ANY TEXT IN CAPITALS OR ITALICS IS FOR INFORMATION OR ASKING FOR COMMENT TO THE PROJECT TEAM AND SHOULD BE LEFT OUT OF THE PUBLICATION DOCUMENT.

1. Introduction

Five hundred and forty five primary inhumation burials were discovered during the course of 12 separate excavations into segments of what is thought to be the East London Roman cemetery. The total area excavated will be referred to as the study area. Five of these primary burials were double; B156, B253, B282, B373 and B396: meaning that the skeletal remains of 550 individuals were recovered for analysis. A further 88 grave cuts were excavated which contained no human bone. The number of skeletons recovered from each excavation is given in table 1.

Various osteologists have been involved with the different sites over the years, so that the sample has been recorded and analysed by a total of four workers intermittently over a period of 13 years. The osteologist associated with each site is listed in table 1. Complete osteological reports were produced for HOO88, WTN84, HAY86, ETN88, SCS 83 and TTL85; and are available from the MoLAS archive. It was necessary to return to the raw data collected for each site sample, for the purposes of the present project, so that all eleven samples (see section 00 concerning the remains from the twelfth site) could be analysed as one “overall” sample representing parts of, what is assumed to be, one cemetery. (See Chapters 1, 2 and 5 for discussion of this assumption.) The detailed recording, and in some cases full analysis, carried out by the other three workers has made this possible, but this author bears full responsibility for the interpretations presented here.

The majority of inhumations were extended and supine, but 14 individuals were prone and six cases had intentionally displaced skulls. Fifty four skeletons had chalk deposits associated with them (another 20 graves also contained these deposits but no surviving human bone); 137 had grave goods of various forms; and 15 had deliberate deposits of parts of animals, for meat, and probably other food stuffs alongside them, thus indicating observance of burial rituals in common with Roman burials elsewhere. Eighty six inhumations had no evidence of any sort of container present; the remainder ranged from 386 with fragments of wood and nails suggestive of coffins to one lead coffin, three lead coffins with wooden outer containers and two tile cists.

The burials are dated from the 1st to the 5th century AD. Phasing of them within this time span has proved difficult and a solution has been proposed of deciding what proportion of them, according to the dating evidence available, are most likely to fall into each of four defined periods (see section 00). Consequently, analysis of the inhumations over time was restricted to comparisons of proportions of the sample rather than in terms of specific burials. The archaeologists did succeed in defining four possible groupings based on the orientation of the grave cuts and 29 "plots" which were spatially distinct groupings (see section 00). The following analysis attempts to investigate if there were any osteological differences between the individuals included in these groups.

A brief description of the characteristics of the overall sample is presented. The nature of this project meant that it was not feasible to undertake an exhaustive analysis of all aspects of the data. Consequently each section discussed here can be seen as an indication of the potential knowledge that could be gained from a more detailed (and time consuming) analysis. Often a note is made of further questions which the archived data would be capable of answering.

It would be easy to be overly pessimistic about the following work, given that four people's data (some of which were collected over ten years ago) have been amalgamated to produce it. However, this would overlook the value of the massive amount of data which has been collected for this sample, and the potential of that data, available in the Museum of London archive, to answer a far more detailed level of questions about life in London in Roman times than was possible here.

2. Sampling

All surviving bone was recovered so no bias has been introduced by a sampling policy. However, graves had been truncated by later disturbance to differing degrees at each of the eleven sites providing samples, so that the amount of recoverable bone varied greatly. The preservation at each site is discussed below. Bone was hand collected at the majority of sites, but experimentation with sieving grave fills to improve recovery standards was carried out at HOO88. This was successful in improving recovery rates, particularly so for the small bones of infant skeletons and the hands and feet of adults, but proved time consuming. As a practical solution on site in succeeding excavations, all hands and feet and infant burials are lifted as a block with the surrounding soil and this block is sieved in the laboratory.

The 12 sites together make up a sample of the total burials originally contained in the cemetery. The proportion of that total which is represented by our sample is not known and cannot be reliably estimated as the extent of the original cemetery cannot be determined at present. This has to be borne in mind when attempting to extrapolate any conclusions about the recovered sample to the cemetery as a whole and even more so, to the living population of London at that time which is the subject of further discussion in Chapter 5.

Soil samples were taken from the grave fills, but by the time of the present project, they had been processed for other purposes and were not available for any parasite or chemical analyses.

The chalk was sampled and analysed, and is discussed in section 00.

3. Methods

3.1 Reliability of the data

Amalgamating the work of four people is obviously not the ideal way to carry out an osteological analysis of a sample because of the potential for inter-observer error. However, by the time it became apparent that the 12 sites taken together would allow questions to be posed about a single cemetery to the east of the Roman town, the human remains from six of the sites had already been written up as separate sites, and it was neither economical nor practical to repeat all this work. Several factors ensured, however, that the existing data for each site and new data recorded for the remaining five sites which had produced human bone were as compatible as possible.

I. Similar recording methods were used by all four workers.

II. The raw data from the written reports or from the original recording sheets were used rather than any interpretations of those data.

III. Where there could only be a subjective assessment of an osteological feature, such as the diagnosis of a pathology, the broadest categorisation of that feature was entered onto the database. For example, it is possible that one worker might diagnose certain joint changes as osteoarthritic, whereas another might employ more stringent criteria and not agree with this diagnosis. Neither would disagree, however, that the changes were degenerative in nature, and this is the level of recording that would be entered on the database. Obviously this has resulted in the loss of much of the interesting detail from individual worker's reports, but the original reports and data are archived in the Museum of London.

IV. The analysis draws comparisons between individuals in each of the plots or orientation groups, or types of burial, rather than between separately excavated sites; the plots and other groups are held to be more significant than the boundaries of an excavation imposed by modern development. Differences observed between the groupings were carefully considered to ensure that they were real differences rather than artefacts of comparisons based on more than one person's recording. For example, Plot 3 was the most remarkable group in several areas of the analysis and was composed of individuals from MST87 in common with Plot 4. Plot 4 could therefore also be expected to behave unusually if the characteristics of note in Plot 3 were simply a product of the recording of MST87, yet there was nothing remarkable about Plot 4. In addition Plot 3 was recorded by Fiona Keily and the present author, yet differs from other plots recorded by FK and JC which conform more to the behaviour of plots recorded by FL and TW. Double checking in this manner would appear to verify that the observed variations between groups were reliable.

V. In addition to checking that all inhumation burial data was compatible, it was also necessary to ensure that this data as a whole was comparable to that collected by the cremation specialist for the cremation burials. This was achieved principally by using the same or equivalent osteological methods and agreeing on suitable groupings for such categories of data as age and sex. This comparability was necessary, as part of the following analysis examines any differences between those individuals undergoing the cremation ritual and those given an inhumation burial.

3.2 Osteological methods

Bone in a sufficiently solid condition was carefully hand-washed, more friable and fragile specimens being brushed or picked clean. Many of the skeletal elements were very fragmented, the skull in particular, but no attempt was made to reconstruct any bone in order to increase the amount of metric information recoverable as this can result in inaccuracies.

Each bone was catalogued to a level of detail which recorded parts present, for example, in the case of a longbone the presence of the midshaft, distal and proximal ends would be scored for separately. The dentition was recorded according to the dental chart proposed by Brothwell (1981, 53). The coding he suggests to record missing teeth etc. on the chart was modified to a numerical one to facilitate entry of the information into the database.

The macroscopic condition of the bone was assessed and described as good (1), moderate (2), or poor (3). The scores were defined as;

1 The surface of the bone was in good condition with no peeling or erosion and, although in some cases fragmented, most osteological information, both metric and non-metric, could be obtained from the remains.

2 The bone shaft was in a moderate to good condition but many of the long bone ends were damaged or missing, limiting the amount of metrical information available.

3 The bone was in a poor condition often with the surface eroded, most long bone ends were missing and the bone was often highly fragmented, all of which would severely limit the amount of retrievable information.

The proportion of the skeleton present was recorded as a percentage eg. 85% present etc. Although the assessment of the missing proportion was subjective, there were set values within this score; the skull would be scored as 20%, both arms as 20%, both legs as 20% and the torso as 40%. A skeleton with the skull, complete torso both legs and the right arm present, for example, would be 100% present less c.10% for the missing left arm, and therefore scored as 90% present. The archaeologists had assigned scores describing the extent of truncation to each individual as perceived on site which are also used in the following analysis. Their score was a little more objective and is described in section 00.

Age estimations for immature skeletons were based on dental development (Schour and Massler 1941)), length of diaphysis (Sundick 1978, Ubelaker 1989, 70-71) and stage of epiphyseal fusion (Salter 1984, Bass 1987). The ages arrived at from the two methods involving diaphysis length were kept separate as they were consistently different; comparison with the more reliable dental data could determine which method was best for this sample and so allow the age of those individuals with no dental data to be most accurately assessed. Age estimates derived were of the developmental age of an individual or age relative to the population standards given in each method, rather than an absolute, chronological age. The Ubelaker method is based on work on protohistoric Arikara skeletons; the Sundick method uses measurements taken on the early prehistoric Indian Knoll collection. Both of these samples are native American groups, and variations in growth rates between these populations and the Caucasian Europeans reported on here should be borne in mind. (Sundick also included skeletons from sixth and seventh century AD Altenerding, Germany, but the sample size that the average stature for each age group was based on was often only one or two individuals, and was therefore not used here.)

It is now acknowledged that osteological age estimation of mature skeletons based on macroscopic techniques is very unreliable (Molleson and Cox 1993, 167-179), whilst microscopic techniques applied to a large sample can be prohibitively expensive in terms of time and expertise. However, it is still desirable to describe the age distribution of an excavated sample in some way in order to gain some idea of the types of person buried at a site and to allow comparisons with samples from elsewhere. As a result, very broad groupings of age were used in an attempt to balance the inaccuracies of the ageing techniques available against the need to describe the age structure of the mature sample.

The groups were young adult, mature adult and elderly adult. Individuals were assigned to one of these groups using a combination of assessment of dental attrition (Brothwell 1981, ??), stage of cranial suture fusion (Meindl and Lovejoy 1985) and level of degenerative change to the pubic symphysis. Some workers had used the Suchey-Brooks method (1986, 1988) others had used the McKern and Stewart method (1957) or revisions of it. This did not present such a problem as at first appeared, as it was possible to assign the first heavily ridged, fresh looking stage of either method to our young adult category; the very worn, almost smoothed of ridges but pitted final stage to our elderly category; and everything in between to the mature adult category. Table 2 gives the age groups used to describe the total sample (including the immature skeletons), the very approximate ages these refer to (in order to allow comparison to data from elsewhere), and the group reference (eg. infants are Age Group 1).

The sex of each adult was established using the sexually dimorphic characteristics of the pelvis and skull in particular, and measurements of the femur, humerus, atlas, scapula, clavicle and sacrum (Ferembach *et al* 1980, Brothwell 1981, 59-63, Bass 1987). Sex could be assigned to one of five categories; male, possibly male, indeterminate, possibly female and female. As many traits as possible were scored for in this way for each skeleton and then an overall assessment of the sex was made. Most weight was given to the traits of the pelvis as this is the most reliable indicator of sex (Brothwell 1981, 62, Bass 1987, 200). Indeed, a characteristic of this sample was that the skulls of many definite females, according to the pelvis, had quite masculine looking, robust skulls.

The mesiodistal and buccolingual diameters of the canine were recorded (following Hillson 1986, 233) for those sites recorded by the present author. These measurements can be sexually dimorphic amongst some populations and allow sexing of individuals of as little as approximately four years of age, as the canine cusp can be fully formed although still hidden within the alveolar at this stage. These data are available on the database and in the archive, but could not form part of the following analysis as the diameters were not recorded by all of the workers.

The physique of the individuals was considered in terms of stature, as determined by the regression formulae of Trotter and Gleser (1952, 1958) and by indices which allow comparison to other populations and provide an objective idea of the shape and size of a bone (Bass 1987, Brothwell 1981, 87-89). Cranial indices, objectively describing the shape of the skull, have been used to infer differences in ethnic origin (Warwick 1968, 152) and as such could trace differences in provenance between groups in the sample over time or spatially, or that a group with a particular provenance was associated with a particular type of burial. Although the use of indices is now somewhat dated as multivariate techniques can establish probable genetic distances between groups more accurately and so indicate the most likely provenance of the sample in question, the highly fragmented nature of the remains meant that the crude level of information required for the indices was more suited to this sample, at least to investigate the presence of any differences initially. A subjective method was also used to classify the remains recorded by this author and by Keily based on the descriptions of skull shape given by Dawes (Dawes and Magilton 1980), as this allowed assessment of the very large number of fragmented skulls which could not be measured accurately for calculation of the metric indices.

