



YORK ARCHAEOLOGICAL TRUST  
**finding** the future

**Female health in Roman York:  
A case study**

*An Insight* Report

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## **1. Female health in Roman York: a case study**

Excavations undertaken in the Hungate area of York by York Archaeological Trust between 2006 and 2011, uncovered a total of 142 inhumation and cremation burials. While a small number of these dated to the medieval period, 112 were Roman inhumations dating approximately from the 1<sup>st</sup> to the early 5<sup>th</sup> century AD. 107 of the Roman individuals were the subject of an osteological assessment undertaken by York Osteoarchaeology in 2017. The aim of the assessment was to quickly record the completeness and preservation levels of each skeleton, and to record the age and sex of the individuals as well as any obvious pathologies.

During the assessment 21 of the skeletons were identified as female or probable female and were analysed in more detail by Roxana Gomez, a master's student on the MSc in Bioarchaeology course at the Department of Archaeology, University of York, with the aim of comparing the health of the female individuals to that of the males. Roman society perceived men and women to have different roles and status, which could have resulted in visible differences in the overall levels of health and in the types of pathologies to which each sex was exposed. This report will expand on the study of the Hungate female assemblage and compare them to the available data from other Roman skeletons from York. As the number of pathological conditions that can be observed in skeletal remains is extensive, only the dental pathologies observed in the Hungate female assemblage will be discussed in this report.

## **2. Roman Hungate**

The site of Hungate is located to the east of York's city centre, and was excavated by the Trust over a period of 6 years in advance of regeneration and development works. Due to its proximity to the historic city centre, the site yielded evidence of human use and occupation spanning almost the entirety of York's history, from the Roman period to the 20th century (Gomez 2017, 9-15).

The Roman phase is represented by a cemetery of 112 inhumations previously mentioned and by a series of ditches and boundaries. The burial ground was located on a hill to the north-east of the Roman legionary fortress, and its elevated position would have made it a much sought-after burial site due to its visibility and its proximity to the military encampment. The location of the cemetery is also in keeping with the Roman law prohibiting burial within the city limits.

111 of the 112 Roman skeletons came from Block H2 of the excavations, and were interred in simple pits. All the deceased were laid out in an extended position, and grave goods were

included in some of the burials. The orientation of the graves varied, with the majority of the individuals oriented NW-SE, and some oriented roughly SW-NE.

While the proximity of the Hungate cemetery to the fortress may suggest that those buried there had a military connection, the lack of grave markers or grave goods with clear military associations mean that it has not been possible to directly associate the Hungate cemetery population to the fortress with any certainty. Given the military origin of the Roman settlement at York ("Eboracum"), it has been suggested that the population of the town would have been predominantly male, especially during the initial period of occupation, however, the cemetery at Hungate was used for the burial of men, women and children. Difficulties in assigning each burial to a specific phase of the long period of use of the site also prevent further investigation into the sex distribution of burials in the first century of occupation.

### **3. The Roman Army and Roman women**

Roman soldiers below the rank of centurion were not allowed to marry until they retired, as decreed by a Roman law that was already in place prior to the invasion of Britain and which was not relaxed until AD 197 (Allason-Jones 2005, 50). Although theoretically this means that there would have been far fewer female residents than male residents in Eboracum before that date, at least some women did follow the movements of the Roman army. They were the wives, sisters and daughters of high ranking officers, and their higher status would have impacted their diet and health as well as the quality of medical treatment they would have had access to.

The richness of the grave goods accompanying some of the burials may suggest the presence of higher status individuals. These may have been high ranking army officers and their families, but as the artefacts have no clear military connections these may equally be wealthy civilians associated with the settlement which developed outside the fortress. In addition, the army would likely have been accompanied by a significant number of lower status female camp followers providing various services to the army. At least some of these would have been the unmarried partners of legionary soldiers, travelling at their own expense and often accompanied by their children.

As many Roman soldiers did not marry until they retired in their 40s, there was also a tendency for men to be much older than their wives (Allason-Jones 2005, 23). This means that their respective levels of health and the type of ailments they suffered from may have been different, with men possibly showing more signs of chronic and degenerative diseases, which in turn are more likely to be recognised in the skeleton. The number of tombstones erected by young widows to husbands in their 50s and 60s seems to confirm this age disparity was common. The practice is however impossible to identify archaeologically.

