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Lorna Tilley

Theory and Practice in the Bioarchaeology of Care

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For Tony
&
Dedicated to the memories of my mother,
Gwyneth Tilley, and my father, Derek Tilley.

Foreword

This volume kicks off a new book series, Bioarchaeology and Social Theory, in a grand and illustrative manner. The series highlights the application of social theories in interpreting data derived from bioarchaeological research. Social theory bridges data with explanation and focuses on cultural processes such as power, ideology, symbols, meaning, social structures, agency and identity. The series promotes studies that link past understandings with present-day problem solving. These studies emphasise ethical and critical considerations of bioarchaeological research.

Disease is a perennial topic of interest to a broad range of social and natural scientists and the public. Being able to systematically place disease within a broader framework to understand its impact on individuals, communities and societies can only be done utilising a framework that is integrative across environmental, biological and cultural domains. Traditionally, bioarchaeological approaches to disease have focused more on the pathology itself. From this, generalisations are made about the effects of disease or temporal/spatial changes in the disease. This volume provides a scientifically based and theoretically enriched model for how to go from descriptions of disease to a discussion of possibilities for what that disease meant for caregiving and caretaking. This model stresses the need for careful and considered analysis of the disease process across life history. Differential diagnosis, medical and clinical understanding of the disease, and the complexities of the biocultural context within which the individual was living are utilised in a systematic and straightforward manner.

This study covers a new area of research in which it becomes possible to discuss disease processes, disability and impairment with specificity and attention to the appropriate clinical and medical literature. Extending this baseline data into an interpretation of care and caregiving as well as the role of agency by the person with the health problem and by their kinfolk or extended family are all carefully considered. The author provides, at every step, the published criticisms of moving beyond the realm of the empirical data derived from the skeleton into more ideological and cultural behaviours involved in caregiving. Providing a point-by-point counter to the general criticism that caretaking can never be empirically proven for past peoples, a sound counter-argument is made for how to approach reconstructing caregiving and caretaking behaviour.

Not only does this volume link social theory with bioarchaeology, but it provides a hands-on how-to manual for carrying this research into ever-expanding regions and time periods. This work can be used by anyone interested in palaeopathology and bioarchaeology to test drive the model to see if it improves upon older methodological approaches to disease. This volume also speaks to the growing interest in scale, that is, in moving between individual, population and regional analyses. It addresses important health issues that have implications for enriching and expanding our understanding of human behaviour into new areas of study. An argument can be made that these kinds of carefully analysed case studies may be useful in contemporary settings to explicate where resources or public policies might be better aimed to provide better care for people living in places where health care is less than optimal.

The value of the case study approach while utilising a range of social theory about dimensions of human propensities and behaviours cannot be stressed enough. This work represents the wave of the future and the direction that bioarchaeological studies are beginning to take. This kind of integrative, contextualised and comprehensive approach to the topic of disease and care is groundbreaking and it has potential to add new dimensions to bioarchaeological research in the future.

Debra L. Martin

Acknowledgements

I think of this book as both an end and a beginning. An end, because it is the refined version of the Ph.D. thesis (submitted in 2013) in which I first laid out the bioarchaeology of care approach I spent years of study developing—finally, here is my public exposition of theory and practice! A beginning, because I know that this new approach has the potential to go further than I have gone with it, and I can only hope that other bioarchaeologists will take what speaks to them about the theory and practice of the bioarchaeology of care as presented here—and make it their own.

It is difficult to know where to start acknowledging the support I have received. But I will begin with a general expression of gratitude for the acceptance and generosity of spirit in relation to my research that I have encountered both among practitioners of (bio)archaeology, palaeopathology and anthropology, and—which surprised me more—among members of the general public. I have received messages expressing interest and encouragement from people from different walks of life and from all parts of the world, and their enthusiasm has kept me going even when frustration threatened to overwhelm endeavour.

Some people have been invaluable in making my work possible, however. Firstly, I must thank Marc Oxenham (Australian National University), who was my Ph.D. supervisor and with whom I have co-authored a number of papers. As my supervisor, Marc gave me complete freedom to develop my own ideas and directions without attempting to impose limits, and as my colleague he has been unfailingly encouraging and fiercely supportive of my research. Without Marc, I may never have undertaken the work that led to the realised bioarchaeology of care approach—and to this book. Next, I must thank Tony Cameron, on two counts. It is convention to thank one's partner in the final paragraphs of the "Acknowledgements," and Tony certainly deserves my deep gratitude—and admiration—for putting up with me during my research for, and writing of, my thesis and this book; more than this, he has been loving, patient, understanding and supportive—and what more could one ask for? However, I must also formally acknowledge Tony's role in producing the Index of Care, the online instrument supporting the bioarchaeology of care methodology. While I am solely responsible for the design and contents of the Index, and any criticism must fall on my shoulders, Tony, an information technology professional, must

take all credit for converting this design into a user-friendly application. And finally, my deepest gratitude goes to Jane Buikstra (Arizona State University) and Debra Martin (University of Nevada, Las Vegas), giants in the field of bioarchaeology and indefatigable in furthering this most exciting of disciplines. Jane and Debra have mentored and motivated me with an entirely selfless grace and patience from the time that I first went public with the bioarchaeology of care to this day, and without their continuing constructive, critical and very practical support and encouragement I am not sure how far this new approach would have gone.

Development and testing of the bioarchaeology of care methodology (and subsequently the Index of Care) relied on access to skeletal remains. Many institutions (and many curators) cooperated in this regard, and I am very grateful to the following for allowing me to work with their collections: Gail Boyle, Bristol City Museum and Art Gallery (UK); Alison Brookes, Corinium Museum (UK); Steve Burrow, National Museum Wales (UK); Ann-Rachael Harwood, Cheltenham Art Gallery and Museum (UK); David Rice, Gloucester City Museum and Art Gallery (UK); Jiří Svoboda, Paleolithic and Paleoethnology Research Centre, Dolní Věstonice (Czech Republic); Petr Veleminsky, Prague National Museum (Czech Republic) and Amélie Vialet, L'Institut de Paléontologie Humaine (France).

In relation to Chap. 8 case study, I wish to thank the Institute of Archaeology, Hanoi, Vietnam, Hirofumi Matsumura of the Sapporo Medical School, Hokkaido, Japan, and Damien Huffer (then Australian National University) for their roles in the excavation of Man Bac Burial 9 (part of this research was funded under an Australian Research Council Discovery Grant). In relation to Chap. 9 case study, I wish to thank Philippe Mennecier and his team from Le Musée de l'Homme, Paris, France, for granting access to the very precious remains of the Neandertals La Ferrassie 1 and La Chapelle-aux-Saints 1; I also thank Jarvis Hayman (Australian National University) for his help in analysing the impacts of their pathologies. Finally, in relation to Chap. 10 case study, I wish to thank the Duckworth Laboratory, University of Cambridge, UK (and Mercedes Okumura in particular), for permitting access to the remains from the north-west chamber of the Lanhill Long Barrow, and Paul Robinson, Wiltshire Heritage Museum, Devizes, UK, for providing access to the remains from the south chamber of this long barrow. Martin Smith (Bournemouth University) directed me towards the Lanhill south chamber remains and joined me in examining the north-west chamber remains, and I am grateful for his company and his observations.

There are many others I could name, had I the space. Among them, I wish to give special thanks to Charlotte Roberts, for her early and continuing interest in my research and for her hospitality; Peter Hiscock, for his encouragement in the early stages of research development; Ladislav Nejman, for facilitating my access to skeletal materials in the Czech Republic (the Dolní Věstonice remains were a highlight of my research); Virginia Esposito, for being a "study partner"-cum-sounding board in the Ph.D. and book writing processes; Robert Tilley (my brother), for his feedback on drafts of Chap. 4 and general faith in my topic; David Mennear, for his promotion of bioarchaeology of care research on his archaeology blog *These Bones of Mine*, his correspondence generally and his feedback on Chap. 2 in particular;

and Gary Campbell, who provided a stimulating and confidence-boosting commentary on most of the draft chapters of this book. A very heartfelt "thank you" is due to my sister, Myfanwy Tilley, who read through all drafts of my thesis (often more than once) in the guise of "intelligent lay reader"; my thesis is the foundation of this book, and her comments—which were always relevant and very highly valued—inform the content of all chapters.

Finally, I would like to thank Teresa Krauss and Hana Nagdimov, both members of the Springer editorial staff, for their good humour and their patience—indispensable qualities for dealing with authors.

Contents

About the Author

Lorna Tilley, a latecomer to archaeology, graduated in 1981 with first class honours in psychology from Flinders University, South Australia (awarded the University Medal), and has worked in areas of social justice, health practice, health status and health outcomes assessment, and health policy development. In 2013 she was awarded a PhD by the Australian National University (ANU) for her thesis, *Towards a Bioarchaeology of Care: A contextualised approach for identifying and interpreting health-related care provision in prehistory*, on which this book is based. Since 2011 she has been sole or primary author of articles, essays and national and international presentations introducing and applying the bioarchaeology of care approach and its dedicated online instrument, the Index of Care; her first case study illustrating application of bioarchaeology of care theory, co-authored with Marc Oxenham and titled 'Survival against the odds: modeling the social implications of care provision to seriously disabled individuals', was recently awarded *Most Influential Paper (2011–2015)* by the International Journal of Paleopathology. Lorna Tilley has taught at graduate and postgraduate levels at the ANU, and is currently a Visiting Fellow at the School of Archaeology and Anthropology, College of the Arts and Social Sciences, ANU.

Chapter 1
Introducing the Bioarchaeology of Care

> Between 3700 - 4000 years ago in northern Vietnam a young man survived for approximately 10 years with disabilities so severe he would have been dependent on assistance from others for every aspect of daily life. … [His] survival reflects high quality, continuous and time-consuming care within a technologically unsophisticated prehistoric community (Tilley and Oxenham 2011:35).

It is axiomatic that disease is a constant of human existence. It is only logical, therefore, that the willingness to care for those who are in some way disabled by disease is widely regarded as a characteristic that defines what it is to be human (Gould 1988; Green 2003). The bioarchaeology of care focuses on this quintessentially human behaviour, providing both a conceptual and an applied framework for analysing archaeological indicators of health-related caregiving practice and, as a consequence of this, deepening our understanding of the past.

In bioarchaeology, the provision of health-related care is inferred from physical evidence in a set of human remains indicating survival with, or recovery from, a disabling pathology in lifeways circumstances where, without such support, the person may not have survived to actual age at death. Yet despite an extensive literature documenting individual examples of serious pathology – including reports in which the likelihood of care is explicitly acknowledged (although rarely explicated) – and a plethora of research exploring interactions between the evolution of disease, social and environmental variables and population health status, archaeology has overlooked health-related caregiving as a specific focus of analysis.

This has resulted in the neglect of a potentially valuable source of knowledge about past behaviour. Care provision is a conscious and purposive practice that involves caregiver(s) and care recipient(s), and it does not take place in a void. In any community, at any point in time, the perception of what constitutes 'health' and 'disease' and the related response to the care requirements of individual group members are shaped by a combination of cultural norms, values and belief systems; traditions; collective skills and experience; political, social and economic organisation; environmental variables; and access to resources (Bates and Linder-Pelz 1990; Gilson 2003; Hardey 1998; Hofrichter 2003; Mishler 1981; Pol and Thomas 2001).

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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 traits, beliefs and behaviours formed within a specific socio-cultural environment (Bowling 2002; Garro 2006; Lieban 1977). It follows that where health-related care practices can be identified in the archaeological record these may offer unique insights into aspects of the society of that period. They may also offer opportunities for reflecting on the state of healthcare practice in modern society as well.

The bioarchaeology of care was developed to mine this untapped seam of information. First employed in a case study of survival with severe disability in an early Neolithic community in Vietnam (Tilley and Oxenham 2011), it provides a theorised, contextualised and systematic approach to identifying and interpreting cases of health-related care provision in the past. Since its introduction, the bioarchaeology of care has aroused considerable interest and provoked some heated discussion in research circles and, following world-wide print and online reproduction of a newspaper article featuring this Vietnamese case study (Gorman 2012), in the public arena as well. However, the approach's theoretical foundations and the detail of its methodology have never been elaborated. This book remedies that situation.

Theory and Practice in the Bioarchaeology of Care is intended to serve as the primary source of information about the new approach as well as a practical guide to its implementation. It takes the reader through the arguments that form the fabric of theory with which the bioarchaeology of care is constructed; it leads the reader step by step through the bioarchaeology of care methodology; and it provides three detailed examples of prehistoric caregiving to illustrate how bioarchaeology of care analysis has the capacity to reveal aspects of group and individual identity and lifeways that might otherwise remain hidden. The bioarchaeology of care approach has already attracted substantial attention. The goal of this book is to encourage debate, research and experimentation, in the hope that all these will lead to a continuing refinement of theory and method in this field.

Establishing Boundaries

Before proceeding, I want to provide some very brief definitions of a few of the key terms and concepts employed in this book, and to note certain limitations facing *any* research into past care practice. I also want to explain some of the parameters that I have adopted in developing the bioarchaeology of care approach, and to present a short overview of the applied bioarchaeology of care methodology. All points covered will be addressed in full at some stage within the body of this book.

Having done this, I will go on to describe the structure of the book and outline the chapter content. I will then raise some of the challenges faced by all archaeological research that deals with subject matter as contested as that of 'disability' and 'care' – and offer a personal response to these.

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 and functional impact. 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 capability.

'Disability' refers to a state (temporary or longer-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 'health-related care', 'care', 'caregiving' and 'care provision' are used interchangeably, and are defined as the delivery of assistance to an individual experiencing short, medium or long-term disability as an outcome of pathology. The detail of this care will depend on the nature of disability, the lifeways context in which disability occurs, and individual care-recipient characteristics. In bioarchaeology of care research, caregiving is loosely divided into 'direct support' – for example provisioning, hygiene maintenance, nursing, physical therapy – or 'accommodation' – such as the adoption of strategies to enable or facilitate a level of participation in cultural, social and/or economic activity which would otherwise not have been achievable. One of the implications of this approach is that a pathology need not have been completely disabling or ultimately fatal in order to qualify for bioarchaeology of care analysis, but when considered in the context of the demands of contemporary lifeways it should be possible to conclude that, on the balance of probabilities, the 'disabled' individual would not have been able to function independently within their community at a culturally appropriate level.

There are obvious provisos in inferring care. Health, disease and disability are perceived very differently in different cultures, and in many situations 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 ability 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 likely provided – must always err on the side of caution.

Finally, bioarchaeology of care analysis will usually be restricted to case studies of individuals. For a variety of reasons, many experiences of pathology will not manifest in bone (even if they have the potential to do so) and may not even be discernible in preserved tissue. This means that in any archaeological population, the full burden of disease and the frequency and features of caregiving response will remain unknown.

Parameters of Research and Development

To date, the development and application of the bioarchaeology of care approach has concentrated almost exclusively on skeletal remains, with most iterations of the methodology tested on curated skeletal materials of varying states of preservation and completeness. This osteological focus is reflected throughout the book, although mummified remains should be equally amenable to a bioarchaeology of care analysis. The reasons for this focus were pragmatic, based on the fact that the majority of prehistoric human remains are recovered in skeletal form and on the comparative ease and affordability of access to, and examination of, skeletal materials.

The selection of actual skeletal materials used in bioarchaeology of care testing and case studies was opportunistic, based on available published reports of pathologies evidenced in individual remains and the cooperation of museum authorities in granting access. This resulted in most of the materials coming from European sites (although one of the case studies in this book is of a South East Asian individual); one of the benefits of this is that European sites are comparatively well researched and documented, simplifying the task of contextualising analysis.

Where human remains meet the evidentiary criteria for receipt of care, the principles of the bioarchaeology of care approach should be applicable to remains from any era of the archaeological past. However, most of my research has been limited to examples of care provision from prehistory (with ‘prehistory’ referring to a period before ‘documented history’) and date to no later than the early to middle Neolithic. What constitutes early Neolithic is, of course, a moveable feast, with chronology and characteristics of early Neolithic culture varying considerably across different locations. For bioarchaeology of care purposes, early Neolithic was operationalised as the time around the adoption of agriculture; a period 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 (such as increasingly hierarchical forms of organisation, differential relationships between socioeconomic status and exposure to health risk) associated with the more complex societies (Kuijt 2000). To expand on this, it is assumed that in cases in which health-related caregiving occurred within a small community of maximally 50–100 members the subject of this care would have been known to everyone in the group. In these circumstances it is likely that most economically contributing group members had some level of involvement in caregiving – 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 when caregiving was required over an extended time. Such a scenario should make it easier to identify the range of opportunities and costs likely to have been involved in care provision; important considerations when attempting to understand the social and economic implications of an instance of caregiving. It must be noted, however, that when a community is very small this introduces a complication of its own – most, if not all, members may belong to the same kinship group, meaning that the role of family relationships in decisions around provision of care must be taken into consideration.

An Overview of the Bioarchaeology of Care Approach

In a case study of caregiving, all analysis ultimately derives from human remains which display potential evidence of survival with, or following, disability and which first triggered research interest. Leading from this, 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 possessing the dual identity of 'actor' and 'artefact'; 'actor' because the skeletal elements represent a once-living person who experienced disability and was an active player in their own care, and 'artefact' because the skeletal indicators of disability only exist by virtue of the care by others that helped this person to survive long enough for pathology to register in bone. Secondly, 'caregiving' is defined 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 the expression of agency.

The bioarchaeology of care methodology itself consist of four sequential stages of analysis, each building on the information, observations and conclusions of the previous one(s). The ordering of these stages describes a progression from straightforward recording of osteological and archaeological data, through increasing levels of deduction and inference, to interpretation.

More specifically, Stage 1 describes the individual's remains, their pathology, their mortuary treatment and the corresponding lifeways environment; the information brought together in Stage 1 is the basis 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 develops a basic model of the care likely to have been received, based on health-related requirements associated with the clinical and functional disease outcomes posited in Stage 2 and on what is possible and probable given what is known of the lifeways context. The likely duration of care and the 'costs' associated with caregiving (e.g. labour requirements, resources) are also considered in this model. Stage 4 unpacks and interprets the Stage 3 model of care.

Continuously referring back to the information and observations generated in Stages 1–3, 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 bioarchaeology of care methodology is supported by the 'Index of Care', a non-prescriptive web application designed to help researchers organise and record evidence, observations and ideas throughout the research process.

The Narrative of Care …

Robb (2001) suggests that drama may be a convenient systematising concept for approaching archaeological interpretation, because 'it incorporates intentionality, emotional engagement and experience, while recognizing the structuring power of context' (Robb 2001:1). It is easy to see how a bioarchaeology of care case study can be conceived of in this manner.

Stripped to its essence, a case study of care is a narrative that relates the story of a collection of individuals (the care-recipient and the supporting cast of caregivers) who are engaged in the complicated, inter-related, interactive, continuously refined and negotiated behaviours that go into providing and receiving care, played out against the backdrop of a particular cultural, social, economic and physical lifeways environment. The drama has its central protagonist in the subject who experiences disability, and action takes place over a period of time. It has a beginning – the first act, in which it becomes apparent that the main character requires health-related care, and those in the vicinity recognise this need and decide to respond to this need by providing the necessary support and assistance; a middle – the second act, covering the days, weeks, months or years during which care, and all the review and revision this entails, is given; and an end – the third act, the dénouement, in which, for whatever reason, be it the recovery, death, or abandonment of the protagonist, it is determined that care will no longer be provided. There may also be an epilogue – a final commentary on the protagonist that is relayed to the audience through the features of this individual's mortuary treatment.

The metaphor of drama is a useful one to bear in mind when undertaking any archaeological research that seeks to go beyond a simple 'list and describe' exercise, but in analysing the implications of caregiving it seems a particularly good fit.

A Guide to Book Structure and Content

Theory and Practice in the Bioarchaeology of Care contains 11 chapters, including this one. Those making up just over the first third of the book provide the background to, explain the reasoning behind, and establish the theoretical foundations, potential scope and boundaries of, the bioarchaeology of care approach. The two middle chapters then detail the four stages of the bioarchaeology of care methodology, and the three chapters following these present case studies illustrating the methodology's application. A brief concluding chapter looks at future possibilities for this new direction in research.

To elaborate – Chap. 2, *Setting the scene for a bioarchaeology of care*, reviews past and present treatment of health-related care provision in archaeological research, considering where, and why, this has fallen short. It discusses possible explanations for the general lack of interest (sometimes active hostility) shown towards this topic, and addresses the standard objections used in decrying archaeological engagement. It is the longest chapter in the book, but this is because it seeks to provide the reader with a comprehensive overview of scholarship, controversy and dissent in this field.

Matters addressed in Chap. 3, *Context for a bioarchaeology of care*, loosely correspond to the content covered in Stages 1, 2 and 3 of the bioarchaeology of care methodology. This chapter defines and operationalises key terms and concepts; reviews obstacles to identifying experience of disability and care in the past; considers likely demand for health-related care 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 loosely 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, *Origins of care,* discusses the conundrum of biological vs. social origins for health-related care, and considers how the position adopted in debate on this issue may affect participants' views on the motivations underlying caregiving behaviours. This chapter does not pretend to provide answers, but borrows eclectically from primatology, evolutionary biology and psychology, sociobiology, philosophy, and cognitive and social psychology in an attempt to identify some of the important questions. Chapter 5, *Agency, identity and the bioarchaeology of care,* invokes the archaeologies of agency and identity to propose ways of deconstructing the decision-making processes and the social relationships involved in the giving and receiving of health-related care, with the goal of illuminating some of the more obscure corners of past lives and lifeways.

As promised by their titles, Chap. 6, *The bioarchaeology of care methodology: Stages 1–3* and Chap. 7, *The bioarchaeology of care methodology: Stage 4*, walk the reader through the bioarchaeology of care methodology. These chapters describe all the elements of each Stage in detail, briefly recapitulate their rationale where considered necessary, and introduce the web-based Index of Care instrument.

Chapters 8–10 report the results of case studies using the bioarchaeology of care methodology, demonstrating the way in which research into past caregiving can contribute to archaeological knowledge and practice. Chapter 8, *Survival with severe disability: a case of long-term care in Neolithic Vietnam*, explores the care required by a young male from Neolithic Vietnam who lived for around a decade with quadriplegia, and discusses what his survival may reveal about the contemporary society and about the personality of the individual himself. Chapter 9, *Care among the Neandertals: La Chapelle-aux-Saints 1 and La Ferrassie 1*, considers what the evidence suggesting health-related care practice present in the remains of these two Neandertals may contribute to our understanding of behavioural complexity in the European Upper Middle Palaeolithic. Chapter 10, *Adjustment and inclusion in the British Neolithic: Lanhill Burial 7 and his community*, which focuses on the experience of an older male who lost the use of one arm in early adolescence, examines the implications of evidence suggesting that care in the form of accommodation was received by multiple individuals from the same British Early Neolithic community. It reflects upon how interpretations of caregiving within this group accord with mainstream beliefs about social relations and social practice in this period – and how they differ from 'established knowledge', and what these differences may signify.

Chapter 11, *Where to from here? Current status and future directions for the bioarchaeology of care*, summarises the main features of bioarchaeology of care analysis, identifies where this new approach sits in relation to wider archaeological theory and practice, and suggests directions for future study. It then reviews popular response to bioarchaeology of care research, and discusses the potential contribution of such research to wider public discourse.

Objective vs. Subjective: Some Preliminary Words on 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 actors and actions of the past. Interpretations may be accurate, or partly accurate, or completely erroneous, but we can never know whether these interpretations 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 sparse 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 (Chap. 2 provides a lengthy discussion on the points canvassed above).

It is freely acknowledged that, in modern western culture, the most basic term used in this book – 'care' – is value-laden, and in combination with the sensitive (and often disputed) term 'disability', it takes on an even greater ideological significance. This is illustrated in the opening statement of this chapter, which reflects the popular assumption that caring for someone who is disabled is unquestionably a 'good' thing to do – more than this, in fact, it is 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.

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 me, is a middle-aged woman who 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 even 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.

In Chap. 2, I discuss the possible contribution of ideology and experience to the previous dismissal of care as a subject for archaeology, and in Chaps. 5 and 7 I again raise the issue of subjectivity in interpreting care in relation to agency and identity. Because of this it seems appropriate to give a quick résumé of my own background, to help explain what I bring philosophically and empirically to the study of past health-related care provision from outside the discipline of bioarchaeology, as well as why I fall into the camp of those who believe 'caregiving' should generally 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 (or nurse assistant) for a total of 18–24 months, 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 geriatrics. I did not go on to qualify as a registered nurse, nor did I work as a behavioural psychologist on graduation, but subsequent employment included jobs in areas of public health and occupational health and safety policy and programs, and for almost a decade prior to beginning my studies in archaeology (I am a latecomer to the discipline) I worked in an agency concerned with issues of health status measurement and health outcomes assessment. The original idea for, and much of the form and content of, the approach to analysing care presented in this book have their roots in the knowledge, experiences, observations and impressions acquired over my own life course.

To conclude, and in a partial defence against the challenge paraphrased at the beginning of this section, I want to stress that the bioarchaeology of care is intended as a flexible approach – most emphatically *not* a formula – for assisting researchers to think about the wider implications of one particular past practice. It is inevitable that, in some instances, 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 that this is ever achievable, by building the highest possible level of transparency into each of the four stages of analysis, thereby ensuring that all steps taken in the analytical process are open to rigorous scrutiny. This book, by laying out the logic underpinning the bioarchaeology of care and providing examples of praxis, contributes to this goal of transparency.

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Chapter 2
Setting the Scene for a Bioarchaeology of Care

Over a century and a half of research documenting disease in human remains from the past has produced many examples of individuals surviving potentially disabling pathological conditions for longer than could reasonably have been expected without support. Yet studies directly addressing the question of how and why these individuals survived, and whether survival may have been contingent on receipt of some form of health-related care, have been 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 thinking about what any such care may have consisted of and what it might reveal about the society providing it.

As the title promises, this chapter presents the background to development of the bioarchaeology of care, and so does not consider the reception of this new approach, first introduced in the article by Tilley and Oxenham (2011), beyond superficial comment in the final paragraph. The first section of the chapter identifies studies in which likely provision of care has been identified, and discusses instances in which care might justifiably have been proposed – but was not. The second section reviews research into specific medical treatments, briefly considering how this might align with a research focus on caregiving – although this has rarely occurred. The third section engages with general and specific criticisms levelled against the archaeological inference of care. The fourth section looks at how archaeology has approached health-related care at the level of theory, and the final section considers where archaeology currently stands – and why – on caregiving as a subject for research.

Health-Related Caregiving in the Archaeological Literature

Reports explicitly raising the possibility of health-related care provision based on archaeological evidence are scarce, but taken together they cover a diverse range of health conditions, span a chronology extending from early human evolution to mediaeval times and beyond, and come from most regions of the world. Almost all

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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.

A summary of archaeological reports suggesting that care was likely provided to one or more individuals in response to experience of a particular pathology is presented in Table 2.1. Where feasible, this Table reproduces authors' comments on the nature of the care inferred in full – the fact that this is almost always achievable illustrates the point made above regarding the lack of prominence given to consideration of caregiving behaviours. This table does not include reports of discrete interventions such as invasive or orthopaedic surgery unless these are specifically discussed in terms of caregiving, because although direct medical intervention unarguably constitutes 'healthcare provision', archaeological analyses of such practices tend to preference issues of procedure and technology, paying little attention to the wider context in which the treatment occurs. Lastly, although this book focuses on health-related caregiving in prehistoric communities prior to adoption of complex forms of social and economic organisation, case studies from protohistoric and early historic periods which rely solely on osteological analysis are also included, providing the most comprehensive survey possible.

Many of the studies represented were discovered through a process of serendipity, because searches on both obvious and obscure keywords were not reliable. There is no claim of exhaustive coverage, and building a database of case studies of care remains a work in progress. Moreover, the reports summarised here are mostly from English language sources; a survey of non-English language literature might well prove rewarding.

Finally, for the sake of completeness, Table 2.1 includes Tilley and Oxenham's (2011) report on care given to a paralysed individual from Neolithic Vietnam, but for reasons previously covered this study is omitted from subsequent discussion. Chapter 8 presents a version of this case study that expands upon the published original, providing a step-by-step demonstration of the way in which the bioarchaeology of care methodology can be applied.

The studies summarised in Table 2.1 differ widely in content, but most are very similar in their approach and their scope. In all these reports the inference of caregiving is based on osteological evidence suggesting survival with, or following, serious disease or injury, and all but three of them address evidence for disease and associated care in individuals – usually one individual, but occasionally more (Cases 28, 29 and 33 discuss caregiving in relation to evidence from larger population samples, and conclusions are correspondingly more generalised). Despite the critique that follows, it must be emphasised that all the reports recorded in Table 2.1 enrich our understanding of past behaviour, and from a bioarchaeology of care perspective are valued accordingly.

Table 2.1 Archaeological reports identifying likely health-related care provision[a]

Case No.	Period *location*	Author(s), subject, pathology, claims for caregiving
1	1.77 million BP *Georgia*	Lordkipanidze et al. (2005, 2006): *Homo erectus/Homo georgicus* 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. *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* (Lordkipanidze et al. 2005:718)
2	1.5–1.7 million BP *Kenya*	Walker et al. (1982); Walker and Shipman (1996): The remains of the adult female *Homo ergaster* 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 *weeks or maybe months …* [enduring] … *such extensive blood clots, she must have been completely immobilised with pain* (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 *strong ties among individuals that came to exceed the bonding and friendship we see among baboons or chimps or other nonhuman species* (Walker and Shipman 1996:134)
3	530,000 BP *Spain*	Gracia et al. (2009): Middle Pleistocene *Homo* Cranium 14 (Sima de los Huesos), belonging to an unsexed child, 5–12.5 years, displays evidence of lambdoid single suture craniosynostosis with severe endo- and ecto-cranial 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 hominims tolerated *abnormal/ill individuals during infancy* (Gracia et al. 2009:6576). This child *may have required extra conspecific care … to survive for a number of years before he/she died at the end of childhood* (Gracia et al. 2009:6573), and of note is that *her/his pathological condition was not an impediment to receiv[ing]the same attention as any other Middle Pleistocene Homo child* (Gracia et al. 2009:6577)
4	400,000 BP *Morocco*	Hublin (1985, 2009), Bower (1994): Cranial remains of a young adult? female *Homo erectus* 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. *The Salé individual undoubtedly had reduced mobility but still survived into adulthood … This implies a certain degree of compassion in early social groups* (Hublin, quoted in Bower 1994:250). In 2009 Hublin explained the survival of the Salé individual as a product of *evolved altruism* (Hublin 2009:6430)

(continued)

Table 2.1 (continued)

Case No.	Period *location*	Author(s), subject, pathology, claims for caregiving
5	180,000 BP *France*	Lebel et al. (2001); Lebel and Trinkaus (2002): Aubesier 11, an older Neandertal? 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. *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* (Lebel and Trinkaus 2002:682). Aubesier 11's survival supports claims for *an important social component in the persistence of individuals during this time period* (Lebel et al. 2001:11102) and the conclusion that this population *had achieved a level of sociocultural elaboration sufficient to maintain debilitated individuals and to provide the motivation to do so* (Lebel et al. 2001:11102)
6	150,000 BP *Sudan*	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. *[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* (Spoor et al. 1998:48) [This cautiously ambiguous last statement is interpreted by this author as an hypothesis of care, although it is acknowledged that no direct claim for caregiving is made.]
7	95,000 BP *Israel*	Tillier (1995), Tillier et al. (2001), Shea (2003), Coqueugniot et al. (2014): The remains of the ancient *Homo sapiens* 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 *cultural behaviors* (Tillier et al. 2001:168), but no direct claim for care is made. Shea (2003) (a secondary source) suggests that *[t]he power of …* [intragroup] *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)* (Shea 2003:362). In 2014, Coqueugniot et al. used three dimensional visual imaging methods to re-analyse the lesion on Qafzeh 11's cranium, concluding that both the injury and its sequelae were far more serious than previously assumed, most probably resulting in lasting damage causing delayed development and affecting aspects of motor, cognitive and psychological function. Although not directly addressing the issue of the care required by this adolescent, the authors associate Qafzeh 11's unique mortuary treatment (placement of deer antlers on the upper body) with his disabled state, noting '*[t]hese biological and archaeological evidences reflect an elaborate social behaviour among the Qafzeh Middle Palaeolithic people*' (Coqueugniot et al. 2014:7)

8	45,000–60,000 BP *Iraq*	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
		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
		Trinkaus (1978), Trinkaus (1983) and Trinkaus and Zimmerman (1982) observe that most remains of older Neandertals exhibit evidence of healed pathology, implying *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* (Trinkaus and Zimmerman 1982:75). Solecki (1971:195–6) notes *[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.* 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 *the very fact that their lame and wounded … had been cared for in the cave is excellent testimony for communal living and cooperation* (Solecki 1971:258), challenging characterisation of prehistoric life as *nasty, brutish and short* (Solecki 1971:268)
9	40,000 BP *Germany*	Schultz (2006): Neandertal 1, male, 50+ years, suffered severe chronic sinusitis *which was the basis of development of a tumorous process* (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. *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* (Schultz 2006:253)

(continued)

Table 2.1 (continued)

Case No.	Period *location*	Author(s), subject, pathology, claims for caregiving
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. *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* (Zollikofer et al. 2002:6447)
11	26,600 BP *Czech Republic*	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 *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* (Trinkaus et al. 2001:1304). DV 15's survival *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* (Formicola et al. 2001:377). 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 *the necessity for all individuals to participate actively in the elevated mobility and overall activity levels of these earlier Upper Palaeolithic human populations* (Trinkaus et al. 2001:1291)
12	11,000 BP *Italy*	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. *[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* (Formicola et al. 1990:435)

13	11,000 BP *Italy*	Frayer et al. (1987, 1988): The remains of Romito 2, male, 17–20 years, ~110–120 cm tall, display chondrodystrophic dwarfism (acromesomelic dysplasia) with associated complications, including bilateral restricted elbow extension. This condition is associated with delayed physical development; would pose mobility problems in the rugged Calabrian environment; and would restrict participation in typical hunter-gatherer activity. Despite Romito 2's disability he was interred in a cave of likely cultural significance; both his survival and mortuary treatment *attest to his acceptance by the group despite his severe handicap and limited ability to contribute to subsistence and other economic activities* (Frayer et al. 1987:62). *[T]his burial is an important case of care and affection towards a handicapped member in Upper Paleolithic society (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). *[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* (Frayer et al. 1988:549)
14	~6800–4900 BC *Russia*	Lieverse et al. (2008): The remains of Shamanka 29.1, male, 20–30 years, display extensive atrophy of all right upper limb bones *from clavicle to manual phalanges* (2008:219) indicative of paralysis of the entire right arm resulting from long standing, probably congenital, pathology. This *tremendous disability* (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, *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* (Lieverse et al. 2008:236)
15	7,500 BP *United States of America*	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). *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* (Dickel and Doran 1989:332)

(continued)

Table 2.1 (continued)

Case No.	Period *location*	Author(s), subject, pathology, claims for caregiving
16	7000 BP *Portugal*	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; malaligned healing resulted in abnormal function. A pathological right third metatarsal suggests injury with infection to the sole of the foot. *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* (Lubell and Jackes 1985:131). Samouqueira 2 (upper limbs only recovered) displayed trauma-induced arthritis in both wrists. *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* (Lubell et al., 2004:212)
17	5000–4900 BC *Germany*	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 *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.* (Orschiedt 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
18	4900–4700 BC *France*	Buquet-Marcon et al. (2007): Skeletal remains of an elderly male from an agropastoral community suggest survival for months, possibly years, following surgical amputation of the left lower forearm. There is no evidence of associated infection, and *sophisticated medical skills* (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 *handicapping osteoarthritic backaches* (Buquet-Marcon et al. 2007:8). This man was interred with particularly rich grave goods, suggesting that *[d]espite the serious handicap …* [he] *obviously enjoyed some particular social status* (Buquet-Marcon et al. 2007:1). This man's survival *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* (Buquet-Marcon et al. 2007:8–9)

19	4200–4000 BC *Bulgaria*	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). *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* (Zäuner et al. 2011:np)
20	4000 BC *Italy*	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. *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* (Formicola et al. 1987:5)
21	6000–5500 BP *China*	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, ~1.5 m tall, suggests hypopituitarism. M53 was recovered from a Neolithic cemetery and received standard mortuary treatment. No disease impacts other than 'short stature' are reported. *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*. (Hernandez 2011:np)
22	3500 BC *England*	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. *This individual was extremely lucky to survive* (Galer 2007:212) both the original injury and later complications that have the potential to compromise central nervous system function. *It seems very likely that this individual would have required care, following the injury* (Galer 2007:213). *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* (Galer 2007:218)

(continued)

Table 2.1 (continued)

Case No.	Period *location*	Author(s), subject, pathology, claims for caregiving
23	4900 BP Switzerland	Milella et al. (2014): Bilateral mesomelia observed in upper and lower limbs of Schweizersbild 9 (S9), a child of ~12 years dating to the Neolithic, result in a diagnosis of Léri Weill dyschondrosteosis (a dwarfism syndrome). This dysplasia is commonly associated impaired mobility and restricted forearm function limiting manipulation skills. The child was interred in the common burial site, suggesting social inclusion, and the authors suggest that *given the survival of the child to the age of about 12 years old, it is possible to postulate active support from the community. … Possible cultural factors underlying such other-regarding behaviors include marked social cohesion operating within the family or community, and/or the attribution of special symbolic (magic-ritual) significance to this pathological condition* (Milella et al. 2014:4). The authors go on to identify the need for a methodological framework and a cross-disciplinary approach in interpreting evidence for disability from archaeological contexts
24	4820 BP *Southern Africa*	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. *Solicitous care maintained the sick infant to an estimated age of 3.5–5 months; it was buried in a manner like that of other deceased group members* (Pfeiffer and Crowder 2004:23) Noting *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* (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
25	2125–1880 BC *England*	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. *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* (Anderson 2002:224). In the physically demanding peri-agricultural economy this individual was possibly *regarded as something of a burden in the community*, but his elaborate burial treatment indicates *a degree of physical incapacity was not in itself a barrier to high status recognition in this Bronze Age community* (Anderson 2002:224)
26	4000 BP *Vietnam*	Tilley and Oxenham (2011): Evidence from the remains of Man Bac Burial 9 (M9), a male of around ~25 years from Neolithic Vietnam born with Klippel–Feil syndrome, suggests he lived for around a decade with an acquired quadriplegia (complete lower body paralysis, at best retaining very limited upper body mobility). M9's survival was dependent upon continuous, dedicated and at times intensive care. This article, the first published application of the bioarchaeology of care approach, establishes M9's level of disability, both in terms of general physical functioning and in relation to specific lifeways context; basic requirements for his care; what provision of care suggests about aspects of his community; and what survival with such serious pathology may suggest about the care subject – M9 – as an individual

27	3500–3000 BP *Hokkaido, Japan*	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. *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* (Suzuki et al. 1984:103)
28	Precolonial era *Brazil*	Lessa (2011): A comprehensive analysis of rates and types of fracture among precolonial (~4000 BC–1000 AD) coastal populations of Brazil found evidence for healed fractures in between 19 and 27 % of the sample studied. Fractures were almost certainly a result of subsistence activities and many likely had severe sequelae—particularly fractures of the femur (present in 10.2 % of all individuals with fractures). Lessa (2011) observes complications of femoral fracture including limb shortening, joint involvement, circulation, nerve involvement and pseudo-arthrosis. Noting that recovery under modern clinical care minimally takes between three to four months, Lessa argues that healing in precolonial Brazil would have taken much longer, requiring extended community support. *The time taken for special care, in addition to the serious functional limitations suffered after healing, suggest the existence of strong social support to compensate* [for] *the morbidity resulting from injury* (Lessa 2011:169)
29	Late Holocene *Australia*	Webb and Thorne (1985); Webb (1995): The presence of congenital meningocoele 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 *the common belief that infanticide was automatically used by [pre-contact] Australian Aborigines to dispose of every congenitally deformed infant must be re-assessed* (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 *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* (Webb 1995:255)
30	400–600 AD *England*	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 *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* (Cox 1999:187), and her contribution to communal and family life would have been limited in comparison to that of the healthy women of her age. *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* (Cox 1999:187)

(continued)

Table 2.1 (continued)

Case No.	Period *location*	Author(s), subject, pathology, claims for caregiving
31	550–800 AD *Sudan*	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 lifetime of disability and perhaps pain* (Kilgore and Van Gerven 2010:641) in which symptoms worsened with age. *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* (Kilgore and Van Gerven 2010:641). A modern tradition of disabled individuals receiving favoured status may have existed in the past: *[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* (Kilgore and Van Gerven 2010:641)
32	500–1000 AD *United States of America*	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. *Cultural mechanisms may have aided this individual in surviving the complications from cleft palate that can lead to infant death.* (Phillips and Sivilich 2006:34) [Brothwell (2010) suggests an alternative diagnosis—rhinomaxiliary changes resulting from adult-acquired trepanematosis [If correct, above claims for care intervention no longer apply.]
33	800–1100 AD *United States of America*	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]t is significant that in specimens observed in this site, rarely did any major disability result from a healed fracture* (Lovejoy and Heiple 1981:540) and attribute this to skilled intervention. *The remarkably complete healing process implies considerable knowledge and ability to care for traumatic lesions* … [suggesting] *effective and thorough care of patients with fractures* (Lovejoy and Heiple 1981:540)
34	1030–370 BP *Argentina*	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. *[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* (Luna et al. 2008:502)

35	1200–1400 AD *United States of America*	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. *Regardless of her range of physical abilities and the 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* (Mann et al. 1998:298). *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* (Mann et al. 1998:296)
36	1300 AD *Peru*	Toyne (2015): Evidence of peri-mortem drilling in post-cranial elements—two right tibiae—of an adult male of ~30–34 years and an adolescent male from Kuelap (Chachapoya culture) most likely indicate surgical intervention performed to relieve symptoms of osteomyelitic infection. The same site has produced evidence of healed *cranial* trepanation using the drilling technique, and it is suggested that the surgeon(s) extrapolated from this established practice. *This specific osteological modification demonstrates the intentional application of an invasive surgical technique in an effort to mitigate a condition affecting the individual. …* [T]*his case is clearly an example of providing care* (Toyne 2015:34)
37	1300–1500 AD *United States of America*	DiGangi et al. (2009): 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 (181 mm) and left (263 mm) humerus, and left (287 mm) and right (345 mm) femur. Her calculated height (118.8–137.4 cm) 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 *indicates that the Mississippian people in this community offered some kind of social support to physically impaired individuals* (DiGangi et al. 2009:425) 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. *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* (DiGangi et al. 2009:438). While not speculating on her specific role, the authors suggest she was likely a valued community member, and her survival represents *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*. (DiGangi et al. 2009:439)

(continued)

Table 2.1 (continued)

Case No.	Period *location*	Author(s), subject, pathology, claims for caregiving
38	1550–1672 AD *United States of America*	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. *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* (Hawkey 1998:336, 338). Other than suggesting that Gran Quivira 1 was probably able to feed himself, although *[g]iven the severity of his condition he would have required someone to supply him with food* (Hawkey 1998:335), the nature of his care is not considered. Based on mortuary treatment Hawkey observes that *[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* (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 *disastrously* worsened his condition (Hawkey 1998:335)

[a] Dates in this Table reflect original dating protocols. Studies are ordered on the basis of earliest to most recent

In most of the reports included in Table 2.1, description and diagnosis of the central pathology (and, where it occurs, documentation of typical clinical symptoms associated with this pathology) 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 very 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' noted may have actually comprised. Notable exceptions include Cases 8 (specifically Solecki, 1971), 31 and 38.

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 characteristics 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, 23, 28, 32 and 35).

There is only minimal cross-referencing – and usually none at all – between studies in which likely caregiving is identified, although cross-referencing appears slightly more common in recent studies such as Cases 19, 21, 23, and 37. This absence of cross-referencing may possibly be 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 to the authors and their readers alike. The scarcity of reports in the 'care' category and the difficulty in finding these may be sufficient explanation for failure in this area, but it is more likely that this failure 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 health-related care provision in more than one study – although problems in identifying reports mentioning care may mean this is an underestimate. While it is conceivable that other authors fail to encounter more than one case of likely caregiving in their palaeopathology research, this seems unlikely given plentiful evidence of serious disease in the past (likely levels of prehistoric demand for health-related care are addressed in Chap. 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, referred to only in terms of age and sex. While it is impossible to 'know' an archaeologically recovered individual in the same way that we 'know' members of our own social group, extrapolation from the osteobiographical work of writers such as Robb (2002), Sofaer (2006) and Martin and Potts (2012) suggests that evidence of severe pathology, considered in the immediate 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 care provision and/or mortuary treatment (e.g. Cases 18, 25, 31 and 38), and one study actually 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 35), 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 38) study, combining skeletal evidence of pathology with musculoskeletal stress marker data, presents a detailed, holistic analysis informed by modern clinical experience of the progressive impact of juvenile-onset chronic arthritis, establishes the stages of Gran Quivira 391's increasing loss of mobility and corresponding levels of dependence on others. Hawkey's (1998) rigorous yet elegant account of the encroachment of disease allows her to conclude, unequivocally, that care was essential for Gran Quivira 391's survival, and offers a model for identifying functional disability from skeletal evidence. Unfortunately, Hawkey (1998) gives only superficial consideration to what this caregiving likely consisted of – the only specific assistance mentioned is food provision, yet the disease process so meticulously documented would demand an ever-evolving range and intensity of support measures. Consideration of the nature of the care required by Gran Quivira 391 would have offered a platform for reflecting on the characteristics of the society providing it.

