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The Biological Anthropology of Diversity: Interdisciplinary Approaches to Migration and Ancestry in Roman Britain

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Abstract

There are many different strands of evidence to consider when reconstructing migration and diversity in past societies. These include–but are not limited to–physical or genetic expressions of ethnicity, stable isotopic evidence for the movement of individuals, and written or artistic indications of geographical or ethnic origin. This dissertation will explore all the different facets of diversity in Roman Britain, all within the context of conquest and imperialism.

First, the concerns of using cranial phenotypic variation as a means of biological distance analysis are addressed by proposing an approach that is diversity-driven, rather than classification-driven. This model, which employs K-means cluster analysis based upon Euclidean distance, is used to explore the phenotypic diversity and, therefore, the visually recognizable diversity at the Lankhills Late-Roman Cemetery, the Poundbury Roman Camp, the Ancaster Late-Roman Cemetery, and the Baldock "California" Cemetery. Next, previously collected stable migratory isotope data, namely $\delta^{18}O_p$, $^{87}Sr/^{86}Sr$, $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$, from several studies are combined and re-evaluated to explore the extent of migration to Roman Britain, specifically at Lankhills Late-Roman Cemetery and the Gloucester London Road Cemetery, as well as several Roman cemeteries in York, Catterick, and London. Then, all known inscriptions throughout Roman Britain that denote people of foreign or indigenous origins are compiled using data from volumes I and III of *Roman Inscriptions of Britain* (Collingwood and Wright 1965, 2010).

Finally, all of these strands of evidence are combined and put within the context of Roman primary sources and provincial responses to Roman conquest in order to better understand the experience of diversity for conquered people within the Roman Empire. Ultimately, it is clear that diversity is well-attested both biologically and archaeologically in Roman Britain, and that the willingness to display one's diversity appears not to have been hampered despite Roman discrimination against provincials.

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Chapter 1

Introduction

Evidence of migration and the resulting diversity are essential components in understanding the structure of a population, as well as the experiences of the people within it. The majority of research on migration and diversity has focused on the presence or absence of supporting data and is generally limited to one or two types of data. For instance, some studies focus only on stable isotopic data to confirm whether or not migrants were present in the population. Other studies are primarily concerned with epigraphic evidence of individuals stating their foreign origins. As a result, many studies are concerned with whether or not migration occurred, but not always concerned with how this affected the lives of people in the past. Overall, there is a general disconnect between studying migration and studying diversity, despite the fact that they are intrinsically interconnected. The purpose of this study is to investigate new and pre-existing data further and to combine different forms of data to interpret migration and diversity as interrelated concepts and to treat these concepts as experiences, not occurrences, using examples from the Roman period in Britain.

1.1 Aims and Objectives

The primary objective of this study is to better understand the significance of diversity within Roman Britain by combining migratory data with evidence of foreign identities, and putting these results into context by using Roman primary sources that are contemporary with those populations from which the data derived. Because of the interdisciplinary nature of migration and diversity research, there are many different strands of evidence to consider. These include craniometric variation, stable isotopic variation, epigraphic evidence of foreign identities, evidence of foreign dress, evidence of foreign material culture, and, finally, evidence of attitudes towards foreigners in Roman primary sources. The fundamental research questions that will facilitate this goal are:

1. What are the demographics of the population at each site? How do we define differences within a demographic from using both osteological techniques and archaeological analysis?

2. How can craniometric variation speak to the level of diversity within a population without attempting to classify individuals into known populations?

3. What do previous studies on migratory isotopes tell us about the demographics of the population in question? Does this support the level of diversity interpreted from the cranial data?

4. Does the archaeological evidence, specifically that pertaining to expressions of foreignness (such as evidence of dress, epigraphs, and other material culture), support the level of diversity suggested by both the isotopic and the craniometric data?

5. How can these different types of data be combined to determine the significance of their interrelationships?

Rather than allowing the methods to determine the research objectives, these questions are designed to explore the strengths and the limitations of each method to create a balanced interdisciplinary study. This will be achieved by combining phentoypic variation, isotopic measures of migration, and epigraphic displays of foreign or indigenous identities. Phenotypic variation will be explored using the cranial metric traits of skeletal material from five cemeteries in Roman Britain: the late-Roman cemetery at Lankhills (Clarke 1979; Booth et al. 2010; Stuckert 2017), the Roman cemetery at Ancaster (Cox 1989), the cemetery at number 3 Driffield Terrace in York (Tucker 2005, data collected by Dr. Anwen Caffell for York Osteoarchaeology Ltd.), the Poundbury Roman cemetery in Dorset (Farwell and Molleson 1993, data collected by Dr. Richard Wright for the Natural History Museum of London), and the “California” cemetery in Baldock (Burleigh and Fitzpatrick-Matthews 2010; Caffell and Holst 2015). These traits will be analyzed using exploratory multivariate statistics, rather than traditional classification methods. Next, migration will be explored by combining the data from seven different previously published studies of Romano-British sites: Lankhills (two studies), Gloucester, Catterick, York (three studies), and London (Evans et al. 2006; Eckardt et al. 2009; Leach et al. 2009; Chenery et al. 2010; Chenery et al. 2011; Montgomery et al. 2011; Muldner et al. 2011; Shaw et al. 2016), all of which generated isotopic data for oxygen, strontium, and lead. These results will be combined, compared, and contrasted in new ways to better understand the full extent of possible conclusions.

Then, epigraphic data detailing all the inscriptions across Roman Britain that imply the geographic, ancestral, and ethnic origins of dedicators or subjects will be used to better understand written expressions of personal and group ethnic identities. These results will be combined and compared with the phenotypic and isotopic data in order to explore if expressions of diversity were as widespread as biological and geographic diversity. Finally, all of these strands will be evaluated through the lens of primary source material, which shows a great deal of discrimination against provincial people on the part of Roman elites. By exploring diversity in this context, conclusions will be drawn about the experience of migration and diversity for people living in Roman Britain.

1.2 Important definitions

There are several important terms that will be used throughout this dissertation, the definitions of which are essential to understanding the aims and results of this study. The terms "ancestry," "ethnicity," and "race," are mentioned regularly in this text. Though these words are interrelated, they are not interchangeable and must be clearly defined in order to avoid misuse. Ancestry refers to a person's lineage and is inextricably tied to familial relationships and DNA, but the Roman definition of "family" is a complex topic that has strong legal connotations. In Roman legal terms, the pater familias had control over all within the household, including his wife, children, and slaves (Allason-Jones 2004; Woolf 2005). Furthermore, adopted children were also considered to be from the same ancestral line, despite there often being little to no genealogical ties between the pater familias and the adoptee. It is unclear whether or not these same ancestral definitions were passed on to the conquered people of Roman Britain (hlDixon 1992; Allason-Jones 2004; Woolf 2005; Evans 2014), but for the purposes of this study ancestry will be defined as being related to familial relationships, regardless of how many generations removed a person is. It is common for biological distance analyses to be labelled as "ancestry estimation" techniques. When used in this way, it implies that biological distance analyses are exploring familial relationships. However, it is important to remember that ancestry can also refer to a shared evolutionary history, which is closely related to the phenotype—or, a person's outward appearance—as is the case with craniometric variation (Relethford and Harpending 1994; Relethford 2016; Mays 2021). Craniometric variation is, of course, inherited, but it can be shared by a larger number of people whose ancestors lived in similar climates for a multitude of generations. Early studies of cranial plasticity theorized that cranial shape could be affected significantly by environmental factors, which included comparing cranial phenotypic markers of immigrants and their descendants (Boas 1903, 1910, 1912, and 1936). However, more recent studies have found that cranial size and shape are much more highly correlated with genetics than environment, and that any changes to cranial size and shape in the children of immigrants is negligible in comparison to the vast size and shape differences between different ancestries (Sparks and Jantz 2002; Roseman and Weaver 2004; Hubbe, Hanihara, and Harvati 2009). Furthermore, because it is an inherently visual marker of a person's genotype, ancestry is often classified by another person regardless of whether or not that original person in question agrees with that assessment. Furthermore, of the three terms (ancestry, ethnicity, and race) ancestry is the most tied to the biology behind why a person looks a certain way. Therefore, this study considers phenotypic variation to be more closely related to the term "ancestry," though it by no means is the only measure of ancestry.

Ethnicity, on the other hand, has much deeper social connotations than ancestry. Ethnicity is the product of a person's perceived culture, which is often related to shared geographic origins, religion, material culture, and dress (Roymans 2004; Derks and Roymans 2009; Leach et al. 2010). Ethnicity is more of a chosen means of expression than ancestry, as a person can opt to display or disclose their ethnicity. So, ethnicity is closely tied to the epigraphy section of this dissertation, as displaying one's origins epigraphically was also a choice made by the individual or, in the case of funerary monuments, by the individual's family. Finally, ethnicity is also inextricably linked with dress and items of personal adornment (Eckardt 2014), which will be featured in the discussion section of this dissertation. However, it is important to remember that while these tangible strands of data are vital to better understanding ethnicity, epigraphy and dress are also heavily reliant upon gender, wealth, and status (Carroll 2013). So, the lens through which one can interpret ethnicity in archaeology is inherently skewed by gender and social class.

Finally, race is a term that will not be used in this dissertation, as the modern notion of four different human races has no basis in biology. Assessments of human variation confirm that genetically, there is very little difference between populations, and that trait variation, much like skin color, occurs in gradual steps as the distance between populations and climates increases (Relethford 1997, 2000, 2002, 2004a, 2004b, 2009; Long et al. 2009, Ousley et al. 2009, Edgar and Hunley 2009). As asserted by many institutions, including the American Association of Physical Anthropologists, biological race does not exist–it is a purely social construct. That being said, "racism" in the modern sense is inherently similar to discrimination in antiquity (Isaac 2006). So, a combination of ancestry and ethnicity data will be viewed within the lens of imperialism and discrimination against provincials, but not by using terminology related to the modern concept of "race."

1.3 Summary

Considering the complex and varied implications of these key terms, it is important to study migration and diversity from all angles. Craniometric methods are important for understanding phenotypic diversity, which is the only biological way in which ancient people could discern individuals of different ancestral origin. Isotopic evidence is important because it allows archaeologists to identify migrants, regardless of their inherited or ethnic identities. Finally, exploring epigraphic evidence is a vital addition to bioarchaeological studies because it highlights the chosen means of self-identification of individuals. Although each coming chapter will explore each of these methods separately, the discussion chapter will combine these primary strands of evidence and combine them with contextual information such as small items of adornment and evidence of dress which are intimately related to appearance. The combination of methods will aid in comprehensively understanding the experiences of both migrants and indigenous people in Roman Britain.

Given the interdisciplinary nature of the current study, it is important to note that the structure of this thesis may be somewhat unconventional. Each strand of evidence (cranial phenotypic variation, stable isotopes, and epigraphy) will have its own dedicated chapter and each of these chapters will include materials, methods, results, and a discussion. Then, all of the findings from these separate studies will be combined in a comprehensive discussion chapter, which aims to compare and contrast varying strands of evidence in the hopes of making larger inferences about the interplay of migration, diversity, and identity in Roman period Britain.

Chapter 2

Background

This chapter outlines the route of Roman conquest in Britain and, through this knowledge, emphasizes why Roman Britain is so well suited to employing an interdisciplinary approach to migration, diversity, and identity. First, a timeline of Roman occupation in Britain will be outlined, which will show that over the course of 400 years of living under Roman control, many indigenous Britons maintained their "otherness" and continued to fight against their conquerors. Then, the links between migration, diversity, and imperialism will be explored, as these inextricably linked topics are vitally important to understanding the experiences of people living in Roman Britain.

2.1 A Timeline of Roman Conquest in Britain

Rome's interactions with Britannia began around 55 BC when Julius Caesar first led an expedition to the island (Salway 2001; Mattingly 2007). These expeditions continued without military conquest until AD 43, when emperor Claudius agreed to send aid to Verica, leader of the Atrebates tribe and known ally of Rome (Salway 2001). According to Cassius Dio's *Roman History* (60.19), Verica fled to Rome after being defeated by the leaders of the *Catuvellauni* tribe, brothers Togodumnus and Caratacus, who were campaigning to expand the land and influence of the *Catuvellauni*. Many modern authors theorize that Claudius took this opportunity to secure a military conquest in order to improve his reputation, but also to avert the smaller tribes of Britannia becoming a united force (Salway 2001; Southern 2011). In this initial campaign, four legions were sent to Britannia: *Legio II Augusta*, *Legio IX Hispana*, *Legio XIV Gemina*, and *Legio XX Valeria Victrix*. All of these legions were recruited from previously conquered provinces: II, XIV, and XX from the Rhine and IX from *Hispana*, though all four legions also contained many Italian-born soldiers (Salway 2001).

Within four years the Roman legions, led by Aulus Plautius, had conquered nearly one-third of the landmass of modern England, taking control of lands previously held by the *Catuvellauni*, *Durotriges*, *Coritani*, *Atrebates*, *Iceni*, *Cantiaci*, and *Trinovantes* tribes, as well as parts of the *Dobunni* tribe (fig. 2.1). Parts of modern Devon and Cornwall remained under control of the *Dumnonii* tribe, while the north remained with the *Brigantes* and modern-day Wales with the *Cornovii* and the remainder of the *Dubonni*. By AD 49, the first settlement (*colonia*) for Roman military veterans was established in modern-day Colchester (*Camulodunum*) (Salway 2001). This location is considered significant for a Roman fort, as it was once the heart of the territory of the *Catuvellauni* tribe, the original target of Claudius' campaigns. Shortly after, another *colonia* was formed in modern-day London (*Londinium*) (Salway 2001).

Over the next ten years, generals Aulus Didius Gallus, Quintus Verianus, and Gaius Suestonius Paullinus led Roman forces north through the midlands of modern-day England and west up to the border of Wales. A revolt ca. AD 60-61 led by Queen Boudica of the *Iceni* tribe significantly hampered the Romans' progress. Combined with remaining members of the *Trinovantes* tribes, Boudica and the *Iceni* burned the Roman settlements at *Camulodunum* and *Londinium*, as well as the nearby town *Verulamium* (in modern-day Hertfordshire). Although Boudicca and her followers were eventually defeated, the havoc they wreaked nearly halted all Roman progress on the island (Salway 2015: 32). At the time, Emperor Nero was considering abandoning the province altogether, but instead appointed Classicianus, who was of Gallic descent, as the procurator of Britannia (Salway 2015). Although expansion ceased during this time (fig. 2.1), rebuilding efforts are often attributed to Classicianus (Mattingly 2007).

The end of this recovery period for Britannia coincides with the end of civil unrest in Rome, commonly known as "The Year of the Four Emperors." In AD 69, after a year filled with assassinations and coups in Rome, Emperor Vespasian prevailed, beginning the Flavian period of Emperors. Vespasian, who had previously campaigned successfully in western Britannia at the same time as Claudius in the early 50s AD, appears to have reignited Roman interest in British expansion (Salway 2015). By the mid 80s AD, Romans had removed all client kingdoms in Britain and had conquered land through the entirety of England and Wales, stopping near the modern border of the Highlands in Northern Scotland (Salway 2015). Much of these northern conquests can be attributed to Gnæus Julius Agricola from AD 77-84 (fig. 2.1). Rather than continuing their course of con-

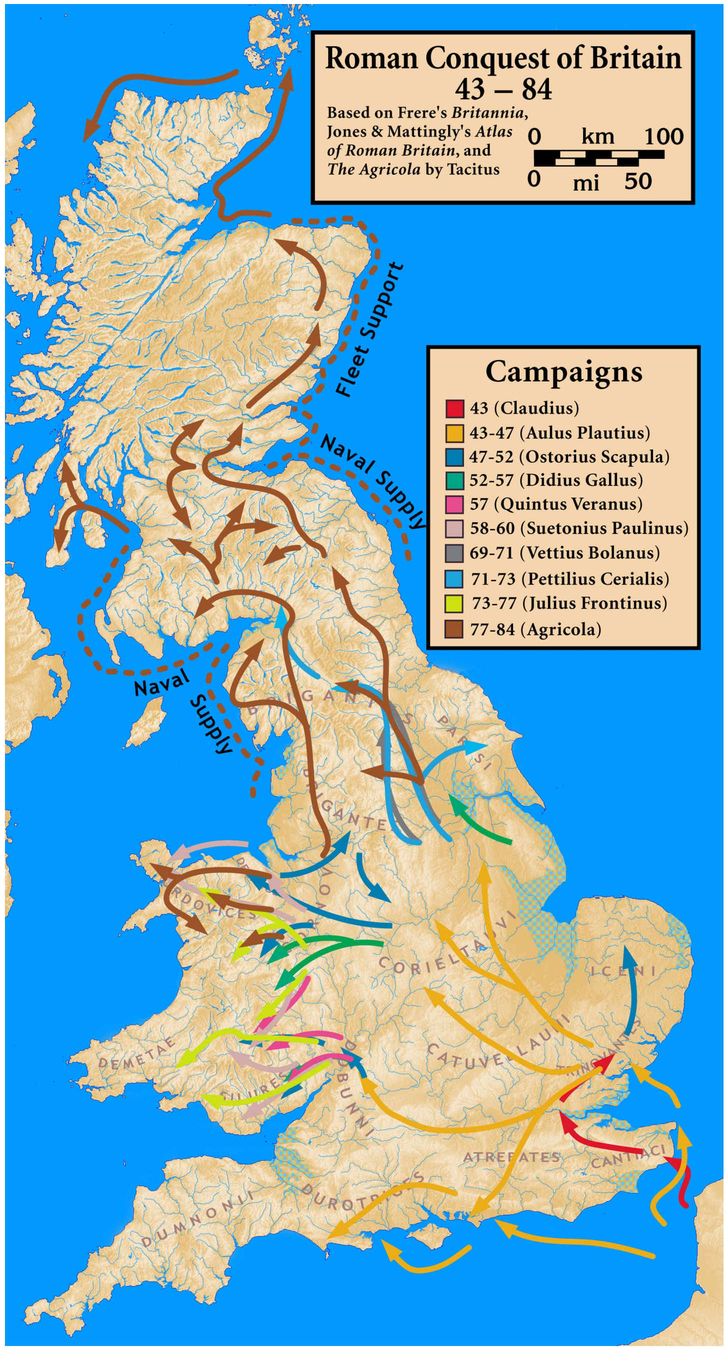


Figure 2.1: *Timeline of Roman conquest in Britain from AD 43-84, compiled from evidence in Frere (1991), Jones and Mattingly (2002), and Tacitus' Annals. (https://commons.wikimedia.org/wiki/File:Roman. Britain.campaigns.43.to.84.jpg)*

quest, Romans instituted a period of general urbanization in the late first to early second century AD. This period was punctuated by occasional revolts from the *Brigantes* tribe, whose land was included in the more recent conquests of Agricola (Mattingly 2007). During the 30 years after Agricola's massive campaign, Roman troops slowly retreated from the more northern areas in Scotland, back down to the area in which Hadrian's Wall was eventually built (Salway 2015). By AD 122, Hadrian began construction of his wall in an effort to clearly mark the boundaries under Roman control, monitor population movement on either side of the border, and also ameliorate the public structures within that boundary (Breeze and Dobson 2000; Salway 2015). However, it is likely that Hadrian's Wall was not solely built for the purpose of military defense and delineating boundaries. Though surviving contemporary written evidence is slim, more recent studies suggest that the wall possibly also served as a means of controlling the movement of the people within Britannia and more efficiently taxing them (Breeze and Dobson 2000; Breeze 2008; de la Bédoyère 2010; Goldsworthy 2018).

The Romans were making headway into Scotland, as they began construction on their new, more northern border, the Antonine Wall, in AD 140. As with Hadrian's Wall, this new border was stocked with Roman forts to house soldiers to deter raids by the northern *Caledonian* tribe (Hanson 2004). However, these revolts continued to such a degree that by AD 164 the Romans were ordered to abandon the Antonine Wall and retreat. Though it is unknown if the Romans fled back immediately to Hadrian's Wall or slowly gave up Scottish territory as they moved southwards, it is clear that Hadrian's Wall had been restored as the northern border AD 180, with a select few northern outposts (Birley 2002) when the *Brigantes* crossed the wall and caused serious casualty to the Romans stationed there (Hanson 2004) (fig. 2.2).

Ten years later, in AD 207, attacks from tribes north of Hadrian's Wall were frequent and devastating enough to warrant imperial intervention. Britannia's governor at the time, Lucius Alfenus Senecio, wrote to Severus in an appeal for reinforcements (Birley 2002). In AD 208, Emperor Septimius Severus, who was co-ruling with his son, Caracalla, came to Britannia himself to campaign against the *Caledonian* tribes. He set up base-camp in York, taking a sizeable imperial retinue with him (Birley 2002). Cassius Dio implies that Severus intended to take back all of the *Caledonian* land that Roman forces had been forced to desert over 50 years earlier (Cassius Dio *Roman Histories* 72). Although Severus made significant advances through Caledonia and is said to have "forced the Britons to come to terms" (Cassius Dio *Roman Histories* 72), his son Caracalla drew up peace treaties with the *Caledonians* and withdrew from their land (Hanson

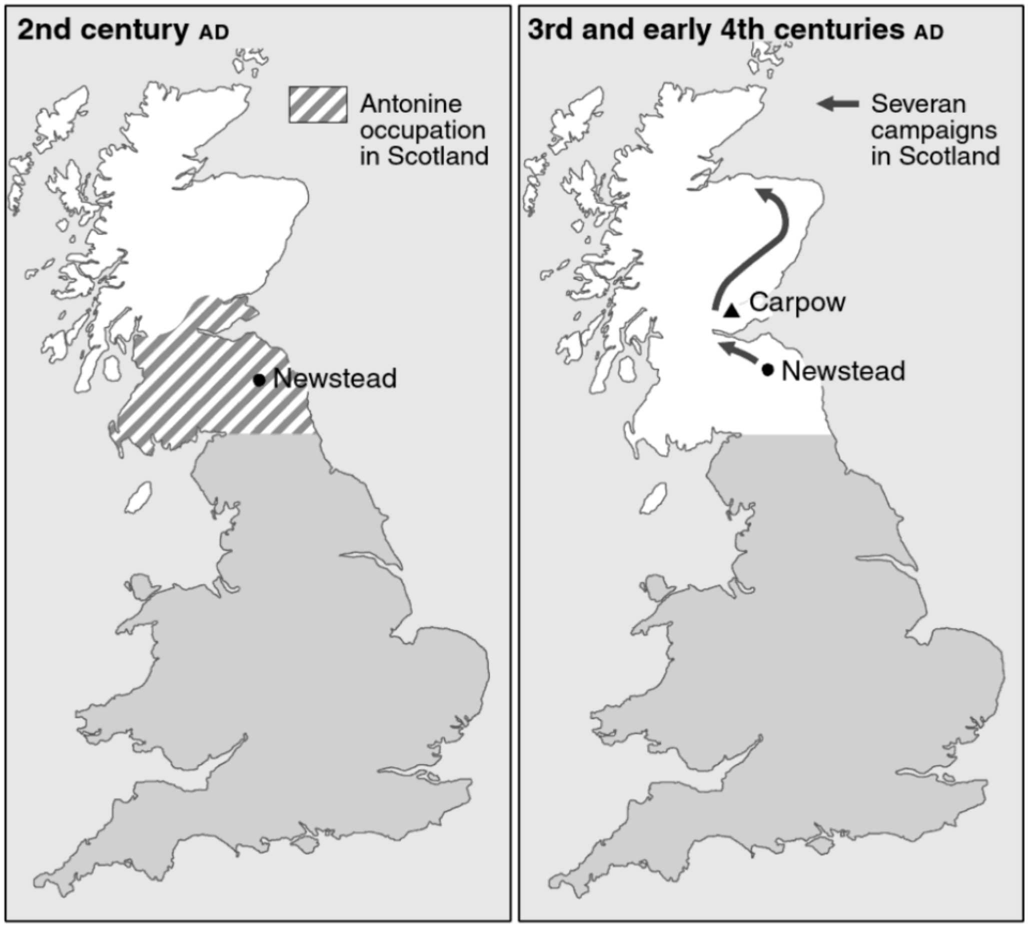


Figure 2.2: *Roman occupation in Britain from the 2^{nd} to 4^{th} centuries AD (Salway 2015: 27).*

2004). Although Caracalla's reasoning remains unclear, his actions resulted in a relatively peaceful period along the border that lasted over a century (Hanson 2004).

At the time of Severus' death in AD 211, Britannia was officially split into two provinces: Britannia Superior (southern Britannia) and Inferior (northern Britannia). *Eboracum*, modern-day York, was made capital of Britannia Inferior while *Londinium*, modern-day London, was made capital of Britannia Superior (Hanson 2004). Birley (2002) suggests that the purpose of this split was to divide the armies of Britain, who sympathized with Caracalla's co-ruler and brother, Geta, and posed a threat as a larger group when Caracalla eventually murdered Geta in AD 211. Not much is known about the period between AD 211 and 259 in Britannia, which is most likely caused by internal conflict elsewhere in the Empire that threatened to cause total collapse (Mennen 2011; Salway 2001). During the reign of Gallienus, the military commander Marcus Cassianus Latianius Postumus, who was stationed on the Rhine, proclaimed himself *Germanicus Maximus* and established himself as the head of what he called the "Gallic Empire" in AD 260 (Drinkwater 1987; Carroll 2001b; Mennen 2011). This Gallic Empire included Germania, Hispania, and Britannia. Drinkwater (1987) argues that the western provinces felt they were better equipped to govern themselves, a sentiment shared by military and civilian groups alike. This is an interesting development because it implies a lack of loyalty to central Rome. Though Postumus died in 269, the Gallic Empire remained separate from the Roman Empire until 274 (Mennen 2011).

During this time, the central Roman government was recovering from attacks both in Rome and in many provinces. The new emperor, Aurelian, was keen to restore the Roman Empire to its previous extent after an era of significant loss (Salway 2001). As central Rome strengthened, the Gallic Empire weakened after the death of Postumus in AD 269 (Salway 2001). After a battle in modern-day Châlons, France, Emperor Aurelian won back the Gallic Empire in AD 274, effectively reabsorbing Britannia back into the Roman Empire (Salway 2001; Mennen 2011). However, Britain and Gaul seceded yet again from AD 287-96 when Roman admiral Carausius declared himself emperor of both provinces (Salway 2001). Carausius was eventually assassinated by his treasurer, Allectus, who quickly took over and began construction of a palace in *Londinium* (Salway 2001). Allectus, however, only lasted three years before he was cornered in battle in the southeast of modern-day England by "junior" emperor Constantius' forces (Salway 2001). Britain and Gaul were, again, reabsorbed into the Roman Empire, and Britain also divided into four separate provinces: Britannia Prima (southern England), Britannia Secunda (midlands of England), Maxima Caeseriensis (northern England up to Hadrian's Wall), and Flavia Caesariensis (Wales) (Jones 1996).

Constantius reached full emperor status in 305 and traveled to York with his son, Constantine I. York served as Constantius' base camp as he battled the Picts beyond the Antonine Wall (Salway 2001). He died in York the following year and the military legions there proclaimed his son, Constantine I, as Emperor, though Constantine had not been a "junior" emperor beforehand, which was the customary line of succession at the time (Esmonde Cleary 2004). Again, not much is known historically about Britain after Constantine I becomes emperor.

The next significant focus on British history is when Emperor Constans visits in AD 343, but the exact reason behind his appearance is unknown (Southern 2004). However, it has been theorized that Constans recruited a group of military scouts from the indigenous British population to campaign beyond Hadrian's Wall against the Picts from Scotland and the Scotti, who came from Ireland (Frend 1992; Southern 2004). After this time, raids from indigenous and Germanic tribes became more frequent. Finally, in AD 367 attacks from all major surrounding regions threatened to collapse the province. Contemporary Roman authors, such as Ammianus Marcellinus (27, 8, 1), refer to this as the *conspiratio barbarica*, as the Romans believed these attacks were coordinated amongst "barbarian" tribes to be carried out simultaneously in different places around the empire (Southern 2004). In Britannia, the Picts attacked at Hadrian's Wall and the Anglo-Saxons in the mid-west of England (Morgan 1984). At the same time, the Franks and Saxons were attacking the coast of Gaul (Morgan 1984). Many scholars consider this event to be the beginning of the end for the Western Roman Empire (Jones 1996, Faulkner 2000; Mattingly 2007). Furthermore, this event is referred to as a conspiracy because it is believed that slaves and non-citizens living in Britannia consorted with the barbarians and aided in their attacks (Frend 1992).

After two failed attempts to suppress the *conspiratio barbarica*, general Theodosius was sent nearly two years after the first attack with four regiments (Frend 1992). Theodosius and his men set up base camp in *Londinium* and were effective in defeating the invading parties and restoring order to the area (Morgan 1984). Magnus Maximus, who became the emperor of Britain and Gaul after negotiating with Theodosius I, declared himself full emperor and took a large retinue of troops to Italy in AD 387 to defend his title. He was subsequently defeated and there is no record of those troops being replenished in Britain (Southern 2004). At this time, it appears that Wales and the west of Britain were effectively abandoned by the Roman military (Southern 2004). It seems the final nail in the coffin of Roman abandonment occurred when another usurper, Constantine III, lead Romano-British troops across the sea to invade Gaul in AD 407 (Jones 1996; Southern 2004). With their forces so depleted, Britain fell easily to the Anglo-Saxons, who began their conquest in Britain from AD 400 (Jones 1996; Southern 2004). Most scholars consider AD 410 to be the end of Roman occupation in Britain (Jones 1996; Salway 2001; Southern 2004; Gerrard 2013).

2.2 Imperialism and migration

Before delving into the methods at hand, it is important to discuss the types of migration that were driven by Roman imperialism. There were many reasons for the migration of individuals or groups of people during both peaceful times and times of conquest. There are two distinct types of migration: voluntary and forced (Scheidel 2004, 2005). Reasons for voluntary migration include employment in the Roman military, which was an option for the men of previously conquered provinces as well as for Roman citizens, the wives and families accompanying them, the dispersal of delegates to rule over conquered lands, who would have certainly brought a retinue along, and an increase in trade and commerce (Scheidel 2004; Moatti 2006). Forced migrants, on the other hand, were part of the slave trade and made up of individuals from conquered regions (Scheidel 2005). But not all provincials were subjected to slavery. A good deal remained in their homelands and experienced the influx of Roman officials, military, and merchants into their homes. For all of these various reasons, one can expect to find Roman citizens with Roman heritage living in every province, slaves from conquered areas with many different ethnic backgrounds living in both Rome and the provinces, and people of trade and commerce from all over the world.

One thing is for certain: the cause of this continuous flow of migration is imperialism. Because of imperialism, studies of migration in the Roman Empire are not simply about the movement of people, but their chosen social identities as a result of being conquered (Mattingly 2006; Versluys 2014; Woolf 2014). Imperialism and conquest created a society in which being a Roman citizen was valued above all else, which makes the study of migration and diversity that much more important. Clearly, despite the fact that Romans occupied the majority of Britannia for nearly 400 years, there continued to be indigenous revolts throughout Roman Britain, as well as several military usurpers established in the province. On top of the historical evidence, archaeological evidence, which will be explored in greater detail in the coming chapters, suggests that there were a great deal of indigenous Britons who continued to identify with tribes that had long since been conquered by Rome, as well as individuals from other provinces that maintained their "foreignness" in the public sphere. Therefore, it is clear that distinguishing oneself as decidedly "unRoman" was an essential component in the personal and public identities of many people living in Roman Britain. For that reason, it is essential to study the ways in which these people experienced diversity through the lens of imperialism.

Chapter 3

The Sites

This chapter will outline each specific site used in the chapters on cranial phenotypic measurements, stable isotope variation, and epigraphic evidence. These summaries will cover the historical background of the site, as well as detailing the archaeological interventions, the demographic information in the case of cemetery sites, and the focus of any publications on the sites. Each site-specific section will also highlight particular moments in history or significant archaeological findings that point to the importance of studying and understanding migration and diversity in Roman Britain. It is important to note that the demographic information included in this chapter is in regards to the cemetery as a whole; it is not a profile of the specific individuals used in the coming analyses. The demographic breakdown solely of individuals included in the coming analyses can be found in their respective chapters. Finally, the information contained in this section is standardized as much as possible for ease of comparison. Unfortunately, many site reports do not employ the same age-at-death ranges or the same effort to subdivide age categories by biological sex. In the interest of maintaining accuracy, only the age-at-death or biological sex categories used in each original site report are used here. Therefore, not every demography table in this section contains exactly the same information. Nonetheless, the information has been adequately standardized to enable comparison between sites.

The cemetery sites, which are featured in either the isotopic analysis or the cranial phenotypic analysis, are: Lankhills late-Rome cemetery in Winchester (*Venta Belgarum*); Driffield Terrace, The Mount, Castle Yard, Clifton, Hospitium, Mount Vale, The Railway, and Trentholme Drive in York (*Eboracum*); London Road Roman cemetery in Gloucester (*Glevum*); Ancaster Roman Cemetery in Ancaster (Latin name unknown); Dere Street, Bainesse Farm, Catterick

Figure 3.1: *List of sites included in the current study*

Bridge, and Honeypot Road in Catterick (*Cataractonium*); the Poundbury Roman cemetery in Dorchester (*Durnovaria*); the California cemetery and associated excavations in Roman Baldock (Latin name unknown); and Great Dover Street, Mansell Street, St. Bartholomew's Hospital, Bishopsgate, Hooper Street, London Wall, Cott's House, Spitalfield Market, and West Smithfield cemeteries in London (*Londinium*). Furthermore, as there are over 55 Roman settlements that include epigraphic evidence, many of which have little to no other archaeological interventions or specific history. Therefore, there are some sites that have been combined based on geographic proximity, like the many sites along Hadrian's Wall (fig. 3.1). It's important to note that despite their proximity to Hadrian's Wall, Chester (*Deva*), Maryport (*Alauna*) are analyzed separately due to the sheer number of epigraphic examples at each of these sites. It is also important to note that some sites are used in multiple analyses. This will be discussed in greater detail at the end of the chapter.

3.1 Winchester

The Lankhills Late-Roman cemetery, which is included in both the chapters on cranial phenotypic variation and migratory isotope variation, is located in Winchester, Hampshire (fig. 3.2). This area was settled in the 3^{rd} century BC, but was likely abandoned circa 10 BC (Booth et al. 2010). In 50 BC, just seven years after Claudius' first campaign in Britannia, Winchester was reestablished as *Venta Belgarum* (Booth et al. 2010). Whether or not *Venta Belgarum* was a military settlement in its early years is unclear, but by the Flavian period (69-96 AD), it had become a leading civilian city in Roman-occupied Britain (Wacher 1995; Wilson 2006; Booth et al. 2010). There is a significant influx of population around AD 350, which corresponds with the estimated period of usage for the Lankhills cemetery (AD 310-410). The Lankhills late-Roman cemetery is located near the northern gate of *Venta Belgarum* (fig. 3.2). Cemeteries to the south, east, and west of the settlement have either not been as extensively researched or have not been excavated at all (Booth et al. 2010).

Lankhills was excavated in three parts: one from 1967-1972 (Clarke 1979), one from 2000-2005 (Booth et al. 2010), and a final, smaller excavation from 2007-2008 (Wessex Archaeology 2009). Due to availability, only skeletons from the first two excavations are used in this dissertation. In addition, another northern, contemporary cemetery at Winchester, Victoria Road West, was unavailable for study, but the demographic summary (Stuckert 2017) is used for comparative purposes. The first excavation by Clarke and his team (1967-72) yielded 451

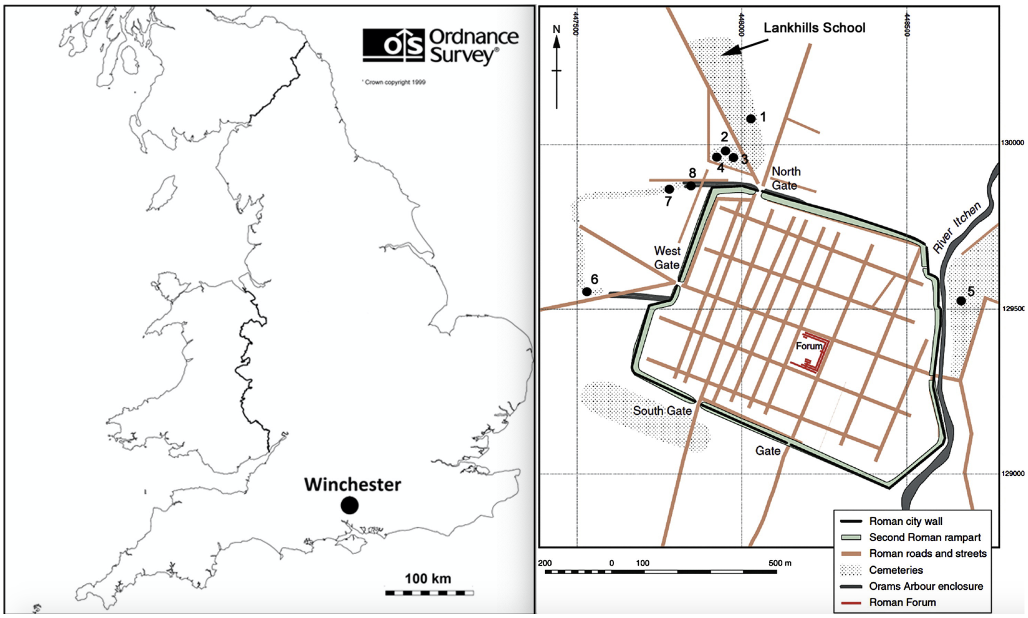


Figure 3.2: *Geographic location of Winchester (left) and plan of Roman Winchester highlighting location of Lankhills cemetery (right) (Bonsall and Pickard 2015)*

skeletons (Clarke 1979; Stuckert 2017). Forty of these individuals had little or no skeletal elements remaining, while 118 were classified as "sub-adult" and 293 as adults (Stuckert 2017). Of those old enough to estimate biological sex, 126 are classified as biologically female, 129 as biologically male, and an additional 43 were considered indeterminate (Stuckert 2017). Additionally, individuals aged 20-29 were the most prevalent category in the cemetery at 30.7%, followed by those aged 30-39 (20.2%), and those simply categorized as "adult" (14.4%). Fewer than 0.7% of the cemetery contained individuals aged 50+ (table 3.1).

Clarke's original study put a heavy emphasis on grave goods, which he described as "grave furniture" (1979). The graves of several individuals could be more definitively dated, based on material culture such as coins, necklaces, and other personal adornments (Clarke 1979). For example, grave 283 from the Clarke's excavation contained three coins, two of which could be attributed to AD 387-402 and the other to AD 350-364 (Clarke 1979: 145; Booth et al. 2010: 512). Overall, the coins included in graves confirm that the use of the Lankhills cemetery coincides with the increase in habitation around AD 350 in *Venta Belgarum* (Clarke 1979). Furthermore, the original excavator, Giles Clarke, theorized that

Age	Male		Female		Indeterminate		Total	
	N	%	N	%	N	%	N	%
0-6 months	-	-	-	-	23	5.6	23	5.6
7 mons-6 years	-	-	-	-	52	12.7	52	12.7
7-13 years	-	-	-	-	23	5.6	23	5.6
14-19 years	1	0.2	4	1.0	5	1.2	10	2.4
"Child"	-	-	-	-	10	2.4	10	2.4
Subadult total	**1**	**0.2**	**4**	**1.0**	**113**	**27.5**	**118**	**28.7**
20-29 years	50	12.2	70	17.0	6	13.9	126	30.7
30-39 years	43	10.5	31	7.5	9	2.2	83	20.2
40-49 years	15	3.6	7	1.7	0	0	22	5.4
50-59 years	2	0.5	0	0	0	0	2	0.5
60+ years	1	0.2	0	0	0	0	1	0.2
"Adult"	17	4.1	14	3.4	28	6.8	59	14.4
Adult total	**128**	**31.1**	**122**	**29.7**	**43**	**10.5**	**293**	**71.3**
Total sample	**129**	**31.4**	**126**	**30.7**	**156**	**37.9**	**411**	**100.0**

Table 3.1: *Estimated age-at-death and biological sex demographic for Clarke's 1967-72 excavations (Stuckert 2017).*

22 of the graves were of an "intrusive" nature, owing to the grave goods included and the organization of these goods around the deceased (Clarke 1979: 378). Sixteen of the 22 were considered earlier (AD 350-410) and shared more common traits than those of a later date. These traits include: 1. A large variety of different types of goods; 2. Consistency in both objects and organization of these objects. For example, biologically male graves contained a brooch at the right shoulder and a belt buckle at the waist whereas biologically female graves contained beads around the neck and wrist, most often the left wrist; 3. An offering situated at the right foot, normally in the form of a vessel; 4. Coins, but none placed near the mouth of the deceased; 5. A knife at the waist in most male graves and a spindle whorl or comb at the right foot in most female graves; and 6. The absence of hobnails (Clarke 1979: 377). Clarke interprets these 16 graves as being from a specific community of migrants, owing to their shared traits and the absence of these traits in earlier or other contemporary burials at Lankhills (1979).

There are an additional six graves, dated AD 390-410, that Clarke (1979) deems "intrusive" and "foreign," but the deceased were not necessarily of the same origin as those in the earlier dissimilar grave-types. These graves also contain personal ornaments and coins that are not placed over the mouth of the deceased, but they otherwise do not conform to the very specific arrangement of the earlier 16 graves (Clarke 1979: 390). Therefore, Clarke maintains that these graves are still "intrusive," but not part of the larger ethnic group he detects in the cemetery from AD 310-410 (1979). By comparing the graves of the earlier 16 graves with contemporary examples around the European continent, Clarke found that these burials were most similar to those of Pannonian origin (1979: 385). These finds led him to hypothesize that a significant number of Pannonian immigrants might have settled in Venta Belgarum, along with smaller groups of migrants from various geographic locations (represented by the six later "intrusive" burial types) (1979). Clarke's original theory has been questioned by several subsequent archaeologists, who used stable isotope analysis and further material culture analysis to support or refute his claims (Gowland 2002 and 2007; Evans et al. 2006; Eckardt et al. 2009; Eckardt 2014). These responses to Clarke's hypothesis (1979) will be discussed at length in the coming chapters, as stable isotope analysis and material culture are essential components to any interdisciplinary study.

The second excavation was carried out by Oxford Archaeology and took place from 2000-2005 (Booth et al. 2010). This team uncovered an additional 284 skeletons, of which 220 are adult (Clough and Boyle 2010). Ninety-four of these adults are biologically male, 94 are biologically female, and 32 are indeterminate. Unlike the previous excavation, the best represented age group in the cemetery was 45+, which accounts for 16.5% of the individuals present (table 3.2). It is followed closely by the general "adult" category (15.5%) and the 35-44 category (13.9%) (Clough and Boyle 2010). Overall, the biological sex demographic for both excavations is relatively similar and equally split, whereas the age demographic, despite the use of slightly different age categories, is more evenly distributed in the later excavation. These differences can be attributed to any number of theories such as differential burial placement by social status or the possibility of a catastrophic event at the time in which the Oxford Archaeology section of the cemetery was in use. However, it is equally likely that the excavation differences are coincidental, considering that, when combined to reflect the cemetery as a whole, the demography profile most resembles attritional mortality patterns (figure 3.3).

Overall, there were fewer incidences of grave goods in the burials excavated from 2000-2005. For Clarke, 157 graves (32.6%) were furnished (1979), whereas the Oxford Archaeology team recorded 88 (28.1%) (Booth et al. 2010). Furthermore, these instances included smaller numbers and smaller varieties of goods per grave, on average (Booth et al. 2010: 284). Unlike Clarke (1979), Booth et al.

Age	Male		Female		Indeterminate		Total	
	N	%	N	%	N	%	N	%
Neonate	-	-	-	-	7	10.9	7	2.5
1-3 years	-	-	-	-	23	35.9	23	8.1
4-7 years	-	-	-	-	21	32.8	21	7.4
8-12 years	-	-	-	-	8	12.5	8	2.8
13-17 years	1	1.1	4	4.3	4	6.3	9	3.2
Subadult (no age)	-	-	-	-	1	1.6	1	0.4
Subadult total	**1**	**1.4**	**4**	**5.8**	**64**	**92.8**	**69**	**24.3**
18-25 years	7	7.5	6	6.7	0	-	13	4.6
26-35 years	8	8.6	20	22.2	0	-	28	9.9
36-45 years	22	23.7	15	16.7	2	-	39	13.0
45+ years	31	33.3	16	17.8	1	-	48	16.5
60+ years	8	8.6	7	7.8	0	-	15	5.3
Adult (no age)	17	18.3	26	28.9	29	-	72	25.3
Adult total	**93**	**43.3**	**90**	**41.9**	**32**	**14.9**	**215**	**75.7**
Total sample	**94**	**33.1**	**94**	**33.1**	**96**	**33.6**	**284**	**100.0**

Table 3.2: *Estimated age-at-death and biological sex demographic for Oxford Archaeology 2000-2005 excavations. (Booth et al. 2010).*

advise concentrating on the vast majority of unfurnished graves, as this is more likely the most common funerary rite, and because this mimics the common practice of the time (2010: 505). They do, however, admit that the presence of graves that seem to follow a completely different, but organized, rite is an important comment on the social structure at Lankhills (2010: 505).

As a whole, Lankhills is one of the largest cemeteries in Roman Britain. Combined, all of the excavations, including the Wessex Archaeology excavation, over 770 individuals skeletons were discovered. The available demographic information corroborates the earlier theory that *Venta Belgarum* was only a civilian settlement, as contemporary military sites tend to have a much smaller proportion of women and children, which will be demonstrated in the coming sections. In this study, 43 individuals were studied for cranial phenotypic variation and the isotopic signatures of another 58 individuals from previously published studies

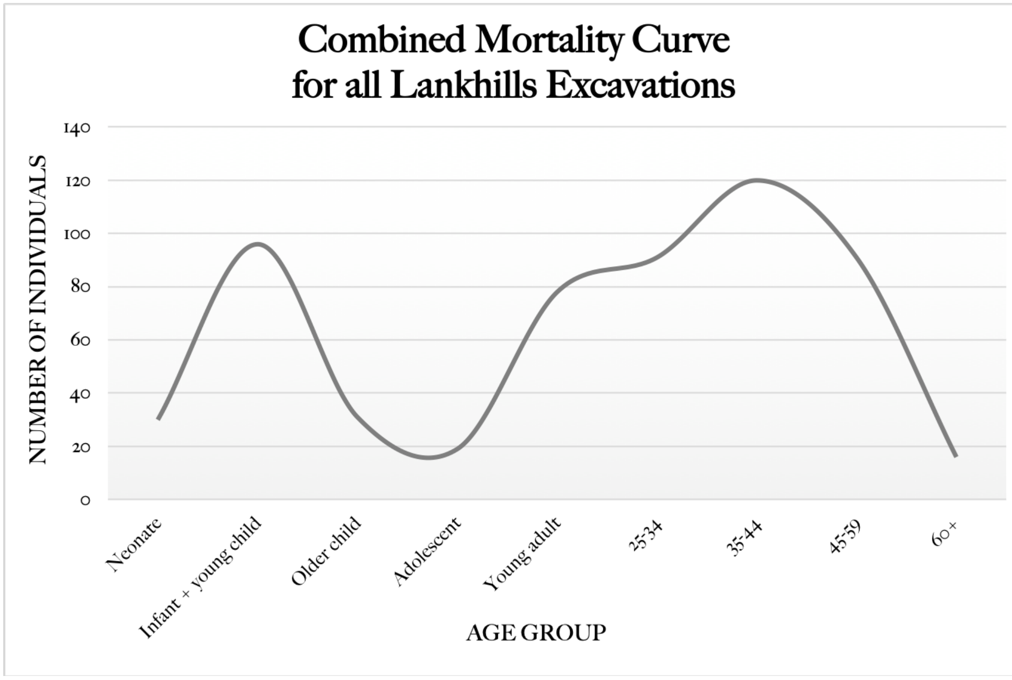


Figure 3.3: *Mortality curve representing the combined age counts for both Lankhills excavations (Clarke 1979; Booth et al. 2010).*

were considered (Evans et al. 2006; Eckardt et al. 2009). As yet, only one Roman inscription has been found and published in Winchester (RIB 88), but the inscriptions in surrounding areas of Bittern, Chichester, Silchester, and Clanville are considered in conjunction with Winchester (Collingwood et al. 1995). Considering the size of the cemetery, the relatively well-preserved remains, and the presence of burials containing carefully organized grave goods amongst the more common "plain" graves of the Roman-era, Lankhills is an ideal site for studying migration and diversity.

3.2 York

York, referred to in the Roman era as *Eboracum*, is situated in the northeast of England in modern North Yorkshire (fig. 3.4). *Eboracum* was captured and settled by the Roman Ninth Legion *Hispania* under Q. Petilius Cerialis, and many authors believe that the construction of the military fortress on the eastern bank of the River Ouse began shortly after (Rollason et al. 1998; Ottaway 2004;

Figure 3.4: *Map of Roman Britain ca. AD 150, highlighting Roman York (Nacu 2008).*

McIntyre 2013). Archaeological evidence shows that the fortress had a number of peripheral buildings that most likely housed families, veterans, and workshops that provided weapons and other resources to the legion (Ottaway 2004; McIntyre 2013). *Eboracum* experienced a period of growth in the early second century, which stalled slightly when the Ninth Legion was removed and replaced by the Sixth Legion (McIntyre 2013). However, by the end of the second century and the beginning of the third, *Eboracum* began to flourish again and expanded to include settlements on the opposite bank of the Ouse. It has been suggested that the western bank was primarily for civilians while the eastern bank remained a military fortress (Ottaway 1999; McIntyre 2013).

It is believed that at this time York received *colonia* status, which was the highest legal status a provincial Roman city could attain (Hurst 1999: 9), though the intricacies of the legal obligations of *coloniae* in Roman Britain is unclear (Carroll 2001). Several authors theorize that Septimius Severus bestowed this title upon York during his stay there in AD 208-211 (Salway 1981; Millett 1990; Mattingly 2007), while others suggest it was a byproduct of his successor Caracalla naming York the capital of Britannia Inferior ca. AD 211-213 (Ottaway 1999; Ottaway 2004; Mattingly 2007; McIntyre 2013). Regardless of exactly when this change occurred, it indicates that York was officially recognized as an important outpost whose structure is modeled after Roman cities (Hurst 1999: 9). It is also important to note that three emperors had extended stays in York, which also speaks to its importance both geographically and politically. As mentioned earlier, Emperor Septimius Severus used York as his base camp while campaigning against the Caledonian tribes of northern, modern-day Scotland (Birley 1979; Ottaway 2004; Mattingly 2007; McIntyre 2013). After the death of Septimius Severus in 211, Britain was split into Superior and Inferior regions, with York being named the capital of Britannia Inferior (Salway 1981; McIntyre 2013). Later, Constantius I and his son, Constantine the Great, relocated to *Eboracum* to campaign against the Picti tribe of northern Scotland (Mattingly 2007). Constantius died within the year and Constantine the Great was named emperor while living in Britain in AD 305. He left York shortly after and made his campaign base elsewhere (Rollason 1998; Ottaway 2004; Hartley et al. 2006; Mattingly 2007; McIntyre 2013). As mentioned above in the overall history of Roman occupation in Britain, the later part of the 4^{th} century AD saw the gradual removal of active Roman troops, as Rome retreated from many conquered areas throughout its Empire (McIntyre 2013).

Eboracum is an essential site to include in any exploration of migration and diversity in Roman Britain because there are numerous examples of migration. The original legion that conquered and settled in *Eboracum* in the first century AD was the Ninth Legion, the *Legio IX Hispania*. This legion is named for the original province of its recruited men, which indicates that at least some of the individuals who settled in York were from Spain (de la Bédoyère 2001). Though this legion left and was replaced by the Sixth Legion (Legio VI Victrix), it is likely that some veterans from the Ninth Legion settled in York permanently (Mann 1983; Leach et al. 2010). The same *Legio VI Victrix* that replaced the Ninth Legion had previously been stationed in Spain and Germania Inferior, which may have led to some recruitment in those areas (de la Bédoyère 2001). Many authors also view the extended stays of three emperors, Septimius Severus, Constantinius I, and Constantine the Great, as an opportunity for increased diversity (Hartley et al. 2006; Leach et al. 2010). Considering the influx of individuals within each emperor's retinue, which likely included slaves from conquered provinces, and the military legions who were slated to carry out these campaigns (Birley 2002), it is reasonable to assume that an increase in diversity accompanied this large-scale migration. Furthermore, Septimius Severus himself was born in Libya, leading Birley to refer to him as the "African Emperor" (Birley 2002). Many scholars consider this to be evidence that other individuals from Roman African provinces might have accompanied Severus here (Birley 2002; Leach et al. 2010; McIntyre 2013).

Given these historical cues, it is not surprising that migration and diversity in Roman York have been the topic of many studies, even before the influx of scientific archaeological advances such as aDNA and stable isotope analyses (Buxton 1935; Warwick 1968). In 1935, L.H. Buxton noticed that the men excavated in the Mount cemetery in York had such similar cranial features to the Saxons that they must be members of a Roman legion recruited from Germania. He theorized that the women, on the other hand, were indigenous to Britain as they "are certainly of a different type from those of the Saxons" (Buxton 1935: 47). R. Warwick (1968) also made a similar suggestion regarding the origins of the individuals interred at Trentholme Drive. He believed that the men were immigrants from various locales, while the women were indigenous based upon several cranial indices but also on average long bone lengths. Later ventures into migration and diversity at Roman York relied upon stable isotopes and craniometric variation. Leach et al. 2009, Montgomery et al. 2011, and Muldner et al. 2011 studied oxygen and strontium stable isotope variation across *Eboracum*, while Leach and colleagues in 2009 and 2010 discussed cranial phenotypic variation using both CRANID (Wright 1992, 2012) and FORDISC (Ousley and Jantz 1996, 2012). All of these studies concluded that foreigners or ethnically distinct individuals existed in Roman York, which lays an excellent foundation for testing new craniometric and interdisciplinary approaches.

Most notably, Leach and colleagues (2010) did a comprehensive analysis of one woman buried at the Sycamore Terrace, the so-called "Ivory Bangle Lady." This individual (ST60) was originally in question because of her unusual burial rite. Her grave included both local and exotic personal adornments including jet and ivory, as well as a bone mount that has been carved to read "Hail, sister, may you live in God" (*S[OR]OR AVE VIVAS IN DEO*) (Leach et al. 2010). Her grave contains many dichotomous elements, such as local and foreign, and Christian wording combined with non-Christian-like opulence (Leach et al. 2010). Further isotopic analysis proved that her origins were likely outside of York, in a warmer climate (Leach et al. 2010). Finally, her craniometric analysis suggests that she is most phenotypically similar to a modern person of mixed race, according to FORDISC (Leach et al. 2010). The "Ivory Bangle Lady" is worth mentioning because her interesting story and the methods used by Leach and colleagues (2010) were a source of inspiration and foundation for the current, larger foray into migration and diversity in Roman Britain as a whole.

There are numerous Roman-era cemeteries contained within the region of York, eight of which will be used in the present analyses (fig 3.5). Skeletons from the cemeteries at 3 Driffield Terrace and 6 Driffield Terrace (fig. 3.6) will be used for the phenotypic analysis. Excavations were conducted at 1-3 Driffield Terrace from August 2004-January 2005 (Ottaway 2005) and continued at 6 Driffield Terrace from July-August 2005 (Hunter-Mann 2005). These two cemeteries date from the late 2^{nd} to 3^{rd} century AD (Hunter-Mann 2005; Ottaway 2005). The skeletons of Driffield Terrace have been studied extensively, due to 70.8% of all inhumations being examples of decapitation burials (Muldner et al. 2010; Montgomery et al. 2011; Caffell and Holst 2012). York Osteoarchaeology Ltd. conducted a full osteological analysis of the skeletons at 3 and 6 Driffield Terrace (Caffell and Holst 2012). A total of 82 skeletons were found at both sites, 59 at 3 Driffield Terrace and 23 at 6 Driffield Terrace. Though no sub-adult skeletons were recovered from 6 Driffield Terrace, seven were found at 3 Driffield Terrace (11.9%) (Caffell and Holst 2012). Full age distributions can be found in table 3.4. Age ranges do not mimic either attritional mortality or catastrophic mortality (fig. 3.7). Caffell and Holst (2012) theorize that due to the large area excavated, the abnormal age distribution could suggest that these cemeteries were reserved primarily for young to middle-aged adults.

Biological sex distribution is equally abnormal at Driffield Terrace. Of the adults, 88% are biologically male. There is only one biological female, from 3 Driffield Terrace, and a total of eight unsexed individuals from both sites combined (Caffell and Holst 2012) (table 3.4). Upon removing the individuals of in-

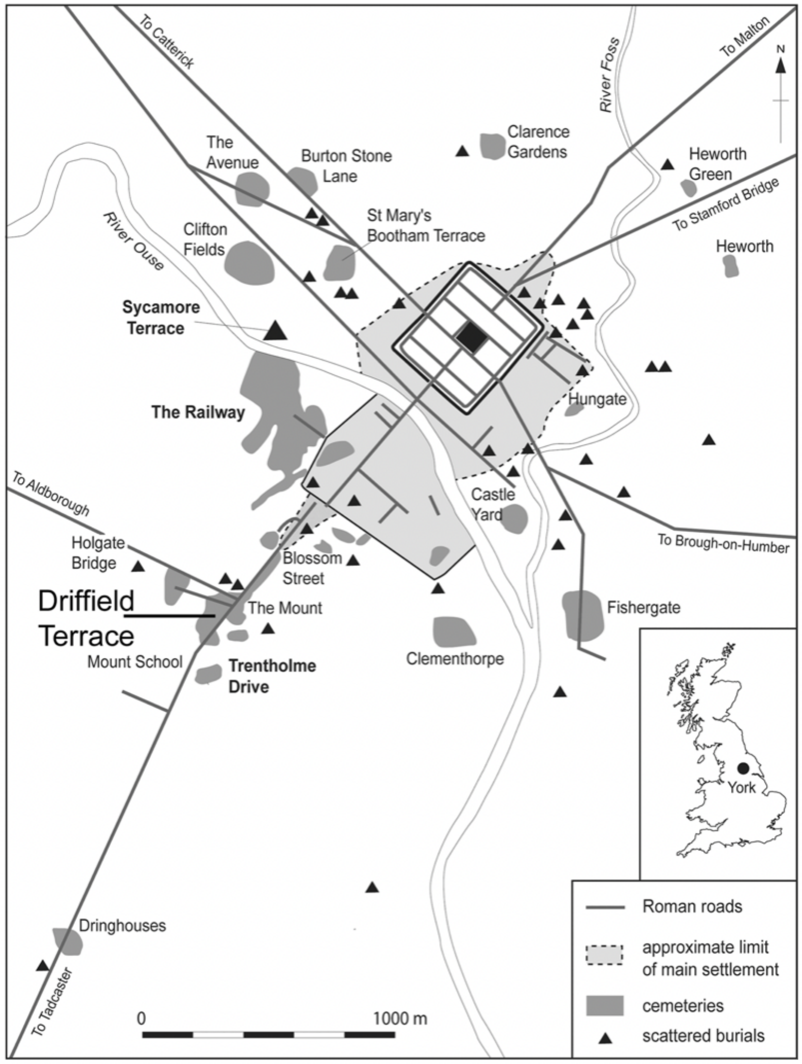


Figure 3.5: *Map of Roman York (Eboracum) and its cemeteries (Leach et al. 2010).*

determinate biological sex, males make up 98.5% of all adults (Caffell and Holst 2012). Furthermore, every individual that has been decapitated is also either male or possibly male (Caffell and Holst 2012). Considering the heavy bias towards young-middle adult males, along with the significant number of decapitations, many have theorized that 3 and 6 Driffield Terrace was not used as a burial ground for civilians. On the other hand, it seems unlikely that Driffield Terrace

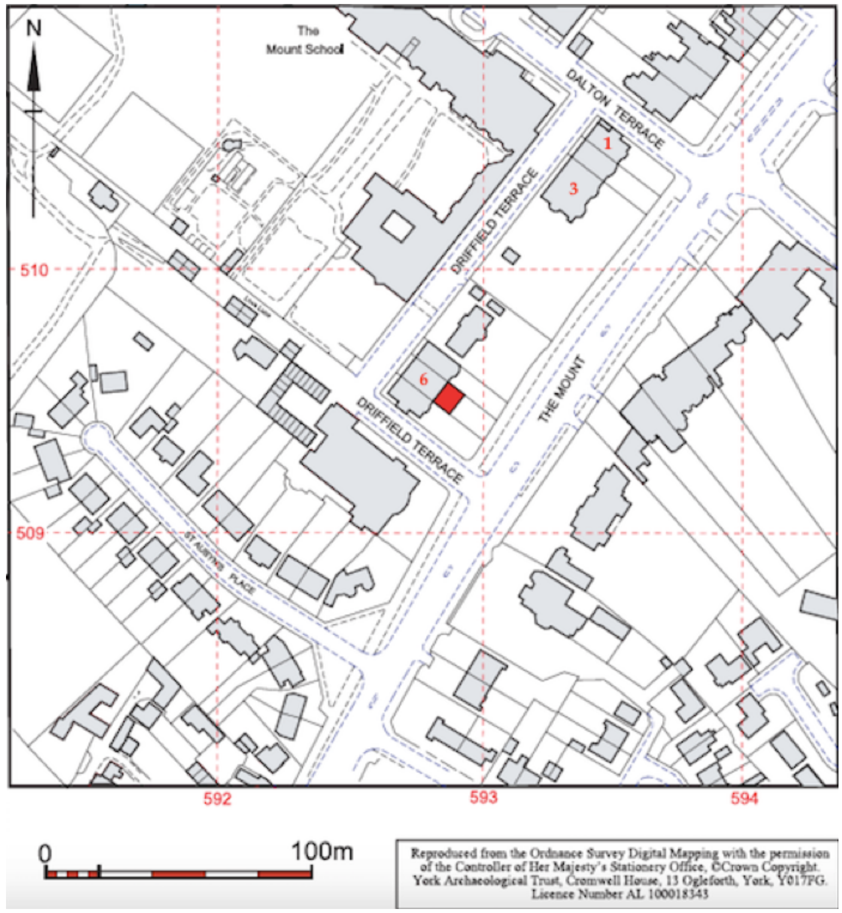


Figure 3.6: *Location of 3 and 6 Driffield Terrace (Hunter-Mann 2005).*

has no civilian ties whatsoever, as the cemetery is not only on the civilian bank of the Ouse, it is also roughly 1,000 meters from the military bank (fig. 3.5)

The chapter on stable migratory isotope analysis will also include skeletons excavated at York, from Clifton, Hospitium, and Castle Yard (the only cemeteries in this study on the eastern bank of the River Ouse), Mount Vale (which includes Trentholme Drive and The Mount), The Railway, 3 Driffield Terrace, and 6 Driffield Terrace. All of these sites were previously studied for oxygen and strontium isotopic values (Leach et al. 2009; Montgomery et al. 2011; Muldner et al. 2011). Trentholme Drive, though it is often studied in isolation, is considered to be part of the larger The Mount cemetery, as is Mount Vale (fig. 3.8) (Leach et al. 2009). Trentholme Drive was excavated between 1951 and 1959 (Wenham

Age	3 Driffield Terrace		6 Driffield Terrace		Total	
	N	%	N	%	N	%
Fetal	1	1.7	0	0.0	1	1.2
Neonatal	1	1.7	0	0.0	1	1.2
1-12 months	0	0.0	0	0.0	0	0.0
1-12 years	2	3.4	0	0.0	2	2.4
13-17 years	3	5.1	0	0.0	3	3.7
18-25	11	18.6	6	26.1	17	20.7
26-35	21	35.6	7	30.4	28	34.1
36-45	12	20.3	7	30.4	19	23.2
46+	0	0.0	0	0.0	0	0.0
Adult (no age)	8	13.6	3	13.0	11	13.4
Total sample	**59**	**72.0**	**23**	**28.0**	**82**	**100.0**

Table 3.3: *Age distribution at 3 and 6 Driffield Terrace (numbers taken from Caffell and Holst 2012) (Stuckert 2017).*

	3 Driffield Terrace		6 Driffield Terrace		**Total**	
Biological Sex	N	%	N	%	**N**	**%**
Male	45	86.5	21	91.3	**66**	**88.0**
Female	1	1.9	0	0.0	**1**	**1.3**
Indeterminate	6	11.5	2	8.7	**8**	**10.7**

Table 3.4: *Biological sex distribution at both 3 and 6 Driffield Terrace (Caffell and Holst 2012).*

1968). In the relatively small 700 square yard excavation area, the skeletal remains of 343 individuals were found (Wenham 1968). There is no uniformity to the orientation of these graves, which the excavators describe as "according to the whim of the grave-digger" (Wenham 1968: 33). Equally, it appears that there was no attempt to organize the plots in any other manner (Wenham 1968). Due to the presence of over 2,000 nails, Wenham theorized that the majority of individuals were interred in wood coffins. Furthermore, there is one stone sarcophagus that includes an adolescent skeleton and dates well before AD 270 (Wenham 1968; Warwick 1968).

Although age and biological sex estimation methods have changed significantly since the Trentholme Drive skeletal data was published, there are no other resources that contain a full inventory of data for the entire site. Therefore, this

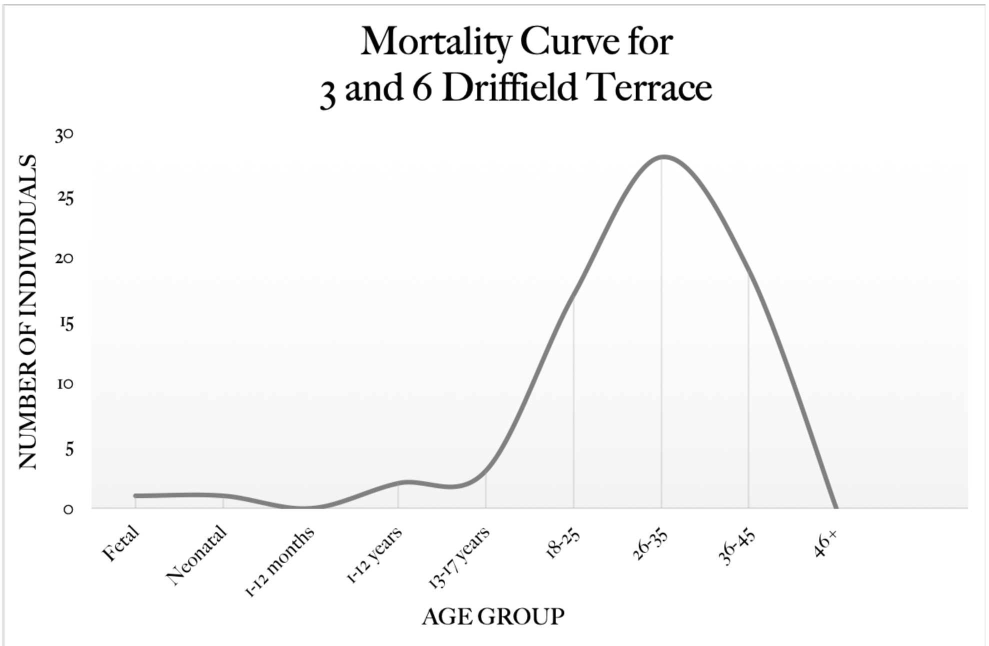


Figure 3.7: *Mortality curve for the combined cemeteries at 3 and 6 Driffield Terrace*

publication (Wenham 1968; Warwick 1968) will be sufficient in understanding the biological sex and age-at-death ratios for all of Trentholme Drive. Of the 343 individuals, 290 were complete enough to estimate biological sex and age-at-death (Warwick 1968). As at Driffield Terrace, a significant portion of the adult remains is either male or probably male (79.7%) (table 3.5). Age categories indicate that over 55% of Trentholme Drive skeletons are between 25 and 40 years of age (table 3.5). The mortality curve does not mimic attritional or catastrophic mortality. Considering its similarities to Driffield Terrace, it is possible that Trentholme Drive was also not used for civilians.

The remaining cemeteries at York are not well known and have not been published to the same extent as Driffield Terrace and Trentholme Drive. The Railway, a burial site directly on the western bank of the River Ouse, was excavated in the 1870s, but the exact number of skeletons is unknown (Jones 1984; Leach et al. 2009). Furthermore, there is no overall demographic information available for study. Excavation records show that the burial pattern was far more organized than at Trentholme Drive, and grave goods such as high quality jewelry and hair adornments indicate that the burials may have been reserved for more elite res-

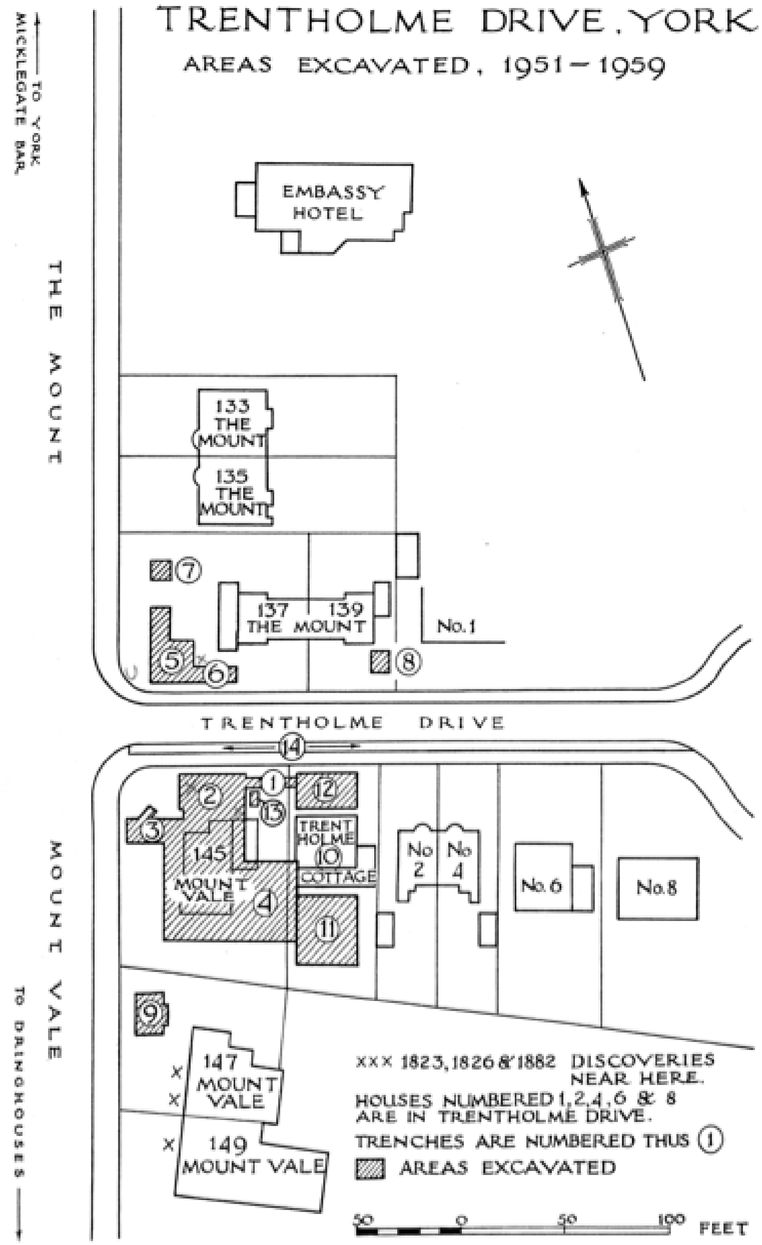


Figure 3.8: *Map of excavations at The Mount, Mount Vale, and Trentholme Drive (Wenham 1968).*

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
0-5 years	-	-	-	-	5	20.8	5	1.6
5-10 years	-	-	-	-	5	20.8	5	1.6
10-15 years	-	-	-	-	14	58.4	14	4.5
Subadult total	**-**	**-**	**-**	**-**	**24**	**100.0**	**24**	**7.6**
15-20 years	-	-	-	-	-	-	20	6.4
20-25 years	-	-	-	-	-	-	29	9.2
25-30 years	-	-	-	-	-	-	46	14.6
30-40 years	-	-	-	-	-	-	116	36.9
40+ years	45	19.5	8	15.4	2	28.6	55	17.5
Adult total	**231**	**79.7**	**52**	**17.9**	**7**	**2.4**	**290**	**92.4**
Total sample	**231**	**73.6**	**52**	**16.5**	**31**	**9.9**	**314**	**100.0**

Table 3.5: *Age-at-death demographic for Trentholme Drive (Warwick 1968).*

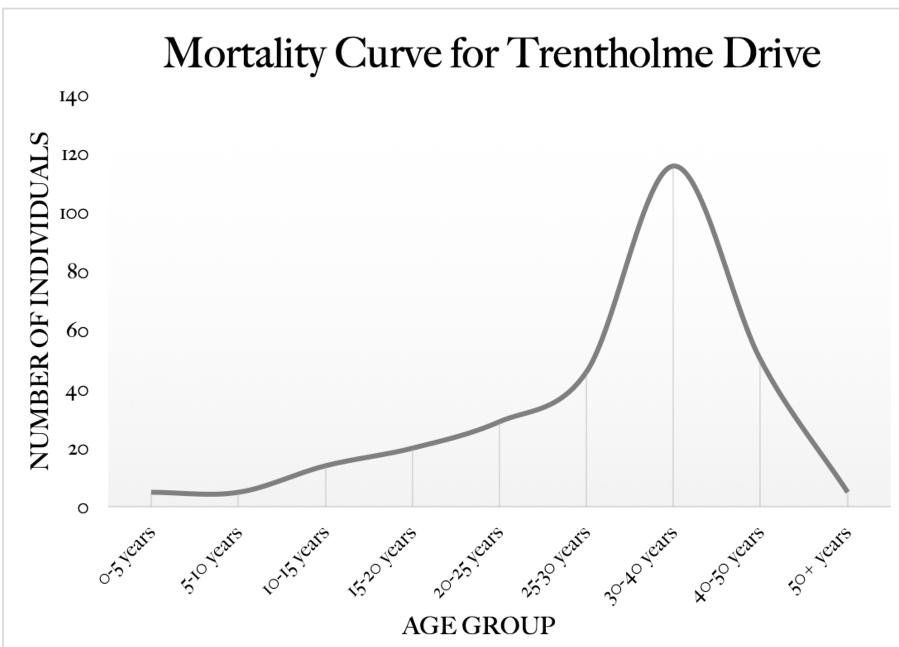


Figure 3.9: *Mortality Curve for the Trentholme Drive cemetery.*

idents of *Eboracum* (Leach et al. 2009). Furthermore, inscriptions on two stone sarcophagi indicate the presence of a woman from Sardinia and a man from northern Gaul, although the original skeletons are lost (Leach et al. 2009). Even less information is available regarding Clifton, Hospitium, and Castle Yard. These three sites are the only in this analysis from the eastern bank of the Ouse, which is where the military fortress is located (McIntyre 2013). Only one skeleton each from Clifton, Hospitium, and Castle Yard is included in the isotopic analysis.

3.3 Ancaster

Roman Ancaster, whose Latin name may have been Causennae, was a relatively minor settlement (Burnham and Watcher 1990), but its location is significant as the town sat on a major trade route, Ermine Street, between Londinium and Eboracum (Todd 1981) (fig. 3.8). Excavations at Ancaster took place in three parts. The main excavations spanned nine years between 1962 and 1971. Additionally, there were two further excavations in the surrounding area. The first occurred in the "southwest angle" in both 1959 and 1964, while the second took place in the "northwest quarter" in 1955 and again from 1960-1961 (Todd 1981). Evidence of a marching camp from AD 45-65 along with forts along Ermine Street from AD 47 indicates that Ancaster was made into a Roman military base camp soon after Claudius' original invasions (Todd 1981). The defensive walls of the civilian town appear to have been completed by the early third century AD, which is corroborated by both the inclusions in the walls themselves and the associated finds within the walls (Todd 1981). Little epigraphic evidence has been found, but a milestone dedicated to the emperor Constantine I (RIB 2422) indicates that Ermine Street continued to be an important travel route well into his reign (AD 306-37).

In addition to Ancaster being included in the epigraphic evidence, a sample of individuals from the late Roman cemetery at Ancaster will be used in the section on cranial phenotypic variation. A total of 327 skeletons were excavated in Ancaster between 1964 and 1973 (Cox 1989). Of these 327, 243 were classified as adults. Though not as drastically as in some contemporary Romano-British cemeteries, there are more biological males than females in the late-Roman cemetery at Ancaster (roughly 3:2) (table 3.6). In Margaret Cox's 1989 report on the human remains from this cemetery, she asserts that this discrepancy in biological sex is most likely not due to differential burial treatment of males and females, and she even suggested that female infanticide may have been commonplace. However, given the location of Roman Ancaster and its origins as a military base, skewed

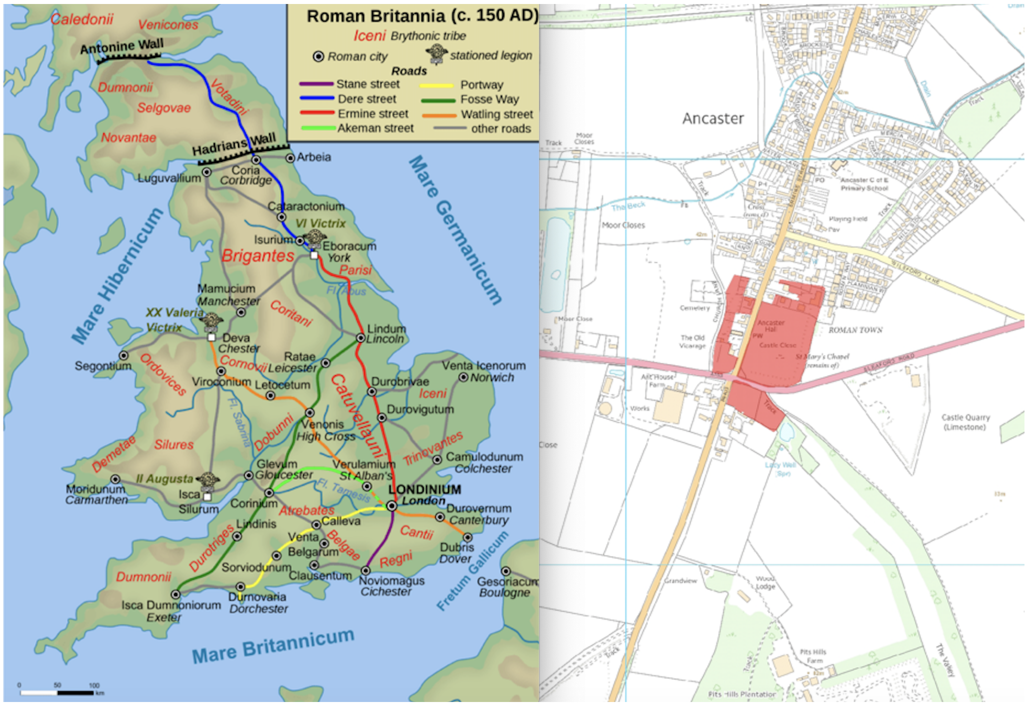


Figure 3.10: *Left: Roads of Roman Britain highlighting Ermine Street (red) (https: //www.ancient.eu/image/575/map-of-roman-britain -150-ad/). Right: Plan of Roman Ancaster superimposed on modern Ancaster, highlighting Ermine Street (in orange) (© Crown Copyright and database right 2019).*

biological sex in adults could simply be the result of increased military presence at the site.

