

Archaeological Excavation Report
10E0117 - Toberjarlath , Tuam, Co. Galway
Nineteenth century burials





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Toberjarlath, Tuam

Co Galway

Nineteenth century burials

Date: April 2014

Client: Coffey Construction and Galway County Council

E No: 10E0117

License Holder: Finn Delaney

Report By: Finn Delaney, Jacinta Kiely and Linda Lynch

Archaeological Excavation Report Toberjarlath, Tuam Co Galway

Written By

Finn Delaney, Jacinta Kiely and Linda Lynch



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Set in 12pt Garamond

Printed in Ireland

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Summary

Human remains were recorded during archaeological monitoring of a watermain trench in the middle of the road at the junction between the Athenry Road and the Dublin Road Housing Estate. The works were associated with the Tuam Town Water Supply Scheme in early 2012. The remains of 48 individuals were recorded and excavated along with a section of the boundary wall and internal ditch of Tuam Union Workhouse. The burials were originally located within the bounds of Tuam Poor Law Union Workhouse which had opened to admissions in 1846. Eighteen grave pits were identified, with each containing between two and four burials. The individuals buried within these grave pits were paupers.

Townland	Toberjarlath
Civil Parish	Tuam
Barony	Clare
County	Galway
License Number	10E0117
Ordnance Survey Map Sheet	GA043
National Grid Reference	144061 251224
Elevation	49m OD
Site Type	Burials, ditch and wall

Acknowledgements

The excavation director was Finn Delaney. The site supervisor was David O'Reilly. The excavation crew comprised Ann Bingham, Brendan Kelly and Ray Riordan. Illustrations are by Robin Turk. Specialist analysis was undertaken by Linda Lynch (oste archaeology). The excavation was undertaken as part of the Tuam Town Water Supply Scheme undertaken by Galway County Council. Sean Whelan was the resident engineer for Galway County Council. John Gibbons was the site manager for Coffey Group the construction contractors for the project.

Introduction

This report constitutes the final excavation report of an archaeological excavation carried out at the junction of the Athenry Road and the Dublin Road Housing estate in Tuam Co. Galway. The excavation was undertaken under license (10E0117) in January and February 2012. Eachtra Archaeological Projects were appointed archaeological consultants to the Tuam Town Water Supply Scheme. The archaeological licence was granted for pre-development testing in specified greenfield areas and excavation of archaeological material which may be discovered during monitoring of works associated with the Tuam Town Water Supply Scheme.

The Scheme proposed the construction of new trunk watermain, new reservoir at Slievedarragh and a new water distribution mains system for the town of Tuam, Co. Galway. The Scheme also proposed the construction of foul, combined and surface water sewers, service ducts and a new storm-water holding tanks for the town. An archaeological Impact Assessment Report was prepared for the proposed works in January 2010 and the mitigation measures outlined in the report were endorsed by the Department of the Environment, Heritage and Local Government (DEHLG).

Sections of the proposed watermain, combined sewer and service duct networks are routed through the Zone of Archaeological Potential (ZAP) established for Tuam and adjacent to a number of individual sites and monuments within the town (Figure 1). In addition, the proposed watermain network in the environs of the town will be routed close to a number of Recorded Monuments located outside the Zone of Potential.

This was the second instance of the discovery of human remains as a result of ground disturbance associated with Tuam Town Water Supply Scheme. The remains of 15 individuals were recorded and excavated in Sawpit Lane along with a series of ditches and pits (Delaney 2013). A stone culvert and the remains of a boundary wall were also identified. Two of the skeletons and a bone fragment from the base of one of the ditches returned calibrated radiocarbon dates centring on the seventh century. In addition a smithing hearth cake typical of early iron smithing was recovered from the upper fill of the ditch along with a bone trial motif piece which has sixth/seventh century parallels. The other pits and ditches had fills containing relatively mixed finds and animal bone fragments. The excavated features are located outside the present Temple Jarlath enclosure in the middle of Tuam and close to the site of the early medieval market area and the site of the post-medieval shambles. The early burial evidence and the early possible enclosing ditch suggest that the graveyard and enclosure at Temple Jarlath may be associated with St Jarlath's original early Christian foundation.

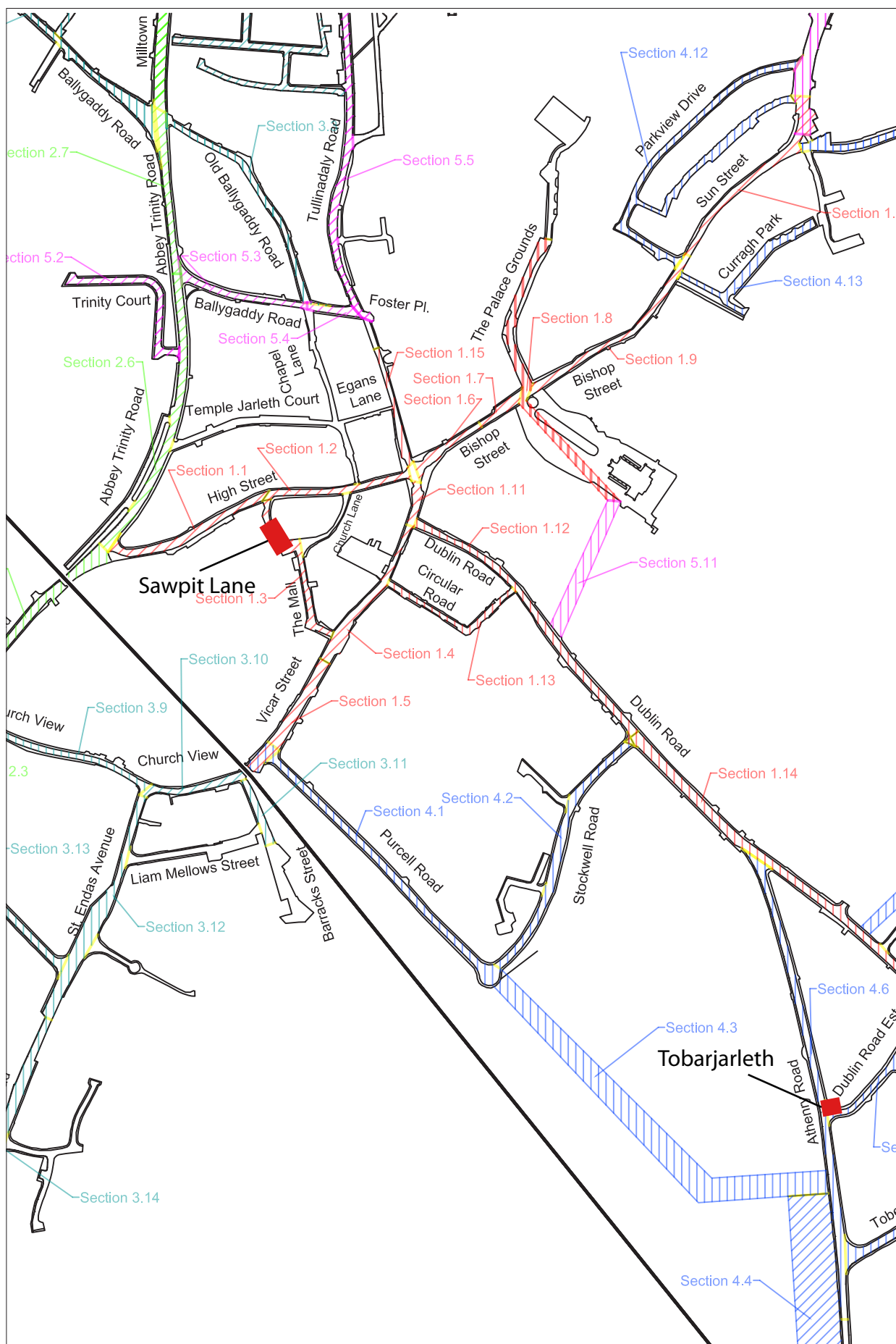


Figure 1: Map of Tuam showing the extent of the works associated with the Tuam Town Water Supply Scheme.



Figure 2: Map of the south-eastern environs of Tuam showing the location of the area of the excavation in Toberjarlath.

Background

Human remains were first discovered in a trench excavated by Coffey Group in order to insert a new watermain as part of the ongoing works associated with the Tuam Town Water Supply Scheme in Toberjarlath townland on the eastern edges of Tuam in County Galway. The trench was located in the middle of the road at the junction between the Athenry Road and the Dublin Road Housing estate (Figure 2, plates 1 and 2).

Following consultation between Eachtra and The Department of Arts, Heritage and the Gaeltacht a mitigation strategy was agreed with both Coffey's and Galway County Council who are supervising the Scheme. It was agreed that a small area measuring 5 m x 6 m across the area of disturbance for two proposed pipeline trenches would be excavated and any human remains would be fully recorded and removed.

Archaeological and Historical Background

Gosling (1995, 127) states that; 'during the thirteenth century Tuam had become one of the foremost ecclesiastical centres in Ireland.... It appears to have been focused around the ecclesiastical enclosures surrounding Temple Jarlath and Templenascreen. These may have contained the residence of the bishop and the guesthouse. Two high crosses probably stood on or just outside their circumference, one probably marking the site of a market place. These enclosures were situated on the low ridge immediately to the south of the ford



Plate 1: View of the area of excavation at Toberjarlath from east. Note the wall of Farrannaboy cemetery in the background.

on the River Nanny. Between them, and overlooking the ford itself, was a major military fortification. A watermill probably stood on the river bank nearby. A short distance to the south-east of Temple Jarlath was the priory of St. John, while to the south-west stood the Romanesque cathedral. Just beyond it, a newly founded house of the Premonstratensian order, known as the abbey of the Holy Trinity, was being built. Standing amidst these structures was at least one other high cross, as well as the humble houses of the lay tenants, artisans and servants, each with their adjoining yards and paddocks. Finally, at a distance of 800 m or so the southeast of this cluster was a third ecclesiastical enclosure at Toberjarlath.'



Plate 2: View of the area of excavation at Toberjarlath from south. Not the remains of the boundary wall C.103 of the Union Workhouse on the left and the Athenry road in the background.

Little is known of Tuam in the later middle ages but it seems to have survived into the sixteenth century as a nucleated settlement, even if it was a small one. Because of its westerly situation the town and its monasteries stayed Catholic until 1587-8 when the cathedral and its revenues passed into Protestant hands (Bradley & Dunne 1992, 167). The English conquest of Connacht and the influx of Protestant settlers in the late sixteenth and early seventeenth centuries marks a turning point in the history of the settlement. In 1613 it became a borough and it subsequently received its charter of incorporation from James I.

The borough and its parliamentary representatives appear to have overseen the establishment of the town as a commercial and trading centre. The population increased for much of the following two centuries and the pattern of streets characterising the towns centre probably took shape. According to Gosling (1995, 129); 'the principle feature of the new layout was the triangular Market Square from which five streets radiated. These included two completely new streets, High Street and Shop Street, the former of which cut through the old monastic enclosure of Temple Jarlaith, while the latter sloped downhill to a new bridge across the River Nanny, eclipsing the old crossing point further downstream..... Finally, to the south ran Dublin Road and Vicar Street. When exactly the subsidiary street known as The Mall was laid out is unclear, however, the other side of the street in this area, Circular Road, was not created until the mid-eighteenth century'.

The revival continued apace in the eighteenth century, with the arrival of Archbishop Synge (1716-1742) heralding a period of notable improvement. The citizens of the borough established breweries, tanneries, tuck mills and gig mills. By the late eighteenth century

Tuam was a prosperous, confident, provincial market town, and many of its finer buildings are testimony to this. Apart from the demesne, other notable additions to the town included the Bishop Street Bridge (1735), the Market House in Market Square (1780), and several other fine residences. The shambles on Vicar Street was laid out in 1795. Slaughtering at the shambles was forbidden in 1818 (Comerford 1817-22). The shambles appears to have been the site of the original market place and the market cross. There were meat markets and fish markets to the east of church lane in the nineteenth century.

The Union Workhouse

The Workhouse was built in 1841 and opened in 1846 with accommodation for 800 paupers in the townland of Toberjarlath. Tuam was very badly affected by famine in 1822 and again in the 1840s. Laheen (2003-2004) records that the Tuam Herald reported in February 1848 that ‘at least 2,000 unfortunates were waiting in front of the Workhouse at Dublin Road on a Monday hoping to gain admission’.

The Irish Poor Law Act of 1838 divided the country initially into 130 poor law unions, including Tuam, each with a workhouse at its centre. An additional 33 were added in 1848-1850. The purpose of the Act was to provide institutional relief for the destitute as poverty was widespread in Ireland in the early 19th century. Each union was administered by a board of poor law guardians, some of whom were elected and some appointed from the local magistracy. The system was originally designed to accommodate 1% of the population but the famine in the 1840s meant that almost 4% of the population were accommodated in the workhouses by the mid-19th century. During the latter part of the 19th century additional functions, relating to health, housing and sanitation, were given to the poor law unions. Under the Local Government Act of 1898, the poor law unions lost some of their housing and sanitation functions to the rural district councils, but remained responsible for poor relief. The early 1920s saw the abolition of poor law unions in the south of Ireland (with the exception of Dublin) and the closure of workhouses to reduce costs. Some workhouses were burned during the War of Independence and Civil War while others were converted into county homes or district hospitals (National Archives of Ireland).

A total of 123 workhouses were originally constructed around the country, and they were all constructed along the same lines. They consisted of an enclosing outer wall and three buildings, with dividing inner walls. The front building consisted of a probationary ward, clerk's office and boardroom. The probationary ward was used to house new inmates until they could be examined by the medical officer and declared free of disease, upon which they were washed, given clothes and released into the main area. The main building, typically a long two-storied structure, housed the inmates, with males to the right and females to the left. This was further separated with two associated exercise yards, one at the front for children, and one at the rear for adults. A high dividing wall separated these yards. They were divided into five classes, based on age and gender; these

were children under 1, boys 2-15, males over 15, girls 2-15 and females over 15. The third building in the complex was the infirmary (Lanigan 1989).

Laheen (2003-2004) noted that the Poor Law Commissioners, the body who supervised the Boards of Guardians of the Workhouses, contacted the Tuam Board in 1847. They strongly disapproved when they discovered the existence of a burial ground within 90 feet of the fever sheds at the Workhouse in Tuam. The Commissioners felt that a burial plot should be located outside the boundary walls. Following this intervention tenders for a burial plot were printed in the local press in February 1848. A plot was found further east along the Upper Dublin Road in Carrowpeter townland in a field known locally as Dr Clarke's field. A memorial was unveiled at the site of this burial ground in 1947 on the centenary of the great famine. A second famine burial ground was located along the Ballymote road to the north of Tuam. The local residents association erected a plaque in 2005 to the memory of those buried there.

Cartographic Analysis

The site of the Union Workhouse is located in the south-eastern suburbs of the modern town of Tuam in the townland of Toberjarlath. A holy well (GA043-080002-), visited on the festive day of Jarlath, gave its name to the townland. The well was concealed under the railway line c. 1859 (Claffey 2009, 1).

The site is shown as an open field on the first edition (1839) Ordnance Survey map No. 43. The Union Workhouse is clearly marked on the second edition (1905) Ordnance Survey map and the 25 inch edition (Figure 3). It is located between the Dublin road to the north-east and the Athenry road to the west. The townland boundary of Toberjarlath and Farrannaboy define the NW, SW and SE boundary of the workhouse. None of the buildings, or indeed a burial ground, within the Union Workhouse is annotated on the map. There is however a narrow portion of land, annotated .218 acres, at the rear of the Union Workhouse. The excavated burials were located at the northern end of this piece of land which bounds the Athenry Road. This is probably the burial ground located within the grounds of the Union Workhouse whose location was deplored by the Poor Law Commissioners. According to local information there were three gates (one main gate and two side gates) on the Athenry road which allowed access into the rear section of the Union Workhouse grounds.

A large cemetery is marked on the second edition (1905) Ordnance Survey map on the western side of the Athenry road, almost across the road (west of) from the Workhouse.

The Dublin Road Housing estate on the eastern side of the Athenry Road was built in the 1970s partly on the site of the old Tuam Workhouse which was demolished in 1969.

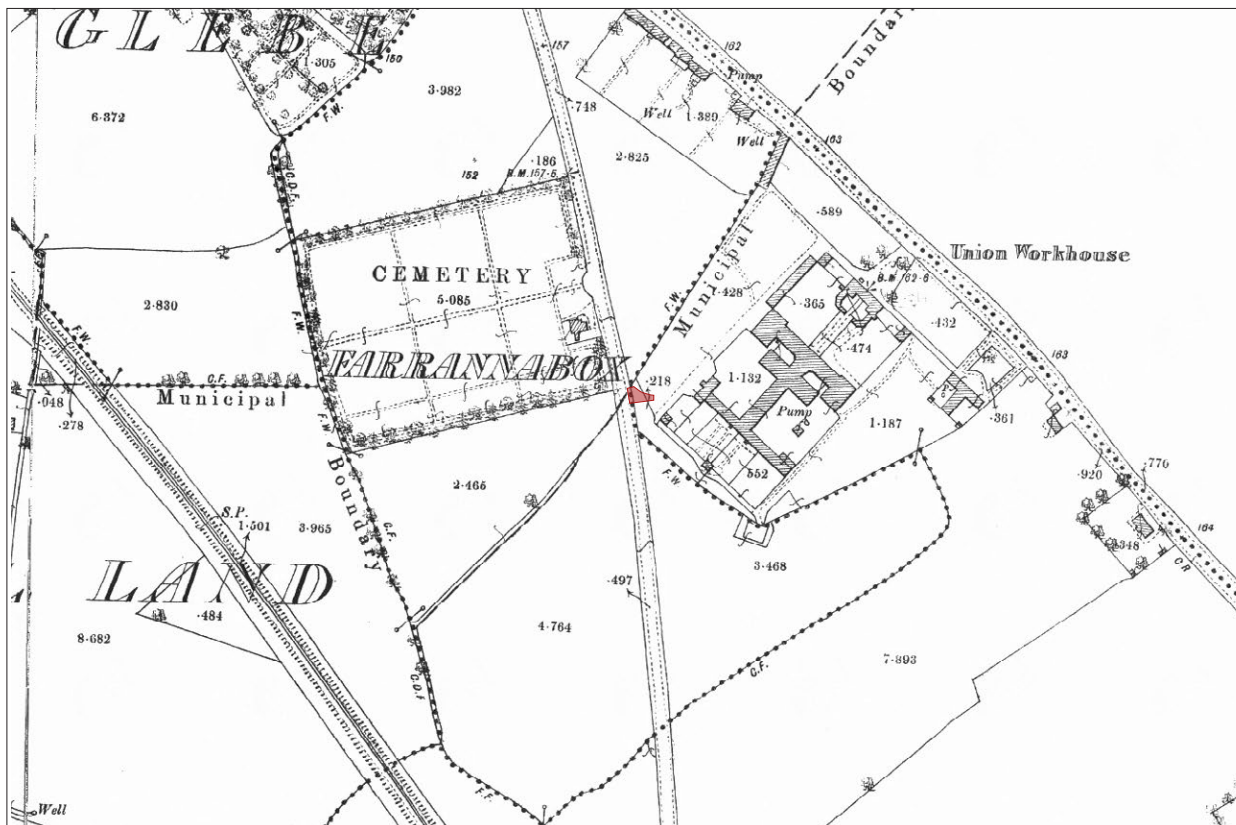


Figure 3: Portion of 25 inch map of Tuam showing the Union Workhouse and the location of the area of excavation in Toberjarlath.

Description of works

Following consultation between Eachtra and The Department of Arts, Heritage and the Gaeltacht a mitigation strategy was agreed with both Coffey's and Galway County Council who are supervising the Scheme. It was agreed that a small area measuring 5 m by 6 m across the area of disturbance for two proposed pipeline trenches would be excavated and any human remains would be fully recorded and removed. The sub-surface remains of a short western section of the Workhouse boundary wall (C.103) was identified just to the west of a modern watermain which forms the western boundary of the excavation area. The burials, some 48 in total, were located just inside this boundary wall (Figure 4).

Modern deposits

A layer of water rolled cobbles (c. 0.1 m in diameter) underlay the modern tarmac. A layer C.3 of black silty soil (maximum depth 0.7 m) underlay the cobbles and overlay the burials in the northern section of the cutting. Fragments of red brick, animal bone, ceramic and glass of 19th and 20th century date were included in this layer. The remnants of the old ground surface C.5 (orange brown silty clay) underlay layer C.3. The grave pits were dug through this layer and into the underlying subsoil C.6.

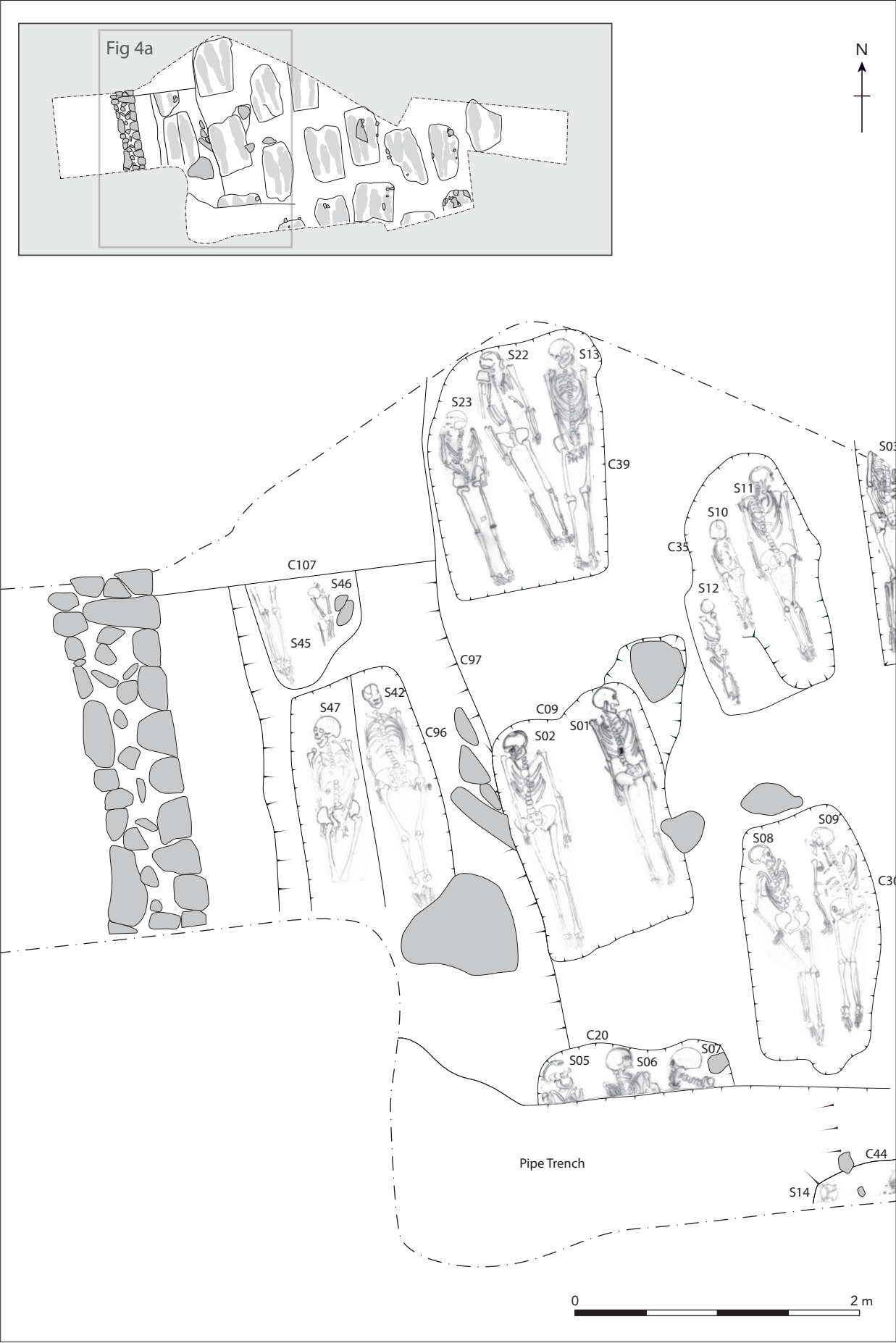


Figure 4a: Post-excavation plan of the human remains in the area of excavation in Toberjarlath.

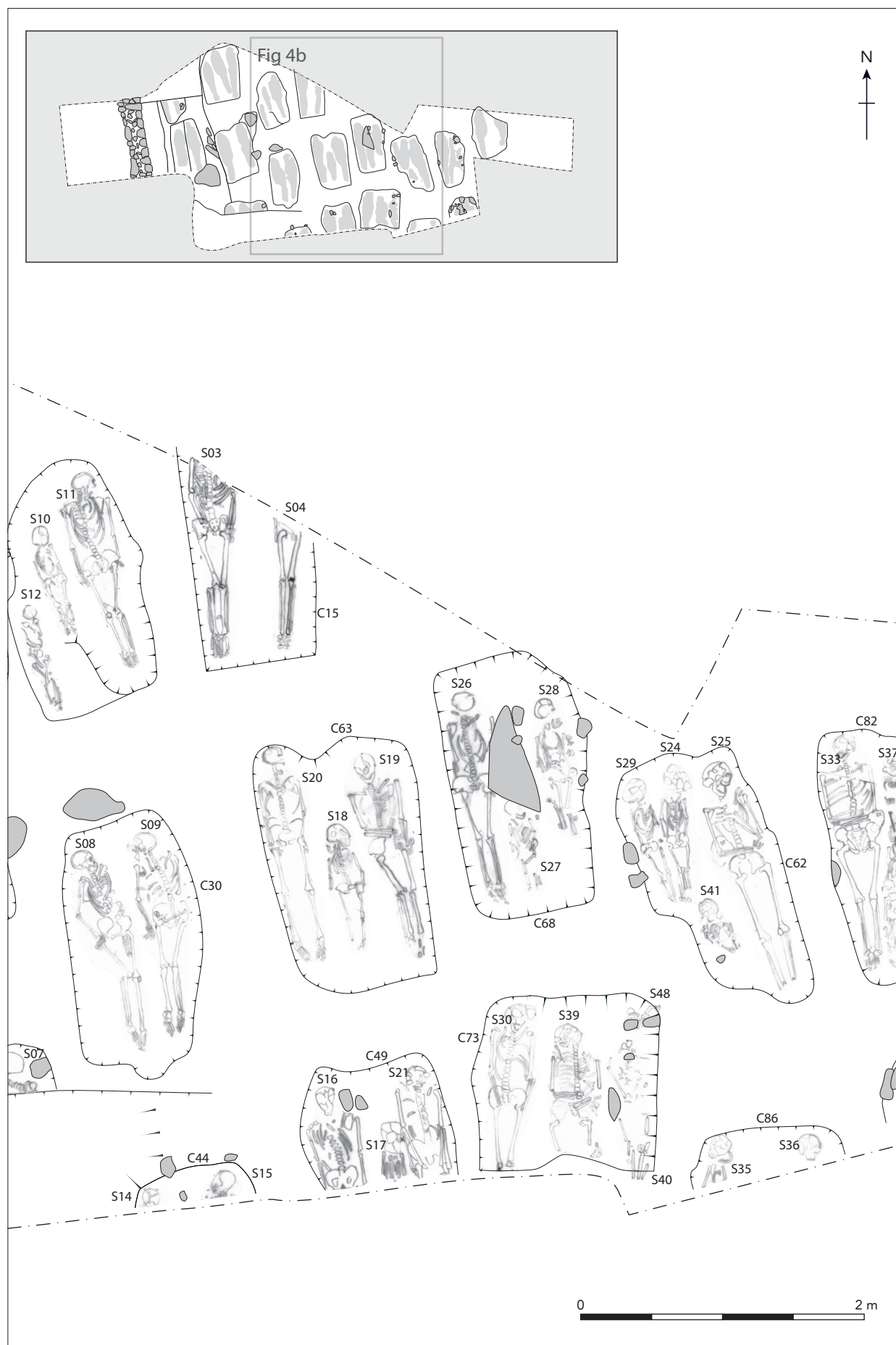


Figure 4b: Post-excavation plan of the human remains in the area of excavation in Toberjarlath.

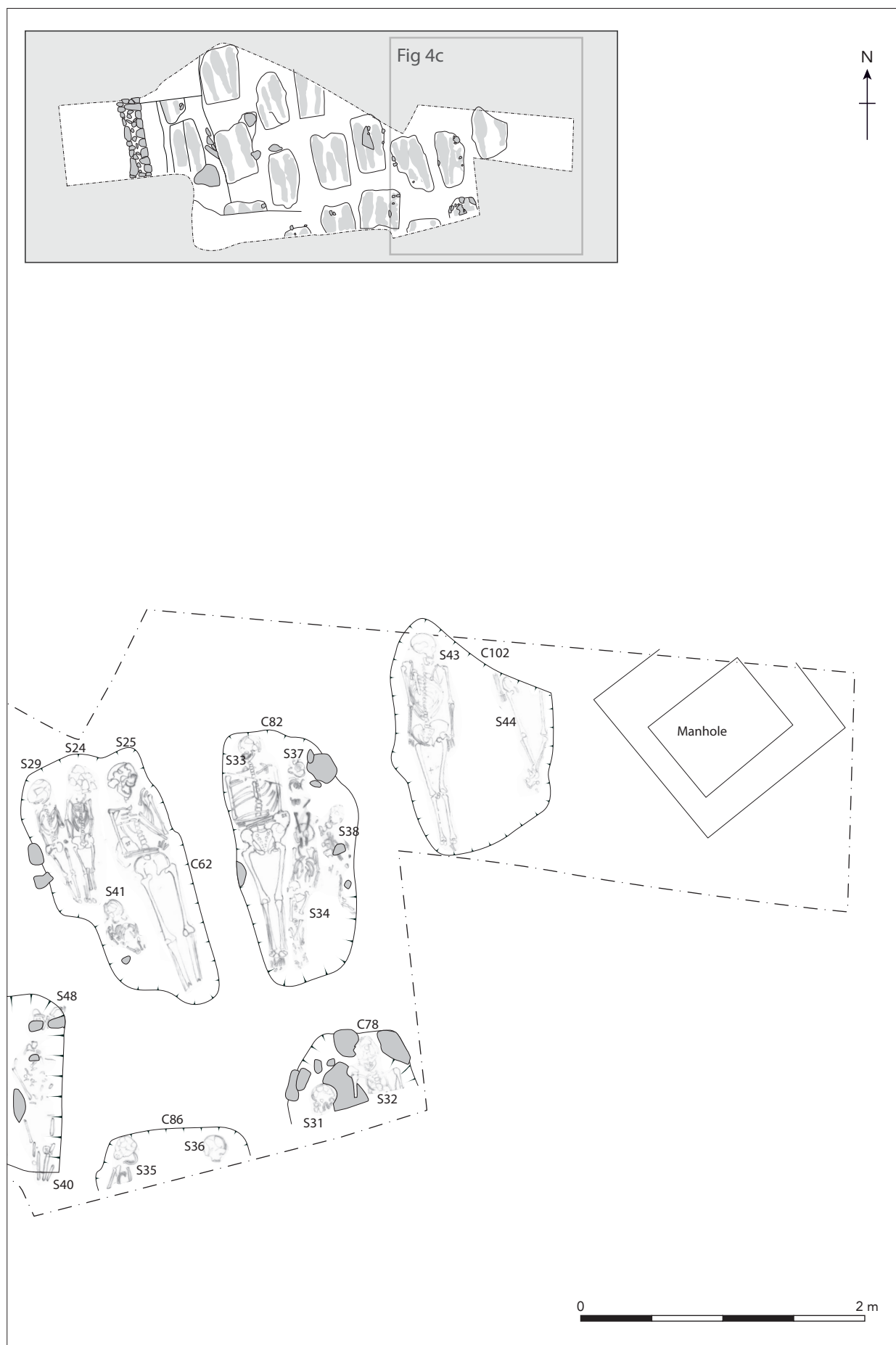


Figure 4c: Post-excavation plan of the human remains in the area of excavation in Toberjarlath.

The boundary wall and ditch

A section of the eastern boundary wall C.103, aligned NS, of the Union Workhouse was recorded in the cutting. It had been demolished above ground but survived *c.* 0.5 m below the modern road surface. The exposed length measured 2.5 m in length by 0.7 m in width (see Plate 9). It was built of random rubble limestone. All of the burials were located on the internal side (east of) of the wall. A ditch C.97 was located on the eastern side of the wall. The exposed ditch was U-shaped in plan and measured 3 m NS by 1.9 m EW by 0.7 m in depth. Two grave pits (C.96 and C.107) were cut into the fill C.98 (brown silty clay) of the ditch.

Grave pits

A total of 18 grave pits were excavated within this small area (Appendix 1). The full extent of 11 of the pits (C.9, C.30, C.35, C.39, C.43, C.62, C.63, C.68, C.73, C.82 and C.96) was fully exposed and the 32 associated burials contained within the pits were fully excavated. The remaining seven grave pits (C.15, C.20, C.44, C.49, C.78, C.86 and C.107) were only partially exposed in the area of the excavation and the exposed parts of 16 burials were excavated. The remaining portions of these 16 skeletons are still *in-situ*. The grave pits were not dug in straight lines but filled the available space. There may have been markers (stones or wooden stakes) placed on the original ground surface as none of the graves pits cut one another.

Grave pit No.	Skeleton No.	Gender and age of skeletons
9	1 & 2	Old adult F & young middle adult poss. M
15	3 & 4	Young adult F & old middle adult M
20	5, 6 & 7	Adult poss. M, young adult poss. M & adult poss. M
30	8 & 9	Adolescent poss. F & old adult F
35	10, 11 & 12	Juvenile, old middle adult F & juvenile
39	13, 22 & 23	Adolescent poss. M, adult F & juvenile
44	14 & 15	Adult M & adult M
49	16, 17 & 21	Old adult poss. M, juvenile & adult M
62	24, 25, 29 & 41	Juvenile, old adult M, juvenile & infant
63	18, 19 & 20	Juvenile, adult F & old adult M
68	26, 27 & 28	Poss. Old adult F, juvenile & juvenile
73	30, 39, 40 & 48	Old middle adult M, old middle adult F, adult poss. F & infant
78	31 & 32	Juvenile & adolescent poss. F
82	33, 34, 37 & 38	Old middle adult M, juvenile, juvenile & juvenile
86	35 & 36	Juvenile & juvenile
96	42 & 47	Old middle adult poss. F & old middle adult M
102	43 & 44	Old middle adult F & juvenile
107	45 & 46	Adult M & juvenile

Table 1: Numbers of skeletons buried in 18 grave pits in Toberjarlath

The numbers of burials within each of the discrete grave pits varied between two and four individuals, 50 % of the grave pits contained two individuals, 33.4 % contained three individuals and 16.6 % contained four individuals. A total of 15 adult males, 11 adult females, 3 adolescents, 17 juveniles and 2 infants were recorded in the grave pits (Figure 5).