Frayer 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 his immediate environment – the Appenine mountains of Calabria, Italy. The authors briefly consider the implications of Romito 2's survival in terms of both the (largely unspecified) care provided and what this may reveal about Upper Palaeolithic society more generally (Frayer et al. 1988). In an interesting development, Frayer, the lead author on both the publications concluding that Romito 2 had received care, 15 years later retreated from this conclusion on the basis that '[b]ecause apes and monkeys show so many skeletal signs of surviving major illnesses and injuries' it was dangerous to assume, on the basis of osteological evidence alone, that Romito 2 had benefitted from special care, and that he, Frayer, may 'have been guilty of jumping to conclusions' (Bower 2002:330). The reasoning behind this retraction remains unelaborated – in contrast to the reasoning presented for assuming care in the first place. It may partly be a response to opposition to archaeological inference of caregiving that emerged in the early 1990s – something discussed later in this chapter. (A recent bioarchaeology of care analysis of the Romito 2 case study supports Frayer et al.'s [1987, 1988] original observations, concluding Romito 2 received care in the form of 'accommodation of difference' [Tilley 2015].)

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 practice they do not pursue. Trinkaus et al. (2001) ingeniously use skeletal evidence for DV15's post-childhood participation in group activities (despite likely physical limitations) to test hypotheses of Upper Palaeolithic imperatives relating to mobility and burden-carrying behaviours, illustrating how a focus on the individual receiving care can contribute to knowledge of contemporary lifeways demands.

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 Table 2.1 rather than reproduced verbatim). 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 standard cultural and economic 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 sociocultural practice.

Even in the reports highlighted above, however, there is only partial consideration of the implications of care. Until publication of the Man Bac Burial 9 case study (Tilley and Oxenham 2011), health-related care provision had not been seen as a rewarding focus of analysis.

Failure to Infer Care Despite Evidence of Likely Disability

Not only is identification of health-related caregiving rare in the archaeological literature, but it may also appear arbitrary. The reports summarised in Table 2.1 represent a very small proportion of the thousands that document human remains displaying evidence for a period of survival 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 Kelley (1982), as well as cases covered in innumerable articles found 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 managed to survive with disability is particularly puzzling when authors reference a report of a similar pathology in which possible caregiving has been proposed, yet ignore the implications of this for their own analysis. Canci et al. (1996) provide a germane 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. Even though 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 in which the evidence appears equally compelling. Trinkaus, for example, has co-authored a number of reports suggesting that health-related care 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 the three individuals likely receiving care at some stage, although 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 Chap. 9, and their respective disability states and claims for receipt of care are discussed in detail there.)

Further to this, in two studies of 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 2011), Trinkaus substantially qualifies 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 – Case 8). 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? Once the hypothesis of abandoning the elderly and immobile had been advanced, observations of caregiving may have been perceived as undermining this. What is not clear is *why* the hypothesis of abandonment, reiterated as recently as 2012 (Trinkaus 2012) was proposed in the first place. The validity of such a sweeping conclusion from demographic analyses based on just over 200 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 later.

Treatments and Technologies

Medical interventions such as surgery (including reduction and stabilisation of limb fracture), dentistry and pharmaceutical therapy 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.

While evidence for 'discrete' interventions is rarely examined from the viewpoint of caregiving, the very existence of such treatment strategies reflects a level of priority afforded to health-related care by prehistoric communities which, when closely examined, should increase our appreciation of this aspect of the past. This section briefly reviews some of the archaeological research on 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 the 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, however, a rich literature on theory and practice of medicine from early historic times onwards, and many of the earliest extant sources incorporate (sometimes very detailed) reference to aspects of disease, diagnosis, prognosis and a wide range of treatments, as well as describing the roles and responsibilities of the variety of healers operating in the corresponding community.

Such sources include Mesopotamian cuneiform tablets (~4000–3000 BP), which offer, among other things, the remnants of a diagnostic and prognostic handbook (Scurlock 2005; Scurlock and Andersen 2005); the Egyptian medical papyri (5000–3,500 BP) (Nunn 1996); and the Caraka and Suśruta *Compendia* (~800–600 BC), which claim their origins in the Indian Vedas (specifically the Rigveda and Arthavaveda, dated conservatively to ~1900 BC and 1000 BC respectively (Wujastyk 2003). That many of the earliest known texts contain reference to medicine systems that are clearly already well-established suggests that these are documenting practices originating considerably *before* the invention of writing – a fertile proposition for further consideration, but beyond the scope of this book.

Surgery

Prehistoric surgery for which there is direct 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 late Middle 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 (Brothwell and Møller-Christensen 1963; Dupras et al. 2010), Israel ~3,600 (Bloom et al. 1995), Pre-Columbian America (Friedmann 1972; Padula and Friedman 1987; Verano et al. 2000), and pre-contact Australia (Webb 1995:212–214). Orthopaedic interventions may be inferred from skeletal evidence for reduction (if only partial) and healing of limb fractures (e.g. Lessa 2011; Lovejoy and Heiple 1981; Redfern 2010; Wentz 2012), and this evidence, in turn, suggests technologies such as splints, casts, bandages and ties, although as these are typically contrived from perishable materials, archaeological evidence is only very occasionally found (Kirkup 2006; Majno 1991; Martin and Horowitz 2003; Moodie 1923; Thorwald 1963). Early beginnings for dental surgery 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).

There is also indirect – but still credible – evidence for pre- and early historic surgery. In one example of this, Ascaso and Huerva (2013) rely on graphic depictions and early texts to suggest that cataract surgery may have been practiced in Egypt and Mesopotamia around 4000 years ago. Another example of indirect evidence relates to small number of archaeologically recovered prostheses from prehistoric and early historic times (Thurston 2007). Among these is a prosthetic eye dating to around 4,800 BP, found in situ in the left orbit of a young woman from Burnt City, Iran and worn for long enough to produce osteological evidence of irritation and infection; the eye appears to have been fixed on either side of the socket by wire, and clearly required surgery for its insertion (Sajjadi 2007). An articulated, wooden, big toe, also found in situ on the right foot of a woman buried in the Necropolis at

Thebes around 900 BC (Finch 2011), again speaks to a level of surgical skills in preparing the foot for its attachment.

Trepanation is by far the most commonly observed form of prehistoric surgery, evidenced in Europe, the Middle East, Africa, most of Asia, the South Pacific, Australia and, more than anywhere else, the Americas (Arnott et al. (2003); Crubézy et al. 2001; Erdal and Erdal 2011; Martin 2011; MacCurdy 1923; Sankhyan and Weber 2001; Webb 1988). In some cultures it may have been a relatively frequent procedure, with evidence for trepanation found in between 2 and 8 % of crania found in some regions of Neolithic Europe (e.g. Piggott 1940; Piek et al. 1999; Robb 2002), and very large numbers of trepanned crania reported from South American Pre-Columbian sites (MacCurdy 1923; Verano 2003). However, although there is an extensive body of archaeological literature on trepanation 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) trepanation surgery was probably performed with therapeutic intent in response to a biomedical condition. Although Verano (2003:232–234) notes that evidence for cranial injury may be removed by trepanation, Andrushko and Verano (2008) report that 80 % of trepanations in their Pre-Columbian sample are associated with cranial trauma; while this is at the upper end of estimates, many researchers identify trauma as the principal motive for surgery (Arnott et al. (2003); Erdal and Erdal 2011; MacCurdy 1923). Ethnomedical studies indicate that other conditions treated by trepanation include neurological disorders, migraine, epilepsy and ‘mental illness’ (Gross 2003) – while such diseases are rarely associated with osseous signatures, there are a few instances in which a probable non-traumatic cause for trepanation can be specified. Mohkam (2013), for example, cites evidence for trepanation undertaken in Iran around 3000 BC most probably to for the relief of intracranial pressure associated with hydrocephaly. Trepanation techniques and/or frequencies were not necessarily consistent across neighbouring cultures or even, 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 largely unaddressed – questions about consistency in cross-cultural and cross-temporal perceptions of, and responses to, disease.

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 further injury 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 cranial 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 and 90 % (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; MacCurdy 1923; Verano 2003).

Sophisticated anatomical, surgical and nursing knowledge and skills were essential to achieving such levels of success. Although this has been acknowledged by some authors (Guy et al. 1989; MacCurdy 1923; Powers 2005; Roberts and McKinley 2003; Weber and Wahl 2006), there has been little consideration of what this fact might suggest about the general environment 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 (Morocco) 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 a 'continuous learning' approach. 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 for trepanation, particularly where it can be inferred that this involved trained, skilled surgeons, reflects community social and economic investment in the health of its members and, as Dastugue (1980) notes, it also reflects bonds of trust between all involved. A more detailed consideration of what this investment and trust might signify can only add to our appreciation of contemporary community values and behaviours more generally.

Pharmacology

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-agricultural and pre-industrial cultures (Forrest 1982; Halberstein 2005; Winkelman 1995) as well as in the earliest texts – such as those from Mesopotamia (Scurlock and Andersen 2005), Egypt (Nunn 1996) and India (Wujastyk 2003). Common-sense suggests that most prehistoric communities had their own pharmacopoeia (Guerra Doce 2006; Guerra Doce and Lopez-Saez 2006; Halberstein 2005).

Indeed, 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 late Middle Palaeolithic (Leroi-Gourhan 1975; Lietava 1992), and evidence for the use of plants with insecticidal and larvicidal properties in working and sleeping quarters of an African Middle Stone Age rockshelter may similarly reflect an awareness of important medicinal properties of certain plants (Wadley 2011). However, direct evidence for ingestion or application of medicines from the archaeological record is difficult to obtain, given issues of poor preservation and constraints on proving intentional pharmacological (as opposed to non-health-related culinary or ritual) use (Hsu 2002). As a consequence, most of the evidence presented for pharmaceutical treatment in prehistory is circumstantial, relying on the presence of residues in archaeological sites and artefacts, 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 (e.g. Dillehay et al. 2008; Guerra Doce and Lopez-Saez 2006; Martin and Horowitz 2003; Torres 1996).

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) will almost always demand qualification. For instance, cannabis was present in China 7000 years and recorded as an ingredient in Egyptian medicines almost 4000 years ago, and opium was cultivated in Mesopotamia around 5500 years ago (Aboelsoud 2010; Adamson 1991; Lee et al. 2007; Nunn 1996). In Europe, evidence for cultivation of plants with psychoactive properties (including cannabis and the opium poppy) dates to 5000–6000 BP (Guerra Doce 2006; Guerra Doce and Lopez-Saez 2006). In Pre-Columbian America and the Caribbean there appears to be a long tradition of psychoactive substance use (Torres 1996; Winkelman 1995). Were these drugs used medicinally (including in shamanism) to treat diseases such as stress, mental disorders, pain and 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 identity of those allowed to take it, may have been restricted (Guerra Doce and Lopez-Saez 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; in addition, Ötzi was also carrying bracken fungus, a traditional medication for abdominal distress known to have purgative and antibiotic properties (Capasso 1998). Wentz's (2012) research at the 8000-year-old Windover site (USA) discovered remains of a number of plants with known medicinal properties in the abdominal regions of individuals displaying skeletal indicators of different, likely painful and in some cases possibly disabling pathologies.

Neither indirect evidence for surgical intervention or medicinal remedies lends itself to analysing the sociocultural implications of health-related care to the same extent as treatments leaving physical markers, but nevertheless this evidence has the potential to help us reflect on the individual and/or the culture to which it corresponds. For example, what might a young woman's ability to endure the discomfort of her prosthetic eye (Sajjadi 2007) suggest about her personality? The eyeball was finely designed and manufactured, with capillaries picked out in gold (Sajjadi 2007) – what do such aesthetics, along with the surgical skill in fixing the eye into place, suggest about craft practice and its relationship to medical practice, or about prevailing social values? Excavations at Monte Verde (Chile, ~14,000BP), one of the earliest occupied sites in the Americas, have produced evidence for a large number of plants with known pharmaceutical properties that include antibiotic and immune system strengthening effects; represented among plant remains were nine species of seaweed, seven of which are also suitable for dietary consumption – however, '[t]wo species, *Gigartina* and *Sargassum* are non-edible and were evidently used exclusively for medicinal purposes' (Dillehay et al. 2008:785). How might the presence of medicinal plants, sourced from the coast 25 km away, provide some insight into health experience, priorities and practices in the first phase of immigration into the New World?

Challenges to the Inference of Care

Archaeological research into health-related care provision has met with resistance – or at least reservations – in some quarters. Challenges to the inference of care fall into two broad categories: general or specific warnings against exaggerating the likely need for, and role of, caregiving; and objections to inference of human care provision based on non-human primate ability to survive in comparable circumstances without receipt of care. Examples in each category are considered below.

The work of one extraordinarily influential critic of archaeological research into care deserves detailed attention. In 1991, Katherine Dettwyler published 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. A separate part of this section of the chapter deconstructs Dettwyler's (1991) arguments, and her views are therefore only referred to superficially – if at all – in the discussion immediately following.

Dangers of Overstating 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 any and all of these, and have correspondingly different health-related needs (e.g. Bowling 2002; Jylhä 2009; Piperata et al. 2014). Reconstructing the sum total of individual physical, psychological and social experience of disease from osteological evidence alone is impossible, and palaeopathologists consistently – and rightly! – warn against attempting such an exercise (Ortner 2009; Roberts 1999, 2000; Waldron 2009). However, the key word here is 'total'; very few archaeologists deny the possibility of identifying *some* level of disease impact on physical functioning – the question centres on the point at which the evidence is sufficient to support a judgement that health-related 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 for her 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) seems comfortable with the inference of care provision under the right conditions, but emphasises the importance of not underestimating human resilience in coping with disease. In her discussion, in fact, she makes a point of referring to ethnohistoric descriptions of Alaskan society that document '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).

Roca et al. (2012), on the other hand, appear distinctly *un*comfortable with the inference of caregiving from evidence in human remains. In their article, the authors describe four individuals from the Spanish Argar Bronze Age Culture (2200 – 1550BC), each of whom lived for some time with severe limitations arising from poorly healed fracture(s) and/or unreduced dislocation. Following Dettwyler (1991), Roca et al. (2012) define 'disability' exclusively as a social construct, by implication one which is stigmatising and not to be attributed to a past individual simply on the basis of evidence for disease (and certainly not attributed to the subjects of their research). Receipt of care is early-on associated with the negativity surrounding the concept of 'disability', although the reasons for this are never made explicit:

> the fact that an individual lived longer than expected does not necessarily imply that he/she received care … and his/her position within the social group cannot be determined from archaeological evidence alone (Roca et al. 2012:163)

While Roca et al. (2012) document significant ‘impairments’ in their subjects’ remains, which they acknowledge must have affected the ability to participate in aspects of normal community life, they dismiss consideration of the possible support needed to help these individuals adapt to changes in their health status and functioning capability: ‘[a]lthough [the four individuals] all had severe lesions, we are unable to determine whether they were considered disabled. … We know nothing of any care they might have received’ (Roca et al. 2012:168). This represents an opportunity lost. Roca et al. (2012) clearly possess a considerable depth of knowledge about the sociocultural context in which their subjects were operating; avoiding discussion of possible caregiving practices within the community – perhaps focussing on flexibility in accommodating subjects’ limitations? – deprives both their readers and themselves of the opportunity to expand upon this.

Certain authors directly question the presumption of disability and associated claims of care in specific case studies, and examples include DeGusta (2002, 2003), Dettwyler (1991), Roberts (2000) and Tappen (1985). Interestingly, both DeGusta (2002, 2003) and Tappen (1985) focus on claims for caregiving by Neandertals. While their arguments differ significantly in detail, a part of the agenda in each case may have less to do with provision of care per se than with challenging the validity of assigning modern human behavioural traits to earlier hominid species – and as such, approach the objections to inference of caregiving presented in the following section under the heading of ‘non-human primate comparison’ from a different perspective.

Tappen (1985) dismisses the proposal 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 providing foods processed to facilitate swallowing. However, the only reference Tappen cites as actually claiming care for La Chapelle-aux-Saints 1 on the basis of edentulism 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 1985:43). Tappen (1985) uses their words as the basis for an eight-page article urging against acceptance of Neandertals as ‘directly ancestral to anatomically modern humans’ (Tappen 1985:50).

In a more meaty paper DeGusta (2002, 2003) similarly disputes claims by Lebel et al. (2001) and Lebel and Trinkaus (2002) that the female 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 on provision of pre-masticated foods. Degusta is scathing in his observation 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 they have omitted ‘published data and interpretations that challenge their claims’ (DeGusta 2003:94). 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 even if Aubesier 11 *was* effectively edentulate, there is no reason she could not have procured and processed her own food herself – without assistance (DeGusta 2002, 2003).

Given the limited osteological evidence available in relation to Aubesier 11, DeGusta (2002, 2003) would seem to have a stronger argument than Tappen (1985) for questioning assertions of care and associated social support mechanisms. But both authors convey a broader in-principle scepticism regarding archaeology's ability to identify caregiving behaviours that goes beyond the individual case studies in question.

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 caregiving 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.

Non-human Primate Comparison: The Case Against Inference of Care

A number of writers have suggested that care cannot legitimately be inferred in relation to hominid survival of pathology when non-human primate survival of an equivalent pathology – presumably without the benefits of care 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).

On the basis of such observations, some authors have gone on to urge 'the need for caution in speculating about the evolution of "prosociality" or "altruistic" behaviour based on deformities found in early hominids' (Struhsaker et al. 2011:17), a stance which creates an interesting tension when considered in the context of arguments – discussed in Chap. 4 – that caregiving behaviours in humans have an evolutionary origin.

Schultz (1939) reviews evidence for developmental and acquired pathologies in 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 nonhuman 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 Sauther (2004) and Millette et al. (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 Sauther 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 begin to explain how such alternatives would work, given the physiological, cognitive and behavioural differences distinguishing the different species.

Cuozzo and Sauther (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'. Yet first, perhaps, it is the data on which this conclusion is based that require examination. Of Millette et al.'s (2009) sample of eight lemurs with tooth loss, one had tooth loss of 44 %, 1 of 22 % and the remaining 6 of between 3 and 19 %, 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 and Trinkaus 2002, p670–671 in particular).

Turner (2011, 2014) reports on work undertaken in the Awajishima Monkey Centre (AMC) that examines high rates of survival and associated adaptation strategies of Japanese macaques with (sometimes severe) congenital limb malformations and seeks to project from this to human caregiving behaviours. The research finds little evidence for active conspecific care directed towards affected adult macaques, although noting that these are often treated with particular tolerance in relation to food access; that although displaying lower levels of active social behaviour – particularly grooming – as their non-disabled fellows they *receive* a similar level of grooming to other group members; and that they are less likely to be the objects of aggressive behaviours (Turner et al. 2014). Disabled infants are described as receiving additional care from their mothers, as well as, on occasion, from unrelated group members (Turner et al. 2014).

Allowing freedom of movement within its confines, the AMC is a privately-owned, for-profit, tourist facility in which the macaques are provided with their food requirements (Turner et al. 2014) and likely protected in other ways. Turner (2011, 2014) does not make clear what, in this benign context, conspecific care might comprise or how it might be recognised *other* than in the behaviours canvassed above, making it difficult to assign much weight to assertions along the lines that, while not all individuals surviving with these malformations in the AMC environment would likely survive in the wild, 'I think that many of them would survive, and survive better than would usually be assumed' (Turner 2011:6; repeated Turner et al. 2014:10). The independence of disabled macaques in managing access to food and participating in 'normal' social interactions allows 'findings [that] emphasize the self-reliant abilities of these disabled primates and suggest caution when inferring conspecific care for even very disabled ancestral humans' (Turner et al. 2014:1) and may indicate that claims for care are overblown: 'the potential abilities of disabled … ancestral hominims [to survive without care] should not be underestimated' (Turner 2011:6). Again, research elements render such conclusions questionable. Turner (2011) 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 per cent 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 ultimately artificial – environment of the AMC, invalidating extrapolation to early human experience.

A final example of extrapolating from non-human primate experience to challenge inference of human health-related caregiving is provided by Struhsaker et al. (2011), who describe an adult female baboon with extreme, likely congenital, facial anomalies manifesting in the absence of almost all her upper jaw and nose. The authors rate this as 'the most severe and potentially debilitating deformity that any of us have ever seen in our field studies of primates' (Struhsaker et al. 2011:16), going on to note that the subject was suckling a juvenile (presumably her own) and was again pregnant, and that – with no evidence for preferential treatment by group members – she appeared to be fully integrated within her group. Citing DeGusta (2002, 2003), Struhsaker et al. (2011) conclude that her survival without receipt of any obvious care supports arguments that early hominids experiencing disability were capable of surviving without assistance.

However, the authors also observe that, despite missing most of her maxilla, the subject retained at least one set of maxillary molars, enabling dental occlusion and mastication and 'partly explaining the excellent physical and reproductive condition of this female' (Struhsaker et al. 2011:17) (no other explanation is discussed). It is clear from Struhsaker et al.'s (2011) report that the subject suffered an extensive and highly visible disfigurement, but it seems that she did not suffer a disability that had any significant impact on her functioning in essential areas of activity – she could eat, she could groom her infant, and she could mate – and therefore had no prima facie requirement for caregiving to facilitate survival. In a human with an equivalent condition, the question of care might revolve around social acceptance of physical difference; in this study we learn that an individual baboon with distinctly different facial features was not stigmatised, but that this is described as a 'debilitating deformity' may reflect more of a modern cultural preoccupation with appearance than anything else.

Reference to non-human primate success in surviving pathology unaided in order to undermine inference of human care provision has 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-analysed Schultz's (1939) museum-provenanced sample, concluding that, *contra* Schultz (1939), long bone fractures are rare in wild primates; they are most likely to occur in juveniles (facilitating healing) rather than in 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 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 nonhuman primates are demolished. Certain pathologies, such as edentulism, may not require care within all species, but no form of care provision is out of contention simply because some species do not engage in it.

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 significantly 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 (Marks 2006, 2008). 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 significant variations in cognitive abilities and behaviours between modern humans occur as the result of cultural affiliation alone means that attempting to compare human behaviour with that of other species is meaningless. Marks (2006, 2008) contends that even when apparently similar behavioural outcomes are observed among humans and apes there is no certainty that the behaviour itself is enacted for the same reasons; further, he suggests that perceptions of primate behaviour are often culturally constructed by human observers, and that this anthropomorphism alone is enough to render comparisons deeply suspect. Marks (2006) puts the case concisely:

> [w]ithout a reasonable presumption that [a human feature shared with an ape] is homologous – that is to say, the product of passive heredity in both lineages from an ancestral form – [comparison] can only be meaningful as metaphor (Marks 2006:47).

The question of whether study of non-human primate behaviour can contribute to unravelling the origins of human caregiving is considered at greater length in Chap. 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 health-related care 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 apparent 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.

Dettwyler, and the Impossibility of Identifying Care and Compassion in the Archaeological Record

A quarter of a century ago Katherine Dettwyler (1991) wrote an article entitled *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, and most subsequent opposition to archaeological inference of caregiving cites this publication as the primary supporting reference. Despite this, it has largely escaped critical scrutiny. Although Knüsel (1999), Hawkey (1998) and Tilley (2015) question certain (different) points raised, none engages in 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 of those referencing Dettwyler's (1991) article, however, do so as if it were received wisdom, requiring no further discussion (e.g. Berkson 2004:222; Boyd 1996:216; DeGusta 2002:1435; DeGusta 2003:94; Metzler 1999:62; Roca et al. 2012:163; Tarlow 2000:726–727). Yet others refer to Dettwyler's (1991) article with what appears to be limited familiarity with its content, perhaps because it has become a de facto requirement to cite it whenever the subject of disability in prehistory is raised. These latter authors sometimes 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 2004:373; Toyne 2015:34). This widespread, inappropriate referencing of Dettwyler's (1991) paper is just one illustration of its mythic status – long overdue for closer inspection.

Before embarking on this inspection, and in spite – or perhaps because – of the critique that follows, I want to make one general, and personal, observation. Dettwyler's (1991) commitment to the rights of those experiencing disability and her passion for this issue shine through in every page of her writing, are admirable, and command respect.

Defining Concepts: Conflation and Confusion

One problem with Dettwyler's (1991) article is the absence of clear – and accurate – definitions of concepts central to its arguments. 'Handicap', for example, is referred to throughout the article as a purely social phenomenon, permitting the assertion 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 1988:23–24, cited Dettwyler 1991:376) and in fact misrepresents the much broader World Health Organisation (WHO) definition it refers to, which defines handicap in terms of cultural, economic and physical limitations as well as social disadvantage (Wood 1980). The premise that we cannot know whether a prehistoric individual was 'handicapped' by their disease experience is therefore not necessarily true. Discerning *social* disadvantage is of course problematic, but if we have some knowledge of the contemporary context it may well be feasible to identify some of the likely practical 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 on 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 a disposition or motivation. Neither does she define 'care', an omission that leads to a lack of acknowledgement that health-related caregiving can take many forms, spanning crisis intervention to longer-term support for, and accommodation of, experience of a chronic condition.

Most troubling, however, is the 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 1991:376–377, 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 as well as, inevitably, the work of researchers identified as guilty of inferring one or both of these.

Dettwyler (1991) concedes, albeit with caveats, that in certain cases survival with or following severe 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* health-related care provision in the archaeological record.

Inflated Claims of ‘Compassion’ and ‘Moral Decency’? Assumptions, Fallacies and Straw Men …

Dettwyler suggests 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 pp. 376–377, 384). Focussing on three studies in which the case for prehistoric care provision is made – Shanidar 1 (Solecki 1971; Trinkaus 1983; Trinkaus and Zimmerman 1982 – Case 8), Romito 2 (Frayer et al. 1987 Case 13) and the Windover Boy (Dickel and Doran 1989 – Case 15) – Dettwyler draws out five ‘implicit assumptions’ that underlie archaeological inference of care and compassion for the disabled and which ‘are unwarranted and can be refuted by ethnographic analogy’ (Dettwyler 1991:379). These assumptions arise from applying modern western values (the notion that care and compassion for disabled individuals is ‘morally good’) to prehistory, and 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).

In fact, the observations contained in the above case studies are very conservative (see Table 2.1); certainly none uses the term ‘moral decency’, nor implies an equivalent judgement. The only primary source using the term ‘compassion’ is Solecki (1971:195 Case 8), although both Solecki (1971:268, Case 8) and Dickel and Doran (1989, Case 15) explicitly use evidence allowing the inference of caregiving to question survival-of-the-fittest stereotypes of prehistoric life. Most secondary sources nominated similarly fail to stand up to scrutiny (these include some introductory anthropology texts, the novel *Clan of the Cave Bear* [Auel 1980] and a brief mention in a National Geographic article [Putnam 1988:452]). More fundamentally, the relevance of using secondary sources to judge the merits of primary research conclusions is questionable.

Dettwyler's (1991) five assumptions have often been referred to by those arguing against the archaeological inference of caregiving, and because of this deserve a close look.

> 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 such periods. Additionally, health-related care provision often entails a marked departure from standard nurturing practice, possibly incurring significant costs for a community. In such situations caregiving may, indeed, reflect a different level of commitment.

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

This suggests archaeologists naively suppose that only individuals whose remains display pathology experienced disability. The source of this assumption is unclear, as no examples are presented. On the contrary, archaeologists recognise that evidence of disease in human remains significantly underrepresents true rates of pathology (references predating Dettwyler 1991 include Brothwell 1961, Brothwell 1972; Buikstra and Cook 1980; and Manchester 1983). The impossibility of inferring disability in human remains without physical evidence of disease explains archaeologists' focus on cases where osteological evidence exists.

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

The implication to be drawn from the discussion elaborating this assumption is firstly, that archaeologists define productivity solely in economic terms, and secondly, they perceive those with disabilities as 'inferior' to non-disabled others. A few pages previously Dettwyler argues that inferences of caregiving, based on evidence of handicap, have

> 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 1991:376–377).

The broader question here is whether acknowledging a person's need for health-related care diminishes that person's worth as an individual. Surely not – such a view perhaps reveals more about Dettwyler's experience of modern social practice than it does about research into prehistoric care provision. Although studies claiming care may observe that a disability compromises economic participation normal for an individual of a particular time and place, Dettwyler (1991) does not cite any research in which the subject is specifically described as incapable of contributing in some way (socially and/or economically) to their group.

> Assumption 4: "Survival" of disabled individuals is indicative of "compassion" (Dettwyler 1991:382)

In the text Dettwyler (1991:382) equates 'compassion' with being '"nice" to the disabled individual'. 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 under care – but then, none of the case studies cited claims 'nice' treatment. Solecki (1971:195–197) comes closest, in discussing community compassion for the disabled Shanidar 1.

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

This assumption is a rhetorical device allowing Dettwyler to discuss why it is sometimes kinder – more compassionate – *not* to prolong life. However, even if archaeologists wanted to conclude that failure to provide care 'evinces a lack of moral decency' (Dettwyler 1991:382) in any particular instance – and no example of this is provided – it would be impossible for them to do so, as archaeological evidence cannot differentiate between those receiving and those *not* receiving care around time of death (this point is discussed further in Chap. 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.

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, offering alternative interpretations of the extent of each individual's disability and in each instance suggesting that claimed level of care likely required for survival is exaggerated, or that level of handicap experienced is significantly overstated, or both. However, this process is flawed both by the failure to take lifeways context into account when challenging assessments of disease impact on functioning, and by the tendency to understate the severity of pathology evident in skeletal remains and/or to overlook aspects of pathology for which evidence exists. The former allows Dettwyler (1991:383) to offer examples of modern individuals coping with apparently equivalent functional impairments without resort to care, although such comparisons are intrinsically invalid because they equate experiences over widely differing cultural, technological and physical environments; the latter allows Dettwyler (1991) to minimise estimates of the likely care required.

Explaining Dettwyler's Impact

Had Dettwyler (1991) simply urged archaeologists to be cautious in proposing motivation for prehistoric caregiving this would have been uncontentious. She went much further than this, and her paper contains errors in fact and logic – yet it has stood unchallenged to this time.

Dettwyler cannot be held responsible for this lack of critical engagement. But *why* did her article 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. Dettwyler's (1991) obvious discomfort with the concepts of 'handicap/disability', 'compassion' and 'moral decency' mirrors elements of modern disability rights discourse that reject the individual-focussed medical model of disability, casting disability as a predominantly social construct (Oliver and Barnes 2012; Reid-Cunningham and Fleming 2009). The disability rights movement has justifiably protested systemic discrimination against people with disabilities for over 40 years (Shakespeare 2006; Whyte and Ingstad 1995), and 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 matters (Bower 2002:330) has added to any reluctance to challenge her views.

However, regardless of how Dettwyler's (1991) arguments are explained, her article has had an inordinately powerful and overwhelmingly negative impact on archaeological research into the complex, but rewarding, areas of disability and care.

Health-Related Care in Archaeological Theory

This book's central premise is that an archaeological focus on health-related care provision will contribute to a broader theoretical framework for interpreting past social practice. Identifying and interpreting evidence for care indisputably poses practical and conceptual challenges; these should not be underestimated, and are addressed in the following chapters. But having acknowledged the difficulties involved, archaeology's neglect of caregiving as an intentional behaviour has occurred in a context in which behaviours as complex and diverse 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).

Perhaps neglect may be partly understood as resulting from the divide between the traditional disciplines of archaeology and osteology (Sofaer 2006), in many ways still unbridged despite the increasing profile of *bio*archaeological 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 such archaeological research and writing has usually been limited to consideration of basic demographic characteristics: age, sex, and latterly, with the availability of increasingly sophisticated isotope and aDNA analytical techniques, affiliation, diet, birthplace and travel and migration patterns.

A potential archaeological theory of care is the victim of a broader failure to position human remains as ‘material culture’ in their own right, or as representing the product, as well as the producer, of the environment in which they are found (Sofaer 2006). It is ironic that although archaeologists have been willing to theorise highly esoteric behaviours from mortuary treatment of human remains (e.g. Carr 1995; Murphy (2008a, b); 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, ‘traditional’ osteological (including palaeopathological) research practice has focused on description and analysis of the physical features of human remains, but has rarely 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 apposite discussion of philosophical and applied differences – or, more accurately, 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 health-related care provision as a subject for theory and research is harder to explain. This relatively recent (sub)discipline (the term was coined by Buikstra in 1976 [Buikstra 1977]) explicitly combines biological, osteological and archaeologically-contextualised analyses of remains. Evidence of 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 and disease prevalence at the other – has been prime subject matter for bioarchaeological focus.

In their recent review of past and future directions for bioarchaeology, Knudson and Stojanowski (2008) noted 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 urged increased awareness of the implications of impairment and disability as possibly capable of shedding light on aspects of individual identity (defined in terms of the personally and socially constructed image of self), but took this observation no further (Knudson and Stojanowski 2008:398, 409). Important as individual identity is, it is only one part of the story potentially retrievable from remains meeting ‘living with disability’ criteria. As argued throughout this book, a focus on the caregiving that enabled an individual to survive with disability in the first place may reveal insights into the skills, socioeconomic practice, daily behaviours and even – *pace* Dettwyler (1991) – motivations of the community in which the care recipient lived that are inaccessible through other means. Knudson and Stojanowski’s (2008) lack of mention of caregiving, in an otherwise comprehensive overview, may simply be a product of the increasingly popular (post-processual) interest in an archaeology of identity within the broader discipline (see Chap. 5), but may also reflect the previously hypothesised political sensitivity concerning how to manage the issue of ‘disability’ without causing offense.

If the process for inferring health-related care from evidence in human remains is conceptualised as comprising firstly, identification of one or more pathological anomalies in the skeleton; secondly, the assessment that 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 a few exceptions, bioarchaeology has stalled at the second step.

If Not an Archaeology of Care, then an Archaeology of Disability?

Establishing the presence of disability severe enough to compromise one or more 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 last 15 years, principally centred on the issue of whether, and how, the state of being 'disabled' can, or should, be defined, identified and interpreted within past 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 raised and, most recently, Southwell-Wright (2013) has argued strenuously for combining archaeological evidence with documentary sources in order to achieve a more accurate understanding of what constituted disability in any particular time and place in the historic past.

Charlotte Roberts (1999) was the first to present an informed discussion on the prospects for an archaeological study of disability. In consecutive articles (Roberts 1999, 2000) she proposed two basic methodological principles: firstly, reference to modern clinical knowledge as an evidence base for assessing the range of possible health effects of a diagnosed palaeopathology – a procedure advocated in earlier publications (Roberts 1991; Grauer and Roberts 1996); and secondly, the need to interpret this information within its archaeological context. Roberts (1999, 2000) considered the implications for archaeology of characterising 'disability' in terms of a qualitative social construct rather than in terms of a quantitative biomedical state, and listed the limitations of osteological data for identifying range and impacts of disabilities experienced in the past, regardless of the model adopted.

In her 1999 paper Roberts put forward four scenarios for categorising community response to individual experience of disability: (1) disability viewed as acceptable and care given; (2) disability viewed as weakness/unacceptable and care withheld; (3) disability seen as conferring special status and care given; and (4) disability accepted so long as it has no impact on performance (Roberts 1999:82). 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 activity – and type of care given – were not considered in any depth. Acknowledging that sometimes physical impairments discernible in skeletal material are so significant that commonsense dictates they were associated with temporary or permanent disability, Roberts (1999, 2000) qualified this by emphasising the primacy of social factors in determining disability experience: 'although such interpretations [of disability] may be correct, it is important to be cautious in presenting any interpretation of this kind' (Roberts 2000:54) – a statement which captures the still widespread reluctance to infer disability from skeletal evidence (e.g. Roca et al. 2012). In clarifying the issues to be confronted in developing an archaeology of disability Roberts (1999, 2000) provided a valuable service, but unfortunately did not go on to consider how these issues 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 recognised, largely limited to consideration of immediate and measurable clinical manifestations of disease. Absence of an agreed – or even a contested – archaeological model of disability means there has been no shared framework for analysis or discussion.

In the *Archaeological Review from Cambridge* volume produced to stimulate archaeological discourse and research on disablement (Metzler 1999), Cross (1999) and Shakespeare (1999) emphasised the importance of creating an archaeological model of disability. The failure to produce one was seen as largely attributable to the perceived need to choose between competing medical and social models (Cross 1999); by the turn of the twenty-first century, sociopolitical readings of disability had achieved extensive acceptance, and pressures to construe 'disability' as (almost) exclusively the product of social forces were in the ascendant (Shakespeare 1999, 2006; Southwell-Wright 2013:67–78), constituting a powerful ideological obstacle to archaeological analysis. Cross (1999) argued 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); study of disability in the past has the potential to contribute to this. Shakespeare (1999), a prominent figure in disability studies, also embraced the potential of an archaeology of disability. He deplored the artificial distinction between medical and social models as the product of an unsustainable 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; see also Shakespeare 2006, 2008). He suggested that 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). Shakespeare (1999) acknowledged there is a long way to go before this potential is realised.

Shakespeare's (1999) observations return discussion to the imperative of developing a broad-based archaeological model of disability, and highlight the fact that, over the years following publication of the 1999 *Archaeological Review from Cambridge* issue dedicated to promoting this, archaeology has come no closer to this goal. Archaeologists have certainly been sensitised to the pitfalls of claiming 'disability' in their research, but for the most part have not actively sought solutions. It seems a given that an archaeological model of disability will have its own identity, while drawing on concepts and definitions from existing areas of disability studies and positioning 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 physical functioning capability before the question of disablement – in any context – can be considered. Knowledge of the sociocultural circumstances in which pathology occurred will always be less than ideal, but a focus on clinical disease impact in relation to more easily retrievable aspects of lifeways context, such as physical environment, settlement features and economic practices, offers a start from which to hypothesise features of likely disability experience. In turn, this opens the door to considering those less immediately accessible social and behavioural aspects of the experience of disablement that may be even more rewarding in exploring the past – the provision and receipt of care.

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 past health-related care: there has been sporadic interest despite a generally discouraging climate, but limited follow-through.

At the moment, identifying likely caregiving where evidence suggests survival with disability is arbitrary, reflecting researchers' personal interests rather than the frequency with which such evidence occurs, and cross-referencing between cases of likely care provision is rare. There is no consensus on the definition of 'disability', and there are no agreed principles or criteria either for establishing the likely experience of disability from evidence in human remains or for 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 agreed 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 health-related care behaviours in prehistory.

However, although the archaeological literature on past health-related caregiving is fragmented, the case studies summarised in Table 2.1 flag the potential contribution of a 'care' focus to expanding our understanding of the past. Together, they suggest a ubiquitous pattern of human behaviour that deserves a systematic attention which it has not received, and they provide the basis for encouraging greatly increased archaeological research on this subject. Before attempting this, though, a fundamental question remains – why has there been so little attention to the study of health-related care provision to date? Possible reasons (some of which have already been raised in this chapter) are briefly canvassed below.

One explanation may be that some 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 response to this, it could be observed 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 (a point elaborated in the next chapter) – but this still leaves plenty of material worthy of consideration in relation to possible care provision.

Another explanation may lie in trends in bioarchaeology and palaeopathology research over the last 20 years, which have seen a growing priority placed on population health and disease at the expense of case studies of individual pathology. This is particularly so 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 archaeological research agenda in the English-speaking world. As discussed in Chap. 3, archaeological research into caregiving is limited to case studies by virtue of its evidentiary base, and in a competitive environment this may mean that funding is 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 speculation. Some (particularly archaeologists of a post-processualist leaning) 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 the above, it could be argued that boundaries have been blurred over recent decades. For example, there is now 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) – health-related care is the overlooked orphan in this line-up.

Finally, perhaps part of the answer lies in the disincentive to the archaeological study of care arising from the political and personal sensitivities associated with the topic of disability enunciated by Dettwyler (1991) and subsequently repeated by others (e.g. articles in the *Archaeological Review from Cambridge* 1999; Tarlow 2000; Roca et al. 2012). The effect of this factor in discouraging research into caregiving is impossible to calculate, but no less real for that.

It is important to overcome the impediments to archaeological research into health-related care. 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 the result of care offers an *in*valuable entrée into the small corners of past human existence. The bioarchaeology of care approach, detailed in the following chapters, provides a theoretical as well as a practical framework for achieving this aim.

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Chapter 3
Context for a Bioarchaeology of Care

The last chapter concluded that there is compelling evidence for health-related caregiving in the archaeological record, but that its potential for increasing our understanding of the past has not been exploited. In large part this may be because the topic of past 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 'care' in the archaeological record; there are no established criteria for identifying possible indicators of caregiving, or for determining what the care provided might have comprised; and there are no shared protocols for attempting to decipher the broader significance of the behaviours involved – or at least implied – in both the giving and the receiving of this care.

The following three chapters attempt to fill this void. This 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 assessing whether, on the balance of probability, 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 the interpretation of caregiving may offer our understanding of past practice 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 the past. It then reviews obstacles facing palaeopathology in identifying disease and disability in human remains, and the implications of these for inferring health-related care provision. The third section considers the likely level of demand for 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 health-related care practice applicable across human history. The final section draws out the implications of all the above for a bioarchaeology of care approach.

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Defining Health, Disease and Disability

> Impairment has always existed, and has its own experiential reality (Shakespeare 2006:54)

It is important to acknowledge the problems inherent in retrospectively applying modern western concepts of 'health', 'disease' and 'disability' to experience in prehistory, given that the consequences of *not* doing so in part underlie the paralysis in archaeological research into health-related care 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.

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; Winkelman 2009). Yet despite an overarching in-principle agreement on positioning health as a 'multivariate positive', most health policies and interventions are still centred on eliminating, reducing or ameliorating disease, and 'solutions' to disease are still aimed at treating the individual (Choby and Clark 2014). It is hard to escape our 'pathology-based way of thinking' (Levin and Browner 2005:746).

Extending consideration to the way in which health is understood in both non-western and 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 well-being, 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; Scheper-Hughes and Lock 1987). The relative nature of health is illustrated by the fact that in certain communities where western medicine has achieved quantifiable improvements in biological health these changes are perceived to be associated with 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 (Stedman'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. 1999; 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 *re*ceived – 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 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 health-related care (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; Scheper-Hughes and Lock 1987; Sobo 2004; chapters in Whitaker 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).

In most circumstances archaeology is restricted to a pathology-based approach to health, relying 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 reality bears this out, providing the basis for sometimes savage critiques of too-literal socio-political interpretations of disease. Anderson (1995), for instance, 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. Vehmas (2008:22) refers to the 'ontological confusion in disability studies' whereby an individual's state of physical impairment is defined primarily in terms of the social and political, with the physical implications of this state often largely ignored. So, for example, '[s]pina bifida is not inherently connected to oppression, because the existence of a neural tube defect is an *intrinsic feature* that exists independently of our views about it' (Vehmas 2008:22 italics in original).

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 practical 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' – in an abstract sense – 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 (their '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 sociocultural 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.

Disability

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

Difficulties reaching consensus in defining health and disease pale in comparison with those encountered in defining 'disability'; in western culture alone there are multiple models of disability in operation and, often, in opposition (Barnes and Mercer 2010; Bickenbach 2009; Devlin and Pothier 2006; Reid-Cunningham and Fleming 2009; Riddle 2013; Shildrick 2009; Stone 2001; WHO 2011). It would be overly simplistic to suggest that this debate can be reduced to a dichotomy of medical (or biological) versus social construction, although to some degree this may be true (Anderson and Carden-Coyne 2007; Oliver and Barnes 2012); the contest is perhaps better envisioned as taking place between an 'interactional approach', elaborated by

Shakespeare (2006:56; see discussion Riddle 2013), which recognises that 'disability is always an interaction between individual and structural factors' (Shakespeare 2006:55) and variants of the critical disability theory viewpoint that present disability as 'not fundamentally a question of medicine or health, nor … [as] just an issue of sensitivity and compassion: rather it is a question of politics and power' (Devlin and Pothier 2006:2; Oliver and Barnes 2012). Shakespeare's (2008:11) rebuttal of this position is direct and to the point: 'my objection to the social model [of disability] is not that it is partisan, but that it is wrong. It fails to capture the complexity of disabled people's lives'. In modern society passions can run high on the issue of how 'disability' is conceived – understandably, since the potential implications of this affect personal identity and self-esteem, development and implementation of social and economic policy, and access to rights and resources for those living with disability (Bickenbach 2009; Shakespeare 2006, 2008; Shildrick 2009; Stone 2001; WHO 2011). As seen in the last chapter, a similar passion is manifest in attempts to define and discuss disability in relation to those long dead.