Sub-adult skeletons comprise 25.7% of the entire cemetery, with perinatal remains making up the majority at 28.6% of sub-adults and 7.3% of the total cemetery (table 3.6). As would be expected in a sample of attritional mortality, sub-adult deaths decrease into the older child and adolescent categories. Unfortunately, more specific age categories are not available for the adult remains. Cox (1989) divided the adults into three categories: young adult, middle adult, and older adult. These categories have been further split by biological sex, with the exception of adults of unknown age. There are 76 adults of unknown age, 20 of which are also of unknown biological sex (table 3.6). Middle adults comprise the majority of the entire population with 121 individuals (37.0%). Furthermore, males comprise 75 of the 121 middle adults, with male, middle adults making up

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Perinatal	-	-	-	-	24	28.6	24	7.3
0-11 months	-	-	-	-	6	7.1	6	1.8
12 months-2 years	-	-	-	-	6	7.1	6	1.8
3-4 years	-	-	-	-	13	15.5	13	4.0
5-6 years	-	-	-	-	10	11.9	10	3.1
7-8 years	-	-	-	-	10	11.9	10	3.1
9-10 years	-	-	-	-	2	2.4	2	0.6
11-12 years	-	-	-	-	5	6.0	5	1.5
13-14 years	-	-	-	-	3	3.6	3	0.9
15-16 years	-	-	-	-	3	3.6	3	0.9
Subadult (no age)	-	-	-	-	2	2.4	2	0.6
Subadult total	**-**	**-**	**-**	**-**	**84**	**100.0**	**84**	**25.7**
Young adult	8	6.2	11	13.3	0	0.0	19	5.8
Middle adult	75	58.1	35	42.2	11	35.4	121	37.0
Old adult	13	10.1	14	16.9	0	0.0	27	8.3
Adult (no age)	33	25.6	23	27.7	20	64.5	76	23.2
Adult total	**129**	**53.1**	**83**	**34.2**	**31**	**12.6**	**243**	**74.3**
Total sample	**129**	**39.4**	**83**	**25.4**	**115**	**35.2**	**327**	**100.0**

Table 3.6: *Biological sex and age-at-death demographic at Ancaster (Cox 1989)*

22.9% of the entire cemetery (table 3.6). The drastic skew of the middle adult category can be seen very clearly in the mortality curve for Ancaster (fig. 3.11). Despite earlier claims that the biological sex distribution at Ancaster is indicative of female infanticide (Cox 1989; Mays 1993; Mays 2003), the breakdown of age-at-death, which has comparatively few infant deaths, in combination with the biological sex estimations seems indicative of a predominately military population, possibly a settlement for retired soldiers as well as active ones. This is in line with the aforementioned archaeological evidence, which suggests both a military fort and the defensive walls of a settlement.

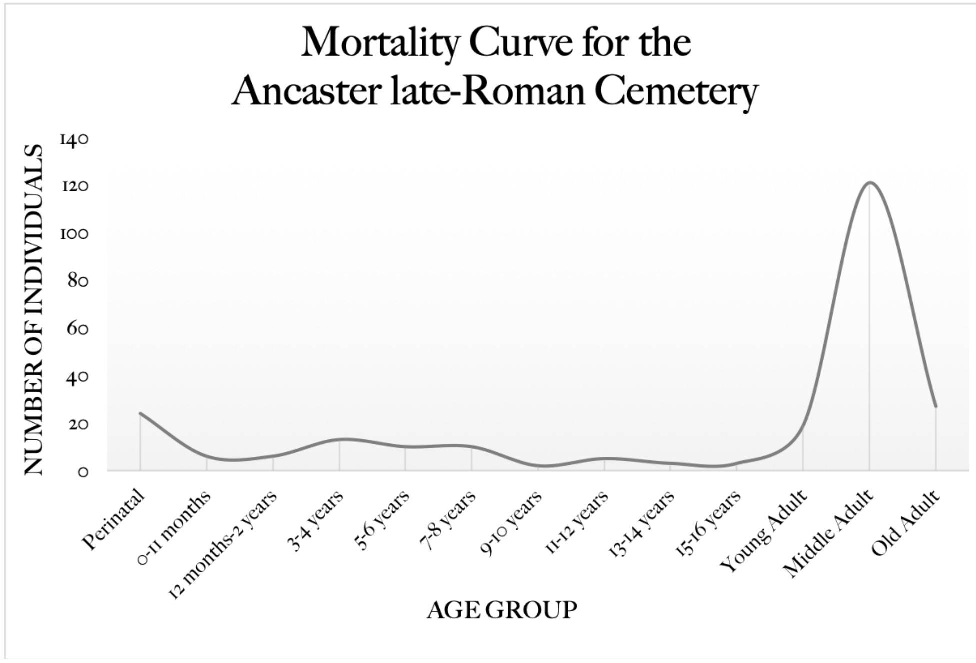


Figure 3.11: *Mortality curve for the late-Roman Cemetery at Ancaster.*

3.4 Gloucester

Roman Gloucester, which was known in the Roman period as both *Glevum* and *Colonia Nervia Glevensium*, is located to the west of the River Severn, in the southwest of modern-day England (fig. 3.12). At the time of the first Roman conquest of Britain, Gloucester was home to the Dobunni tribe and it is possible, considering the lack of disruption to the early settlement, that they either peacefully deferred to Roman rule or were part of a larger local client kingdom (Miles et al. 2007; Simmonds et al. 2008). Romans established a fortress around AD 49 for the Twentieth Legion in Gloucester in order to subdue a revolt from a nearby tribe in southern Wales. This fortress was abandoned circa AD 60 and the legion was moved to a new fortress at the site of the modern city center, roughly one kilometer south of the original (Simmonds et al. 2008). *Glevum* became *Colonia Nervia Glevensium*, a colony for legionary veterans, in the late first century AD. Due to the inclusion of "Nervia," many scholars believe that Gloucester's *colonia* status was appointed during the reign of Nerva (AD 96-98), but others believe, based upon archaeological evidence of extensive rebuilding, that the promotion

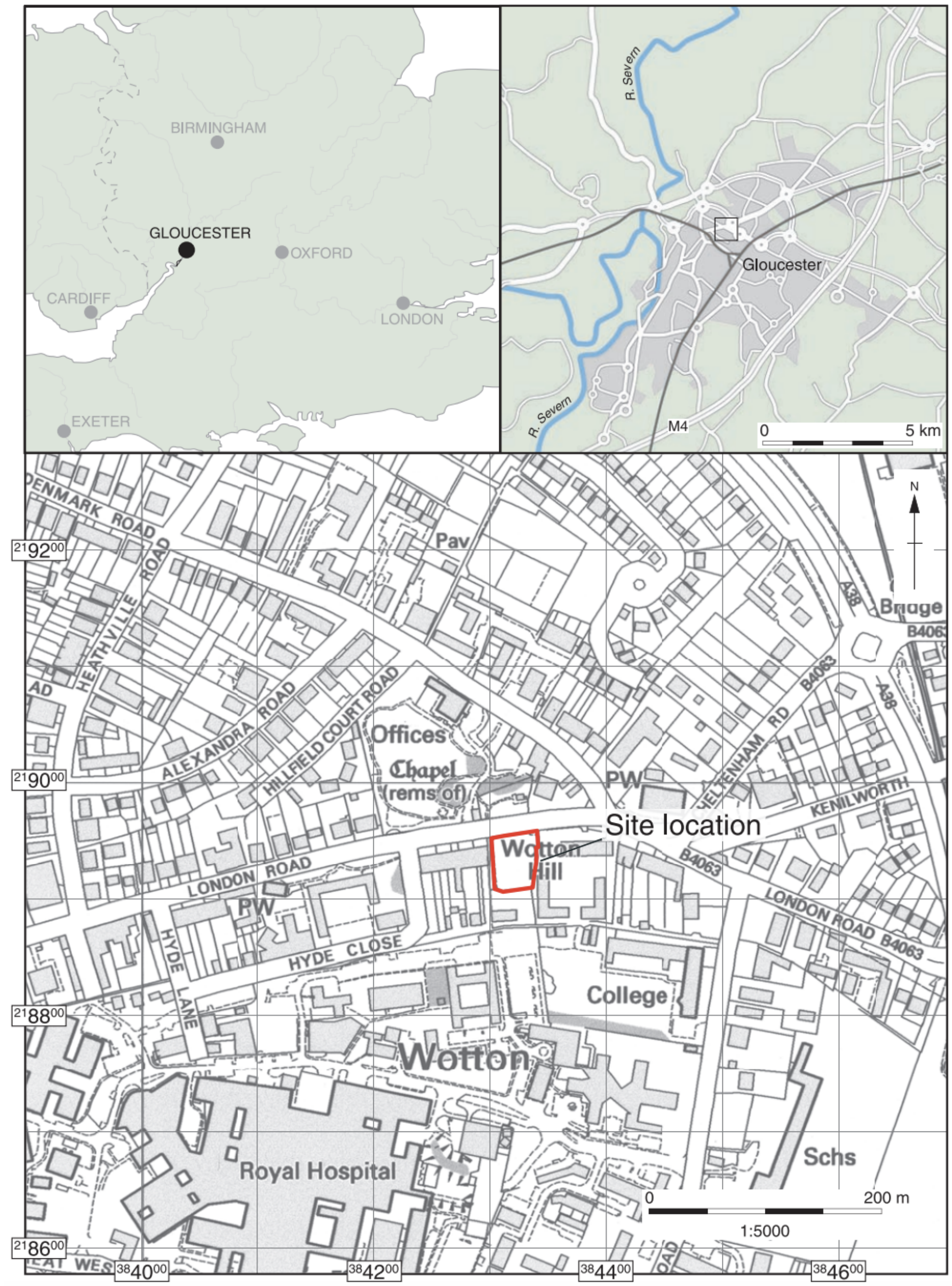


Figure 3.12: *Location of Gloucester and the London Road Cemetery (Simmonds et al. 2008).*

took place after AD 86 during the reign of Domitian and was subsequently renamed for Nerva after the *damnatio memoriae* of Domitian (Simmonds et al. 2008).

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Fetus	-	-	-	-	0	0.0	0	0.0
Perinate	-	-	-	-	1	11.1	1	1.5
Neonate	-	-	-	-	0	0.0	0	0.0
Infant	-	-	-	-	0	0.0	0	0.0
Young child	-	-	-	-	2	22.2	2	3.1
Older child	-	-	-	-	2	22.2	2	3.1
Adolescent	-	-	-	-	3	33.3	3	4.8
Subadult (no age)	-	-	-	-	1	11.1	1	1.5
Subadult total	**-**	**-**	**-**	**-**	**9**	**100.0**	**9**	**15.0**
Young adult	6	26.1	4	36.4	2	11.8	12	19.0
Middle adult	5	21.7	4	36.4	2	11.8	11	17.5
Mature	1	4.3	1	9.1	1	5.9	3	4.8
Older adult	5	21.7	1	9.1	1	5.9	7	11.1
Adult (no age)	6	26.1	1	9.1	11	64.7	18	28.6
Adult total	**23**	**45.1**	**11**	**21.6**	**17**	**33.3**	**51**	**85.0**
Total sample	**23**	**36.5**	**11**	**17.5**	**26**	**27.0**	**60**	**95.0**

Table 3.7: *Biological sex and age-at-death demographic at Gloucester London Road Cemetery–discrete inhumations only (Simmonds et al. 2008)*

After being upgraded to a *colonia*, Gloucester ceased to exist as an active military base and became solely a settlement for civilians and retired soldiers (Wacher 1995; Simmonds et al. 2008). Excavations of the city center revealed a forum, other public buildings, and civilian housing that date to the early second century AD (Wacher 1995). Though some early authors believe that Gloucester failed to flourish as a *colonia* (Hurst 1964; Wacher 1995), it is clear from inhumations outside the city walls that the site was in use well into the late-Roman period (Simmonds 2008). There are several Roman cemeteries surrounding Gloucester beyond each of the main gates, many of which were discovered in the late 19^{th} century and, therefore, are not well recorded (Simmonds et al. 2008). Wotton cemetery, however, which is used in the current analysis, has sufficient demographic information.

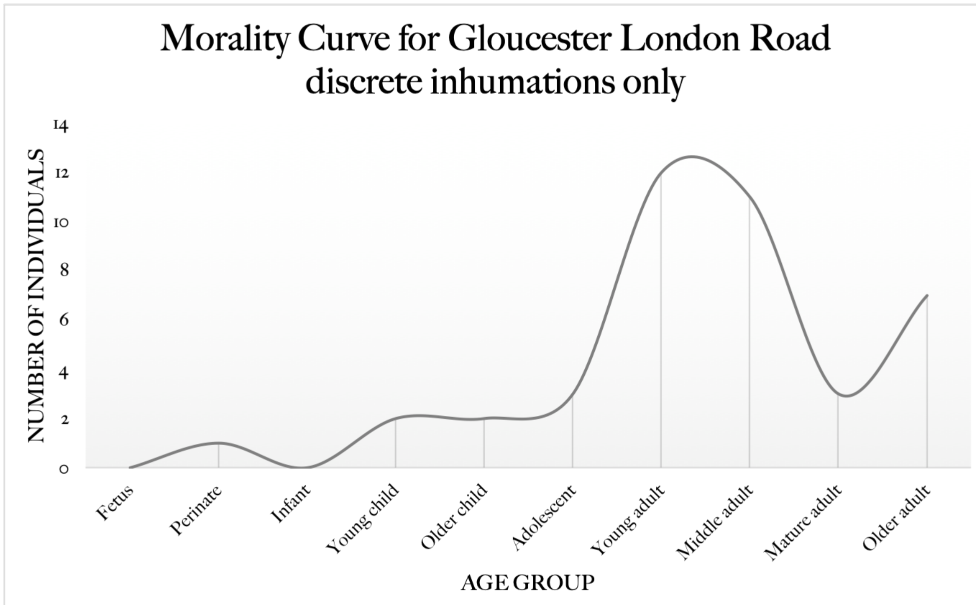


Figure 3.13: *Morality curve for the discrete inhumations at 120-122 London Road, Gloucester.*

The individuals used in the isotopic dataset of the current study were excavated at 120-122 London Road in Gloucester, which is part of the larger Wotton Cemetery, both having been excavated in the early 2000s (Simmonds et al. 2008; Ellis and King 2014). 120-122 London Road is located roughly one kilometer northeast of the Roman settlement's northern gate. The site is unique as it contains both discrete inhumations and a mass grave, all of which date from the late 1^{st} to the 4^{th} century AD (Simmonds et al. 2008). The discrete graves (N= 60) represent a number of time periods within the 1^{st} and 4^{th} centuries, but the mass grave (MNI= 91) is confined to the end of the 2^{nd} century and beginning of the 3^{rd} century AD (Simmonds et al. 2008).

There is a total of 64 discrete graves and 63 inhumations, 60 of which could be examined for biological sex and age-at-death estimations. Of these 60, 9 were sub-adult (15.0%) and 51 were adults (85.0%). Of the adults, 23 were biologically male (45.1%), 11 were biologically female (21.6%), and 17 were indeterminate (33.3%) (table 3.7). Age ranges were defined in broad terms such as young, middle, mature, and older adult (Simmonds et al. 2008). The young and middle adult categories are fairly evenly split between males and females, whereas the mature and older adult categories had significantly more males. Eleven adult individuals (21.6%) could not be assessed for either age-at-death or biological sex. The mortality curve does not mimic either attritional or catastrophic models, but is similar to the cemeteries at 3 and 6 Driffield Terrace, Trentholme Drive, and Ancaster in that there is a heavy skew towards young and middle adults (fig. 3.13).

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Fetus	-	-	-	-	0	0.0	0	0.0
Perinate	-	-	-	-	0	0.0	0	0.0
Neonate	-	-	-	-	0	0.0	0	0.0
Infant	-	-	-	-	1	6.7	1	1.1
Young child	-	-	-	-	3	20.0	3	3.3
Older child	-	-	-	-	4	26.7	4	4.4
Adolescent	-	-	-	-	7	46.7	7	7.7
Subadult total	**-**	**-**	**-**	**-**	**15**	**100.0**	**15**	**16.5**
Young adult	19	54.3	7	50.0	10	37.0	36	39.6
Middle adult	7	20.0	4	28.6	2	7.4	13	14.3
Mature adult	2	5.7	2	14.3	3	11.1	7	7.7
Older adult	3	8.6	1	7.1	1	3.7	5	5.5
Adult (no age)	4	11.4	0	0.0	11	40.7	15	16.5
Adult total	**35**	**46.1**	**14**	**18.4**	**27**	**35.5**	**76**	**83.5**
Total sample	**35**	**38.5**	**14**	**15.4**	**42**	**46.2**	**91**	**100.0**

Table 3.8: *Biological sex and age-at-death demographic at Gloucester London Road Cemetery–mass grave only (Simmonds et al. 2008).*

The minimum number of individuals from the mass grave is 91, but could be as high as 201 (Simmonds et al. 2008). The degree of entanglement in the mass grave suggests a single deposition, such as being dumped from a wheelbarrow rather than individually placed (Simmonds et al. 2008). Of the known 91 individuals, 15 are sub-adults (16.5%) and 76 are adults (83.5%). Of the adults, the sample is once again skewed in favor of biological males (5:2) and an additional 27 individuals are of indeterminate sex (table 3.8). Overall, the mortality curve for the mass grave is similar to that of the discrete inhumations (fig. 3.14). As a whole, both subsections of the Gloucester London Road cemetery are highly skewed towards young adult burials and have considerably more males than females. In light of Gloucester's military history, these demographic breakdowns are not surprising.

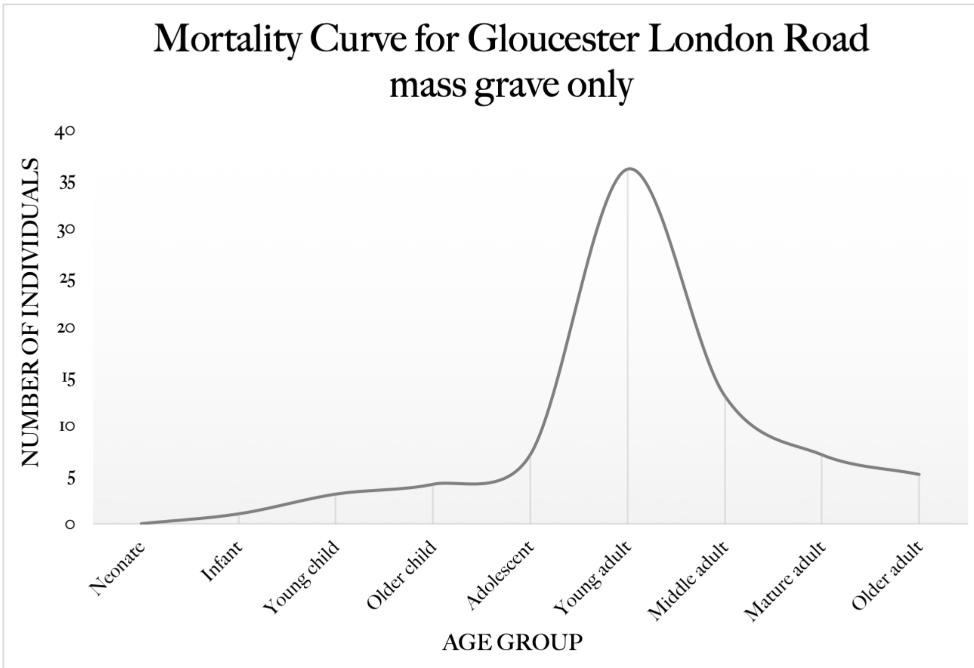


Figure 3.14: *Morality curve for the mass grave inhumations at 120-122 London Road, Gloucester.*

3.5 Catterick

Roman Catterick, or *Cataractorium*, is located northwest of York (fig. 3.15). Its main road, Dere Street (fig. 3.15), is an extension of Ermine Street, the aforementioned trade route from London to York. Circa AD 150, Dere Street ran from York to the Antonine Wall (see fig. 3.10 above in Ancaster section), which speaks to its importance as a military thoroughfare. There is little evidence regarding a preliminary fort at *Cataractorium* during the early Agricolan administration, but pottery evidence suggests that the site was in use for military purposes from AD 80 (Wilson 2002; Chenery et al 2011). It is hypothesized that *Cataractorium* was abandoned shortly after and rebuilt twice between the late 2^{nd} and early 4^{th} centuries AD (Chenery et al. 2011). Roman Catterick consisted of military forts and

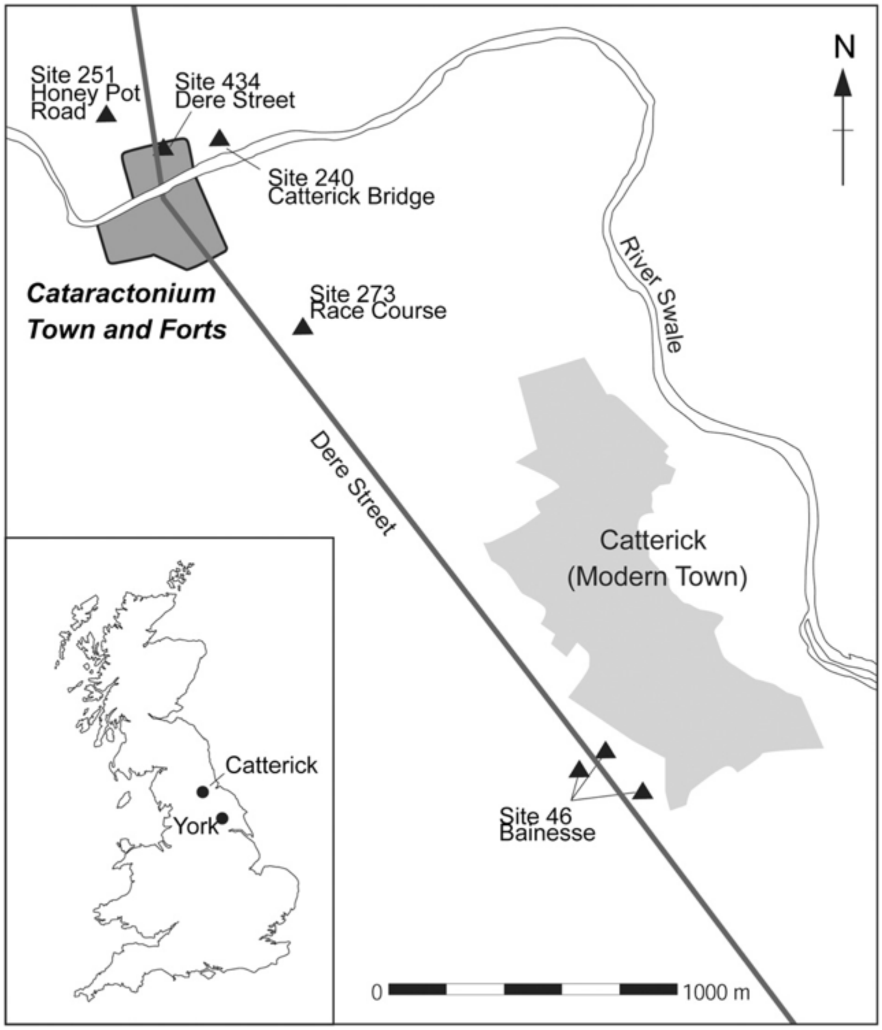


Figure 3.15: *Map of Roman Catterick and the cemetery sites used in the current study (Chenery et al. 2011).*

civilian settlements, as well as an associated suburb 2km south of the town in the Bainesse area (site 46, fig. 3.15) (Chenery et al. 2011). *Cataractorium* became a defended small town by the early 4^{th} century, but it appears that the military and civilian settlements were abandoned by the end of this century (Chenery et al. 2011). Catterick is ideal for an interdisciplinary study regarding migration and diversity because of its well-preserved skeletons and the presence of epigraphy and material culture suggesting an influx of non-indigenous and non-Roman individuals, both of which will be discussed in the coming chapters (Wilson 2002; Cool 2002; Chenery 2011).

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Fetus	-	-	-	-	1	7.7	1	1.6
Infant	-	-	-	-	2	15.4	2	3.1
Small child	-	-	-	-	5	38.5	5	7.8
Older child	-	-	-	-	1	7.7	1	1.6
Adolescent	0	0.0	1	100.0	4	30.8	5	7.8
Subadult total	**0**	**0.0**	**1**	**7.1**	**13**	**92.9**	**14**	**23.3**
20-24 years	5	15.6	1	7.7	1	50.0	7	10.9
25-34 years	6	18.8	5	38.5	0	0.0	11	17.2
35-44 years	10	31.3	2	15.4	0	0.0	12	18.8
45+ years	3	9.4	0	0.0	0	0.0	3	4.7
Adult (no age)	8	25.0	4	30.8	1	50.0	13	20.3
Adult total	**32**	**69.6**	**12**	**26.1**	**2**	**4.3**	**46**	**76.7**
Total sample	**32**	**50.0**	**13**	**20.3**	**15**	**23.4**	**60**	**93.7**

Table 3.9: *Demographic profile for all Roman Catterick cemeteries (sites 46, 240, 251, 273, 433, 434, 452, and YWA 1987).*

Individuals from several surrounding cemeteries, including Dere Street, Bainesse Farm, Honeypot Road, and Catterick Bridge (fig. 3.15), are included in the isotopic re-analysis, originally carried out by Chenery and colleagues in 2011. The demographic information for these cemeteries is outlined below (table 3.9). As with many of the other cemetery sites included in this study, the Roman Catterick demographic is heavily skewed towards adult males. Of the adults, 70% are male, and of the entire population, 50% are adult males (table 3.9). The mortality curve (fig. 3.16) is not representative of attritional or catastrophic mortality in the subadult categories, but is more or less attritional in the adult categories, indicating an adult-centric demographic.

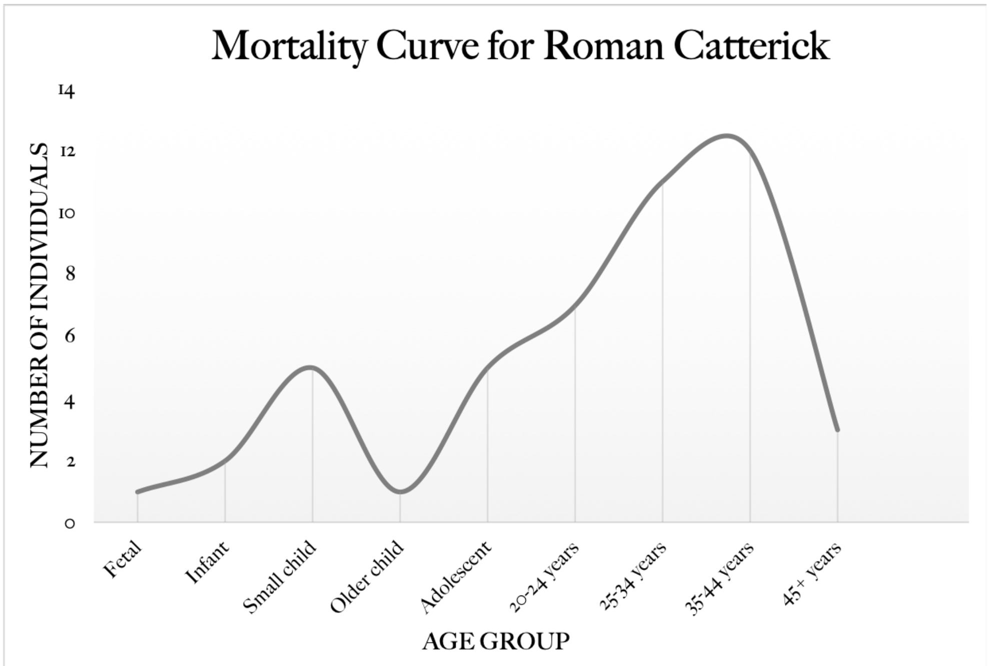


Figure 3.16: *Mortality curve for all Roman Catterick cemeteries.*

3.6 Poundbury

Poundbury Roman Camp is a late-Roman cemetery associated with the Roman settlement *Durnovaria* in Dorchester. *Durnovaria* sits on the southeast bank of the River Frome, near the southern coast of Britain (fig. 3.17). In the Iron Age, this land belonged to the Durotriges tribe. Archaeological evidence in the surrounding lands, combined with contemporary accounts, reveal that the Durotriges were most likely defeated by the *Legio II Augusta*, commanded by future-emperor Vespasian, during emperor Claudius' rule, though the exact year is unknown (Wacher 1995). Roman military occupation began in the mid-1st century AD (Sparey Green 1987) shortly after the defeat of the Durotriges, but not all groups of the tribe were forced to vacate the land. The residents of the nearby hill called Maiden Castle remained, probably due to political bargaining power, but those living on Hod Hill were evacuated, and occupation on Poundbury hillfort was intermittent from the time of Roman conquest (Wacher 1995). There is evidence to suggest that a military fort was constructed in the town of Dorchester shortly after conquest, and that Dorchester became a civitas, or a planned city, during

Figure 3.17: *Map of England highlighting Dorset County (https://en. wikipedia.org/ wiki/Dorset/media/File: Dorset _UK _locator_map _2010.svg).*

the Flavian period (AD 69-96) (Wheeler 1943; Wacher 1995). Whether or not the indigenous populations from Maiden Castle and Poundbury hillfort migrated to the Roman *civitas* is unknown. *Durnovaria* grew rapidly after the first century AD, as there is evidence of an amphitheatre, a bathhouse, and a possible forum, which were all in use well into the fourth century AD, with evidence of renovations and rebuilding taking place in the third century AD (Wacher 1995). There is evidence of both domestic and commercial buildings from the second century AD, most of high quality, which were also in use until the late Roman period (Wacher 1995).

There are several cemeteries surrounding *Durnovaria*, the largest of which is the Poundbury Roman Camp cemetery, which is located to the northwest of the main settlement (fig. 3.18). Poundbury was in use for an estimated 75 years in

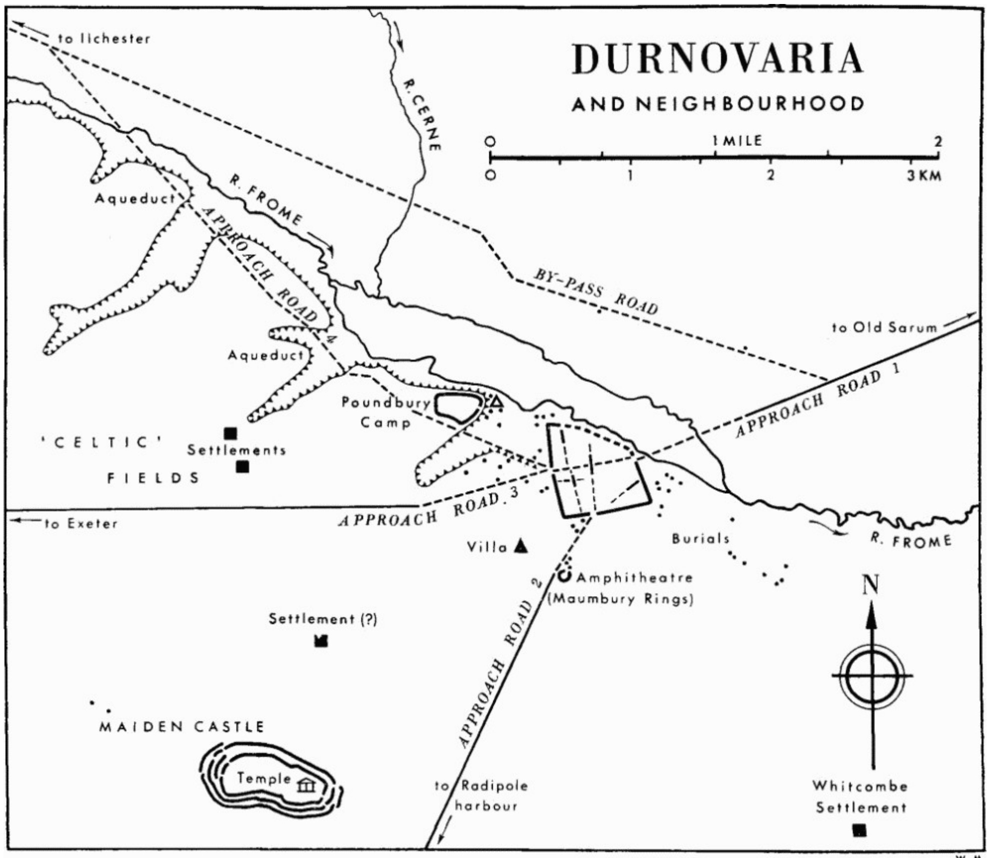


Figure 3.18: *Durnovaria and the surrounding region, including the Poundbury Camp (Farwell and Molleson 1993).*

the fourth century AD (Farwell and Molleson 1993; Wacher 1995). Excavators have organized the Poundbury cemetery into five adjacent sections: site C (101 burials), the eastern peripheral group (90 burials), the northern peripheral group (36 burials), outlying late Roman burials (39 burials), and the main late Roman cemetery (1114 burials) (fig. 3.19) (Farwell and Molleson 1993). There is a relatively even split between male and female graves (346 and 326, respectively) and the mortality curve mimics attritional mortality (table 3.10 and fig. 3.20).

Fourty-nine skeletons from Poundbury are used in this study in the section on cranial phenotypic variation. Of these 49, 43 were excavated from the Main Late Roman cemetery. The Main Late Roman cemetery includes mainly wood coffin burials without grave goods, as well as a select few stone mausolea and lead-lined stone coffins, most oriented west-east (Farwell and Molleson 1993). Of the 43 skeletons from the main cemetery used in this analysis, all were buried in wood coffins and only 3 included grave goods. These three are skeletons 707 (F, 60+), 734 (F, 25-34), and 854 (M, 45-54), and all contain just one coin (Farwell and Molleson 1993). The coins found in the main cemetery were the primary method of dating, which places usage of the cemetery between the first and third quarter of the 4^{th} century AD (Farwell and Molleson 1993).

An additional 3 skeletons were excavated at Site C, to the east of the main burial area (fig. 3.19). Again, most burials at Site C consisted of wooden coffins with the addition of a few burial pits lined with stone, most oriented west-east (Farwell and Molleson 1993). Interestingly, Site C contains a large proportion of infant burials (which Molleson defines as under one year of age)–34.1%–considering that infant burials comprise only 15.2% of the entire Poundbury cemetery (Farwell and Molleson 1993). Much like the main Late Roman cemetery, Site C has few examples of individuals interred with grave goods, none of which are included in the cranial assessment (Farwell and Molleson 1993). Coin and pottery evidence indicates that Site C was in use around the mid-4^{th} century AD, making it contemporary with the main cemetery (Farwell and Molleson 1993).

The final three individuals included in this study come from the eastern peripheral burial group, which can be found in between the main Late Roman cemetery and Site C (fig. 3.19). The Eastern Peripheral Group differs from the first two sites because the graves are, for the most part, oriented north-south, and there is a much larger percentage of grave goods to be found (Farwell and Molleson 1993). Of the 98 graves, 22.4% include grave goods, as opposed to 4.2% in the Main Cemetery and 14.3% in Site C. Coin and pottery evidence suggest that the eastern peripheral area was in use during the early stages of the cemetery, starting in the mid-3rd century AD (Farwell and Molleson 1993). Therefore, the individuals buried in this section could be up to one century older than those in the Main Cemetery or Site C. The three individuals used in this analysis do not have grave goods and cannot be more definitively dated.

Like Lankhills, the late Roman Cemetery at Poundbury is one of the largest in all of Roman Britain. A total of 1074 inhumations have been excavated at this site (Farwell and Molleson 1993). There are 378 subadult burials at Poundbury, which make up over 35% of the entire cemetery. Of these subadults, 163 (43.1%) are neonates and infants. Most individuals from Poundbury are adults between the ages of 24 and 55, who make up 41.2% of the population. There is a relatively even split overall between adult males and females, although certain age categories are skewed for biological sex. There are 50% more female burials than male burials between the ages of 35 and 44, but significantly more male burials from the age

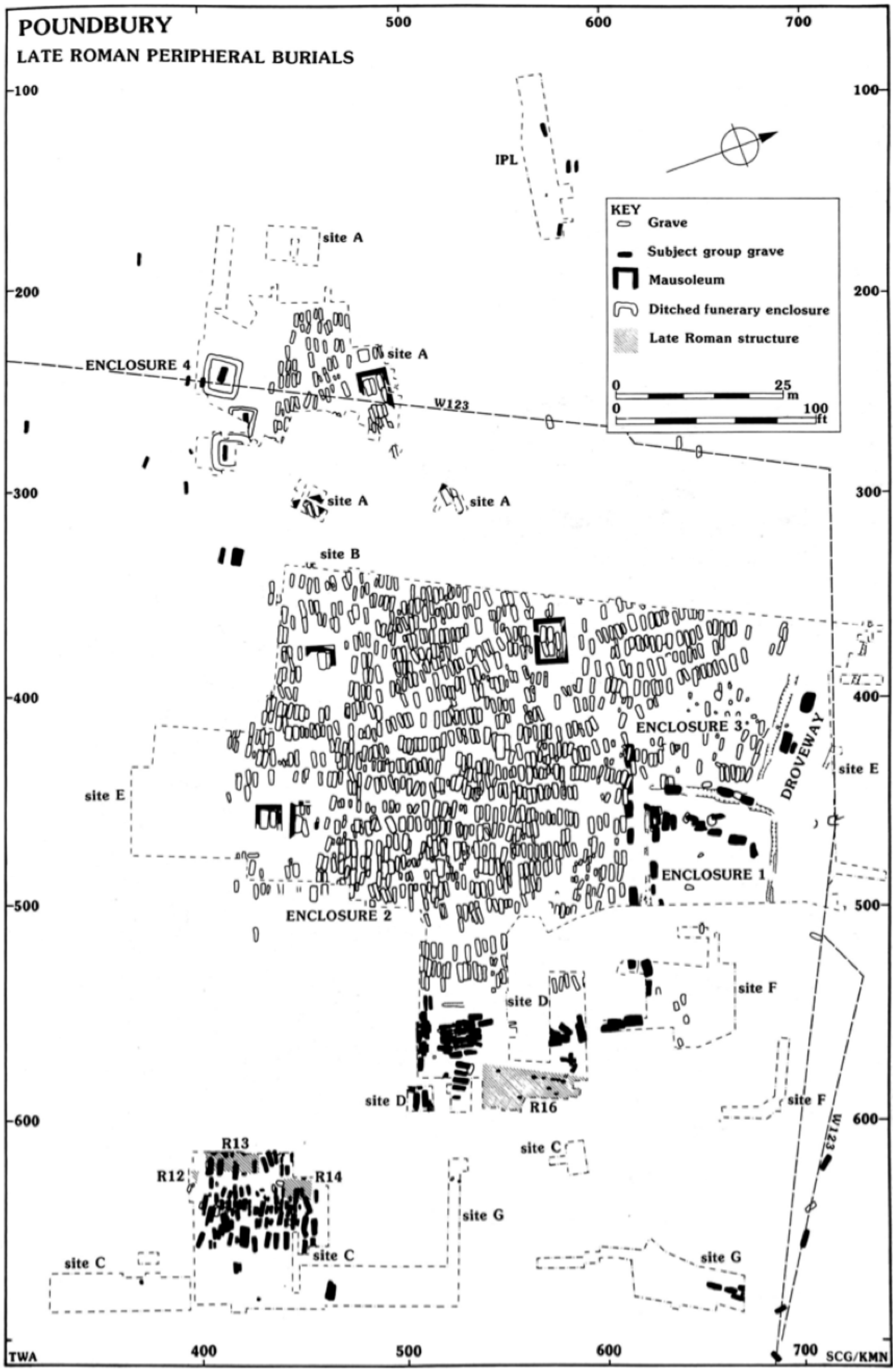


Figure 3.19: *Layout of all Poundbury cemetery sections and all excavated graves (Farwell and Molleson 1993: 17)*

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Neonate and Infant	-	-	-	-	163	43.1	163	15.2
1-3 years	-	-	-	-	62	16.4	62	5.8
4-7 years	-	-	-	-	54	14.3	54	5.0
8-13 years	-	-	-	-	52	13.8	52	4.8
14-19 years	-	-	-	-	47	12.4	47	4.4
Subadult total	**-**	**-**	**-**	**-**	**378**	**100.0**	**378**	**35.2**
20-24 years	43	12.4	39	12.0	2	8.3	84	7.8
25-34 years	87	25.1	81	24.8	6	25.0	174	16.2
35-44 years	63	18.2	97	29.8	5	20.8	165	15.4
45-54 years	52	15.0	49	15.0	2	8.3	103	9.6
55-64 years	52	15.0	36	11.0	1	4.2	89	8.3
65+ years	25	7.2	10	3.1	2	8.3	37	3.4
Adult (no age)	24	6.9	14	4.3	6	25.0	44	4.1
Adult total	**346**	**49.7**	**326**	**46.8**	**24**	**3.4**	**696**	**64.8**
Total sample	**346**	**32.2**	**326**	**30.4**	**402**	**37.4**	**1074**	**100.0**

Table 3.10: *Age and biological sex distribution for all Poundbury late-Roman burials. Adapted from Farwell and Molleson (1993).*

of 55 and older (table 3.10).

Though many studies have been conducted regarding health and disease in the Poundbury cemetery (Lewis 2010; Redfern et al. 2010; Redfern et al. 2012), no migratory stable isotopes, i.e. strontium or oxygen, have been collected for analysis. Data from Poundbury appears only in the sections on cranial phenotypic variation and epigraphy. As previously mentioned, 49 individuals from the late-Roman cemetery at Poundbury are used in the cranial analysis. The measurements pertaining to these individuals were collected by Richard Wright in order to add more populations to the Howells Craniometric Dataset for his software CRANID6 (Wright 2012). Access to the measurements was granted by the Natural History Museum in London, as they are the current curators of the Poundbury skeletons. There is one instance of ethnic expression in epigraphy found in Dorset, but none in the surrounding region. Poundbury was selected for this study because of its excellent cranial preservation and its previous use in craniometric analyses. Though it lacks the isotopic or epigraphic data to complete

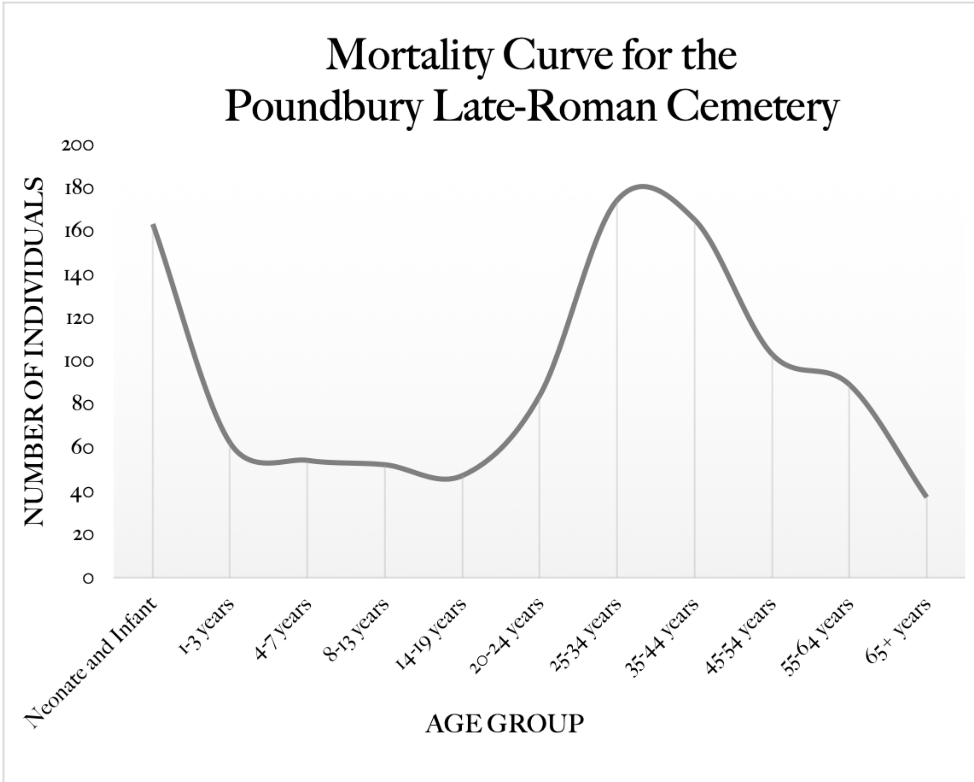


Figure 3.20: *Mortality curve including all burials in the Poundbury late-Roman cemetery*

an interdisciplinary approach, it is an important addition because the site is often used as an example of a standard Romano-British phenotypic profile (Wright 2012). Therefore, it is important to study the phenotypic variation within the site to determine the presence of diverse individuals or groups.

3.7 London

London, or *Londinium*, is considered to be the most widely excavated Romano-British city (Hingley 2018). Because of this, there is a multitude of evidence regarding its history and there are numerous burial grounds. Moreover, London was an important site for trade, due to its location on the Thames, and there is strong archaeological evidence for a diverse community of traders from around the Empire (Hingley 2018). *Londinium* was established in the Roman period no

Figure 3.21: *Plan of new buildings and renovations in Londinium (AD 120-160) (Hingley 2018: 124).*

earlier than AD 47, with little evidence of a pre-Roman site (Wallace 2014; Perring 2015; Hingley 2018). There is some debate surrounding the origins of *Londinium*, as it appears that the town was not preceded by a Roman military settlement (Wacher 1996; Wallace 2014; Perring 2015). It has been theorized that London was settled by migrating merchants (Wacher 1996; Perring 2015), as the army had largely moved more north by the time *Londinium* was established (Wallace 2014). However, it remains unclear whether London was formed by civilian settlers or by Imperial Roman settlers (Hingley 2018).

Though London grew from AD 50-60, most of the city was burned in Boudicca's revolt in AD 60 (Perring 1991; Hingley 2018). From the Flavian period (AD 69-96) to the Nerva-Trajan dynasty (AD 96-138), London was rebuilt (Marsden 1986; Perring 1991; Hingley 2018). New structures included a forum, warehouses and quays along the Thames, a public bathhouse and a palace also by the Thames, and other public buildings such as a possible guild hall and *mansio*, a government inn for couriers and officials (Perring 1991; Hingley 2018). London maintained a military presence in the Flavian period, most notably by the Second Cohort of Tungrians (Perring 1991).

Many historians and archaeologists consider AD 125-160 to be a time of peak growth and stability for *Londinium* (Hingley 2018), which might be a result of Hadrian granting the city *colonia* status during his visit in AD 122, although this is far from certain (Perring 2015). This period saw a surge in the construction of public spaces, including a remodeling of the existing amphitheater and the building of a Romano-Celtic temple and adjacent bathhouse, a colonnaded covered walkway leading up to London Bridge, and an expansion of the *pomerium*, the city limits (Perring 2015; Hingley 2018) (fig. 3.21). Furthermore, renovations took place on governmental buildings such as the governor's palace on the south bank of the Thames (Perring 2015). These renovations to both public and private spaces indicate the growing importance of *Londinium*. Moreover, some of the new temples constructed during this time period signify the presence of foreign traders flaunting their wealth and status, such as one at Tabard Square, which includes a votive dedicated by a trader who indicated that his family was of Gallic descent (Hingley 2018) (fig. 3.22).

In the late second century AD, it appears that London experienced a slight decline in population density, but public buildings such as the amphitheater and baths were still in use (Hingley 2018). It seems that more cemeteries were established around the periphery of *Londinium* at this time, in which a range of different burial practices can be found (Hingley 2018). *Londinium* prospered significantly in the third century AD. Public building works are abundant, but exact occupation levels are unknown as many areas have become waterlogged by the changing course of the Thames over time (Hingley 2018). In late Roman London, there is evidence for increased manufacturing processes, such as metalworking, and the production of bone and leather commodities, which could indicate that

Figure 3.22: ©*Roman Inscriptions of Britain 2017, RIB 3014, excavated from Southwark, London, between two Celtic temples. It reads: "To the Divinities of the Emperors (and) to the god Mars Camulus. Tiberinius Celerianus, a citizen of the Bellovaci, moritix, of Londoners the first [...]." Moritix is most closely defined as "seafarer" (Collingwood et al. 1995)*

those settled in the area became less reliant on incoming trade (Hingley 2018). Domestic buildings from the late-Roman period suggest a wealthy population (Hingley 2018).

In the early fourth century AD, it is hypothesized that *Londinium* became the capital of *Maxima Caesarienesis*, one of the four new provinces into which Britannia was split (Birley 2005; Hingley 2018). London also served as home-base for the *vicarius* of Britannia, a person responsible for governing all four Britannic provinces (Hingley 2018). *Londinium* remained an important port throughout this century and well into the fifth century AD, even as Roman troops and officials began their retreat from the province (Hingley 2018).

Figure 3.23: *Distribution of the Roman London cemeteries used in the current study (Shaw et al. 2016)*

Several cemetery sites from *Londinium* are used in the current project (fig. 3.23). These include: Bishopsgate (Swift 2003), St. Bartholomew's Hospital (Bentley and Prichard 1982), Cott's House (Schofield and Maloney 1998), Great Dover Street (Mackinder 2000), Hooper Street (Barber and Bowsher 2000), 52-63 London Wall (Redfern and Bonney 2014), 65-73 and 49-55 Mansell Street (Barber and Bowsher 2000), Spitalfields Market (Thomas 2004?), and 24-30 West Street (Schofield and Maloney 1998). The chapter on isotopic variation in the current study features a sample of 20 individuals from these cemetery sites, collected and originally analyzed by Shaw and colleagues in 2016. Both *Londinium* proper and the surrounding areas are included in the chapter on epigraphic expressions of diversity.

St. Bartholomew's Hospital lies just outside the northwest border of both the Roman and Medieval walls of London (Bentley and Prichard 1982) (fig. 3.23). It was in use as a cemetery from the 1st century to the 4^{th} century AD (Bentley and Prichard 1982). The use of the cemetery is separated into several time periods. Period IV, which is referred to by the excavators and analysts as the "Roman cemetery," occurred during the 3^{rd} and 4^{th} centuries AD (Bentley and Prichard 1982). The skeletons within the Roman cemetery are used in the current analysis. There are twenty known inhumations at St. Bartholemew's Hospital Roman cemetery (table 3.11). Eight of these burials contain evidence suggesting the use of wooden coffins and two contain grave goods other than coins (Bentley and Prichard 1982).

Most notably, the excavators deduced that some of the graves appeared to be in distinct, relatively undisturbed clusters within the Roman cemetery, implying that the gravediggers deliberately identified certain burial areas in order to associate certain graves with one another (Bentley and Prichard 1982). Furthermore, these grave clusters contain mixtures of men, women, and children, which the authors take as possible evidence for familial burial groups. The biological sex and age-at-death demographic for St. Bartholomew's Hospital could support this theory, as the age and sex categories are more evenly distributed than any other burial ground in this study (table 3.11, fig. 3.24). However, the sample size at this cemetery is far too small to make any definitive assumptions about the larger population.

The inventory of remains from both 24-30 West Smithfield and Cotts House are, unfortunately, unpublished (Hingley 2018). Therefore, the demographic and specific dating information for these cemeteries cannot be discussed. 24-30 West Smithfield is located west of Roman London, further outside the city limits than St. Bartholomew's Hospital cemetery (fig. 3.23). Excavations at 24-30 West Smithfield (site code WES89) took place in 1989 (Filer 1991; Frere and Tomlin 1991; Schofield and Maloney 1998). A total of 127 Roman-period burials were found at this site (Filer 1991; Frere and Tomlin 1991; Schofield and Maloney 1998). Excavations at Cotts House (site code COT88), which is also referred to in records as Camomile Street, were conducted in 1988 (Heathcote 1989; Schofield and Maloney 1998). Cotts House is located on the northeast perimeter, outside the city wall of Roman London, to the east of the Ermine Street gate (fig. 3.23). Twelve Roman period skeletons were uncovered at this cemetery, but no further analysis has been published (Heathcote 1989; Frere et al. 1989; Schofield and Maloney 1998).

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Infant	-	-	-	-	1	16.7	1	5.0
Young child	-	-	-	-	2	33.3	2	10.0
Older child	-	-	-	-	1	16.7	1	5.0
Adolescent	0	0.0	2	50.0	2	33.3	4	20.0
Subadult total	**0**	**0.0**	**2**	**25.0**	**6**	**75.0**	**8**	**40.0**
18-25 years	0	0.0	2	50.0	0	0.0	2	10.0
26-35 years	1	20.0	0	0.0	0	0.0	1	5.0
36-45 years	2	40.0	0	0.0	0	0.0	2	10.0
Unknown adult	2	40.0	0	0.0	5	100.0	7	35.0
Adult total	**5**	**41.7**	**2**	**16.7**	**5**	**41.7**	**12**	**60.0**
Total sample	**5**	**25.0**	**4**	**20.0**	**11**	**55.0**	**20**	**100.0**

Table 3.11: *Demographic profile for the St. Bartholomew's Hospital Roman cemetery in London (Bentley and Prichard 1982).*

Great Dover Street is the only cemetery in this study on the south side of the Thames (fig. 3.23). Excavations from 1996-1997 revealed 25 inhumations and 5 cremations at this site (White 2000). Eleven of these 30 graves contained grave goods of either ceramic or glass nature, but no coins were found (White 2000). Most of the inhumation burials at Great Dover Street have been dated as being later than the mid-2^{nd} century AD (60.0%), but there are also six later than the late 1st to early 2^{nd} century (24.0%), three later than the late 2^{nd} to early 3^{rd} century (12.0%), and one later than the mid-3^{rd} century (4.0%) (White and Wardle 2000). Ten of the 25 burials are subadults, ranging from neonates to 16 years of age (table 3.12). The remaining 15 are adults, although just under half cannot be assigned a specific age-at-death (table 3.12) (White 2000). Unlike contemporary cemeteries in other areas of Roman Britain, there is a relatively even split between males, females, and adults of indeterminate biological sex at Great Dover Street (table 3.12) (White 2000). However, this demographic breakdown is more common in the Romano-British cemeteries of London (tables 3.11, 3.12), possibly due to the city's civilian, rather than military, nature. Assessing the mortality curve at Great Dover Street is difficult because 28.0% of the inhumations cannot be assigned to a more specific age category. However, it is clear from the demographic profile of subadults that the Great Dover Street population does not mimic either attritional or catastrophic mortality (fig. 3.25). More skeletons

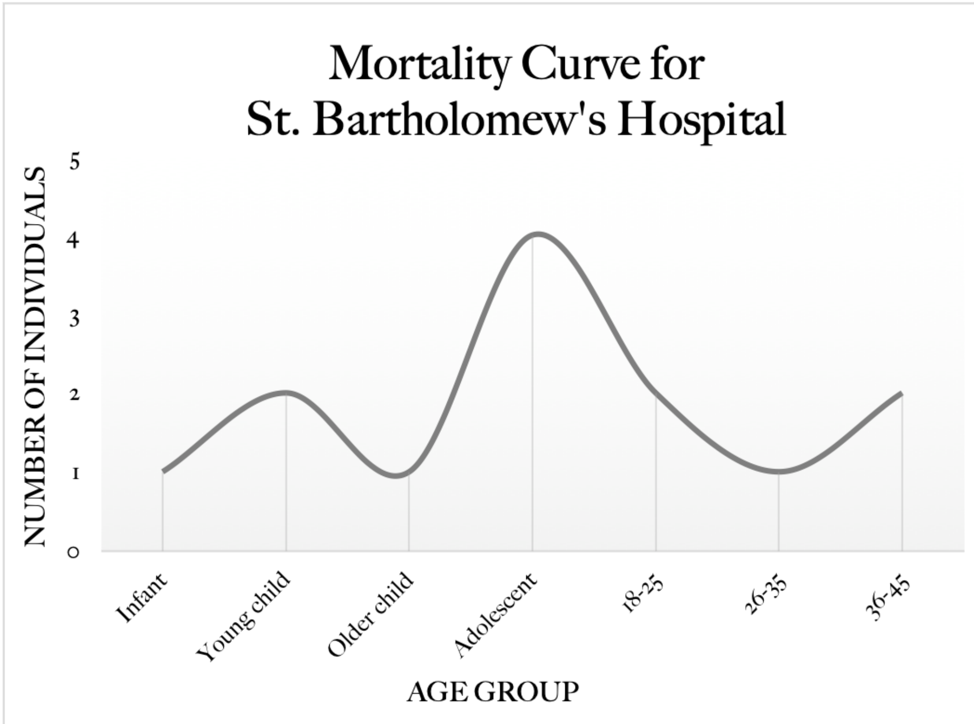


Figure 3.24: *Mortality curve for St. Bartholomew's Hospital Roman Cemetery (BAR79) (Bentley and Prichard 1982).*

would need to be excavated to confirm this demographic profile.

The Romano-British cemeteries at Hooper Street (HOO88) and Mansell Street (MSL87 and MNL88) are both contained within the larger "eastern" cemetery of Roman London (Barber and Bowsher 2000; Conheeney 2000). Individuals from 65-73 Mansell Street (MNL88 or Site E), 49-55 Mansell Street (MSL87 or Site F), and Hooper Street (HOO88 or Site D) were used in the section on stable migratory isotopes in the current study. However, the demographic information for these cemeteries is combined with all other sites that comprise the Roman London's eastern cemetery, which contains a total of 545 inhumation burials and 550 skeletons (5 double burials) (Conheeney 2000). Furthermore, as modern excavations determined the boundaries of these specific sites, Hooper Street and Mansell Street will be considered in the larger context of the eastern cemetery. The demographic information for all sites within the eastern cemetery is included here.

The eastern cemetery of Roman London covers an expanse of 12 hectares just

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Neonate	-	-	-	-	1	10.0	1	4.0
0-5 years	-	-	-	-	4	40.0	4	16.0
6-12 years	-	-	-	-	3	30.0	3	12.0
13-16 years	-	-	-	-	2	20.0	2	8.0
Subadult total	**-**	**-**	**-**	**-**	**10**	**100.0**	**10**	**40.0**
17-25 years	2	40.0	2	33.3	0	0.0	4	16.0
26-45 years	2	40.0	1	16.7	1	25.0	4	16.0
Adult (18+)	1	20.0	3	50.0	3	75.0	7	28.0
Adult total	**5**	**33.3**	**6**	**40.0**	**4**	**36.7**	**15**	**60.0**
Total sample	**5**	**20.0**	**6**	**24.0**	**14**	**56.0**	**25**	**100.0**

Table 3.12: *Demographic profile for the Great Dover Street cemetery of Roman London (GDV96) (Mackinder 2000).*

outside the eastern wall of the Roman city, following the line of a Roman road that is no longer in existence (Barber and Bowsher 2000). This cemetery was in use between AD 39-410, though the majority of the inhumations (66.0%) occurred between AD 250 and 410 (Barber and Bowsher 2000). At site F of the eastern cemetery, which contains the inhumations of 49-55 Mansell Street, the earliest burials must have been interred after AD 70, but no later than AD 270 (Barber and Bowsher 2000). At site D, which contains the Hooper Street burials, there is no definitive start date for the plots, but it appears that the area was used for burials into the 3^{rd} century AD. Finally, site E, which contains the burials from 65-73 Mansell Street, evidence suggests that one of the ditches was closed after AD 180, another after AD 200, and a third was still in use by AD 350 (Barber and Bowsher 2000). Overall, most of the contexts here can be considered late Roman, with the exception of the earlier burials from 49-55 Mansell Street. However, none of the skeletons deposited in the early burial phases are used in the isotopic analysis of the current study.

Throughout the eastern cemetery, there are 129 instances of subadult burials (23.5% of the cemetery), the majority of which range from newborn to 5 years old (table 3.13) (Coheeney 2000). The rate of age at death in subadults subtly declines in older children and adolescence. By far the largest demographic group is that of males between the ages of 26 and 45, of which there are 91 (16.5%

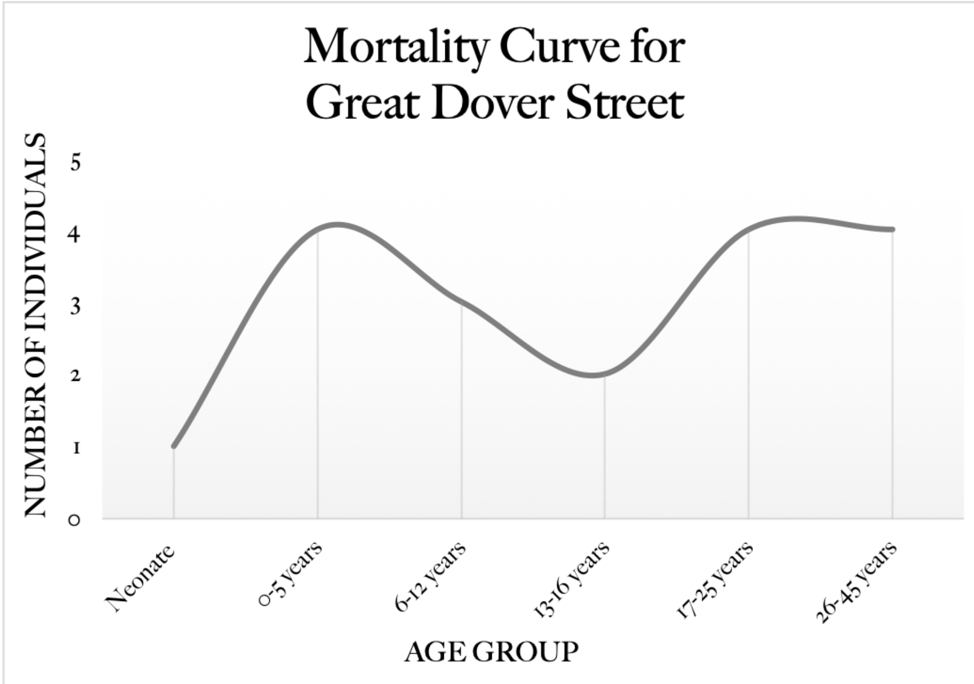


Figure 3.25: *Mortality curve for the Great Dover Street cemetery of Roman London (GDV96) (Mackinder 2000).*

of the cemetery) (table 3.13) (Coheeney 2000). Overall, there are more males than females (roughly 3:1.5), but this distinction is not as pronounced as many of the contemporary cemeteries in other parts of Roman Britain in this study. The mortality curve does not exactly mimic attritional mortality, but it contains many of the same qualities. For example, the rates of infant and small child deaths are higher than those of older children and adolescents (fig. 3.26). Furthermore, age-at-death rates peak in middle adulthood and decline as age ranges increase (fig. 3.26).

The cemetery at 52-63 London Wall is located in the north of Roman London, at a known leather-making site (Redfern and Bonney 2014). Interestingly, this cemetery is situated within the Roman city walls, rather than outside, which is rare (Beard et al. 1998: 180). However, it is possible that the cemetery was in use before city walls were expanded. The individuals from this cemetery date significantly earlier than most other contexts in this study. The two individuals used in this study from the cemetery date between AD 40-200 (Redfern and Bonney 2014). There are no definitively female and no subadult remains at the

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
0-5 years	-	-	-	-	49	38.0	49	8.9
6-12 years	-	-	-	-	34	26.4	34	6.2
13-18 years	-	-	-	-	29	22.5	29	5.3
Subadult (no age)	-	-	-	-	17	13.1	17	3.1
Subadult total	**-**	**-**	**-**	**-**	**129**	**100.0**	**129**	**23.5**
19-25 years	30	16.1	19	17.5	7	7.7	56	10.2
26-45 years	91	48.9	54	49.5	14	15.4	159	28.9
ca. 45 years	32	17.2	18	16.5	4	4.4	54	9.8
Adult (no age)	33	17.8	18	16.5	66	72.5	117	21.3
Adult total	**186**	**48.2**	**109**	**28.2**	**91**	**23.6**	**386**	**70.2**
No ageing data	-	-	-	-	35	13.7	35	6.3
Total sample	**186**	**33.8**	**109**	**19.8**	**255**	**46.4**	**550**	**100.0**

Table 3.13: *Demographic profile for the eastern cemetery of Roman London, which includes the Hooper Street and Mansell Street excavations (Conheeney 2000).*

London Wall Roman cemetery (Redfern and Bonney 2014). There are 16 adult male burials that range between 18 and 35 years of age-at-death and an additional 20 adult males that cannot be definitely aged (Redfern and Bonney 2014) (table 3.14). The remaining four burials are adults of unknown age or sex (Redfern and Bonney 2014) (table 3.14). Because there are only two definitive age groups at the London Wall cemetery, no mortality curve was calculated. Unlike the other contexts in this study, Roman London is not known to be primarily a military settlement, but rather a settlement of tradesmen, craftsmen, Roman officials, and families. However, the demographic at the London Wall cemetery mimics those of military settlements in Roman Britain (tables 3.4, 3.5, and 3.9). On the other hand, the London Wall Roman cemetery differs fundamentally from every other site in this study—and, in fact, from every cemetery that follows imperial Roman custom—in that its burials are within the *Londinium* city limits (fig 3.23).

Both the Spitalfields Market (SRP98) and the Bishopsgate (BGB98) cemeter-

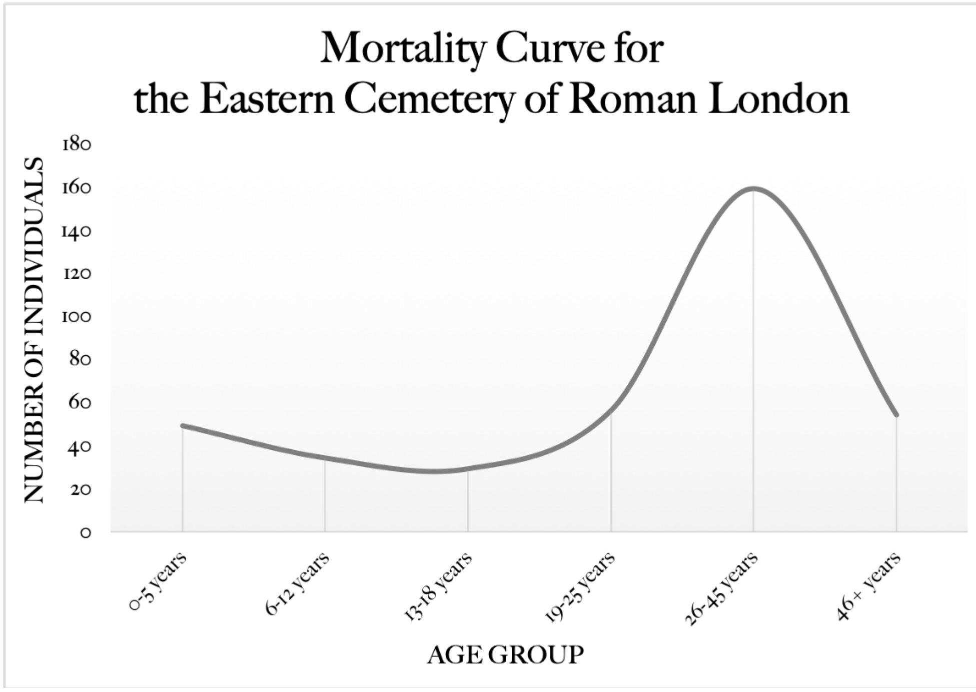


Figure 3.26: *Mortality curve for the eastern cemetery of Roman London (Conheeney 2000).*

ies are also a part of the northern cemeteries of Roman London. Both cemeteries flank Ermine Street, with Bishopsgate to the west and Spitalfields to the east, and are roughly four kilometers north of the city walls (fig. 3.23). Very little has been published regarding the Spitalfields Market late Roman cemetery (Barber and Hall 2000). Thomas (2004) gives a brief overview of the site, stating that most burials date between AD 250 and 400, much like the other Romano-British cemeteries in this study, which is corroborated by Barber and Hall (2000). Crerar (2012) has been able to determine that roughly 200 skeletons have been excavated so far from the Spitalfields Market cemetery. Unfortunately, no demographic information is available specifically for Spitalfields Market. Despite the lack of information, one skeleton in particular has been discussed in a publication—as well as several news articles—based upon her elaborate burial filled with grave goods that point to origins outside of Roman London, possibly from North Africa (Thomas 1999; Pearce 2011). The demographic information for the Bishopsgate Roman cemetery is equally elusive (Barber and Hall 2000). Bishopsgate is the smaller of the two Ermine Street cemeteries, housing around 50

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
18-25 years	1	2.8	-	-	-	-	1	2.5
26-35 years	15	41.7	-	-	-	-	15	37.5
36-45 years	0	0.0	-	-	-	-	0	0.0
46+ years	0	0.0	-	-	-	-	0	0.0
Adult (18+)	20	55.6	-	-	4	100.0	24	60.0
Total sample	**36**	**90.0**	**0**	**0.0**	**4**	**10.0**	**40**	**100.0**

Table 3.14: *Demographic profile for the London Wall Cemetery (Redfern and Bonney 2014).*

inhumations (Crerar 2012). Though the osteological reports are unavailable for these two cemeteries, Barber and Hall (2000) determined from tombstones that at one time at least six adult males and two adult females were present, as well as an additional four adults of indeterminate biological sex and nine subadults.

3.8 Baldock

Baldock, whose Latin name is unknown, is a small, undefended Roman settlement in the southwest of modern-day England (Burnham and Wacher 1990) (fig. 3.27). Like Ancaster, it is also situated on the trade route between Londinium and Eboracum (fig. 3.4). The Iron Age settlement at Baldock was well established before the Roman conquest (Fitzpatrick-Matthews 2007). Unlike other sites, there is no evidence of Romans building a town from scratch, but rather a change in pottery types and burial rites that signify a cultural or population change at Baldock (Fitzpatrick-Matthews 2007; Burleigh and Fitzpatrick-Matthews 2010). Little else is known about the settlement at Baldock, as the cemeteries are the most widely excavated feature to date (Fitzpatrick-Matthews 2010). Aerial surveys have revealed a Romano-Celtic temple and some associated structures in the center of the Roman town, but none of this area has been excavated (Fitzpatrick-Matthews 2010). Most of the evidence for a Roman town at Baldock comes from inhumations, cremations, pottery, and aerial photography (Fitzpatrick-Matthews 2010).

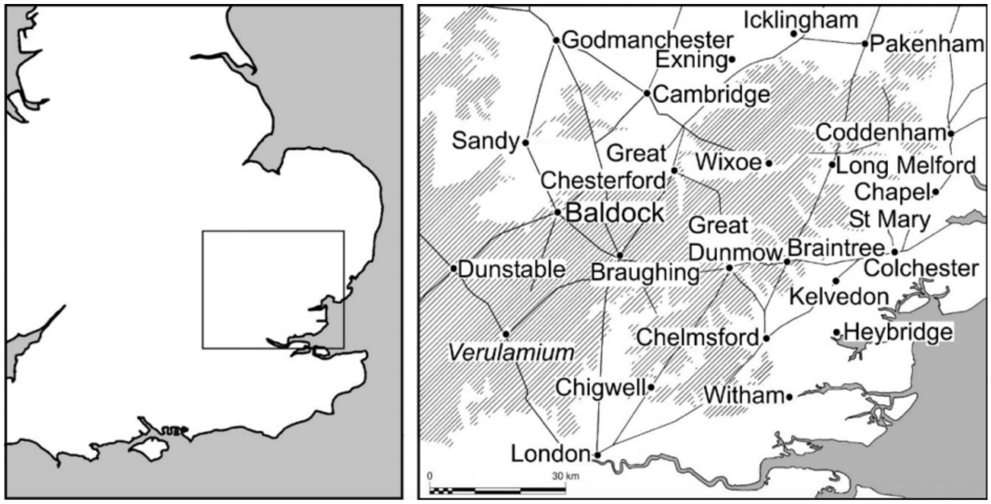


Figure 3.27: *Location of Baldock, North Hertfordshire*

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Infant	-	-	-	-	1	9.1	1	1.8
Juvenile	-	-	-	-	9	81.8	9	15.8
Adolescent	-	-	-	-	1	9.1	1	1.8
Subadult total	**-**	**-**	**-**	**-**	**11**	**100.0**	**11**	**19.3**
17-25 years	4	16.0	0	0.0	0	0.0	4	7.0
26-35 years	2	8.0	0	0.0	0	0.0	2	3.5
36-45 years	4	16.0	4	22.2	0	0.0	8	14.0
46+ years	14	50.0	13	72.2	0	0.0	27	47.4
Adult (no age)	1	4.0	1	5.6	3	21.4	5	8.8
Adult total	**25**	**54.3**	**18**	**39.1**	**3**	**6.5**	**46**	**80.7**
Total sample	**25**	**43.9**	**18**	**31.6**	**14**	**24.6**	**57**	**100.0**

Table 3.15: *Demographic profile for the Land to the Read of California cemetery in Roman Baldock (Caffell and Holst 2015)*

There is no evidence of Baldock containing the structures necessary to house permanent military units, but it is almost certain that soldiers would have crossed through the area given its location, especially during the Boudiccan revolt (AD 69) (Burleigh and Fitzpatrick-Matthews 2010). It is more likely that the site was characterized by a mixture of trade and agriculture (Fitzpatrick 2007). Although there is very little evidence of buildings and other structures, it is theorized that Baldock was occupied well into the fifth century AD—after Romans retreated from Britain—based upon the dates of several inhumations (Fitzpatrick-Matthews 2016). Most of the evidence suggests that Baldock remained, for the most part, in the hands of indigenous Britons, considering the lack of military activity and the lack of epigraphic evidence. However, more archaeological interventions are necessary to say anything definitive about the settlement as a whole. Because of these restrictions, evidence from Baldock is only used in the section on cranial phenotypic variation. However, epigraphic evidence in the surrounding region will also be considered.

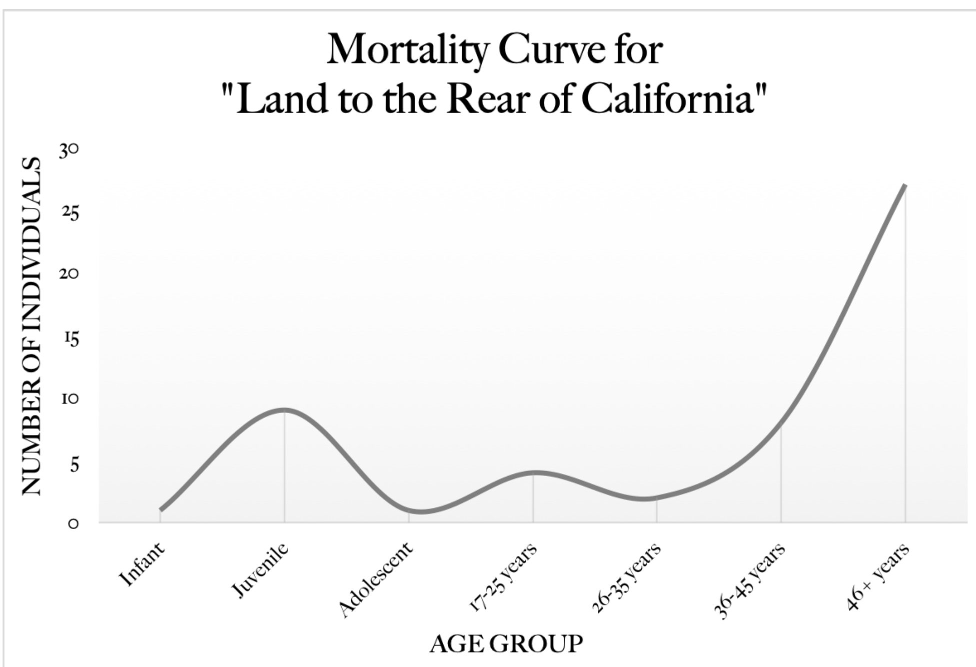


Figure 3.28: *Mortality curve for the "Land to the Rear of California" cemetery in Baldock (Caffell and Holst 2015).*

	Male		Female		Indeterminate		Total	
Age	N	%	N	%	N	%	N	%
Infant	-	-	-	-	6	46.2	6	6.6
Child	-	-	-	-	3	23.1	3	3.3
Subadult (no age)	-	-	-	-	4	30.8	4	4.4
Subadult total	**-**	**-**	**-**	**-**	**13**	**100.0**	**13**	**14.3**
Young/mature adult	14	48.3	16	44.4	1	7.7	31	34.1
Adult	8	27.6	11	30.6	10	76.9	29	31.9
Older adult	7	24.1	9	25.0	2	15.4	18	19.8
Adult total	**29**	**37.2**	**36**	**46.2**	**13**	**16.7**	**78**	**85.7**
Total sample	**29**	**31.9**	**36**	**39.6**	**26**	**28.6**	**91**	**100.0**

Table 3.16: *Demographic profile for the late-Roman California cemetery in Baldock (Fitzpatrick-Matthews, Burleigh, and Stevenson 2010).*

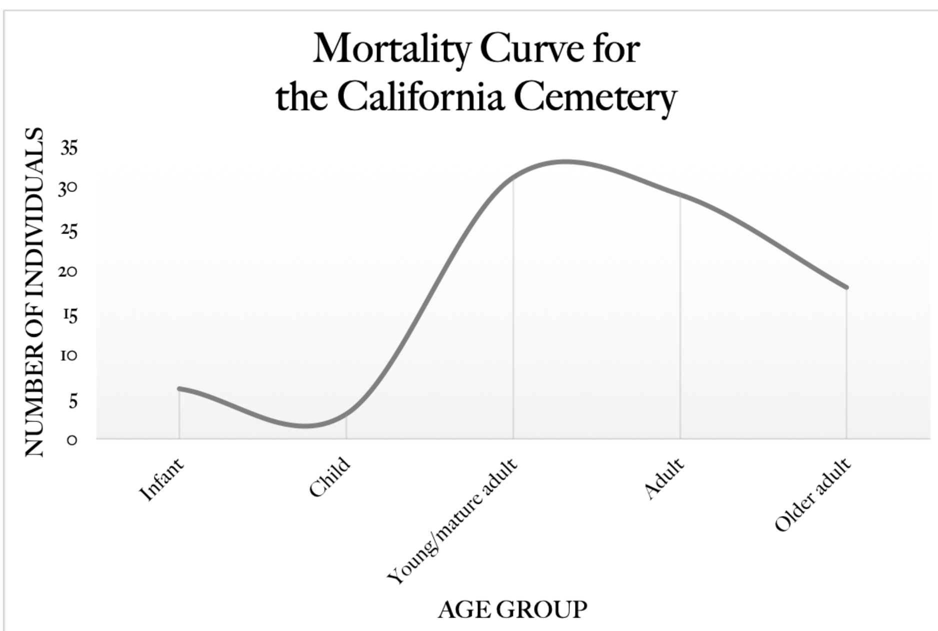


Figure 3.29: *Mortality curve for the California cemetery in Baldock (Fitzpatrick-Matthews, Burleigh, and Stevenson 2010).*

There are twenty-two excavated sites that include Roman cemeteries in Baldock, many of which were established during the Iron Age (Fitzpatrick-Matthews 2007; Burleigh and Fitzpatrick-Matthews 2010). Skeletons from two late-Roman Baldock cemeteries are used in the cranial phenotypic variation portion of the current study: the California cemetery (site code BAL-1) and an offshoot of this site referred to as "land to the rear of California" (site code HN897) (Fitzpatrick-Matthews, Burleigh, and Stevenson 2010; Caffell and Holst 2015). At the two sites combined, there is an equal split between adult males and females (tables 3.15 and 3.16), which is most similar to the aforementioned Lankhills and Poundbury cemeteries (tables 3.1, 3.2, and 3.10). This demographic is vastly different from the contemporary military-centric sites used in this study, which corroborates the theory that Baldock was a market center (Fitzpatrick-Matthew 2007).

