

## 1. INTRODUCTION

The remains of 74 articulated skeletons and a small quantity of disarticulated human bone from early medieval burials excavated in Exeter Cathedral Close were examined by the writer in 1998. The burials, all dating from the period between the late 7th and the 12th centuries, came from three adjacent sites excavated by Exeter Museums Archaeological Field Unit in 1971-2.

### 1.1 The sites

The three sites lay to the west of St Peter's Cathedral.

- **Mary Major.** The site of the parish church of St Mary Major, in which burials were excavated in 1971-2 (site code MM).
- **Mary Major Trench 8.** An outlying trench, located 30m to the north-west of the main Mary Major site; excavated in 1971-2 (site code MM).
- **War Memorial.** An extensive area to the north of the church site; excavated in 1972 (site code WM).

The burials all overlay the remains of the basilica and forum complex of the Roman town (Henderson and Bidwell 1982).

Other human remains, of 12th/13th- to 17th-century date, excavated in 1976 from the area between the east end of St Mary Major and the west front of the medieval cathedral, are discussed in a preliminary study by Gill Stroud (Stroud 1999).

### 1.2 The skeletons

The human remains retained from the various Cathedral Close excavations are stored at the University of Sheffield's Department of Archaeology and Prehistory where the more complete and better-preserved skeletons have been used as teaching material. The material had formerly been in the care of the DoE Ancient Monuments Laboratory. Because the skeletons were not examined close to the time of their excavation, much useful information has now been lost. Consequently, it has been difficult to determine the exact number of skeletons excavated from each site (it is known that medieval and later skeletons from the 1971-2 sites were re-interred before excavation was completed, although there is no written record of this). Discrepancies were also found between the labels accompanying some of the bones and the site archives. However, the overall analysis is likely to be unaffected because the skeletons represent individuals from broadly the same population.

#### ***Burial types and phases***

The excavated skeletons came from four burial types distinguished by the excavators: ordinary burials (OB), charcoal burials (CB), vault burials (V), and graves (G).

The burials recorded in the excavations fell into four phases determined to a large extent by their alignments (Henderson and Bidwell 1982). The first three phases belonged to three successive cemeteries (I-III) which pre-dated the medieval parish church of St Mary Major.

Cemetery I contained the earliest burials and is thought to have been in use by the 6th century, i.e. the early Christian period (phase 1). Six skeletons belonging to this group were reported on by the late Calvin Wells (Wells 1979). The present whereabouts of this material

is unknown. The combination of calibrated radiocarbon determinations for two of these skeletons gives a date range of 430 AD-650 AD at 95% confidence (HAR-1613 and 1614; Bidwell 1979, 111; Stuiver and Kra 1986; OxCal v2.18 cub r:4 sd: 12 prob [chron]).

Cemetery II is thought to date from the period between the late 7th and early 10th centuries (phase 2). It contained burials lying on an approximately E-W alignment which are assumed to have been associated with the Middle Saxon monastery that is mentioned in the Life of St Boniface (Henderson & Bidwell 1982). Cemetery II contained both ordinary burials and charcoal burials, as also did cemetery III.

Cemetery III probably dates from the early 10th to the early 12th century (phase 3). The burials in this cemetery were aligned ESE-WNW and could be shown to be associated with an Anglo-Saxon church with an apsidal east end, whose fragmentary remains underlay the medieval and Victorian parish church of St Mary Major. The late Saxon church is thought to be the minster church which according to an 11th-century tradition was refounded by Athelstan in the early 10th century; between 1050 and 1133 this church served as a cathedral (*ibid.*).

The latest burials on the site (those designated 'grave' at the time of excavation) were of medieval and later date and clearly associated with the parish church of St Mary Major (phase 4). These burials mainly shared the same alignment as cemetery III. The great majority of them were either removed by machine without record or recorded in a summary fashion and discarded. No burials assigned the 'grave' classification at the time of excavation were retained for further study. The skeletons retained from the Mary Major and War Memorial sites were mainly those that cut into the underlying Roman deposits at the lowest level in the graveyard. The retained sample of ordinary burials on the cemetery III alignment is therefore likely to date from phase 3, but the possibility that some individuals belonged in phase 4 cannot be ruled out.