The level of correspondence between past and present assessments of what it is to be 'disabled' may be unclear in certain cases, because – polemics aside – a disease state that is incapacitating in one sociocultural setting may be of negligible importance in another, and vice versa. For example, Scheer and Groce (1988) suggest that high rates 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. Knüsel (1999) describes a male adult 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 and productive focus on repetitive tasks. Tarlow (2000) observes that in prehistory infertility may have been considered more disabling than pathology affecting more immediate aspects of physical functioning; 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 Ingstad and White (1995) and Priestly (2001) provide further examples of the way in which cultural contingency influences disability status in relation to certain disease impacts.

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; Imrie 2004; WHO 1997, 2011a, b), and this 'biopsychosocial' model – essentially the same as Shakespeare's (2006, 2008) 'interactional' 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 (1) impairment in body structure and function, and level of disruption caused by this impairment in daily life; (2) 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 (3) 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 care provision for further analysis, initiation of Stage 1 of the bioarchaeology of care approach relies on evidence suggesting a period of survival with 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 Chap. 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 experience of disability may have entailed for specific individuals in the past.

The Limitations of Skeletal Analysis for Identifying Disability

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

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, relatively few pathologies have the potential to register in bone, and those that *do* have this potential affect bone on average only 10–20 % 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 5 %, in leprosy sufferers it is between 3 and 5 %, and in those with a trepanematosis it is between 1 and 5 % (with the exception of yaws, where skeletal involvement is around 15 %) (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 conditions (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 that are easily accessible to researchers (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, quite 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 (CT) scanning and magnetic resonance imaging holds promise both for improving the reliability of diagnoses in skeletal and mummified remains and for increasing the number of cases in which disease can be detected (see, for example, Thompson et al.'s (2013) use of CT scans to reveal surprisingly high rates of atherosclerosis in four hunter-gatherer/pre-industrial groups), but the preservation status of remains, access to technologies, and cost are, variously, barriers to their adoption (Cohen and Crane-Kramer 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 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 nineteenth 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 disease 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 totality of 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).

In outlining the 'osteological paradox' Wood et al. (1992) review some of the complexities of palaeopathology analysis. For example, 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 an unknown cause). 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, often referred to as variability in individual frailty (Wood et al. 1992:344; see also Piperata et al. 2014). Taking all three 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), most researchers agree that uncertainty regarding population representativeness is inevitable when working with prehistoric small to medium-size samples (e.g. Ortner 2009; Waldron 1994).

Implications for Identifying Cases of Care in the Archaeological Record

The problems faced in recognising, diagnosing, interpreting and quantifying pathologies in skeletal remains have obvious consequences for identifying potential cases of health-related care 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 diseases 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 support before the disease process reached this particular stage – and in assessing how health-related needs (and suitable 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 of this requirement is that most perimortem care will be indiscernible. In the case of incomplete or poorly preserved remains, even where sufficient evidence exists to identify and diagnose pathology, evidence relevant to inference of care may have been lost – although Brickley and Buckberry (2015) demonstrate that even when skeletal fragments are all that is available it may still be possible to infer likely clinical and quality of life impacts of certain diseases from these, and this may allow very basic speculation regarding possible provision of care. 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 care is again noted, and this consideration restricts inference of receipt of care to those individuals whose remains display clear evidence of serious, and activity-limiting, pathology.

Variants on the osteological paradox (Wood et al. 1992) apply to inference of health-related care 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 has not done so 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 one consequence of this is that past levels of health-related caregiving activity will always be underestimated.

The Demand for Health-Related Care 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 2013; 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 (also see Finch 2010; Gurven and Kaplan 2007), and that 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; Ortner 2003; Steckel and Rose 2002a; Thompson et al. 2013). Rothschild (2003) and Rothschild and Rothschild (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 17000 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 8000 BP to early colonial times, noting ‘it would be no exaggeration to say that for the past 8,000 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 need 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 possibly received some level of support. However, as argued in Chap. 2, the palaeopathology literature contains sufficient evidence of remains displaying indicators of such severe pathology that the need for assistance cannot be doubted, supporting the premise of a constant, and certainly not *in*significant, need for care in the past.

Ethnographic studies of health in communities with lifestyles comparable to those of the pre-industrial past (e.g. Finch 2010; Gurven and Kaplan 2007; Hewitt 2003) can contribute to the consideration of past caregiving requirements by providing examples of what such needs may have consisted of in practice – always recognising that the experience of modern subsistence economy groups, however isolated, cannot be automatically transposed onto 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. He records high rates of both reported and observed illness and injury; of those reporting illness, 88 % experienced disability (defined as inability to participate in normal duties and activities) of 14 days or more, and 65 % reported disability of over 30 days (Sugiyama 2004a:382–384). Sugiyama (2004a) concludes that without healthcare provisioning most individuals in the two latter groups would not have survived. Proximate causes of reported disability included pathologies potentially evident in skeletal remains, such as broken bones and systemic infection associated with untreated dental abscess, but for the most part comprised predominantly soft tissue pathologies such as snake, insect and animal bites; parasitic infestations; bacterial infections associated with lacerations and puncture wounds (these infections might register in bone once chronic); childbirth-related trauma; burns (dependent on severity burns might register in bone); 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 health-related care provision to individual *and* group survival throughout human evolution.

Studies of different populations present a similar picture. Reviewing the experience of a selection of hunter-gatherer groups in Africa and the Americas, Kaplan et al. (2000:173–175) report findings comparable to those of Sugiyama (2004a) in relation to rates and general category of pathology and the associated care requirements. 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 % 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 % 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 % of cases individuals presented in distress although without physical signs of inability to function, and these people were cared for until they felt capable of returning to their normal occupations. Frankel (1986) documents similar experiences of, and caregiving responses to, pathology experienced within an unrelated Papua New Guinea community.

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 is likely to produce diagnostic skeletal markers on any consistent basis, yet all would have been present in prehistory. The WHO *World Report on Disability* (2011a) estimates that at any one time approximately 15 % of adults experience 'significant [severe or extreme] functioning difficulties in their everyday lives', with 2.2 % 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 developing nations today (WHO 2004; Steckel and Rose 2002b). (It is noted, in this context, that aging of 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 affecting functioning capability – and therefore a rough equivalence in the need for care – between prehistoric and modern times.

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 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 health-related care 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 their ability to participate within the community at an expected 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 health-related care. Neither domain is exclusive of the other, and many cases of caregiving will involve elements of both – simultaneously or sequentially.

Table 3.1 Henderson's 14 components of nursing practice[a]

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, *et cetera*
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

[a] From Henderson, V. 1964 the nature of nursing. *The American Journal of Nursing* 64:62–68 (p65)

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 interpretation of prehistoric care provision will become apparent in Chap. 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 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 her time (Henderson and Harmer 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 health-related care, 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 experience of healthcare delivery, and provide an empirical foundation for teasing out possible 'constants' of care practice.

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 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 care 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 and operating in institutional environments; the caregiving focused on in this book occurs in mobile, semi-sedentary or recently settled, small-group, subsistence environments, and the commentary accompanying each care constant proposed in Table 3.2 reflects this.

Table 3.2 'Constants of care' (direct support) for a bioarchaeology of care analysis[a]

1.	*Provision of food and water* [*Henderson component 2*]
	Adequate nourishment and hydration are fundamental to survival, and relatively non-problematic to provide (dependent on resource access). Problems with nutrient absorption (e.g. edentulism, digestive 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
2.	*Maintaining body temperature within normal range/protection from the elements* [*Henderson components 6 and 7*]
	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 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
3.	*Facilitation of rest and sleep* [*Henderson component 5, partial component 4*]
	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) Archaeological inference of interventions to assist rest and sleep is limited to instances in which the individual (1) would have been incapable of achieving a position conducive to these outcomes unaided (e.g. paralysis) or (2) experienced a pathology for which rest may be assumed essential for healing (e.g. head injury, lower limb fracture)

(continued)

Table 3.2 (continued)

4.	*Ensuring physical safety* [*Henderson component 9*]
	This might include protection from potential 'active' hazards (ranging from other humans, animals, reptiles or insects to unknowable demons or elements of a hostile cosmos), environmental hazards (e.g. terrain posing problems for those with impaired mobility or vision) and domestic hazards (e.g. open hearths). Individuals with pathology leading to loss of control over behaviour may attempt injury to themselves or others, and require restraint. Ensuring physical safety may sometimes require a level of monitoring (see [6]) that makes this component particularly demanding
5.	*Maintaining/assisting mobility* [*Henderson partial component 4*]
	When independent mobility is significantly compromised support may be required in basic activities of daily living (e.g. maintenance of personal hygiene – [7] below). Maintenance of mobility can be integral to recovery from/management of disease, and health consequences of medium to long-term immobility can be detrimental (even fatal) A mobility-challenged individual in a mobile community may require assistance to keep up. This might span concessions for disability (e.g. allowing slower than normal 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'
6.	*Monitoring health status* [*no Henderson equivalent*]
	In many diseases, health status monitoring is essential to allow timely response to physiological needs and to avoid health crises; this is particularly critical in relation to the requirements described in the care 'constants' [7], [8] and [9] below. [Henderson (1964) does not identify monitoring as a 'care 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 a behaviour essential in effective care]
7.	*Maintenance of personal hygiene and protection of the integument* [*Henderson component 8*]
	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, cleansing of wounds) 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
8.	*Physical manipulation*: '*move and maintain desirable posture*' [*Henderson component 4*]
	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 state is important physically *and* psychologically (see [3]) Physical manipulation may help maintain or improve physiological functioning across a range of conditions (e.g. positioning, massage and percussion assist respiratory functioning; positioning and massage assist gastrointestinal and circulatory functioning) – see [9] below
9.	*Maintenance of physiological functioning* [*Henderson components 1 and 3*]
	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 (see [1]). Although management of internal haemorrhage would likely be beyond prehistoric capability, staunching external haemorrhage (tourniquet, pressure, cauterisation, wound-stitching) was probably achievable

[a] This table builds on Henderson's (1964) components of nursing practice (Henderson, V. 1964 the nature of nursing. *The American Journal of Nursing* 64:62–68)

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). All prehistoric individuals identified in a bioarchaeology of care approach as likely receiving 'direct support' would almost certainly have required more than one of the forms of care outlined in Table 3.2 at some stage, and many individuals may have required most or even *all* of these forms of support over a short period (for example, during an acute phase of disease). However, only those individuals suffering the most severe pathology would have required the full complement of support activities on a long-term basis.

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 differ in their level of importance. Caring for a disabled individual is an integrated activity, with all aspects of care contributing to preserving life and improving health, 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, potentially suggesting 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? How was infection avoided following surgical amputation?), 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 the interpretation of the wider sociocultural implications of caregiving, and are discussed in these contexts in Chaps. 5–7.

The last five of Henderson's (1964) components of nursing practice apply to both 'direct support' and 'accommodation', and address what are primarily psychological requirements: variously, communication; spiritual fulfilment; 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 Chap. 6 and illustrated in the case studies in Chaps. 8–10 – not wholly impossible.

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. The assistance required to allow participation in community activities will always differ between individuals, because each person's circumstances – impact of disease, acquired abilities and handicaps, personality, interpersonal relationships, 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 care component [5] in Table 3.2 above, individuals with restricted mobility in a mobile, pre-industrial society may require an arrangement that enables 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. In a subsistence hunter-gatherer economy, those with mobility problems may be unable to take up the 'normal' productive role of others in their cohort although still be under pressure to contribute to the group economy. 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 have difficulty in performing these efficiently. Taking into account cultural, economic and physical environments, it may be possible to identify a range of alternative tasks – or non-traditional roles – that might have been undertaken by the individual, although exact correspondence will almost certainly be impossible. The study of Lanhill Burial 7, the British early Neolithic adult male who lacked the use of his left arm and is the focus of Chap. 10, and that of Romito 2, the young male with skeletal dysplasia from a hunting community in Epigravettian Italy (Case 13, Chap. 2 – Frayer et al. 1987, 1988; Tilley 2015) examine the sorts of considerations raised above in detail.

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 this person have been capable of freeing up the labour of others by taking on alternative (non-normative) work duties, or would group members have had to compensate for the individual's reduced productivity by taking on additional responsibilities without any such relief? This reflexive interrogation of 'individual-in-context' helps to inform broader interpretation of case study material, and arguments for such an approach are further discussed in Chap. 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, and these are summarised below.

Firstly, limitations to archaeological research into health-related care provision need to be acknowledged. Although the presence of disease is established as a constant of human existence, restrictions inherent in reliance upon often poorly preserved osteological materials to identify pathology in prehistoric remains mean that many instances of likely disability can never be retrieved 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, information on care needs that might emerge from considering commonly associated clinical signs and symptoms is inaccessible for analysis.

The criteria for inferring care 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 the utmost 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 a knowledge of context that, in many instances, 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 (Chap. 6) promotes 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, the contextualised strategy provides a systematic approach to identifying prehistoric disability status that is open to review.

In sum, the observations made above emphasise the need for researcher conservatism in interpreting disability impact and in inferring health-related caregiving.

Thirdly, while the specifics of care provided 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 care required to address various categories of disease impact successfully. 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 as well as protection against hostile aspects of their environment; anyone who is bedridden will require shelter, assistance with hygiene, and 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 controversial to suggest that 'social support' as a form of caregiving can be inferred from the archaeological record (see discussion in Chap. 2), consideration of the potential contribution of a positive social environment to survival with disability is part of a bioarchaeology of care analysis, and will be considered at a theoretical level in Chap. 5 and at an applied one in Chap. 7.

In conclusion, while there will have been considerable variation in the detail of prehistoric health-related caregiving, 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 Chap. 6.

Fourthly, and finally, while it will be argued in Chap. 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 what are essentially randomly-recovered, discrete examples of prehistoric care in an attempt to identify population-level patterns of health-related care 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 small, contemporary group it may be possible to identify behavioural consistencies, however, and the ramifications of this are explored in the Chap. 10 case study.

The fundamental principle expounded here is that each instance of prehistoric care provision must be analysed individually, even if a particular context offers more than one example of a person for whom care may be inferred. 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 health-related care provision. 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.

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Chapter 4
The Origins of Care

If the process of analysing prehistoric health-related care is considered as a narrative, as suggested in the Introduction, then the previous chapters have focused on unpicking the elements of the 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 motivations 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 caregiving, 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 possibly 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 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 looks at some of the constituent elements of caregiving behaviour and the possible drivers of these; at whether caregiving evolved as a biological or a cultural solution to conspecific experience of disease; and at whether it is even possible to distinguish between the processes

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of biological and cultural selection in relation to care provision. It then considers what the views held on the origins and underlying motivations of care imply for a bioarchaeology of care approach.

As a topic, the ‘origins of healthcare’ deserves its own book; in *this* book it receives a single chapter, resulting in an inherently complex subject, integral to the ‘big picture’ of caregiving, receiving a frustratingly abbreviated coverage. Moreover, the sources referred to in developing this chapter undeniably reflect personal interests, assumptions, knowledge, theories and beliefs (perhaps, after all, this chapter does not differ very greatly from much of the literature that it references?). The chapter is best read as a meditation on an ultimately unresolvable question – ‘why do we humans provide care to those suffering the impact of disease, sometimes at significant cost to ourselves?’. It does not pretend to provide any definitive answer.

Health-Related Care: The Product of Selection?

If health-related care is viewed as a behaviour selected for through biological evolutionary processes, and if the orthodoxy that modern non-human primate behaviour approximates that of shared human and non-human primate ancestors is accepted (although see arguments for rejecting this in Chap. 2), then one might expect direct evidence for care practice among living non-human primate relatives – as well as indirect evidence in the remains of early *Homo*.

Non-human Primates: Disputed Evidence for Health-Related Care Practice

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 1990a, b; Lovell 1991; Nakai 2003; Schultz 1939; Stokes and Byrne 2001), and survival with acute and chronic diseases including osteomyelitis (Lovell 1990a, b; Lovell 1991), polio (Goodall 1971:199ff) and severe osteoarthritis (Lovell 1990a, b; Jurmain 2000). Yet despite such observations there appears little evidence for 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), and as discussed in Chap. 2, Lovell is only one of many. Long before Lovell (1991), Schultz (1939) had reached a similar conclusion.

de Waal (1996) documents a few instances 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 have 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 (de Waal 1996:6–9), is one of the most frequently cited instances of primate compassion. However, Mozu inhabited a conservation park in which monkeys received daily rations and were therefore not competing for survival, added to which 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 again illustrates the need for caution in extrapolating from animal studies (in this regard see also the discussion of work by Turner (2011) and Turner et al. (2014) in Chap. 2).

There are some instances in which healthy chimpanzees have intervened to protect a disabled group member from aggressive conspecifics. Goodall (1971:200–203) reports that the chimpanzee Hector shadowed the terminally ill chimpanzee Mr. McGregor, occasionally intervening to discourage aggression by other group members. When Mr. McGregor failed to keep up with the group, Hector fell back too; behaviour interpreted as protective. Hector was not observed providing Mr. McGregor 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. McGregor. 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. McGregor's case, possibly because polio had reduced a once-dominant male to a state of 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 the fourth of the care 'constants' proposed in Table 3.2 ('Ensuring physical safety'), it is a stretch to classify these responses as evidence of predominantly health-related care-driven activity.

Despite the dearth of evidence for health-related care among non-human primates, there *are* examples suggesting care provision is not 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, but not exclusively, female) non-kin members of the group (e.g. Silk 1992; Turner 2011). This behaviour is not consistently found across different groups of the same species, but when it occurs it goes beyond the normal nurturing given to healthy dependent juveniles and might be judged atypical in providing care to 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. McGregor) 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 Taï Forest chimpanzees (Boesch 1991; Boesch and Boesch-Ackerman 2000; Boesch et al. 2010). Taï 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 Taï 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 groups nor the singular example of the Taï chimpanzees by themselves constitutes evidence for an innate predisposition to health-related care provision in non-human primates. Individual elements of the assistance given to disabled non-human primate infants are not per se distinguishable from those that make up normal nurturing practice (although may be carried out more intensively or for longer periods), and perhaps are most economically regarded as an extension or generalisation of established parental behaviours rather than falling into a specific 'healthcare' category.

The Taï chimpanzees' response to injury unarguably falls into the category of care given to meet health needs. Boesch himself, however, is 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 2007, 2008:453) and has urged the importance of analysing such altruistic behaviours within their socio-ecological context (Boesch et al. 2010). Lycett et al. (2007, 2010) have demonstrated that many chimpanzee behaviours commonly regarded as innate are the result of social learning rather than biology, and the health-related care practices observed among Taï chimpanzees, but not recorded in other chimpanzee (or other non-human primate) groups, seem better explained by the former than by the latter.

A Biological Basis for Human Healthcare Behaviours?

Although modern non-human primate studies do not offer much support for a shared pre-hominid hereditary basis for health-related care provisioning, does *any* evidence exist for evolutionary selection for health-related care behaviours in the human line?

Indicators allowing the inference of caregiving by *Homo neanderthalensis* and early *Homo sapiens* populations (see Table 2.1, Cases 5–11) leave open the question of whether this care was (1) a behavioural trait inherited from a common ancestor; (2) independent learning or independent biological evolution of a useful behaviour in (in)directly related species; or (3) one species adopting a useful behaviour observed in another species. Sugiyama (2004a:386) suggests that if care provisioning can be firmly identified in *Homo erectus* this would support an evolutionary origin for this behaviour, and urges further research. As noted in Chap. 2, instances of care practice *can* be inferred from evidence in a small number of pre-Neandertal hominin remains (Table 2.1, Cases 1–4), but this alone does not constitute 'proof' that human caregiving behaviours are hardwired. The relatively developed reasoning capacity attributed to the early stage of hominid development (e.g. Lycett 2008: Simão 2002) suggests that caregiving is just as likely to have been the product of social learning as those practices displayed by the Taï chimpanzees (Boesch 1991; Boesch and Boesch-Ackerman 2000; Boesch et al. 2010).

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; 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 a predominantly biological origin for healthcare provision, it might seem logical to explain the human practice of health-related care as an evolved specialisation of parental (particularly maternal) nurture.

Fábrega (1999:68ff), whose arguments for an evolutionary basis of health-related care 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. Some of the skill sets used in health-related caregiving undeniably overlap with some of those employed in assisting healthy women around pregnancy and in raising dependent infants, and activities in the latter sphere may well 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 pregnant women, some mothers and probably many infants may be candidates for healthcare at various times. However, to explain health-related care provision as an extension of infant nurturing is to ignore the quite different, and perhaps more complex, cognitive demands involved in caring for an individual suffering the impacts of disease.

Furthermore, although there is often unquestioning acceptance of 'maternal instinct' as a biologically determined behaviour, this cornerstone assumption has also been challenged. Coe (2003), for example, argues that behaviours associated with altruism and compassion are modelled on 'maternal roles' (2003:10). 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. Barlow and Chapin 2010; Beausang 2000; Dettwyler 1995). If even maternal skills can be understood, in great part, as produced through an applied learning process, then the same interpretation must be applied to explaining specialised interventions required in response to disabling pathology.

A number of authors, chiefly from the disciplines of biology and psychology, have suggested that caring for sick and disabled group members is one of a number of instinctive disease-control behaviours selected for over the period of human evolution (others include, variously, active avoidance of pathogens and parasites; stigmatisation and/or quarantining of diseased individuals; use of herbal medicines; immune system priming; minimising energy expenditure during acute phases of disease; and mate selection on the basis of pathogen resistance) (Hart 1990, 2005, 2011; Oaten et al. 2011; Pacheco-López and Bermúdez-Rattoni 2011; Schaller and Neuberg 2012; Stevenson et al. 2011). The activities that comprise human caregiving behaviour are not considered other than in vague generalities, however, although some examples of animals (such as elephants, lions, mongooses and foxes) caring for conspecifics are discussed (Hart 1990, 2011).

Fábrega (1999, 2011) is the most thorough – and possibly most extreme – proponent of a largely unmediated evolutionary basis for health-related care among humans. Both caregiving *and* the physical manifestation 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 answer to this, 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 covers 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)

In this chapter it is impossible to address the detail of Fábrega's arguments as presented in his major work, *The Evolution of Sickness and Healing* (1999), but some problems are immediately obvious. There are conceptual contradictions: for example, at one point 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 (Fábrega 1999:66–68) that includes some of the cultural outcomes of those same 'adaptations' identified ten pages earlier. 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 memes (Dawkins [1976] 2006:189ff), Fábrega's (1999) memes are characterised by an ill-defined inclusiveness that enables everything and anything to be attributed either to a biological meme or to the culturally realised products of this biological entity, leaving no potential for hypothesis falsification. Yet despite criticisms, Fábrega (1999) provides an interesting discussion both of the cognitive skills – courtesy of specifically human, and indisputably evolved, cognitive capabilities – required for care provision and of the likely biological and social rewards of caregiving that 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 posits there may be a biological evolutionary basis to (1) 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; (2) 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 (3) 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.

Returning to the question posed at the beginning of this section – can biological evolutionary mechanisms help explain human health-related caregiving behaviours? Not satisfactorily, because even where the detail necessary to make an assessment of such a claim is provided, there are no behaviours ascribed to biology that are not equally well – or better – explained by sociocultural learning processes. Where authors such as those cited above posit that certain specific features of care behaviours are the product of fitness selection, other researchers have framed caregiving as the product of more generalised, and perhaps deeper-seated, behavioural predispositions, and these call for a closer look.

Altruism: Contested Identity, and Role in Relation to Care

Healthcare 'altruism', sometimes 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 caregiving 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 evolutionary sciences the term 'altruism' signifies something very different, however. It is an '[i]nstinctive 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); indeed, most of us will be able to come up with many examples from our own experience. 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 McFarlane 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; Wilson and Wilson 2007).

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).

Altruism, Expectations of Reciprocity, and Health-Related Care

Altruism is potentially open to exploitation by those who receive its benefits, and theorists from the sociobiological end of the spectrum seek to explain the existence of altruism in terms of the 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 health-related care referred to by Hill et al. (2009), Kaplan et al. (2000) and Sugiyama (2002, 2004a, b; Sugyama and Chacon 2000) is ill-defined, but from context is understood as largely comprising the provisioning (food, water) 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 and/or another group member in a situation of comparable need, 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 in this task as college students in the USA. 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 (2008), an economist, and Sugiyama (2004a) identify the importance to the caregiver of establishing a 'reputation for generosity or unique abilities' (Hanson 2008:15; Sugiyama 2004a). Hanson (2008) directly attributes the development of health-related care provision, or 'deep medical habits' (Hanson 2008:2), 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 by the studies summarised in Table 2.1 (Chap. 2), there are enough examples of health-related care 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 available evidence 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 – and unnecessary – 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 care provision, but how 'reciprocity' was understood, and what drove this reciprocity, is far from clear.

Altruism, Social Learning (Altruism Is Its Own Reward?) and Health-Related Care

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 multidimensional 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), and 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 the cultural expectations and beliefs in social responsibility of the actors involved (Bierhoff and Rohmann 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 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 (concentrating on adult altruistic behaviours) similarly concludes that 'it's good to be good' (Post 2005:66) – that 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 defend 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 carers' 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 – as long as the workload is not overwhelming – caregiving has positive health outcomes for carers. Kramer's (1997) meta-review of carers' experiences 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 none of the research cited above queries the detail of what motivates the behaviour of health-related care provision. Nevertheless, there seems general agreement in both the clinical and social psychology literature that, at the level of individual care-giver, drivers of care are likely to include both altruistic (in the sense of 'desire to do good') and egoistic components – often simultaneously (Schulz et al. 2007).

When altruism is expressed in a behaviour as demanding, multifaceted and complex as health-related care, seeking an explanation for this trait which goes beyond genetic determinism is not in any way 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 pathology-associated needs. 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 below, is proposed as one of the proximate motivations for directed altruism (de Waal 2008).

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 essential for the practice of health-related caregiving, as well as for the multitude of other prosocial behaviours which both enable and sustain community living (Apicella et al. 2012; Bowles and Gintis 2003; Cosmides and Tooby 1992; Gächter et al. 2010; Rilling et al. 2007; Weiss et al. 2011).

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 Semmann 2010). Cooperation involves working with others to achieve a common purpose or benefit (in a sociobiological 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 health-related care provision from earliest prehistory onwards. Put simply, it is suggested that caregiving behaviours, enabled by internal group cooperation, bring 'benefits' distinct from those associated with any personal relief experienced by the care-recipient by positively reinforcing those aspects of group beliefs, customs and values that led to the provision of care in the first place – thereby strengthening group identity and cohesion (also see discussion in Fábrega 1999). Doat (2014) goes even further than this, arguing that the relatively frail and vulnerable human species is defined by interdependence; species survival has always required collaboration between, and care for, the strong, the weak, the healthy and the sick, and this dependency on each other has simultaneously driven, and been enabled by, social and biological selection for cooperation.

Over the last few decades, the dominance of sociobiology has seen the explanation of human evolution in terms of (the elimination of) competition, popularly summarised as the 'survival of the fittest', gain widespread acceptance; Bird and O'Connell (2006), for example, 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, 1997; Ronay and von Hippel 2010; Thornhill and Palmer 2001; chapters in Barkow et al. (Eds.) 1995. For critical review and discussion see e.g. Dingwall et al. 2006; 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 during recent years. 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 15–20 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 Suchak 2010). Garber's (1997) study of Tamarin monkeys finds the ratio of cooperative behaviour to combative 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 2000; 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 and 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 3 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) findings, although they suggest that the transition from freely given cooperation to expectations of reward or 'reciprocity' may not take place until 6 or 7 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). In a detailed discussion of the way cooperation is represented in nature and throughout time Weiss et al. (2011) conclude that cooperation is the basic organising principle in evolution, driving selection at every stage – from the molecular level to that of the ecosystem.

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, found not only in humans, but also in non-human primates and in a wide range of other animals, is 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 often claimed as an evolved trait serving 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 Suchak 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 themself (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, whatever 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 30 years (and particularly the last decade and a half), which they attribute directly to sociocultural phenomena.

Hill et al. (2009) draw direct links between cooperation, health-related care, 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 co-evolution, 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 is clearly an important enabling factor for initiating and maintaining caregiving in both the past and the present, 'health-related care provision' and 'cooperation' are no more synonymous than 'co-operation' and 'altruism' or 'cooperation' and 'empathy'. Unravelling the significance of caregiving behaviours involves much more than establishing the existence – or otherwise – of a genetic template.

Emotion and the Origins of Care

Emotions provide the impetus to action, making an understanding of emotion essential to an understanding of behaviour (Barrett 2006; Izard 2007; Keltner and Gross 1999; Power and Dalgleish 2008). Despite the affective demands that characterise caregiving, however, there is little in the literature examining the role of emotion 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 (although Fábrega 2011 touches on this question indirectly). Having said this, the last few years have seen some interest in the role played by the emotion 'compassion' – 'the feeling that arises in witnessing another's suffering and motivates a subsequent desire to help' (Goetz et al. 2010:354) – both in a general context and in instigating and moderating healthcare behaviours (in relation to the former, see Goetz et al. 2010; in relation to the latter, see Spikins et al. 2010). What follows provides a brief introduction to theoretical debate in the field of emotions, followed by a speculative discussion on the part played by emotion in the provision of care.

Defining Emotions and Exploring 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 predominantly cognitively mediated (views vary greatly – see, for example, Boiger and Mesquita 2012; Izard 1992, 2007; Ortony and Turner 1990; Power and Dalgleish 2008; Tooby and Cosmides 1990; Wierzbicka 2010; Wetherell 2012 provides a particularly thorough review of these and other issues in the study of affect and emotion).

For those who view emotion as instinctive, '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 in Ortony and Turner 1990:316; Izard 1992, 1993, 2007; Power and Dalgleish 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. (Interestingly, 'compassion' is rarely included in research into either 'basic' or 'complex' emotions – perhaps because the associated connotations of morally 'good' actions are, as Goetz et al. (2010:351) suggest, just too 'controversial'.)

Those from the 'cognitively-mediated' school 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 2006; 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 2006; 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.

Emotion, Empathy and Altruism: And Their Roles 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 personal experience tell us: individuals actively involved in caregiving experience emotions, and these emotions influence how caregiving is performed. However, the nature of the 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, and 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 concern to alleviate the distress (an emotion) of another that is triggered, partially at least, by the ability to empathise (allowing recognition of the need for intervention).

There is not much in the literature on this question, and in what there is there seems 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 account empathy and emotion are effectively undifferentiated (de Waal 2008). Izard (2007:267), under the heading of '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.

Izard (2007) does not make it clear 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 his restriction of altruism to 'human toddlers and chimpanzees', Izard (2007:267) may also intend the reader to understand altruistic behaviour as an instinctive, rather than a reasoned, response. Omdahl (1995:15ff) argues that the relationship between empathy and emotion is complicated and multilayered, 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.

Building on de Waal (2008), although taking a different perspective, emotion, empathy and altruism might be envisaged as components in a continuous, positive-reinforcement feedback loop. The empathy (identification) experienced by one individual in response to pathology-related distress in another is made possible by the former's emotional 'knowledge'; this empathy is likely magnified by the existence of a personal relationship between actors, something unavoidable in most early human contexts. Empathy works with emotion to bring about a suitable behavioural response – in the caregiving scenario a form of altruism (the principle or practice of concern for the welfare of others) that is realised materially through the provision of care. The experiences encountered in providing this 'altruistic care' feed back into the emotion-empathy circuit, perhaps modifying or negating emotions already in play, or stimulating new and different ones; empathic responses must change correspondingly. Further, the caregiver's expression of altruism (through care), and possibly even the caregiver's very 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.

Returning to emotion – the main concern of this section – two very general observations are relevant here. Firstly, and mostly by default, much of the literature addresses 'emotion' as a single response to a discrete stimulus. While this certainly makes the topic easier to discuss, it misrepresents the complexity of many emotionally-arousing situations confronted in real life – such as becoming aware that someone with whom one is close is suffering a serious and disabling pathology. The initial response on learning this news will likely canvass a *range* of emotions – including, for example, love, compassion, distress, despair, sadness, panic, tenderness – in close succession and in any combination.

The second, and related, point is that the literature largely fails to consider the role of emotions, however defined, in maintaining long-term behaviour. Emotions may drive the immediate reaction to a stimulus; even with an activity as complex as healthcare provision, emotions will likely be the primary movers of an initial care response, and 'compassion', as earlier defined, is one of the obvious and strongest candidates in this context (see Spikins et al. 2010) – although it is unlikely to be the only one. But what sustains the difficult and demanding behaviours involved in caregiving over the duration (possibly months or years) for which they are required? There will be changes over time in healthcare requirements; caregiver and care recipient characteristics; and in features of the lifeways in which care is provided. Emotions will change, or at least fluctuate, over this period as well. Caregiving generates emotional rewards (for example, the person cared for improves, or minimally their condition does not deteriorate, the bonds between caregiver and care-recipient are enriched) and emotional costs (despair and depression due to the care-recipient's failure to recover, or resentment, irritation or anger at the demands associated with care); emotion may continue to motivate care provision or, in a reversal of the initial emotion-driven response, may undermine it. In any event, maintaining care beyond the initial establishment phase requires emotions to be consciously and continuously re-examined, and where necessary reconstituted, redirected and perhaps restrained.

While emotion, empathy and altruism seem inextricably interrelated, and all are critical components in the production of health-related caregiving behaviour, the extent to which these elements (singly or in combination) have been selected through biological rather than social evolutionary processes remains unanswered – and is, perhaps, unanswerable. In relation to emotions specifically, however, it can be agreed that these play a major role throughout the process of caregiving; that in so doing, they help to drive a biologically and socially functionally adaptive behavioural strategy of benefit to the wider group; and that regardless of whether the very first emotional response to somebody suffering the impact of disease comprises a 'basic' as opposed to 'cognitively-mediated' emotion, subsequent and longer-term responses building on this initial reaction undoubtedly fall into the latter category.

Archaeology, and the Recovery of Emotions from the Past

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

While there have been no moves towards a specific archaeology centred on three of the identified ingredients of caregiving – cooperation, empathy and altruism – the last decade has seen growing interest in prospects for identifying emotion in the archaeological record (see the dedicated issue of *Archaeological Dialogues* Volume 17(2) 2010 and the review by Tarlow 2012). Emotion was first substantively theorised as a topic for archaeological research by Tarlow (2000), although assumption of emotional experience has always been integral to phenomenological analyses of landscape and monument (e.g. Tilley 1994, 2004, 2008), and emotional state has occasionally been raised in discussion of prehistoric experience of likely affective events (e.g. Mithen 1991).

Acknowledging that emotions are enabled and expressed through biological mechanisms, allowing some presumption of a basic continuity and comparability across time and culture, Tarlow (2000, 2010, 2012) emphasises that in any analysis of emotions context is crucial – she urges against an essentialism that assumes a universality of emotional meaning and experience and that might be used to make claims of 'knowing' the intimate feelings of actors from a largely *un*knowable past. She suggests that it is more productive to concentrate on the concept of socially constructed 'emotional value' 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 – or at least the presence of these emotional values if not the detail of their content – accessible to archaeological identification (Tarlow 2000, 2012). 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, 2012) offers little practical guidance as to how this might be achieved.

Ironically, Tarlow (2000, 2012) explicitly dismisses the idea 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 2000:726–727) and characterising reference to compassion in association with caregiving as 'the retrojection of modern ideas about the inherent burdensomeness of disabled people' (Tarlow 2012:178) (see Chap. 2 for arguments countering this rather sweeping viewpoint). Indeed, this is the *only* area of behaviour that is specifically ruled out in terms of archaeological consideration. It is unfortunate because, as briefly discussed below, caregiving potentially provides one of the most profitable contexts for considering how 'emotional values' may influence action.

Harris and Sørensen (2010) expand on Tarlow's (2000) more general observations on emotion in archaeology, 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 a history 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 a 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 in considering emotion and its role in care, immediate and unmediated ‘visceral’ emotional responses to stimuli must rapidly become subject to cognitive control if they are to be sustainably channelled. 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.

Implications for a Bioarchaeology of Care

In thinking about the ‘why’ of health-related caregiving behaviours this chapter has included theory and research from so many disparate disciplines that it been difficult to come up with a coherent synthesis – and maybe a coherent synthesis is an impossibility, anyway. Regardless of this, it is still possible to draw out implications for a bioarchaeology of care from the material discussed here.

To recapitulate: questions relating specifically to the *origins* of health-related care are not often addressed in the literature, but they have received some attention, mostly from a sociobiological perspective, such 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 (e.g. Fábrega 1999, 2011; Hart 1990, 2005, 2011), and consideration of caregiving as a practice made possible through the selected mechanism of ‘reciprocal altruism’ (e.g. Sugiyama 2004a, b; Sugiyama and Chacon 2000).

Critically, all the evidence reviewed indicates that provision of care, when defined as a consistent and purposive response to the impact of pathology, is an almost exclusively human behaviour (the only notable exception found in the behaviour of one group of chimpanzees (Boesch 1991; Boesch and Boesch-Ackerman 2000; Boesch et al. 2010)). 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 exposure to pathology-related distress in another may stimulate immediate 'instinctive' empathic and emotional responses that then activate altruism, the commitment to care and the performance of all subsequent caregiving 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 partly 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, in practice, the prospects for even delayed reciprocity are poor.

The most plausible explanation for the origins of care seems to reside 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. The human brain – with its highly developed cognitive potential – is, of course, the product of evolutionary selection processes. The behavioural applications of this cognitive potential are produced through social learning and expressed within a particular cultural context, and these drive and sustain motivation for, and development and implementation of, health-related care strategies. Within this simple model, nature provides the infrastructure that makes human health-related caregiving technically possible; nurture controls whether, and how, this potential will be employed.

In terms of interpreting a specific case of caregiving within a specific lifeways environment, the argument proposed above may seem 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 lifeways in which it took place, the people who provided it, and the person who received it. Whether the origins of care are attributable to biology or culture hardly seems to matter. Yet in order to approach questions of motivation, and to appreciate the sophistication of the behaviour under study, it is valuable for the researcher to have some conceptual understanding of how 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 topic 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 1–3 of the bioarchaeology of care methodology, which follow a straightforward sequence of steps (detailed in Chap. 6) in ascertaining diagnosis of disability and likely need, type and nature of care provision in any specific instance, the answer is 'no'.

In relation to 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. The following chapter considers what insights into aspects of agency and identity may come from bioarchaeological analysis of care, and it does so based on the theoretical approach to health-related care origins outlined above.

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 bioarchaeology of care research.

In the small groups of early prehistory, as in any small group society, members were intersecting and interdependent in most of the personal, social and economic activities making up daily life. If one group member suffered the distress of pathology serious enough to require care, most other members would probably 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 undertaking the actions involved in 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 virtually unavoidable.

Recognising that all instances of caregiving in the past will have been invested with social emotional values of some description is hardly provocative. In the following chapter it will be proposed that from one perspective the set of human remains from which the inference of caregiving is drawn may be considered as much an item of material culture as Harris and Sørensen's (2010) henge, in the sense that the physical evidence from which care is inferred 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), surely the presence of emotion in relationships based on the giving and receipt of care is 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.

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Chapter 5
Agency, Identity and the Bioarchaeology of Care

Whatever the origins of the initial impulse to care for others, the elements involved in providing health-related care are indisputably the products of conscious, purposeful, goal-directed behaviour. Health-related care is not a default option. In each instance of care provision 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, regardless of the content and quality of care provided, and regardless of 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. Each attempt at caregiving reflects the design and implementation of strategies – successful or not – to address needs arising from this challenge, and in each case the health outcomes of the care provided will, to some extent, rely on the attributes of the person receiving it.

Stage 4 of the bioarchaeology of care approach seeks to draw out a deeper understanding of past lives and lifeways through interpretation of evidence for health-related care, and the concepts of agency and identity – collective and individual – are integral to this process. This chapter discusses the application of these concepts in bioarchaeology of care analysis, and in doing so presents the theoretical foundation for the final stage of the bioarchaeology of care methodology.

Evidence for Care Seen as Evidence of Agency

The 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 occurred.

L. Tilley, *Theory and Practice in the Bioarchaeology of Care*,
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Logically, therefore, where some part of survival of, or with, pathology is considered 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 caregiving, 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 virtue of 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 recovery, allowing care to be reduced or dispensed with altogether, the question is more complicated. At a functional level the period corresponding to 'embodied agency' might be seen as consisting only of that period during which the individual likely received active care. Taking a more inclusive view, it might be argued that the whole of the lifespan following the inception of caregiving up until eventual death 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. Traditional practices in osteological research suggest that viewing remains as archaeological 'artefact' is likely to be the more intuitive approach. Yet the individual receiving care is also an 'actor'. Archaeologists are often reluctant to deal with questions of 'the individual', and in studies in which caregiving is inferred this has resulted, for the most part, in subjects of such interventions being treated as if they were nothing *but* items of material culture. This reification, which is both unnecessary and wrong, has undoubtedly contributed to the discomfort of those who question the validity of archaeological identification of disability and/or care provision (see discussion in Chap. 2).

While it is, of course, 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 probably nothing more personal than the experience of a disabling disease. In modern health practice it is now well-established that people receiving care (other than those incapable of cognitive function) must be regarded 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).

Every instance of caregiving stands alone, and interpretation must always be anchored in the corresponding lifeways context. But with these principles as givens, archaeological remains allowing inference of care provide an unparalleled opportunity to explore examples of collective and individual agency as practiced in the past.

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." (Carroll 1875:87)

The question of 'agency' has received increasing attention in post-processual 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) in response to the realisation that neither the description of the cultural history tradition, nor the reductionism of the succeeding processualist movement, is capable of adequately unravelling 'the relationship between material culture and people [which] is complicated, context specific, and dialectical' (Dobres and Robb 2005:161; Trigger 2006).

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 differences in definition revolve 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 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' (in the sense of inconceivable), 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 were based on an unthinking adherence to the status quo, thus 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 for complex behaviours, such as the intellectually, emotionally and physically demanding requirements of healthcare provision. Established values, beliefs and customs might well exert a powerful influence on decisions regarding whether, what, and by whom, care is to be given, but all decisions made regarding caregiving practice will invariably require a level of deliberation – if only because no two cases in which care is required will ever be exactly the same in every characteristic.

Principles for Approaching Agency in Care Provision in the Past

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-related 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 driving the decision to initiate and maintain care and determining what sort of care was 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 health-care amenable to archaeological inference will rarely have been limited to a single act, or necessarily have comprised 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 a 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 *im*possible 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 health-related care provision is inferred, interpretation of agency rests on the premise that, before care was initiated, choices existed for caregivers to *not* provide care, or for the recipient to not *accept* care, but that the presence of skeletal indicators suggesting 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 options 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 to whatever options were likely available.

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 with 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 through this 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 might result in modifying existing economic and social practice, affecting (positively or negatively) within-group relationships, which in turn might reinforce or dilute initial caregiving resolve. Even the creation of categories of 'caregiver' and 'care-recipient' may have influenced the internal group dynamic (see Chapman 2000 and discussion of 'dynamic nominalism'). If nothing else, the survival of an individual who might otherwise have died will have altered the group's demographic profile and influenced any activities contingent on this (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 took 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 circumstances specific to the need for care. For example, how was the pathology acquired – was it a congenital condition, was it an infectious disease, was it a disease of old age, was it the result of an accident or of interpersonal violence – and if the latter, was it incurred in defence of the group, possibly associated with special kudos and influencing the decision to provide care? Were the symptoms of this pathology likely to have been commonplace or little known 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 exploration of otherwise inaccessible aspects of social practice and social relations. This proposition is elaborated below.

Deconstructing Caregiving Through the Lens of Agency

Introducing a 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 health-care provision, 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 both 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 caregiving agency (represented by skeletal evidence indicating survival for a period of time 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 the 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 archaeology – equifinality; different treatments may produce the same health outcome, although as argued in Chap. 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 the most likely candidates for implementation 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 it 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 Klingle 1996), and on this basis it may be possible to speculate on other aspects of the individual’s behaviour and even, possibly, some very broad aspects of their character.

The following two sections focus on questions of agency associated with the care-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 which takes place in a specific context. The physical evidence of this care resides in a set of human remains displaying indicators of survival with, or following, a disabling pathology. To explore the choices made in the process of care provision or, in other words, to deconstruct the agency of caregiving, the bioarchaeology of care methodology borrows directly from cognitive archaeology.

A Matter of Choice: Tracing the 'Decision Path' in the Provision of Care

Recognition 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 objects'] 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 in order 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 a systematic, deconstructionist analysis of meaning and intent. This 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 that shapes, and is in turn shaped by, caring strategies and their outcomes – although many parts of this process may be archaeologically unobservable. Caregiving 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 adjustment should be; and, finally, whether and when it is appropriate to cease care.

The bioarchaeology of care model assumes that in small prehistoric communities care provision was a collective activity that, directly or indirectly, involved or at least in some way impinged upon, most or all members. 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 most probably 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 in relation 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, and caring may have had a symbolic as well as a 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.

