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Investigating social status using evidence of biological status: a case study from Raunds Furnells

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This paper combines an analysis of social status and biological status within late Anglo-Saxon cemetery populations in order to illuminate how burial was used for social display in Christian cemeteries. It relies on recent re-evaluations of late Saxon mortuary ritual, which emphasise variability in burial rites and grave elaborations, and which suggest that funerary display did not cease after the eighth century, as has sometimes been implied (Buckberry 2007; Hadley 2000a; 2004; Thompson 2004). This recent acknowledgement of social expression in the later Anglo-Saxon burial record allows inferences to be made about social status and society. The concepts of biological status used here were developed in the 1930s (Selye 1936), but not introduced into archaeological contexts until the 1980s, largely in studies with an economic focus (e.g. Cohen and Armelagos 1984). The combined analysis of the biological and social statuses of individuals within a community can greatly enhance our understanding of mortuary ritual by emphasising which individuals in society were afforded specific forms of treatment in death. Analysis of the spatial organisation of a cemetery also has the potential to reveal social and cultural patterning through a consideration of hierarchy of space, as, for example, graves in close proximity to a ritual focus could be considered to occupy a higher status position than those at a distance.

It has been suggested that a disciplinary separation between bio-anthropology and social archaeology has resulted in a paucity of studies that seek to link the approaches characteristic of the two fields (Robb et al. 2001, 213). In response, this paper aims to emphasise the potential of the combination of such methods and the need to tackle the lack of this form of integrated cemetery analysis for the later Anglo-Saxon period. A case study investigating social status and biological status amongst the tenth-eleventh century cemetery population at Raunds Furnells (Northamptonshire) is included.

Social status and late Saxon mortuary ritual

Mortuary archaeology of the later Anglo-Saxon period has suffered from a lack of exhaustive study (examples of studies that do address this period include Buckberry 2007; Hadley 2000a; 2004; and this volume; Reynolds 1997; 2002). Academics appear to have been deterred by the paucity of symbolic inclusions encountered in graves and the apparent simplicity of funerary rites, and excavators dissuaded by difficulties such as complex stratigraphy (Kjølbye-Biddle 1975) and the continued usage of church sites. Past research has characterized the burial rites of the Christian period as uniform, lacking the symbolic expression of earlier Anglo-Saxon contexts, and reflecting universal and egalitarian burial provision (Hodder 1980, 168; Geake 1997, 127; Carver 1999, 8). The ‘final phase’ model, which developed from the work of T. C. Lethbridge and E. T. Leeds in the south-east of England during the 1930s (Lethbridge 1931, 1936; Leeds 1936), and has been drawn together and refined since (Hyslop 1963; Meaney and Hawkes 1970; Faull 1976), concludes that burial from the eighth century onwards is located entirely in churchyards and uniformly free from grave goods (Meaney and Hawkes 1970: 51). The standard model of burial for the later Anglo-Saxon period emphasises large, static, Minster-controlled cemeteries (Blair 1988, 35) and reinforces the impression of an egalitarian rite.

However, several theoretical advances in mortuary archaeology have questioned this interpretation. Changes within the social and economic structure of society are now considered to be equally influential in their effects on burial practice to that of the

Church, with some scholars denying the input of Christianity at all (Boddington 1990; Halsall 1995, 61-3; Stoodley 1999). Documentary research supports this, highlighting a distinct lack of ecclesiastical intentions to prohibit the use of grave goods or prescribe alternative burial rites in the Anglo-Saxon period (Bullough 1983). Furthermore, there is compelling evidence for continuity from earlier to later Anglo-Saxon periods attested by continued ecclesiastical condemnation of the use of incantations, sacrifices and other superstitious ritual well into the later medieval period (Thacker 1992, 156-7). In addition, prior to the development of the parochial system in the tenth century, church cemeteries were probably too scarce to have accommodated everyone (Buckberry 2004, 19) and alternative places of burial clearly persisted well into the tenth century (Blair 2005, 244; Buckberry this volume; Cherryson 2008; this volume). The concurrence of the emergence of churchyard burial and the origins of a geographically fixed burial location, which existed throughout the medieval period, appears to be spurious. It is becoming increasingly clear that burial places were fluid, being set up and falling into disuse throughout the later Anglo-Saxon period (Morris 1983, 52; Hadley 2000b; Buckberry this volume; Cherryson this volume). It is possible to see Christianity as providing a new arena for the existing practices of expressing social and economic identities, but without diminishing the desire for expressing such concepts in burial (Hadley 2000a, 152).

The methods by which social identity could be expressed in later Anglo-Saxon burial practices have been discussed in several recent papers. Individuals could be buried in one of a range of cemetery types, some of which would be expected to attract higher status patronage than others. For example, royal foundations, Minsters and higher status churches would have conferred an intrinsically higher status to those buried there than for example manorial cemeteries (Reynolds 1997; Buckberry 2004, 2007; Hadley 2004). Individuals within cemeteries could also be distinguished by a range of grave types and elaborations: including grave structures, containers for the body, elaborate grave markers or covers, stone inclusions, clay or charcoal linings, or unadorned plain earth graves (Buckberry 2004, 2007; Cherryson 2005; Hadley 2000b).