In trench 8, the entire sequence of burials was excavated by hand and recorded in detail on a series of plans drawn at nine successive excavation levels. This area probably continued in use for burial down to the early 17th century. Four skeletons were retained from trench 8. Nos OB130 and OB131 were recorded at plan level 8; and OB 204 and OB205 at level 9. This part of the cemetery was evidently already in use during the late Saxon period, since a charcoal burial was recorded in the trench (not retained). The level 9 burials can be assigned with a reasonable degree of confidence to cemetery III, but the level 8 skeletons have been treated as unphased (U/P) in the analysis.

The burials classified phase 2/3 (which cannot be assigned firmly on the basis of alignment to either cemetery II or III) have been treated as unphased. The four 'vault' burials (with stone linings) retained from the War Memorial site have also been treated as unphased.

Table 1. Numbers of burials presented for examination by type and phase.

Site	Charcoal burials (CB)	Ordinary burials (OB)	Vault burials (V)	Total	Cemetery II (phase 2)	Cemetery III (phase 3)	Unphased (U/P)	Total
Mary Major	14	13	0	27	13	12	2	27
War Memorial	10	29	4	43	21	8	14	43
Trench 8	0	4	0	4	0	2	2	4
Total	24	46	4	74	34	22	18	74

## 2. RESULTS

### 2.1 Articulated remains

Although 72 numbered skeletons were received for examination, two extra discrete individuals were found with skeletons V21 and OB254, making the total number of articulated skeletons examined 74. Several unlabelled bags of skeletons were also present, and these were treated as disarticulated

CB4-6, 8, 13 and 17, and OB18-19 were all labelled as belonging to the War Memorial excavation. However, according to the archive, War Memorial charcoal burials start at CB25 and ordinary burials at OB250, so these individuals were reassigned to the Mary Major assemblage.

#### *Condition and completeness*

Based on a visual assessment of the bones, the condition of each skeleton was recorded as good, fair or poor. Those skeletons that fall into the poor category have bones that have suffered a high degree of post-mortem damage. As a result the surfaces of many of these bones are abraded. On the whole all of the skeletons have suffered post-mortem breakage and are very fragmented.

Table 2 Condition of skeletons.

Burial Type	No. of skeletons	No. of poor skeletons (%)	No. of fair skeletons (%)	No. of good skeletons (%)
Vault	4	1	2	1
Charcoal	24	14	6	4
Ordinary	46	9	17	21
Total	74	24 (32.4%)	25 (33.8%)	25 (33.8%)

The recovery of the skeletons varied considerably from fairly complete individuals with nearly all their bones present to skeletons represented by one bone. There was much disturbance on the site, with some skeletons being cut by later structures and earlier burials being disturbed by later ones.

Table 3 Numbers of skeletons from each phase and percentage of bones surviving.

Phase	Total no. of burials	No. of skeletons with less than 30% bone	No. of skeletons with 30-70% bone	No. of skeletons with 70-100% bone
Phase 2	34	4	24	6
Phase 3	22	2	18	2
Unphased	18	4	12	2
Total	74	10	54	10

#### *Age and sex*

Ageing adult skeletons is problematic since techniques are based on degenerative changes, which can vary between individuals and populations (Mays 1997). Methods used to age adults are described in Brothwell (1981) and Mays (*ibid.*) The degree of wear on the molars, and pubic symphysis changes, which increase with age, were the main techniques employed. Non-adults were aged according to the pattern of tooth eruption (Ubelaker 1978) and epiphyseal union (McMinn *et al.* 1993; Bass 1987). Tooth eruption was the preferred

technique since the effect that the environment, diet and disease have on epiphyseal union is more variable (Hoppa 1992), and this method is also unsatisfactory for incomplete skeletons. Skeletons with no appropriate traits present, but which were clearly fully grown at time of death, are referred to as 'Adult'. Due to the fragmentary nature of the samples, this was the case for the majority of skeletons.

The following age categories were used: 0-5 years (infant), 6-15 (juvenile), 16-25 (young adult), 26-35 + 36-45 (adult), and 45+ (mature).