Non-metric traits, or non-pathological variation of the skeleton, as defined by Berry and Berry (1967) and Finnegan (1973) were recorded. These traits are genetically and/or environmentally determined. Thus individuals with combinations of several of these traits in common may be related either genetically or culturally according to which traits are present. In theory, this could be useful in examining the factors influencing the spatial organisation of the cemetery, and to see if certain groups were associated with certain types of burial. However there were difficulties at the data collection and analysis levels concerning these traits. The difficulties and their implications are described in the relevant section as they affect the way the data are discussed.

Enthesopathies are evidence of trauma at the site of muscle insertion points. It is possible that patterns in their distribution, when a group as a whole rather than the individual is considered and is compared to other groups, may be indicators of particular repetitive movements (Stirland 1991) or put very crudely, as evidence of the effects of occupation. Stirland states that there should be no genetic or cultural differences in the group being analysed and that individuals of different age and sex and which side of the body is affected in each case should all be considered separately. The analysis of enthesopathies was preceded by the discussion of cranial indices and non-metric traits in order to rule out possible genetic differences for the groups included in this analysis. Side of the body affected was indicated during data collection. Age and sex were not specified here as the object at this stage was simply to see if there were any observable patterns of activity, not who was affected in the various groups. The data are available to take this line of research further. Unfortunately the presence of enthesopathies was only recorded in a suitable way for inclusion in the analysis for sites undertaken by the present author. This meant that only certain plots and parts of the orientation groups could be compared in terms of activity as indicated by enthesopathies development, which may compromise the interpretation given.

Pathological changes to the bone were described and the most likely diagnosis assigned. However, for the reasons already discussed above (section 00) associated with inter-observer error, only the very broadest categories of pathology can be used when discussuing the sample as a whole. The detailed pathology recorded for each site sample is available in the archive.

Variation in the approaches to the collection of dental pathology data were more difficult to overcome, as each worker had chosen to include or omit differing categories and had recorded differing levels of detail for the categories included. The largest body of data was recorded by the present author (310 individuals, over half the overall sample) and this also formed the most detailed data set satisfying every criteria which had been defined on the Roman burials database. Consequently the best solution seemed to be to use only the 310 individuals recorded by the present author in a discussion of dental pathology, thus removing any possibility of inter-observer error or omissions. Clearly this decision can be criticised for introducing a further level of sampling to the data ultimately analysed, which may affect how representative the analysed sample is of the burial population as a whole. Ideally each worker's data would be included and analysed to the highest level possible for that particular category of information so that the whole sample could be discussed. Time did not allow for this. The data collected by the other workers are available in a specially established general dental pathology section on the database or directly from their reports or recording sheets.

4. Preservation

It is important to establish the level of preservation throughout the sample, and the factors which may have influenced the deterioration of the bone. Any deterioration results in a reduction in the amount of recoverable information from the bone and the level may have varied between sites or various groups. This loss of information, if ignored, could adversely affect any interpretation of the available data.

4.1 Variation in preservation between sites.

Any site with a sample size of less than ten has been omitted from this discussion as such a small sample could not be regarded as representative. Of the remaining sites, bone from MSL was in the best condition with 74.9% of individuals scoring good or moderate for condition, compared to a range of 48.6% to 57.0% for MST, HOO, HAY and WTN (table 3a).

Considering what proportion of the skeleton survived (the completeness of the burial), the sample at HOO was the best preserved with 60.1% of individuals with over 50% of the skeleton recovered, closely followed by WTN with 59.8%. HAY, MST and MSL, in that order, range from 35.3% to 40.4% (table 3b).

Table 3b only includes burials where a skeleton was recovered. The archaeologists' perception of the amount of truncation at each site may differ somewhat as sometimes a grave cut would be disturbed to such a degree that no skeleton survived. From this perspective (the intactness of the burial), WTN was the site with the best preservation of burials, with 34.5% of burials complete and undisturbed; WTE was the worst with only 4.5% of burials undisturbed (table 3c).

The spatial plots defined by the archaeologists correspond to the divisions of the separate sites to some degree (table 4), so these variations in preservation should be borne in mind as they may be reflected in comparing the level of preservation between plots.

4.2 Variation in preservation between plots.

Of those plots with a sufficient sample size to consider, the bone from Plots 3 and 28 was generally in a worse condition than that from any other plot with 91.7% and 90.0% of individuals respectively in the combined moderate and poor classes (table 5a). These plots correspond to sites MST and HOO, which were relatively poorly preserved compared to the other sites but not to such a marked degree as the observed variation between these plots and plots corresponding to other sites. When the proportion of skeleton recovered was considered, the plots behaved very similarly to their respective sites (table 3b and table 5b).

4.3 Variation in preservation between orientation groups.

Only groups 1 and 2 were of sufficient size to compare. They behaved very similarly in both condition of bone and proportion of skeleton recovered (table 6a and 6b).

4.4 The factors most likely to be causing differential preservation between plots.

The most obvious cause, given that the differences in preservation observed between plots mirrored that present between sites, was variation in the quality of excavation at each of the sites. This can be tested for by examining the number of specific skeletal elements recovered compared to the expected number of that element. A careless or hurried excavation would recover smaller proportions, particularly of small or difficult to identify bones, than the recovery rates of a more rigorous excavation. If the figures for phalanges were compared (table 7), foot phalanges were recovered at similar rates for all plots with larger sample size, Plots 2,3,16,17,22,and 28; hand phalanges rates were similar for all except Plot 17 where a higher proportion were recovered at 67.3% and 63.6% respectively for right and left phalanges. (Orientation groups 1 and 2 also presented very similar recovery rate figures to each other [table 7]). All the excavations were therefore of similar quality and the variation in preservation was probably due to other factors.

Variation in physical conditions may have resulted in differential preservation. Soil conditions were similar at all 11 sites; "brickearth" on gravels. HOO and WTN had earlier quarry pits, into the backfill of which burials had been cut, but the backfill was very similar to the original "brickearth" which had been dug out. Variation in soil condition therefore was not a factor. However, the amount of physical disturbance at each site over the years had varied (table 3c). It is possible that once a grave or area of a site was disturbed the rate of deterioration of the bone could be affected.

The average male skeleton is generally perceived to be more robust than the average female, so this might have affected preservation. When the condition relative to proportion recovered was compared for males and females across the whole sample (table 8), bone from both sexes behaved very similarly indicating that sex was not influencing preservation. Not surprisingly, if the indeterminate part of table 8 is compared to the figures for either sex, the indeterminate bone was generally in poorer condition and less of the skeleton was recovered, accounting for the reason that this bone was more difficult to identify.

Similarly, adult skeletons are perceived as more robust than immature ones. When preservation of adult, immature and infant skeletons across the whole sample were compared in terms of condition relative to proportion recovered, all three groups acted very similarly (table 9). Therefore age of the individual did not appear to be a factor in differential preservation.

The main factor influencing differential preservation across the whole sample therefore appeared to be the variation in truncation and disturbance experienced by different sites. This is important when interpreting observed differences in data between plots as the differences may be due in some part to such differential preservation. For example, any spatial analysis of non-metric traits to test for the osteological significance of the plots is likely to be seriously compromised because of the variation in missing data between the plots; it would not be clear if a suite of traits observed amongst individuals in one plot was truly absent in another or simply the result of missing data.

5. Results and Discussion.

5.1 Development and layout of the cemetery.

Extent of the cemetery.

The archaeologist had hoped that osteological examination would decide if a redeposited skull (XWL 80) and human bone (GYD 75-76) were part of the same cemetery sample as the bulk of the human bone. Unfortunately, bone from these site codes was never traced, but it is very unlikely that a macroscopic examination of the bone could have definitively demonstrated that these few pieces or even few individuals were part of the main sample or not.

Evidence for groupings of burials.

The archaeologists had proposed that two types of groupings suggested themselves; 29 plots which were spatially distinct groups, or, four groups based on the orientationation of the skeleton. This section examines if there is any osteological evidence to distinguish these groups.

The orientation groups

Unfortunately, the sample size of the four orientation groups varied considerably. Orientation group 1 had 240 individuals, orientation group 2 had 274, orientation group 3 seven and orientation group 4 ten. This meant that in much of the analysis it was possible to compare only orientation group 1 and orientation group 2 in any meaningful way. The data for orientation group 3 and orientation group 4 are included in the relevant tables for reference.

Burial rite

The most direct evidence of the presence of differing burial rites is likely to come from characteristics of the burial, such as position or attitude of the skeleton or the presence, position and type of grave good (see chapter 3). However, one line of evidence directly observable from the skeletal material would be different treatment of males and females or individuals of varying ages.

The numbers of each sex present in each orientation group are given in Table 10. The male to female ratio in both orientation group 1 and orientation group 2 was 1.7:1, so there appeared to be no selection by sex in operation. Similarly, age appeared to have no effect, with the age structure of orientation group 1 and orientation group 2 very similar (table 11).

Status

An indication of different status accorded to certain burials could again be different treatment of sexes or ages, but this has already been discounted for the orientation groups. The possibility of demonstrating varying status osteologically is somewhat controversial, but in some samples the presence of several indicators in conjunction does suggest that status can be reflected in the skeletal remains. For example, at St Mary Spital in London (Conheeney in Thomas *et al* forthcoming) individuals buried within the church and known from the documentary evidence to be probable “elite” burials fell towards the top end of the stature range obtained for the whole site sample, and exhibited several skeletal and dental pathologies distinct from individuals buried outside the church. In this case the supposed “elite” were made up of wealthy patrons and senior members of the clerical inhabitants of the priory compared to normal parishioners, patients from the priory hospital and the main body of the priory population buried in the external cemetery. Elsewhere specific pathologies are thought to target certain types of people, for example, the suggested connection between diffuse idiopathic skeletal hyperostosis (DISH) and affluence (Waldron 1985). With these examples in mind, various aspects of the data for orientation group 1 and orientation group 2 were compared.

The average statures for orientation group 1 and orientation group 2 were very similar at 1.69m and 1.70m for males and 1.60m and 1.56m for females respectively. More importantly, the range of statures for the two groups overlap (figure 1).

When the incidence rates of types of pathology were compared between orientation group 1 and orientation group 2 (table 12), each category had an incidence rate of approximately the same order of size. However it was interesting that for all but the nutritional and infections categories, the incidence rates for orientation group 2 were slightly higher than the incidence rates for the overall sample and those for orientation group 1 were slightly lower. There was no obvious explanation for this as the age and sex structures of orientation group 1 and orientation group 2 were similar, and indeed, the difference proved not to be statistically significant. In total 47.9% of individuals in orientation group1 presented any evidence of pathology compared to 55.5% in orientation group2. The most common pathology in both groups was degenerative disease, as is the case in almost all archaeological samples. This was closely followed by the rate for trauma but it should be noted that the trauma category includes Schmorl's nodes which could be classed as resulting from a combination of trauma and degeneration (see section 00).

The data for dental pathology are somewhat restricted as only the sites recorded by the present author were recorded in such a way as to allow the following comparison. However, a similar number of individuals were recorded for orientation group1 and orientation group2 so the two groups can be compared even though not all their members are included.

Orientation group 1 and orientation group 2 appeared to suffer a different pattern of attack by caries; with maxillary third molars more frequently affected and first molars less affected in orientation group 2 than orientation group 1. The caries rates for all of the remaining teeth were similar for both groups (table 13). The most likely cause of the different pattern of caries is some difference in diet or hygiene practices but it is impossible to say which. There were similar incidence rates of hypoplasia between the two groups in all the maxillary teeth; where there was any slight variation there was no discernible pattern to it. In the mandible, however, rates were consistently lower in orientation group 2. Hypoplasia is the result of interruptions to the normal development of the dental enamel during the formation of the tooth cusp due to episodes of severe dietary, pathological or psychological disturbances in the developmental history of the individual (Hillson1986, 130). The lower rates in orientation group 2 would therefore suggest that those individuals suffered less from serious childhood disease than members of orientation group 1. However, true hypoplasia should affect both the maxillary and mandibular teeth in an individual so there would seem to be some other explanation for the difference noted in orientation group 2.

There was no discernible difference in the rates of calculus between the two groups which was not surprising with similar age structures, and it would also imply that the diet and/or hygiene levels experienced by the two groups were similar, in common with the caries evidence. It was interesting that there was no difference in the calculus rates as the alveolar recession and periodontal disease incidence rates did vary between the two groups. Calculus, as an irritant of the soft tissue, is a major contributor to periodontal disease which is then evident as alveolar recession. Interestingly, the patterns of alveolar recession and periodontal disease also varied from each other within the two groups. As apparent alveolar recession can be due also to continuous eruption of the teeth in response to tooth wear (Whittaker *et al* 19??), it suggests that it must be the tooth wear contributory factor which is the cause of the difference here. The maxillary anterior teeth including the premolars were generally more affected by recession in orientation group 2 than orientation group 1 and the molars less affected (table 13). This perceived relationship was statistically significant for seven of the 16 maxillary teeth (table 13a). In the mandible there was no clear pattern. If this difference is reliable, it suggests that the individuals in orientation group 2 were experiencing more wear on the anterior teeth and less on the molars than individuals in orientation group 1. Heavy molar wear is usually seen where there is prolonged mastication of a coarse or fibrous diet such as comparatively dry baked bread rather than a sloppy porridge or gruel or better refined cereals.