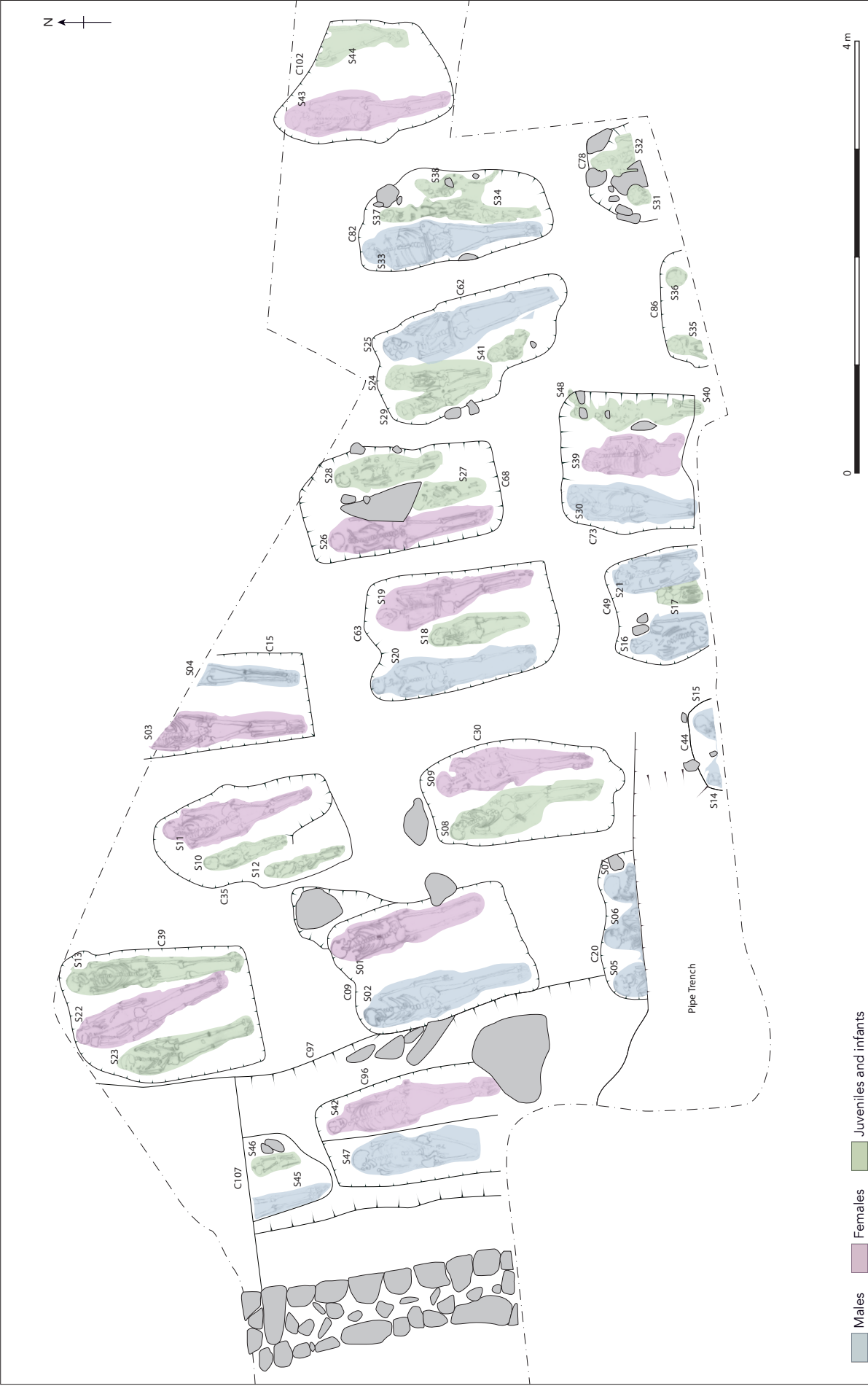




Plate 3: Excavation of skeletons 1 and 2 in grave pit C.9 at Toberjarlath.

The largest of the grave pits measured 1.8 m NS by 1.2 m EW by 0.2 m in depth. Evidence for the use of coffins was attested to by coffin nails found alongside the burials. No timber fragments were recovered from any of the grave but some discolouration of soil around some of the skeletons and tiny fragments of wood which had adhered to some of the nails indicated the presence of coffins. The skeletons were consistently orientated north/south – with the head to the north. It is possible that the position, rather than the established east/west orientation was dictated by the space available within the angle of the boundary wall.

Grave pit C.9

Grave pit C.9 measured 1.8 m NS by 1.2 m EW by 0.15 m in depth. Sk 1 (female) and Sk 2 (possible male) lay side by side, SK 1 on the E side of Sk 2 within the cut (Plate 3). The skeletons were fully extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.15

The N portion of grave pit C.15 extended under the N edge of the cutting. The exposed portion measured 1.6 NS by 0.9 m EW by 0.15 m in depth. Sk 3 (female) and Sk 4 (male) lay side by side, Sk 3 on the W side of Sk 4 within the cut (Plate 4). The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.



Plate 4: Post-excavation of skeletons 3 and 4 in grave pit C.15 at Toberjarlath.

Grave pit C.20

The S portion of grave pit C.20 extended under the S edge of the cutting. The exposed portion measured 0.4 m NS by 1.4 m EW. Three skeletons (5, 6 and 7, possible males) lay side by side; Sk 6 in the middle with Sk 5 to the W and Sk 7 to the E. They appear to be extended and orientated NS but only the skull, shoulders and upper ribs were excavated. Fragments of iron nails were recovered from the grave fill.

Grave pit C.30

Grave pit C.30 measured 1.82 m by 0.98 m by 0.26 m in depth. Sk 8 (female) and Sk 9 (female) lay side by side, Sk 8 on the W side of Sk 9 within the cut. The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.35

Grave pit C.35 measured 1.8 m NS by 1.1 m EW by 0.2 m in depth. Sk 10 (juvenile) and Sk 11 (female) lay side by side, Sk 10 on the W side of Sk 11 within the cut. Sk 12 (juvenile) was located further S and to the W of Sk 10 within the same cut (Plate 5). Fragments of iron nails were recovered from the grave fill.



Plate 5: Post-excavation of skeletons 10 and 11 in grave pit C.35 at Toberjarlath. The skull of skeleton 12 is visible in the right middle ground.

Grave pit C.39

Grave pit C.39 measured 1.8 m NS by 1.3 m EW by 0.35 m in depth. Three skeletons (13, 22 and 23) lay side by side; Sk 22 (female) in the middle with Sk 13 (possible male) to the E and Sk 23 (juvenile) to the W. The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.44

The majority of grave pit C.44 extended under the S edge of the cutting, in a similar manner as grave pit C.86. The exposed portion measured 0.3 m NS by 0.9 m EW by 0.2 m in depth. Sk 14 (male) and Sk 15 (male) lay side by side; Sk 14 on the W side of Sk 15. They appear to be extended and orientated NS but only the skulls were excavated. Fragments of iron nails were recovered from the grave fill.

Grave pit C.49

The southern portion of grave pit C.49 extended under the S edge of the cutting. The exposed portion measured 0.9 m NS by 1 m EW. Three skeletons (16, 17 and 21) lay side by side within the cut. Sk 17 (juvenile) in the middle with Sk 16 (possible male) to the W and Sk 21 (male) to the E. The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.



Plate 6: Mid-excavation of skeletons 27 and 28 in grave pit C.68 and skeleton 30 in grave pit C.73 at Toberjarlath. Skeleton 30 is in the right background.

Grave pit C.62

Grave pit C.62 measured 1.5 m NS by 1 m EW by 0.08 m in depth. Three skeletons (24, 25 and 29) lay side by side; Sk 24 (juvenile) was positioned in the middle, Sk 29 (juvenile) to the W and Sk 25 (male) to the E. The fourth skeleton 41 (infant) was placed at the feet of the two juveniles (Sks 24 and 29). The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.63

Grave pit C.63 measured 1.9 m NS by 1.15 m EW by 0.15 m in depth. Three skeletons (18, 19 and 20) lay side by side; Sk 18 (juvenile) was positioned in the middle, Sk 19 (female) to the E and Sk 20 (male) to the W. The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.68

Grave pit C.68 measured 1.9 m NS by 1.15 m EW by 0.15 m in depth. Three skeletons (26, 27 and 28) lay side by side; Sk 27 (juvenile) was positioned in the middle, Sk 26 (female) to the W and Sk 28 (juvenile) to the E (Plate 6). There was a large stone in the centre of the grave pit and both Sk 26 and 27 overlay the stone. The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.73

The S portion of grave pit C.73 extended under the S edge of the cutting. The exposed portion measured 1.26 m NS by 1.35 m EW by 0.15 m in depth. Three skeletons (30, 39 and 40) lay side by side; Sk 39 (female) was positioned in the middle, Sk 30 (male) to the W and Sk 40 (possible female) to the E. Sk 40 was disturbed and in poor condition. During examination of Sk 40 by Linda Lynch (osteoarchaeologist) it became apparent that this adult female was buried with an infant, who was less than 1 year old. The infant was given the number Sk 48. Cranial fragments of a young juvenile (1-6 years) were also identified.

Grave pit C.78

The majority of grave pit C.78 extended under the S edge of the cutting, only the skull of Sk 31 (juvenile) and skull and upper torso of Sk 32 (adolescent) were excavated. The exposed portion of the grave pit measured 0.5 m NS by 1 m EW by 0.24 m in depth. The two skeletons lay side by side with Sk 31 positioned to the W of Sk 32. The junction of two water pipes overlay the burials.

Grave pit C.82

Grave pit C.82 measured 1.9 m NS by 0.9 m EW by 0.25 m in depth. A water pipe overlay the burials. Sk 33 (male) was positioned on the W side of the grave pit and three juveniles (Sk 34, 37 and 38) were positioned on the E side of the grave pit. Sk 34 partially overlay Sk 37 in the middle of the grave pit and Sk 38 was positioned to the E. Sk 37 and 38 were quite fragmented and incomplete, the poor preservation of these two skeletons maybe due to disturbance from earlier water pipe installation works. The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.86

The majority of grave pit C.86 extended under the S edge of the cutting in a similar manner as grave pit C.44. Only the skull and upper torso of Sk 35 (juvenile) and skull of Sk 36 (juvenile) were excavated. The exposed section of the cut measured 0.35 m NS by 1.15 m EW by 0.2 m in depth. The two skeletons lay side by side with Sk 35 positioned to the W of Sk 36.

Grave pit C.96

This grave was located in the ditch that ran parallel to the boundary wall of the Union Workhouse (Plate 7). It measured 1.9 m NS by 1.05 m EW by 0.25 m in depth. Two skeletons lay side by side; SK 42 (possible female) was located E of Sk 47 (male). The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill. The grave had been cut deeper into the ditch fill than those which cut the subsoil which may account for the good state of preservation.



Plate 7: Post-excavation of skeleton 42 in the ditch C.96 at Toberjarlath.



Plate 8: Post-excavation of skeletons 43 and 44 in grave pit C.102 at Toberjarlath.

Grave pit C.102

The E edge of the grave pit extended under the N edge of the cutting. The grave pit measured 1.66 m NS by 1.12 m EW by 0.11 m in depth. Two skeletons lay side by side; Sk 43 (female) was positioned W of Sk 44 (juvenile) (Plate 8). Only the legs of Sk 44 were excavated. The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.

Grave pit C.107

Grave pit C.107 was located to the north of grave pit C.96 in the ditch. The N portion of the grave extended under the N edge of the cutting. The edges of the cut were difficult to define. Only the legs of Sk 45 (male) and Sk 46 (juvenile) were excavated (Plate 9). The skeletons were extended and orientated NS with the head to the N. Fragments of iron nails were recovered from the grave fill.



Plate 9: View of the legs of skeleton 45 in the ditch C.96 at Toberjarlath. Note the remains of the boundary wall C.103 of the Union Workhouse on the left.

Discussion

The following discussion on the skeletons excavated at the site of the Union Workhouse in Tuam is extracted from the osteoarchaeological report written by Linda Lynch (Appendix 3).

The skeletons recently excavated from Tobar Jarlath in Tuam are believed to be directly associated with the nearby Tuam Union Workhouse, and particularly to the earliest years of the workhouse corresponding with the Great Famine (J. Kiely, pers. comm.). Until recently very few workhouse cemeteries had been excavated. However, the past decade has seen archaeological excavations and skeletal reports on a number of Union Workhouses including Cashel and Thurles in Co. Tipperary, Manorhamilton in Co. Leitrim, and Kilkenny city, amongst others (Fibiger 2004; Geber 2012; Lynch 2002; 2008; Rodgers *et al* 2006; Sutton 2010).

The Irish Poor Relief Act of 1838 sought to reform the manner of dealing with the huge amount of poverty and pauperism that had developed in Ireland by the fourth decade of the nineteenth century. The Act established 130 Poor Law Unions across the country, each of which was to construct a workhouse in order to cater for the impoverished of that district. The workhouse was to be constructed from poor rates collected in that union. Tuam workhouse was quite large, designed to cater for 800 people (O'Connor 1995, 263). It was built to one of three standard plans, all designed by the architect George Wilkinson. All workhouses followed a set design:

There was a small entrance block, known as the workhouse administration unit, which housed the board-room and offices. Passing through this block one came to the main institution, usually a transverse three-storey building of stone. This block contained the workmaster's office and several wards, usually for ambulant inmates. At the rear [*sic*] were the kitchens, wash-houses and store rooms (ibid. 81). Although built in 1840/41, Tuam workhouse only took its first admissions on 4th May 1846, after problems in the collection of the poor rates (ibid., 123, 263, www.workhouses.org.uk/Tuam/). This may not have been detrimental to the poor of the district as by 1846 workhouses of the country were only half full (ibid. 120). This was a partial reflection of the intense hatred the Irish poor had of the workhouse system of dealing with poverty, as opposed to the established tradition of outdoor relief.

However, the workhouse system was immediately put to the test. The potato crop of 1845 was struck by a devastating blight, a fungal disease called *phytophthora infestans*. By then, the potato had become the subsistence food for at least one-third of the eight million people in the country (Crawford 1995, 60). Although undoubtedly hunger and disease increased in that year, the real devastation began in 1846 when the blight struck again. Seed potatoes, meant as the foundation for the crop of 1847, were consumed. Famine and disease rapidly spread across many parts of the country and the crisis continued until 1852. The worst affected areas saw workhouse admissions increase dramatically as the destitution, disease, and starvation forced thousands to seek admissions to the abhorred institutions. In 1845 there were 38,497 admissions. By 1851 this had risen to

217,388 individuals (O'Connor 1995, 177). Over half of the 116,000 people in the workhouses in 1847 were children (Robins 1980, 179). The conditions within the workhouses during the Great Famine, as a whole, were horrific. The workhouses were specifically designed and run to be almost below basic survival levels, in order to deter people from entering. Mortality was high within the walls. By the winter of 1846-47 workhouse death rates reached 2,500 deaths per week (Kinealy 1995, 118). Sixty children under the age of 13 died in one week in Cork workhouse in February 1847. By 1852 the Famine was over, although the destitution it brought about undoubtedly continued. Many who were forced into pauperism by the conditions of the famine would have had no choice but to stay within the walls of the workhouse. After the 1850s the numbers entering workhouses diminished, and they took on a role resembling a hospital. Most eventually came under the management of the religious orders (O'Connor 1995, 180).

The burials examined in this study relate to Tuam workhouse, and so date to after 1846. The specific date of the burials is not known. However, as suggested by documentary evidence the burials are likely to date from the very earliest years of the workhouse and are likely to directly relate to the volatile period of the Great Famine, 1845-1852. This would be confirmed by the method of burial, with multiple individuals being buried in communal pits. These mass grave pits are a reflection of the rate of death that became common in these institutions at the time of the Great Famine. The high numbers dying militated against the provision of individual graves and the pragmatic solution was to dig large grave pits that could accommodate multiple burials. Evidence of coffined burials being buried stacked on top of each other in large pits has been identified at other workhouses, such as Kilkenny and Borrisokane (J. Geber, pers. comm.; Lynch 2009), while multiple burials, with up to three or four individuals buried next to each other in a single pit, have also been identified in Cashel and Manorhamilton workhouses (Lynch 2008, Rodgers *et al* 2006). The present burials from Tuam conform to the latter pattern, with eighteen grave pits being identified in the small area excavated, containing at least 48 individuals. The graves were in relatively organised rows, each containing between two and four individuals each. Figure 5 shows the locations of the female and male adults, and the juveniles within each grave.

No clear pattern was evident in terms of who is buried in what grave. Female adults were buried with male adults and both were buried with children also. Some graves contained only adults, and some apparently only juveniles. The randomness is likely a reflection of the scale of death within the walls of the workhouse. The large grave pits were filled according to the order in which individuals died. It is likely that most of the individuals within each mass grave had no familial relationship to each other. An infant (SK48) identified in post-excavation in association with a female adult (SK40) may represent a mother and child buried together in a coffin, although the post-depositional truncation made this difficult to interpret. Similarly, two juveniles (SK24 and SK29) appeared remarkably similar in size in the excavation plan and were buried side by side, suggesting they may have been twins. In most cases however, it is impossible, without resorting to

methods such as DNA analysis, to determine the relationships between the individuals in each mass grave.

Interestingly, these burials from Tuam, as with other workhouse burials noted earlier, have dismissed a very common assumption that, due to the scale of deaths during the Great Famine, it was almost a matter of course to use a coffin with a sliding bottom to deposit the dead within the pits, or to simply wrap corpses in cloth and use no coffin (O'Connor 1995; Kissane 1995, 120). The belief was that the Poor Law Unions simply could not, or would not, meet the demand for coffins. All of the burials from Tuam were coffined. So too were the hundreds of individuals buried in pits in Kilkenny workhouse (J. Geber, pers. comm.), in the pits associated with Borrisokane workhouse (Lynch 2009), and in the more organised burials from Manorhamilton (Rodgers *et al* 2006) and Cashel workhouses (Lynch 2008). It appears that, despite the horror of the Great Famine and the abhorrent conditions within the workhouses, at least in the early years, the dead were routinely afforded the dignity of a coffined burial, even if it was into a mass, nameless pit.

What can the skeletal remains of the Tobar Jarlath individuals, apparently associated with the horrendous years of the Great Famine in Tuam workhouse, tell us? Obviously there are biases in the data in terms of the limits of excavation. The 48 individuals recovered from Tobar Jarlath represent a snapshot of the hundreds, or thousands, that would have died in the workhouse from its foundation. They represent perhaps the weakest of those who were admitted. The workhouse was not meant as a place of death. It was meant to alleviate destitution. Therefore the actual skeletal remains of those who died in the institution are a unique and very specific section of society in nineteenth century Ireland.

The age profile is typical, with almost half (45.8%) of the excavated individuals being less than 18 years at the time of death. In a skeletal sample recently excavated from Cashel workhouse in Co. Tipperary 55.6% of individuals were juveniles, while 28.8% of a cemetery associated with Manorhamilton workhouse were juveniles (Lynch 2002; 2008). Given that children were amongst the most vulnerable in the pauper class (an individual had to be destitute in order to be admitted to the workhouse), it is not surprising to find high numbers in a workhouse cemetery. Children would have been admitted with their families or they may have been orphans. Some children were literally abandoned at the gates of the workhouse by their parent/s. Others were foundlings, infants abandoned at birth, whose care was transferred from the parish to the poor law union in the 1850s (Robins 1980, 184). Children who were destitute were already in appalling conditions on the outside. When they entered the walls of the workhouse their survival rate was very poor.

Somewhat surprisingly, just two infants were recovered from Tobar Jarlath. This represents just 9.1% of the juveniles. In the skeletons from Cashel workhouse 24% of juveniles were infants, while just 10.5% of those in the Manorhamilton were infants (Lynch 2002; 2008). The very low rate in this skeletal sample from Tobar Jarlath appears exceptional. Infant mortality rates would have been very high both within the workhouses and in society in general. In post-famine Ireland that rate was 115/1000 births (Clarkson and Crawford 2001, 239). In the early half of the century it was likely to have been higher. In-

herent biases within the excavation may account for the lack of infants. They may simply have been buried somewhere else. This may be within the existing cemetery, or within the grounds of the workhouse, or perhaps they were buried outside of the workhouse completely. It is evident that infants were frequently afforded different burials (Delaney 2009; Dennehy and Lynch 2001; Donnelly and Murphy 2008), and perhaps this was also the case within the workhouse institution.

Most of the juveniles (59.1%) from Tobar Jarlath were aged between 1-6 years at the time of death. In Cashel workhouse 48% of juveniles were in that age-category (Lynch 2008). The age-at-death categories used in the Manorhamilton analysis varied slightly: in that site 15.8% of juveniles were aged between 1 and 5 years at the time of death (Lynch 2002). The high number of young juveniles in Tobar Jarlath is again indicative of the dire circumstances faced by children in the destitute class. In the early nineteenth century over half of children died before the age of 10 years (Farmer 2004). Again, in times of stress this would be expected to be even higher. In terms of pathological lesions the juveniles from Tobar Jarlath revealed a number of interesting traits that were indicative of the physiological stresses they would have been under (see below).

In the adult population in Tobar Jarlath, there appears to be a significant bias toward older individuals, with 82.4% of adults aged over 35 years at the time of death. As with the juveniles, this is a reflection of the vulnerable state of older individuals who were destitute. Slightly more male adults (57.7%) than female adults (42.3%) were present in this sample. Women in nineteenth century Ireland were considerably more economically vulnerable than men. Accordingly, they used the welfare institutions significantly more than men. From the onset of the Poor Law in Ireland more women were in the workhouses than men. Census returns for 1881 reveal that 72% of the individuals in hospitals, asylums, and almshouses were women. More male adults (60%) than female adults (40%) were also present in the sample from Manorhamilton workhouse (Lynch 2002), while slightly more females (58.6%) than males (41.4%) were present in burials recovered from Cashel workhouse (Lynch 2008). Again, the almost equal numbers of female and male adults in the Tobar Jarlath sample may be a reflection of excavation biases. However, an important factor to consider is that while data indicates that more females than males entered the workhouse this may not necessarily translate to death rates. Indeed in pre-famine Ireland, and in post-famine Ireland until the 1930s women had higher mortality rates than men (Daly 1986, 100). However, during the Great Famine the situation was reversed. This may have been due to a combination of increased pressure on the male bodies undertaking heavy relief works, and also to the higher calorific demands of males (*ibid.*).

The skeletal remains also reveal a wealth of information in terms of health status. The average female stature was 155.3cm, while the average male stature was 170.2cm. Data provided in Section 2.2 (Appendix 3), indicates the males in Tobar Jarlath were taller than other males in comparable pauper populations, while the females were relatively similar to their contemporaries in other workhouses. Both sexes were shorter in stature than their contemporaries in middleclass populations. While stunted growth is genetically linked, nutritional deficiencies also appear to be a major contributing factor (Goodman 1991).

‘Poor growth and short stature are trade marks of deprivation’ (Cole 2006, 166). If an individual is under- or malnourished then their potential final attained height may be compromised. Given the low socio-economic status of these individuals, it is likely that their final height was significantly influenced by a poor diet.

Until the 1850s the diet for the majority of the population would primarily have comprised potatoes. Cottiers and labourers would have supplemented the potato with buttermilk, while small-farmers also consumed milk, oatmeal, and wheaten bread. Herring was utilised along the coast (Ó Tuathaigh 1990). Potatoes, combine with buttermilk, are a highly nutritious diet (Dickson 1997, 12). Providing it was consumed in enough quantity this diet was very beneficial to an individual. When the Great Famine hit it obliterated the huge numbers who existed on this subsistence diet. In the workhouse the diet was poor, particularly in the opening years of the 1840s, which coincided with the Famine. At the foundation of the workhouse adult meals were to comprise eight ounces of stirabout and a half pint of milk for breakfast, and three and a half pounds of potatoes and one pint of skimmed milk for dinner (O’Connor 1995, 101). Children were to get three ounces of oatmeal and a half pint of new milk for breakfast, two ounces of potatoes and half a pint of new milk for dinner, and six ounces of bread for supper (*ibid.*). This constantly changed over the years, and was particularly poor during the years of the Great Famine. It is likely that the restricted nature of the diet of the poor was highly influential both on their final attained stature, and on their health profile.

This diet is reflected in the teeth of the Tobar Jarlath individuals, although not in the traditionally expected manner. There was a high prevalence of calculus, or calcified plaque, which is indicative of a soft diet, combined with poor oral hygiene. However, most of note is the prevalence of carious lesions, or cavities in the teeth. Almost nine out of ten adults had at least one tooth affected (CPR 86.4%, 19/22), while more than half the juveniles had carious lesions (CPR 57.9%, 11/19), despite the young age (1-6 years) of most of the juveniles. High prevalences have been recorded in other Irish workhouse populations also (Lynch 2002; 2008). Traditionally, carious lesions are associated with a diet high in sugar. Given the restricted diet that the Tobar Jarlath individuals would have consumed, both outside and inside the workhouse, it is unlikely they had any significant access to sugar. However, the lesions are also known to occur through the consumption of certain starches and high prevalences have been identified in other populations where large quantities of potatoes were consumed (Wasterlain *et al* 2009). It is possible that the high prevalence of caries in workhouse populations is directly related to the huge quantities of potatoes consumed. Directly related to the high prevalence of caries was a high prevalence of ante-mortem tooth loss, with a CPR of 59.1% in adults. Today in Western Europe, with access to professional dentists and anti-biotics, carious lesions and abscesses are not considered a serious issue, rather a tiresome burden. But in nineteenth century Ireland, if the infection was not dealt with, presumably by extraction by whatever means possible, the result was undoubtedly excruciating pain which could affect ever aspect of life including food consumption. Ultimately it could also lead to septicaemia and death. Rather surprisingly, no edentulous (the ante-mortem loss of all teeth) individuals were

present, which would be expected in a population such as this, where the adults were older in age and where there was a high prevalence of both caries and ante-mortem tooth loss. This was contrary to evidence from other workhouse populations (Lynch 2002; 2008).

The high prevalence of caries in the juvenile individuals may not necessarily have been caused by a primarily potato-based diet. In skeletons from a large post-medieval *cillín* in Mackney in Co. Galway (Delaney 2009), just CPR 8.3% (2/24) of juveniles aged between 1 and 17 years had carious lesions (Lynch 2007). In contrast, CPR 32.6% (6/19) of the juveniles examined from Cashel workhouse had carious lesions (Lynch 2008). It is possible that at least some of the young juveniles with caries were only just weaned, if even, at the time of death. It is possible that the caries in those individuals was caused by the use of a sugar-rag or teat, although it could certainly be argued that pauper and the destitute would not have had any access to sugar.

Differential ages of physiological stress were apparent from the hypoplastic defects in adults and juveniles. Firstly, only male adults had the lesions. No females were affected. This suggests that females and males had a different experience of childhood physiological stresses, with males suffering more than females. Secondly, adult hypoplastic defects indicated stress between the ages of 1 and 3.5 years, while the defects in the juvenile individuals indicated stress between the ages of 6 months and 1 year. This suggests that early physiological stress may have had a direct influence of longevity. Interestingly, another indicator of physiological stress was higher in the male adults than in the female. Porotic hyperostosis was higher in males (TPR 69.2%) than in female adults (TPR 44.4%). The condition, while being linked with iron deficiency anaemia, had been identified as being an indicator of the body fighting a physiological assault. The higher prevalence of this in male adults, combined with the data from the enamel hypoplastic defects indicated that the males in this population may have been exposed to more physiological stresses than females.

Other factors are likely to be more indicative of lives lived outside of the workhouse. Some individuals would have been born and raised in the environs of the workhouse (Robins 1980), but it is probable that most of the adults in the present sample lived much of their lives outside of the walls of the institution. Evidence of pipe smoking was preserved in the dentitions of over half of the male adults. None of the female adults had the tell-tale facets of wear in the teeth. This indicated a strong bias towards male smoking. However, smoking was banned in the workhouse. In addition, many of the traumatic fractures that were so common in the adults in this group may have been related to occupational hazards. Many that would have finally sought admission to the workhouses were originally cottiers and labourers. Changes in circumstances, most obviously during the Great Famine but also due to other factors, would force them to seek the help of the workhouse. But evidence of their hard physical labours was preserved on their bones. Fractures to the hands and feet of males were common, and may be related to ordinary labour comprising either agricultural and/or industrial work. However, they may also have been sustained during participation in outdoor relief schemes where, in return for substantial physical labour, an individual would be provided with food or money. Joint

disease also had a high prevalence in the adults and is probably related both to lives of hard work and to the aged nature of the population.

The evidence of infectious lesions was indicative of the abysmal living conditions of these individuals. Over half of the adults (CPR 53.8%) had lesions of infection, with similar prevalences in females and males. A high prevalence of the lesions in the maxillae and mandibles of male adults was linked with dental disease. Most of the classic evidence of infection was present in the bones of the lower limb, and in the tibia in particular (TPR 66.7% male tibiae, TPR 50% female tibiae). When an individual had periostitis on one limb bone it was always present in at least one other limb bone. Bilateral periostitis is linked with systemic infection (Larsen 1997). The juveniles also had a high prevalence of infectious lesions (CPR 47.6%). In contrast to the adults however, the most common location was as endocranial (internal) lesions in the skull (TPR 42.1%). The lesions may relate to haemorrhaging associated with trauma or to inflammation, particularly associated with meningitis (Lewis 2004; Ortner 2003, 84; Schultz 2001). In both juveniles and adults the lesions indicate the significant physiological stresses that would have been faced by these individuals. However, of import also is the fact that the lesions are present at all. An individual needs to be physically strong enough to survive for at least some time for the evidence of the infection to transfer to the bone. A weakened individual may succumb quickly to an infection that would never leave any trace on the bone. It is quite likely that those in the low social classes of the nineteenth century, who would have been routinely exposed to infections, may have actually built up a certain level of immunity that allowed them to withstand the disease, at least for a time. Although some individuals had active lesions at the time of death, that is they were still suffering from the infection, all also had older healed lesions, indicating repeated infections. Most of these individuals would have been born into poverty, and all its associated implications in nineteenth century Ireland. Not surprisingly their bodies had adapted to their living conditions to a certain degree.

Rather surprisingly, periosteal lesions on the visceral surface of the ribs were observed in just a single juvenile individual. None was identified in the adult population. This was unexpected for a mid-nineteenth century population. Rib lesions are typically related to pulmonary infections, and have been closely linked with tuberculosis (Roberts *et al* 1994). TB was endemic in Ireland in the mid-nineteenth century and was, and is, primary linked both to living conditions and work environments (Jones 2001, 30). The lack of any skeletal evidence of the infection in the individuals from Tuam is somewhat unexpected.

Of particular note in the population was the numbers of individuals with skeletal evidence of physical and possibly mental impairments. Possible cases of ankylosing spondylitis and DISH were identified. Both of these can eventually lead to spinal fusion, with associated restriction in movement. One individual may have suffered from the painful condition of rheumatoid arthritis. She, and another female, also suffered from kyphosis, or anterior bending of the spine, as did a juvenile. This can lead to significant problems as, if pronounced, it can cause constriction of all of the major organs. Breathing may be difficult and there may be increase pressure on the heart. Interestingly, the adolescent that suffered from kyphosis was the only individual in the population that also had evidence

of pulmonary infection. Spondylolisthesis may have resulted in spinal problems for one female adult, as her *in situ* photograph indicated abnormal curvature of the spine. However, this left no trace on the actual skeletal remains. The osteomyelitis (infection of the bone marrow) in the left fibula of SK13, was indicative of a serious and life-threatening infection. While it cannot be confirmed that this was the actual cause of death, other inferences may be made. The sinuses indicate that infected matter, probably including bone fragments, was draining out through the skin. The leg would have been very swollen, hot to the touch, and extremely painful. Soft tissue infection may also have been present. Such infections are treatable today with antibiotics. It is possible that this chronic disease was, at least sometimes, debilitating to this individual. Two adults also had healed skull fractures that may have resulted in at least some cognitive impairment. The work capacity of most, if not all, of the individuals listed here was at least somewhat compromised by their physical state. They literally may not have been even able to work, if that option was open to them. In an era before the modern welfare state, the only option for such individuals, without the support of family or friends, was to enter the workhouses. In some instances, they may have been forced into the workhouse by said family and friends, due to a variety of circumstances. It was not until 1862, and the Relief of the Destitute Poor in Ireland (Amendment) Act, that sick individuals who were not destitute were admitted to the workhouse (O'Connor 1995, 179). It was also at that time that workhouses began to act more as hospital-like institutions.

Conclusions

It is possible that the burials uncovered and excavated in the western corner of the grounds of Tuam Union Workhouse formed part of the mid 19th century burial ground within the Workhouse which so displeased the Poor Law Commissioners. The north/south orientation of the burials is unusual as an east/west orientation is the Christian tradition. It is likely in this case that the available ground, respecting the boundary wall, favoured the north/south orientation as is the case with some modern cemeteries. Each of the grave pits contained between two and four individuals, men, woman and juveniles were mixed in the graves. These probably do not represent family groups but people who died at the same time. The graves were dug close to each other but a distance of approximately 0.6 m, a narrow walkway, separated each of the grave pits. The burial ground probably extends further to the south, south-east and west. Anecdotal evidence from residents in adjacent houses told of encountering human bone when digging in their gardens. It is difficult to know how many other men, woman and children are buried within the grounds of Tuam Union Workhouse.

