Introduction

Reproduction is a key aspect of human biological, demographic, and social life, yet despite its importance and the diversity of behaviors related to reproduction among human populations, it remains a relatively underexplored category in archaeology. Within anthropology more broadly, reproduction is being re-conceptualized to push back against biogenetic, heteronormative, and masculinist assumptions that have dominated scientific thinking about this important aspect of human life. In this chapter, we consider the central problem of how to understand the reproductive strategies, lives, and concerns of humans in the past. Two pressing concerns frame our response. One, what can we know about past reproductive lives given the kinds of evidence available in the archaeological record? Two, we discuss how archaeology can contribute to the unsettling of longstanding assumptions about human reproduction in past societies, considering here both the limits and the possibilities of evidence. To address these questions, we draw from available skeletal and material culture evidence foregrounding what we can know about past reproductive lives and what gaps in our knowledge remain. We begin our chapter by outlining how recent anthropological and feminist theorizing seeks to unsettle conventional thinking about reproduction.

Human reproduction is distinctive; anthropologist Carole Browner reminds us that “unlike other biological beings, [humans do] not simply ‘get pregnant’ and ‘give birth’” (Browner 2000: 773). Rather, and here we paraphrase her extended conceptualization, reproductive biology is always mediated by cultural interpretations, specific material conditions, and diverse social circumstances and relationships, all “typically based on differential access to resources and other forms of power, [which] profoundly shape the institutional and cultural arrangements through which biology, sexuality and reproduction are expressed” (Browner 2000: 773–774). How might this locally situated biocultural approach to reproduction be applied to archaeological evidence? Voss (2008: 320) suggests conceptualizing reproduction as the strategies used in the past for “prevention and the promotion of conception as well as measures taken to interrupt or support the development of the embryo or fetus and to care for the birthing mother and infant before, during, and after delivery.” Importantly, this focus on reproductive management (Voss 2008: 320) includes both having and not having children, and it calls attention to reproduction as caregiving. At the same time, framing reproduction as managing fertility, conception, pregnancy, and
childbearing tends to keep our attention on the biologies and behaviors of women/females. While clearly not Voss’s intent, feminizing reproduction can perpetuate longstanding patriarchal, heteronormative, and biogenetic assumptions which limit reproduction to fertility, gestation, and delivery, reduce males to fertilizers, and privilege childbearing as what women contribute to society (Stone 2018).

Unsettling this narrative means attending to ways in which reproduction is not confined to female bodies, hetero-relationships, or genetic kinship, but is a relational and distributed event (Almeling 2015: 430; Smietana et al. 2018: 122; Tallbear and Willey 2019). Rethinking reproduction means thinking about past forms of authoritative knowledge, or the ideas and skills that get to count in how reproduction was managed (Jordan 1992), and reproductive governance, or “the mechanisms through which different historical configuration of actors … use legislative controls, economic inducements, moral injunctions, direct coercion, and ethical incitements to produce, monitor, and control reproductive behaviors and population practices” (Roberts and Morgan 2012: 243). Thinking about reproduction beyond the biology of individuals also draws our attention to Colen’s idea of stratified reproduction which Ginsburg and Rapp define as “the power relations by which some categories of people are empowered to nurture and reproduce, while others are disempowered” (1995: 3). Recent work in bioarchaeology, for example, highlights how conception extends “backward” to parental life contexts (nutrition, work, toxins) and “forward” beyond delivery to care and rearing of infants and children (Rutherford 2018; Halcrow et al. 2018, 2020). Thinking about reproduction as relational and distributed disrupts the usual biogenetic and matricentric foci and encourages us to consider a broader range of social relationships of exchange, dependence, nurturance, and support that are engaged to conceive, gestate and raise a child. Mindful that human reproduction is always about more than creating children, we need to attend to larger projects and agendas or what Gammeltoft calls the “enactment of social belonging … as people strive to become part of something larger” (2014: 9), be that family, kinship, gender, community, nation. As we discuss in this chapter, applying this new narrative for past reproductive lives is complex and requires researchers to ask new questions about the archaeological record.

**Bioarchaeological evidence of reproduction**

Human skeletal remains from archaeological contexts provide the only direct source of biological data on people in the past from which we might infer aspects of reproduction during the life course of individuals and populations (see also Scott and Betsinger 2018, and Halcrow et al. in this volume). These data are limited to the ways in which reproduction affects, or is thought to affect the skeleton, concerning life history characteristics (e.g., timing of puberty and maturation), parturition, maternal and neonatal mortality, infanticide, breastfeeding, and maternal health. Not all of these data are reliable indicators, however, and their interpretation can be challenging.