The study of symbolism within the burial record has undergone a dramatic change in theoretical perspective in recent decades. Most notably, the nature of what is being represented in a cemetery has been revealed as a complex and actively constructed representation of society, not a simple reflection of everyday life (Saxe 1970; Binford 1972; Goldstein 1976; Tainter 1978; Parker Pearson 1982; Hodder and Hutson 1986, 2; Lucy 2000). It has also been emphasised that the body does not “bury itself” but is interred by the wishes of community members, perhaps family or religious authorities (Wason 1994, 67). Symbolic expression is argued to legitimise dominant culture and forms an important factor in its construction and reciprocation (Barrett 1991, 206), suggesting a viable reflection of socio-cultural features in the mortuary record. Although these theoretical approaches have been adopted in the study of earlier Anglo-Saxon cemeteries, they have made little impact on later Anglo-Saxon mortuary archaeology to date.

Prior to the 1990s, research suggested that earlier Anglo-Saxon burial rites codified social status, age and sex, denoted tribal groupings and generally classified society (Hawkes 1973, 186-7; Sheppard 1979; Arnold 1980; Alcock 1981). However such studies rely heavily on grave goods to provide a proxy for social status, yet have tended to be uncritical of the subjectivity of “value” (Stoodley 1999, 6), neglecting the fact that grave goods do not supply a straightforward index of wealth or the social standing of the deceased (Hadley 2000a, 155). Awareness of this problem has stimulated a shift in research focus towards the investigation of other features within the cemetery that may convey status (e.g. Pader 1982), including many that exist in later Anglo-Saxon contexts. These include:

The form of the grave

- Treatment of the corpse (Boddington 1996: 13)
- Grave inclusions e.g. stone arrangements around the head and/or feet (Hadley 2000b)
- Identity of the individual e.g. age, sex, pathology, individual and family status (Buckberry 2007)

- Multiple interments (Stoodley 2002; Hadley this volume)
- Unusual or elaborate graves e.g. stone sarcophagi at York Minster and Winchester Old Minster (Kjølbye-Biddle 1992, 227; Philips and Heywood 1995, 82)

Organisation of the cemetery

- Demography of population (age, sex etc.) (Buckberry 2007)
- Grave type (Buckberry 2007)
- Grave location e.g. proximity to foci (Adams 1996)
- Inter-cutting and special grave relationships, e.g. the concentration of graves, including several multiple interments, at Addingham (Adams 1996, 151-91)
- Boundaries (Gittos 2002)
- Grave markers e.g. at Kirkdale and Thornhill, Yorkshire, York Minster (Lang 1991, 60-6, 161-3)
- Central foci, e.g. church, sculpture, important graves (Kjølbye-Biddle 1992; Boddington 1996)

Cemetery context

- Relationship to settlements (Hadley 2007)
- Cemetery type e.g. execution, church, non-church (Buckberry this volume)
- Status of associated church e.g. high status cemeteries at York Minster, St Oswald's, Gloucester and Winchester Old Minster (Phillips and Heywood 1995; Heighway and Bryant 1999; Kjølbye-Biddle 1992).
- Associated monuments e.g. above ground signalling of status for a wider audience (Hadley 2000a, 159)

A small, but growing number of cemetery analyses have begun to investigate the expression of social status in later Anglo-Saxon cemeteries, with mixed success. Some general patterns that hint at differential treatment and a desire to express social concepts

in the burial record can be seen at several sites. For example, graves at Addingham, West Yorkshire (Adams 1996, 151-91) appear to have a distinct focal point and there are several multiple interments in close proximity to this point, while at the same time grave cuts with no inhumations occur at the opposite end of the cemetery. The excavator's interpretation suggests that the community may have favoured one area of the cemetery, translating remains into other graves in the focal area, packing graves closer together and inserting them between earlier graves, rather than utilising areas of the cemetery more distant from this focus (Adams 1996, 151-91).

Analyses of other cemeteries have revealed other spatial patterns. For example, people of different sexes were more likely to be buried in different areas of the cemetery at St Mark's Lincoln (Gilmour and Stocker 1986) and at Ailcy Hill, Ripon, where phases 2 and 3 of the cemetery only contained males (where sex could be determined) (Hall and Whyman 1996, 120-2). A cluster of 16 burials near to the supposed grave of St Swithun at Winchester Old Minster also contained only adult males. Evidence indicates that these interments were made only intermittently, and were therefore the lowest in density of the entire cemetery, suggesting that these individuals were specially selected for such notable burial, perhaps as members of small religious communities (Kjølbye-Biddle 1992; Hadley this volume). However similar investigations at late Anglo-Saxon cemetery sites in Yorkshire and Lincolnshire found less conclusive evidence; while there was a tendency to bury more males in a more prestigious manner or location than females, this was by no means an exclusively male preserve (Buckberry 2004; 2007). Differential treatment of adults and juveniles has been reported at the Church Walk cemetery, Hartlepool (Daniels 1999, 109-10) and Raunds, Northamptonshire (Boddington 1996, 55). Similarly, the combined analysis of York Minster, Swinegate, St Andrew's Fishergate, Barrow upon Humber, St Peters Barton-upon-Humber and St Mark's Lincoln (Buckberry 2004; 2007) has revealed a tendency for older individuals to be afforded more elaborate burial.

