenon analysed by Sofaer (2006), and discussed in Chapter 2. It is epitomised in texts such as *Thinking through the body*, an edited volume of chapters addressing the 'meaning of the body and exploration of its variable relationship to self, subject, person or, particularly, individual ... [and] embodiment - experience from and of the located material body' (Hamilakis et al 2002:1-2).

Despite its stated focus, the Introduction dismisses the potential contribution of physical anthropology to 'Archaeology and the Human Body' in one paragraph (Hamilakis et al 2002:4). There is only one chapter in the volume that engages with the potential contribution of osteological analysis to deciphering what it may have meant to 'think through' - or, more mundanely, 'live in' - a *specific* body, and this is the study by Robb (2002) referred to above. Much of the archaeology exploring agency has sacrificed the individual as an 'agent' in their own right by presenting the individual as a 'theoretical prop to the emphasis on intentionality' (Hodder 2000:22), again likely reflecting discomfort in dealing with physical remains. Thomas (2000, 2002), for example, in

writing on the British Neolithic draws an equivalence between mortuary treatment of pottery and mortuary treatment of skeletal elements. This treatment is interpreted as metaphorically significant, but from the text alone it is sometimes difficult to determine which set of 'objects' (bones or ceramic sherds) is the metaphor for the other. Thomas (2002) writes '[I]n the absence of extensive information relating to everyday activities, much of what we know about Neolithic *bodies* comes from funerary contexts' (Thomas 2002:38, emphasis added). By 'bodies' Thomas (2002) presumably means 'people' (there is no attempt at skeletal analysis or physiological inference), but this use of words distances both author and reader from the human beings to whom these bones once belonged.

That most archaeological writing on the individual results in group-level generalities may be an outcome of thinking in terms of 'the body' rather than in terms of 'the subject' or 'the actor'. In the literature on identity the body is frequently (re)created by archaeologists as a site of adornment or display, with focus on the material culture of dress, ornamentation and other associated artefacts and extending to practices of physical modification, such as tattooing, head binding, dental filing, dental decoration and dental ablation, all of which are necessarily addressed in terms of identifiers of particular group membership rather than as signifiers of individual experience (e.g. Bulger and Joyce 2012; chapters in Díaz-Andreu et al. 2005; Joyce 2005; McCafferty and McCafferty 2011; Meskell 2000). As Joyce (2005:145) puts it:

Archaeological analysis ... can tell us about the embodied life of deceased persons, but only through an understanding of the reflexive relations between body practices, perceptions and experience between persons.

In short, 'the body' is understood as an object produced through cultural and social practice. This is a perfectly legitimate perspective for archaeological analysis - but it is not the full story.

Construction of 'identity' through analysis of appearance, posture and gesture recorded in two and three dimensional prehistoric human figurative representations is also popular, although again the focus is limited to cultural or symbolic identity rather than that of the individual (e.g. Danielsson 2002; Díaz-Andreu 2005; Morris and Peatfield 2002). Bailey (2005:197ff) hypothesises that the original creation of anthropomorphic figurines suggests a community acceptance of the physical body as 'the primary site of the individual and the self' (Bailey 2005:201); if these figurines say nothing about personal identity, then they at least suggest an awareness of self as existing both

separately from, but in relation to, others. McDermott (1996; McCoid and McDermott 1996) suggests that some prehistoric figurines may actually depict specific people, and in certain cases may be self-portraits. If he is right, and in relation to the possible self-portraits nominated McDermott (1996; McCoid and McDermott 1996) he makes a convincing case, these figurines might be a useful source of information both about individual features of the artists and their models, and about aspects of the lifeways in which the sculptures were produced.

Finally, it is noted that over 30 years ago researchers explored the potential to identify the individual in archaeology through artefact manufacture and/or application of technologies (Hill and Gunn (Eds.) 1977), and there has been a recent revival of interest in distinguishing the individual craftsperson in prehistory as a means of achieving a more nuanced understanding of past social relations (Thomas et al. 2009). Individual artisans may be identifiable on the basis of idiosyncrasies of style, but despite recognition of these 'prehistoric signature(s)' (Thomas et al 2009:54) they appear to remain anonymous in every other detail.

5.5.1.1 Does the prehistoric 'individual' exist?

Problems in defining the individual in archaeology are compounded by the disconcerting way in which many texts switch from talking of the (individual) 'person' to talking of 'personhood' (for examples see Fowler 2001; Joyce 2005; for discussion see Knapp and van Dommelen 2008; Meskell 2000). 'Personhood' describes the patterns and products of relationships between elements constituting a community, and is more accurately employed in the context of group identity (Fowler 2001). If the term 'person' is deliberately used to convey the notion of a single generic unit embodying group identity then the conflation of personhood and person is less egregious.

However, 'person' and 'personhood' are often used interchangeably and also synonymously with 'individual' to indicate a unique human being (Thomas 2008:27), and in this situation the way these terms are used clearly matters.

That individuals are both produced and defined through their relationships in the world is not disputed; an individual's behaviours are largely shaped by, and reflect, norms, values and expectations of their sociocultural context (Bordieu 1990; Knapp and van Dommelen 2008; Robb 2010). However, each individual also develops a unique sense of self - or 'identity' - as a result of their unique experience within their environment.

As a corollary of this, however constrained within their field of action (Bordieu 1990), each individual will possess and exercise agency in their daily lives. '[W]e must accept that people in the past were capable of acting as social agents and, crucially, *were aware of themselves as persons*' (Knapp and van Dommelen 2008:22, emphasis in original; also see Moore 2000).

This imperative is not universally accepted, and claims for the existence of individual agency (as this is understood today) in prehistoric times have been challenged. One of the most popular counter-arguments is the contention that endowing past peoples with the potential for individuality reflects the hegemonic dominance of the post-Enlightenment embrace of individualism - defined as the 'discourse celebrating and prioritising the modern Western individual' (Thomas 2008:27; Fowler 2001; Insoll 2007; Joyce 2005; Shanks and Tilly 1987). Many authors argue that ethnographic accounts of 'dividual' pre-modern communities provide a better model for re-creating past personhood and past persons ('dividualism' refers to forms of social relations that prioritise integration or unity, in comparison with 'individualism', which, by prioritising the individual, is a form of social relations which alienates [Fowler 2001]).

This might be so, but there is no logical reason for a model of social relations derived largely from anthropological work in the South Pacific (Strathern 1988) to be more applicable to the past than models derived from other pre-modern, or even modern, societies. More to the point, there is no reason to exclude the existence of the individual on the basis of a collectively-oriented social order. Jones (2005:194), for example, writes of the people in the North Western European Neolithic that 'they are not so much individuals as 'dividuals': who they are and what they do is generated by their transactions with each other, with material culture and the dead'. The certainty of this retrospective assignment of source of identity in the European Neolithic is interesting in its own right (not least the assumption that it is so fundamentally different to modern relationality), but it does not explain why, or how, this situation might rule out individual agency.

Thomas (2002, 2008) goes further, suggesting that it may not be valid to apply the idea of 'the individual' to prehistoric culture at all:

to impose the concept of the individual on the distant past is a dangerous and potentially narcissistic exercise ... personhood [in the past] is relational, we should explore the relationships that enable humanity to create and sustain itself in the past ... rather than presume that the transcendental individual has always stood at the centre of everything (Thomas 2004: 147-148, cited Knapp and van Dommelen 2008:15).

The various positions and protagonists in the debate around an archaeology of the individual are reviewed by Knapp and van Dommelen (2008). They conclude: 'we suggest that experiencing oneself as a living individual is part of human nature, and archaeologists should reconsider the social, spatial and ideological importance of the individual and of individual embodied lives in the past' (Knapp and van Dommelen 2008:16). Comprehensive as their paper is, Knapp and van Dommelen (2008) fail to convey the frustration expressed by some at an archaeology in which, for the most part, 'we still omit real people' (Meskell 2000:20).

5.5.1.2 New directions for seeking the individual

This returns discussion to consideration to the few successful attempts to date to bring an individual from the prehistoric past into the modern gaze. Robb's (2002) case study, for example, works so well because it situates a particular Neolithic woman within the framework of her own body and her own physical life history as well as within her lifeways context, and this combination of the physiological and cultural is exponentially more powerful in explaining this person to a modern audience than either category of information on its own. The same observation applies to many of the case studies in Stodder and Palkovich (2012).

Biological data alone are obviously not enough to give us the individual. Hawkey's (1998) meticulously-drawn account of the disease-related life course of Burial 391 offers no explicit insight into personal identity (although there is certainly scope to speculate). However, without the ability to position an actor in their physical body we have an abstraction rather than a person, so assignment of materiality is a critical first step. This view is supported in Knudson and Stojanowski's (2008) review of bioarchaeology's '*recent contributions to the study of human social identities*'. The authors define identity in terms of the 'social construction of human experience' (Knudson and Stojanowski 2008:398), acknowledging that 'identity' is created and

operates at both a personal and a communal level, and that people will have multiple and changing identities corresponding to the social roles they occupy. While explicitly rejecting the idea that identity can be accessed through a tally of skeletal measures and markers, Knudson and Stojanowski (2008) point out that social roles are often associated with, or expressed in, 'osteological indicators that are both durable and plastic and therefore provide both mutable and immutable information about the identities people [are] signalling' (Knudson and Stojanowski 2008:398). They argue for equal status for bioarchaeological data in research into identity:

[t]he combination of durability, plasticity and temporal sensitivity [of the bioarchaeological data set] can be used to reconstruct past social processes in a manner simply not possible using archaeological or historical data sets alone (Knudson and Stojanowski 2008:399).

Knudson and Stojanowski (2008) provide a valuable overview of potential bioarchaeological contributions to the topic of identity, coincidentally identifying health, disease and impairment as promising areas for future research on social identity, but they restrict their focus to 'identity as social construct' - the 'generic individual' discussed earlier. They stop short of considering the possibility of a (bio)archaeology of truly *individual* identity; one that might build upon the concept of 'osteobiography' first articulated by Saul (1972; Saul and Saul 1989) and adapted (although in different ways) by Hawkey (1998) and Robb (2002) to produce personal histories of disease experience.

5.5.2 Identifying the individual through the lens of disability and the lens of care.

The sum of a person is neither determined nor defined by their disability. In an archaeological context, however, a set of human remains displaying evidence for survival with significant disability provides a focus for singling out one, specific, individual from the past; a person demonstrably different to others in their community in terms of physical capabilities and, because of this, most likely different in terms of role, interactions, opportunities and expectations as well.

Because the approach proposed for attempting to access aspects of the personality of the individual has its foundations in evidence for disability, some are likely to be profoundly uncomfortable with it (for example, Dettwyler 1991; Roberts 1999, 2000). Significant disability potentially shapes and constrains aspects of daily living, social

roles and interactions (WHO 2001); in practice, living with disability affects the way people experience their world and experience themselves within this world, as well as the way that they are perceived and treated by others (Shildrick 2009:33-36). To the extent that identity is a sociocultural construct, the individual experiencing disability is likely to be assigned, or to assign themselves, an identity that in some way distinguishes them from others of their cohort who are not so affected. (This is not to suggest that this identity is either inferior *or* their only identity - as Knudson and Stojanowski [2008] point out, people have multiple identities.)

In addition, and within social, cultural, economic and environmental parameters, the experience of disability is also mediated through psychological and physiological traits particular to the individual, such as their personal understanding and expectations of what it means to be healthy, efficacy of coping mechanisms and mental resilience, tolerance for pain and discomfort, level of immunocompetence and general health status (e.g. Bowling 2002; Cooper et al. 2011; Fillingim 2005; Jylhä 2009; Nusselder et al. 2005; Olff 1999; Taylor and Lynch 2004). If the archaeological goal of identifying 'the individual' and 'the individual life lived' is understood as recovering evidence of a once-living human being who possessed a set of personal characteristics and a life history that are unique, then the remains of an individual who lived with disability provide a promising starting point.

Before proceeding, it is necessary to acknowledge the caveats that must be factored into all bioarchaeology of care research (detailed in Chapter 3). It is taken as a given that we can never recover the detail of experience and character of someone who lived in a time and culture that can only be entered through often arbitrarily-selected and poorly-preserved biological and cultural remains. Skeletal evidence only reveals the minimum pathology present during life, and this, together with individual variability in disease response, means that translation of osteological evidence into personal experience of disease requires utmost caution. The person with one observable pathology may have suffered others that are archaeologically indiscernible, and these latter may have been associated with additional disability or an increased level of disability to that linked to the 'known' condition. The search for identity must ignore these possibilities, yet leaving them out of the equation inevitably skews understanding of the individual's experience of living with disability. In the following discussion all these qualifications should be taken as applying to the interpretative directions canvassed.

In a best-case scenario, and in conjunction with what is known about the corresponding lifeways context, a picture of the individual's disability-related life course and social identity might be generated using the following fields of information:

- i. Basic descriptors (non-pathology-related) - physical characteristics (such as sex, age at death, general health status, height, build, activity markers, non-pathological anomalies, and where possible isotopic or DNA-derived information on family, origin, diet, travel, and so on);
- ii. Pathology-related indicators - description of pathology associated with disability; manner of acquisition; age at acquisition and likely duration; (minimum) range of likely clinical and functional impacts of pathology, including implications for participation in lifeways activity 'normal' for the demographic cohort; likely type(s) of care required to counter pathology impact(s); and
- iii. Social indicators - (possible) evidence of social or occupational role or status, such as mortuary treatment.

To this point, the procedure is very similar to that used by Robb (2002) (and by authors in Stodder and Palkovich (Eds.) 2012), other than in the increased emphasis placed on variables relating to the subject's likely experience of pathology. It can be summarised as seeking the individual through the lens of disability, and is relatively self-explanatory.

The next step builds on this by looking at the experience of the individual through the lens of care, examining the individual in relation to both the type and duration of the care they likely received and the possible interactions between themselves and those in the community who provided this care. The first half of this chapter considers how evidence of the collective agency demonstrated in caregiving has the potential to furnish insights into group identity and lifeways practice. Reviewing the individual's 'osteobiography of disability' in the context of this collective agency may allow inference about the functional (and possibly emotional) nature of relationships between the person cared-for and their caregivers. Focusing on these relationships, in turn, may allow inference about personal characteristics and behaviour of the subject at the centre of care. It may also suggest something about how this individual was seen by others - a glimpse of their public persona.

Recognising that the person who is cared for is not just a passive target for the actions of others is fundamental to this analysis. Assuming cognitive function, this individual is an active agent in negotiating the treatment they receive and the way they are perceived within their group. Negotiations may be undertaken consciously or unconsciously, formally or informally. In reality, because of factors such as resource limitations, sociocultural norms, knowledge and skills available and so on, the individual may have little scope to influence the content of care forthcoming. Nevertheless, they may be able to influence mode and manner of care delivery, perhaps by virtue of their status within their family or group and/or by personality alone.

At the very least, every care-recipient retains the power to choose whether to collaborate with the healthcare on offer or to reject it, either overtly, by repulsing attempts at care, or covertly, by refusing to cooperate with, or actively undermining, the care regime. The individual's attitude - an expression of their agency - can be a critical factor in managing the impact of serious disease, and positive engagement with family and community and maintenance of external interests contribute significantly to both general and health-related quality of life (Bloor and McIntosh 1990; Cooper et al. 2011; Lupton 1997; Nusselder et al. 2004). It follows that what is inferred about the nature of the care supplied, and the individual's response to the elements of this care (survival indicating at least temporary compliance if not active cooperation), may offer another perspective for approaching the identity of the care-recipient.

Taking a step back, there is the question of whether interpersonal relationships operating in the context of caregiving can be archaeologically identified and, if so, what these may reveal. 'Relationship' in these circumstances can be defined in a number of ways, the simplest being those interactions necessary to deliver whatever care is dictated by the individual's condition and, more conjecturally, encompassing interactions that also meet the individual's social and emotional needs and create a meaningful role for the individual within family and community (Henderson 1966; Kim 2010; Watson 1999).

It is valid to infer the existence of a contingent cared-for/carer relationship where care was clearly required for survival. For the most part - many would argue without exception - the meaning and quality of this relationship may be impossible to assess. While likely drivers of care can be discussed at a theoretical level (see Chapter 4), the relationships between the individual with disability and their carers - positive or negative, optimistic or pessimistic, generous or mean, based on love or duty, between

equals or non-equals, compliant or defiant, or all of these at various times and involving different people - can never be fully known. However, where disability was likely extreme, where care was likely correspondingly demanding and possibly costly, and where this care was likely provided over an extended period (suggesting considerable commitment), evidence supports inference of relationships of positive emotional attachment, minimally between some of the actors involved, rather than relationships of a purely functional nature (Kramer 1997). In these cases, and in light of what may be deduced about the individual and their situation from the bioarchaeological evidence, it may be defensible to draw broad inferences regarding the individual characteristics of a care-recipient capable of eliciting such a substantial care response.

In addition to obstacles already noted, there are more general conceptual difficulties in exploring posited caregiver/cared-for relationships. An obvious one is that the 'meaning' ascribed to a particular disease and associated disability can be as much a sociocultural construct as identity itself (see Chapter 3). The ethnographic literature indicates that caregiving relationships are often shaped by a pathology's cultural significance (such as beliefs associated with aetiology or outcomes) as much as by its physical manifestation (e.g. Frankel 1986; Ghai 2001).

In contemplating possible relationships between the disabled individual and others it will be difficult to separate the role of tradition from that of personality at even the most hypothetical level. Nonetheless, recent work by Marsteller et al. (2011) identifying sickness ideology and social experience of leishmaniasis in pre-Columbian Chile based on contextualised analyses of evidence of disease in human remains demonstrates that it is not impossible.

5.5.2.1 Questions to reveal the individual

Combining the perspectives of disability and care allows interrogation of the way in which the individual may have been perceived by their contemporaries. It is possible to take the assessment of the potential limitations of the disability, and the potential impact of these limitations on participation in community activity, and turn these on their head. For example, given what is known of community lifeways and what has been inferred about group identity, what activities may have been accessible to the individual? Certain writers insist that prehistoric individuals with disability likely made an equal-if-different socioeconomic contribution to their group, with the most popular alternative

occupations suggested being those of shaman or story-teller (e.g. Dettwyler 1991; Tarlow 2000). While not inconceivable, it is improbable that such important roles were regularly allocated on the basis of disability alone, and the claim appears to be more a reflection of current social values than a realistic proposition for past behaviour (see Chapter 2). Nevertheless, in a prehistoric subsistence context the disabled individual would have been called upon to contribute to the extent of their capability, so what might their role have been?

Ideally, an osteobiography would include information on the likely manner in which the disability was acquired. This information will often not be available, but where it is, research undertaken in the modern era (Stone 2001) indicates it is rewarding to explore possible relationships between cause of disability and care provision, and to consider what these may suggest about care-recipient role and status in the community.

Qualified use of mortuary data in relation to practice of collective agency was urged earlier in this chapter, and refocusing this analysis on implications for individual identity may be rewarding; evidence of deviation from or, conversely, adherence to, normative practice in relation to disposition of the disabled individual may provide an idea of how this person (and their condition) was received by the community which can then be used in reflecting back on the individual's lived experience.

Attempts to understand the way a care-recipient experienced the meaning of their care and/or the impact of this care on their sense of self are admittedly problematic. Yet where there is a disability for which specific types of health-related care can be hypothesised, practical considerations can be identified that provide a frame of reference for approaching questions of identity. For example, if disability likely prevented participation in occupations typically undertaken by others of the same cohort, how might 'accommodation' involving non-standard tasks affect experience of personal identity? Where assistance was required for activities normally carried out independently (for example hygiene maintenance, postural positioning, operation of other body functions) and/or involved intimate, intensive and possibly physically and psychology intrusive physical therapies (such as toileting, washing and wiping, massage and manipulation), how may this have affected the care-recipient's self-esteem, or influenced others' perception of the care-recipient?

A final question relates to what is known about healthcare provision within the community generally, and where the individual, their disability and their care might fit with such behaviour. Was the individual singular in receiving care, or are there other

examples of caregiving? The constraints in identifying pathology in skeletal remains (and consequently to the ability to infer customs of care practice) were discussed in Chapter 3. Notwithstanding, where there is a basis for hypothesising a tradition of care provision, the inclusion of the individual as a care-recipient may shed light on aspects of their social identity pre- and/or post-disability onset.

The more detailed and personal the questions relating to identity, the more speculative and qualified the responses become. There is no possibility of ever 'proving' that a particular person in prehistory, known to us primarily through their bones, occupied a particular role and possessed a particular set of personality traits. Beyond a certain point the search for the individual is more art than science.

5.6 Summing up: agency, identity and the bioarchaeology of care

This chapter presents the theoretical basis and justification for Stage 4 of the bioarchaeology of care methodology, which interprets bioarchaeological evidence for caregiving in terms of collective and individual agency and identity. Both the conceptual and applied frameworks proposed for these analyses have been described in some detail. In summary, the key to interpretation is understanding both the act of giving care and the act of receiving it as expressions of agency.

Unpacking the likely decisions made by caregivers in the process of providing care, and reading these decisions in relation to lifeways context, enables systematic and transparent interrogation of aspects of group identity and practice that might otherwise go unconsidered. This exercise allows development of a more nuanced appreciation of the community in which healthcare was provided, although it is recognised that such knowledge must inevitably be incomplete.

In turn, the care-recipient is acknowledged as an active player in their own healthcare. Examining the possible interactions between elements of the individual's osteobiography, inferences regarding likely experience of disability and care, lifeways, and conclusions (however tentative) about group agency and identity, provides a structured approach for seeking out the unique individual who is the focus for care.

The propositions contained in this chapter will undoubtedly make it the most contentious of this dissertation, just as Stage 4 of the bioarchaeology of care approach will be seen as the most contentious of this methodology. As discussed in Chapter 2, some of the previous attempts to extract a wider sociocultural meaning from inference

of prehistoric health-related caregiving have attracted strong criticism, and the views put forward in the critiqued studies (see Appendix A) pale into insignificance with what is proposed here. Some of the impediments, caveats and qualifications in essaying a bioarchaeology of care analysis have been covered in the text of this and preceding chapters, and they include the difficulties encountered in assessing the nature, extent and impact of pathology from osteological evidence; the dilemma of equifinality; and researcher bias in interpretation. These are valid concerns, but not insuperable obstacles.

Problems in identifying characteristics of disease (essential to analysing 'agency' implications at both group and individual levels) confront all palaeopathology research, and possible measures for dealing with these are addressed in the following chapter, which details the specifics of the bioarchaeology of care methodology and its application. Concerns relating to equifinality plague most archaeological studies, and a bioarchaeology of care analysis of agency is no different; there may be a number of 'decision paths' capable of producing the same evidence for survival with disability and all must be considered, with those best explaining the evidence identified. Finally, although health care provision may be more sensitive than most topics in archaeology for a variety of (modern) sociopolitical reasons, it is not alone in facing the challenge of coping with possible researcher bias. As argued in Chapter 1, it is impossible for any archaeologist investigating social behaviour to completely put aside the expectations, values and prejudices that each of us, as individuals produced in a particular social and cultural environment, brings to our understanding and interpretation of the past. The only way of confronting the potential for bias is to be open about the reasoning employed in analysis, and the need for such accountability is repeatedly emphasised throughout this thesis, and is integral to all stages of the bioarchaeology of care approach and the applied methodology.

There is one final point that requires more discussion than it can be given here. The analytical procedures proposed in this chapter consist in large part of questions developed through positioning and repositioning information and inference in a wide variety of combinations. These questions may be just as significant as any answers obtained. The process of framing the questions acts to concentrate attention on the group and the individual (the parties bonded in the caregiving relationship) and helps to bring both parties' experiences to life. In doing so, it aims for what many in the field see as archaeology's prime responsibility to those people whose history is being

invoked - the most complete and honest (re)production and (re)presentation of past lives that is possible. Writers on the ethics of archaeology urge a practice that does not shy away from interpretation based on less than perfect evidence, on the proviso that this practice freely admits the possibility of error and accepts that conclusions will be challenged and changed - above all, they argue that archaeologists should engage constructively, sensitively and ceaselessly with the past (Hodder 1991, 2000; Kintz 2001; Tarlow 2000, 2001; Tilley 1988; Wylie 1989). The bioarchaeology of care methodology in its totality, but in particular in its exploration of agency and identity, meets these criteria.

The approaches to interpretation outlined in this chapter offer internally consistent, practical and theoretical frameworks for addressing collective and individual agency and identity in the context of health-related care practice. Chapter 7 elaborates on the implementation of the concepts discussed in this chapter, but the potential power these offer for bringing us closer to the lived experience of the past is best illustrated in the detailed case studies presented in Chapters 8, 9 and 10.

CHAPTER 6. The Bioarchaeology of Care Methodology: Stages 1-3

The bioarchaeology of care methodology provides a framework for identifying and interpreting archaeological evidence suggesting the provision of health-related care to an individual who, at some stage of their life, experienced disabling pathology. This chapter and the following one describe the content and structure of the methodology, while the case studies documented in Chapters 8, 9 and 10 illustrate its application and demonstrate its power.

Previous chapters have included general observations about format, scope and aims of bioarchaeology of care analysis, and these will be elaborated in this and the following chapter. In summary, bioarchaeology of care analysis is case study-based; centred on the recovered remains of an individual (conceived as both subject and object) which display evidence of survival with, or following, serious disability; informed by archaeological evidence and modern clinical experience; and contextualised within the corresponding sociocultural and physical environments.

The bioarchaeology of care methodology comprises four distinct stages of analysis, each building on the observations and conclusions of previous ones with the goal of achieving the most comprehensive understanding possible of the individual's experience of disability and the behaviours of the group that provided care. In practice, however, information considered at the various stages will overlap, and later stage inference may be used recursively to refine earlier stage analyses. Stage 1 records the individual's remains, their lifeways, detailed description of pathology(ies) and, where possible, diagnosis of disease. Based on identification of likely clinical and functional impacts of the identified pathology, Stage 2 establishes whether, on the balance of probabilities, provision of health-related care was required and provided. Stage 3 considers what caregiving likely involved, producing a 'model of care' within contextual parameters of what was possible and probable. Stage 4, described in Chapter 7, examines what this caregiving response may reveal about community social practice and social relations more broadly, and in some cases what it may suggest about the identity of the individual receiving care. Although not an intentional design feature, these stages to some extent parallel the four rungs of Hawke's (1954) 'ladder of inference', with the first stage concentrating on description and measurement of material evidence - the 'relatively easy' (Hawke 1954:161) aspect of analysis - and

subsequent stages moving through successively more challenging levels of analysis and inference, with the final stage wholly focused on inference and interpretation.

Figure 6.1 summarises the four stages of bioarchaeology of care analysis and the relationship between these.

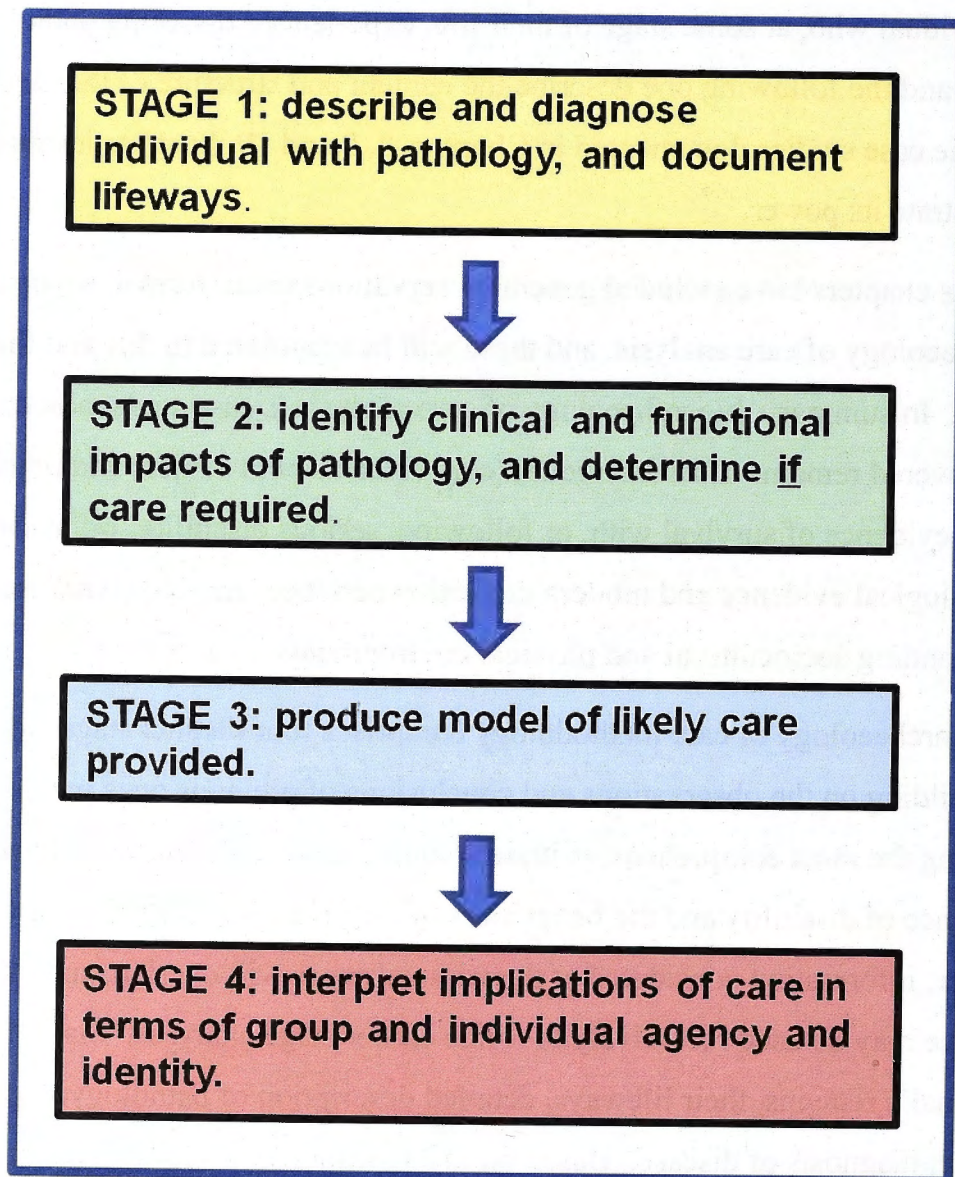


Figure 6.1 The four stages of the bioarchaeology of care.

The methodology presented below can be applied as an integrated part of the primary analysis of individual remains; in re-examination and (re)analysis of already-documented remains; and in a re-analysis of remains that is completely literature-based. The two latter applications use existing research as the foundation from which to explore a new perspective on past behaviour; there are obvious advantages in doing this, not least the ease of locating individual remains meeting the criteria for inclusion in bioarchaeology of care analysis, and the opportunity to benefit from the expertise of other researchers (at a minimum in relation to the requirements of Stage 1).

Initial work on the bioarchaeology of care methodology exploited this last application to identify questions that might validly be asked of archaeological materials across various situations, but all substantive development and refinement of the bioarchaeology of care approach and of the Index of Care (below) is based on direct examination and analysis of skeletal remains.

6.1 The Index of Care

Data gathering and interpretation protocols corresponding to each stage of bioarchaeology of care analysis have been developed to help to achieve consistency in data collection and analytical approach across research into past caregiving. Combined, these form the 'Index of Care'.

The Index of Care is a computer-based application designed as a tool to assist those undertaking bioarchaeology of care analysis. It is completely non-prescriptive; there are no constraints on the way it is employed, and researchers may pick and choose sections of the Index appropriate for their way of working, or reject its use entirely. Having said this, the Index offers a structured process for thinking through analysis of a case study of care; it comprises a series of worksheets and text boxes that provide a practical guide to step-by-step documentation, interrogation and interpretation of the osteological, archaeological, palaeopathological and clinical evidence on which a case for health-related care provision relies, and its use is recommended. Most items in the Index protocols are open-ended; most information sought is qualitative; and most input consists of descriptive text. There is provision throughout for recording additional observations, and the researcher may add to, or edit, all information entered into any Index protocol as required. A disk containing the Index of Care (beta version) is provided in Appendix B.

Corresponding to the four bioarchaeology of care stages of analysis, the Index of Care protocol for Stage 1 documents the evidence relating to the individual, their experience of pathology, their mortuary treatment and their lifeways context. The Stage 2 Index protocol structures and standardises (as far as feasible) consideration of possible clinical and functional outcomes of pathology, leading to a determination regarding likely provision of care. The Stage 3 Index protocol identifies the information necessary for developing a model of care specific to the subject and their lifeways. The Index protocol for Stage 4 offers a framework for drawing together and interpreting the social

and behavioural implications of material covered in Stages 1-3 by identifying possible subject matter areas for consideration and, in relation to these, proposing questions to help focus analysis.

The substance of the Index of Care protocols are based on information from empirical and theoretical archaeology, bioarchaeology and palaeopathology sources (Chapters 2, 3 and 5); modern clinical and healthcare literature; and the researcher's experience in (modern) health status assessment and health outcomes measurement. Where appropriate, protocols adopt or recommend data categories, definitions and measurement standards used in other archaeological research in order to maximise potential for cross-fertilisation. The contents and, where relevant, item-provenance of individual protocols are discussed in the section corresponding to the stage of analysis in which they are employed.

The Index of Care has three principle functions. The first is to serve as a 'prompt', ensuring - as far as possible - that all relevant information for each case-study is recorded and reviewed systematically, and that nothing which might inform any aspect of analysis or interpretation is overlooked. To this end, the protocols are designed with a level of redundancy.

The second function is to encourage shared operational definitions of terms - such as 'disability', 'care', 'support', 'severity', 'short or long term impact' - that are often used loosely in archaeological literature on caregiving (see Chapter 2).

The Index of Care's third function is to provide a framework for the logical ordering of the observations, information, inferences, conclusions and interpretations that go into a bioarchaeology of care analysis, at the end providing a record for use by the researcher in writing up the final case study. Importantly, it also allows identification of the information that is *not* available for analysis in a particular research study. Adherence to the Index framework assists transparency in the analytical process by making it easier for others to follow and evaluate the reasoning underlying inference of caregiving.

Additionally, this very broad standardisation of approach achieved through application of the Index facilitates comparison of care-giving behaviours across different groups and different circumstances, although it is emphasised that this can only ever be attempted within the strict limits discussed in Chapter 3.

Each case study documented using the Index of Care is saved as a separate record. It is reiterated that data used in bioarchaeology of care analyses are predominantly

qualitative and contextually dependent. Individuals identified as care recipients cannot be taken as in any way 'representative' of a given population (see Chapter 3), meaning it will never be valid to attempt statistical analysis of data associated with individual case records; however, if the Index were to become widely adopted and case study records collated in a dedicated repository, a key-word search facility across records could be developed.

The current version of the Index of Care is in the early beta development stage, and the next step is to offer it for trialling by others. It is hoped that the Index will evolve with the help of feedback, leading to refinement of the content covered, the user interface design, and its interrogation capacity.

6.2 Stage 1: Documenting the individual, their pathology, and their lifeways context

The decision to undertake a bioarchaeology of care analysis is triggered by evidence in a set of human remains indicating that the individual lived for a period of time with, or following, experience of a serious pathology which may have required care from others to enable the individual's survival.

There are three contingent elements buried in this statement that require closer examination before outlining the content of Stage 1 of the bioarchaeology of care approach. Firstly, what constitutes a 'set of human remains' capable of representing an 'individual' and their experience for the purpose of bioarchaeology of care analysis? Problems relating to skeletal preservation were discussed in Chapter 3, and these include difficulties in diagnosing and/or differentiating between specific diseases and in identifying the full nature and extent of disease impact. Lubell et al. (2004), for example, find no difficulty in proposing community support for two disabled, unsexed, individuals represented by partial remains (one individual represented only by upper limbs). It is suggested here that the bioarchaeology of care methodology can be applied even if there is only a single skeletal element present, so long as provenance data provide sufficient context for analysis and the evidence of disease is sufficient to indicate likely temporary or permanent loss of functional independence in tasks of daily living (Stage 2 analysis). However, to the extent that there is not sufficient evidence to allow determination of the likely range of disease characteristics or basic characteristics

of the individual, such as age and sex, the potential for analysis and interpretation will be limited.

Secondly, there is the reference to 'period of time'. To meet the criterion for inclusion in bioarchaeology of care analysis there has to be evidence that receipt of care was at least a possibility, and therefore indicators of a pathology only experienced perimortem fail to meet this test. This concern applies mainly to questions of care following acute trauma, where at a minimum remains should display indications of early bone response at the site of injury (suggesting survival post-injury for a period of days) for the possibility of care provision to be contemplated.

Finally, there is the phrase 'serious pathology which may have required care'. In deciding whether to commit to investigating possible health-related care, what constitutes 'serious pathology' will be a matter for researcher judgement based on their assessment of what symptoms may have been associated with disease experience. Whether or not care was likely required for survival cannot properly be established until disease implications for functioning ability have been thoroughly assessed (Stage 2).

6.2.1 Stage 1: The platform for the analysis of care

Stage 1 of the bioarchaeology of care methodology is the platform for all subsequent analysis. It brings together the available osteological, palaeopathological and archaeological information about the individual, their experience of disease, and the cultural, social, economic and physical contexts in which this disease occurred.

Because bioarchaeology of care analysis is initiated following identification of the possibility of health-related care provision, initial recording, analysis and diagnosis of the remains and the evidence for pathology will usually have been undertaken, and the research focus on caregiving sits on top of this existing work. (Where the possibility of caregiving having occurred is recognised before beginning documentation of remains, then initial description and diagnosis should be carried out in accordance with the researcher's standard practice.) The requirement that all steps in bioarchaeology of care analysis be thoroughly contextualised may, nonetheless, demand additional research into aspects of the lifeways environment.

6.2.1.1 Corresponding Index of Care protocol

The corresponding Index of Care protocol is divided into four sections, each containing multiple items prompting the researcher to provide all available information and observations about the subject and their lifeways that inform analysis of disability and care. Each section offers the opportunity for unlimited comment against each nominated item, and at the end of every section there is scope for additional commentary. As is the case in relation to all the protocols, the researcher has the option of ignoring items not considered relevant or for which there is no information available. The end result of the Stage 1 Index protocol is, essentially, a series of lists identifying what is known about the case study and its context, and also, if only by default, what potentially useful information is missing.

The first section, 'The Individual', records individual identifiers (basic provenance details and personal characteristics such as sex, age, height, results of any stable isotope or DNA analysis relating to diet, origins and so on) and a description of the remains (elements recovered, completeness, preservation, morphology and anomalies - pathological or otherwise).

The second section, 'Pathology', focuses on evidence for, and diagnosis of, disease. As relevant, items cover description of pathology indicators and activity status at time of death; location and pattern of indicators; relationships between multiple indicators; any diagnoses considered and actual diagnosis proposed; implications of missing skeletal elements for understanding pathology; age of pathology acquisition and duration of pathology; and summary comments relating to obvious disease symptoms and possible course of disease (detailed consideration of likely clinical and functional impacts of disease occurs in Stage 2).

The third section - 'Mortuary Context' - records the way in which the individual was treated after death, including the basics of location, disposition, orientation, accompanying grave goods and so on. Where possible, it compares the treatment received by the individual with the treatment of others, particularly those from the same demographic cohort. The caveats regarding reliance on mortuary evidence noted in Chapter 5 are relevant to Stage 4 interpretation; this early section simply lists evidence and observations which might contribute to later consideration of the individual's social role and treatment during life. The items included in this section are drawn from a variety of sources dealing with aspects of mortuary archaeology, including Gowland and Knüsel (Eds) (2009) and Pearson (1999).

The final section of the Stage 1 protocol, 'Lifeways', is aimed at developing a picture of the cultural, social, economic, physical and general health environment in which the individual lived, and is based on information available from primary and secondary sources. The list of items for which information is sought ranges through diet and food procurement strategies, geography and climate, settlement features, technologies used, materials available and artefact production to economic, social and political organisation and external relations - such as trade, exchange or warfare (see Martin and Horowitz [2003] for discussion of biocultural approaches to disease in prehistory). Many of these variables have been employed in population-level research into prehistoric health; for example, the 'ecological variables' categories employed in Steckel and Rose's (2002b:563ff) analysis of the history of health in the western hemisphere have been adapted for this protocol. A subsection of 'Lifeways' elicits what is known in relation to community general health status and history, experience of specific diseases, and indications of possible care practice in contemporary cases.

6.3 Stage 2: Establishing the case for care.

Stage 2 of the bioarchaeology of care analysis establishes whether there is a valid basis for claiming provision of care. Taking as its foundation the Stage 1 physical evidence of disease or injury and, where available, the diagnosis proposed, Stage 2 first refers to modern medical literature to identify potential clinical implications of the pathological condition(s) identified, and seeks to establish the likely nature and extent of clinical symptoms experienced in the case under review. It then considers what the experience of these symptoms, within the corresponding lifeways context, may have meant in terms of the individual's ability to meet the normal basic requirements of daily living and to participate within their community at an appropriate level. This assessment of functioning capability informs the conclusion as to whether or not the individual likely experienced disability requiring health-related care.

Components from a selection of widely-used modern health status assessment instruments have been adapted in developing Index of Care protocols for Stage 2 analyses.

6.3.1 *Clinical implications: the individual's experience of pathology*

The first section of Stage 2 involves identifying the known primary and secondary clinical manifestations of the pathology described (and optimally diagnosed) in Stage 1; assessing which of these were likely experienced by the subject of study; and the level of intensity and duration of symptom impact. Basic human biology, and thus basic physiological response to disease stimuli, are accepted as constants over time and culture (discussed in Chapter 3), and this provides the foundation for extrapolating from modern clinical knowledge to the possible and probable clinical impacts of a given pathology in the past.

At the theoretical level, identification of the range of likely signs and symptoms accompanying a diagnosed pathology is relatively easy. There are several resources available providing comprehensive overviews of the epidemiology, diagnostic criteria, characteristic features, prognosis, common complications and comorbidities and treatments associated with specific diseases. It is also important to note factors potentially influencing symptom expression and/or vulnerability to complications and/or comorbidities: these include sex, age, level of activity and/or health status prior to pathology, duration of pathology, and possible interactions between lifeways variables and clinical impacts of pathology as well as between different pathologies (if more than one pathology is evident in the individual under study).