**Fertility and reproductive maturity**

Life history characteristics of past populations, such as variation in the timing of puberty and reproductive maturity, can be influenced by ecological and demographic factors that can have impacts on the timing of reproduction in the life course of an individual and fertility at the population level (see Kramer, Veile, and Henry in this volume). The onset of puberty in adolescence marks the beginning of hormone-mediated processes of reproductive maturation and the skeletal growth spurt for both females and males. By the end of adolescence, the majority of
bones in the skeleton have completed their growth and development (Cunningham et al. 2016). Several key skeletal indicators of development are associated with particular phases of puberty and the adolescent growth spurt. For example, the onset of menstruation in females and adult voice characteristics in males occurs about one year after peak height velocity (PHV), and full fertility in women and the adult male muscularity are achieved shortly after the completion of the skeletal growth spurt (Tanner 1973; Marshall 1978). Inasmuch as phases of puberty and the adolescent growth spurt can be detected skeletally, we can make inferences as to the timing of reproductive maturation. The other aspect of reproductive lifespan that we may wish to know about is the timing of menopause; unfortunately, there are no known skeletal indicators specifically associated with the timing of reproductive cessation in women. While the onset of deterioration in bone quality (e.g., trabecular or “spongy” bone thinning) may be indicative of older age, particularly in females (but see Agarwal 2012), it does not directly coincide with menopause.

Shapland and Lewis (2013, 2014) developed a system of assessing puberty status from skeletal indicators associated with phases of the growth spurt (Figure 4.1), including cervical vertebrae

Figure 4.1 Developmental stages of each pubertal indicator in the system proposed by Shapland and Lewis (2013, 2014) with the pubertal growth spurt. The stages of each indicator are: Mineralization of the mandibular canine stages F = Demirjian stage F, G = Demirjian stage G, G/H = intermediate between Demirjian stages G and H, H = Demirjian stage H; ossification of the hook of the hamate stages G = hook undeveloped, H = hook appearing, H.5 = hook developing, 1 = hook complete; fusion of the hand phalangeal epiphyses, and distal radius epiphyses stages U = unfused, PF = partially fused, F = fully fused; ossification and fusion of the iliac crest epiphysis stages U = unfused epiphysis, OU = ossified but unfused epiphysis, PF = partially fused epiphysis, F = fully fused epiphysis; cervical vertebrae maturation (CVM) stages 1 = initiation, 2 = acceleration, 3 = transition, 4 = deceleration, 5 = maturation, 6 = completion. For a full description of the stages, see Shapland and Lewis (2013, 2014). Source: Reprinted from Arthur et al. (2016). “Coming of age in Roman Britain: Osteological Evidence for Pubertal Timing.” American Journal of Physical Anthropology, 159, 698–713, with permission of John Wiley and Sons.
Conceiving of reproduction in archaeology

maturation, ossification and fusion of the iliac crest, fusion of the distal radius and hand phalangeal epiphyses, ossification of the hook of the hamate, and mineralization of the mandibular canine (Shapland and Lewis 2013, 2014). When assessed at the population level, the pattern and timing of these features can be used to estimate whether puberty and adult reproductive maturity occurred early or late, and the speed and duration of peak height velocity of the growth spurt. The system has been applied to several skeletal samples, mostly in Romano-British or medieval/post-medieval England (Shapland and Lewis 2013, 2014; Lewis et al. 2016a, 2016b; Arthur et al. 2016), but also Bronze Age and eleventh- to thirteenth-century Spain (Doe et al. 2019a, 2019b), and early twentieth-century Portugal (Henderson and Padez 2017). All of these studies found that for both girls and boys the onset of puberty was delayed to varying degrees, and the duration of the skeletal growth spurt was extended relative to modern reference standards. In general, these results were interpreted as indicating that ecological conditions, such as nutritional deficiencies, infectious disease load, and/or workloads led to delayed ages of reproductive maturation relative to recent populations. Lewis and colleagues (2016b) advocate that the pattern of delayed and extended puberty can shed light on the nature of adolescence and extended periods of social transition in medieval-period Britain. However, Doe and colleagues (2019a) point out that the consistency of these patterns across skeletal samples suggests that the trends may be due to methodological artifacts (e.g., skewed distributions of estimated ages at death), or the inherent limitations of working with skeletal samples (e.g., the Osteological Paradox noted by Wood et al 1992). Nonetheless, the work of Lewis and colleagues is promising and further research may allow bioarchaeologists to create more refined links between biological indicators of reproductive maturity and environmental and socioeconomic factors.