The overall demography of a cemetery may indicate the type of population buried there: for example high numbers of adults of the same sex may denote an ecclesiastical

population. The north-eastern area of the cemetery at Wearmouth contains an unusually high proportion of males and juveniles, therefore has been argued to be the monastic cemetery where monks and novices were buried separately from other high status individuals (McNeil and Cramp 2005, 88). Similarly, the almost exclusively male population buried at Beckery Chapel, Glastonbury is argued to represent an exclusively monastic community (Rahtz and Hirst 1974, 33).

Biological status: the application of the stress concept to archaeological material

The human body requires certain conditions in order to thrive; therefore absence of, or restrictions in access to, these resources can have visible effects on the body. It is well recognized in modern populations that richer individuals have less biologically stressful lives and suffer fewer illnesses (Robb et al. 2001, 213), however attempts to explore this pattern in archaeological contexts has returned mixed and confusing results. Analysis of this kind began with the work of Hans Selye (1936) who associated environmental conditions with the expression of stress. Stress was defined as a series of non-specific responses by the human body to a demand made upon it (Selye 1973). The term “stress” in these studies was used in its biological sense, referring to the physical manifestations of resource deprivation, not to the mental consequences of pressure. Individuals adapt to stress by various nervous, immunological and hormonal methods in order to maintain a homeostatic environment within the body (essential for the functioning of all systems) (Selye 1973, 699). It is this physical adaptation that has allowed biological anthropologists to adopt Selyean stress in skeletal analyses.

In order to apply stress studies to archaeological contexts, the theoretical assumption must be made that those who were wealthy within their contemporary societies had more opportunity to meet their biological needs than the poor or lower classes. These poorer individuals would therefore suffer greater biological stresses caused by a selection of factors such as inferior nutrition, higher levels of disease, polluted living conditions and water sources, lack of medical care and long hours of physically challenging labour (Robb et al. 2001, 213). This is then hypothesised to result in poorer health, smaller adult stature and shorter life span, factors which can be investigated in

past populations by osteological and pathological analysis. An overall consideration of these physical manifestations of stress can be categorised as the “biological status” of either an individual or community.

The manifestations of biological status on the skeleton were comprehensively considered by Goodman and colleagues (1984) with a primary aim of differentiating between populations suffering from varying levels of stress. A collection of conditions were identified and termed ‘stress indicators’ (Goodman et al. 1984, 15). The extent to which stress indicators are present on the skeleton depends on environmental constraints, cultural systems and host resistance to the original stressor (Goodman et al. 1984, 15). Cultural adaptations and social conventions can buffer stress, for example the use of dwelling places to prevent cold stress, or storage to counter famine. However, cultural adaptations can also magnify stress for certain individuals by creating inequality and differential access to resources. Within communities, the effects of environmental constraints and host resistances can be negated to some degree, as they will remain relatively constant (Goodman et al. 1984, 16). It can therefore be concluded that prevalence of stress indicators is an effective indirect reflection of biological status within societies. Biological status has been investigated by several other studies of both prehistoric and historical societies, which have suggested that elites were taller and/or healthier than their poorer contemporaries (Haviland 1967; Hatch and Willey 1974; Schoeninger 1979; Angel 1984; Rose 1985). However, it should be noted that other studies have shown little skeletal effects of polarized resource access (Wilkinson and Norelli 1981; White et al. 1993).

The primary physical manifestation of stress, and one of Goodman’s main stress indicators, is reduced age-at-death. However, the incorporation of age-at-death data into palaeopathological and stress marker research is complex. Although succumbing to a fatal disease can be broadly considered as indicative of stress (the less healthy will be more likely to die) it cannot be directly inferred that all of those who died young were stressed. Many conditions that were likely to have been common in the past, such as septicaemia secondary to non-skeletal trauma, imply no initial level of stress for an

individual, and would show no skeletal indication of their presence (Roberts and Manchester 2005, 2). These concepts form part of the so-called osteological paradox. Outlined by Wood et al. (1992), this emphasises that interpretation of the osteological appearance of health during life is complex and hazardous. For example, an individual with gross skeletal manifestations of disease or stress will have had to suffer chronic illness (i.e. for a long period of time), in order for the skeleton to develop bony manifestations of disease, indicating that they were fit and strong enough to survive beyond the initial stress. Conversely, an individual with no skeletal manifestations of stress or pathological lesions, especially if they died young, could conceivably have been either the healthiest or the most stressed member of a community. Good health throughout life will leave no trace, however so will sudden fatal illness for an individual with little resistance and poor initial health.