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/or 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 implicit or explicit 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, and perhaps revisited, by a small prehistoric community over the duration of an instance 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 attempting to make sense of evidence of behavioural phenomena. So the first step, 'Identify need for health-related care', effectively corresponds 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 deemed to be 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 providing a workable match between the individual's and the group's needs, resources and abilities was achieved. Furthermore, the fact that disease is rarely static, meaning the care-recipient's needs are likely to change over time, and recognition that the group's ability and willingness to address these needs may also undergo change, mean that any model of care decided upon is likely to have been in a constant state of evolution.

Bioarchaeology of care analysis can only be applied to those cases where caregiving can be inferred with confidence; it is impossible to distinguish unsuccessful caregiving (in the sense of care that failed to save life) from *absence* of caregiving. This means that any stage of the process a decision made 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 those choices that appear to have been made, and to clarify where it is not possible to determine the decision taken. For this reason Fig. 5.1 identifies steps at which a decision to deny care was an option.

The final step identified in the decision path – treatment of the care-recipient after death – requires some comment. Mortuary treatment of remains manifesting

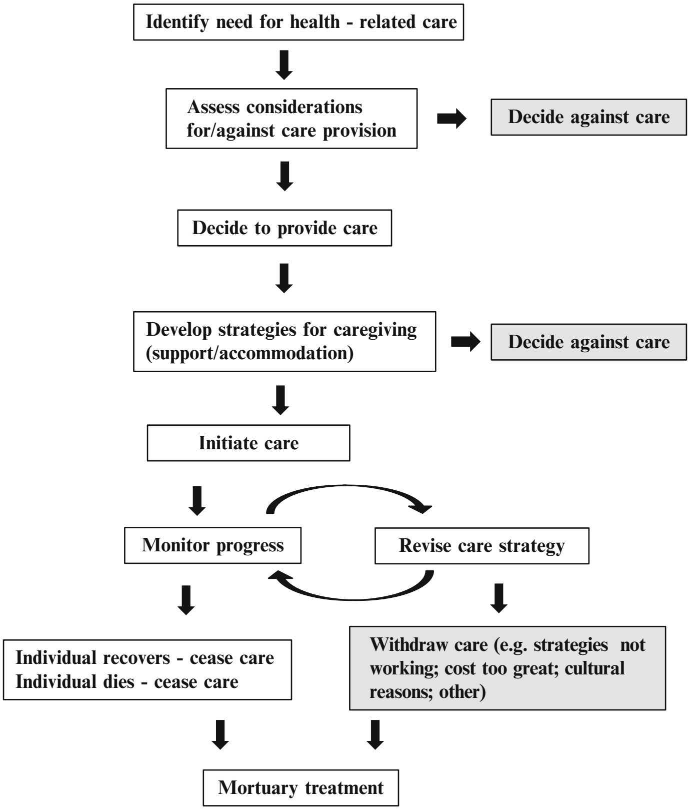

Fig. 5.1 Generic decision path for health-related care provision

signs of difference (pathological or otherwise) is often used as the basis for inference about the status of the individual during life (Carr 1995; Fay 2009; Formicola and Buzhilova 2004; Shay 1985), but this correspondence is not automatic (Hodder and Hutson 2003:2–6; Pankowska 2009; Parker Pearson 1982, 1993, 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 population and even, perhaps, the same demographic cohort, it may be rewarding to consider similarities and differences in the care-recipient's mortuary treatment in the context of disability experienced, the likely practices of care, and the agency underlying these latter. Results may contribute additional – or new – insights into group custom and behaviour.

In Fig. 5.1 the decision steps are presented as discrete and sequential. In real life, decision-making about care 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 unpredictable, and such details will be invisible to archaeologists. The irony in arguing for an interpretive methodology that acknowledges the agency inherent in the choice to give care, while proposing what might appear a highly 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 each instance of caregiving, a claim supported by ethnographies of healthcare provision in pre-modern societies (e.g. Bloom 2005; Cohen 1989; Frankel 1986; see, for example, the flow-chart illustrating 'Paths in the interpretation and treatment of illness' among the Gnau in Lewis 1975:250).

Caregiving, Agency and Group Identity

Considering the decisions likely taken by a community in providing health-related care 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 in the bioarchaeology of care consists of asking the same basic question at each of the points identified in the likely decision path: *Given what is known about the context in which this particular choice was made, 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 does the fact 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' in the sense of '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 Chap. 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 a specific therapy or more general nursing care 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 in any form 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 health-care provision, and ability to apply past learning to what is possibly a new situation? And at the most straightforward level of consideration, what do the practical requirements of care suggest about the basic resources and developed 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; evidence indicating likely health-related care provision, the starting point for bioarchaeological analysis, 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 caregiving into conclusions about group identity and lifestyle, and any conclusions drawn will ultimately 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 intrinsic to this process, because even if this analysis is only accepted on sufferance it brings us that much closer to understanding how a particular group of people lived in their own particular time and place.

Revealing the Person at the Heart of Care

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 a duration long enough to leave evidence in bone. If any phenomenon in prehistory is capable of providing insight into aspects of the life experience and character of one specific individual, then surely this is it.

Most of the remainder of the chapter discusses the history of, and prospects for, an 'archaeology of the individual', going on to consider whether, and how, it might be possible to achieve some understanding, however limited and provisional, of the identity of the person at the heart of a case study of care.

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 15–20 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. 2002b; Insoll 2007b; 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 largely 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 content in Stodder and Palkovich's (2012) recent publication is a third – *The Bioarchaeology of Individuals* comprises a collection of detailed osteobiographies, some verging on 'portraits' (see, among others, chapters by Boudin; Geller; Heathcote et al.; Lozada et al.; Martin and Potts; and Walker et al.).

Generally speaking there is little shared understanding of what constitutes 'individual identity' for archaeological purposes, and there is not even consensus as to whether, in a pre-modern context, the concept of 'the individual' is valid 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 – an everyman-or-woman representing a generic inhabitant of an homogenised community. In archaeology, 'the body has been cast as an object, a thing, a metaphor for society or a product of semantics' (Meskell 2000:13).

Archaeology's failure to deliver convincing individuals from prehistory may be largely 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 Chap. 2. It is epitomised in texts such as *Thinking Through the Body*, an edited volume 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. 2002a:1–2; 2002b), yet which in the Introduction dismisses the potential contribution of physical anthropology to 'Archaeology and the Human Body' in one paragraph (Hamilakis et al. 2002a:4). Paradoxically, much of the archaeology exploring agency has sacrificed the individual as an 'agent' in their own right by presenting them as a 'theoretical prop to the emphasis on intentionality' (Hodder 2000:22), perhaps again reflecting discomfort in dealing with physical remains. Thomas (2000, 2002), for example, in writing on the British Neolithic draws an equivalence between the mortuary treatment of pottery and that of skeletal elements. This equivalence is interpreted as metaphorically significant, but from the text alone it can be 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 osteological analysis), 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 such abstractions may be the outcome of thinking in terms of 'the (anonymous) 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, focusing 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 addressed in terms of identifiers of particular group membership rather than as signifiers of individual experience – although the term 'individual' may indeed be invoked (e.g. Bulger and Joyce 2012; chapters in Díaz-Andreu et al. 2005; Joyce 2005; McCafferty and McCafferty 2011; Meskell 2000). Construction of 'identity' through analysis of appearance, posture and gesture recorded in two and three dimensional human figurative representations is also popular, although this is explicitly limited to considerations of cultural or symbolic identity rather than that of a particular person (e.g. Danielsson 2002; Díaz-Andreu 2005; Morris and Peatfield 2002). Bailey (2005:197ff) hypothesises that anthropomorphic figurines suggest a community acceptance of the physical body as 'the primary site of the individual and the self' (Bailey 2005:201), McDermott (1996; McCoid and McDermott 1996) suggests that some prehistoric figurines may actually depict specific people, although – frustratingly – deeper knowledge of the models themselves is denied to us. In all the above research 'the body', almost imperceptibly conflated with 'identity', is effectively an object produced through cultural and social practice. This is a perfectly legitimate perspective for archaeological analysis, but it is hardly the full story.

Does the Prehistoric 'Individual' Exist at All?

Problems in defining the individual in archaeology are compounded by the disconcerting way in which 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 therefore the way these terms are used clearly matters.

That individuals are both produced and defined through their relationships in the world is not disputed; individuals' behaviours are largely shaped by, and reflect, norms, values and expectations of their sociocultural contexts (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 of their environment. As a corollary of this, however constrained they may be 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, italics in original; Moore 2000).

This imperative is not universally accepted, and claims for the existence of individual agency (as understood today) in prehistoric times have been challenged. One of the most popular counter-arguments contends that endowing past peoples with the potential for individuality reflects the hegemonic dominance of the post-Enlightenment embrace of individualism – 'discourse celebrating and prioritising the modern Western individual' (Thomas 2008:27; Fowler 2001; Insoll 2007a Joyce 2005; Shanks and Tilley 1987). Thomas (2004) suggests 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).

Some argue that ethnographic accounts of 'dividual' pre-modern communities (Strathern 1988) provide a better model for re-creating past personhood and past persons (dividualism refers to forms of social relations prioritising integration or unity, in comparison with *in*dividualism, which, by prioritising the individual, is a form of social relations which alienates) (Fowler 2001). 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', but neither he nor anyone else elaborates on why a collectively-oriented social order should necessarily rule out those behaviours, preferences and quirks of character that differentiate one person from another.

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 study 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).

New Directions for Seeking the Individual

Biological data alone are obviously not enough to give us the individual. Hawkey's (1998) meticulously reasoned account of the disease-related life course of Burial 391 offers no explicit insight into personal identity (although there is certainly scope for speculation). However, without the ability to position an actor in their physical body we have an abstraction rather than a person, so assignment of materiality – or, more precisely, *corporeality* – is a critical first step. Reviewing the potential contribution of bioarchaeology to the study of 'human social identities' – with identity defined as the 'social construction of the human experience' – Knudson and Stojanowski (2008:398) observe 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'. They argue for a bioarchaeological approach in which

> [t]he combination of durability, plasticity and temporal sensitivity [of the osteological 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).

Coincidentally, Knudson and Stojanowski (2008) identify health, disease and impairment (although not care) as promising areas for future research. In restricting their focus to identity as a social construct, however, they stop short of considering the possibility of a bioarchaeology of truly *individual* identity; one building upon the concept of 'osteobiography' first articulated by Saul (1972; Saul and Saul 1989) and adapted (although in different ways) by Hawkey (1998), Robb (2002) and Martin and Potts (2012) to produce personal histories of disease experience.

This returns discussion to consideration of the few successful attempts to date to bring an individual from the prehistoric past into the modern gaze. Robb's (2002) case study and the previously cited chapters in Stodder and Palkovich (2012) work so well because each situates a particular man or woman within the framework of his or her own body and physical life history as well as within his or her specific lifeways context. This combination of the corporeal and the cultural is exponentially more powerful in explaining a *real* person – someone once as alive as any of us – than either category of information on its own.

Seeking 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 some features of social role, interactions, opportunities and expectations as well.

Because the approach to uncovering aspects of individual personality proposed in the bioarchaeology of care analysis has its foundations in evidence for disability, some may be profoundly uncomfortable with it. In practice, however, living with significant disability shapes and constrains the way people experience the world around them and the way they experience themselves within this world, as well as the way that they are perceived and treated by others (Shildrick 2009:33–36; World Health Organization 2001). To the extent that identity is a sociocultural construct, the individual experiencing disability is likely to be assigned, and/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 for a moment that this identity is either inferior *or* their only identity – as Knudson and Stojanowski (2008:398) 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 (including locus of control), tolerance for pain and discomfort, level of immunocompetence and general health status (e.g. Bowling 2002; Cooper et al. 2011; Fillingim 2005; Jylhä 2009; Fahlander and Kjellström 2010; 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 Chap. 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 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, an overview of the individual's disability-related life course and (social) identity might be generated using the following fields of information:

1. *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).
2. *Pathology-related indicators* – description of pathology (including likely complications) 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 subject's demographic cohort; likely type(s) of care required to manage pathology impact(s).

3. *Sociocultural indicators* – social or occupational activities (potentially) engaged in, social role or status, mortuary treatment.

To this point, the procedure is very similar to that used by Robb (2002) and by authors in Stodder and Palkovich (2012), other than in the increased emphasis placed on variables relating to the likely impacts of pathology on the subject's life experience. 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 caregiving they likely received and their possible interactions with 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 light of what this agency reveals may allow inference about the functional (and possibly emotional) nature of relationships between the person who received care and those who provided it. Focusing on these relationships, in turn, may allow inference about personal characteristics and behaviours of the subject at the centre of care; it may also help to clarify how this individual was seen by others during their lifetime – a matter returned to later in this chapter.

Recognising that the person who is cared for is not simply 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 trust in caregivers, positive engagement with family and community, and maintenance of external interests all contribute significantly to both general and health-related quality of life (Bloor and McIntosh 1990; Cooper et al. 2011; Gilson 2003; Lupton 1997; Nusselder et al. 2005; Sahlsten et al. 2008; Thom 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.

Reading Relationships Between Givers and Receivers of Care

Can interpersonal relationships operating in the context of caregiving be archaeologically identified and, if so, what these may reveal? 'Relationship' in these circumstances may 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 subject'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 might 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 Chap. 4), the relationships between the individual with disability and their carers – positive or negative, optimistic or pessimistic, generous or resentful, based on love or duty, between equals or non-equals, compliant or defiant, or all of these at various times and involving the same or 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 and mutual trust, minimally between some of the actors involved, rather than relationships of a purely functional nature (Calnan et al. 2006; Kramer 1997; Thom et al. 2004). In these cases, and in light of what may be deduced about the subject and their situation from the bioarchaeological evidence, it may be defensible to draw broad inferences regarding the characteristics of an individual capable of eliciting such a substantial care response as well as those of a community willing and able to provide it.

In addition to obstacles already noted, there are more general conceptual difficulties in exploring posited caregiver/care-recipient relationships. One obvious one is that the 'meaning' ascribed to a particular disease and associated disability can be as much a sociocultural construct as individual identity itself (see Chap. 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.

The ‘Fit’ Between Individual and Group: Some Basic Questions

Combining the perspectives of ‘disability experienced’ and ‘care provided’ 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, in any particular case, given what is known of community lifeways and what has been inferred about group agency and 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). It seems improbable that such important roles were regularly allocated on the basis of disability alone, yet in a prehistoric subsistence context all individuals would likely have been called upon to contribute to the extent of their capability. So – given the nature of functional disablement and the features of contemporary lifeways – what roles *might* the subject have performed? Where the origins of a disability are known, research undertaken in modern times (Stone 2001) indicates it is rewarding to explore possible relationships between cause of disability and care provision, and to consider what the decision to give care – and the type of care given – under these circumstances may suggest both about the subject’s acceptance and their role within the community and, of course, about community norms and values more generally. Cautious use of mortuary data in relation to practice of collective agency was proposed earlier in this chapter, and refocusing analysis of these data on implications for individual identity may be productive; 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, and this can then be used to reflect back on the individual’s lived experience (e.g. Klaus and Ortner 2014).

Attempts to understand both the way a care-recipient experienced the meaning of their care, and the impact of this care on the subject’s 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 developing questions that – at the very least – deserve to be asked. For example, if disability likely prevented participation in occupations typically undertaken by others of the same cohort, how might the subject have felt about ‘accommodation’ involving non-standard tasks or involving activities with a very different demographic cohort? 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’ perceptions of, and responses to, the care-recipient?

A final question relates to what is known about health-related care provision within the community generally, and where the individual, their disability and their care stood in relation to such behaviour. Was the individual exceptional 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 Chap. 3. Notwithstanding, where there is evidence suggesting some previous history of care provision, focusing on the care-recipient against this background may shed light on aspects of the subject's 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.

Summing Up: Interpreting the Giving and Receipt of Care in the Past

If it were necessary to summarise the message of this chapter in one sentence, this sentence would read: 'the theoretical basis for Stage 4 of the bioarchaeology of care approach is the understanding that the act of giving care and the act of receiving care are expressions of agency on the part of both the group and the individual involved'.

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, at the same time, 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 the final picture will always 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 features, and conclusions (however tentative) about group agency and identity, provides a structured approach for seeking out that unique person who was the focus for the care provided.

The propositions contained in this chapter will undoubtedly make it the most contentious of this book, just as Stage 4 of the bioarchaeology of care approach is seen as the most contentious of this methodology. As discussed in Chap. 2, some of the previous studies attempting to extract a wider sociocultural meaning from inference of prehistoric health-related caregiving have attracted strong criticism, and the ideas put forward in these pale into insignificance compared to 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, including the difficulties in estimating the true nature, extent and impact of pathology from osteological evidence; the dilemma of equifinality; and researcher bias in interpretation.

These are all 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 multiple care ‘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-related care provision may be more socially and politically sensitive than many topics in archaeology, it is not alone in facing the challenge of coping with possible researcher bias. As observed in the introductory chapter, it is impossible for any archaeologist investigating social behaviour to completely put aside the expectations, values and prejudices that each of us, as individuals raised within our particular social and cultural environments, 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 in all stages of the bioarchaeology of care approach and is integral to the applied methodology.

One final point requires more discussion than it receives here. The analytical procedures proposed in this chapter consist in large part of questions developed through positioning and *re*positioning information and inference in a wide variety of combinations. These questions may be just as significant as any answers obtained. The very 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 conjured with – 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 the researcher freely admits the possibility of error and accepts that conclusions will be challenged and changed – above all, these writers argue that archaeologists should engage constructively, sensitively and ceaselessly with the past (Hodder 1991, 2000; Kintz 2001; Tarlow 2000, 2001; Tilley 1998; Wylie 1989). The bioarchaeology of care methodology in its totality, but in particular in its exploration of agency and identity, strives to meet these criteria.

The approaches to interpretation outlined in this chapter offer a theorised, internally consistent, and practical framework for addressing collective and individual agency and identity in the context of health-related care practice. Chapter 7 describes how the ideas that have been discussed might be applied in bioarchaeology of care analysis, 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 Chaps. 8–10.

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Chapter 6
The Bioarchaeology of Care Methodology: Stages 1–3

Recapitulating the points made in preceding chapters, bioarchaeology of care analysis is qualitative and case-study based; it is centred on the recovered remains of an individual (conceived as both subject and object) in which evidence suggests the intentional provision of care by others; it is informed by archaeological evidence and modern clinical experience; and it is contextualised within the corresponding sociocultural and physical environments.

The procedures elaborated in this chapter and the next one provide the framework for undertaking this analysis. The title of this book promises a *Theory and Practice in the Bioarchaeology of Care*, and where previous chapters have covered the 'theory' underlying this new approach, the following chapters are dedicated to the elements of 'practice'. Chapters 6 and 7 describe the content and structure of the bioarchaeology of care methodology, while the case studies documented in Chaps. 8, 9 and 10 illustrate its application and demonstrate its power.

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 care, and the behaviours of the group that provided this care. In practice, information considered in all four 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 the possible and the probable. These first three stages are covered in this chapter. Stage 4, described in Chap. 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 a planned design feature, the four stages in

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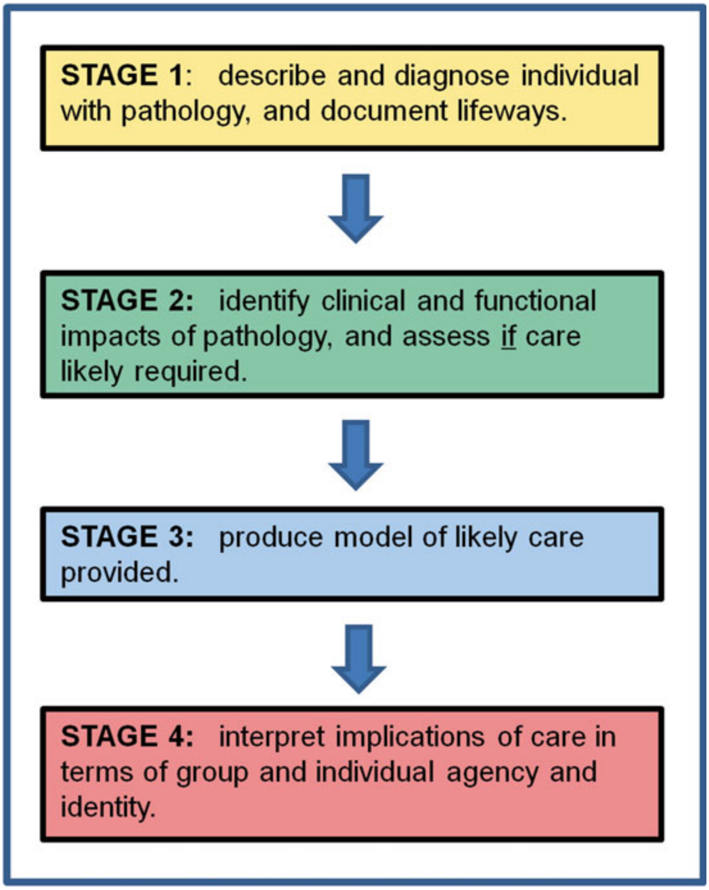

Fig. 6.1 The four stages of the bioarchaeology of care

some ways parallel the four rungs of Hawkes' (1954) 'ladder of inference', with the first stage ('rung') concentrating on description and measurement of material evidence – the 'relatively easy' (Hawkes 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.

The methodology presented below can be applied as an integrated part of a primary analysis of individual remains; in re-examination and (re)analysis of already-documented remains; and, where thorough, reliable documentation exists, in a re-analysis of remains that is completely literature-based [for example, the bioarchaeology of care analysis of the case of Romito 2 in Tilley (2015)]. 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 information requirements of Stage 1.

The Index of Care: An Instrument Supporting Bioarchaeology of Care Analysis

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 make up the 'Index of Care' (Tilley and Cameron 2014).

The Index of Care, found at www.indexofcare.org, is a freely available 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 are free to pick and choose sections of the Index appropriate to their way of working, or, indeed, to reject its use entirely. There is no onus on researchers undertaking a bioarchaeology of care study to refer to the Index at all. Having said this, the Index offers a structured process for thinking through an analysis of a case study of caregiving. It comprises a series of worksheets and text boxes providing a practical aid for 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 reference to the Index is recommended. Most items in the Index protocols are open-ended; most information sought is qualitative; and most input consists of descriptive text.

Corresponding to the four bioarchaeology of care stages of analysis, the Index of Care Step 1 protocol collocates evidence relating to the individual, their pathology(ies), their mortuary treatment and their lifeways context. The Step 2 Index protocols structure and standardise (as far as feasible) consideration of possible clinical and functional outcomes of pathology, leading to an assessment as to whether – or not – the subject received care, and the Step 3 Index protocol assists the researcher to develop a model of care (comprising direct support, accommodation, or a mixture of both) specific to the subject and their lifeways. The Step 4 protocols present options for drawing together and interpreting the social and behavioural implications, for both the group and the individual, of material covered in Steps 1–3, identifying possible subject matter areas for consideration and, in relation to these, proposing generic questions to help focus analysis.

Figure 6.2 describes the workflow of the Index of Care web application from Step 1 through to Step 4, and detailed workflow diagrams for each Index Step are provided in the Appendix. The purpose of including these latter is to assist readers in applying the logic of the bioarchaeology of care methodology to their research in circumstances where they do not wish, or are unable, to use the online instrument.

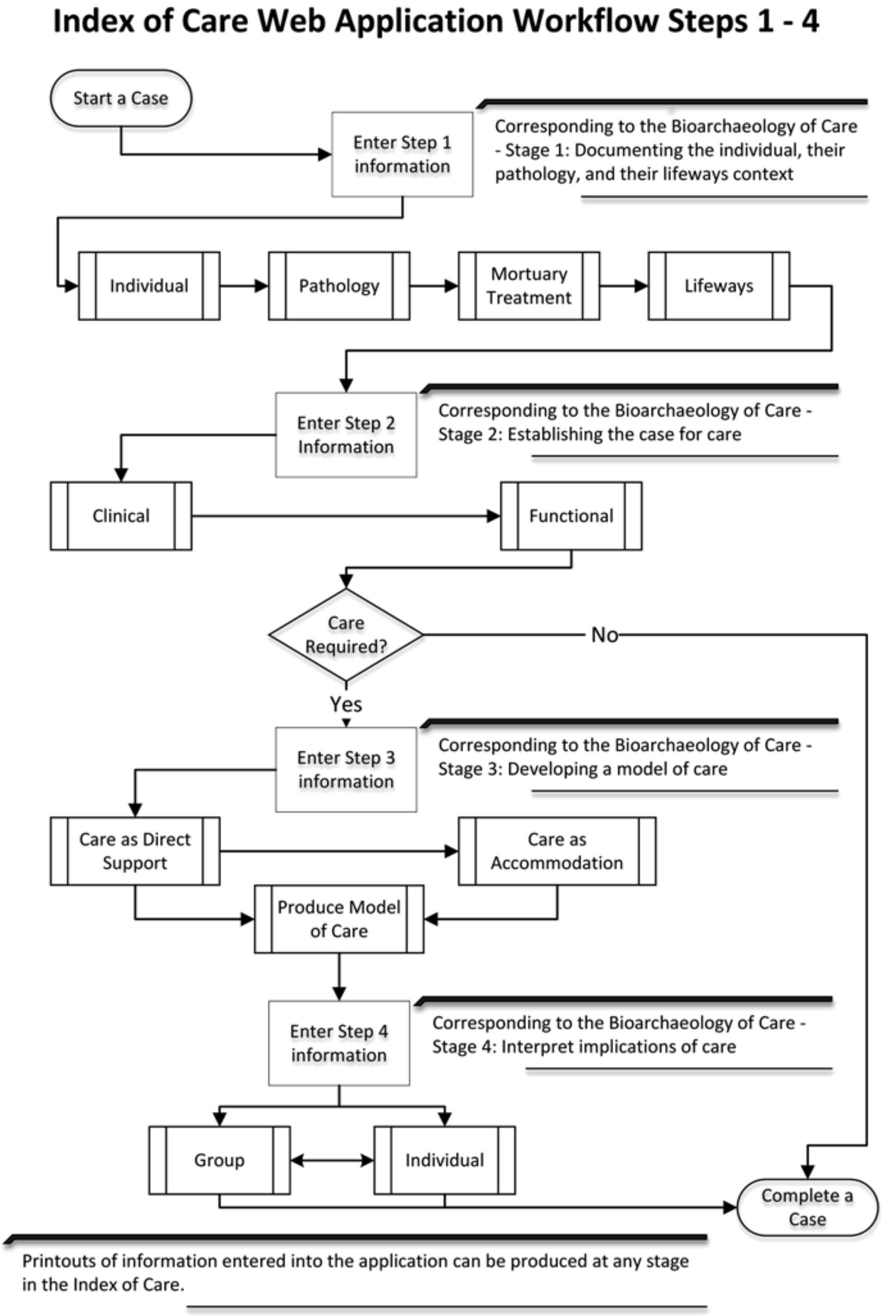

Fig. 6.2 Overview of the Index of Care web application workflow (Steps 1–4). Diagram produced by Tony Cameron

The substance of the Index of Care protocols is based on information from empirical and theoretical archaeology, bioarchaeology and palaeopathology sources (Chaps. 2, 3 and 5); modern clinical and healthcare literature; and health status assessment and health outcomes measurement instruments in use today. Where appropriate, protocols adopt or recommend data categories, definitions and measurement standards used in other fields of archaeological research in order to maximise potential for cross-fertilisation. The contents and 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 four principle functions. The first is to serve as a 'prompt', identifying the sort of information that is important for a case study of care, and ensuring – as far as possible – that that the available information is recorded and reviewed systematically and that nothing which might inform analysis or interpretation is overlooked. At the same time, this role as 'prompt' helps the researcher to identify information that is *not* available for analysis. The second function is to suggest and encourage the use of operational definitions of terms and concepts – such as 'disability', 'care', 'support', 'severity', 'short, medium or long-term impact' – that are often used loosely in archaeological literature on caregiving; this potentially assists within-study rigour and cross-study consistency in assessing the effects of disability and the caregiving response. The 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 of this process creating a comprehensive case record for use in writing up a final report. Finally, 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.

The remaining three sections of this chapter describe Stages 1, 2 and 3 of the bioarchaeology of care methodology. Each section first discusses, in general terms, the subject matter of the particular stage; this is followed by an outline of the corresponding Index of Care protocol(s), providing details of the specific information sought in these protocols and the questions which might be asked of this information once acquired. Once again, it is emphasised that it is not essential to employ the Index of Care instrument itself in undertaking a bioarchaeology of care analysis – but in order to get the most out of any research into past caregiving it *is* essential that the questions identified in the Index protocols are raised for consideration where practicable.

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 that 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, for the purpose of bioarchaeology of care analysis, what constitutes a 'set of human remains' capable of representing an 'individual' and their experience? Problems relating to skeletal preservation were discussed in Chap. 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 an adequate 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 (covered in Stage 2 analysis). However, to the extent that there is insufficient evidence to allow determination of the possible range of disease characteristics and/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 suggesting that receipt of care prolonged life for some period of time, however short this may have been – meaning that perimortem indicators of pathology fail to pass the 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) in order 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 researchers' judgement, based on their assessment of what symptoms may have been associated with disease experience. Whether or not care was likely required cannot properly be established until disease implications for functioning ability have been thoroughly assessed in Stage 2 analysis.

Stage 1 of the bioarchaeology of care methodology is the platform for all subsequent analyses, bringing 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. Bioarchaeology of care analysis is initiated because the possibility of health-related care provision has been identified; often the initial recording, analysis and diagnosis of the remains and associated evidence for pathology will have been undertaken already, 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 (as was the case with Man Bac Burial 9, the subject of Chap. 8), then initial description and diagnosis of the individual should be carried out in accordance with researchers' 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.

Corresponding Index of Care Protocol: Step 1

The purpose of the Step 1 Index of Care protocol is to assist the researcher in producing a comprehensive record of all information available about the subject and their lifeways that might contribute to an analysis of disability and care, and – if only by default – to identify what potentially useful information may be missing. Step 1 consists of four sections, each containing multiple 'prompt' items to help ensure all relevant areas are considered.

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(s) experienced by the subject (there is the facility to enter information on as many pathologies as required). Items cover description of pathology indicators and activity status at time of death; location and pattern of indicators; relationships between multiple indicators; all diagnoses considered and (where applicable) the actual diagnosis proposed as 'most likely'; implications of any missing skeletal elements for understanding the pathology; age of pathology acquisition and duration of pathology; and brief comments relating to obvious pathology symptoms and the 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 Chap. 5 are taken into account in applying Step 4 (Interpretation) of the Index; this section of the Step 1 protocol simply collates evidence and observations which might contribute to consideration of the individual's social role and treatment during life. The prompt items included in this section are drawn from a variety of sources dealing with aspects of mortuary archaeology, including Carr (1995), Gowland and Knüsel (2009) and Parker Pearson (1999).

The final Step 1 section, 'Lifeways', is aimed at building up 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 items for which information is sought range from geography and climate, diet and food procurement strategies and settlement features through 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 variables in 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 (2002:563ff) analysis of the history of health in the western hemisphere have been adapted for this section. 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 previous cases of pathology.

Stage 2: Establishing the Case for Care

Stage 2 of the bioarchaeology of care methodology establishes whether there is a valid basis for claiming provision of care. Taking as its foundation the physical evidence of disease or injury and, where available, the diagnosis proposed as covered in Stage 1, Stage 2 first refers to modern medical literature to identify potential clinical implications of the pathological condition(s) identified and, based on this, seeks to establish the likely nature and extent of clinical symptoms experienced by the subject in the case under review. Stage 2 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 – in other words, the functional implications of the pathology. This assessment of functioning capability informs the researcher's 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.

Stage 2 (Part 1): The Clinical Implications of Pathology

The first part 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 therefore basic physiological response to disease stimuli, are presumed constants over time and culture (as discussed in Chap. 3), and this provides the foundation for extrapolating from modern clinical knowledge to 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, prognoses, 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, including 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 interactions between different pathologies (if more than one pathology is evident in the study subject).

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 compound fracture of the femur 25,000 years ago will have been the same as those of a compound fracture of the 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 severity 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 (Claydon et al. 2006; 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).

The implications for a bioarchaeology of care analysis of individual variability in response to disease were discussed in Chaps. 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 Chaps. 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.

Corresponding Index of Care Protocol: Step 2 (Part 1)

The Step 2 (Part 1) Index of Care protocol offers a structured approach for examining the clinical implications of disease experienced by the individual, which is loosely based on that of the World Health Organisation International Classification of Functioning, Disability and Health (ICF) (WHO 2003). The protocol requires researchers to consider what symptoms are known from modern clinical literature to be associated with the disease diagnosed in the case study (or, where the pathology cannot be diagnosed with confidence, those symptoms associated with the specific pathology indicators present), and then asks researchers to consider which symptoms were likely to have been experienced by the subject, the likely severity of expression of each symptom identified, and the likely duration of symptom impact (recognising that different symptoms may have different trajectories). Researchers are also encouraged to consider the potential for interaction between symptoms of the same and/or different pathologies for which there is evidence.

The protocol opens with a list of physiological domains, described in Table 6.1, from which researchers select those body systems and functions potentially affected by the pathology evidenced in the individual's remains. The Index then generates a second worksheet containing three columns, the first of which lists only those domains identified as potentially implicated.

Taking into account the possible influence of individual and lifeways variables documented in Stage 1, in the second column 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.

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 the researcher-entered text associated with domains identified as 'Probable' or 'Possible' included in the relevant cells.

The second column of this worksheet asks researchers to make a qualitative estimate of the likely *severity* of clinical impact of symptoms identified as 'Probably'

Table 6.1 Body systems/functions potentially affected by pathology[a]

(Neuro)musculoskeletal and movement-related systems/functions	Sensory functions/nervous system (1): pain (e.g. acute, chronic, intermittent)
Mental functions (e.g. intellectual, consciousness, attention, orientation language)	Sensory functions/nervous system (2): 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]

[a] List of body systems/functions adapted from the ICF (WHO 2003:2–4)

or 'Possibly' experienced, and the third column asks researchers to rate this severity. The ICF (WHO 2003:3) 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 6.2) is based on the ICF descriptors. *Prima facie*, the rating of symptom intensity experienced by someone dead for millennia, based on evidence from often incomplete and/or poorly preserved skeletal remains, appears impossible, yet this is often done 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 is included in the Index, however, because it encourages a focus on the lived impact of pathology *and* a standardisation of the way this impact is described – and in this latter aspect it contributes to the goal of a shared 'vocabulary' for research into past care provision.

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

Where there are multiple pathologies the worksheets may be repeated for each condition, and a fourth step exploring the potential for interaction between different pathologies is included. Similarly, in cases where there are competing diagnoses researchers may wish to generate separate worksheets for each condition in order to compare possible health outcomes. In instances where there is evidence for experience of pathology, but no primary diagnosis is possible, worksheets can, of course, only address the implications of the lesions present. Where an individual's remains are too incomplete or too poorly preserved to estimate the likely full effect of a diagnosed pathology this should be noted, and conservatism is urged in assessment of clinical impact that goes beyond the physical evidence available.

Table 6.2 Operational definitions for rating 'likely severity of clinical impact'

1. '*Little or no impact/impossible to tell*' – for the purpose of bioarchaeology of care analysis of 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 that it 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

[a] Definitions adapted from the ICF (WHO 2003:3)

Stage 2 (Part 2): The Functional Implications of Pathology—Activity Limitations and Participation Restrictions

The second part of Stage 2 of the bioarchaeology of care methodology 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 independently and 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 'care' and 'disability' have been covered previously, but it is worth briefly revisiting these. 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 this impairment is experienced.

Deciding whether a state of 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 care 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 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 reservations in extrapolating from recent 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 '*ab*normal' 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 (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 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 (Kamp 2001; Kramer 2005; Oxenham et al. 2008a, b), and it is reasonable to assume this practice applied in prehistoric times. From mid-childhood onwards, in situations in which 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.

Corresponding Index of Care Protocol: Step 2 (Part 2)

The Step 2 (Part 2) Index protocol for assessing the impact of 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 study 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 protocol encourages the researcher to think about what, in the specific context, this 'normal activity' may have comprised. A separate protocol for considering impact of disease on infant and early childhood functioning awaits 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 the disease runs its course, and this has implications for interpreting the experience of disability and care. As the goal of Step 2 of the Index 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. (Step 3 of the Index examines questions relating to form and duration of the care itself.)

Essential Activities of Daily Living

The first section of the protocol comprises a worksheet containing 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 ability to eat and drink without assistance); managing personal hygiene (essential for maintaining skin integrity, addressing infection and reducing 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.

The worksheet items are adapted principally from the Katz Index of Independence in Activities of Daily Living (Katz ADL) (Katz et al. 1970; Katz 1983), 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 2006; 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 column in which researchers can firstly ‘score’ functional capability (‘Capable’, ‘Not capable’, ‘Unknown/Uncertain’) and then elaborate on this assessment. In the modern context an overall ‘activity of daily living’ 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, and have been formulated to reflect this.

Instrumental Activities of Daily Living

The second section of this protocol examines disease impact in relation to 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). While 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 even 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 played a 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 a bioarchaeology of care analysis are whether (1) the individual was able to contribute to (or participate in) these activities, and (2) 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 cohort, or was of a roughly equivalent value to the group. Such a determination will almost always require the researcher to make a judgement call at some level, but one of the benefits of the Index of Care is that it can help to make explicit the reasoning underlying this judgement.

Two linked worksheets address performance of and/or participation in 'instrumental activities of daily living'. The first aims to develop an outline of the likely 'instrumental activities' carried out in the individual's community and by the individual's demographic counterparts (in so far as the evidence allows), and to identify physical, sociocultural and economic factors with the potential either to facilitate or to constrain the subject's participation in these activities. The contextual information recorded in the Step 1 'Lifeways' section provides the basic material for this exercise.

The second worksheet requires the researcher to position what is known about the clinical impacts of pathology and any problems identified in managing 'activities of daily living' against the practical demands of the 'instrumental activities of daily living' identified in the first worksheet – and based on this, and taking the already identified lifeways factors into account, the researcher is asked to estimate the subject's likely ability 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 contemporary 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) instrument 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 first provides a worksheet with three columns. The first column lists general 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 as required. The second column asks researchers to identify activities likely undertaken in the community against each domain (where possible highlighting 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 of this worksheet a second worksheet containing four columns is generated, for use in assessing the individual’s likely performance potential in relation to the researcher-identified ‘instrumental activities of daily living’. The first two columns contain the information provided by the researcher in the preceding worksheet; the first column lists ‘domains’, and reproduces the domain-related activities identified in the second column of the first worksheet, and the second contains the observations made regarding facilitating and constraining factors.

The third column of this 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 somebody belonging to the subject’s demographic cohort. 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 unquestionably 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 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 – they are devices intended 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 when 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) can be assumed.

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

Assessing the Probability of Health-Related Care Provision

On completing the second part of Stage 2 analysis, the researcher must decide whether, based on the evidence available and on the balance of probability, the impact of pathology compromised the ability of the individual to operate within their lifeways context to the extent that this individual 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 requiring care, and the provision of care in response to this need, are inferred, and the bioarchaeology of care analysis is continued.

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 consistently promoting a high level of caution in interpretation, there can be no doubt that by the end of Stage 2 (Step 2 of the Index of Care) 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 remembered that the bioarchaeology of care approach is not designed to correspond to a conventional healthcare delivery (primary care) model, and that the bioarchaeology of care definition of caregiving encompasses a very wide range of behaviours.

Developing a model of what such care likely comprised in any given situation is attempted in Stage 3 of the bioarchaeology of care.

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. Combined, these processes should provide the materials for constructing a plausible model of the care received by the individual.

Briefly revising observations made in Chap. 3, there are important 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 (as illustrated in the Chap. 8 case study), 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 conservatism mandatory in interpreting osteological evidence of disease 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, Chap. 3 distinguishes between 'direct support' and 'accommodation', and in discussing the former further distinguishes between 'basic' and 'advanced' forms of care (while stressing the arbitrary nature of these distinctions). In relation to 'direct support', Chap. 3 argues 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 disease 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 many of 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 the community normative expectations and practices nominated in Stage 2 analysis. What 'accommodation' of disability may have entailed in a particular instance 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 along with identification of possible opportunities in other activity areas, is justified – as long as the fact that it *is* speculation is made clear.

Two additional procedural points must be raised. 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 research relating to the more applied aspects of care provision have been thoroughly considered.

Corresponding Index of Care Protocol: Step 3

The Step 3 Index protocol requires the researcher to refer to the analysis of clinical and functional impacts undertaken in Step 2 and to lifeways factors recorded in Step 1. The protocol contains separate sections addressing healthcare in terms of 'direct support' and 'accommodation', but the Index 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. The first column, under the heading 'Components of care practice', details the nine 'constants of care' as these appear in Table 3.2 (Chap. 3), and below these provides an additional cell (*Specific intervention*(*s*) *and technologies*) to cover elements of care practice not included in the nine 'constants', but for which there may be osteological or material artefact evidence – such as invasive surgery, non-invasive orthopaedic treatment, pharmaceutical usage, 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 one or more of the corresponding 'constant of care' 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 – for example, what sort of diet (Item 1: Provision of food and water) may have been required to meet specific needs? What level of assistance with toileting (Item 7: Maintenance of personal hygiene) may have been necessary?

On completion of the first worksheet a second worksheet is generated that contains five columns. The first column contains each component of care identified by the researcher as 'Possibly' or 'Probably' provided to the individual, along with observations made by the researcher regarding the details of this care practice.

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). In the third column researchers are asked to expand on their response 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 until death; discussion of likely changes in the way care components were implemented over the caregiving period is also encouraged at this point. 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, 2004), and moderated by the limitations imposed by dependence on osteological evidence for identifying the presence of pathology, and for inferring care response to this pathology, in the first place.

The fourth 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 the materials and the technologies used in care provision. Researchers are again reminded to base their assessment on what is known or inferred about lifeways context (Index Step 1) and the individual's particular care needs (Index Step 2). For example, if 'medium term' care of an individual from a hunter-gatherer community involved provisioning with food and water (Item 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 7) and to undertake frequent 'physical manipulation and postural adjustment' (Item 8) in the 'longer term' care of an adult from small, Neolithic settlement who was incapable of performing such tasks for himself? (This question is addressed in the Chap. 8 case study.) What effort and resources may have gone into 'short term' care involving wound management and general nursing (Items 7, 9 and possibly several others) following trepanation surgery (Item 10) to relieve head injury?

The fourth column 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 not be directly applicable to the goal of constructing a model of care, but may prepare the way to thinking about aspects of community health-related 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 Index Step 3 protocol comprises two linked worksheets based around the 'instrumental activities of daily living' domains introduced in Index Step 2. Here, 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 the 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 care as ‘direct support’, the first worksheet contains three columns: the first column 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, Neolithic, hunter-gatherer/pastoral community, what adjustments might 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 Chap. 10 case study.)

A second worksheet containing five columns is generated on completion of the first, and this follows the same format as the second worksheet corresponding to consideration of ‘care as direct support’. The first column lists each activity domain nominated by the researcher as ‘Possible’ or ‘Probable’, along with any observations made regarding the nature of the possible accommodation. The second column asks researchers to estimate the period during which accommodation may have occurred, using the same categories (short, medium and longer term) as previously, and researchers are asked to elaborate on their response in the third column. In the fourth column, researchers are asked for their estimate of effort and resources involved in adjusting to the individual’s health-related needs, and in the fifth column researchers are asked for their judgement of the efficacy of possible accommodation strategies adopted.

Producing a ‘Model of Care’

At the end of Stage 3 (Step 3) analysis, the combination of ‘Possible’ and ‘Probable’ components of caregiving identified through the processes outlined above should enable researchers to produce an integrated model of care that is both unique to the individual and specific to the individual’s lifeways context. All components of this care model should have a defensible rationale, because they will have been identified through clearly documented deductive procedures. Depending on the quality and quantity of osteological and archaeological data available, some models of care will be much more detailed than others, but even the most basic model of care should provide some insight into a past response to the disabling effects of disease.

The conservatism urged throughout Stages 1–3 of the bioarchaeology of care methodology dictates that any model of care must be understood as most probably underestimating the amount and type 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, analysing 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 taken by this accommodation can probably 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 yet again acknowledged that in many cases prehistoric caregiving will likely have been shaped by forces of cultural, social, religious and cosmological significance that were perceived by those involved as equally, or more, important than the applied responses to physical manifestations of disability inevitably given prominence in the bioarchaeology of care methodology. 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 recognising that, in past as in modern times, the actual options for care implemented – selected from all those available – 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 the past.

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Chapter 7
The Bioarchaeology of Care Methodology: Stage 4

Stages 1–3 of the bioarchaeology of care methodology construct an argument for the provision of care 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 a particular case of 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 of these elements 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 laid out the background to and justification for this position, and what follows below is what was promised at the conclusion of that chapter – a process

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for applying the concepts of agency and identity to evidence for 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 material on which to base interpretation may just not be equal to the task. In either circumstance, researchers may cease bioarchaeology of care analysis on completion of Stage 3 without compromising valuable work undertaken to this point.