The harder task lies in interpreting how all the above information may relate to the experience of the once-living person. However, most people suffering pathology sufficiently serious and/or chronic to register in bone will experience *some* symptoms, meaning that in relation to certain conditions, at least, certain assumptions can be made in relation to disease impact. For example, at the most simplistic level, the immediate short-term effects of a fractured femur 25,000 years ago will have been the same as those of a fractured femur today - these may include shock, pain, collapse, possible haemorrhage, embolism, respiratory disease and increased susceptibility to infection (Behrman et al. 1990; Buzdon et al. 1999; Mamaril et al. 2007; Santy and Mackintosh 2001). Dependent upon location and type of fracture the medium term impacts include inability to use the limb effectively, and dependent upon healing outcome there may be long-term residual effects associated with an altered and/or weakened bone, affecting posture and mobility and with ramifications for the health of the spine and lower limb joints (Aukerman 2011). The symptoms in an advanced case of tuberculosis in the early Neolithic would have been similar to those in an untreated case today. The skeleton is

only implicated in tuberculosis once the disease is advanced; symptoms accompanying advanced tuberculosis that are likely to be invisible in the skeletal record, but are none the less real, include pulmonary haemorrhage, vulnerability to respiratory infections, behavioural distress, fever, pain, swelling, loss of energy and weight loss (Herchline 2012; Sherman et al. 1999). Prolonged immobility from whatever cause, evidenced skeletally in (lower) limb atrophy, is typically associated with potentially serious dysfunction in one or more of the body's organ systems - even with the benefits of intensive modern care (e.g. Claydon et al. 2006; McKinley et al. 2002; Olsen and colleagues 1967).

The implications for a bioarchaeology of care analysis of individual variability in response to disease were discussed in Chapters 3 and 5, and the caveats raised in these chapters are repeated here. It cannot be sufficiently emphasised that conclusions regarding clinical manifestations of pathology in any particular case must be made with the utmost caution and may only postulate the minimum level of potential impact consistent with the skeletal evidence of disease. However, as the examples elaborated in Chapters 8, 9 and 10 demonstrate, this can still be enough to provide a platform for identifying both the need for care and the likely type of care required.

6.3.1.1 Corresponding Index of Care protocol

The corresponding Index of Care protocol offers a structured approach for examining the clinical implications of disease experienced by the individual that is loosely based on that of the World Health Organisation International Classification of Functioning, Disability and Health (ICF) (WHO 2003). Essentially, the Index protocol prompts researchers to consider which symptoms, from the spectrum of those known from modern clinical literature to be associated with a specific disease (or indicators of an undiagnosed disease), were likely experienced by the individual under study; the likely severity of individual symptom expression; and the likely duration of impact of the various symptoms experienced (recognising that different symptoms may have different trajectories). Researchers are also prompted to consider the potential for interaction between symptoms of the same and different pathologies.

The protocol begins with a list of physiological domains, from which researchers select those body systems and functions potentially affected by the pathology evidenced in the

individual’s remains (see Table 6.1). The Index then generates a second worksheet listing only those domains identified as potentially implicated.

Table 6.1 Body systems/functions potentially affected by pathology*

(Neuro)musculoskeletal and movement-related systems/functions	Sensory functions/nervous system (i): pain (e.g. Acute, chronic, intermittent)
Mental functions (e.g. Intellectual, consciousness, attention, orientation language)	Sensory functions/nervous system (ii): other (e.g. Sight, hearing, balance
Cardiovascular system/function	Haematological system/function
Respiratory system/function	Immune system/function
Digestive, metabolic, endocrine system/function	Genitourinary, reproductive system/function
Integumentary system/function	Other [name/describe]

* List of body systems/functions adapted from the ICF (WHO 2003:2-4)

Taking into account the possible influence of individual and lifeways variables documented in Stage 1, researchers are asked to indicate beside each domain the likelihood of the case study individual experiencing associated clinical impacts using a four point scale: Impossible to tell, Unlikely, Possible, Probable. In a third column, beside the domains ranked as ‘Possible’ and ‘Probable’, researchers are asked to describe the symptoms they believe the individual may have experienced, where appropriate commenting on their reasoning. They may also record any other observations.

On completion, a third worksheet comprising four columns is generated. The first column contains the domains reordered (from ‘Probable’ to ‘Impossible to tell’) to reflect the researcher’s assessment of likely experience of pathology impact, with text associated with domains identified as ‘Probable’ or ‘Possible’ included in the relevant cells.

The second column asks researchers to make a qualitative estimate of the likely severity of clinical impact of symptoms identified as ‘Probably’ or ‘Possibly’ experienced, and the third column asks researchers to rate this severity. The ICF (WHO 2003) contains a five point scale for scoring individual experience of impact from body system and

function impairment, where 0 equals 'no problems experienced' and 4 equals 'complete difficulty'. The Index provides a simplified four point version - no problem/impossible to tell, mild, moderate and severe - but the operationalisation of these terms (see Table 6.1) is based on the ICF descriptors. *Prima facie* the rating of symptom intensity experienced by an individual dead for millennia, based on evidence from often incomplete and/or poorly preserved skeletal remains, appears impossible, yet this is often done implicitly in palaeopathology research. No retrospective rating system can provide a scientifically 'reliable' assessment of a case study subject's experience - and this is openly acknowledged. A scoring system has been included in the Index because it encourages a focus on the lived impact of pathology and a standardisation of the way this impact is described - it contributes to the goal of a shared 'vocabulary' for research into past care provision.

Table 6.2 Operational definitions for rating 'likely severity of clinical impact'
(Index of Care Stage 2 protocol)

1. 'Little or no impact / impossible to tell' - for the purpose of bioarchaeology of care analysis the subject is considered as having no significant problem.
2. 'Mild impact' - signifies a problem that presents for less than 25% of the time and/or presents with an intensity and/or in such a way it that can be easily tolerated and/or compensated for.
3. 'Moderate impact' - signifies a problem that presents for less than 50% of the time and/or presents with an intensity and/or in such a way that it interferes with aspects (but not the totality) of day-to-day life.
4. 'Severe impact' - signifies a problem that presents for more than 50% of the time and/or presents with an intensity and/or in such a way that it interferes with most or all aspects of day-to-day life.

The fourth column asks researchers to estimate the duration of clinical impact on each body system/function affected.

Where there are multiple pathologies, or competing diagnoses, the three worksheets are repeated for each condition, and a fourth step exploring the potential for interaction between different pathologies is included. In cases where there is evidence for experience of pathology, but no primary diagnosis is possible, worksheets can only address the immediate implications of the lesions present. Where remains are too

incomplete or poorly preserved to estimate the likely full impact of pathology this is noted where appropriate, and where there are competing diagnoses researchers are asked to take these into consideration.

6.3.2 Functional implications: activity limitations, participation restrictions

The second step in Stage 2 takes what has been determined about the likely clinical impact of pathology, in conjunction with what is known of contemporary lifeways, and estimates the individual's ability care for themselves and to function appropriately on a day-to-day basis within their community. This is a crucial point in a bioarchaeology of care analysis, because the results of this assessment are the basis for concluding whether, in any given case, an individual likely experienced a level of disability severe enough to support inference of health-related care in explaining survival to age at death. If the inference of care can be justified, then the bioarchaeology of care analysis proceeds. If it *cannot* be justified, then analysis must be abandoned.

Definitions of 'disability' and 'care' were discussed in Chapter 3, but it is relevant to briefly re-present these here. Health-related care is taken to include all forms of assistance, from 'direct support' through to 'accommodation', provided to an individual whose ability to meet 'normal' demands of daily living within the group is compromised as a result of pathology. Disability is understood in terms of temporary or permanent activity limitations and/or participation restrictions associated with the impact of pathology, with type and severity of disability shaped by the interaction between the characteristics of body system and function impairment resulting from disease and the context in which these are experienced.

Deciding whether disability requiring provision of care existed can be complicated. In some studies the identified pathology will be so clearly associated with such extreme disabling outcomes that, regardless of lifeways, there can be no doubt that healthcare was essential for survival. In others, what constituted independent function, or age and sex-appropriate group participation, will be much harder to judge. As discussed in earlier chapters, the presence of clinical symptoms does not necessarily translate into disabling functional impact - symptoms experienced as disabling in one cultural context may have had minimal impact in a community with different normative requirements. Ethnographic accounts of disease impact on functionality within broadly similar social, economic and physical lifeways may be of assistance in suggesting broad parameters of what may be considered disabling, but obviously there must be strong reservations in

extrapolating from this information to prehistoric experience. The precautionary principle dictates that, where there is any uncertainty, only the minimum level of functional impact can be assumed.

The natural dependency of infants and young children will make it difficult to distinguish, empirically and conceptually, between 'normal' altricial care and 'abnormal' health-related care. Most young children experience health challenges of varying degrees of severity that may or may not require significant additional attention, and skeletally these can manifest in frequently encountered stress indicators such as linear enamel hypoplasia, cribra orbitalia and porotic hyperostosis (e.g. Cohen and Crane-Kramer 2003; Goodman and Martin 2002; chapters in Grauer and Stuart-Macadam 1998; Steckel et al. 2002). There is considerable debate over both aetiology and clinical significance of these particular indicators (Goodman and Rose 2005; Oxenham and Cavill 2010; Walker et al. 2009; Wood et al. 1992) and, in the absence of other signs, evidence of survival in combination with these indicators alone cannot be taken as reflecting intentional health-related caregiving - although in some cases it may do just that. Additional, specifically health-related, care can only validly be assumed in infants and young children when there is skeletal evidence indicating pathology likely associated with a specific and severe disabling impact.

In relation to older children and adolescents, the literature suggests that in foraging through to early agricultural economies children take on a working role from a young age (Kramer 2005; Oxenham et al. 2008), and it is reasonable to assume this practice applied in prehistoric times. From mid-childhood onwards, where pathology likely affected an individual's capacity to perform tasks undertaken by others of their cohort, continued survival can be interpreted as reflecting group care.

6.3.2.1 Corresponding Index of Care protocol

The Index of Care protocol for assessing the impact of a pathology on the individual's everyday functioning contains items designed to prompt consideration of the ways in which, and the length of time during which, the subject was likely limited by their pathology. In each case it is necessary to take into account not only the material opportunities and obstacles in the individual's lifeways environment; but also the likely sociocultural age and sex/gender-related expectations typical for someone of the individual's demographic cohort. The outline of protocol content that follows is

predicated on the individual being of an age where some level of independent social and economic participation within the group would be considered normal, and the Index encourages the researcher to think about what, in the specific context, this 'normal activity' may have comprised. A special section for considering impact of disease on infant and early childhood functioning is proposed for a future version of the Index of Care.

In many pathologies the type and degree of clinical and functional impact in an individual will change over time as disease runs its course and, as discussed in previous chapters, this has implications for interpreting the experience of disability and care. As the goal of Stage 2 is to establish the probability (or otherwise) of health-related care practice, regardless of its duration, the protocol asks researchers to focus on the period of most severe disease impact. (The Stage 3 protocol examines questions relating to form and duration of the care itself.)

Essential activities of daily living

The first set of protocol items comprises six questions examining the individual's ability to perform essential tasks involved in self-maintenance or 'activities of daily living': two tasks relating to self-feeding (ability to access food and drink placed in close proximity, and physical ability to eat and drink without assistance); managing personal hygiene (essential for maintaining skin integrity and addressing infection and infection risk); simple manipulation of objects (including self-dressing); and two activities reflecting level of independent mobility (ability to move without assistance within a limited area such as a domestic setting, and ability to sit up and transfer from a resting position without help). This assessment of basic functioning capability does not require researchers to take lifeways context into account to any great extent. Where the individual rates negatively in any of the above domains, there can be little doubt that survival was contingent on receipt of care.

Protocol items in this section are adapted principally from the Katz Index of Independence in Activities of Daily Living (Katz ADL) (Katz et al. 1970; Wallace and Shelkey 2007), with additional reference to the 'activities of daily living' assessment measure produced by the Australian Department of Veterans' Affairs (1998). The Katz ADL is a well-established, extensively validated instrument for assessing the functional status of individuals in relation to activities fundamental to self-maintenance (Katz et al.

1970; Katz 1983; Wallace and Shelkey 2008; Wiener et al. 1990), rating adequacy of performance in six areas of function on a simple Yes (1) (capable of performing activity) / No (0) (not capable) scale, with the sum of scores taken as indicating level of independence/dependence in daily living and the corresponding level of caregiving required. The Index of Care protocol builds on this approach, providing two columns alongside the identified activity in which researchers can firstly 'score' functional capability ('yes', 'no', 'unknown/uncertain') and then elaborate on this assessment. In the modern context the overall score provides a useful single index of the amount of assistance that one patient requires relative to others, but the case study-based approach of the bioarchaeology of care makes summing of scores irrelevant. As noted above, lack of independence in *any* of the essential activities of daily living is automatically interpreted as indicating the need for health-related care.

There is a close correspondence between items in the Katz ADL and those in this section of the Index of Care. However, while the Katz ADL is typically used for assessing individuals in geriatric care and/or with chronic disease, the Index of Care items are intended for application in cases of temporary as well as longer-term disease, and across all age groups.

Instrumental activities of daily living

The next section of the protocol examines disease impact on the more complex behaviours and areas of task performance that are often referred to as 'instrumental' or 'extended' activities of daily living (Chong 1995; Lawton and Brody 1969). Although an individual experiencing disease may remain capable of undertaking the 'activities of daily living' tasks necessary for self-maintenance, they may nevertheless encounter difficulties in participating in some or many important aspects of community lifeways at an appropriate level. For example, in a foraging society could *this* individual, with *this* disease, have hunted, gathered plants or fetched water - could they have taken part in providing food for themselves and others? Could they have constructed shelter, or protected themselves from an adverse climate in other ways? In a horticultural or agricultural community, could they have looked after animals or tended crops? What technologies might they have been able to use? What artefacts might they have been able to manufacture? In a mobile society, could they have kept up with their group?

Although in pre-industrial societies many activities are undertaken communally, the core issues for bioarchaeology of care analysis are whether (i) the individual was able to contribute to (or participate in) these activities, and (ii) where the individual *was* likely able to make some contribution, the extent to which this contribution either matched normative role expectations of someone from that particular demographic, or was of equivalent value to the group. This determination requires a level of subjective judgement, but the Index of Care protocol allows the reasoning underlying the inferential process to be fully recorded.

There are two steps in this latter section of the protocol. The first involves developing an outline of the likely daily 'instrumental' activities carried out in the individual's community and by the individual's demographic counterparts - in so far as the evidence allows - and identifying physical, sociocultural and economic factors with the potential to facilitate or constrain participation in these activities by the individual experiencing pathology. The contextual information recorded in Stage 1 provides the basic material for this exercise.

The second step involves comparing the clinical and, where relevant, 'activities of daily living' functional implications of the individual's disease experience, identified in preceding sections of the Stage 2 protocol, against the practical demands of daily activity and community participation identified, and estimating the likely ability of the individual to meet these demands.

Modern instruments used in assessing individual performance potential over activity domains provide models for structuring this part of the protocol, although the actual content of modern instruments is rarely directly applicable (usually referring to activities such as housework, food preparation, shopping, household budgeting, use of public transport, leisure activities and hobbies) (Chong 1995; Lawton and Brody 1969). The Australian Department of Veterans' Affairs (1998:263-274) protocol for assessing 'lifestyle effects' of impairment identifies four areas for consideration - personal relationships, mobility, recreational and community activities, and employment and domestic activities - in which performance is self-rated on a descriptive scale; this measure is limited in many ways (it is designed for determining pension eligibility), but the simplicity of approach has appeal, and the four areas are universally relevant.

The ICF (WHO 2003:4-8) is the least culturally-specific of all measures. While its design does not distinguish explicitly between essential and instrumental activities of daily living, it identifies broad domain headers with the potential for translation to a

prehistoric context, including 'learning and applying knowledge'; 'general tasks and demands'; 'communication'; 'mobility over distance'; 'domestic activities'; 'interpersonal interactions'; 'major life areas (including employment and independence)'; and 'community life'. The ICF also includes a section that assesses the extent to which 'environmental factors [that] make up the physical, social and attitudinal environment in which people live and conduct their lives' act as 'barriers or facilitators' to activity and participation (ICF 2003:7).

The Index of Care protocol first provides a worksheet with three columns. The first column lists generic activity domains along with brief examples of what activities these might include: domains nominated are 'basic lifestyle' (mobility/settlement behaviours), 'economic', 'domestic', 'mobility over distance', 'community life' (social and cultural activities not covered in preceding domains), 'interpersonal relations' and 'learning/applying' knowledge, and there is potential to add new domains if required. The second column asks researchers to identify activities likely undertaken in the community against each domain (particularly activities relevant to expectations of someone of the subject's cohort). In the third column researchers nominate lifeways factors which might affect - negatively *or* positively - the individual's ability to perform in the nominated domain (for example, variables such as terrain, climate, resource accessibility, gender role expectations).

On completion, a new worksheet containing four columns is generated for use in assessing the individual's likely performance potential in relation to researcher-identified 'instrumental activities of daily living'. The first two columns contain the information provided by researchers in the preceding worksheet; the first lists 'domains', and reproduces the domain-related activities identified in the second column of the first worksheet under the domain heading, and the second contains the observations made in the third column regarding facilitating and constraining environmental factors.

The third column of the new worksheet asks researchers to rate the individual's likely ability to participate in and/or contribute to domain activities in a way appropriate for someone of the subject's demographic. While many instrumental activities of daily living measures contain elaborate participation and/or performance rating scales, the potential for nuanced assessment in the archaeological context is obviously limited. Nonetheless, because it is helpful to nominate possible ease or difficulty encountered in these general areas of activity, the protocol adapts four, very broad, rating indicators

from those employed in modern instruments. These are (2) 'able to participate in/contribute to most or all appropriate domain activities with no, or only minimal, assistance/accommodation'; (1) 'needs moderate to substantial assistance/accommodation to participate in/contribute to appropriate domain activities'; (0) 'not able to participate in/contribute to appropriate domain activities to any significant extent (or at all) even with assistance/accommodation'; and (?) 'unable to assess'. The fourth column asks researchers to elaborate on these assessments.

Two points are emphasised. Firstly, the rating categories adopted are (undeniably crude) devices to focus researchers' attention on the subject's likely experience in performing certain tasks, and to help achieve an holistic picture of the functional impact associated with disease. Ratings assigned in this process have no significance or application other than in relation to these aims. Secondly, as is the case throughout all stages of bioarchaeology of care analysis, it is emphasised that in assessing likely impact of disease on functional capability the most conservative interpretation must be adopted. Where there is uncertainty, only the minimum likely impact (or none at all) may be assumed.

Finally, researchers are encouraged to consider possible pathology-related changes (or patterns) over the disease course in the individual's ability to undertake 'instrumental activities of daily living'.

6.3.3 Deciding the case for care

On completing Stage 2 analysis the researcher must decide whether, on the evidence available, the impact of pathology compromised the ability of the individual to operate within their lifeways context to the extent that they would have been unlikely to survive to age at death without provision of some form of care. If the answer is 'yes', then the existence of disability and the provision of care are inferred.

The conclusion that care *was* received may sometimes be controversial, particularly in cases where evidence of pathology is clear, but evidence of clinical impact less so. However, because the methodology entails rigorous and systematic examination of all relevant information, as well as promoting a consistently high level of caution in its interpretation, there can be no doubt that by the end of Stage 2 many individuals who in life received care from their community will have been eliminated from consideration on the basis of researcher conservatism. It must also be restated that the bioarchaeology

of care approach is not designed to correspond to an exclusively primary health care model, and that the definition of caregiving encompasses a wide range of behaviours.

What this care likely comprised is addressed in the Stage 3 of the bioarchaeology of care.

6.4 Stage 3: Developing a model of care

Stage 3 of the bioarchaeology of care requires researchers to consider the evidence for disability documented in Stage 2 in the context of lifeways variables documented in Stage 1. Based on this, researchers are asked to identify options available to, and most likely adopted by, those involved in managing the clinical symptoms and functional challenges experienced by the case study subject. Stage 3 also examines the likely duration of care and possible changes in caregiving over time; considers the effort and resources likely to have gone into giving this care; and asks for an estimate of care efficacy. The Stage 3 process provides the material for constructing a credible model of the care received by the individual.

Briefly revisiting observations made in Chapter 3, there are some basic caveats. Any archaeological model of care will always fall short of the care actually provided, because a set of human remains, however well preserved, only ever represents a partial record of human experience. While complications and comorbidities commonly associated with a diagnosed pathology, but leaving no skeletal signature, may - with due caution - be factored into analysis under certain conditions (see Chapter 8), these will often have to be excluded from the care equation for lack of reliable evidence.

Identification of the individual's psychological or spiritual needs is impossible, although we can be confident that these existed and interacted with physical symptoms to shape whatever care was required and how care was received. Most cases will offer no clues as to how a particular pathology was understood within its cultural context, although the meaning assigned to experience of disease will influence the way in which the sufferer is regarded and the treatment they receive. The obligatory conservatism in interpreting osteological evidence will result in underestimating impacts of pathology and, consequently, in underestimating the requirements of health-related care.

In discussing what health-related care might comprise, Chapter 3 distinguishes between 'direct support' and 'accommodation', and in discussing the former further distinguishes between 'basic' and 'advanced' forms of care (while emphasising the

arbitrary nature of these distinctions). In relation to 'direct support', Chapter 3 argued that, just as there is a fundamental uniformity in physical and physiological responses to particular disease stimuli, there is a similar uniformity in the practical measures of healthcare needed to address these responses. These 'constants of care' are described in Table 3.2, and provide a list of core care practices, to which specific types of treatment (e.g. surgery, pharmacy) can be added as relevant, for considering the 'direct support' forms of caregiving likely applicable in a given case study. Reference to lifeways characteristics should provide the basis for considering what the practical aspects of care comprised and their mode of delivery.

In relation to caregiving as 'accommodation', the proposed model of care must consider areas of likely functional impact in terms of required modifications to normative expectations and practices nominated in Stage 2 analysis. What 'accommodation' of disability may have entailed in any particular case will probably be impossible to identify in any but general terms, although a degree of speculation, based on Stage 2 identification of difficulties likely faced by the individual in participating in certain activities and possible opportunities in other activity areas, is justified - as long as the fact that it *is* speculation is made clear.

There are two more procedural points to raise. Firstly, in any particular case study, and in relation to any particular symptom, there may be a number of potential caregiving options that in the lifeways context are equally likely and credible yet possibly (to some extent) mutually exclusive, and these should be acknowledged in the model of care produced.

Secondly, the goal of Stage 3 is to produce an outline of what care may have comprised, not to infer motivation, nor to make any assessment of those providing or receiving care. This level of interpretation is undertaken in Stage 4 of the bioarchaeology of care approach, once all aspects of the study relating to the more applied aspects of care provision have been thoroughly considered.

6.4.1.1 Corresponding Index of Care protocol

The Index of Care protocol for Stage 3 asks the researcher to refer to the analysis of clinical and functional impacts undertaken in Stage 2 and to lifeways factors recorded in Stage 1. The protocol contains separate sections addressing healthcare in terms of 'direct support' and 'accommodation', but encourages users to consider both categories

of caregiving, regardless of possible preconceptions about the type of care received by their case study subject.

Care as 'direct support'

The section of the protocol addressing 'direct support' begins with a worksheet containing three columns and based on Table 3.2 (Chapter 3). The first column details the nine 'constants of care' components as these appear in Table 3.2, and below these provides an additional cell (*Specific intervention(s) and technologies*) that covers elements of care not included in the nine 'constants', but for which there may be evidence - for example, surgery, non-surgical orthopaedic treatment, pharmaceutical treatment, and so on.

On the basis of what was concluded in Stage 2 regarding clinical and functional impacts of pathology, the second column asks researchers to indicate whether the corresponding component was *possibly* or *probably* an element in the care received by the individual. In the third column, researchers are urged to elaborate on what this care may have comprehended in practice, taking into account contemporary context (for example, what sort of diet may have been provided to meet specific needs? What level of assistance with toileting may have been required?).

On completion of the first worksheet a second worksheet is generated that contains four columns. The first column lists each component of care identified by the researcher as 'possibly' or 'probably' provided to the individual, along with the observations made by the researcher regarding the form this care practice may have taken.

The second column asks researchers to estimate the period for which this care component may have been required. In most instances precision will be impossible, but researchers are initially asked to select between 'short term' (< 3 months), 'medium term' (3-6 months) and 'longer term' (>6 months), and prompted to expand on this where feasible - for example, identifying 'lifetime' care in response to congenital disability, or estimated 'remainder of lifetime' care where caregiving likely spanned disability acquisition up to death. Discussion of likely changes in the way care components were implemented over the caregiving period is encouraged. The definitions of short, medium and longer term are arbitrary and open to refinement; they are loosely based on reported frequencies of disease duration from ethnographic studies of pre and peri-agricultural communities (e.g. Frankel 1986; Lewis 1975; Sugiyama 2002, 2004a), moderated by the limitations imposed by dependence on osteological

evidence for identifying the presence of pathology, and any care response to this pathology, in the first place. The benefits of adopting some form of standardisation are that this encourages researchers to consider the issue of care duration and allows a shared vocabulary across studies.

The third column asks researchers to think about the effort and resources possibly involved in providing this component of care to the disabled individual. 'Effort' is defined as work undertaken or energy expended additional to what would normally have been the case, and 'resources' are defined as a combination of the labour responsible for 'effort' and materials and technologies used in care provision. Researchers are again reminded to base their assessment on what is known or inferred about lifeways context (Stage 1) and the individual's particular care needs (Stage 2). For example, if care of an individual from a hunter-gatherer community involved provisioning with food and water (care component 1), what might variables such as group size, terrain, resource availability, or climate/seasonality imply in terms of 'effort' required for care? How does this estimate change if a 'special diet' was required? What sort of atypical 'effort' (time and labour) might it have taken to 'maintain personal hygiene and protect the integument' (Item 8) of an adult from small, Neolithic settlement who was incapable of performing this task for themselves (this question is addressed in the Chapter 8 case study)? What effort and resources may have gone into wound management and general nursing (Items 7 and 9 and possibly several others) following trepanation surgery (Item 10) to relieve head injury?

Information sought in the fourth column may not be directly applicable to the task of constructing a model of care, but is potentially useful for Stage 4 analysis. This item takes advantage of researchers' focus on type of care provided to ask for an assessment of the likely effectiveness of the care delivered. Observations may prepare the way to thinking about aspects of community healthcare knowledge, skills and experience that contribute to the wider understanding of social relations and social practice sought in Stage 4.

Care as 'accommodation'

The second section of the Stage 3 protocol comprises two linked worksheets based around the 'instrumental activities of daily living' domains introduced in Stage 2. In Stage 3, however, the analytical focus is quite different. Instead of examining the individual's potential functioning capability in relation to domain activities, domain activities are considered from the perspective of adjustments that may have been

necessary in 'accommodating' the individual within their group. In this way, accommodation is a concept relevant to individuals with functional challenges in both 'essential activities of daily living' and 'instrumental activities of daily living' spheres.

Repeating the format established in considering 'direct support', the first worksheet contains three columns: the first lists 'instrumental activities of daily living' domains; the second asks researchers to indicate the domains in which it is either *possible* or *probable* that accommodation occurred; and the third asks researchers to elaborate on what this accommodation may have involved - for example, in a small, semi-sedentary group what adjustments may have been made to accommodate an adult male retaining use of only one arm? How might this person have contributed to the group? (This situation is addressed in the Chapter 10 case study.)

A second worksheet containing four columns is generated on completion of the first. The first column lists each activity domain nominated as *possible* or *probable* by the researcher, along with any observations made by the researcher regarding the nature of the possible accommodation.

The second column asks researchers to estimate the period during which accommodation may have occurred. The same categories (short, medium and longer term) are used as previously, and again, researchers are asked to consider likely changes to the way accommodation was realised over the caregiving period.

In the third column, researchers are asked for their estimate of effort and resources involved in adjusting to the individual's health-related needs, and in the fourth column they are asked for their judgement of the efficacy of possible accommodation strategies adopted.

6.4.2 Producing the 'model of care'

Taken in combination, the possible components of caregiving identified through the processes outlined above allow production of an integrated model of care specific to the lifeways context and unique to the individual.

All components of this care model have a clear rationale, developed through clearly documented deductive processes. Depending on the quality and quantity of osteological and archaeological data available some models of care will be more detailed than others,

but even the most basic model will provide insights into prehistoric responses to disease and disability.

The conservatism urged throughout Stages 1 to 3 of the bioarchaeology of care methodology dictates that the model of care must be understood as comprising the minimum amount of health-related care actually provided. Conclusions regarding the likely nature of care are based on the reasoning that certain disease impacts require certain practical responses if the disabled individual is to survive. While this undoubtedly makes claims for the type of care falling into the 'direct support' category easier to defend, detailed analysis of the impact of a specific pathology, within its biocultural context, can reveal areas in which 'accommodation' would inevitably have been required - even if the precise form this took may never be known with certainty.

This leads to a final observation. In accepting that archaeologically-based models of care can only ever hope to reproduce a small part of any care given, it is also acknowledged that in many cases prehistoric caregiving was likely shaped by forces of cultural, social, religious and cosmological significance perceived by those involved as equally, or more, important than the applied responses to physical manifestations of disability inevitably given prominence in bioarchaeology of care methodology (see Chapter 3). Shanks and Tilley (1987) have argued that archaeologists' tendency to insist on a 'least cost' approach to elucidating past behaviour assumes a perfect (economic) rationalism in decision-making that is both reifying and unrealistic. It is important to qualify any model of care proposed in Stage 3 by acknowledging that, in past as in modern times, the options for care selected in practice will reflect the values, knowledge, experience, beliefs and traditions of all involved in the caregiving process. Indeed, it is this recognition that opens the way for Stage 4 analysis - interpreting the wider implications of health-related care provision in prehistory.

CHAPTER 7. The Bioarchaeology of Care Methodology: Stage 4

Over Stages 1-3 of bioarchaeology of care analysis a model of the health-related care likely provided to an individual in the past is constructed through methodical, cumulative and conservative analysis of evidence.

Stage 4 effectively *de*-constructs this process, examining what a single case of caregiving may reveal about both the community in which it occurred and the individual who was its focus. Stage 4 juxtaposes the information, observations and inferences that culminated in the Stage 3 model of care and examines these from a reverse-engineering perspective, in effect asking 'if, in *this* lifeways environment, *this* form of care was provided, or survival occurred in relation to a pathology with *that* impact, what does it suggest about the context for providing care and/or the group that gave this care and/or the person who received it?'. From a small, but frequently complex, often demanding, and personally and collectively significant fragment of prehistoric experience, Stage 4 seeks insights into culture and practice, social relations and identity.

The first three stages of bioarchaeology of care analysis follow a series of clearly identified steps, within parameters constrained by physical data from human remains and contextual data from archaeological, anthropological, clinical and other relevant sources. Stage 4 enters new territory. Concerned with identifying and interpreting the broader implications of behaviours associated with undertaking the particular set of actions that make up caregiving, Stage 4 relies on deductive inference to move between, and draw together, the elements that went into producing the final model of care, exploring whether, and how, different combinations may contribute to a deeper and more rewarding reading of this segment of past life.

The central premise of Stage 4 analysis is that the behaviours making up the giving and receiving of health-related care express the agency of all concerned, and that this agency has the potential to illuminate aspects of group and individual identity. Chapter 5 detailed the background and justification for this position, and what follows was promised at the conclusion of that chapter - a process for applying the concepts of agency and identity to cases of health-related care in prehistory.

Some researchers may be uncomfortable about venturing into the realm of Stage 4 interpretation, and in some cases the background evidence on which to base

interpretation may simply not be available. In either circumstance, researchers should cease bioarchaeology of care analysis on completion of Stage 3.

7.1 Interpreting the implications of care: an overview of Stage 4 analysis

In a bioarchaeology of care analysis, healthcare provision is understood as a process that takes place over time and as the product of a series of intentional choices, made by carers and cared-for, between options available within the corresponding lifeways. These choices reflect the opportunities and constraints, and values and beliefs, of the cultural, social, physical, personal and emotional environments in which they were made.

Although many of the variables that influenced any given instance of caregiving will be invisible to archaeology, and although no two examples of caregiving will ever have been identical, a generic 'decision path' for providing care can be hypothesised. This comprises a series of points at which choice between alternative actions would have been required, and although *actual* options available and selected would have differed across different situations, the basic steps in the decision path are broadly applicable to all cases of care. The Stage 3 model of care was produced by matching the options available for care provision to likely care-recipient requirements, and selecting the most convincing 'best fit'. The first part of Stage 4 analysis investigates what the choices made in caregiving may signify in terms of the motivations, cultural practices and social relations of those involved in providing health-related care.

The person receiving care will also have been faced with choices at various points in the trajectory of experiencing disability, although their options - and thus ability to express agency - may have been more restricted, and will be even more difficult to identify retrospectively. Nevertheless, where the existence of choice can be inferred, the examination of choices most likely made, in the context of the available osteobiographical detail of the individual, may suggest aspects of the individual's personality - albeit in a very general and speculative sense (see discussion Chapter 5). The second part of Stage 4 analysis investigates this possibility.

Throughout Stage 4 all inferences must be tested continuously against details of the lifeways context; the inferences regarding likely clinical and functional impacts of disease; and the assumptions and conclusions embodied in the Stage 3 model of care.

To the extent that a model of care's components are grounded in what is already established about the physical, social and economic environments in which care took place, it seems logical that Stage 4 'backward reasoning' from this model should confirm existing knowledge, particularly in relation to the more materially-based and archaeologically accessible elements. However, the different perspective taken in Stage 4 analyses may offer more - for example, it may suggest additional ways of explaining a particular practice, technology or artefact. Sometimes there may be dissonance between what is received wisdom regarding certain features of group life and practice and what is suggested by bioarchaeology of care analysis, and this dissonance may offer new ways of viewing the past. When such situations occur the researcher will have to decide whether an irreconcilable contradiction exists (and, in this case, which view of the world is more likely to be true?) or whether this dissonance reflects the complexity of prehistoric life where, just as in modern society, contradictions could exist simultaneously within a single community.

Alternatively, Stage 4 analyses may reveal something completely new about an aspect of contemporary lifeways and, however modest this item of information may be, it is valuable because it has the potential to add substance, texture and colour to the way we envisage past populations. The case studies presented in Chapters 8, 9 and 10 variously illustrate the points made above.

Finally, the description of the first three stages of the bioarchaeology of care methodology in the last chapter outlined a logical, orderly process, an approach reinforced by constant reference to structured Index of Care protocols. For Stage 4, the Index presents two protocols that are best described as loose 'frameworks for analysis', one corresponding to each of the broad areas of analytical focus outlined above. Each protocol 'framework' offers a very flexible schema, within which it may be possible to achieve a degree of consistency in the way that questions of collective agency and individual identity are conceptualised across case studies of care.

7.2 Healthcare provision, the 'decision path' and group agency

Figure 5.1 in Chapter 5 depicts a generic decision path for care provision in the form of a flow chart. In the Index of Care protocol examining group agency in caregiving, the bones of Figure 5.1 have been given flesh by the addition of some general questions

which correspond to points in the decision-making *chaîne opératoire* and touch on the lifeways, identity, aims and motivations of those providing healthcare.

In Stage 4, the term 'lifeways' is used (as throughout this thesis) to include sociocultural and physical environments, practices and technologies; what constitutes 'group identity' was thoroughly canvassed in Chapter 5. 'Aims' and 'motivations' were discussed in Chapters 3, 4 and 5, but these are difficult concepts to define operationally in an archaeological context, and what these terms might encompass in talking about past caregiving practice is therefore briefly discussed below. Following this, Table 7.1 provides examples of some of the variables that might be addressed when considering group care-related decision making processes.

- Aims

The aims of caregiving are likely to be multiple, stratified and complex, and impossible to extricate from the even broader - and even more controversial - issue of 'motivation'. However, from a purely functional perspective, restricting 'aims of care' to a definition centred on 'primary purpose or anticipated results of care' may allow inference about some aspects of group values and the group's history of practice in relation to care provision. Expectations of what care can achieve will influence the type of care provided, or even whether care is offered at all. So in any case study, an idea of what the initial goal of care may have been, and possible changes to this goal over time (see below), may reflect something of how a pathology was perceived in cultural terms, as well as level of prior experience with, and knowledge of, both this or similar pathologies and appropriate treatment response(s).

Although many factors determine the impact and eventual outcome of pathology, the care provided is often influential in moderating aspects of associated disability experience. It is not a great leap to suggest that, for the purposes of interpreting care, it may be possible to infer some uncomplicated aims (as defined above) from the results with which caregiving is associated. For example, where there is evidence indicating that an individual received support to recover from disabling injury and then returned to an active life, this suggests that one aim of care was curative - to facilitate healing and re-entry into the working community. Where an individual survived for an extended period with a severely disabling and likely deteriorating pathological condition requiring continued attention, this may suggest that an important aim of care, at least after the severity of pathology became apparent, was palliative. Where remains display evidence for participation in standard lifeways activities in some areas, but long term

pathology impact likely precluded participation in others, this suggests that a principal aim of care was to accommodate the needs of the disabled individual.

Because caregiving is a process rather than a one-off 'event', the aims of care may change over time. To some extent this happens in all situations - acute care may transform into chronic care, or rehabilitation, or monitoring, or be dispensed with completely; care requirements may change in intensity; and accommodation of long-term disability may become 'normalised' and automatic over time. In some instances (e.g. Hawkey 1998) it may be possible to track changing care needs, along with changes in the nature of care provision to meet these needs, and in such cases a focus on the aims of care may be particularly rewarding.

- Motivations

Motivations involved in health-related care behaviours will be different - and differently weighted - in all cases of caregiving. As discussed in Chapters 4 and 5, motivations in any prehistoric example of caregiving will likely have ranged from the personal and the emotional to the collective and the calculated, and the fine detail of, and balance between, the forces driving initiation and maintenance of care will be impossible to extract from archaeological evidence alone.

Having said this, in some cases it may be justifiable to consider possible motivations for caregiving and/or the likely strength or endurance of motivations underlying care based on what can be inferred about the costs associated with the nature of the care provided. That caregiving undertaken within a small subsistence community calls for an expenditure of time and energy that requires a level of group commitment has already been argued. If it is possible to identify and assess (however crudely) some of the actual costs involved in terms of time, labour, and resources, this establishes a basis for contemplating what these costs may have meant in terms of demands on the group; what 'benefits' may have been hoped for or experienced in return; and what acceptance of these costs may signify in terms of group dynamics.

Likely effort and resources employed in caring were considered in deriving a model of care in Stage 3 analysis, and crude estimates of costs (as defined above) should begin with these observations. Additionally, analysis of 'costs' should cross-reference analysis of 'aims'; for example, in cases where full recovery was the likely goal of caregiving, the 'cost of care' may have been perceived as finite, and outweighed by the longer term social and economic 'benefits' of restoring the individual to a productive

role within the group. In cases of severe or permanent disability, where recovery was most likely recognised as unlikely or impossible, the cost of care may have been accepted as an open-ended commitment from early on, with care provision producing personal and/or higher-level social rewards (for example, reinforcing a cohesive group identity) that will almost always be archaeologically inaccessible - although there is merit in at least acknowledging the possibility of their existence.

It should go without saying that motivation in prehistoric health-related caregiving will never be explained simply by reference to a cost-benefit equation; humans were as complex and complicated in the past as we are in the present. Even putting to one side the by-now well-rehearsed caveats intrinsic to bioarchaeological research into caregiving, however, there is the obvious point that the amount of effort required in any instance of care provision will be determined, in greater or lesser part, by the nature of disability impact on the individual and the ease or difficulty of caring for the individual in a given environment. To use cost as a proxy for motivation would be to assume, without any grounds at all, that caregiving was associated with lower levels of motivation in a resource-rich environment, or in relation to a less demanding pathology, than in a resource-poor environment or in relation to a more demanding disease - which would be ridiculous. In relation to motivation, as to any other consideration in bioarchaeology of care analysis, each instance of care has to be treated on its own merits and in its own context.

It has to be presumed that both the meaning ascribed to a particular pathology and the motivations for providing (or withholding, or withdrawing) care were as diverse in prehistory as they are known to be ethnographically, historically, and in modern western society today. Nevertheless, establishing the likely minimum level of commitment - or 'cost' - in any given case may be the closest we can get to an empirical base from which to begin consideration of motivations for past caregiving. Aspects of motivation inferred through this process, limited and beset by qualification as they must be, may contribute to more sophisticated hypotheses regarding social relations and social organisation - identity or 'personhood' - within the caregiving group.

Table 7.1 lists key points in the decision path for caregiving (first presented in Figure 5.1), giving examples of possible variables for consideration when analysing agency in the prehistoric provision of health-related care (variables identified are suggestions only, and are *not* exhaustive).

Table 7.1 Decision-making steps in healthcare provision

1.	<p>Determine that need for health-related care exists</p> <p>Identifying the <i>requirement</i> for health-related care is the first step. Relevant factors may include group skills/experience in ‘reading’ symptoms; knowledge of disease; history of care practice (is there evidence for care in other remains?); ‘values’ (intervention vs. acceptance).</p>
2	<p>Assess considerations for and against providing health-related care</p> <p>Considerations for and against care will be weighted differently in different lifeways contexts. Factors influencing any decision might include e.g.: subject characteristics (age, sex, role, relationships, status, personality); attribution of disease causality; care as the norm (care for all - or some?); knowledge, skills, experience in care; ‘aims of care’ - prospect of successful outcome vs. likelihood of failure (however these are defined); likely care demands (long vs. short term, intensive vs. light); potential costs of care and availability of resources (labour, other) to meet these; potential benefits of providing care.</p>
3.	<p>Decision to provide care</p> <p>Was the decision made by few or collectively? What might this decision require from the group - who takes responsibility? Were there likely limits placed on type, scope, duration of care? Was care likely contingent on other conditions?</p>
4.	<p>Determine and initiate strategies for care delivery (direct support and/or accommodation)</p> <p>Some plan (implicit or explicit, basic or elaborated) of actual ‘care’ required must be decided before care is given. Factors in care strategy may include e.g.: goals, and measures needed to attain these; labour, skills and other resource demands and ability to meet these; acquisition of additional resources where necessary; allocation of responsibility for directly caregiving tasks; strategy for meeting costs of care (e.g. increased food production / reduced individual consumption, compensating for diverted labour).</p>
5.	<p>Implement and review care practice</p> <p>Caregiving is an iterative process consisting of (a) period of care provision simultaneous with or followed by (b) review of progress, identifying changing care needs, refinement of care strategy, and implementation of changes. In addition to care-recipient health status such review may include (re)assessing group ability / willingness to afford care and/or renegotiating responsibility for (aspects of) care.</p>

6.	Cease care Decision to cease care because: subject recovers; subject dies; care is no longer deemed possible, productive, affordable and/or appropriate, and is withdrawn (regardless of health status)*. Where the subject received care over a period up to around time of death, were they still receiving care at death? Implications if so?
7.	Decide treatment after death* Considerations include whether the subject will receive <u>any</u> mortuary treatment, and if so how this compares to 'normal' practice. Influences in deciding 'appropriate' mortuary treatment may include subject 'identity' (status, personality, etc.); nature of pathology experienced; cultural beliefs and practice; etc.