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Appendix 1 Context Register

Context	Context Type	Sample	Description
1	Deposit		Modern road material, tar sand chips gravel etc.
2	Structure		Cobbles under modern road surface
3	Fill		Dark deposit, dump material, iron frags, glass etc. N edge site
4	VOID		
5	Deposit		Orange silty clay soil overlaying natural
6	Deposit		Natural yellow-grey silty gritty layer
7	Fill	Soil 1,2	Fill of grave C.9 for Skeleton 1 and Skeleton 2
8	Skeleton 1		Skeleton 1 in cut C.9
9	Cut		Cut for Skeleton 1 and Skeleton 2 filled by C.7
10	VOID		
11	Skeleton 2		Skeleton 2 in cut C.9, fill C.8
12	VOID		
13	Fill	Soil 3	Fill of grave cut C.15 for Skeleton 3 and Skeleton 4
14	Skeleton 3		Skeleton 3 in cut C.15, fill C.13
15	Cut		Cut of grave for Skeleton 3 and Skeleton 4 filled by C.13
16	VOID		
17	Skeleton 4		Skeleton 4 in cut C.15, fill C.13
18	Fill	Soil 4	Fill of grave cut C.20 for Skeleton 5, Skeleton 6 and Skeleton 7
19	Skeleton 5		Skeleton 5 in cut C.20, fill C.18
20	Cut		Cut of grave for Skeleton 5, Skeleton 6 and Skeleton 7
21	VOID		
22	Skeleton 6		Skeleton 6 in cut C.20, fill C.18
23	VOID		
24	VOID		
25	Skeleton 7		Skeleton 7 in cut C.20, fill C.18
26	VOID		
27	Fill	Soil 5, 6, 8	Mottled mid brown silty soil containing Skeleton 8 and Skeleton 9
28	Skeleton 8		Skeleton 8 adjacent to Skeleton 9
29	Skeleton 9		Skeleton 9 adjacent to Skeleton 8
30	Cut		Cut of grave containing Skeleton 8 and Skeleton 9
31	Skeleton 10		Skeleton 10 Juvenile west of Skeleton 11
32	Skeleton 11		Skeleton 11 east of Skeleton 10
33	Fill	Soil 7, 12	Fill of grave cut C.35 containing Skeleton 10, Skeleton 11 and Skeleton 12
34	VOID		
35	Cut		Cut of grave containing Skeleton 10, Skeleton 11 and Skeleton 12
36	Skeleton 12		Skeleton 12 west of Skeleton 10
37	Fill	Soil 18	Fill of grave cut C.39 containing Skeleton 13, Skeleton 22 and Skeleton 23
38	Skeleton 13		Skeleton 13 in grave cut C.39
39	Cut		Cut of grave containing Skeleton 13, Skeleton 22 and Skeleton 23
40	Skeleton 14		Skeleton 14 adjacent to Skeleton 15
41	Skeleton 15		Skeleton 15 adjacent to Skeleton 14
42	Fill	Soil 9, 10, 11	Fill of grave cut C.44 containing Skeleton 14 and Skeleton 15
43	VOID		
44	Cut		Cut of grave containing Skeleton 14 and Skeleton 15
45	VOID		

Context	Context Type	Sample	Description
46	Fill	Soil 13, 14, 19, 20, 31	Fill of grave cut C.49 containing Skeleton 16, Skeleton 17 and Skeleton 21
47	Skeleton 16		Skeleton 16 adjacent to Skeleton 17
48	Skeleton 17		Skeleton 17 adjacent to Skeleton 16
49	Cut		Cut of grave containing Skeleton 16, Skeleton 17 and Skeleton 21
50	Skeleton 18		Skeleton 18 adjacent to Skeleton 19
51	Skeleton 19		Skeleton 19 east of Skeleton 18
52	Fill	Soil 15, 16, 17, 21, 22	Fill of grave cut C.63 containing Skeleton 18, Skeleton 19 and Skeleton 20
53	VOID		
54	Skeleton 20		Skeleton 20 west of Skeleton 18
55	Skeleton 21		Skeleton 21 associated with Skeleton 16 and Skeleton 17
56	VOID		
57	Skeleton 22		Skeleton 22 in grave cut C.39
58	Skeleton 23		Skeleton 23 in grave cut C.39
59	Skeleton 24		Skeleton 24 west of Skeleton 25
60	Skeleton 25		Skeleton 25 east of Skeleton 24
61	Fill	Soil 23, 24, 37	Fill of grave cut C.62 containing Skeleton 24, Skeleton 25, Skeleton 29 and Skeleton 41
62	Cut		Cut of grave containing Skeleton 24, Skeleton 25, Skeleton 29 and Skeleton 41
63	Cut		Cut of grave containing Skeleton 18, Skeleton 19 and Skeleton 20
64	Skeleton 26		Skeleton 26
65	Skeleton 27		Skeleton 27
66	Skeleton 28		Skeleton 28
67	Fill	Soil 25, 26, 28	Fill of grave cut C.68 containing Skeleton 26, Skeleton 27 and Skeleton 28
68	Cut		Cut of grave containing Skeleton 26, Skeleton 27 and Skeleton 28
69	Skeleton 29		Skeleton 29 west of Skeleton 24
70	VOID		
71	VOID		
72	Skeleton 30		Skeleton 30 sharing grave with Skeleton 39 and Skeleton 40
73	Cut		Cut of grave containing Skeleton 30, Skeleton 39 and Skeleton 40
74	Fill	Soil 27, 34, 36, 41	Fill of grave cut C.73 Skeleton 30, Skeleton 39 and Skeleton 40
75	Skeleton 31		Skeleton 31 in grave cut C.78 near pipe trench
76	Skeleton 32		Skeleton 32 east of Skeleton 31
77	Fill	Soil 29	Fill of grave cut C.78 containing Skeleton 31 and Skeleton 32
78	Cut		Cut of grave containing Skeleton 31 and Skeleton 32
79	Fill	Soil 30, 32, 35	Fill of grave cut C.82 containing Skeleton 33, Skeleton 34, Skeleton 37 and Skeleton 38
80	Skeleton 33		Skeleton 33 west of Skeleton 34
81	Skeleton 34		Skeleton 34 east of Skeleton 33
82	Cut		Cut of grave containing Skeleton 33, Skeleton 34, Skeleton 37 and Skeleton 38
83	Skeleton 35		Skeleton 35 under water pipe
84	Skeleton 36		Skeleton 36 east of Skeleton 35
85	Fill	Soil 33	Fill of grave cut C.86 containing Skeleton 35 and Skeleton 36
86	Cut		Cut of grave containing Skeleton 35 and Skeleton 36
87	Skeleton 37		Skeleton 37 legs of juvenile partly under Skeleton 34

Context	Context Type	Sample	Description
88	Skeleton 38		Skeleton 38 east of Skeleton 37, disturbed
89	VOID		
90	Skeleton 39		Skeleton 39
91	Skeleton 40		Skeleton 40 east of Skeleton 39, badly damaged
92	VOID		
93	Skeleton 41		Skeleton 41 within grave cut C.62
94	Skeleton 42		Skeleton 42
95	Fill	Soil 38, 39, 43	Fill of grave cut C.96, within boundary ditch, containing Skeleton 42 and Skeleton 47
96	Cut		Cut of grave, within boundary ditch, containing Skeleton 42 and Skeleton 47
97	Cut		Cut of boundary ditch at the western end of the cutting
98	Fill		Fill of boundary ditch at the western end of the cutting
99	Fill	Soil 40	Fill of grave cut C.102 containing Skeleton 43 and Skeleton 44
100	Skeleton 43		Skeleton 43 west of Skeleton 44 in grave C.102
101	Skeleton 44		Skeleton 44 east of Skeleton 43, in extended part of the site
102	Cut		Cut of grave containing Skeleton 43 and Skeleton 44
103	Structure		Workhouse boundary wall at western edge of the site
104	Fill		Fill of grave cut C.107 containing Skeleton 45 and Skeleton 46
105	Skeleton 45		Skeleton 45 west of Skeleton 46
106	Skeleton 46		Skeleton 46
107	Cut		Cut of grave containing Skeleton 45 and Skeleton 46
108	Skeleton 47		Skeleton 47 west of Skeleton 42
109	VOID		
110	VOID		
111	Deposit		Topsoil build up over ditch at the western end of the site, non archeological

Appendix 2 Photo Register

PHOTO REGISTER							
Site Name: <u>TOBARTALATH TUM</u>		CAMERA		Ministerial Directions Subnumber: <u>10E0117</u>			
Photo #	Context	Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
1	/	1832	E		Site during Mechanical Stripping	9.1.12	D.O'R
2	/	1834	W		Site after stripping	10.1.12	"
3	/	1836	E		" "	10.1.12	"
4		1837	SE		" "	10.1.12	"
5		1838	E		" "	10.1.12	"
6		1841	SE		" "	10.1.12	"
7		1842	N		Pre ex Grave cut Skels 1+2	11.1.12	"
8		1844	S		" " " " " " Skel #1 Skull Viable	11.1.12	"
9		1845	S		" " " " " " " " "	11.1.12	"
10		1848	E		Working shot Skels 1+2 during excavation	11.1.12	"
11		1851	N		Skels 1+2 exposed. (1 right, 2 left)	11.1.12	"
12		1852	N		" " " " " "	11.1.12	"
13		1853	N		" " " " " "	11.1.12	"
14		1855	S		" " " " " "	11.1.12	"
15		1856	E		" " " " " "	11.1.12	"
16		1857	W		" " " " " "	11.1.12	"
17		1859	SW		" " " " " "	11.1.12	"
18		1865	N		Pre ex Grave Cut Skels # 3+4	12.1.12	"
19		1866	N		" " " " " "	12.1.12	"
20		1867	N		Skels 3+4 exposed	12.1.12	"
21		1868	N		" " " " " "	12.1.12	"
22		1869	N		" " " " " "	12.1.12	"
23		1870	W		" " " " " "	12.1.12	"

PHOTO REGISTER							
Site Name: <u>TOBARTALATH TUM</u>		CAMERA		Ministerial Directions Subnumber: <u>10E0117</u>			
Photo #	Context	Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
24		1871	NW		Skels 3+4 exposed	12.1.12	D.O'R
25		1873	N		Post ex Skels 3+4 showing Cut C.15	12.1.12	"
26		1877	NW		Pre ex Skels 5,6,7 SW edge site	13.1.12	"
27		1881	W		Skels 5,6,7 exposed, Cut by pipe trench	13.1.12	"
28		1882	W		" " " " " "	13.1.12	"
29		1884	N		" " " " " "	13.1.12	"
30		1885	N		" " " " " "	13.1.12	"
31		1886	SE		Vertical shot detail Skel #5	13.1.12	"
32		1887	/		" " " " " "	13.1.12	"
33		1888	/		Vertical shot detail Skel #6	13.1.12	"
34		1889	/		" " " " " "	13.1.12	"
35		1890	/		Vertical shot detail Skel #7	13.1.12	"
36		1891	/		" " " " " "	13.1.12	"
37		1892	E		Detail Skel #7	13.1.12	"
38		1894	W		Post ex Grave Cuts Skels 5,6,7	13.1.12	"
39		1896	N		" " " " " "	13.1.12	"
40		1899	N		" " " " " "	13.1.12	"
41		1901	N		Pre ex of Skels 8+9	16.1.12	"
42		1902	N		Pre ex of Skels 10,11,12 (Skull of 11 Viable)	16.1.12	"
43		1904	/		Vertical shot pre ex Skels 14 +15 in trench edge	16.1.12	"
44		1905	/		" " " " " "	16.1.12	"
45		1906	W		Pre ex shot Skels 14 +15 in trench edge	16.1.12	"
46		1907	W		" " " " " "	16.1.12	"

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #	Context	CAMERA Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
47		1908	N		Skele 8+9 exposed	17.1.12	DOR
48		1909	N		" " "	17.1.12	"
49		1910	N		" " "	17.1.12	"
50		1911	N		Skele 10 (left) + 11 (right) exposed	17.1.12	"
51		1912	N		Skele 10 (left) + 11 (right) exposed	17.1.12	"
52		1913	/		Vertical shot detail Skel #10	17.1.12	"
53		1914	SE		Skel 10+11 exposed, skull of Skel 12 visible	17.1.12	"
54		1915	N		Pre ex Skel 12 after lifting of Skel 10+11	17.1.12	"
55		1916	N		" " " " " " "	18.1.12	"
56		1918	S		Skele 14+15 exposed showing grave cut in Section	18.1.12	"
57		1919	N		Pre ex Skel #13 NW edge of Site	18.1.12	"
58		1920	N		" " " " " " "	18.1.12	"
59		1922	/		Vertical shot detail Skel #13 exposed	18.1.12	"
60		1923	/		" " " " " " "	18.1.12	"
61		1924	NE		Skel 13 exposed	18.1.12	"
62		1925	N		Skel 13 exposed showing cut	18.1.12	"
63		1926	N		" " " " " " "	18.1.12	"
64		1927	S		Detail of skull (head?) bones underneath skull Skel 13	18.1.12	"
65		1929	/		" " " " " " "	18.1.12	"
66		1931	N		Post ex Skel 13 after lifting showing cut	18.1.12	"
67		1932	N		" " " " " " "	18.1.12	"
68		1933	N		" " " " " " "	18.1.12	"
69		1934	N		Skel #13 exposed.	18.1.12	"

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #	Context	CAMERA Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
70		1935	N		Skeleton #13 exposed	18.1.12	DOR
71		1936	S		" " "	18.1.12	DOR
72		1937	S		Skele 14+15 after lifting exposed bones	18.1.12	DOR
73		1938	S		" " " " " " "	18.1.12	DOR
74		1939	S		" " " " " " "	18.1.12	"
75		1940	W		Site, Morning of 19th Jan	19.1.12	DOR
76		1941	N		Pre-ex shot of Skele 18, 19, 21	19.1.12	DOR
77		1942	S		Pre-ex shot of Skele 16+17 Sedge of Site	19.1.12	DOR
78		1943	/		Vertical shot detail of Copper ring in situ beside Skel #17	19.1.12	DOR
79		1944	S		Skele 16+17 exposed, S. edge of Site	19.1.12	DOR
80		1945	E		Skele 16+17 exposed S. edge of Site	19.1.12	DOR
81		1946	N		Skele 18+19 exposed (Skel 20 not visible yet)	19.1.12	DOR
82		1947	N		Post ex after lifting Skele 18+19 (20 not visible yet)	19.1.12	DOR
83		1949	S		Post ex after Pre ex before exposing Skel #21	23.1.12	DOR
84		1950	E		Working shot excavating Skel #21	23.1.12	DOR
85		1951	E		Skel #21 exposed (Skele #16+17 lifted)	23.1.12	DOR
86		1952	/		Vertical shot, Detail of Skel #21	23.1.12	DOR
87		1953	N		Skel #20 exposed (Skele #18+19 lifted)	23.1.12	DOR
88		1954	N		" " " " " " "	23.1.12	DOR
89		1955	S		Pre ex Skele #22 + #23 (#13 lifted)	24.1.12	DOR
90		1956	N		" " " " " " "	24.1.12	DOR
91		1957	N		Pre ex Skele #24 + #25	24.1.12	DOR
92		1958	/		" " " " " " Vertical shot	24.1.12	DOR

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #	Context	CAMERA Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
93	1859	1959	/		Vertical Shot of Skel #26 + #24 Re ex	24.1.12	D.O.R
94		1960	N		Post ex of Grave Coat Skels #18 #19 #20	24.1.12	D.O.R
95		1961	/		Vertical Shot Skel #24 exposed (Sk #25 being excavated)	24.1.12	D.O.R
96		1962	/		" " " " " " " "	24.1.12	D.O.R
97		1963	N		Skels #22, #23 exposed NW Corner of Site	24.1.12	D.O.R
98		1964	/		Vertical Shot Skels #22 #23 exposed (#13 lifted)	24.1.12	D.O.R
99		1965	/		Detail of trauma to Skull of Skel #22 Internal View	25.1.12	D.O.R
100		1966	/		" " " " " " " "	25.1.12	D.O.R
101		1967	/		" " " " " " External View	25.1.12	D.O.R
102		1968	/		" " " " " " " "	25.1.12	D.O.R
103		1969	N		Skel #25 exposed	25.1.12	D.O.R
104		1970 1971	N		" " " "	25.1.12	D.O.R
105		1972	N		" " " "	25.1.12	D.O.R
106		1973	SE		Working Shot on site conditions during excavation Skel #25	25.1.12	D.O.R
107		1974	N		Re ex Skels #26, 27, 28 (the 2nd peg visible)	26.1.12	D.O.R
108		1975	N		" " " " " " " "	26.1.12	D.O.R
109		1976	N		Skel #29 exposed Vertical Shot	26.1.12	D.O.R
110		1977	/		" " " " " " " "	26.1.12	D.O.R
111		1978	/		" " " " " " " "	26.1.12	D.O.R
112		1979	N		Skels #26 + #29 exposed part of Skel #27 visible	26.1.12	D.O.R
113		1980	W		Working Shot Skels #29, 26, 27, 28 Visible	26.1.12	D.O.R
114		1981	W		" " " " " " " "	26.1.12	D.O.R
115		1983	W		" " " " " " " "	26.1.12	D.O.R

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #	Context	CAMERA Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
116		1984	N		Skels #26 + 28 exposed (2nd visible)	26.1.12	D.O.R
117		1985	S		" " " " " " " "	26.1.12	D.O.R
118		1986	E		" " " " " " " "	26.1.12	D.O.R
119		1987	N		Post ex after removal of Skel #29	26.1.12	D.O.R
120		1988	N		" " " " " " " "	26.1.12	D.O.R
121		1989	N		Skels #27, 28 exposed (#26 lifted)	27.1.12	D.O.R
122		1990	/		Vertical Shot detail Skel #27	27.1.12	D.O.R
123		1991	/		" " " " " " " "	27.1.12	D.O.R
124		1992	/		Vertical Shot detail Skel #28	27.1.12	D.O.R
125		1993	S		Skels #27, 28 exposed	27.1.12	D.O.R
126		1994	SW		Linear feature @ W edge of Site after Cleaning	27.1.12	D.O.R
127		1995	S		" " " " " " " "	27.1.12	D.O.R
128		1997	NW		" " " " " " " "	27.1.12	D.O.R
129		1998	S		Working Shot - lifting Skels #27, 28 + excavating #30	27.1.12	D.O.R
130		1999	S		" " " " " " " "	27.1.12	D.O.R
131		2000	/		Vertical Shot Skel #30 exposed	27.1.12	D.O.R
132		2001	S		Skels Skel #30 exposed	27.1.12	D.O.R
133		2002	W		Skel #30 exposed	27.1.12	D.O.R
134		2005	E		Pre ex Skels #31 + 32	30.1.12	D.O.R
135		2006	E		" " " " " " " "	"	"
136		2007	E		" " " " " " " "	"	"
137		2008	N		Pre ex Skels #33, 34, 37, 38	"	"
138		2009	N		" " " " " " " "	"	"

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #:	Context	CAMERA Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
139		2010	N		Pot ex Shels # 33, 34, 37, 38	30.1.12	D.O.R
140		2011	N		Pot ex Shels # 33, 34, 37, 38 + #31, 32 (lids)	"	"
141		2012	E		Shels # 31 + 32 Exposed.	"	"
142		2013	/		" " " " Vertical Shot	"	"
143		2015	/		" " " " " "	"	"
144		2016	/		" " " " " "	"	"
145		2017	E		Pot ex, after lifting Shels # 31 + 32	"	"
146		2018	E		" " " " " "	"	"
147		2019	/		" " " " " " Vertical	"	"
148		2021	N		Pot ex after lifting Shels # 26, 27, 28	31.1.12	"
149		2022	NW		" " " " " "	31.1.12	D.O.R
150		2023	N		Shels # 33 exposed, # 34 + 37 partly exposed	31.1.12	"
151		2024	N		" " " " " "	"	"
152		2025	NE		" " " " " "	"	"
153		2026	N		Pot ex Pot ex Shels # 39, #40. (Sk#30 lifted)	"	"
154		2028	S		Pot ex Shels # 35 + 36	"	"
155		2029	E		" " " " " "	"	"
156		2030	N		Shels # 33 + 34 exposed	"	"
157		2031	E		" " " " " "	"	"
158		2032	/		Detail Shel # 34 Vertical Shot	"	"
159		2033	N		Shels # 33 + 34 exposed	"	"
160		2034	/		Vertical Shot Pot ex Shels # 37 + 38 (Sk#30 lifted)	1.2.12	D.O.R
161		2035	/		" " " " " "	"	"

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #:	Context	CAMERA Photo #	CAMERA FACING Direction	Scale	Short description	Date	Initials
162		2036	S		Shels # 35 + 36 Exposed	1.2.12	D.O.R.
163		2037	X		Shels # 35 + 36 exposed Vertical Shot	1.2.12	"
164		2039	/		Detail Shel #35 Vertical	"	"
165		2040	/		Detail Shel #36 Vertical	"	"
166		2041	/		Pot ex Shel #41 Vertical	"	"
167		2042	N		" " " " " "	"	"
168		2043	S		Pot ex after lifting Shels # 35 + 36	"	"
169		2044	S		" " " " " "	"	"
170		2046	/		Vertical Shot Shels # 37 + 38 exposed	"	"
171		2047	N		Shels # 37 + 38 exposed.	"	"
172		2048	/		Vertical Shot Detail Shels #37+38	"	"
173		2049	/		" " " " " "	"	"
174		2050	/		Vertical Shot Sk #41 exposed	"	"
175		2052	/		" " " " " "	"	"
176		2053	/		Vertical Shot Sk #39 exposed	2.2.12	D.O.R
177		2054	/		" " " " " "	"	"
178		2056	/		" " " " " " (Sk #40 under tape)	"	"
179		2057	/		Sk # 39 exposed Vertical Shot	"	"
180		2058	NE		Pot ex after lifting Shels # 33, 34, 37, 38	"	"
181		2059	N		" " " " " "	"	"
182		2060	N		" " " " " "	"	"
183		2063	N		Pot ex after liftg Shel #41	"	"
184		2065	/		Shel # 40 exposed Vertical Shot	3.2.12	"

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #	Context	CAMERA PHOTO #	CAMERA FACING Direction	Scale	Short description	Date	Initials
185		2066	/		Vertical shot Sk # 40 exposed	3.2.2012	DOR
186		2067	SW		Skel # 40 exposed	"	"
187		2068	/		" " " Vertical shot	"	"
188		2075	NW		Pie ex skel # 42 (in ditch)	"	"
189		2076	"		" " " "	"	"
190		2079	NW		" " " "	"	"
191		2081	/		Post ex after lifting skels # 30, 39, 40	"	"
192		2082	/		" " " " " "	"	"
193		2085	/ S		Working shot on pie skel # 42 (in ditch)	6.2.12	"
194		2088	S		" " " " " "	6.2.12	"
195		2091	NW		" " Skel # 42 partly exposed	"	"
196		2092	N		Skel # 42 exposed	7.2.12	"
197		2093	/		" " "	"	"
198		2094	/		" " "	"	"
199		2095	NW		" " "	"	"
200		2096	W		" " "	"	"
201		2097	W		" " "	7.2.12	"
202		2098	NW		" " "	7.2.12	"
203		2101	/		Shot showing post against barbed skel # 42	7.2.12	"
204		2102	S		East end of site backfilled	7.2.12	"
205		2103	NW		Post ex after removal skel # 42	7.2.12	"
206		2104	N		" " " " "	"	"
207		2105	NW		" " " " "	"	"

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #	Context	CAMERA PHOTO #	CAMERA FACING Direction	Scale	Short description	Date	Initials
208		2106	N		Detail Rutish layer C03 Animal bone, Glass, Ceramic etc.	7.2.12	DOR
209		2107	N		" " " " " "	"	"
210		2108	N		Post ex, exposed half of ditch C97/98 excavated	"	"
211		2109	"		" " " " " "	"	"
212		2110	NW		" " " " " "	"	"
213		2111	N		View of Section of ditch C97/98 exposed half	"	"
214		2112	N		" " " " " "	"	"
215		2113	N		Pie ex Skels # 43 + 44 (After extending site to North)	8.2.12	"
216		2114	E		" " " " " "	"	"
217		2115	/		Vertical shot Skel # 33 (After extending site to North)	"	"
218		2116	/		" " " " " "	"	"
219		2117	E		Skel # 33 Skull exposed	"	"
220		2118	E		Working shot Skel # 33 exposed	"	"
221		2120	/		" " Skels # 43 + 44	"	"
222		2121	/		Post ex after removal Skel # 33	"	"
223		2122	/		Vertical shot foundation of Skel 37 (After extending site North)	9.2.12	"
224		2124	/		" " " " " "	9.2.12	"
225		2125	/		" " " " " "	"	"
226		2126			Skels # 43 + # 44 exposed	"	"
227		2127			" " " " " "	"	"
228		2128			" " " " " " Detail Skel # 43	9.2.12	"
229		2129			" " " " " "	"	"
230		2130			Detail Wood from Coffin around Skull of Skel # 43	"	"

PHOTO REGISTER							
Site Name:		Ministerial Directions Subnumber:					
PHOTO #	Context	CAMERA PHOTO #	CAMERA FACING Direction	Scale	Short description	Date	Initials
231		2131	/		Vertical Shot Post ex after lifting Sheds # 33 35/37	9.2.12	D.O.R.
232		2132	E		Working Shot excavating Sheds # 33 43+44	9.2.12	D.O.R.
233		2133	/		Sheds # 33 43+44 exposed Vertical Shot	10.2.12	"
234		2134	/		" " " " " "	"	"
235		2135	/		" " " " " "	"	"
236		2136	S		" " " " " "	"	"
237		2138	/		" " " Detail of #3 Vertical Shot	"	"
238		2139	N		" " " " " "	"	"
239		2140	N		Post ex Sheds # 33 43+44 after lifting	"	"
240		2141	N		" " " " " "	"	"
241		2151	N		C.103 Warehouse boundary wall west side before exposing	13.2.12	D.O.R.
242		2154	N		C.103 Warehouse boundary wall exposed	14.2.12	D.O.R.
243		2156	N		" " " " " "	14.2.12	"
244		2157	NW		C.103 wall and unexcavated half (west) of boundary ditch C.97	"	"
245		2158	N		" " " " " " Sk. 45 legible	14.2.12	"
246		2160	N		" " " " " " " "	"	"
247		2161	W		" " " " " " " "	"	"
248		2162	SW		" " " " " " " "	"	"
249		2163	SW		" " " " " " " "	14.2.12	"
250		2164	S		" " " " " " " "	14.2.12	"
251		2168	NE		Sheds # 43 45+46 exposed in boundary ditch	15.2.12	"
252		2169	NW		" " " " " " " "	15.2.12	"
253		2170	/		" " " " " Vertical Shot	15.2.12	"

[illegible]

Appendix 3 Osteoarchaeological Report

By Linda G. Lynch

Abstract

This report details the osteoarchaeological analysis of 48 human skeletons excavated at Tobar Jarlath, Tuam, Co. Galway by Eachtra Archaeological Projects (licence number TBC). The burials were originally located within the bounds of Tuam Poor Law Union workhouse, opened to admissions in 1846. It appears that the current burials date to the period of the Great Famine, 1845-52. Eighteen grave pits were identified, with each containing between two and four coffined burials. The individuals buried here were paupers, forced through circumstances to seek indoor welfare relief from the workhouse. Their skeletal remains preserved substantial evidence of life outside of the workhouse and the difficult circumstances endured from early childhood. Females and males were subject to different experiences. The skeletons also reveal that these individuals had built up a certain level of immunity to the circumstances dealt to them in life, with the ability to survive at least some of the physical insults afforded to them. The excavation itself was limited due to the nature of the works involved but indicates the high potential in the study of such sites.

Osteological Terms Used

A number of basic terms are used frequently in osteo-archaeology and these are outlined below. The definitions are taken from White and Folkens (1991, 28-35) and Bass (1995, 319-321).

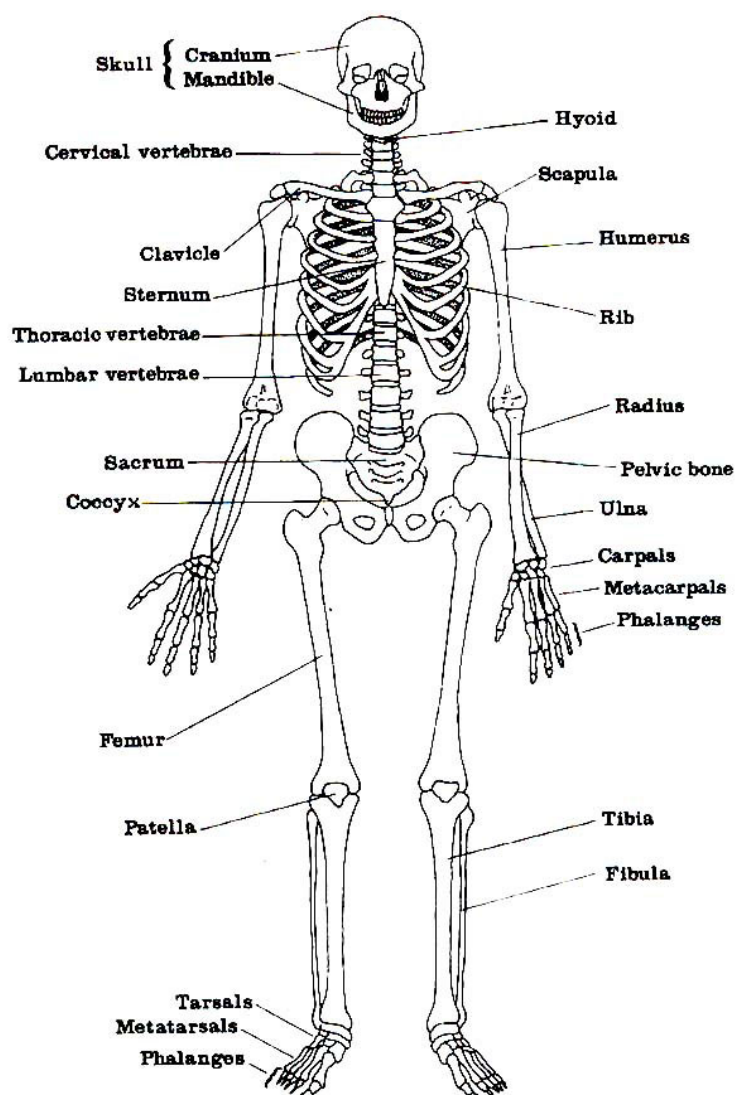


Figure 1. Annotated diagram showing main skeletal elements (after Mays 1998, 2, fig. 1.1)

Directions - General

Superior	toward the head of the body.
Inferior	opposite of superior, body parts away from the head.
Anterior	toward the front of the body.
Posterior	opposite of anterior, toward the back of the individual.
Medial	toward the midline of the body.
Lateral	opposite of medial, away from the midline of the body.
Proximal	nearest the axial skeleton, usually used for long bones.
Distal	opposite of proximal, furthest from the axial skeleton.
Palmar	relating to the hand, the palm side
Plantar	relating to the foot, towards the sole of the foot
Dorsal	relating to the hand/foot, back of the hand, top side of the foot
External	outer.
Internal	opposite of external, inside.
Endocranial	inner surface of the cranial vault.
Ectocranial	outer surface of the cranial vault.

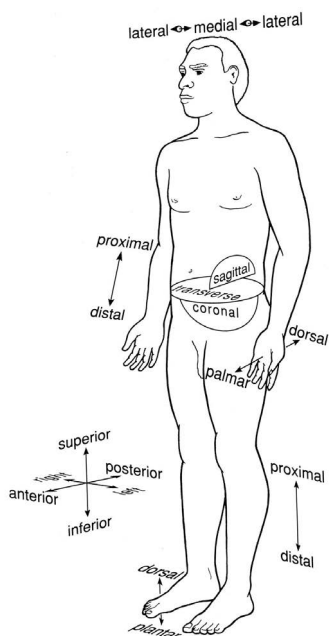


Figure 2. Anatomical directions

(from White & Folkens 1991, 29, Fig. 3.1)

Direction - Teeth

Mesial	toward the point on the midline where the central incisors meet.
Distal	opposite of mesial.
Lingual -	toward the tongue.
Labial	opposite of lingual, toward the lips.
Buccal	opposite of lingual, toward the cheeks.
Incisal	the biting surface of the tooth.
Occlusal	the chewing surface of the tooth.

General bone features/terms

Process	a bony eminence.
Eminence	a bony projection, usually not as prominent as a process.
Spine	generally a long, thinner, sharper process than an eminence.
Tuberosity	a large, usually roughened eminence of variable shape, often the site of a ligament attachment.
Tubercle	a small, usually roughened eminence, often a site of a ligament attachment.
Trochanters	two large, prominent, blunt, rugose processes found on the distal femur.
Malleolus	a rounded protuberance adjacent to the ankle joint.
Boss	a smooth round broad eminence.
Articulation	an area in which adjacent bones are in contact at a joint.
Condyle	a rounded articular process.
Epicondyle	a non-articular projection adjacent to a condyle.
Head	a large, rounded, usually articular end of a bone.

Shaft/ diaphysis	the long, straight section between the ends of a long bone.
Epiphysis	usually the end portion or extremity of a long bone which is expanded for articulation.
Neck	the section of a bone between the head and the shaft.
Torus -	a bony thickening.
Ridge	a linear bony elevation, often roughened.
Crest	a prominent, usually sharp and thin ridge of bone.
Line	a raised linear surface, not as thick as a torus or as sharp as a crest.
Facet	a small articular surface, or tooth contact.
Metaphysis	a line of junction between epiphysis and diaphysis.
Osteoblastic	process of bone formation
Osteoclastic	process of bone resorption

Other osteological terms/abbreviations

C1-C7	cervical vertebrae (neck) numbered from 1-7.
CEJ	cemento-enamel junction, junction of crown of tooth and root.
DJD	degenerative joint disease.
T1-T12	thoracic vertebrae (torso) numbered 1-12.
TMJ	tempromandibular joint, joint of lower jaw.
L1-L5	lumbar vertebrae (lower back) numbered 1-5.
S1-S5	sacral vertebrae (in between left and right pelvis) numbered 1-5.
MC-	metacarpal (bones of the palm of the hand).
MT	metatarsal (bones of the arch of the foot).
IAM	Internal Auditory Meatus in temporal bone of cranium.
EAM	External Auditory Meatus in temporal bone of cranium.
MN	Minimum Number of Individuals.
CPR	Crude Prevalence Rate.
TPR	True Prevalence Rate.
SN/s	Schmorl's nodes, depression defects in the vertebral bodies, associated with herniation of intervertebral disk.

1. Introduction

1.1 Background to Project

The *in situ* skeletal remains of 48 individuals were recently excavated by Eachtra Archaeological Projects from Tobar Jarlath in Tuam, Co. Galway (licence number TBC). The cemetery was initially uncovered during works associated with the Tuam Town Water Supply Scheme by Coffey Group, between the Athenry Road and the Dublin Road Housing Estate. Following consultation between the Department of Arts, Heritage and the Gaeltacht and Eachtra Archaeological Projects, a mitigation strategy was agreed with Coffey Group and Galway County Council, which entailed the complete excavation of an area measuring 5x6m, with all human remains within that trench to be fully excavated. A total of 48 individuals were recovered, who had been buried in a series of 18 mass pits, all apparently in individual coffins (J. Kiely, pers. comm.; see **Figure 3**).

The evidence to date has indicated that the burials were recovered from an area that would have been located within the grounds of Tuam Poor Law Union Workhouse, which was demolished in 1969 (*ibid.*). The workhouse was established under the Poor Law Union of 1838, and Tuam Poor Law Union was formally established in 1839. The workhouse was built in 1840/41, but, as a result in difficulties collecting the Poor Law rates in the Union, it did not take admissions until 1846 (www.workhouse.org.uk/Tuam/). It was built to a standard plan, and had a capacity of 800 inmates (*ibid.*; O'Connor 1995, 263). By May of 1847 sheds to house up to 50 individuals suffering from fever were under construction (O'Connor 1995, 256). Research by Eachtra Archaeological Projects has indicated that the current burials, which would have been located within the boundary walls of the workhouse, are likely to date to the very early years of the workhouse. By 1848, following complaints about the practice of burying the dead within the bounds of the workhouse (with those burials probably being the burials recently uncovered), tenders were sought for burial grounds located outside of the workhouse (J. Kiely, pers. comm.). Thus the present burials appear to date to the devastating years of the Great Famine 1845-1852.

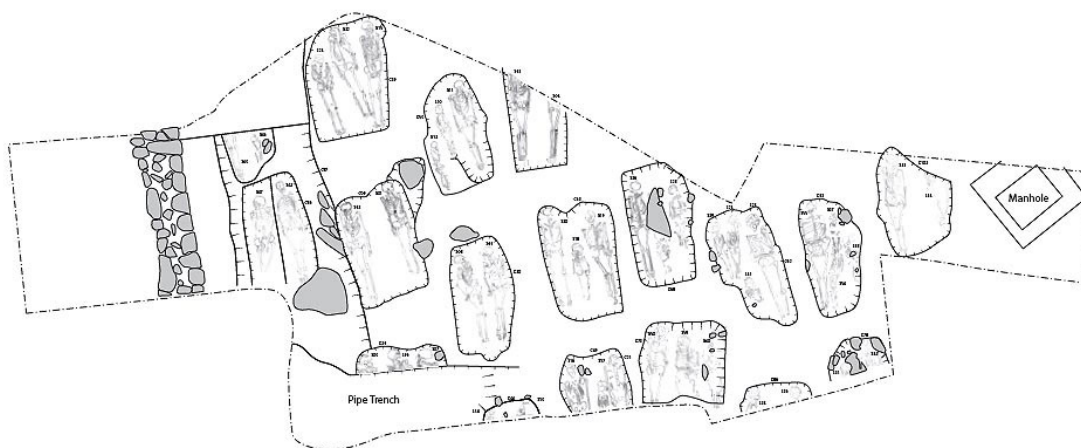


Figure 3. Plan of *in situ* skeletal remains (copy supplied by client)

1.2 Scope of Study

This report details the osteoarchaeological analysis of the 48 excavated skeletons. There is a brief outline of the materials (that is, the bones) that were examined (**Section 1.3**). The methodology utilised in the study is presented in **Section 1.4**. The results of the osteological analysis are presented in **Section 2**. A summary of the analysis and a discussion of the osteoarchaeological results are provided in **Section 3**, while the conclusions of the present study are provided in **Section 4**. The skeletal remains of are catalogued in **Section 6.1**, while the metrical information is provided in **Section 6.2**.

1.3 Materials

Forty-seven skeleton numbers (SK1-SK47) were allocated during the excavation. An additional number (SK48) was allocated during post-excavation, when it became apparent that an infant had been interred with the highly truncated remains of SK40.