Where possible the adult individuals were sexed using the techniques described in Brothwell (1981), Bass (1987) and Buikstra and Ubelaker (1994). In particular, the morphology of the pelvis and the skull, and the size of the femoral and humeral heads were used. The range of male and female skull morphology and measurements of the femoral and humeral heads have a tendency to overlap and therefore the pelvis was considered the most important. This is the most sexually dimorphic bone and yields sexing information with about 90-95% accuracy (Brothwell 1981).

Skeletons with ambiguous traits were recorded as ?male or ?female, but treated as definite male and female for analysis purposes. Individuals where no, or unreliable, criteria survived were recorded as 'unknown'. This group includes all non-adult skeletons since sexual dimorphism does not become distinct until puberty.

Table 4 Range of ages and sexes from the whole sample.

Sex	0-5	6-15	16-25	26-35	36-45	45+	Adult	Total
Male	0	0	4	6	3	6	12	31
Female	0	0	5	3	1	0	7	16
Unknown	3	2	1	2	1	0	18	27
Total	3	2	10	11	5	6	37	74
% of 74	4.05%	2.71%	13.51%	14.86%	6.76%	8.11%	50.00%	

Table 5 Range of ages and sexes: phase 2.

Sex	0-5	6-15	16-25	26-35	36-45	45+	Adult	Total
Male	0	0	3	3	2	3	5	16
Female	0	0	1	2	0	0	4	7
Unknown	2	1	0	0	0	0	8	11
Total	2	1	4	5	2	3	17	34
% of 34	5.88%	2.94%	11.76%	14.70%	5.88%	8.82%	50.0%	

Table 6 Range of ages and sexes: phase 3.

Sex	0-5	6-15	16-25	26-35	36-45	45+	Adult	Total
Male	0	0	1	1	0	1	4	7
Female	0	0	4	1	1	0	1	7
Unknown	0	1	1	2	1	0	3	8
Total	0	1	6	4	2	1	8	22
% of 22	0%	4.55%	27.27%	18.18%	9.09%	4.55%	36.36%	

Table 7 Range of ages and sexes: unphased

Sex	0-5	6-15	16-25	26-35	36-45	45+	Adult	Total
Male	0	0	0	2	1	2	3	8
Female	0	0	0	0	0	0	2	2
Unknown	1	0	0	0	0	0	7	8
Total	1	0	0	2	1	2	12	18
% of 18	5.55%	0%	0%	11.10%	5.55%	11.10%	66.70%	

### ***Stature***

Statures can be estimated from longbone measurements using the formulae set out by Trotter and Gleser (1952 and 1958) This method is based on fully grown longbones and uses different calculations for the two sexes. Where possible those bones with the lowest standard of error are used. Stature could be calculated for 27 individuals, of which 17 are male and 10 female (see Table 8 below); the mean height for males is 1.73m and the mean height for females 1.61m. The overall mean height is 1.69m.

Table 8 Range of female heights by phase

Height	Phase 2	Phase 3	Unphased	Total
1.51-1.55	1	0	1	2
1.56-1.60	1	1	0	2
1.61-1.65	2	1	0	3
1.66-1.70	1	2	0	3
1.71-1.75	0	0	0	0
1.76-1.80	0	0	0	0
1.81-1.85	0	0	0	0
Total	5	4	1	10

Table 9 Range of male heights by phase.

Height	Phase 2	Phase 3	Unphased	Total
1.51-1.55	0	0	0	0
1.56-1.60	0	0	0	0
1.61-1.65	1	0	0	1
1.66-1.70	2	0	2	4
1.71-1.75	4	1	2	7
1.76-1.80	3	0	1	4
1.81-1.85	1	0	0	1
Total	11	1	5	17

### ***Dental health***

Thirty-four adult individuals have permanent dentitions surviving: 16 from phase 2, 12 from phase 3, and 6 unphased. The total number of teeth expected is 1,088 (34 x 32) and the actual number present is 562. Thirteen teeth are not present, and in all cases this involves the third molars only. Thirty teeth have been lost ante mortem, 84 teeth have been lost post mortem, and 401 teeth are unaccounted for due to missing jaws and teeth.

Conditions found on the adult dentitions were caries, abscesses, ante mortem (A/M) loss, periodontal disease, calculus and enamel hypoplasia as follows:

Table 10 Percentage of individuals with a dental condition.