* 'Care after death' is not an automatic extension of care during life, but decisions made regarding mortuary treatment may assist in interpreting the latter (see discussion Chapter 5).

7.2.1 Corresponding Index of Care protocol

The Index of Care protocol for Stage 4 consideration of group agency is based around the decision path for care provision proposed in Chapter 5. It opens with a worksheet consisting of two columns, the first of which identifies the six major decision points encountered in the process of providing health-related care (beginning with the determination that care is required and ending with the decision to cease care). It also includes an additional decision point - the one at which a choice is made concerning the individual's treatment after death (the rationale for the steps in the decision path, and provisional inclusion of mortuary treatment as one of these, is discussed in Chapter 5). Under each of these seven 'decision domains' are listed a number of variables which may have influenced the decision making process and determined the decision likely reached. Table 7.1 reflects the content of this column. Researchers are encouraged to insert new decision domains (i.e. new or more detailed 'steps' in the decision path) where relevant, and are expected to add case study-specific variables in most or all domain categories.

One further point is noted in relation to the decision domains nominated in this column. The understanding that caregiving is a process taking place over time is comprehensively discussed in Chapter 5, and decision making in relation to caregiving will reflect this in practice. The decision steps identified do not occur at regular intervals in the caregiving process, as might mistakenly be inferred from the way that these steps are represented in both Figure 5.1 and Table 7.1; some decisions will have to

be taken rapidly (such as the initial decision to provide care in response to an acute pathology), while other decisions may be extended over days, weeks, months or even years (such as in the case of an individual experiencing slow deterioration in functioning capability, or in relation to implementing and reviewing care practice) - and this issue must be acknowledged in attempting interpretation.

The second column in the worksheet provides unlimited space beside each decision domain identifier for observations regarding the decision likely adopted. Researchers are asked to consider everything recorded in previous Stages of the Index in relation to the individual, their care and their lifeways, and in this context suggest what a particular decision, made at a particular point, may have comprised and may signify in relation to aims and motivations for care; practical aspects of social and economic practice; cultural factors; and group social relations. Researchers are also asked to outline the reasoning for their answers.

Following completion of the worksheet, and (as always) taking into account the individual's characteristics, care and lifeways, researchers are presented with a box that allows unlimited text entry and asked to speculate about what the answers recorded against individual decision domains suggest about broader social and cultural aspects of the community in which care took place. It is suggested that researchers would benefit from structuring this exercise by generating a range of specific questions to address. For example, what might the decision to care for a severely disabled subject in a resource-poor environment, where there is evidence for systemic health stress in the general population, suggest about group social relations and/or capacity to (re)organise economic activities and/or manage available resources? What might the decision to care for a subject in a lifeways for which there is evidence of high levels of interpersonal violence suggest about cultural practice, values and identity - where might caregiving 'fit'?

It is strongly emphasised that this protocol is a prompt, not a prescription. It offers one possible framework for approaching the task of interpretation - and no more than this.

7.3 The care-recipient understood as individual and agent

Clinical experience shows that the nature and outcomes of healthcare may be dependent on the attitudes and behaviours of the person receiving it; the care-recipient always has options, even if only the binary choice of 'cooperation - non-cooperation'. The interpretive approach outlined below adopts the premise that the subject of care possesses agency and that uncovering this agency may allow access to a small part of their individual identity, and is based on theory and praxis detailed in Chapter 5.

This last step in the bioarchaeology of care analysis aims to construct an impression of the person who was the focus of caregiving activity. The term 'impression' is used advisedly; this approach may be seen as pushing the boundaries of interpretation, and for this reason it is necessary to repeat previous qualifications. Firstly, it is acknowledged that archaeology is a blunt instrument for attempting to recover individual identity, and will never be able to do so with precision. Secondly, it is acknowledged that any insights into 'individual identity' in bioarchaeology of care analysis arise from the context of disability, and that while the way an individual deals with an experience so central to their daily life will inevitably reflect elements of who they are, no-one - past or present - is defined by disability alone. Both these reservations recognise that the detail of the individual around whom bioarchaeology of care analysis revolves will always be beyond reach.

Despite this, where cases of care provision meet certain criteria it is defensible to hypothesise some very general behavioural tendencies. In determining whether it is profitable - or possible - to explore individual identity, one basic criterion is that the remains of the individual provide enough information from which to create a basic physical profile of the care-recipient (minimally sex and age category), enabling consideration of role and expectations within the social setting. Recognising that in difficult circumstances survival with disability may be construed in terms of significant *personal* achievement, two other important criteria relate to severity and duration of disease. Where an individual lived with severely disabling pathology on a long-term basis, and where there is sufficient information about the corresponding lifeways to infer impact of disability on social as well as physical functional capability (another essential criterion), the fact of survival alone may suggest certain strengths and skills in coping, which in turn may suggest aspects of personality. (In cases where an individual received care over relatively short period of time, until either recovery or death, this contention may be impossible to sustain.)

In the context of the bioarchaeology of care, 'individual identity' describes the combination of physical, behavioural and social characteristics that make up a person whom we might claim to 'know' in a way that fundamentally distinguishes them from others. The methodology proposed for reproducing this singular human being involves bringing together data relating to physical characteristics, inferences regarding the individual's likely disability and care-related experiences, and the lifeways variables affecting role(s) and activities potentially relevant to the individual to create an extended osteobiography, and then using this information reflexively to hypothesise personality characteristics that may have played a part in the way the individual managed their disability - and their care.

The first part of this process re-presents material which has already been examined, but where appropriate seeks to shift the analytical focus from the viewpoint of providing care to that of *receiving* care - and, in the process, shaping what this care consists of. The new work comes in asking questions developed to elicit intimate details of a past life, and in knitting together any answers proposed in a way that provides a credible glimpse of the individual who inhabited it.

Some additional comments are offered below. Firstly, an obvious constraint is that in bioarchaeology of care analysis the assessment of disability impact is always conservative and will usually be underestimated (see Chapter 3). The implications of this for analysis of care provision were discussed in relation to Stages 2 and 3 of the bioarchaeology of care methodology, but it has clear ramifications for considering aspects of identity as well. For example, if level of disability greatly exceeded what is estimated on the basis of skeletal evidence, what does this imply about availability of alternative social role(s)? If disability was more extreme than is apparent, what are the implications for understanding personal qualities brought to managing disability impact?

Secondly, attempts to identify aspects of personality will invariably result in broad generalisations, because there is simply not the evidence to allow nuance. Furthermore, these generalisations will be replicated across case studies where subjects are thought to have survived similar levels (although not necessarily similar manifestations) of disability. This does not invalidate either the observations made or the wider exercise of attempting to get closer to the subject of care. To take one personality trait as an example: in a prehistoric society most individuals surviving the physical and psychological burdens of a pathology severely restricting independent function will

undoubtedly have had a 'positive attitude', in the sense of having a 'strong will to live' (see Chapter 5). But each of these individuals will have been 'positive' in their own way, and the particulars of this way will not be accessible. By itself the observation that someone had a strong will to live is not particularly revealing, but taken in conjunction with other attributes it may contribute to an overall feel for both the person and their public persona. Trying to be more specific regarding any particular personality trait is probably unwise. Referring to the example above, one person might think of 'positive attitude' or 'will to live' in terms of 'courage', another in terms of 'obstinacy' or 'refusing to let go', another in terms of 'powers of endurance', 'patience' or 'undemanding nature', and all of these definitions (and more) have the potential to explain mechanisms for coping that underlie survival, and none are mutually exclusive. Where interpretation attempts this level of subtlety the results will likely reveal more about the researcher than anything else, but again this does not invalidate the exercise - as long as the basis for interpretation is made explicit.

While under certain conditions it may be plausible to infer personality traits likely associated (directly or indirectly) with survival, it is not possible to do the reverse. So although 'positive attitude' or 'will to live' might be proposed as characteristic of an individual who survives with a significantly disabling condition, 'negative attitude' or 'lack of will to live' or even 'wish to die' cannot be automatically attributed to a subject who does not survive (note that 'positive' and 'negative' are not intended to reflect a value judgement). Nor can it be suggested that the death of a once 'positive' individual (i.e. one who survived a period of time with severe disability) reflects a change in this initial attitude. Individuals may fail to survive because of a range of reasons beyond their control or that of their carers, regardless of how strong their 'will to live' may be. However, given the challenges intrinsic to most prehistoric lifeways contexts the converse - that individuals will survive severe disability no matter how 'negative' their attitude - is unlikely to be true.

Finally, although in discussing Stage 4 of the bioarchaeology of care methodology this chapter addresses issues of group agency and identity before those of individual identity, it may prove productive to use insights gained in examining the latter to reflect back on the nature of the community providing care. For example, if survival with disability suggests 'will to live', what sort of values and practices within the group may have supported such a characteristic?

7.3.1 *Corresponding Index of Care protocol*

The essentially subjective nature of the level of interpretation outlined above begs the question of whether a corresponding Index of Care protocol should even be attempted. The decision to proceed with one in the beta version of the Index is based on the understanding, re-emphasised in introducing this section of the Index, that each researcher is responsible for selecting those aspects of the protocol relevant to their study. The aims of this protocol are to encourage researchers to think about their subject's identity, and to provide some ideas and a possible framework for beginning this process; the rest is up to researchers themselves. Future testing of the Index should show whether or not this approach has any value.

The Index of Care protocol corresponding to this last step in Stage 4 analysis seeks to facilitate a continuous positioning of what we would *like* to know about the 'individual as agent' against what is already known (or inferred) about the individual in the role of care-recipient; about those providing care; and about the context in which care was given. In doing this it simultaneously reveals possible areas of enquiry and reminds researchers of evidentiary constraints on interpretation.

The protocol begins with a worksheet designed to produce a précis of all information and inference recorded in Stages 1-3 of the Index relating directly to the individual who received care. The aim of this exercise is to encourage researchers to build up a picture of their subject based on material they are already familiar with, covering (i) basic physical characteristics or 'identifiers', such as age, sex, height, general health status and health experience (although *not* including indicators of pathology for which care is inferred), and including other characteristics (such as origins, mobility, diet) for which there is material evidence (e.g. stable isotope analysis, DNA); (ii) social indicators, such as evidence for role and/or status (e.g. artefact association, body modification), family membership; mortuary treatment; (iii) pathology and its likely impact(s) ('the individual through the lens of disability'); (iv) likely care received, with emphasis on possibilities for interaction between care-recipient and caregivers ('seeking the individual through the lens of care'); and (v) lifeways variables identified in terms of possible 'opportunities or constraints' affecting the individual's ability to participate. The worksheet comprises two columns; the first of these contains headings for the domains above, along with prompts for the information sought (items may be added by researchers as required). The second column provides unlimited space beside each domain for information and observations.

Researchers then proceed to a second worksheet, again with two columns. The first contains a sample of broad, generic questions which can be modified for use in specific case study circumstances. These questions focus attention on the more intimate details of the individual's likely experience of disability and care; the intention is to encourage researchers in developing a greater appreciation for their subject's life history, and to consider the possible effects of loss of functioning capability on the subject's perception of self and interactions with others. Table 7.2 contains examples of questions proposed; in the Index protocol itself, these questions are briefly elaborated along the lines of discussion in Chapter 5.

Responses to these questions, including details of the way the question was adapted for the researcher's study, are entered in the second column. Researchers are asked to generate further questions specific to their subject and their lifeways context, and the worksheet has the capacity to add as many extra cells as required for this purpose.

Table 7.2 Individual identity - the subject as agent

(Index of Care, Stage 4 protocol)

Examples of 'generic' questions relating to the individual's experience *

* Researchers are asked to adapt these questions for relevance to their case study.

- What does the disabled subject's survival suggest about personality and motivation?
- Does the subject's ability to obtain care suggest any particular personality traits? Are there other cases of care in the group? If so, how do 'cases of care' compare?
- What was required from the subject in terms of cooperation in their own care? What does cooperation suggest in terms of level of function, personality, etc?
- How did disability likely affect the subject's ability to perform the same activities as those of their cohort? How may this have affected the subject's self-perception and perception by others?
- Where care included assistance with 'self-maintenance' involving intimate interventions (e.g. toileting, washing, massage) how might this affect self-esteem?
- What might long term survival in this dependent state suggest about a severely disabled subject? About their relationship with carer(s)?

The final task in this final Index of Care protocol invites researchers to take what has been recorded in the last two worksheets and, in relation to likely experience of disability and care, to speculate on some of the personality traits and behavioural characteristics that may have formed part of their subject's personal identity.

7.4 Stage 4 of bioarchaeology of care analysis: final comments

To recapitulate: the bioarchaeology of care methodology is an integrated approach to analysis comprising four stages, each of which drills progressively deeper into the detail of lifeways, experience, behaviour and identify of those associated with the provision and receipt of health-related care. Each succeeding stage is built on the findings of the preceding one, and each involves an increasing level of inference. Figure 7.1 elaborates on the ‘four stages of the bioarchaeology of care’ first presented in Figure 6.1.

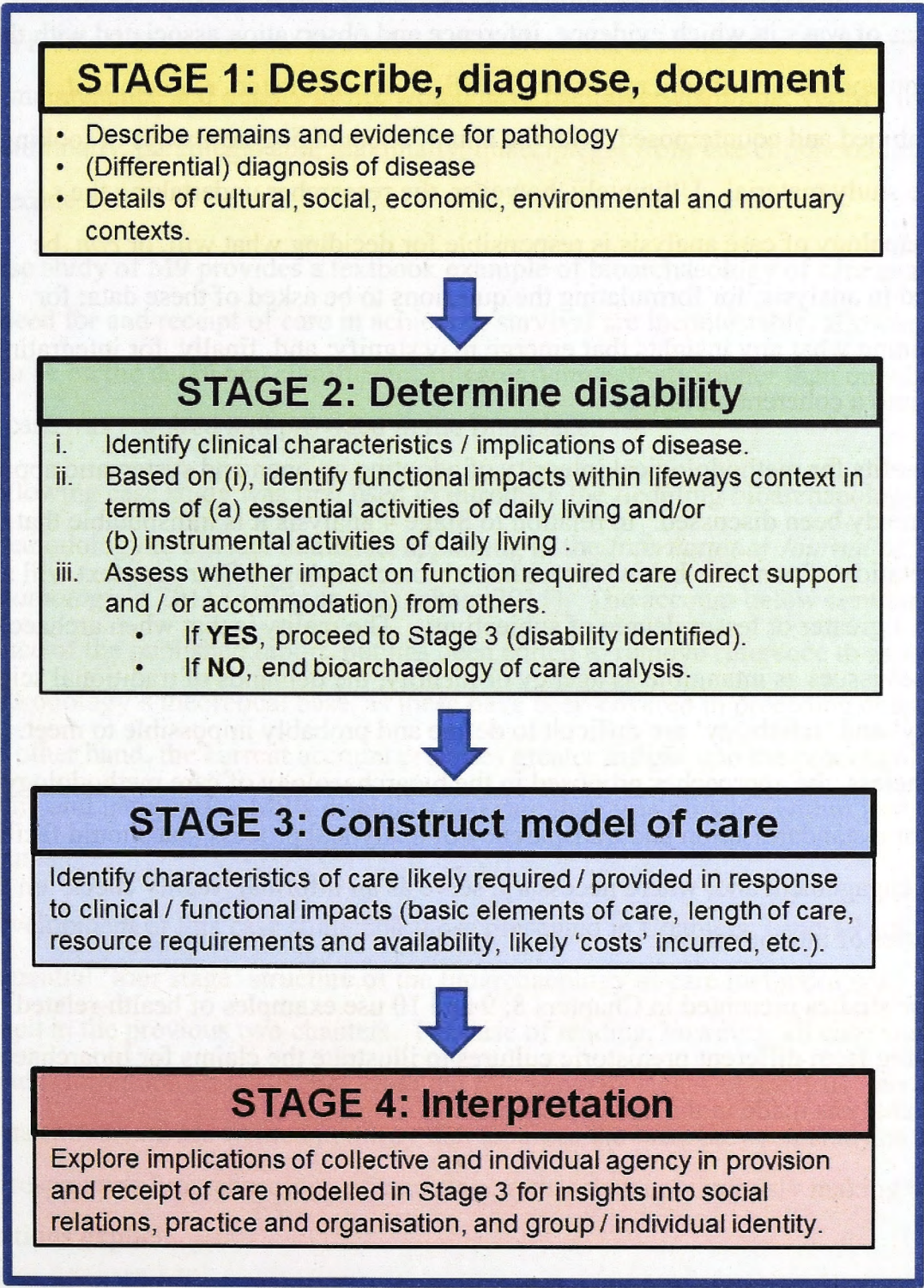


Figure 7.1 The four stages of the bioarchaeology of care (expanded)

In any study of prehistoric caregiving the goal is to extract the maximum amount of information and meaning from the material available. Even in those studies where researchers are unwilling or unable to attempt Stage 4 interpretation, application of the first three stages of the bioarchaeology of care methodology will enable a far more methodical and more detailed understanding of caregiving behaviours than has been achieved to date.

The purpose of the Index of Care Stage 4 protocols is to assist in approaching questions of group and/or individual identity. In relation to each of these areas the Index provides examples of ways in which evidence, inference and observation associated with the provision and receipt of care might be identified, deconstructed, reassembled, (re)combined and counterposed, with the aim of encouraging new ways of looking at the case study material. Ultimately, however, the researcher undertaking the bioarchaeology of care analysis is responsible for deciding what will, or *can*, be included in analysis; for formulating the questions to be asked of these data; for determining what any insights that emerge may signify; and, finally, for integrating all of this into a coherent narrative.

The benefits for methodological integrity of adopting an open and systematic approach have already been discussed. In relation to Stage 4 analysis it is indisputable that interpretation of complex behaviour within a bioarchaeology of care context will always involve a greater or lesser degree of subjectivity. The reality is that when archaeology addresses issues as intangible as agency or identity, the demands of traditional scientific 'validity' and 'reliability' are difficult to define and probably impossible to meet.

Nevertheless, the approaches proposed in the bioarchaeology of care methodology allow for a standardisation and transparency of analytical process that should facilitate critical engagement and, where necessary, serve as an informal 'reality check' on the boundaries of interpretation.

The case studies presented in Chapters 8, 9 and 10 use examples of health-related caregiving from different prehistoric cultures to illustrate the claims for bioarchaeology of care analysis made in the last two chapters.

CHAPTER 8. Survival against the odds - intensive care in the Vietnamese Neolithic. (Case Study 1)

Around 4000 years ago in northern Vietnam a young man survived for approximately ten years with disabilities so severe he would have been dependent on assistance from others in every aspect of daily life. Paralysed from the waist down, and with at best very limited upper body mobility, the skeletal remains of Man Bac Burial 9 (M9) provide evidence of a pathological condition difficult to manage successfully in a modern medical environment. In a subsistence Neolithic economy the challenges to health maintenance and quality of life would have been overwhelming, yet M9 lived with, minimally, paraplegia and, maximally, quadriplegia from late childhood into his third decade.

The case study of M9 provides a textbook example of bioarchaeology of care analysis. M9's need for and receipt of care in achieving survival are incontestable, allowing the focus to be on the detail and significance of caregiving activity, rather than on whether or not care was required and provided in the first place.

The following case study was first used to introduce the fledgling bioarchaeology of care methodology to a wider audience, appearing in the *International Journal of Paleopathology* in 2011 (Tilley and Oxenham 2011). The account below contains the substance of the published report, but has been edited to remove reference to aspects of the methodology's theoretical base, as these have been covered in preceding chapters. On the other hand, the current account provides greater insight into the process of analysing and interpreting M9's disability and care than was possible within journal constraints.

The development of this case study and those presented in Chapters 9 and 10 adhered to the sequential 'four stage' structure of the bioarchaeology of care methodology described in the previous two chapters. For ease of reading, however, all case studies integrate information and inference from the four separate stages of analysis into a fluent narrative, and are written in a way that assumes the links between analysis and the corresponding bioarchaeology of care stage rather than continuously making these associations explicit.

8.1 Man Bac Burial 9: the individual and his context (Stage 1)

The remains of M9 (designation MB07H1M09), a male aged between 20 to 30 years at time of death, were recovered in 2007 from the late Neolithic Man Bac cemetery, Ninh Binh Province, North Vietnam. M9 was buried on his right side, with both legs flexed to the right and knees brought up parallel to the top of the pelvis; his right arm (his left arm was missing) was laid at an acute angle to his body, with his right hand resting over his abdomen; burial orientation was north-south, head to the north and facing due west. Fragments of two small-medium-sized terracotta vessels represented the only preserved grave goods.

The author was directly involved in the recovery and analysis of M9's remains. A detailed description of M9, including preservation, pathological conditions and differential diagnosis, is provided in Oxenham, Tilley et al. (2009) and is summarised below.

8.1.1 M9: description and diagnosis

Figure 8.1 summarises the skeletal preservation of M9; anomalies suggestive of disability were immediately apparent on excavation, and are clearly visible in Figure 8.2, which shows the remains of M9 *in situ*.

Evidence of pathology comprises significant diaphyseal atrophy of the lower limbs; a lesser level of atrophy (although still significant) in the remaining right upper limb; various anomalies in the remaining bones of the right hand, including diaphyseal narrowing of the middle phalanges; fusion of the sacroiliac joint; ankylosis of all cervical vertebrae and of the remaining upper thoracic vertebrae (C1-T3); articulation anomalies between the first cervical vertebra and the base of the skull (occipitalisation) and the first and second cervical vertebrae (atlantoaxial rotary fixation); and signs of moderate to severe osteoarthritis on both mandibular condyles and on the left mandibular fossa (the right fossa is not preserved). There are no signs of trauma or infection on any of the preserved elements. There is evidence of linear enamel hypoplasia in both maxillary and mandibular dentition as well as cribrotic remodelling in both orbits, indicating that B9 had experienced and survived health challenges during early childhood.

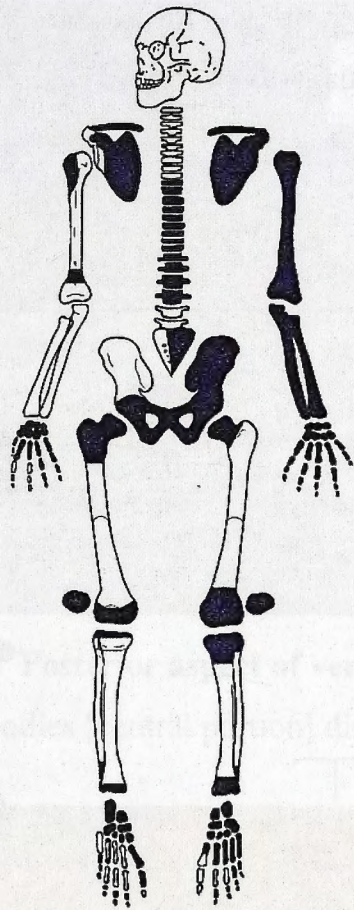


Figure 8.1 Schematic summarising skeletal preservation (black represents missing portions).



Figure 8.2 (above) M9 *in situ* (note extreme gracility of limbs); grave goods (terracotta pots) removed

Figures 8.3, 8.4 and 8.5 address, respectively, disuse atrophy in the lower and upper limbs, vertebral ankylosis, and occipitalisation and atlantoaxial rotary fixation.

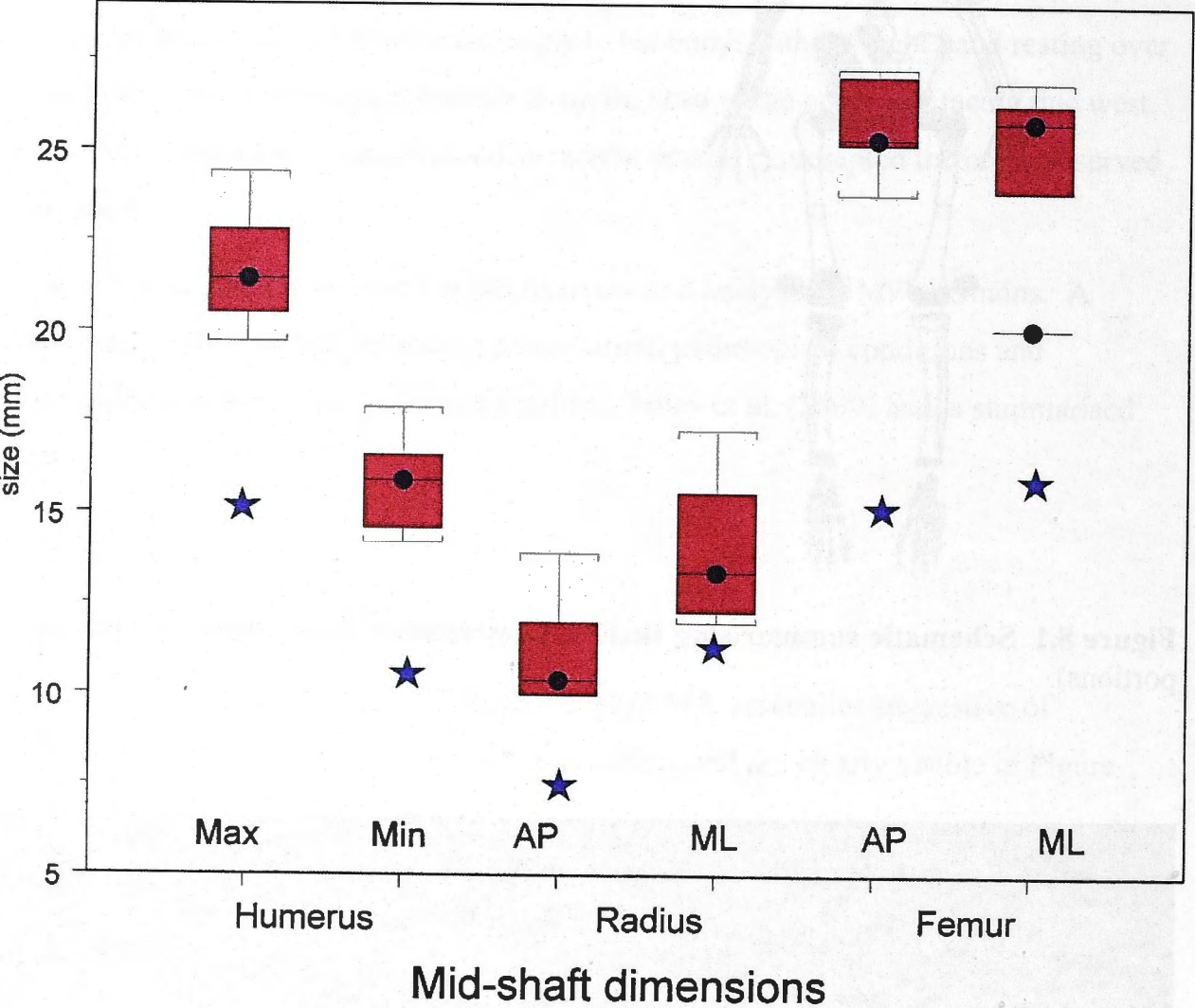


Figure 8.3 M9 limb dimensions (stars) compared to 6 other Man Bac adults: implications for unloading. (Courtesy of Dr Marc Oxenham)

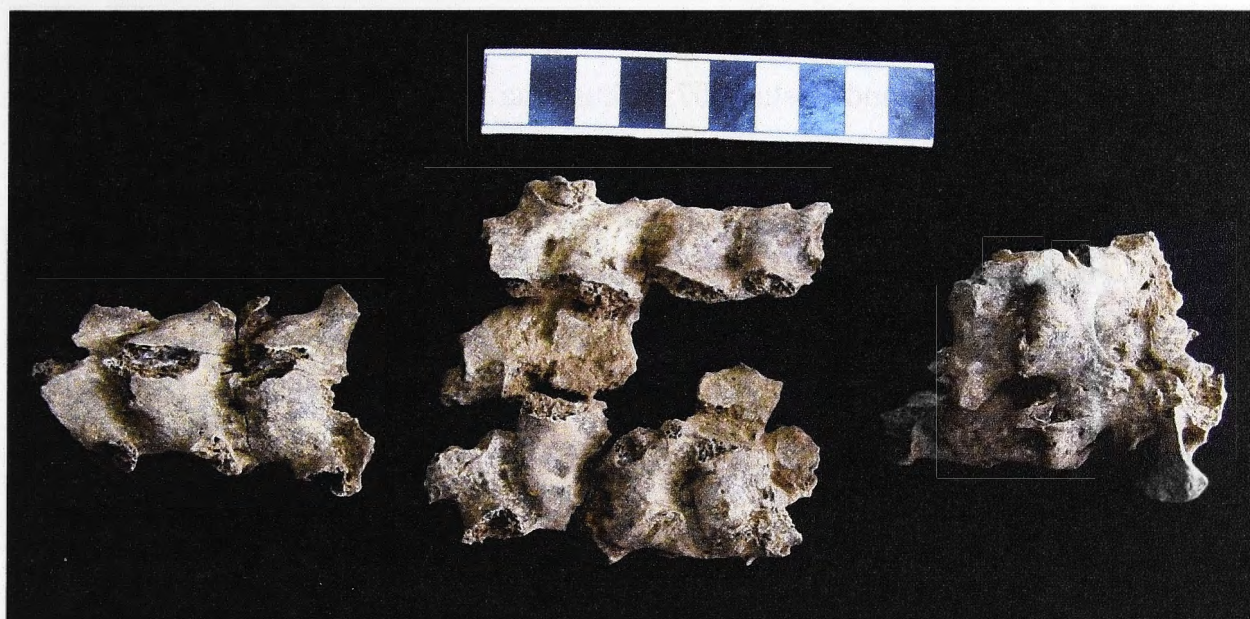


Figure 8.4 Posterior aspect of vertebrae C1-T3, illustrating ankylosis (C4-C7 vertebral bodies [central portion] disintegrated upon lifting).



Figure 8.5 Superior aspect of C1-C2, illustrating atlantoaxial rotary fixation and occipitalisation (roughened bone at arrow represents broken right occipital condyle fused to superior C1 condylar facet).

Differential diagnosis suggests Klippel-Feil Syndrome (KFS) (Type III), a rare developmental syndrome, was most probably responsible for the skeletal indicators of vertebral pathology in M9, which in turn was either causal of, or contributory to, neurological impairment leading to the disuse atrophy reflected in the appendicular skeleton. In the case of M9, preservation does not allow identification of the proximal cause of paralysis, but progressive neurological degeneration and/or (subsequent) trauma to an unstable ankylosed vertebral column would explain the skeletal evidence.

M9 is not the first prehistoric individual to be diagnosed with Klippel-Feil Syndrome (Barnes 1994; Fernandes and Costa 2007; Fukushima 1988; Pany and Teschler-Nicola 2007; Papathanasiou 2005; Silva and Ferreira 2008; Urunuela and Alvarez 1994).

However, the extent of axial and appendicular involvement makes this case not only one of the most convincing of all reports, but also the most severe palaeopathological manifestation to date.

8.1.2 *The context for care*

The Man Bac cemetery is located in the Ninh Binh province of northern Vietnam, 100 kilometres south of Hanoi. Excavations carried out between 1999 and 2007 produced the remains of 95 individuals, extending through three separate layers, all primary burials, and comprising the first signs of human presence at the site. During occupation, Man Bac was located at the mouth of an estuary of one of many rivers making up the Red River Delta, with a landscape of flat loess interspersed with sharply rising, rugged, limestone karsts (Figure 8.6). Climate was similar to that of the present, with cool, humid winters (minimum average temperature is 12 degrees centigrade, descending to 6 degrees centigrade) and hot, wet summers (Sterling et al. 2006).

Archaeological evidence suggests a predominantly hunter-gatherer economy. Faunal remains indicate a focus on terrestrial and aquatic vertebrate resources (Sawada and Vu 2005), with stable isotope data indicating over 50 per cent of protein intake derived from fish (Yoneda 2008). While long grain rice has been recovered from contemporaneous Red River Delta sites (Nguyen et al. 2004), there is no evidence for rice cultivation/consumption at Man Bac. Analysis of Man Bac pottery suggests regional links among Red River Delta communities (Nguyen 2008), and lithic evidence indicates trade routes extending as far as China (Higham 1996).

Mortuary analysis indicates a demographic profile typical of early sedentism, with elevated levels of infant mortality suggesting high fertility rates (Domett and Oxenham 2011). Analysis of Man Bac remains suggests a population under stress: oral health, measured by frequency of carious lesions by tooth count (permanent dentition 8.6 per cent, deciduous dentition 3.6 per cent), is poor in comparison to earlier Neolithic and later Metal Age samples in the region; 73.1 per cent of the adult and 90.6 per cent of the



Figure 8.6 The modern Man Bac landscape, looking southwest, excavation site middle right. (At the time of M9 the lower ground would have been underwater)

subadult sample display evidence of cribra orbitalia; and 92.3 per cent of adults and 16.7 per cent of subadults display evidence of linear enamel hypoplasia (Oxenham and Domett 2011). Observations indicate a greater frequency of non-specific infectious lesions than seen in either the earlier Neolithic or later Metal periods (Oxenham pers. comm. 2012; Oxenham et al. 2005). There is neither skeletal nor cultural evidence for unusual levels of trauma or for interpersonal violence.

Mortuary treatment is consistent across all three burial layers, with the standard burial position supine, extended and oriented east-west as shown in Figure 8.7 - M9's burial is one of only three to deviate from this tradition. Preserved grave goods commonly associated with individual remains include pottery, worked shell, bone and stone implements and, less commonly, jade artefacts, and analysis suggests age-based differentiation in nature and quantity of grave good deposits. Characteristic burial procedures for newborns through to adults strongly suggest that all members of the community were accorded an individual identity from the earliest age onwards (Oxenham et al. 2008b).



Figure 8.7 Man Bac cemetery 2007 (looking east, illustrating standard burial practice)

8.2 Clinical implications and functional impacts of disease (Stage 2).

Clinical and functional impacts can be identified from the evidence of disease in M9's remains, and from these it is possible to draw inferences about his physical health status, health needs and health-related quality of life. Although only the most basic impacts are assumed in the interpretive sections of this chapter it is certain that M9 experienced a far greater range of neurological as well as physical symptoms resulting from his condition, and these are briefly referred to below to underline the conservative approach taken in this bioarchaeology of care analysis.

Extreme atrophy of M9's lower limbs, combined with the absence of any visible muscle attachment points, indicate a total loss of voluntary and involuntary lower body control of extended duration, and analysis suggests lower body paralysis onset occurred around ten to twelve years of age (Oxenham, Tilley et al. 2009). Although not open to verification, it is possible that the leg flexure seen in burial was the result of muscle foreshortening (contracture) during life, a known complication of immobilisation (Dittmer and Teasell 1993; Olsen and Edmonds 1967); if this was the case, even passive leg extension would, over time, have become impossible. Fusion of M9's right sacroiliac joint was most probably an outcome of long-term paralysis (Bhate et al. 1975; Park et al. 1993), and would have served as another constraint on positioning.

The diaphyseal atrophy in M9's remaining upper limb contrasts with a marked deltoid muscle insertion and marginal osteophytosis of the humeral head, indicating M9 likely retained use of his arms, all be it much reduced, following onset of lower body paralysis. However, the extent of bone atrophy in humerus, radius and ulna suggests that in the latter part of his life, at least, M9 did not use his arms in any weight-bearing capacity (for example, to support his weight when moving between seated and supine positions). The few preserved phalanges of the right hand display reduced mass, possibly associated with reduction or loss of movement.

Extensive cervical vertebral ankylosis, combined with occipitalisation and permanent torticollis, resulted in significant constraints on neck flexion and extension and a head permanently twisted to the right side and angled slightly upwards. Abnormal head position would affect jaw movement, and resultant mechanical stress may have been responsible for the bilateral temporomandibular joint degeneration (Hodges 1991). Ankylosis of the preserved thoracic vertebrae (T1-3) adds to the overall picture of constrained upper body flexibility.

In summary, the immediate physical effects of M9's pathology were to render him not only immobile (effectively 'bed-ridden'), but also unable to use his upper body to any significant extent, possibly not even to adjust position - making it impossible for him to provide for himself in any way, including obtaining food and water, maintaining personal hygiene, and achieving protection against the elements (shelter and warmth). It is likely that limitations in upper limb activity, combined with restrictions on cranial, neck and upper back mobility, made it difficult for M9 to feed or hydrate himself efficiently - if at all - when provided with food and drink by others. Scope for

participation in social activities would be extremely limited, and participation in normative economic activity inconceivable.

8.2.1 *Complications secondary to immobility*

In addition to the primary health impacts outlined above, clinical practice recognises a range of common, interactive and potentially fatal diseases secondary to extended immobility. It is not necessary for an individual to suffer neurological damage to experience these complications; immobilisation alone, even over short periods of time (Anderson and Spencer 2003; Corcoran 1991; Stillman 2008), is sufficient to induce health challenges including pressure sores; urinary tract infections, kidney stones and kidney failure; gastrointestinal dysfunction affecting ingestion, digestion, nutrient absorption and bowel activity; respiratory tract dysfunction and infections; cardiovascular dysfunction, thrombosis and embolism; metabolic dysfunction; osteoporosis; muscle spasms and contracture; reduced immunocompetence; and psychological depression. Table 8.1 summarises the effects of immobility on body systems, and describes the mechanisms by which these impacts are mediated.

Some of the potential complications identified in Table 8.1 will be referred to in developing and interpreting a model of the basic care given to M9. Although few of these complications are likely to register in the skeleton each has the potential to pose a severe health threat, and it will be argued that M9's survival for over a decade, while completely immobilised, suggests certain care interventions aimed at prevention and/or remediation of such conditions.

Table 8.1 is relatively detailed and would not usually be contained in a final report. It is included here to demonstrate how, in certain circumstances, the information generated in the 'clinical impact' step of Stage 2 of the bioarchaeology of care methodology (see Chapter 6, Section 6.3.1) can be used not only to help in determining whether the subject experienced a disability requiring care, but to contribute to the process of identifying what such care likely encompassed (the Stage 3 'model of care').

Table 8.1 Health complications of immobility*#

BODY SYSTEM / FUNCTION:	MUSCULOSKELETAL
Mechanism(s) of impact:	
<div>1. Lack of weight bearing activity disrupts normal bone formation/ resorption. Bone calcium depletion, increased excretion of phosphorus and nitrogen leads to loss of bone mass (demineralisation).</div> <div>2. Prolonged joint immobility leads to muscle atrophy and contraction of muscle fibres.</div>	
Impact(s) on physiological function:	
<div>1. <u>Osteopenia / osteoporosis and (vulnerability to) fracture</u> - bones become light and fragile, lack structural strength and susceptible to fracture/other damage.</div> <div>2. <u>Contracture</u> - limbs fixed in flex position, reduced/loss of joint movement.</div>	
BODY SYSTEM / FUNCTION:	MENTAL (PSYCHOSOCIAL)
Mechanism(s) of impact:	
<div>1. Physiological (e.g. metabolic changes, pain) and psychological stressors directly affect mood and behaviour, and depress immune system function. Loss of control over (part of) the body and the immediate physical environment undermines sense of personal identity and worth, and affects social 'persona' and interactions.</div>	
Impact(s) on physiological function:	
<div>1. <u>Behavioural change / depression / general health stress</u>: frustration, anger, withdrawal, apathy and self-destructive behaviours, including suicide. Loss of functional ability in physical/behavioural areas disproportionate to 'actual' handicap. Reduced immunocompetence threatens health status and prolongs recovery times.</div>	
BODY SYSTEM / FUNCTION:	CARDIOVASCULAR
Mechanism(s) of impact:	
<div>1. Reduced muscle tone affects venopressor mechanism, blood pools in lower body.</div> <div>2. Gravity pressure regulating circulation removed. Blood volume in legs redistributed, increasing volume to be circulated. Reduction in muscle tone affects venopressor mechanism, resulting in increased heart pressure.</div> <div>3. Venous stasis in legs, hypercoagulability, and circulatory stasis all contribute to increased blood clotting activity/formation of thrombi and emboli. Dehydration/ increased blood calcium levels contribute to hypercoagulability.</div>	

Impact(s) on physiological function:

1. Orthostatic hypotension - dizziness, weakness, confusion.
2. Increased heart workload (up to ~30%). Cardiac output and stroke volume increase to meet new requirements. Heart rate increases with immobility; tachycardia or cardiac arrest can result from 'over exertion'.
3. Cerebrovascular accident/stroke; deep vein thrombosis; pulmonary embolism - Thrombus or embolus (i) blocks or ruptures a blood vessel to the brain, causing loss of brain function; (ii) lodges in the pulmonary artery causing respiratory dysfunction.

BODY SYSTEM / FUNCTION: RESPIRATORY**Mechanism(s) of impact:**

1. Chest expansion limited by resting positions compressing the thorax; abdominal distension; muscle wastage; reduced neural arousal. Efficient movement of air lost.
2. Decreased respiratory efficiency leads to pooling of secretions/ secretion stasis in the respiratory tract and congestion. Dehydration results in thickening of secretions, making expulsion harder.
3. Diffusion of oxygen /carbon dioxide limited by restricted respiration; affected by changes in cardiovascular function. Carbon dioxide build up in blood leads to tissue hypoxia.

Impact(s) on physiological function:

1. Decreased respiratory efficiency - reduced lung expansion, resulting in decreased depth/increased respiration rate. Partial/total collapse of lung(s), coughing compromised.
2. Respiratory tract infections - congestion increases strain on respiratory function, predisposing to infections. Secretions are medium for pneumococci, staphylococci and streptococci.
3. Oxygen/carbon dioxide imbalance - increased carbon dioxide concentrations in the blood create a respiratory acidosis, potentially leading to respiratory or cardiac failure and death.

BODY SYSTEM / FUNCTION: GASTROINTESTINAL**Mechanism(s) of impact:**

1. Efficiency of ingestion, digestion and nutrient absorption affected by physiological (changes in metabolic and motor function) and psychological (para-sympathetic nervous system) factors.
2. Gastro-elimination mechanisms affected by atrophy of abdominal, diaphragm and levator ani muscles; inability to squat (gravity aids elimination); depression of intestinal reflexes. Dehydration, diet, prolonged retention of faeces in colon or rectum lead to hardening of stools. Pressure from faecal impaction interferes with respiratory and circulatory function.