Parturition scarring and parity status

To be able to determine from her skeletal remains whether an individual had been pregnant or gave birth during her life would provide valuable information about fertility in the past. Since the early twentieth century, researchers have been looking for such skeletal markers, called parturition scars, on the bones of the pelvis (for a history of this research, see Uberlaker and De la Paz 2012). The premise is that the additional weight of carrying a full-term fetus and the relaxing of pelvic ligaments and the forces acting on the pelvis during childbirth can lead to pitting around the sacroiliac joints (preauricular sulcus) or the posterior body of the pubic bone (dorsal pits) and extension of the pubic tubercle. But, do these features actually reflect parity status, or might other factors produce similar markers? Many studies have tested various features; few have found support for them. In skeletal samples with known parity, dorsal pitting and preauricular sulcus form have not been predictive of parity, but more strongly associated with body or pelvic size, and found on males as well as nulliparous females (Decrausaz 2014; Maass and Freidling 2016; McHadden and Oxenham 2018). Maass and Friedling (2016) suggest body weight and pelvic stability may be better explanations for these features and that an increased need for ligamentous stabilization of pelvic joints is more significant in females. This is supported by McFadden and Oxenham’s (2018) finding that dorsal pitting was a weak predictor of sex, though not parity.

Following their extensive review of the literature to date, Ubelaker and De la Paz (2012) conclude that while pregnancy and childbirth may generate bony changes to the pelvis, other factors can produce similar features. They also note that changes within and among populations to practices of child birthing and obstetrical care may mean that relationships between skeletal markers and parturition from one context may not be applicable in others. Therefore, while documenting the parity status of females in the past may be desirable, we do not currently
have the tools to do so, and the evidence suggests it may not ultimately be possible. Recently, Igarashi and colleagues (2020) did find a relationship between the degree of development of the preauricular sulcus and the total number of pregnancies and parturitions in females in a modern Japanese anatomical sample. Using this method, the authors estimated fertility in Japanese archaeological populations, concluding that fertility decreased between the Jomon (4,000–2,000 years BP) and Yayoi (2,000 BP). While this method has yet to be tested elsewhere, it raises the possibility that improved categorization of parturition scarring morphology and statistical design may enable archaeologists to assess aspects of fertility in past populations and the influence of changing social and environmental contexts on reproductive choices, though Ubelaker and De la Paz’s critiques may still apply.

**Death in childbirth**

Identifying cases of maternal or neonatal death in childbirth in archaeological skeletal samples has the potential to be informative about obstetric-related risk in the past (Pfeiffer et al. 2014; see also Trevathan and Rosenberg and Dunsworth in this volume). Gestational age at death for infant skeletal remains can be relatively accurately estimated allowing the identification of perinatal mortality (death around the time of childbirth) (Cunningham et al. 2016; see also Scott and Betsinger in this volume). However, whether the infant died in childbirth, or within a few weeks post-childbirth, and from what cause cannot usually be determined. The presence or absence of perinatal remains raises questions not only about the circumstances of mortality, but also sociocultural meaning and practice (see Mitchell 2016 for a contemporary perspective). Finding clear cases of maternal mortality has also proven challenging. The presence of fetal remains buried with a female skeleton is not, on its own, secure evidence of death in childbirth. In a relatively rare phenomenon known as coffin birth (postmortem fetal extrusion), a fetus is fully or partially expelled from the mother after death as a result of putrefaction gas pressure against the uterus, which can be mistaken for death in childbirth, though this generally occurs only with pre-term fetuses given their smaller size (Schulz et al. 2005). Lieverse and colleagues (2015) report fewer than 20 clear cases of death in childbirth in the archaeological literature since the 1970s. Their case of an early Neolithic burial (8,000–7,000/6,800 BP) from Lake Baikal, Siberia, provides a rare example where death in childbirth is diagnosable, here of a woman with twins. Evidence comes from the breech position of one of twins, while the other was still in utero at burial. Coffin birth tends to occur only with fetuses in the vertex position (Schulz et al. 2005; Lieverse et al. 2015). A similar full-term breech position death in childbirth comes from Neolithic southern Vietnam (c. 4,100–3,050 BP), documented by Willis and Oxenham (2013). The mother’s small stature and contracted pelvic canal are good skeletal evidence of physiological stress during her childhood that may have compromised her skeletal growth, leading the authors to suggest that even if the fetus was not breech, successful childbirth may have been difficult. This study highlights how reproduction is deeply shaped by broader contexts across the life history and beyond the body of individuals.

The clearest examples of maternal and neonatal mortality in an archaeological sample come from the mummified remains from Arica, Chile, dating to 3,300–1,400 years BP (Arriaza et al. 1988). As these are mummified, Arriaza and colleagues found unambiguous evidence of death in childbirth, including fetal heads still present in the birth canal, and placenta buried with the mother. In total, 128 female mummies were examined, 18 (14%) of which died from childbirth-related complications. The majority of these (15 of 18) were estimated to be older than 25 years of age at death, suggesting this was not likely an issue of death at first birth. Cases of mummified remains are rare in the archaeological record, and given the paucity of documented cases of
death in childbirth from skeletal contexts, reconstructing rates of maternal or neonatal mortality in childbirth in the past will remain a challenge. This lack of observable data, in turn, limits our ability to trace unequally distributed risks and ways in which mother–infant contexts were variable and impacted birthing outcomes and reproductive successes.