Most skeletons are not associated with a grave marker, so family relationships cannot normally be identified in skeletal assemblages. It is also impossible in the absence of written records to know how long an individual survived the death of their spouse. Almost all Roman grave markers that have survived were not found *in situ* and have lost their original context, having been reused in later buildings or having originated from antiquarian collections and poorly documented 19th century excavations. The military character of many Roman settlements in Britain further hinders research into this subject. As soldiers and army officials changed post every few years and travelled extensively, both soldiers and their widows will have frequently been forced to move elsewhere leaving the graves of spouses and children behind (Allason-Jones 2005, 42-60).

An additional difficulty encountered during the analysis of female and male health patterns at Hungate is the poor preservation of the remains, which prevented a determination of biological sex for 26 of the 73 adults (35.61% of the adult assemblage; Holst 2018; see Table 1). Females and probable females were more numerous than male and probable male skeletons in both the Young Middle Adult category (26-35 years old at the time of death) and the Mature Adult category (46+ years old). There was an equal number of males and females in the Old Middle Adult age range (36-45 years old). The available data on the sex and age distribution of the Hungate population therefore does not seem to reflect the patterns that would be expected from a military cemetery, as the ratio of female to male skeletons is similar (albeit possibly skewed by poor preservation). 34 of the 107 Roman skeletons analysed belong to juveniles aged from under 1 to 18 years old. Children under 16 would not normally have been buried in military cemeteries. As predicted, there is also no evidence that the older individuals in the cemetery were predominantly male.

Age	M + M?	%	F + F?	%	U	%	
YA (18-25)	4	57.14%	2	28.57%	1	14.28%	
YMA (26-35)	2	25.00%	6	75.00%	0	0.00%	
OMA (36-45)	6	42.85%	6	42.85%	2	14.28%	
MA (46+)	3	33.33%	6	66.66%	0	0.00%	
18+	5	20.83%	1	4.16%	18	75.00%	
25+	0	0.00%	0	0.00%	1	100%	
26+	1	50.00%	0	0.00%	1	50.00%	
36+	3	75.00%	0	0.00%	1	25.00%	
26-45	2	50.00%	0	0.00%	2	50.00%	
<b>TOTAL (Adults)</b>	<b>26</b>	<b>35.61%</b>	<b>21</b>	<b>28.76%</b>	<b>26</b>	<b>35.61%</b>	<b>73</b>
Juvenile (<18)	---	---	---	---	34/107	31.77%	
<b>TOTAL (inc. juveniles)</b>	<b>26</b>	<b>24.29%</b>	<b>21</b>	<b>19.62%</b>	<b>60</b>	<b>56.07%</b>	<b>107</b>

**Table 1:** Age and sex distribution of the skeletal assemblage from Roman Hungate. The predominant biological sex category for each age group is highlighted. Key: YA = Young Adult (18-25), YMA = Young Middle Adult (26-35), OMA = Old Middle Adult (36-45), MA = Mature Adult (46+).

#### 4. Women and health in Roman society

The wealth of written sources dating to the Roman period allows researchers to examine quite closely both the role and status of Roman women in different parts of the empire. Roman society was notoriously androcentric, with men being perceived as physically, mentally and socially superior to women. Women were legally and financially dependent on their fathers and their husbands, and often only attained a measure of independence by outliving the male relative responsible for their care (D’Ambra 2007, 1-44).

It has been suggested in the past that the lower status of women and young girls may have resulted in them having a plainer diet than that of the men. The surviving writings of some practising Greek and Roman physicians support this theory by recommending that women’s intake of nourishing food, meat and wine should be restricted, especially during childhood and pregnancy (Gamsey 1999, 100-112). The theory of the four humours on which Roman and Greek medicine were based further reinforced this point by arguing that women have a “cold and wet” constitution which must be corrected by eating primarily hot and dry foods and avoiding fish (especially freshwater fish), fatty meat and meat from new-born animals - all very nutritious foods (Gamsey 1999, 105). The choice of foods thought suitable for the weaning of infants also unwittingly exposed babies of both sexes to malnutrition, which in turn could have led to stunted growth and further ill health in later life. Women would have had some control over food storage, preparation and serving, but Roman notions of health,

nutrition and femininity mean they may not have used this to their advantage. This unbalanced treatment could have led to severe malnutrition and increased susceptibility to disease in female children and adults, seen as the least productive members of the household.