Stage 4: Interpreting the Implications of Care

In a bioarchaeology of care analysis, health-related care provision is understood as a process that takes place over time, the product of a series of intentional choices made by carers and cared-for, and made 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 bioarchaeology, and although no two instances of caregiving will ever have been identical, a common '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.

Those receiving care will also have been faced with choices at various points in the trajectory of experiencing disability, although their options – and thus their ability to express agency – may have been more restricted, and will be even more difficult to identify retrospectively. Nonetheless, where the existence of choice can be inferred, the examination of choices most likely made, in the context of the osteobiographical information available for the individual, may suggest aspects of this individual's personality – albeit in a very general and speculative sense (see discussion in Chap. 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; against the inferences regarding likely clinical and functional impacts of disease; and against the assumptions and conclusions embodied in the Stage 3 model of care. To the extent that the components of a model of care are grounded in what has already been established about the physical, social and economic environments in which this care took place, it seems logical that the results from 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 analysis 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 researchers 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 simply reflects the same complexity in prehistory that we have come to expect in modern life.

Alternatively, Stage 4 analyses may suggest 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 Chaps. 8, 9 and 10 variously illustrate the points made above.

Finally, the protocols contained in the first three Steps of the Index of Care (conforming to Stages 1–3 of the bioarchaeology of care) offer a straightforward, easy-to-follow pathway for analysis. In direct contrast, the two protocols comprising Step 4 of the Index of Care (corresponding to the two parts of Stage 4 of the bioarchaeology of care methodology) are best thought of as very broad, flexible frameworks, scaffolding to support a degree of consistency in the way that questions of collective agency and individual identity are conceptualised across case studies of care – but no more than this. The actual questions themselves – and, of course, the answers arrived at in response to these questions – will always differ in their content and significance.

Stage 4 (Part 1): Group Agency and Identity

Chapter 5 proposes a generic ‘decision path’, summarised in Fig. 5.1, which describes points in the process of caregiving at which a decision regarding action has to be taken by those who are, or are likely to be, involved in the provision of care – whatever form this involvement might take. Stage 4 of the bioarchaeology of care methodology focuses on the seven steps identified in this decision-making *chaîne opératoire* in order to gain a deeper understanding of the lifeways, identity, aims and motivations of this group (this approach is elaborated in the Index of Care protocol presented in the following section).

The term ‘lifeways’ here, as throughout this book, includes social, cultural and physical environments, practices and technologies, and what constitutes group ‘identity’ has been thoroughly canvassed in Chap. 5. Concepts of ‘aims’ and ‘motivations’ were considered in Chaps. 3, 4 and 5, but these are problematic terms to define operationally in an archaeological context and, because of this, what these terms might encompass in relation to past caregiving practice is discussed below.

Aims…

In most circumstances the ‘aims’ of caregiving are likely to be multiple, stratified and complex, and impossible to completely disentangle 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 some inference about aspects of the group’s values and its 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 attempted 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 conceived in cultural terms, as well as level of prior experience with, and knowledge of, this or similar pathologies and appropriate treatment response(s).

Although many factors determine the impact and eventual outcome of disease, the care provided is often influential in moderating aspects of the associated experience of disability. It is not a great leap to suggest that, for the purposes of interpreting past care behaviours, 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 ‘to cure and restore’ – to facilitate healing and re-entry into the working community. Where an individual survived for an extended period with a severely disabling and possibly deteriorating condition requiring continued attention, this may suggest that an important aim of care, at least once the severity of pathology became apparent, was stabilising and/or palliative. Where remains suggest participation in standard lifeways activities in some areas, but long-term pathology impact likely precluded participation in others, a principal aim of care may have been to actively adjust activities to accommodate the needs and capabilities of the disabled individual.

Because caregiving is most often a process rather than a one-off ‘event’, the aims of care may well change over time. To some extent this happens in all situations – acute care in response to emergency may transform into a monitoring of progress and then rehabilitation, care may become established at a constant level as a condition becomes chronic, or it may be dispensed with altogether; care requirements may vary in intensity – often unpredictably; and accommodation of long-term disability may become ‘normalised’ and automatic over time, and no longer perceived as ‘caregiving’ at all. In some instances [such as the case of the individual with juvenile systemic chronic arthritis described by Hawkey (1998)] it may be possible to track changing care needs, along with changes in the nature of care required to meet these needs, and in such cases a focus on the aims of care may be particularly rewarding.

… and Motivations

Motivations involved in health-related care behaviours will be different – and differently weighted – in every case of caregiving. As discussed in Chaps. 4 and 5, motivations in any prehistoric example of caregiving likely 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 the archaeological evidence alone.

Despite this, in some cases it may be justifiable to consider possible motivations for caregiving, and even the possible strength of these motivations, 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 typically 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 in return, and what the acceptance of these costs may have meant for intra-group dynamics.

Likely effort and resources employed in caring will have been considered in deriving a model of care in Stage 3 analysis (Step 3 of the Index of Care), and crude estimates of costs (as defined above) can 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 'costs 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. In cases of severe or permanent disability, where recovery was most likely recognised as unlikely or impossible, the costs 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 just raising for debate the possibility of such rewards acting to shape behaviour contributes to archaeology's quest to humanise the past.

It should go without saying that motivations driving prehistoric caregiving will never be explained merely by reference to a cost-benefit equation; human motivation was undoubtedly as complicated and incomprehensible in prehistory as it is in the present. Even putting to one side the by-now well-rehearsed caveats intrinsic to bioarchaeological research into caregiving, 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 their environment. To use cost as a proxy for motivation would be to assume, without any grounds at all, that caregiving in a resource-rich environment, or in relation to a less demanding pathology, was associated with lower levels of motivation than caregiving in a resource-poor environment, or in relation to a more demanding disease – which would be ridiculous.

In relation to motivation, as in relation to any other consideration in bioarchaeology of care analysis, each instance of care has to be treated on its own terms.

In summary, 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 the past as they are known to be ethnographically, historically, and in modern western society today. 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 – collective identity or ‘personhood’ – within the caregiving community.

Corresponding Index of Care Protocol: Step 4 (Part 1)

As foreshadowed, the design of the Index of Care Step 4 protocol – or ‘framework’ – for considering group agency is centred on the decision path for health-related care provision proposed in Chap. 5, and it opens with a worksheet consisting of two columns. The first column lists the six major decision points likely to be encountered across the trajectory of caregiving, beginning with a determination that care is required and ending with the decision to cease care, and it also includes the seventh decision point identified in Fig. 5.1 – 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 for the pragmatic inclusion of mortuary treatment as one of these steps is discussed in Chap. 5). As prompts for the researcher, some of the factors that might potentially influence the decision-making process are incorporated under each of these seven domain headings. It is expected that researchers will generate case study-specific considerations in most or all domain categories, and new decision domains (i.e. additional points in the decision path) can be inserted if desired. Table 7.1 presents the seven domains (and some of the associated ‘prompts’) contained in this protocol worksheet.

The worksheet’s second column provides unlimited space beside each decision domain for observations and discussion. Researchers are asked to consider everything recorded in the Index of Care Steps 1–3 in relation to the individual, their pathology, their care and their lifeways, and against this backdrop to suggest what a particular decision, made at a particular point, may have comprised and, furthermore, to speculate about what this decision may indicate in relation to aims and motivations for care; practical aspects of social and economic practice; cultural factors; and group social relations. Researchers are also urged to make explicit the reasoning behind their answers.

One further point is noted in relation to the nominated decision domains in this worksheet. The nature of caregiving as a process taking place over time has already been discussed, and decisions made in relation to caregiving will naturally reflect

Table 7.1 Decision domains in health-related caregiving

1.	*Determine that need for health-related care exists.* Identifying the *requirement* for health-related care is the first step in caregiving. Variables may include: group skills/experience in 'reading' symptoms of disease; previous exposure to/awareness of this or similar disease; evidence of care practice in the past; behaviours or 'values' displayed in other spheres
2.	*Assess considerations for and against providing health-related care.* Considerations for and against care will be weighted differently in different lifeways contexts. Variables might include e.g. subject characteristics (age, sex, role, relationships, status, personality); attribution of disease causality; care as the norm (care for all – or only 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
3.	*Decision to provide care.* What might this decision require from the group? Was the decision made by few or collectively, and how was responsibility for the decision allocated? Were there likely limits placed on type, intensity, duration of care? Was care likely contingent on specific lifeways imperatives?
4.	*Determine and initiate strategies for care delivery* (*direct support and/or accommodation*). Some plan – provisional or 'permanent', implicit or explicit, basic or elaborated – is needed before care is given. Variables might include: identification of goal(s) and measures needed to attain these; labour, skills and other resource demands of care, and ability to meet these; availability of additional resources where necessary; allocation of responsibility for caregiving tasks; strategy for meeting costs of care (e.g. increasing food production/reducing individual consumption, compensating for lost/diverted labour)
5.	*Implement and review care practice.* Caregiving is an iterative process consisting of (a) 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 a review may include (re) assessing group ability/willingness to afford care and/or renegotiating responsibility for (aspects of) care. See possible variables listed in (4) above
6.	*Decision to cease care.* At some stage there will be a decision to cease care. This may be because: the subject recovers, and no longer requires care; the subject dies; care is no longer deemed possible, productive, affordable and/or appropriate, and is therefore withdrawn – regardless of health status. Where the subject likely received care over the period up to around the time of death, were they still receiving care when they died? What are the implications if so?
7.	*Decide treatment after death*[a]. Decisions to be made include whether the subject will receive *any* mortuary treatment, and if so how this compares to 'normal' practice. Variables in deciding 'appropriate' mortuary treatment may include subject 'identity' (status, personality, etc.); nature of pathology experienced; cultural beliefs and practice; etc.

[a] '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 Chap. 5)

this. The decision points 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 Table 7.1 above; some decisions will have to be taken rapidly (such as an initial decision to provide care in response to an acute pathology), while decisions made at other stages may be extended or reformulated 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 it is important to acknowledge this in interpretation.

Following completion of the worksheet, and within the parameters of what has been established or inferred about the subject's care requirements and the wider lifeways context, the protocol provides a text-box in which it invites researchers to speculate on what the observations recorded against individual decision domains might suggest about broader social and cultural characteristics of the community in which caregiving took place, concentrating on aspects that are in some way implicated in, or affected by, the caregiving process. To assist in this process the protocol suggests that researchers might benefit from first generating and addressing a range of case-specific questions – the more intricate and stimulating the better. For example, 'what might the decision to care for a severely disabled adult individual 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?', or 'what might the decision to care for a badly injured adolescent female within a lifeways for which there is evidence of high levels of interpersonal violence suggest about cultural practice, values and identity – where might this caregiving "fit"?'. The protocol provides a second worksheet, consisting of two empty columns headed 'Questions' and 'Observations', to be used for the above purpose.

Once again it is emphasised that the Index of Care Step 4 (Part 1) protocol is a prompt, *not* a prescription. The protocol offers one possible approach to the task of interpretation – and it lays claim to no more than this.

Stage 4 (Part 2): Individual Identity – The Subject as 'Agent'

Clinical experience shows that the nature and outcomes of health-related caregiving will, to a greater or lesser extent, be dependent on the attitude and behaviour of the person receiving it – the care-recipient always has options, even if only the binary choice of 'cooperation' versus 'non-cooperation' with care providers. The interpretive approach outlined below emerges from theory and praxis discussed in Chap. 5; it is based on the premise that the subject of a bioarchaeology of care case study is an active agent and that teasing out possible manifestations of this agency may allow access to a small part of that subject's unique identity.

This second part of Stage 4 analysis is the final step in the bioarchaeology of care methodology, and it aims to construct an impression of the person who was the focus of caregiving activity. The term 'impression' is used advisedly; the approach outlined below may be seen as transgressing 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 recovering individual identity, and will never be able to do this 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 must inevitably reflect elements of who they are, no-one – past or present – is defined by disability and nothing else. Both these reservations recognise that the fine detail of the individual around whom bioarchaeology of care analysis revolves will always be beyond reach.

Notwithstanding, where cases of care provision meet certain criteria it may be defensible to hypothesise some very general behavioural tendencies. In determining whether it is profitable – or possible – to explore individual identity, one indispensable criterion is that the remains of the individual provide enough information from which to create a basic profile (minimally sex and age category), enabling informed conjecture regarding the range of likely roles experienced and expectations encountered within their 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 (another obviously indispensable criterion) to infer impact of disability on social as well as physical functional capability, the very fact of survival 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 would be difficult 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 makes them distinct 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. These are combined to create an expanded osteobiography, components of which are then used reflexively to hypothesise personality characteristics that may, conceivably, 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 on how, in this process, characteristics of the care-recipient might have shaped and been reflected in what this caregiving comprised. It consists of asking questions developed to elicit intimate features of a specific past life, and in knitting together responses in a way that offers a possible – and credible – glimpse into the character of the individual who inhabited it.

Some additional comments are necessary. Firstly, there is an obvious constraint in that in a bioarchaeology of care analysis the assessment of disability impact is always conservative and will usually be underestimated (see Chap. 3). The implications of this for analysis of care provision were raised in relation to Stages 2 and 3 of analysis, 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 and, more particularly, failing to appreciate, personal qualities brought to managing disability impact?

Secondly, attempts to identify aspects of personality will invariably result in broad generalisations, because there will never be the evidence to allow nuance; these generalisations will probably be replicated across case studies where subjects are thought to have survived similar levels (although not necessarily similar symptoms) of disability. This does not invalidate either the observations made or the wider exercise of venturing to get closer to the subject of care. Taking 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 Chap. 5). But each of these individuals will have been 'positive' in their own way, and the particulars of this way will remain unknown. 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 would be unwise. Returning to the example above, one researcher might interpret '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 a characteristic of an individual who survives with a seriously 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.

Lastly, although in discussing Stage 4 of the bioarchaeology of care methodology this chapter addressed issues of group agency and identity before those of individual identity, it may prove productive to use insights gained in examining individual identity to reflect again on the nature of the community providing care. For example, if survival with disability suggests 'strong will to live', what sort of values and practices within the group may have nurtured and honoured this drive?

Corresponding Index of Care Protocol: Step 4 (Part 2)

The subjectivity unavoidable at the level of interpretation outlined above begs the question of whether an Index of Care protocol should even be attempted, and the proviso that all researchers are responsible for selecting those aspects of the Index and its protocols relevant to their study is reiterated here.

Having said this, the aims of a Step 4 (Part 2) protocol are modest: they are to encourage researchers to focus on the question of the subject's identity and to provide some ideas (and a basic structure) for beginning this process. The protocol promotes a continuous positioning of what we would *like* to know about the 'individual as agent' against what is already known (or inferred), variously, about the individual when cast as an essentially passive 'recipient of care'; about those providing this care; and about the context in which this care was given. In doing this it simultaneously reveals possible areas of enquiry and reminds researchers of evidentiary constraints on interpretation.

This protocol consists of three sections, the first comprising a worksheet intended to produce a précis of all information and inferences recorded in Stages 1–3 of the Index that relate directly to the care-recipient. The aim of this exercise is to have researchers build a picture of their subject based on material with which they are already familiar, and it revisits (1) the subject's basic physical characteristics or 'identifiers', such as age, sex, height, general health status and health experience (but not including indicators of pathology for which care is inferred – see below), and other characteristics (such as origins, mobility, diet) for which there is material evidence (e.g. stable isotope analysis, DNA); (2) social indicators, such as evidence for role and/or status (e.g. artefact association, body modification), family membership; and mortuary treatment; (3) the pathology (and its impacts) for which care is claimed – 'the individual through the lens of disability'; (4) features of the care likely received, with emphasis on possibilities for interaction between care-recipient and caregivers – 'seeking the individual through the lens of care'; and (5) those lifeways variables identified in terms of possible 'opportunities or constraints' affecting the individual's ability to participate. The worksheet contains two columns; the first of these lists headings for the domains above, along with prompts for the information sought (domains may be added by researchers as required). The second column provides unlimited space beside each domain for information and observations.

Researchers then proceed to the next section of the protocol, a new worksheet that also contains two columns. The first column contains a sample of very broad and generalised questions that focus attention on the more intimate details of an individual's likely experience of disability and care. These questions, examples of which are given in Table 7.2 below, are aimed at inspiring researchers to develop a greater appreciation for their subject's life history, and to consider the possible effects of loss of functioning capability on that subject's perception of self and their interactions with others. In the Index of Care application these questions are briefly elaborated along the lines of discussion in Chap. 5, and it is expected that researchers

Table 7.2 'Seeking the subject' – examples of generic questions relating to individual experience and identity (Index of Care Step 4 [Part 2])[a]

• What does the disabled subject's survival suggest about personality and motivation?
• What was the likely (quality of) relationship between subject and carer(s)?
• Does the subject's ability to obtain care suggest any personality traits? Are there other cases of care in the group? If so, how do 'cases of care' compare?
• Is it likely that different 'care' options were available? Is it likely the subject influenced which options selected? How?
• What was required from the subject in terms of cooperation in their own care? What does cooperation suggest in terms of e.g. level of functioning, personality, etc?
• How may disability have acted on the subject's ability to perform the *same* activities as those of their cohort? How may this have influenced the subject's self-perception and perception by others?
• *What might be the answer to the last question where opportunities to participate in alternative activities of equivalent value were available*?
• 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)?

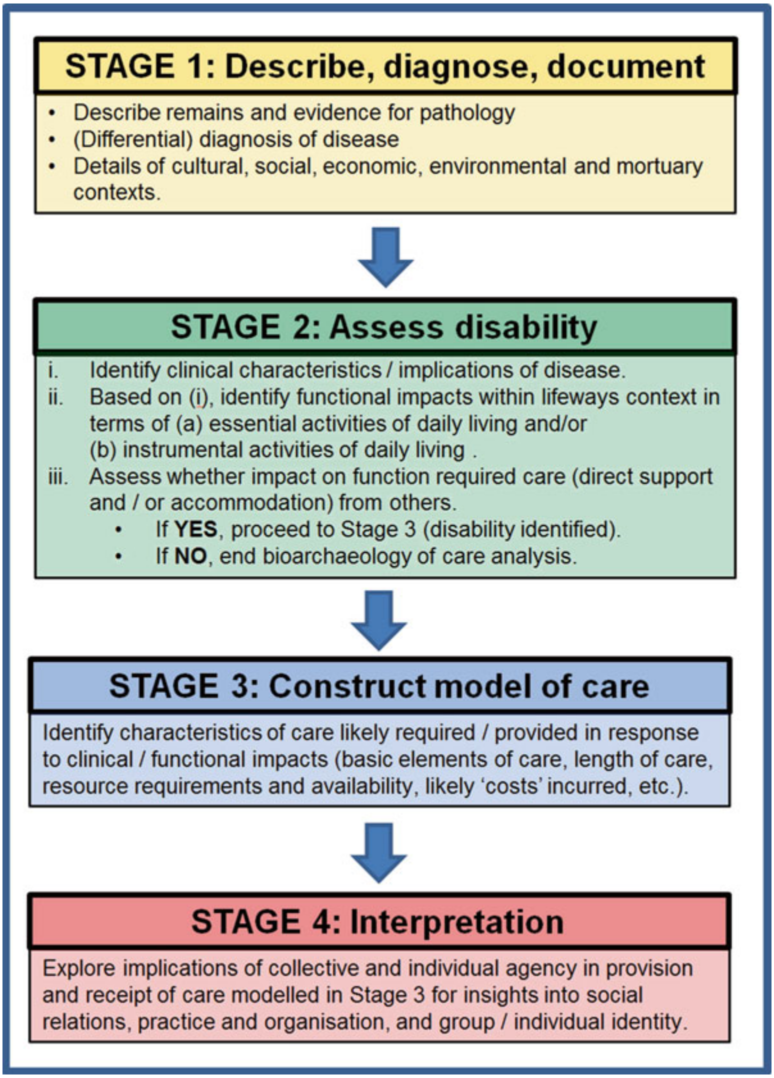
[a] Researchers are asked to adapt these questions for relevance to their study and/or to generate appropriate questions

will modify and/or add to these questions to reflect the particular circumstances of their case study. Responses to these questions, including information about the way the question was adapted by the researcher for their particular study, are entered in the second column.

The final section in this final Index of Care protocol simply provides a text box and invites researchers to take what has been recorded in the last two worksheets and, in relation to the 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.

The Bioarchaeology of Care Methodology: Some Final Comments

To recapitulate: the bioarchaeology of care methodology is a contextualised, case study-based, approach to analysis comprising four sequential stages, each of which drills progressively deeper into the detail of lifeways, experience, behaviour and identity 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 Fig. 6.1 – *The four stages of the bioarchaeology of care* – to present a more detailed graphic summation of the bioarchaeology of care approach.



STAGE 1: Describe, diagnose, document

- Describe remains and evidence for pathology
- (Differential) diagnosis of disease
- Details of cultural, social, economic, environmental and mortuary contexts.

STAGE 2: Assess disability

i. Identify clinical characteristics / implications of disease.
ii. Based on (i), identify functional impacts within lifeways context in terms of (a) essential activities of daily living and/or (b) instrumental activities of daily living .
iii. Assess whether impact on function required care (direct support and / or accommodation) from others.
  - If **YES**, proceed to Stage 3 (disability identified).
  - If **NO**, end bioarchaeology of care analysis.

STAGE 3: Construct model of care

Identify characteristics of care likely required / provided in response to clinical / functional impacts (basic elements of care, length of care, resource requirements and availability, likely 'costs' incurred, etc.).

STAGE 4: Interpretation

Explore implications of collective and individual agency in provision and receipt of care modelled in Stage 3 for insights into social relations, practice and organisation, and group / individual identity.

Fig. 7.1 The four stages of the bioarchaeology of care (expanded from Fig. 6.1)

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 Stages 1–3 of the bioarchaeology of care methodology will enable a much more methodical and a far more comprehensive understanding of caregiving behaviours than would otherwise be achieved.

The purpose of the potentially more contentious Stage 4 analysis is delve into aspects of group and individual agency and identity – most plainly put, to bring the past to life. In relation to each of these areas the Index of Care Step 4 protocols provide examples of ways in which evidence, inference and observation associated with the provision and receipt of care might be identified, deconstructed, reassembled, and differently combined and counterposed in order to encourage new ways of looking at the case study materials. Ultimately, however, the researcher undertaking the bioarchaeology of care analysis is responsible for deciding what will, or *can*, be included in any and all stages of 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 asserted. In relation to Stage 4 analysis it is undeniable that interpretation of complex behaviour within a bioarchaeology of care context will involve subjectivity – the reality is that, when archaeology addresses issues as abstract as agency or identity, the traditional conventions of scientific 'validity' and 'reliability' will be difficult to define and probably impossible to meet. Nevertheless, the approaches proposed in the bioarchaeology of care methodology and operationalised in the Index of Care 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 limits of interpretation.

The case studies that follow apply the methodology described in these last two chapters to examples of health-related caregiving from different prehistoric times and cultures, and illustrate the claims made for the bioarchaeology of care approach.

Reference

Hawkey, D. E. (1998). Disability, compassion and the skeletal record: Using musculoskeletal stress markers (MSM) to construct an osteobiography from early New Mexico. *International Journal of Osteoarchaeology, 8*, 326–340.

Chapter 8
Survival with Severe Disability: A Case of Long-Term Care in Neolithic Vietnam (Case Study 1)

Around 4000 years ago, a young man in northern Vietnam survived for approximately 10 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 quadriplegia from adolescence into his third decade.

M9 is the perfect subject to use in illustrating the bioarchaeology of care approach in action. That care was critical for M9's survival is incontestable, and this fact allows analysis to focus on the detail and wider significance of caregiving activity, rather than becoming bogged down in the basic question of whether or not care was actually required and provided. Indeed, an earlier version of this case study was originally used in 2011 to introduce the fledgling bioarchaeology of care to a wider audience (Tilley and Oxenham 2011). The account below includes the substance of this report, but it goes into greater detail on the process of analysing and interpreting M9's disability and care than was possible within journal constraints, and it also contains updated information about, and expanded discussion on, a number of contextual variables.

Because the case study of M9 is the first worked-through example of the bioarchaeology of care methodology's application to be presented in this book, the chapter provides a fuller description of some of the procedures involved (and the relationship of these to the four stage methodological framework) than would normally appear in a publication. The case studies presented in Chaps. 9 and 10, on the other hand, presume the links between analysis undertaken and corresponding bioarchaeology of care stage, and do not attempt to make these associations explicit on any consistent basis.

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Man Bac Burial 9: The Individual and His Context (Stage 1)

The remains of M9 were recovered in 2007 from the early Vietnamese Neolithic cemetery at Man Bac, a site dating to between 1745–1538 and 2016–1775 cal. BCE (Oxenham et al. 2011). Male, aged between 20 and 30 years at time of death, M9 was buried on his right side, with both legs flexed to the right and knees brought up parallel to the top of his 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; his burial orientation was north-south, with his head to the north and facing due west. Fragments of two small to medium-sized terracotta vessels, positioned at his head, represented the only preserved grave goods present. I participated in the recovery, recording and analysis of M9's remains, and skeletal anomalies signalling a serious and potentially very disabling condition were immediately apparent to all present; in effect, the decision to study M9 from a bioarchaeology of care perspective was taken on the spot. Figure 8.1 presents the remains of M9 in situ.

M9: Description and Diagnosis

A detailed description of M9's partially preserved remains (summarised in Fig. 8.2), and of the evidence for, and the differential diagnosis of, M9's pathology, is provided in Oxenham et al. (2009). In brief, indicators of pathology comprised

Fig. 8.1 M9 in situ (note extreme gracility of limbs); grave goods (terracotta pots) have been removed. Image by Lorna Tilley

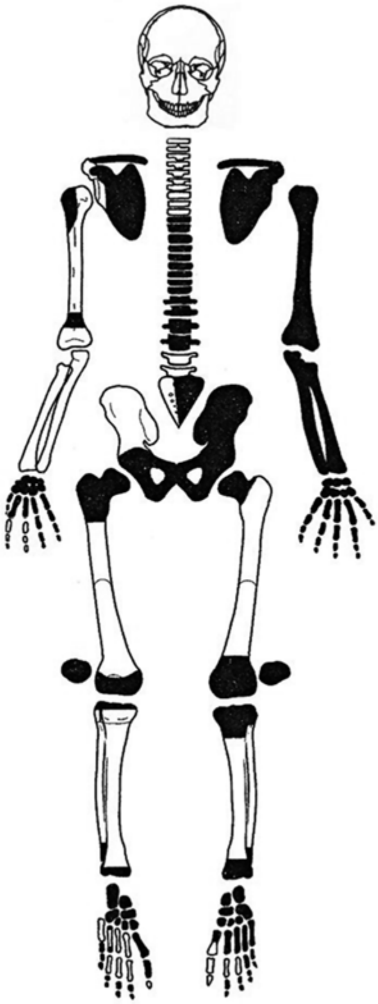

Fig. 8.2 Schematic summarising skeletal preservation of M9 (*black* represents missing portions)

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 few remaining bones of the right hand, including diaphyseal narrowing of the middle phalanges; fusion of the right sacroiliac joint; ankylosis of all cervical vertebrae and of the three 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 were no signs of trauma or infection on preserved elements. There was evidence of linear enamel hypoplasia in both

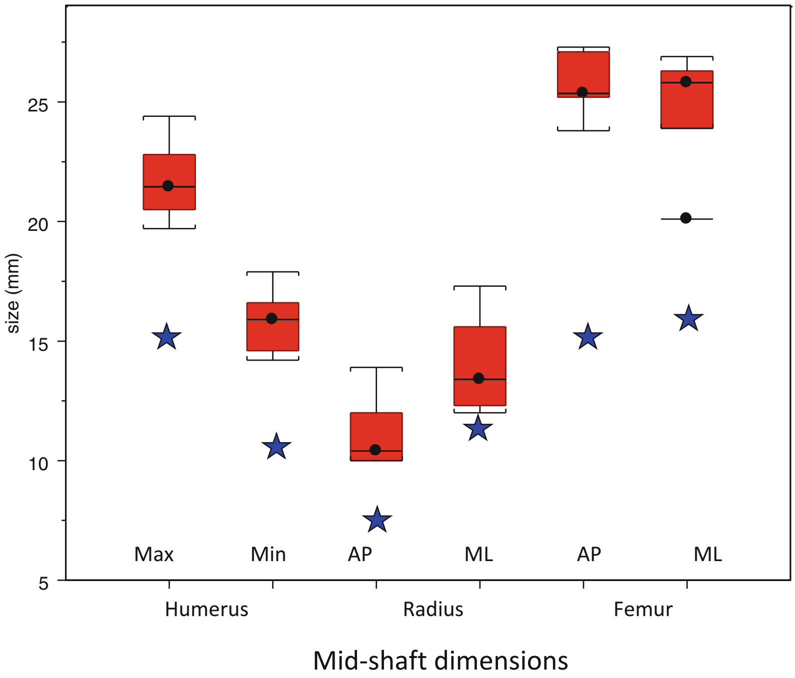

Fig. 8.3 M9 limb dimensions (*stars*) compared to six other Man Bac adults: implications for unloading (Courtesy Marc Oxenham)

maxillary and mandibular dentitions as well as cribrotic remodelling in both orbits, reflecting experience of health stress during early childhood. Figure 8.3 compares the limb dimensions of M9 to those of a sample of other adults from the Man Bac cemetery, graphically displaying the effects of disuse atrophy on M9's lower and upper limbs. Figures 8.4 and 8.5, respectively, show the extensive vertebral ankylosis and occipitalisation and atlantoaxial rotary fixation present in M9's remains.

Differential diagnosis suggests Klippel–Feil Syndrome (Type III), a segmentation disorder characterised by fusion of two or more vertebrae (Samartzis et al. 2006), 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. Skeletal evidence suggests quadriplegia onset occurred during M9's early adolescence, but the state of skeletal preservation does not allow identification of the proximal cause of paralysis. However, while M9 may have experienced some progressive neurological degeneration as a result of his congenital condition (particularly in view of articulation anomalies in the first two cervical vertebrae), paralysis was most likely caused by a trauma – possibly quite minor – propelling the ankylosed block of vertebrae C1-T3 across the 'free' vertebra below, damaging the spinal cord. This phenomenon is well documented in modern medical literature (Elster 1984; O'Donnel and Seupaul 2008; Oxenham et al. 2009).

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

Fig. 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) (Image by Lorna Tilley)

M9 is not the first individual in bioarchaeology to be diagnosed as suffering Klippel–Feil Syndrome; other instances include those identified by Barnes (1994), Fernandes and Costa (2007), Fukushima (1988), Pany and Teschler-Nicola (2007), Papathanasiou (2005), Silva and Ferreira (2008) and Uruñuela and Alvarez (1994). However, the extent of axial and appendicular involvement makes this case not only one of the most convincing of all such reports, but also the most severe palaeopathological manifestation to date.

The Context for Care

The Man Bac site is located in the Ninh Binh province of northern Vietnam, 100 km south of Hanoi, and consists of three well-delineated cultural phases. Excavations carried out between 1999 and 2007 produced the remains of 100 individuals, all primary burials, extending through three separate layers in the earliest of these phases; these individuals constitute the first signs of human presence at the site. During this period of 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 karst; although the coastline has since receded between 10 and 20 km, Fig. 8.6 offers a reasonable representation of the past physical environment. The climate was similar to that of the present, with cool, humid winters (minimum average 6–12 °C) and hot, wet summers (Sterling et al. 2006).

Fig. 8.6 The modern Man Bac landscape, looking southwest, excavation site middle right. (At the time of M9 the lower ground – middle of the picture – would have been underwater) Image by Lorna Tilley

In its earliest phase this site was used exclusively as a cemetery; other than materials directly associated with the interments, there are no cultural deposits. Although it has been assumed that the community to which this burial ground belonged lived nearby, no evidence for any associated camp or settlement has been found – and this leaves a large gap in our knowledge of contemporary practice. Based on evidence from sites that are dated to a similar period, a predominantly hunter-gatherer economy, possibly combined with horticulture, has been inferred; analysis of enthesial and cross-sectional data from a large sample of adult Man Bac individuals indicates that both males and females were undertaking activities involving strenuous upper limb use, and Huffer and Oxenham (in press) suggest the evidence is consistent with performing tasks connected to the use of watercraft. Preliminary stable isotope data from a small sample of cemetery inhabitants indicating a high proportion of protein intake (possibly up to half) derived from fish (Yoneda 2008), while faunal remains from the middle phase of the site (the layers immediately above the level of the cemetery) indicate a focus on both aquatic and terrestrial resources (Sawada and Vu 2005). 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 in M9's time. 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 treatment was structured and consistent across all three burial layers. As illustrated in Fig. 8.7, the standard burial position was supine, extended and oriented roughly east (head) – west (feet); M9's burial is one of only six (out of 76 burials for which orientation and disposition can be discerned) to deviate from this custom. Grave goods were found in association with all adults and most subadults: type and quantity of these vary, with the most common inclusions being one or more pottery vessels, followed by single or multiple shells (bivalve, cowrie, clam and/or gastropod), with less common grave goods including nephrite beads, adzes, and bracelets (Huffer and Trinh 2011). Oxenham et al. (2008) find a positive correlation between the number and type of grave goods and age at death, although there are some exceptions to this. The same burial procedures were applied to members of all demographics – male and female, neonates through to adults (Oxenham et al. 2008) – and this is possibly indicative of a broadly egalitarian social order, in which all members of the community were accorded an individual identity from the earliest age onwards.

Human remains recovered from Man Bac display considerable genotypic and phenotypic heterogeneity, containing individuals with, variously, indigenous (Australo-Melanesian) characteristics, Northeast Asian characteristics, and a mixture of both; while cultural evidence is lacking, this phenomenon most likely reflects the well-documented diffusion into Southeast Asia of farming peoples from the north (Oxenham and Matsumura 2011; Oxenham et al. in press). Elevated levels of infant mortality, suggesting high fertility rates, provide a demographic profile of cemetery occupants typical of early sedentism (Domett and Oxenham 2011), although the lack of material evidence to support an assumption of a particular lifestyle is again noted. There are indications that at times this was a population under considerable health stress: oral health was significantly worse than that of earlier

Fig. 8.7 Man Bac cemetery 2007: burials are oriented east (*heads*) – west (*feet*), reflecting standard mortuary practice. Image by Lorna Tilley

Neolithic and later Metal Age samples in the region, and frequencies of cribra orbitalia and linear enamel hypoplasia are among the highest found in Neolithic Southeast Asia (Oxenham and Domett 2011). There is a high frequency of non-specific periostitis manifesting on upper and lower limbs of Man Bac subadults (Oxenham 2014, pers. comm.), often indicative of a generalised immune response to one or more health stressors, such as infection, metabolic system disruption and/or poor nutrition (e.g. Goodman et al. 1984; Ribot and Roberts 1996). Only one case of traumatic injury, involving a (healed) forearm fracture, has been identified (Oxenham 2014, pers. comm.), and there is neither skeletal nor cultural evidence of interpersonal violence.

The Clinical Implications and Functional Impacts of Pathology: Assessing Probability of Care Provision (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. While only the most basic impacts are assumed in this chapter, it is certain that M9 experienced a far greater range of neurological as well as physical symptoms. These symptoms are briefly raised below in order to underline the conservative approach taken in this bioarchaeology of care analysis.

M9 and His Experience of Disease: Clinical Impacts

Extreme atrophy of M9's lower limbs, combined with the absence of any visible muscle attachment markers, indicates a total loss of voluntary and involuntary lower body control of extended duration, with skeletal evidence suggesting lower body paralysis probably occurred between 10 and 14 years of age (Oxenham 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. 1979; Park et al. 1993), and would have acted as another constraint not only on lower limb but also whole-of-body positioning.

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

Extensive cervical vertebral ankylosis, combined with occipitalisation and permanent torticollis, resulted in significant constraints on neck flexion and extension, along with 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 present (Hodges 1991). Ankylosis of the preserved thoracic vertebrae (T1-3) adds weight to the overall picture of constrained upper body flexibility.

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 very 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 muscle 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.

Table 8.1 is detailed, and its contents would not usually be presented in this format in a final report. Here, however, it is included as an example of the richness of material that can be generated in working through the ‘clinical implications’ component of Stage 2 of the bioarchaeology of care methodology. In this particular case, a thorough understanding of both probable and possible clinical impacts was invaluable for developing and interpreting a model of the care likely received by the study’s subject (Stages 3 and 4 of the methodology), as will become apparent. While only a few of the complications listed in Table 8.1 are likely to register in bone, each has the potential to pose a severe health threat, and M9’s survival for over a decade, while completely immobilised, argues for certain basic interventions aimed at prevention and/or remediation of such conditions.

In addition to the impacts canvassed in Table 8.1, 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 % of patients with spinal cord injury associated with paralysis experience pain within the first 4 years of symptom onset, with up to 45 % 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 should be acknowledged in considering caregiver and care-recipient behaviours in response to the demands of this condition.

Determining the Need for Care: Functional Impacts

In summary, the physical effects of M9’s pathology would be to render him not only immobile (in colloquial terminology, ‘bed-ridden’), but also unable to move his lower body at all or use his upper body to any significant extent. This would leave M9 incapable of independent function in relation to most, if not all, items on the list of ‘essential activities of daily living’ proposed in the bioarchaeology of

Table 8.1 Health complications of immobility[a,b]

BODY SYSTEM/FUNCTION: musculoskeletal
Mechanism(s) of impact
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)
2. Prolonged joint immobility leads to muscle atrophy and contraction of muscle fibres
Impact(s) on physiological function
1. *Osteopenia/osteoporosis and* (*vulnerability to*) *fracture*) – bones become light and fragile, lack structural strength and susceptible to fracture/other damage
2. *Contracture* – limbs fixed in flex position, reduced/loss of joint movement
BODY SYSTEM/FUNCTION: mental (psychosocial)
Mechanism(s) of impact
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
Impact(s) on physiological function
1. *Behavioural change/depression/general health stress*: 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
BODY SYSTEM/FUNCTION: cardiovascular
Mechanism(s) of impact
1. Reduced muscle tone affects venopressor mechanism, blood pools in lower body
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
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
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 (a) blocks or ruptures a blood vessel to the brain, causing loss of brain function; (b) 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

(continued)

Table 8.1 (continued)

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
1. *Loss of appetite*, *anorexia*, *malnutrition*, *other* (including dyspepsia, gastric stasis, distension, diarrhoea) – all compromise general health maintenance and ability to resist and recover from infection
2. *Constipation*; *intestinal obstruction* – 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
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/psychological stress disrupts metabolic function; supine position acts to reduce metabolic activity
Impact(s) on physiological function
1. *General system dysfunction* – 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
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

(continued)

Table 8.1 (continued)

Impact(s) on physiological function
1. *Pressure sores* (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
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
1. *Urinary tract infection*; *incontinence* – particles in pooled urine become focus for infection. Bladder distension leads to (i) overflow incontinence and (ii) back pressure, resulting in kidney dysfunction
2. *Kidney stones* – 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)

[a] Body systems do not operate in isolation, and immobility-related impacts will interact

[b] 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

care methodology (see discussion Chap. 6, or refer to Index of Care Step 2 [Part 2]). Specifically, M9 was unable to provide himself with food and water, to manage personal hygiene requirements, or achieve unaided movement over even the shortest distance. It is likely that restrictions on upper limb activity, combined with those on cranial, neck and upper back movement, made it difficult – if not impossible – for M9 to feed and/or hydrate himself (actions which require a level of manual precision) even when provided with food and drink by others. These same restrictions would very probably constrain the manipulation of other objects in his immediate environment as well. Finally, as has been noted previously, it is very unlikely that M9 had any control at all over the positioning of his lower body, and probably only minimal control (possibly decreasing over time) over his positioning of his upper body.

M9's ability to take part in 'instrumental activities of daily living' (again, see discussion Chap. 6, or refer to Index of Care Step 2 [Part 2]), would be extremely problematic. Participation in any of the standard economic or domestic activities undertaken in the Man Bac lifeways is inconceivable. Despite there being no reason to suppose that M9's intellectual ability or his communication skills were affected by his pathology, meaning that participation in certain aspects of social and cultural activity may well have been possible, it is difficult to see how, in practical terms, such participation could have been achieved without considerable efforts by others to bring it about.

Given the devastating impact of disease on M9's functioning capability, there can be absolutely no doubt that health-related care was essential to his 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. In Klippel–Feil Syndrome, myelopathic symptoms with a progressive loss of function may manifest at an average age of 10 years (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. While this is another question with potential implications for considering planning and delivery of care, the answer is beyond reach.

Developing a Model of Care (Stage 3)

The range and nature of likely clinical and functional impacts of pathology, taken in conjunction with knowledge of contemporary context, make it possible to identify basic components of the care received by M9 with a high level of confidence.

Provision of Food and Water; Assistance in Eating and Drinking

M9 was incapable of obtaining food and water independently, so clearly these most crucial necessities of life must have been supplied by others. Difficulties in aspects of upper body coordination likely posed problems for M9 in feeding himself and/or in holding a container at the correct angle for imbibing; it is possible that M9 received assistance with eating, and even more likely, given the nature of the task, that he required help with drinking.

Restrictions on head and neck movement, combined with constraints associated with temporomandibular joint osteoarthritis, may have impeded efficient mastication and led to a need for food that did not require a lot of chewing – although it is noted that level of tooth wear in M9 appears normal for his 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 been given foods 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 caregivers 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 largely based around 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 his digestive capabilities and nutritional requirements as well as ensuring adequate fluid intake, and his lengthy survival indicates both were achieved.

Maintaining Body Temperature; Protection from the Elements

There is no direct evidence for Man Bac dwellings from this period, but because M9 would have found it impossible to survive exposure to the elements for more than a short period of time a shelter providing protection from sun, wind and rain must be assumed. M9's continued survival would also have been dependent on (1) a structure elevating him above cold or wet ground, possibly with provision of additional structures to support him in both sitting and reclining positions, and (2) provision of a soft surface to lie on. Failure in either of these areas would, minimally, have resulted in continuous, and likely rapidly fatal, health challenges from 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 very sensitive to core temperature fluctuation, which may require management by adjustment of clothing or other coverings. Although nothing has been recovered from the cemetery excavations that sheds light on dress 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.

Ensuring Physical Safety

Individuals suffering 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 without spinal cord damage will lose an amount of sensation over time (Bergman et al. 1997). For M9, hazards likely 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. Care in this context would not only entail carers being aware of M9's location 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 examination of M9's body to check for injury.

Maintenance of Personal Hygiene; Protection of the Integument

M9 would have been 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 it makes sense that he may have been moved elsewhere for, and/or attended during, 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 consequently to bacterial and parasitic infection (AHCPR 1992; Stillman 2008). 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 have increased M9's susceptibility to decubitus ulcer (or pressure sore) development. Such complications have potentially fatal consequences for an immobile individual (Stillman 2008; Thompson Rowling 1967; Yeo et al. 1998). Care provision would have included removal and disposal of body wastes; continual observation and action to ensure M9 was clean and dry (wiping, bathing, towelling); and constant replacement and cleansing or disposal of soiled clothing and bedding.

Dedicated Nursing: Health Monitoring, Hands-on Care, and Maintenance of Physiological Functions

Modern clinical experience suggests secondary complications must often have arisen, prompting repeated care interventions following immobilisation and up to M9's death. Characteristics of paralysis 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 compensating 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 highly visible signature characteristics of Klippel–Feil Syndrome, such as abnormal shortness of neck or shoulder anomalies (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 previously, 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' perception of what constituted a health threat and their ability to respond effectively.

'Looking out' for M9 must have encompassed the ability to recognise 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 may manifest 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 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; Moyer et al. 2004; 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*), sometimes used in folk medicine for abdominal (including parasitic) and urinary complaints, was given to children at Man Bac, possibly at the time of teething (Oxenham et al. 2008). There is no direct evidence for pharmaceutical treatment in relation to M9, however.

When M9 experienced acute health crises, intensive care over days, or perhaps weeks, would have been necessary. The physical therapies outlined above would need to be 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, protecting M9 against the hazards of immobility would have involved frequent repositioning, manipulation and massage, because this was the main risk mitigation strategy available to his carers. At a theoretical level there can be no doubt that M9 received this prophylactic care and that it was integral to his extended survival.

When Absence of Evidence for Disease Becomes Evidence for Care…

At an empirical level, and in relation to two of the most common complications of prolonged immobility, absence of evidence in the skeleton becomes possible evidence for receipt of care. The absence of evidence for pressure sores and bone fracture in M9's remains calls out for closer attention.

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 an early response 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 frequently 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 open-wound pressure sores is around 85 % (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 local and systemic infection; had M9 survived the initial stages, localised infection would almost certainly have been expressed in bone lesions easily recognisable in his remains (Boel and Ortner 2013). The absence of evidence for infection from pressure sores (or infection from any other cause) in M9's remaining skeletal elements, combined with the length of M9's survival with paralysis, suggests a minimum level of care comprising routine inspection and cleaning of skin surfaces, provision of cushioning materials, and routine physical manipulation to relieve pressure points and maintain vascular flow.