Phase	Caries (%)	Abscesses (%)	A/M loss (%)	Periodontal disease (%)	Calculus (%)	Enamel hypoplasia (%)
Phase 2	3	0	3	3	8	3
Phase 3	5	0	1	1	5	2
Unphased	5	1	4	0	6	0
Total % of 34 individuals	13 (38.29%)	1 (2.94%)	8 (23.53%)	4 (11.76%)	19 (55.88%)	5 (14.71%)

Out of 562 teeth that were present, 21 (3.73%) were carious. No individuals with caries had cavities that exceeded three in number. Of the 510 tooth spaces that were present, two (0.39%) had abscesses (these were both observed on skeleton V20) and 30 (5.88%) had been lost ante mortem (the most teeth any one individual had lost was 15, on skeleton OB399).

The following table shows the distribution of dental conditions among the different adult age categories.

Table 11 Age distribution of adults with dental changes.

Age	Caries	Abscesses	A/M loss	Periodontal disease	Calculus
16-25	4	0	2	0	1
26-35	4	1	1	0	7
36-45	2	0	1	1	3
45+	2	0	2	3	5
A	1	0	1	0	3

Deposits of calculus were recorded as being slight, moderate (the majority of cases) or severe. Only traces of enamel hypoplasia were found. Three adults have shovel-shaped incisors (V21i, OB11, OB13). Although this abnormality is affected by environmental factors, inheritance has the greatest influence on its manifestation (Brothwell 1981). Two infants and one juvenile with surviving deciduous dentitions (OB361 and 323ii from the War Memorial and CB14b from Mary Major) showed no evidence of dental pathologies or abnormalities.

### *Non-metric (discontinuous) traits*

These are anomalies in the morphology of the skeleton. Hundreds of examples have been described (e.g. Berry & Berry 1972; Finnegan 1977) and they can appear both cranially, such as extra bones in the cranial sutures, and post cranially, such as extra foramina in the humerus (septal aperture). They are of no apparent pathological significance and they vary in their frequency between populations. The presence of such traits is thought to signify familial relationships although the extent to which they are genetically and environmentally controlled is far from clear. The traits found on the individuals from Spitalfields, London were plotted on cemetery plans and it was found that none reflected familial relationships (Molleson and Cox 1993).

Given the time constraints of this analysis, a restricted number of discontinuous traits were looked for. These were selected on the grounds that they are evenly distributed around the skeleton and are least ambiguous. However, due to the fragmentary nature of the remains, in particular the number of crushed crania, the number of observations that could be made was low. Twenty-two cranial and 13 post-cranial traits were scored (as below).

Table 12a Frequency of cranial non-metric traits.

Trait	No. of individuals	No. with traits	%
Lambda wormians	9	2 (2 male)	22
Supra orbital foramen	8	2 (2 male)	25
Parietal foramen	14	9 (3 female, 6 male)	64
Parietal notch	4	1 (1 female)	25
Torus maxillaris	16	3 (3 male)	19
Torus mandibularis	20	5 (4 male, 1 unsexed)	25

Table 12b. Frequency of post-cranial non-metric traits.

Trait	No. of individuals	No. with traits	%
Sternal foramen	14	2 (1 male, 1 unsexed)	14
Supracondylar process	30	1 (1 female)	3
Septal aperture	30	4 (2 female, 1 male, 1 unsexed)	13
Squatting facets	24	6 (3 female, 2 male, 1 unsexed)	25

### *Evidence for disease*

#### *Joint disease*

Joint disease is the most frequently encountered pathology in skeletal populations, and the most common type of joint disease in both modern and archaeological populations is osteoarthritis (OA). This is a disease that affects the synovial joints and it is found to increase in frequency with age. It can affect any synovial joint in the skeleton, the common sites of which have varied over time and among populations. Bony changes characteristic of OA include the presence of eburnation (polished bone) or marginal osteophyte, pitting on the joint surface of the bone and bony contour change (Rogers and Waldron 1995).

There are many patterns of OA described in clinical literature and some of them have distinct epidemiological features, e.g. OA of the knee and the hand are positively associated with obesity (Waldron 1993). This population has a high prevalence of OA of the spine, which is the most common site for such changes in archaeological populations. Individuals with more than one joint involvement are interesting as they could be linked to a number of different activities and occupations in which the individual's age sex and genetic predisposition will have played an important part.