The anterior teeth were least frequently affected by periodontal disease in orientation group 1 and the incidence rate then increased through the premolars until the molars had the highest proportion of affected teeth. In contrast all types of teeth were more evenly affected amongst individuals in orientation group 2 at rates approximately similar to the anterior tooth rates of orientation group 1. The pattern was very clear amongst the maxillary teeth but less so in the mandible (table 13). This was unlikely to be a reflection of bias introduced by antemortem tooth loss as a similar number of sockets were examined for each group. The causes of this disease are multi-factorial, but hygiene, consistency of diet and age are usually three major factors. Poor hygiene allows the accumulation of calculus which, as an irritant of the soft tissue, contibutes to the onset of periodontal disease. In this case there was no difference in calculus rates between the groups. The disease is progressive with age, but the two groups had similar age structures. Generally, a coarse fibrous diet is healthier for the teeth in terms of periodontal disease as mastication tones the gums and keeps them healthy; in this case orientation group1 appeared to have had a diet which required more mastication and yet had the more severe periodontal disease. Having ruled out the three most likely causes of a difference in incidence, one of the remaining possibilities was that there could be genetic factors in operation as some groups are more susceptible to periodontal disease than others. However, this is a very complex disease and such a brief consideration of the evidence as this does not exhaust the issue.

Considered overall, the data for physique, skeletal pathology and dental pathology did not present any clear evidence of differing status between orientation group 1 and orientation group 2. However, the dental pathology did indicate that individuals in orientation group 2 appeared to have eaten a more processed or less coarse diet than orientation group 1, and that one explanation amongst others for differences observed in the levels of periodontal disease may be some genetic difference between the groups. This suggestion would require confirmation from other lines of evidence, such as the analysis of non-metric traits, to be seriously considered.

Dietary studies making use of the amount of strontium stored in the bone have been used to comment on status as meat diets are known to result in high levels of strontium and evidence for a meat rich diet has been interpreted as indicative of elevated status.

However, so much is known about Roman diet from other sources and indicators of social status are more readily available directly from the burials as already discussed, that the expense of this method was not justified as part of this study. Similarly isotope analysis can be used for dietary reconstruction (Keegan 1989), by identifying the groups of food consumed. Again, more detailed evidence such as the specific foods eaten is available from other sources such as the animal bone recovered.

Provenance of the sample

ANDREW WAS CONCERNED ABOUT THE POLITICAL CORRECTNESS OF THE FOLLOWING PARAGRAPH IN THE INITIAL DRAFT; OPINIONS PLEASE ON THIS AMENDED VERSION?
(AND FOLLOWING SECTIONS ON PROVENANCE THROUGHOUT THE REPORT)
Patterns of differences in cranial indices calculated from measurements on the skeleton have been used to suggest the possible presence of groups of different provenance in a previous skeletal analysis (Mays 1991). Kennedy (1989 table 1) has attributed variation in certain post cranial indices to environmentally caused differences between populations. Brothwell (1971, 91) lists differing values of the platymeric index amongst different populations. Unfortunately, the numbers of measurable individuals were too small to allow sound comparison between even the larger orientation groups in this respect. Generally the results were that the most common skull shape in orientation group 1 and orientation group 2 was mesocranial (mid-way between round and long headed) by the cranial index and orthocranial (mid-way between a low and high skull vault) by the length-height index; the average cranial module (numerical value for the size of the skull) was similar at 151.1 and 151.0 respectively; and the most common palatal shape was brachystaphyline or broad (table 14).

Subjective assessment of the morphological appearance produced a similar picture (table 15). The most common skull shape, as viewed from above, in both groups was oval followed by pear in which the narrowest part was the frontal bone. The trends in forehead shape were similar with high vertical and low convex the most frequent types; not surprisingly as these are the classic male and female descriptions. The most common chin shape was square in both orientation groups followed by round, again classic male and female types. The only difference from the the objective assessment was that the most common palatal shape in both groups was narrow and deep. It is possible that the subjective assessment was affected by being restricted to those individuals recorded by FK or JC whereas the objective metrical assessment included all of the overall sample. Alternatively it may be correct that there were more narrow and deep palates but that these tend to fragment more than the broad and deep ones and therefore were not sufficiently complete to measure but could be subjectively assessed.

In the post cranial indices there was a similar lack of variation between orientation group 1 and orientation group 2. The most common femur shaft shape in both was eumeric (rounded, table 16) and the most common tibia shaft type eurycnemic (rounded, table 17).

Overall, therefore, there was no evidence for differing provenance between individuals in orientation group 1 and orientation group 2, although it should be remembered that the data available were limited.

Family groups or plots

Non-metric traits are non-pathological variations in skeletal morphology between individuals. The traits can be environmentally and/or genetically determined. Clustering of several of these traits occurring in combination in individuals in a cemetery, may therefore indicate the presence of family or cultural groupings depending on which traits are present. In theory this would be a very useful technique to apply to the defined groups in this sample in order to determine if there was a genetic or cultural factor to their composition. However, the data for the East London cemetery as a whole is compromised because;

I. There was severe truncation of many burials and the degree of truncation varies between sites. This will have affected the apparent incidence of some of the traits because of these spatial "gaps" in the data. This meant that any spatial patterns observed may not be reliable.

II. The MOLAS computer system is not capable of handling spatial plots of combinations of traits for the whole cemetery sample at present alongside other demands made on the processing capabilities of the system, though this is being worked on and should be possible in the near future.

III. The problems with using the non-metric traits as part of a spatial analysis meant that the analysis was restricted to looking at the relative frequencies of traits between groups. This method requires that cases where the site of the trait is present on the bone but the trait itself is absent are recorded as distinct from cases where no data is available. Unfortunately, this "absence"data was not recorded by all workers and although recorded by the present worker were not entered onto the database as initially a spatial analysis of the traits was intended. This could be rectified as part of any future work but will not be necessary when G.I.S. becomes available in the near future. As a temporary compromise a count of the presence of the skeletal element on which the trait appears for each group was used as a crude denominator in the calculation of incidence rates of various traits rather than the more accurate count of how many sites were actually present. This will have the effect of lowering the apparent incidence rates as in some cases a bone may be present and so included in the denominator when the actual site of the trait may be damaged or missing. Although this allows some sort of comparison between the groupings in this sample, it does mean that the figures for the overall sample cannot be compared reliably with the frequency of traits at other sites.

When rates of traits were compared, the only differing rate was that for metopism (the retention of the mediofrontal suture in individuals older than two years of age); approximately equal for the overall sample and orientation group 2 at 9.0% and 9.8% of individuals affected respectively, higher in orientation group 1 at 15.1% (table 18). The usual rate is around 10% in Iron age/ Romano-British samples (Brothwell 1981, 92). The trait can be genetically controlled (Brothwell 1972, 94) suggesting the possibility that individuals in orientation group 1 may have been genetically different to those in orientation group 2. However, the difference in rates was not statistically significant.

The only other interesting rate was for vastus notch (affecting the patella) which was high for the right sides of the overall sample and orientation group 1 (27.3% in orientation group 1) compared to the rates for both sides of the body in orientation group 2 (16.9% on the right side in orientation group 2). The frequency in the overall sample is probably a reflection of the very high frequency in orientation group 1. This trait has been attributed to both injury and inheritance (Steele and Bramblett 1988, 220) which may indicate a genetic difference or a difference in activity between the two groups, but again, the difference in rates was not statistically significant.

Dental non-metric traits can be the most useful of all the skeletal traits in defining the presence of family or genetic groups as many are genetically controlled and they also tend to be less frequently occurring than some of the skeletal traits and so more significant when they do occur. However, in addition to the problems affecting the analysis of the skeletal non-metric traits as a whole, only a proportion of the sample has been recorded in a way suitable for inclusion in the analysis of dental traits (those sites recorded by the present author). The best available denominator for calculation of incidence rates was the number of individuals with a surviving dentition, therefore only the plots recorded by the present author could be compared as they had been recorded in their entirety. As far as the orientation groups were concerned, this denominator would be inaccurate as not all individuals in each group were included in the counts of traits. However, the same traits were present in orientation group 1 and orientation group 2 and in similar numbers (table 19) which suggests that there was no difference between the orientation groups in terms of dental non-metric traits.

Livelihood

It is not possible to determine a person's livelihood as such from their skeletal remains, but it is possible to identify signs of repetitive activity distinctive to one group compared to another. Enthesopathies are bony spurs, the result of trauma at the site of muscle insertion points on the bones. Patterns in the occurrence of these in the sample may suggest repeated activity by specific limbs or groups of muscles.

There did appear to be a difference in incidence rates in enthesopathies occurring on the femur lesser trochanter, fibula and iliac crest on both sides of the individual and the linea aspera on the right femur with all more frequent in orientation group 2 than orientation group 1 (table 20). The observed differences in rates were significant for the left lesser trochanter (at the 90% level), and for the right and left iliac crest (at the 99.9% and 95% levels respectively). The muscles affecting the femur lesser trochanter are the psoas major and the iliacus, usually involved in working against resistance, lifting the knee and turning it and bending the trunk forward. Those muscles affecting the iliac crest, the internal oblique and the external oblique, hold in the viscera, help to keep the trunk erect and assist in the rotation of the trunk. The peroneus brevis, attaching to the fibula, everts the foot and prevents over inversion ie. “going over” on the foot. An experienced physiotherapist (C.Taylor pers comm), unprompted, stated that the most obvious activity which would satisfy the involvement of this group of muscles was horse riding. This was interesting as horse riding had been suggested for some of the individuals examined at Poundbury (Molleson 19??, ??).

Orientation group 1 had a noticeably higher prevalence of enthesopathies on the soleal line on both right and left tibiae (both significant at the 99.9% level). The soleus steadies the foot on the ankle and as such is working continuously. Over use might therefore imply movement over rough ground (C.Taylor pers comm).

Considering the "handedness" in the humerus and femur, the right humerus was longer than the left in the majority of individuals in both orientation group 1 and orientation group 2, and the left femur was more frequently the longer in both groups although not as markedly as the trend for handedness observed in the humerus. This is the case in most archaeological samples (table 21).

There did appear to be some indication of difference between orientation group 1 and orientation group 2 in terms of activity; individuals in orientation group 1 might have been more frequently traversing rough ground or surfaces than those in orientation group 2, while horse riding, or an activity requiring similar movements and the same specific positioning of the trunk and limbs, appeared to be a more frequent activity undertaken by individuals in orientation group 2 compared to those in orientation group 1.

The Spatial Plots

The number of individuals in each plot is given in table 5. Of the 29 plots, only 6 were of sufficient size to allow reliable comparison ; Plots 2, 3, 16, 17, 22 and 28. Data for the remaining plots are available for reference in the relevant tables but are not included in the discussion as they may not be representative samples.

Burial rite

A greater proportion of males were buried in Plots 3 and 17 with ratios of 2.6:1 and 3:1 respectively relative to Plots 2 , 16, 28 and the overall sample with ratios of between 1.3:1 and 1.8:1 (table 22). The number of individuals that could be sexed in Plot 22 was too small to include.

Plot 3 was also unusual in that no infants were buried there (table 23). Plot 17 had fewer infants than most other plots and relatively fewer still in Age Group 2 and 3 or 6-18 year olds; the vast majority at 90.9% were adult. Amongst the adult categories the most common age group in all plots except 28 was Age Group 5 , the mature adults. The adults in Plot 28 were spread almost evenly between Age Groups 4, 5 and 6. Plot 17 had many more individuals in Age Group 5 with 50.9% than the other plots in compensation for the small proportion of immature individuals it held. Otherwise the observed age distribution in Plots 2, 3, 16 and 17 was similar.

Age and sex appear to have had some influence on which plot an individual was buried in, with Plots 3 and 17 having a preponderance of adult males relative to the other plots (see Chapters 2 and 5 for further discussion of the possible reasons governing the formation of the plots).

Status

The apparently differing distribution of ages and sexes in certain plots may indicate a difference in regard for specific types of person. The osteological characteristics were examined in association with other evidence such as the presence of status grave goods in order to test this (see section 00).

There appeared to be no difference between plots in the stature attained as all the average statures were comparable to the male and female averages obtained for the overall cemetery sample (table 24) and the range of stature for each plot overlapped (figure 2).