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 remedies for pressure sores (Stillman 2008). This treatment would have required sophisticated and dedicated effort, however, and reflects the high level of commitment to M9's survival.

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 remaining upper and lower limbs display no sign of antemortem damage, despite extreme atrophy rendering them potentially vulnerable to even the comparatively minor trauma that can eventuate from the physical therapies that have been deduced as elements of his care.

Furthermore, M9 must often have been transported over short distances, at least, if only for the purposes of maintaining the hygiene necessary to avoid infection and, probably, to allow him to participate in community gatherings (the likelihood of this latter is returned to in the following section); and if the Man Bac community was at all mobile, then M9 must have been transported by others, perhaps on a litter or by water (there is no evidence for draught animal domestication). Ensuring M9's safety during transportation would require both ever-present consciousness as well as physical strength on the part of those involved in this process.

Interpreting Care: Implications for Group and Individual Agency and 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). In prehistoric times, the predicted outcome of a condition such as M9's – with such severe functional impact and range of potential health complications – would be rapid death, probably well before pathology had the opportunity 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.

Man Bac: Clues to Community Through the Analysis of Care

Because the exact 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 make 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, intensive and possibly increasing care for the rest of his life.

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 by group members, particularly during infancy and early childhood, 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 without catastrophic consequences. 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 (Kamp 2001; Kramer 2005; Oxenham et al. 2008). In the case of M9 it seems fair to assume that the adoption and maintenance of support behaviours, resulting in a level of reduced productive capacity for the community over a period of years, would have required consent and cooperation (if only indirect) from the group as a whole.

The care for M9 provides clues to behaviours and characteristics of the Man Bac community 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 the use and the production of, or possibly trade in, some form of textile. Lack of ante mortem fracture suggests it is unlikely that M9 belonged to a mobile society; although it is just conceivable that, in a mobile group, M9 could have been transported between occupation camps, it is not credible that this occurred on a regular basis or over significant distance without incurring injury – supporting the independently derived hypothesis [based on mortuary demographic profile (Domett and Oxenham 2011)] that Man Bac was a predominantly sedentary community. We have no knowledge of what sort of dwellings (if any) were used by the Man Bac community, but we can infer from M9's survival that the group was capable of constructing a shelter protecting him from environmental stress and, most probably, of creating the 'furniture' (such as a platform, or 'bed') needed to support his body in sitting and recumbent positions and to keep him raised above a cold and possibly damp floor – it seems unlikely that these skills were not employed in other contexts. Meeting M9's dietary requirements suggests a broad knowledge and range of food resources, food processing skills capable of overcoming problems with appetite and digestion, and the ability – and willingness – to take the time needed for special food preparation. Finally, 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 et al. 2000; Lewis 1975; Sugiyama 2004a, b), add some weight to this observation.

The effective, long-term response that enabled M9 to live with disability for so long argues for a socially stable and cohesive community that was experienced in nursing the sick – one capable of assessing the likely demands and costs of caregiving in relation to a serious and permanent pathology, able to develop an effective set of procedures for responding to this situation, and willing and able to maintain these procedures over many years. Man Bac community members made an informed commitment to the extended care of one of its members, one that was probably regularly reviewed and re-committed to in response to changes in – and the inevitable decline of – M9's health status.

It is also worth thinking about how the evidence for care aligns with what has been inferred about Man Bac society from other archaeological sources. For example, in the earlier section of the chapter describing the Man Bac broader lifeways context it was reported both that the cemetery population comprised the remains of individuals of indigenous, immigrant and mixed ethnicities and that none of the remains so far recovered displays signs of interpersonal violence. Might these facts indicate that, in this location at least, the movement of farmers from what is now southern China into Southeast Asia was achieved without either aggression, on the one side, or resistance, on the other? Certainly, an hypothesis that the northern newcomers integrated peacefully into the existing indigenous culture sits well with a conclusion of community collaboration in the care of M9.

Uncharted Waters: Beliefs and Values, Disability and Care

It is worth emphasising a point made in previous chapters: motivations behind 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 Man Bac society understood disease or how this understanding may have affected the decision to care for M9, but while recognising the dangers of retrospective attribution of motive it may still be possible to gain some partial insight into the beliefs and values held by the Man Bac community on the matter of caring for others in need. For instance, the considerable and continuing effort that unarguably went into keeping M9 alive suggests that the people of Man Bac were not fatalistic in relation to their views of disease and its origins.

People who are perceived as ‘different’ by their community in life are often distinguished by different treatment in death (Fay 2009; Shay 1985), and based on a review of social, philosophical-religious, circumstantial and physical determinants of mortuary practice Carr (1995) suggests that burial orientation, and to a lesser extent the positioning of remains, embody spiritual and cosmological beliefs about life after death and how this may be attained. As already noted, there are significant differences in both disposition and orientation of M9’s remains. M9’s atypical flexed position may have been an outcome of limitations imposed by his physical condition – specifically, difficulty in breaking ankylosis and established muscle contracture. If this *was* the case, then unwillingness to enforce conformity by breaking flexure, thereby ‘violating’ M9’s remains, may indicate that regard for M9 as an individual was stronger than the demands of convention. Conversely, M9’s flexure may have been imposed by those burying him, and together with his north-south as opposed to east-west burial orientation may speak to his role in the community while alive and/or the special requirements of his passage into the afterlife.

Notably, all six individuals receiving anomalous burial at Man Bac were interred with the same level of attention as that afforded those interred in accordance with standard burial practice (Huffer and Trinh 2011; author’s observations). The deliberate departures from what appears as a well-established and widely respected tradition must surely have had particular meaning for group members. M9’s presence, a person who was severely disabled and dependent on others during life, may suggest that different mortuary treatment was not punitive in any way, but indicative of concern for an individual’s well-being that extended beyond his death. The assimilation of M9’s and all other ‘deviant’ burials within the main Man Bac burial ground – rather than interment on the periphery of the cemetery or even outside the cemetery boundary, for example – might in part be interpreted as an extension of the community’s ability *and* willingness to accommodate individuals’ differences within the group during life.

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 very dangerous comorbidity of paralysis resulting from spinal cord injury today (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 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) – all quite independently areas of concern for an immobilised individual. It is impossible to make a direct comparison between modern and prehistoric experience at a psychological or 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 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 health-related care provided, it seems justifiable to speculate that his caregivers' motivations included compassion, respect and affection.

M9: Seeking the Subject of Care

For around the last 10 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 would have experienced the hormonal changes of adolescence as a severely disabled young boy (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, as he grew older he may have taken on a role of story-teller or counsellor – 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 circumstances that must have caused him, at times, to feel completely devastated and without hope; 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 a very long period of time. These qualities do not develop in a vacuum, so despite all the obstacles confronting him, M9 likely maintained an active engagement with the world – and would have been encouraged to do so by those around him.

All this reflects both on M9’s carers and on M9 himself. That such demanding care was given suggests a community capable of generosity. For M9 to elicit this generosity over such a long period suggests a positive – and appealing – personality.

A Final Word…

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 for understanding the experience of disease and disability, this will not be the case in most instances in which the likelihood of caregiving is argued – and this will become obvious in the bioarchaeology of care case studies which follow.

The example of M9 is particularly valuable because it so clearly demonstrates the bioarchaeology of care methodology’s potential for achieving a 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 of someone who emerges, across the barrier of time, as a unique and almost tangible individual.

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Chapter 9
Care Among the Neandertals: La Chapelle-aux-Saints 1 and La Ferrassie 1 (Case Study 2)

The book's second case study applies the bioarchaeology of care to two examples of caregiving that are much less straightforward than that of M9, for whom it was relatively easy to identify the extent of health-related care required. The current chapter illustrates how bioarchaeology of care analysis copes with incomplete and ambiguous evidence when attempting to infer and interpret the provision of care – a situation far more commonly encountered in this field of research.

This chapter is also particularly important because it demonstrates the methodology's capacity to help address some long-standing and fundamental questions concerning cognition and behaviour in an earlier species. The last century has seen vigorous debate on the topic of Neandertal intelligence and how it might have compared to that of *Homo sapiens*, but this debate has relied either on contrasting Neandertal morphology with that of anatomically modern humans and extrapolating from the results to implications for Neandertal functioning, or on inference from characteristics of Neandertal artefact manufacture, economic activity and mortuary treatment (see, for example, Appenzeller 2013; d'Errico et al. 2003; Drell 2000; Pearce et al. 2013; Villa and Roebroeks 2014). How the evidence suggesting Neandertal health-related caregiving might contribute to this discussion has not been looked at until now.

Despite its title, this chapter comprises *two* case studies. In turn, these examine the propositions that care was required by, and provided to, the Neandertals La Chapelle-aux-Saints 1 (LC1) and La Ferrassie 1 (LF1), whose remains are conserved in Le Musée de l'Homme in Paris; these remains have been extensively documented since their discovery in the first half of the twentieth century and I was privileged to be given access to them. The chapter's first section provides an overview of Neandertal lifeways as context for assessing probability of care in relation to both individuals, who date to somewhere between 50,000 and 70,000 years ago and who come from the same geographic region (Pettitt 2011:110ff); while such a generalised background is not ideal, it reflects the lack of subject-specific information available, and – in mitigation – the archaeology suggests broad consistency

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(although not necessarily homogeneity [Ready 2010]) in European Neandertal social and economic activity across this period. The second and third sections outline and interpret the case for caregiving in relation to LC1 and LF1 respectively. While ignorance of the detail of each subject's lifeways limits what is achievable, the inferences that *can* be drawn are sufficient to shed light on certain assumptions about Neandertal practice. The final part of this chapter combines findings from both case studies, and considers the implications arising from these for gaining a more rounded understanding – and a greater appreciation – of Neandertal cognitive and behavioural potential.

Lifeways Context: La Chapelle-aux-Saints 1 and La Ferrassie 1

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 background for inferring health-related care from evidence in 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 of 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). The case study subjects 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° centigrade, with minimum temperatures averaging −15° 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 patrilocal, kin-based, mixed-age groups (Lalueza-Fox et al. 2011). Most estimates are of a typical group size of 10–25 individuals (Adler et al. 2006; Hayden 2012; Wynn and Coolidge 2012:78), although the possibility of much larger groups has been mooted (Davies and Underdown 2006). These small communities were highly mobile, travelling between short-stay camps situated 5–10 km apart, exploiting faunal resources within a 5–10 km radius then moving on once these were depleted, and a seasonal territory of up to 10,000 km^2 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 Underdown 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. In some instances Neandertals appear to have 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 Underdown 2006; Hayden 2012; Wynn and Coolidge 2012:75–77). Certain areas may have been dedicated to tool manufacture, animal-processing and possibly refuse deposition, suggesting an opposition of ‘domestic’ vs. ‘working’ space (Davies and Underdown 2006; Hayden 2012; Vaquero et al. 2001).

The 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, mostly sourced 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 Underdown 2006; d’Errico 2003; Marean 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 that Neandertals stored (or had the potential to store) food surplus to immediate requirements (Davies and Underdown 2006; Hayden 2012).

Some recent studies suggest that Neandertal exploitation of plants may have been more extensive than previously thought. Hardy et al. (2012) report evidence for ingestion of cooked plant materials from a site in Spain, and Salazar-García et al. (2013) also report use of plants in the Neandertal diet, although the latter view this as pragmatic, seasonal exploitation that was supplementary to a predominantly meat diet. In an interesting development, Hardy et al. (2012) found evidence in the dental calculus of one individual for the ingestion of two plants with medicinal (appetite suppressant) but not nutritional qualities, and the authors suggest this may indicate self-medicating behaviour, which in turn reflects a level of applied knowledge about resources available in the surrounding environment.

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; Wynn and Coolidge 2012:35ff.). 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; Stiner and Kuhn 2009) 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. Skeletal evidence suggests a high rate of (likely) occupation-related trauma among Neandertals, and while there are fewer injuries recorded in female remains (Wynn and Coolidge 2012:85) it is also the case that fewer female remains have been recovered; there are no statistically 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 widely interpreted as demonstrating inability to innovate, in turn reflecting cognitive limitation – and in some quarters it still is (e.g. Pettitt 2000; Wynn and Coolidge 2004, 2012:166ff.).

Recently there has been a significant re-evaluation. More contextualised analyses of choice of raw materials, 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; Turq et al. 2013; Vaquero et al. 2001). Further, lithic microwear and residue analyses indicate that some tools were originally hafted, reflecting a complicated process of preparing and applying resin to blade and shaft (Davies and Underdown 2006; Rots 2013; Zilhão 2011); that some tools were used for woodworking, suggesting wooden tools and/or other artefacts were manufactured, although not preserved (Davies and Underdown 2006; Hardy and Moncel 2011; Hardy et al. 2013; 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 Moncel 2011; Hardy et al. 2013; Kuhn and Stiner 2006; Rots 2013; Zilhão et al. 2010 – dental evidence suggests that Neandertals also used their teeth in preparing animal hides (Pettitt 2000)). There is limited evidence for working bone and for production of bone tools (Davies and Underdown 2006; d'Errico and Stringer 2011; Hayden 2012; Hardy et al. 2014). Hardy et al. (2013) report residue evidence for twisted plant fibres, and conclude that this may indicate production of string or cordage suitable for use in nets and traps for food acquisition, as well as in bags or straps for transport of possessions.

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 cautious and 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 that this is not significantly different to 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 likely continued throughout life; based on the patterning and frequency of developmental stress indicators, Ogilvie et al. (1989) suggest that European Neandertals experienced frequent dietary deprivation, possibly on an annual basis – perhaps indicating that 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; Davies and Underdown 2006; Harvati 2010; Trinkaus 1995, 2011a). Underdown (2004; Davies and Underdown 2006) reports evidence of long bone trauma in 28 % 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). Revisiting this earlier analysis, Trinkaus (2012) proposes that some Neandertal trauma may be the result of interpersonal conflict rather than animal confrontations (citing St Cesaire 1 (Zollikofer et al. 2002) and Shanidar 3 (Trinkaus and Zimmerman 1982) as examples). However, it has to be observed that evidence distinguishing intentional violence from accidental injury is very rare.

Pettitt (2000) suggests that trauma may have been 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), a position repeated by Pettitt (2000). Flaws in this hypothesis were discussed in Chap. 2, and are further challenged by the case study findings presented in this chapter.

Neandertal Cognition and Behaviour: The Continuing Debate

Ultimately, debate over Neandertal cognitive ability is reduced to assessing Neandertal behaviour against that of anatomically modern humans. A 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 around this time (Green et al. 2010; Prüfer et al. 2014 – although this is questioned by some (e.g. Eriksson and Manica 2012)), archaeological evidence for interaction is less clear. To avoid any doubt, the research cited below deals with evidence dating to before the earliest possible presence of modern humans in Europe (note that both the subjects of this case study lived well before modern human occupation).

Views on Neandertal cognitive potential range from positing this as limited to task-oriented concrete thinking, with basic problem-solving but no long-term strategic planning capacity, (e.g. Gargett 1999; Mellars 2010; Wynn and Coolidge 2004, 2008, 2012), 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) – although not quite the same (Pearce et al. 2013). 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, 2008). 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 (Davies 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 Underdown 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; D'Anastasio et al. 2013; Frayer et al. 2012; Krause et al. 2007), although this does not necessarily mean Neandertals had complex language – simply that 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: Treatment After Death

Despite earlier – and in some cases continuing – opposition (Balter 2012; Gargett 1989, 1999; Wynn and Coolidge 2012:107–110) there is now general consensus that in some places, and some periods, Neandertals practised intentional primary 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) and possibly secondary burial and/or ritual post-mortem modification of remains (Garralda et al. 2014; Russell 1987). All remains recovered from primary burials come from well-protected caves and rockshelters, most of which also contain evidence of occupational or domestic activity (Rendu et al. 2014), although whether this is contemporary with mortuary use is not established. Disposition of remains reflects deliberate mortuary treatment, although its significance remains unknown; individuals are most commonly found along an east–west orientation, fully extended and supine, or partially supine with legs 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 % of burials, but there remains debate as to whether all of these represent deliberate deposits (Harrold 1980; Riel-Salvatore and Clark 2001). Pettitt (2000) and Hayden (2012) suggest 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 burials represent ritual – or 'symbolic behaviour' – or are 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 is probably also 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. 2011; d'Errico 2003; d'Errico and Soressi 2002; d'Errico and Stringer 2011; Kuhn and Stiner 2007; Zilhão 2011; 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. 2011; d'Errico and Stringer 2011; Zilhão 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). Clearly predating the arrival of modern humans in Europe there are a few examples from Neandertal sites of engravings on bone, on a cave wall and on a free-standing stone (the latter from a mortuary context), as well as possible evidence for painted rock art, and these also are interpreted as reflecting Neandertal capacity for abstract thought (Appenzeller 2013; Bednarik 1992; d'Errico and Stringer 2011; Zilhão 2011). Most recently, evidence has been presented suggesting that Neandertals even used bird feathers, bones and claws for decorative – in other words, 'symbolic' – purposes (Peresani et al. 2011; Rodríguez-Vidal et al. 2014).

Neandertals and Health-Related Care Provision

Reports identifying likely Neandertal caregiving were identified in Table 2, and comprise the cases of the Middle-Eastern Neandertals Shanidar 1 and 3 (Solecki 1971; Trinkaus and Zimmerman 1982) and European Neandertals Saint Cesaire 1 (Zollikofer et al. 2002), Neandertal 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 Cesaire 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 some of the other aspects of Neandertal behaviour, there is now a widely-held, in-principle acceptance that Neandertals cared for diseased conspecifics – acceptance, at least, with certain provisos. Analysis of what this caregiving behaviour might signify is lacking, however. 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 and 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 – even implicitly – in considerations of Neandertal cognition, although (as argued in Chap. 5) the actions involved in providing care require sophisticated decision-making, strategic planning, organisation and negotiation. The analyses of the experiences of LC1 and LF1 address this situation.

La Chapelle-aux-Saints 1 and the Case for Care

LC1's articulated remains, dating to between 50 and 60,000 BP, were recovered in 1908 from a cave near the village of Chapelle-aux-Saints, Correze, France (Bouyssonie et al. 1908; Pettitt 2011). LC1's skeleton is that of a robust, male individual with well-delineated muscle and ligament insertions. Age at death was originally estimated at 40–50 years (Straus and Cave 1957; Trinkaus 1985), but has since been revised downwards to maximally 40 years and possibly as little as 25 years (Dawson and Trinkaus 1997). Remaining elements are well-preserved, although with some reconstruction, and are well documented (Dawson and Trinkaus 1997; Straus and Cave 1957; Trinkaus 1985, 2011b).

There can be no question that LC1 received intentional burial. As depicted in Fig. 9.1, he was laid on a roughly east–west axis (head to west), on his back with legs flexed to the right side, in a rectangular, straight-walled and flat-bottomed pit excavated just inside the entrance of a limestone cave (Bouyssonie et al. 1908; Pettitt 2002, 2011; Rendu et al. 2014). 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 near vicinity of, his remains (Bouyssonie et al. 1908; Day 1986:31ff; Pettitt 2011); despite some disagreement (e.g. Pettitt 2000, 2011:110–111), these are generally regarded as deliberate grave good deposits (Riel-Salvatore and Clark 2001).

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.

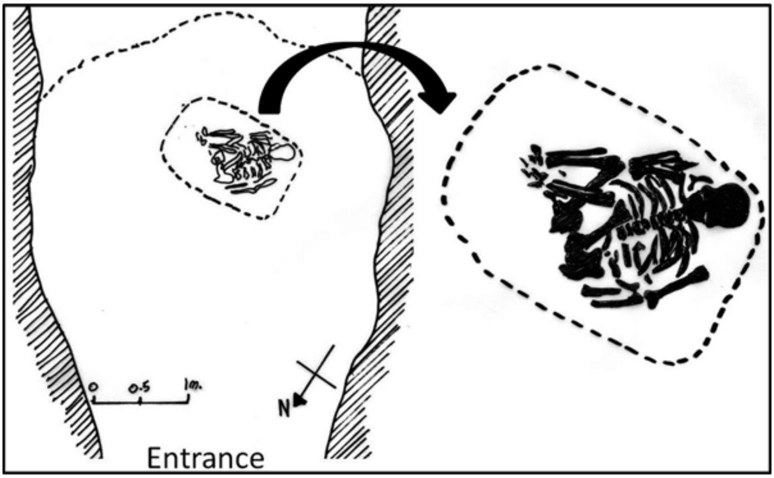

Fig. 9.1 LC1 remains in situ (After the original plan by Bouyssonie et al. 1908)

Pathologies Experienced by La Chapelle-aux-Saints 1: Clinical and Functional Implications

Osteological 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 interphalangeal joint of the right foot (Brennan 1991; Dawson and Trinkaus 1997; Straus and Cave 1957; Trinkaus 1985; author's observations).

The clinical and functional implications of these pathologies, together with likely associations between individual pathologies, are discussed below.

Periodontal Disease, Tooth Loss, Temporal Mandibular Joint Dysfunction

Figure 9.2a–c illustrates widespread, active periodontal disease and extensive maxillary and mandibular antemortem tooth loss.

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 the time of death and were likely chronic; evidence of bone proliferation as well as resorption is clearly visible.

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 advanced or complete, 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 (Fig. 9.3). 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

Fig. 9.2 (**a**) Frontal view of the LC1 maxilla, showing alveolar resorption at RI_1 and RI_2 and an apical abscess straddling the RC_1 and RPM_1. (**b**) Palatine view of the LC1 maxilla, showing antemortem loss of LC_1, LM_1, LM_2 and LM_3, and RPM_1 and RPM_2. (**c**)Frontal view of the LC1 mandible, showing widespread infection extending across the anterior surface and associated antemortem loss of RI_1, RI_2, RC_1 and PM_1, and complete alveolar resorption at RPM_2, M_1, M_2 and M_3. All Images by Lorna Tilley

surface of the right glenoid fossa shows some alteration, perhaps reflecting greater involvement of the right glenoid fossa than proposed.

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

Fig. 9.3 Superior view, LC1 right mandibular condyle: lipping, distortion and pitting of surface visible. Image by Lorna Tilley

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 his 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 probably reduced potential sources of nutrition. LC1's diet very likely 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 high energy-related requirements of Neandertal lifeways.

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 it appears that trauma was common among Neandertals (Pettitt 2000; 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 not assessable; 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 (certainly) and travel between campsites (probably) more difficult, but there is no evidence to suggest these injuries, 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.

Lower Body Pathology

LC1's preserved left pelvis comprises most of the iliac and ischial portions of the acetabulum, with surrounding portions of iliac and ischial bone. As shown in Fig. 9.4a, b, the remaining acetabular surface displays evidence of severe degenerative and infectious activity. Some of the following osteological description is taken directly from Trinkaus (1985:28–29), but a new interpretation of some pathological features is proposed and this is clearly distinguished in the text.

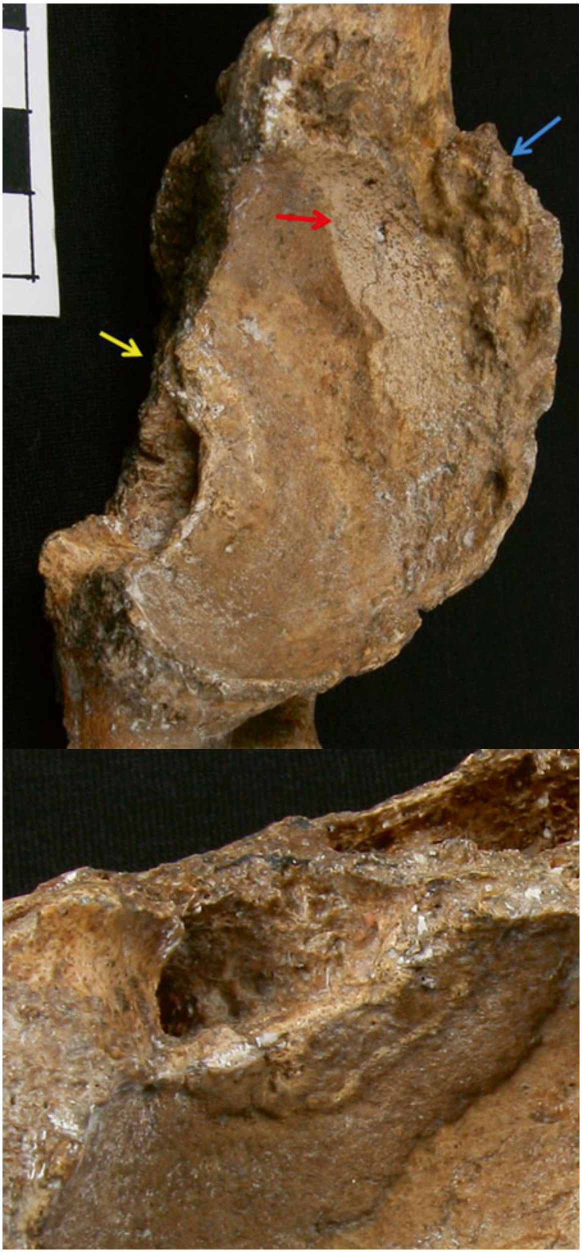

Fig. 9.4 (**a**) Lateral aspect, fragment of LC1 left acetabulum. *Blue arrow* indicates exostosis, *red arrow* indicates eburnation, *yellow arrow* indicates lytic activity at acetabular notch. Image by Lorna Tilley. (**b**) Detail of infectious activity and bone proliferation at the acetabular notch, left os coxa. All images by Lorna Tilley

There is a very large exostosis with a maximum projection of 11.5 mm running over 58 mm along the lateral acetabular margin, and a smaller exostosis located near the origin of the rectus femoris muscle. A strip of bone approximately 30 mm in length and averaging 11 mm 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, but as the proximal half of the left femur was not preserved corresponding damage to the femoral head cannot be assessed.

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 pathology on the left side 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 bacterial infection in the bone itself (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 personal communication 2012). Although it is 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 as possibly a sequela to invasive trauma is not impossible (Barrett and Bal 2007). It is more likely, however, that sepsis was caused by a haematogenous pathogen, the most common in this situation being *Staphylococcus aureus* (Bal and Barrett 2005; Barrett and Bal 2007; Brusch 2014; Yeargan et al. 2003), possibly originating in the periodontal infection discussed earlier. Chronic degenerative joint disease increases vulnerability to blood-borne infection (Brusch 2014; King 2011), and any osteoarthritic changes already underway would provide a fertile environment for such infection, in turn resulting in a septic arthritis of the hip (Brusch 2014; Scillia et al. 2010). The question of primary causation of sepsis may never 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 this infection would be 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. Without doubt, LC1 experienced discomfort, most likely pain, on ambulation, and given the extent of damage (including total loss of joint space in at least one area) quite possibly on resting, as well. There is no way to gauge the level 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; Chapman et al. 2008; 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 at the left hip at a physiological level through inflammatory and osseous processes, and at a mechanical level, pain on weight-bearing would discourage mobility, and localised tenderness and pain would limit leg abduction, rotation, and possibly extension and flexion – these barriers to movement leading to postural instability and also contributing to loss of joint function (Brusch 2014; King 2011; Marieb 1991:324–329; Morgan and Yates 1966; Yeargan et al. 2003).

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 when in motion) 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. Chapman et al. 2008; 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 (Brusch 2014; 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 6–12 months before death (Hayman personal communication 2012), probably experiencing significant functional disability during this time.

On the principle of adopting the most conservative estimate of likely disease consequences, it is assumed that LC1 remained ambulatory up to his death; it is impossible to tell whether there were times of health crisis when pain and/or infection rendered him immobile, although this would be unsurprising (Hayman personal communication 2012). Trinkaus (2012:3693) argues that the lower limb robusticity seen in LC1's remains indicate that he remained mobile until his death, the implication being that LC1 was not significantly affected by his pathology. This ignores the obvious questions about the quality of function retained, however. While maintaining the capacity to put one foot in front of the other, LC1's speed and ease of locomotion were almost certainly constrained by pain-based and mechanical restrictions on movement – restrictions that would be particularly challenging in traversing parts of the steep, uneven landscape of his environment. LC1 may have been capable of managing the estimated 5–10 km distance between camps without direct physical assistance, although with difficulty and in his own time rather than that of the group, but this would likely be the extent of his ability. The effects of degenerative changes in LC1's upper and middle spine would undoubtedly interact with his lower body pathology to increase the discomfort, pain and general fatigue encountered in travelling across difficult terrain.

LC1's lower body pathology would have rendered him incapable of participating in hunting, the main Neandertal economic activity; with such severely limited mobility he would have been unsuitable even in the less confrontational occupational roles of 'beaters or game drivers' proposed for (pregnant) Neandertal females and juveniles (Kuhn and Stiner 2006:959). In theory, LC1 could potentially have performed other instrumental 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, but as underlying infection (systemic and/or localised) took a progressive toll on his general health and strength over the last 12 months of his life, LC1's ability to undertake and maintain participation in any area would most likely have decreased accordingly.

On the balance of probability, did LC1 require health-related care from his community? It is entirely credible that he did. His remains display several different pathologies, some of which were likely (causally) associated and the most damaging of which were progressive, resulting in a continuing decline in health and functioning. It seems unquestionable that during the last months of LC1's life, at least, the effects of these pathologies, both individually and in combination, would have constituted loss of independence – and therefore significant disability – when assessed within the Neandertal lifeways context. The extent and impact of his pathologies suggest that LC1 needed and received health-related care provision to achieve survival to age at death.

Modelling the Care Received by La Chapelle-aux-Saints 1

In the terms of bioarchaeology of care analysis, LC1 would have required care in the form of both 'direct support' and 'accommodation'. The following discussion of what this care may have involved is situated against the broad lifeways context outlined at the beginning of this chapter.

Care as 'direct support' minimally consisted of providing LC1 with food during the last several months of life and, during any episodes of immobility imposed by infection-related health crises, with water. Given the level of infection witnessed in his remains it is virtually certain that LC1 experienced feverish episodes during which his temperature became dangerously elevated; he may have received dedicated nursing during this time to control fever and ensure hydration. With increasing levels of oral pathology causing difficulty in managing the Neandertal meat diet, care may also have involved preferential allocation of more easily digestible portions of kill and/or possibly pre-mastication of food. While it is controversial to infer caregiving from survival with (partial) edentulism (see discussion Chap. 2), and theoretically LC1 could have 'tenderised' difficult-to-ingest meat himself, it is also tempting to speculate that the unquestionable provisioning of LC1 included the allocation (or where necessary processing) of food that he could eat with relative ease – particularly when he was at his weakest.

Neandertals are believed to have lived in mobile groups in which all members, from childhood onwards, engaged in the primary economic activity of hunting. Care as 'accommodation' is reflected in the continuing presence – a proxy for the continuing *acceptance* – of LC1 within his group, despite his inability to contribute materially to group subsistence and despite the fact that his support may have constituted a significant burden when resources were scarce. The matter of LC1's provisioning has been addressed above. In relation to mobility demands, there is greater uncertainty. For example, Salazar-García et al. (2013) raise the possibility that some more or less contemporary Neandertal groups may have alternated mobility over long distances with longer-term or seasonal site occupation, and although these authors are looking at possible behaviours in the more temperate climate of the Iberian Mediterranean, it suggests a potential for a more (semi) sedentary lifestyle than is normally considered in relation to Neandertal culture. If a similar practice existed in LC1's community, then LC1's compromised mobility might have been a less significant concern. In the case that LC1's group moved from site to site on a more frequent basis, it is not known whether group members typically travelled *en masse* between camps, or whether faster, unencumbered members travelled ahead of slower ones (such as young children and pregnant women); obviously LC1 would have aligned with the slower subset where this was an option. It is also possible he received aid from his group when the terrain was particularly challenging, because given the topography of the region it is very probable that some form of relief was required – even if this only consisted of setting the speed of travel.

How effective was the care provided to LC1? The immediate cause of LC1's death is unknown, with the most likely explanation being that he succumbed to the complications of bacterial infection; even in this era of antibiotics, death can be rapid (e.g. in relation to septic arthritis, Brusch 2014; Yeargan et al. 2003). On the one hand, the amount of time by which LC1's life was prolonged by the care he received is impossible to judge – we simply cannot discriminate between the part played in LC1's survival by factors such as his residual fitness, his will to live, or the ability of his immune system to respond to disease. On the other hand, we can say with certainty that had he *not* received support along the lines hypothesised above it is very unlikely he would have survived to develop the indicators of pathology we find in his remains.

La Chapelle-aux-Saints 1 and His Community: Interpreting the Significance of Care

It has already been acknowledged that LC1 may have retained the capacity to contribute to his group in certain ways, but it also has to be recognised that the impact of his pathologies would periodically interrupt and continuously diminish 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 simply for travelling between occupation sites, would reduce the prospects for undertaking less active group tasks such as manufacturing tools or preparing animal hides. Yet LC1's continued inclusion within the group is attested by his mortuary treatment, which conforms to known Neandertal practice in terms of type of location and disposition and orientation of remains. That LC1's remains were found in articulation and in relatively good condition tells us that he was buried soon after death, indicating that other group members were likely present at the time of death and probably throughout whatever time it took for LC1 to succumb. It appears LC1 retained his status as a group member and was cared for until he died, and the inclusion of a variety of grave goods likely indicates that he was held in some esteem to the end.

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, so it is not possible to tell whether health-related caregiving was standard group behaviour or a response to LC1 as one particular individual. However, the nature of the caregiving that has been proposed in this case study *does* suggest some broader social and behavioural characteristics of his group.

Caring for LC1 entailed social and economic cost. Extrapolating from what is generally postulated about Neandertal lifeways (see the first part of this chapter), LC1 likely belonged to a small, kin-based, mixed-age group, perhaps consisting of around 10–20 members, with some of these too young to contribute economically and others possibly experiencing temporarily reduced productivity due to pregnancy or injury, or even permanent reduction in productivity associated with age. With an almost exclusively meat diet, and no custom of long-term food storage, group survival depended on regular and successful hunting; the subsistence lifestyle was likely seasonally driven and at times precarious. Supporting an economically non-contributory adult male – and possibly meeting specialised dietary and nursing needs – for around 12 months and possibly more would have required the cooperation of every working member of the community. Care provision would involve either additional labour input from functioning group members to obtain adequate food supplies (possibly including new or increased exploitation of secondary food sources, such as smaller animals and plants if available), or acceptance of reduced food rations, or both; any dedicated nursing undertaken would also require a diversion of labour from economic activities (whether this was required can only be hypothesised). LC1's survival while suffering disease reflects not only the group's willingness to accept the responsibility of caring for a disabled member, but also members' cognitive flexibility in adapting behaviour with regard to managing available resources, thereby enabling this caring to occur with some degree of success. The commitment reflected in caring for LC1, together with his treatment after death, suggests that the members of LC1's community were characterised by strong social and emotional ties.

Given the ubiquity of trauma among Neandertals, LC1's group more than likely understood what was potentially involved in taking the decision to provide care, and, despite the earlier proviso, 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 – particularly complications of infection in the later stages of disease – might well be considered extreme. There could have been little expectation of recovery. 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 seen as improbable.

What is suggested about LC1's identity as an active player in the caregiver/care-recipient 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 perhaps related) species. Nevertheless, some general propositions are presented for discussion.

In Neandertal culture, persistence in the face of pain and physical restrictions on mobility may have been commonplace (Pettitt 2000), 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 suggests determination. Hayden (2012) proposes that receipt of care may reflect status, and Pettitt (2000) 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 acquired status determined access to 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 in life and interment on death, it may be 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, or all of the above, is impossible to tell.

La Ferrassie 1 and the Case for Care

The articulated remains of LF1, a Neandertal male aged between 40 and 55 years, were recovered in 1909 from a rockshelter at La Ferrassie, Dordogne, France, and are dated to between 60 and 70,000 BP (Maureille and Van Peer 1998; Pettitt 2011; Zilhão 2007).

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 it has been thoroughly documented (Fennell and Trinkaus 1997; Heim 1976; Trinkaus 1985). Features of tooth wear indicate habitual paramasticatory activity (Pettitt 2000). Osteological evidence suggests that LF1 experienced at least two unrelated pathologies that compromised health and functional status; as was the case with LC1, these pathologies have been thoroughly described (along with proposed diagnoses) by others (Fennell and Trinkaus 1997; Heim 1976; Trinkaus 1985), and this work provides a platform for the following bioarchaeology of care analysis.

The Immediate Context

LF1 is one of seven sets of remains located in a limestone rock shelter, with the others comprising those of an adult female (25–30 years), a child of around 10 years, two children of 2–3 years, one neonate, and one foetus. Although there is some disagreement as to whether (all) these individuals received intentional burial (Balter 2012; Gargett 1989), majority opinion is that this was, indeed the case and that the La Ferrassie rockshelter, depicted in Fig. 9.5, is one of very few Neandertal multiple burial sites so far discovered (Hayden 2012; Maureille and Van Peer 1998; Pettitt 2011; Zilhão 2007). The relationship between these individuals is unknown; Binford's (1968) suggestion of a family grouping makes intuitive sense, but is unproven. To assume no connection between the individuals buried here stretches credulity, however. The burials were probably roughly contemporaneous; the close 'pairing' of six interments has been achieved without any cross-cutting of remains, indicating that if the burials were not carried out in close order then grave locations were clearly and deliberately demarcated.

LF1 was interred in a shallow pit (probably a natural depression that was further excavated), and lies on an east–west axis (head to west), on his back, knees flexed to the right, right arm flexed and left arm extended (see Fig. 4, Maureille and Van Peer 1998:297; 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. Heim 1976; 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 but on an east–west

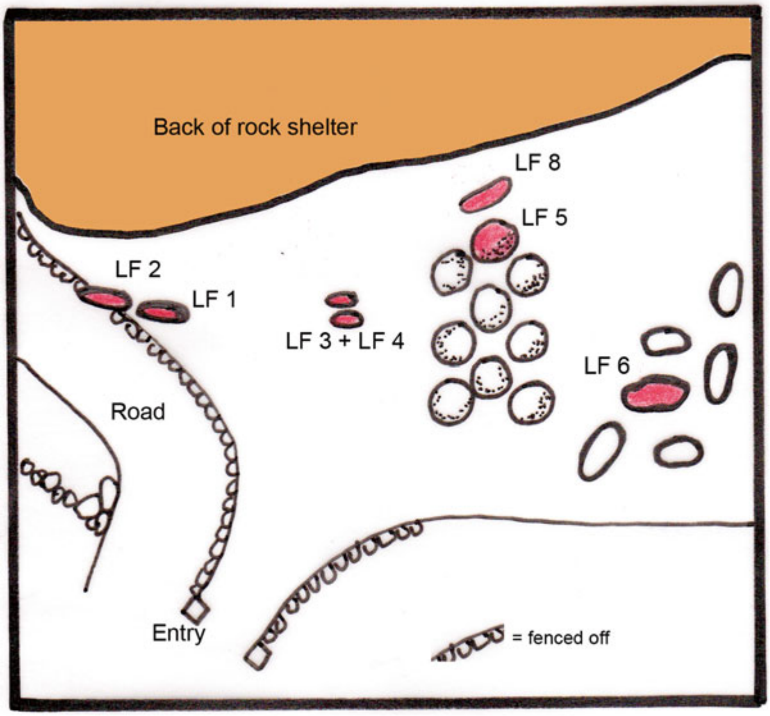

Fig. 9.5 Plan of the La Ferrassie rock shelter showing location of burials (after the original plan by Capitan and Peyrony 1912, amended by Heim 1976)

axis (head to east), were located only half a metre from LF1; these individuals lie head-to-head, suggesting some relationship during life. In the context of this case study it is relevant to note that the LF2's remains bear evidence of a fully-healed fracture to the proximal right fibula (Heim 1976). Secondly, the fact that foetal and neonatal remains received intentional burial is intrinsically interesting for what it may suggest about the importance given to (perhaps the hopes invested in?) new life by this Neandertal community – even if the early promise of life was not realised. Thirdly, the grave of La Ferrassie 6 (~3 years) was covered by a triangular limestone slab with 18 'cupoles' engraved onto the inferior surface; this stone is believed to be the earliest example of 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' that claimed kinship-based territorial rights (Hayden 2012:19).

Pathologies Experienced by La Ferrrassie 1: Clinical and Functional Implications

LF1 displays evidence of minor periodontal pathology, consisting of circumscribed apical abscesses on the left mandible, with 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 the time of death (Brennan 1991; Fennell and Trinkaus 1997; Heim 1976; Trinkaus 1985; author's observations).

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 chapter.

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 Fig. 9.6.

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 subadults up to around 17 years of age and is understood in terms of epiphyseal separation, with usually minimal displacement of bone (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).

Following trauma, pain is typically experienced in the affected hip and leg; this can last for some 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 possible after 6–8 weeks, although

Fig. 9.6 LF1 right proximal femur, posterior aspect, manifesting trochanteric enlargement and distortion. Image by Lorna Tilley

healing is gradual and it may take up to 3 months before full functional recovery (Davenport 2010; Hayman personal communication 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; the gluteus medius, in particular, 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 – 6–8 weeks.

During the period of recovery LF1's mobility would have been limited, affecting his participation in group activities. While likely able to move between occupation camps if necessary, even with assistance his passage over the variable terrain would have been slow and, at least initially, painful. LF1 would not have been able to participate in hunting during this time, and would have been dependent on the group for food. Although there are crucial differences between the mobility-related disease experiences of LC1 and LF1, general comments with regard to inability to participate in primary economic activity apply here. Assuming that he possessed appropriate skills, LF1 would have been capable of making a practical contribution to group life in his convalescence by undertaking essentially sedentary work tasks, such as tool manufacture, bone or wood-working, and/or hide processing.

Systemic Disease: Hypertrophic Pulmonary Osteoarthropathy

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 (examples are provided in Fig. 9.7a–c). They conclude that LF1 was in the 'early stages of an acute form of hypertrophic pulmonary osteoarthropathy (HPO), with a duration of the disease at the time of death of 2–14 months' (Fennell and Trinkaus 1997:994).

HPO, 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) propose that the most likely trigger for HPO in LF1 was either 'pulmonary infection or pulmonary carcinoma, with venous stasis as a possible contributing factor'. The diagnosis of HPO 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 HPO requires consideration of the likely impacts of this condition in its own right; the likely impacts of the primary pathology that stimulated the HPO 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 is possible to produce a credible – if impressionistic – picture of disease impact on LF1's experience of daily life in the months leading up to his death.

The clinical symptoms most commonly associated directly with HPO 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); inflammation, swelling and pain in major joints in the vicinity of HPO; 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 HPO initiates, although very occasionally HPO manifestation may precede primary disease symptoms by up to a year (Dhawan 2011). HPO activity may be asymptomatic, particularly in the early stages (Dhawan 2011).

Fennell and Trinkaus (1997) describe HPO progression in LF1 as in the early stage, potentially an argument against viewing this condition as having had 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),

Fig. 9.7 (**a**–**c**) Examples of periosteal proliferation on LF1 (**a**) distal right tibia (posterior view), (**b**) distal left tibia (anterior view); (**c**) distal left femur (posterior view). Images by Lorna Tilley

suggesting that while HPO 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 HPO 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 HPO activity; Dhawan (2011) reports that when HPO is associated with pulmonary disease it is usually associated with pain and swelling in the joints and pain in affected long bones. While it is impossible to be completely confident that LF1 experienced symptoms directly arising from HPO, on the balance of probabilities it is very likely that he experienced a level of discomfort, if not pain, in response to this condition.

In estimating the possible impacts of LF1's condition it would clearly be useful to know the identity of the primary disease underlying HPO. Fennell and Trinkaus (1997:994) nominate pulmonary disease in this role and there is nothing to contradict this conclusion – indeed, pulmonary disease is the one most frequently associated with HPO (Assis et al. 2011; Dhawan 2011). As discussed in previous chapters, uncertainty regarding diagnosis is a common feature of palaeopathology research, and where this occurs the approach taken by the bioarchaeology of care methodology is to focus on the most conservative clinical (and related functional) impacts that can be inferred directly from the available osteological evidence. *All* triggers of HPO 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 inter-related 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 maintaining homeostasis; loss of appetite and weight; and fevers and other physiological symptoms associated with acute (intermittent) disease crises (Amital et al. 2004; Dhawan 2011). The point has been made before in this book, but bears repeating – in looking at LF1's experience (or that of any other person suffering disease), it is important to remember that symptoms such as these will interact to produce a more powerful effect than the simple examination of each symptom in isolation might suggest.

Primary pathology symptoms would be exacerbated by any HPO-related symptoms, but it is not really necessary to consider the latter in postulating the functional implications of LF1's disease experience. The general deterioration indicated above means he would have become increasingly incapable of participating at any level in hunting activities (from taking part in the kill, through spotting prey, to transporting kill to the campsite), and correspondingly dependent on others for food. Consequent on reduced energy levels he likely experienced greatly reduced mobility, even over short distances, towards the end making travel over even the relatively short distances between occupation camps difficult or impossible without help. This same lack of energy, combined with acute and/or chronic pain and possible loss of psychological as well as physical resilience, would most probably render the more sedentary tasks canvassed earlier increasingly difficult to accomplish successfully.