Impact(s) on physiological function: <ol style="list-style-type: none">1. <u>Loss of appetite, anorexia, malnutrition, other</u> (including dyspepsia, gastric stasis, distension, diarrhoea) - all compromise general health maintenance and ability to resist and recover from infection.2. <u>Constipation; intestinal obstruction</u> - may lead to disruption of gastrointestinal pathways and nutrient absorption (fluid and electrolyte imbalance), dehydration and pain. Straining to eliminate impacted faeces may induce ulcers, fissures, rectal prolapse, heart block and stroke. Abdominal pressure contributes to breathing difficulties and thrombosis.
BODY SYSTEM / FUNCTION: METABOLIC
Mechanism(s) of impact: <ol style="list-style-type: none">1. Decreased cell energy requirements reduce metabolic rate, affecting metabolic homeostasis. Outcomes include changes to cellular absorption/exchange processes; increased rates of tissue atrophy/destruction; bone decalcification and demineralisation; fluid and electrolyte imbalance. Physical/ psycho-logical stress disrupts metabolic function; supine position acts to reduce metabolic activity.
Impact(s) on physiological function: <ol style="list-style-type: none">1. <u>General system dysfunction</u> - disruption of metabolic activity compromises efficient functioning of all physiological systems, contributing to development of complications noted throughout this Table (e.g. bone decalcification and demineralisation leads to osteoporosis; tissue vulnerability contributes to formation of pressure sores; decrease in cell nutrient absorption facilitates malnutrition; etc).
BODY SYSTEM / FUNCTION: INTEGUMENTARY / SOFT TISSUE
Mechanism(s) of impact: <ol style="list-style-type: none">1. Reduced blood circulation activity/changes to metabolic function result in decreased nutrition to/health of soft tissues. Pressure over bony prominence limits blood supply to area, resulting in ischemia, anaemia or hypoxemia in compromised soft tissue, leading to tissue necrosis, ulceration, infection.
Impact(s) on physiological function: <ol style="list-style-type: none">1. <u>Pressure sores</u> (decubitus ulcers, pressure ulcers, bed sores). Severity: Stage I (pressure-related alteration of intact skin) - Stage IV (full thickness skin loss, involving muscle, tendon, bone). Secondary/chronic infection (cellulitis, septicaemia, osteomyelitis).

BODY SYSTEM / FUNCTION	URINARY
Mechanism(s) of impact:	
<ol style="list-style-type: none"> 1. When [semi]supine, urine is expressed from kidney into ureter against gravity and urinary stasis may occur. Bladder voiding reflex may be depressed, and bladder distension occurs. 2. Immobility leads to increases in calcium excretion from bone resorption. Immobility results in increased urine alkalinity, and this and urinary stasis favour precipitation of calcium salts in the kidney. 	
Impact(s) on physiological function:	
<ol style="list-style-type: none"> 1. <u>Urinary tract infection; incontinence</u> - particles in pooled urine become focus for infection. Bladder distension leads to (i) overflow incontinence and (ii) back pressure, resulting in kidney dysfunction. 2. <u>Kidney stones</u> - stimulated by particles in pooled urine. Obstructive larger stones can cause renal colic (severe pain, nausea and vomiting) and damage the lining of the urinary tract (blood in the urine, increased vulnerability to infection). 	

* Body systems do not operate in isolation, and immobility-related impacts will interact.

Information in Table 8.1 is sourced from the following: Bergman et al. 1997; Campagnolo 2006; Dittmer and Teasell 1993; McKinley et al. 2002; Olsen 1967; Olsen and Edmonds 1967; Olsen and Johnson 1967; Olsen and McCarthy 1967; Olsen and Schroeder 1967; Olsen and Thompson 1967; Olsen and Wade 1967; Teasell and Dittmer 1993.

It is very likely that M9 experienced local and/or generalised, acute and/or chronic pain - again, a disease outcome which leaves no skeletal markers. Over 90 per cent of patients with spinal cord injury associated with paralysis experience pain within the first four years of symptom onset, with up to 45 per cent of patients reporting that pain disrupts daily living activities (McKinley et al. 2002:S61). Pain tolerance differs between individuals and we have no ability to gauge M9's subjective experience, but nevertheless this almost universal complication of paralysis must be acknowledged in considering both group and individual response to M9's pathology.

8.2.2 Determining the need for care: functional impacts

M9's experience of pathology left him incapable of independent function in relation to all essential and instrumental tasks of daily living, and there can be absolutely no doubt that health-related care was essential to M9's survival. In determining what this care may have comprised there are some qualifications, however.

Certain characteristics of M9's pathology directly relevant to considering the extent of, and adaptation to, disability must remain unknown. For example, it is impossible to tell whether M9's spinal cord damage was complete or incomplete. A complete injury results in the total loss of autonomic nervous system activity, sensation and voluntary movement below the level of damage, but in an incomplete injury some of these aspects may be retained (Ginis et al. 2005). This has important implications not only for control of organ function, quality of life and long-term survival, but for the type and level of care required (this will become clear in later discussion).

Equally, it is not possible to tell whether onset of M9's paralysis was sudden or gradual. Myelopathic symptoms with a progressive loss of function may manifest at an average age of 10 years in Klippel-Feil Syndrome (Samartzis et al. 2006), but if paralysis occurred as the result of trauma, functional disability would become apparent within hours (Elster 1984; O'Donnel and Seupaul 2008; Strax and Baran 1975). Although making no difference to the practical aspects of long-term support required, the timing and nature of disability onset may have had implications for the decision to provide care and for mode of care-delivery. Again, this question has possible implications for considering planning and delivery of care, but the answer is beyond reach.

8.3 Developing a model of care (Stage 3).

The support required for M9's survival can be identified along a continuum of 'basic' to 'advanced' care.

8.3.1 *Provision of food and water; assistance in eating and drinking*

M9 was incapable of obtaining food and water independently, so clearly these must have been supplied by others. Upper limb limitations combined with vertebral anomalies would have affected coordination, possibly posing problems for M9 in feeding himself and / or in holding a container at the correct angle for imbibing. It is probable that M9 received assistance with both eating and drinking, but almost certain that he required help in relation to the latter.

Restrictions on head and neck movement, combined with those associated with temporomandibular joint osteoarthritis, may have impeded efficient mastication and required softer foods, although level of tooth wear observed in M9 appears normal for

age. Nevertheless, M9 may have been provided with a special diet, possibly involving additional processing to encourage appetite, digestion and absorption. Loss of mobility is associated with adverse gastrointestinal outcomes ranging from anorexia to constipation (Olsen and Schroeder 1967; Schnelle and Leung 2004). In the absence of an appropriate diet, constipation and/or mechanical bowel obstruction are an almost inevitable corollary to prolonged immobility, and consequences can be severe (McKinley et al. 2002; Olsen and McCarthy 1967; Teasell and Dittmer 1993); M9 may have received food(s) with known laxative properties to facilitate bowel movement. Immobility-associated changes in metabolic function also affect dietary requirements; high levels of dietary protein are needed to compensate for poor nutritional absorption resulting from reduction in cell metabolism rates, and foods with an acid residue, such as fish, meat, poultry and cereals, may be beneficial in countering increases in system alkalinity which affect urinary and other functions (Agarwal 2002; Olsen and McCarthy 1967; Olsen and Schroeder 1967). M9's carers may not consciously have been aware of developing an optimal dietary regime, but they probably arrived at one through trial and error - aided by the fact that their normal diet was based on high protein, low fat, marine foods.

Immobilised individuals must be kept well hydrated; dehydration can be both an outcome of, and a contributor to, body organ dysfunction (Bergman et al. 1997; Massagli and Reyes 2008; Olsen and McCarthy 1967). Attention must have been given to ensuring not only that M9 had water within easy reach (particularly important in the hot months when sweating increases loss of body fluid), but that he was assisted in drinking if this was required.

Maintaining M9's health required establishing a balance between digestive capabilities and nutritional requirements as well as ensuring adequate fluid intake, with his continued survival indicating this was achieved.

8.3.2 *Provision of shelter, maintaining body temperature*

There is no direct evidence for Man Bac dwellings from this period, but M9 would have found it impossible to survive exposure to the elements for any period of time, and a water, wind and sun-resistant shelter must be assumed. M9's continued survival would also have been dependent on (i) a structure elevating him off cold or wet ground, and possibly provision of additional support enabling rest in a range of positions, and (ii)

this situation; and willing and able to maintain these procedures over years. Members of the Man Bac community made an informed commitment to the extended care of one of its members, probably one regularly reviewed and re-committed to in response to changes in - and the inevitable decline of - M9's health status.

8.4.1.1 Caring for M9: cultural values in practice

Motivations for any substantive human behaviour are multifaceted, ambiguous, frequently contradictory and, at a distance of almost 4000 years, impossible to unravel completely. We can never know exactly how the Man Bac society understood disease and how this may have affected the decision to care for M9, but while acknowledging the dangers of retrospective attribution of motive in the bioarchaeological context it may still be possible to gain partial insight into the value placed by this community on caring for others in need. For example, the considerable effort put into keeping M9 alive suggests that the people of Man Bac were not fatalist in their views of disease and its origins.

Individuals who are perceived as 'different' by their community in life are often distinguished by different treatment in death (Fay 2009; Shay 1985), and although M9 was placed with his contemporaries in the Man Bac cemetery there were dispositional anomalies in his burial. His atypical position and orientation may be an outcome of limitations imposed by his physical condition - specifically, difficulty in breaking ankylosis and flexure; if this *was* the case, then unwillingness to force conformity by breaking flexure, essentially 'violating' M9's remains, may be an indicator that regard for M9 as an individual was stronger than the demands of convention. Conversely, this mortuary positioning may have been a mark of M9's difference, and had meaning in relation either to his role in the community while alive or to his passage into the afterlife. Whatever the reason for differences in mortuary treatment, there is no indication of careless handling and every sign of respect for someone who was unique in his physical disability.

In general, Man Bac mortuary practice appears to only differentiate on the basis of age, which is associated with quantity (and sometimes quality) of preserved grave goods. The significance of grave goods in 'standard' burials is not fully understood, making M9's comparatively poor endowment (two small pottery vessels) difficult to interpret, however. While it may be the case that number and type of pots in an adult burial

In practical terms, the costs to a small community of supporting M9 involved not only the provision of resources necessary for his survival, but also compensation for the labour foregone of those involved in meeting his care requirements. Care for M9 was labour-intensive, in the sense that he required regular postural adjustment as well as frequent checking to ensure health needs were being met and safety was not compromised even when he was free of acute secondary complications. When suffering a health crisis, M9 would have required round-the-clock nursing.

Despite evidence for the experience of health stress (see Section 8.1.2), the Man Bac environment was relatively resource-rich - a situation facilitating the full time support of a dependent individual, and enabling group members to be taken out of mainstream activity to provide dedicated care. Nevertheless, in a small subsistence community it is usual for all members to participate in the economy as soon as they are old enough to do so (Kramer 2005; Oxenham et al. 2008a). In the case of M9 it is fair to assume that the adoption and maintenance of support behaviours, resulting in reduced productive capacity for the community over a period of years, would have required consent and cooperation from the group as a whole.

Consideration of the support received by M9 provides clues about behaviours in Man Bac for which there is as yet no material evidence. For example, essential tasks of bathing and drying M9, as well as the need for covering in colder months, suggest textile production. Lack of antemortem injury to M9 suggests a sedentary community lifestyle. Meeting M9's dietary requirements suggests a broad knowledge and range of food resources, food processing skills capable of overcoming constraints on appetite and digestion, and the ability to take the time needed for special food preparation. Furthermore, while prior experience of such an extreme condition as M9's is unlikely, the effectiveness of the care enabling his long-term survival suggests a community experienced in looking after people incapacitated by disease. The elevated level of general health stressors in Man Bac, as well as ethnographic research into disease frequencies and healthcare practices among hunter-gatherer and horticulturalist societies in South America, Africa and Papua New Guinea (e.g. Frankel 1986; Kaplan 2000; Lewis 1975; Sugiyama 2004a, b), indirectly support this observation.

In summary, the effective and long-term response to M9's condition argues for a socially stable and cohesive community experienced in nursing the sick; capable of assessing the likely demands and costs of care-giving in relation to a serious and permanent pathology; able to develop an effective set of procedures for responding to

Absence of evidence of antemortem bone fracture in M9's remains, despite their gracility, also reflects the quality of care provided. Immobility over a lengthy period results in osteoporosis; lack of weight-bearing exercise leads to depletion of bone calcium and demineralisation and bones lose density, becoming brittle and subject to fracture under minor stress (Bergman et al. 1997; McKinley et al. 2002; Olsen and Edmonds 1967), with such fractures occurring most commonly in the femur, spine and wrist (Dittmer and Teasell 1993). M9's preserved lower and upper limbs display no sign of antemortem damage, despite extreme atrophy rendering them potentially vulnerable.

8.4 Interpreting care: implications for group and individual identity (Stage 4)

The case of M9 is possibly the earliest and most extreme prehistoric experience of long-term survival with total disability. Only one other instance of survival with this level of paralysis is known; that of an individual from Hokkaido, dating to around 3500 years BP (Suzuki et al. 1984). The predicted outcome of a condition such as M9's - with such severe functional impact and such a wide range of potential health complications - would be rapid death, long before pathology had a chance to register skeletally. There can be no question that M9's survival was due to the care he received, and this allows certain observations to be made about Man Bac as a community and about M9 as a person.

8.4.1 *Man Bac - the community*

Because the size and composition of the Man Bac community is not known, it is impossible to tell whether carers came exclusively from M9's family; whether carers were drawn from non-kin community members; or whether there existed dedicated healers for particular aspects of treatment. It is possible to extrapolate, however, that the act of caring for M9 received general community endorsement. At some stage following paralysis onset, the extent of functional impact, combined with failure to improve, would have made it obvious that M9 was not going to recover independence; that his health would probably deteriorate further; that he would never be capable of making a substantive material contribution to the community (whatever other contribution he was capable of); and that he would require continuing and intensive care for the rest of his life.

8.3.6.1 Absence of evidence: pressure sores and bone fracture

Changes in skin elasticity, vascular function and muscle tone resulting from prolonged immobility render the skin vulnerable to both pressure and shearing forces, and facilitate pressure sore (ulcer) formation. When the skin's surface is ruptured the risk of wound infection is high; once established infection is difficult to control, and unless contained will cause extensive deep tissue damage, may become systemic, may spread to bone, and may prove fatal. Pressure sores need early attention to achieve uncomplicated healing (AHCPR 1992; Margolis et al. 2003; Olsen and Edmonds 1967; Stillman 2008).

To avoid sores, the resting surface of an immobile individual must be soft but supportive, and the person must be regularly repositioned to relieve areas of pressure (AHCPR 1992; Olsen and Edmonds 1967; Stillman 2008). Monitoring skin condition is essential; damp conditions increase vulnerability to lesions, but cracked, dry skin creates entry points for infection and requires lubrication (AHCPR 1992; Olsen and Edmonds 1967; Stillman 2008). In modern contexts the lifetime risk of immobile individuals experiencing pressure sores is approximately 85 per cent (Stillman 2008:1), and pressure sores are acknowledged as an ever-present problem for this population (AHCPR 1992; Margolis et al. 2003; Olsen and Edmonds 1967; Stillman 2008).

Had M9 suffered untreated pressure sores these lesions would almost certainly have led to long-term systemic infection, which, had M9 survived the initial stages, would likely have been expressed in bone lesions. The absence of evidence for infection from pressure sores (or infection from any other cause) in the recovered skeletal elements, combined with length of M9's survival with paralysis, suggests a minimum level of care comprising regular inspection and cleaning of skin surfaces, provision of cushioning materials, and routine physical manipulation.

It is very unlikely that M9 was able to avoid the initial stages of pressure sore development, given their ubiquity in situations of prolonged immobility (AHCPR 1992; Stillman 2008). Treatment would require keeping the lesion clean, with possible debridement of necrotic tissue to promote healing. Management of early stage pressure sores would have been within the technological capability of the Man Bac community, and it is possible that the site's marine proximity encouraged the use of seaweed dressings or saline washes, effective antiseptics used in some modern therapies (Stillman 2008). Treatment would have required sophisticated and dedicated effort, however, and reflects the high level of commitment to M9's survival.

appetite, general discomfort, abdominal swelling, tangible mass in the colon, or abdominal pain (McKinley et al. 2002; Olsen and McCarthy 1967).

The community's ability to treat these conditions aggressively was probably limited, but effective therapies may have existed nonetheless. Modern clinical experience shows that physical therapy interventions can be very successful if applied in the early stages of a complication. Mobilisation, repositioning, elevation, massage, percussion and postural drainage can improve respiratory and circulatory function, and repositioning, elevation, manual pressure, massage and manipulation can assist urinary flow and faecal elimination (McKinley et al. 2002; Olsen and Johnson 1967; Olsen and McCarthy 1967; Olsen and Schroeder 1967; Olsen and Thompson 1967). It is also possible that medicinal remedies were available for a range of conditions, such as fever, pain and gastrointestinal complaints (Halberstein 2005); for example, it has been suggested that betel nut (*Areca catechu*), traditionally used for abdominal (including parasitic) and urinary complaints, was frequently given to children at Man Bac (Oxenham et al. 2008a). There is no direct evidence for pharmaceutical treatment in relation to M9, however.

When M9 experienced acute health complications, intensive care over days, or perhaps weeks, would have been necessary. The physical therapies outlined above would have been applied at frequent intervals, suggesting at least one, but probably more, dedicated carers with the strength and skills to lift, move and manipulate M9 without compromising his safety. In this context it is noted that sacroiliac joint fusion, together with possible lower limb contracture (referred to earlier), would make this aspect of care yet more demanding.

Even without the stimulus of an immediate health crisis, M9 must have received daily physical manipulation because this was the main risk mitigation strategy available to his carers. Protecting M9 against the hazards of immobility must have involved regular repositioning and massage. At a theoretical level, there can be little doubt that M9 received this prophylactic care and that it was integral to his extended survival. At an empirical level, and in relation to two of the most common complications of prolonged immobility (pressure sores and bone fracture), absence of evidence in the skeleton becomes possible evidence for receipt of care in its own right.

8.3.6 *Health maintenance, health monitoring, and dedicated nursing*

Modern clinical experience suggests secondary complications must have arisen, prompting care interventions at regular intervals following immobilisation and up to death. Characteristics of symptom onset would have shaped initial treatment. If M9 experienced a gradual decline in mobility and sensation, then at first the need for direct medical intervention may have been minimal and support efforts concentrated on compensation for functional restrictions. If paralysis was of sudden onset, then intensive care would have been necessary over the initial period of stabilisation (Lee and Green 2002), followed by development and implementation of an ongoing support regime. At a minimum, M9 probably experienced severe restrictions on head and neck movement from birth, and he may also have manifested other signature characteristics of KFS (Hensinger et al. 1974; Thomsen et al. 1997). Indeed, M9 may have been marked out as 'different' and perhaps in need of assistance even before paralysis.

As reviewed earlier, individuals with long-term mobility constraints face an extensive range of possible secondary complications (Table 8.1). Some, such as osteoporosis, are unavoidable, and many can be life-threatening (Anderson and Spencer 2003; Dittmer and Teasell 1993; Marik and Fink 2002; Teasell and Dittmer 1993). M9 displays extreme atrophy and bone demineralisation of both upper and lower limbs, but most other complications have no effect on bone; this makes it impossible to say what other health challenges M9 experienced, but it is hardly credible that he experienced none at all (Corcoran 1991; Lee and Ostrander 2002; McKinley et al. 2002). Close monitoring of an immobile individual is required to ensure that symptoms associated with complications are addressed quickly. Consideration of what this monitoring may have comprised in relation to M9, and what sort of care may have been provided in direct response to an acute challenge, provides insight into carers' awareness of what constituted a health threat and their ability to respond effectively.

'Looking out' for M9 must have included recognition of early symptoms of distress, even if these could not be attributed to a specific cause. Cardiovascular dysfunction may manifest in dizziness, rapid heart rate, excessive sweating and headaches (Claydon et al. 2006; Olsen and Thompson 1967; Winslow 1985) and respiratory system dysfunction in difficulties in breathing and coughing, or raised temperature (McKinley et al. 2002; Olsen and Johnson 1967). Urinary and renal dysfunction may manifest in raised temperature, pain, blood in the urine or nausea (Bergman et al. 1997; Olsen and Schroeder 1967), and constipation or bowel obstruction may manifest in loss of

8.3.4 *Ensuring physical safety*

Individuals who suffer loss of sensation as a result of spinal cord damage are vulnerable to acquired injury in affected areas of their body, because they are unable to tell when damage is occurring; even immobile individuals who do not suffer sensory deficit will lose an amount of sensation over time (Bergman et al. 1997). For M9, hazards probably included open fires; surfaces capable of penetrating or tearing the skin; disease-carrying or poisonous insects or reptiles; lengthy exposure to damp or cold; and the range of domestic accidents that happen whenever people live in close proximity. Support in this context would not only entail carers being aware of the location of M9 in relation to potential threats and acting to reduce risk, either by environmental management or by removing him from danger, but also undertaking regular physical examinations of M9's body to check for injury.

8.3.5 *Personal hygiene*

M9 was completely reliant on others for the maintenance of personal hygiene, and this must have involved a regular regime of bathing and toileting. Although possibly bathed *in situ*, M9 may have been moved elsewhere for, and/or assisted in, the voiding of bowel and bladder.

This care was fundamental to his survival. Had M9 been left for any extended period lying in his own waste this would have increased vulnerability to breaches of skin integrity and to bacterial and parasitic infection (AHCPR 1992; Stillman 2008).

Similarly, changes in metabolic function associated with immobility may lead to increased sweating (Campagnolo 2006; McKinley et al. 2002), and this physiological response would have intensified during the humid summer season. Sweat-moistened skin would also have increased M9's susceptibility to pressure sore development and have required particular attention. All the above complications have potentially fatal consequences for an immobile individual (Stillman 2008; Thompson Rowling 1967; Yeo et al. 1998). Care must have included removal and disposal of body wastes; continual observation and action to ensure M9 was clean and dry (wiping, bathing, towelling); and frequent replacement of soiled bedding.

provision of a soft surface to lie on. Failure in either of these areas would minimally have resulted in continuous and likely fatal health challenges from acquired pressure sores and respiratory tract infections (AHCPR 1992; McKinley et al. 2002; Olsen and McCarthy 1967).

Limitations on M9's upper body function would have been a serious impediment to self-dressing. In a modern clinical context the ability of an individual with spinal cord injury to clothe (and clean) themselves is given prominence because independence in these areas is associated with psychological well-being (Krause et al. 1997), but there is a practical consideration as well - immobilised individuals are sensitive to core temperature fluctuation, which may require management by adjustment of clothing or other covering. Although nothing has been recovered from the cemetery excavations that sheds light on specific dress customs at Man Bac, there is clear evidence for textile manufacture in the contemporary Phung Nguyen period (Cameron 2002), and winter temperatures (Sterling et al. 2006), at least, would have necessitated an external source of warmth for M9.

8.3.3 *Transport*

If M9 undertook travel following paralysis onset he must have been transported by others, perhaps on a litter or by water (there is no evidence for draught animal domestication). Consideration of transportation may offer an insight into the Man Bac economy. It would not be impossible for a community undertaking seasonal movement to support a seriously handicapped individual (e.g. Dickel and Doran 1989), but it would be very unusual. Furthermore, the extreme fragility of M9's limbs would render these vulnerable to fracture from even minor trauma. Given lack of evidence of antemortem injury it seems unlikely that M9 was involved in any regular movement over distance, supporting the independently-derived hypothesis that Man Bac was predominantly a sedentary community. Despite this, M9 must frequently have been moved over short distances, if only for the purposes of maintaining the hygiene necessary to avoid infection, and would have been dependent on the physical strength of others for conveyance, and on their caution in carrying him for his safety.

represent some sort of social standing, it is not safe to assume that because M9 was accompanied by only two pots this suggests an inferior status held during life because the high quality care he received argues against this. It is possible, however, that the smaller than normal complement of burial items is consistent with an 'other-than-adult' status within the cultural mainstream.

The improbability of M9's survival suggests that the Man Bac community placed a high value on individual life. While the culturally-mediated nature of psychological health is acknowledged (Lillard 1998; Scheper-Hughes and Lock 2006), it is worth speculating on M9's experience in the context of modern clinical observations. Psychological depression, associated with loss of self-esteem, social isolation and social rejection, is a significant comorbidity of paralysis resulting from spinal cord injury (Bockian et al. 2002; Boekamp et al. 1996; Kennedy and Rogers 2000; Krause et al. 1997; Olsen 1967). Direct (suicide) and indirect (e.g. failure to cooperate with treatment) self-destructive behaviours are a leading cause of mortality among this population, with perceived quality of life positively correlated with length of survival following disability onset (Krause et al. 1997). Additionally, psychological depression, mediated via physiological stress systems, is associated with a variety of adverse impacts on physical health status, including reduction in general immune system function (O'Leary 1990; Weisse 1992; Zorrilla et al. 2001); increased risk of cardiovascular disease and congestive heart failure (Jagoda et al. 2003; Sherwood et al. 2007); and increased incidence of respiratory tract pathologies (O'Leary 1990).

It is impossible to make a direct comparison between modern and prehistoric experience at a behavioural level, but it can be assumed that fundamental physiological responses to stress were the same then as now. In a situation in which amenities were basic, had M9 suffered from clinical depression there is little doubt that he would have quickly succumbed to health challenges.

It is reasonable to conclude, therefore, that to have survived with his disabilities for more than ten years M9 must have received extensive psychosocial as well as physical support. Modern experience (Bockian et al. 2002; Krause et al. 1997) suggests that at a non-culturally-specific level this must have included the creation of a secure, emotionally-supportive, inclusive environment in which care was provided ungrudgingly, enabling M9 to reach adulthood, to develop a role for himself within the group, to retain a sense of self respect, and to interact with others in his community at whatever level was feasible. In view of the prolonged and particularly demanding

nature of the healthcare provided, it seems justifiable to speculate that the carers' motivations included compassion, respect and affection.

8.4.2 M9 - the individual

For a minimum of the last ten years of life M9 would have been unable to take on the normal role of those in his cohort. He could only watch on as his peers participated in the activities of late childhood/early adolescence in Man Bac. He experienced the hormonal changes of adolescence as a severely disabled individual (although the impact of these may have been mitigated by immobility-related changes in metabolic function [Olsen and Wade 1967]). M9's peers moved through adolescence to adulthood, being admitted into the roles and responsibilities associated with achieving different age-related stages in life (Robb 2002), while M9 remained without prospect of attaining 'normal' development. Although M9 may have contributed to his group in many ways - for example, the success of M9's continued survival may have been a source of strengthened community identity and cohesion - none of these is archaeologically accessible. All that can be concluded with certainty is that M9 was reliant on others for every aspect of his physical and social existence.

M9's prolonged survival with extreme disability suggests an extraordinarily strong will to live; (almost certainly) an ability to bear considerable pain and physical distress; a robust psychological adaptation to circumstance; a self-esteem capable of overcoming complete loss of independence; and a personality capable of inspiring others to maintain high quality and costly care over time.

8.5 Conclusion

As the introduction to this chapter notes, the study of M9 deals with the experience of a disability so extreme that establishing care provision offers little challenge. Inevitably, given the limitations of skeletal evidence of disease for understanding the experience of illness and disability, this will not be the case in most instances where the likelihood of caregiving is argued - as will be obvious from the bioarchaeology of care case studies which follow.

Having said this, the example of M9 is particularly valuable because it so clearly demonstrates the bioarchaeology of care methodology's potential for achieving a more detailed and nuanced understanding of aspects of contemporary prehistoric cultural

practice and social relations within a specific community. In this case, consideration of M9's experience of pathology over time also allows speculation on aspects of identity, allowing a glimpse, if only partial, of a real person.

This second case study chapter applies the bioarchaeology of care approach to examples of caregiving which are much less straightforward than that of M9, for whom it was relatively easy to identify the individual range of care received. The current chapter is particularly important, however, not only in illustrating how bioarchaeology of care analysis copes with ambiguous and incomplete evidence in inferring and interpreting the provision of care, but also in demonstrating the methodology's potential to address fundamental questions of cognition and behaviour.

The last century has seen vigorous debate over Neanderthal cognitive and behavioural capacities, but to date identification of Neanderthal potential has relied on extrapolation from anatomy and morphology, or on inference from artefact manufacture, ownership, activity and mobility trajectories. The possible contribution of evidence for Neanderthal health-related caregiving to this discussion has not been considered until now.

This chapter comprises two case studies, veridically examining likely caregiving to the Neanderthals La Chapelle-aux-Saints 1 (LC1) and La Ferrassie 1 (LF1) by the parents and both Neanderthals, conserved in Le Musée de l'Homme, Paris, were excavated by the author in 1977. While each case is dealt with separately, observations from both are combined to provide a novel perspective on aspects of Neanderthal cognition.

The first part of this chapter provides the background for these case studies. Unlike the data from respective mortuary sites, there is no information about the specific lifeways of these two individuals, although both date to between 40,000 to 70,000BP and come from the same geographic area (Pomel 2011:140ff). The archaeological consensus, consistent in Western European Neanderthal social and economic activity, however, is time, however, and on this basis a generalised context is described which can be used as a reference point for both Neanderthal case studies.

The second and third sections of this chapter interpret the data from each case study, LC1 and LF1, respectively. While lack of specific evidence limits the degree of detail achievable, the inferences drawn are sufficiently robust to challenge existing assumptions about Neanderthal practice.

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CHAPTER 9. Evidence for care in the Upper Middle Palaeolithic: the cases of La Chapelle-aux-Saints 1 and La Ferrassie 1 (Case Study 2)

This second case study chapter applies the bioarchaeology of care approach to examples of caregiving which are much less straightforward than that of M9, for whom it was relatively easy to identify the minimum range of care required. The current chapter is particularly important, however, not only in illustrating how bioarchaeology of care analysis copes with ambiguous and incomplete evidence in inferring and interpreting the provision of care, but also in demonstrating the methodology's potential to address fundamental questions of cognition and behaviour.

The last century has seen vigorous debate over Neandertal cognitive and behavioural capabilities, but to date identification of Neandertal potential has relied on extrapolation from anatomy and morphology, or on inference from artefact manufacture, economic activity and mortuary treatment. The possible contribution of evidence for Neandertal health-related caregiving to this discussion has not been considered - until now.

This chapter comprises two case studies, variously examining likely caregiving to the Neandertals La Chapelle-aux-Saints 1 (LC1) and La Ferrassie 1 (LF1); the remains of both Neandertals, conserved in Le Musée de l'Homme, Paris, were examined by the author in 2007. While each case is dealt with separately, observations from both are combined to provide a novel perspective on aspects of Neandertal cognition.

The first part of this chapter provides the background for these case studies. Other than data from respective mortuary sites, there is no information about the specific lifeways of these two individuals, although both date to between 40,000 to 70,000BP and come from the same geographic area (Pettitt 2011:110ff). The archaeology suggests broad consistency in Western European Neandertal social and economic activity across this time, however, and on this basis a generalised context is described which will be the reference point for both Neandertal case studies.

The second and third sections outline and interpret the case for caregiving in relation to LC1 and LF1 respectively. While lack of specific context limits the degree of detail achievable, the inferences drawn are sufficiently substantial to challenge certain assumptions about Neandertal practice.

The final section discusses how these studies' findings may provide a more rounded understanding of Neandertal potential.

9.1 Background: general lifeways context

This section synthesises aspects of Neandertal lifeways and behaviours in Western Europe during the Upper Middle Palaeolithic. Together with skeletal evidence of pathology, it provides the basis for inferring healthcare from the remains of LC1 and LF1, as well as for exploring the implications of the caregiving itself.

The remains of both LC1 and LF1 derive from around the Dordogne region of south-west France, an area famous for Middle and Upper Palaeolithic occupation. The topography at that time comprised steep-sided river valleys cutting through limestone cliffs containing rock shelters, caves, and cave complexes; these cliffs are topped by flat or gently undulating plateaux (Jones 2007; Texier and Bertran 1995).

Both Neandertals correspond to Marine Isotope Stage 4-3, a period characterised in Western Europe by cold to very cold and dry conditions, with dry, open grasslands interspersed with limited, mixed cold-climate tree cover supporting steppe-adapted fauna such as reindeer, bison and horse (Bradley 2006:16ff; Sandgathe et al. 2011). Average maximum temperatures ranged from -2 to +15 degrees centigrade, with minimum temperatures averaging -15 degrees centigrade and below (Bradley 2006:51ff).

Limited genetic diversity suggests low total population numbers (Green et al. 2008; Briggs et al. 2009), and Neandertals likely lived in possibly patrilocal, mixed-age groups (Lalueza-Fox et al. 2011) with most estimates of a typical group size of ten to 25 individuals (Hayden 2012) although the possibility of much larger groups has been mooted (Davies and Underdown 2006). Groups were highly mobile, travelling between short-stay camps situated five to ten kilometres apart, exploiting faunal resources within a five to ten kilometre radius and moving on once these were depleted; a seasonal territory of up to 10,000 square kilometres per group is suggested (Davies and Underdown 2006; Harvati 2010; Hayden 2012; Vaquero et al. 2001). There is evidence of repeated, intergenerational use of certain sites (Davies and Underwood 2006; Hayden 2012; Sandgathe et al. 2011), offering some support for proposals of Neandertal identification with, or 'ownership' of, a particular landscape (Hayden 2012).

Evidence for settlement practice is restricted to caves and rock shelters. There are indications that Neandertals organised areas into 'activity' and 'habitation' zones, using

hearth placement and sometimes rock 'walls' to divide interior space; in some caves, smaller 'warming hearths' are situated towards the back, providing heat for clusters of individuals, and larger hearths, likely intended for collective use, are located more centrally (Davies and Underwood 2006; Hayden 2012). Certain areas may have been dedicated to tool manufacture, animal-processing and possibly refuse deposition, suggesting an opposition of 'domestic' versus 'working' space (Davies and Underdown 2006; Hayden 2012; Vaquero et al. 2001).

Neandertal economy

Stable carbon and nitrogen isotope analyses, together with archaeological evidence of resource exploitation, indicate the Neandertal diet consisted almost entirely of animal protein, predominantly from large, herbivorous mammals and supplemented by smaller game, shellfish and birds (Balter and Simon 2006; Harvati 2010; Kuhn and Stiner 2006; Stiner and Kuhn 2009). Neandertals were probably skilled, strategic and flexible hunters (Davies and Underwood 2006; d'Errico 2003; Marea and Assefa 1999; Vaquero et al. 2001), and evidence for targeting large and potentially aggressive prey, together with frequencies of traumatic injury in Neandertal remains (to be discussed in more detail below), suggests they were also active and risk-taking ones as well (e.g. Berger and Trinkaus 1995; Kuhn and Stiner 2006; Stiner and Kuhn 2009). Larger animals were dismembered at kill-sites and elements transported to base for consumption; medium-sized kill was transported whole (Balter and Simon 2006; Vaquero et al. 2001). There is no evidence to indicate Neandertals stored (or had the potential to store) food surplus to immediate requirements (Davies and Underwood 2006; Hayden 2012).

The Neandertal economy was a monoculture, in which all members, including women and juveniles, were involved in hunting (Davies and Underdown 2006; Kuhn and Stiner 2006; Stiner and Kuhn 2009). Low levels of sexual dimorphism and skeletal robusticity indicating high levels of physical activity in both sexes from childhood onwards, lead Kuhn and Stiner (2006) to argue that there was little or no sex or age-based division of labour; strength, skill and health status determined the individual's role in the hunt. It is noteworthy that while (likely) occupation-related trauma frequencies are high, there are no significant male-female differences in lesion pattern and frequency (Berger and Trinkaus 1995; Frayer and Wolpoff 1985).

Neandertal technologies

Evidence for technology is largely restricted to lithic artefacts, and in the past research focused almost exclusively on stone tool production methods and materials. The perceived unchanging nature of the Neandertal lithic industry was interpreted as demonstrating inability to innovate, in turn reflecting cognitive limitation (Wynn and Coolidge 2004).

Recently there has been a significant re-evaluation. More contextualised analyses of stone tool creation and curation suggest implementation of strategies to produce tools intended for a specific purpose and environment (d'Errico 2003; Hiscock et al. 2009; Vaquero et al. 2001). Further, lithic micro-wear and residue analyses indicate that some tools were originally hafted, reflecting a complicated process of preparing and applying resin to blade and shaft (Davis and Underdown 2006; Zilhão 2011); that some tools were used for woodworking, suggesting wooden tools and/or other artefacts were manufactured, although not preserved (Davis and Underdown 2006; Hardy and Moncell 2011; Vaquero et al. 2001); and that stone tools were used to process animal hides, presumably for clothing and/or shelter (d'Errico 2003; Hardy and Moncell 2011; Kuhn and Stiner 2006; Zilhão et al. 2011). There is limited evidence for working bone and for production of bone tools (Davis and Underwood 2006; d'Errico and Stringer 2011; Hayden 2012).

Neandertal morphology and health status

Western European Neandertal morphology was adapted for thermoregulation and insulation, reflected in a comparatively squat and stocky build, and a higher proportion of body mass (mainly muscle) compared to that of anatomically modern humans (Bradley 2006; Froehle and Churchill 2009; Kuhn and Stiner 2006; Ruff 1993).

Neandertals probably had a higher basal metabolic rate, and therefore higher energy (calorie) requirements, than modern human counterparts (Froehle and Churchill 2009; Sandgathe et al. 2011).

The small number and questionable representativeness of recovered Neandertal remains means demographic analysis must be qualified. Trinkaus (1995, 2011a) describes high levels of mortality among young adult Neandertals (20-40 years), with fewer than 20% of adults achieving older adult status (>40 years), although notes this is not significantly different from early modern human mortality rates. Neandertal remains reflect

experience of high levels of developmental stress (Brennan 1991; Trinkaus 1995, 2011a), initiating around the time of weaning and continuing through adolescence (Ogilvie et al. 1989). Systemic health stress continued throughout life; based on the patterning and frequency of developmental stress indicators, Ogilvie et al. (1989) posit that European Neandertals experienced frequent dietary deprivation, possibly on an annual basis - suggesting difficulties in obtaining adequate food were seasonally-related.

Male and female Neandertals experienced high frequencies of trauma and degenerative joint disease, reflecting a physically demanding lifestyle (Berger and Trinkaus 1995; Davis and Underdown 2006; Harvati 2010; Trinkaus 1995, 2011a). Underdown (2004; Davis and Underdown 2006) reports evidence of long bone trauma in 28 per cent of Neandertal remains. Berger and Trinkaus (1995) famously compare lesion distribution in Neandertals with those in modern human archaeological and clinical samples, noting a similarity with patterns found in rodeo performers and concluding the 'overall pattern [of Neandertal pathology] was the product of frequent close encounters of the dangerous kind with prey animals' (Berger and Trinkaus 1995:850). Trinkaus (2012) recently proposed that some Neandertal trauma may be the result of interpersonal conflict rather than animal force (citing St Cesaire 1 [Zollikofer et al. 2002] and Shanidar 3 [Trinkaus and Zimmerman 1982]), but actual evidence for conspecific violence is extremely rare. Pettitt (2000) suggests that trauma was possibly a structuring principle in Neandertal society. Participation in hunting was a rite of passage, with identity and status earned through physical prowess; 'debilitating trauma (if encountered) [equalled] loss of value' (Pettitt 2000:361). Trinkaus does not take interpretation of trauma this far, but he does argue that absence of skeletal evidence for significant pathology-related or age-induced mobility restrictions indicates a practice of abandoning those unable to keep up with the group (Berger and Trinkaus 1995; Trinkaus 1995, 2011a, 2012). Flaws in this hypothesis were discussed in Chapter 2, and are further challenged by the findings reported in this chapter.

9.1.1 Neandertal cognition and behaviour: the continuing debate

Debate over cognitive ability is ultimately reduced to assessing Neandertal behaviour against that of anatomically modern humans. A frequent point of contention is whether, when Neandertals show evidence of behavioural complexity, this is the product of

indigenous social (and biological) evolution *or* reflects behaviours learnt from modern human contact. The earliest evidence of modern human presence in Europe dates to 35,000 (possibly 40,000) years ago (Higham et al. 2010), but while DNA evidence suggests a degree of intimacy between the two species (Green et al. 2010), archaeological evidence for interaction is less clear. Studies cited below claim evidence dated to before modern human occupation (both LC1 and LF1 are dated to before the earliest possible presence of modern humans in Europe).

Views on Neandertal cognitive potential range from positing this as limited to task-oriented concrete thinking, with a basic problem-solving but no long-term strategic planning capacity, (e.g. Gargett 1999; Mellars 2010; Wynn and Coolidge 2004), to endowing Neandertals with cognitive capabilities very similar to those of anatomically modern humans (e.g. d'Errico and Stringer, 2011; d'Errico et al. 1998; Zilhão 2011). One of the principle arguments used to support the former position is lack of innovation in Neandertal culture and technology (e.g. Wynn and Coolidge 2004). This is countered by observations that such stasis reflects absence of environmental stimulus for change rather than inferior cognition, and that it is more appropriate to judge Neandertal sophistication on the basis of successful adaptation to ecological opportunities and constraints (Davis and Underdown 2006; d'Errico and Stringer 2011).

Increasingly, researchers are examining ways in which Neandertals managed their environment and the available resources, and are concluding (although not without opposition) that Neandertals were capable of complex, flexible and skilled behaviours, including the use of symbols, the ability to plan for future contingencies, and verbal communication (Davies and Underwood 2006; d'Errico and Henshilwood 2011; d'Errico and Stringer 2011; Hiscock et al. 2009; Peresani et al. 2011; Vaquero et al. 2001; Zilhão 2011).

It is now generally accepted that Neandertals were morphologically and neurologically capable of speech (Beaman 2007; Frayer et al. 2012; Krause et al. 2007), although this does not necessarily mean Neandertals had complex language - simply that some sort of linguistic communication was possible and likely probable (Davies and Underdown 2006). Some researchers suggest that Neandertal speech (if it existed) was action-focused and restricted to the immediate, material world (e.g. Pettitt 2000; Wynn and Coolidge 2004), but others reference complex, symbolic behaviours which would likely have required abstract language for the transfer of knowledge, experience and ideas (e.g. Zilhão 2011).

Behavioural complexity: burial.

Despite early opposition (Gargett 1989, 1999) there is now consensus that in some places, and some periods, Neandertals practised intentional burial (Arsuaga et al. 2007; Belfer-Cohen and Hovers 1992; Davies and Underdown 2006; d'Errico and Stringer 2011; Hayden 2012; McBrearty and Brooks 2000; Pettitt 2011). All remains recovered come from well-protected caves and rockshelters; individuals are most commonly found along an east-west orientation, fully extended and supine, or supine and flexed, or sometimes on one side and flexed (Harrold 1980; Riel-Salvatore and Clark 2001; Pettitt 2011). There is less consensus on the matter of grave goods; articulated animal remains and/or artefacts have been recovered from up to 50 per cent of burials, but there remains debate as to whether these represent deliberate deposits (Harrold 1980; Riel-Salvatore and Clark 2001). Pettitt (2000; Hayden 2012) suggests that receipt of mortuary treatment reflects special status within the group, but there is no evidence to support this, and Neandertal interments comprise males, females and a mix of ages from perinatal onwards (Riel-Salvatore and Clark 2001).