3.9 Chester

Roman Chester, or *Deva*, is located in the east midlands of modern England (3.30), which was in the territory of the *Cornovii* tribe before Roman conquest in Britain (fig. 3.4). Though there is little evidence, it is possible that troops passed briefly through Chester on their way to the north and west coasts of Wales in the early days of Roman occupation in Britain (Shotter 2002). In the late 70s and early 80s AD, a military fortress was constructed at Chester. This fortress may have been built as a base for the Legio II Adiutrix (Shotter 2002). The fortress was large and elaborate, and contained baths and a basilica, which is unusual for the generally utilitarian nature of military settlements, especially one at the very edge of the province with few links to major trade routes besides a port (Mason 2002a). It is also suggested that the Legio II Adiutrix was rewarded with more extravagant accommodations for supporting Vespasian in the Year of the Four Emperors (Mason 2002a).

As for the town and port, there is evidence for baths, an arena, a parade ground, and a *mansio*–an inn for government travelers (Mason 2002b). Many of the structures show evidence of use and refurbishment throughout the period of Roman occupation until around the mid-fourth century AD (Mason 2002b). Chester is an important site in this study because of its heavy military focus. There is evidence to suggest that three different legions settled in Chester: *Legio II Adiutrix*, *Legio II Augusta*, and *Legio XX Valeria Victrix* (Collingwood et al. 1995). There are over 150 inscriptions from *Deva*, over half of which are dedicated by members of the army. Despite its classification as being "on the edge of the Empire" (Mason 2012), Chester appears to have been home to individuals from

Figure 3.30: *Map highlighting Cheshire, the county in which Chester resides. © Creative Commons.*

all over the Roman world, which will be discussed further in the coming chapters. There are no excavated cemeteries from this site, which limits this study. However, the epigraphy and material culture from Chester are important findings that will aid in better understanding the experience of foreignness in Roman Britain.

3.10 Hadrian's Wall and Maryport

Although Hadrian's Wall is a vast area containing many Roman military forts, it can also be thought of as a continuous line of connected settlements that share common goals. As these goals include creating boundaries, controlling the movement of people, controlling the taxation of people, and separating "civilization" from "barbarianism" (Breeze and Dobson 2000; Breeze 2011; Breeze 2014; Goldsworthy 2018), all topics that are relevant to migration and diversity, Hadrian's Wall will be considered as a whole entity in the current project. This section will also include a history of Maryport, a Roman town on the western edge of Hadrian's Wall, which is considered separately in this project because of its importance as a port and its abundance of epigraphy denoting people of foreign origin. Firstly, the wall was built as a means of delineating the border between lands under Roman control and lands under Pictish control (Breeze and Dobson 2000; Salway 2015). While the exact function of the wall remains under debate, it is clear that it was not intended to be just a boundary (Breeze and Dobson 2000; Breeze 2011; Breeze 2014; Goldsworthy 2018). The main issue in understanding all of the functions of the wall lies in the fact that all contemporary evidence referring to the wall's purpose was written by Romans (Goldsworthy 2018).

As mentioned in the previous chapter, construction of Hadrian's Wall began in AD 122 and was completed in 128. Three legions were sent to construct the wall: *Legio II Augusta* based in Caerleon, *Legio VI Victrix* based in York, and the *Legio XX Valeria Victrix* based in Chester (Taylor 2000). The *Legio VI* originally had been stationed in Spain and then Lower Germany, but came to Britain specifically to aid in building Hadrian's Wall (Taylor 2000). This means that there were over 15,000 troops involved in constructing the wall over a 6-year period, many of which had been recruited from previously conquered provinces (Birley 2002). The 117.5km (73 miles, 80 Roman miles) wall contains 158 turrets, 80 milecastles, and 15 manned military forts (Goldsworthy 2018). The primary forts along the wall were at South Shields, Newcastle-upon Tyne, Wallsend, Benwell, Rudchester, Halton Chesters, Chesters, Housesteads, Great Chesters, Birdoswald, Castlesteads, Stanwix, Burgh-by-Sands, Bowness-on-Solway, and Maryport (Breeze and Dobson 2000; Taylor 2000).

Each milecastle was equipped to hold 20-30 men (Breeze and Dobson 2000). The forts, on the other hand, were designed to hold entire auxiliary units, which could be as large as 800 men and were often comprised of non-Romans from non-Roman areas (Goldsworthy 2018). This means that around every 7.5km there were 800 auxiliary men guarding the wall and its walkways, as well as an

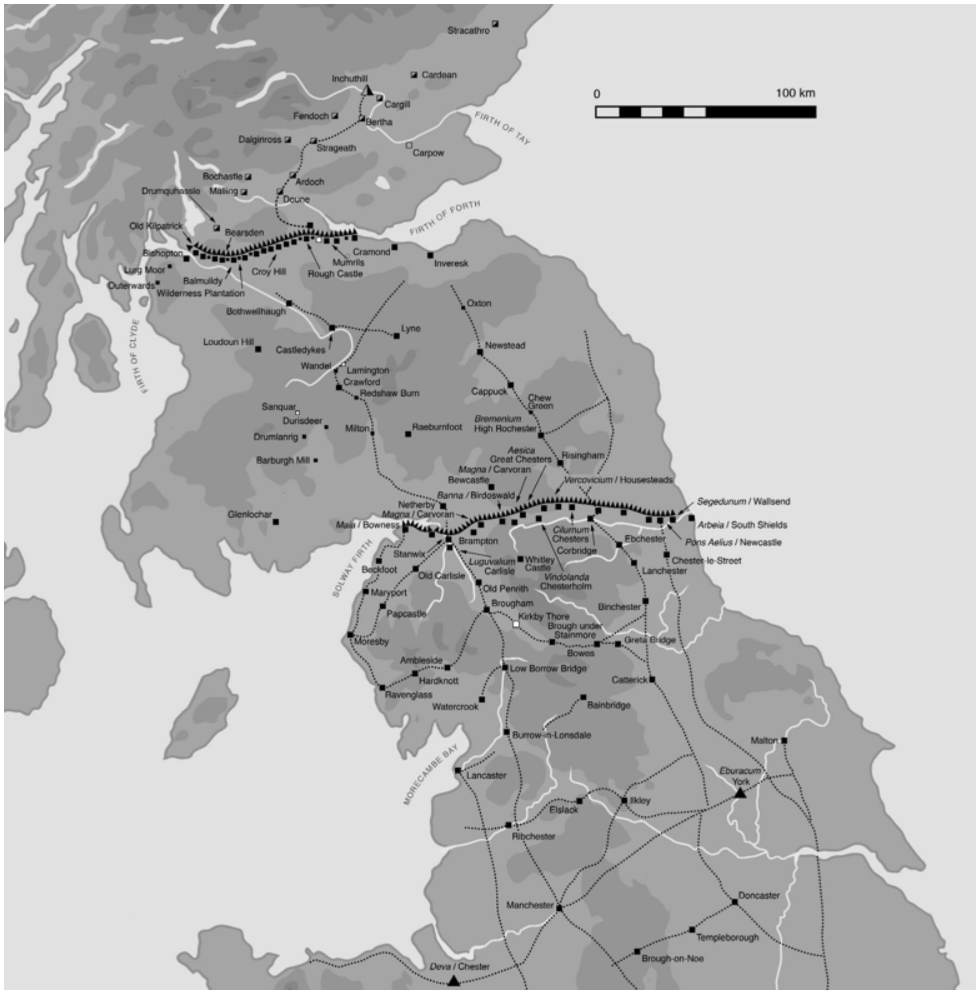


Figure 3.31: *Map of Hadrian's Wall (southern) and the Antonine Wall (northern) (Breeze 2011).*

additional 20-30 soldiers at every 1.5km mark in between these forts. Considering the size of the wall, there could be more than 13,600 men patrolling the border at its peak capacity. Each of these areas contained a gate, which allowed the patrolmen to control movement over the border (Breeze and Dobson 2000). They also argue that this "liberal provision of gates" is evidence that Hadrian's Wall was not meant to prevent movement, but merely control it (Breeze and Dobson 2000: 37).

Shortly after Hadrian's death, emperor Antoninus Pius effectively abandoned Hadrian's Wall in an effort to conquer northern Britain (Breeze and Dobson 2000).

Antoninus began construction of the Antonine Wall in AD 142, a little over 100km to the north of Hadrian's Wall (fig. 3.31). Two separate emperors, Antoninus Pius and Septimius Severus, attempted to successfully occupy the Antonine Wall and incorporate the land in between Hadrian's Wall and the Antonine Wall into the empire. During these times, from AD 142-160 and again from AD 208-211, Hadrian's Wall was not consistently occupied, but eventually both campaigns failed and the Roman army retreated back to the original wall (Breeze 2014). During this time Hadrian's Wall suffered from neglect, but was repaired in the early-to-mid third century (Breeze and Dobson 2000). At this time, some of the existing forts were expanded upon and refurbished (Breeze and Dobson 2000). Also at this time, civilian sites expanded to the south of the wall and indigenous sites expanded to the north of the wall (Breeze and Dobson 2000).

In the late third century, Hadrian's Wall fell into disrepair yet again as Britain seceded from the Roman Empire and joined the Gallic Empire (Breeze and Dobson 2000; Salway 2001). Although Britain was reabsorbed into the Roman Empire in AD 274, they seceded yet again in 287, and in 296 Hadrian's Wall was abandoned as Romano-British troops followed the "usurper" Allectus to defend his claim to Britain and Gaul in battle (Breeze and Dobson 2000; Salway 2001; Drinkwater 1987). Early in the fourth century, Hadrian's Wall became secondary yet again to the Antonine Wall, as the new emperor Constantine I campaigned north into Pict lands (Goldsworthy 2018). These campaigns were short-lived as civil war broke out in the south of the Empire and pulled forces away from Britain (Goldsworthy 2018). In the mid-to-late fourth century AD, the *conspiratio barbarica* laid waste to Hadrian's Wall and the indigenous people of modern Scotland continued to raid far south of the wall (Goldsworthy 2018). Some rebuilding of the northern frontier occurred in the later fourth century AD, but attacks from indigenous people continued and Britain was denied help and there is very little known about occupation at the wall in the late fourth and early fifth centuries AD (Breeze and Dobson 2000; Goldsworthy 2018).

Maryport, or Aluana, in particular is an interesting site at the edge of Hadrian's Wall because is it is also associated with a second border: a port. Though many coins used for dating have now gone missing, there is evidence to support the theory that the fort at Maryport was constructed shortly before work began on Hadrian's Wall (Wilson 1997; Breeze 2018). Unfortunately, very little is known about the fort and settlement at Maryport between the second and third centuries AD (Wilson 1997). It is known, however, that Alauna was an important site for importing the materials needed to construct the wall, but its ports also became an important part of the "Hadrianic frontiers" as they are well positioned to defend the Cumbrian coast (Wilson 1997). Additionally, there is epigraphic evidence that Maryport served as a base for many foreign-recruited auxiliary cohorts, including the First Cohort of Spaniards, the First Cohort of Dalmatians, and the First Cohort of Baestasians (Breeze 2018). Though not all of the men in these cohorts would have still been from these places, there is a plethora of epigraphic evidence to suggest that many members were of foreign origin (RIB 812, 816, 832, etc.). The origins of these men will be discussed in later chapters.

As no burial grounds around Hadrian's Wall or Maryport were available for analysis, this dissertation will deal only with the inscriptions on the wall and the surrounding areas. However, as these settlements were almost purely military in nature, these sites are a valuable resource in determining the structure of the army and the willingness of its men to proudly display their origins. Unfortunately, a large number of these inscriptions cannot be dated with any certainty. Nonetheless, both Hadrian's Wall and Maryport are both important examples of the Roman army introducing vast diversity into Britain.

3.11 Summary

This study will utilize important archaeological information, namely cranial phenotypic variation, stable isotope information, and expressions of foreign identities, from each of the sites listed above. Though every site does not contain examples of each specific type of evidence, it is important to incorporate sites from all areas of Roman Britain to better understand the diverse experiences across the province. Table 3.17 outlines which strands of evidence were available for study at each individual site, including whether or not epigraphy describing foreign origins or affiliations exists in the nearby region.

All of the skeletal material used in this study is considered to be late Roman, with the exception of the two skeletons from 60 London Wall, skeleton 325 from Great Dover Street, and skeleton 1407 from Hooper Street (Shaw et al. 2016). Additionally, seven skeletons could not be definitively dated and are, therefore, not decidedly late Roman. These are skeletons: 400 from 201 Bishopsgate, 30 from Cotts House, 105, 518, and 652 from Hooper Street, and 599 and 709 from 24-30 West Street (Shaw et al. 2016). Late Roman refers to the period roughly between AD 200 and 410, during which time inhumation was the primary burial rite. The four skeletons that are definitively earlier than the late-Roman period remain within the study because they are all, at most, only 100 years earlier than the confines of the late-Roman period, and they have been included in other primarily late-Roman studies in the past without issue (Shaw et al. 2016).

Site	Phenotypic Variation	Stable Isotope Analysis	Epigraphic Evidence	Epigraphy in surrounding regions
Winchester	X	X	X	X
York	X	X	X	X
Gloucester		X	X	X
Ancaster	X		X	X
Catterick		X	X	X
Poundbury	X		X	X
Baldock	X			X
London		X	X	X
Chester			X	X
Hadrian's Wall			X	X
Maryport			X	X

Table 3.17: *Types of evidence analyzed at each site.*

Though there are some cemeteries whose periods of use do not overlap (fig. 3.32), it is important that a variety of sites are included in this comprehensive study. Winchester, Poundbury, Baldock, and most London sites are excellent examples of civilian settlements with evidence of trade, whose cemeteries reflect a more equal division between age groups and biological sex (tables 3.10, 3.12, 3.15, and 3.16). On the other hand, the cemeteries used here from York, Catterick, Ancaster, Gloucester, as well as the Eastern London cemetery and 60 London Wall, have significantly imbalanced demography (tables 3.6, 3.7, 3.9, and 3.13). Not only do these sites lack an equal balance between adult males and females, they also often have little to no evidence of subadult inhumations. This suggests that the burial contexts in question are military in nature. Regardless of slight differences in time period, it is invaluable to have examples from both civilian and military contexts in a study of migration and diversity.

Lastly, the sites included in this study are geographically diverse. They range from one of the most southerly points on the island (Dorchester) to Hadrian's Wall, which was the most stable and consistent northern border throughout the Roman period in Britain (refer back to figures). It is important to include a variety of sites in this manner because certain geographic locations in Roman Britain held greater meaning in terms of migration and diversity. First of all, it is clear from the conquest timeline that many of the southern sites were under Roman

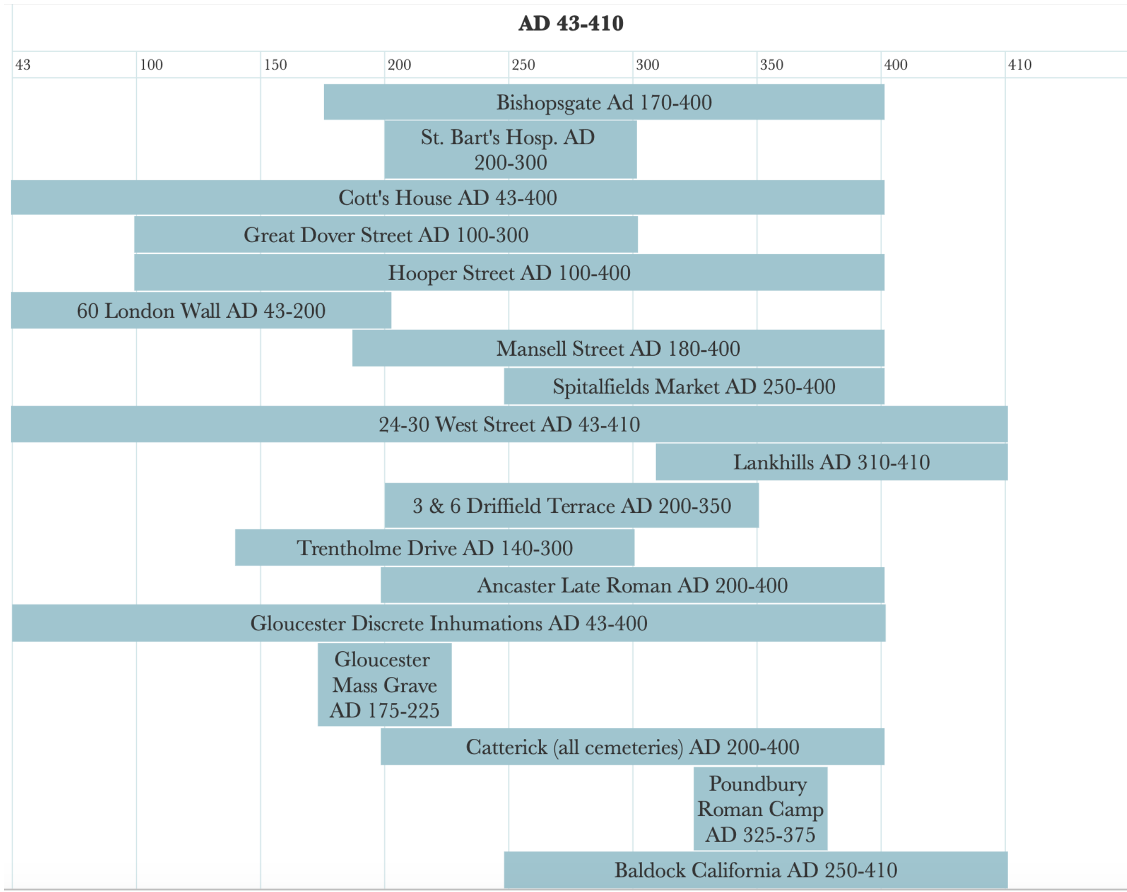


Figure 3.32: *Timeline highlighting each cemetery's use during the Roman period in Britain.*

control far longer than the midland and northern sites, such as York and Hadrian's Wall. London, in fact, had a forum, basilica, and amphitheater for nearly 50 years before construction begins at Hadrian's Wall. Moreover, the age and biological sex demographics at most sites corroborate the evidence that military occupation continued for long periods after the initial conquest–sometimes for many generations. In addition, conflicts in Northern Britain between indigenous British tribes and Roman legions continued for over 100 years after *Londinium* began to flourish as the capital. Both Ancaster and London were close to—and affected by—Boudicca's revolt, which indicates a nearby presence of indigenous Britons who were not loyal to the Roman Empire. Furthermore, Hadrian's Wall is well known for being populated by soldiers from all over the Empire, but also for being subjected to attacks from these rebels beyond the border. Each specific area has a significant history that is important in understanding how individuals living at those sites experienced diversity.

Furthermore, throughout the late Roman period-—a time in which many of the individuals included in this study were living-—Britain experienced a period of extreme political upheaval. To recap: in this short span of 200 years Britain, Gaul, and Spain seceded from the Roman Empire, then subsequently was reabsorbed into the Empire. Shortly after returning to the Roman Empire, Carausius, declared himself emperor of Britain in AD 287. He was then murdered and replaced by his secretary, Allectus in AD 293. Britain was re-conquered by Rome in AD 296, but the province remained frequently under attack by both indigenous and external tribal groups, which translates to a near-constant military presence in Britannia. Considering the fact that much of the Roman army in Britain was recruited from previously conquered provinces, all of these political happenings should have a profound effect on the ways in which archaeologists and historians alike approach complex topics such as migration and diversity. This is why including a variety of important sites across Roman Britain is essential to any comprehensive study on the experiences of Romano-British people.

Chapter 4

Cranial Phenotypic Variation

This chapter will outline statistical techniques to explore craniometric and phenotypic variation in an efficient, accurate, and ethical manner using skeletal material from five cemeteries in Roman Britain: the late-Roman cemetery at Lankhills (Clarke 1979; Booth et al. 2010; Stuckert 2017), the Roman cemetery at Ancaster (Cox 1989), the cemetery at number 3 Driffield Terrace in York (Tucker 2005, data collected by Dr. Anwen Caffell for York Osteoarchaeology Ltd.), the Poundbury Roman cemetery in Dorset (Farwell and Molleson 1993, data collected by Dr. Richard Wright for the Natural History Museum of London), and the "California" cemetery in Baldock (Burleigh and Fitzpatrick-Matthews 2010; Caffell and Holst 2015). These cemeteries will be analyzed independently and also as a group.

Many recent studies have uncovered a multitude of accuracy and ethical issues (Albanese and Saunders 2006; Elliott 2008; Elliott and Collard 2009; Anton, Malhi, and Fuentes 2018; DiGangi and Bethard 2020). Ancestry is often considered to be one of the most difficult components of personal identification in forensic medicine (Dunn et al. 2020), so, naturally, is it even more difficult in archaeological studies. Forensic scientists have the advantage of describing a person's ancestry in socially-recognized terms that are consistent with the modern society in which that individual lived. In other words, forensic anthropologists use ancestral and ethnic terminology that modern people understand in order to identify a modern person. However, many of these techniques rely upon modern definitions of race, ethnicity, and ancestry—concepts that had significantly different meanings in many other past societies (Jones 1997; Isaac 2006; Mattingly 2006; Eckardt 2014). In essence, traditional classification techniques require researchers to ancestral categories that may not have even existed when that past person was living. However, ethical and statistical issues aside, ancestry and ethnicity were vitally important components of an individual's identity—components that cannot be ignored simply because the methods and words we use to describe variation are currently insufficient. This issue will be explored in much greater detail throughout this chapter, but one of the key aims of the current study is to find a more statistically sound and ethical means of describing ancestry and variation in past people. So, rather than using these traditional classification techniques, the current study will use a mixture of multivariate distance analysis along with K-means clustering to determine within-site phenotypic variation. Ultimately, this chapter will argue that the use of K-means clustering is better suited to discussing diversity in past populations, not only because it produces more nuanced results that allow for a more ethical discussion on the meaning and nature of diversity, but also because its results are better suited to be combined in interdisciplinary studies that include ancient DNA, stable migratory isotopes, and material culture evidence, which will be explored in the subsequent chapters.

4.1 Biological Distance

Biological distance, or biodistance, is a measure used to discuss the biological relationship between past people. A biodistance analysis refers to a multivariate statistical technique used to quantify human variation in terms of similarity or dissimilarity. This technique can be used with different types of data relating to human variation, namely those associated with phenotypic and genotypic variation. Genotypic variation refers to the inherited differences in DNA. Phenotypic variation is the result of all of a person's "observable traits" (Lesk 2012: 4, Relethford 2004: 385). These traits include height, weight, hair color, and cranial size and shape. They are influenced by both an individual's DNA and the environment in which their ancestors lived over many generations (Lesk 2012: 4). Biological distance can be quantified using many different data collection techniques including, but not limited to, cranial metric variation, cranial nonmetric variation, dental nonmetric variation, and mitochondrial DNA. Cranial metric variation, often referred to as craniometrics, will be used in this current study because it is the most "visible" trait available in the archaeological record. In other words, cranial size and shape differences are traits that could have feasibly been noticed by ancient people, whereas DNA and dental nonmetric traits are modern inquiries that require scientific investigation or, at least, an understanding of genetic variation.

Furthermore, according to more recent psychological studies, cranial size and shape are the most likely feature to trigger neurological responses that result in "racial" or "ethnic" classifications between humans (Brebner et al. 2011; Stepanova and Strube 2012; Gwinn and Brooks 2015). Modern psychologists found that cranial size and shape, especially in the facial region, were the features most likely to elicit racial categorization in modern humans, even more than skin color (Brebner et al. 2011; Stepanova and Strube 2012; Gwinn and Brooks 2015). For these reasons, craniometric variation was deemed the most appropriate means of studying phenotypic variation in Roman Britain.

Craniometric data collection techniques consist of taking a series of cranial measurements that are used to quantify the overall size and shape of an individual's skull (Howells 1973, 1989, 1996). Not only have these measurements been proven to elicit neurological responses in the humans that see them, but they are also proven to vary both genetically and regionally (Howells 1973, 1989, 1996; Relethford 2004), meaning that they are an ideal means of studying migration and diversity. It is not clear whether genetic or environmental factors more heavily influence cranial size and shape, but it is clear that this type of phenotypic variation can be quantified in a population-specific manner (Ishida et al. 2009). Because cranial variation is both observable in life and quantifiable in the skeleton, it is an ideal method to illuminate experienced diversity in the past. However, given the fact that these biological differences are often misused to purport the superiority of one group over another (Gould 1996), craniometry must be treated with extreme sensitivity. This section will review the use of cranial metric variation in both archaeological and anthropological contexts over the past 150 years to illuminate previous mistakes and successes in an effort to determine the best way to proceed to ensure accuracy and ethical treatment of data.

4.1.1 Craniometrics

Craniometric analysis has a long, problematic history. The study of population diversity through craniometry has been tainted by the misuse of data to support racist and prejudicial agendas (Gould 1996). Since the birth of craniometric analysis, the data collected has been distorted and skewed to meet a variety of agendas, many of which focused on establishing the superiority or inferiority of specific groups (Gould 1996: 63). Although the field has since experienced several changes, many scholars still tend to associate craniometric analysis with racism and an array of obsolete belief systems. In fact, there are many recently published, peer-reviewed works that confuse craniometry with phrenology, which is the outdated practice of using cranial measurements to infer a person's intelligence or moral capacity (Kramer and Johnson 1997: 31, Kennedy et al. 2013:

xv). Due to this added complexity, this section will also explore the relationship between craniometry and "biological" race over time and how this relationship has changed socially and scientifically.

Craniometry became a prominent topic of research in Europe around the turn of the 18^{th} century. It was a product of the accepted belief that methods of measuring the body could enable classification of individuals into biological races, and that these "races" were not socially, morally, or intellectually equal. In the mid-1800s, measuring as a form of objective data collection became increasingly popular (Gould 1996: 105-106). At the same time, theories concerning evolution were also burgeoning, and scholars were quick to seek a means of "objectively" measuring the inequalities between people of different races and sexes (Gould 1996: 63; de Gobineau 1915: 38). Stephen J. Gould, the author of The Mismeasure of Man, asserts that the theory of evolution was possibly the most widely misused concept during the time of these scholars (1996: 142). Craniometric variation quickly became a widely used technique for champions of Social Darwinism, the idea that natural selection is the cause of "natural" hierarchies in human races, and Eugenics, the idea that only those humans with "desired" traits should reproduce (Galton 1883). While the techniques of measuring and numerical quantification both remain a hallmark of the scientific method today, these early anthropologists were ignoring another primary requirement for objectivity: testing a hypothesis without predetermined conclusions. Data were manipulated to justify the prior assumption that white men were the superior human group. Unsurprisingly, the authors that contributed to this field at the time, including Paul Broca (1861), Arthur Comte de Gobineau (1853), and Samuel George Morton (1849), were white men.

In the early twentieth century, a significant shift occurred in the field of anthropology. Franz Boas (1858-1942), who is often referred to as the father of modern anthropology, began to conduct careful studies to explore the possibility that cranial size and shape differences could be caused more by an individual's environment than his or her genetics. Boas was one of the first to conclude that parallels in outward physical appearance may not always be a result of genetic affiliation, but also a result of shared environment (Boas 1903, 1912, 1938, 1939). Though his initial claims that cranial shape is predominately affected by environment, rather than genetics, have since been disputed (Sparks and Jantz 2002), his ideas sparked a new wave of anthropology that sought to test, and eventually disprove, the theories behind eugenics and phrenology (Wald Sussman 2014: 151). In his 1912 study entitled "Changes in the Bodily Form of Descendants of Immigrants," Boas theorized that there is a high degree of cranial difference between individuals of the same tribe or region, which, he argues, negates the reliability of the cephalic index—a value that represents the ratio between an individual's maximum cranial breadth and length—as a measure of racial difference (Boas 1912: 562). Though his theory of cranial plasticity has been largely refuted (Sparks and Jantz 2002; Roseman and Weaver 2004; Hubbe, Hanihara, and Harvati 2009), Boas' questions represent an important shift in anthropological thinking and many of Boas' students went on to become prominent anthropologists and built upon the theories that Boas himself researched. One of his students, Ashley Montagu, wrote that these "so-called 'racial' differences simply represent expressions of variations in the relative frequencies of genes in different parts of the species population…" (Montagu 1942: 375), which is a concept that is still widely accepted to this day. Considering that many scholars still believed in eugenics and social Darwinism around the time of Boas' death, it is clear that Boas and his pupils were pioneers that have had an unprecedented effect on the current state of anthropological research.

The second half of the twentieth century saw another valuable advancement in the field of craniometrics: the addition of multivariate statistics. By the late 1960s, computational methods had advanced to the point where researchers other than mathematicians and statisticians could employ multivariate statistics with relative ease (Howells 1973: vii). W.W. Howells, in particular, was a champion of this advancement and used it to create the most extensive dataset of cranial measurements from all over the world to date (Howells 1973, 1989, 1996). Howells took up to 82 measurements each from 2,524 crania, deriving from 28 populations. These populations range from the 6^{th} century BC to the 1950s and were selected to represent as many geographic areas as possible (Howells 1973, 1989, and 1996). He demonstrated that multivariate means of relating populations to one another—specifically multivariate discriminate functions and factor analysis—are far more effective and objective than using one or two measurements per cranium (Howells 1973: 3).

A key conclusion of Howells' work was support for the hypothesis that cranial variation between populations exists in clines and clusters, not as four distinct races (Howells 1973: 151). Though this study is now almost 50 years old, Howells' conclusions that cranial phenotypes vary globally at population-specific levels—and can be observed through multivariate statistical methods—are continually upheld in more modern studies. For example, Ishida et al. use Howells' theory to compare modern Japanese islanders with ancient groups in the region to better understand how past migration and mixing of cultures has shaped modern phenotypic variation—albeit with more modern statistical approaches (2009:

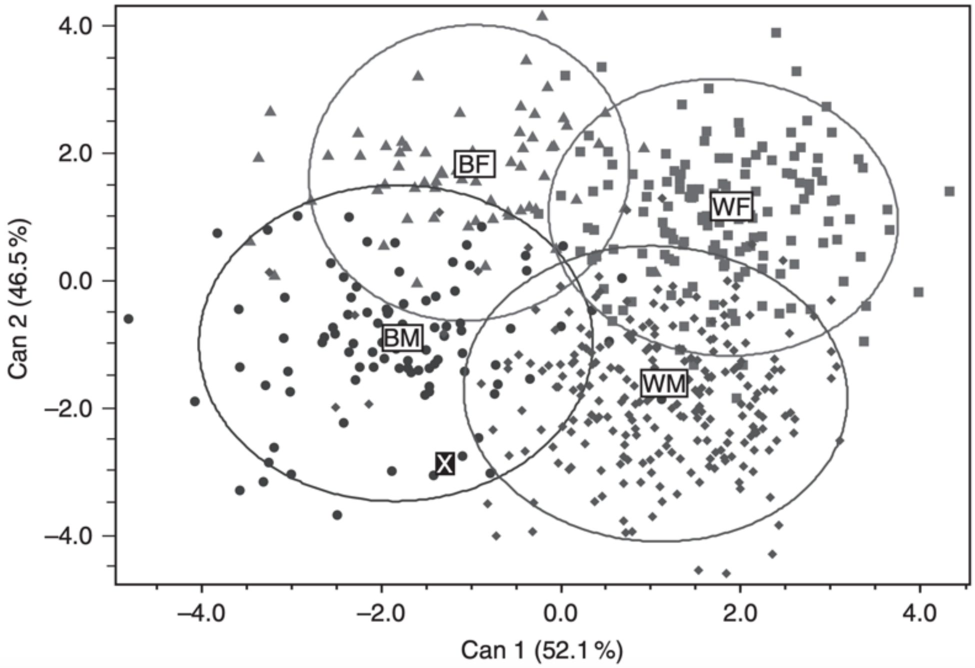


Figure 4.1: *Graph showing a two-dimensional reconstruction of population clusters representing differences between the sexes (males (M) and females (F)) and ancestral groups ("black" (B) and "white" (W)). These are the results of using multivariate statistics to view trends in cranial size and shape (Ousley and Jantz 2012: 314).*

154). Furthermore, many recent evolutionary biologists also use similar methods to Howells (1973, 1989, 1996) and Ishida et al. (2009) in order to measure the differences between both modern and ancient groups (Relethford 1994, 1997, 2000, 2002, 2004, 2009; Ousley et al. 2009; Beals et al. 1984) (fig. 4.1). It is clear from these studies that it is possible to statistically quantify phenotypic variation and, therefore, diversity.

Recently, computer programs, such as CRANID (Wright 1992, 2012) and FORDISC (Jantz and Ousley 1992, 1996, 2005), have used Howells' dataset as a reference collection with which to compare individuals of unknown ancestry to dozens of known populations. CRANID and FORDISC gained popularity in archaeology and forensic anthropology because they provide a simple, user-friendly means of assessing biological affinities for those who are not students of mathematics. Furthermore, they require far fewer measurements than Howells (around

30 for CRANID and 40 for FORDISC), which is both more efficient and practical given the generally poor preservation state of many archaeological skeletons. They also include a "best fit" feature for crania that do not fit statistically into any of the 40 known reference populations (Jantz and Ousley 1992, 1996, 2005; Wright 1992, 2010).

While they appear to add accessibility and accuracy to the field, there are many issues associated with using classification software. For example, many papers have studied their accuracy and found that both programs are only effective in classifying individuals that fit within the reference populations (Elliott and Collard 2009). One study used CRANID to classify crania of known origin that were not part of Howells' reference collection (Kallenberger and Pilbrow 2012). They found that if a cranium does not belong to one of the populations to which is it being compared, is of mixed ancestry, or is from a contemporary population, there is a significant chance that CRANID will inaccurately classify the individual in question (2012: 463). In other words, the "best fit" feature for crania outside of the reference populations is statistically unsuccessful.

Others found similar issues with FORDISC. Both Ubelaker et al. (2002) and Williams et al. (2005) independently concluded that FORDISC was significantly inaccurate if the test crania did not belong to one of the populations in the reference collection. Furthermore, Elliott and Collard (2009: 64-65) found that FORDISC did not consistently assign a cranium to the correct population unless the reference population was pre-filtered by biological sex, even when the correct population of origin was present in the reference data. They also found that accuracy was significantly reduced if the test cranium did not include all 40 required measurements, which makes the software unsuitable for incomplete, damaged, or poorly preserved remains. CRANID6, which was the only version of this program that was accessible for the current study, will not produce results for skulls with any missing variables for its linear discriminate analysis (LDA) test, and only allows two missing variables for its nearest neighbor discriminate analysis (NNDA) test (Wright 2012). Furthermore, it has been proven that CRANID's NNDA test, which is designed for crania that have up to two missing variables is statistically inaccurate, even in cases with one missing variable (Elliott and Collard 2009).

Furthermore, geographical locations where inward migration occurred are likely to have an increase in individuals of mixed ancestry, whose identification is also problematic using these software programs (Elliott and Collard 2009; Kallenberger and Pilbrow 2012). Migration was prevalent across the Roman Empire, and thus it is likely in a Roman British skeletal sample will include individuals of mixed ancestry. CRANID has less of a capacity than FORDISC to classify mixed ancestry, but FORDISC relies upon modern examples of mixed ancestry to make classifications and, therefore, may not provide a viable basis of comparison for past people of mixed ancestry (Elliott 2008; Elliott and Collard 2009; Kallenberger and Pilbrow 2012; Sierp and Henneberg 2015). In fact, it has been proven using skeletons of known ancestry that if they do not adhere to parameters of just one CRANID population—thereby excluding individuals of mixed ancestry—the test itself has a 39 percent chance of correctly assigning the cranium to a similar population (Kallenberger and Pilbrow 2012; Sierp and Henneberg 2015). For all of these reasons, it is likely that many Roman individuals will be assigned to an incorrect or inappropriate population if compared to the comparative datasets of classification software programs. In sum, testing has identified issues with classifying individuals not represented by the reference samples, identifying individuals of mixed ancestry, and that missing data significantly affects the accuracy of these programs. These strict parameters set by both CRANID and FORDISC simply aren't realistic for most ancient skeletons.

The issues associated with craniometric classification software extend to conceptual concerns as well, especially when dealing with past populations. In essence, modern cranial classification, at its core, is not particularly different than the practices of the past. Though modern techniques are not used as means to justify racism, they do have the same outcome of classifying individuals into possibly inappropriate categories and implying that this categorization is meaningful and significant. For example, both databases for CRANID6 and FORDISC comprise 74 populations that represent a mix of prehistoric, ancient, medieval, and modern individuals (Wright 2012; Jantz and Ousley 2005). This categorization appears logical because it is instinctive to describe the ancestral differences of past people in terms that a modern individual can understand. In fact, this is the very reason it works so well for modern forensic cases in which a victim needs to be identified (Ousley, Jantz, and Freid 2009). However, this approach does a disservice to anthropological and archaeological studies of diversity in the past because it forces modern notions of "race," ethnicity, and ancestry on ancient populations by comparing unknown crania to known crania and known populations that were not even in existence at the same time.

Though there are still many issues associated with using craniometry, evidence suggests that the size and shape of the cranium does vary across ancestral groups. These physical differences that occur between populations would have been visible to those living in imperial Rome and its provinces, allowing individuals to recognize a suite of ancestral traits in each other. It is also clear that this phenotypic variation is quantifiable in the archeological record. It is essential to find a means of studying phenotypic variation in Roman societies to better understand diversity and its experience among ancient people, while avoiding the pitfalls of craniometric classification. Instead of classifying each cranium into a previously studied population, crania can be compared to one another to determine whether there are any phenotypic outliers or significant groupings within the population, similar to the successful studies by Howells (1973, 1989, 1996) and Ishida et al. (2009). Cranial measurements can serve as a measure of diversity within the population while avoiding the concerns associated with classification. When compiled with isotopic data, epigraphic evidence, and material culture evidence, this approach to craniometry might prove to be a viable means of exploring diversity and its implications in ancient populations.

4.2 Materials and Data Collection

The skeletons included in the craniometric analysis are from the cemeteries at Lankhills (Clarke 1979; Booth et al. 2010; Stuckert 2017), Ancaster (Cox 1989), number 3 Driffield Terrace in York (Tucker 2005, data collected by Dr. Anwen Caffell for York Osteoarchaeology Ltd.), the Poundbury Roman cemetery in Dorset (Farwell and Molleson 1993, data collected by Dr. Richard Wright for the Natural History Museum of London), and the "California" cemetery in Baldock (Keefe, Challanáin, and Holst 2015). York and Poundbury are the only two sites in which the cranial data has been collected by another researcher. All other cranial data was collected by the current author for the current study.

Data were collected adhering to the guidelines in Standards for Data Collection from Human Skeletal Remains (Buikstra and Ubelaker 1994: 71-78), Guidelines to the Standards for Recording Human Remains (Brickley and McKinley 2004: 27-30), and Guide to using the CRANID programs CR6bIND: for linear and nearest neighbors discriminate analysis (Wright 2012). All 29 cranial measurements suggested by Wright in his manual to CRANID6 were chosen for this study (2012: 39-51). These measurements do not include the mandible. Furthermore, an additional 10 craniofacial and mandibular measurements suggested by Ousley and Jantz (2005) were included. This decision was a result of the present study's reliance on perceived and visible diversity, and the aforementioned importance of facial structure on diversity-related neurological responses (Brebner et al. 2011; Stepanova and Strube 2012; Gwinn and Brooks 2015). Since facial structure is such an important factor in recognizing differences in other humans, it seemed essential for an exploratory study to include measurements of the mandible and some additional facial measurements. To the same end of highlighting only per-

Code	**Measurement**	**Pertains to**
ASB	Biasteronic breadth	Posterior cranial width
AUB	Biauricular breadth	Middle cranial width
BBH	Basion-bregma height	Facial prognathism
BNL	Basion-nasion length	Facial prognathism
BPL	Basion-prosthion length	Facial prognathism
CDB	Bicondylar breadth	Facial width
DKB	Interorbital breadth	Upper nasal width
EKB	Biorbital breadth	Facial width
FMB	Bifrontal breadth	Facial width
FRC	Frontal chord	Upper cranial length
FRS	Frontal subtense	Facial prognathism
GNI	Gnathic index	Anterior mandibular height
GOG	Gonion-gonion length	Mandibular width
GOL	Glabello-0ccipital length	Anterior-posterior length
HMF	Mandibular body height	Facial profile
JUB	Bijugal breadth	Middle cranial width
MAB	Maxillo-alveolar breadth	Facial width
MAL	Maxillo-alveolar length	Facial prognathism
MAN	Mandibular angle	Facial profile
MLN	Mandibular length	Facial prognathism
NAS	Nasal subtense	Facial prognathism
NLB	Nasal breadth	Lower nasal width
NLH	Nasal height	Facial height
NOL	Nasio-occipital length	Anterior-posterior length
NPH	Nasion-prosthion height	Facial height
OBB	Orbital breadth	Eye width
OBH	Orbital height	Eye height
OCC	Occipital chord	Posterior cranial height
OCS	Occipital subtense	Posterior cranial prognathism
PAC	Parietal chord	Anterior-posterior length
PAS	Parietal subtense	Cranial prognathism
SSS	Zygomaxillary subtense	Facial width
TMF	Mandibular body breadth	Facial width
WMH	Minimum cheek height	Facial height
XCB	Maximum cranial breadth	Middle cranial width
XFB	Maximum facial breadth	Facial width
XRB	Maximum ramus breadth	Facial profile
XRH	Maximum ramus height	Facial profile
ZMB	Bimaxillary breadth	Facial width

Table 4.1: *List of all included cranial measurements and their respective general categories*

ceived and visible diversity, no cranial nonmetric traits were considered as they are bony features that would not have been visible during life. Altogether, the aim was to collect a total of 39 cranial and mandibular measurements per skeleton (table 4.1).

To obtain a sufficient number of measurements from each cranium, only individuals whose skulls were 80-100% complete—which was determined by consulting inventory sheets from previous researchers—were considered. In cases of less than 100% completeness, priority was given to individuals with retention of craniofacial bones, as many are essential points in the majority of accepted measurements (Cox et al. 2008; Wright 2010; Ousley and Jantz 2012). Eliminating crania that did not meet these requirements reduces the amount of missing data, which, in turn, removes sources of computational error in statistical analyses. Furthermore, to ensure accuracy and reproducibility of measurements, it was essential to choose individuals with sufficient cranial surface preservation. Poor surface preservation can skew measurements by making crania as a whole, or sections of crania, appear smaller than they would have been in live. Since surface preservation is often erratic, it is impossible to discern the individual's true cranial size and shape in these instances. Therefore, individuals with a surface preservation score of 4 or above, which means that most of the bone surface has been affected by erosion (Brickley and McKinley 2004) were excluded from the study.

Several further considerations were taken into account when selecting the sample for analysis. Estimating ancestral origins in the sub-adult skeleton is not advised, as the cranium undergoes many changes during development (Cunningham, Scheuer, and Black 2016). Therefore, only individuals reported as c. 18 years or over in each original study's inventory were considered for this study (Clarke 1979; Booth et al. 2010). Similar considerations apply for older adults, mainly in the 60+ age category, as these individuals are more susceptible to age-related morphological changes, especially resorption related to tooth loss. Therefore, any wholly and partially edentulous individuals whose maxillary and mandibular resorption caused significant morphological changes to the cranium, particularly on or near measurement landmarks, were excluded. Finally, any individuals with obvious pathologies that affected the morphology of the cranium were excluded. Furthermore, every attempt was made to have equal numbers of males and females. Because male and female skeletons also have cranial morphological differences, attempting to have an even ratio would ensure that sexual dimorphism does not affect the results more than phenotypic changes in morphology. Biological sex assessments were conducted by for the original reports on these cemetery sites, but were also corroborated by the current author when data was collected for this study. Any discrepancies in opinion on the biological sex of certain individuals are noted in the results.

All of these considerations were applied to every assemblage analyzed in this chapter, including assemblages that were not measured by the author. To ensure consistency, it was established that measurements obtained from previous studies had been collected by researchers who also adhered to the guidelines listed above. In order to detect any observer error, the first two crania measured each day were repeated again at the end of the day, which ensured that the data collection techniques were consistently applied. It is important to note that the following sections on demographics include all of the individuals that were sampled, but not necessarily all of these individuals were included in the final data analysis as additional stages of data cleaning were undertaken (refer to section 4.3 for summary of data cleaning methods). The results section for each site has a clear male to female ratio breakdown of the individuals that were included after data cleaning. Furthermore, a list of each individual, each measurement, and whether or not that individual was eliminated during data cleaning can be found in Appendix A.

4.2.1 Lankhills

	Male		Female		Indeterminate		**Total**	
Age	N	%	N	%	N	%	**N**	**%**
18-25 years old	8	23.5	8	38.1	0	0.0	**16**	**28.6**
26-35 years old	10	29.4	9	42.9	0	0.0	**19**	**33.9**
36-45 years old	6	17.6	2	9.5	0	0.0	**8**	**14.3**
46+ years old	7	20.6	1	4.8	1	100.0	**9**	**16.1**
60+ years old	1	2.9	0	0.0	0	0.0	**1**	**1.8**
Adult (no specification)	2	5.9	1	4.8	0	0.0	**3**	**5.4**
Total	**34**	**60.7**	**21**	**37.5**	**1**	**1.8**	**56**	**100.0**

Table 4.2: *Demographic profile for the Lankhills late-Roman skeletons used in the current chapter*

Of the 518 adult skeletons from both Lankhills excavations, 56 crania were sufficiently intact, preserved, and without obvious pathologies. Of the adults, 34 are male and 21 are female, for a ratio of approximately 5:3. One individual is of indeterminate sex (table 4.2). While this is not exactly representative of the nearly

1:1:1 ratio (male: female: indeterminate) in the Lankhills population as a whole, an acceptable number of males and females are represented. Most individuals fall within the accepted age range for studies of cranial phenotypic variation, with the exception of one individual aged "60+" who did not exhibit visible signs of age-related changes to the cranium. The Lankhills late Roman sample is an ideal candidate for studying phenotypic variation based upon K-Means Clustering due to the relatively even split between male and female samples, as well as its comparatively large sample size.

4.2.2 Ancaster

There were 40 adult skeletons with suitably intact crania, free from obvious cranial pathologies from the Ancaster late-Roman Cemetery. Despite having overall good preservation, curatorial issues have caused a loss of some contextual information for certain skeletons (Cox 1989). While this will not directly affect the efficacy of craniometric methods used in the coming analysis, it is important to note that some individuals' crania do not match the post cranial skeletons with which they were catalogued. Of these 40 adults, 24 are male, 13 are female, and 3 are indeterminate, which represents a similar biological sex ratio to the cemetery as a whole (table 4.3). The relatively small proportion of indeterminate individuals is beneficial to this study. As males and females tend to differ in regard to cranial size and shape, it is better to have more individuals in distinct biological sex categories, rather than individuals of indeterminate sex, in order to effectively compare differences within groups of the same biological sex. However, it will be important to remember the nearly 4:2 ratio of males to females when interpreting

	Male		Female		Indeterminate		**Total**	
Age	N	%	N	%	N	%	**N**	**%**
17-25 years old	1	4.2	3	23.1	0	0.0	**4**	**10.0**
26-35 years old	10	41.7	3	23.1	1	33.3	**14**	**35.0**
36-45 years old	2	8.3	1	7.7	0	0.0	**3**	**7.5**
"Mature"	10	41.7	6	46.2	1	33.3	**17**	**42.5**
Adult (no specification)	1	4.2	0	0.0	1	33.3	**2**	**5.0**
Total	**24**	**64.0**	**13**	**32.5**	**3**	**7.5**	**40**	**100.0**

Table 4.3: *Demographic profile for the Ancaster late-Roman skeletons used in the current chapter*

the results of this analysis. The preponderance of male crania could cause the results for males to be more reliable than the results for females, which is important to keep in mind when interpreting the data. The most populous age categories in this sample are 26-35 years of age and "mature," which was not defined by Cox in 1989 but presumably related to skeletons of 46+ years. None of the individuals included, even those in the "mature" category, exhibited signs of aging, such as edentulism, that could skew results.

4.2.3 Baldock

Of the 148 skeletons from both the California and Land to the Rear of California cemeteries, 39 adults were sufficiently intact, preserved, and without obvious pathologies. Of these adults, 28 are male and 10 are female, a roughly 3:1 ratio (table 4.4). There are no individuals of indeterminate sex included at this site. There are 22 individuals classified as young and middle adults, 15 classified as older adults, and one adult of indeterminate age (table 4.4). Though there is a high proportion of older adults at Baldock, none of the crania included presented any age-related morphological changes.

	Male		Female		**Total**	
Age	N	%	N	%	**N**	**%**
18-25 years old	8	28.6	2	20.0	**10**	**26.3**
26-35 years old	4	14.3	2	20.0	**6**	**15.8**
36-45 years old	4	14.3	2	20.0	**6**	**15.8**
46-50 years old	11	39.3	2	20.0	**13**	**34.2**
50+ years old	0	0.0	2	20.0	**2**	**5.3**
Adult (no specification)	1	3.6	0	0.0	**1**	**2.6**
Total	**28**	**73.7**	**10**	**26.3**	**38**	**100.0**

Table 4.4: *Demographic profile for the Baldock Roman skeletons used in the current chapter*

There are some concerns with the Baldock sample in regard to the number of individuals and the level of preservation. While Baldock has a similar sample size to the Ancaster dataset, it is problematic because there are fewer than 39 individuals in the dataset. As a general rule, multivariate statistical tests work best when the number of samples (individuals) exceeds the number of observations (measurements) (Keefe, Challanáin, and Holst 2015). However, as it will become clear in the coming section on data cleaning, many observations will be removed due to the presence of missing data. In most cases, both measurements and individuals will be removed from the sample, but it is possible to remove fewer individuals than measurements by careful planning. This will be attempted in the case of Baldock in an effort to explore the boundaries of K-Means Clustering of cranial variation. Moreover, the ratio of males to females is more than 3:1 at Baldock (table 4.4). As mentioned earlier, this is not ideal for studies of craniometric variation. Baldock is not a perfect candidate for studies of cranial phenotypic variation, but as this is an exploratory analysis, the data was retained to explore the limits of K-Means clustering in regard to cranial variation.

4.2.4 Poundbury

Robert Kruszynski of the Natural History Museum in London collected cranial data from 49 skeletons at the Poundbury Roman Camp (Wright 2012). Much like the Lankhills late Roman cemetery, Poundbury had enough intact skeletons to create a large dataset comprising 49 adults (table 4.5). There is a 4:3 ratio of males to females and no indeterminate individuals. The majority of skeletons are aged under 45 years, but four are 46 and over. Because these measurements were collected by Richard Wright, it is unclear whether or not these four skeletons have any age-related morphological changes to their crania. However, Wright cites strict data collection standards in his CRANID6 manual (2012), which are identical to those used in this current study. Poundbury's comparatively large number of samples and relatively even split between males and females makes it an ideal site for studying cranial phenotypic variation.

	Male		Female		**Total**	
Age	N	%	N	%	**N**	**%**
18-25 years old	7	25.0	9	42.9	**16**	**32.7**
26-35 years old	6	21.4	5	23.8	**11**	**22.4**
36-45 years old	12	42.9	3	14.3	**15**	**30.6**
46+ years old	4	14.3	4	19.0	**8**	**16.3**
Total	**28**	**57.1**	**21**	**42.9**	**49**	**100.0**

Table 4.5: *Demographic profile for the Poundbury Roman skeletons used in the current chapter*

4.2.5 York

Of the 75 adult skeletons at 3 and 6 Driffield Terrace, only 34 were viable for craniometric analysis. There is only one female at this site, but this skeleton was also not viable for craniometric analysis. Therefore, all the skeletons included in this analysis are male or possibly male. Of these males, the majority (44.1%) are between the ages of 26 and 35 (table 4.6). Additionally, 21 (61.8%) show evidence of being decapitated at or soon after the time of death (Caffell and Holst 2012).

Much like the Roman cemetery at Baldock, there are few sufficiently intact skeletons from 3 and 6 Driffield Terrace. This dataset will be treated in the same way as the Baldock dataset in analysis to ensure that there are more samples (individuals) than observations (measurements). Though the results should be qualified because 3 and 6 Driffield Terrace will be analyzed with fewer measurements than the rest of the datasets, it is an interesting site to consider. There are no female burials, no subadult burials, and 61.8% of the skeletons included in the current section were decapitated, though this number may be even greater according to evidence of perimortem cut marks (table 4.6) (Caffell and Holst 2012).

	Male		Female		**Total**		Decapitated	
Age	N	%	N	%	**N**	**%**	N	%
17-25 years old	5	16.7	1	25.0	**6**	**17.6**	1	4.8
26-35 years old	14	46.7	1	25.0	**15**	**44.1**	12	57.1
36-45 years old	10	33.3	0	0.0	**10**	**29.4**	6	28.6
Unknown adult	1	3.3	2	50.0	**3**	**8.8**	2	9.5
Total	**30**	**88.2**	**4**	**11.8**	**34**	**100.0**	**21**	**61.8**

Table 4.6: *Demographic profile for the 3 and 6 Driffield Terrace skeletons used in the current chapter*

4.3 Data Analysis

R Studio (R Core Team 2019) was used to analyze all data. Each site's database was analyzed independently, unless otherwise noted. First, descriptive statistics were run to determine the range, mean, median, and standard deviation of all measurement categories. These calculations help explore the magnitude and distribution of the raw data, identify any preliminary statistical outliers, and check for any observer error during data collection. Any individuals flagged as initial outliers were checked for observer error and reevaluated. No observer error was found in any of the datasets.

Next, each dataset was cleaned in order to extract both samples and observations with too many missing variables. It is possible to impute missing data statistically, but it is not advised to do so when an individual or a type of measurement has more than 5% missing data (Scheffer 2002). Doing so can cause an exponential increase in potential error. Therefore, it is important to remove these measurements and individuals before imputing any missing values. The equation: *function(x){sum(is.na(x))/length(x)*100}* was applied to both the samples (individuals) and the observations (measurements) of the raw data at each site to find and remove the vectors that did not meet this criteria from the rest of the analysis (R Core Team 2019; van Buuren and Groothuis-Oudshoorn 2011). In order to optimize the ratio of samples to observations, observations with surplus missing data were removed prior to samples with surplus missing data.

Once all potential sources of error were removed, it was possible to ascribe values to the few missing measurements that remained. This was achieved using the *MICE* function (van Buuren and Groothius-Oudshoorn 2011). *MICE* uses multivariate chained equations and random predictor selection to approximate missing values based on the present values (van Buuren and Groothius-Oudshoorn 2011). It assumes that missing values are missing at random, which is true for these datasets. Because of this assumption, *MICE* also presumes that the missing values are relative to those that are present and can be estimated using regression equations and then randomized (van Buuren and Groothius-Oudshoorn 2011).

Once variables are imputed, it is important to explore whether or not these imputed values changed the inherent nature of the data. In order to do so, the observations of each site were tested for normality using the Shapiro-Wilk test both before and after missing values were imputed. It is important to note that if these sites do contain phenotypic variation, it is expected that some variables will not be normally distributed. Non-normal distribution merely means that there are outliers in the dataset, not that the dataset is not suitable for multivariate analysis. However, it is a viable way to determine if imputing missing values has changed the nature of the dataset. If some variables are not normally distributed before the missing values have been imputed, those same variables should also be not normally distributed after the missing values are imputed. The same theory applies to variables that are normally distributed.

Next, the database was examined for highly correlated variables. This step is essential in determining which formula will be used to create a distance matrix of the data. Mahalanobis distance is better suited to dealing with databases in which some of the variables are highly correlated, whereas using Euclidean distance in these instances could result in a distribution range that is much higher than in reality (Farber and Kadmon 2003). The Pearson test for correlation was used to determine the strength of association between all pairs of variables present at each site (R Core Team 2019). Upon finding several high correlations within the measurements at all sites, which will be discussed in greater detail in the results section, the Mahalanobis method was chosen for distance analysis in order to correct for similar measurements having an increased effect on the results (Farber and Kadmon 2003). Next, the completed database was prepared for multivariate analysis. In order to ensure that larger measurements (e.g. maximum cranial breadth) do not have a more significant impact on the results than smaller measurements (e.g. nasal aperture breadth), the completed database was converted to z-scores, which standardizes each observation by its distance in number of standard deviations from the mean of each variable (McKillup 2012).

Once the databases were cleaned and scaled, they were analyzed for significant outliers. This was achieved by applying classic multidimensional scaling (R Core Team 2019) to the z-scores, which reduced each individual's measurements into two summary variables, and analyzing the subsequent dataset in *Moutlier* from the *chemometrics* package (Filzmoser and Vermuza 2017). This test checks for significant outliers based upon classic and robust Mahalanobis distance (Filzmoser and Varmuza 2017). The threshold for outliers was set at 1.96 standard deviations from the mean, which should account for 95% of the population's estimated "normal" values. Any outliers were identified and recorded.

The next steps required returning to the database of z-scores for each site. These z-scores were run though the *dist* function in the stats package, with the distance measure set to "Mahalanobis" (R Core Team 2019). The resulting distance matrix is suitable for use in k-means cluster analysis (R Core Team 2019). Because k-means cluster analysis requires the analyst to choose the number of clusters assumed to be correct, it was necessary to first run optimization tests, which statistically estimate the ideal number to choose. This was achieved with the *NbClust* package (Charrad et al. 2014). Once the optimal number of clusters was identified, the k-means cluster analysis was run on the distance matrix (R Core Team 2019). Finally, the *fviz_cluster* function from the *factoextra* package was used to graph the results of the k-means analysis (Kassambra and Mundt 2017). As mentioned earlier, the databases were analyzed for significant outliers before being analyzed in k-means clustering. In cases in which outliers were detected, which will be discussed further in the results, k-means cluster analysis was repeated twice: once with any outliers kept in the original database and once with them removed. The clustering results of both scenarios were compared.

Because male and female crania differ morphologically, it is normal for the results to be in two clusters. So, the clusters were cross-referenced against biological sex assignments by coloring the points to reflect biological sex. This allows for outliers in male and female categories to be identified. For example, if a biological male is more similar to the cluster of biological females, he will be further analyzed against the other male skeletons by determining if he is significantly different than the centroid of the male cluster, and vice versa. The same process will be repeated for skeletons that comprise a third or fourth superfluous cluster, or individuals who were classified as outliers in the earlier stages of analysis. Essentially, each potentially outlying individual will be compared against the cluster that matches his or her biological sex, not against the dataset as a whole.

4.4 Results

4.4.1 Lankhills

Measurement	% Missing
CDB	79.7
GNI	32.2
GOG	64.4
HMF	33.9
MAB	18.6
MAN	39.0
MLN	44.1
TMF	40.7
WRB	39.0
XRB	40.7
XRH	44.1

Table 4.7: *Observations removed from the Lankhills dataset due to excessive missing values*

The data cleaning methods identified several measurements and individuals that contained a significant amount of missing data. Eleven measurements—ten of which are from the mandible—were removed (table 4.7) and eight individuals—seven of which were excavated by Clarke (1979)—were removed (table 4.8).

This resulted in a dataset of 28 measurements and 51 individuals, which is an acceptable ratio for multivariate analysis (Beukelman and Brunner 2016).

Skeleton	% Missing
LH 25	41.4
LH 39	13.8
LH 52	10.3
LH 64	34.5
LH 150	17.2
LH 233	10.3
LH 266	10.3
LH 270	17.2

Table 4.8: *Samples removed from the Lankhills dataset due to excessive missing values*

Skeleton	Imputed Variables
LH 11	DKB, NLB
LH 97	MAL
LH 192	XCB
LH 309	AUB
LH 410	NPH, XCB
LH 271	MAL
LH 435	OCC, OCS
LH 554	MAL
LH 593	ASB, MAL
LH 1022	SSS
LH 1532	XCB
LH 1793	JUB

Table 4.9: *List of imputed variables in the Lankhills dataset*

MICE (van Buuren and Groothius-Oudshoorn 2011) identified 16 missing values and used multivariate chained equations and random predictor selection to impute those values (table 4.9). For Lankhills, the Shapiro-Wilk test found that DKB, JUB, NLB, NLH, NPH, OBB, PAC, and PAS were not normally distributed. These eight variables were not normally distributed after the missing values were imputed, and the W and p-values were comparable (table 4.10). The scale function converted the dataset into z-scores, which allows the variables to be compared on the same scale (R Core Team 2019) (figure 4.2). The z-scores were scaled using multidimensional scaling and tested for overall outliers based on both classic and robust Mahalanobis distance in the *(*Moutlier) package (Filzmoser and Varmuza 2017). The threshold was set at 1.96 standard deviations from the mean so individuals that are more than 95% different from the mean are classified as outliers. Classic Mahalanobis distance found two outliers: LH 1640 and LH 309, while robust Mahalanobis distance found four: LH 1640, LH 309, LH 51, and LH 89 (figs 4.3 and 4.4).

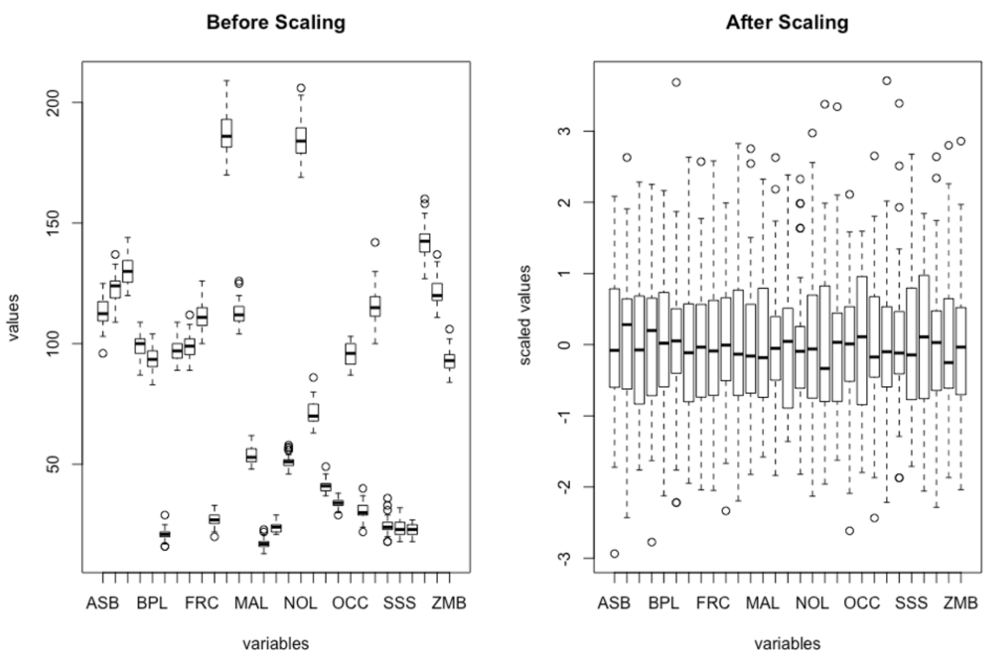


Figure 4.2: *Boxplot of the Lankhills measurements vs. boxplot of the scaled Lankhills measurements (R Core Team 2019).*

Finally, K means cluster analysis was applied to the Z scores dataset to explore any inherent clusters of phenotypic variation at the site. When the outliers are included in the dataset, there are three significant phenotypic groupings at Lankhills of sizes 23, 9, and 20 (figure 4.4). When the outliers are removed from the dataset, the ideal number of clusters is 2 of sizes 26 and 23 (figure 4.5). The cluster assignments for the results that exclude the original significant outliers were cross-referenced by biological sex estimations (figure 4.5). The first

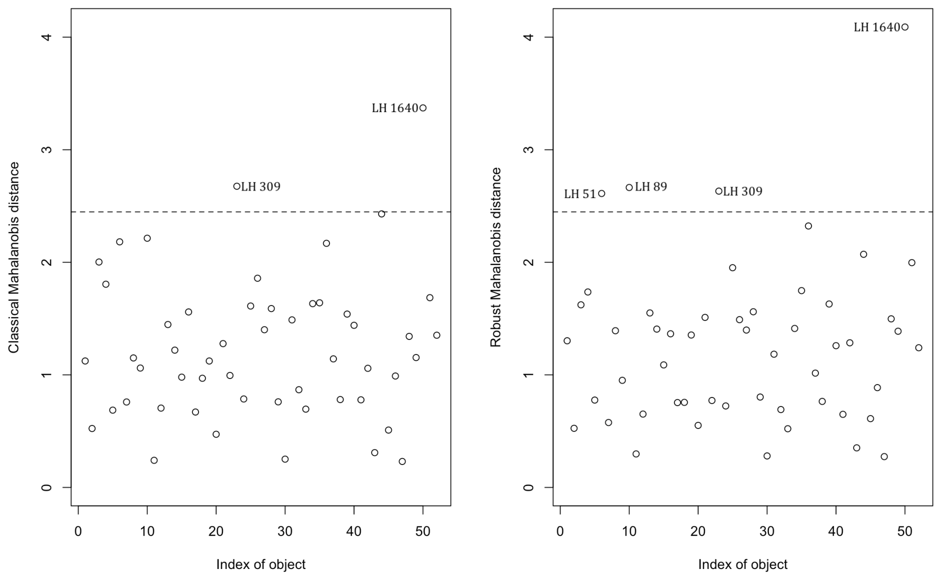


Figure 4.3: *Significant phenotypic outliers based on classic Mahalanobis distance (left) and robust Mahalanobis distance (right).*

cluster (red, figure 4.5), which contains 26 individuals, has 9 male skeletons and 17 female skeletons. This is roughly a 1:2 ratio in the first phenotypic grouping. Furthermore, cluster one contains 17 (81.0%) of the 21 female—or possibly female—skeletons included in the entire Lankhills sample. Cluster two (blue, figure 4.5), on the other hand, contains 23 individuals, 19 of which are either male or possibly male. This cluster also contains 3 females—including possible females—and one individual of indeterminate biological sex. Therefore, males outnumber females by more than 6:1 in this phenotypic grouping.

These results suggest that there may be two distinct scenarios at play here. The first scenario suggests that there is a homogenous population at Lankhills of both males and females (though there are more females than males in this group), as well as a primarily male immigrant population, which would be consistent with a site that contains both military and civilian populations. Furthermore, cluster two is more phenotypically diverse than cluster one. There is a clear grouping of males (and one indeterminate individual) from x= 0 to x= -3 and y= 0 to y= -2, another centered on y= 2, and another centered on x= -6, as well as some somewhat dissimilar (though not in a statistically significant manner) individuals from y= -2 to y= -4 (figure 4.5). These groupings support the argument that cluster two represents a military-based immigrant population, as the diverse na-

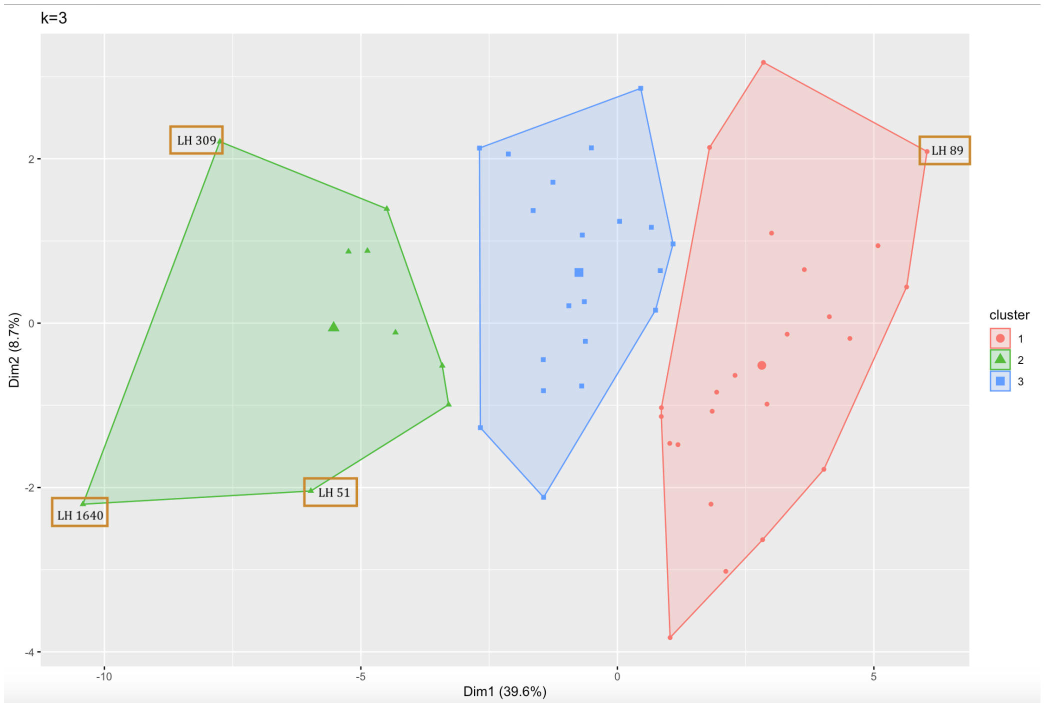


Figure 4.4: *Ideal number of clusters for the Lankhills cemetery with significant outliers included. Created using the fviz_cluster() function in the factoextra package (Kassambara and Mundt 2019).*

ture of the Roman army is well known from primary written sources. In this circumstance, the individuals in column two of table 4.11 would be considered phenotypically dissimilar and, therefore, possibly foreigners.

A second scenario could suggest that each cluster centroid represents the mean for males and females, respectively. In that case, any female assigned to cluster two—the primarily male cluster—would be considered phenotypically different from the other females at Lankhills, and vice versa. If this is the case, LH 203, 967, and 1532 are female outliers. Male outliers are more difficult to classify, as there are many more males in cluster one than females in cluster two (figure 4.5). As is evident in figure 4.5, many of the males in cluster one are not vastly different from most of the males in cluster two, but they are significantly different from the centroid of cluster two. For this reason, it is essential to visualize the clusters. While simple cluster assignments reveal each individuals' proximity to those within their cluster, figure 4.5 shows that males are far more phenotypically diverse than females at Lankhills. Therefore, it is harder to determine male

	W-value		p-value	
Variable	Before Imputation	After Imputation	Before Imputation	After Imputation
DKB	0.926	0.930	0.0035	0.0046
JUB	0.945	0.950	0.0199	0.0279
NLB	0.943	0.937	0.0159	0.0088
NLH	0.952	0.952	0.0384	0.0367
NPH	0.928	0.927	0.0042	0.0034
OBB	0.931	0.931	0.0056	0.0050
PAC	0.947	0.945	0.0236	0.0185
PAS	0.931	0.937	0.0053	0.0087

Table 4.10: *W and p-values for all non-normally distributed observations at Lankhills.*

outliers. Unfortunately, it is impossible to perform K-means analysis on the male crania in isolation, as the sample size is not large enough. However, these results clearly show a phenotypically diverse male population and a population of females that are relatively phenotypically similar with a few outliers. This interpretation of the results is also consistent with a settlement that contains both military and civilian components, which will be explored in greater detail in the discussion.

Cluster 1	**Cluster 2**
LH 19, LH 35, LH 53, LH 55, LH 67, LH 89, LH 96, LH 107, LH 119, LH 133, LH 161, LH 192, LH 194, LH 273, LH 330, LH 343, LH 365, LH 61, LH 84, LH 108, LH 271, LH 435, LH 616, LH 724, LH 1512, LH 1793	LH 11, LH 16, LH 20, LH 51, LH 97, LH 141, LH 158, LH 203, LH 410, LH 413, LH 32, LH 434, LH 451, LH 489, LH 554, LH 593, LH 642, LH 702, LH 967, LH 1022, LH 1474, LH 1532, LH 1852

Table 4.11: *Cluster assignments for the Lankhills dataset excluding significant outliers. Highlighted individuals indicate potential outliers based on their deviance from the centroid of the cluster that best represents their biological sex.*

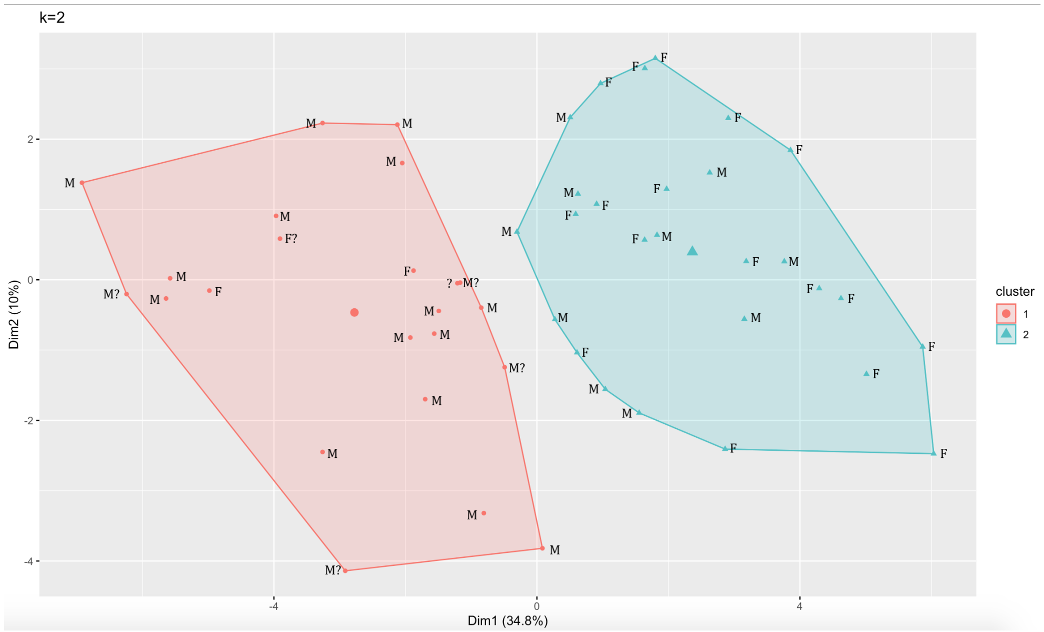


Figure 4.5: *Ideal number of clusters for the Lankhills cemetery, significant outliers excluded, labeled to reflect biological sex estimations. Created using the fviz_cluster() function in the factoextra package (Kassambara and Mundt 2019).*

4.4.2 Ancaster

Data cleaning identified several measurements and individuals that contained a significant amount of missing data. Thirteen measurements—ten of which are from the mandible—were removed (table 4.12) and two individuals, SK 92 and SK M, were removed (table 4.13). The resulting dataset contained 38 individuals and 25 measurements, which is ideal for multivariate analyses. MICE (van Buuren and Groothius-Oudshoorn 2011) identified 13 missing values and imputed new values using multivariate chained equations and random predictor selection (table 4.12). The results were the same for Ancaster, with three variables of non-normal distribution—GOL, NLB, and OBH—but in this case the W and p-values were exactly the same before and after imputation.

MICE (van Buuren and Groothius-Oudshoorn 2011) identified 13 missing values and imputed new values using multivariate chained equations and random predictor selection (table 4.14). The scale function converted the dataset into

Measurement	% Missing
CDB	57.5
GNI	45.0
GOG	45.0
HMF	42.5
MAB	50.0
MAL	22.5
MAN	30.0
MLN	35.0
NPH	17.5
TMF	37.5
WRB	25.0
XRB	30.0
XRH	25.0

Table 4.12: *Observations removed from the Ancaster dataset due to excessive missing values*

Individual	% Missing
Sk 92	11.5
Sk M	7.7

Table 4.13: *Samples removed from the Ancaster dataset due to excessive missing values*

Z Scores, which allows the variables to be compared on the same scale (R Core Team 2019) (figure 4.6). The dataset of Z scores was simplified using multidimensional scaling (R Core Team 2019) and tested for overall outliers based on both classic and robust Mahalanobis distance. The threshold for outliers was set at 1.96 standard deviations from the mean, which should account for 95% of the overall variation within the sample. Therefore, individuals in that are more than 95% different from the mean are classified as outliers. Both classic Mahalanobis distance identified skeleton M as a significant outlier whereas robust Mahalanobis distance identified both skeletons M and 152 (Filzmoser and Varmuza 2017).

Finally, K means cluster analysis based on Mahalanobis distance was applied to the Z scores dataset to explore any inherent clusters of phenotypic variation at the site once including and once excluding the outliers. In both cases, the ideal number of clusters was 3 (Charrad et al. 2014). Since cluster assignments and configurations did not change with or without the outliers, only the results with

Skeleton	Imputed variables
SK 39	JUB
SK 52	SSS
SK 58	BPL
SK 65	BPL
SK 72	XFB
SK 106	AUB
SK 168	XFB
SK 48	BPL
SK I(A)	SSS
SK M	BPL, SSS
SK O	SSS
SK S	BPL

Table 4.14: *List of imputed variables in the Ancaster dataset*

Skeletons 3 and 152 were included here to avoid redundancy. Skeletons 3 and 152 are highlighted in K-means cluster plot (figure 4.7). Each cluster assignments was cross-referenced by biological sex estimations (figure 4.7). The first cluster (red, figure 4.7, table 4.15), which contains 14 individuals, has 10 females, three males, and one indeterminate skeleton. This works out to a roughly 3:1 ratio of females to males in the first cluster. Furthermore, cluster one contains 10 (71.4%) of the 14 female skeletons included in the entire Ancaster sample. Cluster two (blue, figure 4.7, table 4.15) contains 20 individuals, of which 15 are either male or possibly male, three are female, and two are indeterminate. Therefore, males outnumber females by nearly 8:1 in this cluster. Cluster two also contains 15 (60.0%) of the 25 male skeletons in the entire Ancaster sample. Finally, cluster three contains only six skeletons, all of which are male (fig. 4.7, table 4.15).

The results for the first two clusters of the Ancaster dataset are relatively similar to the Lankhills dataset. There are two significant clusters: one that contains mostly male skeletons with a select few female skeletons, and another that contains mostly female skeletons with a select few males (figure 4.7, table 4.15). However, the third cluster suggests that there is a group of male skeletons (table 4.7, table 4.15) that are significantly different in appearance than the rest of the males and females at Ancaster.