The skeletal remains were processed in post-excavation by the excavation team following the established standards (see Buckley *et al* 1999). There was been little post-burial disturbance of the burials, with perhaps the exception of SK40 in particular which had suffered significant disturbance and truncation. Some of skeletons were incomplete, particularly those at the southern limit of the excavated area. This is as portions of many of the skeletons in that area lay beyond the limit of the excavation. The general level of preservation was excellent, with minimal erosion and/or fragmentation of the bones. A catalogue of the *in situ* skeleton is provided in **Section 6.1** (standardised for all articulated assemblages examined by the writer), with a summary of the age-at-death, sex, and stature of each individual at the end (**Section 6.1.1**), along with the metrics (**Section 6.2**). Eachtra Archaeological Projects furnished the writer with all relevant excavation records prior to the onset of the project.

1.4 Methods

The analysis of human skeletal remains from archaeological contexts can provide information on demography, health, diet, disease, trauma, and possible genetic variations and relations, as well as data on sociological and cultural trends. Standardised methods of assessing the osteological aspects of various skeletal populations allow for comparisons and contrasts to be made across both space and time. When the osteological information is broadened using a bioarchaeological approach the results of osteoarchaeological analysis can yield detailed and invaluable information. The keys to this approach are firstly the use of standardised methods of analysis, and secondly the size and preservation of the skeletal population in question. The assessment of age-at-death, sex, stature, and dental remains are the primary methods that have been standardised. These methods have generally been formulated using data from known populations.

The ages-at-death of the adult individuals from Tobar Jarlath were determined on the basis of the morphology of both the auricular surface of the ilium (Lovejoy *et al* 1985), and the pubic symphysis (Brooks and Suchey 1990). The method of assessing the

rates of dental attrition to determine age-at-death of the adults (Brothwell 1981, 71-2) were not utilised in this study. Dental attrition may be affected by a wide variety of factors, such as individual mastication or chewing traits, dietary preferences, and access to foodstuffs. Rates of fusion of secondary epiphyses were also considered in relation to any younger adults (Scheuer and Black 2000). Archaeological adult skeletons cannot be aged very accurately and are assigned into broad age categories. These are ‘young adult’ (18-24 years), ‘middle adult’ (25-44 years), and ‘old adult’ (45+ years). The middle category is further divided into ‘young middle adult’ (25-34 years) and ‘old middle adult’ (35-44 years). The method used for each individual is provided in the catalogue in **Section 6.1**.

The sex of the adults was determined on the basis of morphological traits in the pelvis and skull (Buiskstra and Ubelaker 1994), and on metrical analysis (Bass 1995). The basis of the differences between the female and male skeletons lies in the basic principle that females tend to be slender and small, with marked particular traits in the pelvis for the birthing process. Males tend to be larger and more robust. The methods used in the determination of the sex of each adult are provided in the catalogue in **Section 6.1**.

The statures of the adults were estimated using the equations of Trotter (1970).

The methods used in the determination of the age-at-death of juvenile individuals are more accurate and specific, and are assessed on the basis of the known rates of growth and development of parts of the skeleton. The most reliable method is to assess the calcification and eruption of teeth (Moorrees *et al* 1963a, 1963b; Smith 1991). The lengths of the long bones may also be used to determine the age-at-death (Maresh 1970; Scheuer and Black 2000). However, long bone growth is highly influenced by nutritional factors and dental remains are considered to be the more reliable indicators of age-at-death. The juveniles are also grouped together under the broader age ranges of ‘infant’ (<1 year), ‘juvenile1’ (1-6 years), ‘juvenile2’ (7-12 years), and ‘adolescent’ (13-17 years). The methods utilised to determine the age-at-death of each individual is provided in **Section 6.1**. It is not possible to accurately determine the sex of juvenile individuals as the sex-specific morphological bone manifestations do not develop clearly until the onset of puberty.

Permanent teeth were recorded using the following chart:

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

right

left

The upper row represents the maxilla and the lower row represents the mandible. These are further sub-divided into left and right quadrants. Each permanent tooth (1-8) is prefixed by the number of the quadrant it belongs to (1-4).

D deciduous teeth were recorded using the chart below:

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

right

left

Again, the upper row represents the maxilla while the lower row represents the mandible, and is subdivided into left and right quadrants. Each deciduous tooth (1-5) is prefixed by the number of the quadrant it belongs to (5-8). In some instances, a combination of the two charts was used.

The following symbols can be used to record the teeth:

P - <i>tooth present</i>	B - <i>tooth broken post-mortem</i>
E - <i>tooth erupting</i>	PM - <i>tooth lost post-mortem</i>
U - <i>tooth unerupted</i>	AM - <i>tooth lost ante-mortem</i>
CA - <i>tooth congenitally absent</i>	R - <i>root only</i>
⌘ - <i>socket absent</i>	

All incidences of dental diseases such as calculus, caries, abscesses, enamel hypoplastic defects, as well as any other anomalies, were also recorded (**Section 2.3**).

Finally, a number of pathological conditions were observed on the bones and these are detailed in **Section 2.4**.

A catalogue of all the skeletons is provided in **Section 6.1**, with a basic summary of the age-at-death, sex, stature, and dental and skeletal pathological lesions provided at the beginning. The main catalogue details the age-at-death, sex, and stature (including the methods of determination) of each individual. It also summarises the level of preservation, the *in situ* position, attitude, and orientation of the burial, whether there were any other skeletons directly associated and whether there were any finds. However, primarily the catalogue provides details on the bones and teeth present, and the pathological lesions that may have been observed on both. Any anomalies are noted and any additional comments are also included.

Metrical information relating to the skeletons is provided in **Section 6.2**.

In all tables '*n*' refers to the number of either individuals or skeletal elements presenting with a particular pathological lesion, while '*N*' refers to the total number of individuals or skeletal elements observable. 'CPR' (Crude Prevalence Rate) refers to the total number of individuals presenting with a pathological process per total number of observable individuals. 'TPR' (True Prevalence Rate) refers to the total number of skeletal elements affected per total number of skeletal elements observable.

All of the raw osteological data on the human skeletons recovered from Tobar Jarlath, Tuam, Co. Galway is housed with the writer. The skeletal remains will presently be returned to the client for storage, and the curation of these individuals will be determined by the National Museum of Ireland.

2. Analysis

2.1 Demographic Profile

A total of 48 burials were recovered from Tobar Jarlath. There were 22 juveniles (<18 years) and 26 adults (18+ years), representing 45.8% and 54.2% of the population respectively. The spread of the adult and juvenile age groups (**Section 1.4**) are shown in **Table 1** and **Table 2**.

Table 1. Distribution of adult ages-at-death

AGE	No. of individuals	% of total (adults whose age could be determined)
Young Adult (18-24 years)	2	11.8
Young Middle Adult (25-34 years)	1	5.9
Old Middle Adult (35-44 years)	8	47.1
Old Adult (45+ years)	6	35.3
Adults (age undetermined)	9	
Total	26	100.1

Table 2. Distribution of juvenile ages-at-death

AGE	No. of individuals	% of total
Infant (<1 year)	2	9.1
Juvenile1 (1-6 years)	13	59.1
Juvenile2 (7-12 years)	4	18.2
Adolescent (13-17 years)	3	13.6
Total	22	99.9

It was possible to determine the sex of all 26 adults. There were 11 females (42.3%) and 15 males (57.7%). A similar pattern of age-at-death was apparent in both sexes (see **Table 3**).

Table 3. Distribution of main age-at-death groups in female and male adults

AGE	Females	Males
Young Adult (18-24 years)	1	1
Young Middle Adult (25-34 years)	-	1
Old Middle Adult (35-44 years)	4	4
Old Adult (45+ years)	3	3
Adults (age undetermined)	3	6
Total	11	15

2.2 Stature

It was possible to determine the stature of 19 of the 26 adults (10 females and nine males). The female statures ranged from 146.3cm to 161.9cm, with an average of 155.3cm. The male statures ranged from 158.7cm to 183.9cm, with an average of 170.2cm. The statures are compared with a number of contemporary populations in **Table 4**.

Table 4. Comparison of statures of various populations with the Tobar Jarlath adults

Site (reference)	Period	Female (cm)	Male (cm)
Tobar Jarlath	19 th /20 th century	155.3	170.2
John's Lane, Waterford (Lynch 2006)	17 th -18 th century	161.8	172.9
St. John the Baptist, Sligo Town (Lynch 2001)	Late 18 th - Early 20 th century	162.3	172.3
Shandon Court Hotel, Cork City (Lynch 2004)	19 th century	157.7	170.6
Our Lady's Hospital, Manorhamilton, Co. Leitrim (Lynch 2002)	19 th /20 th century	159.0	167.4
St Patrick's Hospital, Cashel, Co. Tipperary (Lynch 2008)	19 th /20 th century	154.9	166.7

The last two sets of statures, from Manorhamilton and from Cashel, are both workhouse population samples. The females from Tobar Jarlath were similar in height to their contemporaries in Cashel workhouse, but smaller than the females in Manorhamilton workhouse. In contrast, the male individuals from Tobar Jarlath were taller than the males in both Manorhamilton and Cashel workhouses. In fact, they were comparable with a mixed urban population from Cork city. However, both the females and the males were shorter than their wealthier contemporaries in Quaker population from Waterford and a Church of Ireland group from Sligo.

2.3 Dental Analysis

Dental remains were recovered from 22 of the 26 adult burials (84.6%). The exceptions were SK4 (old middle adult female), SK45 (adult female), SK3 (young adult male), and SK40 (adult male). The lack of dentitions in four of the burials was primarily due limitations of the excavation, as the remainders of the skeletons lay outside the designated excavation area. As mentioned earlier (**Section 1.3**), preservation on the site was excellent. The 22 individual adults with teeth represent a total potential of 704 permanent teeth (32 teeth/adult individual). At least 53 teeth were lost post-mortem, 105 teeth were lost ante-mortem, and six teeth were congenitally absent. Dental remains were recovered from 9/11 (81.8%) female adults and 13/15 (86.7%) male adults. The distribution of the dental remains as recovered per age-at-death and sex group is presented in **Table 5**. The number of observable individuals is too low to assess the progress of any dental conditions relating to advancing age. However, female and male comparisons were made where possible. Every adult that had dental remains had some form of dental disease.

Table 5. Dental remains as recovered per adult age-at-death group and sex

Age-at-death	Female	Male
Young Adult	-	1
Young Middle Adult	-	1
Old Middle Adult	4	3
Old Adult	3	3
Adult (age undetermined)	2	5

Dental remains were recovered from 19/22 or 86.4% juvenile individuals. No dental remains were recovered from burials SK46 (juvenile1), SK44 (juvenile2), and SK48 (infant). This was again due to the fact that some of the bones of these individuals lay outside the designated area of excavation. All of the juveniles aged between 1-6 years at the age of death had combinations of deciduous and permanent teeth. The infant (SK41) only had deciduous teeth, while the juveniles aged between 7-12 years and 13-16 years had only permanent teeth. Most individuals had a combination of erupted and unerupted teeth. In total there were 205 erupted and 10 unerupted deciduous teeth, and 188 erupted and 96 unerupted permanent teeth. The latter in particular only includes teeth that were immediately visible, either through partial eruption or post-mortem breaks, and does not include teeth that were still developing deep in the alveolar bone. Calculus and/or carious lesions were present in 94.7% (18/19) of observable juvenile dentitions and these are detailed below. The exception was SK41, the infant. It would be unusual for an individual of this age to display any evidence of dental disease. The age group divisions of juvenile with dentitions are provided in Table 6.

Table 6. Dental lesions per number recovered, juvenile individuals

Age group	<i>n / N</i>	% affected
Infant	0/1	0
Juvenile1	12/12	100
Juvenile2	3/3	100
Adolescent	3/3	100

2.3.1 Tooth loss

The preserved alveolar bones were examined to assess the prevalence of post-mortem (after death loss, typically due to post-depositional taphonomic factors) and ante-mortem (during life) tooth loss, as well as to record teeth that were congenitally absent. When teeth are lost post-mortem the socket will still be present and open. In contrast, when a tooth is lost ante-mortem the socket of the tooth will begin to heal. It may close over completely if the tooth is lost a significant time prior to death. Congenitally absent teeth are frequently the third molars or ‘wisdom teeth’, and are generally apparent due to the absence of the tooth and the lack of space for same.

A total of 469 permanent erupted teeth were recovered from the adults. In addition, there were three unerupted permanent teeth. These were identified in SK5 (adult male), SK6 (young adult male), and in SK22 (old middle adult male). There were 597 observable sockets. Most individuals had lost teeth post-mortem: 16/22 (CPR 72.7%). This is typical of archaeological skeletons, given the wide variety of taphonomic factors that may affect a sample. In total 53 teeth were lost post-mortem, which represents TPR 8.9% of observable sockets. Six teeth were congenitally absent, representing TPR 1.0% of observable sockets or 5/22 (CPR 22.7%) of observable individuals. In all five individuals it was the third molar that was congenitally absent, either in the maxilla or mandible.

Ante-mortem tooth loss was common in the adult individuals. In total, 13/22 individuals or CPR 59.1% of individuals had lost teeth ante-mortem (**Plate 1**). This represents 105/597 of observable sockets or TPR 17.6%. The numbers of teeth lost ante-mortem range from one tooth (SK22 adult female) to 18 teeth (SK26 old adult female). Females had an ante-mortem tooth loss TPR 24.9% (62/249) compared with male TPR 12.4% (43/348).

Many of the juveniles had also lost teeth post-mortem, but there was no evidence of ante-mortem tooth loss or congenital absence of teeth. The latter in particular would be difficult to assess in juvenile remains given the immature nature of the teeth.



Plate 1. Unusual anterior ante-mortem tooth loss, SK47 (old middle adult male)

2.3.2 Calculus

Calculus (**Plate 2**), or calcified plaque, is often the most prevalent dental condition on archaeological teeth. The deposits can be generally removed through good dental hygiene using for example a small brush or stick, but the deposits may also be inadvertently removed through the consumption of grittier foods. Calculus deposits in a population may suggest both poor oral hygiene and the possible consumption of quite a soft and sucrose-based diet (Roberts and Manchester 1995, 55).

The aetiology is multi-causal but its formation is aided by alkaline in the mouth and a high protein diet (Lieverse 1999).

Calculus deposits were present in 22/22 adult (CPR 100%), a prevalence which is not unusual in archaeological samples. In total 425/469 of the teeth were affected TPR 90.6%. These high prevalence rates are likely to be reflective both of a high protein diet and poor oral hygiene. The deposits varied from slight to considerable in severity. Calculus deposits were present on 143/165 female teeth and 282/304 male teeth, representing TPR 86.7% and 92.8% of teeth respectively.

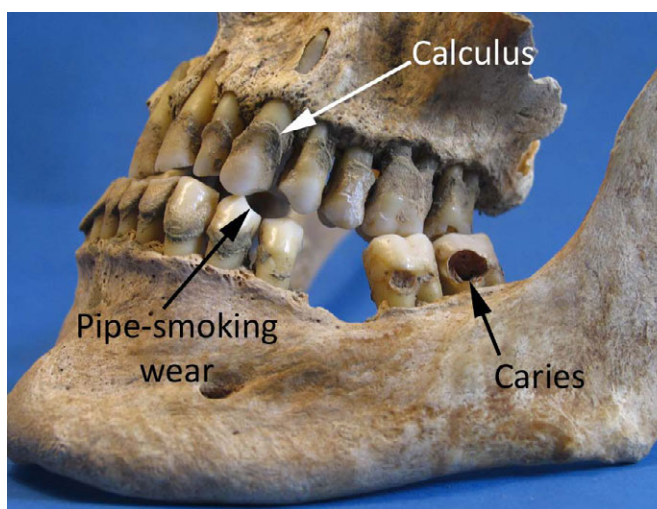


Plate 2. Calculus, caries, and evidence of pipe-smoking, SK14 (adult male)

Calculus was identified in CPR 84.2% (16/19) of observable juveniles. The exceptions were an infant (SK41), and two young juveniles (SK10 and SK27). It is likely that the young ages of these individuals was a major factor in the lack of calculus. The deposits ranged from slight to moderate in severity in those affected. Again, the youth of the juveniles is probably the main factor in the lack of severe deposits of calculus. Deposits were present on both deciduous and permanent teeth, depending on the age-at-death of the individual.

2.3.3 Carious lesions

Carious lesions (**Plate 2**), or cavities in the enamel of the teeth, were recorded in the dentitions of a number of individuals from Tobar Jarlath. Bacteria contained in plaque can metabolise certain carbohydrates into an acidic waste that can dissolve the enamel of the teeth resulting in cavities (Mays 1998, 148). Sugars are known to be cariogenic (Hillson 1986, 293; Woodward and Walker 1994). There is also evidence that refined carbohydrates are a contributory factor (Hillson 1986, 293). The frequency of dental caries has increased over time, particularly with the increased consumption of refined foods from the post-medieval period onwards.

A total of 19/22 (CPR 86.4%) of observable adults had carious lesions. The cavities were present in TPR 24.3% of teeth (114/469). The lesions varied in severity from tiny cavities to large erosions of the entire crown of a tooth. The number of teeth affected per individual varied from one tooth (SK2 young middle adult male; SK33 old middle adult male) to 16 teeth (SK42 old middle adult female; SK16 old adult male). The prevalence of females with cavities was CPR 77.8% (7/9), while CPR 92.3% of males (12/13) had the lesions. This represents TPR 23% (38/165) of female teeth and TPR 25% (76/304) male teeth. Eight individuals (two females and four males) with caries also had dental abscesses (8/19 or CPR 42.1%). Caries is recognised as one of the primary causes of dental abscesses (see **Section 2.3.4**).

Carious lesions were relatively common in juvenile individuals (**Plate 3**), with CPR 57.9% (11/19) individuals displaying the lesions. Seven of these were young juveniles. Five of those were between 1 year and 4 years at the time of death, and two of those were between the ages of 1 and 2 years. Both the high prevalence and the young age profile of the carious lesions in the juveniles were unexpected.



Plate 3. Carious lesions in SK18 (2.5-3 years)

2.3.4 Abscesses



Plate 4. Large dental abscess, SK15 (adult male)

Dental abscesses occur as a result of the exposure of the pulp cavity of the tooth through attrition, caries, or trauma, and the subsequent infection of the cavity by bacteria (**Plate 4**). The pus resulting from the infection extrudes from the area of the tooth root out through the alveolar bone. The abscess can occur externally on maxilla or mandible, or it may drain inwards particularly into the maxillary sinuses, and can cause a variety of other physiological problems. Carious lesions are

particularly linked with the development of caries in modern populations, rather than attrition, due to the change in diet in recent centuries.

Dental abscesses were present in the dental remains of eight adults. This represents CPR 36.4% (8/22) of observable individuals. All eight of these individuals also had carious lesions and it is likely that most, if not all, of the abscesses were directly associated with the cavities in the teeth. The prevalence of the abscesses varied from one (SK43 old middle adult female, SK5 adult male; SK25 old adult male; and SK30 old middle adult male) to three abscesses (SK15 adult male and SK16 old adult male).

No juveniles presented with dental abscesses.

2.3.5 Periodontal disease

Periodontitis occurs when the gums become inflamed (gingivitis) and may transfer to the underlying alveolar bone (periodontitis) (Roberts and Manchester 1995, 56). The bone may resorb significantly and can ultimately lead to tooth loss. Deposits of calculus in particular can aggravate the problem.

Periodontal disease was common in the adult individuals from Tobar Jarlath and is likely to be related to the high prevalence rates of both calculus and caries noted above. It was identified in 21/22 or CPR 95.5% of adults. The exception was SK2 (young middle adult male). The rate of resorption of the bone ranged from slight to severe, with severe resorption being identified in 16 individuals (eight females and eight males).

No juveniles had periodontal disease.

2.3.6 Enamel hypoplastic defects



Plate 5. Enamel hypoplastic defects, SK31 (10-13 years)

Enamel hypoplastic defects manifest as a depressed line or series of line or pits on the surface of the enamel (**Plate 5**). They occur as a result of a disturbance to the growth of the organic matrix, which is later mineralised to form enamel. The disturbance to the growth is thus reflected in the enamel (Mays 1998, 156; Hillson 1986). The defects can occur as a result of a number of diseases and/or nutritional deficiencies including diarrhoea, parasitic infestations of the gut, scurvy, rickets, allergic reactions, and general malnutrition (Mays 1998, 158). Once the enamel is

formed the defects are preserved in the enamel. Teeth calcify in childhood and therefore, enamel hypoplastic defects are a reflection of stresses suffered by an individual in youth. By measuring the location of a lesion on a particular tooth it is possible to determine approximately the age at which the stress occurred, as teeth form at a known rate.

Hypoplastic defects were present in the teeth of three male adults (3/13 or CPR 23.1%). None were present in the female adults. Two teeth were affected in SK16 (old adult male), four teeth in SK7 (adult male), and eight teeth in SK21 (adult male). The first two individuals suffered physiological stress between the ages of 3-5 years, while the last individual suffered a physiological assault between about 1 year and 3.5 years.

Hypoplastic defects were present in the teeth of two juvenile individuals (CPR 10.5%, 2/19). SK2 (juvenile1) had defects on two teeth indicating stress at about 6 months of age, while SK31 (juvenile2) had defects on 10 teeth indicating stress between 6 months and 1 year.

2.3.7 Dental Anomalies

Concave lesions were observed on the teeth of 7 adult individuals. These lesions are indicative of habitual clay-pipe smoking (**Plate 2**). All were male adults, representing CPR 31.8% (7/22) observable adults and CPR 53.8% (7/13) observable males. Three males had bilateral lesions (SK7 adult male; SK14 adult male; and 25 old adult male), two had lesions on the left (SK25 adult male; SK47 old adult male), while the other two males had the lesions on the right side of the mouth (SK20 old adult male; SK30 old adult male).

2.4 Pathological Conditions

Numerous pathological lesions were identified in the skeletal remains recovered from Tobar Jarlath.

2.4.1 Joint Disease

Degenerative joint disease (DJD) is one of the most common pathological conditions in archaeological populations. The onset of the disease tends to be age related, as it appears to primarily occur as a result of repeated ‘wear and tear’ on the joints through degeneration of the articular cartilage (Ortner and Putschar 1981, 419-20). The disease can be accelerated by occupational activities and may also be brought on by trauma. The evidence of joint degeneration in skeletal remains is manifested in the form of porosity or pitting of the joint surface and/or additional bone growths or osteophytes. In more advanced cases, eburnation or polishing of the bone can occur as the bones of the joint rub off each other. The presence of eburnation is pathognomonic of osteoarthritis (Rodgers and Waldron 1995).

Degenerative joint disease was identified in the joints of CPR 88.5% (23/26) of the adults from Tobar Jarlath. It was on CPR 90.9% (10/11) of female adults and CPR 86.7% (13/15) of male adults. The exceptions were SK40 (adult female), SK7 (adult male), and SK6 (young adult male). Each joint from each skeleton was individually recorded and the prevalence of joint disease per joint is presented below in **Table 7**, along with the true prevalence rates for both females and males. The data on the female and male prevalence rates per joint are depicted in **Figure 4**.

Table 7. TPR of DJD in adult joints (23 adults in total), by sex

Joint	Female <i>n</i> / <i>N</i>	Female <i>n</i> / <i>N</i>	Total female <i>n</i> / <i>N</i> (%)	Male <i>n</i> / <i>N</i>	Male <i>n</i> / <i>N</i>	Total male <i>n</i> / <i>N</i> (%)
	left	right		left	right	
TMJ*	0/7	0/9	0/16 (0)	2/11	3/11	5/22 (22.7)
Sternoc.+	1/4	1/5	2/9 (22.2)	1/5	1/7	2/12 (16.7)
Shoulder	7/10	5/10	12/20 (60)	5/12	6/13	11/25 (44)
Elbow	5/10	4/10	9/20 (45)	3/8	2/8	5/16 (31.3)
Wrist	3/11	4/11	7/22 (31.8)	1/9	3/9	4/18 (22.2)
Hand	1/11	1/11	2/22 (9.1)	1/8	0/8	1/16 (6.3)
Spine	10/11 (side na)		10/11 (90.9)	10/14 (side na)		10/14 (71.4)
Hip	3/10	3/10	6/20 (30)	4/9	5/9	9/18 (50)
Knee	5/9	6/11	11/20 (55)	3/8	4/8	7/16 (43.8)
Ankle	1/9	1/9	2/18 (11.1)	1/6	0/6	1/12 (8.3)
Feet	2/9	3/8	5/17 (29.4)	1/6	1/5	2/11 (18.2)

* tempromandibular joint, + sternoclavicular joint

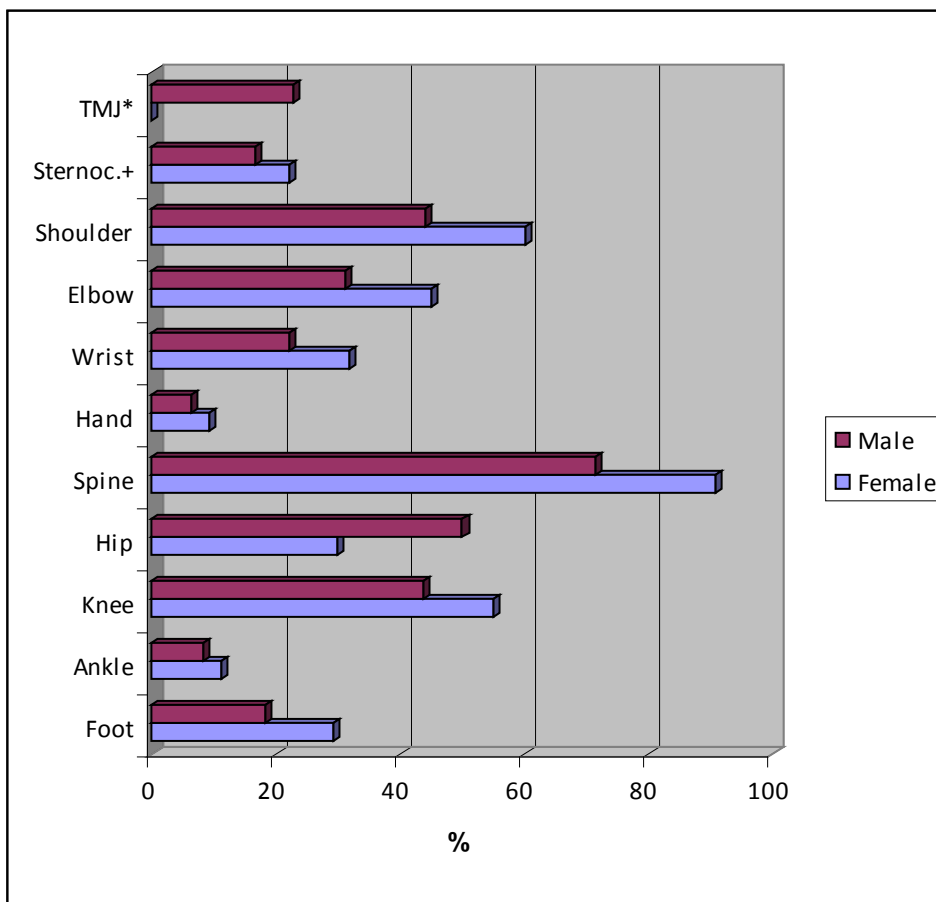


Figure 4. TPR of joint disease in adults, by sex

* tempromandibular joint, + sternoclavicular joint



Plate 6. Osteoarthritis on left MT1 and MT2 with eburnation and grooving, SK 9 (old adult female)

Females overall had a marginally higher prevalence of DJD than males, CPR 90.9% and CPR 86.7% respectively. Interestingly, females also had a higher prevalence of DJD in almost all joints. The exceptions were the tempromandibular joint and the hip. The spine was the most prevalent location for joint disease, while the joint of the shoulders, elbows, hips, and knees also feature prominently. In most instances the severity of the lesions was relatively mild. However, some more severe lesions were evidence. Osteoarthritis, in the form of eburnation, was present in a number of individuals. In total, CPR 17.4% (4/23) of

adults had osteoarthritis. One male (SK20 old adult male) had osteoarthritis of the spine, while osteoarthritis was present in the foot bones of SK1 (old adult female) and SK9 (old adult female, see **Plate 6**). The latter also had osteoarthritis of the right temporomandibular joint. SK19 (adult female) had osteoarthritis of the right wrist, both hands, the spine, the right knee, and both feet. The severity of DJD in this individual may well have been linked with age, but unfortunately it was not possible to determine a specific age-at-death. The disease may have been hastened by the fact that this individual had suffered a series of fractures to the spine, which may have affected her typical work practice (see **Section 2.4.4**). Not surprisingly, all of the individuals that had osteoarthritis, and whose age-at-death could be determined, were old adults. This links in with the basic fact that the progress of the disease accelerates with age.

As mentioned, the spine was the most common location for joint disease. The lesions identified were a combination of degeneration of all of the joint surfaces of the various vertebrae including the bodies, the apophyseal joints, and the costal facets. Degeneration occurred in the form of both bone formation (osteophytes) and bone erosion (porosity). In addition there were numerous cases of defects known as Schmorl's nodes. These manifest as small, depressed lesions on the superior and/or inferior bodies of the vertebra. They typically occur in youth as a result of the rupturing of the nucleus pulposus (the pulposus gelatinous core of the intervertebral disk). This expands or bursts into the adjacent vertebral body as a result of pressure (Mann and Murphy 1990, 52; Ortner and Putschar 1981, 323). The immature nature of juvenile bone ensures the resulting depression in the normal surface of the bone. This pressure can be caused either by a fall or by straining the spine by, for example, lifting heavy objects incorrectly. The lesions were recorded in CPR 40% (4/10) of observable female spines and CPR 50% (5/10) of observable male spines.

A number of joint lesions were identified, primarily in the spine, that merit more detailed mention. Spinal DJD was apparent in SK26 (old adult female). It is probable that at least some of the degeneration was related to compression fractures of some of the thoracic bodies of the spine (see **Section 2.4.4**). The fractures were identified in T4, T5, and T7 and there was also a Schmorl's node in T7. The fractures would have resulted in kyphosis, or anterior bending of the spine, as the normal heights of the vertebral bodies were reduced. In addition, the left superior facet of T4 had fused to the left inferior facet of T3. The fusion is likely to have been an attempt at stabilisation of the joint structures of the spine in light of the kyphosis from the fractures. As mentioned earlier, DJD in the spine of SK19 (adult female) is also likely to have been linked to spinal fractures (see **Section 2.4.4**).

Spinal degeneration in spine of SK5 (adult male) may have been linked with evidence for more serious joint disease. Unfortunately the remains are very incomplete, as the remainder of the skeleton was outside the bounds of the excavated area. However, incomplete thoracic fragments revealed evidence that at least three thoracic arches had fused together at the apophyseal joints (**Plate 7**). No thoracic vertebral bodies were observable. The joint spaces of the apophyseal joints were obliterated. There was no excessive bone growth. The morphology of the arches suggests they are located somewhere between approximately



Plate 7. Possible ankylosing spondylitis in thoracic vertebrae, SK5 (adult male)

T6 and T10. A number of factors may account fusion of the apophyseal joints, including a number of diseases and trauma. One of those diseases is ankylosing spondylitis. It is a progressive inflammatory disease of unknown aetiology. It results in fusion of both the bodies and the apophyseal joints of the spine. The diagnostic features, in terms of skeletal remains, are the 'squared' fusion of the vertebrae, starting in the lower spine, and the fusion of the sacro-iliac joint

(Ortner 2003, 571ff; Ortner and Putschar 1981, 411; Roberts and Manchester 1995, 119; Rogers 2000, 175-6; Schwartz 1995, 249). Without the remainder of the vertebra being present it is virtually impossible to diagnose an aetiology for the fusion in the spine of SK5.

Fusion of the sacro-iliac joint was identified in the remains of SK4 (old middle adult male, see **Plate 8**). This trait is specifically associated with ankylosing spondylitis, as mentioned above, as well as other seronegative spondyloarthropathies (Rogers and Waldron 1995, 50). However, crucially, in those diseases, fusion occurs within the joint. In the case of SK4, the fusion is at the superior aspect of the right sacroiliac joint and the joint space is preserved. There is no indication of fusing of the left joint. This type of unilateral fusion, with maintenance of the joint space is typical of bone changes associated with diffuse idiopathic skeletal hyperostosis or DISH (*ibid.*). This disease typically affects the older male and is believed to be associated with obesity and diabetes. The vertebral bodies, in particular, may become fused by the growth of osteophytes which take on the appearance of 'flowing wax', particularly on the right side of the thoracic spine (Mays 1998, 127; Roberts and Manchester 1995, 120; Rogers 2000, 170-1; Schwartz 1995, 243). In addition, other parts of the skeletal structure would also be affected by enthesopathies or small bony growths (Rogers 2000, 170-1; Schwartz 1995, 243). Again, the skeletal remains of SK4 are very incomplete, as the upper half of the skeleton was unexcavated as it lay outside the line of excavation. It is therefore not possible to accurately determine the causative factor of the fusion in the sacroiliac joint.

Finally, there were a number of unusual factors observed in the skeletal remains of SK20 (old adult male). There was DJD of a number of joints including the shoulders, elbows, wrists, hips, left knee, right foot, and spine. The latter included osteoarthritis and Schmorl's nodes. The preservation of the vertebra was relatively poor. However, it was apparent that the bodies of at least four unidentified thoracic vertebrae were significantly wedged anteriorly (Plate 9). One body measured 19.55mm in height at the posterior margin



Plate 8. Evidence of partial fusion of right sacro-iliac joint, possible DISH SK4 (old middle adult male)

of the body and 15.75mm at the surviving anterior margin. No DJD was apparent in the body. The second body measured 24.03mm at the posterior margin and 17.01mm at the anterior margin, and there were Schmorl's nodes on the superior and inferior body. The third body measured 19.27mm posteriorly and just 9.25mm at the anterior margin. Finally, the fourth body measured 19.23mm in height at the posterior margin and 14.85mm at the anterior margin. Certainly the wedging would have resulted

in kyphosis or anterior bending of the spine. No fractures were identified or any destructive elements in the vertebral bodies. Neither was any prolific bone formation or destruction apparent. It is unknown what may have caused the wedging. Additional pathological joint lesions were present in a number of other joints. A lytic focus, with smooth edges and large internal smooth-walled cavities, were present at the inferior margin of the lesser tubercle of the proximal epiphysis of the left humerus (Plate 10). It measured 6.65mm superior/inferior by 7.1mm, and was 6.67mm deep. Another lytic focus was present at the margin of medial aspect of the distal head of the right first metatarsal (Plate 11). Again the edges were smooth and the trabecular bone was remodelled. It measured 4.69mm proximal/distal by 3.98mm and was 1.88mm deep. Another smaller possible lytic focus was located immediately adjacent to the latter. In addition, the left superior facet of the fourth cervical vertebrae was severely eroded (Plate 12). The subchondral bone was destroyed and partially remodelled, and there was osteoarthritis of the right superior facet, as well as of the second cervical vertebra.