One case of rotator cuff disease (RC) was found on the gleno-humeral joint of skeleton V21i. This disease is related to general degenerative changes around the gleno-humeral joint and is when the rotator cuff, which helps to stabilise the shoulder joint, becomes diseased. Changes that are characteristic of OA appear on the joint. In this specimen the humeral head was slightly flattened with roughening and marginal osteophyte and it had been displaced downwards below the glenoid.

Osteoarthritic changes were found on eight individuals as follows:

Table 13 Distribution of osteoarthritis.

Skeleton No.	Phase	Sex	Age	Site
CB5	3	N/D	33-45	Spine
V21i	U/P	M	25-35	Spine, RC

CB48	3	M	45+	Spine
OB399	2	M	45+	Spine
CB51	3	F	A	Spine
V21ii	U/P	N/D	A	Hand
CB48	3	M	45+	Hand
CB48	3	M	45+	Wrist
V20	U/P	M	25-35	Knee
OB399	2	M	45+	Hip
OB452	2	M	A	Elbow

### *Spinal Changes*

Twenty-seven individuals had spinal changes other than OA, the prevalence of which are shown below.

Table 14 Incidence of spinal changes

No. of adult spines	No. with degenerative disc disease (%)	No. with schmorls nodes (%)	No. with DISH (%)	No. with osteophytosis (%)
43	1 (2.32%)	13 (30.23%)	1 (2.32%)	10 (23.25)

Degenerative disc disease, or spondylosis, appears on bone in the form of coarse pitting and bone deposits on the surfaces of vertebral bodies. It is a phenomenon that is known to increase in frequency with age. These changes were found on the thoracic and cervical spine of skeleton CB48, a male with an age of 45+.

Schmorls nodes appear on dry bone as depressions on the superior or inferior surface of the thoracic and lumbar vertebral bodies. They result from intervertebral herniation into the vertebral body and their exact cause is unknown. It has been suggested that trauma is one of the major causes (Roberts 1997), although they are also associated with degenerative disease, activity and metabolic disorders (Rogers 1998). This condition is very common in skeletal assemblages and in this sample it accounts for the highest number of cases of spinal changes.

One adult of unknown sex (skeleton OB354) showed changes that are characteristic of Diffuse Idiopathic Skeletal Hyperostosis (DISH) on the thoracic vertebrae. DISH is a disease of the ligament insertions or entheses. The characteristic site for this is the thoracic spine, which becomes fused down the right hand side with bone that has the characteristic appearance of dripped candle-wax. The lumbar spine is also occasionally involved. This disease usually occurs in individuals over the age of 50 and is more frequent in males than females. It is known for its associations with obesity and metabolic disorders but, apart from some restricted movement and some spinal stiffness, it causes little discomfort or disability despite its spectacular appearance (Klippel and Dieppe 1994).

In a second individual (skeleton OB404) the arches of the thoracic bodies of at least three vertebrae have fused.. No other changes are apparent on the spine or the rest of the skeleton although it is very fragmented and the condition of the bone is poor. Differential diagnosis includes DISH, ankylosing spondylitis, infection, trauma or a congenital anomaly. As there is no evidence for fusion of the vertebrae down the right hand side, DISH is unlikely. There is no involvement of the sacrum and therefore ankylosing spondylitis is also unlikely. The skeleton is too badly preserved to say which of the remaining diagnoses is the most likely cause. In addition to the above spinal changes two individuals have extra sixth lumbar vertebrae. This is a congenital phenomenon and here was found on one male and one female.



### *Enthesophyte*

This is bone formation at the site of ligament insertions and can be caused by trauma from muscle exertion although it usually appears with other conditions, especially DISH. These changes were found on 17 individuals from Mary Major and the War Memorial the most frequently affected sites being the anterior surface of patellae, the linea aspera of the femur, the posterior of the calcaneum and the iliac crest. In the majority of cases the changes are only slight. Since these changes can accompany other diseases it is impossible to say that they are activity related.

### *Trauma*

Four individuals were affected by trauma. The proximal and middle phalanxes of the hand belonging to skeleton V20 were fused together and the talus and calcaneum of the right ankle were also fused together on skeleton OB280. Differential diagnosis includes congenital abnormality or trauma. As no other changes were found on these skeletons it is not possible to say which is the most likely cause.