The most common type of pathology was degenerative disease followed by trauma, as in the orientation groups. Plots 22 and 28 had a higher incidence of infectious disease than all the other plots (table 25), but this could be due to inter-observer variation. The worker who recorded Plots 22 and 28 used periostitis as an indicator of the presence of certain infectious complaints whereas the two workers who recorded Plots 2, 16 and 17 regarded periostitis as multi-causal, treated it separately and assigned it to “other” category (table 4 lists which workers recorded specific plots). Plot 28 also had a much higher incidence of degenerative disease than the other plots. This could reflect the relatively greater proportion of older adults in this plot (table 23).

There was slight variation in the incidence rates presented in table 25 but it was necessary to be very cautious not to overinterpret this as not only is the diagnosis of pathology very subjective, but the decision at what point to include something as a pathology rather than regard it as simply a variation from the norm will also vary between workers. One clear variation that could not be explained away by inter-observer variation was that Plot 16 had consistently lower incidence rates of all categories of pathology than any of the other plots being considered. This variation must be reliable as Plots 16 and 17 were both composed of individuals from site WTN and were recorded by one worker and Plot 17 behaved similarly to the other plots. There was no obvious explanation for these lower rates as Plot 16 was similar in age and sex structure to the overall sample and to several of the other plots.

The dental pathology data were again restricted to the sample from those sites which the present author recorded, as in the comparisons for orientation groups. This meant that only Plots 2, 3, 15 and 18 could be included in this section and of these Plots 15 and 18 were too small to be of any use (table 26). The posterior teeth of the individuals in both Plots 2 and 3 were affected more by caries than the anterior teeth and at about the same frequency when the mandible was considered. Amongst the maxillary teeth, the right and left premolars were most affected in Plot 3 whereas the molars, as is the more usual case, were most affected in Plot 2. There is no obvious explanation for this.

Calculus and alveolar recession incidence rates by tooth behave similarly in the two plots but tend to be very slightly higher in Plot 3. This could be due to the slightly higher proportion of older adults in Plot 3 relative to Plot 2. It was therefore interesting that the rates of periodontal disease for the majority of teeth were very slightly less for individuals in Plot 3 than in Plot 2; periodontal disease would be expected to follow the same pattern as calculus and alveolar recession (see section 00 in the orientation groups) and, as an age-related affliction, the predicted rates would be higher for Plot 3 than those of Plot 2. All of the observed patterns were more obvious in the maxilla than the mandible. The lower level of disease does not appear to result from better hygiene amongst the individuals of Plot 3 as the calculus levels were similar in Plots 2 and 3. There could be a number of explanations with no other evidence to pinpoint the cause; different diet, differing genetic predisposition to periodontal disease, better nutrition overall in Plot 3, or even the effects of more males in Plot 3 as pregnancy can accelerate the progression of the disease (MacPhee and Cowley 1981, 124).

The incidence rates of hypoplasia were very interesting as Plot 2 was affected much more severely than Plot 3 (table 26), which suggests that individuals in Plot 2 suffered from serious episodes of stress in childhood more than those in Plot 3. This relationship was statistically significant for six of the eleven types of tooth present, not significant, but observable in four of the eleven, and reversed, that is Plot 3 had higher rates of hypoplasia, in the left maxillary first premolar to a signficant degree (table 26a).

Similarly to the orientation groups, the data for physique, skeletal and dental pathology do not provide clear evidence of differing status between the plots. However, there did appear to be some difference between Plots 2 and 3 on the basis of dental pathology.

In addition to the indicators of status discussed above, it has been suggested (Toynbee 1971) that there may be a focal burial of elevated status in spatially distinct groupings in Roman cemeteries, such as the plots defined in this study, around which other burials of lesser prestige tend to cluster. The data held on the ELRC database would be sufficent to investigate the possibility of this occurring in this sample and are available for future research.

Provenance of the sample

The most common cranial shape was mesocranial in all except plot 1 with two brachycranial individuals and plot 28 with three dolichocranial individuals but as these were the the total number of individuals within these plots, no significance should be attached to this (table 27). The most common shape as defined by the length-height index was orthocranial except for plots 6 and 16, but with only one measurable individual in each of these, they cannot be regarded as of any significance. Brachystaphyline was the most common palatal type, with some deviation but again involving very small and therefore unreliable samples.

Only plots 2 and 3 had sufficient assessable individuals to allow comment on the subjective morphology (table 28). Both plots behaved similarly, and similarly to orientation group 1 and orientation group 2 also, in all categories.

The platymeric index defined femurs from plots 2 and 3 as predominantly eumeric, and the other two assessable plots 17 and 28 as having platymeric femurs most frequently (table 29). The most common tibia shape was eurycnemic in all assessable plots (table 30).

The only evidence of difference in characteristics that could indicate variation in provenance between groups as defined by the plots was, therefore, the platymeric index. This alone is insufficient evidence of differing proveance as the index has so many other proposed causes, such as nutritional factors or mechanical forces (Brothwell 1972, 91).

Family groups or plots

Extreme caution is required when comparing the frequency of traits between plots; because of the problems with varying truncation it is not possible to remark on missing traits or low frequencies of traits as it could simply be that the relevant part of the skeleton was missing. It is therefore only possible to comment on the high frequencies.

There were unusually high frequencies of metopism in Plots 17 and 22 at 15.8% and 28.6% respectively. These two plots had similarly high frequencies of the supraorbital foramen (table 31). There was a high proportion of individuals with a third trochanter in Plot 2 and to a lesser degree a high proportion with Allen's fossa. Plot 22 had a high frequency of squatting facets occurring on the right side tibias, whilst Plot 3 had a high proportion on the right side talus. Plots 2 and 16 had high frequencies of vastus notch on the right side and Plot 17 on both sides (see table 31 for frequencies involved).

The metopism and vastus notch evidence may imply genetic differences between plots. The third trochanter, squatting facets and again the vastus notch may indicate differences in repeated activity or injury. It is not possible to expand any further with such imperfect data.

Plots 2 and 3 only were sufficiently large amongst the plots recorded by the present author to compare for differing rates of dental non-metric traits. The same traits were present as reported for the orientation groups and there was no difference in frequency of traits between Plots 2 and 3 except for rotation of tooth and crowding both of which were more frequent in Plot 2 (table 19). Rotation of a tooth will often result from overcrowding in the tooth row as the tooth is pushed out of its correct alignment. It has been suggested that there should be little crowding in the dentition of a sample associated with a coarse diet as the individuals would not have evolved the reduced dentition associated with a more refined diet requiring less mastication (Molleson 1993, ???). However, such an adaptation would be a very gradual process over time and is unlikely to be evident as differing between two localised, contemporaneous groups as these. A more likely explanation is that the larger proportion of males in Plot 3 with larger, robust jaws experienced less crowding. The data to test this hypothesis are available in the archive.

Livelihood

Only Plots 2 and 3 could be compared for enthesopathies incidence rates (table 32). As with the orientation groups, there was some variation. Plot 2 had higher rates of hand phalanges, ischial tuberosity, linea aspera and soleal line enthesopathies. Trauma to the site of attachment of the flexor digitorum and assorted other muscles on the phalanges suggested a movement which flexed the proximal phalanges and the wrist, as in a grip but not a power grip (pers comm C. Taylor). The other entheopathies were consistent with a horse riding type posture as already discussed for the orientation groups. Plot 3 had higher rates of enthesopathies affecting the left side only of the iliac crest, the olecranon process on both sides and the radial tuberosities on both sides. The involvement of the iliac crest in controlling an erect posture has been discussed for the orientation groups. Trauma to the olecranon process suggests the involvement of the triceps, and to the radial tuberosity suggests the biceps. Both enthesopathies could result from strain on the elbow following a repeated a controlled sweeping movement, similar to the repetitive strain injuries reported today (pers comm C. Taylor). All of these differences were significant, at least for one side of the body (table 32a).

In terms of handedness, the right humerus was longer in the majority of individuals in all assessable plots. The left femur was most frequently longer than the right in all plots except Plots 17 and 28.

As with the orientation groups, it appears that there might have been some difference in activity undertaken by the individuals of different plots.

Preferential use of certain plots over time

Only Plots 2, 3, 22 and 28 produced enough precisely datable burials to be included in this comparison. Plots 2 and 28 were used as expected compared to the proportion of total inhumation burials in each of the proposed phases (table 33). (See section 00 for an explanation of the phases.) Plot 3 appeared to have been slightly under-used in Phase 1 and over-used in Phase 4, having gained in popularity continuously over time. Plot 22 was similar to the expected pattern in Phases 1 and 2 but was more popular than expected in Phase 3 and less in Phase 4, that is the number of inhumations placed in Plot 22 appeared to have declined between Phase 3 and Phase 4. All of these variations were very slight, however, and were too small to be statistically significant. What it is possible to say, is that all the larger plots were being used throughout the life of the cemetery, not just in specific phases.

5.2 The Overall Cemetery Sample

The whole sample of 550 skeletons is discussed as one group in this section in order to consider the types of people selected or accepted for burial in the cemetery, their health and some aspects of their lifestyle. Obviously this is not ideal as we know that the inhumations span at least three centuries, but was unavoidable in the absence of more reliable phasing information.

Who the sample represents.

There were 386 adults (Age Groups 4, 5, 6 and 7), 80 immature individuals (Age Groups 2, 3 and 9) and 49 infants (Age Group 1). The adults made up 75% of those that could be aged, the immature 15.5 % and the infants 9.5% (table 34). 25% of those that could be aged died before 18 years of age. The most frequent age at death for both males and females was Age Group 5, that is mature adults but not elderly. This group included 41.3% of all adults.

This age distribution was similar to that at Cirencester where 21.8% were less than 18 years of age (Wells 1982, ??) and, to a lesser degree, Trentholme where 15% were less than 20 years of age (Warwick 1968, ??). Lankhills (Harman 1979, ??) and Poundbury (Molleson 1993, ??) had much larger proportions of infants and immature, with 35% under 18 years of age and fewer than 39% "immature" respectively. The relatively low percentage of immature individuals in the study area was not due to differential preservation as age has been shown to have no bearing on the preservation of this sample (section 00). Possibly there was an organisational or cultural influence as at Poundbury, where there was an area of burials where perinatal individuals predominated. With the piecemeal nature of the excavated areas of the study area, it is very possible that areas reserved for specific burials could have been missed. Alternatively, immature individuals may have been excluded from the cemetery to some degree. Interestingly, the proportion present is very similar to that recorded at Giltspur Street (MacLaughlin and Scheuer unpub) which is part of a cemetery to the west of Roman London. Here 26.5% of individuals were less than 18 years of age.

When those individuals less than 18 years of age were split into one year age bands (table 35), only 5.9% had an average age at death of less than one year. Brothwell (1971) says that the ratio of infants, ie. those less than one year, to those aged less than 20 years should be somewhere between 4:1 and 4:3 in a normal population. The ratio in the East London cemetery was 1:16.8 (and this was for up to 18 years so including 19 and 20 year old individuals would increase the ratio still further away from the "normal" population). Very young individuals in particular therefore appear to be missing from the sample.

Of the adults, 186 were male or possibly male, 109 were female or possibly female and 88 were of indeterminate sex. This gives a male to female ratio of 1.7:1. This ratio was very similar to that present at Lankhills (1.6:1) an indigenous urban cemetery, and was different from Cirencester (2.2:1) and Trentholme (3.6:1) both interpreted as affected by being garrison town cemeteries. Ancaster (Cox 1989), another indigenous town cemetery, was 0.67:1 male to female. Poundbury across all its phases averages out at approximately 0.9:1. It seems likely that those buried in the study area represented a normal urban population rather than reflecting any military presence. Indeed the ratio at Giltspur Street was very similar to that of the study area at 1.5:1.

The sex ratio remained pretty constant in all adult age groups (table 36). There were very slightly more females in the younger age group, but this variation was so slight that no sexually specific causes of death, such as childbirth, were apparent. At Giltspur Street there were far more females (1:2.25) in the equivalent of Age Group 4 here.

No attempt has been made to analyse the demographic data any further, for example, construct life tables or live population estimates. The absence of accurate phasing, the unknown extent of the cemetery, an unknown proportion of the total number of burials in the cemetery recovered and the unreliability of macroscopic ageing techniques all combine to make any interpretation of this kind excessively problematical.

Appearance

The overall physical appearance of the sample seems to have been very similar to that described for Poundbury in that the majority of individuals were slightly shorter than their modern counterparts and were strikingly uniform in their skull shape and type, being quite robust, with even many of the females having characteristics generally accepted as male around the jaw line.