Acknowledgement of the osteological paradox within studies of biological stress serves to limit conclusions that may be drawn about individual cases. However, analysis of pathological prevalence rates can allow general patterns of stress to be inferred. The age-at-death of individuals with stress-related pathology can also be interpreted, since, where high proportions of juveniles have stress markers, it is possible that stress caused them to die young. Because of the pitfalls outlined in the osteological paradox, it is therefore vital to consider a combination of varied stress markers to assess biological status. Some of these are outlined in Table 1.

TABLE 1

Combined analysis of social and biological status

The study of both biological and social status each has its individual advantages and disadvantages. Stress markers can reveal whether an individual had access to nourishment, water and clean living conditions, and therefore, whether they were resource rich or resource poor. They can suggest aetiologies of stress and model the ways in which the skeleton reacts to demands placed upon it (Goodman et al. 1984). However, methods of assessing biological status fail to address intrinsic archaeological questions:

why certain individuals within a society had more resources than the others; how this came about; and the quality of life experienced by people in the past. Social archaeology presents almost a complete mirror image of these successes and failings. Using theoretical constructions drawn mainly from ethnographic analogy, cultural patterns within burial rites can be identified and associated with social status. Those who were commemorated with more exotic items, in association with extravagant structures and with greater energy expenditure, can be considered as the most wealthy or high status (Parker Pearson 1982) and, by default, considered as having more resources. However, social archaeology cannot provide the evidence to confirm they suffered less stress. There is an intrinsic caveat with all mortuary-based studies of status: that ritual is not expressing social values in an unambiguous and directly readable form (Bloch 1974; Lewis 1980, 8, 10-11, 19, 31; Parker Pearson 1982, 100). This problem has been examined briefly by theorists, who prefer to emphasise that the dead are subject to manipulation by different groups and that burial contexts reflect relationships between the living and dead, an idealised social structure and changing power relations (Parker Pearson 1982) rather than ask in what ways this manipulation is occurring.

Studies which combine assessment of social status and biological status have the potential to address the issues identified above, providing both evidence for the experience of biological stress and a means by which its causes can be investigated. A much deeper picture of social and economic life is created: access to nutrition, levels of disease, living conditions including water sources, medical care and labour divisions can all be revealed and correlated with the way in which the individual was perceived and treated within a wider social context (Robb et al. 2001, 213).

There are few examples of previous studies that have exploited the potential of combining biological and social status suggested here. The first attempt was by Goodman and colleagues (1984) who proposed the use of multiple stress indicators to determine demographic patterning of stress at the tenth- to fourteenth-century AD site of Dickinson Mounds, Illinois. They emphasised the need to understand better the causes and responses of past populations to stress. As an early project, this was encouraging,

however the full bio-cultural possibilities for this study were not explored. For example, the reasons why certain individuals of different age groups or sexes were in better health than others were not addressed. Conversely, an example of a study which employed social status without properly exploring biological status is that of Keswani (1989, 64), who identified group affiliation amongst a late Bronze Age Cypriot community from pictorial devices used on craters in Mycenaean tombs and then assumed that this reflected kinship ties, without considering any data regarding the biological status of the individuals.

Biological stress has been traditionally applied to certain, very restricted social concepts, for example Cook (1984, 237-71) used accumulations of stress indicators around the ages of two to four to evaluate the inadequacies of early agriculturalists' weaning diet. Other studies also link dietary stress and social status (for example the stable isotope evidence of Privat and colleagues (2002) for Anglo-Saxon diet and social status in the mid fifth to early seventh century cemetery at Berinsfield, Oxfordshire), and dietary stress and occupational stress (for example the early study of Lane (1887) on the physical hardship and 'pressure changes' (plastic skeletal responses) in contemporary working classes).

One modern study that does fully explore the potential of studying biological and social status is that of Robb and colleagues (2001), assessing an osteological collection and grave goods in Iron Age Italy. Dental enamel hypoplasia, cribra orbitalia and adult stature were not found to correlate with a measure of social status suggested by grave goods, however trauma, periostitis (inflammation of the outer layer of the bone commonly caused by infection or trauma) and Schmorl's nodes (pitting in the surface of the vertebral bodies caused by intervertebral disc herniation, thought to be a result of axial compression of the spine) were more frequent in unfurnished graves than those with grave goods. This allowed conclusions to be drawn about the divisions of labour between higher and lower status individuals (Robb et al. 2001, 213).

The successes of Robb and colleagues (2001) suggest that the study of both biological and social status could be fruitful for other archaeological periods. In response to this suggestion, a case study exploring the late Anglo-Saxon cemetery at Raunds Furnells, utilising the methods considered above for assessing status from both osteological data and grave elaborations, has been included here.