The spread of the Romans' lifestyle and culture in Britain seems to have had an effect on the health of the population as a whole compared to the pre-Roman period. The largest collation of data on health and disease in Britain, Roberts and Cox's *Health and Disease in Britain from Prehistory to the Present Day* (2003), noted that compared to the preceding and following periods of British history, the Roman era is characterised by:

- a rise in dental disease, possibly related to the introduction of a "Romanised" diet;
- a rise in indicators of physical and nutritional stress such as cribra orbitalia and dental enamel hypoplasia;
- a sharp increase in the incidence of skeletal trauma, such as bone fractures, which could indicate a higher urban population density or higher levels of interpersonal violence (Roberts and Cox 2003, 163).

It is important to bear in mind that the data used to identify these trends was independently collected from a number of sites unevenly distributed across the territory once controlled by the Romans, and that regional variations may affect the degree to which these trends are manifested at different sites.

## **5. A note on prevalence rates**

A frequent issue which arises when comparing osteological data is the difficulty in reconciling the recording systems employed for different skeletal assemblages. In many cases, especially for older excavations, only "crude prevalence rates" (CPR) for each pathology are known. CPRs reflect the number of individuals presenting a certain disease within the assemblage; the figure is provided as a percentage of the total number of skeletons excavated.

The very nature of archaeological skeletons means that they are often incomplete due to the processes that took place after burial, such as intercutting by other graves or later disturbances due to human activity on the site. As it is impossible to know whether any missing bones presented any pathology, osteologists also calculate "true prevalence rates" (TPR). TPRs record individual bone elements affected by each pathology, rather than full individuals, and are presented as a percentage of all the bones of the same type in the assemblage.

For example, when talking about fractures of the femur, the CPR shows how many skeletons out of the total presented such fractures. A true prevalence rate indicates how many fractured femora were present as a percentage of the femora that were actually recovered during excavation. TPR rates are therefore more accurate than CPR in that they only consider what is actually present and recordable in the skeletal assemblage. They also allow for a more accurate comparison against skeletal data from other sites, where the preservation and completeness of skeletal remains may be completely different. Crude prevalence rates are used throughout this analysis due to the way skeletal data was gathered for different sites, but true prevalence rates will also be used whenever possible.

Despite being published 15 years ago, Roberts and Cox (2003) remains one of the main and most useful sources to investigate ancient disease in Britain. It includes information from 52 Romano-British sites, which have yielded a total of 5716 individuals. However, very few studies have focussed on comparing the health levels of Roman females as opposed to Roman males, and then only at a local level. This makes comparing material from different sites difficult without first hand examination, as prevalence rates for disease are often only presented without specifying how many females and males are affected by each disease.

## **6. Pathological conditions of the female Hungate skeletons**

### ***Dental disease***

493 teeth and 607 tooth positions were available from the female assemblage at Hungate, and were used to calculate prevalence rates for several types of dental disease. The crude prevalence rate for the female assemblage was 100%, meaning that all female skeletons were affected by at least one type of dental disease. In contrast, only 76.9% of males suffered from dental complaints; although this percentage is still very high, there was clearly a marked difference in the dental health of men and women buried at Hungate.

### ***Dental enamel hypoplasia (DEH)***

Dental enamel hypoplasia is characterised by the appearance of grooves on the surfaces of the teeth: the lines indicate a period of the individual's childhood when the tooth enamel stopped forming due to a prolonged episode of malnutrition or disease. At Hungate 19 out of 21 females were affected, for a crude prevalence rate of 90.5%. The CPR among the males was considerably lower at 13 out of 26 (50%). The most severely affected age group were the 26-35 year-olds, with a TPR of 53.7% among the women (87 out of 162 teeth).

As can be seen from Table 2, the prevalence rate for DEH at Hungate is much higher than both the British average and that of the other York sites, especially for females. This is true



even when the two sexes are considered separately. Such a disparity indicates very different levels of dental health, and seems to suggest that the population at Hungate was subject to very severe stress during childhood, or that they were much more exposed (and susceptible) to infectious disease. Difference in sample sizes must also be kept in mind, as the Hungate assemblage is significantly larger than the other two sites. However, the results from Hungate potentially support the contemporary written evidence for girls having a poorer diet than boys, leading to the much more widespread formation of DEH grooves and lines.