Dispute now centres on whether Neandertal burial represents ritual - or 'symbolic behaviour' - or is simply an expression of emotional and/or social attachment (Davies and Underdown 2006). Such a finely drawn distinction is difficult to define, and impossible to identify archaeologically. In terms of Neandertal ability to experience, interpret and respond to abstract emotional and intellectual stimuli (surely significant components of symbolic behaviour?) it may also be irrelevant.

Behavioural complexity: the use of symbols

Kuhn and Stiner (2007:43) suggest that '[b]ody ornaments signal the existence of the uniquely human ability to manipulate symbols'.

Neandertal potential for 'symbolic behaviour', often employed as a proxy indicator for cognitive capability, is commonly operationalised in terms of personal ornamentation and/or decoration of surfaces. Neandertal use of coloured mineral pigments and ochres is established, although it is impossible to be definitive about how these materials were employed; applications might include personal adornment, indicators of group membership or status, medicinal or religious purposes, or preservation of hides (Caron et al. 2012; d'Errico 2003; d'Errico and Soressi 2002; d'Errico and Stringer 2011; Kuhn and Stiner 2007; Zilhão et al. 2010). A very few Neandertal sites have produced

pierced shell ‘beads’ and grooved and perforated bone and tooth ‘pendants’, presumably intended for personal embellishment (Caron et al. 2012; d’Errico and Stringer 2011; Zilhão et al. 2010), but some have argued that these ornaments derive from, or reflect the influence of, subsequent modern human occupation (e.g. Higham et al. 2010; Mellars 2010). There are a few examples of engravings on bone, and in one instance on stone, from Neandertal sites, and these also are interpreted as reflecting Neandertal capacity for abstract thought (Bednarik 1992; d’Errico and Stringer 2011; Zilhão 2011). Most recently, Peresani et al. (2011) suggest that Neandertals used bird feathers and possibly bird bones and claws for decorative (i.e. symbolic) purposes.

9.1.2 Neandertals and health-related caregiving.

Reports identifying likely Neandertal caregiving were identified in Chapter 2, and comprise the cases of the Middle-Eastern Neandertals Shanidar 1 and 3 (Trinkaus and Zimmerman 1982) and European Neandertals Saint Césaire 1 (Zollikofer et al. 2002), Neanderthal 1 (Schultz 2006) and Aubessier 11 (Lebel et al. 2001; Lebel and Trinkaus 2002). Of these, the claims made in relation to Aubessier 11 are disputed (DeGusta, 2002, 2003), and the study of St Césaire 1 (Zollikofer et al. 2002) focuses explicitly on acquired trauma possibly resulting from interpersonal violence, with probable care provision mentioned only in passing.

Ironically, given the passionate debate over other claims for Neandertal behaviour and the comparative paucity of evidence for abstract behaviours claimed, there is now a widely-held, in-principle acceptance that Neandertals cared for diseased conspecifics, at least with certain provisos. This perception is likely accurate - but analysis of what this caregiving behaviour might signify is lacking. For example Harvati (2010), commenting on Neandertal experience of trauma, simply notes that most acquired injuries show signs of healing and that ‘many of the individuals would not have survived the period of convalescence without being cared for by others’ (Harvati 2010:4). Hayden (2012:16), reviewing research on Neandertal social structure, accepts as given that Neandertals practised caregiving, queries whether ‘caring for elderly and infirm individuals ... might not reflect [these individual’s] special status’ - but does not pursue this observation further. Discussing competing hypotheses for Neandertal social organisation, Davies and Underdown (2006:148) observe that the ‘extensive, intragroup care needed to sustain infirm members is surprising unless [these members] provided

some valuable service, such as transgenerational communication within the group'. They fail to elaborate on this, although later add that '[c]ompassion for infirm group members enabling them to survive with serious illnesses and disabilities is frequently considered to be unproblematic in Neanderthal societies' (Davies and Underdown 2006:157).

Despite its 'unproblematic' nature, caregiving is nowhere included in consideration of Neandertal cognition, although providing care involves sophisticated decision making, strategic planning, organisation and negotiation (as argued in Chapter 5). The analyses of the cases of LC1 and LF1 address this situation, and are undertaken against the admittedly generalised background provided above.

9.2 La Chapelle-aux-Saints 1 and the case for care

LC1's articulated remains, dating between 40-60,000BP, were recovered in 1908 from a cave near the village of Chapelle-aux-Saints, Correze, France (Bouyssonie et al. 1908; Pettitt 2011). Age at death was originally estimated at 40-50 years (Straus and Cave 1957; Trinkaus 1985), but has been revised downwards to maximally 40 years, and possibly as little as 25 years (Dawson and Trinkaus 1997).

LC1's skeleton is that of a robust individual with well-delineated muscle and ligament insertions. Remaining elements are well-preserved although with some reconstruction, and are well documented (Dawson and Trinkaus 1997; Straus and Cave 1957; Trinkaus 1985; Trinkaus 2011b). Indicators of likely traumatic and systemic disease are present in both upper and lower body elements; these lesions have been fully described (Brennan 1991; Dawson and Trinkaus 1997; Straus and Cave 1957; Trinkaus 1985), and diagnoses from the existing literature are used as the starting point for considering the clinical and functional implications of disease for LC1 during his life-course.

9.2.1 Immediate context

LC1 received intentional burial. He was laid on a roughly east-west axis, supine and partially flexed on his right side, in a rectangular, straight-walled and flat-bottomed pit excavated at the entrance of a limestone cave (Pettitt 2002, 2011). Animal bones, including those of rhinoceros, horse and reindeer, and stone tools, including retouched blades and scrapers, were found in association with, or in the vicinity of, his remains

(Bouyssonie et al. 1908; Day 1986:31ff; Pettitt 2011); despite some disagreement (e.g. Pettitt 2002, 2011:110-111), these are generally regarded as representing deliberate grave good deposits (Riel-Salvatore and Clarke 2001).

9.2.2 *Pathologies experienced, and clinical and functional implications.*

Osteological disease indicators suggest that over his lifetime LC1 experienced a number of health challenges of varying severity. These include extensive antemortem tooth loss and severe and chronic periodontal disease; degenerative joint disease in minimally the right temporomandibular joint; severe degenerative joint disease in lower cervical and upper thoracic vertebrae, and moderate to severe degeneration of lower thoracic vertebrae; osteoarthritis in both shoulder joints; a rib fracture in the mid-thoracic region; severe degeneration and likely chronic osteomyelitis in the left hip; and degeneration in the fifth proximal inter-phalangeal joint of the right foot (Brennan 1991; Dawson and Trinkaus 1997; Straus and Cave 1957; Trinkaus 1985).

The clinical and functional implications of these pathologies, together with likely associations between individual pathologies, are discussed below.

9.2.2.1 Periodontal disease, tooth loss, temporal mandibular joint dysfunction

Figure 9.1 (a-c) illustrates widespread, active periodontal disease and extensive tooth loss in LC1's maxilla and mandible.

In the maxilla there are small apical abscesses and generalised bone resorption at the right incisors and left second incisor; there is also a well-established apical abscess at the right canine and first premolar, and the alveoli of the left first and second premolars also exhibit resorption suggestive of infectious activity. The anterior surface of the mandible is dominated by a large abscess extending minimally from the right first canine to the right first incisor, and there are signs of additional lytic activity in the region of the left canine and left first premolar, possibly affecting both left incisors. Both areas of infection were active at time of death and were likely chronic; evidence of bone proliferation as well as resorption is clearly visible.



Figure 9.1(a) Frontal view of the LC1 maxilla, showing alveolar resorption at RI¹ and RI² and an apical abscess straddling the RC¹ and RPM¹



Figure 9.1(b) Palatine view of the LC1 maxilla, showing antemortem loss of LC¹, LM¹, LM² and LM³, and RPM¹ and RPM².



Figure 9.1(c) Frontal view of the LC1 mandible, showing widespread infection extending across the anterior surface and associated antemortem loss of RI₁, RI₂, RC₁ and PM₁, and complete alveolar resorption at RPM₂, M₁, M₂, and M₃.

Prior to death, LC1 had minimally lost around 50% of his teeth, including all maxillary and mandibular molars, the maxillary left canine and right first and second premolars, and the mandibular right incisors, canine and first premolar (Tappen 1985; Trinkaus 1985) and probably the maxillary left canine (Trinkaus 1985). Resorption at the mandibular and maxillary alveoli, as well as at the maxillary left canine and right premolar alveoli, is either complete or advanced, indicating tooth loss well before death. Loss of the right mandibular incisors, canine and first premolar appears more recent, and is almost certainly related to abscess activity (Tappen 1985; Trinkaus 1985).

Only the right mandibular condyle is preserved; it is enlarged, with exostoses along the anterior margin and a flattened and pitted superior surface (Figure 9.2). Trinkaus (1985) notes that neither glenoid fossa exhibits an equivalent degenerative impact, although both manifest slight roughening of the articular eminence, suggesting that osteoarthritis visible in the right temporomandibular joint was 'primarily between the condyle and the articular disk' (Trinkaus 1985:24). The anterior surface of the right

glenoid fossa shows some alteration, perhaps reflecting greater involvement of the right glenoid fossa than proposed.



Figure 9.2 Superior view, LC1 right mandibular condyle: lipping, distortion and pitting of surface visible.

The above pathologies are probably interrelated. Clinical experience (Wayne et al. 2001) suggests at least some of the tooth loss resulted from the ‘prolonged and intensive’ (Straus and Cave 1957:360) infection observed in both maxilla and mandible. In turn, tooth loss was likely a major contributor to temporomandibular joint degeneration (Granados 1979).

There are separate clinical implications for periodontal infection, partial edentulism and temporomandibular joint arthritis. The extent and chronicity of infection would be minimally associated with local and generalised pain in the mouth and jaw, and demands on immune function consequent on infection would likely be associated with general loss of energy and increased susceptibility to disease (including cardiovascular and respiratory system dysfunction) (Doty et al. 1982; Holmstrup et al. 2003; Wayne et al. 2001). Temporomandibular joint degeneration likely caused pain upon and/or restrictions to jaw movement, particularly when exerting pressure associated with mastication (Guardia 2012; Pereira et al. 2006). Extent and pattern of tooth loss likely limited both amount and type of food that LC1 was able to eat, potentially

compromising nutritional status (Felton 2009; Lee et al. 2004; Nowjack-Raymer and Sheiham 2003).

In rejecting the notion that LC1 received conspecific support to overcome dietary constraints arising from his partially edentulate state, Tappen (1985:49) argues that the Neandertal retained sufficient teeth to be 'able to bite and chew well into his declining years and perhaps right up to his death'. This ignores a clinical reality - that interaction between pathologies described above suggests a greater impact on health status and general functioning than does a review of each in isolation. Although at death LC1 possessed five upper and lower opposed teeth in the left frontal array, the functionality of these teeth is questionable and their effectiveness in managing an exclusively meat-based Neandertal diet is problematic. In practice, the effects of the combined pathologies likely reduced potential sources of nutrition. LC1's diet probably consisted of food that was comparatively soft and easy to consume; food demanding vigorous mastication would probably not only have exceeded his physical capability, but may have demanded more time and effort than was available, given the mobility demands and high energy-related requirements of Neandertal lifeways.

9.2.2.2 Vertebral and upper body pathologies

LC1 displays severe degeneration in both vertebral bodies and articular facets extending from C5 to T3 and significant degeneration in the lower thoracic vertebrae (driven by damage to the T10/T11 articulation), although the lumbar region shows only moderate degenerative activity (Brennan 1991; Dawson and Trinkaus 1997; Straus and Cave 1957; Trinkaus 1985). This pattern of lower cervical/upper thoracic degeneration is atypical for both Neandertal and comparable modern human reference groups (Dawson and Trinkaus 1997; Mitra et al. 1996), and most probably results from trauma (Dawson and Trinkaus 1997; El-Khoury and Whitten 1993). Furthermore, in comparable populations the lumbar region is typically involved in lower back degenerative pathology (instead of, or in addition to, thoracic vertebrae), suggesting lower thoracic degeneration may also be of traumatic origin (Dawson and Trinkaus 1997).

Right and left humeral heads display evidence of moderate osteoarthritis, although neither appears to be significantly deformed; the remaining clavicle shows evidence of minor degenerative activity, as do both left and right elbow joints (Brennan 1991; Trinkaus 1985).

Possibly LC1's upper and lower vertebral pathologies (together with the broken rib) result from a single traumatic incident, although as trauma was common among Neandertals (Trinkaus 1995) this cannot be ascertained. Degeneration in both shoulders may be the secondary effect of upper vertebral degeneration limiting mobility in neck and shoulder regions, resulting in bilateral stresses on upper arm movement and associated 'wear and tear' damage.

LC1 likely experienced pain and restriction on movement immediately following upper body trauma, although duration of this response is impossible to assess; there is no evidence suggesting lasting neurological involvement. However, progressive degeneration in the upper spine would have been associated with increasing limitations on neck rotation, extension and flexion, and most likely chronic discomfort, if not actual pain (Al-Shatoury 2012; Windsor 2010). Similarly, degeneration in the lower thoracic region may have resulted in pain or discomfort, and possibly restricted movement (Trinkaus 1985; Mitra et al. 1996).

In a Neandertal context the experience of these upper body and lower middle back pathologies would have made hunting activities and travel between campsites more difficult, but there is no evidence to suggest these pathologies, taken in isolation, would have prevented LC1 from participating normally in group activity. They did not exist in isolation, however, and almost certainly interacted with the lower body pathology discussed below to increase the disabling impact of the latter - although the extent of this interaction cannot be known.

9.2.2.3 Lower body pathology

LC1's preserved left os coxa comprises most of the iliac and ischial portions of the acetabulum, with surrounding portions of iliac and ischial bone. As shown in Figure 9.3 (a-b), the remaining acetabular surface displays evidence of severe degenerative and infectious activity. Although much of the osteological description that follows is taken directly from Trinkaus (1985:28-29) original interpretation of certain pathological features is proposed, and where this occurs it will be clear from the text.

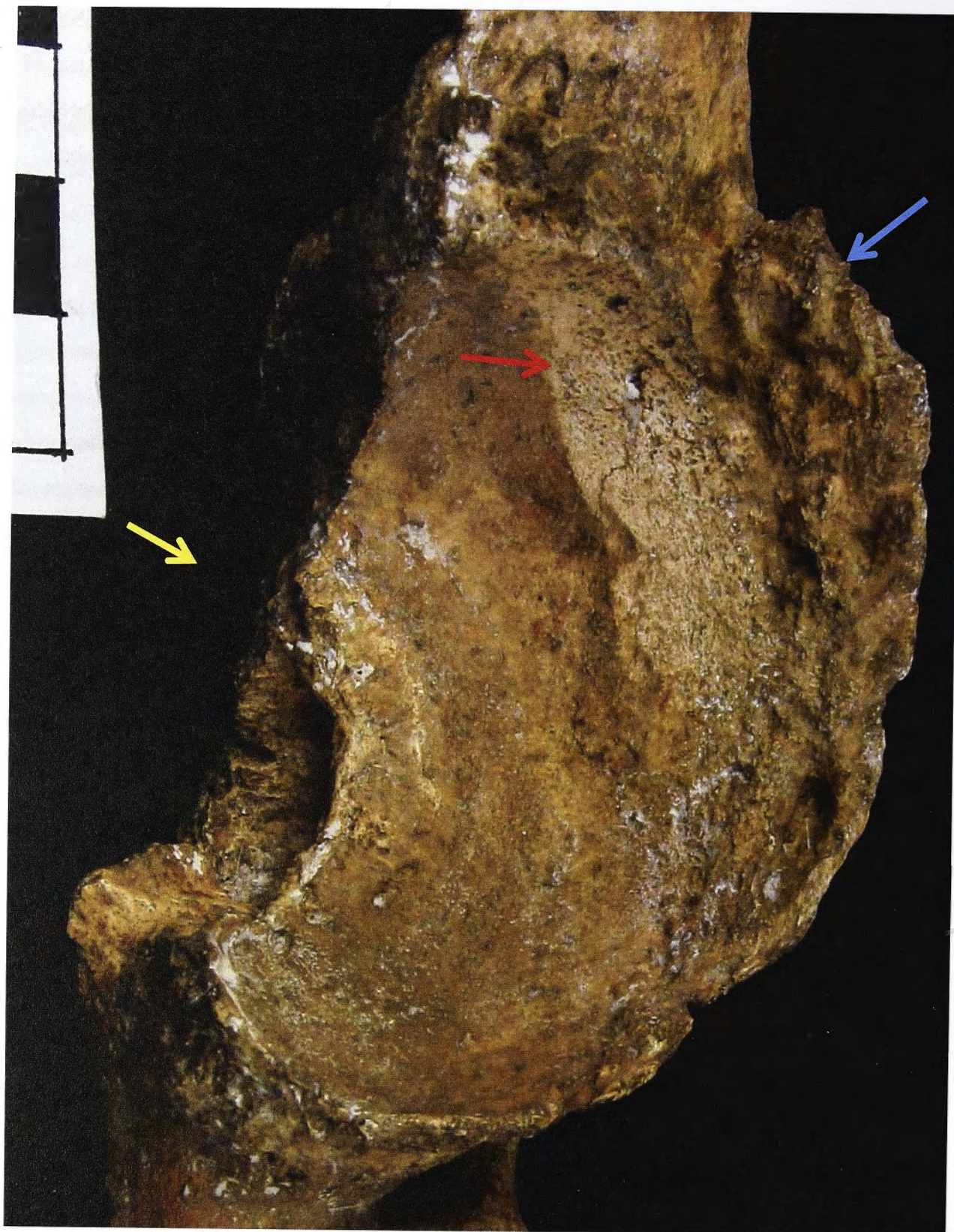


Figure 9.3 (a): Lateral aspect, fragment of LC1 left acetabulum. Blue arrow indicates exostosis, red arrow indicates eburnation, yellow arrow indicates lytic activity at acetabular notch.

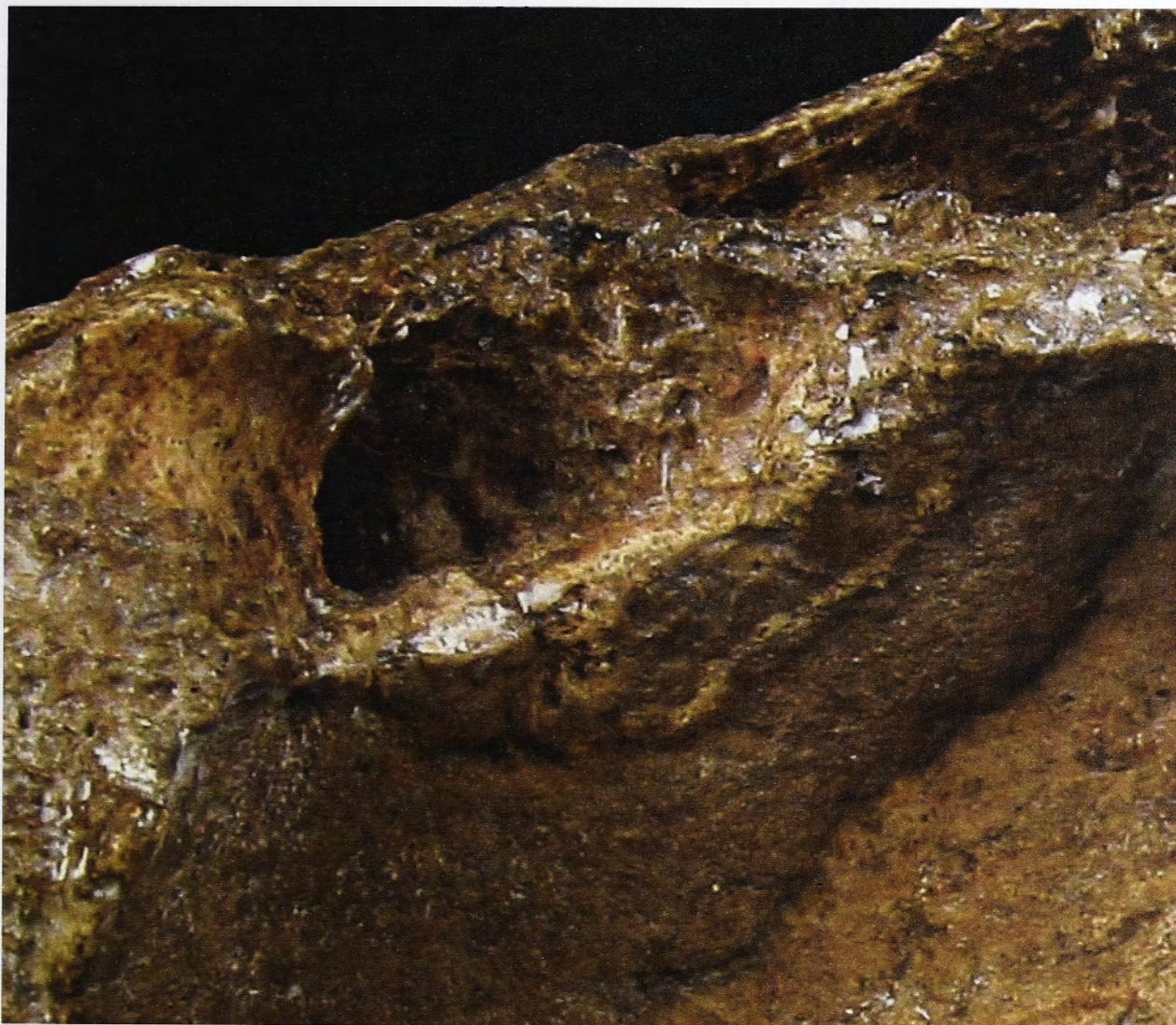


Figure 9.3 (b): Detail of infectious activity and bone proliferation at the acetabular notch, left os coxa.

There is a massive exostosis with a maximum projection of 11.5mm running over 58mm along the lateral acetabular margin, and a smaller exostosis located near the origin of the rectus femoris muscle. A strip of bone approximately 30mm in length and averaging 11mm in width, characterised by porosity and eburnation, runs medially to the acetabular boundary and in the primary weight-bearing area of the joint. This deformation indicates well-established 'bone-on-bone' activity; the left femoral head was in direct, continuous contact with this area of the acetabulum for a significant period.

Trinkaus (1985) records deposition of new bone on the subchondral surface radiating outwards from the acetabular notch, attributing this to inflammatory activity associated with osteoarthritic change. Noting the lack of evidence for joint degeneration on either the preserved fragment of right pelvis or preserved portion of the right femoral head, Trinkaus (1985) suggests the left side pathology resulted from trauma. He also suggests

that arthritic changes to the fifth proximal phalanx of the right foot result from gait-related compensation for the diseased left hip joint (Trinkaus 1985:30).

Osteomyelitic activity in the region of the acetabular notch is evident, and Trinkaus (1985) ascribes this to an abscess secondary to degenerative changes. Examination reveals a raised ridge of bone 1-2 mm in height around the lesion circumference, possibly reflecting a physiological response aimed at preventing infection from invading surrounding bone. This suggests that new bone deposition around the acetabular notch, identified by Trinkaus (1985) as a response to inflammation associated with degenerative change, may instead (or as well) have been triggered by osteomyelitis. There are indications of (possibly resolving) lytic activity, particularly at the lesion's inferior margin, and lesion size and status suggest that infection was minimally active for a period of several months (Hayman pers. com. 2012). Although it is very unusual for adults to experience primary infection in acetabular bone (Morgan and Yates 1966; Rand et al. 1993; Yeargan et al. 2003) a diagnosis of primary septic arthritis of the hip joint, possibly a sequela to trauma, is not impossible (Barrett and Bal 2007). It is more likely, however, that sepsis was caused by a haematogenous pathogen (Bal and Barrett 2005; Barrett and Bal 2007; Yeargan et al. 2003), possibly originating in the periodontal infection discussed earlier. Chronic degenerative joint disease increases vulnerability to blood-borne infection (King 2011), and any osteoarthritic changes already underway would provide a fertile environment for such infection, which might, in turn, result in a septic arthritis of the hip (Scillia et al 2010). In practice the question of primary causation of sepsis may not ultimately be amenable to resolution, but what is important for the purpose of bioarchaeology of care analysis is that - regardless of aetiology - the clinical and functional impacts of infection would have been the same.

Some clinical implications of LC1's hip pathology have been foreshadowed. Subchondral degeneration in the acetabular weight-bearing area represents significant and long-term bone-on-bone contact. It is inevitable that LC1 experienced discomfort, most likely pain, on ambulation, and quite possibly, given the extent of damage (including total loss of joint space in at least one area) on resting; it is impossible to gauge the extent of pain experienced by LC1, but it is worth bearing in mind that persistent pain - regarded as a disease in its own right, independent of its proximal cause - can affect normal endocrine, cardiovascular, immune, neurological and musculoskeletal function (Chapman and Gavrin 1999; Tennant 2004). The osteophyte

'rim' adjacent to the area of greatest subchondral damage possibly acted as a physical barrier to movement. Osteomyelitic infection would further exacerbate joint degeneration, both at a physiological level through inflammatory and osseous processes, and at a mechanical level by restricting movement (in response to pain and/or tenderness) and thereby contributing to loss of joint mobility and increasing pressure on, and irritation of, affected joint surfaces (King 2011; Morgan and Yates 1996; Yeargan et al. 2003). In combination, the impact of degenerative factors likely imposed physical restrictions on left leg abduction, rotation, and possibly extension and flexion (Marieb 1991:324-329).

Inflammation associated with osteomyelitis would increase localised pain and tenderness (King 2011; Scillia et al. 2010; Yeargan et al. 2003) and (as noted) would add to existing limitations on hip joint mobility and associated postural instability (Marieb 1991:324-329). At a systemic level, infection would impose more stress on an already-challenged immune system (see discussion of oral pathology implications above).

The constant requirement to manage chronic pain (minimally on locomotion) associated with severe degenerative change, combined and interacting with the demands of chronic infection, likely manifested (minimally) in symptoms such as depressed immune system function, increased vulnerability to disease, chronic fatigue, and disruption to the diurnal cycle (e.g. King 2011; Watkins and Maier 1999; Yeargan et al. 2003). In acute phases, osteomyelitis may also have been associated with symptoms such as raised temperature, fever, chills and severe headaches (King 2011; Rand et al 1993; Yeargan et al. 2003).

The exact time taken to achieve the damage seen in this joint is unknown, but clinical experience suggests LC1 lived with extreme hip pathology for minimally 12 months before death and with osteomyelitic infection for minimally six months (Hayman pers. com. 2012), probably experiencing significant functional impact from both pathologies during this time.

On the principle of adopting the most conservative estimate of likely disease consequences, it is assumed that LC1 remained ambulatory until death. It is impossible to tell whether there were times when pain and/or infection rendered him immobile, although this would be unsurprising (Hayman pers. com. 2012). Speed and ease of locomotion were likely significantly constrained by pain-based and mechanical restrictions on movement, particularly when traversing the steep, uneven landscape of

his environment. LC1 could probably manage the estimated five to ten kilometre distance between camps, although in his own time rather than that of that of the group, and possibly taking alternative routes to avoid difficult or dangerous passage. The effects of degenerative changes in LAC upper and middle spine would act to increase difficulty and discomfort in difficult terrain.

LC1's lower body pathology would eventually render him incapable of participating effectively in hunting - the primary Neandertal economic activity. With severely limited mobility he would have been unsuitable even in the less direct occupational roles of 'beaters or game drivers' proposed for Neandertal females and juveniles (Kuhn and Stiner 2006:959). LC1 could potentially have performed other tasks of value to his group, such as processing kill brought back to base, manufacturing stone tools and other artefacts, and taking part in physically undemanding social and cultural activities.

9.2.2.4 Summary

LC1's remains display several different pathologies, some of which were likely (causally) associated and which individually and in combination constituted significant disability when assessed within a Neandertal lifeways context.

Most of LC1's pathologies were progressive, resulting in a continuing decline in health and functioning. At a minimum, LC1 would have found it increasingly difficult to engage in hunting, and therefore to obtain food independently; to traverse distances between occupation sites and to keep up with his group while doing this; and to consume the 'normal' Neandertal diet and, therefore, to achieve adequate nourishment. Towards the end of his life participation in hunting would have been impossible, making him totally dependent on others for provisioning.

The extent and impact of his pathologies suggest that LC1 required health-related care to achieve survival to age at death.

9.2.3 *A model of health-related care*

LC1 would have required care in the forms of 'direct support' and 'accommodation'. The following attempt to identify what this may have comprised is situated against the evidence for Neandertal lifeways context presented in Section 9.1.

Care as 'direct support' minimally consisted of providing LC1 with food during the last several months of life. With increasing levels of oral pathology leading to problems in managing the unprocessed Neandertal meat diet, care may also have involved preferential allocation of more easily digestible portions of kill and/or pre-mastication of food. It is controversial to infer caregiving from survival with (partial) edentulism (see discussion Chapter 2), and theoretically LC1 could have met his need for softer foods by manually 'tenderising' tougher meats himself. Although intuitively it seems probable that the unquestionable provisioning of LC1 would have included, where possible, providing him with food he could eat with relative ease, this cannot be stated with certainty.

Evidence indicates that from childhood onwards all Neandertals engaged in some aspect of hunting (Kuhn and Stiner 2006; Stiner and Kuhn 2009). Care as 'accommodation' is seen in the acceptance of LC1 within his group despite inability to contribute materially in the normative manner, and despite the fact that, in a subsistence economy, he may have been a burden when resources were scarce. As suggested earlier, LC1 may have contributed to the group in some other way, but in practice the impact of his various disabilities likely affected his potential to do so. For example, the demands of a compromised immune system and the likely experience of pain-induced fatigue, together with extended time and increased energy expenditure required for travelling between occupation sites, would reduce prospects for undertaking other tasks.

LC1's continued inclusion within the group is attested by his mortuary treatment. This conforms to known Neandertal mortuary practice in terms of location, disposition and orientation of remains. That LC1's remains were found in articulation indicates he was buried soon after death, suggesting other group members may have been present up to this time. Proximal cause of death is unknown, although it is very possible that LC1 succumbed to systemic infection associated with periodontal infection, but it appears he retained group member status and was cared for until he died; the inclusion of a variety of grave goods also suggests he may have been held in some esteem.

In relation to Neandertal mode of travel between campsites it is not known whether the group travelled together, or whether faster, unencumbered members travelled ahead of slower ones (e.g. young children, pregnant women, those with minor injury). Obviously LC1 would have travelled with the latter as far as possible, and it is tempting to speculate he may also have received special assistance when terrain was particularly challenging.

9.2.4 *Interpreting care*

The only information available about LC1's community or lifeways is that associated with his burial and the inferences made regarding his receipt of care. It is therefore not possible to tell with certainty whether health-related caregiving was standard group behaviour or a response to LC1 as an individual. However, the care inferred here *does* suggest some broader social and behavioural group characteristics.

Caring for LC1 entailed a level of social and economic cost. Extrapolating from what is proposed about Neandertal lifeways (Section 9.1), LC1 likely belonged to a small, interrelated mixed-age group, with some members too young to contribute economically and others possibly experiencing (temporarily) reduced productivity due to pregnancy or injury. With an exclusively meat diet, and little practice of long-term food storage, group survival depended on regular and successful hunting; the subsistence lifestyle was likely seasonally driven and probably often precarious. Supporting an economically non-contributory adult male - and possibly meeting specialised dietary needs - for up to a year or more would have required group agreement and cooperation. Care provision would have involved either additional labour input from functioning group members to obtain adequate food supplies, or acceptance of reduced food rations, or both. LC1's survival reflects not only group willingness to commit to care for a disabled member, but also cognitive flexibility and sophistication in adapting behaviour to successfully manage available resources.

The commitment to care and, ultimately, the disposition of LC1's remains, suggests this group was characterised by strong social and emotional bonds, leading members to accept responsibility for supporting LC1 from the stage at which his functional disability made this necessary, during his deterioration, and likely right up to his death.

Given the ubiquity of trauma among Neandertals (Berger and Trinkaus 1995; Davis and Underdown 2006; Harvati 2010; Trinkaus 1995, 2011), LC1's group more than likely understood what was potentially involved in taking the decision to provide care, and - despite the earlier qualification - probably had some tradition of caregiving. The combination of degenerative pathologies seen in LC1 would not be unusual in an older adult at the end of a hard life - although even in this context, certain aspects might be considered extreme. There could be little expectation of recovery of health. If LC1 was actually a *young* adult, as argued by Dawson and Trinkaus (1997), then his condition may have been viewed as atypical or even 'unknown', requiring group cognitive adjustment in coming to terms with evidence of essentially age-related processes in an

unusually young body. Greater certainty regarding LC1's age at death is required to explore this latter point further.

Regardless of how LC1's condition was perceived, his group made a conscious commitment to caring for him that was sustained over time, within the constraints of a subsistence economy, in the face of his likely increasing demands on group resources, and in circumstances where health improvement would be known to be improbable.

What is suggested about LC1's identity as an active player in the caregiving and receiving relationship? If it is speculative to consider this question in relation to later modern humans, then it is clearly far more perilous to attempt it in looking at an individual from a different (if related) species. Nevertheless, some general propositions are presented for consideration.

In Neandertal culture, persistence in the face of pain and physical restrictions on mobility was probably commonplace, but nonetheless would have required resilience and ingenuity. Possible obstacles encountered in travel between camps have been discussed, and overcoming these when routes were particularly demanding demonstrates determination. Hayden (2012) suggests receipt of care may reflect status, and Pettitt (2002) hypothesises the same for burial. LC1's inability to meet normative requirements for a substantial period before death would argue for diminution of any economic-based status acquired when healthy, so if status determined care and/or burial among Neandertals, it must be concluded that, once conferred, status was a permanent identifier. While group membership (and familial relationships implied in this) alone may have entitled LC1 to receipt of care and interment on death, it is feasible that these services also reflect a special regard for him felt during life - although whether on the basis of past performance, particular knowledge or skills possessed, or individual personality traits is impossible to tell.

9.3 La Ferrassie 1 and the case for care

The articulated remains of LF1, a Neandertal male aged between 40 to 55 years, were recovered in 1909 from a rockshelter at La Ferrassie, Dordogne, France, and are dated to 60-70,000BP (Maureille and Van Peer 1998; Pettitt 2011).

LF1's skeleton is that of a robust individual with well-developed muscle and ligament insertions; it is relatively complete and well preserved (although with some reconstruction), and is well documented (Heim 1976). Osteological evidence suggests

that LF1 experienced at least two unrelated pathologies that compromised health and functional status. As in the case of LC1, these pathologies have been described and diagnosed by others (Heim 1976; Fennell and Trinkaus 1997; Trinkaus 1985), and this work provides a platform for the following analysis.

9.3.1 *Immediate context*

LF1 is one of seven (possibly eight) intentional burials located in a limestone rock shelter; the others comprise those of an adult female (25-30 years), a child of around ten years, two children of two to three years, one neonate, and either one or two foetal remains (Figure 9.4). This is one of very few known Neandertal multiple burial sites. Confusion regarding number of burials persists; Pettitt (2011), for example, claims seven individuals at the beginning of discussion of this site (Pettitt 2011:131) and eight at the end of it (Pettitt 2011:136). The relationship between these individuals is unknown. Binford's (1968) suggestion of a family grouping makes intuitive sense, but is unproven - however, to assume no connection between these individuals stretches credulity. The burials were probably roughly contemporaneous; the close 'pairing' of six interments has been achieved without any cross-cutting of remains, suggesting that if the burials were not carried out in close order then grave locations were clearly marked.

LF1 was interred in a shallow, excavated pit, on an east-west axis (head to west), on his right side and flexed (Pettitt 2011). One limestone slab lies directly under his head, and there is one positioned either side of his torso; bone fragments from mammoth, hyena, ox, deer and horse, as well as a number of rock shards (sometimes described as tools), were found in association with LF1 or in the upper grave fill, and some or all of these items are considered to be grave goods (Pettitt 2011; Riel-Salvatore and Clark 2001; Zilhão 2007). A bone fragment engraved with four sets of multiple parallel lines was found with LF1's remains, although opinion regarding contemporary grave inclusion is divided (Pettitt 2011:132; Zilhão 2007).

The remaining burials have been described elsewhere (e.g. Pettitt 2011:131-136), but a few features are of particular interest. Firstly, the remains of the adult female La Ferrassie 2 (LF2), also flexed to the right and on an east-west axis (head to east), were located only half a metre from LF1; these individuals effectively lie head-to-head, suggesting some relationship during life. In the context of this analysis it is relevant to

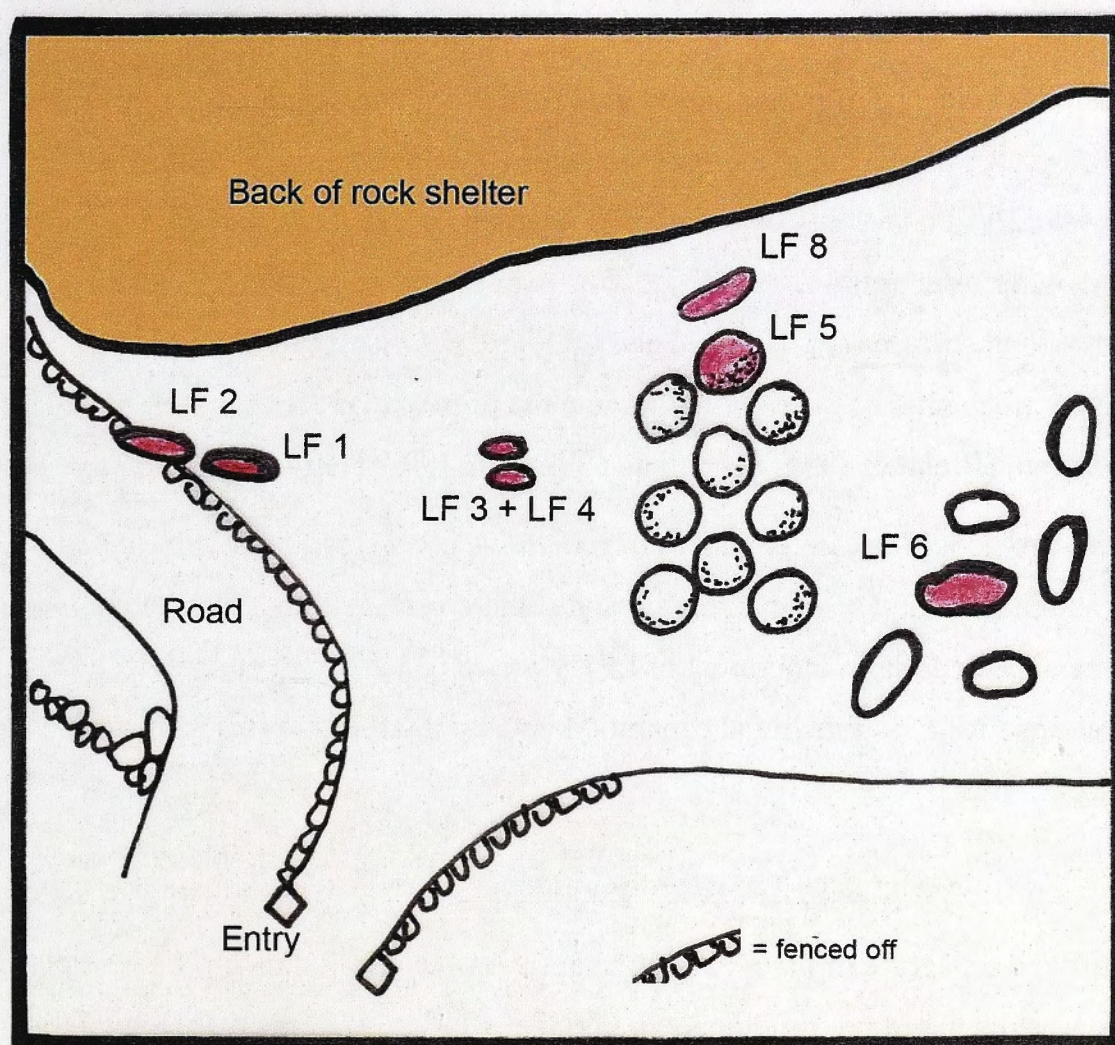


Figure 9.4: Plan of the La Ferrassie rock shelter showing location of burials (after the original plan by Capitan and Peyrony 1912, amended by Heim 1976).

note that the LF2's remains display evidence of a fully healed mid-shaft fracture of the right fibula, sustained long before death (Heim 1976). Secondly, the fact that foetal and neonatal remains received intentional burial is intrinsically interesting for what it may suggest about the value placed on life by this Neandertal community - even if the early promise of life was never realised. Thirdly, the grave of La Ferrassie 6 (~3years) was covered by a triangular limestone slab with 18 'cupoles' engraved onto the inferior surface; this stone is believed to be the earliest European rock art (Bednarik 1992; Zilhão 2007).

Hayden (2012) suggests the La Ferrassie burials may reflect sophisticated Neandertal social organisation. Observing that the regional topography may have been propitious for hunting, he suggests the grouped burials in the rock shelter may 'symbolise membership in a consciously identified social group' (Hayden 2012:19) which claimed kinship-based territorial rights.

9.3.2 *Pathologies experienced, and clinical and functional implications.*

LF1 displays evidence of minor periodontal pathology, consisting of circumscribed apical abscesses on the left mandible, and some alveolar resorption on the mandible more generally and possibly on the maxilla (taphonomic damage makes this difficult to assess); minor osteoarthritic changes to the lower spine and right elbow joint (most of the major joint surfaces are damaged and therefore not assessable); a healed fracture of the greater trochanter of the right femur; and the presence of active systemic disease at time of death (Brennan 1991; Fennell and Trinkaus 1997; Heim 1976; Trinkaus 1985).

The first two conditions are typical of degenerative processes found in Neandertals and modern humans living a comparable lifestyle, and are, if anything, less severe than might be expected for an individual of LF1's age. The latter two conditions have implications for LF1's functional capability, and are the focus of this study.

9.3.2.1 Fracture of greater trochanter of the femur

LF1 suffered a fracture of the greater trochanter of the right femur in which a detached portion was displaced proximomedially (Trinkaus 1985:34). This pathology likely occurred many years before death; healing is complete, but the injury sustained is apparent in trochanteric enlargement and distortion, illustrated in Figure 9.5.

There are two common types of isolated fracture of the greater trochanter. A standard avulsion fracture usually occurs at the insertion of the gluteus medius when acute forced muscle contraction results in detachment of a portion of bone; this is typically seen in non-adults up to around 17 years, and understood in terms of epiphyseal separation, and displacement of bone is usually minimal (Davenport 2010; Evans and McGrory 2002; Roberts et al. 1993). Avulsion fractures can occur in adults under extreme conditions (Roberts et al. 1993).