Social and biological status: a case study from Raunds Furnells

The cemetery at Raunds Furnells provides an ideal collection for comparing funerary rites and osteological evidence. The site is well recorded with detailed evidence of variability in burial provision (Boddington 1996). The site report hints at the differential treatment of certain individuals within the cemetery, for example a cluster of infants is clearly visible around the contemporary church walls and males seem to be more numerous in the zone around the church, indicating that more detailed analysis would find further relationships.

Radiocarbon dates were recovered from the church and graveyard and gave an average range of cal AD 978-1040 to 2σ for the cemetery (Boddington 1996, 72), placing its usage firmly within the late Anglo-Saxon period. The cemetery was completely excavated and a total of 361 inhumations recovered (Boddington 1996, 28), therefore it can be reasonably assumed that the remains analysed in this study represent the entire burial population. Demographic patterns indicate a normal community of all ages and both sexes, with about 40 individuals alive at any one time during its two centuries of use.

The inhumations were all within an enclosed churchyard (except for an infant buried under the chancel itself), orientated in rows of supine, west-east aligned graves, surrounding the central church structure, a pattern common to early churchyard burial (Boddington 1996, 103). There was extensive variability in the mode of burial of individuals. More than half of the graves included stone linings and arrangements around the body, possibly to protect and support the individuals (Boddington 1996, 38). A

maximum of six stone coffins were recovered; however poor wood preservation prevented the identification of more than two wooden coffins. The presence of other wooden coffins could, however, be inferred from body positioning (Boddington 1996, 42). Two in situ stone grave covers and three carved stone crosses were also discovered. Grave markers of some form appear to have been used frequently and 36 stone markers were excavated. Burial 5156 was so compactly positioned that the individual was almost certainly shrouded, and similar evidence for shrouding was observed elsewhere in the cemetery (Boddington 1996, 28).

No grave goods were found, which accords with the generally accepted nature of later Anglo-Saxon Christian burial ritual (Boddington 1992, 103), and no shroud pins or coffin fittings were recovered either (Boddington 1996, 13). However, textual evidence, combined with the paucity of shroud pins recovered at some sites, suggests that shrouds were sewn up with thread in the later medieval period, which would not leave an archaeological trace (Daniell 1997, 156-7; Thompson 2004, 108; Gilchrist and Sloane 2005, 23).

The published report for Raunds and the original recording forms do not contain all of the information necessary to undertake a detailed study of stress markers, therefore the senior author (EFC) re-analysed the skeletal material. In addition, re-analysis offered the opportunity to apply more recent methods of age estimation and sex assessment. Re-analysis was undertaken for the entire population of 361 individuals, of which 103 were males, 82 females and 162 juveniles. The standard osteological analyses of age-at-death, biological sex and living stature (Buikstra and Ubelaker 1994; Brickley & McKinley 2004) were supplemented by analysis of a selection of the conditions considered to be indicative of biological stress, in particular linear enamel hypoplasia (LEH), cribra orbitalia and non-specific tibial periostitis. Harris lines were not included as their usage as a stress indicator had been widely criticized (Garn et al. 1968; Walimbe and Gambhir 1994) and porotic hyperostosis was found to be too rare in this population for any meaningful conclusions to be drawn from its analysis. A brief discussion of the study and aetiologies of these three conditions is included below.

Cribra orbitalia

Cribra orbitalia has traditionally been considered a manifestation of anaemia. There are several causes of anaemia and its symptoms including iron deficiency (due to diet, loss of blood, inadequate absorption of iron or the sudden demands of accelerated growth or pregnancy), parasitic infection, a high pathogen load or hereditary conditions (thalassaemia and sickle cell anaemia) (Stuart-Macadam 1992). However, there is increasing debate over whether cribra orbitalia can be considered synonymous with anaemia, for example Wapler and colleagues (2004) found that over half of the cases of cribra orbitalia in their sample had no supporting histological evidence of anaemia, thus were more likely to be taphonomic damage with the appearance of a pathology, or related to another pathological condition, such as osteoporosis. Despite the problems surrounding the aetiology of the lesions, cribra orbitalia is still regarded as an indicator of stress.

Cribra orbitalia is characterised by porous lesions of the orbital roof, and is believed to be a childhood condition (see Figure 1) (Stuart-Macadam 1985). Many schemes have been suggested for ranking the lesions (e.g. Stuart-Macadam 1991; 1992; Buikstra and Ubelaker 1994), however all incorporate a progression from discrete porosity to confluent lesions (Stuart-Macadam 1989).

FIGURE 1

Linear enamel hypoplasia

Linear enamel hypoplasias (LEH) are horizontal defects in the tooth enamel which occur during disruptions of ameloblastic activity in childhood, as the crown is developing, and remain visible throughout life, making them a potentially excellent indicator of childhood stress (Figure 2). Many factors have been implicated in the formation of enamel hypoplasia including hereditary anomalies, localized trauma and systemic metabolic stress such as nutritional deficiencies or childhood illness (Goodman and Rose 1991).