One fracture was observed on the left rib of skeleton OB360. The proximal shaft of the fourth left metatarsal of skeleton OB490 is thickened and remodelled. This bone has suffered badly from post-mortem damage and as such it is difficult to tell if the bone has been fractured and substantially remodelled or if it has fused to the lateral cuneiform. If the latter is the case then differential diagnosis includes congenital abnormality or fracture. The x-ray appearance of this bone is inconclusive.

### *Infection*

Periostitis was found on the bones of six individuals. This is a non-specific inflammation of the outer surface of the bone (the periostium). It typically appears as plaques of new bone which are finely pitted and longitudinally striated. It can be associated with infection but there are other causes e.g. varicose veins. The most common sites for periostitis are on the tibiae and fibulae, particularly the shin bone, which is subject to recurrent minor injury (Roberts & Manchester 1997).

Table 15 Distribution of periostitis

<b>Skeleton No.</b>	<b>Age</b>	<b>Site(s)</b>
CB1	25-35	Left tibia
OB6	A	Right fibula
CB13	25-35	Right femur
OB204	Juvenile	Right fibula
OB323i	A	Right and left tibiae, right femur, right humerus
OB361	0-5	Right humerus, right femur, left femur
OB452	A	Right and left tibiae
OB490	A	Right tibia

With the exception of skeletons CB13 and OB452, periostitis on these bones was not extensive appearing as patches of fine pitting and/or striated bone along the shafts. The periosteal reaction on the bone shafts of Skeletons CB13 and OB452 were florid with deposits of large plaques of new bone.

Thoroughgoing osteomyelitis was found on the left fibula of skeleton OB452, which was thickened, with pitting and irregularity on the bone surface and cloacae (sinuses) through which pus would have drained. Osteomyelitis is a bacterial infection where bone is

simultaneously destroyed and repaired and where pus formation is common. The appearance of infected bones can be quite spectacular with areas of irregularity, pitting and large plaques of new bone.

#### *Metabolic disorders*

These are triggered by either an excess or a deficiency in the body's dietary requirements and hormones resulting in specific skeletal changes. *Cribra orbitalia* is one such disorder currently thought to be associated with iron deficiency anaemia (Stuart-Macadam 1987). It is characterised by fine pitting on the roof of the orbits. These changes were found on skeleton CB14b, a child aged between 7 and 10 years. In this case the changes were only slight.

#### *Other diseases and abnormalities*

Skeleton OB492 had bowed tibiae. As this is bilateral it is unlikely that this is due to injury. The bone is in a healthy condition so it probably happened early in the individual's life. It is possible that this is a sign of Rickets but if it is the individual was not severely affected. Apart from incomplete fibulae there are no other long bones present on which to observe any other changes. It is quite possible that these changes are due to activity or just the morphology of the bone.

## **2.2 Disarticulated remains**

Three unlabelled bags of bone and two loose bones were found in boxes containing other unrelated skeletons. These remains represent a minimum number of six individuals; this was determined by the repetition of a bone and any disparity in size between bones; one individual was female but the remainder could not be sexed. No traits were available to assess ages, although from the size of these bones it was concluded that all were adults. No dentitions were present and there was no evidence for pathology or abnormality.

Table 16 The disarticulated material: minimum numbers of individuals, ages and sexes.

	Minimum No. of individuals	Age	Sex
<b>Bag 1</b>	2	A, A	?,?
<b>Bag 2</b>	1	A	F
<b>Bag 3</b>	2	A, A	?,?
<b>2 loose bones</b>	1	A	?

## **3. DISCUSSION**

The selection of human remains examined from the three sites represents a total of 74 articulated and at least six disarticulated individuals. A large proportion of the articulated skeletons were between 30% and 70% complete and they were found to divide equally between the categories of poor, fair and good. The sample comprises 31 male, 17 female (including one disarticulated) and 32 unsexed individuals. Thirty-seven individuals could be assigned an age category, while it was concluded that the remaining 43 skeletons were all adults (although appropriate traits for the determination of a more precise age were not available).