The second type of fracture is typically caused by direct trauma to the part of the greater trochanter that projects upwards from the junction with the femoral neck. Impact results in a comminuted fracture in which portions of the bone may be significantly displaced; where this occurs, extensive soft tissue damage is inevitable (Davenport 2010; Evans and McGrory 2002). When traumatic fracture occurs in younger adults it is usually associated with significant external force (Evans and McGrory 2002).



Figure 9.5: LF1 right proximal femur, posterior aspect, manifesting trochanteric enlargement and distortion.

Following trauma, pain is typically experienced in the affected hip and leg, and can last for some time (possibly weeks) following injury even if the leg is not required to bear weight. Abduction, rotation and extension of the affected leg are compromised, and efforts to undertake these movements (or other movements exerting pressure through the greater trochanter) are also associated with pain. As pain decreases and acute symptoms (e.g. inflammation) resolve, supported ambulation is possible; full weight-bearing on the affected side is usually feasible after six to eight weeks, although healing is gradual and it may take up to three months before full functional recovery (Davenport 2010; Hayman pers. com. 2012; Naudé and Lindeque 2004; Roberts et al. 1993).

Based on location and appearance of the lesion, and lack of evidence for disruption to epiphyseal fusion, it is concluded LF1 sustained a comminuted fracture to the greater trochanter as the result of direct trauma sometime after 17-18 years of age. Trinkaus (1985) notes that gluteus medius and/or obdurator externus muscles were likely implicated in LF1's injury (both insert into the affected trochanteric site). These muscles act, respectively, to control abduction and medial rotation and lateral rotation of the thigh, and both stabilise the pelvis and hip joint; in particular, the gluteus medius is critical to efficient gait (Marieb 1991:324-329).

While LF1 may have been capable of independent locomotion immediately following trauma, it is more probable that he was effectively immobile for (minimally) some days following injury. Given LF1's robust morphology and likely fitness (a product of the active Neandertal lifestyle), and the fact there is no evidence for disease complications, it must be assumed he recovered normal function in the minimum time judged necessary - six to eight weeks. During most of this time he probably had limited locomotion, allowing him to travel between occupation sites with his group. However, he would have been slow, and passage over uneven and steep terrain would have been difficult and painful, even with assistance.

LF1 would not have been able to participate in hunting during the period of recovery, and would have been dependent on others for provisioning. Although there are crucial differences between the mobility-related disease experiences of LC1 and LF1, comments made relating to the former's inability to participate in hunting apply here; during 'convalescence', LF1 would have been physically capable of undertaking alternative tasks to contribute to the group.

9.3.2.2 Systemic disease

Fennell and Trinkaus (1997) present an exhaustive differential diagnosis of largely symmetrical periostitis found on proximal and distal surfaces of both tibiae, the distal surfaces of both femora and both fibulae, and the distal surface of the right radius (Figure 9.6 a-d), concluding that LF1 was in the 'early stages of an acute form of [hypertrophic pulmonary osteoarthropathy], with a duration of the disease at the time of death of 2-14 months' (Fennell and Trinkaus 1997:994). Hypertrophic pulmonary osteoarthropathy (HPOA), also referred to as secondary hypertrophic osteoarthropathy, is a syndrome secondary to a more serious underlying pathology, most commonly

pulmonary or cardiac disease (Assis et al. 2011; Dhawan 2011). Based on physical evidence and lifestyle factors, Fennell and Trinkaus (1997:994) suggest the most likely trigger for HPOA in LF1 is either 'pulmonary infection or pulmonary carcinoma, with venous stasis as a possible contributing factor'. The diagnosis of HPOA makes this 'the only case of a systemic disorder likely to have been directly related to the cause of death and known for a Neanderthal' (Fennell and Trinkaus 1997:994).

The task of assessing clinical and functional implications of HPOA requires consideration of the likely impacts of this condition in its own right; the likely impacts of the primary pathology that stimulated the HPOA response; and possible interactions between these two. As will be apparent from the discussion below, there are many questions relating to LF1's condition about which there is no, or at best uncertain, information. Despite this it may be possible to achieve a credible, if necessarily very broad and generalised, idea of disease impact on LF1's experience of daily living in the months before his death.

The clinical symptoms most commonly associated with HPOA itself are clubbing of the digits (a soft tissue response that only registers skeletally in the very late stages [Gall et al. 1951] and which is not evidenced in LF1); arthritis, swelling and pain in major joints in the vicinity of HPOA; and deep-seated, potentially severe, pain in periostitis-affected bones (Amital et al. 2004; Dhawan 2011; Gall et al. 1951; Johnson et al. 1997). In most cases symptoms of the underlying primary disease are apparent before HPOA initiates, although very occasionally HPOA manifestation may precede primary disease symptoms by up to a year (Dhawan 2011). HPOA activity may be asymptomatic, particularly in the early stages (Dhawan 2011).

Fennell and Trinkaus (1997) assess HPOA progression in LF1 as in the early stage, potentially an argument against viewing this condition as having implications for LF1's health-related quality of life. However, the distribution of periostitis in LF1 corresponds to Stage three (of four stages) identified by Gall et al. (1951), suggesting that while HPOA may not necessarily have been *active* for an extensive period, it was certainly well-established. If Fennell and Trinkaus (1997) are correct in their estimate of an HPOA duration of 2-14 months, this suggests rapid onset and apposition; Gall et al. (1951) report that rate of periosteal activity is positively correlated with experience of pain and tenderness. Fennell and Trinkaus (1997) argue convincingly for an underlying pulmonary pathology driving HPOA activity; Dhawan (2011) reports that



Figure 9.6 (a-d): Examples of periosteal proliferation on LF1 (a) distal right tibia (posterior view), (b) distal left tibia (anterior view); (c) distal left femur (posterior view); (d) distal right fibula (lateral view).

when HPOA is associated with pulmonary disease it is usually associated with pain and swelling in the joints and pain in affected long bones. While ultimately it is impossible to be completely confident that LF1 experienced symptoms directly arising from HPOA, on the balance of probabilities it is very likely that he experienced a level of discomfort, if not pain, in response to this condition.

Considering the primary pathology, Fennell and Trinkaus (1997) suggest that the disease underlying HPOA was the cause of death for LF1, and there is no evidence to contradict this hypothesis. Although the primary disease cannot be established with certainty, pulmonary disease is the pathology most frequently associated with HPOA (Assis et al. 2011; Dhawan 2011).

In evaluating the likely clinical impact of LF1's primary condition for Stage 2 bioarchaeology of care analysis it would clearly be advantageous to know precisely what this disease was. However, as has been discussed in Chapters 3 and 6, uncertainty regarding diagnosis is a common feature of palaeopathology research; where this occurs, the approach taken by the bioarchaeology of care methodology is to focus on the likely clinical (and related functional) impacts that can be conservatively inferred from the available osteological evidence. *All* triggers of HPOA are serious, potentially terminal, pathologies, and include pulmonary, cardiac, hepatic, metabolic and intestinal diseases (Assis et al. 2011:156); all are associated with mid to late-stage severe and debilitating symptoms; none are self-remitting; and in modern clinical practice all require aggressive intervention (Assis et al. 2011; Dhawan 2011). If LF1 died because of his primary pathology, then it must be assumed that, at the most conservative estimate, for the last few months of life the symptoms of this disease impinged on everyday experience and were increasing in intensity.

Whatever the *specific* disease, the following interrelated and interacting symptoms almost certainly presented: depressed immune function; loss of energy, with fatigue following minor activity; difficulties in sleeping; localised and/or generalised pain and discomfort; problems with homeostasis; loss of appetite and weight; and fevers and other physiological symptoms associated with acute (intermittent) disease crises (Amital et al. 2004; Dhawan 2011).

Primary pathology symptoms would be exacerbated by any HPOA-related symptoms, but it is not necessary to postulate the latter in considering functional implications of disease experience. LF1 would have become increasingly incapable of participation in hunting, and correspondingly dependent on others for food. He likely experienced

greatly reduced mobility, even over short distances, consequent on reduced energy and loss of resilience; towards the end of life this may have made even modest distances between camps difficult or impossible without help.

9.3.3 *A model of health-related care*

LF1 received health-related care on at least two occasions during his life. The first instance involved care as 'direct support', consisting (minimally) of provisioning during recovery from the fractured greater trochanter of the right femur, and given over a period of around two months or possibly longer, until he was able to return to effective participation in group hunting activity. Additional nursing care and/or help in travelling between camps may also have been provided.

LF1 also received care in the months prior to his death - although exactly how much care and for exactly how long is impossible to assess. Specifically, and in terms of 'direct care', he must have been provisioned by others, and may have been assisted in travelling between occupation sites. Unable to hunt, he may have undertaken alternative activities (as discussed in relation to LC1), but as his health deteriorated the capacity to do so would have decreased, and this diminishing ability to contribute to the group economy would have required care in the form of 'accommodation' of disability.

Other 'direct support' provided in response to LF1's increasing debility may have included provision of a heat source, such as a 'warming hearth' and/or animal-hide coverings - all else aside, inactivity and likely reduced food intake (due to loss of appetite and inability to process food efficiently) would result in increased vulnerability to cold. More dedicated care, such as close monitoring and hygiene maintenance, would have been required during possible (probable) acute disease episodes.

It may have been necessary for LF1 to remain in a single location between the possibly short period between advanced disease manifestation and death, because by this stage unaided travel over any distance would have been physically impossible. As in the case of LC1, it is presumed that LF1 was cared for until close to time of death, as his articulated remains indicate interment shortly following this. LF1 may have been 'allowed' to die - for example, as symptoms worsened, food may have been withheld - but given the care taken in his interment (his articulated remains indicate burial fairly shortly after death) he does not seem to have been abandoned.

9.3.4 *Interpreting care*

Evidence for LF1's care, particularly in relation to his second known pathology, offers insights into his social environment, although lack of evidence for the specific course of his later disease militates against consideration of identity, and this will not be attempted.

In interpreting the significance of LC1's care some general points were made in relation to costs of caregiving and the need for negotiation, cooperation and flexibility in managing these. While LC1 and LF1 suffered very different diseases, some of the substance of basic care required was similar. Observations relating to broad practicalities and qualities of caregiving in the case of LC1 apply equally in the case of LF1, and they are not repeated in detail here.

As in the case of LC1, it is impossible to tell whether LF1's care was typical of that given to all group members experiencing disease, or was particular to him. However, it is significant that LF2, the young female adult buried in close proximity to LF1, had a healed mid-shaft fracture of the left fibula (Heim 1976) - an injury which would have restricted locomotion and prevented primary economic participation for minimally six to eight weeks (Devas and Sweetnam 1956). Together with the care given to LF1 following trochanteric fracture, it suggests a community practice of supporting members incapacitated by minor injury, at least.

Interpreting care given in response to LF1's second known disease experience is more complex. Disease impact would have manifested incrementally and without obvious explanation for disability. If LF1's primary disease was a pulmonary pathology, as suggested by Fennell and Trinkaus (1997), possible mid to late-term symptoms include shortness of breath, persistent coughing and/or haemoptysis, and it seems improbable that these symptoms would fall within the common experience of a small Neandertal community. Initially, group acceptance of disease impact on LF1's capacity to function was likely based on self-report, perhaps combined with observation and analysis of behaviour. However achieved, recognition and acceptance of the need for care, despite absence of external physical indicators of pathology, suggests a cognitive ability to deal with an abstract concept of 'disease' and a sophisticated ability to communicate (verbally or otherwise). Again, as was the case in relation to LC1, evidence for costly caregiving, in a possibly challenging subsistence economy and in circumstances where return to health may (eventually, at least) have been understood as unlikely, suggests a cohesive, co-operative group with a strong, inclusive social identity.

LF1's burial entailed an expenditure of energy suggesting a continuation of care experienced during life, although what the detail of his interment signifies remains a mystery. It is not known whether LF1 was the first individual buried at this site, with others interred subsequently because of their relationship to him, or the reverse. Neither is it known what, if any, this relationship may have been; perhaps group membership alone was sufficient. Hayden's (2012) suggestion that the group burial may reflect territorial 'ownership' attributes a symbolic purpose to this small cemetery that it is impossible to verify, but nonetheless, the inclusion of LF1 indicates that his disabled status did not result in significant loss of value as an individual. Returning to earlier observations on the burials of La Ferrassie foetal and neonatal remains, LF1's treatment in life and death may reflect the value placed on human life *per se*.

It would be interesting to know whether LF1 was cared for, and eventually died, in this rockshelter, or whether he was transported here just prior to, or following, death. However his treatment is explained, this site likely possessed (or came to possess) a special cultural and/or emotional significance, and the burial of LF1 reflects the same deliberation in decision-making and planning demonstrated in his caring during life.

9.4 Care in the Upper Middle Palaeolithic: wider implications

Findings from the analysis of care given to two individuals possibly living over ten thousand years apart do not constitute incontrovertible evidence of normative Neandertal behaviour, but they *do* call into question some existing assumptions about Neandertal social practice, and they may contribute to debate over Neandertal cognitive capability.

With respect to social practice, Trinkaus' (1995, 2007, 2011a, 2012; Berger and Trinkaus 1995) often-repeated assertion that elderly and disabled Neandertals 'with reduced mobility were left behind to die and have their remains consumed by the ubiquitous carnivores on the landscape' (Trinkaus 1995:1269) to prevent care-related demands from endangering group survival has entered the folklore of Neandertal behaviour, and has never been directly challenged. Trinkaus (1995, 2007, 2011, 2012; Berger and Trinkaus 1995) does not provide a consistent operational definition of reduced mobility - definitions range from inability to keep pace with the group to complete absence of independent mobility - but regardless of this, its use always implies

that the mobility-compromised individual became a significant burden on their community.

In the cases of LC1 and LF1, Trinkaus' (1995, 2007, 2011, 2012; Berger and Trinkaus 1995) hypothesis of abandonment is rejected. Both Neandertals suffered significantly reduced mobility and significantly diminished productive potential for a substantial time before death. Despite this, both received support that enabled survival with disability. The precise period of caregiving is not known in either case, and neither can it be known whether the eventual death of one or both resulted from deliberate withholding of care, but the characteristics of both burials suggest group members were in attendance, or close by, at the end of life. While the two cases examined here are not sufficient basis for claiming automatic care provision to the elderly and/or immobile among Neandertals, they demonstrate that claims of absence of evidence for maintenance of group members with reduced mobility need to be reconsidered.

With respect to cognitive capacity, examination of caregiving behaviours adds a new and valuable perspective. It is emphasised again that inference from two cases cannot represent the totality of Neandertal practice or potential. Nevertheless, the two instances of caregiving considered in this chapter, together with similar analyses of other cases of Neandertal care provision, may increase understanding of the complex, cognitively-demanding, and sometimes counter-intuitive behaviours of which Neandertals were capable. It is relevant at this point to reiterate that, in relation to debate over whether evidence for behavioural sophistication in the Upper Middle Palaeolithic reflects cultural transfer from modern humans rather than 'indigenous' Neandertal development, care for LC1 and LF1 occurred long before modern human presence in Europe.

Summarising previous observations, long-term care provision to both LC1 and LF1 reflects group acceptance of disabled individuals unable to fulfil normative role demands, suggesting the capacity to value individuals for qualities other than their potential for material contribution to the group. Caregiving in both cases indicates the ability to observe and interpret signs of disease in the affected individual; in particular, LF1's second pathology likely required advanced communication skills in carers and care recipient to establish the parameters of disease, disability and associated needs.

The fine detail of what LC1 and LF1's care comprised will remain inaccessible until there is more precise information about their corresponding lifeways environments, and for this reason the caregiving proposed for each Neandertal has been broad and basic.

Nonetheless, the decision that care (however envisaged) was required, and the working-out of what this care should consist of, suggest application of problem-solving skills.

While the need for well-defined, short to mid-term, uncomplicated caregiving in response to trauma may have been so frequent (Berger and Trinkaus 1995; Pettitt 2000; Trinkaus 1995) that it was factored into Neandertal organisation, this does not diminish the fact that each individual case of care was unique and demanded situation-specific social and economic flexibility in managing the tasks involved in caregiving and in wider group survival. Care provision also reflects group agreement, however negotiated, to accept the costs associated with the burden of caregiving. Care was likely given to both LC1 and LF1 with the understanding that incurred 'costs' had no prospect of return (such as restoration of productivity), and this suggests that, in some circumstances, emotional and social considerations were given priority over functional concerns.

Wadley (2011:98) proposes a working compromise to the difficulty of reaching a satisfactory definition of symbolic behaviour: 'I shall therefore approach symbolism indirectly by examining unequivocal evidence for behaviour in the past that can be linked to human cognition like our own'. Examining behaviours in the African Middle Stone Age, Wadley deconstructs the manufacture of compound adhesive used in hafting stone tools, demonstrating that this procedure 'required complex cognition of the kind that intersected with our own' (Wadley 2011:106), including the ability to multitask; visualise the finished product; deal with abstract concepts; and alter behaviour in response to task-generated feedback. She observes that the number of (often unpredictable) variables involved in adhesive production and hafting suggests that language was probably involved in instructing others in the procedure (Wadley 2011).

Providing costly care over an extended period, where recovery may be recognised as unlikely, in a difficult environment in which food resources need to be constantly replenished and are never guaranteed, arguably involves exponentially greater complexity in its undertaking than does the hafting of stone tools.

Combining evidence, inference and observation, bioarchaeology of care analysis supports claims for Neandertal cognitive and behavioural modernity found increasingly in the recent literature. That it does this by focussing on evidence for a behaviour that has as much an emotional component to it as a cognitive one is particularly important, because this provides a new way of looking at Neandertal interpersonal relationships as well.

CHAPTER 10. Accommodating difference in the British Neolithic: Lanhill Burial 7 and his community (Case Study 3)

The almost intact remains of Lanhill Burial 7 (LB7), a male of around 50 years of age, were recovered in 1936 from the Lanhill Long Barrow, a monument from the early British Neolithic Cotswold-Severn tradition (Keiller and Piggott 1938). At some stage during adolescence LB7 had sustained an injury to his left elbow joint, permanently depriving him of the use of his left arm (Cave 1938a,b). Yet despite this handicap, which undoubtedly imposed substantial restrictions on aspects of economic and social participation, LB7 lived to old age - apparently a fully-integrated member of his small community.

LB7 was not the only one of his group to suffer the impact of disease. Out of the six other adults recovered from the same burial chamber in the Lanhill Long Barrow, three display indicators of severe, chronic and degenerative pathologies, in each case likely associated with some level of disability. While the following analysis focuses on the experience of LB7, because his pathology was possibly the longest-standing and is certainly the most straightforward to interpret in terms of impact, it also draws on the experience of disease, disability and possible receipt of care by Lanhill Burials 1, 2 and 5 (LB1, LB2, LB5).

This final case study serves three purposes. Firstly, it illustrates the bioarchaeology of care methodology applied in a situation where 'care' is used to signify 'accommodation' - the adjustment of expectations and requirements necessary for maintaining within the group an individual constrained by disability, albeit an individual still capable of independent function.

Accommodation is clearly a more complicated practice to argue for and to operationalise than the caregiving described as 'direct support' examined in the preceding case studies. At the same time, accommodation is also likely to be the most *common* care practice encountered in everyday life - so where the archaeological record is amenable, a focus on this form of caregiving offers obvious rewards. Admittedly, establishing the need for accommodation of a disability potentially compromising participation in 'normal' group activity presupposes knowledge of what 'normal' behaviour consists of in the first place, and in archaeology this can never be perfectly known. However, where an individual's loss of capability in areas of physical

functioning can be identified, this provides a basis for assessing potential performance across the known range of lifeways activities - and the case of LB7 falls into this category.

Secondly, the case study demonstrates how the health-related experiences of contemporary community members can be positioned as part of the wider lifeways context, thereby further informing a bioarchaeology of care analysis which, as discussed in Chapter 3, must be centred on a single individual.

Thirdly, by extrapolating from observations made in considering the life and lifeways of LB7 and his community, the study contributes to continuing debate over questions of identity and behaviour in the wider Cotswold-Severn culture.

In a case study of accommodation, establishing context assumes an even greater importance than usual in identifying disability and inferring care. For this reason the first section of Chapter 10 opens with a review of what is known specifically about Lanhill Long Barrow and its human contents, then summarises relevant aspects of the Cotswold-Severn cultural tradition and associated issues of contention, and goes on to consider disease among Lanhill group members other than LB7. Only then does it examine LB7 and evidence for his disability. The two sections following this discuss the clinical and functional implications of LB7's pathology and the likely nature of the caregiving response, and the fourth section interprets this care in terms of insights into the immediate Lanhill community and reflections on Cotswold-Severn cultural practice more generally.

Remains from the north-west and south chambers of the Lanhill Long Barrow were examined by the author in 2007. The remains from the south chamber were never recorded in detail, are incomplete, and have suffered extensive damage. The north-west chamber of the Lanhill Long Barrow is the source of all individuals identified in this study; these remains are generally well preserved and are comprehensively documented by Cave (1938a). Unless otherwise stated, all descriptions of skeletal materials are based on Cave's (1938a,b) reports and/or the author's observations. Cave's age and sex assessments were confirmed by application of the guidelines for documenting sex differences and age changes provided by Buikstra and Ubelaker (1994:15ff) and/or Lovejoy's (1985) chart for estimating adult age at death on the basis of tooth-wear.

10.1 Lanhill Burial 7: context and pathology

The 1936 excavation (Keiller and Piggott 1938) of the undisturbed north-west chamber of the Lanhill Long Barrow produced seven substantially complete sets of human remains, representing two males (LB1 and LB7) and one female (LB2) of 50 years or over; two mature age adults (one male and one female) of between 30-40 years (LB3 and LB5); one young adult male of between 20-29 years (LB6); and one adolescent of around 12-13 years (LB4). The partial remains of a young male of around 20 years (LB8) and of an infant of about 12 months (LB9 - represented only by the right femoral shaft) were also recovered (Cave 1938a,b). Missing skeletal elements were attributed to water erosion; based on the completeness of remains, Keiller and Piggott (1938) conclude that mortuary practice involved primary burial in the chamber, with skeletonised remains moved as necessary to allow insertion of the newly deceased. The small chamber was filled to capacity. LB7 was the last individual to be interred before the chamber was sealed, and the only one to remain in articulation. Bones from earlier burials were found stacked along the back and side walls, loosely arranged according to element, and these were sorted and analysed by Cave (Cave 1938a; Keiller and Piggott 1938).

Until recently it was thought that long barrows belonging to the Cotswold-Severn culture (~3800-3400BC) were used over many generations, and that individuals represented in these monuments were probably separated by decades, or even centuries, during life - rendering untenable any presumption of a common lifeways context for long barrow occupants. In 2007, however, a project dating remains from a sample of Cotswold-Severn long barrows found these monuments were typically used for mortuary purposes for between only one to three generations (Bayliss et al. 2007 and related reports in the dedicated Supplement S1, Volume 17, *Cambridge Archaeological Journal* 2007). The Lanhill Long Barrow architecture conforms to early Cotswold-Severn design. On this basis, and given the features of mortuary deposition in the north-west chamber, the implications drawn by this author from the above 2007 conclusions are that the Lanhill interments were likely carried out within a 20 to 60 year period. This means that to all intents and purposes the lives of the individuals interred in the Lanhill Long Barrow must be thought of as roughly contemporary, and justifies the inclusion of evidence for pathology in remains other than those of LB7 in the bioarchaeology of care analysis.

10.1.1 Context (i): *Lanhill and the Cotswold-Severn tradition*

Typology places the Lanhill Long Barrow in the early phases of the Cotswold-Severn tradition, around 3,700 BC (Darvill 2004:81-85). It is located in Wiltshire, a region of gently rolling chalk hills intersected by wide river valleys in south-western England; at the time of construction it was surrounded by 'lush, herbaceous vegetation' (King 1966:85).

Lanhill Long Barrow has been excavated on four occasions: in 1855 (Thurnam 1857), 1909 (Cunnington 1910), 1936 (Keiller and Piggott 1938) and 1963 (King 1966). Recovered skeletal materials suggest a minimum of 24 individuals, likely a substantial underestimate of actual interments. Thurnam (1857), who recovered elements (unavailable) described as representing four adults (a male and a female ~20 years, a male of ~40 years and a female ~50 years) quotes an elderly local recounting that when the site was quarried in the early 1800s 'many human bones were thrown up, among which ... [were] several lower jaws' (Thurnam 1857:68]. Cunnington (1910) discovered the partial remains representing minimally eleven individuals in a disturbed burial chamber on the south side of the barrow; in Beddoe's (Cunnington 1910:308-310) brief report he suggests these indicate eight 'persons' (by implication adults - including one male and one, possibly two, females), two 'elderly' adults (one male, one female), and one child of between seven to twelve years.

It is noteworthy that six out of the (minimum) total of 24 individuals attributed to the Lanhill Long Barrow were assessed by the various excavators as belonging in the 'older adult' category of 50 years and over. It may be that the elderly received preferential selection for long barrow interment (although in this case, how are burials of young adults and subadults to be explained?), but it may also indicate that Lanhill individuals tended to be unusually long-lived; Brothwell (1972:83-84) estimates average age at death in the British Neolithic as 31.5 years for males and 28.3 years for females, with only 5 per cent of adults surviving to 50 years and over. It is also noteworthy that overall there appears no significant differentiation in receipt of mortuary treatment on the basis of sex, despite claims by Edmonds (1999:63) and Shanks and Tilley (1982) to the contrary.

None of the individuals from the north-west chamber displays observable indicators of developmental stress (e.g. porotic hyperostosis, cribra orbitalia or linear enamel hypoplasia), suggesting low exposure to health challenges such as poor nutrition, infectious diseases and/or parasites. Male and female remains recovered from the

northwest chamber are relatively gracile; of average stature for this period, with males ranging between 163-172 centimetres (Cave 1938a; Roberts and Cox 2003:67); and display relatively low sexual dimorphism (Cave 1938a; Smith and Brickley 2009:98). All adults manifest strongly-developed musculoskeletal stress markers on the lower limbs, which are also characterised by platymeric and platynemic morphology (Cave 1938a), indicators likely reflecting a very active and probably mobile lifestyle (similar characteristics are documented in other long barrow remains [e.g. Wysocki and Whittle 2000]). There is a 'generalised flattening' of the upper limb bones (Cave 1938a:147) along with similarly well-developed muscle insertion sites, and these characteristics may suggest repetitive loading associated with aspects of economic activity (Smith and Brickley 2009:98; Stock and Pfeiffer 2001, 2004; Wysocki and Whittle 2000). With the exception of LB7, all preserved vertebrae from adults over 30 exhibit degenerative activity (Cave 1938a). The advanced degeneration present in the cervical spine in all mature adults for whom these vertebrae are preserved may indicate a practice of either carrying loads directly on the head or using a tumpline for transporting goods (Bridges 1994; Jäger et al 1997; Lovell 1994), possibly reflecting economic and/or cultural practice such as movement of food resources between sites of production and consumption; movement of materials for construction; and/or regular movement (involving transport of goods) between occupation sites.

On the basis of shared morphological traits, Cave (1938a) suggests that the north-west chamber remains may represent two or three generations of a single family. Smith and Brickley (2009:92-93) dispute the extent of similarity claimed, and point out that, in any event, the features identified by Cave (1938a) are commonly found in remains from this period and may simply reflect lack of genetic diversity within the general British population. The question of whether the Lanhill north-west chamber remains represent an extended family (Cave 1938a) or members of a wider group (Smith and Brickley 2009) - or whether the two are essentially synonymous - remains open.

Typical of long barrow contexts (Smith and Brickley 2009), little material culture and no preserved grave goods were discovered at Lanhill; a total of three flint flakes were recovered from within the long barrow (Cunnington 1910; Keiller and Piggott 1938) and scatters of worked flakes were found around the exterior, but all appear to be accidental deposits (King 1966). Pottery sherds were found in the south chamber (Cunnington 1910) and in the forecourt area (King 1966), but again deposition appears accidental. A small number of domestic (ox, sheep and pig) and wild (hare) animal

bones were found in the forecourt area in association with long barrow use (King 1966), and Thurnam (1857) reports a deer horn in the body of the mound. Domesticated animal remains may reflect human activities contemporary with site construction and/or use, suggesting that the Lanhill community engaged in a level of pastoralism, while non-domesticated remains may indicate a continued level of dependence on hunting.

10.1.1.1 The Cotswold-Severn culture

There is no specific information available about the everyday activities of the Lanhill community, but it would likely conform to what is known about standard early Cotswold-Severn lifeways (Darvill 2004; Smith and Brickley 2009).

Most groups practiced pastoralism, predominantly farming cattle but also sheep and goats, and engaged in horticulture rather than agriculture, enlarging natural clearings but not undertaking the larger-scale clearance and intensive land maintenance associated with established farming practice (Allen 2000; Bonsall et al. 2002; Brown 1997; Guttman 2005; Pollard 1999; Thomas 1999). Hunting and gathering still contributed to diet, although dairy, blood and meat products from cattle provided the major source of proteins and fats (Beja-Pereira et al. 2003; Copley et al. 2003, 2005; Richards and Hedges 1999; Thomas 1999). There is no direct evidence for group size, but taking into account the skeletal evidence and modern anthropological experience it is thought most communities consisted of around 30 to 50 (perhaps possibly up to 100) individuals, ranging across the age spectrum, and predominantly made up of extended kin (Dunbar 1991; Harding 1995; King 2001, Wysocki and Whittle 2000.). There is no evidence for either large settlements or domestic structures around Cotswold-Severn long barrows, and groups were likely semi-sedentary, practicing transhumance (King 2001; Pollard 1999); while lack of evidence for dwellings does not mean none were erected, combined with paucity of evidence for domestic activities it suggests any such structures were not designed for permanence. Artefact evidence suggests communities engaged in regional social and trade networks, and the introduction of domesticated animals indicates contact with continental western Europe (Case 1969; Thomas 1999, 2003).

Causewayed enclosures may have served as centres for cultural and economic activities (Harding 1995).

Much of the archaeological literature focuses on the purpose(s) of the long barrows and on the significance of the often incomplete, jumbled and fragmented human contents.

The architecture has been variously interpreted - for example, as representing or 'transforming' Linear Band Keramik long houses of fifth millennium BC continental Europe and/or as a metaphor for male and female sexuality (e.g. Bradley 1996; discussion in Brück 2001; Jones 2005; Thomas 2000). Non-mutually exclusive functions proposed include the long barrow as an indicator of group claims to, or identification with, surrounding land; a focus for community in the absence of established settlements; a more general signifier of group power and prestige; and a repository (real or symbolic) of the 'ancestors' (Edmonds 1999; Jones 2005; Thomas 2000).

In relation to Lanhill specifically, Shanks and Tilley (1982) cite the remains from the north-west chamber (with remains from four other long barrows) to argue that patterns in deposition of preserved skeletal elements were designed to defend the reality of unequal power relations in lived experience by providing the illusion of a collective social order at the time of death: 'the regrouping of disarticulated remains incorporates, in the expression of symmetry between body parts, a denial of the asymmetric relationships in life' (Shanks and Tilley 1982:151). Conversely, Fowler (2001) refers to the same Lanhill remains to support arguments that (re)organisation of skeletal elements in long barrows (and other Neolithic sites) constitutes 'citations of relations of personhood' (Fowler 2001:142-3), reflecting a (far more heterarchical) relational as opposed to individualistic concept of identity. Thomas (1988) suggests that the reorganisation of skeletal remains in the Lanhill north-west chamber implies a greater significance than simply making way for new interments:

[i]t is possible that the transition from the newly dead person to the ancestral bones ... was carried out within a single monument, and that this involved movement in space which symbolised the stages undergone by the individual after death (Thomas 1988:547-548).

Some interpretations are on shaky evidentiary ground. Smith and Brickley (2009:88-89) suggest that some studies - including that of Shanks and Tilley (1982) - demonstrate lack of familiarity with the skeletal materials. Fowler (2001:143) illustrates this when claiming that two of the crania from Lanhill were associated with mandibles belonging to other individuals; Keiller and Piggott (1938:125) report only one such pairing. While not denying the Lanhill community's capacity for symbolic expression, Keiller and Piggott's (1938) more pragmatic explanations for missing elements and the arrangement of remains in the Lanhill chamber appear the most immediately plausible.

Evidence for violence in the Cotswold-Severn culture has also received a great deal of consideration. Antiquarian excavators were quick to preference violence in explaining features of long barrow human remains (e.g. Cunnington 1889; Thurnam 1864, cited Cunnington 1889:107; Smith and Brickley 2009:102-112), but interest in this focus declined during most of the twentieth century. Over the last 15 years, however, archaeologists have again embraced the subject of violence in the Neolithic (e.g. Armit et al 2006; Keeley 1996; Schulting and Fibiger 2012; Schulting and Wysocki 2005), although few have gone as far as Darvill (2004), who suggests that

evidence mounts for traumatic death and intergroup hostilities. ... [A] substantial number of burials within long barrows shows evidence that the cause of death was wholly or substantially wounds inflicted by physical assaults or by arrow shot (Darvill 2004:208).

There is no material support for such all-encompassing propositions. Smith and Brickley (2009:102-112) review the evidence for violence in the Cotswold-Severn culture, and identify only six confirmed instances of projectile wounds in long barrow remains (Smith and Brinkley 2009:104). Although in some cases there are unequivocal osteological indicators of interpersonal violence, a review of the literature provides no basis for assuming either systemic within-group violence or institutionalised between-group conflict in the Cotswold-Severn culture. While there is certainly evidence for traumatic pathology in the Lanhill community, as seen in the elbow joint of LB7 and the fractured cheekbone of LB2 (see below), incidental injuries are common in physically demanding lifeways and are as likely to result from accident as intent. There is certainly no evidence for interpersonal violence at Lanhill.

10.1.2 Context (ii): LB1, LB2 and LB5 - disease and disability

The remains of LB1, a male of around 50-60 years, LB2, a female of around 60-70 years, and LB5, a female of around 30-40 years, all display severe degenerative pathologies in upper and lower regions of the spine, and LB1 and LB2 also display extensive, severe and long-standing oral infection, multiple tooth loss and osteoarthritis of both temporomandibular joints (Cave 1938a,b). The experience of these individuals is outlined below, and Figure 10.1 (a-f) illustrates some of the pathologies described.

LB1 experienced extensive, long-term, unresolved periodontal infection and tooth loss throughout right and left maxillary and mandibular molar regions; retained teeth are in

extremely poor condition, manifesting very heavy wear and root exposure of the remaining maxillary molars. The evidence testifies 'eloquently to the severity of the dental disease from which this subject suffered so chronically in later life; for years before his death his whole mouth must have been in an intensely septic condition' (Cave 1938a:133). LB1 also displays severe bilateral temporomandibular joint osteoarthritis.

All LB1's preserved vertebrae display degenerative changes, particularly extensive and severe in the bodies and articular facets of the cervical vertebrae (C2-7). Thoracic vertebrae (T1-10 preserved) and the remaining assessable lumbar vertebra (?L4) present signs of moderate (upper spine) to severe (lower spine) osteophytosis and osteoarthritis, with Schmorl's nodes present in the lower thoracic and lumbar vertebrae; Cave describes 'the whole condition [as] suggesting ... considerable limitation of movement' (Cave 1938a:133).

LB2's elderly status is reflected in age-related osseous indicators across all skeletal elements. At death she was edentulate, retaining only the mandibular left canine and second premolar and the maxillary right canine in a functional state. There is evidence for longstanding and extensive periodontal infection in both maxilla and mandible. In the right mandibular canine socket infection penetrates the inferior dental canal, possibly leading to an intense neuritis of the mandibular nerve Cave (1938a:134).

There is moderate to severe bilateral temporomandibular joint degeneration. At some stage LB2 sustained a fracture to the right zygomatic process; this resulted in a deformity which may have contributed to temporomandibular pathology.

All bodies and articular facets of LB2's three remaining cervical vertebrae display evidence of severe degenerative activity, and the only surviving lumbar vertebral body (?L4) manifests a similar level of pathology. All five lumbar vertebrae were recorded by Cave, who describes LB2's lumbar region as 'the seat of extensive pathological change', with all vertebral bodies displaying evidence of severe degeneration and

the dorsal articular facets of the last two lumbar and of the sacrum reveal[ing] great architectural destruction: the articular areas are pitted, eburnated and abnormally exaggerated, while their enclosing capsular ligaments have undergone extensive ossification (Cave 1938a:135).

LB5's entire vertebral column exhibits severe degenerative activity, particularly pronounced in the cervical, lower thoracic and lumbar regions. Vertebral bodies C1-7 display (variously) pitting, porosity, cavitation, hypertrophic bone growth and

osteophytic lipping. All articular facets exhibit lipping, pitting and/or eburnation, and most are grossly enlarged and distorted, some with mushroom-like florescence of bone and/or extreme osteophyte activity. Most thoracic vertebral bodies display cavitation, pitting, porosity, and osteophyte activity, some display Schmorl's nodes; all articular facets display some pathology, with those of T8-T12 severely diseased. Lumbar vertebrae continue this degeneration, with all vertebral bodies displaying (variously) moderate or severe porosity, cavitation, pitting, Schmorl's nodes and osteophytic lipping. Preserved articular facets display extensive, severe osteoarthritic changes. The sacrum is intact; the cranial surface shows degenerative change and the articular facets exhibit eburnation and gross distortion.

The severe pathologies manifest in the remains of the LB1 and LB2 are probably predictable legacies of long, hard lives. The extent of vertebral degeneration in LB5 is at least equal to that in LB1, a man possibly over 20 years her senior, however. There may be no single explanation for this; it may be the result of interacting factors including genetic predisposition, lifeways factors, and traumatic injury (although no evidence for trauma is obvious) (e.g. Mandelbaum and Waddell 2005). LB5 was very short statured, her estimated height of approximately 148 centimetres making her around 14 centimetres shorter than the only other adult female represented in the chamber (LB2, at ~162 centimetres) and placing her well below the female mean height for this period of 157 centimetres (Roberts and Cox 2003:67). She exhibits no visible skeletal indicators of developmental stress, and appendicular elements are characterised by the same robust morphology as those of her companions, suggesting short stature was not related to juvenile disease burden. If LB5's vertebral pathology results even in part from participation in economic activity, as seems likely, then this reinforces the picture of a society in which every adult, irrespective of age, sex, size or relative strength, was expected to undertake their share of physical labour.

Drawing implications for health-related quality of life from evidence for osteoarthritis is contentious (Waldron 2009:30-31). With regard to vertebral osteoarthritis, however, clinical research indicates a consistent relationship between (i) number of vertebrae affected, location, and degree of degenerative activity and (ii) limitations on function and/or experience of pain (e.g. Badley et al 1994, 1995; Faccia and Williams 2008; Faneule et al 2000; Manchikanti et al 2002; Schellinger et al 1987).



Figure 10.1 (a) LB1 maxilla displaying lytic infection in right and left molar regions and associated tooth loss.