As dental enamel hypoplasia is linked to dietary factors, much of the archaeological work pertaining to them has focused on linking defect prevalence rates and periods of subsistence change (Goodman et al. 1984; Larsen 1984) and weaning (Goodman et al. 1984). The standard procedure is to record the number and type of teeth affected, number of defects, appearance and severity (Roberts and Manchester 2005, 77). In this study, number and severity of defects was recorded for the canines, where LEH has been found to be most easily identifiable (Condon and Rose 1992).

FIGURE 2

Tibial periostitis

Periosteal reactions are caused by inflammation of the periosteum, the fibrous tissue that covers the bone, which results in osteoblastic (bone forming) activity characterised by single or multiple layers of new bone formation on the bone surface (i.e. between the bone and the periosteum) (Figure 3). Periostitis can be a result of infection of the periosteum, haemorrhage under the periosteum (often due to damaged capillaries or secondary to soft tissue trauma), or ulceration (Ortner and Putschar 1985, 131). Many periosteal reactions are symptomatic of specific infections such as leprosy and syphilis; however other, specific, skeletal changes are always needed to diagnose specific infections (Rogers and Waldron 1989). The presence of largely symmetrical bilateral periosteal reactions can indicate a systemic illness, however in many cases the skeletal lesions may not be sufficiently distinct to allow identification of a specific disease. Scurvy (vitamin C deficiency) also produces periosteal reactions as a result of haemorrhage, however this can be difficult to diagnose in dry bone, especially in adults (Brickley 2000, 187). Despite their complex aetiology, periosteal reactions are frequently used as an indicator of general stress (Robb et al. 2001), especially when present on the tibia and/or fibula.

FIGURE 3

Active periosteal reactions appear as deposits or plaques of woven bone on the surface, which become more ordered, striated and compact as they heal, and this process can form the basis of a grading system. The most common location of infection is the tibiae, possibly because of the bones' proximity to the surface (the cooler temperature increases susceptibility to infection or its physiologically inactive surface, leading to easier bacterial colonisation) and blood stagnation in the lower legs resulting in bacterial accumulation (Roberts and Manchester 2005, 172-3).

The presence and severity of each stress condition was recorded on a scale between 0 (not present) and 3 (severe). This scoring system was developed in reference to the previous work of Stuart-Macadam (1982; 1991) (detailed in Craig 2006). The three stress markers described above have been used to represent the biological status of the individuals at Raunds. Social status was represented by data on burial position, grave form and location within the cemetery itself. Data was adapted from the site report (Boddington 1996) to form seven categories of elaborate burial (Table 2). These groups were chosen to best reflect the range of elaborations present at Raunds and represent some of the main burial types commonly found in later Anglo-Saxon cemeteries (Rodwell and Rodwell 1973; Schofield et al. 1981; Painter 1982, 26-35; Gilmour and Stocker 1986, 15-20; Kjølbye-Biddle 1992, 87-108; Rahtz and Watts 1997; Thompson 2002, 230-2; Buckberry 2007).

TABLE 2

Stress related pathologies and grave elaboration

For the purpose of this study, any graves which appeared abnormal, or singled out from the general population in any way, are of interest. It has been initially and tentatively hypothesized that unusual graves were used for unusual people, for example those of abnormally high or low status, those with special roles within society or outsiders (see Hadley this volume). The attempted association of these graves with biological status inferred from stress markers on the skeleton is designed to reveal whether those unusual

people, whose burial was marked in some way as distinct from the norm, were skeletally distinct also.

The prevalences of stress markers in the Raunds population were relatively high. Of the 361 individuals recorded, 85 out of 286 with orbits had skeletal evidence of cribra orbitalia (29.7%), 46 out of 187 with at least one canine had LEH (24.6%) and 109 out of 316 with at least one tibia present had tibial periostitis (34.5%). Several correlations between stress markers and grave elaborations produced statistically significant results (Table 3). Individuals with cribra orbitalia were more likely to be buried without an elaborate marker or cover (Chi-square=7.207, $p=0.007$). The tendency for cribra orbitalia to be more common in juveniles had the potential to affect this correlation, however there was no significant relationship between age and prevalence of cribra in the Raunds population. Individuals with tibial periostitis and LEH were also less likely to be burials in a grave elaborated with a marker or cover, but these results were not statistically significant. The occurrence of more individuals with all three stress conditions in plain graves than those with covers or markers provides some evidence that they were both poor in health and in social status, as their graves were less commonly marked above ground. The pattern of plain graves being used for individuals who experienced greater biological stress is not universally applicable, however, as a higher percentage of individuals buried in charcoal or clay burials had LEH than those buried without these elaborations (Chi-square=4.298, $p=0.038$). Several scenarios may explain this result. LEH reflects periods of stress experienced during childhood, so it is possible that the individuals buried in charcoal- or clay-lined graves achieved an elevated social status in later life. Alternatively, this result may suggest that either the childhood stress that causes LEH did not predominantly affect lower status individuals as might have been expected, or that the use of charcoal and clay in the grave was not linked to high social status at Raunds. It must also be noted that all other correlations between stress markers and grave elaborations produced no pattern, especially those which included differing severities of stress markers. In light of this mixed result, further analysis was undertaken to investigate the spatial distribution of stress markers and grave elaborations throughout the cemetery.