Considering the clinical and functional implications of LF1's experiences of disease discussed above, there is little doubt that LF1 required and received health-related care on at least two occasions during his life.

Modelling the Care Received by La Ferrassie 1

The first of these occasions involved caregiving in the form of 'direct support', consisting (minimally) of provisioning during recovery from a fractured greater trochanter of the right femur, and given over a period of around 2 months or possibly longer, until he was able to return to effective participation in group hunting activity. Provision of water and assistance with hygiene maintenance may well have been required in the first days (or even weeks) following injury, and he may have needed help in travelling between camps – always supposing that this activity was called for during the period of LF1's recuperation.

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 support', he must have been provisioned by others, and may have been assisted either in travelling between occupation sites. Unable to hunt, LF1 may have undertaken alternative tasks – as previously suggested, these may have included artefact manufacture or, given his seniority, may have included a role as teacher or story-teller – but as his health deteriorated his capacity for active involvement would have correspondingly decreased. This diminishing ability to contribute to either subsistence or social lifeways would have demanded a continuing adjustment in group expectations – or care in the form of 'accommodation' – to match LF1's increasing limitations.

Other 'direct support' provided in response to LF1's progressive debility may have included provision of a heat source, such as a 'warming hearth' and/or 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 temperatures. More dedicated care, such as monitoring and possibly manipulation/positioning, management of fever, and maintenance of hygiene, would almost certainly have been required during 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 any form of travel (short of portage) over distance would probably not have been feasible. As in the case of LC1, it must be presumed that group members were present when LF1 died, as his articulated remains indicate interment shortly after this. Following from this it seems justified to propose that LF1 was cared for until around his time of death. It is possible his death may have been facilitated – for example, as symptoms worsened and disability increased food and water may have been withheld – but given the evidence of his burial treatment he does not appear to have been left behind.

How effective was the care given to LF1? The first instance of caregiving consisted of providing the practical support necessary to enable LF1's traumatic injury to heal in its own time; clearly, this care was successful. The second occasion of caregiving could never have achieved anything other than providing practical and emotional support to ease the passage of dying. Whether it was successful in doing this must remain a matter for speculation.

LF1 and His Community: Interpreting the Significance of Care

In the preceding interpretation of LC1's care a number of necessarily generalised observations were made concerning both the likely costs of caregiving within a Neandertal lifeways environment and the need for group cooperation and flexibility in approach for absorbing these costs. While LC1 and LF1 suffered different pathologies, the symptoms associated with each would have had a similar impact on the subjects' ability to perform some of the essential, and many of the instrumental, activities of daily living. Other than the presence of multiple burials we have nothing significant to distinguish the La Ferrassie from the La Chapelle-aux-Saints culture, and therefore must proceed on the assumption that the caregiving demands made of each community, *and* the basic decision-making variables and processes involved in addressing these, were also broadly similar. Following this reasoning, those observations made in the attempt to interpret aspects of group behaviour in the case of LC1 that apply equally to the case of LF1 are not repeated here; the inability to draw a finer distinction between the two communities is frustrating, but – given the lack of archaeological evidence available – unavoidable, and serves as a salutary reminder of the importance of possessing detailed information of context in bioarchaeology of care analyses. The discussion below concentrates on behaviours relating to the points of difference in the two studies, and what these may suggest about the 'La Ferrassie group' practice specifically.

As in the case of LC1, it is impossible to tell whether the care received by LF1 was typical of the response to all group members experiencing disease, or was particular to him. However, it may be significant that LF2, the young female adult buried in close proximity to LF1, displays evidence of a proximal fracture of the right fibula that is completely healed, although with significant distortion (Heim 1976). This type of fracture is often associated with lower leg ligament damage and ankle joint involvement (DiFiori 1999; Lock et al. 1987; Pankovich 1976); in a conservative scenario, this injury would cause pain on weight-bearing and would restrict, although probably not prevent, locomotion – but it would have precluded direct participation in primary economic activity (hunting) for around 6–8 weeks (Devas and Sweetnam 1956). Taken together with the care given to LF1 following his first known pathology of trochanteric fracture, this may suggest an established group practice of supporting members immobilised by minor traumatic injury – in the short to medium term, at least.

Interpreting caregiving in response to LF1's second known disease experience is more complex. Disease impact would have manifested incrementally and without obvious explanation for the accompanying disability. If LF1's primary condition was a pulmonary pathology, as argued by Fennell and Trinkaus (1997), physical manifestations of mid- to late-term systemic disease would probably include symptoms unlikely to fall within the experience of a small Neandertal community – such as extreme shortness of breath, persistent coughing and/or haemoptysis (spitting or coughing up blood) – but *not* include some of those symptoms with which the group may have been more familiar (such as those associated with trauma, for example). Initially, group members' acceptance of disease impact on LF1's capacity to function would likely be based largely on self-report, combined with observation and analysis of changes in his behaviour (for example, severe fatigue is a common symptom of chronic respiratory disease, and although there is no directly associated visible indicator of this state it will be reflected in aspects of task performance). However achieved, the recognition and acceptance of LF1's need for care, despite absence of more obvious symptoms of pathology, suggests group members were capable of working with an abstract concept of 'disease' and were able to engage in problem-solving in relation to novel disease impacts.

Estimated to be between 40 and 55 years of age when he died, LF1 is one of the oldest Neandertal individuals yet discovered (Trinkaus 2011a). As LF1's symptoms intensified and his ability to participate in most of the everyday group activities declined, his advanced age was probably also taken into account as a factor in assessing the likelihood of his recovery. It seems reasonable to suppose that, at some stage in the process of deciding what care was appropriate, it would become apparent that the goal of caregiving was palliative. The possibility that LF1 received (albeit possibly for a limited time only) what was recognised as being palliative care, despite the everyday pressures of a Neandertal subsistence lifestyle, may not only suggest a community with a strongly inclusive social identity and a cooperative practice, but also one characterised by respect for its elders – this latter proposal aligning with more general comments by Hayden (2012:16) on the structure of Neandertal society.

The details of LF1's burial signify a continuation of the attention given during life, although whether particular features of his interment in some manner reflect the 'care-recipient' aspect of his final social role remains a mystery; for example, what meaning can be read into the limestone slabs positioned around his body, or the fact that his head was oriented to the west (as was LC1's), while LF2's head was oriented to the east? LF1 may have been the first individual buried at this site, with others interred subsequently because of their relationship to him, or the reverse may be the case. As earlier noted, neither is it known what, if any, this relationship may have been; the age and sex profile of burials suggests a familial intimacy, but perhaps group membership alone was sufficient. Hayden's (2012) suggestion that the burial may reflect territorial 'ownership' attributes a symbolic purpose to this small cemetery and possibly an elevated status to one or more of its inhabitants that are impossible to verify, but nonetheless, the inclusion of LF1 indicates that his disability at the end of life did not result in any significant loss of worth as a person. Adding to a previous observation on the implications of the mortuary treatment given to foetal and neonatal remains at La Ferrassie, LF1's treatment while alive and after death gives further substance to the proposal that community members were invested with social and emotional value throughout their life course.

It would be very interesting to know whether LF1 was cared for, and eventually died, in the La Ferrassie rockshelter, or whether he was transported to the site just prior to, or shortly following, his death because it was an already-established site of significance. However his mortuary treatment is explained, this site likely possessed (or came to possess) a special cultural and/or emotional meaning, and the burial of LF1 reflects the same level of intentional decision-making – or agency – that characterised his care during the last months of life.

Care in the Upper Middle Palaeolithic: Some Wider Implications

Conclusions drawn from the analysis of health-related caregiving inferred in relation to two individuals who possibly lived over 10,000 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 around Neandertal cognitive capability.

With respect to social practice, Trinkaus' (1995, 2007, 2011a, 2012; Berger and Trinkaus 1995) oft-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 the term 'reduced mobility' (in theory, possible definitions might range from inability to keep pace with the group to absence of independent mobility), but regardless of this the context of its use implies that mobility-compromised individuals became literally unbearable burdens on their community.

In the cases of LC1 and LF1 (and LF2) this hypothesis of abandonment is unsupported. 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 was in some way expedited, but the characteristics of both burials indicate group members were in attendance, or close by, at the end of life.

While the cases examined in this chapter may not be sufficient basis for claiming automatic care provision to the elderly and/or immobile among Neandertals, they demonstrate that assertions of lack of evidence for maintenance of group members with reduced mobility need to be reconsidered. Indeed, given likely the high frequency of traumatic injury among Neandertals (e.g. Berger and Trinkaus 1995; Davies and Underdown 2006; Pettitt 2000; Trinkaus 2011a), and considering the evidence we have for Neandertal planning and organisational ability in areas such as managing domestic and work spaces, hunting, and tool manufacture (e.g. Davies and Underdown 2006; d'Errico 2003; Hiscock et al. 2009; Marean and Assefa 1999; Turq et al. 2013; Vaquero et al. 2001; Wynn and Coolidge 2012), it is very easy to believe that Neandertals possessed the intellectual flexibility necessary to schedule travelling around the capacity of individual group members to manage the journey.

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 future bioarchaeology of care analyses of other cases of possible Neandertal caregiving (for example, Shanidar 1 and 3 (Solecki 1971; Trinkaus and Zimmerman 1982), Saint Cesaire 1 (Zollikofer et al. 2002), and Neandertal 1 (Schultz 2006)), 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 the earliest evidence for 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 developed communication skills in caregivers and care recipient in establishing the parameters of disease, disability and associated needs.

The detail of what LC1 and LF1's care comprised will remain inaccessible, at least until there is more precise information about their corresponding lifeways, 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 calculation of what this care should consist of, suggest application of problem-solving skills. Possibly 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; Berger and Trinkaus 1995; Davies and Underdown 2006; Harvati 2010; Trinkaus 1995, 2011a) that this practice was factored into Neandertal organisation (even perhaps in the sense of a Neandertal 'habitus'). However, this does not take away from the fact that each individual case of care would have been unique, demanding situation-specific social and economic flexibility in balancing the requirements of caregiving with the imperatives of group survival. Care provision also reflects group consensus, 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 little prospect of return (such as restoration of productive capacity), and this suggests that, in some circumstances, abstract social and emotional considerations were given priority over material concerns.

Wadley (2011:98) proposes a working compromise to the problem 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, in circumstances where disease symptoms may be unknown and unpredictable and where recovery may be recognised as unlikely, at the same time operating in an 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 the claims for Neandertal cognitive and behavioural modernity increasingly found in the recent literature. That it does this by focussing on evidence for a behaviour that probably has as much of an emotional component to it as a cognitive one is particularly important, because it may offer a way of exploring aspects of Neandertal interpersonal relationships as well.

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Chapter 10
Adjustment and Inclusion 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). 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 north-west 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 capable of independent function in many, or even most, activity spheres.

Accommodation is clearly a more complicated practice to operationalise and to argue for 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 past and present – 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 a good idea of what 'normal' behaviour consists of in the first place, and in archaeology this knowledge can never be perfect. However, where an individual's loss of

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capability in an area 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 to inform a bioarchaeology of care analysis, which – for the reasons discussed in Chap. 3 – is always centred on a single subject.

Thirdly, by extrapolating from observations made in considering the life and lifeways of LB7 and his community, the study adds a new perspective to continuing debate over questions of identity and behaviour in the Cotswold-Severn and wider Neolithic 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 Chap. 10 opens with a review of what is known specifically about Lanhill Long Barrow and its human contents, summarises relevant aspects of the Cotswold-Severn cultural tradition, and examines evidence for disease among Lanhill group members other than LB7. Only then does it look at LB7 and the evidence for his disability. The remainder of the chapter addresses the clinical and functional implications of LB7's pathology and the likely nature of the caregiving response, interprets conclusions reached through this process in terms of what these may suggest about Lanhill society and LB7 himself, and then quickly considers whether matters raised in this study may have relevance for research into Cotswold-Severn cultural practice more broadly.

In 2007 I examined skeletal remains recovered from the north-west and south chambers of the Lanhill Long Barrow (courtesy of, respectively, the Duckworth Laboratory, University of Cambridge, UK and the Wiltshire Heritage museum, Devizes, UK). 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 on my own observations. Cave's (1938a) age and sex assessments were confirmed by application of the guidelines for documenting sex differences and age changes in Buikstra and Ubelaker (1994:15ff) and/or Lovejoy's (1985) procedure for estimating adult age at death on the basis of tooth-wear.

Lanhill Burial 7: His Context and His Pathology

The 1936 excavation 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 and 40 years (LB3 and LB5);

one young adult male of between 20 and 29 years (LB6); and one adolescent of around 12–13 years (LB4) (Keiller and Piggott 1938). 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 (Keiller and Piggott 1938). 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, some appearing to be loosely arranged according to element, and these were sorted and analysed by Cave (1938a).

Until recently it was thought that long barrows belonging to the Cotswold-Severn culture (~3800–3400 BC) were used over many generations, and that individuals represented in these monuments were probably separated by many 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 1–3 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, and on this basis, and given the features of mortuary deposition in the north-west chamber, it is likely that interments were carried out within a 20- to 60-year period. This means that for all intents and purposes the lives of the individuals interred in the Lanhill Long Barrow can be thought of as roughly contemporary, and justifies the inclusion of evidence for pathology in remains other than those of LB7 in this bioarchaeology of care analysis.

Context (i): Lanhill and the Cotswold-Severn Tradition

The design of the Lanhill Long Barrow, shown in Fig. 10.1, places it in the early phases of the Cotswold-Severn tradition, around 3700 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 its 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). Documentation referring to recovered skeletal materials suggest a minimum total of 24 individuals, but this may be a substantial underestimate of actual interments. Thurnam (1857), who excavated in the mid-nineteenth century, recovered elements (unavailable for examination) described as representing four adults (a male and a female ~20 years, a male of ~40 years and a female ~50 years). He

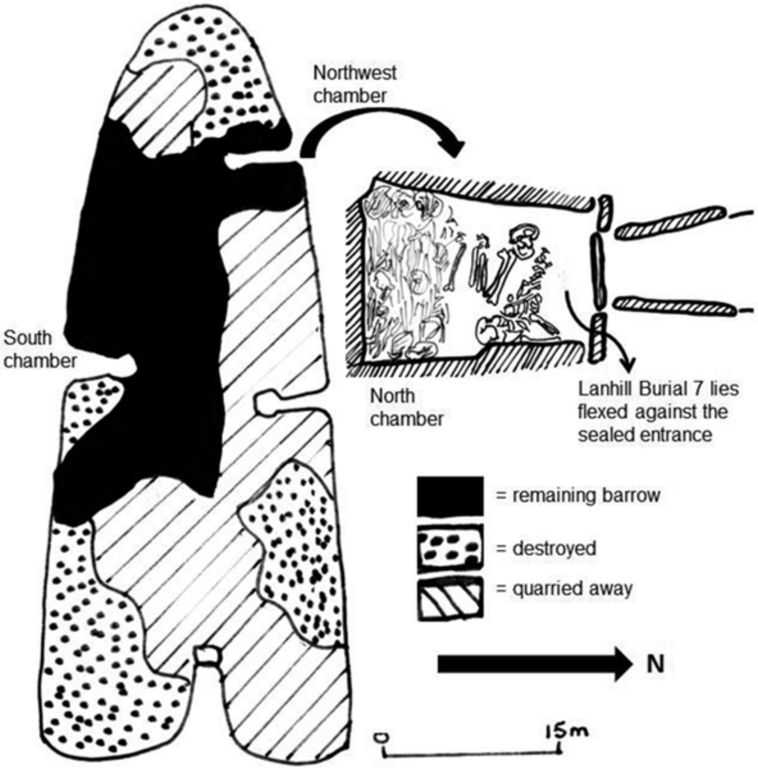

Fig. 10.1 A plan of the early Neolithic Lanhill Long Barrow, Wiltshire, UK; much of the barrow has been destroyed by quarrying between the early 1800s and the 1950s (after King 1966:74). The out-take of the north-west chamber shows the position of LB7, the last individual interred (after Keiller and Piggott 1938:126)

quotes an elderly local recounting how when the site was quarried in the early 1800s ‘many human bones were thrown up, among which … [were] several lower jaws’ (Thurnam 1857:68]. At the beginning of the twentieth century, Cunnington (1910) discovered partial remains representing minimally 11 individuals in a disturbed burial chamber on the south side of the barrow. A brief appendix to the main report suggests these remains represent 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 7 and 12 years (Beddoe, in Cunnington 1910:308–310). (A small selection of the bones listed in the report is retained in the Wiltshire Heritage Museum, and the whereabouts of the remainder is unknown.)

It is noteworthy that 6 out of the (minimum) total of 24 individuals attributed to the Lanhill Long Barrow were assessed by their corresponding analysts as belonging in the ‘older adult’ category. 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 (1972b: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 % of adults surviving to 50 years and over. In a point which will be returned to in later discussion, it is also noteworthy that there appears to be no differentiation in either receipt of burial or on the mortuary treatment itself on the basis of sex, despite reports of this from other long barrow contexts (e.g., Shanks and Tilley 1982; Wysocki and Whittle 2000. In relation to Lanhill, Thomas (1988:552) suggests that there *is* a male/female difference in relation to allocation to burial chamber, but this is not supported by the evidence reviewed here).

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 north-west chamber are relatively gracile; of average stature for this period (Roberts and Cox 2003:67), with males ranging between 163 and 172 cm (Cave 1938a); 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 platycnemic morphology (Cave 1938a), indicators likely reflecting a very active and probably mobile lifestyle and documented in the remains from other Neolithic long barrows (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 ~30 years of age and over exhibit degenerative activity (Cave 1938a). The advanced degeneration present in the cervical spine in all mature adults (other than LB7) 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), possibly reflecting economic and/or cultural practices 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 these 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, possibly intentionally placed, recovered from the body of the mound. Domesticated animal remains most likely reflect human activities contemporary with site construction and use, suggesting that the Lanhill community practiced a level of pastoralism, while non-domesticate remains may indicate a continuing level of dependence on hunting for dietary supplementation.

The Cotswold-Severn Culture

There is no specific information available about the everyday activities of the Lanhill community, but there is nothing to indicate that it deviated from what is known of early Cotswold-Severn lifeways generally (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; Guttmann 2005; Pollard 1999; Serjeantson 2011; 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 30–50 (possibly up to 100) individuals, ranging across the age spectrum and predominantly made up of extended kin (Dunbar 1993; Harding 1995; King 2001; Wysocki and Whittle 2000). There is no evidence for either large settlements or domestic structures around Cotswold-Severn long barrows, suggesting groups were probably semi-sedentary, likely practicing seasonal movement of livestock between grazing grounds (King 2001; Pollard 1999); while lack of evidence for dwellings does not mean that none was erected, combined with paucity of evidence for domestic activities it does suggest that 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, common features in the landscape, may have served as centres for cultural and economic activities (Harding 1995).

Much of the relevant 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 interpreted in a variety of ways – 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 and/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 (along 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 collectivist 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, as well as in other Neolithic sites, constitutes 'citations of relations of personhood' (Fowler 2001:142–143), reflecting a heterarchical relational, as opposed to hierarchical individualistic, concept of identity. Thomas (1988) suggests that the reorganisation of skeletal remains seen in long barrow interments, including in the Lanhill north-west chamber, has a greater significance than simply making way for new burials:

> [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)

Certain interpretations are on shaky evidentiary ground. Smith and Brickley (2009:88–89) point out 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 (re)arrangement of remains in the Lanhill chamber (water erosion and making space for new occupants respectively) 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 during the twentieth century this explanation declined in popularity. Over the last 15 years, however, archaeologists have again embraced the subject of violence in the European Neolithic (e.g., Armit et al. 2006; Fibiger et al. 2013; 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 [British] 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 little hard evidence for such an all-encompassing proposition. 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 Brickley 2009:104). Schulting and Wysocki (2005) found evidence of trauma in 31 (almost 9 %) of 350 British Neolithic crania, and propose that in around 21 of these 31 crania the trauma was violence-related; however, while the authors are scrupulously conservative in their conclusions, in some instances their attribution of causality as deliberate rather than accidental is debatable. Overall, although in some instances 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 as likely to result from chance as intent. There is no evidence to suggest habitual interpersonal violence at Lanhill.

Context (ii): LB1, LB2 and LB5 – Health Challenges to Others in the Lanhill Community

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, which forms part of the background against which the implications of LB7's care are considered, is outlined below, and Fig. 10.2a–f illustrates some of the evidence for 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).

Fig. 10.2 (**a**) LB1 cranium and mandible; on right (*top*) maxilla displaying infection in right and left molar regions and associated tooth loss, and (*bottom*) mandible displaying infection and antemortem tooth loss in the right molar region, antemortem tooth loss in the left molar region. Images by Lorna Tilley. (**b**) LB1 C2-7, caudal aspect, displaying extreme degeneration (cavitation, lipping, porosity, eburnation). Image by Lorna Tilley. (**c**) LB2 cranium, mandible in anatomical position, illustrating extreme edentulism (note advanced right mandibular alveolar resorption). Image by Lorna Tilley. (**d**) LB2 maxilla, inferior aspect, displaying chronic lytic infection along right and left posterior alveolar margins. Note healed fracture of right zygomatic. Image by Lorna Tilley. (**e**) (*top*) and (**f**) (*bottom*): LB5 cervical vertebrae 1-7, cranial (**e**) and caudal (**f**) aspects, displaying severe degenerative pathology (gross enlargement of articular facets, pitting, porosity, lipping, eburnation). Images by Lorna Tilley

Fig. 10.2 (continued)

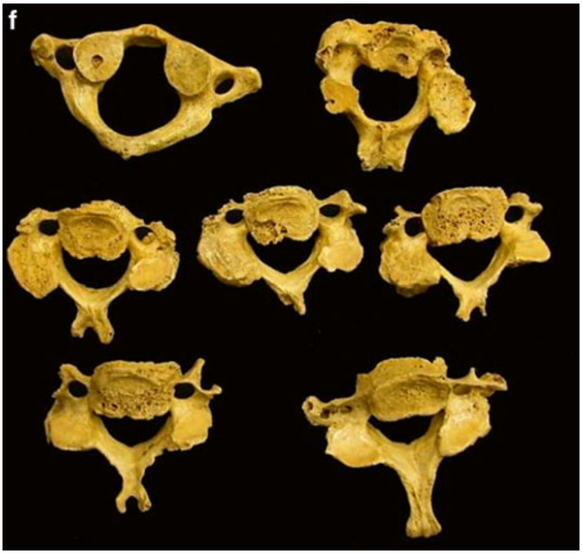

Fig. 10.2 (continued)

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 evident in the right mandibular fossa (the right mandibular condyle is not preserved).

All bodies and articular facets of LB2's three remaining cervical vertebrae display evidence of severe degenerative activity, and the only lumbar vertebral body (?L4) still available for examination manifests a similar level of pathology. All five lumbar vertebrae were recorded by Cave (1938a), 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 lumbars 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, with some displaying Schmorl's nodes; all articular facets display some pathology, with those of T8–T12 severely diseased. Lumbar vertebrae continue this litany of degeneration, with all vertebral bodies displaying (variously) moderate or severe porosity, cavitation, pitting, Schmorl's nodes and osteophytic lipping. Preserved articular facets display extensive and severe osteoarthritic changes. The sacrum is intact, and its cranial surface shows degenerative change with the articular facets exhibiting eburnation and/or gross distortion.

The severe pathologies seen in the remains of the LB1 and LB2 are probably predictable legacies of long, hard lives. However, the extent of vertebral degeneration in LB5 is equal to, if not more advanced than, that present in LB1, a man possibly over 20 years her senior. There may be no single explanation for this; it may be the result of interacting factors including genetic predisposition, lifeways demands, and traumatic injury (although no other evidence for trauma is obvious) (e.g., Mandelbaum and Waddell 2005). LB5 is estimated to have been approximately 148 cm tall, making her around 14 cm shorter than the only other adult female represented in the chamber (LB2, at around 162 cm) and placing her below the contemporary female mean height of 157 cm (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 her below-average stature was not related to any childhood 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 degenerative joint disease is contentious (Waldron 2009:30–31). With regard to vertebral osteoarthritis, however, clinical research indicates a consistent relationship between (1) number of vertebrae affected, location, and degree of degenerative activity and (2) limitations on function and/or experience of pain (e.g., Badley et al. 1994, 1995; Faccia and Williams 2008; Fanuele et al. 2000; Manchikanti et al. 2002; Schellinger et al. 1987).

Given the extent and severity of vertebral degeneration in LB1, LB2 and LB5, this suggests that although the details of clinical and functional impact are inaccessible, we can be fairly confident that each individual experienced *some* impact. This would most probably include reduction in flexibility and restrictions on certain activities (limitations on movement from intra-articular restrictions and loss of disc space are skeletally indicated), discomfort, and periodic or chronic 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 minimally 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).

LB1, LB2 and LB5 may all have been able to cope with the effects of their pathology without special assistance, but it is more likely that each faced difficulties in maintaining normal activity levels from time to time, and because of this would have required cooperation from – or 'accommodation' by – other community members to successfully balance the demands of their health with their responsibilities to the group.

Lanhill Burial 7: Description and Diagnosis

The remains of LB7, the central figure in this study, represent a male aged around 50 years at time of death, and as depicted in Fig. 10.1, he was the last person to be included in the north-west chamber. LB7 was found positioned just inside the narrow entryway, tightly flexed and lying in an east–west orientation (head to east); following his burial, the portal to this chamber was sealed (see Keiller and Piggott

1938:126–128 for a detailed description). There is evidence of serious pathology affecting his left elbow joint, and the developmental impacts secondary to this pathology are displayed in his left humerus, ulna and radius. In life LB7 stood approximately 163 cm tall; the elements of his right arm appear unaffected 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 (Cave 1938a and author's observations).

LB7 experienced injury to the distal epiphysis of the left humerus, causing epicondylar disruption and resulting 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 fixed in position at an 80–85° angle to the upper arm. Cave (1938a), concludes that during life muscle contracture would have resulted in permanent flexure of LB7's left forearm against his upper arm at an angle of around 45°, precluding all but the most limited forearm extension. This proposition is supported both by the skeletal evidence for disuse atrophy and the lack of evidence of 'wear and tear' that, had extension been regularly attempted, might have been expected in the proximal ulnar and/or distal humeral articular surfaces in view of the mechanical constraints of 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 retention of normal wrist and hand movement. Illustrating the observations made above, Fig. 10.3 presents the anterior and posterior aspects of the deformed left distal humerus; and Fig. 10.4 presents the proximal articular surfaces of the left ulna and radius.

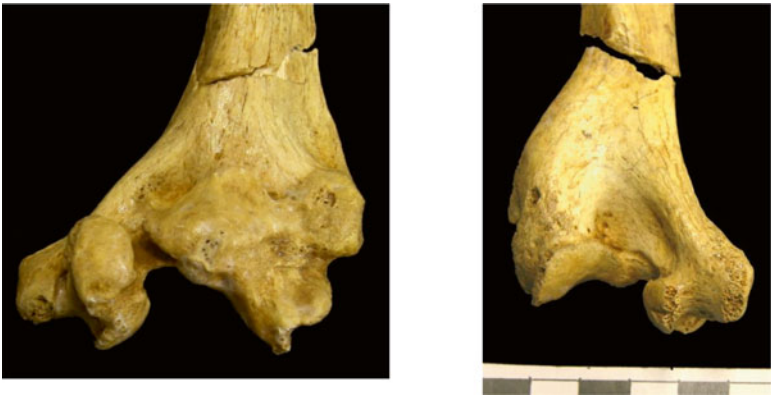

Fig. 10.3 LB7, left distal humerus, anterior (*left*) and posterior (*right*) aspects, illustrating deformity resulting from injury in adolescence. Images by Lorna Tilley

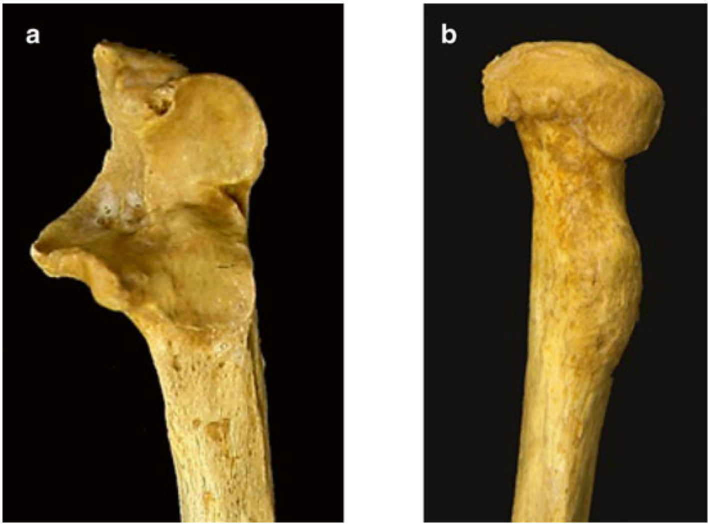

Fig. 10.4 LB7 medial view of proximal left ulna (**a**) and medial view of proximal left radius (**b**) illustrating adaptation of both articular surfaces in response to deformed distal left humerus (Images by Lorna Tilley)

Table 10.1 LB7 – comparison of left and right humerus[a]

	Left humerus (% of right humerus)	Right humerus
Length[b]	280 (93 %)	301
Mediolateral diameter	18.3 (78 %)	23.3
Anteroposterior diameter	18 (75 %)	23.7
Least circumference	57.1 (87 %)	65.6
Maximum head diameter[b]	40 (87 %)	46

[a]Measurements are in mm. Measurement sites are based on Bass (1995:152)
[b]Measurements are best estimates only due to damage

The left humerus displays both atrophy and arrested development. As detailed in Table 10.1 and evidenced in Fig. 10.5, the left humerus is shorter than its right equivalent; the left humeral head is smaller than that of the right humerus; 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 are normal. Although the differences are much less marked, LB7's left radius and ulna also reflect lack of use, with minimal development of muscle attachment areas. It is difficult to compare features of right and left forearm elements, because the right radius and ulna are incomplete and broken and the left ulna is incomplete, but where comparison *is* possible the left ulna and radius consistently measure between 2 and 3 mm less in mediolateral and anteroposterior aspects than their right counterparts (comparison of length is impossible). Bilaterally, LB7's clavicles appear uncommonly gracile, although post-mortem damage makes

Fig. 10.5 LB7, left humerus (*top*) compared to right humerus (*bottom*), anterior views, illustrating differences in size (length and diameter) and robusticity

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 (completely fragmented since Cave's description) consistent with the disuse atrophy evident in the left limb (Cave 1938a:143–144).

The injury to LB7's left elbow 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), it is more likely that LB7's pathology was the result of trauma to the elbow joint displacing 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). Medical 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 possible that his forearm was stabilised against his upper body in an attempt to minimise pain from movement and to protect against further trauma, and this would potentially 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 depicts the likely outcome of LB7 injury – permanent flexure, interrupted development and atrophy of the left arm.

Fig. 10.6 Representation of the outcomes of injury to LB7's left elbow: permanent flexure, disrupted longitudinal growth, disuse atrophy. Drawing by 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 1971; Trinkaus and Zimmerman 1982). Other than Solecki (1971:258–268), these authors focus predominantly on osteological description and disease diagnosis, with care provision a secondary consideration.

Lanhill Burial 7: The Long-Term Repercussions of Injury

The lasting consequences of injury would leave LB7 unable to take part in any activity demanding significant upper body strength and/or the active use of both arms. He would also have been handicapped in performance of most tasks demanding the use of both hands, because although he probably retained full movement of his left hand, inability to break left arm flexure would limit the opportunities for exploiting this. In some situations the positioning of his left arm may have actively impeded task performance, with the subnormal development of the right clavicle recorded by Cave (1938a:143–144) possibly indicating restrictions on the use of the left arm were a barrier to undertaking 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 disability 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 does not allow specific symptom attribution to LB7. For example, nerve dysfunction is a 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 obviously 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 situation (Datta et al. 2004; Maguire and Parkes 1998; Wallander and Varni 1995), and the research identifying 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 both 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 Step 2 of the Index of Care, LB7 would have been capable of performing all basic activities of daily living such as feeding and dressing himself, maintaining bodily hygiene, and independent mobility. He would also have been capable of taking part, at some level, in many of the daily activities typical of a Neolithic 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 very effective ways of working around it – from around the age of 14 years onwards he would not have been able to perform the full range of tasks typically undertaken by those of his cohorts.

More precisely, LB7's disability would limit, although not necessarily exclude, his involvement in the primary economic practices of this time, for example affecting performance in many of the tasks associated with land clearance, land cultivation, construction, hunting and most pastoral practices involving hands-on animal handling (such as birthing and butchery); it would also constrain participation in some of the more sedentary occupations likely undertaken by the group, such as artefact manufacture requiring free use of both hands in the production process (such as most work in wood, bone or stone, although pottery-making might have been possible). Nevertheless, following injury in adolescence LB7 lived for over three decades as a member of a subsistence economy, within which, it is reasonable to assume, he would have been called upon to make a material contribution. Economic activities based predominantly on lower body functioning would have been limited, however. Demands made on LB7 may have been quite different from those made on other male and female members of his age cohort, for whom robust upper limb morphology, combined with patterns of vertebral pathology, suggest occupations requiring substantial upper body involvement.

Lanhill Burial 7: The Options for Care

To integrate LB7 within the small Lanhill community would require members to reassess conventional expectations of ‘normal’ adolescent, and later adult, roles and responsibilities in order to come to terms with, and to adjust for, LB7’s inability to function effectively in certain areas. The logical approach would be to take advantage of LB7’s abilities wherever feasible, allocating tasks that did not rely on upper limb use, even where these might be considered unusual or inappropriate 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 functional capability and contributing actual value to the group, would be the most effective form of immediate rehabilitative care and continuing support over the long-term (Desmond 2007; Reed and Claunch 1998; Roberts 2007). In summary, it can be said that provision of care 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 he is the only adult over 30 years to exhibit no sign of degenerative changes, activity-related or otherwise, in any part of his spine; Cave’s (1938a, b) observation relating to underdeveloped left *and* right side clavicular morphology also supports this conclusion. Referencing earlier discussion of the vertebral pathologies present in the remains of LB1, LB2 and LB5, in the Lanhill context (as in the example of Man Bac Burial 9 presented in Chap. 8) absence of evidence for disease may be construed as indirect evidence for provision of care – in this case, care realised as ‘accommodation’, given form through the recognition and acceptance of LB7’s disability and the limitations it imposed.

Identifying specific occupations LB7 *may* have been engaged in is a very different question. It is possible to speculate on roles available to LB7 that either would not intrinsically require significant upper body strength or the ability to use both hands, or that might be created by dividing tasks requiring a component of upper body involvement between LB7 and another group member. Such occupations might range from minding flocks or scouting out new pastures, through caring for infants or temporarily incapacitated group members (freeing others for more strenuous labour), to taking on the position of story-teller or poet, priest or prophet – although in relation to the last four vocations it seems unlikely that the community could have afforded to carry an otherwise healthy individual for over three decades without some more tangible output 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 us with answers on this point.

With the exception of Solecki (1971:258), all the archaeological reports that identify likely caregiving in response to upper limb disability referred to earlier fail to examine the functional implications of pathology within the corresponding lifeways (explicitly in the study by Lieverse et al. 2008, by default in the remainder), offering no discussion of the detail of the care suggested beyond general statements of likely social acceptance, assistance, intervention, support, indulgence, mutual aid and solidarity – although all of these are valid observations (Buquet-Marcon et al. 2007:1; Lieverse et al. 2008:236; Mann et al. 1998:296; Schultz 2006:253; see Table 2.1 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 behaviour.

Caregiving at Lanhill, and What It May Reveal

Taken as a discrete study of care provision, LB7 is a good example of a partially disabled individual who was unable to participate in at least some 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 inclusion 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 a particular care recipient there will always be some basic questions that are hard to resolve. As seen in the previous case studies in this book, one obvious question centres on 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. Including the Lanhill Long Barrow burials among their examples, Shanks and Tilley (1982) hypothesise that the selection of remains for long barrow interments was designed to give the illusion of an egalitarian society by disguising the reality of a sociopolitical hierarchy; this proposal may seem convoluted, but they are hardly alone in pointing out that mortuary ritual represents the interests of the living rather than the dead (see Chap. 5). A related question to the one canvassed above 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 into the north-west chamber) 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. The treatment of LB7 can be considered against the backdrop of evidence suggesting that others from the same community, for whom skeletal evidence indicates experience of episodic disability, very possibly required periodic support as well. Given the likely consequences of pathologies experienced by LB1, LB2 and LB5 it is probable that the Lanhill members would, at times, have had to adjust their expectations of all three of these individuals during their later years. LB1 and LB2 may also on occasion have required care in the sense of 'direct support', in the form of provisioning or preferential allocation of appropriate foods to counter challenges posed by edentulism, dental disease and temporomandibular joint disease, and possibly even in the form of more dedicated nursing to help these individuals through health crises occasioned by systemic impacts of oral infection.

The inference of care provision to LB1 and LB2 is, of course, confounded by the variable of age. While 'being old' is not synonymous with 'requiring healthcare', the process of ageing may be associated with the cumulative effects of disease experience during life, as well as with reductions in physical fitness and endurance independent of observable pathology. The obvious issue arising from this is 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 sociocultural support for community members moving through the lifecycle from 'economically productive adult' to 'less economically productive 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, and support for the elderly may indeed have been a cultural characteristic [although see earlier caveats regarding skeletal data from sources other than Keiller and Piggott (1938)]. LB1 and LB2's remains display indicators of progressive disease, justifying the inference of specifically *health-related* care provision, but even at a conceptual level distinguishing between accommodation made for these two individuals on the basis of age and accommodation made on the basis of disease is impossible. For the purposes of interpreting LB7's experience, however, it is enough that adjustments seem to have been made.

To return to the first question identified above, the long-term support given to LB7 fits well with an understanding of the Lanhill group as one with a tradition of supporting all 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 – or not solely – because of his identity as an individual, but because of his larger identity as a member of the community.

Any suggestion that LB7 was included in the north-west chamber to indicate a level of social inclusion in death which was absent in life must also be rejected. The evidence indicates that of the nine individuals represented in the north-west chamber minimally three others very likely experienced disability, meaning that although (on skeletal evidence) LB7 was the most distinctively, and probably the most severely, affected of all in terms of functioning, he was not unique in this regard. The arguments for assuming that LB7 took part in some form of economic activity and for assuming LB7's acceptance by his community have already been discussed, and there is no indication that he was treated as being of an inferior status to other group members. Further to this, it might be argued that the doubtless joint achievement of the Lanhill community and LB7 himself in establishing, in a highly physically active lifeways, a meaningful social role suited to someone with activity restrictions suggests an intellectual flexibility and good will on the parts of all involved.

Taking into account both the experience of LB7 and the broader picture of caregiving practice at Lanhill may also illuminate aspects of group organisation. As has been argued in previous chapters, provision of care always involves cost. Although the Cotswold-Severn region was fertile, with relatively easily traversable terrain and a temperate climate, the osteological evidence from Lanhill, as well as that from contemporary communities in southern England (e.g., Wysocki and Whittle 2000), reveals that life was physically demanding for all ages and both sexes, and suggests a considerable level of economic interdependence as well as likely economic uncertainty. At Lanhill, despite evidence indicating that for periods of time certain individuals would have been operating (at best) at below usual levels of productivity, the absence of skeletal indicators of compromised nutritional status, taken with the skeletal evidence for longevity, suggest that the group was skilled – and cooperative – in managing work practices in such a way as to compensate for intermittent reductions in the labour force. Perhaps in addition to the obvious solution of workers who were healthy working longer and harder to compensate for those who were not, strategies may have included having a workforce in which each member participated according to ability, rather than any other criterion – a proposal briefly elaborated below.

The Lanhill sample is unarguably a very small one, but when the evidence for accommodation of LB7 is combined with evidence from the other Lanhill human remains an interesting feature of economic organisation is suggested. The lack of significant sexual dimorphism, together with the evidence for disabling pathology (if only intermittent) among a proportion of group members, speaks of 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 could 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 and that there appears to be no difference in the treatment of these remains; 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 role and status of Lanhill women was equivalent to the role and status of Lanhill men, but that is no reason to exclude this possibility.

Observations from the analysis of Lanhill community's treatment of members who were temporarily or longer term disabled in some way 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; see discussion in Chap. 5). 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, relation*less*, 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, despite potential 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 most definitely 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, would still have been required. At its most basic, however, in a dividual social order the act of caring for a disabled member capable of benefiting from such care would be taken as a given.

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 around puberty?

Qualifications regarding the prospects for truly 'knowing' a prehistoric individual through their bones alone are taken as read. However, despite the perils in extrapolating from modern clinical research to past experience, it is 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. For a riveting account of personal experience of an injury similar to that of LB7 – albeit to a professional middle-aged woman in the twenty-first century – see Oakley 2007).

LB7's initial injury was very likely a source of pain at the time of acquisition and throughout the healing process (Ramachandran and Skaggs 2009; Ristic et al. 2000), although there may possibly have been some form of herbal medication available (see discussion of prehistoric use of *materia medica* in Chap. 2). 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 almost certainly have been far more devastating than any pain, however. 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). Personal acceptance of, and adjustment to, disability and disfigurement requires time for mourning the loss of both physical ability and self-image as a 'whole person', 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 Fig. 10.6, would not only serve as a constant sign to others of his disability, but may also have constituted a physical impediment to upper body movement that made it hard for him to ever fully 'forget' his condition.

Given his longevity, LB7 clearly *did* adapt to living with disability. Whether he went on to be content with, accepting of, resigned to, frustrated by, or angry or bitter about the changes to his life arising from his experience of disability remains invisible to us – but all are very human reactions, and none would be surprising. That he appears to have been fully integrated within his community, however, while spared the heavy labour that was most likely responsible for the degenerative disease seen in other Lanhill adults, suggests that his overall quality of life was on a par with other group members and that his abilities and his limitations were recognised and respected. In a 'dividual' community, as discussed above, such treatment might be afforded irrespective of an individual's character and personality, but in more immediate, human terms it may also suggest a caregiving response based on personal affection and respect.

Some Final Observations…

As vulnerable human beings most of us, if we live long enough, will experience disability at some stage of life. This disability may not necessarily require intensive care, but it may well require adjustments, for however short a time, to the way we live and to what is expected of us. Our community's willingness and ability to make these adjustments – to accommodate us – will reflect both the values our society espouses and the way our society is organised.

In focusing on care expressed in the form of accommodation, the case of LB7 illustrates that this modern-day observation is also applicable to behaviour that took place millennia ago. To repeat a point made in earlier chapters, in any archaeological study it is unavoidable that proposals regarding what such accommodation may have comprised will typically be broad and often 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 in supporting disabled members will always remain obscure, where evidence suggests that accommodation of a disabled individual took place it provides a fresh point of entry for examining aspects of social practice, social relations and identity in the past.

The case study of LB7 also demonstrates the value of considering health status and experience of group members other than the core 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 that 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, in examining museum collections I have 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 possible case of care provision from the Ascott-under-Wychwood Long Barrow remains 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 (and wider European) Neolithic lifeways was noted in discussing the context for this case study. That incidents of interpersonal violence occur in all cultures and across all times is not an issue 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 and more three-dimensional understanding of this culture and those who created it. Indeed, this observation can be extended to all places and periods in archaeological research.

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Chapter 11
Where to from Here? 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 2005:161–162)*

The title of this book – *Theory and Practice in the Bioarchaeology of Care* – implies that 'theory' and 'practice' are separate entities, but in the unapologetically case study-based bioarchaeology of care approach they are actually inextricably combined. Positioning health-related caregiving as a complex behavioural response to an individual's experience of disability, bioarchaeology of care analysis takes the osteological evidence for survival with disability, together with the archaeological evidence of lifeways environment, to identify and interpret care provision. The care response itself is understood as a series of linked actions that take place over time and are the product of intentional choice by those directly and indirectly responsible for providing care. The care recipient is regarded as both artefact and actor; 'artefact' because 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 almost certainly played an active role in shaping their care. 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 case studies of the preceding chapters illustrate the practical application of the bioarchaeology of care methodology and demonstrate the variety, richness, intimacy and immediacy of the insights that bioarchaeology of care analysis can deliver. The four stages of the methodology structure analysis and interpretation of evidence for

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health-related care provision in a way that renders every step of this process transparent and open to scrutiny; each stage becomes the platform for the next, enabling an orderly transition from the relatively straightforward recording of subject, pathology and context in Stage 1; through determination of disability in Stage 2 and identification of the likely care required and given in Stage 3; to the teasing out of aspects of the agency and identify of those 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 in developing the bioarchaeology of care approach. As discussed in Chap. 2, questions around caregiving have proven extremely contentious in archaeology, leading to it being passed over as a focus for research. To an extent controversy has been inevitable, because in modern western society discussion of the concept and the reality of 'disability' provokes strong passions, reflecting deeply held cultural and personal values. A substantial part of the problem, however, has arisen 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 addresses this by being explicit that, once the researcher moves beyond the information collection of Stage 1, the study of past healthcare provision is based on informed inference and deduction rather than on established 'fact', and emphasising that, because of this, research parameters have to be crystal clear. To meet this goal, the bioarchaeology of care offers a comprehensively theorised set of meanings and measures intended for use as a shared research 'vocabulary', which includes a contextualised process for assessment of individual disability in relation to disease 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 structured but completely non-prescriptive guide through the four stages of analysis. The shared vocabulary discussed above was integral to Index construction, and from this perspective the instrument can be seen as quite literally embodying bioarchaeology of care theory. In this role, it is hoped that while application of the Index is not, in any sense, a prerequisite for undertaking bioarchaeology of care research, its convenience will encourage its adoption, and its use will stimulate continuing debate around bioarchaeology of care philosophy, principles and practices.