Demographic parameters of a skeletal assemblage have also been used to estimate the rate of maternal mortality. A skeletal assemblage biased with an excess of young females of about 20–30 years of age, when they might be expected to have their first experiences of childbirth, is interpreted as evidence of high maternal mortality. However, as Stone (2018) points out, the assumption that excessive young female deaths indicate maternal mortality has not been tested. Further, given the age distribution of maternal deaths in the Arica mummies, maternal mortality is not necessarily limited or even more common with first births. Numerous challenges remain to using bioarchaeological evidence to demonstrate the distribution of maternal mortality across a population.

Infanticide

One documented method of controlling reproduction has been infanticide, whether by the mother, father, or another community member (Dickemann 1984). Detecting infanticide in skeletal assemblages is not easy, since aside from instances of violent trauma affecting the skeleton (Abel 2011), no skeletal evidence of the cause of death remains. Bioarchaeologists have instead used the age-at-death distribution of infant burials to infer contexts of infanticide. In a comparison of age-at-death profiles of infant burials from British sites, Mays (1993) documented a peak at the full-term (38–41 weeks gestation) age range in Roman sites that was not seen in medieval sites. Mays interpreted the unusual number of full-term perinatal deaths as suggestive of a regular occurrence of infanticide in the Roman period. Gowland and Chamberlain (2002) later criticized this conclusion, arguing that the age-at-death distribution was an artifact of the age estimation methods used, and that when using a Bayesian approach to age estimation, the distribution of ages is broader, and more consistent with expectations where stillbirths are given burial rites as well as neonates. Further, Gowland and Chamberlain point out that stillbirths are given burial rites as well as neonates. Regardless, this discussion illustrates the methodological and statistical challenges of interpreting demographic data as evidence of infanticide in the past. If, for example, the sex of the interred individuals could be determined, then it might be possible to use sex-based patterning to test infanticide as a hypothesis. However, sex cannot be estimated from fetal remains except in cases where DNA tests have been conducted (e.g., Teschler-Nicola et al. 2020). Even in cases where infanticide can be established with relative certainty, the practice may not be related to reproductive management, although arguably its impacts are the same.

More recently, Booth and colleagues (White and Booth 2014; Booth 2016; Booth et al. 2016) have developed a method to differentiate stillborn from short-lived infants by examining bone diagenesis for evidence of bacterial bioerosion. If we can separate stillborn from short-lived infants, we may be able to differentiate between interpretations like that presented by Mays from that of Gowland and Chamberlain. Bacterial bioerosion, or destruction of internal bone microstructure through the action of environmental bacteria, is the most common form of diagenesis seen in archaeological skeletal remains (Booth 2016; Booth et al. 2016). Several studies have identified endogenous gut bacteria as one of the main sources responsible for this process (Jans et al. 2004; White and Booth 2014; Booth 2016). After the death of an individual, the gut bacteria spread via the circulatory system, ultimately accessing the bone microstructure
Booth and colleagues (White and Booth 2014; Booth 2016; Booth et al. 2016) have proposed that since many infant skeletal remains with estimated ages-at-death of less than one month show a lack of bacterial bioerosion, this may be evidence that the infant never fully developed their gut microbiome and were therefore stillborn or short-lived. The development of the osteolytic component of the gut microbiome is heavily dependent on the ingestion of the mother’s colostrum (Booth et al. 2016) suggesting these infants may not have been breastfed. While the data on microbial bioerosion alone will not identify victims of infanticide, the presence of infant skeletal remains with and without such bioerosion may be indicative of differential treatment in the first weeks of life that may support such an interpretation. When combined with other lines of evidence, such as stable isotopic data indicating a breastfeeding signal (see following discussion), clearer determinations of birth survival may be possible (Siebke et al. 2019).

Ethnographically, we know that factors influencing an infant’s risk of death by infanticide include birth order and timing, number of surviving siblings, sex, illegitimacy, deformity, twinning, illness, having a “difficult” personality, and being “unattractive” (Brewis 1992). In her study of infanticide among the Classic Maya, however, Ardren (2011), argues convincingly that it is the high social capital of infants and young children that leads to them being sacrificed to the gods. It is also important to note that infanticide is not only about the infant, but may point to different stresses on the birthing individual and family.