Again, there is more phenotypic variation in the male sample than the female sample (figure 4.7). As with Lankhills, the first interpretation of the results is that each cluster represents a different phenotypic group at the site. The second

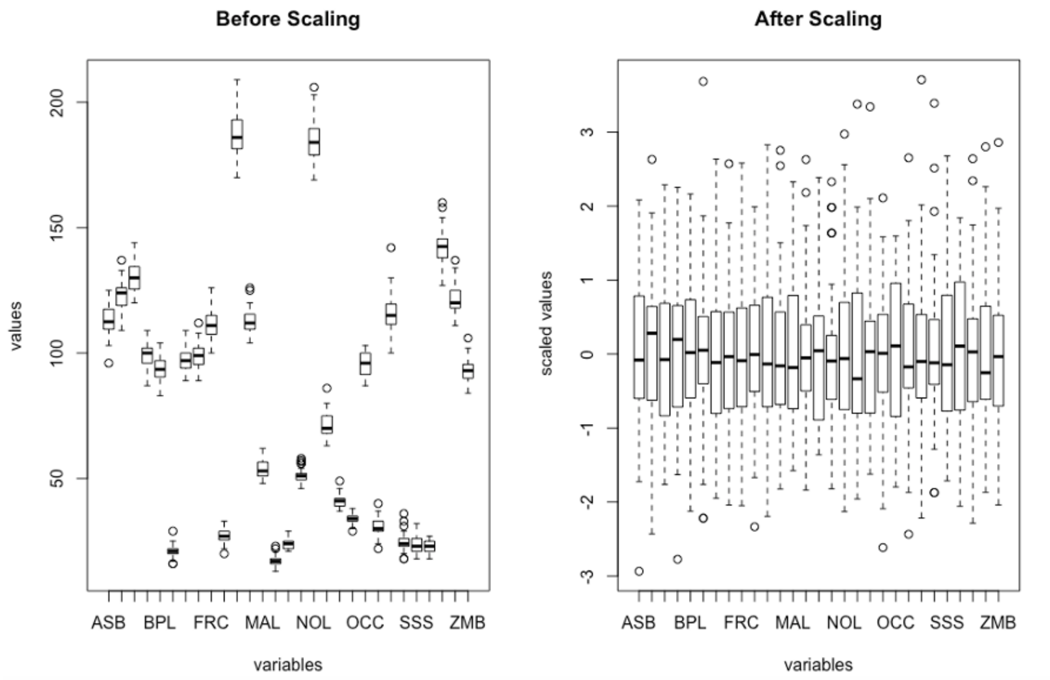


Figure 4.6: *Left: Boxplot of the measurements in the Ancaster dataset. Right: Boxplot of the scaled measurements in the Ancaster dataset. Created using the boxplot() function in R Studio (R Core Team 2019)*

Cluster 1	Cluster 2	Cluster 3
Sks M, O, S, U, 52, 58, 72, 115, 128, 148A, 152, 156, 168, and 202	Sks H, N, Q, I(A), 12, 34, 38, 49, 65, 93, 102, 106, 157, 200, 204A, 210, 211, 216, 229, and 238	Sks K, 39, 47, 92, 188, and 231

Table 4.15: *Cluster assignments for the Ancaster dataset excluding significant outliers (R Core Team 2019). Highlighted individuals indicate potential outliers based on their deviance from the centroid of the cluster that best represents their biological sex.*

Figure 4.7: *Cluster assignments for Ancaster cross-referenced with biological sex estimations. Red boxes indicate potential outliers based on their deviance from the centroid of the cluster that best represents their biological sex*

. Created using the fviz_cluster() function in the factoextra package (Kassambara and Mundt 2019)

interpretation would be that both clusters one and two represents the norm for either males or females and that any females who have been assigned to the male cluster are phenotypic outliers and vice versa. Furthermore, all individuals in cluster three would be phenotypic outliers in this case. This would mean that male skeletons K, 39, 47, 92, 188, and 231 in cluster three, and N, 58, and 156 in cluster one are male outliers, as well as female skeletons Q, 38, and 157 in cluster two. It is also possible in this scenario that the males are simply more phenotypically diverse than the female sample. It is possible that males at Ancaster are simply more phenotypically diverse than females, but none of the males in cluster three are statistically significant outliers, which indicates that they could be a completely different phenotypic group.

4.4.3 Poundbury

Poundbury is a unique dataset because there are no missing variables. Therefore, no imputation methods are necessary and data cleaning only consists of converting each measurement to a Z score (figure 4.8). The Poundbury data was collected by another researcher, specifically as a supplemental population to the Howells dataset in CRANID6 (Wright 2012). Therefore, only the original 29 CRANID6 variables are included here, none of which pertain to the mandible (Wright 2012: 39-51). As mentioned earlier, there are 49 Poundbury skeletons included in this sample, which is an ideal ratio for multivariate analyses (Beukelman and Brunner 2016).

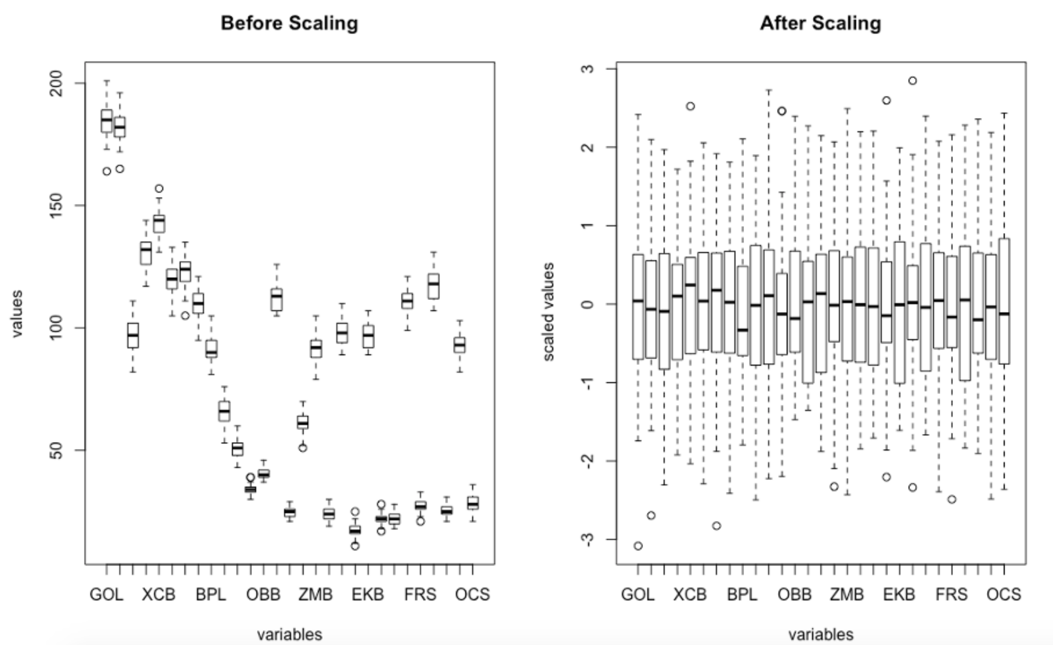


Figure 4.8: *Left: Boxplot of the measurements in the Poundbury dataset. Right: Boxplot of the scaled measurements in the Poundbury dataset. Created using the boxplot() function in R Studio*

The dataset was scaled further using multidimensional scaling, then analyzed based upon classic and robust Mahalanobis distance to highlight any significant phenotypic outliers (R Core Team 2019). Again, the threshold was set at 1.96 standard deviations from the mean, which should account for 95% of the overall variation within the sample. Classic Mahalanobis distance identified one outlier:

PRC 358 (female), while robust Mahalanobis distance identified two outliers: PRC 358 and PRC 212 (male) (figure 4.9). The results of the robust Mahalanobis distance test are used throughout the rest of the Poundbury analysis As with the other sites, K means cluster analysis was performed once including these outliers and once excluding these outliers. In both scenarios—including and excluding significant outliers—the ideal number of clusters is two (Charrad et al. 2014). Therefore, it is only necessary to outline the results of the k-means analysis that includes the outliers—individuals 358 and 212.

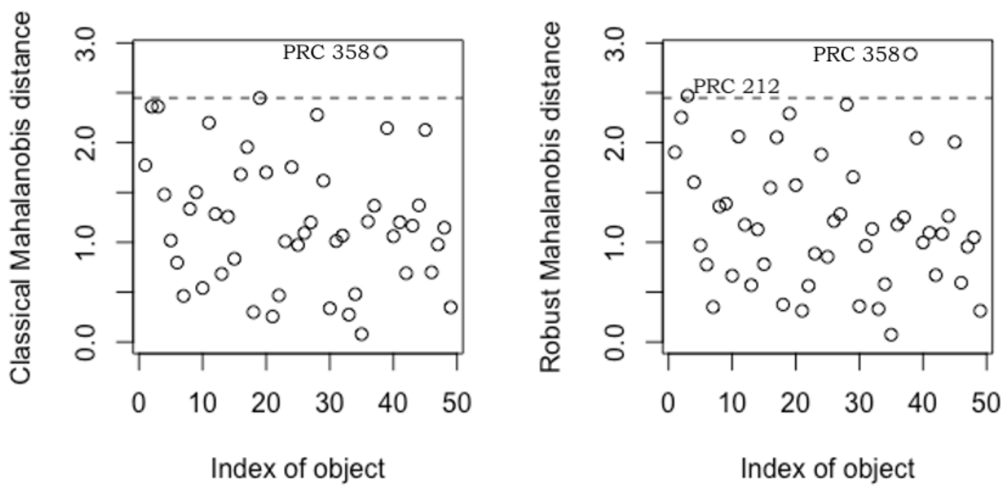


Figure 4.9: *Significant phenotypic outliers for Poundbury by classic Mahalanobis distance (left) and robust Mahalanobis distance (right)*

Much like the first two sites, Poundbury has two, relatively equal clusters (n= 25 and 24, respectively), each of which are heavily skewed to one biological sex or the other (figure 4.10). There is one female, PRC 357 that has been classified into the primarily male cluster and is significantly different than the centroid of the primarily female cluster. As with the first two sites, there are far more males classified into the primarily female cluster. These include PRC 392, 495, 702, 752 and 821. Furthermore, the primarily female cluster (red) is far more compact than its male counterpart, with the exception of four females: PRC 357, 543, 739, and 750. This would indicate that there is far more phenotypic diversity among the males at Poundbury, but a core group of phenotypically similar females with at least four females that do not conform to this group (figure 4.10).

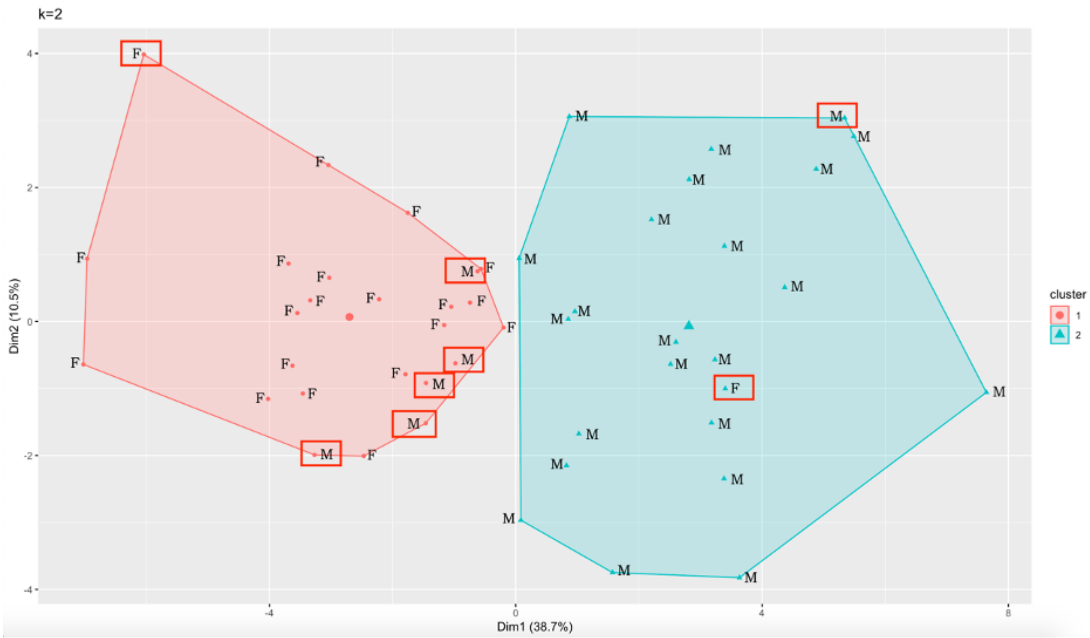


Figure 4.10: *Cluster assignments for Poundbury cross-referenced with biological sex estimations. Red boxes indicate potential outliers based on their deviance from the centroid of the cluster that best represents their biological sex*

. Created using the fviz_cluster() function in the factoextra package (Kassambara and Mundt 2019)

4.4.4 Baldock

As mentioned earlier, the Baldock dataset has far more missing variables than the other datasets in this study. Therefore, the Baldock results should be viewed not as definitive answers, but as an exploration into the limits of using k-means cluster analysis to quantify phenotypic diversity. In order to properly clean the dataset, 22 measurements had to be removed, leaving only 17 variables, none of which pertain to the nasal or ocular regions of the face (table 4.16). As mentioned earlier, psychological studies have found these facial regions to be vital components in recognizing differences in other individuals (Brebner et al. 2011; Stepanova and Strube 2012; Gwinn and Brooks 2015). It will be important to keep this in mind when interpreting the results of the k-means analysis.

Measurement	% Missing
BPL	65.8
CDB	68.4
DKB	44.7
EKB	63.2
GNI	23.7
GOG	60.5
HMF	23.7
JUB	65.8
MAB	52.6
MAL	44.7
MAN	18.4
MLN	23.7
NLB	52.6
NLH	48.7
NPH	60.5
OBB	52.6
OBH	47.4
TMF	42.1
XRB	34.2
XRH	29.0
ZMB	57.9

Table 4.16: *Observations removed from the Baldock dataset due to excessive missing values. Highlighted rows represent variables pertaining to the craniofacial skeleton*

After removing these variables, there were still several skeletons with excessive missing values. Out of the original 38, seven skeletons were removed from the dataset (table 4.17). Of these seven, four were biologically female, which comprises 40% of the original number of females in the dataset. Considering that the original dataset was already skewed towards biologically male individuals, removing these individuals has made the divide even larger (roughly 5:1 males to females). Overall, 20 missing values were imputed using MICE (van Buuren and Groothius-Oudshoorn 2011) (table 4.18).

When Baldock was tested for significant phenotypic outliers using multidimensional scaling and Mahalanobis distance, the results according to classic Mahalanobis distance were unusually different than those according to robust Ma-

Individual	% Missing
SK 73	33.3
SK 396	33.3
SK 551	23.5
SK 1040	52.6
SK F18(1)	23.5
SK 1047	33.3
SK 87	33.3

Table 4.17: *Samples removed from the Baldock dataset due to excessive missing values*

Skeleton	Imputed variables
50	FMB
426	FMB, WRB
396	FMB, WMH
443	WMH
563	XCB
577	BNL
1070	WMH
1122	WMH, XCB
1174	BBH, BNL
1372	WRB
1374	WMH, WRB
1426	WMH
1447	AUB
F18(2)	WRB
F475(2)	WRB

Table 4.18: *List of imputed variables in the Baldock dataset*

halanobis distance (figure 4.11). Classic Mahalanobis distance identified only one phenotypic outlier (Sk 366), whereas robust Mahalanobis distance identified six significant outliers (Sks 50, 366, 443, 522, 1446, and 1447). Because the dataset would be far too small if all six robust Mahalanobis distance outliers were removed, the k-means cluster analysis is performed once with skeleton 366 and once without.

Interestingly, the k-means cluster results for Baldock are strikingly similar to

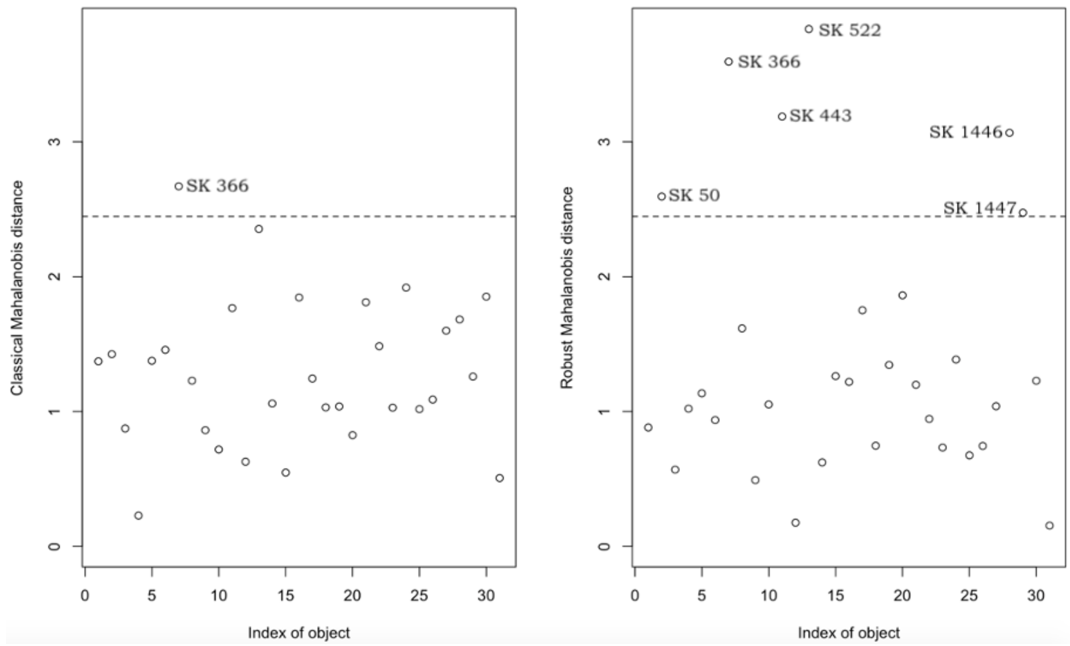


Figure 4.11: *Significant phenotypic outliers for Baldock based on classic Mahalanobis distance (left) and robust Mahalanobis distance (right)*

the other datasets in this chapter. There are two distinct clusters, one that is primarily male (n=23) and one that is primarily female but contains some males (n=8). Unfortunately, because there are far fewer individuals in this dataset, it is impossible to tell if there is also a core group of phenotypically similar females. Upon closer inspection, cluster two, which is primarily female and far smaller than cluster one, is comprised of every robust Mahalanobis distance outlier (orange outline, figure 4.12). Essentially, this is a result of the imbalance between male and female crania. Because there are so few female crania in the Baldock dataset, they are classified as significant phenotypic outliers in classic distance analyses. However, the addition of k-means cluster analysis has highlighted the fact that the phenotypic diversity at Baldock is far more complex. These results prove that k-means cluster analysis is more suited to dealing with smaller datasets or datasets that have a disproportionate number of males and females because simple distance analysis would classify the minority group as outliers.

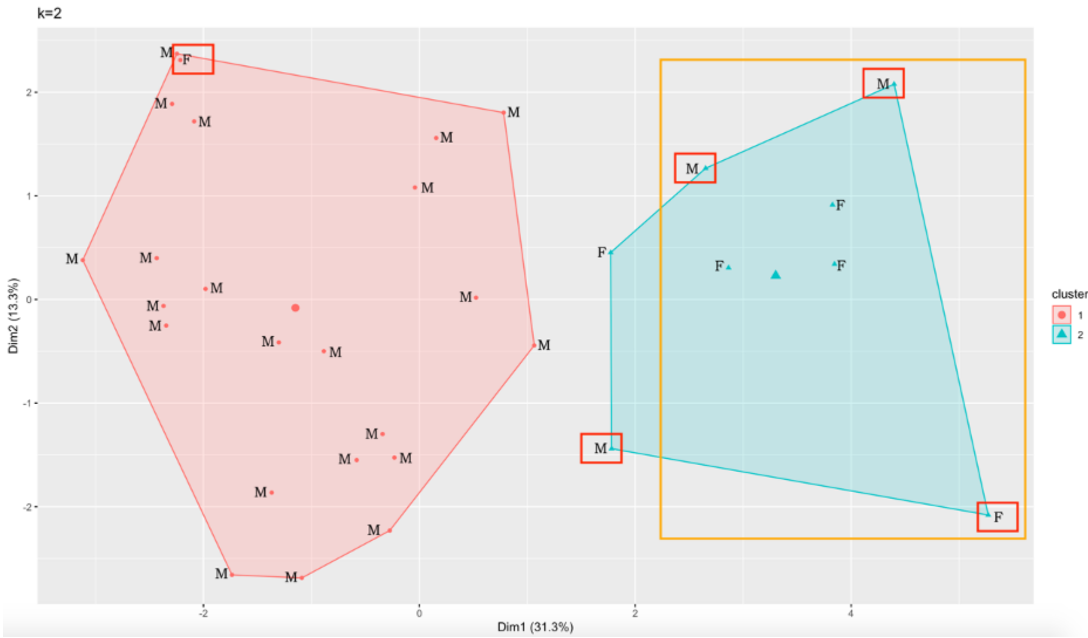


Figure 4.12: *Cluster assignments for Baldock cross-referenced with biological sex estimations. Red boxes indicate potential outliers based on their deviance from the centroid of the cluster that best represents their biological sex*
. Created using the fviz_cluster() function in the factoextra package (Kassambara and Mundt 2019)

4.4.5 York

As with the Baldock dataset, the cranial measurements from 3 and 6 Driffield Terrace, York were collected by an external researcher, Dr. Anwen Caffell (Caffell and Holst 2012). Dr. Caffell's report was meticulous and thorough, especially in noting which measurements may have been affected by glue, which was applied to the crania years before. At first glance, the dataset appeared to be sufficiently complete. However, upon removing all individuals that may have been affected by glue, as well as any others without a sufficient number of measurements, over half of the skeletons were not viable for multivariate analysis so York had to be excluded due to an insufficient number of individuals. While this is unfortunate, it is also a reminder that interdisciplinary analyses are essential because archaeological material is often compromised in this way.

4.5 Discussion and summary

The purpose of this study in biological distance was first, to determine whether or not K-means cluster analysis is a viable means of exploring phenotypic variation in archaeological populations at the site level and, second, to utilize multivariate analysis to explore and interpret the phenotopic diversity of 5 Romano-British populations. This discussion will explore the methodological observations first, followed by the interpretation of the results as evidence for the extent and nature of diversity among the populations. The assessment of methods to study biodistance was achieved by using cranial measurements from five different Romano-British sites to determine the advantages and disadvantages, and test the boundaries of biological distance analyses based on K-means cluster analysis.

Knowing that the nature of the data has not been significantly altered by any of the data cleaning techniques, it is possible to review the K-means cluster analysis without bias. In each of these sites, there are two possible interpretations of the results. The first interpretation is that the cranium is primarily shaped by an individual's biological sex, and secondarily by an individual's phenotype. In this scenario, K-means cluster analysis inherently identifies the changes in biological sex and creates two clusters based upon these results. However, there are some individuals, such as LH 203, 967, and 1532 from the Lankhills dataset or PRC 357, 543, 739, and 750 from the Poundbury dataset, that are not phenotypically similar to others of the same biological sex. In this instance, the individuals that are classified into a cluster that does not match his or her biological sex are phenotypic outliers. Furthermore, any males or females that are assigned to a third, smaller cluster would also be outliers, such as those in the Ancaster results. By these standards, it would appear that males are more phenotypically varied at each site than females, but that there are a small number of female phenotypic outliers as well. Not only are the male clusters less dense than the female ones, but the female clusters contain far more males than the reverse. Furthermore, in the only instance of a third, smaller cluster of phenotypically dissimilar individuals, all of the skeletons assigned to this cluster were male. Though some sites, such as Poundbury and Lankhills, have a greater difference between the density of male and female clusters, this outcome is essentially true at all sites in this study.

The second interpretation assumes that the cranium is primarily shaped by an individual's phenotype and secondarily by his or her biological sex. In this scenario each cluster would be representative of a phenotypic grouping. Therefore, the phenotypic groups for Lankhills, Poundbury, and Baldock would each be either primarily male or female. Ancaster, on the other hand, would have three phenotypic groups, one primarily male, one primarily female, and one exclusively male. If this is the case, it is possible that the clusters that are primarily female with some males represent the indigenous population and those that are primarily male with few females represent an incoming population, since the Roman army did not allow soldiers wives and children to accompany them on campaigns—though occasionally those rules were broken (Allison 2006; Phang 2001). Ultimately, K-means cluster analysis succeeded in quantifying and describing the phenotypic variation at each site, but it is clear that more sites with bigger sample sizes are needed to confirm which interpretation of the results is the more likely scenario.

Interestingly, in all of the populations present here, both scenarios would be consistent with prior knowledge about the nature of each site. Regardless of whether the clusters represent phenotypic groups, biological sex differences, or a combination of the two, these results show how phenotypically diverse males and females are at each site and allows for the two groups to be compared. At each site, most of the variation happens in dimension one, so the differences between males and females can easily be described in this dimension. At Lankhills, males have a longer range on dimension one than females—they span from -6 to 3.5 while females span from -5 to 6. However, the female are more dense within cluster one and a select few skew the range in cluster two. The males have a more consistent density through their range. As Winchester had a combination of military and civilian settlements contemporary with the Lankhills cemetery, it makes sense that males have more consistent phenotypic diversity because of the military settlement at the site.

At Ancaster males are significantly more diverse than females. Not only do male skeletons have two distinct phenotypic clusters, but they range from -6 to 3 on dimension one. Females on the other hand, range from -2 to 4 on dimension one. Both cluster one (primarily female) and cluster two (primarily male) are relatively similar in size, range, and density. Cluster three, however, skews the male sample to make it overall more phenotypically diverse. These results could imply that cluster three represents an incoming male group and that clusters one and two are the indigenous population. If this is the case, these results would be consistent with the fact that Ancaster had both a military and a civilian settlement. It could also imply that at least some of the military population came from one specific province.

At Poundbury, males and females are more or less equally dispersed across dimension one. Males range from -4 to 8 while females range from -8 to 4. However, while the range of males and females on dimension one at Poundbury would imply that these two groups are equally diverse, Poundbury females have quite a dense group of individuals near the centroid of cluster one from -4 to 0. There are only four females at Poundbury that are contributing to the wider range on dimension one: PRC 357, 543, 739, and 750. These results are similar to those from Lankhills. Ultimately, the males at Poundbury are more consistently diverse, whereas the females are not very diverse with the exception of a few outliers. Again, this would imply an incoming military population of mostly males, which is consistent with what is known about the contemporary settlements in and around Dorset. Unlike Ancaster, it appears this male population might be from a variety of different provinces, given the fact that no one cluster of males stands out significantly.

Finally, Baldock is a difficult site to compare on the basis of male and female differences, as the population has significantly more males than females. Males range from -2 to 5 on dimension one while females range from -3 to 4. Though the density of males versus females in each cluster is not ideal, these similar ranges imply that both biological sexes have similar levels of phenotypic diversity. Baldock is known for having a very light military presence but a heavy civilian presence, which is consistent with these results. It could be that these clusters represent an indigenous population and those that are outliers for their biological sex are incomers. Alternatively, it could be that the lack of excessive phenotypic diversity in late-Roman Baldock is a result of genetic admixture from an earlier military settlement that intermingled with the indigenous population.

The most significant argument for the use of K-means cluster analysis lies in the Poundbury Roman Camp results. The Poundbury cranial measurements were collected specifically to be included in the CRANID6 database (Wright 2012). However, the results of K-means cluster analysis in the current study suggest that there is a wide range of phenotypic variation at the Poundbury cemetery. As mentioned above, there is a concentrated group of female skeletons in cluster one, but four females— PRC 357, 543, 739, and 750—do not conform to this central group. Though PRC 543, 739, and 750 technically are still classified in the primarily female cluster, PRC 357 is classified in the primarily male cluster, which indicates that she is significantly different than the rest of the females. Furthermore, the Poundbury late-Roman cemetery has the largest difference between male and female phenotypic variation of any site in the current study, when considering the difference between the male population and the centroid cluster of the female population. It is abundantly clear from the results of K-means cluster analysis that males in Poundbury have far more phenotypic variation than females. Considering these results, it appears that the Poundbury skeletons would not be an ideal choice to represent a cohesive, genetically similar population in CRANID6.

These results call into question the validity of using any single cemetery site to represent the phenotypic variation of an entire population, which is precisely what CRANID6 and FORDISC attempt to do. At the very least, these results indicate that although CRANID6 and FORDISC attempt to discuss the possibility of phenotypic variation in a sample, their definition of phenotypic similarity needs to be explored further.

Essentially, K-means cluster analysis is a very effective tool in exploring phenotypic variation, but it is not a one-size-fits-all solution. While it is possible to impute missing values without altering the effectiveness of the method or the essence of the data, the skeletons at 3 and 6 Driffield Terrace proved that too many missing values makes multivariate analysis impossible. K-means cluster analysis is, therefore, slightly better suited to handling missing data than CRANID and FORDISC, but not significantly so. Furthermore, the techniques required to carry out K-means clustering are not as simple as CRANID and FORDISC, which only require measuring and inputting those measurements into the program. Multivariate analyses have far more steps and these steps vary based upon the data available. As seen above, there is no need to impute missing values using MICE at the Poundbury cemetery because there are no missing values. On the other hand, a cemetery like Baldock requires some significant dataset cleaning before it can be used in multivariate analyses. Due to the number of missing values, it was difficult to remove individuals and observations in such a way that optimized the ratio of individuals to observations. While it was ultimately possible to achieve optimization at Baldock, the cemetery at 3 and 6 Driffield Terrace proves that these methods do not work for every site. Finally, it is possible that some of the "outlying" individuals have simply been inaccurately sexed, but this is unlikely given that the original biological sex assessments were corroborated by the current author before any skeleton was included in this study.

Especially considering the results of the Poundbury K-means cluster analysis, it seems that multivariate analysis is better suited to exploring the diversity within a site than classification programs such as CRANID6 (Wright 1992, 2012) and FORDISC (Jantz and Ousley 1992, 1996, 2005). Though it requires more preparation than classification software, K-means cluster analysis highlights inherent patterns in cranial variation at each site and allows the researcher to investigate all possible interpretations of the results. Essentially, K-means is a more efficient means of understanding phenotypic variation, not just an individual's similarity or dissimilarity to other "populations" whose limits have not been properly defined.

Ultimately, the goal of biological anthropologists and archaeologists is to better understand the experiences of past people. As is evident from the primary source material, it is clear that past people had some inklings about genetics, but not to the same scientific extent that we do today. They relied heavily upon what modern scientists call phenotypic variation—which past people simply defined as different appearances—and they often distinguished, or discriminated against, those of a different phenotype. Of course, ancient people recognized the differences in others and tied these differences closely with other ethnic and genetic groups, but many past people would never have come across more than half of the populations in Howells' (1973, 1989, 1996) dataset. Therefore, how can modern anthropologists and archaeologists justify using modern ideas about what a population is to define past populations? It is against the very nature of anthropology to create definitive answers about groups of people rather than exploring their experiences. In the end, anthropologists and archaeologists want to understand if there was phenotypic variation and, if so, how this variation would have affected the people in question. Though K-means cluster analysis has its limitations, it will become clear that this method is better suited to answering questions of experiencing diversity when these results are combined with isotopes and epigraphy.

Chapter 5

Stable Isotopes Isotopes

Stable isotope analysis is an important component of studies of migration and diversity because it enables identification of possible first-generation migrants in past populations. However, previous statistical approaches to stable isotopes are problematic, the results of which are often treated as indisputable science (Bruun 2010). In reality, though stable isotope analyses do provide results with hard numbers, there are multiple ways to interpret these numbers. This chapter will first explore the many uses of stable isotopes along with a review of the many sampling methods and analysis methods that have been used in the past. The aim of this re-visitation is to explore the many different ways in which stable isotopic data can be interpreted, so that the results of previously studied Romano-British sites can be reanalyzed in a way that is more conducive to interdisciplinary studies. Ultimately, it will be argued that stable isotope data can have nearly as many interpretations as "non-scientific" data (Bruun 2010) and that while very useful, the results of stable isotope analyses should always be combined with additional forms of contextual data.

Though this particular study has not collected any new isotopic data from tooth enamel or bone, the common practice of publishing raw isotopic values means it is possible to reanalyze the results of previous studies to address new questions, which is the approach adopted in this chapter. This chapter will re-assess data from seven different studies of Romano-British sites: Lankhills (two studies), Gloucester, Catterick, York (three studies), and London, all of which generated isotopic data for oxygen, strontium, and lead (Evans et al. 2006; Eckardt et al. 2009; Leach et al. 2009; Chenery et al. 2010; Chenery et al. 2011; Montgomery et al. 2011; Muldner et al. 2011; Shaw et al. 2016). The various established approaches to interpreting raw stable isotopic data in these seven studies will be explored to determine which methods are successful and which require some reconsideration. From these notes, it will be argued that three ideal comparative methods for assessing migration and diversity from raw data analysis emerge. These include comparing results to an external database of known individuals, and comparing individuals within a site using two methods of significant outlier detection. These three methods were tested on the data compiled from all seven Romano-British studies to propose and execute additional methods of isotopic analysis and interpretation by challenging the drawbacks and concerns while utilizing the successes of previous research.

5.1 Background

Stable isotope analysis provides a method of determining an individual's geographic origins based upon their skeletal remains, and has, therefore, become a common approach to studies of migration in the past (Evans et al. 2006; Dupras and Schwarcz 2001; Prowse et al. 2007). Isotopes are the result of natural variation in the number of neutrons in any given element. A change in the number of neutrons ultimately results in different atomic masses of the same element without changing the protons or electrons or, therefore, the net charge of that element (DiGangi and Moore 2013: 427). Climate and environment contribute to changes in isotopic signatures in water, soils, and biological organisms (Mays 2000: 425). Ratios of oxygen stable isotopes (δ^{16}O and δ^{18}O) fluctuate in rainwater because of factors such as temperature, humidity, elevation, distance from the ocean, and distance from the equator (Killgrove 2013: 46). Strontium isotopes (^{86}Sr, ^{87}Sr, and ^{88}Sr), on the other hand, diffuse into soil through eroding geologic and biological materials and vary based on geological and biological characteristics, including the age of bedrock and the pathways of strontium consumption through biological processes such as plant growth and ground water absorption (Bentley 2006: 136). Locality-specific ratios of oxygen and strontium isotopes are present in groundwater and soil and, therefore, in vegetation grown in that soil and the animals that consume the vegetation and drink the water (Beard and Johnson 2000: 1051) (fig. 5.1). The strontium and oxygen isotopic signatures from any specific region will, theoretically, be reflected in their bone or dental enamel of individuals living in that region at the time of tissue formation (Bentley 2006: 136). In stable isotope analysis, isotopic signatures from ancient dental enamel and bone are then compared to distribution maps of the expected δ^{18}O or ^{86}Sr and ^{87}Sr values for certain regions, or to samples of modern people living in that region today in order to narrow down the potential geographic origins of past individuals (Beard and Johnson 2000: 1051, Prowse et al. 2007). Since stable isotopes are not radioactive, their relative proportions are unaffected by the passage of time, making them an ideal source of information for archaeologists (Mays 2000: 425).

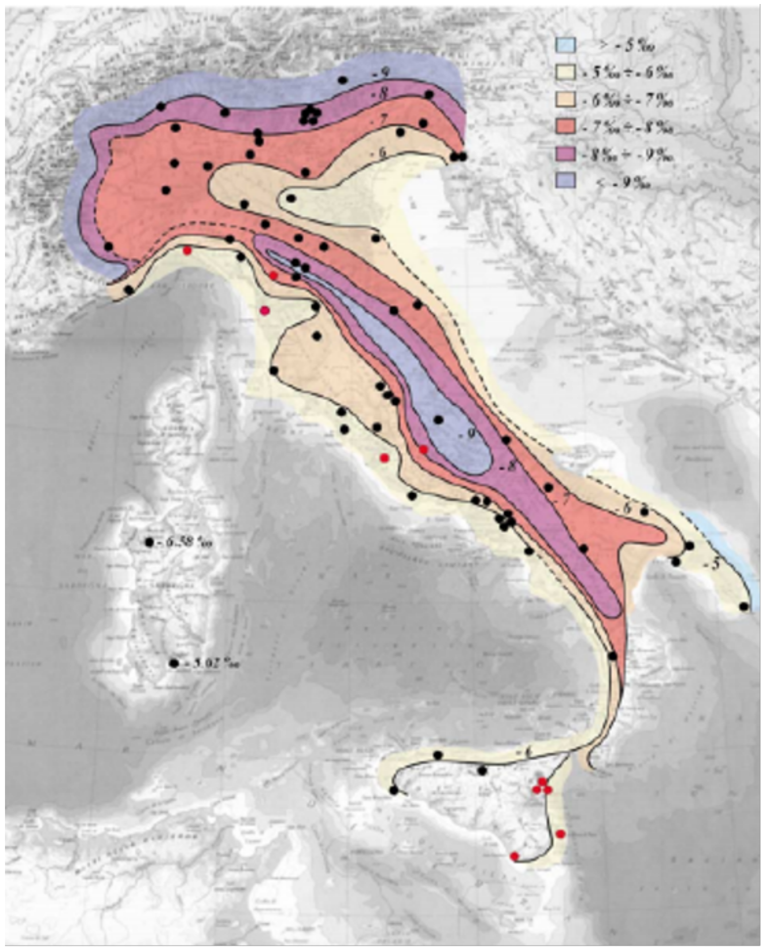


Figure 5.1: *Expected oxygen stable isotope variation throughout Italy (Longinelli and Selmo 2003: 80)*

Stable isotope analysis provides data concerning migration at different scales of resolution dependent on the tissue analyzed and the method applied. The process of constant remodeling and replacement which takes place in bone means that stable isotopic signatures derived from this tissue are wholly dependent on which bone is used for the analysis—as each bone has significantly different rates of resorption and renewal—and, at most, can only convey the strontium signatures from up to the final ten years of an individual's life (Knudson et al. 2012; Fahy et al. 2017; Curto et al. 2020). Stable isotope analysis of dental enamel has different constraints: it is limited to the discussion of the first 14 years of life because dental tissues are formed during childhood and adolescence but do not remodel (Prowse et al. 2007: 511). Therefore, even when dental enamel and bone isotope data are combined, there will be significant gaps in the knowledge of an individual's whereabouts throughout their life. Theoretically, a person could migrate within that time gap and return to their place of origin at least 10 years before death without it being accounted for in the isotopic signature. Therefore, the results are limited to discussing whether or not a person migrated after the age of 17.5 years or within the last ten years of life.

Furthermore, isotopic signatures of any kind can only identify first-generation migrants. Because these signatures are based upon the source of food and water a person has consumed, the offspring of migrants who have settled in a new place—referred to as second generation migrants—will not register as foreigners from their isotopic signatures. It is true that these individuals are not technically migrants themselves, but it is possible that during life they considered themselves to be foreigners based on their perceived ancestry, a topic which will be discussed in greater detail in the chapter on epigraphy. It is also possible that those indigenous to any particular land consider the children of migrants to be foreigners as well (Isaac 2004; Mattingly 2006). Because the results of stable isotope analysis cannot identify these individuals, it is likely that this type of analysis is masking a subset of individuals that are an important component in understanding the diversity at any given site.

Another concern in stable isotope studies is that the raw data from individuals who made multiple, short migrations could reflect an average of what one would expect from two separate geographic locations, resulting in them being incorrectly assigned to a different region of origin. For example, Dupras and Schwartz (2001) use bone to determine the geographic origins of the skeletons buried in the Roman period cemetery, Kellis 2, in the Dakhleh Oasis, Egypt. This cemetery was ideal for testing the stable isotope levels of bone because the individuals were naturally mummified and the bones exceptionally well preserved (Dupras and Schwartz 2001: 1202-1203). However, the results of this study were not fully conclusive because the authors found that some males displayed higher than expected oxygen levels in conjunction with expected strontium levels for the area. They concluded that they might be viewing an average isotopic signature from two different locations, which could happen if a person was migrating frequently between two locations or if their bone had not fully remodeled since migration occurred (Dupras and Schwartz 2001: 1206). They also call into question the current knowledge of bone resorption rates and consider the idea that bone mineral and bone collagen remodel at different rates, which would further explain this dichotomy in some males (2001: 1206). If this were the case, it would change the results of countless previous studies.

5.1.1 Sampling methods

Another aspect of isotopic analysis that is. Concerns about obtaining averaged isotopic values from both bone and dental tissues have fueled the popularity of incremental data collection techniques. Incremental sampling, also referred to as serial sampling or intra-tooth sampling, takes multiple samples of tissue from horizontal layers of dental tissue. As dental enamel forms in cumulative layers, from cusp to root, isotope data for each layer will reflect a different period of childhood life (figure 5.2). For example, taking a sample of dental enamel from the crown of a third permanent molar will yield results from when the individual was around 9 to 10.5 years of age, whereas sampling the root of that same tooth will yield results from the ages of 17 to 20 (Scheuer and Black 2000: 159). Taking these small, cumulative samples can be expensive and difficult to justify, as they are destructive over a large area of the tooth. Therefore, it is more common for studies to take a small sample from molar or premolar cusps often from multiple teeth of one individual to represent different times in his or her life.

Prowse et al. (2007) have undertaken this type of "incremental" study of the dental enamel from individuals excavated in Ostia and Portus, two major port cities just south of Rome, in an attempt to pinpoint more specifically when an individual migrated in his or her lifetime. Rather than taking samples from the cusp of the crown to the root, Prowse et al. sampled the cusps of the first and third molars of adults living in Ostia and Portus during the first to third centuries AD and compared these results to the isotopic levels of children living in modern-day Rome (2007: 513). In theory, this method would allow the researcher to determine if the child had migrated between the ages of 6 months and 9 years, therefore either refuting or supporting the hypothesis that migration demographics mainly consisted of adult males (2007: 510-511). In this study they were able to determine that migration was not always limited to adult men, but that women and young children between 6 months and 9 years of age were on the move as well (2007: 518). While this study was an important step for isotope analysis there have since been studies that question the formation times of dental enamel. Reade et

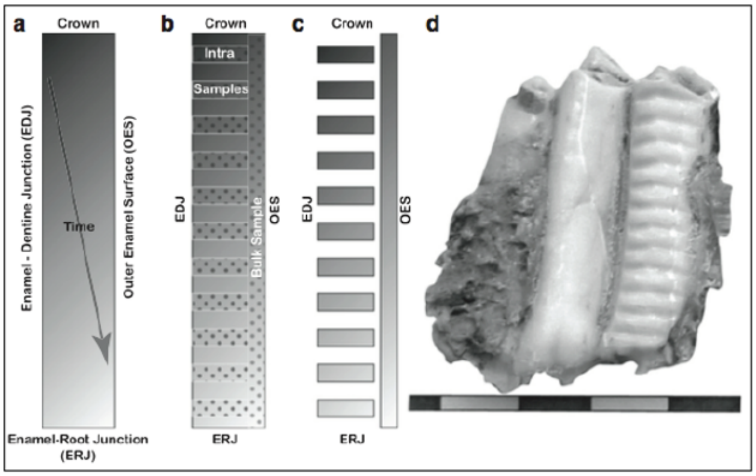


Figure 5.2: *Example of serial sampling on an Ammotragus lervia lower third molar (Reade et al. 2015: 127)*

al. (2015: 126), for example, have suggested that dental enamel is laid down both vertically and horizontally over time. Therefore, it is likely that the inner enamel will have formed at a different time period than the outer enamel, even on the same portion of one tooth. This finding could have serious ramifications for past isotopic studies, as many of them could be interpreting an average signature of two different geographic locations, which is unlikely to be representative of either region that the person had lived in. It is important to keep in mind that this type of average signature is a possible conclusion for any isotopic value.

5.1.2 Methods of analysis

There are many different techniques to analyze stable isotopes, all of which are represented in the seven studies used in the current project. One of the most widely used methods requires converting the oxygen phosphate ($\delta^{18}O_p$) values extracted from tooth enamel to their corresponding drinking water ($\delta^{18}O_{dw}$) values. Many choose to use this method because it is the only way in which to compare a specific individual with a specific source of water. However, it requires additional analysis because when drinking water is ingested, the $\delta^{18}O$ isotopes undergo fractionation within the body (Daux et al. 2008). Therefore, the $\delta^{18}O_p$ values extracted from tooth enamel will not equal those of the original drinking water. Once converted, the $\delta^{18}O_{dw}$ values for each individual can be compared to the actual $\delta^{18}O$ values in drinking water, which can be found in modern geological studies (Daux et al. 2008; Evans et al. 2012). Unfortunately, there are a multitude of different equations aimed at recreating the expected fractionation and reverting the $\delta^{18}O_p$ back to $\delta^{18}O_{dw}$ (Longinelli 1984; Luz et al. 1984; Levinson et al. 1987; Daux et al. 2008; Chenery et al. 2010). Studies do not always use the same methods due to varying opinions on which equation best represents the fractionation process (Chenery et al 2010; Evans et al. 2012). A paper in 2010 explored the levels of error associated with each equation and ultimately found that Levinson's corrected equation contained the least (Chenery et al. 2010). Despite these findings, later papers, such as Evans and colleagues in 2012, continued to use Daux's equation (Daux et al. 2008) in their comprehensive analysis of expected isotope values across Britain. Therefore, the standard that many archaeologists and anthropologists rely on is not truly a suitable resource for comparison regarding $\delta^{18}O_{dw}$. Oxygen isotopes are greatly affected by climate and anthropogenic factors, such as pollution, have affected the earth's climate since the Roman period in Britain (Lightfoot and O'Connell 2018). Therefore, ancient drinking water oxygen values could be different than today due to climate change, which would further skew any interpretation of the results, considering that only modern $\delta^{18}O_{dw}$ values are available to current researchers (Evans et al. 2012; Lightfoot and O'Connell 2016).

Aside from the effects of fractionation, there are culturally-induced factors that may affect a person's oxygen isotope signature. Oxygen signatures in water can be affected by boiling for cooking or drinking, making beer and wine, or through secondary consumption after fractionation, like drinking cow's milk (Lightfoot and O'Connell 2018). Additionally, breastfeeding in humans can result in similar variation, as the water consumed by the mother will undergo fractionation before it is consumed by the infant. Since tooth crown formation begins at such a young age, it is possible that these sources of variation can have an effect on oxygen isotope results in archaeological samples (Lightfoot and O'Connell 2018). Considering the fact that there is a direct, linear correlation between $\delta^{18}O_p$ and $\delta^{18}O_{dw}$ values (Pollard et al. 2011), many recent authors feel that the conversion step is unnecessary because it merely adds another source of possible error, which can easily be avoided by relying on $\delta^{18}O_p$ values alone (Pollard et al. 2011).

Finally, these equations introduce more than just another possible source of error; they also may not produce an accurate result that resembles any one source of drinking water. As outlined in the explanation of serial sampling, it is common for anthropologists to take samples from areas of the tooth that develop throughout childhood, such as M1, M2, and M3, which achieve crown completion around 2.5, 6.5, and 12.5 years, respectively, for both biological males and females (Scheuer and Black 2000: 159). As it is possible for a researcher to collect a sample that reflects ingestion of multiple drinking water sources, especially if an individual is migrating, the resulting $\delta^{18}O_p$ value will present as a mean of two or more separate $\delta^{18}O_{dw}$ values, which will match the drinking water levels of a completely different location, rather than the individual's place of origin or place of settlement, completely unbeknownst to the modern researcher. The introduction of unnecessary error has inspired a recent shift in $\delta^{18}O$ analysis, with authors favoring the use of raw $\delta^{18}O_p$ values, rather than converting these values to reflect possible drinking water sources. Moreover, the use of raw $\delta^{18}O_p$ values eliminates the possible false diagnoses associated with serial sampling, as individuals who have ingested multiple drinking water sources over the course of his or her development will theoretically have significantly different $\delta^{18}O_p$ values than local individuals, which will identify their possible migrant status without relying upon using the $\delta^{18}O_{dw}$ values their possible place of origin as evidence.

The other option is to use only $\delta^{18}O_p$ values to compare the isotopic values of one skeleton to other skeletons, rather than comparing skeletons to geographical locations, which is the case when converting $\delta^{18}O_p$ values to $\delta^{18}O_{dw}$ values. The most commonly used of method entails comparing $\delta^{18}O_p$ values to those of locally buried individuals. Thankfully, in the case of Britain, a comprehensive study has been carried out to create a database of such individuals (Evans et al.2012). The range of $\delta^{18}O_p$ values expected for Britain in this study are based on a dataset of 615 individuals (Evans et al. 2012). The original dataset included 666 individuals, which, when analyzed, revealed a non-normal distribution that would indicate the inclusion of significant outliers. Upon further inspection, the authors found that 51 individuals in the dataset were of questionable origin, and were, therefore, removed, resulting in a 7.1% rejection rate (Evans et al. 2012: 757). The final 615, which comprised a near-normal distribution (skewness = -0.13, kurtosis = 0.3), revealed a mean of 17.7‰ $\pm$ 0.7 (1 standard deviation) (Evans et al. 2012: 756-7). $\delta^{18}O_p$ values from the seven sites in question were compared to this mean, within the range of 1.96 standard deviations, which should represent 95% of individuals raised in Britain. Unfortunately, it is always possible that geographic outliers remain in this dataset despite every effort to remove them. Furthermore, not every locale has a similar comprehensive database for comparison, making this method unsuitable in certain geographic locations.

Currently, there are also two main ways in which $^{87}Sr/^{86}Sr$ values in human tooth enamel are used in migration studies: they are either compared to the expected levels in the biosphere in the surrounding landscape, or compared to other human tooth enamel samples that are presumed to be local (Evans et al 2012).

There are drawbacks associated with both of these approaches. For example, the $^{87}Sr/^{86}Sr$ values found in the local biosphere have a much higher level of variation across Britain than the $^{87}Sr/^{86}Sr$ values in human tooth enamel from apparently local individuals (Evans et al. 2012: 756) (fig. 5.3). A discrepancy such as this would indicate that humans are ingesting foods from a variety of different areas (Evans et al. 2012: 756). Therefore, in order to compare human tooth enamel levels to the expected regional levels, one would need to collect isotopic data from the areas where the imported food and drink were cultivated. Since it is not possible to know all the exact sources of these imported goods, the best estimate would be to compare all of the strontium values for tooth enamel, dentine, or bone mineral at a given site. If the people local to the area are all eating foods from similar areas, they will have similar $^{87}Sr/^{86}Sr$ values, whereas individuals from different locations will lie outside of this norm. However, unlike water sources, there are greater social class discrepancies in access to imported foods even within smaller communities. Despite this issue, it appears that simply comparing the $^{87}Sr/^{86}Sr$ values in human tooth enamel at a given site, rather than relying on biosphere comparisons, is the approach that is least likely to introduce significant error.

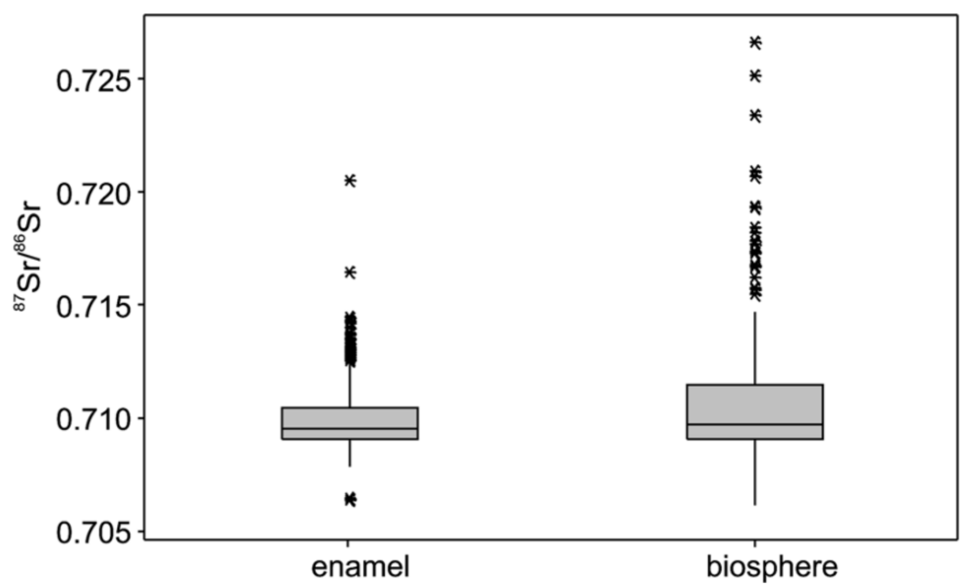


Figure 5.3: *Difference in strontium isotope variation between dental enamel and the biosphere in Britain (Evans et al. 2012: 756)*

Lead (Pb) isotopes are less commonly used in the study of migration, but many recent authors have discussed the advantages of lead isotope comparison methods, especially in the case of Roman-era skeletons (Montgomery et al. 2005; Montgomery et al. 2010; Shaw et al. 2016). As discussed earlier, $^{87}Sr/^{86}Sr$ levels throughout Britain can vary widely (Chenery et al. 2010; Shaw et al. 2016) and, therefore, it is helpful to also analyze another isotope to help triangulate a person's place of origin, which is why $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ are so commonly used in conjunction with one another. Though only the London skeletons included in this current study have been tested for lead isotopic signatures (Shaw et al. 2016), it was deemed appropriate to keep the lead data in the current analysis because the addition of another type of isotope can be so helpful when analyzing $^{87}Sr/^{86}Sr$ for migratory evidence. As mentioned earlier, London is an excellent example of a merchant-heavy community (Wacher 1996; Perring 2015) and, subsequently, a migrant-heavy community. Rather than exclude the London skeletons from the migratory analysis due to their lack of $\delta^{18}O_p$ signatures, these individuals have been treated slightly differently than the other sites, but in such a way that their migratory evidence can still be compared and contrasted with other sites.

There are five main lead isotopes that are commonly tested in studies of migration: $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$ (Budd et al. 2001; Montgomery et al. 2002, 2005, 2010, and 2011; Shaw et al. 2016). Like strontium and oxygen isotopes, lead isotopes in a person's skeletal elements will reflect the lead isotopes found in the local geology where a person was raised. However, a person's lead isotopic signature can be heavily influenced by the amount of cultural lead exposure through means such as lead in water supply pipes, cooking utensils, and air pollutants from smelting processes, wine sweetening supplements, cosmetic additives, coffin linings, and many more, all of which were prevalent in Roman culture (Montgomery et al. 2010; Shaw et al. 2016). These anthropogenic sources of lead ore cause an averaging of $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$ isotope signatures that reflect a mix of local ore sources and the ore sources of consumed (anthropogenic) lead (Shaw et al. 2016). Furthermore, burial environment can also significantly alter both the Pb concentration and isotopic signatures of skeletal material postmortem (Budd et al. 2001; Rasmussen et al. 2019; King et al. 2020). Lead coffins, grave goods, or simply heavy lead concentrations in the surrounding soil can introduce lead concentrations that were not ingested by the individual during life and, therefore, do not reflect that individual's history of migration (Rasmussen et al. 2019; King et al. 2020). Fortunately, this issue is more often the case in cortical and trabecular bone samples, not dental enamel (Rasmussen et al. 2019), which is why the London lead isotopes were deemed viable for the current study. Anthropogenic sources, on the other hand, can certainly affect lead signatures in dental enamel during a person's life (Shaw et al. 2016).

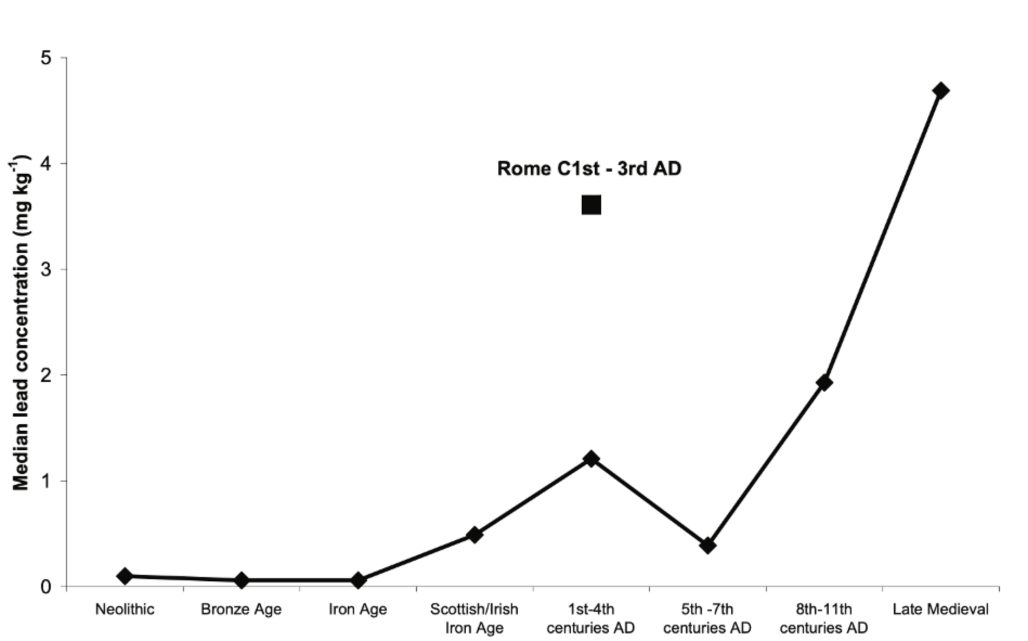


Figure 5.4: *Median enamel lead concentrations for humans in Britain with the addition of the same median for humans in Rome from the first to third centuries AD (Montgomery et al. 2010)*

In order to determine if a skeleton's Pb signature has been affected by anthropogenic sources, it is essential to first analyze the concentration of lead in any given sample. These concentrations are measured in parts per million (ppm) and reflect whether or not a person has been over-exposed to lead. Generally, 0.5ppm is considered the highest enamel lead concentration a person can have if he or she has not experienced over-exposure to lead (Montgomery et al. 2010). Because of the influx of these goods and cultural processes during Roman times, it is natural for a pre-Roman population in Britain to have lead concentrations that are less than 1ppm (parts per million), while those in the Roman period have concentrations around 1ppm (figure 5.4) (Montgomery et al. 2010; Shaw et al. 2016). Though this is a clear indication of Roman influence over British lead consumption, individuals originating from Roman Britain still test well below the lead concentrations of those originating from Rome itself (Montgomery et al. 2010). Montgomery and colleagues (2010) found that, on average, individuals living during the first and third centuries AD in Rome have significantly higher lead concentrations in their tooth enamel than those living at the same time in Britain (figure 5.4). These differences will vary depending on site location and history, but it is apparent that there are some cultural differences between the extent to which those living in Rome and those living in Britain use lead. By these standards, it could be suggested that a person with a lead concentration above 1ppm might not have originated from Britain (figure 5.4).

From an analytical standpoint, knowing that an individual or group of individuals have been affected greatly by anthropogenic sources of lead is an indication that their $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$ signatures—or any other isotope of lead–will not reflect the local signatures of their places of origin (Shaw et al. 2016). This is because these people have been exposed to lead sourced from other locales used in the production of traded goods. Therefore, comparing these isotopic signatures to geological samples will not yield accurate results. Furthermore, individuals who have been polluted with anthropogenic lead all tend to hover around a median isotope value for all lead isotopes (Montgomery et al. 2010), which will be explored later in the results. Therefore, it is likely that individuals with high lead concentrations may show a similar average lead isotopic value but originate from different locales. Thankfully, this phenomenon depends upon the degree to which a person has been affected by lead. Those with extremely high lead concentrations will tend towards a median lead isotope value but those with little to no anthropogenic lead influences are more likely to display a wider range of lead isotope values. Furthermore, it is possible to compare and contrast the $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$ of each individual against environmental and anthropogenic lead sources in an effort to determine which contributes the most to that individual's averaged isotopic signature. By those means, it is possible to tentatively estimate the origins of individuals with high lead concentrations but, more importantly and more accurately, discuss the differences between individuals buried at the same site.

In a recent study of lead isotopic signatures in Roman London, Shaw and colleagues (2016) use the methods described above to compare several different sources of lead isotopes and their expected "normal" range. They consider the lead isotopic signatures for geological ore samples from Mendips, England (Haggerty et al. 1996), a sample of Roman coins (Butcher and Ponting 2014), dental enamel samples from Post-Medieval London (Millard et al. 2014), and a database of contemporary German artefacts (Bode et al. 2009). This compilation of sources is ideal because it combines local and foreign sources of lead as well as natural and anthropogenic sources of lead. In cases in which anthropogenic sources of lead are low, it is possible to only compare some Pb signatures to known geological databases, but this approach from Shaw and colleagues (2016) is more appropriate for time periods in which anthropogenic lead use increases, of which Roman Britain is a prime example. As mentioned above, it is possible to estimate which areas may have had an influence on that person's lead signature by comparing each individual to several known sources of geological and anthropogenic lead.

Though there are many limitations to the method, which are evident in the above case studies, the study of stable isotopes has significantly advanced the field of migration analysis and would be a valuable component to any study of migration and diversity. One of the key shortcomings for studies of migration and diversity is that stable isotopes are only suited to exploring the geographic component of migration. While it is possible to identify individuals who have relocated to new places during their lifetimes, isotopic data cannot illuminate other important factors of migration, such as the resulting variation in the level of diversity and the issues of social identity that inevitably follow such changes. Of course, the same can be said of any other scientific method seeking to identify foreigners or the "other"—these methods are not sufficient when used without other methods of identifying experienced diversity. Furthermore, there are many issues associated with interpretation of stable isotope results, such as the possibility of obtaining an average signature that is not consistent with the locations in which an individual has lived. However, stable isotope analysis remains an important and useful tool in studies of migration and diversity. There are times when the results of these analyses are interpreted as indisputable scientific facts, when, in reality, it is important to remember that there are often many possible explanations to the results (Bruun 2010). It is essential to note that alone, isotopic evidence—and any other form of migration of diversity evidence—is merely a piece of the migration puzzle. Stable isotopic evidence cannot provide a wider representation of the experiences of past people, which is a key aim in the fields of biological anthropology and archaeology, unless it is used in conjunction with other methods. If these cautions are kept in mind, stable isotope analysis can be an instrumental addition to any study of migration and diversity.

5.2 Materials and methods for the current study

Seven studies have explored the $\delta^{18}O$ and $^{87}Sr/^{86}Sr$ isotopic variation at several Romano-British sites: Lankhills 1967-72 excavation (Evans et al. 2006), Lankhills

2000-05 excavation (Eckardt et al. 2009), various sites across York—which include Castle Yard, Clifton, Hospitium, Mount Vale, The Mount, The Railway, and Trentholme Drive, all from Leach et al. 2009, as well as 3 Driffield Terrace (Montgomery et al. 2011), and 6 Driffield Terrace (Muldner et al. 2011)—, Gloucester London Road (Chenery et al. 2010), various Catterick excavations—which include Bainesse Farm, Catterick Bridge, Dere Street, and Honeypot Road—(Chenery et al. 2011). One additional study from various sites across London (Shaw et al. 2016) used a combination of $^{87}Sr/^{86}Sr$ and various lead isotopes. All of these papers contain the raw isotopic data for each tested skeleton, which allows for continued analysis. Overall, these papers cover 193 skeletons, the demographics of which are outlined below (table 5.1). For the current project, the following information was recorded for each skeleton: which tooth was used in the analysis, the amount of strontium per sample in parts per million, the $^{87}Sr/^{86}Sr$ value, the $\delta^{18}O$ value for oxygen phosphate ($\delta^{18}O_p$), which represents the levels present in tooth enamel, and the $\delta^{18}O$ value expected for the drinking water source ($\delta^{18}O_{dw}$) of that sample using the corrected Levinson's equation (Levinson et al. 1987, Chenery et al. 2010), as well as the authors' notes on the individual's possible place of origin. Though some authors also include isotopic values for dentine or bone mineral, the current study only takes the values found in dental enamel into account. This was a conscious choice based upon the more extensive sources of error discussed above when using bone mineral (Knudson et al. 2012; Fahy et al. 2017; Curto et al. 2020). Dentine, which is much more resilient than bone but not as resilient as dental enamel (Goldberg et al. 2011), is also not used. These issues also compelled the choice not to compare results from enamel samples to those of bone mineral and dentine samples. Considering the sources of error that may be present in bone mineral or dentine, it seems that the results may not be entirely comparable. From a statistical standpoint, there are far more examples of enamel samples than either dentine or bone mineral, which means that the datasets will be larger and more inclusive if only enamel is used.

After collecting this raw data from Evans et al. (2006), Eckardt et al. (2009), Leach et al. (2009), Chenery et al. (2010), Chenery et al. (2011), Montgomery et al. (2011), Muldner et al. (2011), and Shaw et al. (2016) it was possible to reanalyze the original results both by site and as a complete unit. These studies span 10 years, during which time major advances have been made in isotope analysis. As mentioned earlier, there are several different methods for comparing and contrasting the results of stable oxygen and strontium isotope analysis, many of which are represented in these seven studies. Therefore, simply comparing the results of each study is not a viable option. In order to compare and contrast

Site	Age	Male		Female		Indeterminate		**Total**	
		N	%	N	%	N	%	**N**	**%**
Lankhills	Subadult	0	0.0	4	18.2	6	100.0	10	20.4
	Adult	21	100.0	18	81.8	0	0.0	39	79.6
	Total	21	42.9	22	44.9	6	12.2	49	100.0
Catterick	Subadult	0	0.0	0	0.0	8	100.0	8	32.0
	Adult	12	70.6	5	29.4	0	0.0	17	68.0
	Total	12	48.0	5	20.0	8	32.0	25	100.0
Gloucester	Subadult	0	0.0	0	0.0	0	0.0	0	0.0
	Adult	11	40.7	10	37.0	6	22.2	27	100.0
	Total	11	40.7	10	37.0	6	22.2	27	100.0
York	Subadult	0	0.0	0	0.0	0	0.0	0	0.0
	Adult	52	72.2	19	26.4	1	13.9	72	100.0
	Total	52	72.2	19	26.4	1	13.9	72	100.0
London	Subadult	0	0.0	0	0.0	3	100.0	3	15.0
	Adult	8	47.1	9	52.9	0	0.0	17	85.0
	Total	8	40.0	9	45.0	3	15.0	20	100.0
Total for all sites	Subadult	0	0.0	4	6.2	17	70.8	21	10.9
	Adult	104	100.0	61	93.8	7	29.2	172	89.1
	All age groups	104	53.9	65	33.7	24	12.4	193	100.0

Table 5.1: *Demographic information for all skeletons included in the isotopic analysis*

these sites, the methods used to analyze both oxygen and strontium needed to be standardized across all sites. Due to these differences, three methodologies were used to analyze δ^{18}O variation. In the case of the London samples, no δ^{18}O data was recorded. Instead, the authors used lead (Pb) isotopes, which included the amount of lead per sample in parts per million. Because these authors did not use oxygen isotopes, the values cannot be compared in the comprehensive database. Therefore, the Roman London samples are the only site in the current project that has only been analyzed in isolation. It should be noted that any further references in the present work to the "comprehensive database," or similar terminology, reflect this omission of the Roman London skeletons. All the values available for each skeleton in this study can be found in Appendix C.

For both strontium and oxygen, three methods of comparison were used for each site and for the comprehensive database. The first method is to compare the findings of all eight studies to that of Evans et al. (2012). This step will determine whether or not the individuals in the current study have comparable strontium and oxygen isotopic ratios to 615 previously tested individuals across Britain, all of whom are presumed to be indigenous. Evans et al. found that for Britain, the mean $^{87}Sr/^{86}Sr$ value was 0.7099 $\pm$ 0.0025 (1.96 standard deviations), which would indicate that 95% of the individuals who spent their developmental years in Britain would range between $^{87}Sr/^{86}Sr$ values 0.7074-0.7124 (2012: 755). However, the actual minimum $^{87}Sr/^{86}Sr$ value found in a human sample in Britain is 0.7078, while the actual maximum is 0.7165. Excluding Scotland, the mean is 0.7124 $\pm$ 0.0022 (1.96SD), which would indicate that 95% of the indigenous population of England alone should reside in the range of 0.7102-0.7146. This was calculated by assessing a known local population from Hereford Cathedral (n=16) (Evans et al. 2012: 756). While Evans et al. do not comment on the lowest value extracted from the Hereford Cathedral sample, they do note that maximum $^{87}Sr/^{86}Sr$ for this population is 0.7140, while the highest recorded from England and Wales is 0.7142, though the origins of this individual are unknown (2012: 756). Theoretically, 95% of individuals indigenous to Roman Britain should fall within this range. It's important to note that this range was calculated from a statistical standpoint and, therefore, there will always be some indigenous isotope signatures that fall outside of this range. Regions of Britain can have vastly different strontium isotope signatures (Chenery et al. 2011), so it is important to statistically calculate expected ranges in areas that differ significantly from the rest of England.

In the case of $\delta^{18}O_p$, Evans et al. (2012) found that most individuals who appear to be indigenous to Britain fall within the range of 17.7‰$\pm$ 1.37 (1.96 standard deviations). These results are from their cleaned dataset of 615 individuals, which has been edited to remove individuals of possible foreign origin. By these standards, 95% of individuals who lived in Britain during their upbringing should have $\delta^{18}O_p$ values that fall between 16.33‰ and 19.07‰, according to Evans et al (2012). There is no specific comment in Evans et al. (2012) regarding the differences that may be present between regions such as England and Scotland.

Lead isotopes have a more complicated method of comparison because exposure to lead is closely linked with cultural processes, as mentioned earlier. First, each sample will be tested for lead concentration. Any individuals with lead concentrations higher than 0.5ppm will be highlighted as it is likely that they have been over-exposed to lead throughout their lifetimes, which will greatly affect their $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$ specific results (Montgomery et al. 2010; Shaw et al. 2016). Furthermore, lead concentrations will be tested for distribution, mean, median, skewness, and kurtosis. Any outliers identified through these methods will be explored. Though this approach is not often done in an analysis of lead concentrations, it may be of use to distinguish between individuals that have statistically different levels of lead in their bodies. This is an indication that individuals consumed vastly different amounts of lead in their formative years, which could be a result of different cultural norms or social status. Furthermore, those with much higher concentrations may have had their isotopic signatures skewed even more so by excessive anthropogenic lead consumption.

Next, each lead isotope, $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$, is analyzed. When available, these isotopes are compared to known databases that include environmental lead studies as well as anthropogenic sources (Shaw et al. 2016). Shaw and colleagues (2016) have most recently compiled many different geological databases for comparison of individuals buried in Roman London. Both the databases they utilize and the individuals they studied will be used in the current study. They use a database of lead signatures from German artefacts compiled by Bode and colleagues (2009), Roman coins compiled by Butcher and Ponting (2014), geological ore in Mendips, England compiled by Haggerty and colleagues (1996), as well as dental enamel samples from Post-Medieval London skeletons (Millard et al. 2014). While Shaw et al. (2016) only utilize the expected geological and anthropogenic ranges for $^{207}Pb/^{206}Pb$ and $^{208}Pb/^{206}Pb$, most of these previous studies also include expected ranges for $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, and $^{208}Pb/^{204}Pb$, which are used in the current study. However, it is well documented that ^{204}Pb isotopes yield less precise results it is not as abundant as ^{206}Pb isotopes (Montgomery et al. 2010). Therefore, ^{206}Pb isotopes will be given more credence when discussing the validity of results. Unfortunately, no raw data was available for $^{206}Pb/^{204}Pb$ isotopes in Mendip ore samples (Haggerty et al. 1996) as well as $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, and $^{208}Pb/^{204}Pb$ isotopes in Roman coin samples (Butcher and Ponting 2014) (table 5.2).

Unlike previous studies, which tend to plot different lead isotopic signatures against one another, all five lead isotopes signatures for each individual were also compared directly with each individual's lead concentration level. This was done to determine the extent to which elevated Pb concentrations affect isotopic signatures for each specific isotope, which, according to Montgomery et al. (2010) is important because individuals who have been heavily polluted with lead will all tend to gravitate towards a central lead isotopic value for all lead isotopes. In addition, this process serves to isolate individuals with both anomalous isotopic signatures and increased sources of anthropogenic lead exposure to determine

Lead isotope	Mendip ore	Roman coins	Post-Medieval dental enamel	German artefacts
$^{206}Pb/^{204}Pb$	N/A	N/A	18.375-18.452	18.147-18.722
$^{207}Pb/^{204}Pb$	15.601-15.688	N/A	15.608-15.632	15.580-15.688
$^{208}Pb/^{204}Pb$	38.257-38.565	N/A	38.330-38.440	38.050-39.120
$^{207}Pb/^{206}Pb$	0.843-0.853	0.840-0.856	0.8467-0.8499	0.838-0.8594
$^{208}Pb/^{206}Pb$	2.071-2.094	2.074-2.106	2.0811-2.0869	2.079-2.101

Table 5.2: *Lead isotope ranges for geological and anthropogenic sources of lead via Haggerty et al. 1996, Butcher and Ponting 2014, Millard et al. 2014, and Bode et al. 2009*

whether or not their isotopic signatures can be successfully compared to environmentally expected levels of lead. Theoretically, individuals being raised in the same communities should have similar lead concentrations and lead isotopic signatures. Comparing every individual based upon these two factors can identify similar and dissimilar individuals in scenarios in which individuals cannot be successfully compared to environmental or geographical sources of lead.

The final two methods used to compare stable isotopes in the current study apply to all three elements: oxygen, strontium, and lead. These techniques use standard deviation and interquartile ranges, respectively, to identify significant isotopic outliers. So, each skeleton's isotopic signature is interpreted in relation to all of the other skeletons at the site, rather than having each skeleton compared to an outside database of expected ranges. Each technique begins the same way, by determining the means, standard deviations, quartiles, normality, skewness, and kurtosis for each site in R (Meyer et al. 2017; R Core Team 2017). Theoretically, the mean should be close to the average expected for the local population, but the distribution should be non-normal if there are a significant number of non-locals, or mathematical outliers. The skewness and kurtosis will help to identify why the curve is not normal, and which values are skewing the normality. At this point, there are two different ways to identify which specific individuals are skewing the curve. These individuals are outliers and can either be identified by the standard deviation (SD) method or the interquartile range (IQR) method. The SD method requires determining the mean and standard deviation for each dataset. Then, the standard deviation is multiplied by 1.96, and this value is both added and subtracted from the mean to create a range in which 95% of normal values should fall. Any individuals outside of this range are considered significant outliers.

The IQR method requires finding the median and the interquartile range for each isotope in each dataset. The interquartile range is then multiplied by 1.5, and that number is both added and subtracted from the median to create another range. Any individuals outside of this range are considered outliers. The results of the IQR method can be visualized in a box plot. Theoretically, by identifying these significant outliers, any individuals of non-local origin are also identified. Upon removing those individuals, the dataset should then have a normal or, as in the case of Evans and colleagues (2012), a near-normal distribution. While this approach is similar to that of Evans and colleagues (2012), it removes a degree of error because it does not assume an expected range based upon data from a combination of relevant and non-relevant sites.

Considering that some of the individuals in the Evans et al. (2012) dataset are of unknown origin, it was necessary to employ supplementary statistical analysis. As with the oxygen isotope samples, the $^{87}Sr/^{86}Sr$ values for both the comprehensive database and the individual sites were analyzed in R studio for mean, standard deviation, quartiles, normality, skewness, and kurtosis (R Core Team 2017; Meyer et al. 2017; Wickham 2016). These values were used to explore the variation in each strontium dataset and identify any $^{87}Sr/^{86}Sr$ outliers using both the standard deviation and interquartile range methods. Due to a lack of information surrounding the expected lead isotope values for individuals living in Britain, only the standard deviation and interquartile range methods were used.

The results of these tests for each site were next compared graphically using the ggplot() function in ggplot2 (Wickham 2016). These graphs are repeated twice. In the first instance, they are color coded to reflect excavation site, which helps to explore any site-specific differences. These differences could be an indication that communities within a larger region did not use the same burial ground. In the second instance, these graphs are color coded to reflect tooth choice. Theoretically, tooth choice should only indicate differences in age range at the time of migration. For example, enamel formation for adult canines around the same time as M1 formation and nearly a full 3 years before M2 enamel formation (Scheuer and Black 2000: 161) (fig. 5.5). Considering this, sampling a permanent canine should not produce a significantly different result than sampling a first molar, which is commonly used in isotopic studies. Therefore, if tooth choice appears to a factor in the cause of isotopic variation, there may be a sampling bias.

Finally, the comprehensive database for the first seven sites, which contains a total of 175 individuals from various excavations at Roman Winchester, York, Gloucester, and Catterick (Evans et al. 2006, Eckardt et al. 2009, Leach et al. 2009, Chenery et al. 2010, Chenery et al. 2011, and Muldner et al. 2011) was

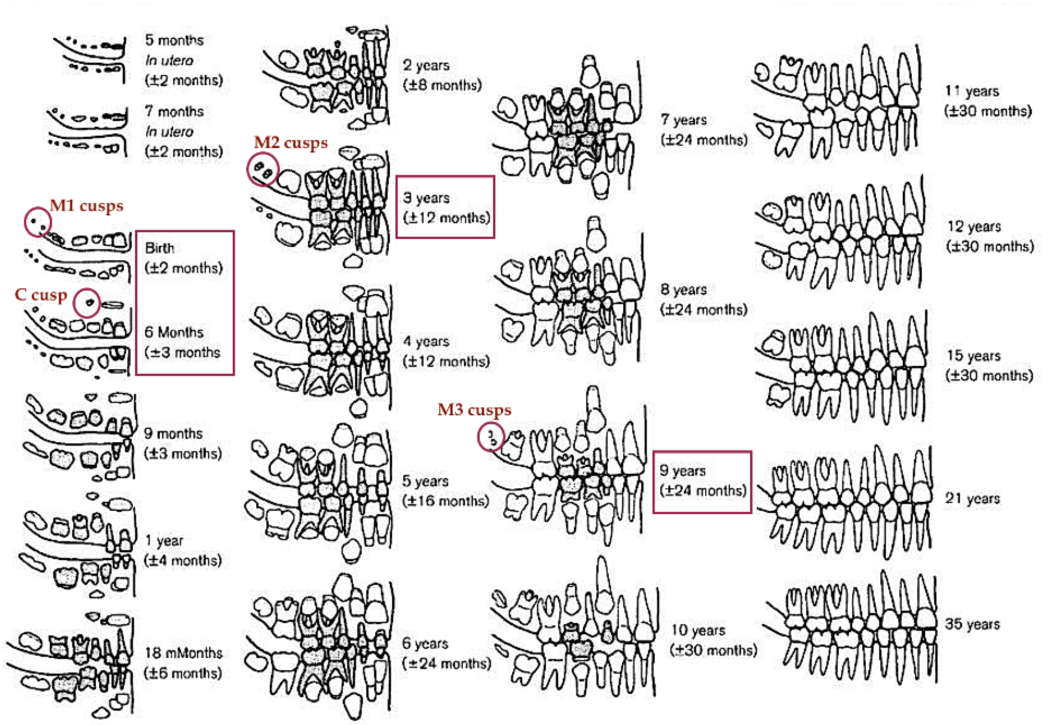


Figure 5.5: *Tooth formation guideline from Scheuer and Black (2000: 161). Annotations outlining stage C_i (initial cusp formation) for C, M1, M2, and M3 added by the author*

graphed by $^{87}Sr/^{86}Sr$ and $\delta^{18}O_p$ (Wickham 2016). The same graph was repeated for each individual site or region in isolation. The choice to include or exclude certain sites from the regional analysis depended on the number of individuals found at that site. For example, there are multiple excavations from various cemeteries around York. Some, like The Railway, have a plethora of individuals tested for isotopes, while others, such as Castle Yard, have only one (Leach et al. 2009: 556). Instead of excluding cemeteries with only one individual, these individuals are added into the datasets for nearby cemeteries. Based on the evidence of Evans and colleagues (2012), any individuals with $^{87}Sr/^{86}Sr$ values below .7078 or above .7165 were noted. Any individuals with $\delta^{18}O_p$ values below 16.33‰ or above 19.07‰ were noted. Lastly, any mathematical outliers were also highlighted on the graph. This step created a side-by-side comparison of the oxygen and strontium isotope analysis methods, because it visually juxtaposes the different expected ranges generated by each approach.