Plate 9. Four unidentified thoracic bodies from left lateral, with anterior wedging, SK20 (old adult male)



Plate 12. Fourth cervical vertebra, with erosion of left superior facet (black arrow), and normal right superior facet in background (white arrow), SK20 (old adult male)

A number of pathological processes proceed with joint erosions and/or destruction with lytic foci. Tuberculosis can involve lytic foci and joint destruction. However, the lesions on SK20 did not conform to the typical presentations of TB in skeletons. Degenerative joint disease frequently involves porosity of the joint surface, but the lesions in SK20 were

indicative of a more serious process. Joint destruction is also a feature of the seronegative spondyloarthropathies of ankylosing spondylitis, psoriatic arthropathy, or Reiter's disease (Rogers and Waldron 1995). However, these typically include significant bone formation and joint fusion, as well as ossification of the entheses. A number of features in SK20 conformed to the expected skeletal manifestations of rheumatoid arthritis or RA (Aufderheide and Rodríguez-Martín 1998; Ortner 2003; Rogers and Waldron 1995). Rheumatoid arthritis is an erosive arthropathy which affects between 1-2% of the population. It is more common in females than in males. The aetiology is unknown, although an environmental stimulus and a genetic disposition appear to play an important role. It typically involves multiple joints, tends to be symmetrical, and the small joints of the hands and feet are characteristically affected. Other joints affected include the wrist, knee, shoulder, ankle, cervical spine, elbow and hip. It is a disease of the synovial membrane of the joint, which becomes infiltrated with inflammatory cells. The diseased membrane becomes thickened and vascularised (pannus) and extends into the joint, eventually resulting in destruction of the cartilage. Cysts may form below the subchondral bone (the joint surface) at the margins of the joints. There may be destruction of the subchondral bone and eburnation may occur. The joint may deform and there can be subluxation (partial dislocation). Bony ankylosis (fusion) is not common. Adjacent bones are frequently affected by osteoarthritis (Aufderheide and Rodríguez-Martín 1998, 99-101; Ortner 2003, 561-563; Rogers and Waldron 1995, 55-63).

Certainly the lytic foci at the margins of the distal joint of the right first metatarsal and the proximal epiphysis of the left humerus were suggestive of the lytic foci associated with RA, as were the erosive lesions in the cervical vertebra. However, the critical defining feature of RA, that of symmetrical lesions, was absent in SK20. In reality too, just a single joint in the hands and feet presented with the lytic lesions. Yet these are the joints most characteristically affected in RA. While it is impossible to conclusively state that this was a case of RA, it is possible that SK20 was in the early stages of RA. There was

no indication that the wedging of the thoracic vertebrae, noted above, was related to the possible diagnosis of RA. Similarly, the periostitis recorded on the on the tibiae, fibulae, calcanei, and left and right MT2s may not be related, but rather indicative of a systemic infection.

Joint disease was obviously limited in the juvenile population, given the young age of these individuals and that most joint disease is related to age progression. A distinctive form of joint disease was identified in one juvenile individual. Considerable morphological changes were evident in the spine of SK8 (15-17 years possible female). Schmorl's nodes, with anterior compression, were evident in T7, T8, and T9. In T7 there was compression of the superior surface, with a concentrated depression on the right lateral half with exposure of the trabecular bone. The posterior height of the body was 14.9mm while the anterior height was 9.24mm. In T8 there was a depression again on the right lateral side of the superior body, with a corresponding depression on the right lateral half of the inferior body. The posterior height was 18.41mm while the anterior height is 9.43mm. The body was also slightly wedged in the right lateral aspect of the body, with the height at the right being 11.27mm compared with 13.95mm on the left. In T9 there was a linear depression on the right lateral of the superior body, and on the left lateral of the inferior body. The posterior body measured 11.87mm in height and just 6.88mm at the anterior margin. The body was also compressed to the left lateral, with a left side height of 6.82mm, compared with 10.88mm on the right. The depressions are variations of Schmorl's nodes. The affected bodies appeared as if the normal height of the bone had compressed and the bone was pressed out anteriorly in particular. This gave the appearance of osteophytic growth, but it was not. Given time, as the vertebral rings of the vertebra would have fused to the vertebrae, the bulging bone would have appeared as anterior apposition of bone, with elongation of the body anteriorly. There were also surface fractures to the superior body of T12. The various wedging of the vertebra would have resulted in kyphosis, or anterior bending of the spine, that lateral wedging may also have resulted in some scoliosis, or lateral bending of the spine. Indeed, while the skeleton was being excavated it was noted on-site that the torso appeared short in comparison to the limbs of the individual. There were mild lesions of degenerative joint disease in the cervical vertebrae. The Schmorl's nodes, combined with at least the kyphosis, suggest this was a condition known as Scheuermann's disease.

Ortner (2003, 463-4) refers to this as a neuromechanical abnormality and Aufderheide and Rodríguez-Martín (1998, 87) refer to it as a circulatory disorder. It was recently identified in a female skeleton from Akarçay Höyük in Turkey, and was linked to trauma due to horse riding (Üstündağ and Deveci 2011). The cause of the disease is linked with the aetiology of Schmorl's nodes, 'followed by the anterior narrowing of the disk space and subsequent growth disturbance in this area of the end plate. This tends to result in diminished growth of the anterior vertebral body and a wedge shape of that body' (Ortner 2003, 464). The curvature associated with this condition typically extends from T8 to T10 (*ibid.* 463). The lesions observed in the spine are indicative of Scheuermann's disease, although normally there is a 'great predilection of the male sex' (*ibid.*)

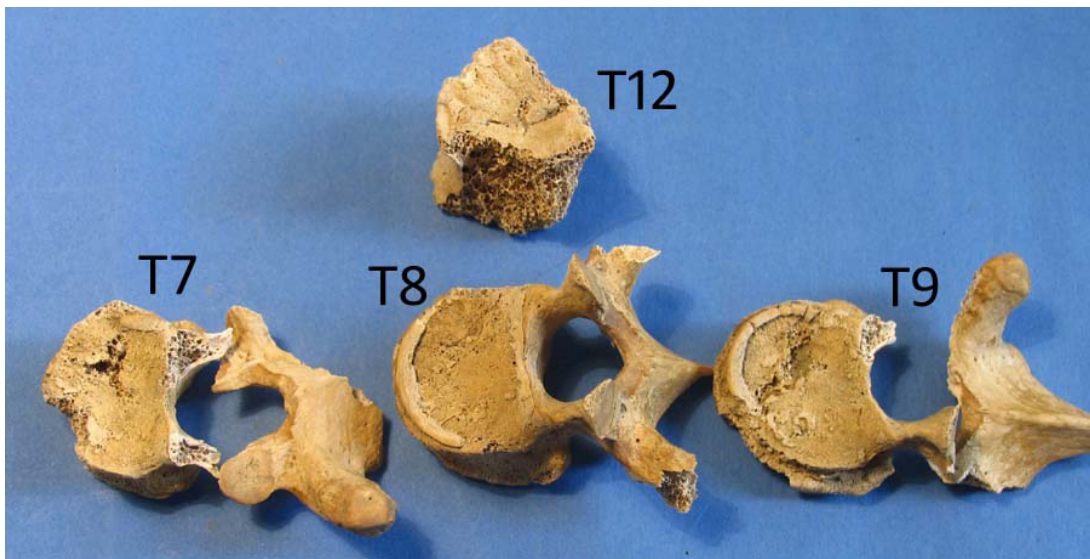


Plate 13. T7 to T9 and T12, with compression and Schmorl's nodes, possible Scheuermann's disease, SK8 (15-17 years female)

Mild joint degeneration was also evident in the spine of SK13 (14-17 years possible male).

2.4.2 Metabolic Disease

Certain porotic lesions of the eye orbits and skull vault are readily identifiable as specific pathological lesions due to the process of their formation. The cranial pathological lesions, porotic hyperostosis, and the orbital lesions, cribra orbitalia, are indicative of a metabolic disorder relating to iron deficiency. This condition occurs when, as a result of a deficiency of iron, the body's marrow increases its output of iron (Mays 1998, 142). The middle layer of the bone expands and there is a corresponding thinning of the outer surface of the bone. This can result in the diagnostic appearance of small holes or foramina on the outer surface of the bone. Although it is frequently assumed that these lesions are indicative of iron deficiency anaemia, studies have indicated that when a body is under stress from an invading organism (such as a parasitic infestation of the gut), the system increases its output of iron in order to counteract the stress. Thus this pathological process may actually be a sign of a healthy defence system (Stuart-Macadam 1991, 105; Roberts and Manchester 1995, 166-7).

Porotic hyperostosis was identified in the crania of TPR 44.4% (4/9) of observable female adults and TPR 69.2% (9/13) of observable male adults. Invariably both the left and right parietals and the occipital were involved, although in a number of individuals the frontal bones were also affected. Cribra orbitalia was identified in one or both of the orbits of CPR 22.2% (2/9) of observable females and CPR 27.3% (3/11) of observable males, where one or both orbits were observable. In the females, one had bilateral cribra orbitalia (SK11 old middle adult female) while it was only present in the left orbit of SK26 (old adult female). The lesions again were bilateral in two male individuals (SK6 young

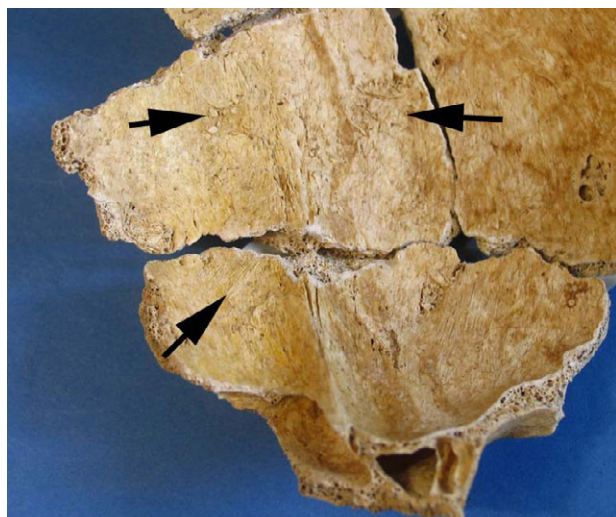


Plate 16. Internal frontal hyperostosis SK9 (old adult female)

adult; SK 30 old middle adult), while the lesions were only present in the left orbit of SK2 (young middle adult male).

Both porotic hyperostosis and cribra orbitalia was identified in the juvenile individuals. Porotic hyperostosis was identified in the crania of two adolescents (SK8 and SK13), and in the cranium of an older juvenile (SK31 10-13 years). In total this represents 15.8% (3/19) of observable crania, including an infant (SK41). In reality however, it would be unexpected to see these

lesions in juveniles of less than one year. Therefore the prevalence is TPR 16.7% (3/18) of juvenile aged between 1 year and 17 years. Cribra orbitalia was also present in five individuals, two of which also had porotic hyperostosis. There were two young juveniles aged between 1-6 years (SK18 and SK28), two older juveniles aged between 7 and 12 years (SK23 and SK31), and one adolescent (SK8). The lesions were bilateral in SK28 and SK8, on only the left orbit in SK23 and SK31, and only on the right orbit in SK18. This represents CPR 31.3% (5/16) of individuals aged between 1 and 17 years, with one or both orbits observable.

One old female (SK9) had patchy deposits of dense bone of the endocranial surface of the frontal bone (visible through post-mortem breaks). These are indicative of a condition known as internal frontal hyperostosis. It is a common finding in older females, particular after menopause. It manifests as 'marked thickening of the frontal bone, presenting a ridged build-up on the inner surface that is often of considerable thickness' (Ortner 2003, 416). Its aetiology is linked with changes in pituitary hormones after menopause (*ibid.*). Although the lesions are typically confined to the frontal, they may sometimes be present on the temporals or parietals. The ratio of incidence in female to male is estimated at 100:1. Therefore the condition can be taken as occurring almost exclusively in elderly females. There is evidence that males are also affected by the condition, though not as frequently (Hershkovitz *et al* 1999).

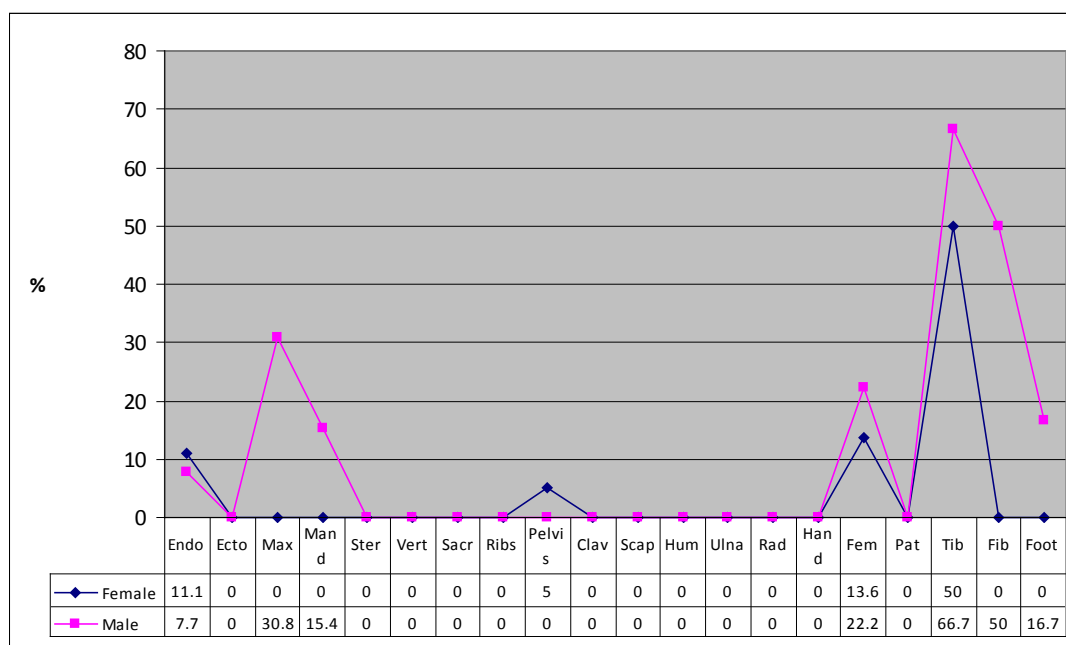
2.4.3 Non-specific Infection

Acute infections, by their nature, rarely leave any trace on skeletal remains. Chronic, long-term infections, where an individual is actually strong enough to survive long enough for the disease to manifest on the bone, are often identified in archaeological populations. In most instances the bone lesions are non-specific, although specific infections may occasionally be identified, such as leprosy. A number of instances of non-specific infections were observed in this population, exclusively in the form of fibre bone or periostitis. Periostitis occurs when the fibrous layer, the periosteum, directly overlying the bone becomes infected. The process of inflammation, with the accumulation of pus and infected matter, forces the periosteum to rise and a new layer of bone may form underneath. When the lesions are active the layer of bone may be grey in colour and may be striated or disorganised. With time the new layer of bone can heal and be remodelled into lamellar bone (the normal surface of the bone). Periostitis is confined to the surface of the bone. However, if infection penetrates into the bone marrow the results are considerably more serious. Osteomyelitis is an infection of the bone marrow. Bacteria may reach the marrow via three avenues - by direct infection through traumatic or surgical wounds, by direct extension from adjacent soft tissue, and by the haematogenous spread of bacteria from a remote septic focus (Ortner and Putschar 1981, 105-6). The process involves the destruction of old bone with the simultaneous forming of new bone (involucrum) and the extrusion of dead bone (sequestra) and pus through sinuses (cloacae) in the new bone.

Lesions of non-specific infection were present in CPR 53.8% (14/26) of adults. A total of CPR 54.5% (6/11) of female adults and CPR 53.3% (8/15) of male adults presented with various lesions. Included in this are endocranial lesions on the cranium (on the internal surface). While these are not periosteal lesions, they are indicative of an inflammatory infectious process within the cranium. The true prevalence rates of infectious lesions are presented in Table 8, with female and male data presented in Figure 5.

Table 8. TPR of non-specific infection in adults, by sex

Bone	Female <i>n</i> / <i>N</i>		Total Female <i>n</i> / <i>N</i> (%)	Male <i>n</i> / <i>N</i>		Total Male <i>n</i> / <i>N</i> (%)
	left	right		left	right	
Endocranial			1/9 (11.1)			1/13 (7.7)
Ectocranial			0/9 (0)			0/13 (0)
Maxilla			0/9 (0)			4/13 (30.8)
Mandible			0/9 (0)			2/13 (15.4)
Sternum			0/7 (0)			0/5 (0)
Vertebra			0/10 (0)			0/13 (0)
Sacrum			0/8 (0)			0/8 (0)
Ribs	0/10	0/10	0/20 (0)	0/11	0/11	0/22 (0)
Pelvis	0/10	1/10	1/20 (5)	0/9	0/9	0/18 (0)
Clavicle	0/9	0/9	0/18 (0)	0/12	0/13	0/25 (0)
Scapula	0/9	0/10	0/19 (0)	0/11	0/10	0/21 (0)
Humerus	0/9	0/11	0/20 (0)	0/9	0/9	0/18 (0)
Ulna	0/11	0/11	0/22 (0)	0/8	0/9	0/17 (0)
Radius	0/11	0/11	0/22 (0)	0/8	0/9	0/17 (0)
Hand	0/11	0/11	0/22 (0)	0/8	0/8	0/16 (0)
Femur	2/11	1/11	3/22 (13.6)	2/9	2/9	4/18 (22.2)
Patella	0/10	0/11	0/21 (0)	0/8	0/7	0/15 (0)
Tibia	5/10	5/10	10/20 (50)	4/6	4/6	8/12 (66.7)
Fibula	0/10	0/10	0/20 (0)	3/6	3/6	6/12 (50)
Foot	0/9	0/9	0/18 (0)	1/6	1/6	2/12 (16.7)

**Figure 5. TPR of non-specific infection in adults, by sex**

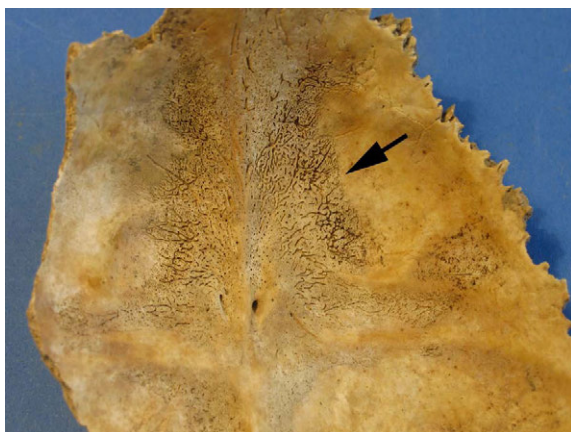


Plate 17. Active endocranial bone SK10 (1.5-2 years)

The leg bones were the most common location for infection in both females and males. This is a typical finding in archaeological populations. In all adult individuals with lesions on the leg bones (five females; four males), the fibre bone deposits were bilateral. These may be indicative of general physiological stresses that were skeletally manifested as widespread periosteal lesions.

In general, male TPRs were higher in most skeletal elements than females. The exceptions were endocranial lesions and periosteal lesions on the pelvis, which were both marginally more commonly involved in females than in males.

In contrast, the maxilla and mandible displayed traces of infection in a number of male adults but no female adults were affected. In all cases the lesions in the maxilla and mandible were linked directly with dental abscesses. The adult lesions varied in severity. Most lesions were mild to moderate in severity, and both healed and active lesions were identified. The most extreme case of infection was recorded in a juvenile individual (see below). In all adult individuals, where active lesions were recorded, older healed or healing lesions were also present. In no case was there an individual who exclusively had active lesions at the time of death.

Lesions of non-specific infection were also commonly observed in the juvenile population. A total of 47.6% (10/21) of juveniles had the lesions. The lesions are summarised in **Table 9**.

The most common location of reactive bone in juveniles was on the endocranial (internal) surfaces of the cranium. These typically comprise the development of highly vascularised and porous bone deposits on the internal surfaces of the cranium. It was identified in 42.1% (8/19) of observable juvenile crania. In all but one individual the lesions were in the process of healing at the time of death. The exception was SK10 (1.5-2 years), where extensive spreads of active vascularised bone was present on numerous bones of the cranium (**Plate 17**). The aetiology of these lesions may be either haemorrhagic (epidural trauma following on, for example, from trauma) or inflammatory (particularly meningitis) (Lewis 2004; Ortner 2003, 84; Schultz 2001). In the case of the infants it is possible that the lesions relate to trauma that occurred at the time of birth or soon afterwards. However, all of the individuals with the lesions in this population were greater than 1 year at the time of death.

Table 9. Lesions indicative of infection on the Tobar Jarlath juveniles

SK	Age-at-death	Cranial reactive bone	Post-cranial reactive bone
10	1.5-2yrs	Active endocranial bone on occipital, parietals, temporals, sphenoid, frontal	-
18	2.5-3yrs		Healing striated bone on left tibia
24	4-6yrs	Healing endocranial bone on occipital, parietals, and frontal	
35	5-6yrs	Healing endocranial bone on frontal	
38	4-5yrs	Healed endocranial bone on occipital	
23	9-12yrs	Healing endocranial bone on occipital	
31	10-13yrs	Healing endocranial bone on occipital, parietals, and frontal	
36	10-13yrs	Healing endocranial bone on occipital and left frontal	
8	15-17yrs		Healed fibre bone on medial ends of two left and three right ribs; healed periostitis on left tibia and fibula.
13	14-17yrs	Healed endocranial bone on occipital	Healed periostitis right tibia; active and healed periostitis left tibia; osteomyelitis left fibula.

In contrast to the adult individuals, where the limb bones in particular were affected by fibre bone deposits, there was limited evidence of periosteal deposits in the limbs of the juveniles. Just three individuals were affected. Remodelled striated bone was present on the left tibia only of SK18 (2.5-3 years), while healed striated bone was present on the left tibia and fibula of SK8 (15-17 years possible female). More serious evidence of infection was present in the left fibula of SK13 (13-17 years, possible female) in the form of osteomyelitis (**Plates 18 & 19**). The normal shaft of the bone was massively increased in size to a maximum diameter of 42.05mm. The proximal and distal epiphyses of the fibula were broken post-mortem and were not recovered. However, the surviving shaft indicated that the swollen shaft did not extend into the metaphyses of the bone. The new bone comprised a dense irregular structure. Three sinuses were present that extended into the interior of the bone. All were located on the medial aspect of the shaft. The first was located 72mm inferior to the surviving proximal extent of the bone. It measured 11.49mm superior/inferior by 6.65mm. Just under 50mm inferior to this was another sinus measuring 12.95mm superior/inferior by 7.2mm. The third sinus was located 63mm inferior to the last, and measured 5.8mm superior/inferior by 5.87mm. The most proximal sinus, as it drained infected matter from the fibula, left an impression in the form of a channel on the adjacent lateral surface of the tibia. This channel measured 21.62mm anterior/posterior by 20.11mm. The tibia also had healed striated bone on the lateral aspect of the anterior shaft, while faint patches of active fibre bone were present on the posterior shaft. Healed striated bone was present on the lateral aspect of the anterior shaft of the right tibia. The cause of the osteomyelitis could not be determined. This individual also had traces of healed vascular bone on the endocranial surface of the occipital and parietal hyperostosis.



Plate 18. Left fibula with osteomyelitis to top, normal right fibula to bottom, SK13 (13-17 years female)



Plate 19. Close up of drainage sinuses on right fibula, SK13 (13-17 years female)

In contrast to the adults, periosteal rib lesions were present in the juvenile sample. The left and right ribs of SK8 (15-17 years possible female) had healed periosteal lesions at the medial ends of the ribs (**Plate 20**). Periosteal lesions on the internal surfaces of the ribs may be associated with pulmonary infections (Capasso 2000; Roberts *et al* 2004). They are frequently observed in skeletal populations from the post-medieval period. It was unexpected that none was present in the adults of this group. In the case of SK8, it is possible that the lesions relate to lung complications brought on by kyphosis due to spinal fractures (see **Section 2.4.4**).



Plate 20. Fibre bone on internal surfaces of ribs, SK8 (15-17 years)

2.4.4 Trauma

Traumatic defects were identified in a significant number of adult individuals. A total of CPR 53.8% (14/26) adults had evidence of trauma. Females and males had virtually identical prevalence rate: 54.5% CPR (6/11) of female adults and CPR 53.3% (8/15) of male adults were affected. Incidentally, these were identical to the prevalence rates of non-specific infection (see **Section 2.4.3**). The prevalence rates of instances of trauma by basic

bone/element type is presented in **Table 10**, with the female and male rates depicted in **Figure 6**.

It is apparent that the hands and feet of male individuals were particularly affected by traumatic assaults. Just one female had a fracture to the foot. SK1 (old adult female), who also had severe trauma to the spine, had a fracture to the distal head of the right 5th proximal foot phalanx. The head was flattened, and was pushed medially. There was also associated osteoarthritis. Three male adults had fractures to a variety of foot bones. In SK45 (adult male) there was a hairline fracture on the left talus, while the distal head of the left 2nd metatarsal was flattened through a compression fracture. Mild joint disease was also present in the left foot. Hairline fractures were also present in the distal joint surfaces of both the left and the right first proximal foot phalanges. This individual also had a fracture



Plate 21. Fractures to right proximal hand phalanges, SK21 (adult male)

in the left hand. Two hairline fractures were also present in the left calcaneus of SK33 (old middle adult male). Fractures to the hand were less prevalence but still prominent. No female had fractures to the hands. Three males had traumatic insults to the hands. SK21 (adult male) had suffered fractures to the distal epiphyses of two proximal right hand phalanges (**Plate 21**). They may be the 3rd and 4th phalanges. In the 3rd phalanx the medial half of the distal epiphysis is compressed, while in the 4th phalanx the lateral half of the distal epiphysis is compressed. There was no associated joint disease. This individual also had a fracture to a left rib and there was a significant fracture to the



Plate 22. Healed fracture to proximal neck of right femur, SK21 (adult male)

neck of the right femur (**Plate 22**). SK2 (young middle adult male) had a well-healed fracture to the shaft of the right 2nd metacarpal, while SK4 (old middle adult male) had two hairline fractures on the proximal epiphysis of the left 1st metacarpal. The palmar half of the joint has been pressed distally. This individual had also suffered fractures to the feet. The concentration of fractures to the hands and feet of male individuals, in contrast to female adults, may be linked to differential work practices.

Table 10. TPR of traumatic lesions in adults, by sex

Bone	Female <i>n</i> / <i>N</i>	Female <i>n</i> / <i>N</i>	Total Female <i>n</i> / <i>N</i> (%)	Male <i>n</i> / <i>N</i>	Male <i>n</i> / <i>N</i>	Total Male <i>n</i> / <i>N</i> (%)
	left	right		left	right	
Cranium			1/9 (11.1)			1/13 (7.7)
Mandible			0/9 (0)			0/13 (0)
Sternum			0/7 (0)			0/5 (0)
Vertebra			4/10 (40)			0/13 (0)
Sacrum			0/8 (0)			0/8 (0)
Ribs	0/10	0/10	0/20 (0)	2/11	0/11	2/22 (9.1)
Pelvis	0/10	0/10	0/20 (0)	0/9	0/9	0/18 (0)
Clavicle	0/9	0/9	0/18 (0)	0/12	0/13	0/25 (0)
Scapula	1/9	0/10	1/19 (5.3)	1/11	0/10	1/21 (4.8)
Humerus	0/9	0/11	0/20 (0)	0/9	0/9	0/18 (0)
Ulna	0/11	0/11	0/22 (0)	0/8	0/9	0/17 (0)
Radius	1/11	0/11	1/22 (4.5)	1/8	0/9	1/17 (5.9)
Hand	0/11	0/11	0/22 (0)	1/8	2/8	3/16 (18.8)
Femur	0/11	0/11	0/22 (0)	0/9	1/9	1/18 (5.6)
Patella	0/10	0/11	0/21 (0)	0/8	0/7	0/15 (0)
Tibia	0/10	0/10	0/20 (0)	0/6	0/6	0/12 (0)
Fibula	0/10	0/10	0/20 (0)	0/6	0/6	0/12 (0)
Foot	0/9	1/9	1/18 (5.6)	3/6	1/6	4/12 (33.3)

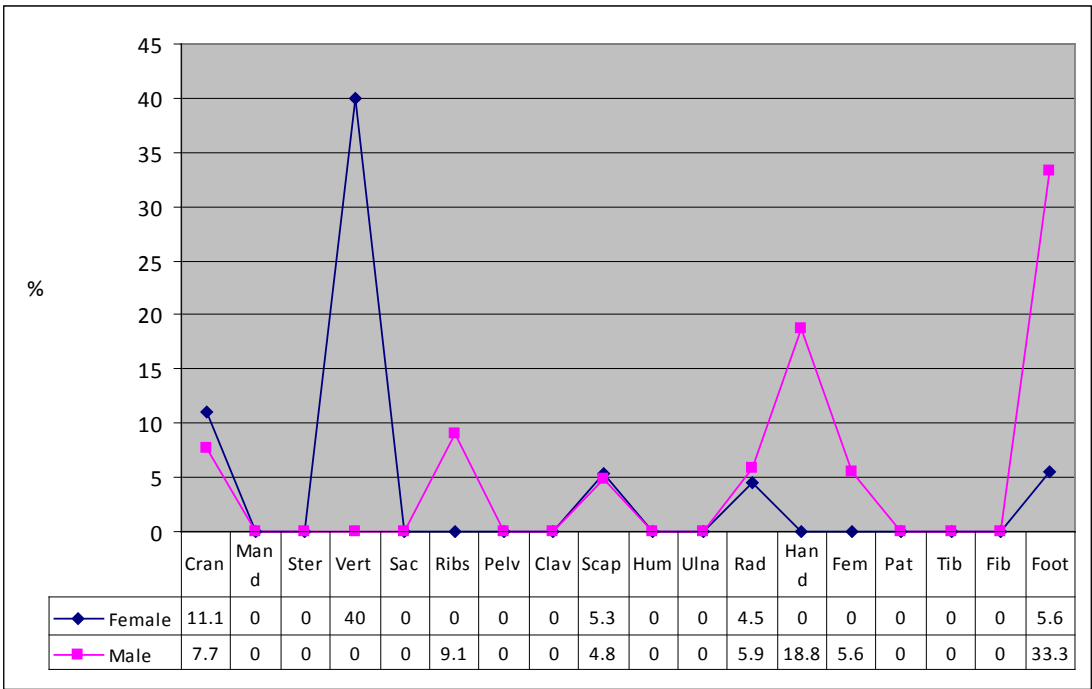


Figure 6. TPR of trauma in adults, by sex

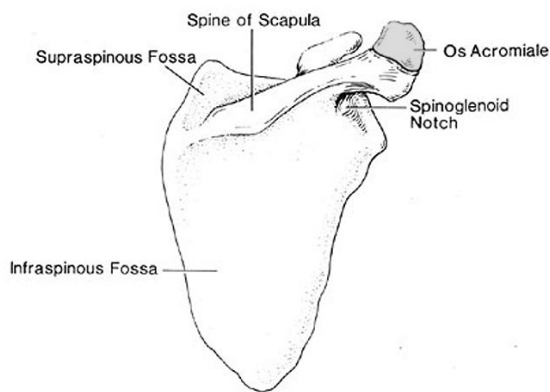


Figure 7. Posterior view of right scapula. Location of os acromiale shaded.

The fractures to the scapulae comprise two cases. Both are stress fractures known as os acromiale (*n.b.* the prevalence rates recorded in **Table 10** refer to the counts of the scapula in general, and not specifically of the acromion). This distinct defect involves the non-union of the acromion process of the scapular blade. The left scapula of both SK9 (old adult female) and SK5 (adult male) had the defects. The right scapula of SK9 was not affected while the right scapula of SK5 was unobservable. Os acromiale can occur

as a result of either an actual fracture or through non-union of the epiphysis (Roberts and Manchester 1995, 76). The defect is believed to occur in as much as 15% of the modern population (Resnick 1995, 4281, after Murphy and McNeill 1993, 128). Although it may be genetically linked, current osteological theory links the process to culturally induced factors (Roberts and Manchester 1995, 113). In a study of the condition on the skeletal remains recovered from the 16th century ship the *Mary Rose*, the high incidence of os acromiale were attributed to the possible long term use of longbows (Stirland 2000; Stirland 1986).



Plate 23. Spondylolysis L5, SK42 (old middle adult female)

Vertebral fractures appear initially to score high in terms of prevalence in females. However, in reality, just four individuals were affected, and two of these were related to a specific stress fracture. Two individuals were affected by stress fractures to the lumbar vertebrae known as spondylolysis. This results in the separation of elements of a vertebra, typically the vertebral body, the pedicles, and transverse and superior articular processes from the laminae, spinous process, and inferior articular processes (Aufderheide and Rodríguez-Martín 1998, 63). The defect occurs as a result of repeated stress (Ortner 2003, 147-8).

However, a congenital weakness at this point of the vertebra has also been mentioned as being 'an important factor in the expression of this abnormality' (Ortner 2003, 148). The typical age of onset is between 10 and 15 years (Bergmann et al 2002). Classic spondylolysis was present in the fifth lumbar vertebra of SK42 (old middle adult female, see Plate 23). A more serious expression of this was present in the fourth lumbar vertebra of SK1 (old adult female, see Figure 8 & Plate 24). In this case the inferior segment of the arch had slipped, with the formation of pseudo facets on the inferior arch of L3. In

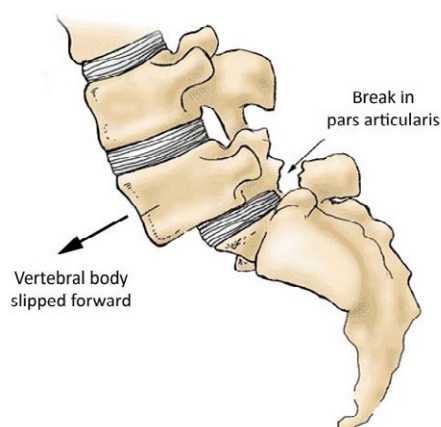


Figure 8. Side view of lower spine and sacrum showing spondylolisthesis of L5, schematised

addition the body of L4 also appears to have slipped anteriorly over the body of L5. This condition is known as spondylolisthesis. The *in situ* photograph of this skeleton during excavation was not detailed enough to allow the lower spine to be examined. However, the excavator of the skeleton noted very clearly, on the on-site recording form, that the lower spine and body of this individual was twisted to the left lateral. Spondylolysis may go largely undetected in the living individual. However, when it gets to the stage of slippage, as in spondylolisthesis, considerable pain may be experienced in the lower back and the legs (Bergmann *et al* 2002). Spinal joint disease was also present in both SK42 and SK1.

The degeneration was more significant in the latter, and while this may be linked with the spondylolisthesis, the age-at-death of the female would tie in with more severe joint disease than a younger individual.



Plate 24. Spondylolisthesis SK1 (old adult female)

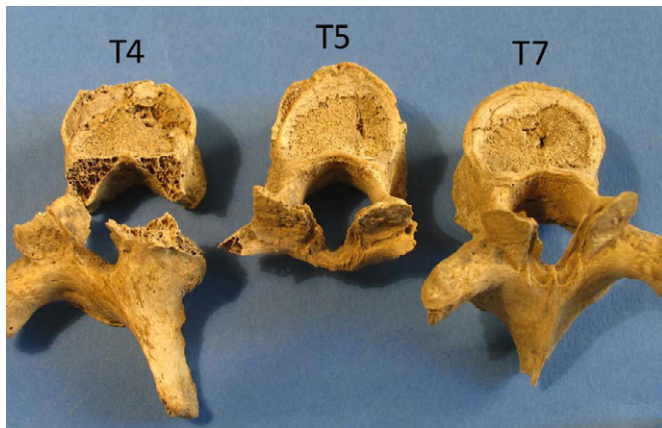


Plate 25. Fractures to bodies of T4, T5, T7, SK26 (old adult female)

T4 the fractures were on the right lateral part of the bodies and measured 12.84mm and 12.93mm in length respectively. In T5 the fracture was on the left lateral half of the body and measured 10.41mm. This individual also had extensive joint disease of numerous elements and osteoarthritis, including the spine (**Section 2.4.1**). Fractures were also present in the thoracic vertebra of SK26 (old adult female, see **Plate 25**). There were fractures to the superior bodies of T4, T5, and T7. There was a general compression fracture to the superior body of T4, with a recorded height of 12.53mm. A hairline fracture was present on the right lateral aspect of the superior body of T5. It measured 12.13mm in length anterior/posterior with another line radiating off to the right for 5.09mm. The body was 15.19mm in height. The superior body of T7 also had a hairline fracture, crescent in shape, at the anterior margin. It measured 17.21mm medial/lateral, and the height of the body was not compromised. There was general spinal joint degeneration, and the inferior left facet of T3 had fused to the superior left facet of T4. This is likely to have occurred

directly as a result of the traumatic fractures. There would have been at least some kyphosis, or anterior bending, of the spine.