**Weaning**

From a life history perspective, average age at weaning is an important indicator of fertility since an earlier age at weaning reflects shorter interbirth intervals and therefore faster population-level reproduction (see also Halcrow et al. in this volume). Attempts to determine age at weaning from human skeletal remains have long focused on stable isotope analysis. Ratios of certain stable (i.e., non-radioactive) isotopes of carbon ($^{12}\text{C}$:$^{13}\text{C}$), nitrogen ($^{14}\text{N}$:$^{15}\text{N}$), and oxygen ($^{16}\text{O}$:$^{18}\text{O}$), among others, can provide a picture of diet in past populations, since light (e.g., $^{12}\text{C}$, $^{14}\text{N}$, $^{16}\text{O}$) isotopes are utilized in different proportions relative to heavy isotopes ($^{13}\text{C}$, $^{15}\text{N}$, $^{18}\text{O}$) in various chemical and physical processes, including the production of bone and dental tissues (for a recent review, see Katzenberg and Waters-Rist 2019). Nitrogen has been a particular focus in weaning studies as it provides evidence of trophic level, and a breastfeeding infant is at a higher trophic level than the mother. As infants begin to wean with the introduction of complementary foods into their diet, their nitrogen signatures are expected to decrease towards maternal signatures. While mother–infant dyads are rarely identifiable in an archaeological assemblage, average nitrogen signatures of infants at given ages relative to average adult nitrogen signatures can be used to identify an age of weaning for a population. Carbon signatures work in a similar way, particularly where the weaning food is a C4-plant, such as maize, while oxygen signatures reflect drinking water sources of the mother, with breastmilk showing an enrichment of the heavier $^{18}\text{O}$ isotope (Katzenberg and Waters–Rist 2019).

While the use of stable isotope analysis to investigate weaning in past populations is widespread, several limitations have been identified. A key issue is that the infants being examined represent the portion of the infant population that failed to thrive. They may not represent the general “healthy” population of infants, as $^{15}\text{N}$ may be elevated under nutritional or physiological stress (Reynard and Tuross 2015; Beaumont et al. 2018; Siebke et al. 2019). Beaumont and colleagues (2015, 2018) demonstrate that nitrogen signatures of bone tissue from infant skeletal remains are not a reliable indicator of breastfeeding or weaning. Since dental tissues (enamel and dentine) that form during the infant period will reflect the diet at that age, one solution is to examine dental tissues from adults rather than infants (Beaumont et al. 2018;
Katzenberg and Waters-Rist 2019). The crowns of permanent dentition begin forming around birth, with the first molars, and continue until early adolescence (third molars or “wisdom teeth”), allowing for changes to isotopic signatures across infancy and childhood to be investigated. The use of carbon and oxygen signals may also serve to support nitrogen-based evidence for weaning times (Beaumont et al. 2018; Katzenberg and Waters-Rist 2019). Weaning times allow bioarchaeologists to estimate interbirth intervals which are related to fertility and population growth, and the number of pregnancies a mother has in her lifetime (on a population level). They are also an avenue for exploring demands on maternal labor and access to support from those in her community. Furthermore, while weaning does indicate a return to fertility and shift in infant and maternal nutritional demands, it is also a transition in infant caregiving, potentially away from the body and labor of the lactating individual to include other family/community members.

**Maternal health**

Fetal and infant growth and development are in large part determined by the gestational and breastfeeding environments provided by the mother, which are in turn reflective of maternal physiological condition over her entire life course, not just during pregnancy (Wells 2010). The neonatal skeleton can therefore be informative about general maternal health (Gowland 2015) as well as the larger social and material contexts in which individuals are maturing, pregnant, and lactating. Neonates who fail to thrive may do so because of competing energy demands on the pregnant or lactating individual (Wells 2018), which again may be an indicator of the social and economic supports available to her. While in a skeletal assemblage the identification of mother–infant dyads is rarely possible, high infant deaths may be indicative of compromised maternal health in the population. Physiological stress during gestation and infancy can also leave signatures on the skeletons that persist throughout life. For example, enamel hypoplasias (disruptions of enamel formation that appear as lines or pits on tooth crowns) on deciduous (“baby”) teeth that form during fetal development can tell us about the gestational environment, while crowns of permanent teeth that begin forming around birth can tell us about the lactational environment. The growing literature on the Developmental Origins of Health and Disease (DOHaD) also highlights the intergenerational effects of nutritional and physiological stress, much of which is mediated through pregnancy and lactation (e.g., Wells 2010, 2018; see also Thayer and Gildner in this volume). Gowland (2015) provides a recent review of the relevance of the DOHaD perspective for bioarchaeology and the mother–infant nexus in particular. If we can reconstruct population-level maternal health across two to three generations (i.e., grandmaternal health) then, in conjunction with information on weaning, we may be able to extrapolate from these data to reproductive stresses acting on the larger population. This in turn provides an avenue for archaeologists to explore the cultural strategies employed to mitigate these stresses.