5.3 Results

This section will summarize the results from all methods of oxygen and strontium comparison, including comparison to the Evans et al. (2012) expected ranges and the statistical methods based upon standard deviation (SD) and interquartile range (IQR). As outlined above, the expected range for Evans et al. (2012) contains fixed values. These ranges will not change based upon the isotopic values at each site and, therefore, only need to be calculated once, which is done in the results section for the comprehensive dataset. On the other hand, standard deviation and interquartile range change based upon the data that is present at each site. Though comparisons to the Evans et al. (2012) database will be presented with site-specific results, it is important to note that those outliers are determined by a fixed "expected" range whereas the standard deviation and interquartile methods are dependent upon the specific values found at each site. To further clarify this difference, any comparisons to the Evans et al. (2012) expected ranges will be referred to as the "fixed threshold" method.

5.3.1 Lankhills

First, the $\delta^{18}O_p$ levels for both Lankhills excavations were tested for outliers using standard deviation and IQR methods. The Shapiro-Wilk test identified that the distribution of $\delta^{18}O_p$ values at Lankhills was not normal (W= 0.913, p= 0.0005) (R Core Team 2017). This indicates that there are significant outliers included in the dataset, which is expected for this population based on previous analyses (Clarke 1979, Evans et al. 2006, Eckardt et al. 2009). Looking at the Q-Q plots for $\delta^{18}O_p$, it's clear that the bulk of oxygen outliers for Lankhills are within the first theoretical quartile and, therefore, will fall below the site mean. This is confirmed by the skewness (-1.08), which indicates a left-skewed distribution and the kurtosis (1.08), which indicates that the distribution is leptokurtic (Meyer et al. 2017). First, the mean and standard deviation approach was used to identify outliers, again with a standard deviation threshold of 1.96. For $\delta^{18}O_p$, the mean value is 17.87‰, with a standard deviation of 1.017. 1.96 times the standard deviation is 1.99, which, therefore, makes any value outside the range of 15.88-19.86‰ a significant outlier. For Lankhills these oxygen outliers are LH 13, 1119, 426, and 81. All of these outliers represent the values lower than the mean, which confirms the results of the skewness and kurtosis test. Next, the Lankhills isotope results were tested for outliers based on their IQR values. The interquartile range for $\delta^{18}O_p$ is 0.85 and 1.5 times that value is 1.275. The median for $\delta^{18}O_p$ is 18.05‰. Therefore, any individuals outside the range of 16.78-19.33‰ are outliers. There are eight lower value outliers (LH 81, 426, 13, 1119, 351, 357, 55, and 281) and two higher value outliers (LH 271 and 119). However, only six of these individuals are significant outliers (LH 81, 426, 13, 1119, 351, and 357) (fig. 5.6) (R Core Team 2017. These results are in accord with the skewness and kurtosis results.

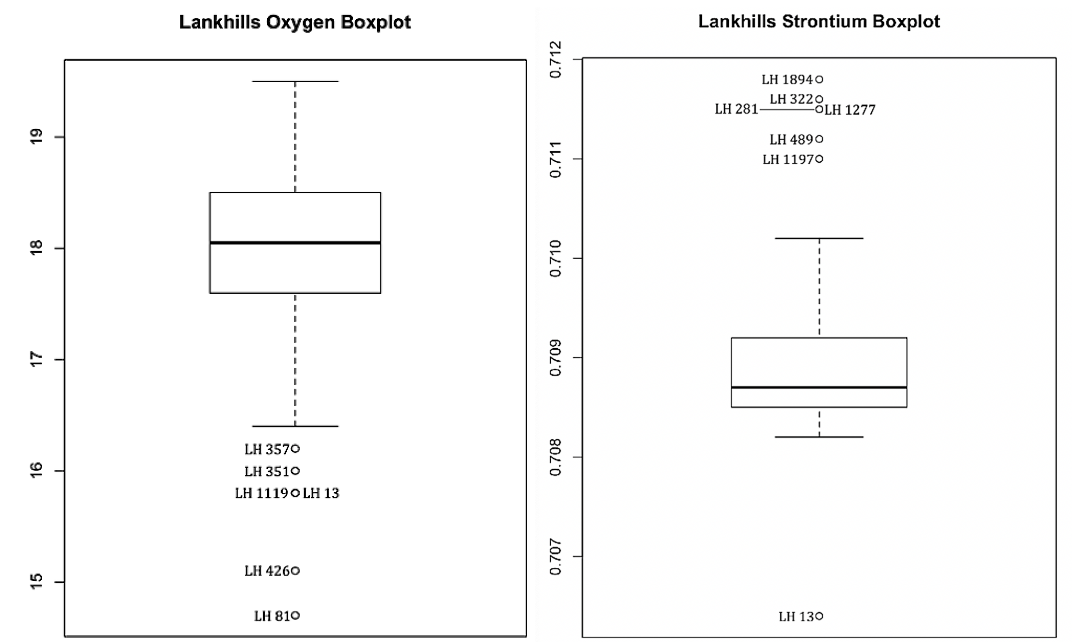


Figure 5.6: *Left: Boxplot of $\delta^{18}O_p$ outliers at Lank. Late Rom. Cem. Right: Boxplot of $^{87}Sr/^{86}Sr$ outliers at Lank. Late Rom. Cem.*

^{87}Sr/^{86}Sr values are also not normally distributed, according to the same Shapiro-Wilk test (W= 0.803, p= 2.3e-7). From the boxplot (fig. 5.8), it's clear that the higher strontium values are skewing the dataset, more so than the lower values. This is confirmed by a positive skewness (1.197), which indicates a right-skewed distribution, and a positive kurtosis (2.12), which indicates a leptokurtic curve (Meyer et al. 2017). For ^{87}Sr/^{86}Sr, the mean is 0.709 and standard deviation is 0.00973. 1.96 times the standard deviation is 0.00191, which makes any value outside the range 0.707-0.711 a significant outlier. Only one low-value outlier was identified: LH 13. As for high-value outliers, the individuals are, from most to least significant: LH 1894, 322, 281, 1277, 489, and 1197. The split between low- and high-value outliers for strontium confirms the results of the skewness

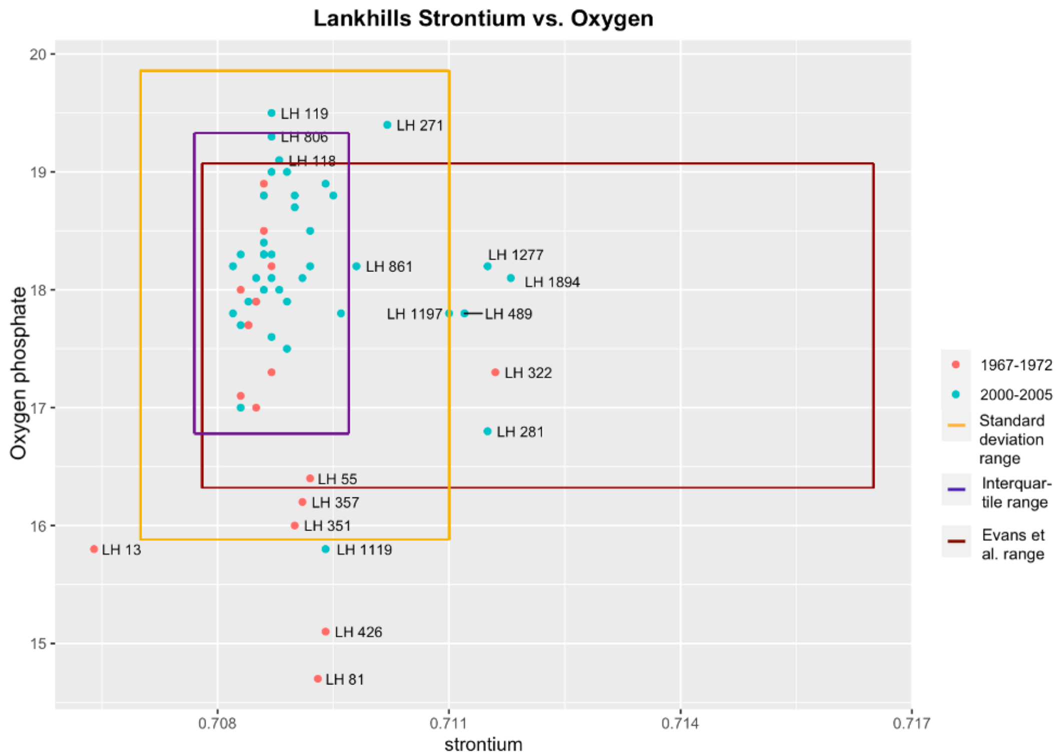


Figure 5.7: *Comparison of all outlier detection methods for the Lankhills database color coded to reflect excavation year.*

and kurtosis tests. The IQR for strontium is 0.00068 and 1.5 times this range is 0.0010. As the median for $^{87}Sr/^{86}Sr$ is 0.7087, the range in which values should fall is 0.7077-0.7097. Therefore, there are eight higher value outliers (LH 1894, 322, 1277, 281, 489, 1197, 271, and 861) and one lower value outlier (LH 13). However, only seven of these individuals are significant outliers, all of which, save for LH 13, are high-value outliers (LH 13, 1197, 489, 281, 1277, 322, and 1894) (fig. 5.6) (R Core Team 2019). This is in accord with the skewness and kurtosis results.

As is evident in figure 5.7, the fixed threshold $\delta^{18}O_p$ range for Roman Britain is more restrictive than the results of the standard deviation method and considerably lower than those of the IQR method, meaning that the use of the fixed threshold method classifies more high-level $\delta^{18}O_p$ values as outliers. Furthermore, the fixed threshold for $^{87}Sr/^{86}Sr$ has a much larger range than either of the statistical methods (figure 5.7). By these standards, only LH 13 is a strontium outlier. This comparative graph also reveals that individuals from the 1967-1972 exca-

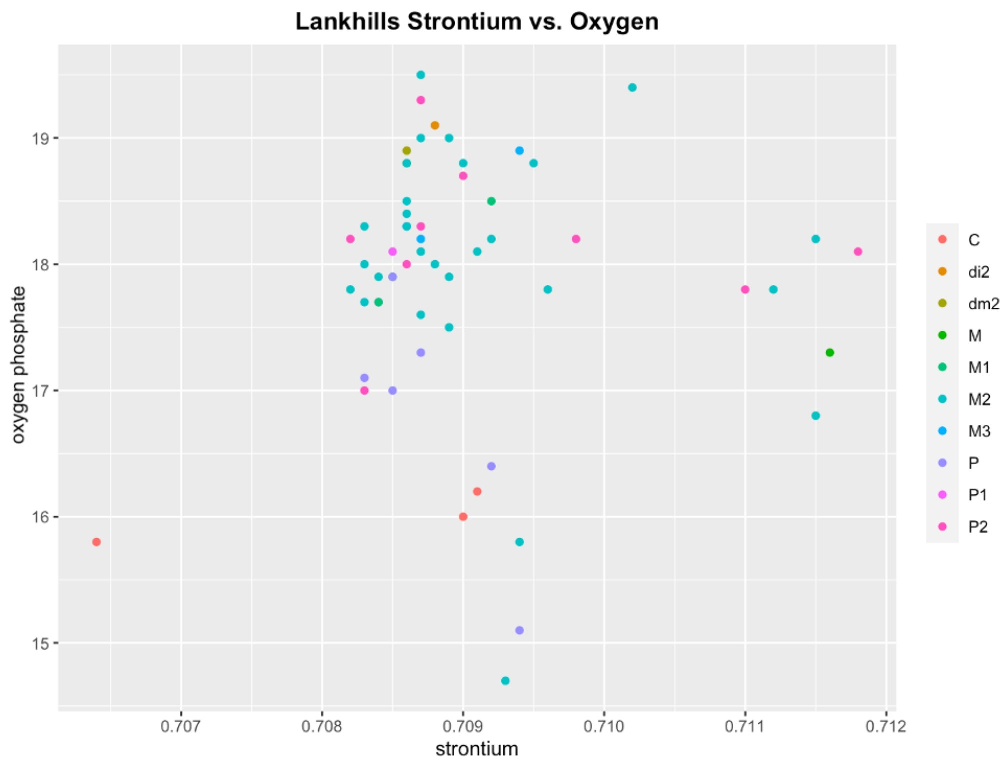


Figure 5.8: *Lankhills* $^{87}Sr/^{86}Sr$ *vs.* $\delta^{18}O_p$*, color coded to reflect tooth choice.*

vation tend to have lower oxygen and strontium signatures, whereas individuals from the 2000-2005 excavation tend to have higher oxygen and strontium values (figure 5.7). Tooth choice, on the other hand, does not appear to have any significant correlation to isotopic signature (figure 5.8).

5.3.2 Catterick

A Shapiro-Wilk test found that the $\delta^{18}O_p$ values at Catterick are normally distributed (W= 0.735, p= 0.466). The Q-Q plot of these values also shows no evidence of outliers, as do the skewness (-0.067), which indicates a slightly longer left tail to the distribution curve, and the kurtosis (-0.874), which indicates a slight platykurtic curve (Meyer et al. 2017). For $\delta^{18}O_p$, the mean is 17.66‰, and the standard deviation is 0.4667, meaning that 1.96 times the standard deviation is 0.915. Therefore, 95% of the population should fall within 16.745-18.575‰.

Since all of the $\delta^{18}O_p$ values fall within this range, no outliers were detected. The interquartile range for $\delta^{18}O_p$ is 0.6775 and 1.5 times that number is 1.016. Since the median for $\delta^{18}O_p$ values at Catterick is 17.745‰, any outliers will fall outside of the range 16.73-18.76‰, but none do.

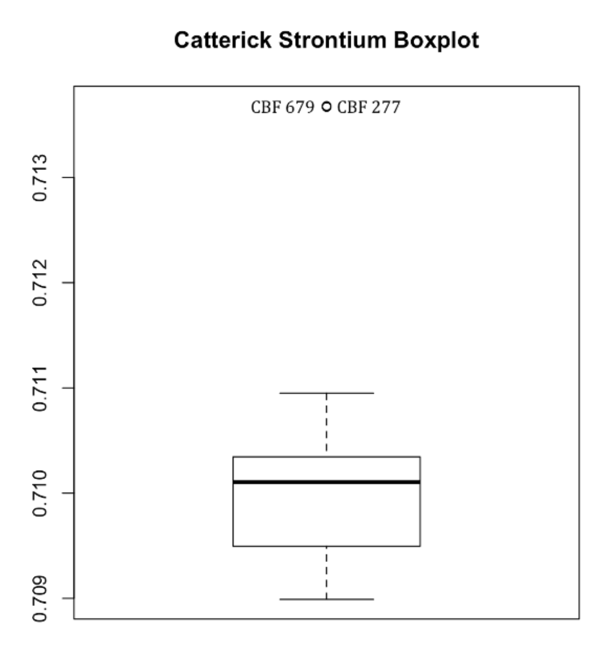


Figure 5.9: *Boxplot showing $^{87}Sr/^{86}Sr$ outliers at all Catterick sites (R Core Team 2019)*

The strontium dataset, however, is not normally distributed (W=0.735, p= 2.998e-5) (R Core Team 2017). The Q-Q plot for $^{87}Sr/^{86}Sr$ indicates that there are some higher-value samples skewing the dataset, which is confirmed by a positive skewness (1.87). The kurtosis value (3.14) indicates that the $^{87}Sr/^{86}Sr$ distribution curve is notably leptokurtic, or flattened (R Core Team 2017). Again, the standard deviation threshold was set at 1.96 to account for 95% of the population. The mean for $^{87}Sr/^{86}Sr$ is 0.7102 and the standard deviation is 0.00119. Therefore, 1.96 times the standard deviation is 0.00234, meaning that 95% of the population should fall between 0.7079 and 0.7125 (R Core Team 2017). As estimated by the Q-Q plot and the skewness value, only two, high-value outliers were identified: CBF 277 and 679, both from the Bainesse Farm excavation. The interquartile range for $^{87}Sr/^{86}Sr$ 0.000835 and 1.5 times the IQR is 0.00125. Therefore, any $^{87}Sr/^{86}Sr$ outliers will have values outside the range of 0.7089-0.7114. As with the

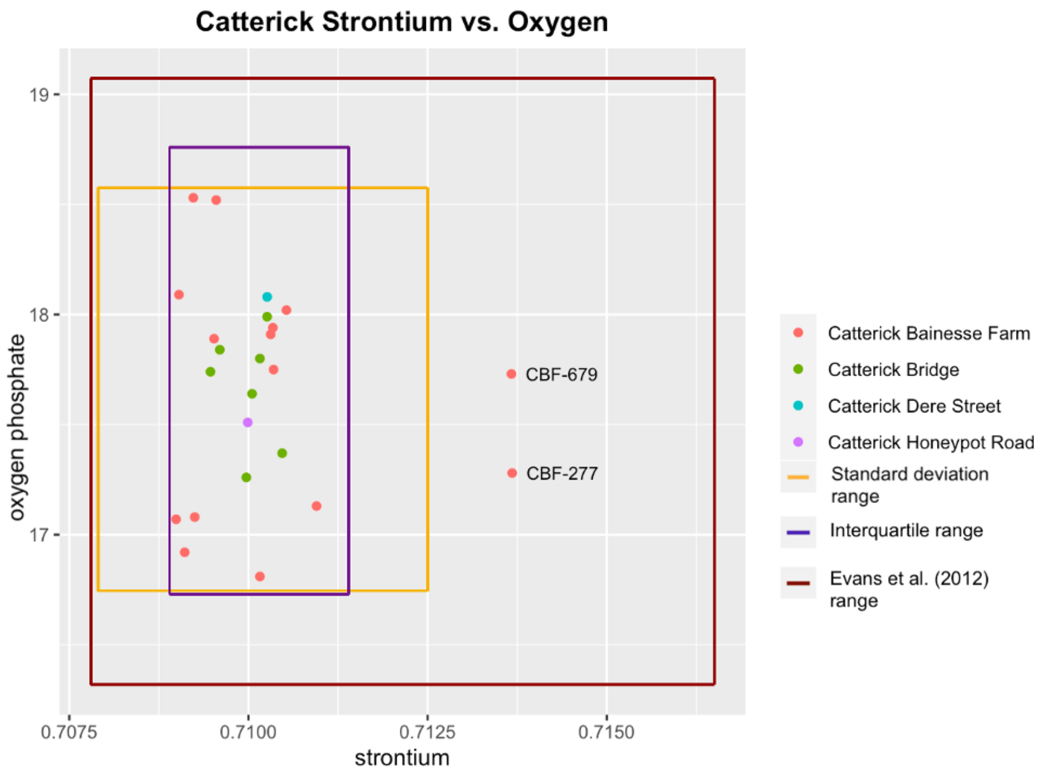


Figure 5.10: *Comparison of all outlier detection methods for the Catterick database color coded to reflect site. Created using the package ggplot2 (Wickham 2016)*

standard deviation method, the only two outliers are CBF 277 and 679, which are both higher than the maximum value of this outlier range (R Core Team 2017). This is confirmed by the boxplot (fig. 5.9).

As is evident in figure 5.10, the fixed threshold ranges for $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ are less restrictive than the results of the standard deviation method and the IQR method. When the Catterick results are compared to the fixed threshold, there are no $\delta^{18}O_p$ or $^{87}Sr/^{86}Sr$ outliers. However, there are two $^{87}Sr/^{86}Sr$ outliers when utilizing both the standard deviation method and the IQR method. Also from figure 5.10, it is clear that individuals from Catterick Bainesse Farm have the most isotopic variation for both oxygen and strontium. Furthermore, figure 5.11 shows that there does not appear to be any discrepancies between tooth choice.

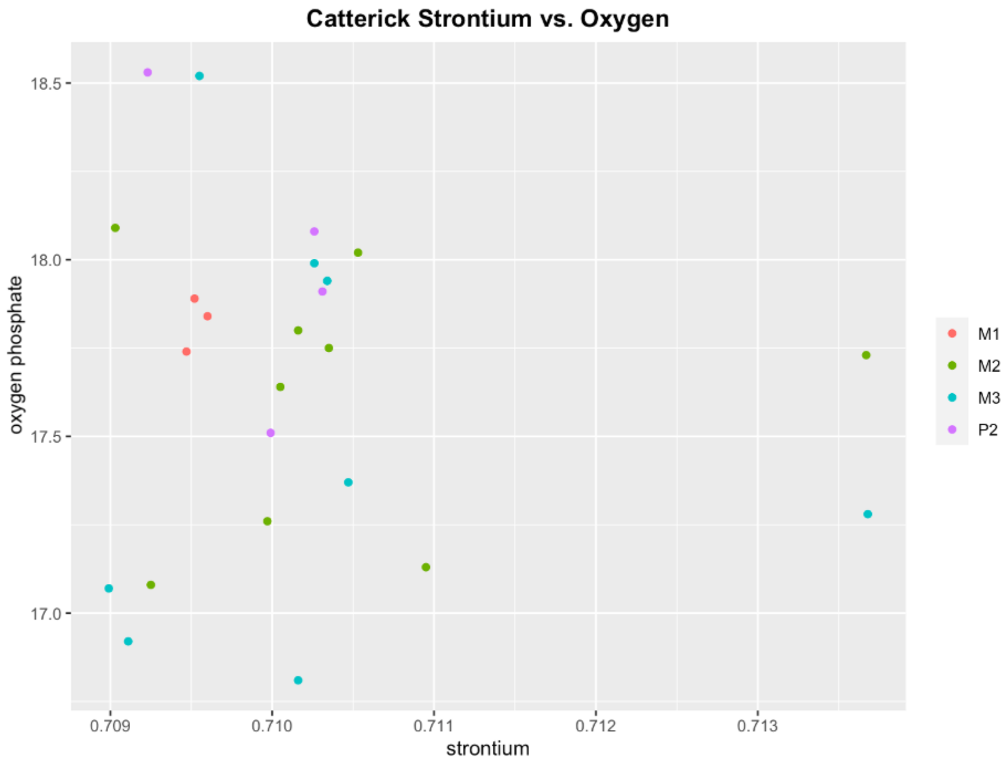


Figure 5.11: *Catterick $^{87}Sr/^{86}Sr$ vs. $\delta^{18}O_p$, color coded to reflect tooth choice. Created using the package ggplot2 (Wickham 2016).*

5.3.3 Gloucester

The $\delta^{18}O_p$ values for Gloucester are normally distributed according to a Shapiro-Wilk test (W= 0.932, p= 0.1532). This is confirmed by a near-nonexistent skewness (-0.08). A kurtosis test (-1.45) revealed that the distribution curve is platykurtic, or tall and thin-tailed (Meyer et al. 2017). These results indicate that there are a nearly-equal amount of low and high values that do not follow the normal distribution line (R Core Team 2017). The mean for $\delta^{18}O_p$ is 18.08‰ and the standard deviation is 0.71 (R Core Team 2017). 1.96 times the standard deviation is 1.39, which means that the range in which 95% of the values should fall is 16.69-19.47‰. Based on these calculations, there are no $\delta^{18}O_p$ outliers. Similarly, the IQR method did not detect any oxygen outliers, as 1.5 times the IQR is 1.8, the median is 18.0‰, and the expected range is 16.2-19.8‰.

The strontium dataset, on the other hand, is not normally distributed (W= 0.867, p= 0.0086). The dataset is positively skewed (0.99), which indicates a

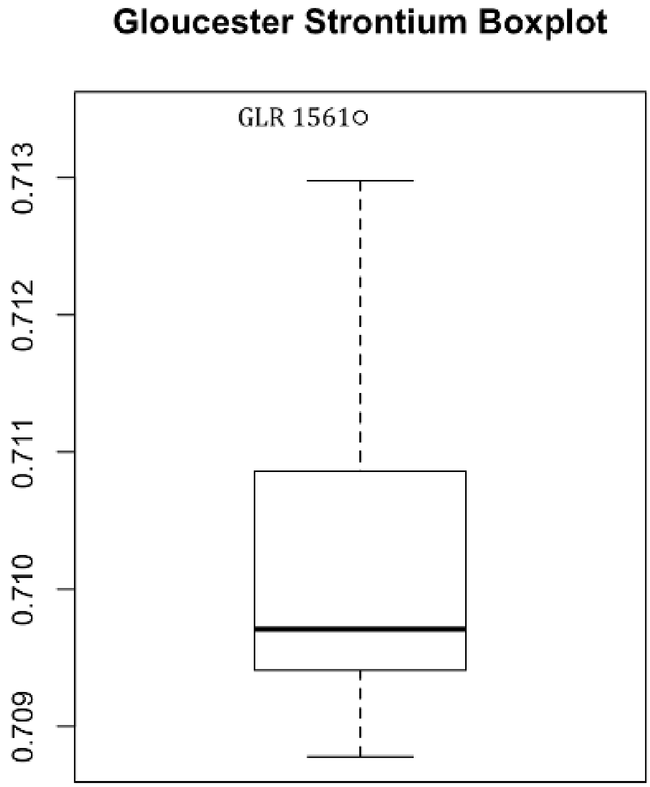


Figure 5.12: *Boxplot showing* $^{87}Sr/^{86}Sr$ *outliers at Gloucester London Road*

right-skewed distribution that contains more high-value outliers. The negative kurtosis (-0.19) indicates a slight leptokurtic curve (Meyer et al. 2017). The mean for ^{87}Sr/^{86}Sr is 0.7102 and the standard deviation is 0.0013. 1.96 times the standard deviation is 0.0026, which means that that outliers should fall outside 0.7076-0.7128. Therefore, there are two SD strontium outliers: GLR 1518 and 1561, both of which have high value ^{87}Sr/^{86}Sr signatures. The interquartile range method of detecting outliers determined slightly different results. 1.5 times the IQR for the ^{87}Sr/^{86}Sr database is 0.002175. As the median is 0.7097, the expected normal range for this dataset should be 0.7075-0.7119. There are 3 individuals that fall outside this range: GLR 1541, 1518, and 1561. All three are high-value outliers, but only one, GLR 1561, is identified as a significant outlier, which is confirmed by the boxplot of strontium values (fig. 5.12) (R Core Team 2019).

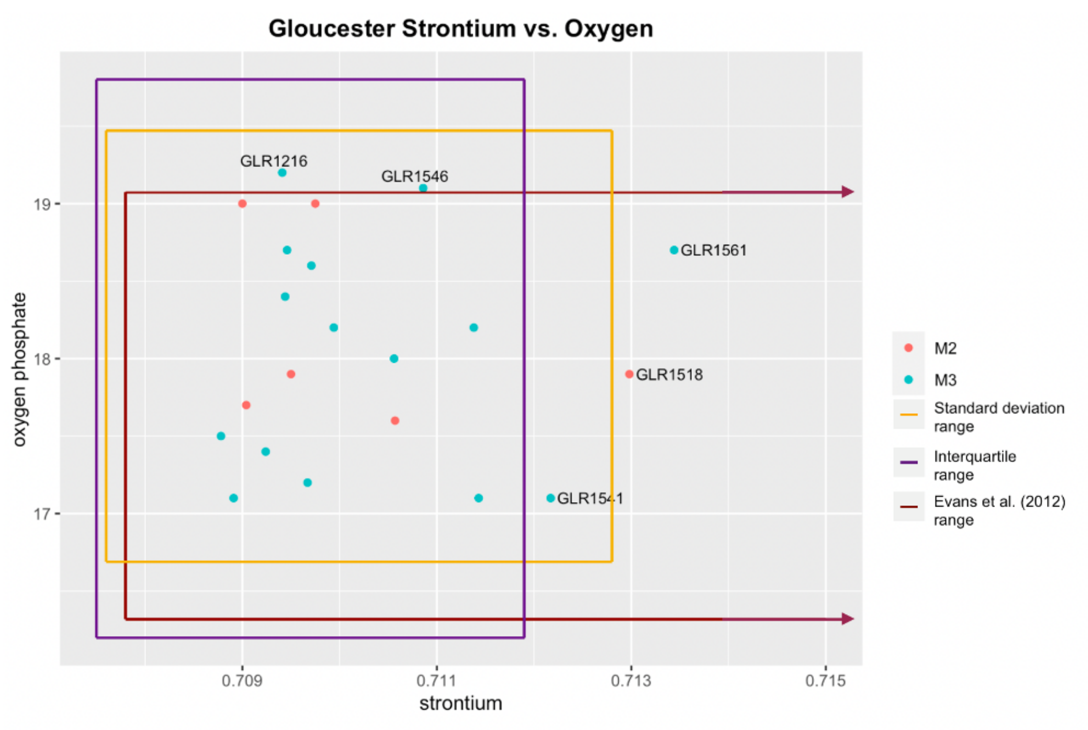


Figure 5.13: *Comparison of all outlier detection methods for the Gloucester database color coded to reflect tooth choice as all Gloucester skeletons are from the same site. Created using the package ggplot2 (Wickham 2016)*

In regards to $\delta^{18}O_p$, the fixed threshold method has a similarly wide range to the statistical methods, but the fixed threshold range contains significantly lower $\delta^{18}O_p$ values. Therefore, using the fixed threshold method would result in more high-level $\delta^{18}O_p$ values as outliers—in this case, GLR 1216 and GLR 1546. Furthermore, the fixed threshold range for $^{87}Sr/^{86}Sr$ is far larger than that of either of the statistical methods and includes $^{87}Sr/^{86}Sr$ that are significantly higher (figure 5.13). This fixed range includes all of the Gloucester skeletons, though there are several $^{87}Sr/^{86}Sr$ outliers identified by the mathematical methods (GLR 1518, 1541, and 1561). All skeletons were excavated from the same site and have, therefore, only been color coded to reflect tooth choice, which does not appear to cause a significant difference.

5.3.4 York

According to a Shapiro-Wilk test, the oxygen dataset is not of normal distribution (W= 0.955, p= 0.011) (R Core Team 2017). A Q-Q plot of this distribution revealed that there are some low values that appear to be skewing the distribution (figure 5.14) (R Core Team 2017). This is confirmed by the skewness (-0.62), which indicates a slightly left-tailed curve, and the kurtosis (1.67), which indicates a substantially leptokurtic, or flat, curve (R Core Team 2017). The mean for $\delta^{18}O_p$ is 17.79‰ with a standard deviation of 0.895. 1.96 times that standard deviation is 1.76, which means that 95% of the values should fall between 16.04‰ and 19.55‰. Four individuals fall outside of this range. 6DRIF-25 and DRIF-10 both fall below 16.04‰, while TDC 710 and 6DRIF-21 both have $\delta^{18}O_p$ values greater than 19.55‰. The IQR method of identifying outliers produced similar results. For the oxygen dataset, the median is 17.87‰ and 1.5 times the interquartile range is 1.62, which means that any individuals outside the range of 16.25-19.49‰ are outliers (R Core Team 2017). By these standards, 6DRIF-24, DRIF-10, TDC 710, and 6DRIF-21 are all outliers. However, only 6DRIF-24 and DRIF-10 are significant outliers (figure 5.15). All of these results corroborate the Q-Q plot and skewness test for oxygen isotopes.

The strontium dataset for York sites is also not normally distributed (W= 0.882, p= 5.59e-6). A Q-Q plot of the distribution highlights a number of significant high-value outliers that appear to be skewing the curve. Skewness confirms this theory (1.32) by indicating a substantially larger right tail to the distribution curve (Meyer et al 2016). Much like the $\delta^{18}O_p$ distribution, the $^{87}Sr/^{86}Sr$ kurtosis value (1.56) indicates a substantially leptokurtic curve. For the $^{87}Sr/^{86}Sr$ dataset, the mean is 0.7099 and the standard deviation is 0.0013. 1.96 times this standard deviation is 0.0025, which means that 95% of values should fall between 0.7074 and 0.7124. Six individuals fall outside this range: DRIF-15, 6DRIF-9, TDC R38, TDC 411, TDC 608, TDC 710. All six individuals have strontium values greater than 0.7124, which concurs with the Q-Q plot and skewness test. The strontium median for York is 0.7096 and 1.5 times the IQR is 0.0018. Therefore, any individuals outside the range 0.7078-0.7114 are outliers. Seven individuals were identified as outliers: MVC, who is the only non-significant outlier, as well as 6DRIF-9, TDC 608, TDC R38, TDC 411, TDC 710, and DRIF-15, all of which are significant outliers. All seven individuals represent strontium values higher than 0.7114. These results are confirmed by the boxplot of $^{87}Sr/^{86}Sr$ values for York (fig. 5.15).

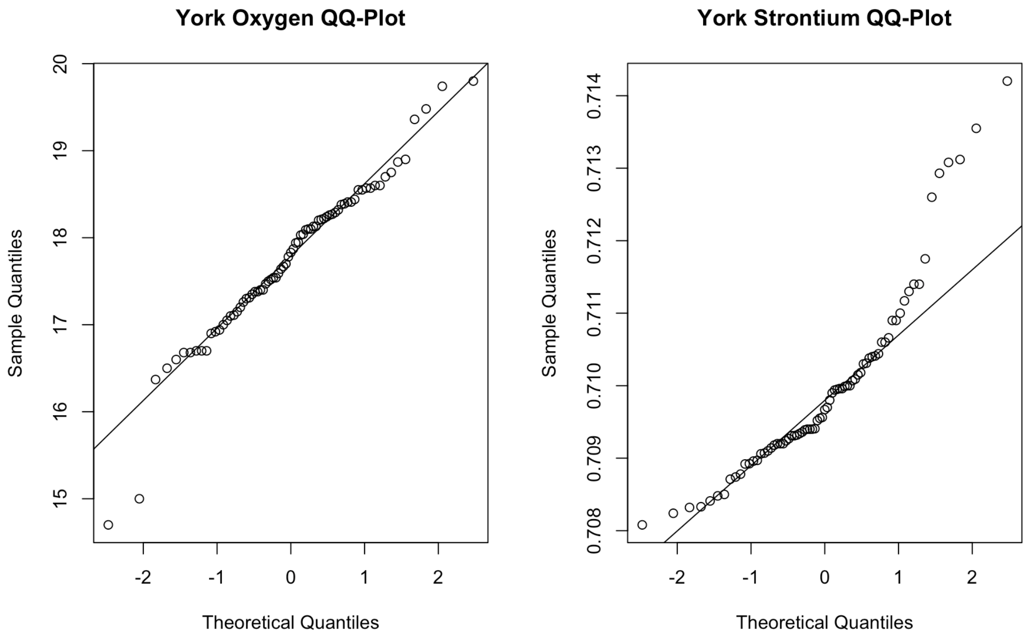


Figure 5.14: *Left: Q-Q plot of the distribution of $\delta^{18}O_p$ at York sites. Right: Q-Q plot of the distribution of $^{87}Sr/^{86}Sr$ at York sites*

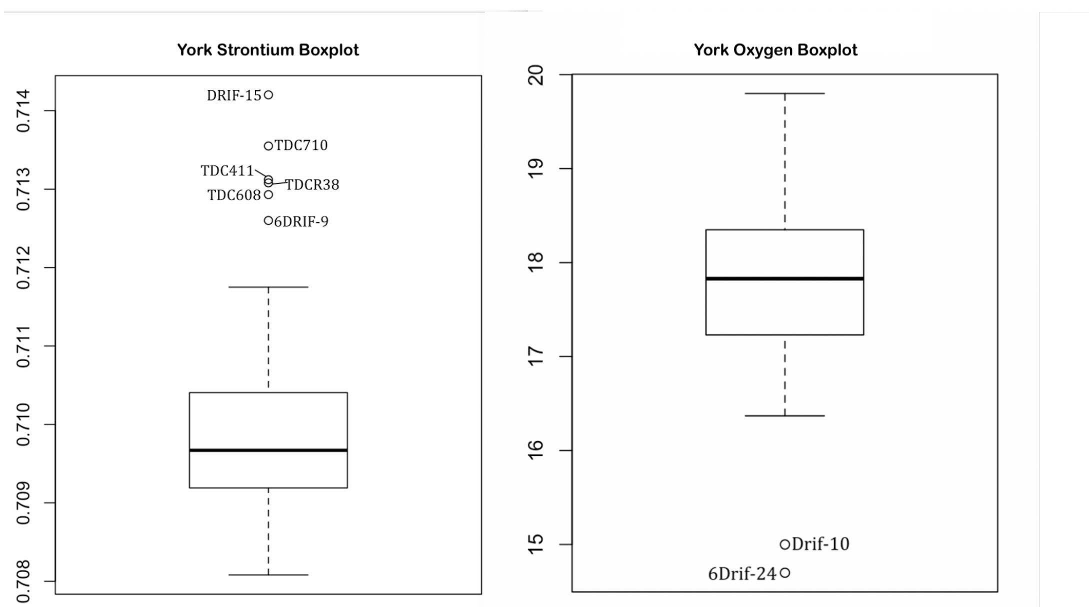


Figure 5.15: *Left: Boxplot of $^{87}Sr/^{86}Sr$ outliers at York sites. Right: Boxplot of $\delta^{18}O_p$ outliers at York sites*

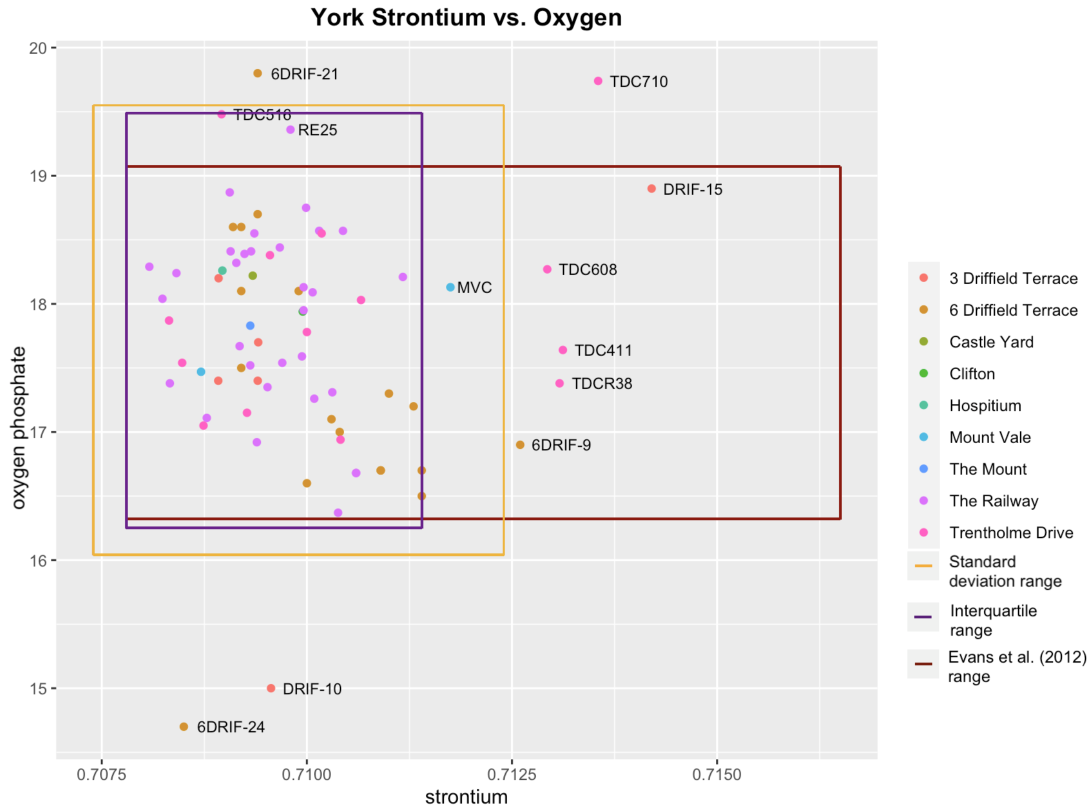


Figure 5.16: *Comparison of all outlier detection methods for the York database color coded to reflect site. Created using the package ggplot2 (Wickham 2016)*

As is evident in figure 5.16, the expected fixed threshold $\delta^{18}O_p$ range for Roman Britain is more restrictive than the results of the standard deviation method and the IQR method, and the upper margin is considerably lower, meaning that the fixed threshold range classifies more high-level $\delta^{18}O_p$ values as outliers but the same number of low-level outliers. Furthermore, as with all the other sites, the fixed threshold range for $^{87}Sr/^{86}Sr$ is much larger (figure 5.16). According to the fixed threshold method, there are no strontium outliers, whereas seven individuals are identified as high-level outliers for the standard deviation and interquartile range methods (figure 5.16). Though there do not appear to be any discrepancies based upon oxygen signatures, it seems that individuals from Trentholme Drive have the largest range of strontium values (figure 5.16). There do not appear to be any discrepancies based upon tooth choice (figure 5.17).

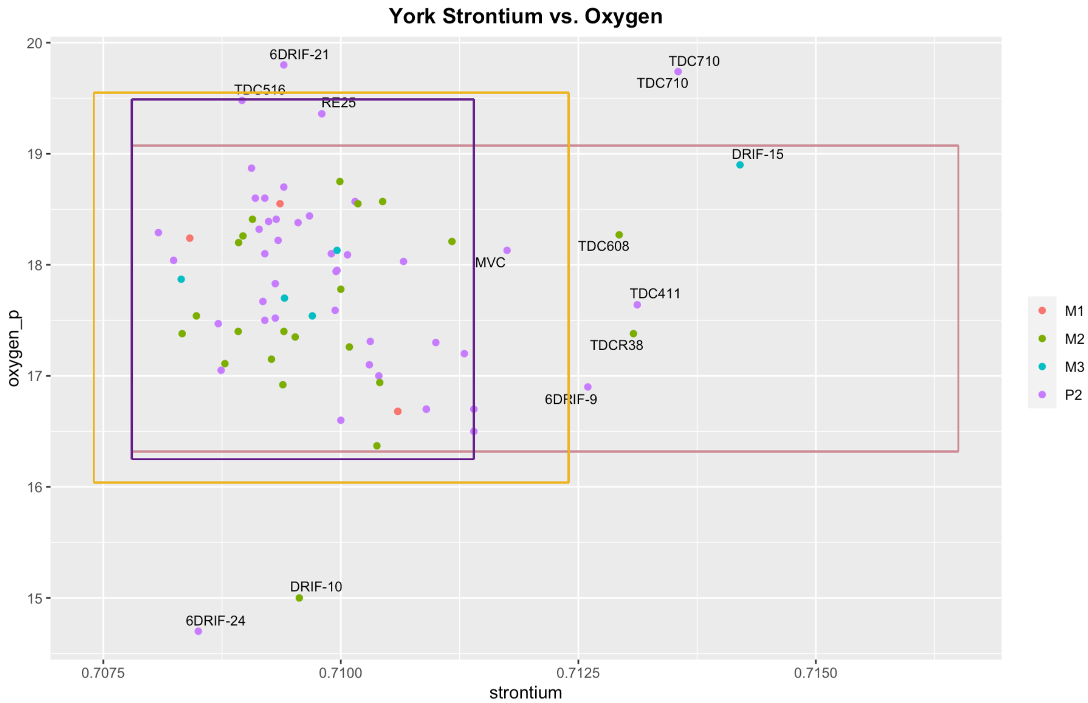


Figure 5.17: *York $^{87}Sr/^{86}Sr$ vs. $\delta^{18}O_p$, color coded to reflect tooth choice. Created using the package ggplot2 (Wickham 2016)*

5.3.5 London

The London dataset comprises 20 individuals from 9 different sites (Appendix C). As mentioned earlier, the London sites differ from all others because these skeletons were not tested for $\delta^{18}O_p$ levels. Instead, the skeletons were tested for $^{87}Sr/^{86}Sr$ values and various lead (Pb) values, including $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$, all of which were extracted from dental enamel (Shaw et al. 2016). Though each isotope comes from the same base element, the distributions of each lead isotope are dissimilar enough to warrant independent analyses. The $^{87}Sr/^{86}Sr$ analysis for the London sites revealed that the strontium values are not normally distributed (W= 0.737, p= 0.000115). A Q-Q plot revealed that there are some higher-value outliers skewing the distribution (fig. 5.18). The positive skewness value (1.73) corroborates this theory, indicating that the distribution is right-tailed. A kurtosis test found that the distribution curve is significantly leptokurtic (k= 2.26). The mean strontium value is 0.7096, with a standard distribution of 0.001. 1.96 times the standard distribution is 0.00197, which means that 95% of strontium values should fall within 0.7076-0.7116. By these standards, individual 390 from the Mansell Street excavation and individual 400 from the Bishopsgate excavation are significant outliers. The IQR method of determining outliers produced somewhat different results. The $^{87}Sr/^{86}Sr$ median value is 0.7094 and the IQR is 0.0006. 1.5 times the IQR is 0.0009, meaning that any outliers will fall outside the range 0.7085-0.7103. Therefore, individuals 803.6 from the London Wall site, 30 from Cotts House, 390 from Mansell Street, and 400 from Bishopsgate are outliers. However, a boxplot reveals that, like the standard deviation method, only 390 and 400 are significant outliers (figure 5.18).

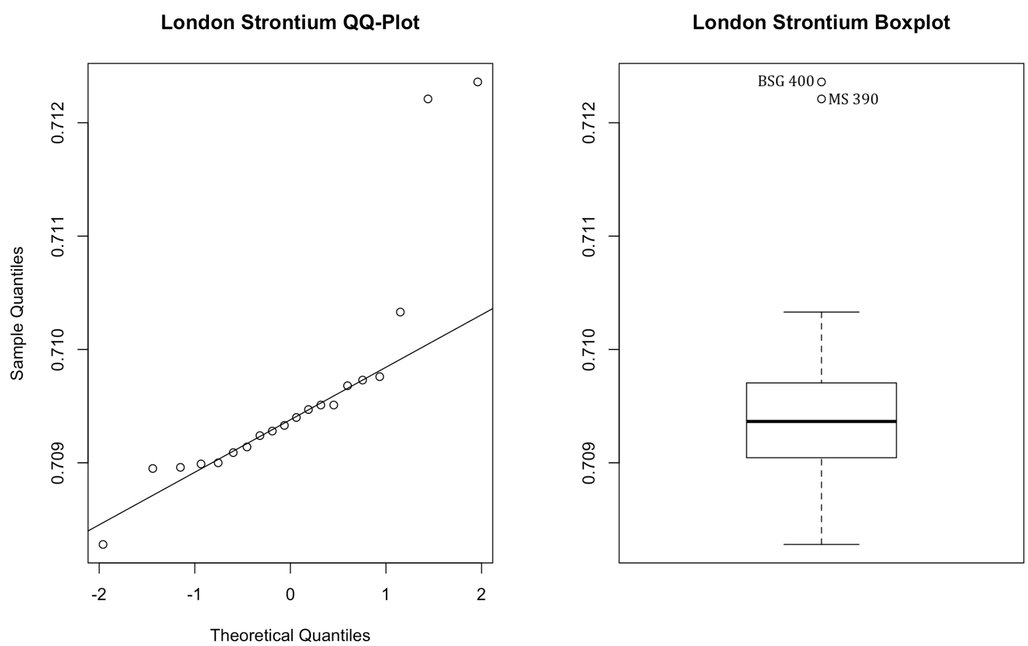


Figure 5.18: *Q-Q plot and boxplot showing the distribution of $^{87}Sr/^{86}Sr$ at all London sites.*

As with all other sites, Evans and colleagues (2012) have a much larger expected range for $^{87}Sr/^{86}Sr$ (figure 5.19). By these standards, there are no strontium outliers, whereas the standard deviation and interquartile methods identified a collective four individuals, three of which are higher-level and one of which is lower (figure 5.19). Furthermore, there do not appear to be any discrepancies based upon excavation site (figure 5.19). Individual 400 from Bishopsgate has the highest strontium value, but as there are no other individuals from that site

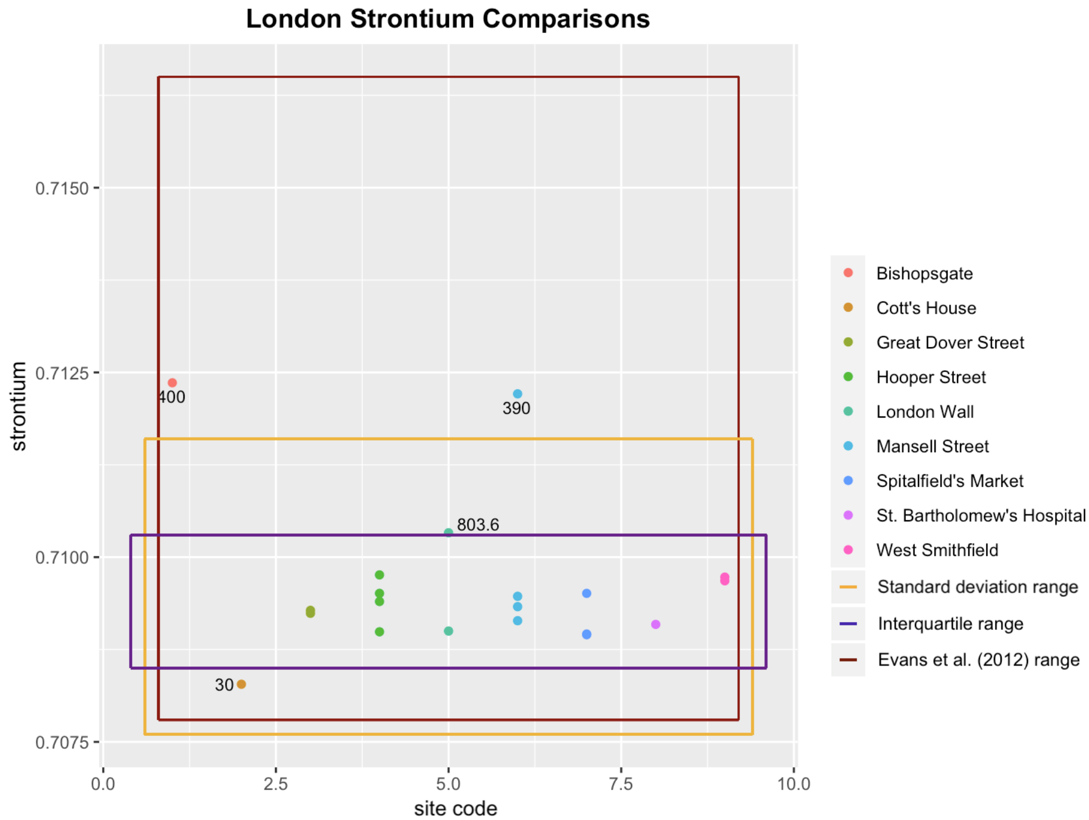


Figure 5.19: *Comparison of all outlier detection methods for the London $^{87}Sr/^{86}Sr$ database color coded to reflect site.*

it is impossible to tell if this is a trend for the site.

When dealing with the lead isotopes, the level of lead concentration for each skeleton was first analyzed to determine if any individuals were exposed to anthropogenic sources of lead. Shaw and colleagues (2016) determined that any sample with more than 0.5ppm of lead has been affected by anthropogenic sources of lead. For London, only one individual seems to be unaffected by cultural lead: London Wall skeleton 60 (0.24ppm) (Shaw et al. 2016). Overall, lead concentrations from London vary widely. Samples range from 0.24ppm to 14.65ppm. Distribution of lead concentrations is not normal (W= 0.742, p= 0.0001). Skewness indicates that outliers are likely to be high value concentrations (1.72), which is confirmed by the Q-Q plot and boxplot (fig. 5.20). The mean for lead concentration is 3.83 ± 3.60 meaning that the only outlier for the standard deviation method is skeleton 150 from Great Dover Street. The median, however, is 2.65 and the IQR

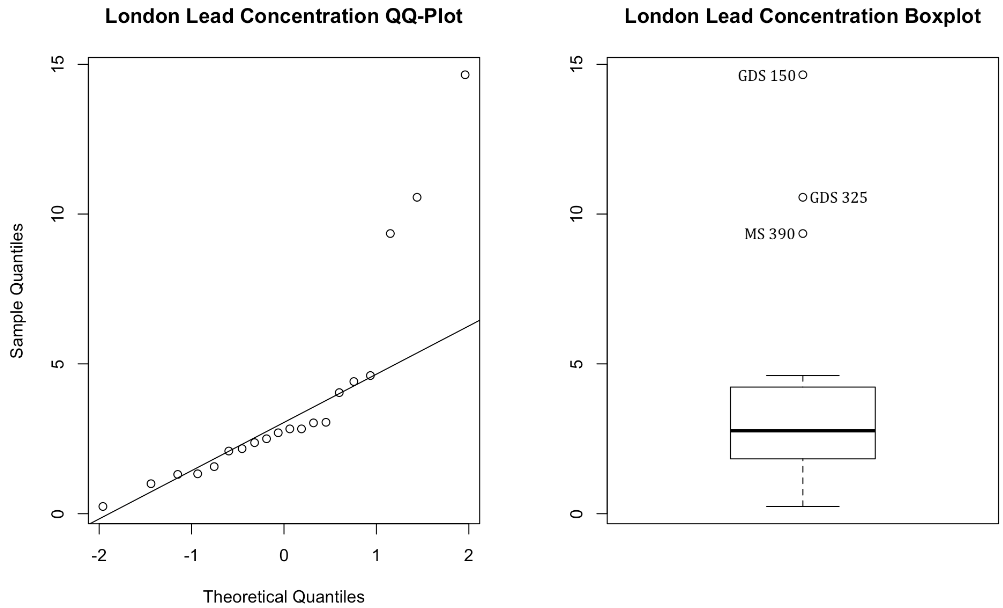


Figure 5.20: *Right: Q-Q plot detailing the distribution of lead concentration values for all London sites. Left: Boxplot detailing the distribution and outliers of lead concentration values for all London sites (R Core Team 2019).*

is 2.17, meaning that the IQR method outliers for lead concentrations are skeletons 150 and 325 from Great Dover Street and skeleton 390 from Mansell Street (fig. 5.20). When analyzing the lead isotope results for these individuals, it will be important to consider their significantly high lead concentrations (Shaw et al. 2016).

Furthermore, it appears that lead concentration levels in London are somewhat related to site location. Figure 5.21 shows the breakdown of lead concentration levels by site. Individuals from London Wall (LOW88) have the lowest levels of lead concentrations, whereas those from Great Dover Street (GDV96) have the highest. Only individuals at Mansell Street (MSL87 and MNL88) have a wider discrepancy between individuals—skeleton 390 has a concentration of 9.35ppm whereas skeletons 37, 163, and 724 range from 1.57-3.05ppm.

Because Shaw et al. used many different iterations of lead isotopes, the results of statistical tests for $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, $^{208}Pb/^{204}Pb$, $^{207}Pb/^{206}Pb$, and $^{208}Pb/^{206}Pb$ are combined and compared below. None of these isotopes had a normal distribution and all had a positive skewness, indicating that most outliers

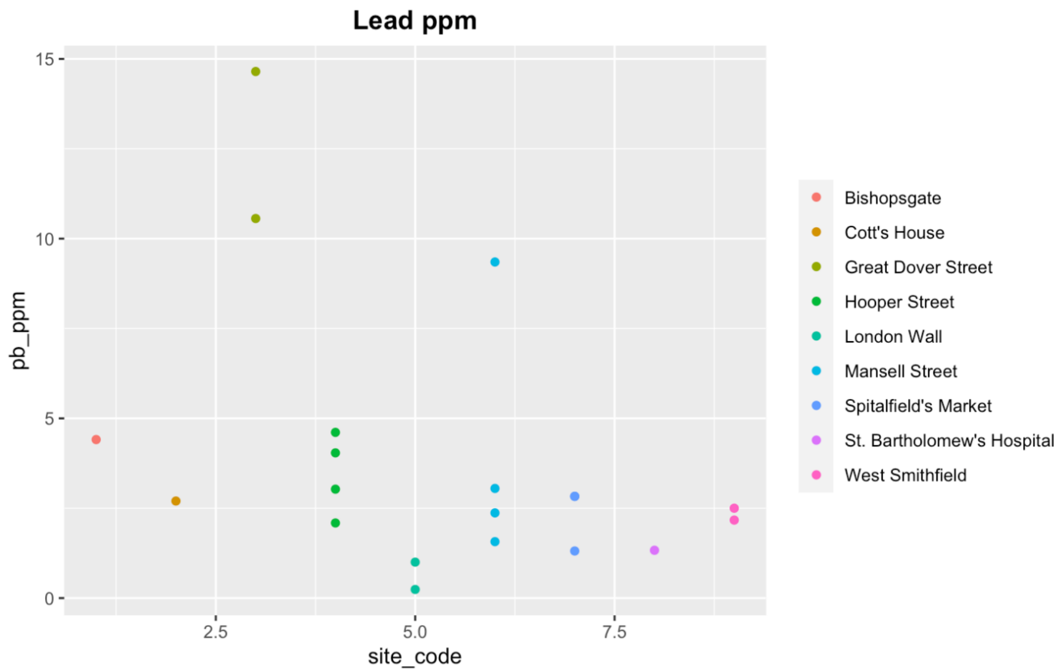


Figure 5.21: *Lead concentrations in London skeletons separated by site. Created using package ggplot2 (Wickham 2016).*

would have high values (table 5.3). This is ideal because it implies that the results for each specific isotope will be similar. Every lead isotope besides ^{208}Pb/^{206}Pb has a positive kurtosis, also known as a leptokurtic curve, which indicates that isotopes ^{206}Pb/^{204}Pb, ^{207}Pb/^{204}Pb, ^{208}Pb/^{204}Pb, and ^{207}Pb/^{206}Pb may have more instances of extreme values (table 5.3). Due to the findings in Montgomery et al. (2010), this could mean that ^{208}Pb/^{206}Pb has more values towards the median, indicating that ^{208}Pb/^{206}Pb values have been more significantly affected by anthropogenic factors. Though the expected range for each lead isotope is different, the same three outliers are present when using the standard deviation method. Skeleton 400 from Bishopsgate is an outlier for ^{206}Pb/^{204}Pb, ^{207}Pb/^{206}Pb, and ^{208}Pb/^{206}Pb (table 5.4). Skeleton 34245 from Spitalfields Market is an outlier for ^{206}Pb/^{204}Pb, ^{207}Pb/^{204}Pb, ^{208}Pb/^{204}Pb, and ^{207}Pb/^{206}Pb (table 5.4). Finally, skeleton 325 from Great Dover Street is an outlier for ^{207}Pb/^{204}Pb and ^{208}Pb/^{206}Pb (table 5.4).

As with all other sites, the IQR method has a stricter interpretation of the expected normal range. This method identified all the same outliers as the standard deviation method (table 5.5), in addition to skeleton 652 from Hooper Street for ^{206}Pb/^{204}Pb, skeleton 803.6 from London Wall for ^{207}Pb/^{204}Pb, and skeleton 325

Pb Isotope	Distribution	W-value	p-value	Skewness	Kurtosis
$^{206}Pb/^{204}Pb$	Not normal	0.881	0.018	0.243	2.462
$^{207}Pb/^{204}Pb$	Not normal	0.797	0.0007	1.304	0.483
$^{208}Pb/^{204}Pb$	Not normal	0.853	0.006	1.365	1.558
$^{207}Pb/^{206}Pb$	Not normal	0.888	0.024	0.202	2.414
$^{208}Pb/^{206}Pb$	Not normal	0.886	0.023	0.817	-0.197

Table 5.3: *Distribution, skewness, and kurtosis for all Pb isotopes at all London sites*

Pb Isotope	Mean	Standard deviation	Expected local range	Outliers
$^{206}Pb/^{204}Pb$	18.477	±0.044	18.36-18.53	BSG 400, SM 34254
$^{207}Pb/^{204}Pb$	15.64	±0.0085	15.62-15.66	SM 34245, GDS 325
$^{208}Pb/^{204}Pb$	38.47	±0.077	38.32-38.62	SM 34245
$^{207}Pb/^{206}Pb$	0.848	±0.0018	0.844-0.851	BSG 400, SM 34254
$^{208}Pb/^{206}Pb$	2.085	±0.0029	2.0798-2.0910	BSG 400, GDS 325

Table 5.4: *Standard deviation for all Pb isotopes at all London sites*

Pb Isotope	Median	Interquartile range	Expected local range	Outliers
$^{206}Pb/^{204}Pb$	18.45	0.028	18.40-18.48	BSG 400, HS 518, SM 34245
$^{207}Pb/^{204}Pb$	15.64	0.0079	15.63-15.65	SM 34245, GDS 325, LW 803.6
$^{208}Pb/^{204}Pb$	38.44	0.059	38.35-38.53	SM 34245, GDS 325
$^{207}Pb/^{206}Pb$	0.848	0.00132	0.8458-0.8498	BSG 400, SM 34254
$^{208}Pb/^{206}Pb$	2.085	0.00198	2.0818-2.0878	BSG 400, GDS 325, MS 724, SBH 182, HS 652, LW 695.5, LW 803.6

Table 5.5: *Interquartile method for all Pb isotopes at all London sites*

from Great Dover Street for ^{207}Pb/^{206}Pb (table 5.5). The differences between the IQR method and the standard deviation method are plotted in figures 5.22-5.26 for comparison, along with all other "expected" ranges for lead isotopes included in this study.

Shaw et al. (2016) also compare the results of ^{207}Pb/^{206}Pb and ^{208}Pb/^{206}Pb to several accepted ranges for Pb isotopes, both geological and anthropogenic, which is repeated here for all five Pb isotopes. Interestingly, all five isotopic signatures for every individual in the London dataset plot well within the ranges for German artefacts (Bode et al. 2009). Furthermore, all of the ^{207}Pb/^{206}Pb and ^{208}Pb/^{206}Pb signatures in this dataset fall within the expected range for Roman coins (Butcher and Ponting 2014). Therefore, these ranges are not included in figures 5.22-5.26.

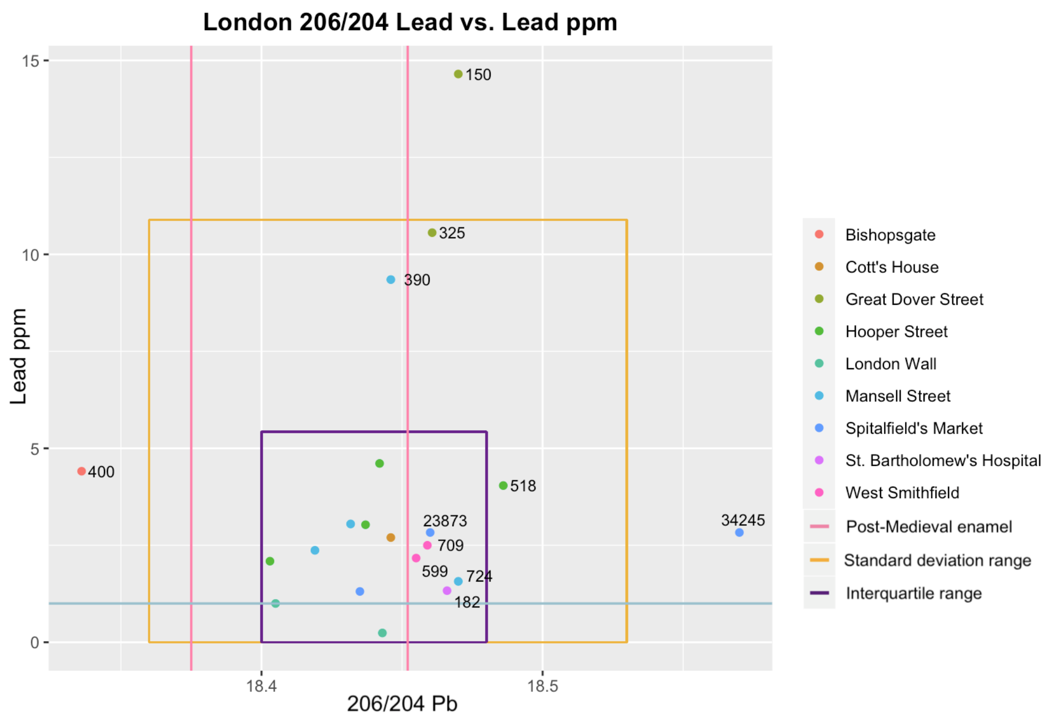


Figure 5.22: *^{206}Pb/^{204}Pb vs. Lead ppm for London sites and range for Post-Medieval dental enamel.*

Interestingly, when compared to the Post-Medieval dental enamel samples outlined in Millard et al. (2014), the results for each lead isotope vary greatly. About half of the individuals from Roman London have ^{206}Pb/^{204}Pb and ^{208}Pb/^{204}Pb signatures within the same range as the Post-Medieval sample (figures 5.22 and

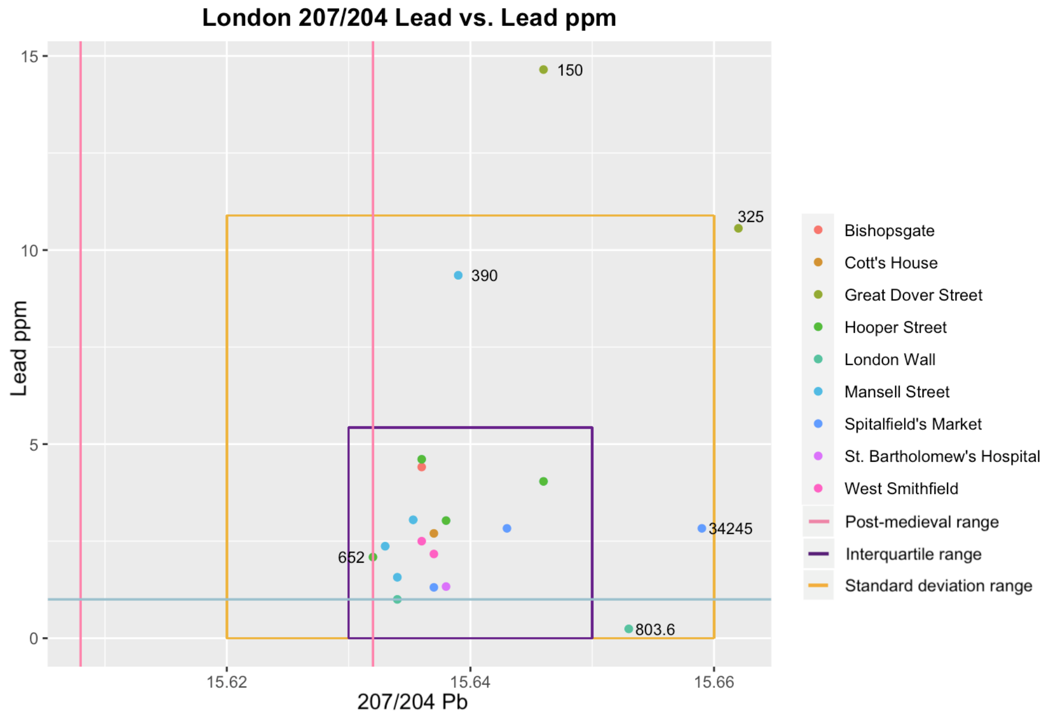


Figure 5.23: *$^{207}Pb/^{204}Pb$ vs. Lead ppm for London sites, ranges for Post-Medieval dental enamel, and Mendip ore.*

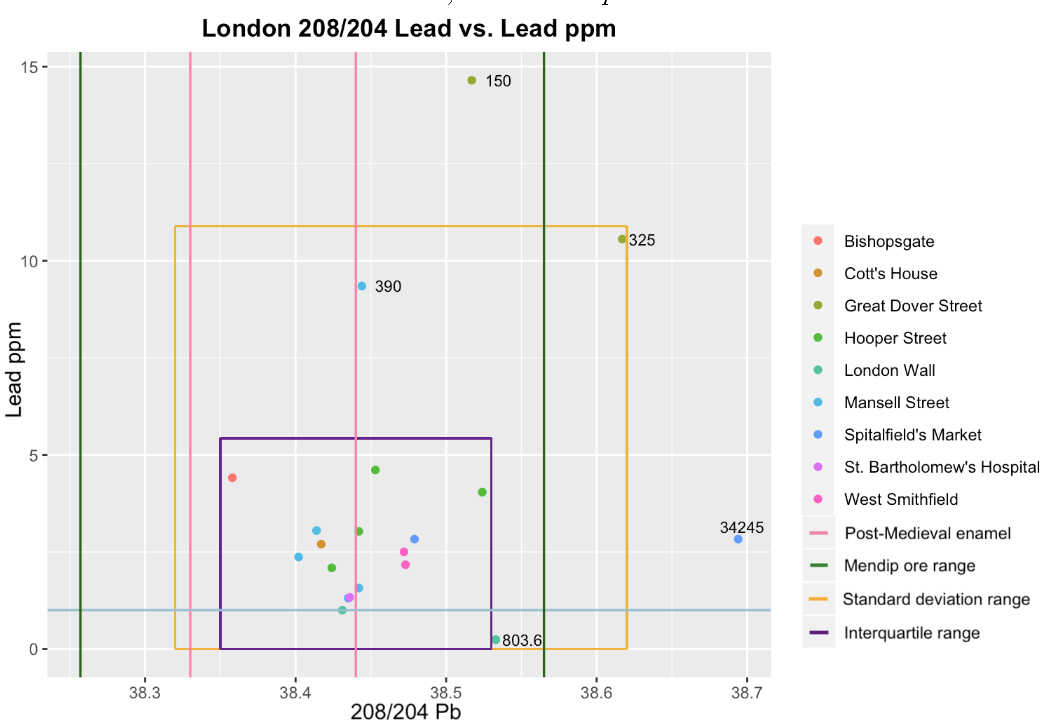


Figure 5.24: *$^{208}Pb/^{204}Pb$ vs. Lead ppm for London sites, ranges for Post-Medieval dental enamel, and Mendip ore.*

5.24), whereas for $^{207}Pb/^{206}Pb$ and $^{208}Pb/^{206}Pb$, nearly all the Roman London skeletons have values well within the Post-Medieval range (figures 5.25 and 5.26). Finally, only one individual from Roman London, HOO88 652, has a $^{207}Pb/^{204}Pb$ signature that falls within the Post-Medieval range (figure 5.23). The rest of the $^{207}Pb/^{204}Pb$ values would be considered outliers by these standards. Of all the lead isotopes tested, only two individuals fall outside the expected range calculated from Mendip ore samples: GDV 325 and SRP 34245. However, these individuals would only be classified as outliers based on their $^{208}Pb/^{204}Pb$ isotopic signatures (figure 5.24). Their signatures for $^{206}Pb/^{204}Pb$, $^{207}Pb/^{204}Pb$, and $^{207}Pb/^{206}Pb$ fall within the expected range for Mendip ore (figures 5.22, 5.23, and 5.25).

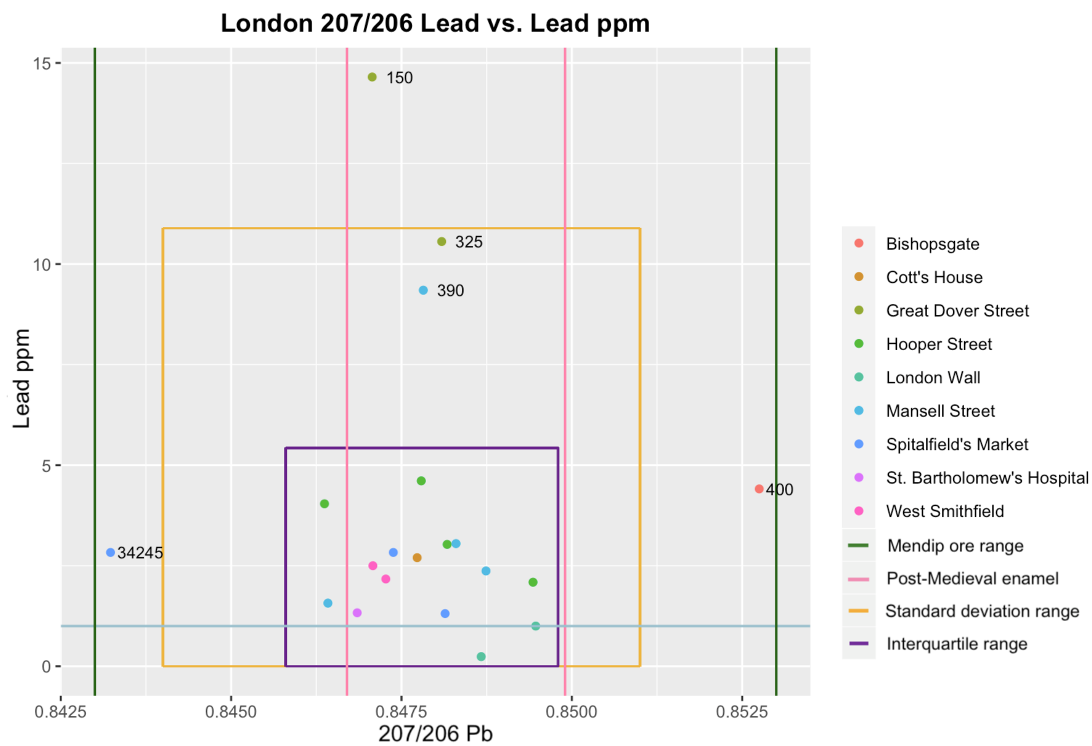


Figure 5.25: *$^{207}Pb/^{206}Pb$ vs. Lead ppm for London sites, ranges for Post-Medieval dental enamel, and Mendip ore.*

Most of the signatures for all five lead isotopes converge around a median value, which is expected for individuals that have been greatly affected by anthropogenic lead (Montgomery et al. 2010) (figures 5.22-5.26), which is true for all but one individual (LOW88 803.6). However, there are several instances in

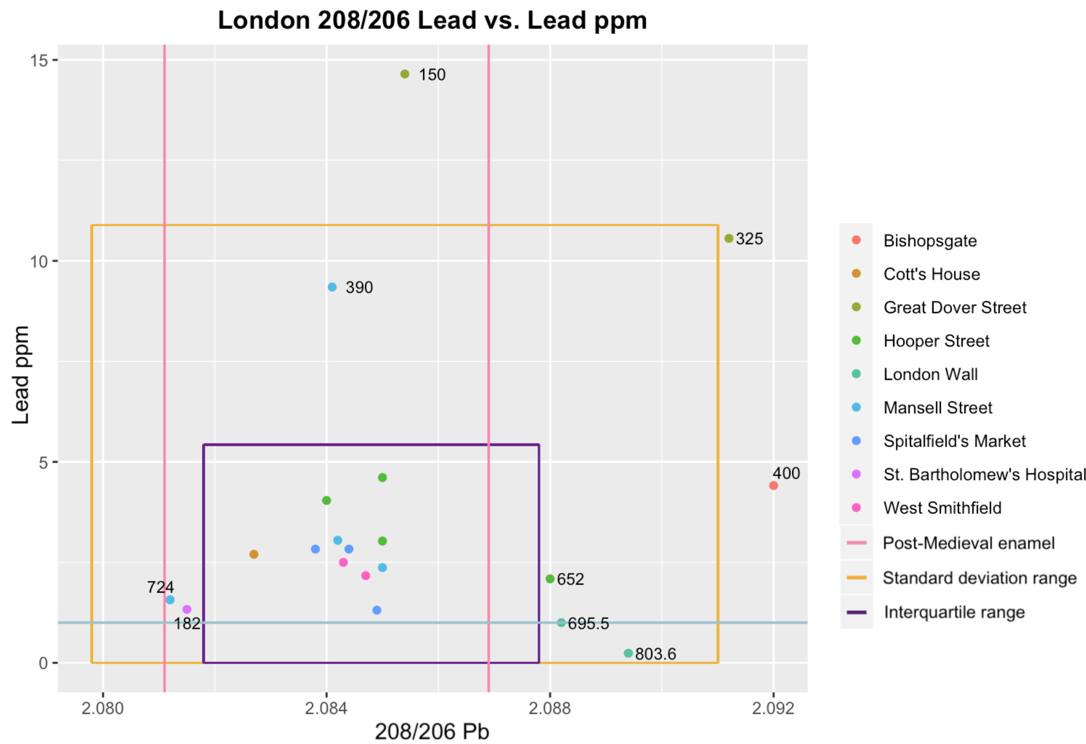


Figure 5.26: *$^{208}Pb/^{206}Pb$ vs. Lead ppm for London sites and range for Post-Medieval dental enamel.*

which certain skeletons have midline signatures for one lead isotope and outlying signatures for another. For example, skeleton 400 from Bishopsgate is an outlier for ^{207}Pb/^{204}Pb, ^{208}Pb/^{204}Pb, ^{207}Pb/^{206}Pb, and ^{208}Pb/^{206}Pb, but adheres to the central cluster of values for ^{206}Pb/^{204}Pb. Alternatively, skeleton 34245 from Spitalfields Market is an outlier for ^{206}Pb/^{204}Pb, ^{207}Pb/^{204}Pb, ^{207}Pb/^{206}Pb, and ^{208}Pb/^{206}Pb but not for ^{208}Pb/^{204}Pb. Furthermore, there are three individuals that have a significantly higher lead ppm than the rest of the skeletons: 150 and 325 from Great Dover Street and 390 from 49-55 Mansell Street. One would expect these individuals to have midline signatures for all five lead isotopes. However, skeleton 325 has outlying values based upon interquartile range and Post-Medieval dental enamel for ^{207}Pb/^{204}Pb, ^{208}Pb/^{204}Pb, and ^{208}Pb/^{206}Pb, as well as outlying values based upon standard deviation for ^{208}Pb/^{204}Pb. Finally, there are several skeletons that have midline isotopic signatures for all other lead isotopes excluding ^{208}Pb/^{206}Pb. These include: skeleton 724 from 49-55 Mansell Street, 182 from St. Bartholomew's Hospital, 652 from Hooper Street, and 803.6

and 695.5 from 60 London Wall, all of which have overall lead concentrations between .24 and 2.09ppm. This could indicate that these individuals from Roman London had access to fewer sources of anthropogenic $^{208}Pb/^{206}Pb$, which would explain why even individuals with high lead concentrations, such as 325 from Great Dover Street, have a wide variation of $^{208}Pb/^{206}Pb$ values. If this is the case, $^{208}Pb/^{206}Pb$ signatures may be the most viable means of identifying first generation immigrants to Roman London through lead isotopes.

As seen in figures 5.22-5.26, there does not appear to be any significant correlation between excavation site and lead isotopic signature, aside from the fact that the two individuals from Great Dover Street have increased exposure to anthropogenic lead (figure 5.26). Though these two skeletons, GDV 150 and 325, have similar lead exposure, they do not always have similar signatures for all lead isotopes, which is discussed above. Therefore, it appears that site location does not have a significant correlation with isotopic signature for most lead isotopes. The same comparison was done with each lead isotope versus strontium, to determine if any of those isotopes have a significant correlation with tooth choice. Each isotope did not have a significant correlation to tooth choice. The results of $^{208}Pb/^{206}Pb$ vs. $^{87}Sr/^{86}Sr$ are below in figure 5.27, while the results for the rest of the lead isotopes can be found in Appendix C.

5.3.6 All sites excluding London

For this section, all three methods of strontium and oxygen isotope comparison will be used to analyze a database of every individual from Roman Britain that has been tested for both strontium and oxygen isotopes. This will include the expected ranges outlined in Evans et al. (2012), which is referred to as the fixed threshold method, the standard deviation method, and the interquartile range method. As mentioned above, the fixed threshold method is based upon a large database of strontium and oxygen isotopes, which used statistical methods to determine that people who are indigenous to Britain will likely have $\delta^{18}O_p$ values between 16.33 and 19.07‰, and $^{87}Sr/^{86}Sr$ values between 0.7078 and 0.7140 for England alone and up to 0.7165 for Scotland. Of the 195 skeletons included in this comprehensive database, 18 have one of more isotope values which fall outside the expected fixed threshold range for Britain. These are: LH 13, LH 81, LH 118, LH 119, LH 271, LH 351, LH 357, LH 806, GLR 1216, GLR 1546, TDC 516, TDC 710, DRIF-10, 6DRIF-21, 6DRIF-24, and RE 25. These outliers come from four sites: Lankhills, Gloucester London Road, and York Driffield Terrace and Railway. The skeletons from Roman Catterick do not include any isotopic outliers according to Evans et al. (2012). The samples from the London sites outlined in Shaw et al (2016) did not include oxygen isotopes. Though they did include strontium isotopes, none of these values were outliers according to the accepted range in Evans et al. (2012).