Two cranial fractures were identified in the adult individuals. In SK22 (adult female), there was a healed penetrating fracture to the posterior aspect of the left parietal, 30mm from the lambdoid suture and 30mm from the sagittal suture (**Figure 9; Plates 26 & 27**). There was a depression in the ectocranial surface measuring 30mm diameter. It was from this point that the measurements to the sutures was taken above. The centre of the depression was open through to the interior of the skull. It measured 16.7mm anterior/posterior by 5.44mm. The edges of the opening were completely smooth, as was the

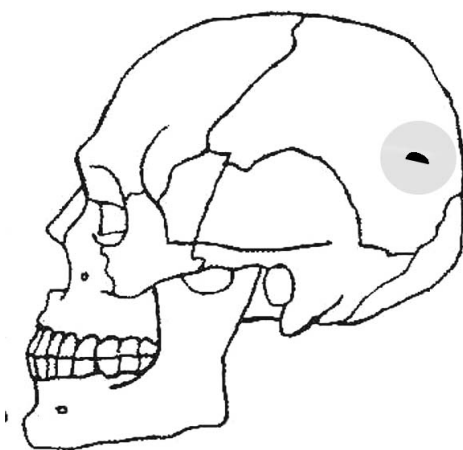


Figure 9. Schematised diagram of healed fracture to cranium of SK22 (adult female)



Plate 26. Penetrating fracture to left parietal, SK22 (adult female)



Plate 27. Endocranial view of penetrating fracture, SK22 (adult female)



Plate 28. Healed fracture to left parietal, SK14 (adult male)

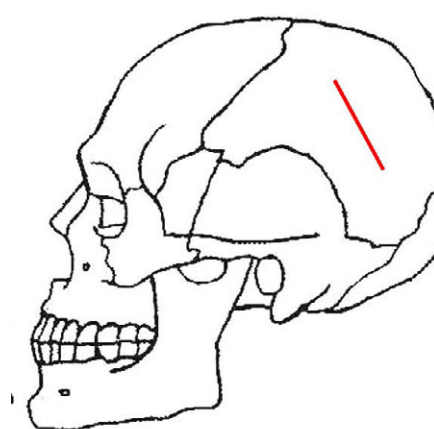


Figure 10. Schematised diagram of healed fracture to cranium of SK14 (adult male)

entire area of the depressed area. Endocranially, there was a fragment of bone at the inferior margin of the opening that was displaced into the brain cavity, but still attached to the main cranium. It measured 29.36mm anterior/posterior by 24.95mm, and was raised 7.08mm above the normal surface of the bone.

In SK14 (adult male) there was another fracture to the left parietal (**Figure 10; Plate 28**). There was an oblique shallow linear depression running superiorly from the posterior aspect of the parietal to the anterior. Endocranially, there was certainly penetration of the internal surface, but only slightly. There are small, dense bone growths in the internal surface. It measured 68.77mm in length, and its anterior end was 56mm from the frontal suture while the posterior end was 34.11mm from the parietomastoid suture. The fracture may have been caused by a blow to the head with a linear implement. Alternatively, it may have been caused by a fall against a sharp-edged surface, such as the edge of a step for example.

Both cranial fractures were in very similar locations on the left parietal of the skull. Certainly the fracture to the female skull penetrated into the brain cavity, while the fracture in the male may have been less severe. Penetration of the cranial cavity may lead to

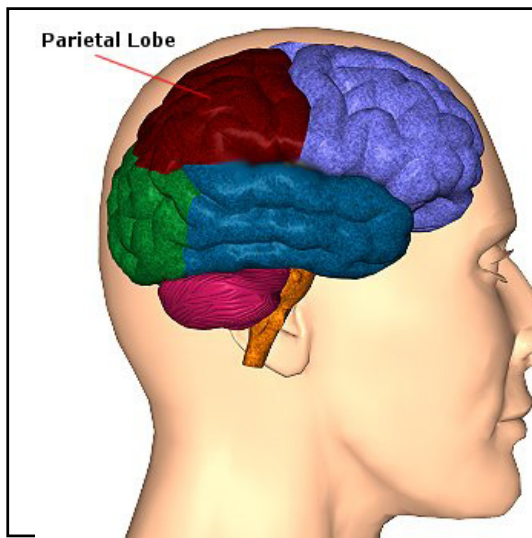


Figure 11. Location of parietal lobe (www.neuroskills.com/tbi/bparieta.shtml)

significant consequences for an individual. In addition, there may be problems relating to the actual force of the injury affecting the brain, even if the bone itself is not penetrated. In skeletal remains it is difficult to assess what, if any, brain injuries may have been caused by the fractures described above. However, 'damage to the left parietal lobe can result in what is called 'Gerstmann's Syndrome'. It includes right-left confusion, difficulty with writing (agraphia) and difficulty with mathematics (acalculia). It can also produce disorders of language (aphasia) and the inability to perceive objects normally (agnosia).'

(www.neuroskills.com/tbi/bparieta.shtml) (see **Figure 11**). Clearly both of these individuals from the Tobar Jarlath cemetery survived the skull fractures, and both may have suffered from some cognitive problems, such as Grestmann's Syndrome, afterwards (Mazonni *et al* 1990). However, these cognitive problems may not necessarily have been problematic in terms of living in nineteenth century Ireland.

Finally, there was evidence of possible soft tissue trauma in one individual, SK30 (old middle adult male). The bones of this individual were noticeably robust, particularly the proximal halves of the humeri. In the right femur the linea aspera, the rough ridge of bone that runs down the posterior aspect of the femoral shaft and anchors a number of muscles, was very prominent, standing up to 3mm above the normal bone surface. This

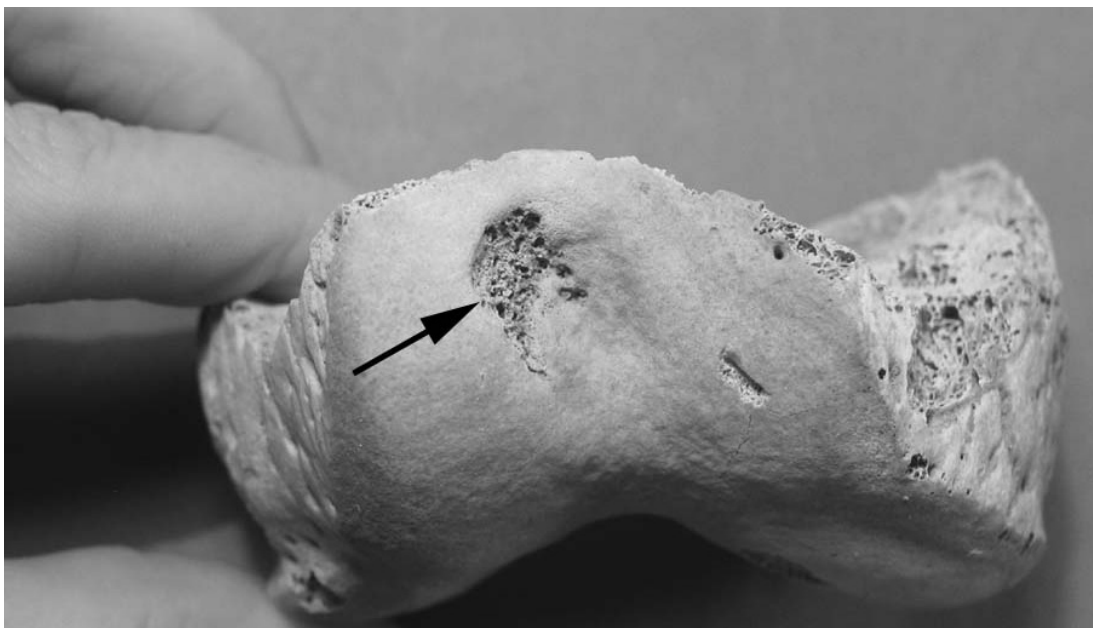


Plate 29. Osteochondritis dissecans distal right femur, SK13 (14-17 years)

begins at approximately the midshaft and ends just superior to the popliteal area. It is possible that this represents the ossification of a muscle tear, an exostosis, in this area. This was not included in the counts in **Table 10** and **Figure 6**.

Trauma were identified in one juvenile individual. In the unfused distal epiphysis of the right femur of SK13 (14-17 years) there was a depressed lesion measuring 13.43mm superior/inferior by 9.02mm, with a maximum depth of 2.68mm (**Plate 29**). It is located on the anterior of the joint, at the superior lateral aspect of the joint. The base of the oval-shaped defect exposed the trabecular bone, which showed some evidence of remodelling. This defect is known as osteochondritis dissecans. This traumatic lesion involves the fragmentation and collapse of the joint. A necrotic fragment of bone separates from the surface of the joint and may remain loose within the joint, may be absorbed, or may heal back into the defect (Roberts and Manchester 1995, 87). Symptoms include swelling, catching, and locking of the joint (Schenck and Goodnight 1996).

2.4.5 Congenital Defects



Plate 30. Detached styloid of left MC3, hunchback carpal, and prominent muscle attachments, SK47 (old middle adult male)

A limited number of congenital or developmental defects were present on the skeletal remains from Tobar Jarlath. The defects were minor and would not have adversely affected the lives of the individuals involved.

In SK47 (old middle adult male) the styloid of the left third metacarpal was detached (**Plate 30**). The fragment was recovered with the hand bones. Normally, the styloid 'does not develop until around 11-12 years of age and then appears as a slowly developing proximal elongation of the dorsolateral surface' (Scheuer and Black 2000, 325). Thus the styloid does not develop as a separate entity; rather it grows out from the existing metaphysis. This indicates it is not simply a case that the styloid had failed to fuse with the metacarpal. It appears that the tip of the styloid had detached and had not healed back. As well as this detached styloid,

also recovered was an additional carpal bone, sometimes referred to as the ninth carpal or the hunchback carpal, or more commonly the os styloideum (Curtiss 1961; Hazlett 1992). It occurs at the base of the third metacarpal and can cause pain and a reduction in mobility. The development of this additional ossicle has been linked with hitting something with the fist, and also to repetitive occupational use. This would also link



Plate 31. Bifurcated distal foot phalanx on right, normal on left, SK8 (15-17 years)

in with the detached styloid process. It was noted also that the attachments for the fibrous flexor sheaths are all prominent on the phalanges of the left hand, with the bony attachments rising up to 2mm above the normal surface. The attachments were also prominent in the right hand.

The distal head of an unsided distal 1st foot phalanx of SK8 (15-17 years possible female) had an unusual developmental anomaly (**Plate 31**). The distal tip appeared to be bifurcated. No comparative case could be found by the writer on this defect.

3. Synthesis

3.1 Summary of Analysis

A total of 48 skeletons were excavated from Tobar Jarlath, presenting 22 juveniles (45.8%) and 26 (54.2%) adults. In the juveniles, there were two infant individuals (9.1% of juveniles), while most of the juveniles (59.1%) were aged between 1-6 years at the time of death. In the adults, there was a bias toward individuals aged over 35 years at the time of death, with 82.4% of adults in that category. There was a slight bias toward male adults (57.7%) over female adults (42.3%). The average female stature was 155.3cm and the average male stature was 170.2cm. The males were taller than other comparable pauper populations, while the females were relatively similar. Both sexes were shorter in stature than their contemporaries in middleclass populations.

The dental remains revealed a high rate of ante-mortem tooth loss, with a CPR of 59.1% and a TPR of 17.6% in adults. No edentulous (all teeth lost or extracted ante-mortem) individuals were present. Calculus was very common. It had a CPR of 100% of adults (TPR 90.6%) and 84.2% of juveniles. Carious lesions were also very common, with a CPR of 86.4% of adults (TPR 24.3%) and a CPR of 57.9% of juveniles. Caries had a higher CPR in male adults (92.3%) over female adults (77.8%), although the TPR difference was minimal (25% and 23% respectively). Dental abscesses were present in CPR 36.4% of adult individuals and in all cases were associated with carious lesions. Undoubtedly linked with the high prevalences of dental disease was the high prevalence of periodontal disease, with CPR 95.5% of adults affected by the disease. Hypoplastic defects were present in CPR 23.1% of male adults, and indicated stress between the ages of approximately 1 and 3.5 years. No enamel defects were present in the dentitions of the female adults. Hypoplastic defects were present in CPR 10.5% of juveniles, with the stress occurring between the ages of 6 months and 1 year. Finally, clay pipe smoking facets were present in the dentitions of CPR 31.8% of adults. All individuals were male, representing a CPR of 53.8% of males.

Numerous skeletal pathological lesions were identified in the skeletons. Joint disease was very common, with a CPR of 88.5% of adults. Both sexes were equally affected, CPR 90.9% of females and 86.7% of males. The TPR was higher in females in all joints except for the tempromandibular joint and the hip. In both sexes, the spine was the most common location for joint disease. Some joint disease could be tentatively linked with traumatic lesions, but in most cases its development was probably age related. A single case of each of possible ankylosing spondylitis, possible DISH, and possible rheumatoid arthritis were identified. The latter individual had also suffered from kyphosis, or anterior bending of the spine, while another adult individual also suffered from the same condition as a result of spinal fractures. Joint disease was minimal in the juvenile individuals, although a case of probable Scheuermann's disease (juvenile kyphosis) was identified in an adolescent female.

Both porotic hyperostosis and cribra orbitalia were common. Porotic hyperostosis was present in TPR 44.4% of female adults and 69.2% of male adults. Prevalence rates of cribra orbitalia were more comparable, with CPR 22.2% of female adults and CPR 27.3% of male adults affected. Both conditions had markedly different prevalences in the juvenile population. Just TPR 16.7% of juveniles had porotic hyperostosis while CPR 31.3% had lesions of cribra orbitalia.

Lesions of non-specific infection were present in CPR 53.8% of adults, with CPR 54.5% of females and CPR 53.3% of males being affected. Maxillary and mandibular lesions were linked with dental disease. The TPRs were very high in the femora and the tibiae. In the latter the TPR was 50% in females and 66.7% of males. Lesions were also present in the juvenile population, with CPR 47.6% of individuals affected. The majority of these lesions were endocranial (the inside of the cranium). In total 42.1% of juvenile crania were affected. Rib lesions were observed in a single juvenile, while osteomyelitis, or bone marrow infection, was present in the leg of an adolescent female.

Traumatic lesions were also common in this population with CPR 53.8% of adults affected. The CPR was similar in females and males, 54.5% and 53.3% respectively. Fractures of various bones of the hands and feet were very common in males in particular, while the spine was involved in a number of females. In two females the spinal fractures consisted of spondylolysis, with one individual suffering further complications as a result of spondylolisthesis. Multiple fractures were present in the vertebra of two other females. A female and a male adult had also suffered from skull fractures to the left side of the head. Both individuals may have suffered from cognitive impairments as a result. Just one juvenile had evidence of a trauma and this was to the joint surface of the knee.

A very limited number of developmental defects were apparent in the remains, which included defects in the wrist and hand bones of an adult, and an unusual bifurcated distal first foot phalanx.

3.2 Discussion

The skeletons recently excavated from Tobar Jarlath in Tuam are believed to be directly associated with the nearby Tuam Union Workhouse, and particularly to the earliest years of the workhouse corresponding with the Great Famine (J. Kiely, pers. comm.). Until recently very few workhouse cemeteries had been excavated. However, the past decade has seen archaeological excavations and skeletal reports on a number of Union Workhouses including Cashel and Thurles in Co. Tipperary, Manorhamilton in Co. Leitrim, and Kilkenny city, amongst others (Fibiger 2004; Geber 2012; Lynch 2002; 2008; Rodgers *et al* 2006; Sutton 2010).

The Irish Poor Relief Act of 1838 sought to reform the manner of dealing with the huge amount of poverty and pauperism that had developed in Ireland by the fourth decade of the nineteenth century. The Act established 130 Poor Law Unions across the country, each of which was to construct a workhouse in order to cater for the impoverished of that district. The workhouse was to be constructed from poor rates collected in that union. Tuam workhouse was quite large, designed to cater for 800 people (O'Connor 1995,

263). It was built to one of three standard plans, all designed by the architect George Wilkinson. All workhouses followed a set design:

There was a small entrance block, known as the workhouse administration unit, which housed the board-room and offices. Passing through this block one came to the main institution, usually a transverse three-storey building of stone. This block contained the workmaster's office and several wards, usually for ambulant inmates. At the rere [*sic*] were the kitchens, wash-houses and store rooms (O'Connor 1995, 81).

Although built in 1840/41, Tuam workhouse only took its first admissions on 4th May 1846, after problems in the collection of the poor rates (O'Connor 1995, 123, 263, www.workhouses.org.uk/Tuam/). This may not have been detrimental to the poor of the district as by 1846 workhouses of the country were only half full (O'Connor 1995, 120). This was a partial reflection of the intense hatred the Irish poor had of the workhouse system of dealing with poverty, as opposed to the established tradition of outdoor relief.

However, the workhouse system was immediately put to the test. The potato crop of 1845 was struck by a devastating blight, a fungal disease called *phytophthora infestans*. By then, the potato had become the subsistence food for at least one-third of the eight million people in the country (Crawford 1995, 60). Although undoubtedly hunger and disease increased in that year, the real devastation began in 1846 when the blight struck again. Seed potatoes, meant as the foundation for the crop of 1847, were consumed. Famine and disease rapidly spread across many parts of the country and the crisis continued until 1852. The worst affected areas saw workhouse admissions increase dramatically as the destitution, disease, and starvation forced thousands to seek admissions to the abhorred institutions. In 1845 there were 38,497 admissions. By 1851 this had risen to 217,388 individuals (O'Connor 1995, 177). Over half of the 116,000 people in the workhouses in 1847 were children (Robins 1980, 179). The conditions within the workhouses during the Great Famine, as a whole, were horrific. The workhouses were specifically designed and run to be almost below basic survival levels, in order to deter people from entering. Mortality was high within the walls. By the winter of 1846-47 workhouse death rates reached 2,500 deaths per week (Kinealy 1995, 118). Sixty children under the age of 13 died in one week in Cork workhouse in February 1847. By 1852 the Famine was over, although the destitution it brought about undoubtedly continued. Many who were forced into pauperism by the conditions of the famine would have had no choice but the stay within the walls of the workhouse. After the 1850s the numbers entering workhouses diminished, and they took on a role resembling a hospital. Most eventually came under the management of the religious orders (O'Connor, 1995, 180).

The burials examined in this study relate to Tuam workhouse, and so date to after 1846. The specific date of the burials is not known. However, as suggested by documentary evidence (see **Section 1.1**; J. Kiely, pers. comm.), the burials are likely to date from the very earliest years of the workhouse and are likely to directly relate to the volatile period of the Great Famine, 1845-1852. This would be confirmed by the method of burial, with multiple individuals being buried in communal pits. These mass grave pits are a reflection

of the rate of death that became common in these institutions at the time of the Great Famine. The high numbers dying militated against the provision of individual graves and the pragmatic solution was to dig large grave pits that could accommodate multiple burials. Evidence of coffined burials being buried stacked on top of each other in large pits has been identified at other workhouses, such as Kilkenny and Borrisokane (J. Geber, pers. comm.; Lynch 2009), while multiple burials, with up to three or four individuals buried next to each other in a single pit, have also been identified in Cashel and Manorhamilton workhouses (Lynch 2008, Rodgers *et al* 2006). The present burials from Tuam conform to the latter pattern, with eighteen grave pits being identified in the small area excavated, containing at least 48 individuals. The graves were in relatively organised rows, each containing between two and four individuals each. **Figure 12** shows the locations of the female and male adult and the juveniles within each grave.



Figure 12. Distribution of female and male adults, and juveniles in the grave pits from Tuam workhouse (amended by writer from original plan supplied by Eachtra Archaeology)

No clear pattern was evident in terms of who is buried in what grave. Female adults were buried with male adults and both were buried with children also. Some graves contained only adults, and some apparently only juveniles. The randomness is likely a reflection of the scale of death within the walls of the workhouse. The large grave pits were filled according to the order in which individuals died. It is likely that most of the individuals within each mass grave had no familial relationship to each other. An infant (SK48) identified in post-excavation in association with a female adult (SK40) may represent a mother and child buried together in a coffin, although the post-depositional truncation made this difficult to interpret. Similarly, two juveniles (SK24 and SK29) appeared remarkably similar in size in the excavation plan and were buried side by side, suggesting they may have been twins. In most cases however, it is impossible, without resorting to methods such as DNA analysis, to determine the relationships between the individuals in each mass grave.

Interestingly, these burials from Tuam, as with other workhouse burials noted earlier, have dismissed a very common assumption that, due to the scale of deaths during the Great Famine, it was almost a matter of course to use a coffin with a sliding bottom to deposit the dead within the pits, or to simply wrap corpses in cloth and use no coffin (O'Connor 1995; Kissane 1995, 120). The belief was that the Poor Law Unions simply could not, or would not, meet the demand for coffins. All of the burials from Tuam were coffined. So too were the hundreds of individuals buried in pits in Kilkenny workhouse (J. Geber, pers. comm.), in the pits associated with Borrisokane workhouse (Lynch 2009), and in the more organised burials from Manorhamilton (Rodgers *et al* 2006) and Cashel workhouses (Lynch 2008). It appears that, despite the horror of the Great Famine and the abhorrent conditions within the workhouses, at least in the early years, the dead were routinely afforded the dignity of a coffined burial, even if it was into a mass, nameless pit.

What can the skeletal remains of the Tobar Jarlath individuals, apparently associated with the horrendous years of the Great Famine in Tuam workhouse, tell us? Obviously there are biases in the data in terms of the limits of excavation. The 48 individuals recovered from Tobar Jarlath represent a snapshot of the hundreds, or thousands, that would have died in the workhouse from its foundation. They represent perhaps the weakest of those who were admitted. The workhouse was not meant as a place of death. It was meant to alleviate destitution. Therefore the actual skeletal remains of those who died in the institution are a unique and very specific section of society in nineteenth century Ireland.

The age profile is typical, with almost half (45.8%) of the excavated individuals being less than 18 years at the time of death. In a skeletal sample recently excavated from Cashel workhouse in Co. Tipperary 55.6% of individuals were juveniles, while 28.8% of a cemetery associated with Manorhamilton workhouse were juveniles (Lynch 2002; 2008). Given that children were amongst the most vulnerable in the pauper class (an individual had to be destitute in order to be admitted to the workhouse), it is not surprising to find high numbers in a workhouse cemetery. Children would have been admitted with their families or they may have been orphans. Some children were literally abandoned at the gates of the workhouse by their parent/s. Others were foundlings, infants abandoned at birth, whose care was transferred from the parish to the poor law union in the 1850s (Robins 1980, 184). Children who were destitute were already in appalling conditions on the outside. When they entered the walls of the workhouse their survival rate was very poor.

Somewhat surprisingly, just two infants were recovered from Tobar Jarlath. This represents just 9.1% of the juveniles. In the skeletons from Cashel workhouse 24% of juveniles were infants, while just 10.5% of those in the Manorhamilton were infants (Lynch 2002; 2008). The very low rate in this skeletal sample from Tobar Jarlath appears exceptional. Infant mortality rates would have been very high both within the workhouses and in society in general. In post-famine Ireland that rate was 115/1000 births (Clarkson and Crawford 2001, 239). In the early half of the century it was likely to have been higher. Inherent biases within the excavation may account for the lack of infants. They may simply have been buried somewhere else. This may be within the existing cemetery,

or within the grounds of the workhouse, or perhaps they were buried outside of the workhouse completely. It is evident that infants were frequently afforded different burials (Delaney 2009; Dennehy and Lynch 2001; Donnelly and Murphy 2008), and perhaps this was also the case within the workhouse institution.

Most of the juveniles (59.1%) from Tobar Jarlath were aged between 1-6 years at the time of death. In Cashel workhouse 48% of juveniles were in that age-category (Lynch 2008). The age-at-death categories used in the Manorhamilton analysis varied slightly: in that site 15.8% of juveniles were aged between 1 and 5 years at the time of death (Lynch 2002). The high number of young juveniles in Tobar Jarlath is again indicative of the dire circumstances faced by children in the destitute class. In the early nineteenth century over half of children died before the age of 10 years (Farrar 2004). Again, in times of stress this would be expected to be even higher. In terms of pathological lesions the juveniles from Tobar Jarlath revealed a number of interesting traits that were indicative of the physiological stresses they would have been under (see below).

In the adult population in Tobar Jarlath, there appears to be a significant bias toward older individuals, with 82.4% of adults aged over 35 years at the time of death. As with the juveniles, this is a reflection of the vulnerable state of older individuals who were destitute. Slightly more male adults (57.7%) than female adults (42.3%) were present in this sample. Women in nineteenth century Ireland were considerably more economically vulnerable than men. Accordingly, they used the welfare institutions significantly more than men. From the onset of the Poor Law in Ireland more women were in the workhouses than men. Census returns for 1881 reveal that 72% of the individuals in hospitals, asylums, and almshouses were women. More male adults (60%) than female adults (40%) were also present in the sample from Manorhamilton workhouse (Lynch 2002), while slightly more females (58.6%) than males (41.4%) were present in burials recovered from Cashel workhouse (Lynch 2008). Again, the almost equal numbers of female and male adults in the Tobar Jarlath sample may be a reflection of excavation biases. However, an important factor to consider is that while data indicates that more females than males entered the workhouse this may not necessarily translate to death rates. Indeed in pre-famine Ireland, and in post-famine Ireland until the 1930s women had higher mortality rates than men (Daly 1986, 100). However, during the Great Famine the situation was reversed. This may have been due to a combination of increased pressure on the male bodies undertaking heavy relief works, and also to the higher calorific demands of males (*ibid.*).

The skeletal remains also reveal a wealth of information in terms of health status. The average female stature was 155.3cm, while the average male stature was 170.2cm. Data provided in **Section 2.2**, indicates the males in Tobar Jarlath were taller than other males in comparable pauper populations, while the females were relatively similar to their contemporaries in other workhouses. Both sexes were shorter in stature than their contemporaries in middleclass populations. While stunted growth is genetically linked, nutritional deficiencies also appear to be a major contributing factor (Goodman 1991). 'Poor growth and short stature are trade marks of deprivation' (Cole 2006, 166). If an individual is under- or malnourished then their potential final attained height may be

compromised. Given the low socio-economic status of these individuals, it is likely that their final height was significantly influenced by a poor diet.

Until the 1850s the diet for the majority of the population would primarily have comprised potatoes. Cottiers and labourers would have supplemented the potato with buttermilk, while small-farmers also consumed milk, oatmeal, and wheaten bread. Herring was utilised along the coast (Ó Tuathaigh, G. 1990). Potatoes, combine with buttermilk, are a highly nutritious diet (Dickson 1997, 12). Providing it was consumed in enough quantity this diet was very beneficial to an individual. When the Great Famine hit it obliterated the huge numbers who existed on this subsistence diet. In the workhouse the diet was poor, particularly in the opening years of the 1840s, which coincided with the Famine. At the foundation of the workhouse adult meals were to comprise eight ounces of stirabout and a half pint of milk for breakfast, and three and a half pounds of potatoes and one pint of skimmed milk for dinner (O'Connor 1995, 101). Children were to get three ounces of oatmeal and a half pint of new milk for breakfast, two ounces of potatoes and half a pint of new milk for dinner, and six ounces of bread for supper (*ibid.*). This constantly changed over the years, and was particularly poor during the years of the Great Famine. It is likely that the restricted nature of the diet of the poor was highly influential both on their final attained stature, and on their health profile.

This diet is reflected in the teeth of the Tobar Jarlath individuals, although not in the traditionally expected manner. There was a high prevalence of calculus, or calcified plaque, which is indicative of a soft diet, combined with poor oral hygiene. However, most of note is the prevalence of carious lesions, or cavities in the teeth. Almost nine out of ten adults had at least one tooth affected (CPR 86.4%, 19/22), while more than half the juveniles had carious lesions (CPR 57.9%, 11/19), despite the young age (1-6 years) of most of the juveniles. High prevalences have been recorded in other Irish workhouse populations also (Lynch 2002; 2008). Traditionally, carious lesions are associated with a diet high in sugar. Given the restricted diet that the Tobar Jarlath individuals would have consumed, both outside and inside the workhouse, it is unlikely they had any significant access to sugar. However, the lesions are also known to occur through the consumption of certain starches and high prevalences have been identified in other populations where large quantities of potatoes were consumed (Wasterlain *et al* 2009). It is possible that the high prevalence of caries in workhouse populations is directly related to the huge quantities of potatoes consumed. Directly related to the high prevalence of caries was a high prevalence of ante-mortem tooth loss, with a CPR of 59.1% in adults. Today in Western Europe, with access to professional dentists and anti-biotics, carious lesions and abscesses are not considered a serious issue, rather a tiresome burden. But in nineteenth century Ireland, if the infection was not dealt with, presumably by extraction by whatever means possible, the result was undoubtedly excruciating pain which could affect ever aspect of life including food consumption. Ultimately it could also lead to septicaemia and death. Rather surprisingly, no edentulous (the ante-mortem loss of all teeth) individuals were present, which would be expected in a population such as this, where the adults were older in age and were there

was a high prevalence of both caries and ante-mortem tooth loss. This was contrary to evidence from other workhouse populations (Lynch 2002; 2008).

The high prevalence of caries in the juvenile individuals may not necessarily have been caused by a primarily potato-based diet. In skeletons from a large post-medieval *cillín* in Mackney in Co. Galway (Delaney 2009), just CPR 8.3% (2/24) of juveniles aged between 1 and 17 years had carious lesions (Lynch 2007). In contrast, CPR 32.6% (6/19) of the juveniles examined from Cashel workhouse had carious lesions (Lynch 2008). It is possible that at least some of the young juveniles with caries were only just weaned, if even, at the time of death. It is possible that the caries in those individuals was caused by the use of a sugar-rag or teat, although it could certainly be argued that pauper and the destitute would not have had any access to sugar.

Differential ages of physiological stress were apparent from the hypoplastic defects in adults and juveniles. Firstly, only male adults had the lesions. No females were affected. This suggests that females and males had a different experience of childhood physiological stresses, with males suffering more than females. Secondly, adult hypoplastic defects indicated stress between the ages of 1 and 3.5 years, while the defects in the juvenile individuals indicated stress between the ages of 6 months and 1 year. This suggests that early physiological stress may have had a direct influence of longevity. Interestingly, another indicator of physiological stress was higher in the male adults than in the female. Porotic hyperostosis was higher in males (TPR 69.2%) than in female adults (TPR 44.4%). The condition, while being linked with iron deficiency anaemia, had been identified as being an indicator of the body fighting a physiological assault. The higher prevalence of this in male adults, combined with the data from the enamel hypoplastic defects indicated that the males in this population may have been exposed to more physiological stresses than females.

Other factors are likely to be more indicative of lives lived outside of the workhouse. Some individuals would have been born and raised in the environs of the workhouse (Robins 1980), but it is probable that most of the adults in the present sample lived much of their lives outside of the walls of the institution. Evidence of pipe smoking was preserved in the dentitions of over half of the male adults. None of the female adults had the tell-tale facets of wear in the teeth. This indicated a strong bias towards male smoking. However, smoking was banned in the workhouse. In addition, many of the traumatic fractures that were so common in the adults in this group may have been related to occupational hazards. Many that would have finally sought admission to the workhouses were originally cottiers and labourers. Changes in circumstances, most obviously during the Great Famine but also due to other factors, would force them to seek the help of the workhouse. But evidence of their hard physical labours was preserved on their bones. Fractures to the hands and feet of males were common, and may be related to ordinary labour comprising either agricultural and/or industrial work. However, they may also have been sustained during participation in outdoor relief schemes where, in return for substantial physical labour, an individual would be provided with food or money. Joint

disease also had a high prevalence in the adults and is probably related both to lives of hard work and to the aged nature of the population.

The evidence of infectious lesions was indicative of the abysmal living conditions of these individuals. Over half of the adults (CPR 53.8%) had lesions of infection, with similar prevalences in females and males. A high prevalence of the lesions in the maxillae and mandibles of male adults was linked with dental disease. Most of the classic evidence of infection was present in the bones of the lower limb, and in the tibia in particular (TPR 66.7% male tibiae, TPR 50% female tibiae). When an individual had periostitis on one limb bone it was always present in at least one other limb bone. Bilateral periostitis is linked with systemic infection (Larsen 1997). The juveniles also had a high prevalence of infectious lesions (CPR 47.6%). In contrast to the adults however, the most common location was as endocranial (internal) lesions in the skull (TPR 42.1%). The lesions may relate to haemorrhaging associated with trauma or to inflammation, particularly associated with meningitis (Lewis 2004; Ortner 2003, 84; Schultz 2001). In both juveniles and adults the lesions indicate the significant physiological stresses that would have been faced by these individuals. However, of import also is the fact that the lesions are present at all. An individual needs to be physically strong enough to survive for at least some time for the evidence of the infection to transfer to the bone. A weakened individual may succumb quickly to an infection that would never leave any trace on the bone. It is quite likely that those in the low social classes of the nineteenth century, who would have been routinely exposed to infections, may have actually built up a certain level of immunity that allowed them to withstand the disease, at least for a time. Although some individuals had active lesions at the time of death, that is they were still suffering from the infection, all also had older healed lesions, indicating repeated infections. Most of these individuals would have been born into poverty, and all its associated implications in nineteenth century Ireland. Not surprisingly their bodies had adapted to their living conditions to a certain degree.

Rather surprisingly, periosteal lesions on the visceral surface of the ribs were observed in just a single juvenile individual. None was identified in the adult population. This was unexpected for a mid-nineteenth century population. Rib lesions are typically related to pulmonary infections, and have been closely linked with tuberculosis (Roberts *et al* 1994). TB was endemic in Ireland in the mid-nineteenth century and was, and is, primary linked both to living conditions and work environments (Jones 2001, 30). The lack of any skeletal evidence of the infection in the individuals from Tuam is somewhat unexpected.

Of particular note in the population was the numbers of individuals with skeletal evidence of physical and possibly mental impairments. Possible cases of ankylosing spondylitis and DISH were identified. Both of these can eventually lead to spinal fusion, with associated restriction in movement. One individual may have suffered from the painful condition of rheumatoid arthritis. She, and another female, also suffered from kyphosis, or anterior bending of the spine, as did a juvenile. This can lead to significant problems as, if pronounced, it can cause constriction of all of the major organs. Breathing may be difficult and there may be increase pressure on the heart. Interestingly, the adolescent that suffered from kyphosis was the only individual in the population that

also had evidence of pulmonary infection. Spondylolisthesis may have resulted in spinal problems for one female adult, as her *in situ* photograph indicated abnormal curvature of the spine. However, this left no trace on the actual skeletal remains. The osteomyelitis (infection of the bone marrow) in the left fibula of SK13, was indicative of a serious and life-threatening infection. While it cannot be confirmed that this was the actual cause of death, other inferences may be made. The sinuses indicate that infected matter, probably including bone fragments, was draining out through the skin. The leg would have been very swollen, hot to the touch, and extremely painful. Soft tissue infection may also have been present. Such infections are treatable today with antibiotics. It is possible that this chronic disease was, at least sometimes, debilitating to this individual. Two adults also had healed skull fractures that may have resulted in at least some cognitive impairment. The work capacity of most, if not all, of the individuals listed here was at least somewhat compromised by their physical state. They literally may not have been even able to work, if that option was open to them. In an era before the modern welfare state, the only option for such individuals, without the support of family or friends, was to enter the workhouses. In some instances, they may have been forced into the workhouse by said family and friends, due to a variety of circumstances. It was not until 1862, and the Relief of the Destitute Poor in Ireland (Amendment) Act, that sick individuals who were not destitute were admitted to the workhouse (O'Connor 1995, 179). It was also at that time that workhouses began to act more as hospital-like institutions.