104 males could be included in the calculation of stature; the average was 1.69 m with a range of 1.58 to 1.80m. For 75 females the average was 1.58m with a range of 1.45 to 1.72m. These were very similar values to those obtained for Cirencester, Trentholme and Giltspur Street. Molleson (1993, ???) has argued that marked sexual dimorphism may indicate a heterogeneous population with either males or females or both migrating into the area from elsewhere. Despite a difference of 0.11m between average male and female statures in this sample, the extent of the range of statures of each sex was similar, which is one of the characteristics Molleson employs, and the ranges overlap to quite a degree. On this basis the sample would therefore appear to be a homogeneous one, implying that the people were born, raised and buried locally. The most common skull shape was mesocranial according to the cranial index with 52.1% of those adults that could be measured belonging to this category; orthocranial according to the length-height index (49.1%) and metriocranial (51.3%) by the breadth-height index (table 37). The fronto-

parietal index showed that the majority of individuals were metriometopic (45.7%) and they had broad or brachystaphyline palates (49.3%). The portrait of the sample gained from these indices agreed with those from Cirencester and Trentholme. Warwick (1968, 154) says that the mesocranial skull shape is typical of a Romano-British population.

A subjective assessment of skull morphology agreed with the majority of the metrical descriptions (table 38) with 63.6% of the assessable sample recorded as oval. The only difference was for palatal shape, subjectively described as the majority were narrow and deep (33.9%) rather than broad.

The post-cranial indices indicated that the majority of femurs were eumeric (75.7% right and 68.1% left) and the majority of tibiae were eurycnemic (right 66.9% and left 62.4%) which was somewhat at variance for the findings from the comparative sites (table 39). However, as the values of these indices can be attributed to so many causes (Brothwell 1972, 91), little can be made of this variation.

The femur robusticity index average was 12.57 for the right and 12.77 for the left. The majority of right humeri were longer than left (89.5%) and left femurs were longer than right (58.9%) in common with practically all archaeological samples (table 21).

Data exist to compare all of the metrical data between the sexes if required.

Health; occupation (activity), diet (nutrition) and environment.

Aspects of the health, activity, diet and environmental surroundings or living conditions of the cemetery sample in life can be suggested by analysis of the skeletal and dental pathologies. The methodological approach to the pathological analysis has been discussed in section 00; in short it has been necessary to consider broad categories of pathology rather than specific examples for comparative purposes between the groups of burials within the cemetery because of the difficulties of inter-observer variation. This section begins in the same way in order to place the overall sample in context with the earlier sections. Then, without quoting numbers of cases involved as this may vary according to the worker, but in order to fill in a little more detail, the specific pathologies where diagnosis could be reasonably certain are discussed in terms of what they imply for the health, activity diet and surroundings of the living population.

Skeletal pathology

Skeletal pathologies present were assigned to one of eight categories (table 40a). Which pathologies these categories include will be obvious, on the whole, as they are the category headings used in any human bone report but the designation of a few pathologies vary between reports. Generally this would not be of great significance as the pathologies are discussed individually and the headings are largely organisational. In this analysis the categories themselves are used in the comparisons so it is important to be clear what the categories include.

Schmorl's nodes are included in trauma whereas many reports would include them in degenerative type pathology. These nodes are lesions on the bony articular surface of the vertebral body caused by degeneration of the intervertebral disc resulting in herniation of the disc and pressure erosion occurring at one or more foci on the bony surface (Ortner and Putschar 1981, 430). Strictly speaking the nodes are therefore indicative of degenerative disease. However, it is generally accepted that the initial degeneration of the disc may be due to excessive weight-bearing in adolescence and is therefore traumatic in origin. Many of the degenerative arthroses may be partially caused by trauma but have so many contributary factors (genetic predisposition, bone morphology, general health and nutritional status of the individual etc) that it was considered desirable to separate out Schmorl's nodes which may have a more definite traumatic cause. In retrospect, a separate category for Schmorl's nodes would have been the best approach as its inclusion in trauma has obscured the true distribution of the more obvious traumas during the analysis.

Cribra orbitalia, or porosity of the orbital roof, is sometimes classed as a nutritional disorder as it can be indicative of iron deficiency anaemia. However, it can have several causes, not all dietary, and therefore has been assigned to the metabolic category here. Some workers would discuss osteochondritis dissecans under a degenerative heading, but here it is placed in "other" as its aetiology is unknown.
It manifests as shallow lesions commonly on the distal femur, but can affect any synovial joint, probably resulting from a localised deficiency in the blood supply
to a small area of articular cartilage and underlying bone both of which become necrotic and break away (Manchester 1983, 69-70). Hyperostosis frontalis interna, a thickening of the endocranial surface of the frontal bone usually resulting from changes in pituitary hormones following menopause, has been assigned to the metabolic category (Ortner and Putschar 1981, 294). The "other" category also contains those pathologies described by the various workers which could not be assigned to a specific pathology. Bone can only proliferate or resorb in response to disease or injury, therefore many clinically distinct disorders can be difficult to differentiate with only skeletal evidence available, and this is compounded when not all of a skeleton or even all of the relevant bone is present.

Overall 52.2% of the sample presented evidence of skeletal pathology. This is quite a low proportion but was probably because of the severe truncation of parts of the site and because immature individuals have been included in the calculation. Degenerative pathology was the most frequent type at 32.5% of all individuals affected, in common with the majority of archaeological samples, followed by traumatic (table 40a).

66.8% of adults had evidence of pathology. This was more comparable to generally expected rates, and when those of indeterminate sex were excluded, ie those most likely to be truncated, 74.2% of the sexed adults had pathologies. Males and females were equally affected by total pathologies at 73.1% and 76.1% respectively (table 40b). The sexes were approximately equally affected by all categories of pathology except for trauma where males were slightly more affected, which could suggest that they were either lifting heavy burdens from an early age more frequently than females or were experiencing more fractures, but this was not a statistically significant difference.

When the frequency of pathology was broken down by age the results were much as expected (table 40c). Infectious disease affected all age groups, except Age Group 2, at rates not dissimilar to that for the frequency of infectious disease in the overall sample. Degenerative disease only affected those from Age Group 4 and older and became increasingly common through the adult age categories until 75.9% of all older adults were affected. No trauma was recorded for Age Groups 1 and 2, possibly because green stick fractures can heal extremely well or possibly because these age groups were too young to be carrying heavy loads. Metabolic conditions were most common amongst the younger age groups, possibly because a large proportion of this category were accounted for by the cases of probable cribra orbitalia. There has been some debate whether the lesions associated with this disorder sometimes heal or always persist into adulthood.

In terms of numbers affected and age of involvement, the types of skeletal pathology were present at much the expected rates and patterns. There were no significant differences in male and female rates.

Dental pathology

Of the 2031 teeth examined, 7.3% were carious. (See section 00; only sites recorded by the present author were included in the analysis of dental pathology.) The frequency is comparable to other Romano-British sites; Cirencester at 5.1%, Trentholme at 4.6% and a survey of five Romano-British sites (Harman and Molleson 1981) at 13%. 91.1% of the caries recorded were of slight severity (table 41). This low incidence suggests either a relatively sugar-free diet or high standards of hygiene. The anterior teeth were least affected, the second premolars and molars more so (table 42a). In two quadrants of the mouth the third molars were most affected of all which suggests that poor hygiene played a greater part than diet in the carious activity present as this is the most difficult part of the mouth to keep clean. Stagnant food trapped in this area allows even complex carbohydrates in a relatively sugar-free diet to be broken down into sugars which will then encourage the development of caries. In fact the most frequently affected site was the interproximal tooth surface which agrees with trapped food being a major cause. (Detailed data on the location and severity of each carie are available in the archive.)

Males and females were affected equally at 8.5% and 8.2% respectively of all teeth present attacked by caries. However, there appeared to be a different pattern of attack with mandibular and maxillary teeth approximately equally affected in females; in males the maxillary teeth were far more frequently affected at 12.7% caried compared to 5.3% in the mandible (table 42b). Both sexes follow the overall pattern of posterior teeth being more affected than the anterior. All adult age groups were affected. Caries in deciduous teeth examined were confined to the molars. Indeed by Age Group 4 caries were still limited to the second premolars and molars (table 42c).

Individuals were not radiographed for the presence of abscesses, so only those visible externally, having erupted through the bone, could be recorded. This means the incidence rate recorded did not necessarily reflect the true incidence and so is not quoted here. Individuals from all sites except PRE, TTL, HAY and SCS were affected and these four sites had very small sample sizes. In the vast majority of cases the cause was attributable to pulp exposure following caries or severe wear. Precise wear data are available in the archive but wear was often severe, particularly amongst the older individuals, suggestive of a coarse diet requiring prolonged mastication. This also agreed with the relative absence of occlusal caries, as complex fissures around the cusps of the teeth crown, which would be particularly vulnerable to caries otherwise, are worn smooth.

Hypoplasia affected 11.9% of teeth overall. The distribution follows the typical modern pattern of the anterior teeth, especially the canines, and the first molars being most frequently affected. Female teeth were very slightly more affected than male teeth at 11.0% to 8.5% but this difference is not significant. As with caries, the variation was seen in the maxillary teeth with only 5.7% of male teeth affected compared to 11.4% of female teeth. Mandibular teeth were equally affected in both sexes. This apparently suggests that females suffered more episodes of severe stress in childhood than males, but as rates were similar in the mandible, it is more likely that the high male maxillary caries rate has effectively hidden many of the cases of hypoplasia in the male teeth. The nature of hypoplasia is such that a true difference in the maxilla should be matched in the mandible. It was of interest that relatively few types of teeth were affected in Age Group 6 (table 42c). This may be because of the relatively few teeth available for inspection, but it is also possible that individuals who, in early life, experienced adverse conditions of sufficient severity to cause hypoplasia, may not have survived into old age.

The majority of teeth were affected by calculus with an overall incidence of 75.4%. The posterior teeth were most frequently affected amongst the maxillary teeth; amongst the mandibular teeth all were equally affected (table 42a). Male teeth appeared to be more affected than female (86.7% to 69.8%), suggesting either a poorer standard of hygiene amongst the males or a different diet, (either of which could also explain the variation in caries rate) but this difference proved not to be statistically significant. Even teeth in Age Group 4 were frequently affected, which given the progressive nature of the condition with age, was surprising. This could probably be explained by a detailed breakdown of the severity of calculus deposits with age as the majority of AG4 cases would probably be of slight severity. The data exist for this analysis if required. Certainly the vast majority of cases were slight (table 41).

Corresponding to the high incidence of calculus, 58.2% of the 1496 tooth sockets examined presented evidence of periodontal disease. The fact that 92.0% of these were of slight severity, ie. alveolitis or pitting of the alveolar only rather than actual resorption of the bone, was reflected in the lower percentage of sites affected by alveolar recession at 46.9%. In both the maxilla and mandible the anterior teeth of both sexes were similarly affected (table 42b). The incidence remained at much the same level for the posterior teeth in females, but in males increased through the molars with 100% of the maxillary third molars affected. This was very suggestive of poorer hygiene amongst the males compared to the females as the third molar area is most difficult to keep clean, and this difference between the sexes has been a common finding in modern epidemiological studies. The incidence rate behaves much as expected between the age groups with sockets in Age Group 4 less affected relative to the older age groups and sockets in Age Group 6 practically all affected (table 42c). Again, most of the cases in Age Group 4 were probably of slight severity (the data exist to test this) but even so, the proportion of sockets affected was high for such a young age group, suggesting that periodontal disease, with the eventually resultant tooth loss, was a serious problem for this population later in life.

Teeth of both sexes were equally affected by alveolar recession and in similar distributions, with no clear pattern except that the posterior teeth were very slightly more affected. The fact that male rates do not follow the male periodontal disease rates suggests that the continuous eruption and wear components of alveolar recession had more of a role in the incidence observed here than did resorption of the bone due to disease. That the posterior or molar teeth were more affected than the anterior may suggest a coarse diet requiring prolonged mastication. This type of diet is good from a preventitive point of view against periodontal disease, which perhaps confirms that it was hygiene and not diet that was responsible for the difference between male and female rates of periodontal disease.

Discussion of occupation, diet and environment

Detailed accounts of all the pathological data discussed in broad terms in the following sections are available as described by the individual workers in the MOLAS archive.

Occupation or activity

The figures for the enthesopathies present are given in table 43. Comparing the figures for right and left, it seemed that the sample were using the right arm more than the left in strenuous physical activity, with high rates of enthesopathies on the right humerus lateral epicondyles (36.2% relative to 28.7% on the left), the olecranon process (43.2% to 34.5% on the left) and the radial tuberosity (17.4% compared to 12.8% on the left). The recordable cases were too few to discuss the sexes separately. At face value, these muscle insertion sites are involved in a movement which throws the arm away from the body with the palm turned downwards, for example, as in sweeping, scything etc. and are typically affected in sufferers of repetitive strain injury today (C. Taylor pers comm) However, without comparable figures for contemporary samples to judge if the figures for the study area reflect anything unusual, and a modern population of similar composition with known occupations or activity and a similar enthesopathies pattern to “diagnose” the pattern in the study area sample, it was impossible to say what the observed pattern might signify. Stirland (1991) points out that this sort of data does have some potential but similarity studies of modern populations practising known repeated activities are essential if this area of analysis is to be taken further. The detailed data are available on the database to any interested researcher.