The sample was divided into burials belonging to phase 2 (cemetery II), phase 3 (cemetery III), and those that are unphased (mainly from either cemetery II or III). From the articulated material, this gave figures of 34, 22 and 18 individuals in these respective groupings,

providing too small a sample from which to make general comparisons between phases or with other assemblages of similar date and type. Even taken as a whole, the sample represents only a small proportion of the individuals buried in the two cemeteries over a relatively large time span, and inferences about demography and health can therefore only be very limited.

The distribution of sexed individuals shows a higher proportion of males to females in both phases 2 and 3. All the vault burials examined contained males, with the exception of one unsexed individual. Both males and females were present in the ordinary burial and the charcoal burial groups.

Of the 37 skeletons that could be assigned an age category, 21 (57%) fall into the 16-25 and 26-35 age brackets; only 6 individuals (16%) were aged over 45 years old. However, since most of these specimens were aged using just their teeth (in most cases the bones necessary for other techniques were either missing or too badly damaged), it is possible that the sample has been under-aged due to a slower rate of tooth attrition, when compared to other medieval populations, a tendency observed on separate burials from the same locality (Loe 1998a-c; Wells 1979; Stroud 1999). While much palaeopathological information has been lost due to missing or abraded bones, it is nevertheless worth noting that certain bony diseases found more commonly in older age groups do not have a high prevalence in this sample.

In general, most male deaths in the sample occurred between 26-35 years and at over 45 years. Female deaths peak at between 16-25 years. The same pattern was found in the medieval and early post-medieval sample from the Cathedral Close (Stroud 1999). Elsewhere, peak deaths for males excavated from Taunton Priory are between 35-45 years, while among the females they occur in the 25-35 years range. At St Oswald's Gloucester, male and female deaths peak at 35-45 and 15-35 respectively in the Anglo Saxon phase, and at 25-35 for males and 25-45 for females in the Norman phase. By comparison, deaths are more frequent in the 45+ age group among individuals excavated from Wells Cathedral. While these trends reflect interesting differences in mortality rates between populations, they must be viewed with extreme caution due to the small sample sizes and the inadequacy of ageing techniques.

Of the children, three died before their third birthday, one died between the age of 7 and 10 years, and one could not be assigned a more precise age other than 'juvenile'. More infants and children would have been expected in this sample, but it may be that they were interred in an unexcavated area of the burial ground or, particularly in the case of infants, that their fragile bones did not survive or were overlooked during excavation.

Stature could be calculated for 27 individuals. Overall average heights of 1.73m (males) and 1.61m (females) were normal for a population of this date and fit well with other sites of similar date and type (e.g. St Oswald's Priory, Gloucester and Taunton Priory). The average heights for males and females excavated in 1976 from the medieval burial ground in Cathedral Close were 1.71m and 1.58m respectively. These results are considered to reflect no significant change in height over time among these populations.

The apparent overall low prevalence of dental conditions (Table 10) is probably largely due to the small number of dentitions available for analysis (34), which precludes useful analysis by phase. Dental conditions observed include caries, abscesses, ante mortem loss, periodontal disease, calculus and enamel hypoplasia. The majority of these conditions were found to be sparse or slight. There was a slight increase in caries in numbers of individuals affected in the

later phase, although this is hardly significant. The prevalence of caries in the phase 2 and phase 3 groups examined here is 2.1% and 2.6% respectively compared to 12.1% of the teeth from the later medieval group in Cathedral Close. This may be linked to the introduction of cane sugar into the diet from the 12th century (Stroud 1999). The prevalence of caries was also found to be higher in the Norman, late medieval and post-medieval phases than in the Roman and Anglo Saxon phases at St Oswald's Priory, Gloucester (Rogers 1999).

Comparing the prevalence of other dental conditions by phase is useless since the numbers are so low. There are few abscesses (2 cavities only), but this is not so unusual when the age of the individuals with teeth is considered. They comprise a young group and it follows that the younger one is the less time one has been exposed to the elements of decay and therefore the less likely one is to acquire an abscess. Periodontal disease also has a low prevalence among individuals with dentitions. Ante-mortem loss was more frequent among males than females but overall was not widely observed within the sample.

As the hypoplastic lines observed on the teeth of 5 individuals are all slight, very little significance can be attached to these. Linear bands of depressed enamel or pitting on the enamel surface are the characteristic changes found in this condition; they occur during the development of the tooth. These changes are usually due to stress encountered during the individual's childhood, the causes of which are non-specific, although infection and malnutrition are among the possibilities.