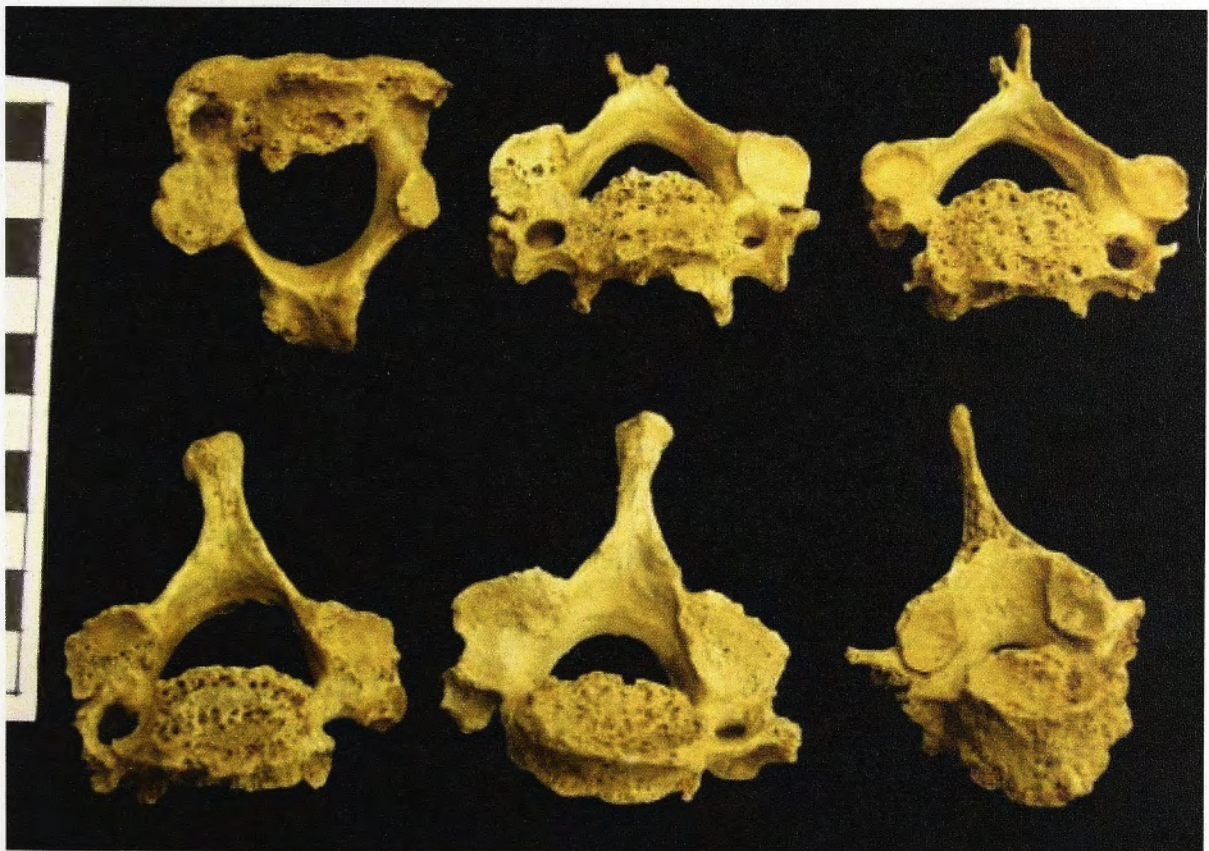


Figure 10.1 (b) LB1 C2-7, caudal aspect, displaying extreme degeneration (cavitation, lipping, porosity, eburnation)

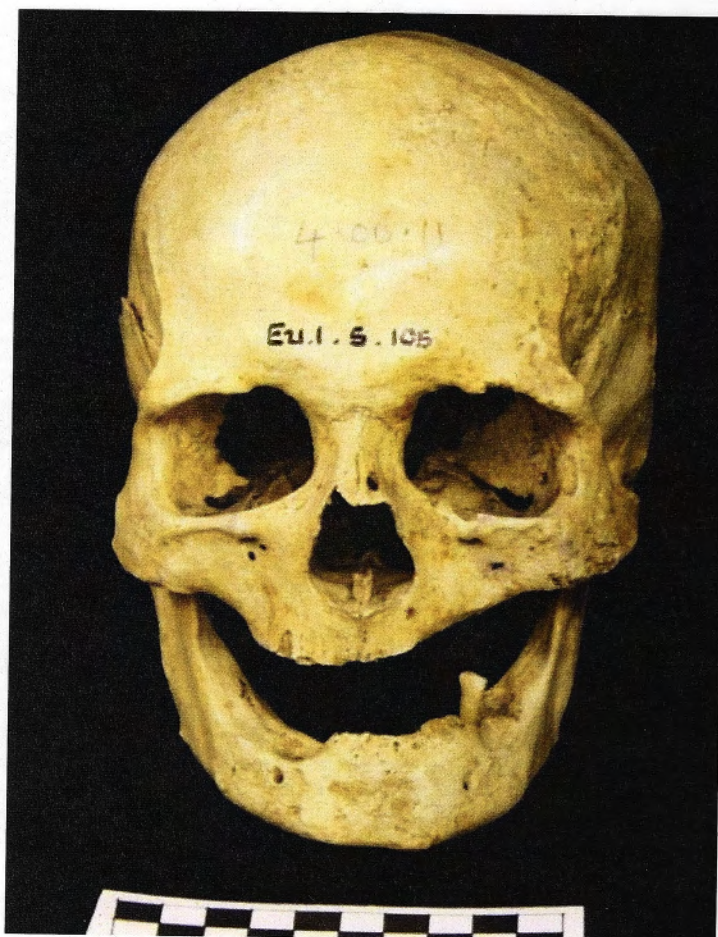


Figure 10.1 (c) LB2 cranium, mandible in anatomical position, illustrating extreme edentulism (note advanced right mandibular alveolar resorption)

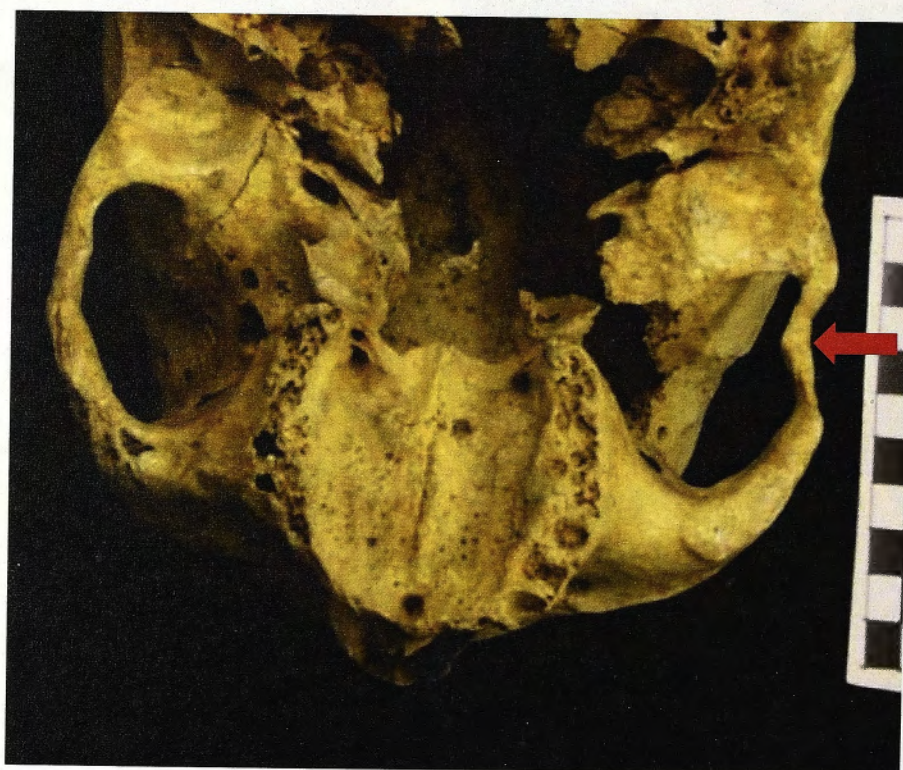


Figure 10.1 (d) LB2 maxilla, inferior aspect, displaying chronic lytic infection along right and left posterior alveolar margins and healed fracture of right zygomatic (arrow).

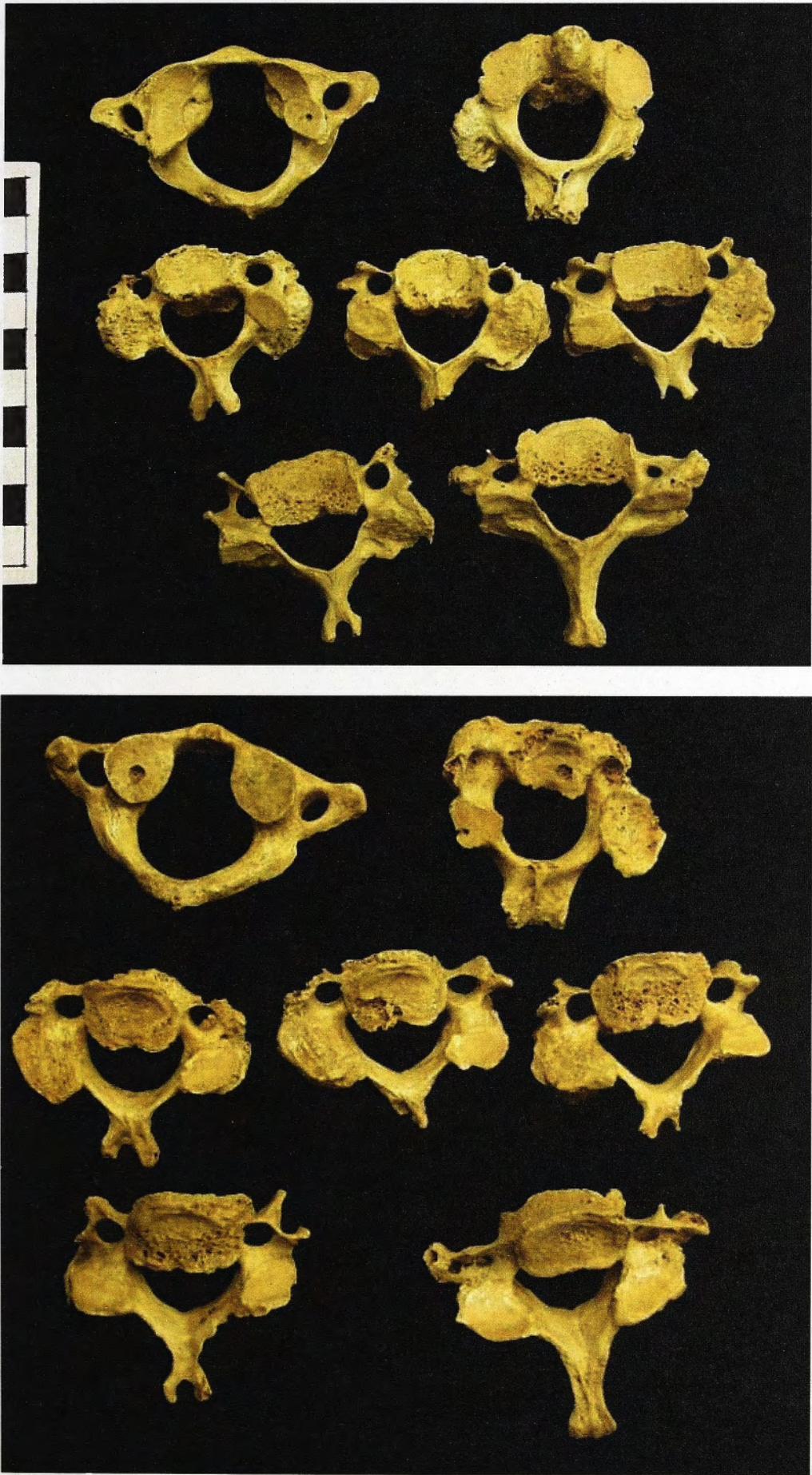


Figure 10.1 (e) and (f) LB5 C1-7, cranial (e) and caudal (f) aspects, displaying severe degenerative pathology (gross enlargement of articular facets, pitting, porosity, lipping, eburnation).

Given the extent and severity of vertebral degeneration in LB1, LB2 and LB5, this suggests that although detail of clinical and functional impact is inaccessible we can be confident that each individual experienced *some* impact. This would unquestioningly include some loss of flexibility and restrictions on certain activities (limitations on movement from intra-articular restrictions and loss of disc space are skeletally indicated), discomfort and, most probably, pain.

In relation to the oral infections, edentulism and temporomandibular joint pathologies exhibited by LB1 and LB2, practical obstacles to mastication, as well as pain associated with chronic infection, would present problems for maintaining a nutritionally adequate diet (Felton 2009; Guardia 2012; Lee et al. 2004; Nowjack-Raymer and Sheiham 2003; Pereira et al. 2006). Further, the chronic infection (and inevitable pain) experienced by LB1 and LB2 would have been associated with a level of reduced immunocompetence and general reduction in energy (Doty et al. 1982; Holmstrup et al. 2003; Wayne et al. 2001).

In summary, LB1, LB2 and LB5 may all have been able to cope with the disabling effects of their pathology without dedicated assistance, but at a minimum each would have faced difficulties in maintaining normal activity levels from time to time, and each would have required cooperation from - or 'accommodation' by - others to manage health demands and lifeways responsibilities successfully.

10.1.3 Lanhill Burial 7: description and diagnosis.

The remains of LB7 represent a male aged around 50 years at time of death. There is evidence of serious pathology affecting his left elbow joint, and the secondary developmental impacts of this pathology are visible in his left humerus, ulna and radius. In life he was approximately 163 centimetres tall; all elements of his right arm appear normal and his lower limbs are robust, with well-delineated muscle attachments suggesting an active, mobile lifestyle. There is no evidence of degenerative change in any region of his spine, and while there is some minor age-related change apparent in the superior aspects of both left and right acetabulum there is no suggestion of any associated impairment (author observation; Jones 1938a).

LB7 experienced an insult to the left distal humerus that resulted in an extreme deformity of the articular surface that effectively locked the head of the ulna into the olecranon fossa. When the humerus and ulna are manipulated into articulation in their

skeletonised state, the forearm is positioned at a slightly less than a 90 degree angle to the upper arm. Cave (1938a), however, argues that during life muscle contracture would have resulted in permanent flexure of LB7's left forearm at an angle of 45 degrees against the upper arm, denying any forearm extension. This proposition is supported both by the skeletal evidence for disuse atrophy (see below) and the lack of evidence of 'wear and tear' degeneration that, had extension been attempted, might be expected in ulnar and/or humeral articular surfaces given the resistance to movement offered by the diseased joint. Although the head of the left radius is considerably distorted it is still capable of movement within the proximal radioulnar articulation, enabling pronation and supination. The distal surface of the left radius appears unaffected (that of the left ulna is missing), suggesting normal wrist and hand movement was retained. On the following page Figure 10.2 presents anterior and posterior aspects of the deformed left distal humerus; Figure 10.3 presents the proximal articular surfaces of the left ulna and radius; and Figure 10.4 shows the left distal humerus and proximal ulna and radius positioned in articulation.

The left humerus displays marked hypotrophy and disuse atrophy. As detailed in Table 10.1, it is shorter than its right equivalent; the left humeral head is smaller than that of the right; and the shaft of the left humerus is substantially more gracile than the right at all measurement locations. The areas of muscle attachment on the left humerus are completely undeveloped (the bone surface is smooth and unmarked), while muscle attachment sites on the right humerus appear normal. Figure 10.5 compares left and right humeri, illustrating the observations made above. LB7's left radius and ulna also reflect lack of use, with both bones measuring between 1-2 mm less in mediolateral and anteroposterior aspects than right counterparts (the right radius and ulna and left ulna are incomplete, making length comparison impossible) and minimal development of muscle attachment areas. Bilaterally, LB7's clavicles appear gracile, although post-mortem damage makes assessment problematic; Cave suggests left *and* right clavicles are 'surprisingly slender and "effeminate", lacking that degree of secondary marking to be expected in an adult male bone', and also notes 'subnormal development' of LB7's left scapula (since fragmented) consistent with the disuse atrophy evident in the left upper limb (Cave 1938a:143-4).



Figure 10.2 LB7, left distal humerus, anterior (top) and posterior (bottom) aspects, illustrating joint deformity resulting from injury in adolescence.



Figure 10.3 LB7 medial view of proximal left ulna (a) and medial view of proximal left radius (b) illustrating adaptation of both articular surfaces in response to deformed distal left humerus.



Figure 10.4 (a) LB7, left distal humerus positioned in articulation with left radius and ulna; (b) drawing after Cave (1938a:144), illustrating points of articulation



Figure 10.5: LB7, left humerus (top) compared to right humerus (bottom), anterior views, illustrating differences in size (length and diameter) and robusticity.

Table 10.1: LB7 - comparison of left and right humerus. Measurements in millimetres.

	Left humerus (% of right humerus)	Right humerus
Length*	280 (93%)	301
Mediolateral diameter	18.3 (78%)	23.3
Anteroposterior diameter	18 (75%)	23.7
Least circumference	57.1 (87%)	65.6
Max head diameter*	40 (87%)	46

* Measures are best estimates only due to damage to both elements. Measurement sites based on Bass (1995:152)

The injury to the distal humerus most likely occurred around the age of 12-14 years, before the humerus attained maximum length and while the distal epiphysis was in the process of fusion (Buikstra and Ubelaker 1994:43). While the possibility of a congenital aetiology has been raised (Smith and Brickley 2009:130), LB7’s pathology

was almost certainly the result of trauma to the elbow joint displacing aspects of the epiphysis and possibly disrupting neurological pathways, as Cave proposes (1938a:144). Disruption or cessation of growth in longitudinal bone, observed in both upper arm and forearm following elbow joint trauma, is ‘[t]he most characteristic consequence’ of physeal injury in children, and other frequently seen outcomes of untreated physeal injury at this site include lasting angular deformity (Ramachandran and Skaggs 2009:20). The literature on paediatric fractures and dislocations identifies the elbow as one of the most common sites of childhood injury (Green and Van Zeeland 2009).

Ironically, LB7’s disability may have been exacerbated by caregiving received at the time injury was sustained. It is likely that his forearm was stabilised against the upper body in an attempt to minimise pain from movement and to protect against further trauma, and this could have affected the healing process in two ways; by restricting blood flow into and around the joint, compromising recovery, and by establishing a relationship between the upper and lower arm bones which muscle flexure and osseous healing response then combined to fix permanently in place. Figure 10.6 is an artist’s representation of how LB7’s arm may have been positioned during life.

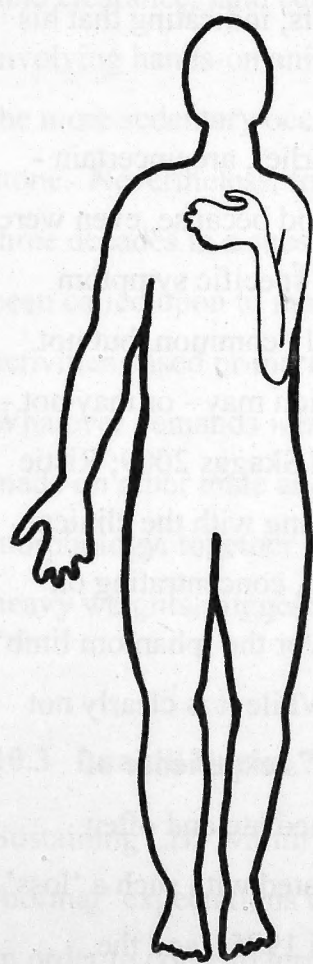


Figure 10.6 LB7: artist’s representation of disability outcome (permanent flexure, hypotrophy and disuse atrophy of the left arm). (Lorna Tilley)

There are at least five published studies of prehistoric individuals who experienced different forms of upper limb pathology resulting in loss of function and for whom some measure of care is claimed, and these are included in Table 2.1 (Buquet-Marcon et al 2007; Lieverse et al. 2008; Mann et al. 1998; Schultz 2006; Solecki 1972; Trinkaus and Zimmerman 1982). Other than Solecki (1972:258-268) these authors focus predominantly on osteological description and disease diagnosis, with care provision a secondary consideration.

10.2 Lanhill Burial 7: the clinical and functional impacts of disease

As a consequence of his pathology LB7 would have been unable to take part in any activity demanding significant upper body strength and/or the active use of both arms and/or both hands. Although he likely retained full movement of his left hand, inability to break arm flexure would have limited opportunities for exploiting this. In some situations the positioning of his left arm may have actively impeded task performance, and the subnormal development of the right clavicle recorded by Cave (1938a:143-4) may indicate the crippled left arm presented an obstacle to a full repertoire of right arm function. LB7's lower limbs, in common with those of other adult group members, were short, powerfully formed and with pronounced muscle attachments, indicating that his upper body handicap had no effect on lower body fitness.

The clinical implications of the injury, beyond those discussed earlier, are uncertain - both because the precise aetiology of the pathology is unknown and because, even were it known, individual variability in symptom experience precludes specific symptom attribution to LB7. For example, nerve dysfunction is a reasonably common, but not inevitable, concomitant of elbow trauma, and this nerve dysfunction may - or may not - be associated with varying levels of pain (e.g. Ramachandran and Skaggs 2009; Ristic et al 2000). From another perspective, much of the literature dealing with the clinical impact of enduring upper limb dysfunction focuses on amputation, concentrating on neurally-induced pain as a concomitant of surgical procedure and/or the 'phantom limb' phenomenon (e.g. Datta et al 2004; Maguire and Parkes 1998). While it is clearly not appropriate to generalise from amputation-associated pain to LB7's experience of pathology, LB7 *did* suffer an effective 'loss' of his left arm. Immediate and often longer-term symptoms of depression are almost invariably associated with such a 'loss' (Datta et al 2004; Maguire and Parkes 1998; Wallander and Varni 1995), and the research identifying the conditions under which successful psychological as well as

practical adjustment to upper limb dysfunction is typically achieved (e.g. Desmond 2007; Reed and Claunch 1998; Roberts 2007) has implications for interpreting LB7's treatment within his community and for considering aspects of LB7's individual identity, and these are discussed in later sections.

It is much easier to identify the functional implications of LB7's disability. Referencing the disability indicators contained in the Index of Care, LB7 would clearly have been capable of performing all basic activities of daily living such as feeding and dressing himself, maintaining bodily hygiene, and independent mobility. Depending upon the specific components of any particular task, he would also have been capable of taking (some) part in many of the instrumental activities typical of the Cotswold-Severn lifeways. Yet however expertly LB7 was able to compensate for his handicap - and modern experience of people coping with equivalent disability support the proposition that he likely developed effective ways of working around it - from around the age of 14 years onwards he would have been incapable of fulfilling the full range of requirements of the normative role for one of his corresponding demographic.

More precisely, LB7's disability would limit his participation in economic practices standard for this period, if not exclude him completely. Such activities might include land clearance, land cultivation, construction, hunting, and most pastoral practices involving hands-on animal handling (such as birthing and butchery), as well as many of the more sedentary occupations likely practised, such as production in wood, bone or stone. Nevertheless, following injury in adolescence LB7 continued living for over three decades in a subsistence economy, and it is reasonable to assume he would have been called upon to make a material contribution to his community. Economic activities based primarily on lower body functioning must have been limited, however. Whatever demands *were* made on LB7, most must have been quite different from those made on other male and female members of his age cohort, for whom upper limb morphology, together with vertebral pathology likely associated in part with handling of heavy weights, suggest occupations demanding upper body involvement.

10.3 Lanhill Burial 7: a model of care

Sustaining LB7 within the small Lanhill community required group members to adjust 'normal' expectations of adolescent, and then adult, community role and responsibilities in order to come to terms with, and to compensate for, LB7's inability to function

effectively in certain areas. The logical approach would be for the group to take advantage of LB7's abilities wherever feasible, possibly allocating tasks considered unusual for one of his demographic. Indeed, given that depression is such a frequent outcome of loss of limb function (see above), the active social inclusion of LB7, through allocation of tasks simultaneously appropriate to his functioning capability and contributing actual value to the group, would be the most effective form of rehabilitative and continuing care (Desmond 2007; Reed and Claunch 1998; Roberts 2007). In summary, it can be said that care provision to LB7 consisted of the 'accommodation' of his physical handicap - his difference - from adolescence onwards.

Going beyond this broad statement is problematic. We can be confident that LB7 was *not* required to carry out activities involving substantial upper body commitment, especially lifting or carrying heavy weights, because in addition to his underdeveloped clavicular morphology he is the only adult over 30 years to exhibit no sign of 'wear and tear' degenerative change in any part of his spine. Bearing in mind discussion of the vertebral pathology manifesting in the remains of LB1, LB2, and in particular LB5, in the Lanhill context - as in the example of Man Bac Burial 9 (Chapter 8) - absence of evidence for disease can be construed as evidence for care, in this case realised in the recognition and acceptance of LB7's disability and the limitations this imposed.

Identifying occupations LB7 *may* have engaged in is a very different question. There were possibly many roles available to LB7 that did not require significant upper body strength or the ability to use both hands. These might range, for example, from child-minder (freeing fully able-bodied adults for more strenuous labour), possibly basic pottery production, animal-herder or advance scout, through story-teller or poet, to priest or prophet - although in relation to the last four vocations it seems unlikely that a subsistence community could have afforded to carry an otherwise healthy individual for over three decades without some tangible economic contribution on his part.

Alternatively, it may have been that LB7 carried out most of the jobs undertaken by non-handicapped others in the community - for example, foraging for wild plants or horticultural tasks - albeit more slowly and/or less productively. There is no evidence directly associated with LB7's remains, nor even indirectly with the Lanhill lifeways, to provide answers on this point.

With the exception of Solecki (1971:258), the archaeological reports that raise the possibility of caregiving in response to upper limb disability referred to earlier all fail to examine the functional implications of pathology within the corresponding lifeways

(explicitly in the study by Lieveise et al [2008], by default in the remainder), and attempt no discussion of the detail of the care they suggest was provided beyond general statements of likely social acceptance, assistance, intervention, support, indulgence, mutual aid and solidarity (Buquet-Marcon et al 2007:1; Lieveise et al. 2008:236; Mann et al. 1998:296; Schultz 2006:253; see Table in Appendix A for more detail). Solecki (1971:258-268) does consider the practical prospects for the disabled Shanidar 1 in his Neandertal setting, but faces similar problems to those encountered in the discussion of choices available to LB7. It is not difficult to develop a hypothetical 'model of care' for an individual who retains a high level of independent functioning despite having a substantial handicap when lifeways context is factored into the equation - but it is impossible to know whether this model is correct. This does not mean, however, that the exercise should not be attempted, because the process of reflecting on the possible elements of the approach taken to care provision helps to establish the framework for interpreting the significance of this act.

10.4 Caregiving at Lanhill: interpretation

Taken as a discrete study of care provision, LB7 is a good example of a partially disabled individual who was clearly unable to participate in many of the physically demanding activities standard for his peers from early youth onwards, but who, nevertheless, was successfully 'accommodated' within a small, mobile, peri-agricultural, subsistence community. Furthermore, LB7's longevity and, at death, his inclusion within the communal burial chamber, suggest his accommodation went beyond mere tolerance to acceptance and integration as a full group member - that he was not stigmatised either on the basis of his conspicuous physical deformity or on the basis of its impact on his functioning.

In focussing on the experience of an individual care recipient there will always be some basic questions that are hard to resolve. A common one revolves around whether the care-recipient was looked after by their group because as an individual they were in some way exceptional, meriting 'special' attention, or because caring for all group members experiencing disability was standard practice. Relevant to this particular study, Shanks and Tilley's (1982) hypothesis that the selection of remains for long barrow interment (including interment at Lanhill) was designed to give the illusion of an egalitarian society by disguising the reality of a sociopolitical hierarchy may seem convoluted, but they are not alone in pointing out that mortuary ritual represents the

interests of the living rather than the dead (see Chapter 5). A related question might therefore address whether LB7 was interred in the north-west chamber not because he was considered to be an ordinary member of his community despite disability, but specifically *because* of his disabled status - in other words, was LB7's inclusion (maybe intentionally the last individual inserted) intended to convey the appearance of social acceptance during life, when in reality he suffered social rejection?

In this particular case, provisional answers to both questions are possible, because the treatment of LB7 can be considered against the backdrop of evidence suggesting that others from the same community, who also experienced some degree of disability, received care as well. Given the possible consequences of pathologies experienced by LB1, LB2 and LB5 (see Section 1) it is probable that the Lanhill group would have had to adjust expectations made of all three of these individuals during their later years, even if these adjustments were only required only infrequently. LB1 and LB2 may also on occasion have required care in the sense of 'direct support', for example in the form of provisioning or preferential allocation of appropriate foods to counter challenges posed by edentulism, oral infections and temporomandibular joint disease, and/or in the form of nursing to help them through health crises arising from chronic periodontal infections.

The inference of care provision to LB1 and LB2 is to some extent confounded by the variable of age. While 'being old' is not synonymous with 'requiring healthcare', the process of ageing (particularly in a subsistence economy) is typically associated with reductions in physical fitness and endurance independent of observable pathology. The obvious issue becomes whether, in a bioarchaeology of care analysis, accommodation of age-related constraints on socioeconomic participation should be viewed in terms of *health*-related care, or in terms of established *cultural* support for community members moving through the lifecycle from 'productive adult' to 'group elder' - the latter being a role usually accompanied by a different set of behavioural expectations (e.g. Mehl-Madrona 2003; Robb 2002). The relatively high proportion of older individuals represented at Lanhill may indicate a community with a sizable older demographic (although see earlier caveats), and support for the elderly may indeed have been a cultural characteristic. LB1 and LB2's remains clearly display indicators of progressive disease, justifying the inference of specifically *health*-related care provision, but at a practical level distinguishing between adjustments made for these two individuals on

the basis of age and those made on the basis of disease is impossible. For the purposes of analysing LB7's experience, however, it is enough that these adjustments were made.

In this wider context, the long-term support given to LB7 fits well with an understanding of the Lanhill community as one that valued the lives of *all* its members - the cross-section of those that can be identified as likely receiving care comprise the young (LB7 acquired his disability as an adolescent), the adult (LB5) and the elderly (LB1 and LB2, and latterly LB7). Therefore the most likely answer to the question of *why* LB7 received care is not - at least primarily - because of who he was as an individual, but because of his identity as a member of the Lanhill group.

Any suggestion that LB7 was included in the north-west chamber because of his difference is similarly rejected. The evidence indicates that of the nine individuals represented in the north-west chamber at least three others experienced disability, meaning that although (on the skeletal evidence) LB7 was the most severely affected of all, he was not unique in this regard.

Taking into account both the experience of LB7 and the broader picture of caregiving practice at Lanhill suggests features of group organisation. Provision of care always involves a cost. Although the Cotswold-Severn region was fertile, with relatively easily traversable terrain and a moderate, temperate climate, the osteology reveals that life was physically-demanding and that everyone was required to contribute their labour (perhaps best exemplified in the case of LB5), indicating a considerable level of economic interdependence and possibly economic uncertainty. Despite evidence indicating that for periods of time certain individuals would have been operating (at best) at below normal levels of productivity, the absence of skeletal indicators of compromised nutritional status (see Section 1), as well as the skeletal evidence for longevity, suggest that in addition to occupying a favourable physical environment the group possessed the planning ability to manage work practices in such a way as to compensate for labour force disruption. In terms of daily activity (for which there is no direct archaeological information - see Section 1) this may have included occupational 'multi-tasking' by group members (i.e. all working-age members were able to undertake all work tasks - see discussion below) and perhaps a practice of accumulating food surpluses for times of stress.

Flexibility would have been required in developing meaningful economic *and* social roles for LB7. The functional impact of LB7's disablement would have led to exclusion from, or poor performance in, many of the Lanhill group economic activities. This

could potentially have had a correspondingly detrimental impact on his social status, given that in many peri-agricultural communities status is linked to economic contribution. The arguments for inferring LB7's acceptance by his community and for assuming that he engaged in some form of economic activity have already been presented, but it must also be recognised that the scope of a small community to provide an alternative role suited to someone with LB7's activity restrictions would have been limited. That such a role appears to have been achieved suggests an amount of creativity as well as good will.

When the evidence for the accommodation of LB7 is combined with evidence from the other Lanhill human remains, a further feature of economic organisation is suggested - although admittedly the Lanhill sample is very small. In the absence of evidence to the contrary, however, the lack of significant sexual dimorphism, together with the evidence for (if only intermittent) disabling pathology among a substantial proportion of group members, suggests a division of labour based on health and fitness rather than on gender or age. To go further, and suggest that the evidence might also support an interpretation of gender equality might be dismissed as pure speculation, were it not that there appears to be a roughly equal (total) representation of females and males within the Lanhill Long Barrow; that half the remains in the older age category are female; and that half the individuals deemed likely to have received some form of care are female as well. It would certainly challenge stereotype to propose that the value placed on the life and death experiences of Lanhill women was equivalent to that placed on the experience of Lanhill men, but it is no reason to exclude this possibility.

Observations from the analysis of Lanhill community's treatment of disabled members are also relevant to the continuing debate about social relations in the Neolithic - regarding whether prehistoric 'identity', or 'personhood', is better understood in terms of relationality and 'dividualism' than in terms of western post-Enlightenment concepts of 'the individual' (Fowler 2001, Jones 2005). In the Cotswold-Severn context, claims for relationality have relied on the assignment of meaning to enigmatic long barrow architecture and/or ambiguous disposition of bones (Fowler 2001, Jones 2005; Shanks and Tilley 1982; Thomas 2000). The evidence from Lanhill that those with disabilities - and, indeed, the elderly - were maintained within the group offers support for the thesis of a social environment in which each person was regarded as an integral part of the greater whole (the dividualism model), rather than each person being seen as an individual negotiating life as a separate, relationless, being.

In turn, positioning Lanhill social relations in terms of dividualism helps when considering the motivation underlying provision of care to group members in need, regardless of apparent cost. Within a dividual framework, similarities between individuals take precedence over differences, and taking care of a disabled group member could (in theory) be perceived by those involved as taking care of the group and, through this, as taking care of themselves. The group is seen as a 'whole' in which each individual, carer and cared-for, is an essential component, meaning that under most circumstances abandonment is not an option. This is not to deny intent by suggesting that caregiving at Lanhill was an automatic response. Decisions regarding how and what care should and could be given to meet an individual's requirements, and how care could be provided without endangering the rest of the community, must still have been required. At its most basic, however, in a dividual regime the value of caring for a disabled member who was capable of benefiting from this care provision would be taken as a given.

10.4.1 LB7 - the individual

What does LB7's osteobiography of disability and care suggest about the unique individual who acquired this incapacitating - and very visible - handicap at the onset of puberty?

Qualifications regarding the prospects for truly 'knowing' a prehistoric individual through their bones have been elaborated in previous chapters (in particular Chapters 5 and 7), and here are taken as read. However, despite the perils in extrapolating from modern clinical research to past experience, it seems reasonable to suggest that when the extent and the permanent nature of his disability became apparent LB7 would have experienced the same raw, immediate, emotional responses observed in adolescents and adults suffering loss of use of an upper limb today - severe anxiety and depression arising from both the impact on functioning and the insult to body image (Datta et al 2004; Maguire and Parkes 1998; Wallander and Varni 1995).

LB7's initial injury may well have caused him pain at the time (Ramachandran and Skaggs 2009; Ristic et al 2000), probably tolerated without alleviation, but the grief associated with the radical alteration to the perception and experience of self, and the coming to terms with permanent loss and disability, would likely have been more devastating. This process has been compared to dealing with the death of a loved one

(Maguire and Parkes 1998), and is observed to be particularly severe when experienced in adolescence (Wallander and Varni 1995). Adjustment to disability and disfigurement requires time for mourning the loss of functioning capability, a supportive community environment, and a positive outlook on the part of the sufferer - the latter enabled by the two former (Desmond 2007; Roberts 2007; Wallander and Varni 1995). In the case of LB7, the fused joint holding his forearm permanently angled against his upper arm, as suggested in Figure 10.6, would not only serve as a constant sign to others of his disability, but likely constituted a physical impediment to upper body movement that made it hard for him to ever 'forget' his disabled condition.

In light of his longevity, LB7 clearly *did* adapt to living with disability. Whether he was happy, or merely resigned, or irritable, frustrated, angry and bitter is inaccessible to us - all are human reactions. That he appears to have been an accepted part of his community, however, and spared the heavy labouring that was most likely responsible for the degenerative disease seen in other Lanhill adults, may suggest that his general quality of life was reasonable and that his needs and abilities were recognised. In a 'dividual' community, as discussed above, such treatment might be afforded irrespective of an individual's character and personality. On the other hand, it may also suggest a caregiving response based on personal liking and respect.

10.5 Conclusion

As vulnerable human beings, most of us will experience disability at some stage of our lives. This disability may not necessarily require intensive care, but it is likely to require adjustments to the way we live and to what is expected of us, and our society's willingness and ability to make these adjustments will reflect both the values it espouses and the nature of its organisation.

In focusing on caregiving expressed in the form of accommodation, the case of LB7 illustrates that this modern-day observation is also applicable to behaviour in the past. Admittedly, ideas regarding what such accommodation may have comprised in any archaeological study will typically be broad and framed in the negative - *this* subject, with *this* disability, could *not* have undertaken *these* tasks. However, although the detail of adjustments made by prehistoric communities to support disabled members may remain hidden, where evidence suggests the accommodation of disabled individuals this provides a point of entry for examining past social practice. The

process of exploring the possible motivations for accommodation, the environment in which accommodation occurred, and the experience of this form of care from the perspective of the care-recipient, focusses attention on questions of social relations and identity, and this cannot fail to enrich our engagement with the past.

This case study also demonstrates the value of considering health status and experience of group members other than the central subject of study as an integral part of the context for bioarchaeology of care analysis. Where multiple examples of possible care provision - in this instance all likely falling under the heading of 'accommodation' - can be identified within a single group, it argues for a consistency in one area of behaviour which may support inference in other behavioural spheres.

Following on from this, it is noted that the Lanhill individuals are by no means the only Cotswold-Severn long barrow remains to exhibit evidence of disease likely to have required a caregiving response. For example, the author has observed indicators of survival with, or following, potentially disabling temporary and longer-term pathologies in skeletal elements from the West Kennet (Wells 1962) and Hazelton North (Rogers 1990) long barrows, and a case of inferred care provision from the Ascott-under-Wychwood long barrow is cited in Table 2.1 (Galer 2007). It is unlikely that the Lanhill community was a cultural anomaly in looking after its own.

And this leads to one final point. The current enthusiasm for reading evidence for widespread, often lethal, violence into early British Neolithic lifeways was noted earlier in discussing the context for this case study. That incidents of interpersonal violence occur in all cultures and across all times is not in dispute. What *is* argued here, however, is that examining the Cotswold-Severn tradition from the perspective of care, as well as from the perspective of conflict, will achieve a more balanced, three-dimensional understanding of the culture and those who created it. Indeed, this observation can be extended to all periods and places of archaeological research.

CHAPTER 11. Conclusion: Current Status and Future Directions for the Bioarchaeology of Care

Importantly, a case study is not [merely] the application of theory to the archaeological record. The reason good case studies move the discipline forward is not just because they apply some abstract theory to a material pattern, but because they suggest new ways to see and make sense of that pattern. Thus, a case study is theory in its own right. (Dobres and Robb 2005:161-2)

This thesis presents the bioarchaeology of care - a new, case study-based and fully theorised approach combining osteological evidence for survival with disability with archaeological evidence of lifeways environment to identify and interpret instances of health-related care provision in prehistory. It positions care as a complex behavioural response to an individual's experience of disability, with 'disability' defined in terms of impact of pathology on function. The caregiving response itself is understood as comprising a series of linked actions that take place over time and are the product of intentional choice. The person receiving care is regarded as both artefact and actor; 'artefact' in that their survival is, at least in part, an outcome of conscious intervention by others, and 'actor' in the sense that as an individual, with a unique biology and a unique personality, they have the potential to play an active role in shaping the form that this care takes. Within this paradigm, contextualised analysis of the potentially costly behaviour of care provision provides a point of entry into aspects of past social relations, social practice and identity which may not be accessible by other means. The three case studies explored in Chapters 8, 9, and 10 demonstrate the variety, richness, intimacy and immediacy of the insights that bioarchaeology of care analysis is capable of delivering.

More pragmatically, these three case studies illustrate the practical application of this new methodology. The four stages of the bioarchaeology of care, explained in detail in Chapters 6 and 7, structure analysis and interpretation of evidence for healthcare provision in a way which renders every step of this process transparent, open to scrutiny, and capable of replication. Each stage of the methodology becomes the platform for the next, and this enables an orderly transition from the relatively straightforward recording of pathology and its context in Stage 1; through determination of disability in Stage 2 and identification of the probable care requirements and likely

nature of the care given in Stage 3; to the interrogation and reproduction of the multiple agencies involved in both provision and receipt of care in Stage 4.

The definition and operationalisation of key terms and concepts relating to health, disease, disability and care provision in the past were critical to bioarchaeology of care design. As discussed in Chapter 2, the topic of caregiving has proved to be an extremely contentious one for archaeology, and this has led to it being passed over as a focus for research. To some extent controversy is inevitable, because the way both society and individuals respond to the concept and the reality of 'disability' reflects deeply-held cultural and personal values - and provokes strong passions. A substantial part of the problem, however, arises from a failure to establish just *what* is being investigated under the vague heading of 'care and compassion' in the first place. The bioarchaeology of care approach is explicit that, once the researcher moves beyond identification of evidence for disease in individual remains in Stage 1, the study of past healthcare provision is based on informed inference and deduction rather than on established 'fact'. Research parameters therefore have to be crystal clear. Chapters 3, 4, 5, 6 and 7 address this imperative through the development of a comprehensively theorised set of meanings and measures intended for use as a shared research 'vocabulary'. This vocabulary includes the contextualised definition and determination of individual disability in relation to impact on function; the identification of 'universal' components of care practice, providing the building blocks for fashioning an individual-specific 'model of care'; and a framework for interpreting features of group and individual agency, based on deconstruction of decision-making processes and pathways involved in giving and receiving care.

The bioarchaeology of care methodology is supported by the Index of Care, a non-prescriptive, step-by-step guide through the four stages of analysis which provides a structured, open-ended format for recording and processing data, observations, inferences and conclusions. The shared vocabulary discussed above is integral to its construction. The Index is primarily a prompt to ensure evidence and issues potentially relevant to a case study are not overlooked, and its application is not a prerequisite for undertaking bioarchaeology of care research. However, it is hoped that the benefits and convenience of this tool will encourage its wide adoption, and that its use will stimulate active and continuing debate around bioarchaeology of care philosophy, principles and practices.

11.1 How does the bioarchaeology of care approach fit with existing theory and practice?

Familiarity with the theoretical foundations of the bioarchaeology of care methodology is crucial to appreciating its potential and its limitations. For this reason, Chapters 3, 4 and 5 take on particular significance.

The bioarchaeology of care approach is firmly embedded in the relatively recent traditions of bioarchaeology, emerging from the work of the pioneers who first argued for the archaeologically-contextualised analysis of human remains (Buikstra 1977) and building on subsequent developments in this field - such as the exploration of identity through osteobiography (from the early work of Saul [1972] to the most recent chapters in Stodder and Palkovich (Eds) [2012]) and the framing of the physical body in terms of material culture (Sofaer 2006). Other fields of archaeology contributing to the bioarchaeology of care include palaeopathology; the archaeologies of agency and identity; cognitive archaeology; and mortuary archaeology. Theory and practice from disciplines outside archaeology are also incorporated, and Chapters 3 and 5 make clear the contributions of social and medical anthropology, ethnography and sociology, the history of medicine, disability studies, clinical practice, and nursing, while Chapter 4 - attempting the hubristic task of shedding light on the origins of, and motivations for, care - is the result of an idiosyncratic and unfinished journey through the evolutionary, primate, biological, psychological and social sciences. This synthesis of ideas, theories and methods from a wide range of disciplines is a defining feature of the bioarchaeology of care. As cross-disciplinarity is recognised as the essence, strength and future direction of bioarchaeological research (Buikstra 2011; Knudson and Stojanowski 2008), in this characteristic, as in others, the bioarchaeology of care remains true to its roots.

Finally, it is noted that the bioarchaeology of care is unavoidably - and unapologetically - case study-focused, and Chapter 3 explains why this is the case. It is simply not possible to generalise from individual examples of survival with disability to population-level practice, although sometimes possible patterns in care practice may be distinguished if indicators of care provision are found in the remains of multiple, contemporary members of the same community, as illustrated in Chapter 10. The bioarchaeology of care approach is therefore seeking to establish itself in a competitive research environment in which population studies are still widely preferred (e.g. Armelagos and van Gerven 2003; Mays 2012).

It is not the remit of this thesis to enumerate the role and rewards of case studies in archaeological research. This task is skilfully performed by others. Among these are Dobres and Robb (2005), whose words preface this chapter and encapsulate the quintessential goal of the bioarchaeology of care: to stimulate new ways of looking at, and making sense of, evidence of past lives and practices in relation to the behaviour of caregiving. From another perspective, Hodder (2000), a proponent of research focusing on individual lives and events, argues that in order for archaeology to fulfil its social potential and obligations and to continue to generate broad-based interest and support 'the public need to sense a human scale in the vast expanses of archaeological time' (Hodder 2000:31). The case histories presented in the last three chapters of this thesis bear witness to the bioarchaeology of care's ability to supply this 'human scale' to the study of the past.

11.2 Where to from here? Future directions for a bioarchaeology of care.

The bioarchaeology of care approach is best described as a work in progress. There are many features that could be refined, and many possible options for consolidating and expanding its application. Some of these are briefly canvassed here.

Evolution of the bioarchaeology of care approach

Reflecting the observation above, neither the conceptual framework of the bioarchaeology of care nor the accompanying Index of Care is regarded as 'fixed'. On the contrary, it is emphasised that the bioarchaeology of care methodology does not pretend to provide a formula for the analysis of health-related care provision, and that the Index is essentially a sophisticated aide-mémoire to support a researcher in the process of thinking through a case of care. It is hoped that both will undergo continuous evolution. Every application of the methodology (and use of the Index) will involve different variables, and it is virtually preordained that some of these will not be adequately catered for within the current model. Any researcher adopting the bioarchaeology of care methodology will have to adapt it to their own needs.