TABLE 3

Spatial analysis

In order to investigate the spatial distribution of both stress markers and grave elaborations, the cemetery was divided into zones in four different ways. Two of these were the zones identified by the excavator: one based on chronological phasing, the other an arbitrary grid. The former was included as it reflected Boddington's view of the site gained during excavation. Excavators can often glean important impressions from their sites and, even though no record may remain for confirmation of their conclusions, they should be given due consideration in later re-evaluations. However, Boddington's interpretation of the cemetery, and the location of his 'zones', appears to have been influenced by the demographic profile of the cemetery (e.g. the zone closest to the church appears to have been identified by Boddington as the area which contained a high number of infant burials). To undertake a more objective analysis of the spatial organisation of the cemetery, two additional zoning systems were created by the present authors; first, a division between areas to the north, south, east and west of the church, and, second, zones at two successive distances from the church (within 5m and between 5 and 10m from the church walls).

Correlation of stress markers with cemetery zones

Prevalence of cribra orbitalia appeared to vary greatly dependant on the position of the individual within the cemetery (Table 4). All individuals with the severest cribra orbitalia were buried to the south-east of the cemetery whereas mild and moderate cases were found to the north of the church (Chi-square=46.446, $p=0.004$). In addition, individuals buried closer to the church had less cribra orbitalia than those further from the church (Chi-square=7.215 $p=0.007$). However, this correlation can be explained in part by the larger number of neonates and infants closer to the church, who had a generally low prevalence of cribra orbitalia. As with cribra orbitalia, cases of tibial periostitis showed strong zoning throughout the cemetery. The majority of cases were located in the south of the cemetery with fewer cases in the north and west (Chi-square=10.592, $p=0.014$).

Unlike cribra orbitalia, the majority of mild cases were located further from the church

(Chi-square=9.637, p=0.008). Presence and severity of LEH had no statistically significant spatial patterning within the cemetery. However the severe and moderate cases also appeared to cluster in the south-east area.

TABLE 4

The clustering of all severe cribra orbitalia and more moderate and severe LEH cases in the south-east corner of the cemetery suggests that this region was used by those who had experienced greater biological stress, and were possibly of lower status, than those in the rest of the cemetery. The results from the analysis of tibial periostitis do not quite follow this pattern, with more cases in the south rather than the south-east of the cemetery. This result could be explained by the complex aetiology of tibial periostitis, which although commonly linked to non-specific stress can also be caused by specific infection and trauma. Indeed, the most severe cases of tibial periostitis in the cemetery – skeletons 5046 and 5256 – were the result of specific infection, not non-specific stress. 5046 had leprosy whereas 5256 had a systemic illness that could not be identified (although Faye Powell suggested the observed lesions “may have been due to leprosy” (1996: 123) this is unlikely due to the lack of diagnostic changes to the maxilla, hands and feet combined with the presence of periosteal new bone formation on the femora, upper limbs and pelvis, which would be unusual in leprosy). Once these two cases are removed, it is apparent that cases of tibial periostitis are found more frequently within the possible low-status zone in the south-east of the cemetery. To explore the relationship between grave location and social status, spatial distribution of grave types was also considered.

Correlation of grave types with cemetery zones

The majority of possible coffin burials lay in the south, in the central areas of the cemetery (Chi-square = 13.037, p= 0.004 and 36.226, p<0.001, respectively) with the fewest in the east, especially the south-eastern corner (Table 5). When only the most reliably identified examples of coffined burial were included in analysis – those where remains of the coffin itself had been identified - and those examples where coffined

burial was assumed based on skeletal positioning were omitted, the pattern remained, in fact revealing an even stronger tendency for confined burials to be located close to the church (Chi-square = 62.035, $p= 0.002$). The use of grave covers and markers did not produce significant correlations with spatial zones, however they appeared to be most frequent in the same area ($p=0.052$). The carved stone covers clustered close to the church (5280, 5282, 5283) with plainer stone covers common in the south-eastern sector. Grave markers were more evenly distributed, but were totally absent from the south-east zone. Stone inclusions and charcoal were distributed evenly across the graveyard, however graves including charcoal and clay appeared to occur in areas more distant from the church.

TABLE 5

The most common stone arrangement, where small stones were placed around the head, occurred statistically most often in the far south-eastern corner of the cemetery (Chi-square = 36.218, $p<0.001$). This area was highlighted in the site report as one of elaborate stone usage and was considered to represent a chronological increase in the use of stone (Boddington 1996, 41), however in light of the high levels of stress markers in this area, stone arrangements around the head may have been a feature of lower status graves, perhaps utilised as an alternative to more elaborate stone arrangements.