It has been suggested elsewhere that patterns in the distribution of osteoarthritis over the skeleton could indicate the presence of stress on particular joints as the result of repeated postures, for example, of the knee through kneeling tasks or specific regions of the vertebral column relating to how loads were carried, and that differences in male and female patterns may signify a difference in work roles (Molleson 1993 p???). Cases of osteoarthritis occurred throughout the skeleton in the overall sample; the most common sites affected were the vertebral column and the hip, unlike Poundbury but similar to Cirencester. The shoulder joint was also frequently involved as at Cirencester. However the contributary factors in the onset of osteoarthritis are very complex with sex, variations in bone morphology between individuals, nutritional status and genetic predisposition playing a part amongst other factors, so that although wear due to repetitive activity is no doubt partially responsible, it is difficult to say what weight should be given to this evidence.

Squatting facets on the tibia and talus have been attributed to a repeated squatting posture, although this has not been conclusively demonstrated (Brothwell 1972, 92). Approximately 10% of the sample have these facets (table 18).

Schmorl’s nodes (see section 00) were common throughout the sample, with the lower thoracic and the lumbar vertebrae most frequently affected. These are the most commonly affected sites (Ortner and Putschar 1981, ???). Both males and females were affected.

Spondylolysis, or the separation of the neural arch either unilaterally or bilaterally from the vertebral body (Ortner and Putschar 1981, ???), has similarly been attributed to excessive strain on the lower back during adolescence. With a minimum of five cases recorded for the sample, the condition was present but not common.

The distribution and types of fracture present can indicate patterns of activity. Fractures were common throughout the sample. The most frequent sites involved were the ribs, metacarpals, metatarsals and to a lesser extent, the clavicle. These injuries are typical of bad falls and general everyday accidents to the hands and feet. Correspondingly, there were a couple of cases of Colles fracture and one fracture of the distal end of the radius, both typical of extending the forearm to break a fall. There was one case of a penetrative wound to the foot with associated secondary infection. There were a few cases of fractures to the lower leg which have been attributed to twisting of the leg whilst the foot was held solid. There were a few cases of parry fracture, that is fracture of the ulna midshaft, which are generally associated with an arm held across the body, in a defensive posture ready to ward off a blow. There were a few cases of depression fractures to the skull which may also be suggestive of violence. Neither of these types of fracture were present in large numbers suggesting a not overly violent living population. There was also one case (WTN [925]) with transverse cuts to the second, third and fourth lumbar vertebrae with no evidence of healing (ie. they were either the cause of death or occurred at the time of death) and no other sign of trauma.

The osteological evidence of activity indicates a group in which a proportion were involved in physical activity and manual labour, probably as the result of which they suffered various fractures and injuries. They were not heavily involved in activity of a violent nature.

Diet and nutrition

Cribra orbitalia was present but not in very large numbers (probably less than 5%). The most frequently cited causes of these lesions are iron deficiency anaemia due to insufficient iron in the diet, or poor uptake of iron due to a lack of vitamin C in the diet, infestation by parasites or because of chronic diarrhoea following stomach infections. The low incidence rate here suggests that none of these contributory factors were major problems amongst the young in this population, which may in turn suggest that the careful hygiene practices required for safe weaning were in place for a large proportion of the sample.

Amongst the immature individuals aged by the present author, less than 5% showed evidence of short limb length, ie. stunted growth, relative to their dental development age. In periods of nutritional stress, physical growth is affected before tooth development. The small proportion affected in this sample suggests that, generally, children were not subject to a severely inadequate diet.

Enamel hypoplasia also reflects the occurrence of episodes of stress during childhood, but as well as severe nutritional stress, the causes may include pyschological and physical stress such as periods of severe illness. The overall incidence rate of hypoplasia was around 10% (see section 00). Assuming then that dietary stress may account for at most half of these cases with 5% of children presenting evidence of stunted growth, pathological (ie. illness) or pychological stress may account for the remainder of the cases of hypoplasia. The data exist to check if those individuals with stunting also had hypoplasia.

Amongst the adults, Molleson (1993, ???) suggests that a lack of sexual dimorphism in a sample can be a reflection of a society with poor nutrition. In particular low male stature reflects a society low in protein. Detailed metrical data exist on the database to compare the majority of the skeletal elements of the sexes, including the dimensions of the canine (which can indicate sexual dimorphism in a population) for over half of the overall sample. The average male stature was 1.69m with a range of 1.58-1.80m, the average for females was 1.58m with a range of 1.45-1.72m; that is there was an 0.11m difference between male and female averages which suggests that male growth was not being stunted relative to female. Therefore there was presumably sufficient protein in the diet and an adequate diet overall.

Molleson (1993) attempted a fascinating breakdown of the diet available to the Poundbury sample using the evidence provided by skeletal and dental pathology present. Her reasoning has been followed in the remainder of this section on diet with some additions. Protein deprivation in the mother during pregnancy and lactation has been proposed as a factor in high caries incidence rate in later life for the child (Sweeney *et al* 1971, ??? cited in Molleson 1993). If the diet was satisfactory in terms of protein, this does not appear to have been a contributary factor in the albeit, low caries incidence rate in this sample. Krogman (1938, ??? cited in Molleson 1993) has suggested that a lack of calcium, phosphate and vitamins C and D during enamel formation can also contribute to the onset of caries later in life. Periostitis of the tibia, including that associated with chronic ulceration has been attributed to a lack of vitamin C (Loudon 1981 cited in Molleson). Approximately 10% of individuals were affected in this sample, which is comparable to results at Cirencester where 10-12% were affected. This would be the minimum number of individuals affected as not all sufferers will experience bony changes. Similarly, scurvy indicates a vitamin C deficiency but has not been frequently recorded in the palaeopathological literature. One possible case of infantile scurvy was identified, amongst the individuals at HOO [1682]. Alveolar osteitis, here recorded as periodontal disease of slight severity, was very common and severe pitting of the palatal roof of several adults was noted, either of which may be an early indicator of scurvy (amongst other things). Some of the palatal tori noted as non-metric traits were described as having a “cauliflower-like” appearance which can also be a characteristic of scurvy. It is possible therefore that scurvy was present amongst the sample but not well advanced in the majority of cases and not in large numbers, even if all the reported cases were correctly diagnosed. Given both the periosteal changes and the possible cases of scurvy, there was possibly some evidence for vitamin C deficiency. This could result from insufficient fresh fruit and vegetables in the diet or because food was over-cooked; prolonged boiling can destroy the vitamin C content.

A deficiency in vitamin D can manifest itself as rickets in children or osteomalacia in adults. There were no observed cases of osteomalacia and very few cases of possible rickets, though two of the cases observed were classic examples, with bowed long bones and splayed ends to long bones and ribs. This suggests that a very small proportion of the sample suffered from a possible vitamin D deficiency which could be due to either a dietary deficiency or inadequate uptake or because of insufficient exposure to sunlight. Again, data exist to check if the same individuals suffered from vitamin D and C deficiencies, hypoplasia and stunting. Where it was noted that this had occurred the consequences were severe. An interesting case, MSL87 [754], was six years +/- 18 months old according to the dental development, but this dental age was well advanced relative to the skeletal age ie. there was stunting; both the fibulas and tibias were abnormally bowed, suggestive of possible rickets; there was enamel hypoplasia; and a radiograph revealed the presence of Harris lines in the distal ends of the femur diaphyses and proximal tibia diaphyses. Harris lines are bands of increased mineral density which show up on a radiograph, and are attributed to a disturbance in growth. Unfortunately immature individuals were not routinely radiographed so the incidence of these lines through the whole sample is not known. This child [754] clearly appeared to have suffered severe environmental and/or nutritional stress, however, and was x-rayed because of the macroscopically visible signs.

Up to this point the discussion has centred on what the available diet may have lacked, but for the majority the diet appeared to contain adequate protein, ie. meat, fish, dairy produce or pulses; adequate vitamin C, that is fresh fruit and vegetables; adequate vitamin D which may mean fish oils, liver, eggs or exposure to sunlight; and overall, sufficient calorific value, as there was little stunting in children or reduced stature in males. Direct evidence from tooth wear, which was generally advanced in older individuals suggested that coarse food requiring mastication, such as cereal baked into bread, was an important component of the diet. Poor hygiene was apparently the most probable cause of caries given that the most frequently affected site was the interproximal surfaces of the teeth (see section 00), and this, combined with the low caries rate overall, suggests that sugar was not a major component of the diet. Not only was the diet adequately healthy for the majority but for a few it may have been excessively rich, as indicated by two possible cases of gout. Gout is a metabolic disorder in which the kidneys excrete an excess of uric acid, which may be deposited in the extremities as uric crystals. The crystals can trigger an inflammatory reaction there with accompanying pain. Affected individuals tend to be older, overweight males (Ortner and Putschar 1981, 415). Alternatively, ingestion of lead can cause the same symptoms because resultant kidney damage leads to increased levels of uric acid in the blood. High lead levels in the bone of individuals from other sites, such as Poundbury, and the heavy use of lead in Roman society for many purposes suggest that this could be a possibility here. Unfortunately control soil samples were not available to test for lead levels. A few cases of possible Paget's disease were identified, perhaps reinforcing the possibility of lead poisoning, as Price (1993, ???) says that ingestion of lead can predispose to the onset of this disorder. On the other hand there were also a few cases of probable diffuse idiopathic skeletal hyperostosis (DISH), a proliferative bone disorder of unknown aetiology, for which a link to an affluent diet, rich in Vitamin A and of high calorific value, has been suggested (Waldron 1985).

It seems that overall the available diet was adequate for the healthy maintenance of the majority of the sample. A few individuals may have had access to an excessively rich or plentiful diet. A small proportion of individuals were compromised either nutritionally or by environmental stresses such as parasitic infestation or chronic stomach upsets hindering efficient uptake from the diet, and presented evidence of possible iron deficiency, vitamin D and/or C deficiencies and a general overall inadequacy of diet.

General environment

Personal hygiene has already been interpreted as generally poor from the evidence of dental pathology, and was possibly worse in males than females. However, food storage and preparation may have been reasonably good, as cribra orbitalia was present at a lower level than at other Romano-British sites and one contributary factor to this condition can be chronic stomach upsets and diarrhoea. Unfortunately, it was not possible to establish the level of parasite infestation amongst the population because of a lack of soil samples (see section 00). Another line of evidence concerning the general level of cleanliness may be the frequency of cases of secondary infection following traumatic injury. Although there were several cases of chronic secondary infection, there were many cases of very well healed fractures with no sign of any reactive changes. This would seem to indicate a generally adequate level of hygiene. Conversely, there were at least two cases of probable tuberculosis which is commonly thought of as an indicator of overcrowded living conditions and poor hygiene. Few of those affected will show any evidence of bony change, so if the proposed cases are reliably diagnosed, a much larger proportion of the sample may have suffered from this disease. Alternatively the supposed tuberculosis could be brucellosis, which could indicate that a proportion of the sample were living in close proximity to animals or were eating contaminated meat or milk products, depending on the type of Brucella bacilli involved (Ortner and Putschar 1981, 138). In this case the type and location of the lesions made tuberculosis the more probable diagnosis, though both cases involved the shoulder, which is one of the less frequently involved joints.

On a wider perspective, regarding pollution of the environment as a whole, an obvious pollutant in Roman society was lead, with its wide usage in food as a sweetener and preservative, the manufacture of table and cooking ware, coffins etc. The absence of control soil samples ruled out analysis of lead levels present but the incidence of pathological conditions which can be exacerbated by the presence of lead, such as gout and Paget's disease, may suggest that individuals were ingesting substantial quantities. In addition, Price (1993, ????) uses the presence of erosive arthropathies to indicate the presence of either pollutants or familial groups, as there can be an inherited tendency towards these complaints, or poor nutrition. There was only one case of possible psoriatic arthritis (HOO88 [525]), and this, in addition to only a few cases of gout and Paget's disease, was insufficient evidence to infer anything concerning environmental pollution, family groups or poor nutrition.

The case of possible psoriatic arthritis is one of a group of afflictions whose onset tends to be observed in individuals in later life, and whose incidence can therefore indicate the presence of a pool of older individuals in the sample which the macroscopic ageing techniques may have overlooked. The cases of probable DISH discussed previously tend to affect males over 45 years of age; Paget's disease tends to affect males over 65 years of age. Degenerative joint disease was the most commonly occurring category of pathology in the overall sample (see section 00) and this also indicates an older population, as the incidence greatly increases after about 40 years of age. There were only a few cases of possible hyperostosis frontalis interna, a marked thickening of (usually) the endocranial surface of the frontal bone resulting from changes in the pituitary hormones after menopause (Ortner and Putschar 1981, 294), and which almost exclusively affects females. Osteoporosis was more common, affecting around 5% of adults in the sample. This diminution of bone mass (Ortner and Putschar 1981, 289) tends to affect females more than males and has its onset during or after the fifth decade. Sufferers could also be troubled by stress fractures of the weakened bones and resulting complications. However, the recorded cases were based on a macroscopic examination only for the most part, and radiographic evidence is necessary to confirm this incidence rate.