Site	Females CPR	Females TPR	Males CPR	Males TPR	Total CPR (M+F)	Total TPR
<b>Hungate</b> (R. Gomez 2017, M. Holst 2018)	19/21 (90.5%)	204/493 (41.4%)	13/26 (50.0%)	---	32/47 (68.0%)	---
<b>Blossom Street</b> (M. Holst 2017)	3/7 (42.8%)	---	1/8 (12.5%)	---	4/15 (26.6%)	---
<b>41 Piccadilly</b> (M. Holst)	---	---	---	---	3/8 (37.5%)	25/111 (22.5%)
<b>Roman Britain</b> (Roberts & Cox, 2003)	110 affected	---	129 affected	---	6.6%	437/4796 (9.1%)

**Table 2:** Crude and true prevalence rates of dental enamel hypoplasia at Hungate, other York sites, and the average for Roman Britain. Only adult individuals whose sex could be assessed are included. Hungate males have yet to be studied in full, so only CPR rates are available.

### Caries

17 out of 21 females from Hungate had at least one carious tooth, which amounts to a crude prevalence rate of 80.9% and a true prevalence rate of 40.2% (198 of 493 observable teeth). Once again the males are not as seriously affected, with only 8 out of 26 males presenting evidence of caries (CPR 30.8%), and the caries were most numerous among the 26-35 year-olds, with a TPR of 45.7% among the women (74 out of 162 teeth).

Site	Females CPR	Females TPR	Males CPR	Males TPR	Total CPR (M+F)	Total TPR
<b>Hungate</b> (R. Gomez 2017, M. Holst 2018)	17/21 (80.9%)	198/493 (40.2%)	8/26 (30.8%)	---	25/47 (53.1%)	---
<b>Blossom Street</b> (M. Holst 2017)	2/7 (28.5%)	---	2/8 (25.0%)	---	4/15 (26.6%)	---
<b>41 Piccadilly</b> (M. Holst)	---	---	---	---	---	11/111 (9.9%)
<b>Trentholme Drive</b> (Cooke & Rowbotham, 1968)	42 affected	---	117 affected	---	159/329 (48.3%)	226/4963 (4.5%)
<b>Roman Britain</b> (Roberts & Cox, 2003)	274 affected	---	428 affected	---	702/3620 (19.3%)	2179/29247 (7.4%)

**Table 3:** Crude and true prevalence rates of caries at Hungate, other York sites, and the average for Roman Britain. Only adult individuals whose sex could be assessed are included. Hungate males have yet to be studied in full, so only CPR rates are available.

As in the case of enamel hypoplasia, the population at Hungate has a much higher prevalence of caries, and a more marked difference between the two sexes, when compared to the two smaller York sites. Both crude and true prevalence rates for Hungate are also far higher than the average for Britain; however, the data gathered by Roberts and Cox shows males are more commonly affected by caries than females. The same is true at the larger cemetery at Trentholme Drive, which shows a much higher incidence of caries among the male skeletons.

The appearance of caries is connected to the consumption of starchy and sugary food, but also to hygiene practices, social status and occupation. The 7.4% TPR for the Roman period overall represents a significant increase from the Iron Age TPR of 2.9%, and is very likely connected to the introduction of new fruits, syrups and grains which formed part of the Roman diet (Roberts and Cox 2003, 132-137). The higher rate of caries among the Hungate females could once again be influenced by the dietary restrictions to which women were subjected. If their consumption of wine, meat and fish was indeed limited, their diet would have consisted mainly of vegetables, fruits, dairy and carbohydrates. Fruits and cereal products in particular contain high levels of sugar, which in turn would have increased the risk of caries formation. The considerable difference in the distribution of caries among the sexes at Hungate and Trentholme Drive deserves further investigation, and may be related to status differences between the two cemeteries. Regional differences have also been reported from other sites across Britain: a recent investigation into oral health in Roman Dorset recorded little evidence of dietary differences between the sexes, but reported that women were more susceptible to caries, while men had higher levels of calculus (fossilised

plaque), which may indicate that the two genders consumed slightly different types of food (Bonsall 2014).