Skeleton	**$\delta^{18}O_p$ value**	**$^{87}Sr/^{86}Sr$ value**	**$\delta^{18}O_p$ or $^{87}Sr/^{86}Sr$ outlier**
LH 81	14.7‰	0.7093	$\delta^{18}O_p$
6DRIF-24	14.7‰	0.7085	$\delta^{18}O_p$
6DRIF-10	15.0‰	0.7096	$\delta^{18}O_p$
LH 426	15.1‰	0.7094	$\delta^{18}O_p$
LH 1119	15.8‰	0.7094	$\delta^{18}O_p$
LH 13	15.8‰	0.7064	$\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$
LH 351	16.0‰	0.7090	$\delta^{18}O_p$
LH 357	16.2‰	0.7091	$\delta^{18}O_p$
GLR 1546	19.1‰	0.7109	$\delta^{18}O_p$
LH 118	19.1‰	0.7088	$\delta^{18}O_p$
GLR 1216	19.2‰	0.7094	$\delta^{18}O_p$
LH 806	19.3‰	0.7087	$\delta^{18}O_p$
RE 25	19.36‰	0.7098	$\delta^{18}O_p$
LH 271	19.4‰	0.7102	$\delta^{18}O_p$
TDC 516	19.48‰	0.7089	$\delta^{18}O_p$
LH 119	19.5‰	0.7087	$\delta^{18}O_p$
TDC 710	19.74‰	0.7136	$\delta^{18}O_p$
6DRIF-21	19.8‰	0.7094	$\delta^{18}O_p$

Table 5.6: *$\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ values for all outliers according to the expected ranges in the fixed threshold method which are 16.33-19.07‰ for $\delta^{18}O_p$ and 0.7078-0.7165 for $^{87}Sr/^{86}Sr$.*

Of these 18 overall outliers, 17 are only considered to be outside of the expected oxygen isotope range (16.33-19.07‰), not the expected range for strontium. LH 13 is the only individual outside both the oxygen and strontium range for Britain (0.7078-0.7165) and, therefore, is the $^{87}Sr/^{86}Sr$ and $\delta^{18}O_p$ outlier (figure 5.27). When taking into account the higher expected $^{87}Sr/^{86}Sr$ maximum for Scotland (0.7165), and the fact that the highest known strontium value for England and Wales is 0.714, it is possible that DRIF-15 from York's Driffield Terrace is an immigrant from Scotland (figure 5.27). However, DRIF-15 cannot be classified as an immigrant to Roman Britain as a whole. The oxygen and strontium isotope signatures for all outliers can be found in table 5.6.

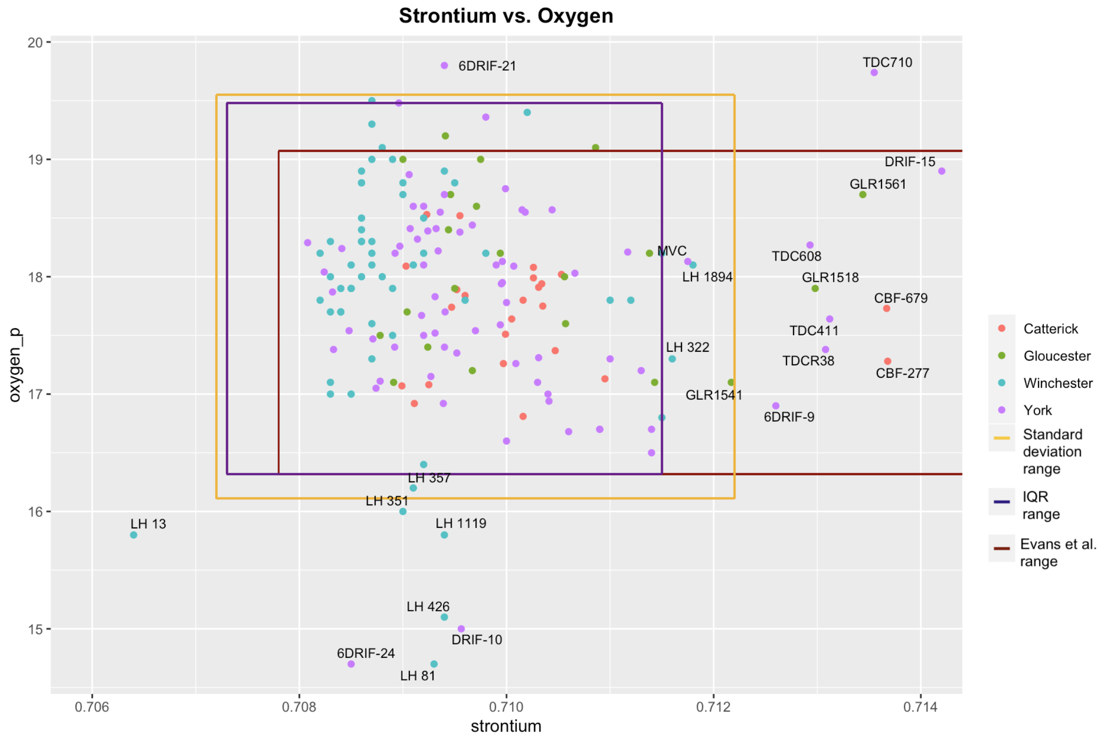


Figure 5.27: *graph of strontium and oxygen phosphate values for the comprehensive dataset color coded to reflect each individual's burial region. Outliers are labeled with their respective skeleton numbers.*

Having identified a number of outliers based on comparison to the fixed threshold expected ranges, the next stage of analysis was to explore whether mathematical outliers were present in the oxygen and strontium isotope data. A Shapiro-Wilk tests show that $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ are not normally distributed for the comprehensive dataset. $\delta^{18}O_p$ has a W value of 0.959 and a p-value of 5.81e^{-5} while $^{87}Sr/^{86}Sr$ has a W value of 0.890 and a p value of 4.60e^{-10} (R Core Team 2017). This lack of normal distribution suggests that these datasets include outliers, which is explored for each element below.

The Q-Q plot for $\delta^{18}O_p$ shows that the bulk of the values are normally distributed, but that there are some high and low values that stray from this normal distribution (fig. 5.28). Overall, there appear to be more low values causing non-normal distribution. This is confirmed by a negative skewness (-0.79), which indicates a left-skewed distribution and a positive kurtosis (1.68), which indicates that the distribution is leptokurtic (Meyer et al. 2017).

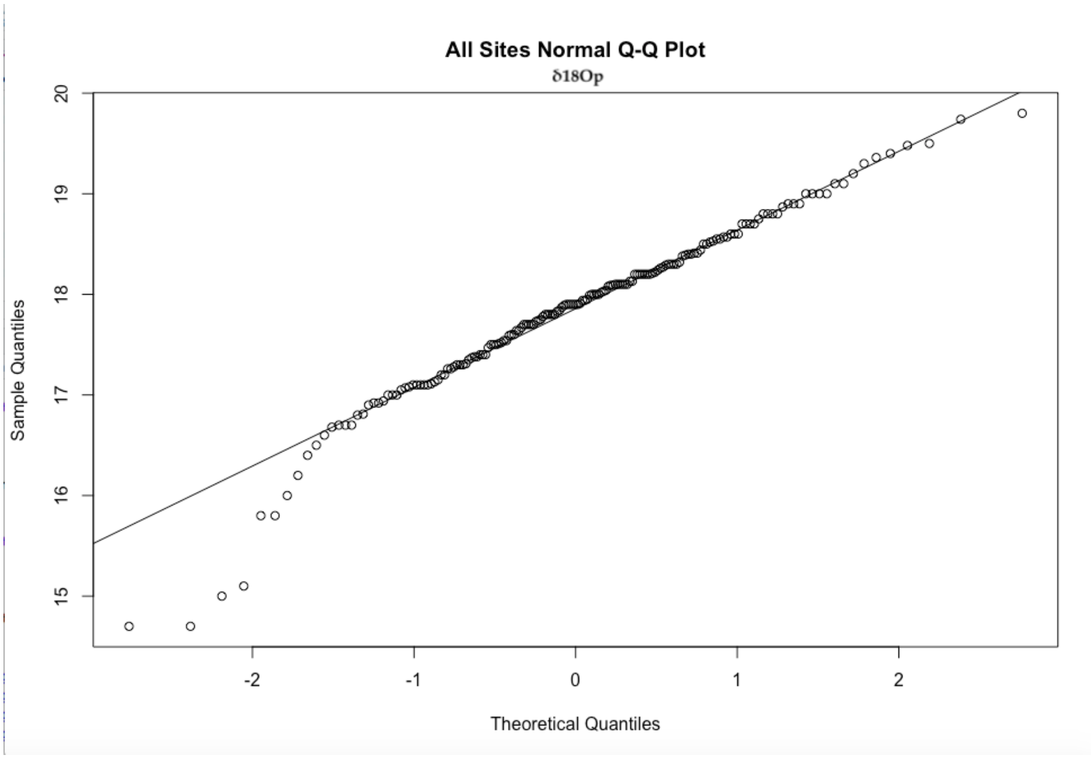


Figure 5.28: *Q-Q plot showing the non-normal distribution of all $\delta^{18}O_p$ values across Roman Britain*

The mean value for $\delta^{18}O_p$ is 17.83‰ and one standard deviation is 0.877‰ (R Core Team 2017). For this study, the outlier threshold for the SD method was set at 1.96 standard deviations from the mean, as 95% of the samples should fall within this range. That would place the range at 17.83‰ ± 1.7183‰, or 16.11-19.55‰. Using the *which.outlier()* function in R (Cooper 2018) with the threshold set to 1.96 standard deviations identified nine significant outliers. LH 13, 81, 351, 426, and 1119, as well as 6DRIF-24 and DRIF-10 all fell below the minimum range cutoff. TDC710 and 6DRIF-21 were the only two with oxygen phosphate values greater than the range maximum.

Interquartile range (IQR) outliers were also explored. For oxygen phosphate the median value is 17.9‰ and 50% of the samples should fall between 17.33 and 18.38‰. With this method, outliers are determined by being 1.5 times greater or less than the interquartile range. The interquartile range for the oxygen samples is 1.055 and 1.5 IQR is 1.583 (R Core Team 2017). Therefore, any individuals that fall outside of the range 16.32-19.48‰ are significant outliers. Using the R function *boxplot.stats()$out*, only four oxygen phosphate samples were identified as being significantly different than the median. These are: LH 81, LH 426, DRIF-10 and 6DRIF-24. In this case, no upper margin outliers were identified and all four of these samples fell below the minimum oxygen phosphate value.

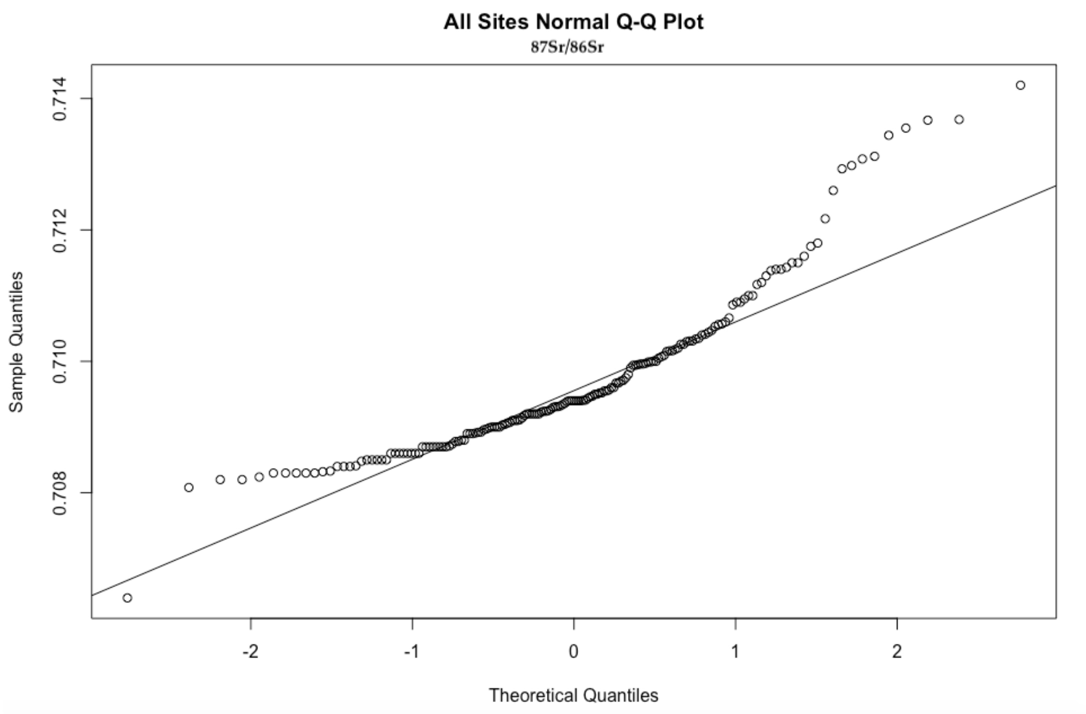


Figure 5.29: *Q-Q plot showing the non-normal distribution of all* $^{87}Sr/^{86}Sr$ *values across Roman Britain*

The Q-Q plot for strontium indicates that the values around the mean are normally distributed, with extreme values on both ends causing skewness (fig. 5.29). Unlike the $\delta^{18}O_p$ distribution, there are far more higher values skewing the strontium distribution. This is confirmed by a positive skewness (1.26), indicating a right-tailed distribution, and a positive kurtosis (1.82), indication a leptokurtic curve (Meyer et al. 2017). Again, this is expected for datasets that include outliers. Using the same methods as the oxygen phosphate analysis, strontium isotope values were found to have a mean of 0.7097 with a standard deviation of 0.001279. Accounting for a threshold of 1.96 standard deviations, 95% of values should fall within the range of 0.7097 ± 0.00251, or 0.7072–0.7122. Using the which.outlier() function in R with the same threshold, LH 13, 6DRIF-9, DRIF-15, CBF 277, CBF 679, TDC R38, TDC 411, TDC 608, TDC 710, GLR 1518, and GLR 1561 were all identified as significant outliers. Of these, LH13 is the only lower margin outlier. Despite only having one outlier based on the fixed threshold method, standard deviation methods identified 11 strontium isotope samples that were significantly different than the mean.

Finally, the same IQR method of determining outliers was applied to the strontium values for the comprehensive dataset. For the strontium samples, the median value is 0.7094 and 50% of the samples should fall between 0.7089 and 0.7103. The interquartile range for strontium is 0.0014, and 1.5 times the IQR is 0.0021. Therefore, any outliers will either be less than 0.7073 or greater than 0.7115 (R Core Team 2017). *Boxplot.stats()$out* calculated this and identified the same 11 samples as the standard deviation method as significant outliers (LH 13, 6DRIF-9, DRIF-15, CBF 277, CBF 679, TDC R38, TDC 411, TDC 608, TDC 710, GLR 1518, and GLR 1561) (R Core Team 2017). Unlike the results of the oxygen phosphate analysis, these two methods produced exactly the same results.

5.4 Discussion

5.4.1 Lankhills

As seen in the earlier figure 5.7, it's clear that more individuals from the earlier Lankhillls excavation—from 1967-1972—had lower ^{87}Sr/^{86}Sr and $\delta^{18}O_p$ values. However, despite the decades in between, these excavations took place within about 100 square meters (figure 5.30). Furthermore, according to burial plans (Booth et al. 2010), the outliers for the both excavations are well dispersed among the non-outliers, indicating that possible migrants were buried alongside possible indigenous people. Though the discrepancies exist, they may not be caused by differential burial treatment. It's possible that burial location is a function of time and that there were time periods in Venta Belgarum in which there were more immigrants present, or that these immigrants settled, which means that their offspring would present as indigenous in the isotopic record. If this is the case, it would appear that many of those buried in the area excavated in 1967-72 came from an area with lower annual rainfall, possibly from continental Europe (Evans et al. 2012) (figure 5.31).

Furthermore, for Lankhills there is a large discrepancy between the fixed threshold ^{87}Sr/^{86}Sr range for Britain and the expected range calculated through standard deviation and interquartile range. Each of the mathematical methods

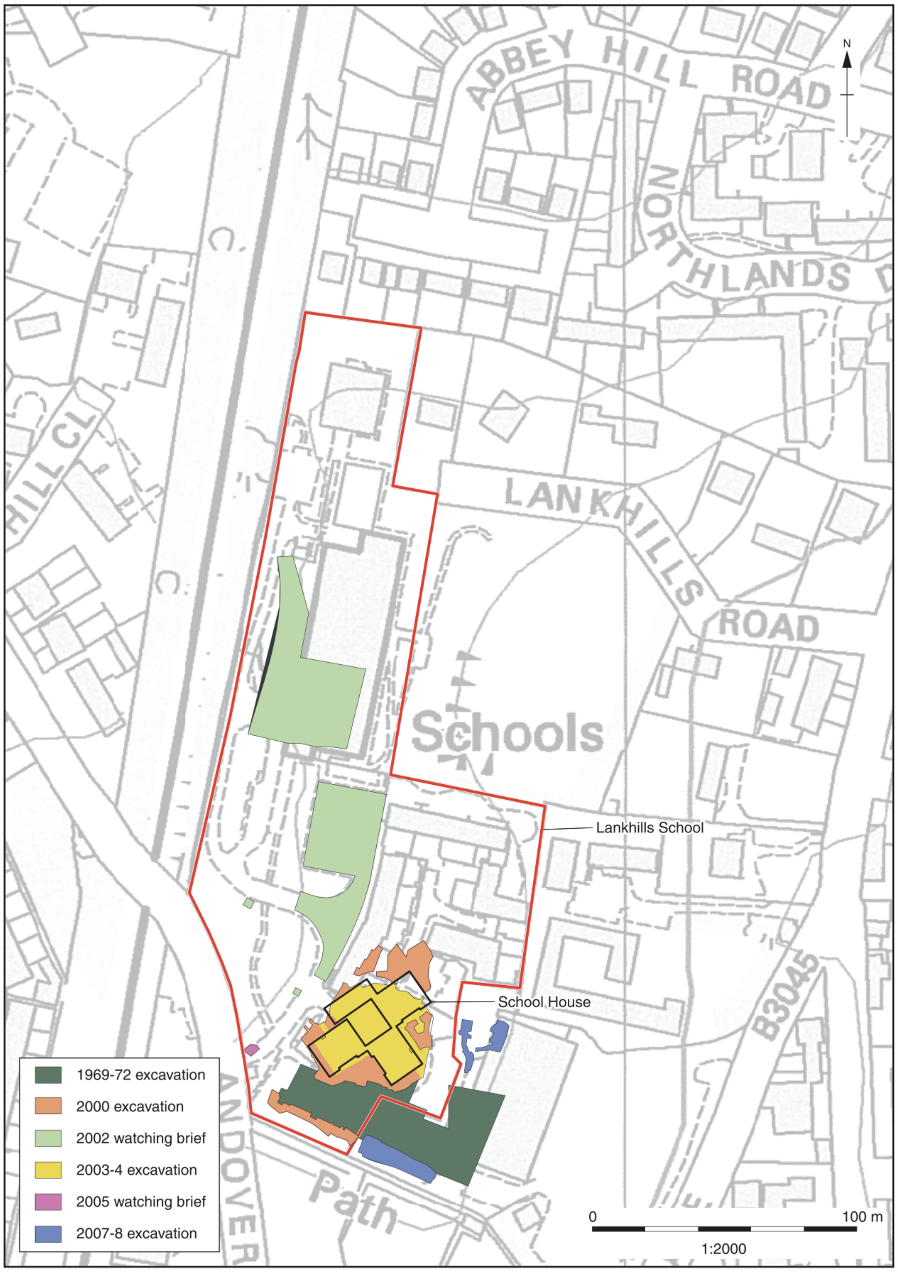


Figure 5.30: *Map of excavation locations in and around Lankhills School, Winchester (Booth et al. 2010)*

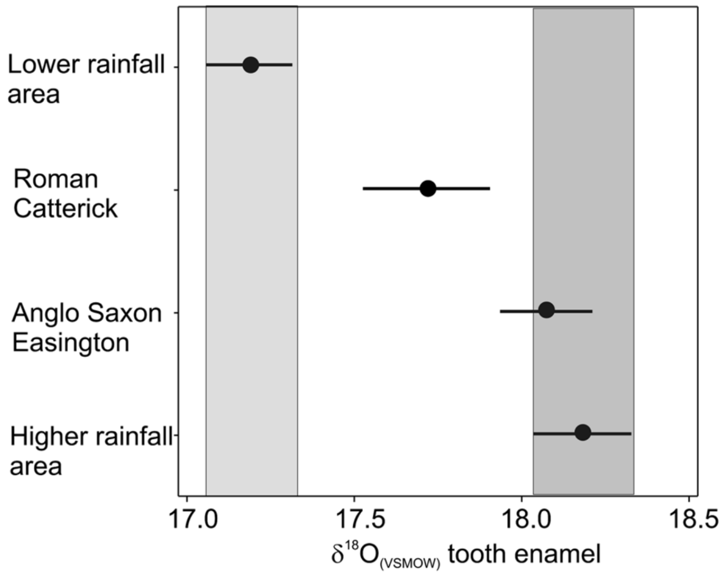


Figure 5.31: *Expected $\delta^{18}O_p$ ranges based upon average rainfall (Evans et al. 2012)*

identified a large number of high-level strontium outliers (LH 861, 271, 1197, 489, 281, 1277, 1894). However, all of these individuals are included in the ^{87}Sr/^{86}Sr fixed threshold range for England and Wales (Evans et al. 2012). Since Lankhills is in southern England, it is possible that these mathematical strontium outliers are not local to Lankhills but did live and grow up in a more northern region of Britain prior to migrating to Lankhills. This is confirmed by a 2010 study into the distribution of strontium values across Europe, which shows that the expected range of values for the Lankhills region is 0.707-0.709, whereas areas of northern Britain and Wales can vary as much as 0.709-0.720 (fig. 5.32) (Voerkelius et al. 2010). This is likely explanation for LH 861, 1197, 489, 1277, and 1894, who all fall within the expected δ^{18}O$_p$ range as well (figure 5.32).

It is also possible that these individuals come from another area with similar ^{87}Sr/^{86}Sr signatures, such as Roman Aquitania, Gallia Belgica, Germania (superior and inferior), Noricum, Southern Italy, and Pannonia (fig. 5.32) (Voerkelius et al. 2010: 936). This is likely true for LH 271 (δ^{18}O$_p$=19.4‰) and 281 (δ^{18}O$_p$=16.8‰), as they have δ^{18}O$_p$ signatures that are, respectively, higher and lower than the rest of the strontium outliers. Based on oxygen and strontium signatures, LH 281 could originate from a place with a higher strontium signature, but a lower rate of rainfall, such as Germania or certain areas around the

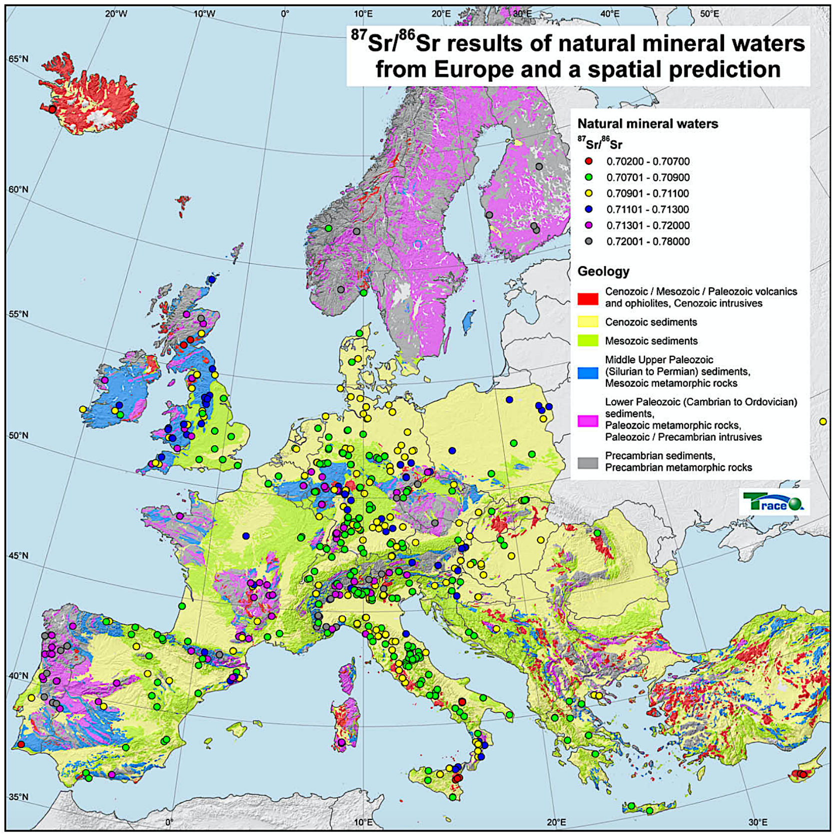


Figure 5.32: *map of $^{87}Sr/^{86}Sr$ isotope ranges for natural mineral water across Europe (Voerkelius et al. 2010). While North Africa is not included in this map, previous studies have suggested that much of that land falls within the 0.7011-0.7130 range, or the dark blue dots (Tafuri et al. 2006 and 2013)*

coast of Italy (figures 5.32 and 5.33). LH 271, on the other hand, could originate from a place with higher strontium and higher rainfall such as Northern Africa (figure 5.33). As there are very few places in continental Europe and North Africa that have such high $\delta^{18}O_p$ signatures, it is easier to estimate the origins of these individuals (figure 5.33).

There are also several individuals who fall within even the most restrictive strontium range but have outlying $\delta^{18}O_p$. LH 118, 806, and 119 each have $\delta^{18}O_p$ values above 19.02‰ but remain well within the strontium range for England and Wales (Evans et al. 2012). Because this is a rare combination of oxygen and strontium signatures, it is possible that these individuals originated from

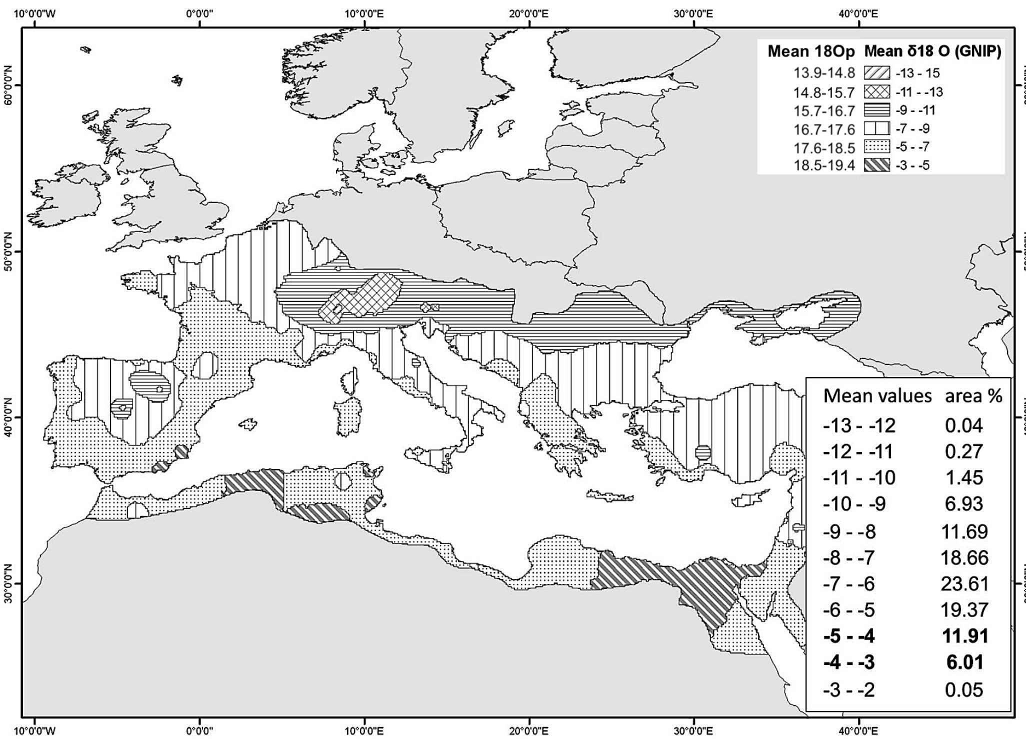


Figure 5.33: *Expected $\delta^{18}O_p$ range for continental Europe and Northern Africa from Evans et al. (2012). The corresponding $\delta^{18}O_p$ ranges were added by the author using Levinson's corrected equation (Levinson et al. 1987; Chenery et al. 2010). $\delta^{18}O_p$ signatures for each individual can be found in Appendix C.*

the southern region of Hispania—modern day Spain (figure 5.33). LH 55, 357, 351, 1119, and 81, on the other hand, all have values far below what would be expected as "local" for Lankhills and Roman Britain in general. The only place in the Roman Empire that has drinking water signatures below 16.4‰ and strontium signatures between 0.707 and 0.709 is Eastern Europe, particularly the area to the north of Italy (figure 5.32). The isotopic signatures of these individuals will later be compared to the aforementioned study by Clarke in 1979 which hypothesized that some individuals buried at Lankhills were of Pannonian descent, a Roman province to the northeast of Italy. A recent study by Crowder et al. (2020) revealed that some individuals from the Archiud "Hânsuri" cemetery in Transylvania, Romania had similar strontium and oxygen signatures to LH 81, 426, and 351, which may suggest that these individuals do, in fact, come from the Roman region of Pannonia. All of these potential migrants and their possible origins are summarized in table 5.7.

Skeleton No.	$\delta^{18}O_p$	$^{87}Sr/^{86}Sr$	Possible origin
13	15.8	0.7064	Pannonia or Eastern Europe
426	15.1	0.7094	Pannonia or Eastern Europe
81	14.7	0.7093	Pannonia or Eastern Europe
55	16.4	0.7092	Eastern Europe
357	16.2	0.7091	Eastern Europe
351	16.0	0.7090	Pannonia or Eastern Europe
1119	15.8	0.7094	Eastern Europe
118	19.1	0.7088	Southern Hispania
806	19.3	0.7087	Southern Hispania
271	19.4	0.7102	North Africa
281	16.8	0.7115	Germania or Coastal Italy

Table 5.7: *Summary of all possible Lankhills outliers*

In 2009, Eckardt et al. conducted an isotopic study on the remainder of the population. They define the ranges associated with an upbringing in Winchester as 0.7080-0.7092 for ^{87}Sr/^{86}Sr and 16.8-18.6‰ for $\delta^{18}O_p$. These ranges are significantly smaller than those estimated by the fixed threshold and the standard deviation outlier detection method, but ultimately reflect a more localized expected range. These ranges are closest to the IQR range for Lankhills of the current study, which are 0.7077-0.7097 for ^{87}Sr/^{86}Sr and 16.78-19.33‰ for $\delta^{18}O_p$. These ranges are centered on a concentrated group near the mean of the sample. It is, therefore, possible that the IQR range in this instance is more indicative of small-scale migrations, such as those from areas within Britain to Winchester.

5.4.2 Catterick

Overall, there are only two outlying strontium values for all of Catterick, CBF 679 and 277. Each of these extreme values comes from the Bainesse Farm excavation (figure 5.34), which could indicate a site bias. However, all four sites are approximately equally distributed throughout the dataset and the same team collected the data for all sites at the same time (Chenery et al. 2011). Therefore, it is unlikely that a sampling bias is the cause and more likely that Catterick Bainesse Farm includes all of the extreme values simply due to the fact that 15 of the 24 individuals sampled were excavated from this site (62.5%). Furthermore,

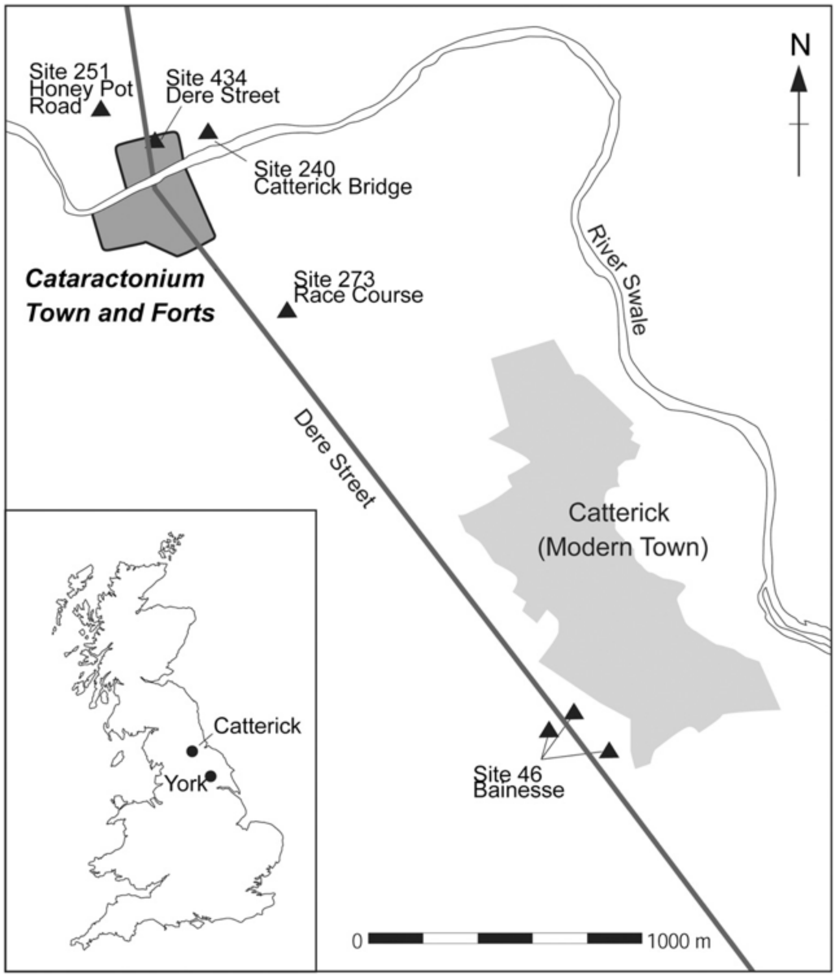


Figure 5.34: *Map of Roman Catterick burial sites (Chenery et al. 2011)*

these differences between sites could be a result of differential burial treatment based on location, considering that Bainesse Farm is around 3,000m from the other three locations (Chenery et al. 2011). It is possible that Catterick Bainesse Farm was a more diverse burial site, whereas Catterick Bridge, Dere Street, and Honeypot Road were more popular among individuals born and raised locally. Unfortunately, the small sample size from Catterick makes it impossible to say anything definitive about the distribution of burials.

As with previous sites, CBF 277 and 679 also fell within the expected range for all of Britain, but not for England and Wales alone. Considering that they each have an $\delta^{18}O_p$ signature around 17.5‰, which are in line with expected ranges for Britain, but elevated strontium signatures, it is possible that these individuals originated from northern Gaul and Germania or a wide range of locations in Italia (figure 5.33) (table 5.8). As these two individuals each have a strontium signature of 0.7137 they fall within the expected range for England and Wales estimated by the fixed threshold method. Without mathematical and other comparison methods, the current accepted range for British strontium values would have overlooked two significantly different individuals, which illustrates the importance of comparing the results of several methods.

Skeleton No.	$\delta^{18}O_p$	$^{87}Sr/^{86}Sr$	Possible origin
CBF 277	17.28	0.7137	Germania, Italy, or Northern Gaul
CBF 679	17.73	0.7137	Germania, Italy, or Northern Gaul

Table 5.8: *Summary of all possible Catterick outliers*

5.4.3 Gloucester

There are some differences between the outlier detection methods for Gloucester London Road. For $\delta^{18}O_p$ signatures, the only fixed threshold method identified any outliers. These are GLR 1216 and 1546, both of which fall within even the most restrictive strontium range. Since GLR 1216 has a much lower strontium signature than GLR 1546, it is possible that these two individuals did not originate from the same locale, despite their similar oxygen signatures. The $^{87}Sr/^{86}Sr$ and $\delta^{18}O_p$ signatures for GLR 1216 are consistent with the southern coast of Spain and some coastal regions of North Africa. GLR 1546, on the other hand, is much more complicated. As is evident in figure 5.33, there are very few regions in Europe and North Africa in which one would expect to find $\delta^{18}O_p$ signatures above 19.0‰ and even fewer that also reflect strontium signatures above 0.7100. Therefore, it is more likely that GLR 1546 originated in North Africa, according to $^{87}Sr/^{86}Sr$ analyses of that region (Tafuri et al. 2006 and 2013). Considering the rarity of $\delta^{18}O_p$ signatures above 19.0‰ in continental Europe and Great Britain (figure 5.33), and the more variable nature of $^{87}Sr/^{86}Sr$ signatures, it is unlikely that GLR 1216 and 1546 originated in Britain.

Additionally, there are three $^{87}Sr/^{86}Sr$ outliers from the mathematical methods that are included in the fixed threshold $^{87}Sr/^{86}Sr$ range and not identified as $\delta^{18}O_p$ outliers by any method: GLR 1561, 1518, and 1541. Though technically these strontium ranges can be found in parts of Britain, these three individuals have significantly different strontium signatures than the rest of the skeletons from Gloucester London Road, indicating a different origin. Based upon both their $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ signatures, it's likely that GLR 1541 and 1518 originate from coastal areas of southern Italy or on the border between Roman Gaul and Hispania. Individual 1561, however, has higher $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ signatures, which are present in only a select few locations. Therefore, it is possible that this individual originated from North Africa. However, it is equally possible that any of these three individuals migrated to Gloucester from as close as Scotland. All of these potential migrants and their possible origins are summarized in table 5.9.

Skeleton No.	$\delta^{18}O_p$	$^{87}Sr/^{86}Sr$	**Possible origin**
1216	19.2	0.70941	Southern Spain or North Africa
1546	19.1	0.70186	North Africa
1561	18.7	0.71344	Gaul, Southern Italy, Hispania, or Scotland
1518	17.9	0.71298	Gaul, Southern Italy, Hispania, or Scotland
1541	17.1	0.71217	North Africa

Table 5.9: *Summary of all possible Gloucester outliers*

According to Chenery et al. (2010), who carried out the original isotopic study on Gloucester London Road, the terrain around Gloucester has a diverse range of strontium values, which can account strontium results for 16 out of the 21 individuals sampled (2010: 156). Based on vegetation samples, they also estimate that the individuals with higher $^{87}Sr/^{86}Sr$ values could have migrated from the Malvern Hills or west of the River Severn (which is to say from Wales), both of which are around 30 miles from Gloucester. However, it is possible that these individuals come from farther afield, as their signatures also match water samples from Roman Aquitania, Gallia Belgica, Germania (superior and inferior), Noricum, Southern Italy, and Pannonia (fig. 5.32) (Voerkelius et al. 2010: 936). In addition, some of the individuals with $^{87}Sr/^{86}Sr$ signatures between 0.709-0.711, though not outliers by any means of detection, could be classified as migrants by the Voerkelius et al (2010) study, as their signatures match groundwater samples from the western coast of Italy all the way up through central Europe, but also from a small area around Gloucester. Despite the many available migrant detection methods, strontium signatures from Gloucester are especially hard to classify considering the large range of available $^{87}Sr/^{86}Sr$ values present in both the vegetation and the groundwater. However, if one assumes that the people of Roman Gloucester had a rather similar diet, and those who were raised outside of Gloucester had a relatively different diet, the statistical methods can help to tease out those individuals who are significantly different, and, therefore, possible migrants without attempting to estimate his or her place of origin.

5.4.4 York

Most of the outliers from the York cemeteries are from either Trentholme Drive (Leach et al. 2009), or one of the two Driffield Terrace excavations (Montgomery et al. 2011; and Muldner et al. 2011), with the exception of RE25 and MVC. Despite comprising a significant portion of the York dataset, the Railway only has one outlier (only based on the fixed threshold method) while the bulk of Railway skeletons are concentrated around the mean for the entirety of York. These results would indicate that there could be some site bias present at York. However, Trentholme Drive, The Railway, and Driffield Terrace are very close in proximity (figure 5.35). Though Driffield Terrace is not included on this map, it is located in between Trentholme Drive and The Railway, all three of which are contained within fewer than 1,000m. Therefore, it is possible that there are certain areas of the same cemetery that are more likely to contain immigrants or groups of non-local individuals. Whether this is a conscious choice or merely reflects a moment in time in which there were more immigrants present in York cannot be definitely determined. Interestingly, there are no outliers from sites on the military bank of the Ouse, which includes Castle Yard, Clifton, and Hospitium (figure 5.34). However, there are only three total individuals from these sites, so it is not possible to tell if these are significant differences.

As mentioned earlier, there are several $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ outliers for the York cemeteries, one of which is both a $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ outlier: TDC 710. There are very few areas of continental Europe and North Africa that coincide with $\delta^{18}O_p$ signatures between 14.7 and 15.0‰ (figure 5.33). Therefore, by cross referencing the maps in figures 5.32 and 5.33, it is likely that 6DRIF-24 and DRIF-10 originated from Germania superior or Rhaetia, conquered areas just north of the Italian province. These areas also coincide with the $^{87}Sr/^{86}Sr$ signatures of 6DRIF-24 and DRIF-10. There are also very few areas that coincide with $\delta^{18}O_p$ signatures above 19.0‰. Areas on the southeastern coast of Spain contain the same $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ outliers, making it one of the only viable places of origin for 6DRIF-21, RE 25, and TDC 516. TDC 710 has unusually high values

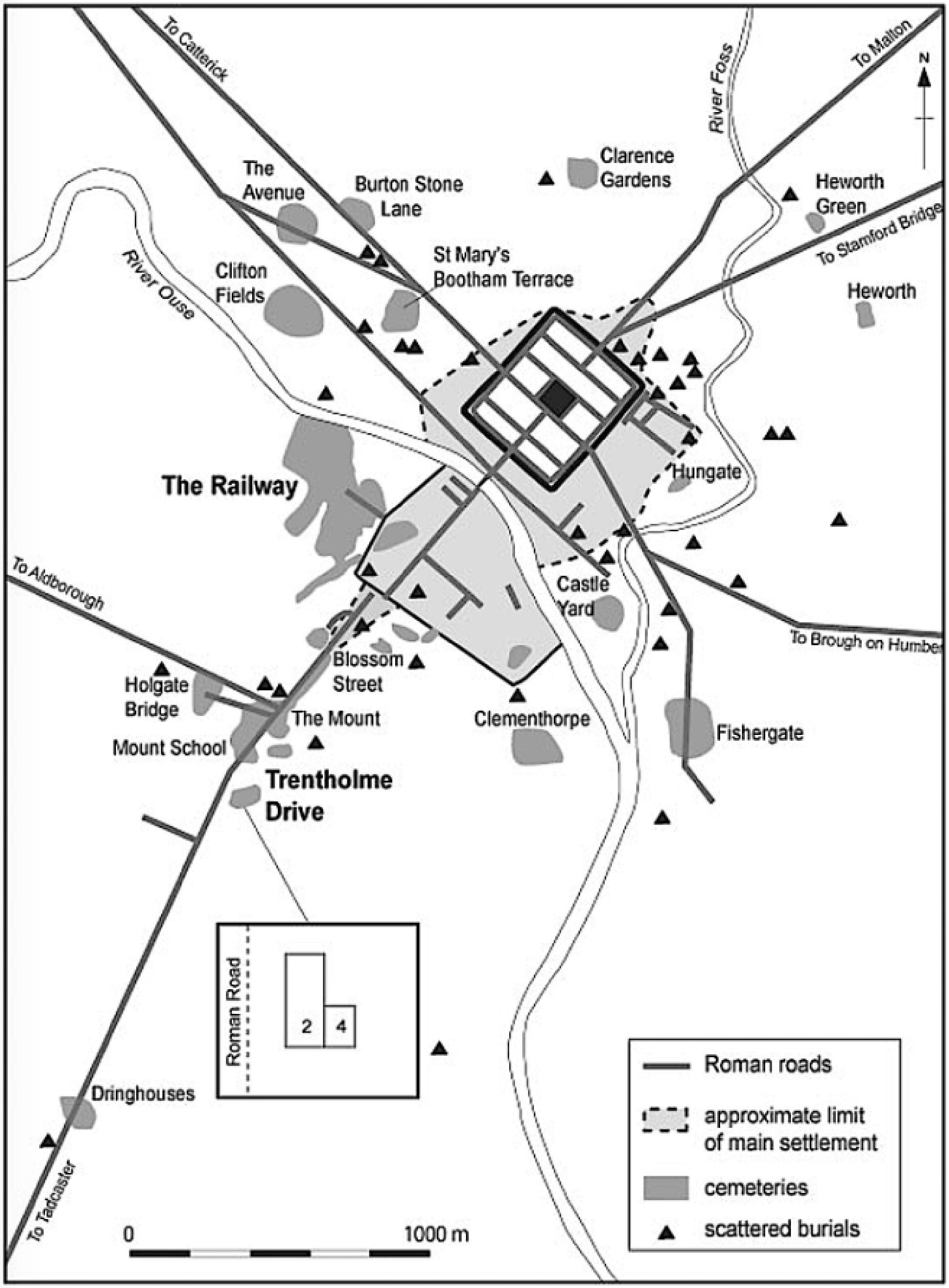


Figure 5.35: *Map of sites tested for stable isotopes in York, taken from Leach et al. (2009: 548).*

for both $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ signatures. Given that this combination of values is rather rare, it's likely that TDC 710 originated from West Africa, one of the few arid places that contains naturally occurring high levels of strontium (Price et al. 2006).

As far as the strontium outliers are concerned, there are a myriad of places that 6DRIF-9, TDC R38, and TDC 411 could have originated from. Based upon their particular combination of $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ signatures, they each match locations across Italy, Germania, Rhaetia, and Pannonia, as well as Scotland and Wales. Considering their adherence to the expected range in York for $\delta^{18}O_p$, it's likely that they migrated more locally from the areas of modern-day Wales or Scotland. However, there is some dietary evidence that further narrows down the possible origins of 6DRIF-9 and DRIF-10 (Muldner et al. 2010). Interestingly, both of these individuals have unusually high $\delta^{13}C$ values—so much so that their levels have not been found in any time period in Britain (Muldner et al. 2010). Based on these findings, it is likely that these individuals migrated from areas rich in C_3 and C_4 plants, which grow around the Mediterranean—or, at least, areas that tended to import plants from that area (Muldner et al. 2010). Due to the slightly higher $\delta^{18}O_p$ and slightly lower $^{87}Sr/^{86}Sr$ values for MVC and TDC 608, there are only a select few places these individuals could have originated including Scotland and parts of central Gaul. Finally, DRIF-15, though not statistically an oxygen outlier, has both $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ values close to that of TDC 710 and could have also migrated from North Africa. All of these potential migrants and their possible origins are summarized in table 5.10.

The York dataset is also an example of why it is important to both revisit past isotopic studies and to use multiple means of detecting isotopic outliers. The previous isotopic studies of Roman York, which all provided the raw data used in the current study, span three different papers, each with different authors (Leach et al. 2009; Montgomery et al. 2011; Muldner et al. 2011). The methods and results for each of the original studies are slightly different, especially considering that all three studies were carried out before the publication of Evans et al.'s 2012 comprehensive analysis for Britain, which is now widely used, as it is the most current study to explore strontium and oxygen isotopic variation throughout Britain. For example, in the original analysis carried out by Montgomery et al. in 2011, the authors speculate that two individuals, DRIF-33 and DRIF-37 were low-value strontium outliers, based on the fact that they fell below their perceived minimum for York, 0.7090, which they based off both biosphere samples and statistical tests on the 3 Driffield Terrace skeletons (Montgomery et al. 2011). Now, the accepted minimum for Britain is 0.7078 (Evans et al. 2012), which is corroborated by both

Skeleton No.	δ^{18}**O**$_p$	^{87}**Sr**/^{86}**Sr**	**Possible origin**
6DRIF-24	14.7	0.7085	Germania Superior or Rhaetia
DRIF-10	15	0.70956	Germania Superior or Rhaetia
6DRIF-21	19.8	0.7094	Southern Hispania
RE 25	19.36	0.7098	Southern Hispania
TDC 516	19.48	0.70896	Southern Hispania
TDC 710	19.74	0.71355	West Africa
6DRIF-9	16.9	0.7126	Italy, Germania, Rhaetia, or Pannonia
TDC R38	17.38	0.71308	Italy, Germania, Rhaetia, and Pannonia
TDC 411	17.64	0.71312	Italy, Germania, Rhaetia, and Pannonia
MVC	18.13	0.71175	Scotland or Central Gaul
TDC 608	18.27	0.71293	Scotland or Central Gaul
DRIF-15	18.9	0.714202	North Africa

Table 5.10: *Summary of all possible York outliers*

the statistical tests of the current study and the groundwater comparisons by Voerkelius et al. (2010). Montgomery et al. (2011) use their statistical tests to assert that skeletons 33 and 37 are more than two standard deviations from the mean of the sample, but this mean is unlikely to be representative of the entire population as only 6 individuals from 3 Driffield Terrace were sampled and 3 of those individuals are concentrated around the mathematical mean (Montgomery et al. 2011).

The oxygen isotope conclusions made by Montgomery et al. (2011) are much more in line with the current study. They, too, have determined that DRIF-10 has an unusually low $\delta^{18}O_p$ signature at 15.00‰, which is consistent with all outlier detection methods in the current study (Montgomery et al. 2011). They also consider the effectiveness of comparing the $\delta^{18}O_p$ signatures of ancient individuals to the $\delta^{18}O_{dw}$ signatures of modern groundwater, considering fractionation within the body and the likelihood of significant climate changes over that period of time. Ultimately, they conclude that the variation and repetition of $\delta^{18}O_p$ signatures across the globe makes the success of pinpointing a person's specific place of origin statistically unlikely (Montgomery et al. 2011). Conclusions such as these have lead to the current study's approach of detecting outliers through many different means of analysis, while exploring all possible places of origin.

Muldner et al. (2011) conducted the original study for 6 Driffield Terrace, which is considerably larger than the sample from 3 Driffield Terrace (n=18). At the time of this study, the most current estimate for the expected range in Britain was from Chenery et al. (2010), which concluded that $\delta^{18}O_p$ signatures should fall between 16.8‰ and 18.6‰. The new estimate by Evans et al. (2012) (also referred to in this study as the fixed threshold range) is less conservative at 16.33-19.07‰. Therefore, the original study by Muldner et al. (2011), has classified far more individuals as possible outliers than the current study. They do not attempt to convert $\delta^{18}O_p$ values to $\delta^{18}O_{dw}$ values. The only significant changes in the $\delta^{18}O_p$ conclusions for this site are in the fact that the expected range for Britain has since changed and that the mean and median in the current study are slightly different because the whole region of Roman York has been combined into a single dataset. These changes have resulted in fewer individuals being classified as possible migrants, but ultimately Muldner et al. (2011) concluded that the same two individuals identified in the current study, 6DRIF-24 and 6DRIF-21, were the most likely to be migrants based upon their extreme $\delta^{18}O_p$ values.

Muldner et al. (2011) found, based on local vegetation samples and human enamel data from other Roman cemeteries in the vicinity of York, that the expected $^{87}Sr/^{86}Sr$ range for individuals who were raised in York should be 0.7084-0.7105, which is significantly smaller and more localized than what the current fixed threshold range would suggest (Evans et al. 2012). This smaller range is, however, closer to those estimated by the standard deviation and IQR outlier detection methods, which indicates that these methods provide a better estimation for both small and large scale migrations, especially in sites without local comparative data.

Leach et al. (2009) conducted the original study for the remainder of York sites included in the current data set. These authors base their expected oxygen ratio for Britain on both modern groundwater samples and human teeth enamel excavated from Britain. At the time, the best estimate was 17.7 $\pm$ 0.9, which translates to a range of 16.8-18.6‰. This is significantly smaller than the fixed threshold range (Evans et al. 2012), which allows for greater variation on both high and low values. The difference is even more significant when compared to the ranges estimated by the standard deviation and IQR methods for all of York (16.04-19.55‰ and 16.25-19.49‰, respectively). Consequently, the current study has far fewer outliers than the original study, but this is expected as estimations have changed and become more accurate over the past decade.

Leach et al. (2009) also estimated, based on biosphere values, that individuals originating in York would have $^{87}Sr/^{86}Sr$ values between 0.7084 and 0.7102, the same range used by Muldner et al. (2011). As with Muldner and colleagues' study, this range is significantly more restrictive than that of the fixed threshold method, but also catered to reflect localized $^{87}Sr/^{86}Sr$ values. The Muldner et al. (2011) range is most similar to the range estimated through IQR analysis (0.7078-0.7114). However, the estimated IQR range also includes data for individuals that are not included in the original Leach et al. (2009) dataset, some of whom are significant strontium outliers. Overall, much has changed since these original studies, which shows the importance of reexamination.

5.4.5 London

The same issues that are present in the strontium analyses of all other sites are present in the London dataset. The standard deviation and interquartile range methods identify far more high-level strontium outliers than the fixed threshold range. Interestingly, the interquartile range method also identified one low-value strontium outlier, skeleton 30 from Cott's House. With a strontium signature of 0.70828, this individual is technically within the expected range for England and Wales, but significantly different than the rest of the London skeletons. No other site has lower-level strontium outliers that are only identified mathematically. This is not because skeleton 30 has an abnormally low strontium value. In fact, skeleton 30 would not be a strontium outlier for any of the other datasets in this chapter. However, the other individuals in the London dataset have, on average, slightly higher strontium values than the rest of the sites sampled. Furthermore, this range is higher than what would be expected based upon the groundwater and vegetation surrounding London (Voerkelius et al. 2010). As mentioned in earlier chapters, London was thought to be a primarily civilian settlement that was a hub for merchants. Considering the influx of trade here, and the nature of trade that requires tradesmen and their families to move back and forth between areas of production and areas of sale, it is possible that the core group of individuals from Roman London have $^{87}Sr/^{86}Sr$ signatures that represent an average of two or more locations, rather than having one specific place of origin. Unfortunately, there is no way to break down these strontium signatures further to discover whether or not this is true and, if so, where these individuals traveled to and from. Furthermore, because there are no $\delta^{18}O_p$ signatures to cross-reference, it would be very difficult to pinpoint possible areas of origin for the outliers. However, it is important to note that they are significantly different than the rest of the population.

Most of the lead isotopes included here share similar outliers. Those that occur

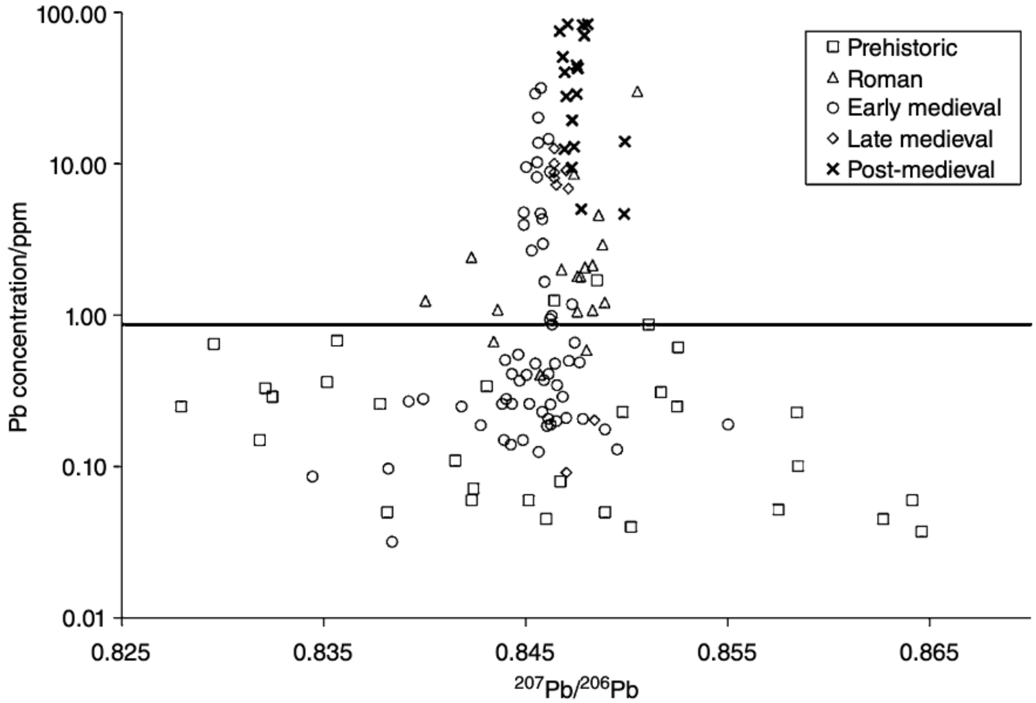


Figure 5.36: *Comparison of logarithmic lead concentration levels for several different time periods as compiled by Millard et al. (2014).*

most frequently across every lead isotope are skeletons 400 from Bishopsgate, 34245 from Spitalfields Market, and 325 from Great Dover Street. Interestingly, skeleton 400 from Bishopsgate is also a strontium outlier according to the standard deviation and interquartile range. ^{208}Pb/^{206}Pb had the most variation of any lead isotope, which indicates that the people buried in Roman London were not ingesting this isotope from the same source. By these standards, individuals 400 from Bishopsgate and 325 from Great Dover Street have the highest ^{208}Pb/^{206}Pb values, closely followed by a smaller grouping of individuals 803.6 and 695.5 from London Wall as well as 652 from Mansell Street. Finally, there are two lower-value outliers: 724 from Mansell Street and 182 from St. Bartholomew's Hospital.

Though all of these individuals are within the expected range for nearby Mendip ore (Haggerty et al. 1996), some of them are considered outliers when compared against Post-Medieval dental enamel samples from Britain (Millard et al. 2014). Furthermore, there are no outliers whatsoever based upon the expected range from German artefacts (Bode et al. 2009) and Roman coins (Butcher and Ponting 2014). This is surprising as one would expect at least some individuals in Roman Britain to have not been in contact with a great deal of traded goods from Germania in their formative years. It is possible that the isotopic signatures of these anthropogenic sources are not viable means of comparison in their raw form, much like how the oxygen isotopes in drinking water need to be converted to be compared to those found in tooth enamel. In that case, it seems that the Post-Medieval dental enamel sample is the most viable comparative tool, considering that no conversion is necessary, and the Post-Medieval skeletons have the most similar level of lead concentration to the Roman skeletons (figure 5.36). Unfortunately, it is impossible to tell at this time if Post-Medieval and Romano-British people were exposed to similar sources of anthropogenic lead. Nevertheless, the standard deviation and interquartile range methods help to identify those who have significantly different lead signatures and significantly higher levels of lead consumption. Theoretically, individuals raised in the same area with the same access to traded goods should have relatively similar lead isotope signatures. Overall, the most commonly occurring London outliers for all Pb isotopes are Bishopsgate 400, Spitalfields 34245, and Great Dover Street 325, so it is likely that these individuals were not raised in the London area. All of these potential migrants and their possible origins are summarized in table 5.11.

Skeleton No.	^{87}**Sr**/^{86}**Sr**	^{208}**Pb**/^{206}**Pb**
Bishopsgate 400	0.71236	2.092
Great Dover St. 325	0.70928	2.0912
Hooper St. 652	0.70951	2.088
London Wall 803.6	0.71033	2.0894
London Wall 695.5	0.709	2.0882
Mansell St. 724	0.70914	2.0812
Spitalfields Market 34245	0.70896	2.0838
St. Bart. Hosp. 182	0.70909	2.0815

Table 5.11: *Summary of all possible London outliers*

5.4.6 All sites

Though the dataset compiled here does not vary significantly from that of Evans et al. (2012), which is the current standard for isotope comparison, there are some important distinctions that make the current study necessary. By comparing and contrasting the means used in this study versus those used in Evans et al. (the fixed threshold range), this section will show the importance of carrying out one's own statistical analyses in addition to using accepted "expected" levels comprised by previous studies. Considering that Evans et al. (2012) used the same standard deviation technique to create an expected oxygen range for Britain, but removed the possible outliers, it is not surprising that their range is slightly smaller than the results of the current study. With two exceptions, LH 357 and 55, all three methods identified the same low-value ^{87}Sr/^{86}Sr and $\delta^{18}O_p$ outliers. The key differences arise when comparing high-value outliers. For high-value $\delta^{18}O_p$ outliers, the discrepancies between methods appear to be caused by the cautiousness of the method at hand. The values are all centered on a distinctive mean, and the "normal" ranges determined by each outlier detection method have varying levels of closeness to this mean. The slight exception is the expected range estimated by Evans et al. (2012). This range identifies more than double the amount of high-value $\delta^{18}O_p$ outliers than the mathematical detection methods. Unlike the Evans et al. expected range for ^{87}Sr/^{86}Sr, the $\delta^{18}O_p$ range is based solely on determining the mean and standard deviation for the $\delta^{18}O_p$ values of 615 presumably local individuals (2012). Therefore, the results should, theoretically, be similar to the current study's expected normal range based on the SD method.

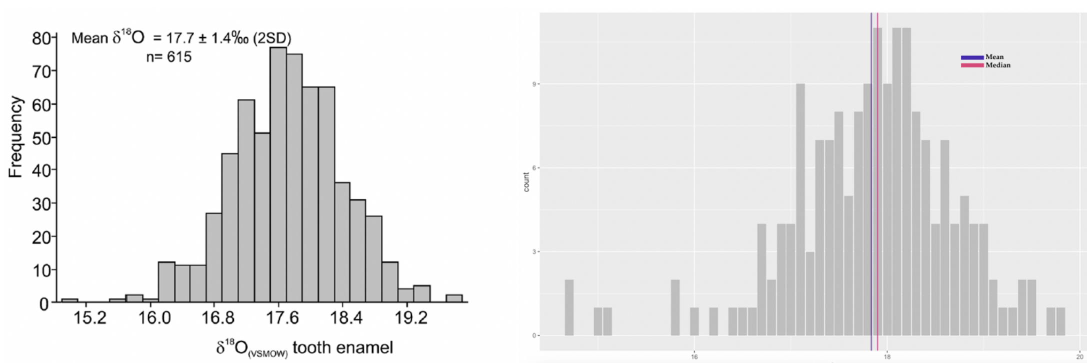


Figure 5.37: *Side by side frequency distribution comparison of $\delta^{18}O_p$ values for both the Evans et al. (2012) dataset (left) and the current study's dataset (right).*

A side-by-side comparison of oxygen isotope signature frequencies shows some significant difference (figure 5.37). Despite having similar means (17.7‰ for Evans et al. and 17.84‰ for the current study), the standard deviations are significantly different (0.7‰ for Evans et al. and 0.87‰ for the current study). The side-by-side comparison indicates that the Evans et al. dataset includes fewer individuals with $\delta^{18}O_p$ signatures higher than 18.0‰. The reason for the aforementioned skewed distribution for the current dataset is clearer considering that the current database includes the presumed non-locals that were removed from the Evans et al. (2012) database. This is an important distinction because realistically, raw datasets will contain outliers. Furthermore, regions outside of Britain do not have the same $\delta^{18}O_p$ comparative material. These regions rely on converting tested $\delta^{18}O_p$ values to $\delta^{18}O_{dw}$ in order to compare the results to local drinking water, which, as mentioned earlier, can introduce many levels of error. The solution in these cases is to run statistical outlier tests, remove the outliers, and repeat the test until there are no remaining outliers. That final range determined by mean and standard deviation (which should include all the remaining values), will represent the expected local variation. As more sites in the region are tested these individuals should be added to the regional database and the outlier tests should be repeated. For Britain, since this database has already been created, the high-level "expected" limit for $\delta^{18}O_p$ created by Evans et al. (2012) will be used in the current study.

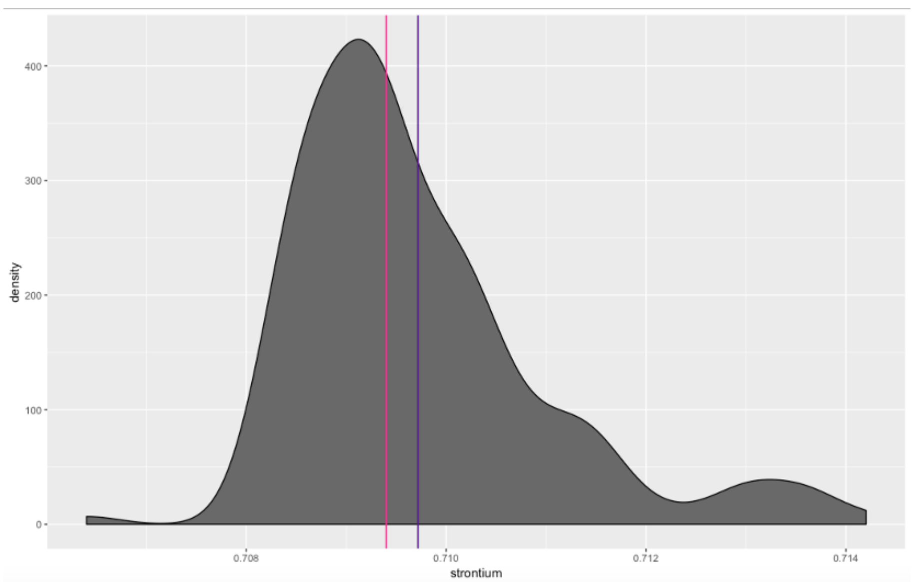


Figure 5.38: *Density plot of strontium values for all sites. The pink line represents the median and the purple line represents the mean.*

Evans et al. (2012) did not use statistical modeling to create an expected range for $^{87}Sr/^{86}Sr$ values across Britain. Rather, they used the minimum and maximum values obtained from human tooth enamel in presumed locals from England, Scotland, and Wales. Therefore, it is impossible to compare the distribution of values from that study to those of the present study. However, it is clear from comparing the three "expected" ranges used in this study that there are quite large differences in the results of each method. From the mathematical methods, it's clear that individuals with higher strontium signatures—most notably those between 0.7120 and 0.7140—are significantly different than the mean based on both IQR and standard deviation. Evans et al. (2012), on the other hand, maintain that the maximum expected strontium value for England and Wales is 0.7140 and 0.7165 for Scotland. By these standards, most of the mathematical outliers would be lost, which would eliminate the ability to identify migrations between Scotland and England. Furthermore, it's clear from the density plot (figure 5.38) that there are a large proportion of values in between 0.7090 and 0.7140 that are skewing the mean and median to be greater than the density peak. These intermediate values that are between the two density peaks (at 0.7090 and a smaller one between 0.7120-0.7140) could be interpreted as individuals who migrated from higher strontium regions, but whose teeth were sampled in an area of development between these two periods in that individual's lifetime. Overall, using statistical methods, rather than relying upon minimum and maximum values from excavated individuals that are presumed to be local—or from local geological samples that may not completely represent what one would expect to find in an osteological sample—opens researchers to more interpretation possibilities.

5.5 Summary

This chapter has applied a multi-method approach to the identification of possible migrants based on different means of identifying outliers based on both fixed and mathematical parameters. It is argued that this approach is preferable because there are significant problems with the most popular means of analyzing stable isotope signatures in regards to migration. While the work that Evans and colleagues (2012) have done to better understand the isotopic range that a researcher might expect to encounter in Britain is undoubtedly valuable, this current study shows that it is also useful to explore variation in values statistically within any particular site. As shown here, it is possible to highlight both inter-site and regional variation through outlier detection methods, such as the standard deviation and IQR methods. These statistical approaches remove some of the issues associated with stable isotope data, especially when used in conjunction with comparison to a fixed threshold dataset, such as the work of Evans and colleagues (2012).

Furthermore, exploring site-wide and regional variation intrinsically removes the need for researchers to rely on comparing individuals to local drinking water and landscape values, which may be based on inaccurate estimates. These drinking water comparisons are a valuable tool that can be used after the statistical analysis is done and, when used in conjunction with strontium isotopic signatures, can help narrow down the list of places in which these two signatures can be found, but it is not a tool that can be used singularly. This is not to say that fixed ranges such as those identified by Evans et al. (2012) are not viable methods of comparison. In fact, when dealing with $\delta^{18}O_p$ variation, their fixed range often identified more outliers than the statistical methods. This is the case for York, Lankhills, and the comprehensive dataset. This is caused by a wide range of $\delta^{18}O_p$ signatures at each of these sites, which have a greater number of outliers that are skewing the mean and median. So, in cases in which there are a large number of potential outliers, it is useful to have previously determined estimates for local variation. Overall, Evans et al. (2012) is a valuable baseline, but when used in conjunction with statistical techniques there is more opportunity to explore both large-scale and small-scale migrations.

Additionally, this multi-method approach was able to explore the results in areas in which the local "expected" signature is problematic, such as Gloucester, where the local biosphere was found to be extremely diverse, which, in turn, affects the expected range of $^{87}Sr/^{86}Sr$ for individuals raised locally. The original authors who studied isotopes at Gloucester, Chenery et al. (2010), do identify "migrants" in the sample, but they suggest these people probably came from relatively local locations such as eastern Wales or the Malvern Hills—places that may be too close by to be considered a significant migration. Upon graphing the sample, it's clear that there is a wide range of strontium values present, but that the site does not have the same clear central concentration of $^{87}Sr/^{86}Sr$ signatures that other sites like York or Lankhills have. As one would expect local individuals to have similar diets that reflect a mixture of local and imported goods, it seems that the locals of Gloucester would not have a range of $^{87}Sr/^{86}Sr$ that are as diverse local biosphere, but would rather have a more centralized range of $^{87}Sr/^{86}Sr$ signatures that are indicative of an average between $^{87}Sr/^{86}Sr$ in the diverse local biosphere and $^{87}Sr/^{86}Sr$ in the similar consumed goods of the region. Instead, this level of diverse $^{87}Sr/^{86}Sr$ signatures could also be interpreted as a dataset that contains locals, migrants, and individuals whose enamel reflects a combination of different origins. Without using a multi-method exploratory approach, this possible conclusion would not have been clear. Considering that this level of local strontium variation is actually quite common (Voerkelius et al.

2010), this same issue is likely to arise at many different sites around the world.

Multi-method approaches are also important because analyses are often dependent on the researcher's definition of migration, as well as the research question at hand. When only comparing $^{87}Sr/^{86}Sr$ and $\delta^{18}O_p$ to known ranges and datasets, it is likely that smaller-scale migrations will be obscured. As seen in the results, the Evans et al. (2012) expected range for $^{87}Sr/^{86}Sr$ in Britain was consistently too inclusive and often was insufficient in commenting on the level of $^{87}Sr/^{86}Sr$ variation at any given site. Using the guidelines set out by Evans et al. (2012), those who have migrated a relatively short distance, such as from Scotland to the south of England, are unidentifiable from $^{87}Sr/^{86}Sr$ signatures alone. Furthermore, individuals whose $^{87}Sr/^{86}Sr$ ratios are indicative of more than one geographical location would also be lost in this wide range. However, the statistical methods show that these individuals have a significantly different strontium results than the bulk of the population in both the comprehensive dataset and the regional datasets. While modern researchers may not classify moving from Scotland to Southern England as "migration," it is important to know that these distinctions are present in the isotopic record. Knowing these intricacies aids in removing modern biases, which leaves researchers open to interpret the possibility that these significantly different individuals were considered migrants to the local population or to themselves.

The most significant reason to use a multi-method approach is that often comparing isotopic values to estimated standards for certain reasons can lead to confusing or conflicting results, especially when using $^{87}Sr/^{86}Sr$ and $\delta^{18}O_p$ or $^{87}Sr/^{86}Sr$ and Pb in unison. Over all the separate analyses in this study, only two individuals, TDC 710 and LH 13, were both $^{87}Sr/^{86}Sr$ and $\delta^{18}O_p$ outliers based on all three methods of analysis, and one additional individual, LH 271, is an $^{87}Sr/^{86}Sr$ and $\delta^{18}O_p$ outlier in the Lankhills-specific database, but only when using the IQR outlier detection method. In the same vein, only one individual from Londinium, skeleton 400 from the Bishopsgate excavation (Shaw et al. 2016) was both a strontium and lead outlier, despite many individuals having questionable origins based on strontium analysis. Furthermore, one individual, skeleton 34245 from the Spitalfields Market excavation, has a significantly different $^{207}Pb/^{206}Pb$ composition than the bulk of the population, but a similar $^{87}Sr/^{86}Sr$ composition to the bulk of the dataset. As mentioned in the discussion, using expected ranges for $^{87}Sr/^{86}Sr$ isotope comparisons might lead to identifying fewer migrants, especially considering how often similar $^{87}Sr/^{86}Sr$ values are found in the biosphere of different geographic locations (Voerkelius et al. 2010). Therefore, for this dataset, all $\delta^{18}O_p$ outliers and the most commonly occurring Pb outliers will be considered,

Skeleton No.	Region	Possible Origin
LH 13	Lankhills	Pannonia or Eastern Europe
LH 55	Lankhills	Eastern Europe
LH 81	Lankhills	Pannonia or Eastern Europe
LH 118	Lankhills	Southern Hispania
LH 271	Lankhills	North Africa
LH 281	Lankhills	Germania or Italy
LH 351	Lankhills	Pannonia or Eastern Europe
LH 357	Lankhills	Eastern Europe
LH 426	Lankhills	Pannonia or Eastern Europe
LH 806	Lankhills	Southern Hispania
LH 1119	Lankhills	Eastern Europe
CBF 277	Catterick	Germania, Italy, or Northern Gaul
CBF 679	Catterick	Germania, Italy, or Northern Gaul
GLR 1216	Gloucester	Southern Hispania or North Africa
GLR 1546	Gloucester	North Africa
GLR 1518	Gloucester	Gaul, Southern Italy, Hispania, or Scotland
GLR 1561	Gloucester	Gaul, Southern Italy, Hispania, or Scotland
GLR 1541	Gloucester	North Africa
RE 25	York	Southern Hispania
TDC R38	York	Italy, Germania, Rhaetia, or Pannonia
TDC 411	York	Italy, Germania, Rhaetia, or Pannonia
TDC 608	York	Scotland or Central Gau
TDC 516	York	Southern Hispania
TDC 710	York	West Africa
MVC	York	Scotland or Central Gaul
6DRIF-9	York	Italy, Germania, Rhaetia, or Pannonia
DRIF-15	York	North Africa
DRIF-10	York	Germania Superior or Rhaetia
6DRIF-21	York	Southern Hispania
6DRIF-24	York	Germania Superior or Rhaetia
BG 400	London	Unknown
SM 34245	London	Unknown
GDS 325	London	Unknown
LW 803.6	London	Unknown
LW 695.5	London	Unknown
HS 652	London	Unknown
MS 724	London	Unknown
SBH 182	London	Unknown

Table 5.12: *Summary of all possible migrants to Lankhills, Gloucester, Catterick, York, and London from both within Britain and abroad.*

regardless of whether or not they are also $^{87}Sr/^{86}Sr$ outliers.

By these calculations, the individuals in table 5.12 are considered possible migrants based on their $^{87}Sr/^{86}Sr$, $\delta^{18}O_p$, or Pb values. This is a total of 38 individuals out of the 196 sampled (19.4%). Though this appears to be a rather large percentage of possible migrants, it is important to note that some of these individuals are considered "possible" migrants due to possible sources of error, the potential effects of breast feeding on isotopic values for teeth such as M1 and C, differential outlier detection methods, and the many pitfalls of comparing isotopic values of human dental enamel to that of local and global biospheres, especially in the case of $^{87}Sr/^{86}Sr$. As always, these results must be used in context with other, equally valuable sources of evidence such as burial location, grave goods, other skeletal assessments, and contemporary contextual information. All of this information will be explored and combined in the coming chapters.

Chapter 6

Epigraphy And Expressions of Diversity

Epigraphy remains one of the most plentiful forms of archaeological evidence in the Roman world. It is a piece of history that has quite literally been set in stone and, therefore, has been studied time and time again by both historians and archaeologists alike. Approaches to interpreting epigraphic evidence have changed over time in response to underpinning theoretical frameworks, but epigraphy has been consistently utilized as a means of understanding migration, social integration, identity, and diversity (Noy 2000; Carroll 2006; Eckardt 2014; de la Bédoyère 2015). The very nature of epigraphic evidence lends itself to these questions because it is a language-based custom, full of descriptive information about specific individuals. This is especially true in the case of epitaphs, which are engraved funerary commemorations. Epitaphs are by far the most plentiful form of epigraphic evidence (Noy 2000: 5). These tributes have the added social complexity of being personal commemorations in public spaces. Homages to the deceased remain outside the city limits by law, so they line the roads that lead to cities and towns such that anyone traveling around the Empire would see numerous examples along the way (Witcher 1998). In addition, building inscriptions frequently denote military units that helped with construction and make reference to the origins of those men. Futhermore, votive dedications to gods and goddesses found in temples and other sacred gathering places often maintain the name and origins of the commemorator. These origins can be stated explicitly or alluded to with smaller clues. These include use of a language other than Latin, dedication to a foreign cult, or use of a non-Roman praenomen or nomen (Birley 1980; Carroll 2006; Eckardt 2014; de la Bédoyère 2015). Because epitaphs include personal descriptions and are for public consumption, they maintain a delicate balance between the public and private identities of the commemorator or subject. For these reasons epigraphic evidence is essential to any study of migration, diversity, and social identity.

This section will analyze the works of past and current scholars in order to explore the successes and shortcomings of the field, as well as to identify the best means of utilizing epigraphic information in an interdisciplinary study. Then, this plan will be put into action by studying the inscriptions across Roman Britain that imply the geographic, ancestral, and ethnic origins of dedicators or subjects. The resulting database will help to understand the groups of people who were migrating to Roman Britain, why they were migrating, where in Britain they were passing through and settling, and whether or not future generations continued to identify as "foreign." The distribution of foreign and indigenous individuals will eventually be used to compare and contrast with the other strands of evidence being used in this project.

6.1 Background

Epigraphy was a popular strand of evidence in the study of migration and diversity in the late 1900s. In the 1980s and 90s in particular, the concept of 'Romanization' became increasingly utilized as a method for interpreting epitaphs at the time. 'Romanization,' is the idea that conquered peoples in the provinces of Rome aspired to be socially and culturally Roman (Haverfield 1905; Millett 1990). It was believed that these groups sought to abandon their cultures in order to reap the social and legal benefits of appearing, and, therefore, being, Roman. Haverfield (1905) pioneered this movement with his book The Romanization of Roman Britain. In fact, he claimed that the second greatest achievement of the Empire was the "assimilation of the provincial populations in an orderly and coherent civilization" (Haverfield 1905). Some primary texts also refer to this idea. Notably, Tacitus' *Agricola* describes Agricola's efforts to "civilize" the population of Britain after conquest:

> The following winter passed without disturbance, and was employed in salutary measures. For, to accustom to rest and repose through the charms of luxury a population scattered and barbarous and therefore inclined to war, Agricola gave private encouragement and public aid to the building of temples, courts of justice and dwelling-houses, praising the energetic, and reproving the indolent. Thus an honorable rivalry

> took the place of compulsion. He likewise provided a liberal education for the sons of the chiefs, and showed such a preference for the natural powers of the Britons over the industry of the Gauls that they who lately disdained the tongue of Rome now coveted its eloquence. Hence, too, a liking sprang up for our style of dress, and the "toga" became fashionable. Step by step they were led to things which dispose to vice, the lounge, the bath, the elegant banquet. All this in their ignorance, they called civilization, when it was but a part of their servitude (21.1-2 Trans. by Sara Byrne).