4. Conclusions

The relatively high numbers of children, the older age profile of the adult population, and the numerous instances of fractures, joint disease, debilitating diseases including kyphosis, and at least two individuals with possibly cognitive difficulties relating to head traumas, is typical of an Irish workhouse population. They represent paupers and infirm individuals, those who could no longer support themselves when the devastating Great Famine of the mid-nineteenth century occurred. They represent the most vulnerable in society, many of whom would have been forced either by circumstances or family to seek the help of the dreaded workhouse. Their skeletal remains preserved evidence of existence before the workhouse regime, one where the life-path of an individual was highly pre-defined by the sex of the individual. By their pauper status, they were largely rejected in life by mainstream society, and in death they were confined to the ignominy of a mass pauper grave. Despite this, a Poor Law Union that was clearly under severe financial strain still ensured that each was at least afforded the dignity of a coffin. The past decade has seen an increase in excavation in these cemeteries and the data that has emerged so far has greatly enriched the study of these infamous institutions and the unfortunates that lived and died within the confines of the walls.

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6. Appendices

6.1 Catalogue of In Situ Human Skeletal Remains

SK1

Age: Old Adult 45+ years (auricular ilium, pubic symphysis)

Sex: Female (pelvis, skull, metrics)

Stature: 158.7+/-3.55cm (right femur and tibia)

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body

Orientation: North/south, head to north.

Associated Skeleton/s: SK2.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Manubrium, sternum, twelve left and twelve right ribs, vertebrae from C1 to S5, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges.

Dental Inventory:

PM	AM	AM	PM	P	P	P	P	P	P	P	P	P	P	P	AM
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	PM	PM	P	P	P	PM	P	P	R	P	P	P	AM	P	P

23 permanent teeth

Dental Pathology:

Calculus – 23/23, slight to severe, subgingival;

Caries – 3/23, (48, 32, 38);

Periodontal disease – moderate 13-28, 43-34, severe 18-14, 48-44, 35-38.

Skeletal Pathology:

Joint disease – left and right shoulders (moderate), right elbow and wrist (mild), left and right hips (moderate), right knee (mild), right foot (osteoarthritis), spine (moderate);

Trauma – well-healed fracture to distal end of possibly the fifth proximal foot phalanx, with displacement of the distal head medially;

– spondylolisthesis of L4, with formation of pseudo-facets on the inferior arch of L3. In addition, the body of L4 appears to have slipped anteriorly over the body of L5.

Anomalies: -

Comments: -

SK2

Age: Young Middle Adult 25-35 years (auricular ilium, pubic symphysis)

Sex: Possible Male (male pelvis, female skull and metrics)

Stature: 165.3+/-2.99cm (left femur and tibia)

Skeletal Preservation: Very good. Complete, some fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK1.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals, metacarpals, and hand phalanges. Manubrium, sternum, nine left and eleven right ribs, vertebrae from C1 to S5, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges.

Dental Inventory:

P	P	P	P	P	P	P	P	PM	P	P	P	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	P	P	P	P	P	P	PM	P	PM	P	P	P	P	P	P

29 permanent teeth

Dental Pathology:

Calculus – 29/29, slight to moderate, subgingival;

Caries – 1/29, (28);

Periodontal disease – slight 18-28, 46-36.

Skeletal Pathology:

Joint disease – spinal DJD, including Schmorl's nodes;

Metabolic – health porotic hyperostosis frontal, left and right parietals, occipital, mild cribra orbitalia on left orbit (none on right);

Trauma – well-healed fracture to distal metaphysis of right MC2, with displacement of the distal end to the palmar aspect;

Non-specific infection – active and healed periostitis on femora, tibiae, fibulae.

Anomalies: -

Comments: -

SK3

Age: Young Adult (auricular ilium, pubic symphysis, epiphyseal fusion)

Sex: Female (pelvis and metrics)

Stature: 161.9+/-3.55cm (left femur and tibia)

Skeletal Preservation: Good. Incomplete but well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK4.

Associated Finds: Coffin nails.

Bones Present: Right scapula and humerus, radi, ulnae, incomplete left carpals and hand phalanges, complete right carpals and left and right metacarpals. Five left and ten right ribs, vertebrae from T7 to S6, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, one sesamoid with left foot, two sesamoids with right foot.

Dental Inventory: -

Dental Pathology: -

Skeletal Pathology:

Joint disease – spinal, including Schmorl's nodes;

Non-specific infection – healed striated bone on tibiae, disorganised active and remodelled bone on the anterior sacrum.

Anomalies: There are six sacral vertebrae.

Comments: -

SK4

Age: Old Middle Adult 35-44 years (auricular ilium, pubic symphysis)

Sex: Male (pelvis, metrics)

Stature: 183.9+/-2.99cm (left femur and tibia)

Skeletal Preservation: Poor. Quite incomplete, good preservation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK3

Associated Finds: -

Bones Present: Right ulna and radius, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Incomplete sacrum, ilia, ischia, right pubis. Fe-

mora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, one unsided sesamoid.

Dental Inventory: -

Dental Pathology: -

Skeletal Pathology:

Joint disease – DJD left and right hips, right knee; the right sacro-iliac joint is fused at the superior margin, with preservation of joint space, no fusion is apparent in the left;

Trauma – well-healed fracture to proximal epiphysis of the left MC1, with two hair-line fractures running medial/lateral, and displacement of the palmar half of the joint distally; hairline fractures also present in the distal epiphyses of both the left and right 1st proximal foot phalanges;

Non-specific infection – active and remodelled striated bone on left femur, tibiae, fibulae,

Anomalies: -

Comments: -

SK5

Age: Adult

Sex: Possible male (skull)

Stature: -

Skeletal Preservation: Very poor. Significant fragmentation. Truncated by pipeline trench.

Skeletal Position: Supine.

Skeletal Attitude: Extended?

Orientation: North/south, head to north.

Associated Skeleton/s: SK6 and SK7.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, proximal humeri. Sternum, two left and eight right ribs, vertebrae from C1 through to incomplete thoracic fragments.

Dental Inventory:

AM	P	AM	P	P	P	P	P	PM	P	P	P	AM	P	AM	AM
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
U	P	P	P	P	P			P	P	P	P	P	P	P	CA

22 permanent erupted teeth, 1 unerupted permanent

Dental Pathology:

Calculus – 22/22, slight to moderate, subgingival;

Caries – 9/22, (17, 15, 12, 11, 22, 47, 46, 36, 37);

Periodontal disease – slight 15-13, 21-25, 48-46, 33-38, severe 18-16, 26-28;

Abscess – one associated with 17.

Skeletal Pathology:

Joint disease - mild DJD left and right TMJs, severe spinal DJD with fusion of at least three thoracic arches and obliteration of apophyseal joints;

Non-specific infection – vascularised bone deposits associated with abscess in maxilla;

Metabolic – healed porotic hyperostosis frontal, left and right parietals, occipital;

Trauma – possible os acromial of left scapula, right unobservable.

Anomalies: -

Comments: -

SK6

Age: Young Adult 17-20 years (epiphyseal fusion)

Sex: Possible male (skull and metrics)

Stature: -

Skeletal Preservation: Very poor. Very incomplete and fragmented. Truncated by pipeline trench.

Skeletal Position: Supine.

Skeletal Attitude: Extended?

Orientation: North/south, head to north.

Associated Skeleton/s: SK5 and SK7.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, proximal humeri. Four left and six right ribs, vertebrae from C1 through to incomplete thoracic fragments.

Dental Inventory:

	P	P	P	P	P	P	P	P	P	P	P	P	P	P	
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
U	P	P	P	P	P	P	P	P	P	P	P	P	P	P	CA

28 erupted and 1 unerupted permanent teeth

Dental Pathology:

Calculus – 14/14, slight to moderate;

Periodontal disease – slight 17-25, 47-37.

Skeletal Pathology:

Metabolic – healed porotic hyperostosis frontal, left and right parietals, occipital; cribra orbitalia left and right orbits.

Anomalies: -

Comments: -

SK7*Age:* Adult*Sex:* Possible male (skull)*Stature:* -*Skeletal Preservation:* Very poor. Very incomplete with significant fragmentation, truncated by pipeline trench.*Skeletal Position:* Supine.*Skeletal Attitude:* Extended?*Orientation:* North/south, head to north.*Associated Skeleton/s:* SK5 and SK6.*Associated Finds:* Coffin nails*Bones Present:* Cranium and mandible. Clavicles, left scapula and proximal left humerus. Vertebrae from C1 to T1.*Dental Inventory:*

P	P	AM	P	P	P	P	PM	PM	P	P	AM	P	AM	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	AM	AM	P	P	P	P	P	P	P	P	P	P	P	P	P

25 permanent teeth

Dental Pathology:

Calculus – 25/25, slight to severe, subgingival;

Caries – 8/25 (18, 17, 43, 42, 35, 36, 37, 38);

Periodontal disease – slight 38, 48-44, moderate 14-28, 43-37, severe 18-15;

Hypoplastic defects – 4/25, single line on each tooth indicating stress between 3/4yrs;

Anomaly – there is one additional single-rooted tooth located at 12. It is small and deformed, with moderate calculus; bilateral wear patterns indicating a pipe-smoker.

Skeletal Pathology:

Metabolic disease – healed porotic hyperostosis frontal, left and right parietals, and occipital.

Anomalies: -*Comments:* -**SK8***Age:* Adolescent 15-17 years (epiphyseal fusion)*Sex:* Possible female (pelvis)*Stature:* -*Skeletal Preservation:* Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left arm parallel to body, right arm slightly flexed lateral at elbow, with hand near right hip.

Orientation: North/south, head to north.

Associated Skeleton/s: SK9

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete right carpals and hand phalanges, complete left carpals and left and right metacarpals. Twelve left and twelve right ribs, vertebrae from C1 to incomplete sacrum, ilia, left ischium. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, two unsided sesamoids.

Dental Inventory:

P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

32 permanent teeth

Dental Pathology:

Calculus – 12/32 (16, 15, 26, 47-31, 36), slight, subgingival;

Caries – 2/32, (43 and 38).

Skeletal Pathology:

Joint disease – the bodies of T7, T8, and T9 are all significantly compressed, with associated irregular Schmorl's nodes. T7 is compressed to 9.24mm, T8 to 9.43mm, and T9 to 6.88mm, all with anterior compression. The irregular Schmorl's nodes are concentrated in the right lateral aspects of the bodies. T8 is also compressed to the right lateral. The spine certainly displayed kyphosis and also possible scoliosis. Scheurmann's disease. There are also compression fractures to the superior surface of the body of T12;

Metabolic – healed porotic hyperostosis left and right parietals and occipital; cribra orbitalia left and right orbits;

Non-specific infection – healed striated bone on left tibia and fibula; and on two left and two right ribs; active fibre bone on anterior of S4 and S5;

Congenital – the distal end of an unsided first distal foot phalanx is bifurcated.

Anomalies: - there is an unusual lytic focus on the lateral aspect of the distal metaphysis of the right femur, just superior to the epiphysis. It measures 11.02mm superior/inferior by 5.23mm and is 1.72mm deep. The edges are jagged and irregular, and the exposed trabecular bone has remodelled into solid irregular bone.

Comments: -

SK9

Age: Old Adult 45+ years (auricular ilium)

Sex: Female (pelvis, skull, metrics)

Stature: 146.3+/-3.57cm (left fibula)

Skeletal Preservation: Poor. Incomplete and very fragmented.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left forearm slightly flexed with hand over pubis. Right arm extended with hand on right pelvis.

Orientation: North/south, head to north.

Associated Skeleton/s: SK8.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left carpals, and left and right metacarpals and hand phalanges, complete right carpals. Four left and five right ribs, incomplete vertebrae from C1 through to lumbar, ilia, ischia. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, one unsided sesamoid.

Dental Inventory:

AM	AM							AM	P	AM	P	AM	AM	AM	AM
18	17	16	15	14	13	12	H	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
AM	AM	AM	PM	PM	AM	AM	AM	AM	AM	AM	P	P	AM	AM	AM

4 permanent teeth

Dental Pathology:

Calculus – 4/4, slight, subgingival;

Caries – 4/4;

Periodontal disease – severe 18, 17, 21-28, 48-38.

Skeletal Pathology:

Metabolic disease – healed porotic hyperostosis left and right parietals and occipital; patchy deposits of dense bone on endocranial frontal, may be start of internal frontal hyperostosis;

Joint disease – right TMJ (osteoarthritis), left shoulder and elbow, left and right wrist and hips, right ankle, left and right foot (osteoarthritis of both), spine;

Trauma – os acromial of left scapula, right unobservable;

Non-specific infection – remodelled disorganised woven bone on medial and lateral aspects of right ilium at sciatic notch.

Anomalies: -

Comments: -

SK10

Age: Juvenile 1.5-2 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended by body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK11 and SK12.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Right clavicle, scapulae, humeri, radi, ulnae, incomplete left and right metacarpals and hand phalanges. One sternal fragment, twelve left and nine right ribs, incomplete cervical, thoracic, lumbar, and sacral vertebrae, ilia, ischia. Femora, tibiae, fibulae, incomplete left and right tarsals, metatarsals, and right foot phalanges.

Dental Inventory:

U	PM	P	PM	P	PM	PM	PM	P	P	P	U
16	55	54	53	52	51	61	62	63	64	65	26
46	85	84	83	82	81	71	72	73	74	75	36
U	P	P	P	P	P	P	P	P	P	P	U

15 erupted deciduous teeth and 4 unerupted permanent teeth

Dental Pathology:

Caries – 1/15 (74).

Skeletal Pathology:

Non-specific infection – active grey vascular bone endocranially on occipital, left and right parietals, left and right temporals, greater and lesser wings of sphenoid, and frontal.

Anomalies: -

Comments: -

SK11

Age: Old Middle Adult 35-40 years (auricular ilium, pubic symphysis)

Sex: Female (pelvis, skull, metrics)

Stature: 151.7+/-3.66cm (left tibia)

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK10 and SK12.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Manubrium, twelve left and eleven right ribs, vertebrae from C1 to incomplete sacrum, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, one unsided sesamoid.

Dental Inventory:

	PM	P	P	P	P	PM	PM	P	P	P	PM	P	P	P	PM
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

26 permanent teeth

Dental Pathology:

Calculus – 16/16, slight to moderate, subgingival;

Periodontal disease – slight 48-44, 36-38, moderate 17-11, 43-35, severe 21-28.

Skeletal Pathology:

Metabolic – cribra orbitalia left and right orbits;

Joint disease – mild DJD on left and right shoulders, elbows, wrists, hips, knees, and spine;

Non-specific infection – remodelled striated bone on posterior shafts of left and right tibia.

Anomalies: -

Comments: -

SK12

Age: Juvenile 2-3 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left arm parallel to body, right forearm slightly flexed with hand on pubic area.

Orientation: North/south, head to north.

Associated Skeleton/s: SK10 and SK11.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete right metacarpals and left and right hand phalanges, complete left metacarpals. Manubrium and two sternal fragments, twelve left and twelve right ribs, vertebrae from C1 to S4, ilia, ischia, pubes. Femora, tibiae, fibulae, incomplete left and right tarsals and foot phalanges, complete left and right metatarsals.

Dental Inventory:

	U	P	P	P	P	P	P	PM	P	P	P	U	U
	16	55	54	53	52	51	61	62	63	64	65	26	27
47	46	85	84	83	82	81	71	72	73	74	75	36	37
U	U	P	P	P	P	P	P	P	P	P	P	U	U

19 erupted deciduous teeth, 7 unerupted permanent teeth

Dental Pathology:

Calculus – 2/19 deciduous teeth (64 and 65), slight;

Caries – 1/19 deciduous teeth, small lesions on 75;

Hypoplastic defects 2/19 deciduous teeth, pitting on each, stress at approximately 0.5 years.

Skeletal Pathology: -*Anomalies:* -*Comments:* -**SK13***Age:* Adolescent 14-17 years (epiphyseal fusion)*Sex:* Possible male (pelvis, skull, metrics)*Stature:* no long bones are fused*Skeletal Preservation:* Good. Complete, some fragmentation.*Skeletal Position:* Supine.*Skeletal Attitude:* Extended. Both forearms slightly flexed with hands resting on pubic area.*Orientation:* North/south, head to north.*Associated Skeleton/s:* SK22 and SK23.*Associated Finds:* Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, complete left and right carpals and metacarpals. Manubrium and sternum, twelve left and ten right ribs, vertebrae from C1 to S5, ilia, ischia. Femora, left patella, tibiae, fibulae, incomplete right tarsals and left metatarsals and foot phalanges, complete left tarsals and right metatarsals, four unsided sesamoids.

Dental Inventory:

P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

32 permanent teeth

Dental Pathology:

Calculus -27/32, all except 18, 27, 28, 48, 38, slight to moderate;

Caries – 6/32 (27, 48, 47, 46, 37, 38).

Skeletal Pathology:

Joint disease – mild spinal DJD;

- osteochondritis dissecans of distal right femur, irregular depression on anterior aspect of joint on superior lateral area, measuring 13.43mm superior/inferior by 9.02mm, and 2.68mm in depth;

Metabolic – healed porotic hyperostosis left and right parietals and occipital;

Non-specific infection – healed endocranial vascular bone on occipital;

- active and healed periostitis on left and right tibiae;

- osteomyelitis of left fibula, massive increase in diameter to 42.05m, minimum of three cloacae present on medial aspect of shaft, sinus imprint on surface of lateral aspect of proximal diaphysis of left tibia matching with uppermost cloaca in fibula.

Anomalies: -

Comments: -

SK14

Age: Adult

Sex: Male (cranium and metrics)

Stature: -

Skeletal Preservation: Poor. Very incomplete, excellent preservation.

Skeletal Position: Supine.

Skeletal Attitude: Extended?

Orientation: North/south, head to north.

Associated Skeletons: SK15.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Right clavicle, vertebrae from C1 to C7.

Dental Inventory:

	P	P	P	P	AM	P	P	P	P	P	P	P	P	P	CA
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	AM	AM	P	P	P	P	P	P	P	P	P	P	AM	P	P

26 permanent teeth

Dental Pathology:

Calculus – 26/26, slight to moderate;

Caries – 3/26 (48, 37, 38);

Periodontal disease – moderate 15-26, severe 17, 16, 26-28;

Anomaly – concave wear on incisal edges of 14, 23, 24, 45, 44, 34, 35, indicative of bilateral clay pipe smoking.

Skeletal Pathology:

Joint disease – DJD right shoulder and spine;

Trauma – oblique fracture to left parietal, linear, but not sharp, slight displacement of bone endocranially with faint traces of vascular bone, well-healed.

Anomalies: -

Comments: -

SK15

Age: Adult

Sex: Male (cranium and metrics)

Stature: -

Skeletal Preservation: Poor. Very incomplete, excellent preservation.

Skeletal Position: Supine.

Skeletal Attitude: Extended?

Orientation: North/south, head to north.

Associated Skeleton/s: SK14.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles. Four left and four right ribs, vertebrae from C1 to T5.

Dental Inventory:

AM	P	P	P	P	P	P	P	P	R	P	P	AM	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	P	AM	P	P	P	P	P	P	R	P	P	P	P	P	P

29 permanent teeth

Dental Pathology:

Calculus – 29/29, slight to severe;

Caries – 14/29 (16, 13-11, 22, 26, 48, 47, 45, 31, 32, 34, 36, 37);

Dental abscesses – 3, associated with 18, 31, and 32;

Periodontal disease – moderate 15-28, severe 18-16;

Anomaly – concave wear in incisal edges of 23, 24, 34, 35, indicating unilateral pipe-smoking on the left side.

Skeletal Pathology:

Metabolic – healed porotic hyperostosis on frontal, left and right parietals, and occipital;

Non-specific infection – healed vascular bone on right maxilla, associated with abscess in third molar;

Joint disease – DJD in left and right TMJ, left sterno-clavicular joint, left and right shoulders, spine.

Anomalies: -

Comments: -

SK16

Age: Old Adult 45+ years (auricular ilium)

Sex: Possible Male (pelvis, skull)

Stature: 164.8+/-4.32cm (left radius)

Skeletal Preservation: Poor. Incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended.

Orientation: North/south, head to north.

Associated Skeleton/s: SK17 and SK21.

Associated Finds: -

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae. Sternal fragments, ten left and eight right ribs, vertebrae from C1 to S1 (incomplete thoracic) ilia. Proximal right femur.

Dental Inventory:

P	P	P	PM	PM	PM	P	PM	P	P	R	R	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	PM	P		P		P			P	P	P	P	P	P	CA

22 permanent teeth

Dental Pathology:

Calculus – 19/22, all except 23, 24, 28, slight to moderate;

Caries – 16/22, all except 18, 17, 12, 25, 27, 35;

Periodontal disease – moderate 18-11, 23-27, 48-46, 43, 33, 35-38;

Abscess – 3, associated with 14, 23, 24;

Hypoplastic defects – 2/22, lines on 43 and 33, indicating stress between 3.5-4.5 years.

Skeletal Pathology:

Joint disease – mild spinal DJD with Schmorl's nodes;

Metabolic – healed porotic hyperostosis left and right parietals and occipital;

Non-specific infection – active vascular bone in maxilla at upper left canine and lower right canine and first and second premolars;

- endocranial remodelling vascular bone on occipital and patchy deposits on endocranial of parietals and frontal;

Trauma – hairline fracture to distal epiphysis of left radius.

Anomalies: -

Comments: -

SK17

Age: Juvenile 3-5 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Poor. Quite incomplete, well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended.

Orientation: North/south, head to north.

Associated Skeleton/s: SK16 and SK21.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri. Sternal fragments, nine left and eleven right ribs, incomplete cervical, thoracic, and lumbar vertebrae.

Dental Inventory:

	U	P	P	P	P	PM	PM	PM	P	P	P	U	
	16	55	54	53	52	51	61	62	63	64	65	26	
47	46	85	84	83	82	81	71	72	73	74	75	36	37
U	U	P	P	P	P	P	P	P	P	P	P	U	U

17 erupted deciduous teeth, 6 unerupted permanent teeth

Dental Pathology:

Calculus -3/17, (55, 85, and 75), slight.

Skeletal Pathology: -

Anomalies: -

Comments: -

SK18

Age: Juvenile 2.5-3 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Good. Complete but significant erosion.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK19 and SK20.

Associated Finds: -

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radii, ulnae, incomplete left and right metacarpals and hand phalanges. Sternal fragments, eleven left and twelve right ribs, vertebrae from C1 to S2, ilia, left ischium. Femora, tibiae, fibulae, incomplete left and right metatarsals.

Dental Inventory:

U	U	P	P	P	P	P	P	P			P	P	P	U	U
17	16	55	54	53	52	51	61	62			63	64	65	26	27
47	46	85	84	83	82	81	71	72	32	33	73	74	75	36	37
U	U	P	P	P	P	P	PM	P	U	U	P	P	P	U	U

19 erupted deciduous teeth, 10 unerupted permanent teeth

Dental Pathology:

Calculus – 15/19 deciduous teeth (all except 52, 63, 65, and 83), slight;

Caries – 4/19, (52, 51, 61, 62).

Skeletal Pathology:

Metabolic – cribra orbitalia on right orbit, none on left;

Non-specific infection – slightly remodelled striated bone on distal half of left tibia, none on right.

Anomalies: -*Comments:* -**SK19***Age:* Adult*Sex:* Female (skull and metrics)*Stature:* 148.1+/-3.55cm (right femur and tibia)*Skeletal Preservation:* Good. Almost complete but significant fragmentation.*Skeletal Position:* Supine.*Skeletal Attitude:* Extended. Left arm extended parallel to body, right forearm slightly flexed with hand on pubis.*Orientation:* North/south, head to north.*Associated Skeleton/s:* SK18 and SK20.*Associated Finds:* Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Manubrium, ten left and eleven right ribs, vertebrae from C1 to L5, ilia. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, two unsided sesamoids.

Dental Inventory:

P			P	P	AM	AM	AM	AM	AM	P	P				
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
AM	AM	AM	PM	P	P	P	AM	AM	P	P	P	PM	AM	AM	AM

11 permanent teeth

Dental Pathology:

Calculus – 9/11, all except 18 and 156, slight to moderate;

Caries – 2/I1 (I5, I4);

Periodontal disease – I8, I3-24, 48-38, severe.

Skeletal Pathology:

Joint disease – mild DJD of right TMJ, left and right sternoclavicular joint, left and right shoulders and wrists (osteoarthritis of right), DJD of left and right hands (osteoarthritis of both), left and right knees (osteoarthritis of right), left and right feet (osteoarthritis of both), spine (osteoarthritis);

Trauma – compression fractures to superior body of T₃, T₄, and T₅, no change in body height.

Anomalies: -

Comments: -

SK20

Age: Old Adult 45+ years (pubic symphysis)

Sex: Male (pelvis, skull, metrics)

Stature: 158.7+/-2.99cm (left femur and tibia)

Skeletal Preservation: Poor. Incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK18 and SK19.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, complete left and right carpals and metacarpals, incomplete left and right hand phalanges. One left and four right ribs, vertebrae from C₁ to S₁ (thoracic and lumbar incomplete), ilia, ischia, pubes. Femora, left patella, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, three sesamoids with right foot.

Dental Inventory:

		AM	PM	R	PM	P		P	AM	R	AM	PM	AM	AM	AM
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
AM	AM	AM	P	P	P								AM	AM	AM

6 permanent teeth, plus 3 unidentified lower incisors

Dental Pathology:

Calculus – 7/I0, all except I4, 2I, 23, slight to moderate;

Caries – 5/I0, (I4, 24, 45, 44, 43);

Periodontal disease – severe I6-I3, 2I-28;

Abscess – 2, associated with I5 and I4;

Anomaly – concave wear in I2 and 43, indicative of unilateral pipe smoking on right side of mouth.

Skeletal Pathology:

Joint disease – DJD left and right shoulders, left elbow, left and right wrists, hips, left knee, right foot, spine (osteoarthritis), latter included Schmorl's nodes, kyphosis, and osteoarthritis, lytic foci at margins of joints of left humerus, distal right MT1, and apophyseal joint of C4 (possible rheumatoid arthritis);

Non-specific infection – active and healed periostitis on tibiae, fibulae, calcanei, left and right MT2.

Anomalies: -

Comments: -

SK21

Age: Adult

Sex: Male (pelvis, skull)

Stature: 172.0+/-4.32cm (left radius)

Skeletal Preservation: Poor. Suite incomplete with significant fragmentation and erosion.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK16 and SK17.

Associated Finds: Coffin nails, copper alloy ring.

Bones Present: Incomplete cranium and mandible. Incomplete clavicles, scapulae, humeri, radi, ulnae, incomplete left and right, right metacarpals, and hand phalanges, complete left metacarpals. Shaft fragments of left and right ribs, lumbar vertebral fragments, right ilium, ischia. Femora.

Dental Inventory:

P	P			P	P	P	P	P		P	P	P			P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
AM	AM	P	P	P	P	P	P	P	P	P	R	P	AM	AM	AM

22 permanent teeth

Dental Pathology:

Calculus – 21/22, all except 34, slight to severe;

Caries – 8/22, (18, 28, 46, 45, 44, 33, 34, 35);

Hypoplastic defects – 8/22 (13, 12, 11, 21, 23, 46, 43, 33), indicating multiple stresses between 1 year and 3.5 years;

Periodontal disease – moderate 14-11, severe 48-38.

Skeletal Pathology:

Metabolic – healed porotic hyperostosis left and right parietals;

Joint disease – DJD right TMJ, left and right elbow, right wrist, right hip;

Trauma – healed fractures to distal epiphyses of two right hand phalanges,

- well healed fracture to the neck of the right femur, with inferior displacement of head,

- healed fracture to shaft of the 2nd or 3rd left rib.

Anomalies: -

Comments: Bones are large and robust.

SK22

Age: Adult

Sex: Female (skull, metrics)

Stature: 159.8+/-4.30cm (left ulna)

Skeletal Preservation: Good. Complete, with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK13 and SK23.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals, right metacarpals, and left and right hand phalanges, complete left metacarpals. Manubrium, six left and six right ribs, vertebrae from C1 to L5, fragments of left and right acetabulums. Femora, patellae, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete left and right foot phalanges, three unsided sesamoids.

Dental Inventory:

PM	PM	P	P	P	P	P	P	PM	P	P	P	P	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	
AM	PM	P	P	R	P	P	PM	PM	P	P	P	P	P	P	P	

25 permanent teeth

Dental Pathology:

Calculus – 24/25, all except 44, slight to severe;

Caries – 2/25, (45, 34);

Periodontal disease – slight 15-25, moderate 18-16, 26-28, 38, severe 48-37.

Skeletal Pathology:

Metabolic – healed porotic hyperostosis left and right parietals, occipital, and frontal;

Joint disease – left shoulder, right knee, spine including Schmorl's nodes;

Trauma – healed depressed fracture to left parietal, with displacement of fragment endocranially, and retention of open space measuring 16.7mm anterior/posterior by 5.44mm. The internally displaced fragment measures 29.36 anterior/posterior by 24.95mm;

Non-specific infection – healed vascular bone endocranially on occipital and parietals, and along sagittal suture;

- healed and active periostitis on femora and tibiae.

Anomalies: -

Comments: -

SK23

Age: Juvenile 9-12 years (dentition, long bones are younger)

Sex: -

Stature: -

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left arm extended parallel to body, right forearm slightly flexed with hand over pubis.

Orientation: North/south, head to north.

Associated Skeletons: SK13 and SK22.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radii, ulnae, incomplete left and right carpals, metacarpals, and hand phalanges. Manubrium, sternum fragments, twelve left and twelve right ribs, vertebrae from C1 to S3, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, incomplete left and right tarsals, metatarsals, and foot phalanges.

Dental Inventory:

U	P	P	P	P	P	PM	P	P	P	P	P	P	P	P	PM
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
U	P	P	P	P	P	P	P	P	P	P	P	P	P	P	U

27 erupted and 3 unerupted permanent teeth

Dental Pathology:

Calculus – I5/27, (I6, I4, I3, 2I, 22, 24-26, 46, 42-32, 35, 36), slight.

Skeletal Pathology:

Metabolic – mild cribra orbitalia left orbit, none on right;

Non-specific infection – faintly remodelled endocranial vascular bone on occipital.

Anomalies: -

SK24

Sex: -

Stature: -

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK25, SK29, SK41.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left carpals, right metacarpals, left and right hand phalanges, complete left metacarpals. Sternal fragments, eleven left and twelve right ribs, complete cervical and lumbar vertebrae, incomplete thoracic and sacral vertebrae, ilia, ischia, pubes. Femora, tibiae, fibulae, incomplete left and right tarsals, metatarsals, and foot phalanges.

Dental Inventory: both deciduous and permanent teeth were recovered.

P	P	P	PM		P	P	P	P	PM
55	54	53	52	51	61	62	63	64	65
85	84	83	82				73	74	75
P	P	P	P				PM	P	P

		P			U	U						13 erupted deciduous teeth			
		16			13	12							P	U	
	47	46			43	42	41	31	32	33			36		
	U	P				U	U	U	U	U			P		

4 erupted and 9 unerupted permanent teeth

Dental Pathology:

Calculus – 5/13 deciduous teeth (55, 54, 84, 74, 75), slight;

Caries 1/4 permanent teeth, 26.

Skeletal Pathology:

Non-specific infection – very patchy, sporadic, and remodelling vascular bone on endocranial frontal, left and right parietals, and occipital.

Anomalies: -

Comments: SK24 and SK29 were buried immediately next to each other. On plan, it appears that the two may have been twins, as they were similar in size. SK24 appeared to be marginally larger than SK29 although the ages-at-death of the two were very similar

(2-4 years and 2-3 years respectively). From the osteoarchaeological evidence, it was not possible to either confirm or deny that these individuals were twins.

SK25

Age: Old Adult 45+ years (auricular ilium, pubic symphysis)

Sex: Male (pelvis, skull, metrics)

Stature: 170.9+/-3.27cm (left femur)

Skeletal Preservation: Good. Complete, with some fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left forearm flexed over chest with hand over sternal area, right forearm flexed with hand located just above left pelvis.

Orientation: North/south, head to north.

Associated Skeletons: SK24, SK29, SK41.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Seven left and three right ribs, vertebrae from C1 to S1, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, incomplete left and right tarsals.

Dental Inventory:

	P	P	P	P	P	PM	PM	PM	P	P	P	PM	P		
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35			
PM	PM	P	P	P	P	P	P	P	R	P	P	P			

20 permanent teeth

Dental Pathology:

Calculus – 19/20, all except 32, slight to severe;

Caries – 7/20 (17-15, 23, 24, 26, 32);

Abscess – 1, external associated with 32;

Periodontal disease – moderate 15-25, 46-35, severe 17, 16, 48, 47;

Anomaly – concave wear on 14, 13, 23, 24, 45, 44, 34, 35, indicating bilateral pipe smoker.

Skeletal Pathology:

Metabolic – healed porotic hyperostosis left and right parietals and occipital;

Joint disease – DJD left shoulder, left and right hips, right knee, spine including Schmorl's nodes.

Anomalies: -

Comments: -

SK26

Age: Possible Old Adult 45+ years (xiphoid process and significant AM loss)

Sex: Female (skull, metrics)

Stature: 154.9+/-3.55cm (right femur and tibia)

Skeletal Preservation: Good. Complete, with some fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK27 and SK28.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Sternum fragment, ten left and eleven right ribs, vertebrae from C1 to S5, ilia, ischia. Femora, patellae, tibiae, fibulae, incomplete left and right tarsals, metatarsals, and foot phalanges, two unsided sesamoids.

Dental Inventory:

			P	AM	PM	PM		AM	AM	AM	AM	P			
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
AM	AM	AM	P	AM	AM	AM	AM	AM	P	P	AM	AM	AM	AM	AM

5 permanent teeth

Dental Pathology:

Calculus – 2/5, 15, 25, slight to moderate;

Periodontal disease – severe 48-38.

Skeletal Pathology:

Metabolic – healed porotic hyperostosis left and right parietals and occipital;

- mild cribra orbitalia right orbit, none on left;

Joint disease – mild DJD left elbow, right shoulder, moderate DJD in spine (some associated with trauma), left and right knees, left ankle;

Non-specific infection – healed periostitis left femur, tibiae;

Trauma – compression fractures to superior body of T4, T5, T7, with resulting kyphosis.

Anomalies: -

Comments: Record sheet said skeleton was prone. Photographs indicate a supine burial.

SK27

Age: Juvenile 1-2 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Poor. Mostly complete but significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left forearm slightly flexed with hand over right pelvis, right arm extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK26, SK28.

Associated Finds: -

Bones Present: Cranium and mandible. Clavicles, left scapula, right humerus, radius, ulna, complete left metacarpals, incomplete left and right hand phalanges. Twelve left and ten right ribs, incomplete cervical, thoracic, lumbar, and sacral vertebrae, ilia, ischia, pubes. Femora, tibiae, fibulae, incomplete left and right tarsals, metatarsals, and left and right foot phalanges.

Dental Inventory:

U	P	P		P	P	P	P	P	P	P	U
16	55	54	53	52	51	61	62	63	64	65	26
	85	84	83	82	81	71	72	73	74	75	
	P	P	P	P	P	P	P	P	P	P	

19 erupted deciduous teeth, 2 unerupted permanent teeth

Dental Pathology:

Caries – 6/19 deciduous teeth (55, 54, 65, 85, 84, 74).

Skeletal Pathology: -

Anomalies: -

Comments: -

SK28

Age: Juvenile 3-4 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left arm?, right arm extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK26, SK27.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, complete left and right metacarpals, and incomplete left and right hand phalanges. Manubrium, sternal fragment, twelve left and ten right ribs, complete lumbar vertebrae, incomplete cervical, thoracic, and sacral verbrae, ilia, ischia, pubes. Femora, tibiae, fibulae, incomplete left and right tarsals and metatarsals.