### Calculus

Fossilised plaque, or calculus was widespread among the Hungate population: 19 out of 21 females (CPR 90.5%) and 20 out of 26 males (CPR 76.9%) were affected. Among the females the true prevalence rate was 70.4%, as 347 out of 493 teeth.

Calculus is one of the most common dental conditions found on archaeological skeletons. Prevalence rates at Hungate are higher than at the smaller York sites, and higher than the British average based on 2003 data (see Table 4). Moreover, females are more affected than males, but the disparity is not as pronounced as with the dental conditions previously discussed.

Accumulations of plaque are caused by poor dental hygiene, and worsened by a diet rich in protein or carbohydrates. Microscopic analysis of the calculus could reveal food and plant remains embedded in the fossilised plaque, and provide further insights into the individuals' diet and any potential difference in dietary habits of men and women.

Site	Females CPR	Females TPR	Males CPR	Males TPR	Total CPR (M+F)	Total TPR
<b>Hungate</b> (R. Gomez, 2017 & M. Holst, 2018)	19/21 (90.5%)	347/493 (70.4%)	20/26 (76.9%)	---	39/47 (82.9%)	---
<b>Blossom Street</b> (M. Holst & S. Newman, 2017)	5/7 (71.4%)	---	5/8 (62.5%)	---	10/15 (66.6%)	---
<b>41 Piccadilly</b> (M. Holst)	---	---	---	---	---	65/111 (58.5%)
<b>Roman Britain</b> (Roberts & Cox, 2003)	---	---	---	---	405/3620 (11.2%)	1702/3923 (43.3%)

**Table 4:** Crude and true prevalence rates of calculus at Hungate, other York sites, and the average for Roman Britain. Only adult individuals whose sex could be assessed are included. Hungate males have yet to be studied in full, so only CPR rates are available.

### Periodontal disease

The presence of fossilised plaque on the teeth can lead to the appearance of periodontal disease (PD), also known as gum disease. This causes an inflammation of the gums which if protracted can lead to tooth loss, and is visible on the skeleton as widespread pitting around the tooth sockets.

The crude prevalence rate for periodontal disease was high among the Hungate females, with 19 out of 21 individuals affected (CPR 90.5%). Most of the women showed slight or moderate levels of PD, while 9.5% were severely affected. The prevalence in the male assemblage was much lower at 69.2% (18 out of 26 individuals). As expected, the CPR of calculus and PD were identical: only two male individuals with calculus did not go on to develop periodontal disease. Although the prevalence rates for caries at Hungate were closer to those observed at other York sites, the prevalence for PD is much higher than the average.

Site	Females CPR	Females TPR	Males CPR	Males TPR	Total CPR (M+F)	Total TPR
<b>Hungate</b> (R. Gomez, 2017 & M. Holst, 2018)	19/21 (90.5%)	---	18/26 (69.2%)	---	37/47 (78.7%)	---
<b>Blossom Street</b> (M. Holst & S. Newman 2017)	3/7 (42.8%)	---	3/8 (37.5%)	---	6/15 (40.0%)	---
<b>41 Piccadilly</b> (M. Holst)	3 affected	---	0 affected	---	---	3/8 (37.5%)
<b>Trentholme Drive</b> (Cooke & Rowbotham, 1968)	---	---	---	---	252/329 (76.6%)	---
<b>Roman Britain</b> (Roberts & Cox, 2003)	86 affected	---	106 affected	---	192/3620 (5.3%)	698/2381 (29.3%)

**Table 5:** Crude and true prevalence rates of periodontal disease at Hungate, other York sites, and the average for Roman Britain. Only adult individuals whose sex could be assessed are included. Hungate males have yet to be studied in full, so only CPR rates are available.

### Abscesses

Dental abscesses are caused by an infection of the nerve of the tooth which spreads into the surrounding bone tissue. Abscesses were observed in five out of 21 females (23.8%) and three out of 26 males (11.5%) at Hungate (Table 6). The only age group not affected by abscesses are the young adults of both sexes (18-25 years old at the time of death).