With the exception of the psoriatic arthropathy which would have been associated with a chronic skin condition, any of the conditions indicative of an older component to the population could have gone unremarked in life or could have been painful to varying degrees and disabling to the point where the individual required help. There were other signs that, at least in some cases, humane care was provided. Many fractures were well aligned, well healed and had no evidence of secondary infection; this suggests the use of splints, medical treatment and subsequent care to keep open wounds clean. On the other hand, some fractures were misaligned with overlap of shaft fragments and evidence of secondary infection, which suggests that little or no treatment was administered. There were no severe congenital defects which may have required prolonged intensive care for the survival of the infant. There was only one case of possible advanced ankylosing spondylitis. If this diagnosis is correct, the individual may have been less physically capable and less able to contribute to the society, thus requiring support or subsidy on a long term basis. Those with fractures to the arms and legs would have needed help at least temporarily. Those with severe osteoarthritis of the major joints, such as the hip, may have been less mobile either because of pain or joint deformity in the later stages thus requiring care and support, although sometimes those with dramatic osteoarthritic changes may feel no pain.

5.3 The sample over time

As already stated, it is not possible to discuss specific burials in each phase because of the limitations inherent in the method of phasing. This section, therefore, looks at variations in the proportions of burials assigned to each of the four proposed “phases” when certain characteristics of the inhumation sample are considered, compared to the predicted proportions for the total burial sample (see section 00).

The popularity of inhumation as a rite behaves quite differently to that of the cremation rite over time (table 44). More cremation burials occurred in Phase 1 and Phase 2 than would be expected from the overall burial proportions, and less than expected in Phase 3 and Phase 4. Inhumations appear to have increased in popularity gradually over time, with the rite slightly less frequent than expected in Phase 1, roughly as predicted in Phase 2 and Phase 3, which reflects an increase in burials overall between Phase 2 and Phase 3, and more popular than expected in Phase 4.

Rates of male and female inhumations also followed different trends. Numbers of male inhumations were nearer the observed proportions for total inhumation burials in all phases than females, slightly under-represented in Phase 2 and Phase 4 and slightly over-represented in Phase 1 and Phase 3. All were very slight deviations but the variation in Phase 4 could indicate a decrease in the popularity of inhumations amongst males during Phase 4. Popularity of inhumation increases continuously over time for females however, and by a noticeably different pattern, with less female inhumations than expected compared to the rate of total inhumation burials in Phase 1 and Phase 2, then successively more than expected in Phase 3 and Phase 4. Males and females were roughly equally represented in Phase 3 but the frequency of female inhumations was most markedly different to that of males in Phase 4 when the female proportion was still increasing but the male frequency was in decline. This may all mean that the popularity of inhumation as a means of burial differed for males and females over time, with inhumation chosen more for males than females earlier on, then declining in popularity for males towards the end of the life of the cemetery as it continued to increase in popularity for females. However, as the phases have been defined purely on the basis of grave good data, it is possible that differences in goods associated with male and females may be producing artificial differences.

Every age group appeared to behave differently over time (see Age Groups 1 to 6 in table 44 for the detailed variation). There seems to be no overall pattern to this variation; again it may be an artificial observation resulting from differences in grave goods in burials of different age groups. COMBINE THIS AND PRECEDING PARAGRAPH WITH ANGELA'S IN CHAPTER 3 TO SEE IF TRUE VARIATION OR RESULTING FROM GRAVE GOOD DATA.

Data for the cranial and post cranial indices assigned to the four phase groups produced sub-samples of insufficient size to discuss.

It is not possible to look at changes in health over time here as this would require the detailed pathological data recorded for each individual to be used, and the difficulties with this when considering the sample as a whole rather than site by site have already been discussed (section 00).

5.4 Burial rites

Do the data provide evidence for variation in burial rite spatially and through time?

Can inhumations and cremations be compared in this way?

The first question (posed by the archaeologists) covers characteristics of the burials such as arrangement and treatment of the skeleton, type of container, presence and type of grave goods and so on, and are dealt with elsewhere (sections 00 and 00). Variation in specific osteological characteristics of the individuals selected or accepted for burial in specific plots or orientation groups has been discussed in section 00).

In this section, the osteological characteristics of cremation burial and inhumation burial samples are compared to look for any change in the population represented by the two samples ie. over time to some degree and between rites.

Comparison of cremation burials and inhumations.
(see J. McKinley's section on the cremated burials)

The decreasing popularity of cremation as a rite, and the increasing popularity of inhumation burial over time has been discussed in section 00. It is worth emphasising that, on the basis of grave good dating evidence, cremation was not completely replaced by inhumation; the two rites were practiced contemporaneously but with variation in popularity.

The cremated bone tended to be better preserved than the inhumed bone because the surrounding matrix of "brick-earth" and gravel is not particularly good for the preservation of unburnt bone and because the degree of truncation affecting the inhumation burials varied between sites. This difference should be borne in mind in case it introduces bias to the comparisons attempted here.

Age

The number in each age band was in the same order of size in the inhumation and cremation burials except that there were inhumation burials of individuals of less than one year of age and none amongst the cremation burials (table 45). McKinley has already discussed the factors affecting cremated remains of individuals less than one year (section 00) and the factors affecting the inhumated sample are discussed in section 00. 7.9% of the cremated burials were of older adults compared with 9.8% of the inhumations. Therefore, apart from the burials aged less than one year, the age structure of the cremation and inhumation burials was similar.

Sex

56 of all cremated contexts, or 49 (63%) of the adult definite cremation burials (see section 00 for definitions), could be sexed. The latter figure was used in this section as it was most comparable with the inhumation data which excludes all data from secondary contexts. (Secondary context data is dealt with separately in section 00).

The cremation burials produced 33 females and 16 males, a male to female ratio of 1:2.1, although McKinley points out that this may be compromised as 36% of adults could not be sexed. In fact, 34% of the adult inhumation burials could not be sexed as the severe truncation of some of the burials meant that many of the individuals assigned to the "adult" category in the age breakdown were represented by little more than a few scraps of bone. This meant that 255 individuals from inhumation burials could be sexed, including 109 females and 186 males, a ratio of 1.7:1. This interesting difference suggests that more females were cremated than males and it agrees with the difference in the way the popularity of inhumation appears to vary over time between the sexes. There were fewer female inhumations than expected and more males than expected during Phases 1 and 2, when cremation was more popular, than in Phases 3 and 4 (see section 00). Perhaps the lack of female inhumations is explained simply by the popularity of cremation in phases 1 and 2. However, some caution is necessary, as McKinley says that cremated remains may preferentially allow identification of females. Also, the male predominance at the majority of inhumation sites of all periods prompts the question of male bias in identification of inhumed remains, although studies have suggested that sex estimates particularly when based on characteristics of the pelvis should have a high degree of accuracy (Ubelaker 1984, 41).

The sexes behave similarly when broken down by age group in both types of burial and this structure has been discussed previously for each sample.

Pathology and dental pathology

It is not possible to comment on comparative health, diet etc. as it would not be accurate to compare incidence rates of various pathologies between the cremation and inhumation burials. McKinley states that amongst the cremation burials "incomplete recovery of skeletal remains places constraints on the pathological diagnosis". Any differences observed are therefore more likely to be as a result of the cremation process rather than true differences between the samples. In general the same types of pathology were present in both samples and degenerative disease was the most common category in both.

Plots

All sample sizes were small when cremation burials were subdivided by plot. Bearing this in mind, Plots 16 and 29 had no immature cremation burials. Plot 28 had a single cremated immature individual representing 3% of the total cremation burials in that plot when the usual proportion of immature individuals was c 10-11%. Plots 2, 17 and 21 had small numbers of immature cremations but closer to the average than Plot 28. In Plot 3, however, immature individuals were overrepresented amongst the cremation burials with 29% immature (14 individuals). Plots 3, 16, 17 and 21 had no cremated individuals from the older adult category; plots 2 and 28 had more than the average of 7-9% with 21% and 14-17% respectively.

The distribution of age groups in the inhumation burials amongst the plots was almost the reverse in some cases. Plot 16 had a higher proportion of infants (0-5 years) and immature individuals (6-12 years) at 14.9% and 27.6% respectively compared to the average figures for these groups of 9.1% and 9.7%, and less adults than expected with 57.4% compared to the average proportion of 74.7% (table 53). In age groups similar to those used for the cremation data this meant 25.2% of the inhumations in Plot 16 were immature compared to a complete absence of immature cremation burials. The second plot with no immature cremation burials, Plot 29, had seven inhumation burials of which three were infant. Plot 21 had too few inhumations to compare to the cremation burials. Plot 2 followed the average inhumation age structure. Plot 17 had few infant and immature inhumations (3.6% and 5.4% respectively) and correspondingly a very large proportion of adults (90.9%). Put into age categories equivalent to the cremation terminology (see sections 00 and 00 for definitions), 5.5% of Plot 17 were immature compared to the cremation burials in Plot 17 including a "close to the average of 10-11%" proportion of immature individuals.

Plot 3 contained the only large sample of inhumation burials without infants. This was to some extent balanced by a greater than usual proportion of individuals in Age Group 2 and Age Group 3 (14.0%), so that the proportion of adults was similar to other plots at 73.2% (table 45). Again, in cremation terminology, Plot 3 had a lower than average proportion of immature individuals.

Plots 3, 16 and 17 all had comparable proportions of individuals in the older adult category (Plot 21 was too small to include) at 8.5%, 7.0% and 12.7% respectively, whereas there were no cremation burials from this age group. Plot 2 had a similar proportion of older adults to Plots 3, 16 and 17; Plot 28 had a similar proportion to the cremation burials with 17.5%.

Every plot had the largest proportion of inhumation burials in the adult category, except Plot 29, which was too small to be reliable with only seven members,.

McKinley cautions that the sample sizes of the cremation burials in many of the plots are too small to attach much significance to, but if the figures are reliable, there does appear to be some preference between plots for either inhumation or cremation rite for certain age groups. Alternatively, perhaps this could reflect a temporal difference of when certain age groups were included in a plot?

Are the data sufficient to question if there is any significance in the internal arrangement of inhumations and the position and types of burial goods within burials?

The different positioning of the body and the positioning of the grave goods are dealt with in detail elsewhere (sections 00 and 00). This section examines the osteological differences between;

Prone and the burials overall (ie. including 536 supine)
"Decapitated" and the undisturbed burials

The prone burials

Fourteen of the 550 skeletons recovered were placed in a prone position. The positioning is unlikely to be a post-burial effect as the skeletons were correctly articulated and therefore appeared to be placed lying face down originally. The small sample size makes any interpretation difficult as apparent differences between the prone and supine burials may be unreliable. Bearing this in mind, females were more frequent amongst the 14 than males, with males at 40% represented in a similar proportion as amongst the overall sample whereas females at 60% were much more frequently present than the 28.2% in the overall sample would predict (table 46). Adults were present in a similar proportion as in the overall sample at 71.4% compared to 70.2% overall. However, there were no infants when almost 9% of the overall sample were in this category and there were almost double the expected number of immature at 28.6% compared to 14.5% (table 47). If the figures are reliable it would appear that the rite was most frequently applied to females and to those from Age Group 2 and Age Group 3 (c. 6-18 years).

For all other osteological characteristics the number of individuals recordable was too small to allow any comment. Average male stature, calculated from two individuals, was 1.70m; average female from four individuals was 1.60m (table 48). Of the two subjectively assessable skulls, one was round and one was oval when viewed from above (table 49). Data for enthesopathies was insufficient to be of any use. Pathology rates were very similar to those for the overall sample (table 50). The most substantial difference was the lower rate of degenerative disease amongst the prone burials, but this presumably reflects the larger proportion of younger individuals amonsgt the prone burials relative to the overall sample.

The "decapitated" burials

There is no osteological evidence that any of the six burials put forward as decapitations by the archaeologists were true decapitations rather than the result of post-mortem purposeful rearrangement once the soft tissue had decomposed, or accidental disturbance. Full descriptions of the six are given in section 00. The condition of the remains ranged from good to poor and the proportion of the skeleton present ranged from 50% to 85% (table 51). The remains of the six were examined by two observers working independently but they saw no signs of any cut marks or dismemberment on the surviving bone. Of course, it is possible that the crucial bones had been lost on the less well preserved individuals, so it is only possible to state that there is no evidence for decapitation, rather than that the six were definitely not decapitated.