Fitting the Bioarchaeology of Care into Existing Archaeological Theory and Practice

The bioarchaeology of care approach is firmly embedded in the relatively recent traditions of bioarchaeology (Buikstra and Beck 2006; Martin et al. 2013), 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 (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. Aspects of theory and practice have also been borrowed – or adapted – from non-archaeology disciplines, including those of social and medical anthropology, ethnography and sociology, social psychology, the history of medicine, disability studies, clinical practice and nursing, and the unresolved encounters with arguments and assumptions from primatology, evolutionary biology and psychology and sociobiology summarised in Chap. 4, bear witness to the breadth of internal debate that went into development of the bioarchaeology of care end product. This synthesis of ideas, theories and methods from a wide range of disciplines is a defining feature of the bioarchaeology of care, and as transdisciplinarity 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 is true to its roots.

Where the 'fit' between the bioarchaeology of care and many other areas of bioarchaeological endeavour is not quite so close is in the former's relatively limited focus of study. The bioarchaeology of care, which is case study-based (refer to discussion in Chap. 3 for the explanation of why this is unavoidable), finds itself in a research environment in which bioarchaeology population studies are generally assigned primacy (e.g. Armelagos and van Gerven 2003; Mays 2012).

This is most definitely *not* to suggest that the bioarchaeology of care should passively accept a secondary role. The importance of case studies to archaeology has been robustly defended by researchers such as 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. Hodder (2000), a proponent of research focusing on individual lives and events, argues that in order for archaeology to fulfil its social potential 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 book testify to the ability of bioarchaeology of care analysis to supply this much-needed 'human scale' to the study of the past.

The Bioarchaeology of Care: A Work in Progress

In the time since publication of the first bioarchaeology of care case study (Tilley and Oxenham 2011; see Chap. 8) there has been a steadily developing interest in the bioarchaeology of care methodology among researchers, reflected in article downloads, article citations, article inclusion in university course syllabi and many user-registrations for the Index of Care. In April 2015, a symposium on the topic

'*Building a Bioarchaeology of Care*', involving 16 speakers from North America, Europe and Australia presenting on aspects of applied research and theory, was held at the Society for American Archaeology (SAA) Annual Meeting – generating plans for further work in the bioarchaeology of care field. It might be said that, in the academic context, the new approach has come quite a way in the last four years.

It must be stressed, however, that the bioarchaeology of care is best described as a work in progress – an initiative that must be subjected to constant questioning and refinement. Neither the underlying conceptual framework nor the accompanying Index of Care should ever be thought of as 'fixed'; every case study will involve different variables and there can never be an immutable formula for analysing care provision (or any other behaviour). Each researcher undertaking bioarchaeology of care analysis will customise the approach to their special needs and circumstances, which is as it should be, because in this way each case study will add a new dimension to bioarchaeology of care method and theory.

Many possible directions for future bioarchaeology of care research projects spring to mind, but the most important point to make at the beginning of the all-too-brief canvassing of options that follows is that the bioarchaeology of care methodology can – and should – be employed across a range of bioarchaeological studies in which the provision of health-related care is not the sole, nor even the primary, focus of research. For instance, research on the topic of violence – domestic, informal, systemic, within and between groups – has increased exponentially in the last decade (Guilaine and Zammit 2005; theme articles in the *International Journal of Paleopathology* 2012 (2); Martin et al. 2012; Schulting and Fibiger 2012). It would be very interesting to submit some of 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 actual care (as discussed in Chap. 3), just as absence of physical evidence for violence does not prove an actual absence of violence. Nevertheless, where evidence for violence and caregiving exists within the same population this may illuminate the sort of contradictions which are the hallmark of most human behaviour, providing a more complete picture of past lives. While acknowledging the difficulties and limitations inherent in introducing a case study-based element into population-based research, further examples of subject matter areas in which a bioarchaeology of care component might pay dividends include research examining trends in prehistoric life expectancy, research focussing on features of the life course within and across group lifeways, and research exploring the relationships between social, political and economic status and health status inequalities.

Application of the bioarchaeology of care approach has so far been restricted to analysis involving skeletal remains, and this suggests one obvious candidate for further care-focussed research. There is no *prima facie* reason why the principles of bioarchaeology of care analysis should not be equally applicable to mummified remains. Indeed, because evidence for survival with disability obtained from preserved soft tissue has the potential to identify experience of a number of diseases that rarely, if ever, register in bone, such research will potentially add considerably to our understanding both of the type and frequency of disabilities lived with in the past and the range of measures likely involved in providing care. For instance, radiological evidence shows a significant incidence of chronic respiratory disease in mummified remains from mountainous regions in northern Peru (Conlogue personal communication 2011). What might a bioarchaeology of care analysis suggest about adjustments made within contemporary communities to manage the functional impacts of such pathology on individuals' ability to participate in traditional lifeways activities?

Another option might be to expand the reach of bioarchaeology of care research into more recent periods. In the early stages of bioarchaeology of care development, the focus was restricted to caregiving practice in early prehistoric lifeways – as explained in Chap. 1, this was a strategy adopted to avoid the complexities inherent in research dealing with larger, more concentrated, populations. There is no intrinsic reason, however, that prevents the bioarchaeology of care methodology being applied to possible cases of disability and care from 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 later prehistoric and protohistoric communities has not yet been explored. Additionally, bioarchaeology of care analysis of remains from historic contexts have the potential to enrich history by extending – or perhaps challenging – 'established knowledge' based on documentary sources alone.

Following from this last point, it might be rewarding to apply the bioarchaeology of care theoretical framework to broader procedural aspects of caregiving. Trepanation, a surgical practice for which there is evidence dating back 13,000 years, is one obvious candidate for consideration in this context. As discussed at some length in Chap. 2, successful performance of this surgery minimally requires anatomical knowledge, surgical skills and post-surgical care. Evidence for trepanation suggests acceptance of invasive health intervention; established nursing procedures; a system of medical training (however limited); and possibly the first archaeologically visible example of skilled division of labour. Examined from the holistic bioarchaeology of care perspective, trepanation may even help us understand the development of more formalised systems of healthcare, such as those recorded in the world's earliest recovered texts from Mesopotamia and Egypt.

Finally, a potentially very 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 (examples in both categories are discussed in Chap. 2). Submitting such cases to a full bioarchaeology of care analysis may produce informative, and possibly unpredictable, results. Were such a project to be undertaken, it would be important to include a measure for assessing whether value is added to the original research by the bioarchaeology of care process, and if so how much.

Caregiving in the Past: Claiming a Place in Modern Public Discourse

Health-related care provision promises to be a rich and rewarding subject for archaeologists. But recent experience shows that a surprisingly broad cross section of the general public – spanning cultures and continents – is also taking a very lively interest in this topic.

On 17 December 2012, an article featuring Man Bac Burial 9 (M9), and including a brief description of the bioarchaeology of care approach, appeared in the *New York Times* (Gorman 2012). Based on a short essay that had appeared a few months before (Tilley 2012), it excited an extraordinary response. In the days immediately following publication the *New York Times* article was reproduced in part or in full in print media and on blogs worldwide, and in many cases the original essay was also either linked to, or uploaded onto, these latter. As the featured archaeologist, in the lead up to Christmas I was inundated with emails from North American, European and Australasian journalists requesting further information, and over the succeeding months I received dozens of emails from non-archaeologist members of the public, many asking (often very insightful) questions about M9 and work on research into caregiving more generally, and providing some heart-warming words of encouragement for my research into the bargain.

From the end of 2012 and throughout the first half of 2013 the analysis of M9 featured in professional and non-vocational blogs, special-interest news sites and discussion forums, and (non-academic) internet journals. Only a few of these sources were exclusively dedicated to archaeology (for example, see https://thesebonesofmine.wordpress.com), with the vast majority dealing with social, political, religious, ethical and health matters, respectively. Inevitably, given the assortment of sites, the perspectives adopted, the interpretations reached and the lessons drawn from the experience of the young man who lived 4000 years ago often differed considerably, and it is worth looking at some examples to get a feel for the variety and depth of reaction to the story of M9 before discussing the significance of this phenomenon.

A small selection of online comments (mostly responding to the *New York Times* article and the 2012 essay rather than the 2011 academic case study) is provided in the breakout box on the following pages. What characterises all these comments, in all their diversity, is the authors' willingness and enthusiasm for engagement with the past – in particular, their collective facility for extrapolating from events occurring thousands of years ago to issues of concern in modern society. (The same qualities characterised hundreds of other online commentaries.) Why such a high level of interest? To begin with, it has to be acknowledged that archaeological practice across the board holds a fascination for many – only consider the enduring popularity of television series, films and non-specialist books about archaeology. Archaeology is seen as having the ability to help us both to understand how we have become who and what we are today and, hopefully, to avoid repeating the errors of the past; reflecting this, most formal archaeology Codes of Ethics contain a clause recognising the public at large as primary stakeholders in archaeological knowledge, and many urge active promotion of research results to the widest audience possible (e.g. see codes for the Australian Archaeological Association; British Association of Biological Anthropology and Osteoarchaeology; Canadian Archaeological Association; European Association of Archaeologists; Society for American Archaeology). More specifically, as previously observed, archaeological research into health-related care provision operates on Hodder's (2000:31) 'human scale'. Almost everyone knows first-hand what is involved in needing and/or giving care because both circumstances rank among the most common of life's experiences, and this makes it possible for people with no training in archaeology per se to develop their own interpretations of work undertaken on this area of past behaviour and apply these to an heterogeneous array of modern situations as they perceive this to be relevant. The small sample of comments offered in the 'breakout box' illustrates this so clearly that any elaboration would be redundant.

From a slightly different viewpoint, it is also important to make all research as accessible as possible not just because archaeology has the responsibility (and the public has a fundamental right) to share available knowledge, but because, when access is provided, the rewards for archaeologists can include an abundance of community-based responses that are so original and constructive they inspire new questions and new ways of approaching old ones. This is what happened when a journalist translated the arguments made for inferring the care provision to an individual living in the Neolithic for a general readership. The ensuing 1500 word article seized the public imagination and stimulated wide-ranging public discourse – which is no mean feat.

A Selection of Online Comments Following Publication of the *New York Times* Article on Man Bac Burial 9 and the Bioarchaeology of Care

Social justice advocates were quick to respond to the article on M9, with Kristina Chew's observations on the '*CARE2* (*make a difference*)' website representative of many views expressed:

> We tend to think that we who live today are "advanced" in regard to people in the past, especially when it comes to the treatment of the sick and those with disabilities; that, in contrast to an ancient Roman law that a "dreadfully deformed child shall be quickly killed", we recognize the rights of individuals with disability. But disability rights activists have to routinely refute claims that they are a "burden to society" and a "drain" on its resources.
>
> We would do well to imitate our prehistoric forbears. I take a great deal of heart in knowing that, eons ago, people cared for those who could not care for themselves (http://www.care2.com/causes/ancient-bones-acts-of-kindness-eons-ago.html)

Clinical groups compared the treatment of M9 to the situation of vulnerable patients in modern healthcare systems. The *Liverpool Care Pathway for the Dying Patient*, a British organisation dealing with palliative care options,

(continued)

noted the '*gross neglect* … [*evidenced in*] *the hundreds of deaths a year*' from pressure sores in the UK; contrasting this to the care inferred for M9, it demands '*what do such examples of* [*modern*] *care*, *or the lack of it*, *say about the culture that provides it*?' (http://liverpool-care-pathway-a-national-sc.blogspot.com.au/2012/12/liverpool-care-pathway-damning.html). Speaking even more directly, the *Private Home Care* newsletter observed:

> We tend to assume that healthcare and provision for the disabled are comparatively recent concepts, reflecting a linear progression from savagery to sympathy. … We regard the [British] National Health Service, rightly, as a mark of civilisation in contrast to systems where healthcare depends on geography, luck or money. …
>
> Human history tends to focus on episodes of cruelty and violence, but it may be that empathy was also central to early human life … In prehistory, the nurse may have been just as important a figure as the fighter and hunter.
>
> As the recession forces ever more difficult choices over the funding of care for the vulnerable, it is worth recalling that we have not invented care in the community, but returned to it (http://www.privatehomecare.ie/news-d.asp?ART_ID=236).

An article in the *Catholic Exchange*, focusing on the compassionate aspects of M9's treatment, attracted the following response (from Ron) –

> M9 and other similar discoveries even older than the Neolithic Age offer a profound witness to the "modern" age. Where contemporary global societies offer abortion on demand, assisted suicide, euthanasia and a godless life-is-disposable mentality, "M9" received empathy and compassionate care from his clan. Now, which Age is the "primitive" one? It kind of puts a little dent in the evolutionary mantra of "survival of the fittest" doesn't it? (http://catholicexchange.com/the-ethics-of-care-in-the-neolithic-age/)

and a contribution on the *Atheist Universe* blog (from Adriana) makes some very similar points, although from a diametrically opposed philosophical position:

> I love it when science allows us a respite from ugly human behaviors such as violence and lets us focus and rejoice on wonderful facts. In this case, archeology combined with pathological examination of … human remains, puts [forward] evidence that compassion and caring have been with our species for a very, very long time, even back in the days when life was supposed to be a constant battle for survival, where survival of the fittest was supposed to be all that our species could muster (http://atheistuniverse.net/group/thenakedape/forum/topics/compassion-and-caring-evidenced-by-archeology-and-paleopathology).

From an economist's perspective, Andrew Szabo, the editor of the online motivation, marketing and sales management blog *MindBodyForce.com*, observed:

> The [New York Times] article led me to wonder what kind of evidence exists for compassion in other animals. In other words, were these human beings expressing a uniquely human emotion, or instead, did the development of certain powers by human beings allow them to extend care in novel ways, but rooted in a more primordial emotion that we share with other species? Adam Smith proposed

(continued)

> "sympathy" as an emotional foundation for human society. In Smith's thought, there is an apparent contrast between the notion of self-interested striving, as expressed in his *Wealth of Nations* (1776), and the binding power of human sympathy, as he expressed it in his *Theory of Moral Sentiments* (1759). Scholars have labored to understand how to reconcile Smith's two great works; philosophers refer to this controversy as "The Adam Smith Problem". As to sympathy, the archaeological evidence suggests that Smith's moral philosophy was onto something potentially profound and powerful, rooted in our very nature. (http://mindbodyforce.com/evidence-for-compassion-in-prehistoric-peoples/)

Much of the commentary reflects an explicit political stance, dominated by views sympathetic to a social democratic philosophy. The gist is pithily encapsulated by an anonymous *Denver Post* reader:

> 'The provision and receipt of care may therefore reflect some of the most fundamental aspects of a culture,' the two archaeologists wrote in the [original article on M9 in the 2011] International Journal of Paleopathology.
>
> That explains why we have Obamacare[1]: it's natural and normal for people to care for members of their own families and communities. Apparently those prehistoric people weren't Republicans (http://www.denverpost.com/nationworld/ci_22212020/archaeologists-find-prehistoric-humans-cared-sick-and-disabled?source=rss)

A final example is this deeply personal response to the killing of 26 people at the Sandy Hook Elementary School[2] a few days previous to the *New York Times* article, posted on *GUIDEPOSTS* (a non-denominational Christian blog) by Amy Wong:

> It has been hard to find answers after the mass shooting at Sandy Hook Elementary. Hard to find hope after the deaths of innocent children and the school staff who gave their lives to protect those in their charge. Prayer has helped. Poetry. Music.
>
> Yet I found the most comfort in an unlikely place: a photograph from an ancient burial site, and the moving story behind it. Australian archaeologists … excavated the 4,000-year-old Man Bac site, in what is now northern Vietnam, and uncovered one grave that stood out from the rest. I was struck by [the]interpretation of this young man's survival. … [that suggests] it shows not only a culture of tolerance but also an individual who, despite being radically different from the people around him, had "a sense of his own worth and a strong will to live."
>
> This is not the first archaeological find – and it won't be the last – to demonstrate that prehistoric people, civilizations far less developed than our own, took care of and made accommodations for the chronically ill and disabled so that they could live among them.
>
> Maybe now more than ever, we need these reminders that the greatest gifts we are given – and can give – are compassion, kindness and love (http://www.guideposts.org/blogs/the-up-beat/greatest-gifts-compassion-kindness-love)

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[1] 'Obamacare' is the colloquial name for the US Patient Protection and Affordable Care Act, designed to bring public healthcare to those unable to afford private healthcare costs; it was signed into law in 2010 by a Democrat President, but vigorously opposed by the Republican Party.

[2] On 14 December 2012, a lone gunman killed 20 children and 6 adults at the Sandy Hook Elementary School in Connecticut, USA. It is not known why Adam Lanza committed this atrocity.

Last Words

The discussion above labours archaeology's obligations to the present, but archaeology has obligations to the past, as well. At best, we can only ever hope to achieve a partial understanding of how people lived in prehistory. But all archaeological research enters into a non-negotiable moral contract 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 the onus is on 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 has already begun to provide a new vantage point for reflecting on the meaning, value and practice of these same behaviours in the present.

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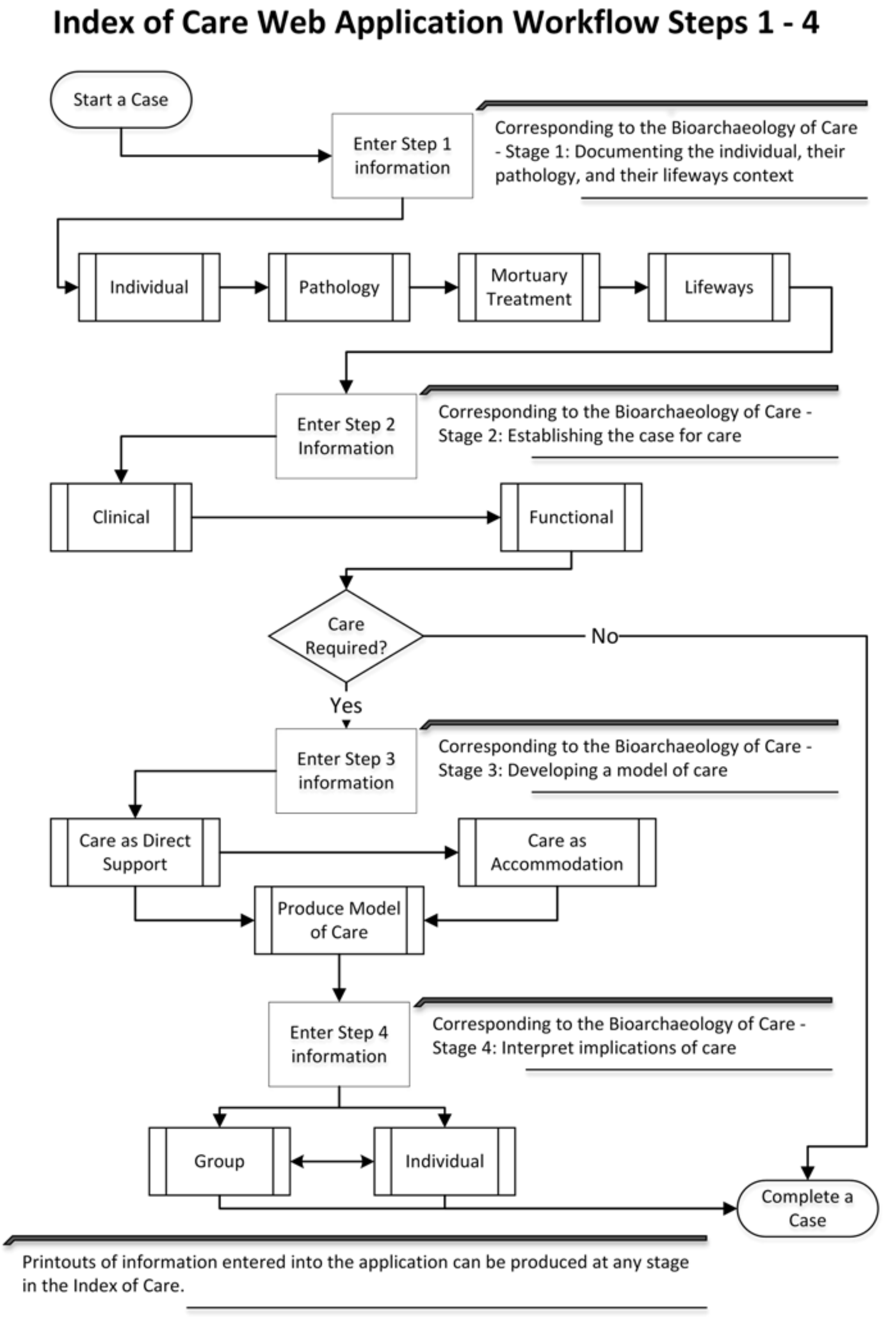
Appendix

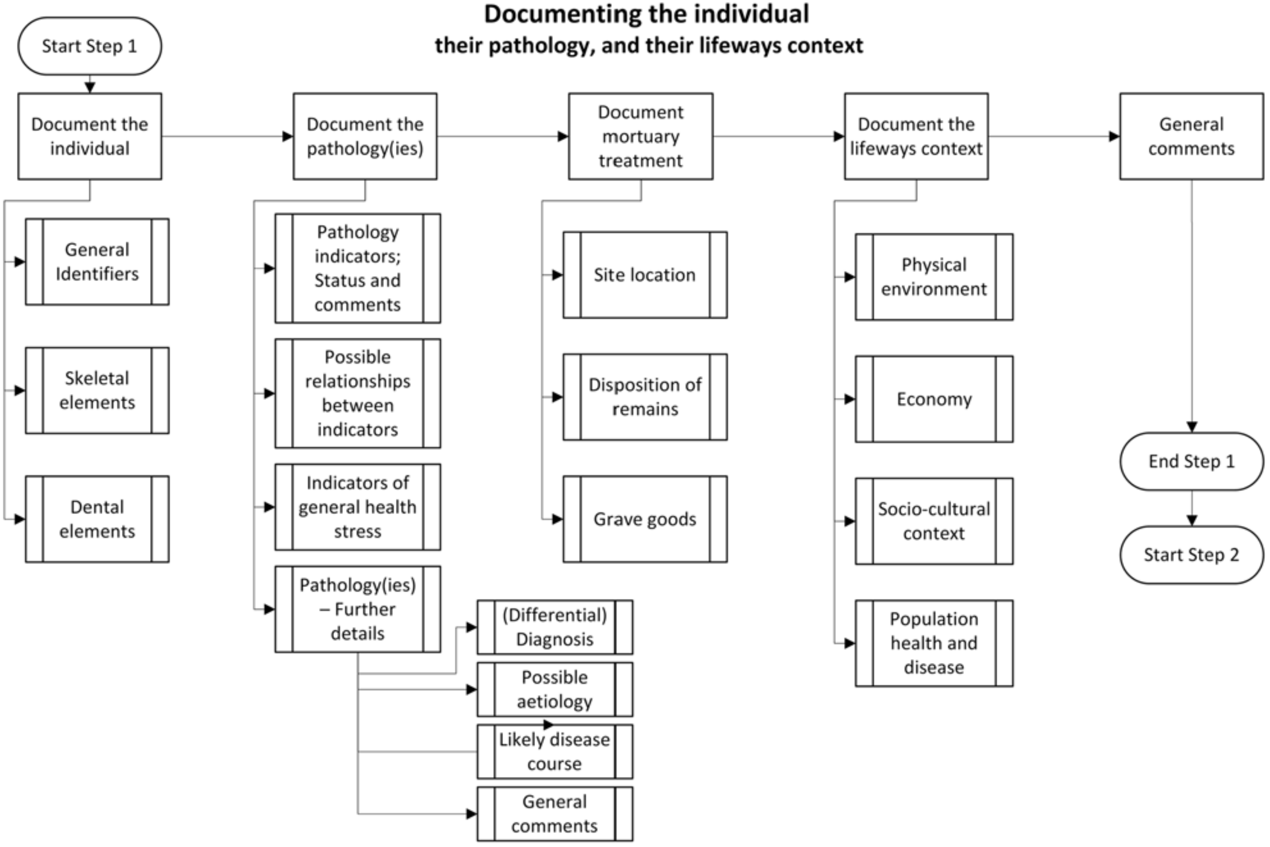
L. Tilley, *Theory and Practice in the Bioarchaeology of Care*,
Bioarchaeology and Social Theory, DOI 10.1007/978-3-319-18860-7



All Index of Care web application workflow diagrams have been produced by Tony and Cameron. The Index of Care (Tilley and Cameron, 2014) is available at www.indexofcare.com

Index of Care Step 1:

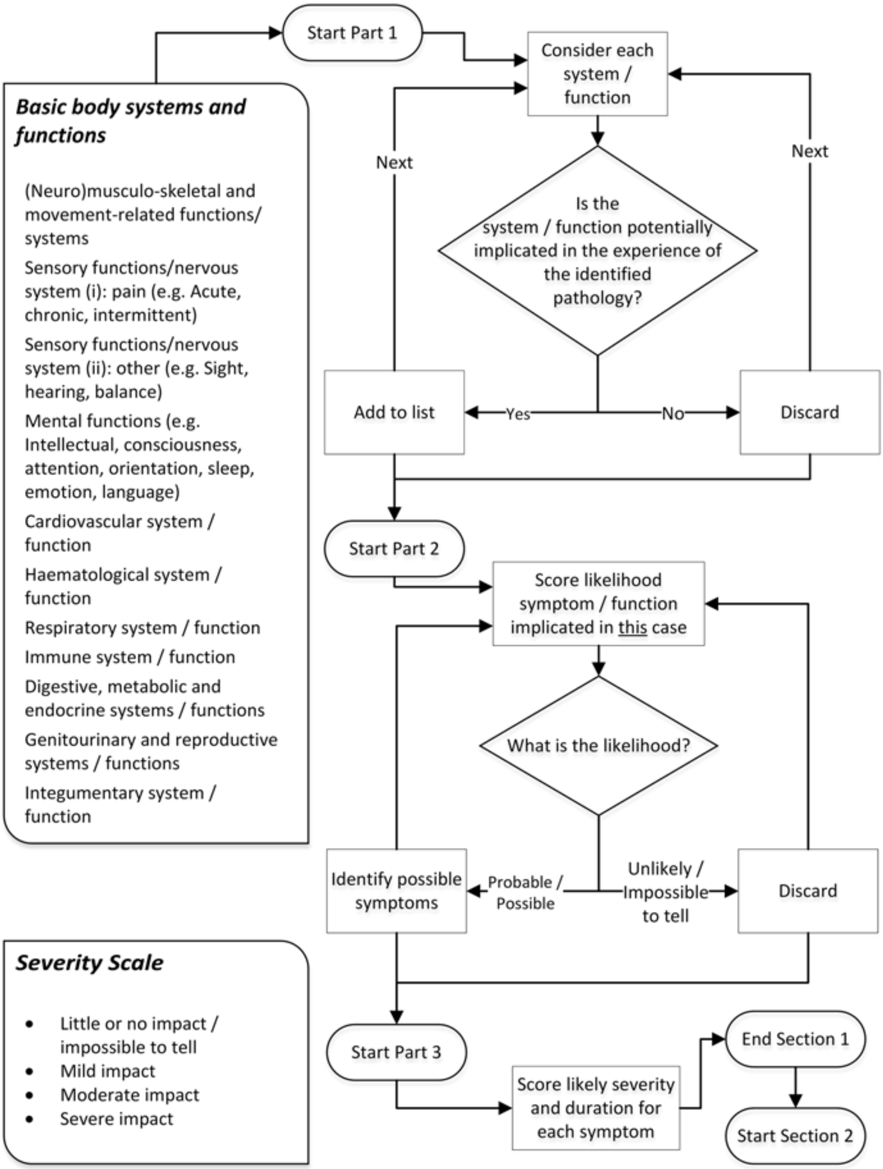
Documenting the individual their pathology, and their lifeways context



Index of Care Step 2:

Establishing the case for care

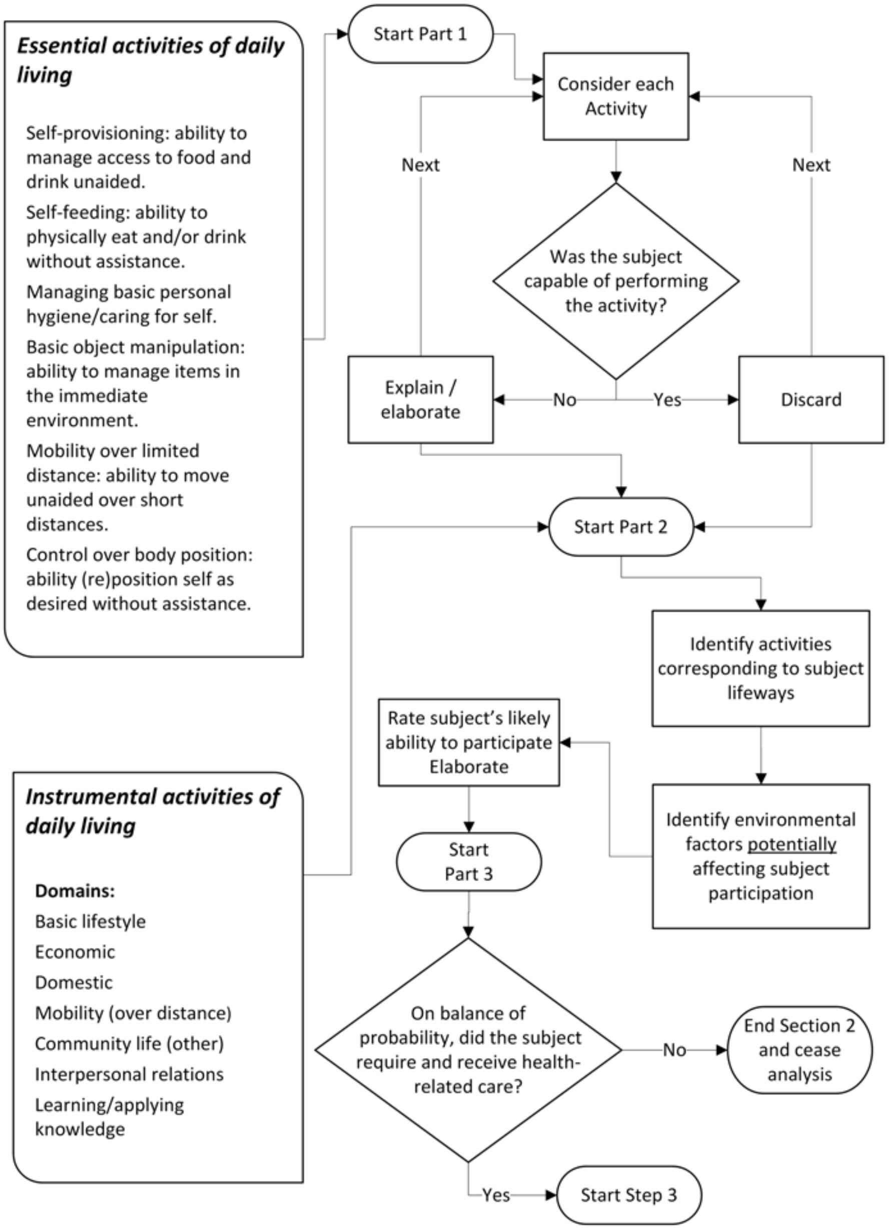
Section 1 - The clinical implications of pathology



Index of Care Step 2:

Establishing the case for care

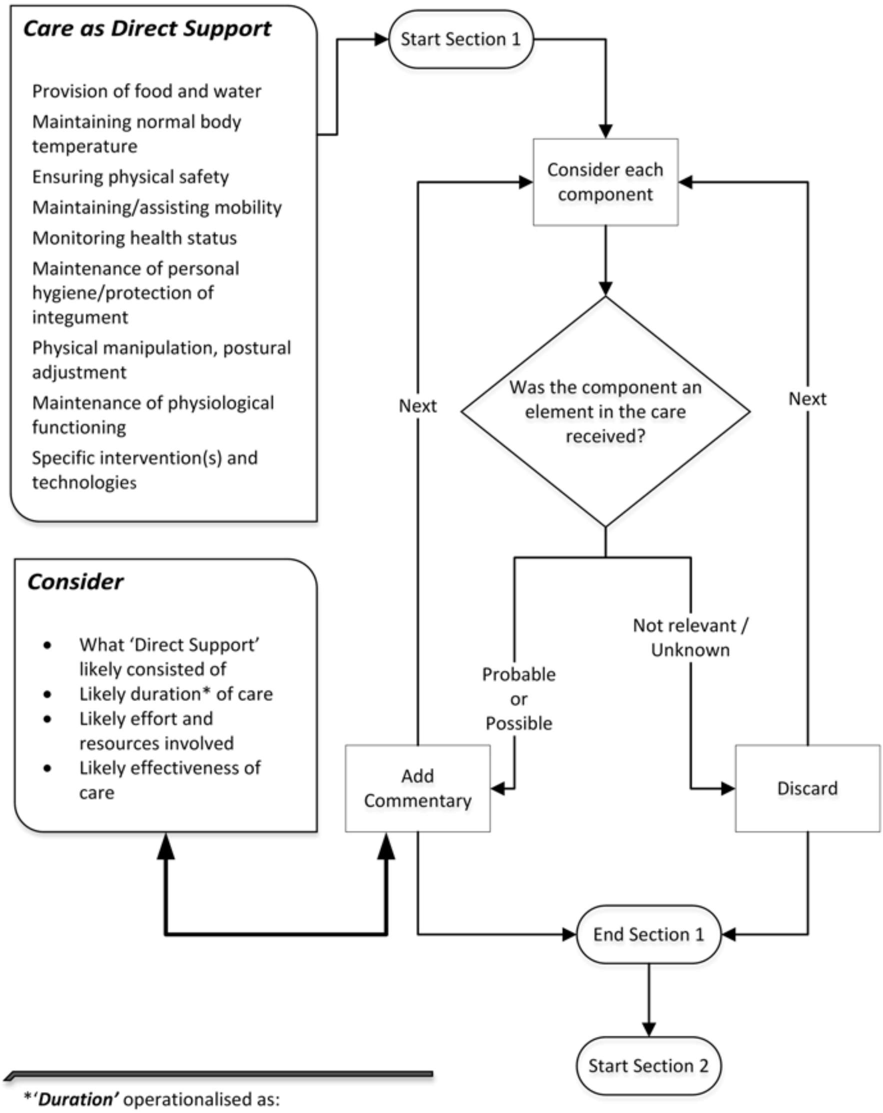
Section 2 - The functional implications of pathology



Index of Care Step 3:

Developing a Model of Care

Section 1 – Care as Direct Support

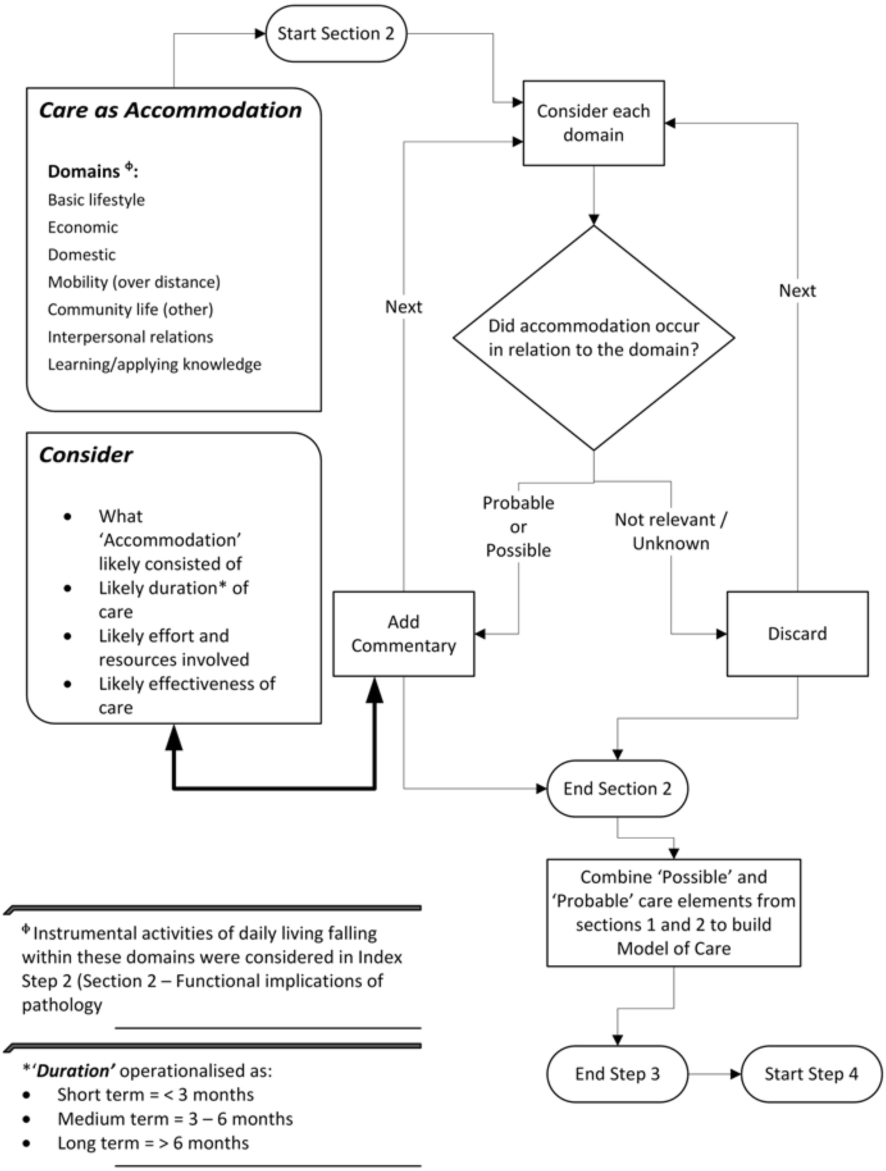


*'***Duration***' operationalised as:
- Short term = < 3 months
- Medium term = 3 – 6 months
- Long term = > 6 months

Index of Care Step 3:

Developing a Model of Care

Section 2 – Care as Accommodation



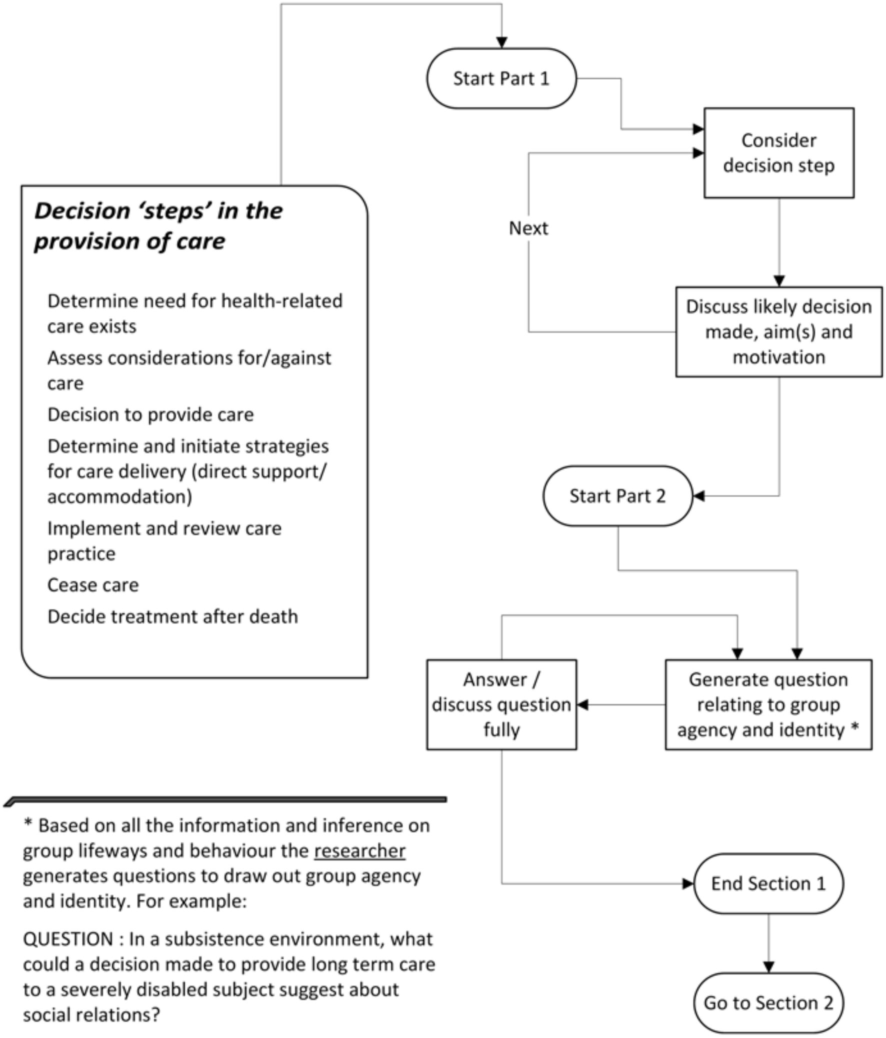
ᶲ Instrumental activities of daily living falling within these domains were considered in Index Step 2 (Section 2 – Functional implications of pathology

*'***Duration***' operationalised as:
- Short term = < 3 months
- Medium term = 3 – 6 months
- Long term = > 6 months

Index of Care Step 4:

Interpretation

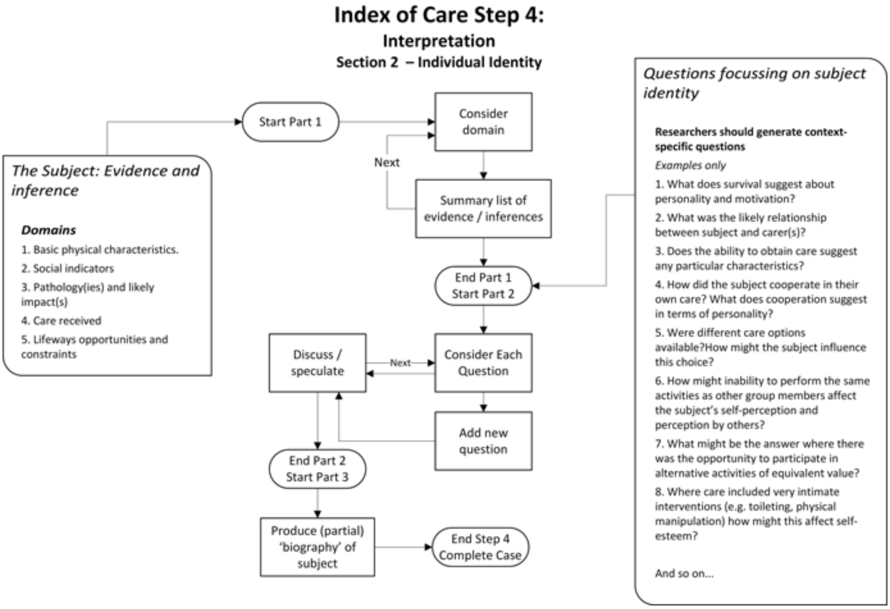
Section 1 – Group Agency



* Based on all the information and inference on group lifeways and behaviour the researcher generates questions to draw out group agency and identity. For example:

QUESTION : In a subsistence environment, what could a decision made to provide long term care to a severely disabled subject suggest about social relations?

DISCUSSION : Reflects cohesive community with strong collective identity - all members 'belonging' and given value? Normative behaviour - duty of care owed regardless of cost - 'dividual' versus 'individual'? and so on …



Domains

1. Basic physical characteristics.
2. Social indicators
3. Pathology(ies) and likely impact(s)
4. Care received
5. Lifeways opportunities and constraints

Researchers should generate context-specific questions

Examples only

1. What does survival suggest about personality and motivation?
2. What was the likely relationship between subject and carer(s)?
3. Does the ability to obtain care suggest any particular characteristics?
4. How did the subject cooperate in their own care? What does cooperation suggest in terms of personality?
5. Were different care options available?How might the subject influence this choice?
6. How might inability to perform the same activities as other group members affect the subject's self-perception and perception by others?
7. What might be the answer where there was the opportunity to participate in alternative activities of equivalent value?
8. Where care included very intimate interventions (e.g. toileting, physical manipulation) how might this affect self-esteem?

And so on...

Reference

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Index

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