Site	Females CPR	Females TPR	Males CPR	Males TPR	Total CPR (M+F)	Total TPR
<b>Hungate</b> (R. Gomez, 2017 & M. Holst, 2018)	5/21 (23.8%)	7/607 (1.2%)	3/26 (11.5%)	---	8/47 (17.0%)	---
<b>Blossom Street</b> (M. Holst & S. Newman, 2017)	3/7 (42.8%)	---	4/8 (50.0%)	---	7/15 (46.6%)	---
<b>41 Piccadilly</b> (M. Holst)	---	---	---	---	---	4/111 (3.6%)
<b>Roman Britain</b> (Roberts & Cox, 2003)	152 affected	---	232 affected	---	384/3620 (10.6%)	970/24995 (3.8%)

**Table 6:** Crude and true prevalence rates of dental abscesses at Hungate, other York sites, and the average for Roman Britain. Only adult individuals whose sex could be assessed are included. Hungate males have yet to be studied in full, so only CPR rates are available.

The crude prevalence rates for dental abscesses at Hungate are lower than those seen at Blossom Street, but higher than those for Roman Britain when the males and females are considered together. The true prevalence rate at Hungate is also lower than the TPR for Roman Britain, but no information about the Hungate males can be provided at present. Abscesses are a consequence of poor oral hygiene practices and can result from the lack of treatment for other dental conditions, such as caries and periodontal disease.

### *Ante-mortem tooth loss (AMTL)*

The loss of a tooth or teeth during life can be caused by a number of factors, the most common being ageing, poor oral hygiene and dental disease. At Hungate, the crude prevalence rate for AMTL was 42.0% for females and 30.9% for males. The true prevalence rate is however much lower, with 32 tooth sockets out of 607 (5.3%) showing remodelling due to the loss of a tooth (Table 7).

Crude prevalence rates for AMTL are lower at Hungate than at the smaller site in Blossom Street. The data for the Hungate males, 41 Piccadilly and the Romano British average is insufficient to produce accurate comparisons. Ante-mortem tooth loss can increase as a result of poor health or oral hygiene, but it is also strongly related to ageing, and is therefore not as diagnostic of health difference between men and women as the dental diseases prescribed so far.

Site	Females CPR	Females TPR	Males CPR	Males TPR	Total CPR (M+F)	Total TPR
<b>Hungate</b> (R. Gomez 2017 & M. Holst 2018)	9/21 (42.9%)	32/607 (5.3%)	8/26 (30.8%)	---	17/47 (36.1%)	---
<b>Blossom Street</b> (M. Holst & S. Newman 2017)	5/7 (71.4%)	---	4/8 (50.0%)	---	9/15 (60.0%)	---
<b>41 Piccadilly</b> (M. Holst)	---	---	---	---	---	10/111 (9.0%)
<b>Roman Britain</b> (Roberts & Cox, 2003)	106 affected	---	142 affected	---	6.9%	5042/35762 (14.1%)

**Table 7:** Crude and true prevalence rates of AMTL at Hungate, other York sites, and the average for Roman Britain. Only adult individuals whose sex could be assessed are included. Hungate males have yet to be studied in full, so only CPR rates are available.

## 7. Conclusion

Osteological analysis of female and male skeletons from the excavations at Hungate has revealed a high frequency of dental diseases including dental enamel hypoplasia, caries, calculus, periodontal disease, abscesses and ante-mortem tooth loss. When crude and true prevalence rates for these dental pathologies were calculated it became apparent that the females buried at Hungate had much poorer levels of dental health when compared to the males from the same site. Higher prevalences were recorded among the female skeletons for each of the pathologies listed above. Excluding abscesses and ante-mortem tooth loss, the crude prevalence rates for both sexes at Hungate were also far higher than both the average for Britain and than those recorded at other sites in York. These results suggest that the Roman women buried at Hungate suffered from poor oral health which may have been worsened by hygiene practices, dietary habits and nutritional and physical stress experienced during childhood. The higher prevalence of dental enamel hypoplasia and caries in particular may be connected to the dietary restrictions recommended to women by Roman physicians, which would have resulted in an increased consumption of less nutritious and more cariogenic foods than those reserved to male individuals.

Further work is needed in order to refine the results of this analysis. The full osteological analysis of the Hungate skeletons, currently in progress, will provide true prevalence rates for the rest of the adult population, and allow for an accurate comparison of prevalences in males and females. Microscopic analysis of calculus could also provide more information on both dietary habits and occupation, and carbon and nitrogen isotope analysis would allow for a better understanding of potential dietary differences between the two sexes. With the

increased standardisation of osteological recording methods, it will also hopefully be easier to compare crude and true prevalence rates from different sites across Britain.

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