Five of the six were adult, of whom two were male, two were female and the sex of one could not be determined. The remaining individual was in Age Group 2, that is 6-12 years old. The average male stature calculated from two individuals was 1.75m, which was a little tall compared to the overall sample average of 1.70m but not reliably so with only two individuals included. The only assessable skull was oval viewed from above; there were insufficient data to discuss the enthesopathies and there was nothing unusual in the pathology rates (table 50). In all, there was nothing unusual about these skeletons other than they had had their skulls displaced.

Are there sufficient data to trace a relationship between burial goods and the attributes of the burials?

Burials with grave goods

There were 137 skeletons with grave goods of some kind. The grave goods data are dealt with in detail elsewhere including discussion of type, position etc. (section 00). Osteologically, the breakdown of sexes and age groups with grave goods was very similar to the overall sex structure and age composition (tables 46 and 47). Average stature was slightly taller than the overall sample average statures, with the exception of the possible females (table 48). Skull shape followed the overall pattern with oval and pear shaped (narrowest portion towards the face), when viewed from above, most common. Again, the enthesopathies data was of limited use and the pathology data was very similar to that of the overall sample (table 50). There was nothing apparently unusual about the burials with grave goods in osteological terms.

Bones from 21 individuals from seven of the 12 sites had green stains on them of the type associated with contact with copper alloy objects (table 52). Most of the individuals affected were adult but at least two were children. Eleven cases involved parts of the skull or cervical vertebrae, six the wrists and hands and six the ankle or foot, which would appear to corroborate that these stains reflected the position of objects such as jewellery or shoe fittings. One unusual case was Burial 614 which had staining on the "lower vertebrae". Three cases (Burials 089, 361 and 586) had green stained teeth, perhaps indicating the presence of something held in the mouth such as a coin.
GET ANGELA TO CHECK THE TABLE AGAINST HER BURIALS WITH GRAVE GOODS TO SEE IF ANY OF THE STAINED HAD OBJECTS WITH THEM.

Burials with chalk-like deposits

Seventy four burials, of which 54 contained skeletal remains, included chalk deposits (section 00). The sex structure of these burials was similar to that for the overall sample (table 46), but there were more infants than expected, 18.5% compared to 8.9%, and fewer adults, 57.4% compared to 70.2%. The average stature of the adults was very similar to the overall sample and the skull shape follows the overall pattern (tables 48 and 49). The frequency of types of pathology was very similar to overall (table 50).

Burials with vessels containing residues

Only four skeletons were accompanied by vessels containing residues. One was a male adult, and two were adults whose sex could not be determined. The fourth skeleton was an infant. None could be measured.

Burials with associated structures

Five skeletons had associated structures. They included three adults, two male and one female, one immature individual and one individual that could not be aged. Average stature of the two males was 1.74m and the female's stature was 1.70m, both above the overall averages of 1.70 and 1.58m respectively, but with so few cases this difference was not significant. The frequency of types of pathology was generally similar to the overall pattern with degenerative disease most common (table 50), but again, this data was not significant.

Burials with animal bone or food

Fifteen inhumation burials had animal bones or other remains of food purposefully included. The sex structure of the 15 was similar to that of the overall sample (table 46) suggesting that neither sex was preferentially given food offerings. Slightly more adults than expected were included, 80% compared to the overall proportion of 70.2%, and slightly more infants, 13.3% compared to 8.9% overall, whereas there were no immature individuals when there were 14.5% amongst the overall sample (table 47). However, with a sample size of 15 these differences cannot be regarded as significant. Average statures were similar to the overall figures (table 48) and those with assessable skull shape were too few to include. The frequency of pathologies were similar to the overall rates (table 50).

Are there enough data to provide evidence for coffin and burial containers?

The evidence for the presence of various types of containers is discussed in section 00. The following section looks for any osteological differences between individuals given different types of containers.

The osteological characteristics of individuals in various types of container

A single lead coffin held a young adult male, and a lead coffin with a wooden outer shell held a 6-12 year old. Three individuals in wood and lead containers were mature adult males and two burials with tile cists were a mature adult male and an older adult female.CHECK The remainder of the sample included 285 with coffins (wood and nails); 18 skeletons with pieces of wood; and 86 skeletons without any evidence of a container.

There did appear to be some difference in the treatment of the sexes (table 46). Males were buried without a container more frequently than females, males making up 57.6% compared to the overall proportion of 48.2% and females 19.7% compared to 28.2% overall. However, neither of these variations was statistically significant. The slightly higher proportions of both male and female with wood than in the overall sample was probably a product of there being fewer individuals who could not be sexed in this group. The sex composition of those with coffins closely followed that of the overall sample.

When age structure was considered (table 47), the proportions of infant, immature and adults amongst those with coffins were very similar to the overall sample composition. Those with no container varied to a small degree from the expected proportions with more infants than expected, 12.8% compared to the overall proportion of 8.9%, and more adults, 75.6% compared to 70.2% overall; correspondingly there were fewer immature individuals, 10.5% compared to 14.5% overall. These differences were not significant.

The most frequent skull shape in any category was once again oval (table 49). The average stature of each group was more interesting. The average stature of males and females without containers, with wood, or with coffins, were all very similar to the average stature of the overall sample (table 48). The male in the tile cist was relatively tall at 1.75m, and the average of two measurable males with wood and lead containers was 1.74m, again relatively tall. Both values were towards the upper end of the range for the whole sample; perhaps this is the first trace of an indication of variation in status between container types but with only this one line of evidence, this was impossible to confirm. (It is interesting that the average statures for those with grave goods were very slightly taller than those for the overall sample and the two measureable "decapitation" burials had a high average at 1.75m.)

It was not possible to compare the enthesopathies data as not all workers had recorded the information. In terms of pathology, those with coffins were very similar to the overall sample (table 50). Those without containers had a slightly higher proportion of degenerative pathologies than expected from the overall figure, but this probably simply confirms that there was a slightly higher proportion of older adults with no container than in the overall sample.

Individuals from burials with only fragments of wood had a different pattern of pathological change to the overall sample; a lower proportion of trauma, 8.3% compared to 15.7% overall (not statistically significant), and a higher proportion of metabolic type trauma, 11.1% compared to 3.6% overall (significant at the 90% level). It is tempting to attach explanations to this variation, but with only 36 cases of pathology amongst the individuals with wood fragments compared to 1127 cases for the overall sample, the fluctuation could be artificial.

Do the data from the secondary deposits eg. ditch fills and pit fills, provide evidence for burial rite?

ie. Who is in the deposits?
Why did they lose their importance and, if originally primary, get moved?

The human bone form the secondary deposits

Eleven of the 40 secondary contexts recorded contained more than one individual. Skulls and skull fragments were the most common bones in these contexts, at 16.5% almost double the frequency of the next most common bones, the right ribs, at 8.5%. The only other pattern to the bone present was that all the larger long bones (apart from the radius) were most frequently represented when the specific skeletal elements present were considered. It seems that the most recognisable human bone was being included in these fills. The smaller bones and those more difficult to recognise, such as those of the hands and feet, were less common. This could be due to either of two factors or a combination of them.

1. All human bone observed during the excavation of secondary features should have been hand collected. In some cases, the fill of secondary features would have been sieved in the process of other types of environmental analysis, and human bone recovered would be retained. This collection policy may not have been rigorously adhered to at all sites at all times, with the more easily noticed human remains being preferentially recovered at the expense of those more easily ignored.

2. Whoever put the fill in the features originally may have preferentially included readily identifiable human bone and were not concerned with any other remains.

Male, female, mature and immature individuals were noted amongst the remains, but there were insufficient data to look at any other aspect of the secondary contexts.

Roman London in general - especially late Roman London

All requests in this section have been taken care of as parts of other queries;
1 is in conclusions
2 is in population under phasing
3 is throughout the report in relevant sections

6. Conclusions

One of the most unusual characteristics of this sample from the outset was that there was nothing immediately remarkable about it. Anybody working with human bone will know that each large sample seems to have at least one or two distinguishing features, which make their presence felt during recording, and can often lead to interesting interpretations in the analysis. It has only been during the later stages of analysis that possible differences between some of the defined groups have become apparent. The analysis could potentially have been compromised by amalgamating the work of four people, and every care has been taken to avoid this. Consequently in some cases only the “lowest common denominator” of data could be used and in others, data for only part of the overall sample. It has been indicated in the text where more data exist, and it would be possible to take parts of the analysis of the overall sample much further for certain sites, as each of the four workers tended to have a category of data which they had concentrated on and recorded in more detail than their colleagues.

The major factor in the differential preservation of the remains across the twelve sites appears to have been variation in the degree of physical truncation of the burials by subsequent activity rather than quality of excavation, soil conditions, age or sex of the skeletons. Comparison with other Roman burial samples suggests that this sample was drawn from an indigenous Romano-British population who had been born, lived and died locally. The people were on average a little shorter than modern Britons and quite robust looking. Immature individuals, particularly infants of less than one year, may have been excluded from the cemetery to some degree, but this impression could easily be an artifact of the piecemeal nature of the excavations. The most common skeletal pathologies were those of a degenerative nature in common with most archaeological samples. The level of dental pathology present was generally in keeping with burials found at other Romano-British sites; caries were not widespread but periodontal disease, and the resulting tooth loss, may well have been a serious problem later in life. Male personal hygiene may have been inferior to female standards judging from patterns of dental pathology, but general levels of cleanliness appeared to have been quite good. Generally the available diet was adequate, but for a small proportion may have been deficient in quantity or composition, and for another even smaller proportion may have been very good. In addition to nutritional stress, a small proportion of children might have been experiencing periods of physical stress (as in severe illness) or possible pyschological stress. A small proportion of the sample appears to have been involved in heavy physical or manual labour from an early age. There may also be evidence for horse riding and the equivalent of today's repetitive strain type injuries, and interestingly these activities appear to have been associated with specific groups. The majority of fractures and traumatic injuries present were probably the result of everyday accidents and the population as a whole did not appear to have borne marks of violence. There would appear to have been some sort of medical treatment applied at least in some cases of wounds and injuries. Also advanced cases of the degenerative complaints of old age may have rendered the sufferers less mobile through pain or deformity and would therefore have required care and assistance in many aspects of daily life.

In terms of organisation of the cemetery, there was no differentiation between the Orientation Groups 1 and 2 on the basis of many osteological characteristics, including age, sex and the indicators of status, amongst others. However, the two groups did appear to be involved in differing activites, with Orientation Group 2 members presenting evidence for an activity such as horse riding and Orientation Group 1 members with bony changes consistent with coping with movement over rough ground. Dental evidence suggested that Orientation Group 2 may have had a more processed or less coarse diet than Orientation Group 1.

The plots varied in age and sex structure. Plots 3 and 17 notably both contained a greater proportion of male adults and fewer immature individuals, particularly infants, than the other plots. Much of the more detailed analysis could only include individuals from Plots 2 and 3. On this basis, individuals in Plot 2 had suffered from more periods of severe stress in childhood and also from higher rates of periodontal disease in later life than individuals from Plot 3. Again there appears to be some difference in the evidence for repetitive activities performed by the groups, with individuals in Plot 2 bearing evidence of both the horse riding and rough ground type changes, and those in Plot 3 exhibiting changes associated with maintenance of an upright posture and also evidence of stress to the elbow very similar to the modern repetititve strain type injuries associated with a sweeping but controlled movement. All the plots were used throughout the life of the cemetery, although the popularity of particular plots appears to have varied over time.

The practice of inhumation did not completely replace the cremation rite as the preferred burial method. On the basis of grave good dating evidence, the two rites appear to have been practised contemporaneously but preference for one or the other varied over time. There did appear to be some preference in certain plots for either inhumation or cremation rite for certain age groups.

Little can be concluded about the more unusual burial practices. Placing the body prone rather than in the more common supine position appears to have been more commonly applied to females and to those from Age Groups 2 and 3 than any other categories of age and sex, but the total number of prone burials was only 14 so this apparent tendency may not be significant. There was nothing unusual about the supposedly decapitated individuals, none of whom bore cut marks to the bone, nor about the burials with grave goods, including vessels with residues, burials with animal bones or other food and those with associated structures. Infants (that is 0-5 years) appear to have been preferentially selected for burial with chalk.

Contents

Acknowledgements

Thanks to;
Frances Lee, Fiona Keily and Tony Waldron for their detailed recording and help with questions about the data which made this attempt at an integrated report for all eleven sites possible.
Naomi Mott of The Institute of Archaeology, University College London, who undertook all the radiographic work.
Tony Waldron for help with diagnoses of pathologies on the remains from sites undertaken by the present author.
Theya Molleson's discussion of diet in the Poundbury volume which provided the basis for part of the discussion of diet in this analysis.
Christiane Taylor ??? ??? an experienced physiotherapist, for her interpretations of the types of movement and activity likely to cause the observed patterns of enthesopathies development.