The concept of 'Romanization' eventually dominated the rhetoric in epigraphic studies because it was a clean explanation for the adoption of the epitaph in conquered communities that had not had a custom of setting up inscribed stone memorials prior to the Roman conquest. Elizabeth Meyer, for example, writes that the "epigraphic habit," a term coined by R. MacMullen (1982), became so popular to the conquered people of Roman provinces because these people had "a belief in the value of Romanization" (Meyer 1990: 74). She argues that Roman funerary inscriptions are the evidence of a legally binding contract between the deceased and his or her inheritor. Since only Roman citizens were legally allowed to write a last will and testament, an epitaph is a sign to the reader that the deceased was a Roman citizen (Meyer 1990: 76). Meyer's arguments, therefore, rely on the assumption that provincial people and foreign migrants to the city of Rome "imitated" this Roman custom because they undoubtedly coveted becoming "Romanized" (Meyer 1990: 78). Tacitus and Haverfield (1905) convey similar sentiments. They rely heavily upon the viewpoint of the conqueror and portray Romanization as a gift from the Romans to the provincial people.

Also in 1990, Martin Millett wrote *The Romanization of Britain*, a text that continued the use of the term "Romanization," but reevaluated its definition. Though Millett (1900: 1) argues for the theory of Romanization, he claims outright in his introductory chapter that his aim is to break away from the common interpretation that Romans were the "pure" culture bestowing their civilized ways upon the provincial barbarian. Instead, he hoped to view Romanization as a "synthesis" of cultures. While his aims are valid, he falls short by concluding that the archaeological evidence proves that the process of Romanization was motivated by indigenous Britons who wanted to emulate Roman society in order to elevate their own social standing Millet 1990: 212). One of Millet's (1990) prime examples is the relative lack of Britons catching on to the "epigraphic habit." He claims that this is not due to a shortage of wealth, but actually evidence that the structure of power was already well-defined within these indigenous tribes and therefore it was unnecessary for individuals to use this decidedly Roman technique to elevate themselves (1990: 82). Though the indigenous Britons in this case are no longer portrayed as inactive receptors of Roman culture, this theory ignores the fact that there are other important factors in culture assimilations, such as literacy (or lack thereof) (Carroll 2007) or simply a desire to maintain one's own customs. Claiming that the epigraphic evidence proves that Romanization was fueled by the indigenous population ignores many other possibilities.

In the late 1990s, it is clear that a shift in interpretation of epigraphic evidence was taking place. The use of "Romanization" as a theory for post-migration cultural changes declined significantly. As the idea of colonialism in the modern world lost moral traction, scholars began to see it as an equally complex phenomenon in the past (Hingley 1996: 40). G. Woolf (1996), for example, criticizes Meyer's (1990) argument directly by pointing out that epigraphy's correlation with the concept of "Romanization" does not necessarily equal causation. He points out that both Meyer's (1990) and MacMullen's (1982) arguments rely on urbanized communities in the provinces, but that there are areas, such as Numidia and the Rhineland that are distinctly "under-urbanized" but have a plethora of epigraphic evidence due to military presence (Woolf 1996: 23; Carroll 2006). Macdonald (1998) expands upon this idea in "Some Reflections on Epigraphy and Ethnicity in the Roman Near East" by aiming to exhibit that epigraphy is a more complex occurrence because each inscription is steeped in ethnicity and identity. Though the paper is largely concerned with monument and graffiti-like inscriptions in the Roman Near East—an area of the Roman Empire that will not be explored in the data collection for this dissertation—he makes many insightful points about the nature of studying epigraphic evidence that show how attitudes towards the concept of "Romanization" have begun to change significantly. Contrary to the Meyer's (1990) paper, which hastily drew conclusions about Romanization being evident in funerary inscriptions just by the mere fact of their existence, Macdonald (1998) takes a more cautious approach to making broad conclusions about a society from epigraphic evidence alone. He strays the most from the model set by his earlier colleagues in his section on the connection between epigraphy and ethnicity. He states that ethnicity is "a matter of perception" because it is defined both by the individual in question and those experiencing contact with said individual, and that it is likely that the individual and the observer may not agree on the ethnic category in which the individual belongs (Macdonald 1998: 181-182). Macdonald's (1998) approach differs because he presents ethnicity as a complex and fluid phenomenon.

Later epigraphic studies used epitaphs as more than simply evidence of identity or Romanization. Many recent works use epigraphy to comment on migration and diversity as well. For example, Noy (2010) explores how non-Roman identities can be inferred from epitaphs and what that means with regards to migration. Noy (2010) focuses on the epigraphic footprint of migrants to the city of Rome. In the first chapter, he fully discloses the limitations of epigraphic evidence. These limitations include the fact that not all foreigners are identified as such on their epitaphs, that the commemorator of the epitaph may have misperceived the deceased's ethnicity, or that the deceased had originated from an area that he or she did not identify with culturally (Noy 2010: 6). His approach to analyzing these epitaphs is quantitative. He determines the number of migrants represented from each foreign location, whether they are military or civilian, their gender, their religious affiliations, and their ages. Each of these categories can be cross-referenced with another. Noy (2010) also has a systematic approach to determining which foreign groups are identified on epitaphs in Rome, be that they are connected by place of origin, culture, or religion. From these numbers he determines that Jews are the most likely of any group to maintain their Jewish identity in funerary commemoration, which could indicate that they also apply the same outward expression of ethnicity in their daily lives (Noy 2010: 287). He admits, however, that most of these epigraphic sources seem to be from first-generation immigrants (Noy 2010: 287), which is very significant in interpreting ancient experiences from epitaphs because it could indicate that second-generation immigrants were more likely to emphasis appearing "Roman." Noy's (2010) approach is commendable because it generates a body of empirical data that enables valid explorations of the social implications of diversity for the population at hand.

These studies show that epigraphy can be a useful tool in answering questions relating to migration, diversity, and identity. However, there are limitations in the extent to which a valid realistic picture of past diversity can be created. The use of rigid categories of identity in the manner of those who would argue for the existence of "Romanization," does not allow for a nuanced or inclusive interpretation of the diverse epigraphic evidence. One must be open to the idea that origins, cultural ties, and expressed identities are not fixed properties in each human's life. Furthermore, it is essential to take into account certain biases in the epigraphic record, such as the fact that the poor are unlikely to afford funerary commemoration (Carroll 2006: 279; Carroll 2007/2008), or that the commemorator may have misjudged the deceased's birthplace or ethnicity (Noy 2000: 5). There are also regional differences in the epigraphic record such as the relative lack of epitaphs in Roman Britain (Woolf 1992: 24). And, of course, there is the bias of survival, which leads scholars to believe that epigraphy was rare in areas in which the evidence may not have survived (Mann 1985: 205). Despite these limitations, epigraphic evidence remains vital to the study of migration and diversity as it provides a rare insight into how individuals perceived the ethnicity of themselves and others.

6.2 The Current Project

Britain, unfortunately, retains a mere fraction of the epigraphic evidence one might find in Italy and other Roman provinces. However, Britain still holds over 3,500 examples of well-preserved and well-documented inscriptions. At the moment, 2,400 are translated and available for study through the Roman Inscriptions of Britain print and online databases (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). The information each inscription contains helps identify ethnic, ancestral, and geographic origins of the dedicators or groups of dedicators, where applicable. These indications include place names, tribal affiliations, and non-Roman names, which are explained in greater detail below. Using these parameters, 511 examples were found to mention foreign or indigenous origins. The resulting data was then used to discuss the distribution and frequency of foreign and indigenous ancestral groups across Roman Britain, spanning from ca. 43 BC to AD 410 (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). It must be noted that only 105 (20.55%) of these inscriptions could be definitively dated. While specific dates could not be pinned down for the majority, they still provide a rich history of social, ethnic, and ancestral origins in Roman Britain.

6.3 Materials and Methods

This study makes use of the Roman Inscriptions of Britain database, as well as literature by E. Birley (1938, 1951, 1966), A. Birley (1980), Eckardt (2014), de la Bédoyère (2015), Elton (2013), Haynes (2016), Keightley (1837), Mattingly (2007), Richmond (1940), Salway (1965), and the notes from the Roman Inscriptions of Britain (RIB) database (Roman Inscriptions of Britain 2017) to identify which of these 3,500 inscriptions mention ethnic, ancestral, or geographic affiliations and origins. The markers used to identify these types of inscriptions include: explicit place of origin stated in the text, an individual's name etymology, the mention of a cohort recruited from another province, dedications and votive offerings to both foreign and indigenous deities, explicit statements of voting-tribe affiliations (which are tied to geographic origins), and any use of a foreign language. These parameters helped to identify 511 inscriptions that reveal a person or group's foreign or indigenous identity.

The first parameter is fairly self-explanatory. If an individual explicitly stated his or her origins, either geographic or ethnic, he or she was included in the database. There are a number of ways in which this is expressed in epigraphy. Some formulae indicated that a person migrated from another area, but his or her ethnic or ancestral connection to this place is uncertain. This can occur as "*ex... domo*," such as "*ex Africa domo*" (*RIB* 783), meaning "from Africa," or "*ex Italia domo Brixia*" (*RIB* 1686), meaning "from Brixia in Italy." Similarly, "*natus*," meaning "born in," was another indication of migration. For example, A. Alfidius Olussa was "*na(tus) Atheni(s)*," or "born in Athens (*RIB* 9). Conversely, some inscriptions more specifically highlight ancestral or ethnic origins. This was often expressed using "*civis*," meaning "citizen of." For example, the dedicators of *RIB* 2148 are "*cives Italici et Norici*," meaning "citizens of Italy and Noricum." "*Civis*" is also used to express citizenship in smaller groups or tribes. For instance, a man named Carinus was identified as "*civi Domnonio*," a citizen of the Dumnonii tribe of south-west Britain (*RIB* 188). The use of the word "*natione*" is even more indicative of ethnic origins. It is often translated as "race," such as in the case of Flavius Helius, whose epitaph reads "*natione Grecus*" (*RIB* 251). The translators at RIB interpret this as "a Greek by race" (Roman Inscriptions of Britain 2017). It can also be translated as "tribe," or as "member of" a certain tribe, as in the case of Mettus in *RIB* 136. He is "*nation(e) Geta*," which is interpreted as "a Getan tribesman" (Roman Inscriptions of Britain 2017).

Expressing membership in a foreign military cohort was also considered an indication of migration. A Roman cohort is comprised of about 800 men, and the name of the cohort implies that, originally, recruiting for this particular cohort took place in a certain province (de la Bédoyère 2001). For example, the First Cohort of Dacians is attested in 27 inscriptions across Roman Britain (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). It is unknown how many of these men at the time of each inscription were recruited from Dacia, but it can be assumed that at least some were of Dacian descent. It must be noted that there is a great deal of overlap in these first two categories. For example, an inscription might include the name of a specific individual and his origins, as well as the origins of the men in the cohort that he belonged to. These could be the same origins, or entirely different. For instance, Sextus Valerius Genialis, a trooper in the Cavalry Regiment of Thracians, in which men were recruited from

Thrace, is identified as a Frisiavonian tribesman, which is a Germanic tribe, in his epitaph (*RIB* 109). More commonly, the prefect or centurion, who is the head of a military unit, identifies his own place of origin, which is often different from that of his men. Based on the data collected in the present study, it appears that it was especially common for the prefect of a cohort to come from Italy, whereas the men were recruited from a different province, as in the case of Lucius Coesius Frontinus, from Parma in Italy, who was the prefect of the First Cohort of Thracians (*RIB* 733) (Holder 1992; Birley 1979).

Furthermore, it is unclear how many woman and children accompanied the recruited men. In the past, the possible presence of women and children in military contexts was not widely studied as there was an official ban on common soldiers marrying (Allison 2006). This ban was lifted by Septimius Severus in AD 197, but it seems that many soldiers did have illicit wives and families accompanying them but living outside the fort (Allison 2006; Phang 2001). Additionally, it is assumed that this ban did not apply to centurions, who were often commemorated by wives upon their deaths in active service (Phang 2001). Furthermore, there is ample evidence to suggest that commanding and senior officers had living spaces within the fort that could—and did—accommodate their wives and children (Allison 2006). Therefore, the number of immigrants could be much larger if many soldiers are bringing their families with them. From epigraphic evidence collected around the Mediterranean, it seems that about one third of active soldiers who died in service had funerary commemorations commissioned by wives (Scheidel 2007). Overall, exact numbers cannot be collected, but some level of foreign migration and/or descent can be assumed from the title of a cohort.

The next parameter used for determining diversity is name etymology. Works by A. Birley (1980), Eckardt (2014), and de la Bédoyère (2015) were resources in determining if an individual had a foreign- or indigenous-sounding name. Based on roots, prefixes, and suffixes, it is possible to estimate the origins of an individual. For example, the suffix "-rix," or "-rex," is common in Celtic names (Birley 1980: 112), and the prefixes "Sen-" and "Bell-" are common in Latinized Briton names, because they are indicative of prefixes for common indigenous names (Birley 1980: 18). Some examples include the epitaphs for Morirex and Rianorix, both classified as Celtic names by A. Birley, found in Maryport, England (*RIB* 861 and *RIB* 862) (Birley 1980: 112), or the dedication to the goddess Coventina by Bellicus, which is a Latinized Celtic name (*RIB* 1522) (Birley 1980: 18). In addition, several names are more common in certain parts of the Empire. For instance, Eckardt (2014: 74) identifies the name "Castus" and all of its derivatives as being a traditionally African name. Therefore, Casta Castrensis (*RIB*

112) and Julia Casta (*RIB* 113), who both died in Cirencester, were identified as African. Plenty of names were also blatantly Greek, such as Aufidius Eutuches (*RIB* 143), a freedman living in Bath who took his ex-owner's praenomen and retained his own Greek *nomen*. There is also Hermes (*RIB* 195) living in Colchester, Demetrius (*RIB* 663) living in York, and Hermogenes (*RIB* 461) a doctor living in Chester, England who even wrote his dedication in Greek, which would indicate that there were other Greeks in Britain who were able to read this inscription.

Certain names were more ambiguous, such as Satrius Honoratus, a 5-year-old child who died in Risingham (*RIB* 1248). Satrius is an Etruscan name and Honoratus is a popular African name (Eckardt 2014:73), making the ancestry or ethnicity of this individual inconclusive, but ultimately foreign. Another name in the ambiguous category would be "Peregrinus" and its derivatives. The word "peregrinus" is a Latin adjective, meaning foreign or exotic (Morwood 2005). Some inscriptions use the word in its intended adjective form to describe a guild of foreigners living in the area, such as *RIB* 69, 70, and 71 from Silchester. Others depict names that contain a derivative of the word. These include: Peregrinus, a man who describes himself as a Treveran (*RIB* 140), Flavia Peregrina, wife of the deceased Crotus (*RIB* 620), Gaius Cornelius Peregrinus, a man from Saldae in Mauritania (*RIB* 812), and a centurion named Peregrinus whose name is inscribed on a century stone along Hadrian's wall (*RIB* 1347 and 1376). When lacking other identifying factors, names such as Peregrinus or Satrius Honoratus are simply described in the database as being likely foreign. In addition, all of the etymology-based assumptions have a level of ambiguity. It is uncertain if these people were migrants, descendants of settled migrants, or simply traveling merchants who died on foreign soil.

Some individuals used voting-tribe affiliations to indicate their citizen status, but these tribes also have a direct correlation with place of origin, so these inscriptions contain evidence of migration and foreign origin. During the Republic, Rome was originally divided into 21 voting districts (*tribus*) based on the private residences of male citizens (Ross Taylor 1960). These districts were called "voting-tribes" Four of these voting-tribes, Collina, Esquilina, Palatina, and Suburana, were urban, and therefore comprised citizens who lived within the city limits of Rome. The seventeen original rural tribes were Aemilia, Camilia, Claudia, Clustumina, Cornelia, Fabia, Galeria, Horatia, Lemonia, Menenia, Papiria, Pollia, Pupinia, Romilia, Sergia, Voltinia, and Voturia. These rural tribes represented the areas of Italy that were conquered by Rome but were not part of the city proper (Ross Taylor 1960: 35-45). As Rome conquered and acquired more land, this land was either assimilated into an existing voting-tribe, or a new tribe was created (Ross Taylor 1960: 3). Eventually, fourteen more rural tribes were added. These were: Stellatina, Tromentina, Sabatina, Arnesis, Pomptina, Poblilia, Maecia, Scaptia, Oufentina, Falerna, Aniensis, Teretina, Quirina, and Velina, in order of their establishment (Ross Taylor 1960: 47-68). All of these tribes have their origins on Italian soil. After 241 BC, no new tribes were added, making the final count 35 official voting-tribes (Momigliano and Cornell 2016).

In the late Empire, the geographic component of these tribes became less important. For example, a son could inherit his father's voting-tribe membership regardless of his own residence (Nicolet 1991: 190). To make matters even more complicated, as the Empire acquired more provincial territories, voting-tribe membership was more or less arbitrarily assigned to new citizens, as well as entire communities of new citizens (Nicolet 1991: 190). Some voting-tribes were more common in certain provinces. For instance, the Voltinian voting-tribe was assigned to most new citizens in Gallia Narbonesis (Momigliano and Cornell 2016). Therefore, someone like Decimus Capienus Urbicus, who identifies as part of the Voltinian voting tribe could be a naturalized citizen from Gallia Narbonesis (*RIB* 525). The same can be said of individuals from the Collina and the Quirina voting tribes, as these were popular in the eastern provinces (Momigliano and Cornell 2016). However, most provinces do not have such a well-documented history of voting-tribe appointment. In fact, it seems that around the time of Augustus and later, the significance of voting-tribes was considerably diminished outside the city of Rome (Nicolet 1991: 198). They were still a necessary component in voting, but now more a symbol of citizen status, rather than a marker of geographic or ancestral origin (Nicolet 1991: 198). Therefore, it is difficult to assign a place of origin or an ancestry to the individuals that include it in their inscriptions. However, voting-tribe affiliation is, nonetheless, a marker of a citizen, and becomes legally part of that citizen's name. As it this is a significant tie to Rome's ancestral origins, it is important to note which individuals chose to include that information in their inscription.

The next category contains votive inscriptions to foreign or indigenous gods and goddesses. Examples of indigenous gods and goddesses can be problematic. There are a number of local deities that are equated with Roman deities. Military men passing through often dedicated to local versions of Roman gods and goddesses. For example, many military officials dedicated to Apollo Maponus, or simply Maponus, the northern British version of the Roman god Apollo. Quintus Terentius Firmus, for example, who was from Saena in Italy and of the Oufentine voting-tribe, prefect of the Sixth Legion Victrix Pia Fidelis, made a dedication to

Apollo Maponus in Corbridge (*RIB* 1120). Clearly, this man is a Roman citizen from Italy, and not indigenous, despite his choice of deity. This is the case for a number of local gods and goddesses, which indicates that it was the custom to tweak a dedication based on one's current location. Therefore, inscriptions in which the only form of evidence includes a Roman version of a local deity are not included in the database. However, distinctly foreign and indigenous deities that are combined with other forms of evidence, such as name etymology or tribal affiliation, are included. For example, Belatucadros was a deity worshiped in northern Britain (MacKillop 2004). Prefects and other Roman army officials tended to dedicate to Mars Belatucadros (*RIB* 918), but there are a few examples of individuals with local-sounding names that dedicate simply to Belatucadros (*RIB* 773, 774, 887, 888; Birley 1980). These individuals were clearly not Roman, based on their names, and their omission of the Roman counterpart to Belatucadros indicates that they were not religiously affiliated with the men of the Roman army. Therefore, they are included in the database as "indigenous." There are also ample examples of indigenous Britons who explicitly state their ancestry and dedicate to their own gods and goddesses. For example, there is inscription commissioned by the "Assembly of the Textoverdi," a local tribe in Vindolanda, which is dedicated to Sattada, their local goddess (RIB 1695). Straightforward examples such as these allow for a positive estimation of the dedicator's ethnic origin.

There are also examples of gods and goddesses from other provinces, a great deal of which were dedicated by foreign recruited soldiers that were sent to Britain. For instance, the prefect of the First Cohort of Hamians from Palmyra dedicated an inscription to the Syrian Goddesses (*RIB* 1792). There is also Hnaudifridus, who has a Germanic name and who dedicated his inscription to Alaisiagae, Baudihillia, and Friagabis, Germanic goddesses attested in Germany (*RIB* 1576). Some cases are less straightforward. *RIB* 1777 is dedicated to Epona, the Gallic goddess of horses (MacKillop 2004), but there is no surviving name and no other identifying factor that would lead to positively identifying the dedicator of this stone as Gallic. On the other hand, dedications to this goddess are exceedingly rare in Britain and, for the most part, she is considered to be only worshipped on the continent (MacKillop 2004). Therefore, this dedicator was listed as "possibly Gallic" in the database. The same goes for Marcus Senecianius V[...], who has the tria nomina of Roman citizenship and a decidedly Latin name that betrays no vestiges of his possible ancestry. He, however, dedicates his inscription to "German Mother Goddesses" (*RIB* 2064). Therefore, he is classified as "possibly German" in the database. Others still are mostly inconclusive. Marcus Minicius Audens, another Latin tria nomina, dedicated his inscription to "The African, Italian, and

Gallic Mother Goddesses" (*RIB* 653). Another, commissioned by Aurelius Juvenalis, is dedicated to "the mother goddesses of his foreign land" (*RIB* 1318). For both of these inscriptions, and others like it, the least presumptuous option was to classify them as "foreign."

The final parameter, and the least frequent, was the use of a foreign language. There are only ten examples of this throughout Roman Britain. Eight of these are written all in Greek, another one, *RIB* 706, is in Greek but also includes a second script of unknown origin, and the last, *RIB* 1065, is in Latin with one line of Palmyran script below the funerary commemoration. These Greek inscriptions often include other implications of Greek heritage. For example, some are also dedicated to Greek gods and goddesses, while others are dedicated by individuals with Greek names. These well-evidenced examples can be classified as Greek without problem. Two of the nine Greek inscriptions (*RIB* 241 and 706) have no other identifying factor other than the use of Greek in the text. These are classified as "possibly Greek," owing to the fact that Greek was widely spoken throughout the Roman Empire.

As seen above, there are many inscriptions that have more than one indication of migration or diversity. Sometimes this clarifies the origins of the dedicator and other times it complicates classification. Hurmius and his father Leubasnus both have Germanic names. In addition, Hurmius is the beneficiarius of the prefect of the First Cohort of Tungrians, who were recruited from Gallia Belgica (*RIB* 1619). So, it was clear that all of the people represented in this epitaph, Hurmius, his father, and his cohort, could be classified as Belgic. Some inscriptions have two different classifications, especially when a prefect or tribune has a different origin than that of his cohort. For example, Gaius Quintis Serverus, who has a Latin name, is tribune of the First Loyal Cohort of Vardullians, Roman citizens (RIB 2118). Gaius himself was from Ravenna, Italy, but the men in his cohort were recruited from Spain. Therefore, this inscription has two definite, but different, origin classifications. On the other hand, there is Pomponius Donatus, who has an African name (Eckardt 2014: Appendix 3), who dedicated his inscription to "the Mother Goddesses Ollototae," who are Germanic (*RIB* 1030). In this situation, one can only guess that Pomponius was either possibly African, possibly Germanic, or contained links—whether genetic or not—to both areas.

These parameters helped to create an overall ethnic or geographic origin for each individual, which are all outlined in the final column of the inscriptions database (Appendix D). These origins are displayed as adjectives, rather than nouns. For example, instead of saying that a person is from Africa, the term "African" is used, because it can be used to describe both geographic and ethnic origins. If there are two separate identities within one inscription, such as in cases of multiple individuals commemorated together in one context, these are separated with a comma, whereas if one person could be from two different origins, those origins will not be separated by a comma. For example, *RIB* 109 is classified as "Germanic, Thracian" to indicate that there are two distinct origins. On the other hand, *RIB* 1030 is classified as "Germanic? African?" because the single individual represented in this inscription could either be Germanic or African, but neither classification is definitive and, in these cases, it is possible that the individual considers his or herself to be a representative of either one or both ethnicities. In the same light, any other questionable origins are also qualified with a question mark. These overall classifications aid in exploring the distribution of diversity across Roman Britain and attempting to quantify the willingness of inscription subjects to display their diversity.

6.4 Results

These methods indicated 511 inscriptions throughout Britain that allude to foreign or indigenous identities (Appendix D). Overall, these inscriptions suggest that there were local/indigenous, Italian, Roman, Gallic, Germanic, African, Greek, Etruscan, Spanish, Dalmatian, Syrian, Thracian, "Celtic," Pannonian, from Asia Minor, Norican, Raetian, Persian, Belgic, Mauritanian, and Dacian people spread throughout the province. Of these 511 inscriptions, 276 (54.01%) were dedications or offerings to gods or temples, 163 (31.90%) were epitaphs, 66 (12.92%) were inscribed building stones to denote work completed or commissioned by specific individuals, 7 (1.37%) were of unknown type and just one (0.20%) was a curse tablet. As for the foreign or indigenous parameters, 221 (43.25%) were identified by their name etymology, 336 (65.75%) by their place of origin, 219 (42.86%) by the mention of a foreign recruited cohort, 105 (20.96%) by votive offerings to foreign or indigenous deities, and 64 (12.52%) by their voting tribe affiliations (table 6.1). It is important to note that these parameters will not add up to 511 or 100% because many inscriptions featured more than one identifying factor, but the inscription itself is only counted once.

Before discussing specific results, one problematic category must be identified. This group includes all inscriptions in which the dedicator or subject is identified as "Celtic" or "possibly Celtic." The earlier "Indigenous" and "Gallic" categories do not include individuals with Celtic-sounding names, as it is unclear whether authors mean Celtic from Gaul or Celtic from Britain. Because the word Celtic is used to describe a set of languages and groups of people across continental

Inscription type	No. of instances	Freq. of instances
Temple offerings	276	54.01%
Epitaphs	163	31.9%
Building Stones	66	12.92%
Other/Unknown	8	1.57%

Table 6.1: *Types of inscriptions that mention or allude to foreign origins and their frequencies*

Europe (especially Northern Gaul) and pre-Roman Britain (as well as some post-Roman groups of Britain and Ireland), authors often use it as a catchall term for both British and Gallic people (Cunliffe 2018). A. Birley (1980), de la Bédoyère (2015), and Elton (2013) classify 38 inscriptions from this database as "Celtic" and 8 more as "possibly Celtic." Unfortunately, there is no further information as to what these authors mean by "Celtic." For example, Birley refers to both indigenous Britons as "Celts" and the "Celtic aristocracy of northern Gaul" (1980: 11-12) in the same paragraph. Because no further information can be gleaned at this point in time, these inscriptions will remain classified as "Celtic" until a more definite estimation can be put in place.

The largest ancestral and geographic group comes from Germania, or the German provinces of Rome, with 105 definite mentions of, or allusions to, Germanic origins and an additional 9 inscriptions that have "possibly Germanic" dedicators and/or subjects. Of these 105, 66 are mentions of cohorts recruited from Germania Superior and Germania Inferior. Many of these cohorts are identified as men from even smaller groups and tribes throughout Germany, northern Gaul and the Alpine regions. These tribes include: Tungrian, Frisian, Marsacian, Raetian, Frisiavonian (also spelled Frixiavone), Baestian, Batavian, Cuberian, Vangione, and Thruponian. Some of these cohorts, such as the cavalry regiment of Tungrians, are only mentioned in one inscription in all of Britain (*RIB* 2140). Others have multiple mentions, such as the First Cohort of Batavians, who are featured in 9 inscriptions from Carrawburgh and one from Carvoran (*RIB* 1534-6, 1544-5, 1553, 1559-60, 1562, 1823). Dating on three of these indicates a span of nearly 40 years of occupation in Carrawburgh by the First Cohort of Batavians from AD 198-237 (*RIB* 1544, 1545, 1553). Six others are dedicated by different prefects, which would indicate that the cohort resided in Carrawburgh for even longer, since only one prefect oversees a legion and, therefore, a cohort (de la Bédoyère 2001: 235).

There are similar results for the First and Second Cohorts of Tungrians and the First Cohort of Vangiones. The first Cohort of Tungrians is featured in 9 inscriptions from Housesteads, a Roman fort along Hadrian's Wall, under five different prefects, indicating that they were stationed on the Wall for a significant period of time (Bowman 1983). The First Cohort of Vangiones is mentioned in 9 different inscriptions across Benwell, Risingham, and Chesters under 7 different prefects. Finally, the Second Cohort of Tungrians had 8 inscriptions, four of which were dedicated by different prefects (*RIB* 2094, 2100, 2104, and 2108). Interestingly, two of these were dedicated the entire group of men in the cohort, not by any one person in particular (*RIB* 2092, 2107) and one was dedicated by a solitary soldier (*RIB* 2109). Both of these scenarios are relatively rare in Roman Britain.

There are other sites that feature multiple inscriptions from the same Germanic cohort, but the same assumption of increased time or occupation at these locations cannot be implied. For example, the First Cohort of Frisiavonians is mentioned in three inscriptions in Chester, England and one in Melandra Castle (*RIB* 577-579 and 297). Though each of these inscriptions mentions a different centurion, it is standard to have five double centuries (of 160 men each) in a cohort, there are also five centurions in a cohort (de la Bédoyère 2001). Since a cohort can maintain five centurions at once, no passing of time can be implied from these inscriptions. The same principle applies to all of the locations in which there is only one mention of a Germanic cohort. Though it is certain that some number of Germanic individuals were in that location at one time, it is unclear if this cohort and their families settled in these locations or moved on quickly.

In addition to mentions of cohorts recruited from Germanic tribes, there are also 25 individuals with Germanic names and 24 who explicitly state their Germanic origins (Appendix D). Many of these inscriptions include both a Germanic name and a mention of origins, such as Maduhus (Birley 1980: 95) who calls himself a German (*RIB* 1526), or Venenus (Birley 1980: 104), who also calls himself a German (*RIB* 1449). Unlike Germanic cohorts, each of these inscriptions represents only the origins of the individual in question. This does not include the 4 inscriptions that were commissioned by groups of Germanic people. *RIB* 883 was commissioned by the "Frisians of Aballava," meaning the Frisian people (from northern Gaul, modern Netherlands) living in the Aballava Roman fort in modern Burgh-by-Sands, England. *RIB* 1538 is dedicated by the "Texandri and Suvevae" men, which are both Germanic tribes, serving in the Second Cohort of Nervians. Finally, *RIB* 1593 and 1594 are dedicated by "The Germans, being tribesmen of the Twenthe," (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). Finally, there are 14 mentions of Germanic deities, most of which are either mother goddesses, or the two Alaisiagae goddesses, Baudihillia and Friagabis (*RIB* 88, 1030-1, 1576, 1594, 2064, 2135).

The next most populous group is those with connections to Gaul. There are 69 mentions of Gallic origins. 46 of these are Gallic cohorts stationed throughout Roman Britain. These include the First, Second, and Fourth Cohorts of Gauls, as well as cohorts and cavalry regiments recruited from the Aquitani, Voconti, Lingones, and Nervii tribes. Unlike the Germanic cohorts, there were never more than three mentions of one Gallic cohort or regiment in the same place. The only cohort that showed evidence of being settled in one area was the Second Cohort of Gauls. There are three inscriptions of this cohort in Old Penrith, England (*RIB* 915, 917, 929). Each of these inscriptions includes a possible date range and two out of three include the names of the prefect (*RIB* 917 and 929). Therefore, it is possible to conclude that the Second Cohort of Gauls was settled in Old Penrith between AD 178 and AD 249, under the charge of at least two different prefects. The other Gallic cohorts have a wider dispersion of inscriptions. For example, the Fourth Cohort of Gauls is mentioned in both epitaphs and dedications in Templebrough (*RIB* 619-20), Risingham (*RIB* 1227 and 1249), Vindolanda (*RIB* 1685-8), Dumfries, Scotland (*RIB* 2062), and Castlehill (*RIB* 2195). This would indicate that the Gallic cohorts were far more mobile than the Germanic cohorts.

While 16 of the 69 Gallic individuals were identified by their place of origin, only four were identified by Gallic name etymology (*RIB* 262, 1252, and 1882-3). This is most likely caused by the 46 individuals classified as being Celtic or "possibly Celtic" by name etymology (Birley 1980; de la Bédoyère 2015, Elton 2013). As mentioned above, the term "Celtic" is especially problematic because many authors use it to describe ancient Britons, ancient Gauls, and sometimes ancient Germans, as well as the languages they speak (Collis 2003; Cunliffe 2018). It is certain that at least some of the individuals classified by their name etymology as "Celtic" would have been identifiable to the ancient reader as Gallic, but these cannot be quantified without further information. Therefore, only the four inscriptions with definite Gallic names can be used. Finally, there are seven dedications to predominately Gallic gods and goddesses. However, two of these (*RIB* 88 and 653) are dedicated to the mother goddesses of many provinces, including Germania, Italy, Gaul, Britannia, and Africa. Another three of these inscriptions have questionable connections to Gaul. Peregrinus, who dedicated to Loucetius Mars and Nemetona, both predominate in northern Gaul and sometimes in Britain (MacKillop 2004), identifies himself as a Treveran, whose tribal area was in Gaul on the Moselle river (*RIB* 140). Next, the First Cohort of Hamians, from Palmyra, Syria, dedicate to Mars Camulus, who is also popular in

Northern Gaul (*RIB* 2166, MacKillop 2004). Finally, a man named Scricus, which the RIB translators interpret as being a Greek name (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017), dedicated to Mars Rigas, another Gallic god (*RIB* 711, Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). This undoubtedly complicates giving each person one single estimated origin, but it also speaks to the richness and complexity of identity.

Definite Spanish origins are mentioned in 55 inscriptions. Of these 55, only five have Spanish-sounding names, but 52 describe Spanish places of origin. 44 of these inscriptions are associated with the military. The cohorts include: the Cavalry Regiment of Vettonians, the First Aelian Cohort of Spaniards, the First Cavalry Regiment of Asturian Spaniards, the First Cohort of Asturians, the First Cohort of Spaniards, the Second Cavalry Regiment of Asturians, the Ninth Legion Hispania, and the First Loyal Cohort of Vardullians, who frequently describe themselves as being Roman citizens. These cohorts tend to have a concentration of inscriptions in one specific area. For example, nine of the ten inscriptions that mention the First Cohort of Spaniards were discovered in Maryport *RIB* 814-817, 822, 823, and 827-829. The tenth was discovered nearly 150 miles away in Ardoch, Scotland *RIB* 2213. The dates on the inscriptions from Maryport span from AD 123-135, indicating that the cohort remained there for at least 12 years. The First Loyal Cohort of Vardullians is attested in five different inscriptions in High Rochester dated from the first of January AD 220 until AD 241. They, however, also dedicated one inscription each in Castlecary, Lanchester, Corbridge, and along Hadrian's Wall (*RIB* 2149, 1076, 1128, and 1421, respectively), indicating some level of mobility.

Nine individual men also claimed Spanish origins in their epitaphs and personal dedications. These include Clunia, Emerita, Corduba, Lucus, and Salaria. Emerita is the most frequently represented with three Roman citizens hailing from that area (*RIB* 492, 501, and 502). Interestingly, all but one of these nine men appears to be a Roman citizen, with seven claiming voting-tribe membership. The ninth, Caecilius Avitus, does not have a tria nomina or an association with a voting-tribe (*RIB* 492). All of inscriptions in which the subject declares Spanish origins were discovered in Chester. An additional 4 examples have possible Spanish origins. Two of these possibly Spanish dedications feature Sulpicius Secundianus (*RIB* 2057-8), whom Birley (1980: 68) suggests has a Spanish name. The remaining two are commissioned by Paulus Postimius Acilianus (*RIB* 847 and 850). Birley (1980: 69) is certain that this prefect is connected with an attested procurator of the same name from Cordova. As this cannot be certain, Acilianus maintains the label "possibly Spanish" in this database.

Italian origins are recorded in 32 inscriptions. Of these, only five have dedicators with Italian or Etruscan name etymology. The rest all explicitly give a place of origin within Italy. These individuals come from Pisaurum, Faventia, Pollentia, Vicetia, Augusta, Veii, Cremona, Brixia, Camerinum, Saena, Sardinia, Ravenna, Novaria, Parma, the Taurine district, and the city of Rome. 15 of these men also incorporate their voting-tribe affiliation in their dedications. These tribes include: Aniensian, Camilian, Claudian, Fabian, Menenian, Oufentine, Sergian, Stellatine, Trometine, and Ultinian. There are a few inscriptions of note. There is *RIB* 184, an epitaph to Respecta from Rome, which remains the only example of a person specifically from the city of Rome residing in Roman Britain. *RIB* 2084 and 3383 are dedicated by Vesuvius Rufus and Ulpius Volunsenus, respectively, who both possess distinctly Etruscan names (Birley 1980: 76-7). Finally, *RIB* 680 commemorates the deceased Gaius, who came from Novaria, Italy, but served as a soldier in the Ninth Legion Hispania. This example is noteworthy because it is uncommon for an Italian man to be included in a cohort recruited from a different province. More often than not, Italian men are commemorated as tribunes or prefects of a foreign-recruited cohort, not as soldiers. Some examples include Lucius Coesius Frontinus from Parma, prefect of the First Cohort of Thracians (*RIB* 733-4) and Gaius Quintis Severus of Ravenna, who served as tribune of the First Loyal Cohort of Vardullians (*RIB* 2118).

Most who classify as "possibly Italian" have Latin tria nomina and mention membership in a voting-tribe, but do not give a definite place of origin. Because these voting-tribes can extend to citizens from provinces, it cannot be certain that these individuals came from Italy. In addition, some name etymologies cannot be definitively assessed. According to Birley (1980), Octavius Seranus (*RIB* 2082) could have either a Celtic or an Etruscan name (75). These inscriptions with Italian and possibly Italian origins are widespread across Britain, with examples in Lincoln, Wroexeter, Chester, Maryport, Bewcastle, Corbridge, Vindolanda, York, Carrawburgh, Castlecary, Oxnam (Scotland), Bowes, and along Hadrian's Wall. They are, however, disproportionately frequent in Chester.

There are 30 inscriptions that mention Dacian origins. 28 of these reflect the presence of cohorts recruited from Dacia. These include the First Cohort of Dacians and the First Aelian Cohort of Dacians. Both cohorts are mainly attested in Birdoswald on Hadrian's Wall, (Wilmott 1997) with only one example between Benwell and Rudchester (*RIB* 1365) and one from Bewcastle (*RIB* 991). The Bewcastle inscription is approximately 10 miles from Birdoswald, but the section of Hadrian's wall that contains *RIB* 1365 is notable farther at 40 miles from Birdoswald. Therefore, it is feasible that the Bewcastle inscription could have been done while the Cohort was stationed in Birdoswald, but the Hadrian's wall example would have required more extensive travel. In Birdoswald, the First Aelian Cohort of Dacians is attested under 10 different tribunes, of which there are generally six to a legion and one per cohort (Encyclopedia Britannica 2018). Their inscriptions span from AD 205-273, indicating that they were stationed in Birdoswald for almost 70 years. There are only two inscriptions that refer to individual Dacians, RIB 1920 and 2046. The first, *RIB* 1920, also found in Birdoswald, is an epitaph to Decibalus and Blaesus, set up by their brother. Decibalus is clearly a nod to the famous Dacian king of the same name, denoting a connection to Dacian history (Birley 1980: 96). The second, *RIB* 2046, from Burgh-by-Sands, is another epitaph to a man named Julius who identifies as a "cives Dacus."

African origins were exhibited by 30 individuals. 23 of those had names with African-sounding etymology. Some are Latin names that have a heavy concentration in African provinces, such as Castus and its derivations, including the female "Casta," Honoratus, Fortunata, and Matrona (Eckardt 2014: 70-74). Others have names that betray their origins, such as Tullia Numidia, whose name seems to be a nod to Numidian origins (*RIB* 23) (Eckardt 2014: 73). There are also six name-specific geographic origins, some as broad as "ex Africa domo" (*RIB* 783), while others contain more specific place names, such as the epitaph of an unnamed man from Oia in Tripoli who served in the Twentieth Legion Valeria Victrix and died in Chester (*RIB* 512). Inscriptions also identified a military unit of Aurelian Moors stationed in Burgh-by-Sands c. AD 253-258 (*RIB* 2042).

Seven additional individuals could have African origin, but they cannot be definitively confirmed. Much of this uncertainty arises from the fine line between African and Celtic name etymology. For example, Birley (1980) and Eckardt (2014) do not agree on the origins of Casta Castrensis, who died in Cirencester in the 1st century AD (*RIB* 112). Birley (1980: 121) classifies her as Celtic based on her name etymology, while Eckardt (2014: 73) maintains that she is African based on the prefix "Cast" in her name. The same issue appears in the two dedications commissioned by Lucius Maximus Gaetulicus (*RIB* 1725 and 2120). Eckardt (2014: 74) classified this centurion as African while Birley (1980: 78) says his name has both Celtic and African elements. Finally, one inscription has tentative African connections, as it is dedicated to the Egyptian god, Jupiter of Heliopolis, but has no other identifying factors (*RIB* 1783). All African inscriptions span a wide geographic range throughout Roman Britain but are especially concentrated around Hadrian's Wall (Appendix D).

Greeks make up another sizeable category of migrants and ancestrally distinctive people. 29 inscriptions throughout Roman Britain that can be classified as Greek and another 13 are possibly Greek. 28 of the 29 inscriptions classified as Greek included Greek name etymology. Some of these names include Apollonius (*RIB*), Hermogenes (*RIB* 461), and Demetrius (*RIB* 663). One of these Greek names, Septimius Nilus (Birley 1980: 66), also happened to be prefect for the Second Cavalry Regiment of Asturians, a cohort recruited from Spain (*RIB* 1465). Another, Claudius Apellinus (Birley 1980: 42), was governor of Britannia Inferior at the time (*RIB* 1281). Many of these inscriptions exhibited multiple parameters of ethnic identification. Three of these 28 also stated geographic or ethnic origins in Greece (*RIB* 160, 251, and 955), another three contained actual Greek text (*RIB* 662, 663, and 758), and one was dedicated to the Greek god Nemesis (*RIB* 2065). Finally, the last definitely Greek inscription only featured Greek lettering (*RIB* 241). All of these are spread throughout Britain. There are examples in York, Chester, Colchester, Lincoln, Carriden, Scotland, and at numerous points along Hadrian's Wall.

There are an additional 13 inscriptions that were classified as "possibly Greek." Six of the 13 have possibly Greek names, including Claudius Hieronymianus (*RIB* 658), Ylas (*RIB* 937), Hellenius (*RIB* 1515), and Herion (*RIB* 1601), and four are dedicated to Greek gods, but the names of the individuals have unknown etymology. One of the latter? is dedicated to the "gods and goddesses according to the Oracle of Clarian Apollo" (*RIB* 1579). Three have been inscribed in Greek lettering (*RIB* 808, 1124, and 1129), but, again, the names are uncertain. Birley (1980), estimates that Julius Melanio from *RIB* 1273 is from Ephesus in Greece, based on an inscription with the same name in Spain (68), but it cannot be confirmed if this is, in fact, the same man. Finally, there is one inscription that combines both Greek lettering and an unknown alphabet (*RIB* 706) (figure 6.1). Since the second alphabet cannot be identified, this inscription cannot be unquestionably classified as Greek.

The final Greek inscription of note, RIB 758, has a number of identifying factors. Firstly, it is an epitaph to a man named Hermes (Greek etymology), who is from Commagene (in modern-day Armenia), and contains a line that reads "you winged your way to the land of the Cimmerian folk," which may be a reference to the name of the people residing in Commagene, Hermes' place of origin (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). Finally, this inscription is unequivocally different than any Roman epitaph. It contains all of the elements one might find in a normal Roman epitaph, such as name, age, and place of origin. However, it reads more like a poem from the dedicator to the deceased and to the reader (figure 6.2). The dedicator asks those

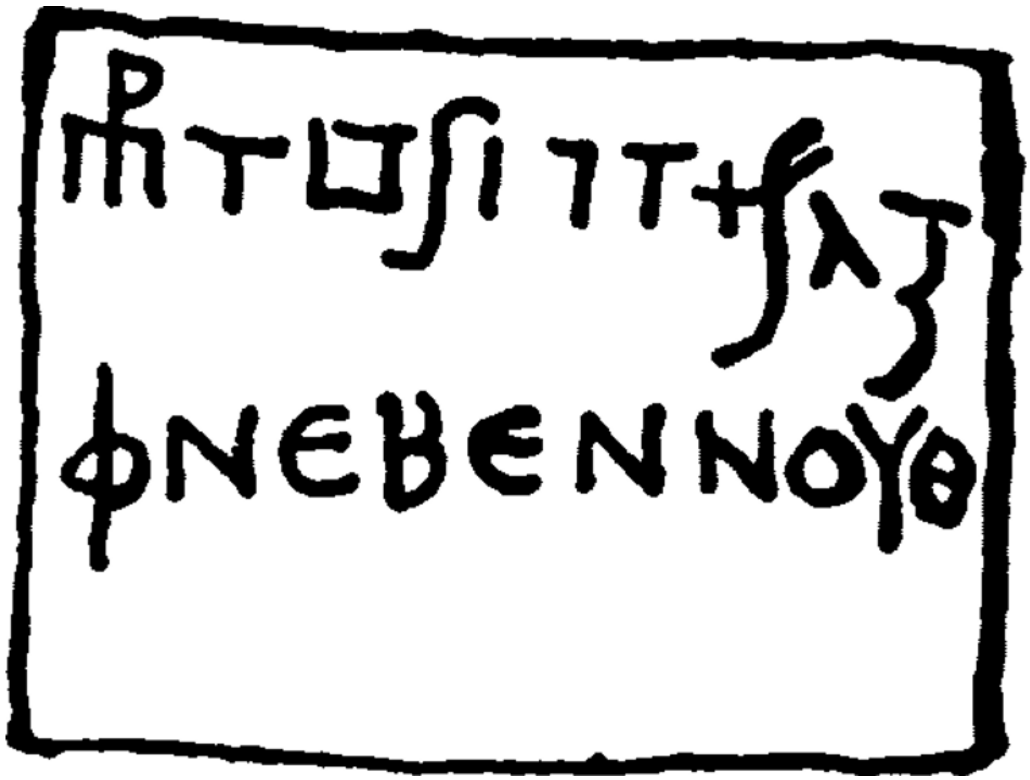


Figure 6.1: ©*Roman Inscriptions of Britain 2017, RIB 706: Unknown alphabet and Greek lettering. No translation.*

travellers passing by to call out to Hermes and give him greetings (RIB 758). These types of "speaking stones," in which the inscription calls out to the reader, are not the norm for Roman funerary inscriptions and have origins in Archaic and Classical Greece (Carroll 2007/2008). Furthermore, this format is not often chosen by elite Romans (Carroll 2007/2008), which speaks to the deceased's or dedicator's willingness to distance himself from Roman norms. For these reasons, it seems that the dedicator and/or the deceased can be positively identified as Greek.

Indigenous British individuals and groups also commissioned inscriptions. There are examples spread widely across Roman Britain (Appendix D). Unlike the representatives from other provinces, the indigenous individuals are not often found in cohorts or other military inscriptions. Overall, there are 20 definite examples of indigenous individuals in the epigraphic record and 9 possibly indigenous individuals. Of these 20, seven were identified by name etymology, five by naming their

ἑκκαιδεχέτη τις
ἰδὼν τύμβω(ι) σκεφθέντ'
ὑπὸ μοίρης Ἑρμῆ(ν)
Κομμαγηνὸν ἔπος
φρασάτω τόδ' ὁδείτης ‣ χαῖρε σύ,
παῖ, παρ' ἐμοῦ,
κἤνπερ θνητὸν βίο(ν)
ἕρπη(ι)ς, ὠκύτατ' ἔπ-
της γὰρ μερόπων ἐπὶ
Κιμμερίων γῆ(ν) [.] κοὐ ψεύ-
σει, ἀγ[αθὸς ‣] γὰρ ὁ παῖς, ῥέξεις
δὲ σὺ [καλόν]

Let some traveller, on seeing Hermes of Commagene, aged sixteen years, sheltered in the tomb by fate, call out: I give you my greetings, lad, though mortal the path of life you slowly tread, for swiftly have you winged your way to the land of the Cimmerian folk. Nor will your words be false, for the lad is good, and you will do him a good service.

Figure 6.2: ©*Roman Inscriptions of Britain 2017, RIB 758. Text added by author.*

place of origin, and 9 had multiple parameters for identification. Seven of the 20 inscriptions are dedicated by groups of individuals. Two (*RIB* 1843 and 1844) are from the tribe of the Dumnonii, who are local to the southwest peninsula of Britain (Cannon and Crowcroft 2015). Surprisingly, these building inscriptions were found along Hadrian's Wall (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). Another is dedicated by the "Assembly of the Textoverdi" (*RIB* 1695), who are believed to be indigenous to the Vindolanda area, where their dedication to the local goddess Sattada was found (de la Bédoyère 1992). Lastly, there are three different cantons named: the Canton of Cornovians, who dedicated a plaque to the emperor in their indigenous Viroconium (*RIB* 288), the Canton of the Durotriges (*RIB* 1672), who also dedicated a plaque to the emperor in their local area of modern-day Haltwhistle, along Hadrian's Wall, and the Brigantian Canton (*RIB* 2022), who built a length of Hardian's Wall near turret 60a. The rest of the inscriptions all come from individual people. It appears that the only indigenous individual known through epigraphy to be associated with a military cohort is Nectovelius, son of Vindex. He identified as "a Brigantian by tribe," who served in the Second Cohort of Thracians, and died in Falkirk, Scotland (*RIB* 2142).

There are 19 mentions of Thracian individuals or groups throughout Roman Britain. 17 of these inscriptions reflect military units recruited from Thrace. These include: The First, Second, and Sixth Cohorts of Thracians, as well as the First Cavalry Regiment of Thracians. The most frequently attested group is the First Cohort of Thracians, which was clearly stationed in Bowes for an extended time. This cohort is mentioned in 6 inscriptions at Bowes under 4 different prefects. Two inscriptions are dated, which suggests that this cohort stayed in Bowes at least between AD 197-208. The Second Cohort of Thracians was well attested in Moresby with one additional inscription in Falkirk, Scotland. This cohort is particularly interesting because it is one of the only cohorts in which there is evidence of soldiers that do not share ancestral ties with the area in which the cohort was recruited. There are two epitaphs associated with the Second Cohort of Thracians: that of Nectovelius, son of Vindex (*RIB* 2142), the aforementioned man with indigenous name etymology, and Smertrius, son of Macer (*RIB* 804), who has a possibly Gallic name (Hatt 1970: 273). While it seems relatively common for the prefect or tribune of a cohort to have different ancestral origins than the men in his charge, it is exceedingly rare in this database for the same to be said of a soldier. Additionally, there are two civilian individuals who identified as Thracian. The first is Mettus, a Getan tribesman, who died in Beverston (*RIB* 136). The second is Caecilius Donatus, a Bessian tribesman with a Latin name who died in Chester around the 3^{rd} century AD (*RIB* 523).

There are also many ancestral and geographic groups that are represented in much smaller numbers throughout Roman Britain. These include Dalmatian, Syrian, Asia Minor, Pannonian, Norican, and Belgic people and groups. There are ten inscriptions that reveal Dalmatian origins. Seven of these are from the First and Second Cohorts of Dalmatians. The First Cohort of Dalmatians is attested mostly in Maryport with one additional inscription in High Rochester. Dating was possible on these inscriptions, which shows that this cohort was in Maryport sometime between AD 139-165. Three inscriptions denote Dalmatian civilians in the province. Sextus Epidus Pudens is from Aequum (*RIB* 486) and Aurelia Ala is from Salonae (*RIB* 1828), though both have Latin names. Desidienus

Aemilianus, on the other hand, does not mention his place of origin, but E. Birley (1966) claims that this name is Dalmatian.

Ten inscriptions denote Syrian ancestry or origin, along with three possibly Syrian inscriptions. Six out of the ten definitive Syrian mentions are connected to the First Cohort of Hamians, which is attested in Carvoran between c. AD 136-166 and in Bar Hill for an undocumented period of time but under two separate prefects. There are also two men who claim Syrian origins. The first is Marcus Aurelius Alexander, a "Syrian from Osroene" (*RIB* 490) and the second is Barates, who is assumed to be the same subject of two different epitaphs. In the first, to his deceased wife and freedwoman, Regina (who happens to be from the indigenous Catuvnellaunia tribe of south-east Britain), he describes himself as being from Palmyra and includes a line of Aramaic script below the Latin text, which emphasizes his origins (*RIB* 1065) (Carroll 2013). If both inscriptions do mention the same man, the second epitaph is his own, which also states that he is from Palmyra (*RIB* 1171). Though the fragmentary nature has erased part of Barates' name, many authors agree that this must be the same man (Birley 1938a; Birley 1980: 127; Collingwood et al. 1965 and 1995; Carroll 2013; Roman Inscriptions of Britain 2017). Three "possibly Syrian" inscriptions remain questionable. Each is a dedication to "Jupiter of Dolichenus," which is a Syrian cult that became vastly popular with the Roman army (Speidel 1978). Therefore, it is impossible to give these inscriptions more than a tentative classification, but the information is useful, nonetheless.

There are nine individuals with origins in Asia Minor, all of which explicitly state their place of origin. Four of these men are from Aprus, who are mentioned above for being members of the Claudian voting-tribe, Gaius Calventius Celer, Gaius Juventius Capito, Lucius Terentius Fuscus, and a final name which does not survive (*RIB* 475-477, 484). The other men include Flavius Longus from Samosata (*RIB* 450), Titius Domitius Hieron from Nicomedia (*RIB* 917), Aelius Antonius from Melitene (*RIB* 583), and an unknown name from Galatia (*RIB* 864). All are associated with the military. Five of these inscriptions are from Chester while the other three were found in Maryport, Old Penrith, and Ribchester.

Individuals who describe themselves as Pannonian are the next most populous group among these rarer cases, with a total of eight inscriptions. All eight have been identified by their place of origin. Four are from Savaria (*RIB* 258, 480, 546, and 547), one is from Mursa (*RIB* 894), one is simply identified as "a Pannonian" (*RIB* 1706), and two are identified by membership in military cohorts recruited from Pannonia (*RIB* 880 and 1288). These are the Second Cohort of

Pannonians and the First Cohort of Breuci, respectively. These inscriptions are fairly widespread, as they occur in modern-day Lincoln, Chester, Old Carlisle, Vindolanda, Beckfoot, and High Rochester.

Seven individuals can be described as Norican from the Alpine region, with one possibly Norican individual who is represented over three separate inscriptions. Like the Pannonian group, six of the seven definitively Norican inscriptions all include an explicit place of origin or ancestry. There are four from Celeia (*RIB* 479, 498, 504, and 511), one from Virunum (*RIB* 531), and one unnamed man who is described as a "Norican tribesman" (*RIB* 1433). The seventh individual is a man named Gaius Cestius Teurnicus (*RIB* 494), who has the tria nomina of a Roman citizen, but his Latinized name is clearly derived from the town of Teurnia in Noricum (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017). Finally, there is Flavius Noricus, a centurion of the Twentieth Legion Valeria Victrix who is attested in three different inscriptions (*RIB* 1664, 1812, and 3378). His name would suggest that he is from Noricum, but Birley is not comfortable assigning Flavius Noricus an origin more specific than "beyond the Alps" (1980: 76). Therefore, he is kept in this database as "possibly Norican." Six of the seven definitely Norican inscriptions were found in Chester, and the seventh in nearby Halton Chesters. All three of Flavius Noricus' inscriptions were found on or near Hadrian's Wall, in the Haltwhistle area.

There are two Belgic individuals, both of whom have explicitly stated their geographic or ancestral origins. One is Julius Vitalis, a Belgic tribesman who died in Bath (*RIB* 156). The second is a milestone dedicated to Emperor Caesar Marcus Antonius Gordianus Pius Felix Augustus from the "canton of Belgae." This inscription is thought to be from Bitterne, but the exact location is unknown (*RIB* 2222). Because the stone is dedicated to a specific emperor, its date must be between AD 238-244 (Collingwood et al. 1965 and 1995; Roman Inscriptions of Britain 2017).

There are also a handful of origins and ethnic groups that are only mentioned once or twice throughout all the epigraphy of Roman Britain. Surprisingly, only one individual describes herself and her deceased brother as being from the city of Rome on his epitaph (*RIB* 184). In addition, the deceased Gaius Saufeius is described as being from Heraclea in Macedonia (*RIB* 255). The Unit of Sarmatian Cavalry, which would have been recruited—at least in part—from modern Iran, is also only mentioned twice, but it is known that they were in Ribchester for at least a short amount of time (*RIB* 583 and 595). Finally, a soldier from the Twentieth Legion, Marcus Valerius Latinus, who is also a Roman citizen, is the only individual described as being from Equestris in Noviodunum, a Roman colony on the border of Gaul (*RIB* 158).

The final category is a mixture of all the individuals who have complex, highly generalized, or unknown origins. This includes individuals that have more than one possible origin, as well as those that are simply classified as “not indigenous,” and those that have rare, non-Latin names, but cannot be identified as being connected to any one etymology. First, there are the six aforementioned inscriptions that make use of the word peregrinus and its derivatives, but do not provide any further information as to the person’s origins (*RIB* 69-71, 620, 1347, and 1346). These were simply classified as “foreign.” In Newcastle, a man names Aurelius Juvenalis dedicates an inscription to the “mother goddesses of his foreign land,” but does not mention a specific place (*RIB* 1318). There are two similar examples of dedications to multiple mother goddesses, *RIB* 88 and 653. *RIB* 88 is dedicated to the Italian, Germanic, Gallic, and British mother goddesses, whereas *RIB* 653 is dedicated to the African, Italian, and Gallic mother goddesses. It is unclear if these individuals are simply trying to appeal to a wider range of deities or if they are members in all of these cults, but since neither mentions a Roman cult, they were deemed “probably foreign.”

There are four names in this database that Birley (1980) describes as “unabashedly barbarian” (113). These are Annamoris and Ressona (*RIB* 784) and Nittunis and Talio (*RIB* 3231). Because Birley does not elaborate on his definition of barbarian, it is impossible to give greater detail. However, it is clear that these names are not Latin and, therefore, should be included in the list of non-Roman individuals. Finally, there are two inscriptions that have been labeled “indeterminate.” *RIB* 786 is an epitaph to Pluma from her husband Lunaris. Birley (1980) mentions that Lunaris is very rare and that Pluma the Latin word for feather, rather than a common name (113). This could indicate that the couple chose their own Latin names, or they might even be slave names. *RIB* 1799 is dedicated by a man named Menius Dada who Birley (1980) speculates is foreign, but otherwise indeterminate (107).

Most of these inscriptions are fairly straightforward. However, there is one from Ribchester (*RIB* 594), unfortunately of unknown date, that is too complex to make a positive identification. This inscription is especially interesting because there are four individuals mentioned and each of them has an identifying factor within their names or titles. Aelia Matrona is thought by Eckardt to be of African origins, considering that Matrona is a highly common name in that part of the Empire (2014: 73). Julius Maximus, the husband of the deceased Aelia Matrona, is the singularis consularis for the Cavalry Regiment of Sarmatians, a unit that was recruited from the Caucasus region on the Black Sea (*RIB* 594). Their six-year-old son, Marcus Julius Maximus, who is also deceased, has the tria nomina of Roman citizenship, which implies that both of his parents were also citizens, particularly his mother, as the mother's citizenship status—or lack thereof—was passed down to her children (Dixon 1990). Finally, Campania Dubitata is Aelia Matrona's mother. Her name is unattested in any other Roman inscription throughout the whole Empire (*RIB* 594). Allason-Jones (2004), the only author to comment on the etymology of Campania Dubitata, appears certain that she is of South Russian descent (274). It seems more likely that Campania has some connection to the region of the same name in southern Italy, though the name Dubitata is certainly not typical of that region. There are a number of conflicting pieces of evidence contained in this one inscription, but no option paints a clear picture of how this family came to be.

The map in figure 6.3 exhibits the extent to which these inscriptions are spread throughout Roman Britain. Chester, known in the Roman period as Deva, is the settlement with the greatest concentration of foreign inscriptions, with 51 mentions of foreign origins, but none of definitive indigenous British descent. Inscriptions from Chester alone make up 11.94% of the entire database and include representatives from nearly every province mentioned in Roman Britain epigraphy. These consist of African, Dalmatian, Gallic, Germanic, Greek, Italian, Norican, Pannonian, Spanish, Syrian, Thracian, and from Asia Minor. Maryport has 28 (5.48%) inscriptions of varying foreign affiliation, including African, and more specifically Mauritanian, Dalmatian, Germanic, Greek, Italian, Spanish, and Turkish. Other settlements that contain a large number of inscriptions are not so diverse. Housesteads, otherwise known as Roman Vercovicium, contains 21 mentions of foreign identity, of which 17 (80.95%) are Germanic. Carrawburgh, known in the Roman period as Brocolitia, has 23 and 18 (78.26%) are German, most of whom have military connections.

Hadrian's Wall, though not one single settlement, exhibits the greatest level of diversity in all of Roman Britain. There are 194 foreign and indigenous mentions across Hadrian's Wall, which makes up 37.96% of the entire sample. These include inscriptions taken from established settlements along the Wall and mile castles or turrets in between these sites (figure 6.4). There are representatives from every ethnic group attested in the inscriptions database (Appendix D). Unsurprisingly, most of the examples along Hadrian's Wall have military associations. These include cohorts, centuries, legions, and also individual soldiers. Some of these were military units that settled along the Wall for long periods of time, such as the First Aelian Cohort of Dacians, who are attested in 26 inscriptions from Birdoswald, or Roman Banna, from at least c. AD 205-278. A small fraction do

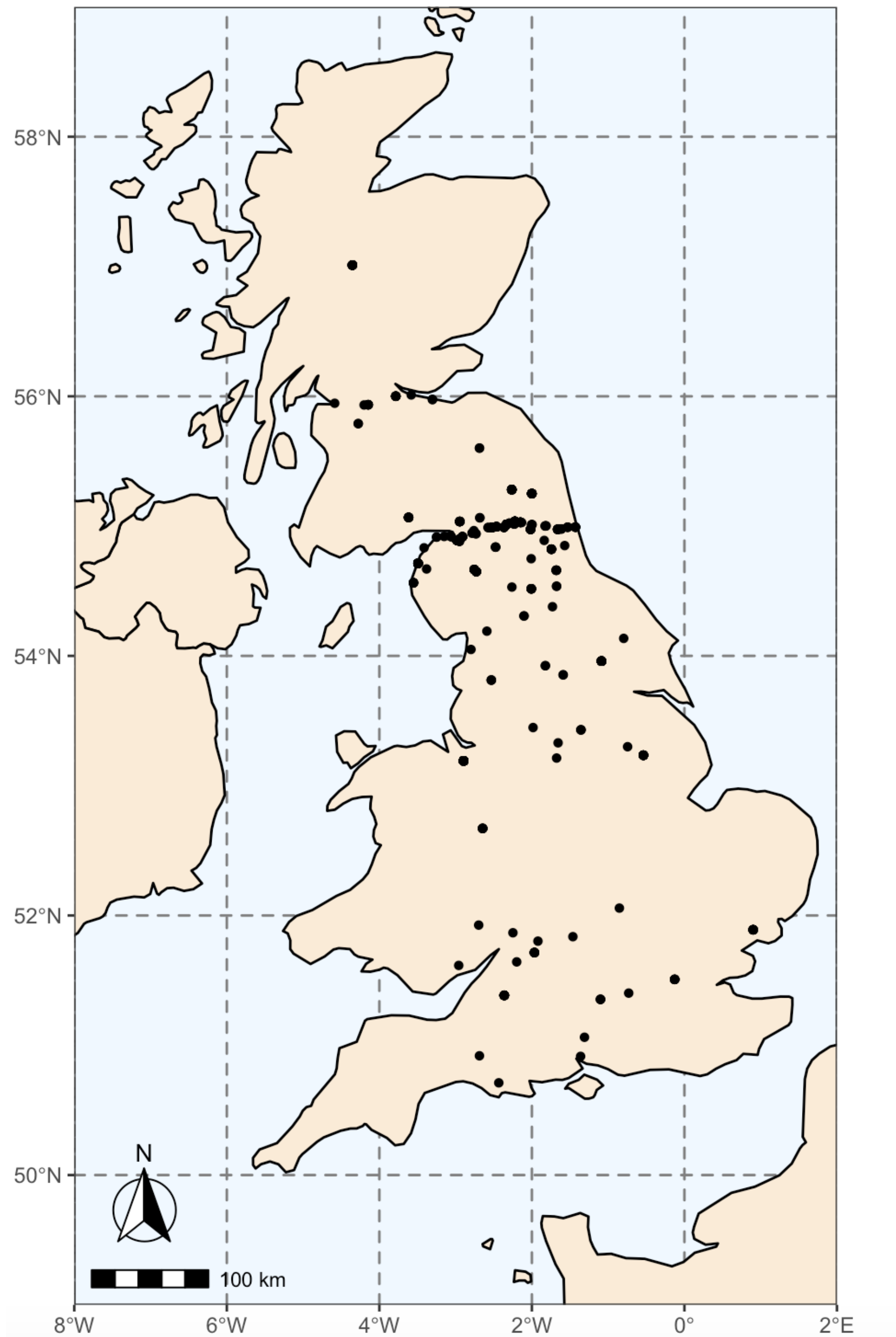


Figure 6.3: *Map showing the distribution of foreign and indigenous inscriptions across Roman Britain. Made using the ggplot2 package in R (Wickham 2016).*

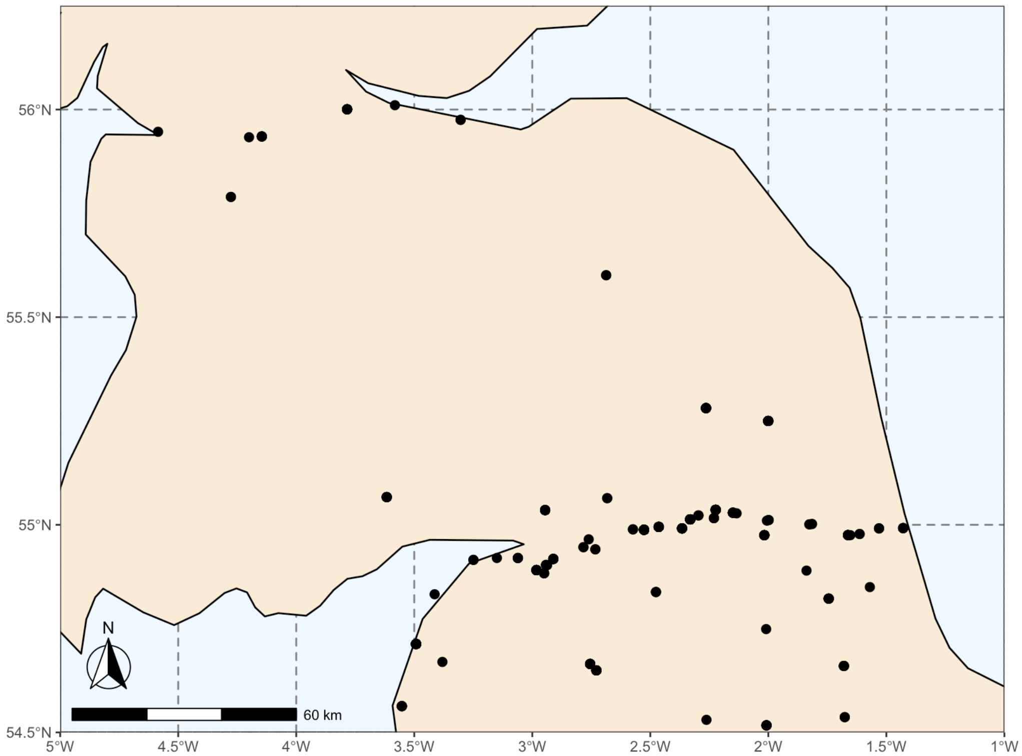


Figure 6.4: *Distribution of foreign and indigenous inscriptions along Hadrian's Wall and the surrounding areas. Made using the ggplot2 package in R (Wickham 2016).*

not mention military associations, such as the Greek inscription from Corbridge dedicated to the Greek goddess Astarte by a man named Pulcher (*RIB* 1124). Clearly, Hadrian's wall was a hub for diverse military cohorts.

6.5 Discussion

Although each inscription in this database has been assessed against the criteria of being foreign or indigenous British, when examined as a whole they create a much more accurate, albeit more complex, understanding of diversity. The significance of these inscriptions lies in the fact that epigraphy was publicly displayed, even in instances of private, familial epitaphs (Witcher 1998). It was once believed that these inscriptions were evidence of Romanization (MacMullen 1982; Meyer 1990). Many earlier scholars interpreted epigraphy as a Roman habit and theorized that foreign and indigenous individuals in Roman Britain adopting this habit was evidence of Romanization, a conclusion that is now, for the most part, rejected because the idea of Romanization does not allow for a nuanced or inclusive interpretation of the diverse epigraphic evidence. Origins, cultural ties, and expressed identities are not fixed properties in each human's life (Isaac 2006; Noy 2010) and the adoption of a "Roman" practice does not inherently imply a desire to become Roman (Mattingly 2004; Isaac 2006; Noy 2010). The database collected for this current project strengthens the argument that Romanization is a gross over-generalization. This database exhibits that the relationships between provincials and their conquerors was far more complex than trading one identity for another. Ultimately, this database highlights the fact that epigraphy was a means of publicly displaying the many facets of identity of a person could have which, in turn, suggests strongly that diversity and identity were important to the people of Roman Britain.

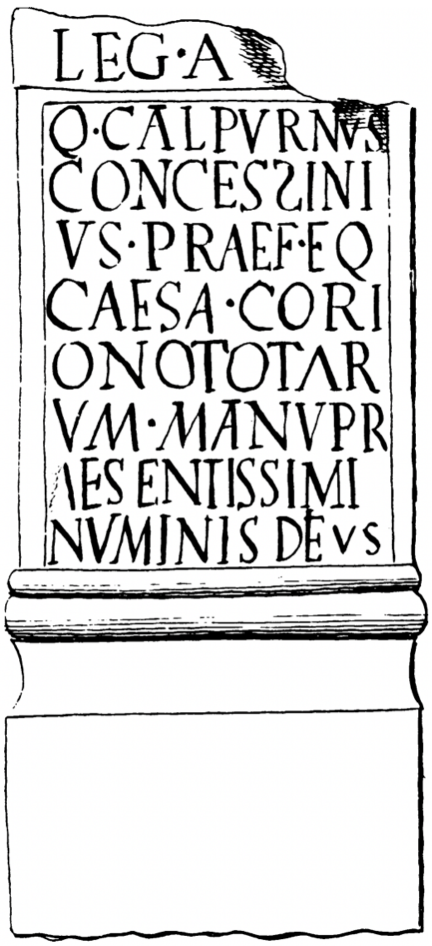
There are many inscriptions that display the complex nature of identity in Roman Britain. For example, Flavius Hellius, "a Greek by race," (*RIB* 251) has a hybrid name that combines Greek and Latin elements (Birley 1980: 121). Alimahus, who has a distinctly German name (Birley 1980: 110), named his son Romulus, which is clearly a nod to Rome's mythical origins, but not a commonly used Latin name (*RIB* 1620). Not all families chose to "Romanize" their names or their children's names. The same inscription is also dedicated by Gratus, son of Fersia, both Germanic names (Birley 1980: 110). In fact, many families show that intermarriage between ancestral or ethnic groups was common. Cornelius Castus, who has an African name (Eckardt 2014: 73) is married to Julia Belismicus (*RIB* 318), whom Birley (1980: 89) believes to be the daughter of a Celtic legionary. There is also the aforementioned familial epitaph which contains names associated with African and (possibly) South Russian origins, one Latin *tria nomina*, and the mention of membership in the Cavalry Regiment of Sarmatians, recruited from the Caucasus region (*RIB* 594). So, it is apparent that these complex identities were created through years of migration and intermarriage.

The origins and identities were also important to the people of Roman Britain, whether these origins are ancestral, geographical, or both. For instance, there is the aforementioned Nectovelius, son of Vindex, who was a Brigantian by tribe but served in the Second Cohort of Thracians (*RIB* 2142). It would appear that Nectovelius or his heir deemed it important to confirm that Nectovelius originated from the Brigantian tribe, as one might have assumed he was recruited from Thrace with his fellow soldiers. Or, there are the Italian prefects and tribunes who command cohorts recruited from other provinces and also state their own place of origin. This is common on epitaphs, but there are dedicators who confirm their origins on building inscriptions as well, like Gaius Quintis Severus from Parma who commands the First Loyal Cohort of Vardullians (*RIB* 2118). If origins and ancestry were not important to these individuals, they would not be compelled to state their own in contrast to those of their military group.

The same concept applies for civilians. Many are compelled to state their ethnic origins, even if it seems at odds with other aspects of their identities. So many of the civilian epitaphs or building inscriptions that state foreign origins or ethnicities follow the prescribed Roman inscription formula, which shows both a willingness to conform to some Roman ways but a desire to assert oneself as not fully Roman. The same can be said for inscriptions by or about Roman citizens using a *tria nomina* but also stating foreign origins, such as *RIB* 109. The deceased, Sextus Valerius Genialis, has clearly gained citizenship but his heir specifically states that Genialis is a member of the Frisiavonian tribe of lower Germania (Birley 1979: 91). These types of monuments prove that stating one's ancestry or ethnicity is a widespread practice, not just for those who are still wholly connected to their homeland.

While this analysis indicates that expressing one's origins or ethnicity was important to the people of Roman Britain, it can also be used to highlight the significance of expressing one's identity in the face of imperialism. During the Roman period in Britain, military occupation was more or less constant in some form, so it is possible to juxtapose military and civilian inscriptions to draw out the nature of these complex relationships. For example, there is an inscription from Corbridge that truly highlights the significance of identifying oneself as something other than "Roman" in this time of constant conquest. In *RIB* 1142, Quintus Calpurnius Concessinius, a prefect of an unnamed cavalry, dedicates an inscription after "slaughtering a band of Corionototae," a local tribe of indigenous people (Moffat 2008) (fig 6.5). This is clearly a source of pride for the Concessinius, as he is fulfilling his end of the symbiotic relationship between himself and a god or goddess (*votum solvit*), which means that he considers the victory to a success granted by the gods. In essence, he is commemorating his victory over a local tribe on what was previously their own land. Seeing as Corbridge also has inscriptions denoting Italian, Greek, Spanish, Syrian, Gallic, and Germanic individuals, it is clear that locals, foreigners, and military forces would have seen this dedication. Considering this attitude towards indeigenous people, it is all the more significant that at least 29 (5.68% of the total sample) commemorators and subjects chose to identify themselves or their families as indigenous.

Furthermore, as is evidenced from the results, many legions, cohorts, and



LEG ‣ A [...]
Q(uintus) Calpurnius
Concessini-
us praef(ectus) eq(uitum)
caesa Cori-
onototar-
um manu pr-
aesentissimi
numinis dei
v(otum) s(olvit)

... Quintus Calpurnius Concessinius, prefect of cavalry, after slaughtering a band of Corionototae, fulfilled his vow to the god of most efficacious power.

Figure 6.5: ©*Roman Inscriptions of Britain 2017: RIB 1142. Text added by author.*

centuries were recruited from previously conquered provinces. These individuals had been removed from their homes to serve in the very army that took away their independence, in order to conquer yet another province. Essentially, the men recruited to "slaughter" these indigenous tribes for the Roman Empire were once the indigenouss they speak of. And yet, they seem to maintain a source of pride for both their provincial origins and their membership in a Roman cohort. For example, the First Loyal Cohort of Vardullians, who are attested in 13 different contexts throughout Roman Britain, almost exclusively refer to themselves as Roman citizens. Moreover, many other individuals, both civilian and military, from Hispania maintain Spanish elements to their Latinized names, but have *tria nomina* and voting-tribe affiliations. While some might state that their use of epigraphy and their insistence on describing themselves as Roman citizens points to "Romanization," this could rather be an example of individuals juggling their multiple identities in times of extreme change.

6.6 Summary

These 511 examples of foreign and indigenous epigraphy highlight the wide range of diversity present in Roman Britain. Figure 6.6 shows from how widely people traveled to come to Britannia. Individuals from a plethora of Roman provinces are present here, as well as those from the source of Roman identity, Italy. These individuals included merchants, civilians, soldiers, military officials, and government officials. They came from local areas around Roman Britain, Italy, Rome, Gaul, Germania, Africa, Greece, Etruria, Spain, Dalmatia, Syria, Thrace, Pannonia, Asia Minor, Noricum, Raetia, Caucasus, Belgia, Mauritania, and Dacia, and more specific tribes and villages within these areas. There is evidence of foreign military cohorts settling in specific areas around Britain and evidence of them moving around. There is evidence of intermarriage between different ethnic groups and children from these marriages being raised in Britain. There is a plethora of mixed identities, hybridized names, and Latinized names. Furthermore, the word choices and willingness to display foreign origins conveys that identities were subject to ongoing negotiation. All in all, the epigraphic evidence proves that diversity was widespread and complex in Roman Britain.

Furthermore, these inscriptions indicate that diversity, ethnicity, and origins were important to the people living in Roman Britain. Previous scholars have surmised that provincials embraced the practice of epigraphy as a result of "Romanization." However, despite epigraphy being a Roman tradition, the fact that indigenous Britons and other provincials adopted this practice does not seem to be an act of homogenization implied by the process of Romanization. Rather, it appears that inscriptions such as these used a Roman format in order to convey foreignness directly to Roman readers. With this possibility in mind, epigraphy provides a necessary justification for studying the diversity of Roman Britain. Diversity only exists when people are forced to acknowledge the differences between one another. Clearly, the people of Roman Britain did recognize these differences; otherwise, their urge to display their own identities—and display them using a means of communication that their conquerors were well versed in—would be illogical. However, it is not always certain that a person's identity will be interpreted in the same way that they present themselves. With this knowledge, it is important to compare and contrast epigraphic evidence with other social and biological markers of diversity and identity. Employing these additional methods will allow for a greater understanding of the interplay between inherited and created identity in Roman Britain.