Dental Inventory:

P	P	P	P	P	P	P	P	P	P
55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75
P	P	P	P	PM	P	P	P	P	P

													19 deciduous teeth	
	U	U	U			U	U	U					U	U
	17	16	15			12	11	21					26	27
		46											36	
		U											U	

10 unerupted permanent teeth

Dental Pathology:

Calculus - 7/19 deciduous teeth, slight to moderate.

Skeletal Pathology:

Metabolic – cribra orbitalia left and right orbits.

Anomalies: -

Comments: -

SK29

Age: Juvenile 2-3 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Good. Quite complete but some fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Right forearm slightly flexed with hand on right pelvis.

Orientation: North/south, head to north.

Associated Skeleton/s: SK24, SK25, SK41.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, right radius and ulna, incomplete and unsided hand phalanges. Manubrium, eight left and twelve right ribs, incomplete cervical, thoracic, and sacral vertebrae, complete lumbar vertebrae, ilia, ischia, left pubis. Femora, tibiae, fibulae, incomplete and unsided metatarsals.

Dental Inventory:

	U	P	P	P			P		P	P	P	U
	16	55	54	53	52	51	61	62	63	64	65	26
47	46	85	84	83	82	81	71	72	73	74	75	
	U	U	P	PM	P	P	P	P	P	P	P	

16 erupted deciduous teeth, 2 unerupted permanent teeth

Dental Pathology:

Calculus – 2/16 deciduous teeth, slight.

Skeletal Pathology: -*Anomalies:* -

Comments: SK24 and SK29 were buried immediately next to each other. On plan, it appears that the two may have been twins, as they were similar in size. SK24 appeared to be marginally larger than SK29 although the ages-at-death of the two were very similar (2-4 years and 2-3 years respectively). From the osteoarchaeological evidence, it was not possible to either confirm or deny that these individuals were twins.

SK30

Age: Old Middle Adult 35-45 years (auricular ilium, slightly ambiguous, may be Old Adult)

Sex: Male (pelvis, skull, metrics)

Stature: 172.3+/-3.27cm (left femur)

Skeletal Preservation: Good. Almost complete, some fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Both forearms slightly flexed with hands near pubis.

Orientation: North/south, head to north.

Associated Skeleton/s: In same grave as SK39 and SK40.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, complete left and right metacarpals, incomplete left and right carpals and hand phalanges. Manubrium, ten left and ten right ribs, vertebrae from C1 to S4 and first coccyx, ilia and ischia. Femora and patellae.

Dental Inventory:

P	P	P	P	P	P	P	P	PM	P	P	P	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	P	P	P	P	P	PM	PM	P	P	P	P	R	P	P	P

29 permanent teeth

Dental Pathology:

Calculus – 28/29, all except 35, slight to moderate;

Caries – 2/29, (35, 36, 37);

Periodontal disease – slight 21-23, 46-43, 33-37, moderate 18-11, 24-28;

Abscess – 1, external, associated with 35;

Anomaly – concave wear on 13, 12, and 43, indicating unilateral pipe smoking on right side.

Skeletal Pathology:

Metabolic – porotic hyperostosis on left and right parietals and occipital;

- cribra orbitalia left and right orbits;

Non-specific infection – healing grey porous bone on left mandibular body, associated with dental abscess;

Trauma – right femur, on the midshaft, the linea aspera is very prominent, rising 3mm above the normal surface, probable ossification of muscle tears;

Joint disease – mild DJD left and right shoulders, and spine, including Schmorl's nodes.

Anomalies: -

Comments: Porous bone present at glabella and zygomatics. Prominent muscle markings of pectoralis major, teres major, and deltoid of both humeri.

SK31

Age: Juvenile 10-13 years (dentition and epiphyseal fusion)

Sex: -

Stature: -

Skeletal Preservation: Very poor. Very incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended?

Orientation: North/south, head to north.

Associated Skeleton/s: SK32.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Right clavicle and scapula fragments. Vertebrae from C1 to T1.

Dental Inventory:

U	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	U
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	
U	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	U

28 erupted and 4 unerupted permanent teeth

Dental Pathology:

Calculus – 8/28, (14, 24, 26, 42-32, 34), slight;

Caries – 4/48, (16, 24, 26, 36);

Hypoplastic defects – 10/28, (13, 11, 21, 23, 43-33), one line on each indicating stress between 6 months and 1 year.

Skeletal Pathology:

Metabolic – porotic hyperostosis left and right parietals and occipital;

- mild cribra orbitalia on left orbit, right unobservable;

Non-specific infection – partially remodelled vascular bone on endocranial surface of occipital in particular, also patchy deposits on left and right parietals, and frontal.

Anomalies: -

Comments: -

SK32

Age: Adolescent 13-17 years (epiphyseal fusion)

Sex: Possible female (skull, and slender bones)

Stature: -

Skeletal Preservation: Poor. Very incomplete and relatively well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended.

Orientation: North/south, head to north.

Associated Skeletons: SK31.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri. Manubrium, seven left and seven right ribs, vertebrae from C1 to incomplete thoracic.

Dental Inventory:

U	P	P	P	P	P	P	P	P	P	P	P	P	P	P	PM
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
U	P	P	P	P	P	P	P	P	P	P	P	P	P	P	U

28 erupted, 3 unerupted permanent teeth

Dental Pathology:

Calculus - 15/28, (16, 12, 26, 46-36), slight to moderate;

Caries – 2/28, (26, 27).

Skeletal Pathology: -

Anomalies: -

Comments: There are two intrusive cranial vault fragments with healed endocranial vascular bone.

SK33

Age: Old Middle Adult 35-39 years (auricular ilium, pubic symphysis)

Sex: Male (pelvis, skull, metrics)

Stature: 167.7+/-2.99cm (left femur and tibia)

Skeletal Preservation: Very good. Complete, with some fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Forearms flexed at 90°, with left hand at right elbow and right hand at left elbow.

Orientation: North/south, head to north.

Associated Skeleton/s: SK34, SK37, SK38.

Associated Finds: -

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Manubrium, sternum, twelve left and ten right ribs, vertebrae from C1 to coccyx, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, incomplete left and right tarsals, left metatarsals, left and right foot phalanges, and one unsided sesamoid.

Dental Inventory:

P	P		P	P	P	P	P								
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
U	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

22 erupted and 1 unerupted permanent teeth

Dental Pathology:

Calculus – 22/22. slight to severe;

Caries – 1/22, small lesion on 38;

Periodontal disease – slight I5-II, 48-38.

Skeletal Pathology:

Joint disease – mild spinal DJD;

Trauma – 2 hairline fractures on left calcaneus.

Anomalies: -

Comments: -

SK34

Age: Juvenile 2-4 years (dentition and long bones)

Sex: -

Stature: -

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK33, SK38, SK38. Head over legs of SK37.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right metacarpals, and hand phalanges. Sternal fragments, eleven left and eleven right ribs, incomplete cervical, thoracic, lumbar, and sacral vertebrae, ilia, ischia, pubes. Femora, tibiae, fibulae, incomplete left tarsals, left and right metatarsals, and left and right foot phalanges.

Dental Inventory:

	U	U	P	P	P	P	PM	P	P	P	P	P	U	U	
	17	16	55	54	53	52	51	61	62	63	64	65	26	27	
	47	46	85	84	83	82	81	71	72	73	74	75	36	37	
	U	U	P	P	P	P	P	P	P	P	P	P	U	U	

19 erupted deciduous teeth, 8 unerupted permanent teeth

Dental Pathology:

Calculus – 10/19 deciduous teeth, (55-53, 65, 85, 83-82), slight.

Skeletal Pathology: -

Anomalies: -

Comments: -

SK35

Age: Juvenile 5-6 years (dentition, long bones indicate younger age of 4-4.5 years)

Sex: -

Stature: -

Skeletal Preservation: Very poor. Very incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended?

Orientation: North/south, head to north.

Associated Skeleton/s: SK36.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Right clavicle, scapula, humeri, right radius and ulna. Three right ribs, incomplete cervical vertebrae.

Dental Inventory:

P	P	P					P	P	P
55	54	53					63	64	65
85	84	83					73	74	75
P	P	P					P	P	P

12 erupted deciduous teeth

	U	P				PM	PM		E	U	U		P	U	
	17	16				12	11		22	23	24		26	27	
48	47	46				42	41	31	32	33			36	37	
	U	P				E	E	E	E	U			P	U	

11 erupting/erupted and 7 unerupted permanent teeth

Dental Pathology:

Calculus – 6/12 deciduous teeth, (55, 54, 65, 84, 74, 75), slight, 3/11 permanent teeth, (47, 41, 42), slight;

Caries – 1/12 deciduous teeth (84).

Skeletal Pathology:

Non-specific infection – faint, remodelled grey porous bone on endocranial surface of frontal, around crista frontalis.

Anomalies: -

Comments: -

SK36

Age: Juvenile 10-13 years (dentition)

Sex: -

Stature: -

Skeletal Preservation: Very poor. Very incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended?

Orientation: North/south, head to north.

Associated Skeleton/s: SK35.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, right scapula. Two left and one right rib, vertebrae from C1 to T1.

Dental Inventory:

U	P	P	P		P	P		P	P	P	P	P	P	P	U
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
	P	P	P	P	P	P	P	P	P	P	P	P	P	P	

26 erupted and 2 unerupted permanent teeth

Dental Pathology:

Calculus – 26/26, slight to moderate.

Skeletal Pathology:

Non-specific infection – partly remodelled grey vascular bone on endocranial surface of occipital and patchy deposits on left frontal. None on right frontal.

Anomalies: -

Comments: Metopic suture.

SK37

Age: Juvenile 2-3 years (dentition)

Sex: -

Stature: -

Skeletal Preservation: Poor. Quite incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended.

Orientation: North/south, head to north.

Associated Skeleton/s: SK33, SK34, SK38.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, left scapula, radi, left ulna. Manubrium, four left and eight right ribs, incomplete cervical, thoracic, and sacral vertebrae, ilia, right pubis. Femora, tibiae, fibulae.

Dental Inventory:

U	P	P	P	P	P	P	P	PM	P	P	
16	55	54	53	52	51	61	62	63	64	65	
46	85	84	83	82	81	71	72	73	74	75	36
U	P	P	P	PM	PM	PM	P	PM	P	P	U

15 erupted deciduous teeth, 3 unerupted permanent teeth

Dental Pathology:

Calculus – 1/15 deciduous teeth, (65), slight.

Skeletal Pathology: -*Anomalies:* -

Comments: -

SK38

Age: Juvenile 4-5 years (dentition, long bones indicate 2.5-3 years)

Sex: -

Stature: -

Skeletal Preservation: Poor. Incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended.

Orientation: North/south, head to north.

Associated Skeleton/s: SK33, SK34, SK37.

Associated Finds: -

Bones Present: Most bones quite incomplete. Cranium and mandible. Clavicles, scapulae, right humerus, radius, ulna, incomplete left and right metacarpals and hand phalanges. Eight left and six right ribs, incomplete cervical, thoracic, lumbar, and sacral vertebrae, ilia, right ischium. Incomplete femora, right tibia and fibula, incomplete left and right tarsals, metatarsals, and foot phalanges.

Dental Inventory:

P	P	P	P	P	P	P	P		P
55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75
P	P	P	P	PM	PM	P	P	P	P

	U	U	U		U	U	U	U	U	U		U	U		
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
		46	45	44	43								36		
		U	U	U	U								U		

17 deciduous teeth

16 unerupted permanent teeth

Dental Pathology:

Calculus – 10/17 deciduous teeth, (55-53, 65, 85, 84, 82, 73-75), slight to moderate;

Caries – 7/17 deciduous teeth, (54-52, 62, 63, 84, 83).

Skeletal Pathology:

Non-specific infection – faint traces of remodelled vascular bone on endocranial surface of occipital.

Anomalies: -

Comments: -

SK39

Age: Old Middle Adult 35-39 years (auricular ilium)

Sex: Female (pelvis, skull, metrics)

Stature: 152.4+/-3.72cm (right femur)

Skeletal Preservation: Poor. Incomplete with significant fragmentation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Forearms flexed at approximately 90°, with arms crossed over each other on the torso.

Orientation: North/south, head to north.

Associated Skeletons: SK30, SK40.

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals, right metacarpals, and left and right hand phalanges, complete left metacarpals. Eight left and five right ribs, vertebrae from C1 to S1, ilia, left ischium. Femora, patellae.

Dental Inventory:

P	P	AM	P	P	P	P	P	P	P	P	P	P	P	P	P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	P	AM	P	P	P	P	P	P	PM	P	P	P	P	AM	AM

26 permanent teeth

Dental Pathology:

Calculus – 26/26, slight to moderate;

Caries – 8/26, (18, 17, 27, 48, 47, 44, 43, 33);

Periodontal disease – slight 35, 36, 48, severe 18-11, 23-28, 47-32, 37, 38.

Skeletal Pathology:

Joint disease – DJD left and right shoulder, spine, including Schmorl's nodes.

Anomalies: -

Comments: -

SK40

Age: Adult

Sex: Possible female (very slender)

Stature: -

Skeletal Preservation: Very poor. Very incomplete with significant fragmentation and erosion.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Right arm extended parallel to body.

Orientation: North/south, head to north.

Associated Skeletons: SK39., SK48.

Associated Finds: Coffin nails.

Bones Present: Incomplete humeri, radi, ulnae, incomplete left and right carpals, metacarpals, and hand phalanges. Unsided rib shaft fragments, incomplete lumbar fragments. Incomplete femora, right patella, tibiae, fibulae.

Dental Inventory: -

Dental Pathology: -

Skeletal Pathology: -

Anomalies: -

Comments: -

SK41

Age: Infant 6-12 months (dentition)

Sex: -

Stature: -

Skeletal Preservation: Poor. Quite incomplete with significant fragmentation and erosion.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: SK24, SK25, SK29.

Associated Finds: Coffin nails.

Bones Present: All bones incomplete. Cranium and mandible. Clavicles, right scapula, humeri, right radius, ulnae, incomplete left and right metacarpals and hand phalanges. Nine left and eight right ribs, incomplete cervical and thoracic vertebrae, incomplete ilia. Femora, left tibia, right fibula.

Dental Inventory:

	U			E	E	E	PM	U	PM
55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75
U	U	U	U	E	E	U	U	U	U

5 erupting and 10 unerupted deciduous teeth

Dental Pathology: -

Skeletal Pathology: -

Anomalies: -

Comments: Porous bone on endocranial frontal appears to be a combination of normal growth and post-mortem erosion.

SK42

Age: Old Middle Adult 35-44 years (auricular ilium, pubic symphysis)

Sex: Probable female (pelvis slightly ambiguous, female skull and metrics)

Stature: 158.3+/-3.55cm (left femur and tibia)

Skeletal Preservation: Very good. Complete, with some fragmentation, no erosion.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeletons: -

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radii, ulnae, incomplete left and right carpals, metacarpals, and hand phalanges. Manubrium, nine left and eight right ribs, vertebrae from C1 to S2, ilia, ischia, pubes. Femora, patellae, tibiae, fibulae, incomplete left and right tarsals and foot phalanges, complete left and right metatarsals.

Dental Inventory:

P			P	P	P	P	P	P	P	P	P	P	P		P
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
P	AM	AM	AM	PM	PM	P	P	P	P	P	R	P	AM	AM	P

22 permanent teeth

Dental Pathology:

Calculus – 16/22, (all except 18, 21, 48, 34, 35, 38), slight to moderate;

Caries – 16/22, (all except 13, 11, 22-25);

Abscess – 2, large external abscess associated with 44/45, moderate external abscess associated with 21;

Periodontal disease – moderate 32, 33, severe 15-26, 48-31, 34-38.

Skeletal Pathology:

Metabolic disease – healed porotic hyperostosis left and right parietals and occipital;

Joint disease – mild DJD left and right knees, spine, including Schmorl's nodes;

Non-specific infection – healed striated bone on tibiae;

Trauma – well-healed fracture to distal metaphysis of left radius, with slight misalignment of interior portion to posterior, with shortening of overall bone by approximately 10.5mm,

– spondylolysis of L5;

Anomalies: -

Comments: -

SK43

Age: Old Middle Adult 35-39 years (auricular ilium)

Sex: Female (pelvis, skull, metrics)

Stature: 161.1+/-3.55cm (left femur and tibia)

Skeletal Preservation: Very good. Complete and well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Arms extended parallel to body.

Orientation: North/south, head to north.

Associated Skeletons: -

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left carpals and left and right metacarpals and hand phalanges. Manubrium, sternum, twelve left and twelve right ribs, vertebrae from C1 to S4, ilia, ischia, right pubis. Femora, patellae, tibiae, fibulae, incomplete left and right tarsals and left metatarsals.

Dental Inventory:

CA	P	P	P	P	P	P	PM	P	PM	P	P	P	P	P	CA
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
		P	PM	P	P	PM	P	P	P	P	P	P	P	P	P

24 permanent teeth

Dental Pathology:

Calculus – 23/24, all except 12, slight to moderate;

Caries - 3/24, (17, 16, 46);

Abscess – 1, external abscess associated with 17;

Periodontal disease – slight 16-28, 46-44, 34-38, moderate 43-33.

Skeletal Pathology:

Joint disease – mild DJD left shoulder, left and right elbow, left knee.

Anomalies: -

Comments: -

SK44

Age: Juvenile 7-8 years (long bones)

Sex: -

Stature: -

Skeletal Preservation: Poor. Suite incomplete, excellent preservation.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Right arm extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: -

Associated Finds: -

Bones Present: right radius and ulna, incomplete right carpals and hand phalanges, complete right metacarpals. Right ilium, left ischium. Femora, tibiae, fibulae, complete left and right tarsals and metatarsals, incomplete right hand phalanges.

Dental Inventory: -

Dental Pathology: -

Skeletal Pathology: -

Anomalies: -

Comments: -

SK45

Age: Adult

Sex: Male (metrics)

Stature: -

Skeletal Preservation: Poor. Quite incomplete, bones relatively complete but fragmentary.

Skeletal Position: Supine.

Skeletal Attitude: Extended.

Orientation: North/south, head to north.

Associated Skeleton/s: SK46.

Associated Finds: Coffin nails.

Bones Present: Femora, patellae, tibiae, fibulae, complete left tarsals, incomplete right tarsals, and left and right metatarsals and foot phalanges, one unsided sesamoid.

Dental Inventory: -

Dental Pathology: -

Skeletal Pathology:

Joint disease – left and right knees, left ankle and foot;

Non-specific infection – active and healed periostitis on tibiae and right MT2;

Trauma – hairline fracture on left talus;

- distal head of left MT2 is flattened, may be healed compression fracture.

Anomalies: -

Comments: -

SK46

Age: Juvenile 1.5-2 years (long bones)

Sex: -

Stature: -

Skeletal Preservation: Poor. Very incomplete, excellent preservation.

Skeletal Position: Supine.

Skeletal Attitude: Extended.

Orientation: North/south, head to north.

Associated Skeleton/s: SK45.

Associated Finds: Coffin nails.

Bones Present: Right ulna, unsided metacarpal and hand phalanges. Vertebrae from L4 to S3, right ilium, left ischium, pubes. Femora, tibiae, fibulae, incomplete left and right tarsals, and unsided metatarsal.

Dental Inventory: -

Dental Pathology: -

Skeletal Pathology: -

Anomalies: -

Comments: -

SK47

Age: Old Middle Adult 35-39 years (auricular ilium)

Sex: Male (pelvis, skull, metrics)

Stature: 175.9+/-3.27cm (left femur)

Skeletal Preservation: Good. Incomplete but well preserved.

Skeletal Position: Supine.

Skeletal Attitude: Extended. Left forearm slightly flexed with hand over pubis, right arm extended parallel to body.

Orientation: North/south, head to north.

Associated Skeleton/s: -

Associated Finds: Coffin nails.

Bones Present: Cranium and mandible. Clavicles, scapulae, humeri, radi, ulnae, incomplete left and right carpals and hand phalanges, complete left and right metacarpals. Four left and seven right ribs, vertebrae from C1 to S1, ilia, ischia. Femora, patellae.

Dental Inventory:

P	P	P	P	P	P	P	PM	P	P	P	P	P	AM	AM	AM
18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38
AM	AM	P	P	P	P	AM	AM	P	AM	P	P	P	PM	P	AM

21 permanent teeth

Dental Pathology:

Calculus – 21/21, slight to moderate, subgingival;

Caries – 2/21, (45, 37);

Periodontal disease – moderate 16-25, severe 18, 17, 26-28, 48-38;

Anomaly – concave wear in 22, 23, 33, 34, indicating unilateral pipe smoking on left side.

Skeletal Pathology:

Metabolic – healed porotic hyperostosis left and right parietals and occipital;

Non-specific infection – healed porous bone on right maxilla, associated with periodontal disease;

Joint disease – right sternoclavicular, left and right shoulders, elbows, hips, knees, spine;

Trauma – partially healed fractures to three right ribs.

Anomalies:

- Styloid of left MC3 is detached, and an additional hunch-back bone is present with the hand;

- attachments of fibrous flexor sheaths are very prominent in the left hand phalanges, less so on right. Up to 2mm in height in the left phalanges. May relate to anomaly mentioned above.

Comments: -**SK48***Age:* Infant (age at death not determined, not a neonate)*Sex:* -*Stature:* -*Skeletal Preservation:* Very poor. Incomplete but relatively well preserved.*Skeletal Position:* Undetermined.*Skeletal Attitude:* Undetermined.*Orientation:* Undetermined.*Associated Skeleton/s:* SK39, SK40.*Associated Finds:* -*Bones Present:* 1 right rib, 6 rib shaft fragments, 2 left and 1 right lumbar arch, 7 left and 1 right thoracic arch, coracoid of left scapula, 1 proximal and 2 intermediate hand phalanges.*Dental Inventory:* -*Dental Pathology:* -*Skeletal Pathology:* -*Anomalies:* -

Comments: The remains of this individual were recovered in a disarticulated state with the highly disturbed remains of SK40. It is probably that SK40, a female adult, was buried with an infant (not a neonate, but less than 1 year), and that both burials were severely truncated by later activity. The cranial vault fragments of a young juvenile (1-6 years) were also recovered. They do not appear to be from the same individual as SK48 (infant), but no other bones of this individual were recovered.

6.1.1 Summary of Ages-at-death, Sex, and Stature

SK	Age	Age2	Age3	Sex	Height (cm)
1	Adult	Old Adult	45+ years	Female	158.7
2	Adult	Young Middle Adult	25-35 years	Male	165.3
3	Adult	Young Adult	17-25 years	Female	161.9
4	Adult	Old Middle Adult	35-44 years	Male	183.9
5	Adult	Adult		Male	
6	Adult	Young Adult	17-20 years	Male	
7	Adult	Adult		Male	
8	Juvenile	Adolescent	15-17 years	Female	
9	Adult	Old Adult	45+ years	Female	146.3
10	Juvenile	Juvenile1	1.5-2 years		
11	Adult	Old Middle Adult	35-40 years	Female	151.7
12	Juvenile	Juvenile1	2-3 years		
13	Juvenile	Adolescent	14-17 years		
14	Adult	Adult		Male	
15	Adult	Adult		Male	
16	Adult	Old Adult	45+ years	Male	164.8
17	Juvenile	Juvenile1	3-5 years		
18	Juvenile	Juvenile1	2.5-3 years		
19	Adult	Adult		Female	148.1
20	Adult	Old Adult	45+ years	Male	158.7
21	Adult	Adult		Male	172.0
22	Adult	Adult		Female	159.8
23	Juvenile	Juvenile2	9-12 years		
24	Juvenile	Juvenile1	2-4 years		
25	Adult	Old Adult	45+ years	Male	170.9
26	Adult	Possible Old Adult	45+ years	Female	154.9
27	Juvenile	Juvenile1	1-2 years		
28	Juvenile	Juvenile1	3-4 years		
29	Juvenile	Juvenile1	2-3 years		
30	Adult	Old Middle Adult	35-45 years	Male	172.3
31	Juvenile	Juvenile2	10-13 years		
32	Juvenile	Adolescent	13-17 years	Female	
33	Adult	Old Middle Adult	35-39 years	Male	167.7
34	Juvenile	Juvenile1	2-4 years		
35	Juvenile	Juvenile1	5-6 years		
36	Juvenile	Juvenile2	10-13 years		
37	Juvenile	Juvenile1	2-3 years		
38	Juvenile	Juvenile1	4-5 years		
39	Adult	Old Middle Adult	35-39 years	Female	152.4
40	Adult	Adult		Female	
41	Juvenile	Infant	6-12 months		
42	Adult	Old Middle Adult	35-44 years	Female	158.3
43	Adult	Old Middle Adult	35-39 years	Female	161.1
44	Juvenile	Juvenile2	7-8 years		
45	Adult	Adult		Male	
46	Juvenile	Juvenile1	1.5-2 years		
47	Adult	Old Middle Adult	35-39 years	Male	175.9
48	Juvenile	Infant			

6.2 Metrics

6.2.1 Adult Cranial Metrics (mm)

Abbreviations based on Buikstra & Ubelaker (1994)

SK	1	2	3	4	5	6	7	9	11	14	15
g-op	-	-	-	-	-	-	197	-	-	-	193
eu-eu	-	-	-	-	-	-	142	-	-	-	-
ba-b	-	-	-	-	-	-	-	-	-	-	140
ect-ect	-	58.01	-	-	-	-	-	-	-	58.23	-
pr-alv	-	46.76	-	-	-	-	-	-	-	-	-
au-au	-	-	-	-	-	-	-	-	-	-	115.55
ft-ft	91.13	-	-	-	-	-	87.06	-	95.65	-	91.72
n-pr	-	-	-	-	-	-	-	-	-	-	-
fmt-fmt	102.08	-	-	-	-	-	94.85	-	99.94	-	102.5
n-ns	-	-	-	-	-	-	-	-	-	-	-
al-al	-	-	-	-	-	-	-	-	-	-	-
Orb.H	-	-	-	-	-	-	-	-	-	-	-
d-ec	-	-	-	-	-	-	-	-	-	-	-
id-gn	36.34	28.18	-	-	-	32.84	32.6	30.52	25.66	34.19	35.27
go-go	92.09	89.32	-	-	95.65	86.6	-	-	87.57	106.7	95.56
Mand.L	71.27	77.24	-	-	68.99	73.09	-	-	72.87	78.57	83.07

SK	16	19	20	21	22	25	26	30	33	39	40
g-op	-	-	-	-	-	-	-	-	-	-	-
eu-eu	-	-	-	-	-	-	-	-	-	-	-
ba-b	-	-	-	-	-	-	-	-	-	-	-
ect-ect	-	-	-	-	-	-	-	-	-	-	-
pr-alv	-	-	-	-	-	-	-	-	-	-	-
au-au	-	-	-	-	-	-	-	-	-	-	-
ft-ft	-	-	-	-	93	-	95.02	-	-	-	-
n-pr	-	-	-	-	-	-	-	-	-	-	-
fmt-fmt	-	-	-	-	97.58	-	101.83	-	-	-	-
n-ns	-	-	-	-	-	-	-	-	-	-	-
al-al	-	-	-	-	-	-	-	-	-	-	-
Orb.H	-	-	-	-	-	-	-	-	-	-	-
d-ec	-	-	-	-	-	-	-	-	-	-	-
id-gn	-	25.45	-	28.53	24.26	36.32	22.63	-	30.83	-	-
go-go	-	90.53	-	-	95.49	103.26	-	105.92	-	96.42	-
Mand.L	-	71.15	-	-	72.99	-	-	69.33	-	71.08	-

SK	42	43	45	47						
g-op	-	192	-	-						
eu-eu	-	132	-	-						
ba-b	-	130	-	-						
ect-ect	-	58.7	-	-						
pr-alv	-	50.37	-	-						
au-au	-	117.43	-	-						
ft-ft	-	99.68	-	95.6						
n-pr	-	70.43	-	-						
fmt-fmt	-	105.11	-	103.28						

SK	42	43	45	47						
n-ns	-	53.02	-	-						
al-al	-	23.71	-	-						
Orb.H	-	34.83	-	-						
d-ec	-	39.62	-	-						
id-gn	30.39	31.9	-	35.69						
go-go	103.61	-	-	117.11						
Mand.L	70.81	-	-	80.11						

6.2.2 Adult Post-Cranial Metrics (mm)

SK	1		2		3		4		5		6	
	left	right	left	right	left	right	left	right	left	right	left	right
HuL1	302	-	-	315	-	307	-	-	-	-	-	-
RaL1	225	227	241	-	231	-	-	-	-	-	-	-
UuL1	242	250	-	-	249	-	-	-	-	-	-	-
FeL1	420	419	437	425	429	430	504	498	-	-	-	-
FeD1	25.75	25.22	26.04	28.72	24.25	23.99	30.91	29.92	-	-	-	-
FeD2	32.5	33.43	31.57	31.97	34.19	34.45	37.69	38.51	-	-	-	-
FeE1	-	77.55	74.47	74.95	76.12	76.45	-	82.64	-	-	-	-
TiL1	-	340	348	340	353	-	424	417	-	-	-	-
TiD1	33.11	33.02	33.39	34.06	34.2	36.08	37.84	39.26	-	-	-	-
TiD2	20.91	21.87	24.53	25.05	23.9	26.13	30.43	30.18	-	-	-	-
TiE1	71.01	70.73	71.87	71.92	70.76	71.61	77.32	78.8	-	-	-	-
FiL1	333	327	-	330	-	337	410	-	-	-	-	-

SK	7		9		11		14		15		16	
	left	right	left	right	left	right	left	right	left	right	left	right
HuL ₁	-	-	-	-	269	277	-	-	-	-	-	-
RaL ₁	-	-	-	-	-	-	-	-	-	-	227	-
UuL ₁	-	-	-	-	-	-	-	-	-	-	247	-
FeL ₁	-	-	-	-	-	-	-	-	-	-	-	-
FeD ₁	-	-	23.60	-	23.16	22.78	-	-	-	-	-	-
FeD ₂	-	-	29.65	-	26.45	28.01	-	-	-	-	-	-
FeE ₁	-	-	-	-	-	-	-	-	-	-	-	-
TiL ₁	-	-	-	-	311	-	-	-	-	-	-	-
TiD ₁	-	-	31.59	-	28.77	28.2	-	-	-	-	-	-
TiD ₂	-	-	20	-	20.11	18.68	-	-	-	-	-	-
TiE ₁	-	-	-	-	64.76	-	-	-	-	-	-	-
FiL ₁	-	-	296	-	-	311	-	-	-	-	-	-

SK	19		20		21		22		25		26	
	left	right	left	right	left	right	left	right	left	right	left	right
HuL ₁	279	281	300	-	-	-	-	-	327	-	-	-
RaL ₁	203	-	-	-	246	250	-	-	245	245	-	223
UuL ₁	221	-	-	-	-	271	239	-	-	270	-	243
FeL ₁	-	378	414	416	-	-	-	-	460	463	-	406

FeD ₁	22.21	22.45	28.13	29.02	30.81	29.98	25.24	26.47	26.19	25.75	25.59	26.37
FeD ₂	33.11	33.91	35.74	35.43	36.61	35.92	33.04	32.68	35.15	35.68	32.21	32.58
FeE ₁	-	-	79.13	-	-	-	-	-	-	-	--	-
TiL ₁	-	305	320	-	-	-	-	-	-	-	325	326
TiD ₁	30.77	31.53	33.47	33.11	-	-	30.46	29.79	36.72	38.42	32.69	33.09
TiD ₂	20.5	20.61	18.28	19.96	-	-	22.13	22.15	27.67	29.58	22.4	22.29
TiE ₁	-	-	78.07	-	-	-	-	-	-	-	67.79	67.67
FiL ₁	-	-	-	-	-	-	-	-	-	-	-	323

SK	30		33		39		40		42		43	
	left	right	left	right	left	right	left	right	left	right	left	right
HuL ₁	341	338	-	333	-	-	-	-	-	-	296	305
RaL ₁	-	250	-	240	-	-	-	-	-	227	223	-
UIL ₁	-	270	-	259	-	-	-	-	236	240	-	243
FeL ₁	466	472	450	444	-	398	-	-	411	409	424	424
FeD ₁	27.7	27.06	24.52	25.5	21.34	22.14	-	-	26.36	25.39	25.7	25.56
FeD ₂	32.49	34.18	35.47	33.5	31.85	31.84	-	-	31.63	32.76	31.02	31.4
FeE ₁	-	83.88	81.53	81.76	-	-	-	-	67.82	69.06	-	-
TiL ₁	-	-	353	-	-	-	-	-	345	-	352	354
TiD ₁	-	-	36.3	37.24	-	-	-	-	29.76	29.75	36.17	37.15
TiD ₂	-	-	24.11	23.87	-	-	-	-	21.14	20.34	24.04	25.78
TiE ₁	-	-	75.63	-	-	-	-	-	63.57	64.29	-	-
FiL ₁	-	-	-	-	-	-	-	-	-	-	-	-

SK	45		47	
	left	right	left	right
HuL ₁	-	-	331	332
RaL ₁	-	-	-	244
UIL ₁	-	-	-	267
FeL ₁	-	-	481	478
FeD ₁	-	-	28.5	30.13
FeD ₂	-	-	34	35.07
FeE ₁	-	82.02	82.2	83.2
TiL ₁	-	-	-	-
TiD ₁	29	26.77	-	-
TiD ₂	23.24	22.55	-	-
TiE ₁	78.97	-	-	-
FiL ₁	-	-	-	-

6.2.3 Juvenile Post-Cranial Metrics (mm)

Sk	8*		10		12		13*		17		18	
			left	right	left	right	left	right	left	right	left	right
HuL ₁	-	284	121.97	122.74	-	-	317	-	157	-	-	146
RaL ₁	-	-	88.78	89.38	-	-	-	-	-	-	-	-
UuL ₁	-	230	-	99.65	-	-	275	-	-	-	-	-
FeL ₁	-	-	163	162	-	-	-	426	-	-	-	-
TiL ₁	-	-	126	128	-	-	-	-	-	-	-	-
FiL ₁	-	-	-	126	-	-	-	-	-	-	-	-

* measurements include epiphyses

Sk	23		24		27		28		29		31	
	left	right	left	right	left	right	left	right	left	right	left	right
HuL ₁	233	235	160	-	109	-	158	160	-	-	-	-
RaL ₁	171	172	-	118	-	-	113	113	-	-	-	-
UuL ₁	-	192	129	130	-	-	125	125	-	114.44	-	-
FeL ₁	326	-	220	217	-	-	215	215	192	195	-	-
TiL ₁	253	252	169	168	108	-	167	166	146	148	-	-
FiL ₁	-	-	-	162	-	100	164	165	-	-	-	-

Sk	32		34		35		36		37		38	
	left	right	left	right	left	right	left	right	left	right	left	right
HuL ₁	-	-	143	144	-	164	-	-	-	-	-	144
RaL ₁	-	-	100	-	-	-	-	-	-	-	-	104.17
UuL ₁	-	-	109	-	-	-	-	-	-	-	-	116.52
FeL ₁	-	-	191	191	-	-	-	-	-	-	-	-
TiL ₁	-	-	146	-	-	-	-	-	-	-	-	-
FiL ₁	-	-	144	-	-	-	-	-	-	-	-	-

Sk	41		44		46		48	
	left	right	left	right	left	right	left	right
HuL ₁	-	-	-	-	-	-	-	-
RaL ₁	-	-	-	161	-	-	-	-
UuL ₁	-	-	-	176	-	-	-	-
FeL ₁	-	-	311	311	166	164	-	-
TiL ₁	-	-	249	247	134	134	-	-
FiL ₁	-	-	244	244	-	133	-	-