Having said this, if the bioarchaeology of care approach is accepted as having merit, then it would be valuable to have some means of incorporating criticisms and contributions into both the conceptual framework and the Index. During its development the methodology was foreshadowed in peer-reviewed and popular articles

(Tilley 2012; Tilley and Oxenham 2011) and conference presentations (Tilley and Oxenham 2009; 2011), and was greeted positively. If this dissertation is accepted, it is intended to write an article describing the stages of the methodology in detail, together with an outline of its theoretical base, and in association with this to make the Index of Care freely available. Researchers employing the bioarchaeology of care approach and using the Index of Care will be encouraged to provide comments and ideas for improvement, and the Index of Care will be updated to reflect such feedback where possible.

Areas for future research focus

There are many possible directions for future bioarchaeology of care research, and a few of these are listed below.

- i. In this thesis, discussion of the bioarchaeology of care was limited to skeletal remains - primarily because of length constraints (see Chapter 1). The principles of the methodology are equally applicable to caregiving inferred from mummified remains; indeed, it is probable that evidence obtained for survival with disability from preserved soft tissue would greatly increase both the knowledge of type and frequency of disabilities lived with in the past and the understanding of the range of likely measures involved in providing care. A possible bioarchaeology of care analysis using radiological evidence of chronic respiratory disease in mummified remains from the Peruvian highlands has been mooted.
- ii. This thesis concentrates on caregiving undertaken in early prehistoric lifeways in order to avoid the complexities associated with larger, more concentrated, populations (see Chapter 1). There is no inherent reason why the bioarchaeology of care methodology could not be applied to instances of disability and care identified within more sophisticated levels of social and economic organisation. Depending on the circumstances, this might require a modified approach to calculating impact of disability (Stage 2) and to deriving the model of care (Stage 3), as well as changes to how the 'decision path' which forms the basis of interpretation (Stage 4) is configured, but the principles driving analysis remain the same. The possibility that repeating patterns of healthcare behaviour may emerge from analysing cases of care practice in larger pre- and protohistoric settlements has not been explored, and research may produce findings that extend - or challenge - existing assumptions.

- iii. A potentially productive avenue of research involves revisiting published studies that either make unelaborated suggestions of care, or describe survival with pathology likely associated with disability but do not raise the possibility of care provision (Chapter 2 identifies examples in both categories). Submitting such cases to a full bioarchaeology of care analysis may produce informative, and possibly unpredictable, results. An open-ended, but standardised, measure should be developed for assessing whether, and if so how much, value is added to the original research in this process; this would provide an independent evaluation of the new methodology, and would be a worthwhile project in its own right.
- iv. Turning to specific research questions, it may be rewarding to apply the bioarchaeology of care theoretical model to the question of how, and when, caregiving transitioned from an apparently *ad hoc* response to the experience of disability into a regulated *system* of healthcare provision - such as those recorded in the world's earliest recovered documents from Mesopotamia and Egypt. Trepanation, a surgical practice dating to the Mesolithic, is one obvious candidate for consideration in the above context. As discussed in Chapter 2, this procedure minimally requires anatomical knowledge and surgical skills (both presumably acquired through training and practice), as well as post-surgical care to manage infection risk and to support the recovery and, where necessary, rehabilitation process. Evidence for trepanation suggests a community acceptance of invasive health intervention; established nursing procedures; a system of medical education (however limited); and possibly the first archaeologically visible example of skilled division of labour. Examined from a holistic bioarchaeology of care perspective, trepanation may provide a window into the development of more formalised systems of care.
- v. The bioarchaeology of care methodology can be employed in archaeological studies in which the provision of healthcare is not the sole, nor even the primary, focus of research. For example, interest in the topic of violence - domestic, informal, systemic, within and between groups - has increased incrementally in the last decade (Guilaine and Zammit, 2005; theme articles in the *International Journal of Paleopathology* 2012 (2), Schulting and Fibiger 2012). It would be interesting to submit those remains studied from the perspective of violence to analysis from the perspective of care. Absence of evidence for care provision would not, of course, prove an absence of care (as discussed in Chapter 3), just as absence of physical

evidence for violence does not prove an absence of violence. Nevertheless, where evidence for violence and caregiving exist within the same population this may illuminate the contradictions which are the hallmark of most human behaviour, providing a more complete picture of past life. Other subject matter areas in which a bioarchaeology of care approach might pay dividends (although noting case study-related limitations) include research examining (a) trends in prehistoric life-expectancy (is there any relationship between living into old age and health-related care?); (b) features of the life course within and across group lifeways; and (c) relationships between provision and receipt of care and health, socioeconomic status and inequality.

Submission to scrutiny

In an ideal world it would be automatic to subject the bioarchaeology of care principles and practice to rigorous review, testing and, where necessary, revision, because it is only through this process that any methodology can achieve its full potential and attain legitimacy. The usual practice is for this to occur informally over time, but in the case of the bioarchaeology of care it may be feasible to hasten this process.

The theme of 'care provision' provides a central organising principle around which it would be possible to develop a university later-year undergraduate or postgraduate semester-long course within an archaeology program. Lectures and laboratories would follow the basic structure of this thesis, and students would be required to produce a substantial case study applying the bioarchaeology of care methodology to existing reports containing either undetailed claims for care and/or evidence suggesting survival with disability (see proposal for research [iii] above); a critique of the methodology generally and the Index of Care specifically, looking for strengths, weaknesses and/or ambiguities, and where possible proposing solutions to problems identified; and a commentary on the bioarchaeology of care approach generally, addressing issues of theory, logic and scope.

The course outlined above would enable a structured and systematic trial of the bioarchaeology of care approach, as well as offering a valuable applied learning opportunity for students.

Increasing accessibility to cases of care

Finally, Chapter 2 (Table 2.1) identifies a number of archaeological studies in which possible health-related care is explicitly identified, and also describes the difficulties encountered in discovering many of these. As studies identifying likely caregiving increase, and more detailed analyses of care provision are undertaken, it would be useful to have a reliable way of identifying this research for the purposes of facilitating peer-to-peer discussion, cross-referencing and cooperation, and, ultimately, encouraging more work on this topic.

The most desirable option would be establishment of an internet-based clearinghouse to which relevant publication details and abstracts could be uploaded, but in the absence of institutional support this is impractical. A more modest option would be to urge the general adoption of standard keyword 'search terms' by authors who identify likely health-related care in their research; this would require minimal effort and make the task of looking for archaeological examples of caregiving much easier. Consultation with bioarchaeologists and palaeopathologists for the purpose of identifying suitable 'search term' candidates would be the logical first step towards this goal.

11.3 Afterword

At best, we can only ever hope to achieve a partial understanding of how people lived in prehistory. But all research in bioarchaeology has a non-negotiable responsibility to give a voice - a presence, no matter how incomplete - to those whose remains we study. As Tarlow (2001) puts it:

All we really know about the past is that our stories about it are too schematic, too incomplete, too thin ... But in the attempt to (re)construct something of the texture and depth of past people's experiences, perhaps we can find a way to deal fairly, honourably and responsibly with the dead' (Tarlow 2001:62)

The bioarchaeology of care provides a framework for constructing a narrative around the experience of disability and care. Some narratives will be more controversial than others, and it is the responsibility of the individual researcher to decide the point at which defensible interpretation crosses the line of unacceptable speculation.

Regardless of where this line is drawn, one of the most important achievements claimed for this new methodology is that it opens the way to a level of engagement with the past that makes possible a glimpse of the complexity, sophistication and humanity of those who precede us.

Equally importantly, this focus on caregiving behaviours in prehistory may, over time, provide a new vantage point for reflecting on the meaning, value and practice of these same behaviours in the present.

Regardless of where this line is drawn, one of the main purposes of the new methodology is that it forces the user to a limited number of choices. It is not a matter of "if" but "when" to make a choice. The user is forced to make a choice at a certain point in the process. This is a significant change from the old methodology where the user could choose to make a choice at any time. This is a significant change from the old methodology where the user could choose to make a choice at any time. This is a significant change from the old methodology where the user could choose to make a choice at any time.

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APPENDIX A

Annotated bibliography of archaeological reports specifically identifying the possibility of health-related care provision*

No.	PERIOD LOCATION	AUTHOR(S), PATHOLOGY, CLAIMS FOR CAREGIVING.
1	1.77 million BP Georgia	Lordkipanidze et al., 2005, 2006. <i>Homo erectus / Homo georgicus</i> Dmanisi 3444/3900 comprises the skull and mandible of an adult male. All teeth but the left lower canine were lost antemortem, and all but one were lost considerably before death. Dmanisi 3444/3900 relied on group cooperation to obtain the nutrition necessary for survival. <i>'The D3444/D3900 individual apparently survived for a lengthy period without consuming foods that required heavy chewing, possibly by eating soft plant and animal foods and/or by virtue of help from other individuals, which must have exceeded that capable of being offered by non-human primates. The edentulous Dmanisi specimen raises interesting questions regarding social structure, life history and subsistence strategies of early Homo that warrant further investigation'</i> (Lordkipanidze et al 2005:718).
2	1.5-1.7 millionBP Kenya	Walker et al. (1982); Walker and Shipman (1996). The remains of the adult female <i>Homo ergaster</i> KNM-ER 1808 display evidence of chronic hypervitaminosis A, a condition causing periosteal calcification of long bones and associated with severe musculoskeletal and vascular complications. Known clinical consequences suggest she survived <i>'weeks or maybe months ... [enduring] ... such extensive blood clots, she must have been completely immobilised with pain'</i> (Walker and Shipman 1996:134). Walker and Shipman (1996) conclude that she had dedicated carers providing food, water and protection from predators, and suggest her prolonged survival marks the beginning of human sociality. Her care reflects <i>'strong ties among individuals that came to exceed the bonding and friendship we see among baboons or chimps or other nonhuman species'</i> (Walker and Shipman 1996:134).

3	530,000 BP <i>Spain</i>	<p>Gracia et al. (2009). Cranium SH14 (Sima de los Huesos), belonging to an unsexed child, 5-12.5 years, displays evidence of lambdoid single suture craniosynostosis with severe endo- and ectocranial deformities likely associated with elevated intracranial pressure. This rare congenital condition is associated with progressive deterioration in cognitive capability and physical appearance. Cranial deformity was apparent at or soon after birth, and this child's survival indicates the Sima de los Huesos hominins tolerated '<i>abnormal / ill individuals during infancy</i>' (Gracia et al. 2009:6576). This child '<i>may have required extra conspecific care ... to survive for a number of years before he / she died at the end of childhood</i>' (Gracia et al. 2009:6573), and of note is that '<i>her / his pathological condition was not an impediment to receiv[ing] the same attention as any other Middle Pleistocene Homo child</i>' (Gracia et al. 2009:6577).</p>
4	400,000 BP <i>Morocco</i>	<p>Hublin (1985; 2009), Bower (1994). Cranial remains of a young adult ?female <i>Homo erectus</i> display cranial distortion and muscular trauma arising from congenital torticollis. This condition can also be associated with limitations on limb movement, hip displacement and club foot. '<i>The Salé individual undoubtedly had reduced mobility but still survived into adulthood ... This implies a certain degree of compassion in early social groups</i>' (Hublin, quoted in Bower 1994:250). In 2009 Hublin explained the survival of the Salé individual as a product of '<i>evolved altruism</i>' (Hublin 2009:6430).</p>
5	180,000 BP <i>France</i>	<p>Lebel et al. (2001); Lebel and Trinkaus (2002). Aubesier 11, an older Neanderthal ?female, is represented by the entire right mandible (extending to the alveolar margin of the left canine) which displays evidence of widespread, active infection for some time preceding death. Extrapolating from extreme antemortem tooth loss, the authors argue that Aubesier 11 was effectively edentulate. '<i>It is unlikely that ... [Aubesier 11] could have survived ... as a forager without social assistance. ... The form of assistance could have ranged from the selective allocation of softer food items to assistance in the preparation of food into a form suitable for deglutition. ... [This aid] may well have made the difference between rapid starvation and prolonged life</i>' (Lebel and Trinkaus</p>

		<p>2002:682). Aubesier 11's survival supports claims for '<i>an important social component in the persistence of individuals during this time period</i>' (Lebel et al. 2001:11102) and the conclusion that this population '<i>had achieved a level of sociocultural elaboration sufficient to maintain debilitated individuals and to provide the motivation to do so</i>' (Lebel et al 2001:11102).</p>
6	<p>150,000 BP <i>Sudan</i></p>	<p>Spoor et al. (1998). Evidence from the late archaic hominid / early modern human Singa calvaria (unsexed, no age status) suggests survival for at least 1 year with extensive labyrinthine ossification in the right temporal region, minimally resulting in unilateral loss of auditory and vestibular function. Pathology was likely associated with an hereditary anaemia or acquired blood disease. '<i>[T]he Singa individual must have gone through a period characterized at the very least by severely impaired body coordination and at the worst by a life-threatening infection such as bacterial meningitis or septicaemia. In addition, there was the considerable handicap of permanent unilateral hearing loss and possibly any symptoms associated with a blood disorder. Given these circumstances it is debatable to what extent the survival of the Singa individual would have required care by others</i>' (Spoor et al 1998:48). [This ambiguous last statement is interpreted by this author as proposing an hypothesis of care, although it is acknowledged that the authors do not make a direct claim for caregiving.]</p>
7	<p>95,000 BP <i>Israel</i></p>	<p>Shea (2003), Tillier (1995), Tiller et al (2001). The remains of the ancient <i>Homo sapiens</i> adolescent Qafzeh 11 display evidence of healed head injury, and those of the child Qafzeh 12 indicate survival to ~3 years with (often fatal) congenital / early acquired hydrocephalous and related post-cranial morbidity. In relation to Qafzeh 12 it is noted that palaeopathology research may help in understanding contemporary '<i>cultural behaviors</i>' (Tillier et al 2001:168), but no direct claim for care is made. Shea (2003) (a secondary source) suggests that '<i>[t]he power of ... [intra-group] affective relationships can be seen in Qafzeh 11's survival of severe cranial trauma as well as in the care given to several of the Qafzeh juveniles with severe neurocranial abnormalities (Qafzeh 19, 21), including hydrocephaly (Qafzeh 12)</i>' (Shea 2003:362).</p>

8	45,000–60,000 BP <i>Iraq</i>	<p>Solecki (1971); Trinkaus 1978; Trinkaus 1983; Trinkaus and Zimmerman (1982). The Neandertal Shanidar 1, male, 35-45 years, survived multiple pathologies occurring years before death, including cranial trauma likely resulting in vision loss in the left eye and left cerebral motor cortex damage; right arm paralysis (possibly occurring in childhood); two fractures of the distal diaphysis of the right humerus as well as transverse fracture across the right olecranon fossa, resulting in amputation of the humerus at the elbow; osteomyelitis of the right clavicle; fracture to the right foot; and degenerative joint disease of the right knee and ankle.</p> <p>Shanidar 3, male, 35-50 years, lived for possibly years with severe osteoarthritis of the right foot (probably resulting from trauma) likely limiting mobility. He also survived an injury puncturing the left pulmonary pleura and possibly penetrating the left lung for (minimally) several weeks, during which time he would have been immobilised.</p> <p>Trinkaus (1978), Trinkaus (1983) and Trinkaus and Zimmerman (1982) observe that most remains of older Neandertals exhibit evidence of healed pathology, implying <i>'that the Neanderthals had achieved a level of societal development in which disabled individuals were well cared for by others of the social group. ... Several of them, particularly Shanidar 1 and 3, lived for many years with severely disabling conditions, which would have prevented them from actively contributing to the subsistence of the local group. These elderly individuals must have contributed in a more indirect manner to the well-being of their social groups'</i> (Trinkaus and Zimmerman 1982:75). Solecki (1971:195-6) notes <i>'[a]lthough he was born into a savage and brutal environment, Shanidar 1 man provides proof that his people were not lacking in compassion. ... [He] was at a distinct disadvantage in an environment where even men in the best condition had a hard time. He could barely forage and fend for himself, and we must assume that he was accepted and supported by his people up to the day he died'</i>. Solecki discusses Shanidar 1's possible economic role in his community, suggesting his intentional burial indicates group esteem. Referring to Shanidar 1 and 3, he observes <i>'the very fact that their lame and wounded ... had been cared for in the cave is excellent testimony for communal</i></p>
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		<i>living and cooperation'</i> (Solecki 1971:258), challenging characterisation of prehistoric life as <i>'nasty, brutish and short'</i> (Solecki 1971:268).
9	40,000 BP Germany	Schultz (2006). Neanderthal 1, male, 50+ years, suffered severe chronic sinusitis <i>'which was the basis of development of a tumorous process'</i> (Schultz 2006:253) up to his death. There are skeletal indicators of recovery from a meningeal disease associated with haemorrhagic activity, caused either by meningitis or from blunt trauma (the latter evidenced in the healed lesion in the right supra-orbital arch). A malaligned healed fracture of the left elbow (resulting in reduced flexion and hypotrophy of the remaining left humerus and ulna) suggests trauma occurred before completion of skeletal development. Microscopic examination reveals osteoclastic processes in upper and lower limb compact bone, likely to have been systemically debilitating. <i>'In summary, this individual suffered from several severe diseases which made his life extremely difficult. Thus, without the social care of his group he probably would not have survived for such a long time and his lesions would not have had the opportunity to heal in such a complete way'</i> (Schulz 2006:253)
10	36,000 BP France	Zollikofer et al. (2002). A healed trauma on the cranial vault of the young adult ?male Neandertal St Césaire 1 shows extensive remodelling, with no signs of post-traumatic infection despite the original wound penetrating to the internal lamina, causing fracture and displacement of bone. Skeletal evidence indicates that St Césaire 1 lived for (minimally) months following injury. <i>'The immediate effects of the trauma were probably serious, implying heavy bleeding, cerebral commotion and temporary impairment. Although it is possible that the individual sustained these adverse effects autonomously, it can be assumed that they benefited at least to some extent from initial intragroup assistance'</i> (Zollikofer et al. 2002:6447).

11	<p>26,600 BP</p> <p><i>Czech Republic</i></p>	<p>Formicola et al (2001); Trinkaus et al. (2001). Skeletal abnormalities in the remains of the Gravettian DV15 (of the Dolní Věstonice 'triple burial') female, 21-25 years, suggest a diagnosis of X-linked dominant form of chondrodysplasia calcificans punctata (CCP). CCP is a congenital condition with potentially life-threatening complications in infancy, including recurrent respiratory and gastrointestinal infection, feeding problems and general failure to thrive. Longer-term effects range from skin disorders to cataracts, joint contracture, asymmetric shortening of limbs and bowing of long bones (the two latter are evident in DV15's remains). DV 15 also experienced one or more upper limb fractures. There is evidence of multiple severe health crises during childhood, and DV15 required applied care during this stage and possibly more generalised support subsequently. DV15's survival to maturity <i>'indicates considerable social support for an individual whose deformities and infirmities must have been apparent from infancy. This reinforces the perception of a highly coherent and supportive social system among these Pavlovian populations'</i> (Trinkaus 2001:1304). DV 15's survival <i>'provides clues about therapeutic knowledge of Upper Paleolithic populations, since the survival of similarly affected children is very problematic in the absence of adequate treatment and care'</i> (Formicola et al. 2001:377).</p> <p>DV15's robust upper and lower limb morphology (plus evidence of severe upper limb osteoarthritis) suggests that despite early and continuing health challenges she later participated in normal group activities, including long-distance travel and transporting heavy loads. This supports observations about Pavlovian lifeways more generally by reflecting <i>'the necessity for all individuals to participate actively in the elevated mobility and overall activity levels of these earlier Upper Palaeolithic human populations'</i> (Trinkaus et al. 2001:1291).</p>
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12	11,000 BP <i>Italy</i>	<p>Formicola et al. (1990). The remains of Arene Candide 2, a robust male, ~25 years, from a hunter-gatherer economy in the mountainous Ligurian region, display bilateral absence of the lesser trochanters, most probably resulting from avulsion fractures occurring prior to ~17 years. This injury is associated with excessive muscular exertion, detaching the lesser trochanter epiphysis from the femur and compromising related muscle insertions. Recovery requires a period of immobility, and is followed by temporarily reduced functional capacity. <i>'[T]he individual would have been moderately to seriously debilitated for about 3 months (according to modern recovery rates) and during this period would have required assistance from his local group during recuperation'</i> (Formicola et al 1990:435).</p>
13	11,000 BP <i>Italy</i>	<p>Frayer et al (1987; 1988) The remains of Romito 2, male, ~17 years, ~110-120 cms tall, display chondrodystrophic dwarfism (acromesomelic dysplasia) with associated complications, including bilateral restricted elbow extension. This condition is associated with delayed development; would pose mobility problems in the rugged Calabrian environment; and would restrict participation in hunter-gatherer activity. Despite Romito 2's disability he was interred in a cave of likely cultural significance; both his survival and mortuary treatment <i>'attest to his acceptance by the group despite his severe handicap and limited ability to contribute to subsistence and other economic activities'</i> (Frayer et al 1987:62). <i>'[T]his burial is an important case of care and affection towards a handicapped member in Upper Paleolithic society'</i> (Frayer et al 1988:563), all the more noteworthy because acceptance and support were given to someone whose handicap was visible from birth (rather than acquired in later life). <i>'[T]he fact that this individual reached late adolescence attests to the tolerance of Upper Paleolithic groups for severely abnormal individuals and their ability to support members who were of limited economic value to the social group'</i> (Frayer et al 1988:549).</p>

14	~6800-4900 BC <i>Russia</i>	Lieverse et al. (2008) The remains of Shamanka 29.1, male, 20-30 years, display extensive atrophy of all right upper limb bones <i>'from clavicle to manual phalanges'</i> (2008:219) indicative of paralysis of the entire right arm resulting from long standing, probably congenital, pathology. This <i>'tremendous disability'</i> (Lieverse et al. 2008:236) would have been particularly challenging in a hunter-foraging society. Although declining to speculate on specific functional consequences of this disability, <i>'it is certain that his condition was widely recognised by his peers and likely that it elicited at least some assistance and intervention on his behalf by the able-bodied'</i> (Lieverse et al. 2008:236).
15	7,500 BP <i>United States of America</i>	Dickel and Doran (1989). The skeletal remains of the 'Windover Boy', ~15 years, display evidence of severe, symptomatic spina bifida aperta and directly and indirectly associated disabling complications, including disuse atrophy of upper and lower limbs, suggesting progressive loss of sensation and mobility, and (likely consequent) serious long term and chronic infection in the right lower leg (left lower leg missing). <i>'The study of paleopathology can indicate a society's ability to support economically non-contributing members, thus aiding an understanding of adaptive success. The chronic nature of the [neural tube defect] and infectious processes helps provide insight on the high level of extended care and attention provided a severely handicapped individual 7,500 years ago. Mobility impairment would be especially difficult to support with an adaptation based on seasonal rounds and dispersed subsistence exploitation, and the need for chronic care must have been compounded by the increasingly severe chronic infection. Despite older stereotypes often found in the popular image of early prehistoric populations, under some conditions life 7,500 years ago included an ability and willingness to help and sustain the chronically ill and handicapped'</i> (Dickel and Doran 1989:332).
16	7000 BP <i>Portugal</i>	Lubell and Jackes (1985); Lubell et al. (2004). The partial remains of two adults, Samouqueira 1 (male) and 2 (?male), from a Mesolithic coastal site, display evidence of survival with/following pathology. Samouqueira 1 experienced an infected compound fracture of the right distal humerus considerably before death;

		<p>malaligned healing resulted in abnormal function. A pathological right third metatarsal suggests injury with infection to the sole of the foot. <i>'It is interesting to speculate upon the level of society which could support an individual such as Samouquiera 1, for whom walking would have been extremely painful</i> (Lubell and Jackes 1985:131). Samouqueira 2 (upper limbs only recovered) displayed trauma-induced arthritis in both wrists. <i>'Neither of these individuals could have functioned normally ... It is clear that the groups living at Samouqueira were able to provide support for individuals who would not have been able to participate fully in all subsistence activities'</i> (Lubell et al., 2004:212)</p>
17	<p>5000-4900 BC Germany</p>	<p>Orschiedt et al. (2003). Cranial remains of an early Neolithic adult male, 40-50 years, display four healed lesions suggesting survival following at least two separate incidents of severe head trauma. The injuries probably resulted from interpersonal violence; would likely be temporarily incapacitating; and likely led to temporary, possibly permanent, neurological damage expressed in motor function disruption and /or intellectual or behavioural deficit. This individual <i>'may have received some medical treatment and social care. This treatment must have exceeded a mere tending of the wounds because of the mental disorders the patient may have suffered during convalescence.'</i> (Orscheidt et al. 2003:381). There is evidence of trephination in a neighbouring cemetery, although this procedure was not used in this case. The authors suggest this may reflect the absence of appropriately skilled 'surgeons' or that trephination was 'prescribed' only for specific conditions not pertaining in this case.</p>
18	<p>4900-4700 BC France</p>	<p>Buquet-Marcon et al. (2007). Skeletal remains of an elderly male from an agro-pastoral community suggest survival for months, possibly years, following surgical amputation of the left lower forearm. There is no evidence of associated infection, and <i>'sophisticated medical skills'</i> (Buquet-Marcon et al. 2007:7) are indicated in relation to both surgery and post-surgical treatment. The remains also display edentulism and arthritis of lower limb joints and the length of the spine, the latter likely resulting in <i>'handicapping osteoarthritic backaches'</i> (Buquet-Marcon et al. 2007:8). This man was interred with particularly rich grave goods,</p>

		<p>suggesting that <i>[d]espite the serious handicap ... [he] obviously enjoyed some particular social status</i>' (Buquet-Marcon et al. 2007:1). This man's survival <i>'confirms the existence at the time of some form of mutual aid and solidarity towards disabled people ... The unexpected attentions and technical competences in surgery given by this Neolithic group towards one of their elderly and disabled member[s] suggests a considerable level of social, medical and even moral development in Western Europe, some 7000 years ago'</i> (Buquet-Marcon et al. 2007:8-9).</p>
19	4200-4000 BC <i>Bulgaria</i>	<p>Zäuner et al. (2011). Evidence of well-healed amputation of the right hand of a female aged 60+ years (No. 105) recovered from a Late Chalcolithic settlement site suggests well-established skills in both surgery and wound management. The authors discuss possible reasons for amputation; possible techniques and technologies employed; analgesic options likely available for use in surgery; and possible relationships between access to surgery and social status (they lack evidence to assess No. 105's status and are therefore unable to draw a conclusion on this aspect). <i>'The accuracy of the surgical intervention and the long survival time indicate highly developed medical knowledge throughout Europe at the end of the fifth millennium. This may also include use of anaesthetics'</i> (Zäuner et al. 2011:np)</p>
20	4000 BC <i>Italy</i>	<p>Formicola et al. (1987). Lower thoracic and lumbar vertebral deformation and destruction evident in the remains of Arene Candide 5, male, ~15 years, indicate late stage tuberculosis; general stress indicators suggest disease onset around 11-12 years of age. Arene Candide 5 came from a small community making the transition to pastoralism and agriculture while still partly reliant on hunting and gathering. <i>'It is likely that the serious infirmity that greatly limited physical capacities could also have affected this individual's social life. In this respect, however, the youth's survival during the long illness and his regular burial prove the group's support and care, indicating integration rather than discrimination'</i> (Formicola et al. 1987:5).</p>

21	6000-5500 BP <i>China</i>	Hernandez (2011). Differential diagnosis of severely restricted growth and delayed epiphyseal fusion observed in the remains of an unsexed adult individual (M53), aged 26-33 years, ~1.5m tall, suggests hypopituitarism. M53 was recovered from a Neolithic cemetery and received standard mortuary treatment. No disease impacts other than ‘short stature’ are reported. <i>‘This condition may have been a disadvantage within this prehistoric society, but there are no signs ... which suggest that this individual was treated differently from the rest of the population. This case adds to previous reported cases of individuals with short stature/skeletal dysplasia in the archaeological literature, thus enhancing our understanding of ancient civilizations and shedding light on how early societies handled individuals with physical anomalies or developmental disabilities.’</i> (Hernandez 2011:np).
22	3500 BC <i>England</i>	Galer 2007. Fused first and second cervical vertebrae, recovered from a deposit of mixed adult skeletal elements from the Early Neolithic Ascott-under-Wychwood long barrow, suggest survival following a potentially life-threatening injury in which the axis body and odontoid process were significantly displaced relative to normal articulation with the atlas. The ankylosis of axis and atlas served to stabilise the injury, indicating a substantial period of survival following trauma. <i>‘This individual was extremely lucky to survive’</i> (Galer 2007:212) both the original injury and later complications that have the potential to compromise central nervous system function. <i>‘It seems very likely that this individual would have required care, following the injury’</i> (Galer 2007:213). <i>‘From the palaeopathological evidence it is feasible to contend that [the individuals recovered from the long barrow] were perhaps a tight familial group, who may well have cared for their sick and injured’</i> (Galer 2007:218).
23	4820 BP <i>Southern Africa</i>	Pfeiffer and Crowder (2004). The skeletal remains of the infant SAM-AP 6060, ~5 months, display evidence of hypertrophic (hyperplastic) rickets, associated with slightly delayed symptom onset ranging from restlessness and irritability through to respiratory and gastrointestinal pathologies and convulsions. <i>‘Solicitous care maintained the sick infant to an estimated age of 3.5-5 months; it</i>

		<p>was buried in a manner like that of other deceased group members' (Pfeiffer and Crowder 2004:23) Noting '<i>the rarity of birth defects and serious chronic diseases among skeletons of foragers is consistent with scenarios which suggest that the frail [young] may not have been maintained within the group</i>' (Pfeiffer and Crowder 2004:23), the authors use this study to suggest that infanticide may have been restricted to those with a disability apparent in the immediate post-natal period.</p>
24	2125-1880 BC <i>England</i>	<p>Anderson (2002). The remains of a male (No. 5605), 35-45 years, display a healed, oblique shearing fracture of the right tibial plateau and the lateral portion of the right proximal tibial shaft. This severe injury would have resulted in temporary immobility and permanently compromised gait efficiency. '<i>The individual must have received attentive nursing. Basic splinting of the injury and some immobilization with the preparation and serving of foods while non-ambulatory. This indicates a level of care and compassion in the Bronze Age community</i>' (Anderson 2002:224). In the physically demanding peri-agricultural economy this individual was possibly '<i>regarded as something of a burden in the community</i>', but his elaborate burial treatment indicates '<i>a degree of physical incapacity was not in itself a barrier to high status recognition in this Bronze Age community</i>' (Anderson 2002:224).</p>
25	3500-3000 BP <i>Hokkaido, Japan</i>	<p>Suzuki et al. (1984). The remains of Irie 9, an unsexed young adult, 17-20 years, from a late Jomon coastal community, display evidence of severe disuse atrophy. A diagnosis of poliomyelitis anterior acuta (infantile spinal paralysis) - a disease usually affecting children aged below 5 years - is proposed. '<i>Irie 9 ... must have been obliged to spend his or her whole life in bed ... [I]t seems to be most interesting to observe that the Irie people must have taken every possible care of this patient and that such a handicapped individual was given such careful treatment and was hospitably accepted by the primitive society of the hunting-gathering Jomon population</i>' (Suzuki et al. 1984:103).</p>

26	(Late) Holocene <i>Australia</i>	<p>Webb and Thorne (1985); Webb (1995). The presence of congenital meningocele with complete perforation of inner and outer cranial tables is evident in the remains of a young adult female of around 20 years. The meningeal sac protruded through this opening, and trauma to the membrane would likely have resulted in infection and death. Despite this the woman survived to early adulthood in a hunter-gatherer economy, suggesting continuous care and monitoring through infancy, childhood and probably later life. That she survived with obvious deformity means <i>‘the common belief that infanticide was automatically used by [pre-contact] Australian Aborigines to dispose of every congenitally deformed infant must be re-assessed’</i> (Webb 1995:244). Webb (1995) documents additional cases of survival with other disabling conditions, including leg amputations and cleft palate. Surveying skeletal evidence of palaeopathology up to and around the time of European contact, he concludes <i>‘there was a great tolerance in Australian society of malformed and badly injured individuals as well as a willingness to look after their sick, deformed and maimed’</i> (Wells 1995:255).</p>
27	400-600 AD <i>England</i>	<p>Cox (1999). The remaining left upper limb bones from the incomplete remains of young adult female, 2BA466 (G114), 17-25 years, recovered from an Early Anglo Saxon settlement cemetery, display significant diaphyseal atrophy, likely the result of an asymmetrical paralysis consequent on a stroke affecting the right cerebral hemisphere. This <i>‘woman would have been severely disabled for some time before her death. Apart from mobility problems she may well have experienced partial or total loss of bladder and rectal control’</i> (Cox 1999:187), and her contribution to communal and family life would have been limited in comparison to that of healthy women of her age. <i>‘It is possible that she would have required special care. Her survival after her disability reflects the versatility and values of the society in which she lived’</i> (Cox 1999:187).</p>

28	550-800AD <i>Sudan</i>	<p>Kilgore and Van Gerven (2010). A young adult male (S-16) from a mediaeval Nubian community survived to 20-25 years with an extreme congenital scoliosis, severely restricting mobility; likely associated with organ defects affecting genitourinary, neurological and/or gastrointestinal functions and resulting in cardiopulmonary dysfunction; and leading to a '<i>a lifetime of disability and perhaps pain</i>' (Kilgore and Van Gerven 2010:641) in which symptoms worsened with age. '<i>There can be little doubt that this individual received considerable care and support from family and friends, and he was probably a well-integrated member of the society</i>' (Kilgore and Van Gerven 2010:641). A modern tradition of disabled individuals receiving favoured status may have existed in the past: '<i>[i]f so, the disabilities that afflicted S-16 may have actually inclined family members and other village inhabitants to provide him some measure of additional care, without which he could not have survived as long as he did</i>' (Kilgore and Van Gerven 2010:641).</p>
29	500-1000 AD <i>United States of America</i>	<p>Phillips and Sivilich (2006). Bilateral full cleft of the hard palate is evident in the remains of a 20-30 year old male from the Late Woodland culture. While in this case related morphological anomalies (affecting nasal bones and aperture) may have facilitated survival into adulthood, active intervention by others to plug the nasal aperture completely and allow suction and swallowing would have been essential to surviving infancy and early childhood. '<i>Cultural mechanisms may have aided this individual in surviving the complications from cleft palate that can lead to infant death.</i>' (Phillips and Sivilich 2006:34).</p> <p>[Brothwell (2010) suggests an alternative diagnosis - rhinomaxillary changes resulting from adult-acquired trepanematosi. If correct, above claims for care intervention no longer apply.]</p>
30	800-1100 AD <i>United States of America</i>	<p>Lovejoy and Heiple (1981). The authors analyse long bone fractures in a Late Woodland population (a sedentary community largely dependent on foraging), reporting a 45% chance of long bone fracture in any single individual. Most fractures appear the result of accident. The authors note high levels of successful healing: '<i>[i]t is significant that in specimens observed in this site,</i></p>

		<p>rarely did any major disability result from a healed fracture' (Lovejoy and Heiple 1981:540) and attribute this to skilled intervention. <i>'The remarkably complete healing process implies considerable knowledge and ability to care for traumatic lesions ... [suggesting] effective and thorough care of patients with fractures'</i> (Lovejoy and Heiple 1981:540).</p>
31	1030-370 BP <i>Argentina</i>	<p>Luna et al. (2008). The remains of a 40-50 year old male (Burial 12) from a highly mobile hunter-gatherer community display multiple osteolytic lesions consistent with late-stage metastasis secondary to a cancer of unknown origin (most likely of the lung, kidney, thyroid gland or bowel). The authors suggest the individual most probably suffered severe pain, weakness, fatigue and muscle atrophy for several months before death. <i>'[A]s a consequence of his impairment, in the last months of his life this individual may have needed the increasing assistance of other members of the social group in order to move and satisfy his basic needs. ... In the last days, the severity of the condition surely increased, and the dependence on other people may have been complete'</i> (Luna et al. 2008:502)</p>
32	1200-1400 AD <i>United States of America</i>	<p>Mann et al. (1998) The partial skeleton of a female (#228400), 20-30 years, from the agricultural Mississippian Moundville culture, displays a congenital malformation of the right arm comprising complete radiohumeral synostosis, absence of the ulna, curved and hypoplastic radius and probable deformity of the right hand (elements are missing), resulting in little, if any, effective use of this limb. <i>'Regardless of her range of physical abilities and degree of self-reliance, her deformity would certainly have been apparent to others. The fact that she survived into adulthood indicates that she was accepted as part of the community'</i> (Mann et al. 1998:298). <i>'That a physically deformed individual could survive to adulthood attests to both their ability to adapt to the handicap as well as society's acceptance, support, or at the very least its indulgence of persons with potentially crippling deformities'</i> (Mann et al. 1998:296).</p>

33	1200-1468 AD <i>England</i>	<p>Stirland (1997). Two male individuals recovered from a Mediaeval parish cemetery were so severely disabled that neither could have <i>'survived into adulthood unaided'</i> (Stirland 1997:590). The first, a mature adult (No. 439), experienced juvenile-onset polyepiphyseal disease <i>'leading to both pain and disability as well as a reduced stature'</i> (Stirland 1997:589). The second (No. 235), a younger adult, likely suffered a severe neuromuscular disorder (congenital or acquired) resulting in paraplegia. There are many other examples of survival with, or following, disabling pathology (including severe injury, age-related diseases and systemic diseases such as tuberculosis and leprosy) from this cemetery which <i>'will have required care for their survival and, therefore, interaction with and intervention by others'</i> (Stirland 1997:590). The evidence <i>'strongly suggests that the associated community was a caring one, where physically disabled individuals were supported and those needing nursing were cared for'</i> (Stirland 1997:587) and <i>'that 'Care in the Community' is not, after all, a modern concept but has long antecedents'</i> (Stirland 1997:590).</p>
34	1300-1500 AD <i>United States of America</i>	<p>DiGangi et al. (2010) The remains of a female (Burial 50), 29-51 years, from the agricultural Mississippian period show evidence of cartilaginous dysplasia resulting in significant differences in length between the right (181mm) and left (263mm) humerus, and left (287mm) and right (345mm) femur. Her calculated height (118.8-137.4cm) is at least 15 cm shorter than mean minimum adult female stature for this population. Skeletal deformities likely manifested during the first decade; she would have walked with a pronounced limp from childhood; and skeletal markers indicate continual biomechanical stress. Her survival to adulthood <i>'indicates that the Mississippian people in this community offered some kind of social support to physically impaired individuals'</i> (DiGangi et al. 2010:425) She was buried in a platform mound, a site typically reserved for males; women receiving this mortuary treatment may have been of special community importance. <i>'If this was indeed the case, then the inclusion of Burial 50 in the platform mound may be symbolic of a community-wide status related to her acute physical differences'</i> (DiGangi et al. 2010:438). While not speculating on her</p>

		<p>specific role, the authors suggest she was likely a valued community member, and her survival represents <i>'a rare glimpse into not only the possible nature of the particular connections that she had with others, but of the nature of social support systems in this Mississippian society. ... [She] provides a unique lens through which to view Mississippian interpersonal relationships.'</i> (DiGangi et al. 2010:439).</p>
35	<p>1550-1672 AD <i>United States of America</i></p>	<p>Hawkey (1998). Skeletal remains of the adult male Gran Quivira 391 display evidence of progressive deterioration and eventual almost total loss of physical functionality resulting from systemic juvenile chronic arthritis. By adolescence walking was impossible; by death at ~40 years almost all joints were immobilised and Gran Quivira 391 was restricted to head, neck, shoulder and possibly finger movement. <i>'The condition of impairment observed in Gran Quivira 391 indicates he was dependent on other people over a protracted period of time. A combination of MSM indicators, joint mobility estimates, and clinical disease progression data suggest that although severely impaired, Gran Quivira 391 was well-cared for, permitting him to survive to middle age'</i> (Hawkey 1998:336, 338). Other than suggesting that Gran Quivira 1 was probably able to feed himself, although <i>'[g]iven the severity of his condition he would have required someone to supply him with food'</i> (Hawkey 1997:335), the nature of his care is not considered. Based on mortuary treatment Hawkey observes that <i>'[a]lthough Gran Quivira 391 may not have been able to perform activities commonly done by others in his cohort, there is no archaeological evidence to suggest he was treated differently'</i> (Hawkey 1998: 336). Gran Quivira 391 may have been subjected to the ethnohistorically-documented practice of strapping an individual to a board in order to 'cure' kyphosis during the early stage of his disease - this would have <i>'disastrously'</i> worsened his condition (Hawkey 1998:335).</p>

* Publication details for all documents cited in this Table are provided in the 'References' section of this thesis. Dates reflect original dating protocols. Reports are ordered on the basis of earliest to most recent.

APPENDIX B

The Index of Care

The Index of Care is a computer-based application developed to support the bioarchaeology of care methodology. Using a series of worksheets to assist in organising and recording evidence, observations and ideas, it offers a structured process for thinking through the analysis of a case study of care centred on a prehistoric individual represented only by their physical remains.

The Index does not generate 'answers'. It is designed as a flexible tool to support researchers in forming their own conclusions based on available evidence, and it has three main functions:

- to help ensure that all information relevant to possible care provision is considered;
- to encourage and enable transparency in bioarchaeology of care research; and
- to assist the logical ordering of information, inferences, conclusions and interpretations, thereby facilitating production of a final research report.

The Index is in the early stages of development. A disk containing the beta version of the Index of Care is provided in the sleeve on the inside back cover of this thesis.

Design and content of the Index of Care are the original work of the author.

The Index of Care was produced as a computer-based application by Tony Cameron.

THE INDEX OF CARE

The Index of Care is a computer-based application developed to support the bioarchaeology of care methodology.

It forms Appendix B of the PhD Thesis *Towards a Bioarchaeology of Care: A contextualised approach for identifying and interpreting health-related care provision in prehistory* (Lorna Tilley).

Instructions for installing the Index of Care

Insert the disk into a Windows 7 or Windows 8 machine. This version of the Index of Care is not designed for use on Macs

If you have a Windows 7 machine, you may need to install the .NET 4.5 Framework. This is on the disk in the .NET 4.5 Installation folder, and may take some minutes to install.

When installation is complete, run the setup.exe program on the disk. (There are two 'set up' folders, one corresponding to 'applications' and one to 'configuration settings' - you want the **first** of these. Select the 'setup' with the solid blue icon named in lowercase). Accept all defaults and wait for the installation to complete. There will be an icon (a black-framed rectangle with a white star on a small black square in the lower left corner) placed on the desktop. If you have not unselected the 'Launch on completion' the Index will open automatically. **N.b. this is a beta version of the Index. Please be patient where necessary!**

Content and design by Lorna Tilley, produced as a computer application by Tony Cameron.

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