The location of two clusters of individuals within the cemetery stands out. First, the area closest to, and especially just south of, the church had many features of a higher status zone. Here, there are virtually no cases of cribra orbitalia and none of the severest cases of LEH or tibial periostitis. The majority of possible wooden coffins are located in this area, as are all of the elaborate stone coffins and all but one example of carved stone markers. In light of these correlations it can be hypothesized that this area was reserved for high-status individuals who enjoyed better levels of health. When combined with Boddington's suggestion that this area is chronologically early, it may be that the earliest church burials were entirely reserved for the founder (possibly skeleton 5282) and those of his social class or family, a pattern suggested at other sites of this period (Richards

2000, 160; Stocker 2000, 180; Stocker and Everson 2001, 224-5). Burials closest to the church building are commonly considered to be of particular interest, their prominence within the cemetery as a whole suggesting a higher status. The most elaborate graves are also often located in this area (Buckberry 2007, 124-5).

Second, in contrast, the south-eastern corner contains all of the severest cases of *cribra orbitalia* and LEH. Coffins occur significantly less often and covers are plainer than in other areas. Interestingly, the high concentration of stone arrangements around the head to the south-east may suggest that this form of grave elaboration may have been more appropriate in lower status graves. This pattern is beginning to be noticed in other cemeteries of this period (Usher 2007 pers. comm.). The segregation of socially and physically distinct individuals on the outskirts of Anglo-Saxon cemeteries is attested at several sites (Wade-Martins 1980; Hall and Whyman 1996; Hadley 2004, 9 and this volume). The occurrence of individuals with unusual pathologies, including the one confidently diagnosed case of leprosy (5046) and an individual with an ‘end stage’ osteoarthritic hip, possibly the end result of a hip dysplasia and a shortened, atrophied left arm (5062), in the south-east, adds to the suggestion that this zone was used more frequently for individuals of lower health or social status (see Hadley this volume).

Discussion

Several theories exist as to why individuals were separated in Anglo-Saxon cemeteries, based on a hypothetical hierarchy of churchyard space. The north of the church is considered to have been an unpopular area for burial (Blair and McKay 1985, 43) and, as at Raunds, young children were frequently buried close to the church walls. The churchyard may conceivably have been divided into zones allocated to parts of the parish, a possibility suggested by documents that associate newer cemeteries with continued roles of responsibility to particular sectors of the old mother church cemetery (Rosser 1996, 80). Other studies have suggested that a small proportion of graves in a cemetery are often distinguished by a more unusual rite and often date to a short period of time (Buckberry 2007, 125), and distinctive high-status graves are also frequently found close together (see above).

It must be emphasized that all of the burials in this study were within the churchyard, in consecrated ground. Archaeological data suggest that true outcasts such as criminals were buried segregated from the churchyard, perhaps to enforce social, legal and religious punishment for their crimes (Reynolds 1997; Daniell 2002, 243). These so-called execution burials or cemeteries include the later Anglo-Saxon execution cemetery at Walkington Wold, Yorks. (Buckberry and Hadley 2007; for further discussion of this kind of burial see Hadley this volume). Therefore, whilst the individuals buried in the south-eastern corner of the Raunds cemetery may be of a lower status, they cannot be described as social outcasts.

Conclusion

It is apparent from the case study presented here and from the small number of other studies of later Anglo-Saxon cemetery populations, that the investigation of social and biological status has great potential to illuminate the motivations behind burial rites. It can be demonstrated that early Christian burial was not egalitarian and that there is clear evidence for social stratification in the burial rite. This pattern is supported by the osteological record, which reveals that individuals who suffered more biological stress were often those commemorated by less elaborate burial and *visa versa*. The method suggested here is ideally suited to the late Anglo-Saxon period, as traditional approaches to social status in cemetery populations have tended to rely upon grave goods and the (now heavily criticised) assigning of degrees of wealth and rarity to them (Arnold 1980; Alcock 1981; Härke 1997), with little consideration of the part that can be played by the biological material recovered from the cemetery beyond age-at-death and biological sex. Broadening our approach to both a comparison of social and biological status and spatial analysis of the cemetery fits well with current trends towards a more integrated, bio-cultural approach to osteological and funerary research. The preliminary results of such studies provide a tantalising possibility of achieving a much deeper understanding of the burial rites and social attitudes of past communities.

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Figures and Tables

Table 1. Stress markers, their skeletal manifestations and aetiologies.

Table 2. Categories and prevalences of grave elaboration used in this study.

Table 3. Statistical correlations between stress markers and different forms of elaborate grave.

Table 4. Statistical correlations between stress markers and locations of graves within the cemetery.

Table 5. Statistical correlations between different forms of elaborate grave and locations of graves within the cemetery.

Figure 1. Cribra orbitalia on the left orbit, Raunds 5040 (Elizabeth Craig).

Figure 2. Two bands of linear enamel hypoplasia, Raunds 5055 (Elizabeth Craig).

Figure 3. Tibial periostitis, Raunds 5256 (Elizabeth Craig).