From this overview of bioarchaeological investigations of reproductive life histories, it is clear that while there are some aspects that we can explore through the human skeletal record, others are likely beyond our reach, and no lines of evidence are without limitations. We can examine the timing and duration of puberty and weaning with some degree of confidence; stillbirths and the treatment of neonates in terms of infanticide are likely to become more visible with new methods of analysis; and maternal health is to some degree visible at a population level. However, rates of death in childbirth are more difficult to determine, making it hard to ascertain if reproduction by some groups was socially valued and supported more than others. Solid evidence that a woman was pregnant or gave birth during her lifetime remains elusive.
One of the most glaring questions, of course, is where in all of this are the fathers who Inhorn et al. (2009) refer to as the “second sex” of reproduction (see also Gray et al. and Powis in this volume). Men as spouses, fathers, and other influential kin are often frustratingly invisible in the archaeological record. A biogenetic view paradoxically represents males as active (versus passive potentially pregnant females), but also reduces men to fertilizers (Stone 2018). Dudgeon and Inhorn (2004) highlight the significant role of males as fathers and partners, and their considerable influence on maternal health, the outcome of childbirth, and access to resources (e.g., care, transportation). Aside from the potential to understand puberty and maturational timing, there are no known biological indicators of reproduction in males to be gathered from the skeleton. Even fetal or infant health is not directly relatable to the paternal condition in any clear-cut manner. “Absent fathers” from the same archaeological sites are made partially visible via skeletal data that indicate their general health, mortality rates, and other demographic trends, yet we rarely, if ever, consider these data in the context of reproduction. Even in cases where adult males are buried with infants and children (e.g., Orschiedt 2018) authors rarely speculate on the relationship that might have existed between the two individuals whereas adult females buried with similarly aged subadults are regularly assumed to be their mothers.

Material culture evidence of reproduction in the past

Objects are not simply the byproducts of human behavior, but rather they are part of broader assemblages of knowledge and relationships which help to constitute a way of knowing and being in the world. The visually impaired person’s cane transforms the tactile and auditory into the visual. The sound when a stone toolmaker strikes an inclusion (imperfection) in the stone changes what she knows about the material and dictates her subsequent actions. An order written on a Post-It note carries less weight than one written on legal letterhead. The affordances (properties) of objects allow for certain behaviors and not others. In a very real sense then, objects have agency and through this agency, they mediate social relations and materialize performance (Johnson 2019).

Much of what constitutes reproductive management leaves few or no traces in the archaeological record outside of bioarchaeological data. Other behaviors, relationships, and ways of moving through the world, however, do have material correlates. Archaeologists draw on a robust body of theory and method to connect static objects in the present to dynamic systems in the past. Nonetheless, they are often faced with the challenges of understanding the meanings, knowledge systems, and relationships in artifact assemblages when they may only have the object devoid of its larger context.

One example relevant to the discussion here concerns the artifact known as the “Venus” figurine. Two to three hundred of these iconic female figurines are known from the European Upper Paleolithic (c. 45,000–10,000 years ago) and they are constructed from a variety of materials including mammoth ivory, stone, bone, and clay (fired loess). While they often lack facial features, the figurines have pronounced and/or detailed secondary sexual characteristics such as large breasts, rounded hips, and detailed mons pubis, very anterior portion of the vulval cleft, and lower quadrants of the abdomen (Chang et al. n.d.) Based on a stereotyping of these figurines and assumptions that there were only two functions for women’s bodies in the past, the most popular explanation for these figures is that they represent Ice Age pornography and/or fertility symbols (Nowell and Chang 2014). However, the corpus of Upper Paleolithic figurines includes human males, females and children, animals, and fantastical creatures. They are found in pottery kilns, burials, ritualized pits, and middens (trash heaps). Some figurines have been hafted while others with perforations were clearly worn as pendants. In Western Europe, some—includ-
ing male examples—are (famously) nude while in Siberia sculptors skillfully depicted hats and hoods, fur overalls, hooded parkas, belts, fur boots, bracelets, bags, and even a backpack with two straps (Lbova and Volkov 2015, 2017). Taken together, the sheer variety of Upper Paleolithic figurines over time and space suggests that while it is possible that some functioned as fertility symbols, it is highly unlikely that they all did. When researchers assume the meaning of an artifact is obvious, i.e., the objects “speak for themselves” and meanings are “clearly” about sex or fertility, they shut off lines of scientific inquiry and they risk situating and authenticating values of the present in the past (Joyce 2008; Nowell and Chang 2014).

While a comprehensive review of the material culture associated with the history of human reproduction is beyond the scope of this introductory chapter, we review major categories of artifacts and features that can be used to study reproduction.