The cranial and/or post cranial non-metric traits recorded here are among those commonly found in other skeletal populations, both in Exeter (e.g. Polsloe Priory) and elsewhere (e.g. St Oswald's Gloucester). However, the number of individuals (24) with traits is too small to allow a consideration of the distribution of those believed to be genetic in origin.

The range of diseases found on these remains include infection, trauma, metabolic disorders joint disease, and spinal changes. The numbers are again too small for comparison by phase. Joint disease was the most frequently observed condition, and in all cases this was due to osteoarthritis (OA). The skeletons exhibiting changes that are characteristic of OA are all in the older age categories, which accords well with the tendency for this disease to be more common in mature individuals. The distribution of sites involved is normal, and they fit into the expected rank order of prevalence. The incidence of elbow OA in the majority of archaeological populations of similar date tends to be lower than that at other sites (Rogers 1998). Today elbow OA is uncommon when trauma or infection does not accompany it (O'Reilly & Doherty 1998) and this may have been the same in the past.

With the exception of rotator cuff disease, which would seem to be closely correlated with activity, it cannot be determined which of the many possible factors (including age, sex, race, and genetic disposition as well as occupation and activity) will have played a role in the manifestation and general course OA in this sample. In rare instances a pattern of OA occurs that is unique to a particular activity or occupation. A study by Waldron and Cox (1989) examined the prevalence of OA in weavers and non-weavers from the Spitalfield's assemblage and found that handloom weaving had no association with OA. None of the patterns of OA found in the specimens from the Cathedral Close sites would seem to be directly associated with a specific activity or occupation.

The range of spinal changes detected are common in both modern and archaeological populations, and are of no particular consequence to health in this sample.

Individuals where osteophytosis, enthesopathy, fusion of the sacro-iliac joints, ossified cartilage and the development of DISH are common are classified as 'bone formers'. A possible link between this bone-forming phenomenon and high status burials in ecclesiastical sites is suggested for Wells Cathedral, Camery (Rogers and Young 1994) and also Merton Priory (Waldron 1993). Skeleton OB354 may be considered as a bone former, since this individual has DISH, osteophytosis and enthesopathies. It would be interesting to consider whether its location may have represented an important positions in the burial ground suggestive of high status. No other individuals exhibit changes that would classify them as bone formers. As there is no distinct group of bone formers in this burial ground, no zone of high status burials can be distinguished in this way.

Very little trauma was found on these individuals, less than the range that is normally seen in an archaeological sample. This is more likely to be due to that fact that a lot of information has been lost due to missing or very fragmented bones rather than reflecting a significant trend in this group.

Numbers of individuals affected by infection and inflammatory change are within the normal range. Indeed figures reflect a prevalence that is similar to the medieval skeletons from Cathedral Close (Stroud 1999) and the Anglo Saxon and Norman burials from St Oswalds, Gloucester (Rogers 1999).

The morphological appearance of some of the skeletons is suggestive of very robust individuals, and this is noticeable in comparison to skeletons from other sites such as St James Priory, Bristol. In particular the long bone shafts (especially the humerii and metacarpals) of skeleton V21i showed very defined muscle markings. Activity and occupation are possible factors that may account for these differences. In addition to this osteolytic lesions in the bone cortex at the sites of muscle insertions on clavicles, humerii and tibiae were a common finding on the more robust individuals. These have the appearance of excavations into the bone, which are roughened, and irregular in shape. It has been suggested that such changes on the clavicle and humerus are caused by occupational stress, and they are not believed to be pathological (Panhuysen *et al.* 1994). However, without a detailed metrical assessment of these muscle markings and osteolytic lesions, these observations should be viewed with extreme caution.

In general the individuals from the Mary Major and War Memorial sites are physically within the normal range. It would seem that in their height, age and sex distribution and health, these individuals do not differ greatly from other assemblages of similar date and type or from the medieval and early post-medieval skeletons examined from the same locality.

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**HUMAN REMAINS  
FROM EXETER CATHEDRAL CLOSE  
1971-2**

**by**

**Louise Loe**

**Exeter Archaeology**

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