**Weaning technologies**

From a biological perspective, weaning age in humans is largely dictated by the nutritional demands of an infant’s rapidly developing brain, though it is clear that many cultural factors also influence when non-breastmilk foods are introduced and by whom (Dettwyler 2004). Weaning technologies in the archaeological record can indicate both the availability of foods that provide sufficient protein, calories, and key micronutrients for the growing infant and the caregiving aspects of reproduction. For example, archaeologists have uncovered Neolithic evidence of small spoons made from cattle bone that bear children’s teeth marks, suggesting that gruel was an important weaning food (Štefanović et al. 2019). Infant feeding vessels are found at sites throughout central Europe; the earliest examples date to the Neolithic (7,500–6,800 BP) but they become more common during the Bronze and Iron Ages (Dunne et al. 2019). These small clay vessels come in a variety of shapes including mythical animals with feet (Figure 4.2). Each has a spout from which liquid can be poured or suckled. Residue analysis conducted on three vessels confirmed that they had once contained the milk of a cow, sheep, or goat. While it is possible that these vessels were used to feed ill or incapacitated adults, their small size, whimsical appearance, and placement in subadult graves lend credence to the hypothesis that they were used to wean and feed children (Dunne et al. 2019; see also Halcrow et al. in this volume). Similarly, spouted vessels are known from fifth-century Greece, and while a variety of interpretations have been advanced for their use, a terracotta figurine of a seated woman feeding a child on her lap from one of these vessels further supports the interpretation of these vessels as infant feeding apparatuses (Carroll 2018).

**Birthing houses and related structures**

Birthing structures or other spaces designated as birthing places are of interest to archaeologists because they indicate the movement of birth beyond the body of the pregnant individual and everyday living areas to those spaces and relationships associated with particular knowledge, practices, and skills. For example, in medieval Europe, four to six weeks prior to delivery, aristocratic women went into confinement in a darkened bed-chamber fitted with luxurious cushions and bedding and specialized clothing and equipment. Illustrated manuscripts from this period support the characterization of this room as a “feminine space” with the mother supported by a midwife and female friends and servants (Gilchrist 2012). However, these illustrations are from books “that were often owned by women, but were mostly commissioned, produced and given by men” (Gilchrist 2012: 139). Therefore, the social context in which these images were produced and consumed may speak to idealized births and the concerns of aristocratic men.
who were invested in ensuring the continuation of their lineage (Gilchrist 2012). Nor do these manuscripts indicate the distribution or specialization of knowledge, support, and material culture for birthing in non-elite households.

The birth process

While in later periods, medical instruments related to birth and delivery are important material correlates of the birth process, little is preserved in the archaeological record of earlier periods.
One window onto this process is visual depictions of women in the act of giving birth. For example, according to Carroll (2018), beginning in the fourth century BC, in funerary contexts, staele and later reliefs and funerary paintings depicted the aftermath of deliveries that appear to have ended tragically. Emphasizing the importance of social support in the birth process (see also Searcy and Castañeda in this volume), she writes,

In all these scenes, the collapsed and seated parturient, disheveled and exhausted from her ordeal in giving birth, or attempting to do so, is supported and helped by one or two other women; very occasionally, the husband is part of the scene.

(Carroll 2018: 33)

In some instances, birth attendants adopt mourning poses and in another, a male figure buries his head in his hands. In another relief, it is a midwife who is being commemorated. She is surrounded by four children of different ages symbolizing the children she has helped to bring into the world (Carroll 2018). Reproductive struggles and losses memorialized in these ways may indicate their emotional and social significance beyond the individual and immediate family.

**Authoritative knowledge**

Through material culture, archaeologists reconstruct what types of knowledge get to count in how reproduction is understood and managed. For example, medieval gynecological texts such as *The Sekeness of Wymmen* and later sixteenth-century manuals for midwives provided detailed instruction on such matters as the use of natural herbs and preferred birthing methods (Gilchrist 2012). By the eighteenth century, these texts were increasingly being challenged and, in some contexts replaced, by claims of science, the writings and practices of physicians, and emerging political concerns about reproduction and “population quality” (Jordanova 1995). Related artifacts that speak to knowledge systems and beliefs are artifacts such as talismans, fertility charms, occult items, and textual amulets that formed part of medieval birthing kits that were handed down within one family for generations (Gilchrist 2012). These and other items suggest the importance of magical and spiritual forces as influential knowledge brought to bear on reproduction, knowledge that may or may not have been accessible by all.

**Reproductive practices**

Reproduction, as broadly conceived, involves more than sexual intercourse and the management of individual fertility. It also includes, for example, the social distribution of access to resources that influences when, how, and which children are produced and, of course, the associated meanings and experiences of reproduction. Concepts such as stratified reproduction and reproductive governance have been explored by archaeologists through textual evidence and material culture. For example, Baxter (2019) argues that childbearing was considered an act of defiance among enslaved peoples living on nineteenth-century plantations in the Bahamas when successful reproduction was not encouraged by their masters. Conversely, Wilkie observes in other contexts of enslavement, “many women chose to avoid becoming mothers. Birth control and abortion provided means of resisting planter attempts to control African-American reproduction while also saving the next generation from a lifetime of hardship” (2003: 60). Similar issues are raised in archaeological studies of brothels. In the course of the excavation of an eighteenth-century tenement building in New York City known at the time to be a “house of ill repute,”
archaeologists uncovered the remains of full-term twins in one privy and a 15–20-week-old “quickened” fetus in another. These discoveries permitted archaeologists to “trace changes in American social and legal attitudes regarding infanticide, abortion, and prostitution and explore the difficult choices faced by working women in New York City from the colonial period to the middle of the 19th century” (Crist 2005: 19).

Discussion and conclusion

The limitations of skeletal evidence from the bioarchaeological record to inform us about reproduction and reproductive strategies, as noted above, suggest we may not be able to answer key questions. For example, while we may be able to detect variation in the timing of puberty and reproductive maturation, parity itself may be undetectable from skeletal markers. However, taking a life history approach to these data, in combination with archaeological data on the ecological and behavioral contexts of past populations, may allow us to draw more conclusions. Life history examines the allocation of a finite energy supply across the lifespan to different biological functions—growth, maintenance, reproduction, and defense (immune function, predator defense). Energy allocated to one function, cannot be reused for another. This energy allocation strategy is shaped by natural selection, but also can be altered via biological plasticity and behavior, meaning the timing of life course processes such as puberty, reproduction, and weaning, as well as the number of and investment in offspring, can all be affected rapidly in response to ecological conditions. Wells and Stock (2020) have recently proposed that a life history perspective can provide valuable insights into how niche construction can influence demography, health, and growth, all of which ultimately relate to reproduction.

How can archaeological and bioarchaeological data be used from a life-history perspective? The goal is to utilize various lines of evidence to understand energy allocation strategies in ecological contexts while also recognizing that energy allocation in humans is always culturally and socially mediated. For example, a secular decrease (consistent over time) in risk of mortality has been associated with an increase in adult stature over time (Wells and Stock 2020). An earlier onset of puberty and reproduction has been associated with resource stress during growth. Early maturation means less energy allocated to growth and a potentially longer period of the life cycle in which the individual is both engaged in and managed by cultural ideas and social expectations regarding reproduction. Is this detectable in reduced statures associated with evidence of early maturation in the skeletal record? Other skeletal evidence for physiological stress (resource availability, infection disease load, physical activity) may also correlate with stature and maturation timing. As well, the growth of distal limb segments (bones of the forearm and lower leg) has been shown to be disproportionately responsive to resources stress, resulting in differences in adult body proportions (distal limb lengths relative to stature) (Pomery et al. 2012), which could provide additional evidence for resource allocation strategies. Further, shorter interbirth intervals as evidenced by earlier weaning, something which is detectable in the skeletal data, are associated with higher external mortality risks (Wells and Stock 2020). Archaeological data on the ecological and social contexts may help to interpret early weaning as a response to resource, demographic, or social pressures. While the accurate detection of parity from the skeleton of individual women may not be possible, population-level fertility and behaviors to control reproduction may be interpreted from rates of infant mortality. Approaching past perinatal mortality in the context of diverse sorts of capacities, risks, and stressors shaping reproduction forces us to rethink infant status/identity and social value as well as the unequal capacities of individuals, families, and community to provide care (Scott and Betzinger 2018).
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Stone (2018: 178) writes, “skeletal analysis of reproductive-aged females [should] include a larger set of data points … [so they are] seen as active participants in their communities as mothers, laborers, providers, and even protectors, and not just pregnant and dead.” Thinking bioculturally about the archaeology of reproduction requires researchers to think of life history and energy allocation as socially and culturally mediated, of potential impacts of unequal access to material and symbolic resources, and of individual bodies within complex contexts in which reproduction is one of multiple aspects of being. This approach may not always be quantifiable, but its inclusion in rethinking reproduction is critical. Certainly, the presence of material culture and especially visual and textual records facilitates this thinking, but we shouldn’t preclude its relevance for contexts and times where those artifacts are absent. A key challenge here is for researchers to examine their own assumptions about what reproduction is, who it involves, and where it occurs.

Note

1 Archaeologists universally refer to this entire region of the figurines as the “vulva” but, in fact, the vulva itself is not depicted (Chang et al., forthcoming.).

References


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