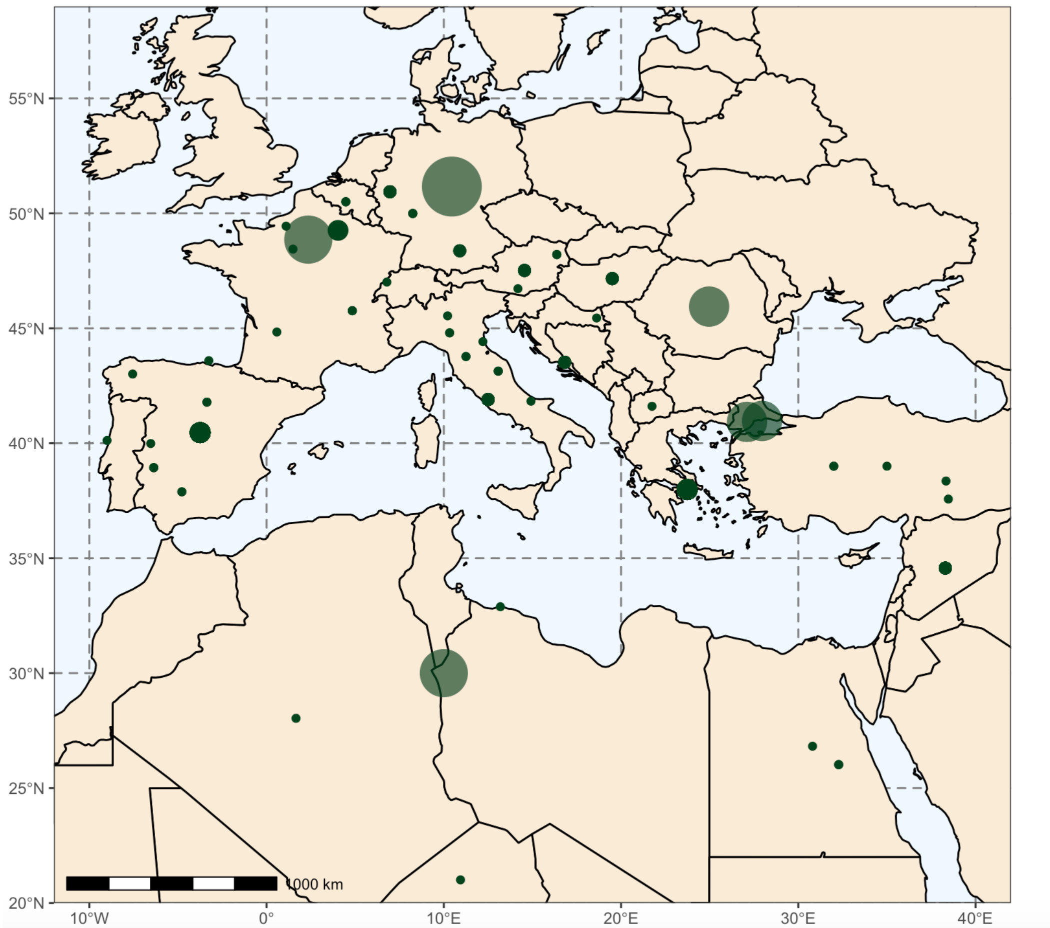


Figure 6.6: *Origins and ethnicities of all foreign inscriptions found in Britain. Point sizes are based on the amount of evidence in Britain for each particular location. Created using ggplot2 (Wickham 2018)*

Chapter 7

Discussion

There are three key questions of relevance to the subject of this thesis that can be addressed by the integration and interpretation of the data presented in the preceding chapters. These questions are: Can we identify migration and interaction between two or more groups? If so, can we identify whether or not the cultural or genetic differences which enable us to identify these groups were perceptible to the groups in question? And, finally, can we explore how each group expressed these differences? Each strand of evidence explored throughout this dissertation contributes to answering one or more of these questions. Results from stable $\delta^{18}O_p$, $^{87}Sr/^{86}Sr$, and various Pb isotopes, as well as epigraphic information can help determine whether migration to or from a particular area occurred. Cranial phenotypic variation, along with epigraphy and primary source material, can then provide insight into whether these differences were perceptible. Finally, epigraphy, material culture, and primary source material can all be used to explore how the people of Roman Britain expressed and experienced these differences. By using evidence in conjunction like this, the three main topics explored in depth throughout this dissertation—craniometric variation, isotopic signatures, and epigraphic evidence—along with the supplementary evidence provided in the background sections—material culture, dress, and primary written sources—allow for a discussion of what it meant to be foreign or indigenous in Roman Britain, and how these distinctions were perceived and manipulated by those living in Roman Britain as a means of display or self-identification. Through this interdisciplinary approach we can better understand what is undoubtedly the core of any anthropological research question: what did these people experience?

The following chapter is divided into three main sections: movement and migration, expressions and perceptions of diversity, and, finally, experiencing diversity in context. Each of these sections combines two or more related stands of evidence. Movement and migration deals only with the evidence that can definitively point to migration like stable isotopes and epigraphic explanations of travel. The subsection on expressions and perceptions of diversity deals with strands of evidence that are either physical and unchanging markers of diversity (like craniometric variation or mtDNA) and chosen or deliberate expressions of diversity like epigraphy or traditional dress. Finally, the subsection on experiencing diversity in context deals with what we know about the complex relationships between Romans, migrating provincial people, and indigenous provincial people. This section is vitally important to understanding why or why not a person might choose to display his or her ethnicity in the face of imperialism. Overall, this chapter aims to weave together all the different aspects of migration and diversity to better understand the experiences of the people of Roman Britain.

7.1 Movement and migration

The first question that must be answered is: did migration occur? The type of geographic and cultural diversity at the heart of this research question cannot occur without some degree of migration—though many of those who may have been considered "diverse" in the Roman Empire may be one or more generations removed from those who physically migrated. In order to establish this precedent, we must first explore the results of stable isotopic and epigraphic studies. Stable $\delta^{18}O_p$, $^{87}Sr/^{86}Sr$, and various Pb isotopes can reveal whether or not a person was born and raised in the area in which he or she was buried. Furthermore, funerary epitaphs of foreigners often reveal his or her specific birthplace or ethnic affiliation. By combining this information, it is possible to explore both individuals who scientifically present as migrants and those who explicitly self-identify as migrants. The following section on movement and migration will combine important results from chapters 5 and 6 (isotopic and epigraphic evidence, respectively) to achieve that goal.

7.1.1 Lankhills and the larger Winchester region

There is strong evidence to suggest that migration did indeed occur both within the community buried at the Lankhills cemetery (in use from AD 350-402) and within the larger region of Venta Belgarum. The two previous migratory stable isotopic studies undertaken on the Lankhills population (Evans et al. 2006;

Eckardt et al. 2009) were carried out in response to the original excavator's theory that the cemetery's grave goods suggested a group of Pannonian immigrants, which will be discussed in greater detail in a subsequent section (Clarke 1979). Both of these studies have been combined here for a more comprehensive analysis (Evans et al. 2006; Eckardt et al. 2009). In this comprehensive analysis, it was found that at least 11 of the 58 sampled individuals are likely to be immigrants, and an additional 7 individuals that have ultimately inconclusive evidence but are possibly immigrants. Based on this isotopic evidence, it is possible that individuals buried at the Lankhills cemetery originated from many geographic regions ranging from modern-day Scotland to Northern Africa. While it is very common for an isotopic signature to be associated with two or more geographic locations, it appears that 7 individuals could, theoretically, be from the Pannonian region of modern-day Eastern Europe or the close-by province of Noricum: 1119(M, 45+), 426 (I, 25-35), 351(I, 25-30), 357 (M, 35-40), and 55 (M, 40+). Interestingly, the aforementioned recent study by Crowder et al. (2020) corroborates this evidence by comparing Lankhills isotopic signatures to those from the Archiud "Hânsuri" cemetery in Transylvania, Romania. They found that LH 81, 426, and 351, had similar strontium and oxygen signatures to the "Hânsuri" skeletons, which may suggest that Clarke (1979) was correct in his assumption that Pannonians migrated to Winchester (Crowder et al. 2020). An additional two individuals have much more restrictive isotopic signatures that point to origins in Rhaetia: LH 13 (M, 45+), and 81 (I, 25-30), which lies slightly to the west of Pannonia and Noricum, directly north of modern-day Italy. Considering that these are mostly middle-aged men, it is possible that they all migrated from a similar region to Winchester after being recruited in the Roman army and settled there after retiring, or that they were merchants, which is also a profession that skews heavily male in Roman times. These possibilities will be explored further in the section on phenotypic variation.

An additional 4 individuals, LH 118 (I, 10m-2yrs), 806 (F, 60+), 271 (F, 26-35), and 119 (F, 26-35), have relatively high $\delta^{18}O_p$ values and lower $^{87}Sr/^{86}Sr$ signatures, indicating possible origins in modern-day Spain (Hispania) and the coast of North Africa. More specifically, LH 118, 119, and 806 in particular appear to have both $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ values that correlate strongly with an area in the north of Egypt along the Nile Valley (Buzon et al. 2019; Evans et al. 2012). Interestingly, all of these individuals are either female or subadult, which is in stark contrast to individuals from other regions. It could be that these families were traveling with their military or merchant husbands and fathers, but that the remains of these men were not tested for stable isotopes. Though technically the

Roman army prohibited families from traveling with their recruited husbands, it was a relatively common occurrence (Goldsworthy 2003). It's also possible that these women and children were part of the slave trade, or slaves travelling with their owners to Roman Britain.

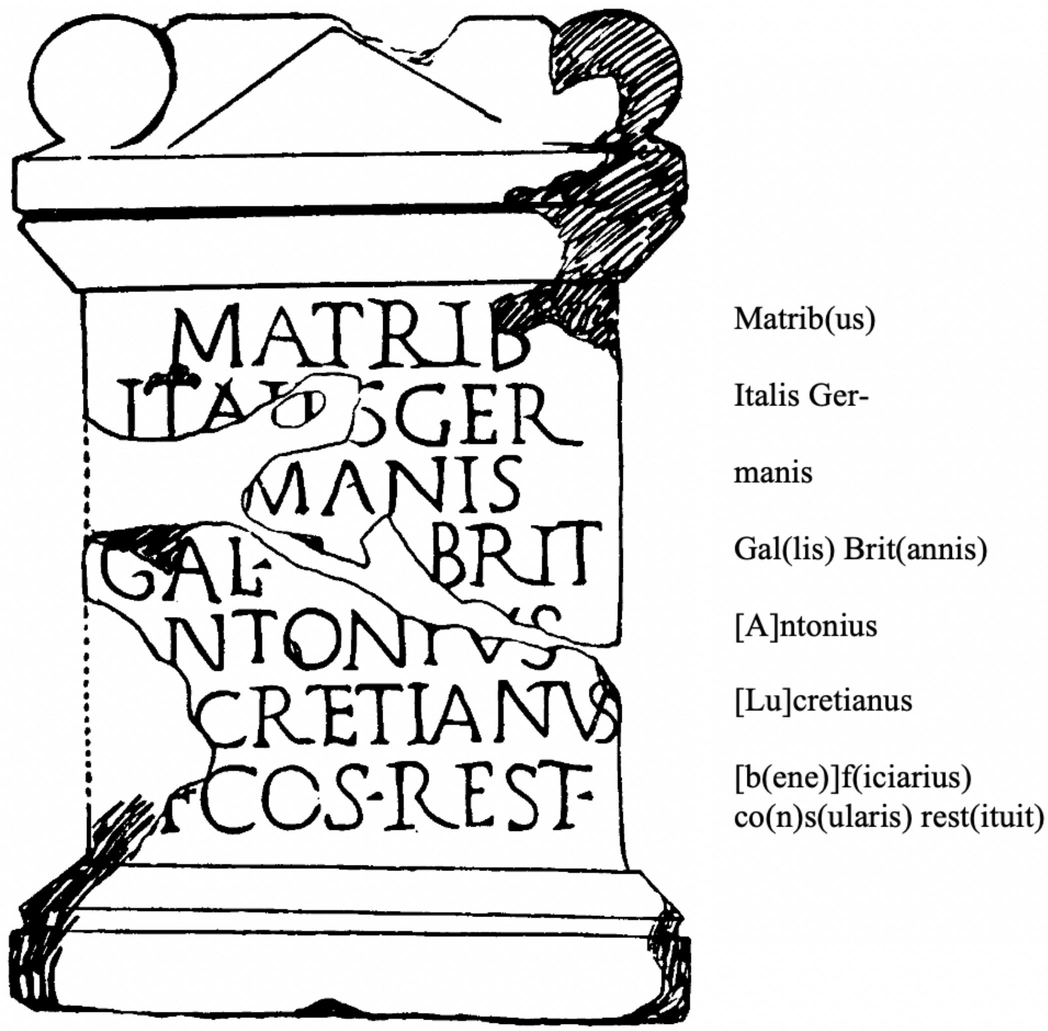


Figure 7.1: ©*Roman Inscriptions of Britain 2017: RIB 88. Text added by author.*

For the additional 7 "possibly migrated" individuals: LH 281 (M, 45+), 322 (M, 25+), 489 (?M, 45+), 1894 (M, 18-25), 1277 (M, 36-45), 1197 (F, 60+), and 861 (M, 60+), it is highly likely that these people migrated from other areas of

Britannia. All have relatively high $^{87}Sr/^{86}Sr$ values, but $\delta^{18}O_p$ values that fall within the expected range for Britain (Evans et al. 2012). While there are many other regions that share the same $\delta^{18}O_p$ signatures, there are relatively few in Europe and North Africa that share the same high $^{87}Sr/^{86}Sr$ values. Therefore, it is likely that these individuals come from areas to the north and west of Lankhills, including modern-day Scotland and Wales.

Unfortunately, there is relatively little epigraphic evidence at all in the Winchester region. Of the three inscriptions found in Winchester, there is one late 1st-early 2nd-century sandstone altar dedicated to the Italian, German, Gallic, and British Mother Goddesses by a beneficiarius consularis named Antonius Lucretianus (RIB 88) (figure 7.1). Birley (1979: 87) suggests that Antoninus Lucretianus is indicating the origins of the men in his cohort, all of which coincide with the isotope findings at Lankhills. So, while there is only one inscription in Winchester that hints at foreign origins, it is likely referring to a large group of men. This correlates well with the isotopic evidence, which shows mostly male migrants with some women and children, all from a variety of locales. So, it is clear there are many migrants to Winchester, and that many of these migrants were young and middle adult males. For the most part, this implies that migration to Winchester could have either been primarily military or merchant focused, which is logical on the basis that the epigraphic data appears to be similarly military-focused.

7.1.2 York

Several different burial sites across York provide isotopic evidence of migrants and there is a plethora of epigraphic evidence throughout the city to corroborate these findings. Of the 75 individuals sampled for stable isotopes, six appear to have migrated from outside the UK to York. Interestingly, many of these migrants have a very specific combination of $\delta^{18}O_p$ and $^{87}Sr/^{86}Sr$ signatures, which helps in narrowing down their places of origin. 6DRIF-24 (?M, young adult) and DRIF-10 (M, 36-45) have low $\delta^{18}O_p$ values and average $^{87}Sr/^{86}Sr$ values that correlate strongly with the Roman province of Rhaetia. TDC 516 (M, 18-25), RE 25 (I, 15-25), and 6DRIF-21(M, mature adult) all have high $\delta^{18}O_p$ values that are primarily found in Northern Africa and parts of Spain, but their $^{87}Sr/^{86}Sr$ signatures help narrow the results further, indicating that they probably originated from Northern Egypt along the Nile Valley (Buzon et al. 2019). Finally, TDC 710 (M, 18-25) has the most interesting combination of isotopic signatures. As mentioned in the chapter on stable isotopes, this individual has an $\delta^{18}O_p$ value that is not found anywhere in Europe, combined with a very high $^{87}Sr/^{86}Sr$ signature that is also

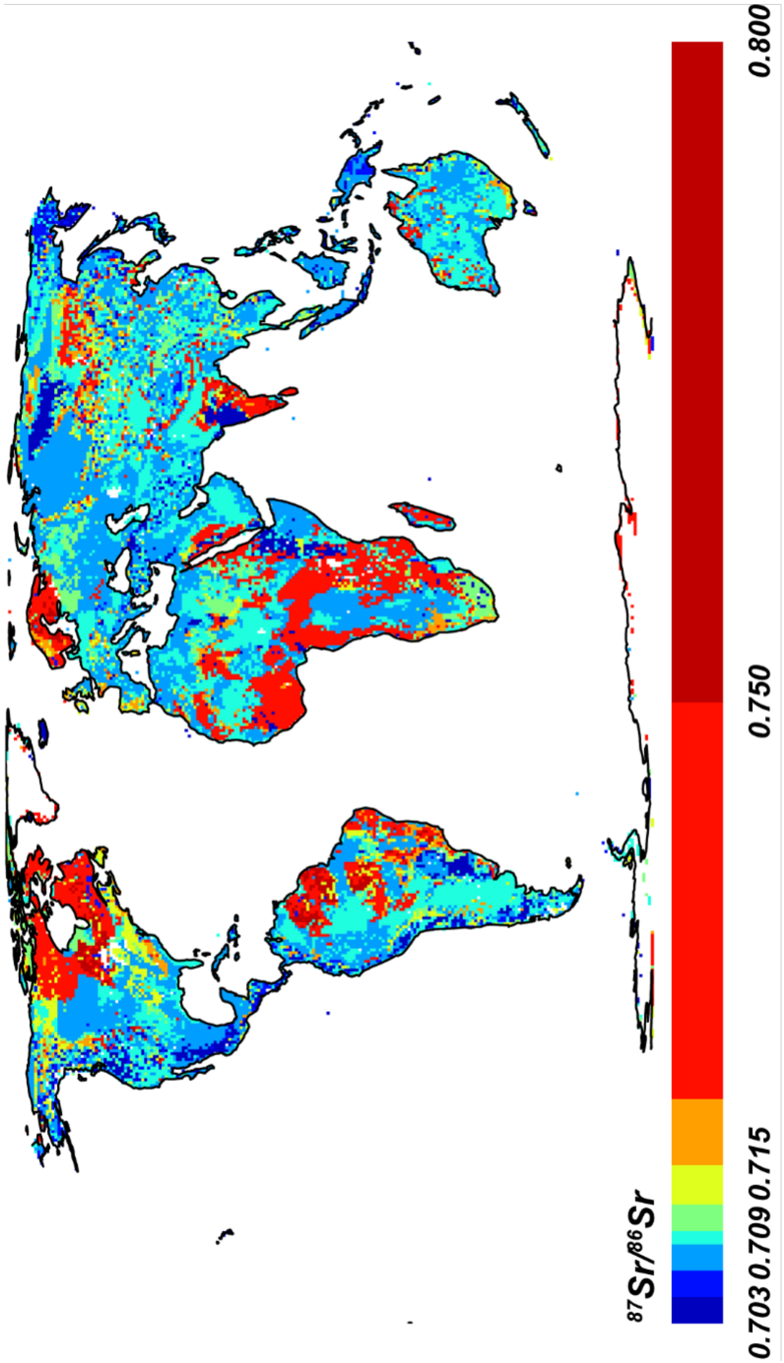


Figure 7.2: *Global map of predicted* $^{87}Sr/^{86}Sr$ *in bedrock (Bataille et al. 2020)*

not traditionally present in North Africa. Based upon this rare combination of values, it is possible that this man originated from an area of West Africa (Price et al. 2006). While there are other regions that share the same $\delta^{18}O_p$ or $^{87}Sr/^{86}Sr$, at this time there no record of a plausible alternative location that contains both of these signatures (figure 7.2).

There is also plenty of epigraphic evidence from York to suggest that foreigners migrated to the city. Of the 16 inscriptions from York that denote a person of foreign origin, seven (43.7%) indicate origins in Greece. While at first glance the isotopic evidence does not seem to indicate that any of the sampled individuals were raised in Greece, it is worth noting that Britain—and especially the area surrounding York—has a very similar range of $^{87}Sr/^{86}Sr$ signatures to the entirety of Greece. Furthermore, most of the expected $\delta^{18}O_p$ ranges for Greece (17.6-18.5‰) fall within the expected range for Britain. As Greek immigrants would be isotopically indistinguishable from locals (at least in the case of strontium and oxygen), as many as 28 of the 75 sampled individuals from York (37.33%) could, theoretically, have originated from Greece. Interestingly, the accompanying dietary isotope evidence may suggest that 6DRIF-9 and DRIF-10 did actually come from Greece or a nearby region (Muldner et al. 2010). As mentioned in chapter 5, both of these individuals have unusually high $\delta^{13}C$ values that have no equivalent in any other British context, regardless of time period (Muldner et al. 2010). Based on these findings, it is likely that these individuals migrated from areas rich in C_3 and C_4 plants, which grow around the Mediterranean (Muldner et al. 2010).

Though the epigraphic evidence is heavily skewed towards representation of Greek immigrants, there are also two examples of North African inscriptions: RIB 653 (undated) and 658 (AD 190-212). RIB 653 is dedicated to the "African, Italian, and Gallic Mother Goddesses" which, again, is likely a nod to the origins of a group of soldiers, while RIB 658 is dedicated specifically to the Egyptian god Serapis by Claudius Hieronymianus, a seemingly Latinized Greek name (figure 7.3). Furthermore, there are several inscriptions denoting the presence of the Legio IX Hispania, a military legion primarily recruited originally from Spain, a handful that refer to regions near Rhaetia and Noricum, as well as a few that indicate Italian origins (Roman Inscriptions of Britain 2017).

Not only does York have isotopic evidence and epigraphic evidence, but there is also a plethora of written evidence to attest to its diverse population. As mentioned in an earlier chapter, Septimius Severus, the so-called "African Emperor," resided in York for a number of months prior to his death and brought with him an imperial retinue (Birley 2002). Many previous studies have attested the pres-

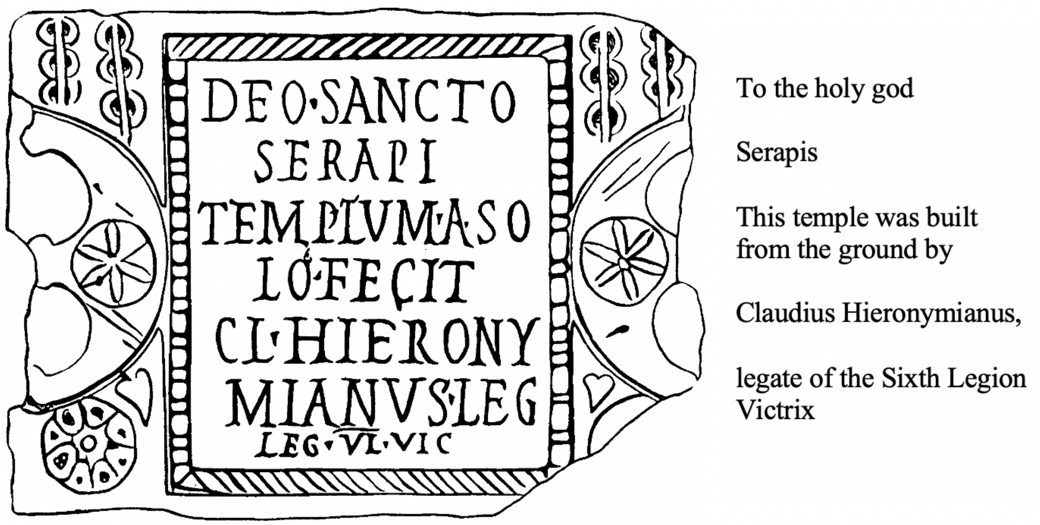


Figure 7.3: ©*Roman Inscriptions of Britain 2017: RIB 658. Text added by author*

ence of North African citizens in York, much of which is attributed to Septimius Severus' stay in the colonia. Through isotopic, epigraphic, and written evidence it is clear that migration to the city of York was prevalent in late-Roman times. These strands of evidence prove that migration from Greece and areas of North Africa was especially frequent, but that it is also likely that some immigrants hailed from Rhaetia, Italy, and coastal Spain.

7.1.3 Ancaster

Unfortunately, no stable isotopic studies have been conducted on the individuals buried in Roman Ancaster, and only three total inscriptions have been found in Ancaster proper, none of which provide any solid evidence of migration (Roman Inscriptions of Britain 2017). However, Ancaster was situated along an important trade route between London and Lincoln (Todd 1981), so it stands to reason that if there is epigraphic evidence of foreigners in nearby Lincoln, it is likely that these immigrants passed through Ancaster, possibly even on a regular basis. Indeed, there are some surviving inscriptions in Lincoln, and many of them denote foreign dedicators. From these inscriptions, it can be deduced that individuals traveled from several areas within Italy, Spain, Gaul, and Greece (Birley 1980; Roman Inscriptions of Britain 2017). Of course, there is no way of knowing whether or not any of the travelers between London and Lincoln stayed for a significant period of time in Ancaster, but this evidence is deemed sufficient here to explore diversity of this population in further detail using other strands of evidence below.

7.1.4 Gloucester

Though Gloucester has the smallest number of individuals who were sampled for stable isotopes (n=21), there are still several skeletons that could have foreign origins. The first two, GLR 1216 (M, 36-45) and 1546 (I, 36-45), are above the expected level of $\delta^{18}O_p$ for Britain as a whole at 19.2‰ and 19.1‰, respectively. GLR 1216 probably grew up in an area of North Africa near the coast of Egypt or in a small section of coastal land in southeast Spain. The possible origins of GLR 1546, on the other hand, are more restricted due to his higher $^{87}Sr/^{86}Sr$ signature. This individual probably originated from coastal Egypt. Gloucester has a very diverse range of $^{87}Sr/^{86}Sr$ signatures, which makes it difficult to identify $^{87}Sr/^{86}Sr$ outliers who fall within the expected $\delta^{18}O_p$ range for Britain. So, while GLR 1561 (M, 18-25), 1518 (M?, 26-35), and 1541 (M, 18-25) are mathematical outliers compared to the rest of the group, it remains possible that they are locals. If they were not local to the area, their strontium and oxygen signatures could denote origins in Roman Aquitania, Gallia Belgica, Germania (superior and inferior), Noricum, Italy, Pannonia, and even small areas along the north of Scotland (Voerkelius et al. 2010: 936). It is also worth noting that all of these possible migrants are men (with the exception of one individual of indeterminate biological sex) between the ages of 18 and 45 which, along with the diversity of possible origins, would suggest they migrated to fulfill military service.

While there are relatively few examples of epigraphy within Gloucester, about half of them denote the presence of migrants. RIBs 121 and 3071-3073 all contain evidence of immigration from either Thrace or Italy, as well as the presence of a slave that migrated with his master from Italy (Roman Inscriptions of Britain 2017). While there is some overlap between epigraphy denoting Italian origins and the isotopic signatures of GLR 1561, 1518, and 1541, it is ultimately unclear whether or not these individuals even migrated at all. Furthermore, RIB 121 mentions the Sixth Cohort of Thracians, which would imply that many Thracians were stationed in Gloucester, but there is no isotopic evidence to support whether or not they stayed or settled in the area. Finally, the very specific isotopic signatures of GLR 1216 and 1546 imply origins in North Africa, but no epigraphy survives to corroborate these results.

7.1.5 Poundbury

No isotopic studies have been conducted on the Poundbury Roman Fort skeletons, and very little epigraphic evidence has survived. Of the four inscriptions found in modern Dorchester, only one refers to a family of unknown origin. Due to poor preservation, it is unclear if the inscription says CIVI [R]OM or CIVI [D]OM. CIVI ROM would indicate that the deceased father is a Roman citizen, while CIVI DOM would indicate that he is a member of the local indigenous tribe, the Dumnonii (Roman Inscriptions of Britain 2017). Birley (1979: 120) suggests that Carinus is a naturalized Roman citizen, so it is possible that both are true. Either way, it would appear that Carinus and his family are indigenous to Roman Britain, which does not, in and of itself, indicate any migrations. However, knowing that a Roman military fort was built on this same site, and that this indigenous family wanted to broadcast either their indigenous origins or their newly earned Roman citizenship using epigraphy, which is traditionally a Roman practice, shows that the interchange of culture that generally follows migration is present here. That, coupled with the known military occupation in the area, means that migration likely happened in this area, but it is unknown where exactly these migrants came from.

7.1.6 Catterick

There are only two isotopic outliers from Catterick: CBF 277 (M, 35-45) and 679 (I, 12-15). These two individuals are well within the expected oxygen range for the area, their strontium signatures, however, are not. Although technically these signatures fall within the expected strontium range for all of Britain (Evans et al. 2012), their signatures are higher than one would expect to find in the area immediately surrounding Catterick (Evans et al. 2010). This suggests that they could have migrated from somewhere as close as Wales or northern Scotland, or as far as Gaul, Germany, and Italy. It is worth noting that CBF 679 is estimated to have died between 12 and 15 years of age, which is markedly younger than most of the identified migrants from the other sites. Given the age, it is unlikely that this individual migrated for military service, as recruitment was generally limited to late-teenage to young adult men (Goldsworthy 2003: 78). However, it is not uncommon for families to accompany their fathers and husbands (Prowse et al. 2007), though it was technically not allowed by Roman military standards (Goldsworthy 2003: 102-5).

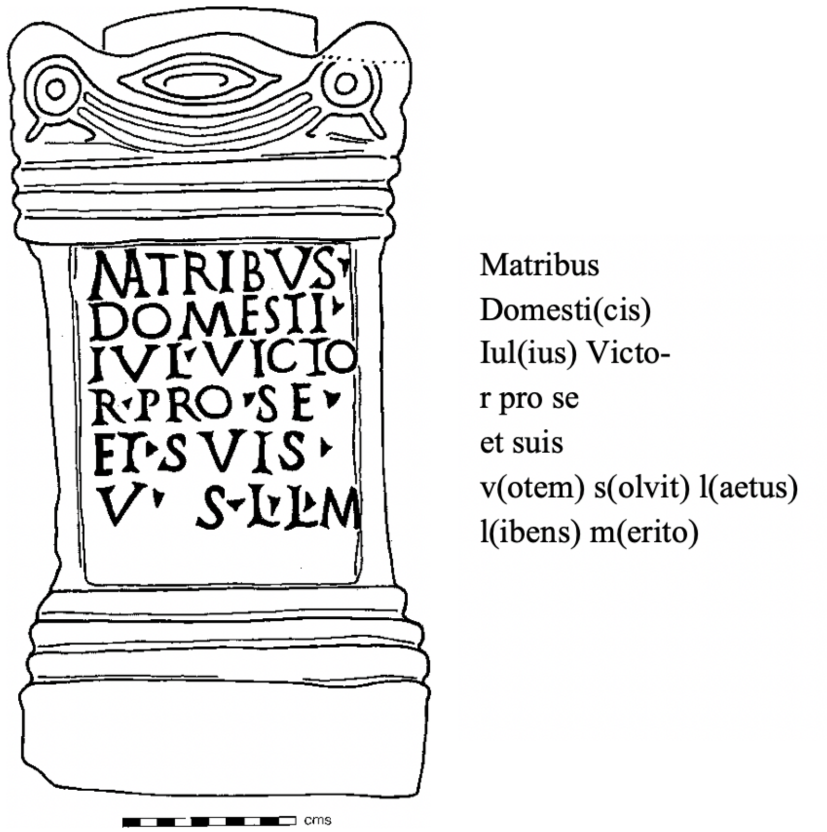


Figure 7.4: ©*Roman Inscriptions of Britain 2017: RIB 3210. Text added by author*

There are not many surviving examples of epigraphy in Catterick and the surrounding regions, but nearly half of them denote individuals of foreign origin, many of which point to Germanic or Gallic origins (RIBs 727, 3210, 3212, and 3214), which is consistent with the results of the isotopic study. The most compelling of these inscriptions is RIB 3210, a dedication to the "Matres Domesticae of home" by Julius Victor on behalf of himself and his family (figure 7.4). The cult of Matres Domesticae is only attested in Britannia and Germania (Roman Inscriptions of Britain 2017), but since Julius commissioned this inscription in Britain and specifically referred to the Matres Domesticae of home, it seems reasonable to assume that Julius was not currently in his home country. It is unclear whether or not his family accompanied him to Catterick, but considering that the isotopic results show evidence of children traveling, it could be possible.

7.1.7 London

There were many different Pb isotope samples available for London cemeteries, and based upon these signatures four main individuals stood out as outliers: Bishopsgate 400 (I, 8-9), Spitalfields 34245 (M, 46+), and Great Dover Street 325 (F, 18-25). Though it is unclear where these outliers may have originated from, there are three inscriptions in London and the surrounding area that indicate that individuals of Gallic origin lived there (RIBs 12, 22, and 3014), as well as one African (RIB 23)—though no exact region within the continent in specified—and one individual from Athens (RIB 9). Interestingly, RIB 3014, which specifically states that the dedicator is both a tribesman of the Bellovaci (in Gaul) and a "Londoner," was found 150 meters from the Great Dover Street cemetery, where skeleton 325 was buried Redfern et al. 2010). This inscription also is dated around AD 160-181, which is within the time that the Great Dover Street cemetery was in use (AD 101-300) and aligns closely with the height of the cemetery's use in the mid-to-late 2nd century AD (White and Wardle 2000). Furthermore, though no definitive conclusions could be made regarding the migrant status of skeleton 150 from Great Dover Street (I, 6-7), it is worth noting that this subadult skeleton had an unusually high concentration of anthropogenic lead. Due to this proximity, and the fact that both sampled skeletons from Great Dover Street had anomalous stable isotope results, there could be a correlation between this cemetery site and the Gallic community in London. More sampling would need to be done to examine the statistical significance of this correlation.

7.1.8 Hadrian's Wall

Though Hadrian's Wall consists of many sites, it was a significant border that was patrolled by the Roman army and, therefore, was a stopping point for many migrants. No migratory isotope studies have been undertaken at any cemetery sites along Hadrian's wall, but there is ample epigraphic and historical evidence to confirm that soldiers from all over the Empire were stationed at Hadrian's Wall and the nearby towns. Nearly 38% of all the inscriptions in Roman Britain that denote foreign or indigenous origins are situated near Hadrian's Wall (chapter 6), totaling nearly 200 inscriptions along the Wall alone. Most of these inscriptions are dedicated by military cohorts, usually named from the area in which they were recruited. These areas include: Germania, Italia, Hispania, Thrace, North Africa, Noricum, Gaul, and Dacia. Furthermore, some civilian inscriptions from the area also denote Greek origins, suggesting that non-military migrations to Hadrian's Wall also occurred. RIB 1129, most notably, is inscribed in Greek

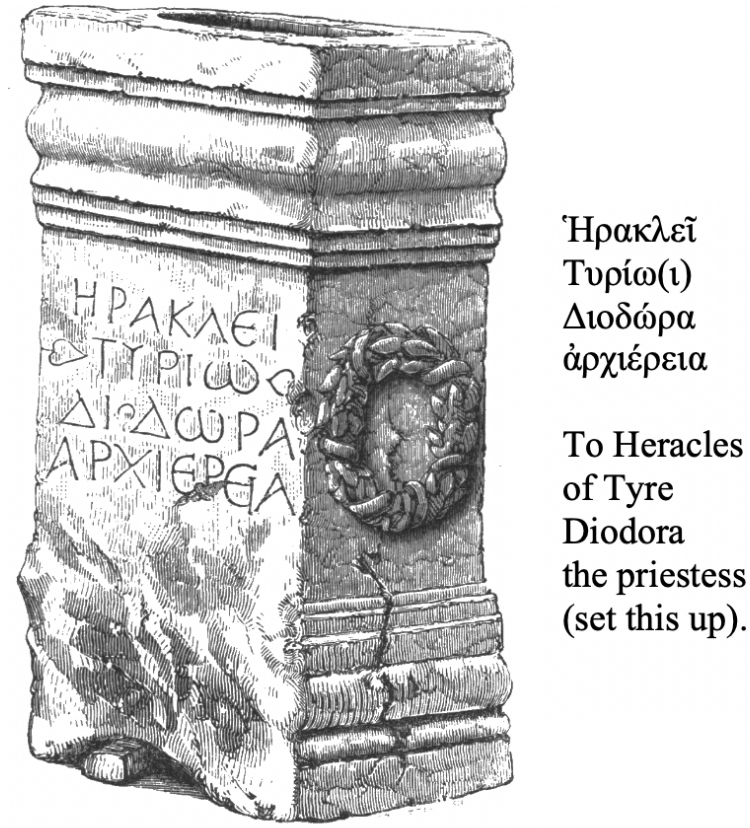


Figure 7.5: ©*Roman Inscriptions of Britain 2017: RIB 1129. Text added by author*

lettering to Heracles of Tyre by a priestess named Diodora (figure 7.5). To have not only a civilian, but a female priestess of a foreign cult, residing in the area shows that although the Wall was primarily a military context, some secondary civilian settlements were forming and these settlements had a demand for access to the religions of their homes. Considering these inscriptions, the settlements along Hadrian's Wall may be some of the most diverse communities in Roman Britain.

7.1.9 Migration summary

Site	Evidence of migration?	Isotopic or epigraphic	Places of origin
Lankhills	Yes	Both	Scotland, coastal Italy, Eastern Europe, Spain, and possibly North Africa
York	Yes	Both	Greece, North Africa, Eastern Europe, Italy, and Spain
Ancaster	Likely	Limited epigraphy	Possibly Italy, Spain, Gaul, and Greece
Gloucester	Yes	Both	North Africa, Gaul, Germany, Italy, and Thrace
Poundbury	Likely	Limited epigraphy	Unknown
Catterick	Yes	Isotopes	Gaul, Germany, Italy
London	Yes	Both	Gallic, Greek, African
Hadrian's wall	Yes	Epigraphy	Germany, Italy, Spain, Thrace, North Africa, Noricum, Gaul, Dacia, and Greece

Table 7.1: *Summary of migration evidence in Roman Britain*

It is clear that migration did occur throughout Roman Britain, even to smaller settlements, and that these migrations were heavily, but not exclusively, associated with the Roman military. Of the 196 individuals sampled for migratory isotopes across all of Roman Britain, at least 38 (19.4%) are not indigenous, a number that does not include individuals that were possibly or inconclusively deemed migrants. Furthermore, there are over 3,500 inscriptions throughout Roman Britain, and 482 of these refer to foreign origins or migration. Sometimes the epigraphic evidence and the possible isotopic origins align, such as in the case of Catterick, where both the isotopic evidence and the epigraphic evidence suggest Gallic and Germanic immigrants. Other times, the epigraphy and the isotopic evidence do not correlate as well, such as in Gloucester, where either the isotopic levels in the biosphere are too varied to definitively identify any migrants or, no migrants exist in the sample. Furthermore, most of the epigraphy has not been reliably dated, which makes it difficult to determine whether the inscriptions were commissioned when the cemeteries were in use. Either way, it is clear that people migrated to Britain from nearly every locale within the Roman Empire, and even beyond those bounds, for both military and civilian purposes.

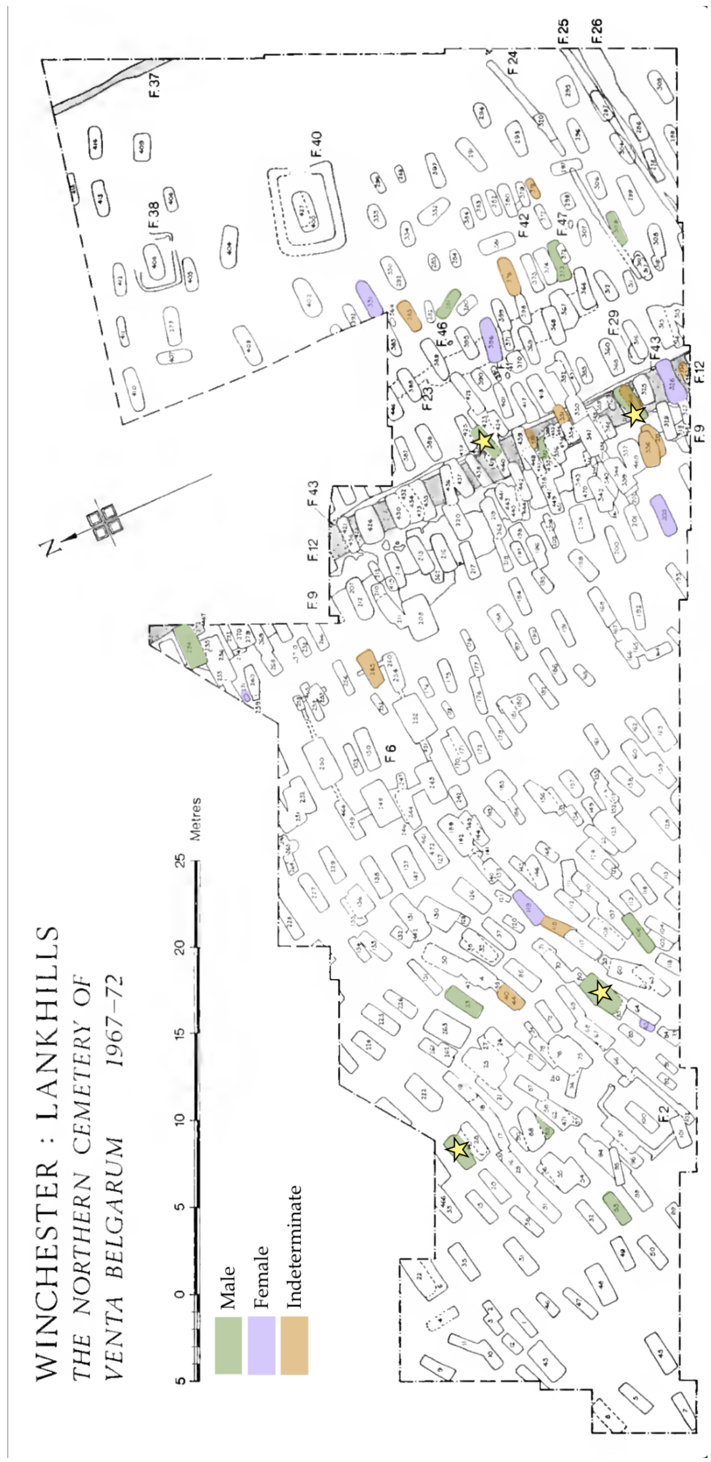


Figure 7.6: *Lankhills cemetery from the 1967-72 excavation (Clarke 1979). Color-coding added by author to reflect individuals with cranial and isotopic markers of migration and diversity. Stars represent individuals who are included in both the craniometric and isotopic studies*

.

While the above discussion has focused on positive evidence for migration, where isotopic or epigraphic evidence identified those who died in locations different to their birth, we cannot say that migration did not occur in areas where there is a lack of evidence. As mentioned in the previous chapters on stable isotope analysis and epigraphy, there are a multitude of ways in which certain biases in the archaeological record could have occurred which are obscuring the full extent of population movement throughout the Empire. To reiterate: in the case of isotopic evidence, it is quite possible that only a small portion of a cemetery has been excavated and that other areas of the cemetery—or completely different locations altogether—were more likely to be used by immigrants, which is likely at the Lankhills cemetery (figure 7.6) but cannot be confirmed at other locations. And, of course, it is possible that there are many second- or third-generation immigrants, who would appear to be local in the isotopic record but may have identified more strongly with the indigenous lands of their parents or grandparents than Britain. Furthermore, it is essential to take into account certain biases in the epigraphic record, such as the fact that the poor are unlikely to afford funerary commemoration (Carroll 2006: 279; Carroll 2007/2008), or that the commemorator may have misjudged the deceased's birthplace or ethnicity (Noy 2001: 5). There are also regional differences in the epigraphic record such as the relative lack of epitaphs in Roman Britain (Woolf 1992: 24). And, of course, there is the bias of survival, which leads scholars to believe that epigraphy was rare in areas in which the evidence may not have survived (Mann 1985: 205). So, while migration and diversity are inextricably linked, a lack of migration evidence does not necessarily mean a lack of diversity. However, a lack of migration evidence in areas in which there is clear evidence of diversity opens up a range other questions, which will be explored in the coming sections.

7.2 Expressions and perceptions of diversity

Having established that migration was widespread throughout Roman Britain, it is essential to discuss the diversity that undoubtedly accompanied these migrants. This can be achieved by exploring phenotypic variation at various sites, which gives insight into the aspects of an individual's diversity—some of which cannot be masked or hidden—and, by exploring evidence of dress and other material culture, which gives insight into the aspects of an individual's culture that he or she willingly expressed. As seen in the previous section, many migrants were not hesitant to display their foreign origins on official dedications and funerary inscriptions, but that does not necessarily mean that these individuals outwardly displayed their origins in daily life. This is why dress and material culture play an important role in the perceptibility of diversity. Much like the previous section, combining this information helps explore both individuals who phenotypically present as diverse—which includes second generation individuals who would not have been identifiable through isotopic signatures—and those who explicitly self-identify as migrants through display material culture.

7.2.1 Lankhills

K-means cluster analysis revealed that there is cranial phenotypic variation in the Lankhills cemetery. Furthermore, much of this variation happens within the males, though there are some females that also appear to be phenotypically different from other females at the site. When the Lankhills cemetery was first excavated, the original archaeologist theorized that there were two distinct groups within the cemetery based upon grave good analysis: Indigenous people and immigrants from Pannonia (Clarke 1979). Clarke hypothesized that a group of 16 individuals buried with numerous artefacts, personal adornments, and differential coin placement (not in the hand or mouth, as was common in the remainder of the cemetery) were of Pannonian descent (Clarke 1979; Evans et al. 2006; Swift 2010; Eckardt 2014).

Isotopic evidence proved that it is unlikely that these individuals were of a common descent, but that they could likely be migrants from a variety of locals within the Roman Empire (Evans et al. 2006), which is corroborated by the results of the K-means cluster analysis test for cranial phenotypic variation. Furthermore, since isotopic evidence has shown that some of the individuals with this “intrusive” burial rite had local signatures, it is also likely that some of these migrants settled and had children or practiced intermarriage at Lankhills (Eckardt 2014). This could also explain why a group of individuals from a variety of locales appear to have been afforded the same “foreign” burial rite, whether or not those individuals were indeed genetically similar to one another. As mentioned in Chapter 2, it was common for conquered provincial men to adopt Roman dress while their wives and daughters, particularly those of elite families, maintained the cultural dress of the region (Rothe 2012; Carroll 2013). It is certainly possible that women from other locales married military men and adopted pieces of their husband’s culture in an effort to maintain familial traditions (Eckardt 2014).

On the other hand, given the extent of phenotypic diversity at Lankhills, particularly among men, only 16 intrusive burials out of the 453 graves excavated at Lankhills seems rather low. Interestingly, it seems that the women in this "intrusive" burial group are far more likely to have extensive personal adornments, which, for females, included beads around the neck and the left wrist as well as spindle whorl or comb at the right foot (Clarke 1979; Evans et al. 2006). Given that fewer females were identified as cranial phenotypic outliers, and that they are more likely to be buried with traditional cultural personal adornments, it is possible that this low number of "intrusive" burials actually correlates well with common practices of the time. Unfortunately, the few females who are phenotypic outliers do not also have grave goods. Of course, this is not to say that they are not, in fact, Pannonian, but they may not have had funds to be interred with the common ceremonial grave goods of their culture. Either way, it's clear that there was both recognizable phenotypic diversity and outward displays of diversity through the use of personal adornments at Lankhills and these instances have relatively similar frequencies.

7.2.2 York

Though it was not possible to conduct K-means cluster analysis on the skeletons of 3 and 6 Driffield Terrace (Chapter 4), there are other previous studies that have analyzed the ancestry of individuals from other Roman cemeteries within York, and many previous studies that have analyzed the grave goods and personal adornments of those living in Roman York (Leach et al. 2009; Leach et al. 2010; McIntyre 2013; Eckardt 2014). Most notably, Leach and colleagues conducted a study of phenotypic diversity on 43 skeletons from the Trentholme Drive and Railway cemeteries in York (2009), both of which were included in the isotope dataset compiled for Chapter 5 of the current work. This study used a both anthropomorphic assessment, which consists of visually identifying certain traits of the cranium that are associated with broadly defined "ancestral groups," and FORDISC 3.0 to explore the phenotypic diversity at Trentholme Drive and The Railway (Leach et al. 2009). Of course, as mentioned in Chapter 4, these types of assessments are not ideal from both a statistical and a social standpoint, but their findings do indicate phenotypic diversity at the sites, whether or not the specific ancestral classifications used are appropriate.

Overall, Leach and colleagues found that when using anthroposcopic assessment, 19 (44.2%) individuals had crania similar to those of traditional European crania, 12 (27.9%) had features consistent with individuals from Africa, and another 12 (27.9%) had a mixture of features from both of these regions. When using FORDISC 3.0, the ancestral categories were more diverse, but the results were overall rather similar: 17 individuals were either classified as "American White" or "European," 8 were classified as "American Black," and 3 as "Egyptian" (Leach et al. 2009). The remainder could not be classified using FORDISC 3.0, which is often the case when attempting to classify individuals of mixed ancestry using craniometric software (Ubelaker et al. 2002; Williams et al. 2005; Elliott and Collard 2009; Kallenberger and Pilbrow 2012; Sierp and Henneberg 2015). So, whether or not these categories are completely accurate, it's clear that some level of phenotypic diversity is present at York and, considering the researcher's use of anthroposcopic assessment, this diversity was likely recognizable to the inhabitants of Roman York (Brebner et al. 2011; Stepanova and Strube 2012; Gwinn and Brooks 2015).

Figure 7.7: *Grave goods buried with the "ivory bangle lady" of the Sycamore Terrace cemetery in Roman York (Leach et al. 2010)*

Phenotypic diversity and outward expressions of diversity appear to be well-correlated at York. One notable study by Leach and colleagues in 2010 found that skeleton ST60—often referred to as the "ivory bangle lady"—from the Sycamore Terrace cemetery had elements of "mixed-race" ancestry and was buried with several personal adornments made of jet, which is associated with Roman Britain, and ivory, which is associated with Roman North Africa (figure 7.7). Of course, not all cases are as unambiguous as this, but the "ivory bangle lady" is a prime example that individuals in Roman Britain may not have considered themselves to be associated with just one culture. Though her isotopes and her cranial phenotype suggest that she was not local to the area (Leach et al. 2010), she was buried with jet bracelets that suggest she also had a connection to the land in which she was buried (Eckardt 2014).

Finally, a study on both mtDNA and Y-chromosome DNA in Roman York focused on the skeletons from Driffield Terrace, some of which were included in the isotopes section of the current study (Martiniano et al. 2016). Six out of the seven individuals tested have DNA markers consistent with Eastern and Northwestern European ancestry. One individual, 6DRIF-26, has DNA markers that would indicate Middle Eastern ancestry—his closest DNA ”neighbors” are Palestinian, Jordinian, and Syrian (Martiniano et al. 2016). As mentioned earlier, it has been suggested that the Driffield Terrace is primarily a military burial ground due to the fact that only one skeleton is biologically female (Muldner et al. 2010; Montgomery et al. 2011; Caffell and Holst 2012). Furthermore, 70.8% of all inhumations at Driffield Terrace were examples of decapitation (Muldner et al. 2010; Montgomery et al. 2011; Caffell and Holst 2012). Because most of the decapitated men were of foreign origins based on isotopic signatures, researchers theorize that Driffield Terrace may have been a burial ground for executed soldiers (Muldner et al. 2010). Due to the nature of this burial site, there is very limited evidence of grave goods (Montgomery et al. 2011), which makes it impossible to make any inferences about whether or not this foreign individual also chose to display his cultural ties. However, these the results of this DNA test further corroborate the isotopic and epigraphic evidence which suggest that there was marked diversity at York during the Roman period.

7.2.3 Ancaster, Poundbury, and Baldock

These three sites have not been extensively analyzed for evidence of foreign personal adornment in grave goods, but there is certainly evidence to suggest that phenotypic diversity was prevalent. As with the other sites, it appears that the male samples from Ancaster, Baldock, and Poundbury are far more phenotypically diverse than their corresponding female samples. This suggests that the majority of these populations were either active military, especially in the case of Poundbury as it was a Roman military fort, or retired military that settled in these locations. Considering that many of the isotopic outliers are male for all of these sites, it seems that the migration and diversity evidence are in accordance. Unfortunately, the extent to which these individuals expressed their foreignness through cultural dress is unclear.

There is some evidence to suggest that individuals from Baldock expressed indigenous ties in their funerary rites by including nail cleaners that are exclusive to Britain and possibly associated with the Catevullauni and Dobunni tribes (Eckardt and Crummy 2008; Eckardt 2014). However, such small items are not associated with personal adornment in daily life and probably would not have been outwardly visual examples of indigenous identity (Eckardt 2014). It is also unclear whether these individuals settled and had families at these sites, as there is little to no overlap between the individuals sampled for isotopes and those sampled for phenotypic diversity. However, there is certainly plenty of evidence to suggest that phenotypic diversity was present at the Poundbury Camp, Ancaster, and Baldock, even if evidence of the expressions of that diversity in the form of personal adornments is lacking.

7.2.4 Diversity summary

In all of the sites sampled there is clear evidence that the biological males were more phenotypically diverse than the biological females, but female burials were more likely to contain ethnic dress or smaller items of personal adornment. This correlates well with the isotopic evidence and the epigraphic evidence, which also show that a large proportion of migrants were male. Though there are far more sites that have been tested for isotopic evidence than examined for phenotypic variation, it appears that there are similar trends. This can be confirmed with further work collecting phenotypic data from Roman Britain. All of the diversity data presented here is consistent with the conclusion that the majority of migrants were part of the Roman military, but from many provinces throughout the Roman Empire. Furthermore, it is possible that these individuals either brought their wives and families with them, which was technically forbidden (Goldsworthy 2003), or settled in Roman Britain after retiring from the army. Though many of these sites also have written evidence of military settlements, there are some sites that have a greater proportion of female and subadult migrants, which may indicate that the slave trade was also a significant factor in migration to these sites. York, in particular,seems to have a heavy emphasis on migrants from North Africa, which is understandable considering that Emperor Septimius Severus, the so-called "African Emperor," used York as his home-base while campaigning in Britain and was accompanied by a large retinue. Considering the fact that men are more phenotypically diverse than females, most of the epigraphic evidence has been dedicated by, or refers to, men, and a large portion of the isotopic outliers are men, it would appear that soldiers recruited from other provinces are the most likely migrants and they are not shy about announcing their origins through epigraphy. The evidence of dress and personal adornment is not as abundant but is also highly correlated with females. As there appear to be fewer female migrants and less phenotypic variation among females, the relative lack of personal adornment and foreign dress is understandable.

7.3 Experiencing diversity in context

The experience of diversity in Roman Britain must have been incredibly complex both for indigenous people and incoming populations. Of course, much of the incoming population was associated with the Roman army, which was recruited from previously conquered provinces. Though this has been attested by many primary sources, it has also been corroborated by the evidence provided in the current work. Many of the Romano-British sites explored here have both isotopic, phenotypic, and epigraphic evidence suggesting that the majority of migrants were diverse groups of men in military cohorts. So, many of these men were recently in the same position as the indigenous population of Britain just before being recruited. At the same time, indigenous Britons are not only being faced with the changes associated with Roman conquest, but also with the influx of numerous new cultures both through military men, their wives and children (though it was technically forbidden to bring them along), and, eventually, through merchants expanding their trade north.

7.3.1 Roman attitudes towards provincials

It is vitally important to also view these facts in the context of Roman attitudes towards provincial people. The existence of conquest and imperialism alone is enough to question how diversity was experienced throughout this time period, but the mentality behind migration and diversity warrants further exploration in primary source material. To do this, it is essential to better understand how Romans understood ancestry, the inheritance of traits, and the effects of environment on those traits. In many Roman texts, these ideas are inextricably linked with their perception of foreigners or "barbarians." Environmental determinism, or the idea that the geographic area or climate in which one was raised has a significant impact on one's personality, is prominent in Roman primary literature from the late republic to the late empire. The following passage from Vitruvius' *de Architectura*, written in the late first century BC, perfectly encapsulates the prejudiced beliefs of many Roman writers:

> For where the sun acts with moderate heat, it keeps the body at a temperate warmth, where it is hot from the proximity of the sun, all moisture is dried up: lastly, in cold countries which are distant from the south, the moisture is not drawn out by the heat, but the dewy air, insinuating its dampness into the system, increases the size of the body, and makes the voice more grave. This is the reason why the people of the north are so large in stature, so light in complexion, and have straight red hair, blue eyes, and are full of blood, for they are thus formed by the abundance of the moisture, and the coldness of their country. Those who live near the equator, and are exactly under the sun's course, are, owing to its power, low in stature, of dark complexion, with curling hair, black eyes, weak legs, deficient in quantity of blood. And this deficiency of blood makes them timid when opposed in battle, but they bear excessive heat and fevers without fear, because their limbs are nourished by heat. Those, however, born in northern countries are timid and weak when attacked by fever, but from their sanguineous habit of body more courageous in battle... Though, however, the southern nations are quick in understanding, and sagacious in council, yet in point of valor they are inferior, for the sun absorbs their animal spirits. Those, on the contrary, who are natives of cold climates are more courageous in war, and fearlessly attack their enemies, though, rushing on without consideration or judgment, their attacks are repulsed and their designs frustrated. Since, then, nature herself has provided throughout the world, that all nations should differ according to the variation of the climate, she has also been pleased that in the middle of the earth, and of all nations, the Roman people should be seated; on this account the people of Italy excel in both qualities, strength of body and vigor of mind. For as the planet Jupiter moves through a temperate region between the fiery Mars and icy Saturn, so Italy enjoys a temperate and unequalled climate between the north on one side, and the south on the other. Hence it is, that by stratagem she is enabled to repress the attacks of the barbarians, and by her strength to overcome the subtlety of southern nations. Divine providence has so ordered it that the metropolis of the Roman people is placed in an excellent and temperate climate, whereby they have become the masters of the world (*de Architectura* 6.1.3-11).

This passage reveals a great deal about traditional Roman ideas regarding how they experience those who have different physical appearances, as well as their own perceived superiority. Vitruvius' passage indicates that Romans did notice what modern people would call phenotypic variation, and, at least in the first century BC, Romans discriminated against those who were different. Isaac (2004) argues that though the concept of "race" is modern, Romans such as Vitruvius exhibit behavior similar to the modern definition of racism. He asserts that it is possible to interpret these past behaviors as racist because racism is ultimately defined as the discrimination that takes place when one group considers themselves superior to another on the basis of unchangeable traits while ignoring the role of another's free will to choose their actions and reactions. This is essentially exactly how Vitruvius views anyone other than born and bred Romans, and he is not alone in his opinion. Several contemporary and later authors echo these same sentiments and build upon the ideas of Vitruvius.

Marcus Tullius Cicero, who served as *quaestor*, *aedile*, *praetor*, and, eventually, governor of *Sicilia* (modern Sicily) from 75-50 BC, is well known for writing *De Re Publica* and *De Legibus* and for giving countless speeches to the senate on the topics of imperialism and rights. In one such speech Cicero referred to Jews and Syrians as people "born to be slaves" (*De Provinciis Consularibus* 5:10). Whether or not this was a widely held opinion (Isaac 2004), it is clear that high-ranking government officials were willing to use environmental and hereditary determinism when advantageous to their own cause. Cicero's speech proves that these judgmental statements were used in actual political arguments presented to the Senate.

Titus Livus, also referred to as Livy, was writing between the late first century BC and the early first century AD and presented the idea that foreigners can only thrive in the land of their ancestors. In a speech that he attributed to a past military general, Livy essentially stated that "seeds" can only optimally grow in the soil from which they originate, and that those who migrate to other lands will degenerate (*Ab Urbe Condita Libri* 38.17). While this is a relatively extreme take on environmental determinism, the sentiment clearly held for years to come. Gaius Plinius Secundus, more commonly known as Pliny the Elder, presented a more positive view in the late first century AD on the differences in temperament caused by a person's environment, but ultimately agreed that those raised in a clement climate are disposed to political greatness (*Naturalis Historia* 2.80.189). These opinions, whether presented in a positive or negative light, continued to be held for centuries by writers such as Galen from AD 129-216, who explicitly stated that a person's outward appearance is indicative of both his or her behavior and country of origin (*de Libriis Propriis* 35), and, even later, Vegetius (AD 4^{th} and 5^{th} century), who believed that the Roman climate has made its people predisposed to rule the world (*Epitoma rei militaris* 1.2). Regardless of date, the common theme is clear: Romans notice physical differences and use the variation they see to justify their perceived superiority.

There are those who interpret the Roman policy on granting citizenship to conquered people as an acceptance of those people. However, Rome never had a consistent policy on admitting foreigners to citizenship. Moreover, agreeing to give citizenship does not imply a lack of prejudice or discrimination. In fact, citizen or not, the aforementioned sources show that Romans believed these characteristics were unchangeable or even further degenerated by migration. Aulus Gellius, ca. AD 125-180, who recorded a speech attributed to Favorinus, warned against using women who are "of a foreign or barbarous nation, descendants of slaves, or slaves themselves" to breastfeed Roman babies, as their "degenerate" qualities would be passed on to the baby (*Noctes Atticae* 12.1). Regardless of citizen status, these women were considered inferior solely based upon their origins, as were many others.

Figure 7.8: *African riders from London (left) and Großsachsenheim (right), 2^{nd}-3^{rd} century AD © Trustees of the British Museum (Eckardt 2014: 84)*

Another important strand of evidence to take into account is Roman artistic depictions of "barbarians." While art is not as direct as a verbatim opinion from a Roman author, the means and motives of the artist or art commissioner can be equally explicit. Furthermore, art forms that depict barbarians were arguably more accessible to foreigners, as many may not have been fluent in Latin or literate at all. Moreover, depictions of ethnicity aid in determining the extent to which these ancient people recognized craniofacial differences, which is a key component in studies of diversity. For example, there are a plethora of objects from all over the Empire depicting facial features and hairstyles from a wide variety of different ethnic groups, which are often exaggerated. Figure 7.8 highlights two figurines of African elephant riders found in London and Großsachsenheim, Germany from the late second to the early third century AD, which may have been crafted in Italy (Eckardt 2014). These men have prominent, hyperbolic facial features that dominate the imagery and are often found on depictions of Africans such as broad, flat noses, corkscrew hair and beards, as well as enlarged lips and eyes (figure 7.3). Figurines such as these prove that ancient Romans not only noticed ethnically different facial features, but also caricaturized them in order to convey sentiments of superiority over people with these qualities.

Another prime example of public artwork that depicts barbarian men and women is the Forum of Trajan, which was built following the Romans' victory in Dacia. The epigraphic evidence shows that Dacians immigrants were one of the most populous groups in Roman Britain–or at least the most willing to announce their origins publicly (Chapter 5). Therefore, their treatment by Roman elites and the artists they commission is an essential strand of evidence when considering their willingness to portray themselves as foreign. The Forum of Trajan includes the Column of Trajan and several statues related to Trajan's conquest in Dacia, most of which depict stylized forms of Dacian "barbarians" (figures 7.9-7.11). The column of Trajan depicts snippets and important events from the wars which feature the Dacian soldiers. The column stands at 34 meters tall, which means that most of the upper scenes were probably were inaccessible to the contemporary viewer, unless that person had access to the interior stairwell which led to several windows and a viewing platform (Lancaster 1999). However, the scenes that are explored in this section are no more than seven vertical panels from the bottom and could easily have been seen by passersby, especially because the reliefs were painted and details could be made out.

The column as a whole is thought to be a justification of Trajan's Dacian wars and, therefore, it is rife with propaganda that depicts Dacians as barbarians in need of Roman civilization (Ferris 2000). Though the Dacians often fought in armor, the artist depicted them as half-naked, disorganized warriors with long hair and scraggly beards (Speidel 2004). The Roman soldiers, on the other hand,

Figure 7.9: *Column of Trajan Scene XVIII, the first Dacian prisoner is presented to Trajan © Roger B. Ulrich (trajans-column.org)*

are all in the same uniform and often stand in organized formations. Figure 7.9, which depicts scene XVIII on the column, is a prime example which shows how the artist juxtaposes Romans and Dacians to display stark differences and establish Dacians as barbarians. In this scene, a Roman soldier is presenting a captive Dacian to Trajan. The Roman soldier has neatly cut hair under a standard-issue helmet and is clean shaven—a stark contrast to the shaggy appearance of the Dacian prisoner. He wears all the customary components of the Roman military uniform including the tunic, helmet, and semi-circular cloak that is draped more heavily over one shoulder than the other, as was common in the Trajanic period (Speidel 2012). Furthermore, his feet are clad in intricately carved shoes while the Dacian remains barefoot. This detail is particularly interesting because it is so small that it is almost imperceptible from the vantage point of and in-person viewer, and yet the sculptor decided that it was a necessary inclusion. Conscious

Figure 7.10: *Column of Trajan Scene XXX, Trajan oversees a group of Dacian women and children being loaded onto ships © Roger B. Ulrich (trajans-column.org)*

choices such as these are important views into how Roman elites wanted the Roman public to view their newly integrated enemies.

Figure 7.11: *Close-up of scene XLV from the Column of Trajan, Rome, 113 AD: Dacian woman torturing a naked Roman soldier (Ferris 2000: 64).*

The artist also depicts civilians in traditional Dacian costumes as part of the column. In one scene (XXX), Trajan oversees a group of Dacian women and children being loaded onto ships and taken away into captivity (figure 7.10). Here, the artist makes the Dacian style of dress abundantly clear. The women all share the same headscarf gathered at the nape of the neck, as well as a long-sleeved bodice covered by a sleeveless, tube-shaped tunic (Rothe 2012). Several scenes later, the artist depicts a group of Dacian women torturing Roman soldiers (scene XLV)(figure 7.11). These women have exactly the same dress and hairstyle as those being pardoned by Trajan in the earlier scene so they are easily recognizable as Dacian to the viewer, but here they are shown as ruthless barbarians. The message from the commissioner here is clear: he wants those living in Rome to be able to recognize Dacians in their traditional dress and associate those Dacians with barbaric behavior.

Figure 7.12: *Statues of Dacian prisoners from the Forum of Trajan* © *Museo Archeologico de Napoli*

Outside of the column, the forum also contained many larger sculptures of Dacians in their traditional costumes that were larger and more readily accessible to contemporary viewers. Many of these statues, such as those in figure 7.12, show Dacians in poses that are customarily used in Roman art to denote that a person is a prisoner. The men in these statues have all the components of traditional Dacian dress: long, shaggy hair, beards, semi-conical hats that fold over just before the rounded top, long sleeve under shirts paired with short sleeved tunics, and a hooded cloak gathered on the right shoulder by a circular pin (Kohler 2012) (figure 7.12). As with the barbarian women in scenes XXX and XLV on the column of Trajan, the way in which the Dacians are dressed serves to help onlookers identify them and their stance as prisoners serves to assign them to a particular social status. The juxtaposition of these two elements is a clear indication of how the commissioner—in this case, Trajan—wanted to influence Roman opinions on Dacians.

Of course, Dacia is far from the only province whose people were depicted in a negative light following Roman conquest. The ”barbarian” treatment was a tried and true method of propaganda used to justify Rome’s many invasions and conquests. Figure 7.13 depicts Claudius grabbing a half-naked personification of Britannia by her long, straggly hair. Though this sculpture was found in Aphrodisias, Turkey, it shows that the indigenous people of Britannia were not spared by Roman artists. To this same point, there are some depictions of British barbarians found on funerary monuments of Roman soldiers who died in the province (Russell and Laycock 2011). Figure 7.14 shows Longinus Sdapeze, a soldier recruited from Sardica (modern-day Sofia, Bulgaria) riding in Roman armor, trampling a naked indigenous man (*RIB* 201, unknown date). As funerary monuments line the main roads that lead into a Roman city, it is certain that other indigenous or foreign conquered people would have encountered this imagery.

While it is important to take into account that these texts and works of art with are the workings of elite, Roman citizens, they remain an important insight into the views of those who held power in ancient Rome. These authors and art commissioners may not represent the opinions of the common people, but they represent the propaganda orchestrated by elite members of society, which certainly would have reached a myriad of individuals living in the empire. Texts and works of art such as these justify the study of diversity in ancient contexts, because it is clear that physical differences were noticed and important to Romans. Furthermore, if these differences were used for prejudice, as the sources suggest, it would be an essential component of a migrant’s experience. In other words, these texts suggest that Romans had an “us versus them” mentality, which, if true, would have had a significant impact on the lives and experiences of foreigners and migrants, or even simply those perceived to be foreigners.

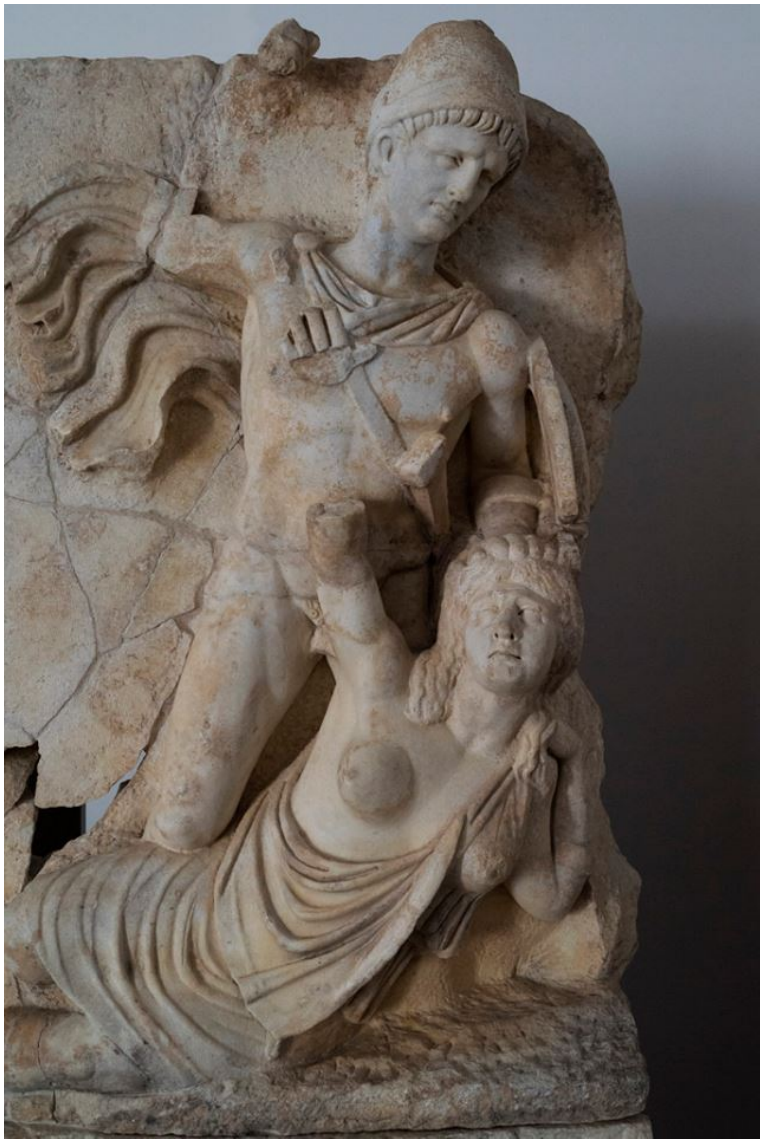


Figure 7.13: *Claudius stands over the sprawling, defeated figure of Britannia. Roman bas-relief 41–58 AD © Archaeological Museum of Aphrodisias, Turkey*

Figure 7.14: ©*Roman Inscriptions of Britain 2017: RIB 201. Funerary monument of Longinus Sdapeze featuring a conquered Briton*

7.3.2 Dress and provincial "otherness"

Despite all of this blatant discrimination, it seems that many provincial people were intent upon displaying their cultural identity in both funerary portraiture and in everyday personal adornments. Dress and personal adornment in the

Roman world have been studied meticulously by a myriad of authors in order to better understand the complexities of identity that encompass ethnicity, gender, and age (Carroll 2006, 2013a, 2013b, 2015; Rothe 2009, 2012; Eckardt 2014). Though all of these aspects are important components in dress choice, the evidence that points specifically to ethnicity will be discussed in this dissertation as a means of displaying the importance of cultural self-identification in the face of imperialism.

Much like epigraphic evidence, funerary monuments are an excellent resource for understanding ethnicity through dress, particularly the traditional costumes associated with certain cultures and ethnicities. It was common for individuals—especially those with financial means—to arrange their funerary monuments before their deaths (Carroll 2013), so it is safe to presume that at least some of these monuments reflect the deceased's image—or desired image—of his or herself. Not many funerary monuments with relief carvings of the deceased in ethnic costume exist in Britain, but there are enough to prove that indigenous dress was at least maintained by some individuals well into the second and third centuries AD. In addition, this section will also focus on evidence of indigenous dress in monuments from Pannonia and Gaul, as it is well-attested in epigraphic evidence that people from those provinces migrated to Britain (Chapter 5). This evidence is equally important because the people from these provinces would have certainly brought along their culturally specific personal adornments when they traveled to Britain (Eckardt 2014). Furthermore, the this evidence from other provinces relates to how locals identified themselves in their own communities post-Roman conquest, which can serve as a blueprint for how indigenous Britons may have also reacted to Roman invasion.

Before exploring this topic, it is essential to note that evidence of dress is tied to several other facets of a person's identity including gender and social status. It is common in funerary monuments for only the mothers and daughters to wear these ethnic costumes, even when it is clear from dress and other personal adornments that the men (and most likely the women) have been granted Roman citizenship (Carroll 2015). Furthermore, if the male immigrant population to Roman Britain is mostly due to military recruitment, then it is likely that they would present themselves in Roman military costume no matter their province of origin (much like Longinus Sdapeze in figure 7.14). Therefore, the majority of the examples detailed below focus on female examples of ethnic dress in funerary portraiture. In the same vein, it is also vital to mention that the forthcoming examples are evidence of people that were able to afford elaborate funerary monuments, so it is safe to assume that the tradition of ethnic dress being passed down the female line is prominent in elite classes—but the same assumption cannot necessarily be made for those of lower classes. However, this does not mean that those of lower classes did not maintain and express their provincial identities. Rather that it is more difficult to ascertain their adherence to provincial norms since they may not have been able to afford the material culture or funerary portraiture that survive in archaeological contexts.

Figure 7.15: ©*Roman Inscriptions of Britain 2017: RIB 1065. Funerary monument of Regina, wife of Barates, featuring indigenous British dress (late 2nd century AD)*

Though it is not as prevalent as in other provinces, there are some examples of funerary portraiture depicting foreign or indigenous dress in Roman Britain. One notable example is Regina, a freedwoman living in South Shields in the second half of the second century AD (*RIB* 1065) (figure 7.15). She was the freedwoman and wife of the aforementioned Barates from Palmyra (*RIB* 1171), and also a "Catuvellaunian by tribe" according to her funerary inscription. Regina wears typical British garb of the second to fourth century AD, which consists of a long tunic with a ruffled collar, a poncho-like coat that requires no brooch or fibula, a bonnet, and what appears to be a single gold-boss earring (Carroll 2015). Interestingly, Regina also wears a "twisted neck ring" that is chronologically consistent with Iron Age Britain (Carroll 2015). An inclusion such as this is odd, but could be a nod to Regina's indigenous ancestors before the Roman campaigns in Britain.

Figure 7.16: ©*Roman Inscriptions of Britain 2017: RIB 961, funerary monument of Vacia featuring indigenous dress, 2*nd *century AD*

Another notable example is the second century AD funerary monument to three-year-old Vacia in Carlisle (*RIB* 961) (figure 7.16). It is common for children to be stylized as smaller versions of adults in funerary monuments, which is exactly the case for Vacia (Phillips 1976; Coulston and Phillips 1988). Vacia wears a long tunic underneath a shorter tunic, both of which feature heavy, vertical pleats. Her outfit also includes a belt over the top tunic and a thick cowl neck with many folds, all of which are typical for indigenous women in Britannia at the time, including two other fragmentary examples from Carlisle (Phillips 1976; Coulston and Phillips 1988). Though Vacia was only three years old at the time of her death, she is depicted in the same manner as indigenous adult women in the area.

Figure 7.17: *Funerary monument of Flavia Usaiu, 2nd cent. AD, Gorsium, Hungary, RIU 1548a*

One example from Pannonia features Flavia Usaiu, daughter of Tattu and mother of Quintus Flavius Titucus (RIU 6 1548a; Carroll 2013) (figure 7.17). Flavia's father, Tattu, has a purely Celtic name while her son is clearly a Roman citizen. Flavia herself has a hybrid name that combines Latin (Flavia) and Celtic (Usaiu) influences. Her dress, on the other hand, is wholly indigenous. Flavia is depicted wearing an intricately tied turban and veil, both of which are distinctly Pannonian (Carroll 2013). She wears the typical tunic and pinafore tied with large fibula on either shoulder. Finally, her arms are laden with elaborate bracelets. Flavia represents an important example of funerary portraiture because similar adornments have been found in the graves of Pannonian women of the same time period (Facsády 1994, 2001; Carroll 2013). Therefore, it is possible to connect these grave goods to a specific type of ethnic dress and ethnic identity, which was a cornerstone of Clarke's (1979) aforementioned research at Lankhills Late-Roman Cemetery.

Figure 7.18: *Meal scene from a funerary monument showing the Gallic tunic. Late second or third century, Neu- magen, Germany. Trier, Rheinisches Landesmuseum Trier, inv. no. 10032 (© T. Zühmer, Rheinisches Landesmuseum Trier).*

Finally, the "Gallic ensemble" of the same time period can, unfortunately, only be attested in art and funerary sculpture, as it requires no metal fastenings or jewelry, which are the most likely components of personal adornment to survive in the archaeological record (Rothe 2012). There is some debate as to the exact nature of Gallic dress in the second and third century AD, but the women in figure 7.18 represent the general consensus (Rothe 2012). This meal scene from a funerary monument in Neumagen, Germany shows the women in a long-sleeved, fitted tunic, with a cloak draped around the neck much like a heavy scarf, and a cloth bonnet. Interestingly, this type of tunic is not attested in pre-Roman Gallic communities (Rothe 2012), meaning that after the Roman conquest Gallic women did adopt a new style, but that style was still decidedly not Roman. On the other hand, Rothe's (2012) findings show that more elite Gallic women of this time tended to lean towards the traditional Roman dress in funerary portraiture. So, there is a mix between indigenous dress and Roman dress for Gallic women in funerary portraiture, if not also in everyday life. This discord would have also been reflected in Gallic women travelling to Roman Britain.

Gendered and socio-economic differences aside, evidence of ethnic dress in the archaeological record is an important component in better understanding the lived experience of conquered people during Roman occupation. In the past, non-Roman use of traditional Roman funerary commemoration has been interpreted as "Romanization," or the belief that provincials emulated Roman citizens (Haverfield 1905; MacMullen 1982; Meyer 1990; Millett 1990). However, there is an argument to be made that choosing a distinctly Roman form of funerary commemoration is, in and of itself, a statement that seems at odds with a statement of non-Roman origins. This is especially true of the inscriptions that feature other languages such as *RIB* numbers 241, 662, 663, and 758. One could theorize that local individuals used this method of commemoration not to align themselves with their conquerors, but to assert their identities in a format that their conquerors could easily understand. The same can be said for the evidence of grave goods present at Lankhills or York (Clarke 1979; Leach et al. 2009). If a person wanted to be seen as "Roman," why would he or she maintain their ethnic customs in death? These acts of expressing one's identity are an essential component in understanding the complex relationship between Romans and provincials, especially when Romans themselves are using these identifiers of "otherness" to degrade provincials and present them as "barbarians."

7.4 Summary

Though the idea of "Romanization" was previously prevalent in studies of migration and diversity throughout the Roman Empire, it is clear from the results of this study that a great proportion of migrants opted to display their origins and their diversity, even in the face of imperialism and discrimination. While all of the topics discussed throughout this dissertation confirm that migration and diversity were prevalent in Roman Britain, combining them in meaningful ways really gets to the heart of the experience of diversity. Using phenotypic, isotopic, and epigraphic evidence together has shown that military groups comprised of previously conquered men make up the majority of migrants to Roman Britain. Considering the primary source material, these men were considered to be barbarians who must be conquered and civilized—and then recruited to continue conquering other barbarians for the sake of their oppressor. Despite the promise of Roman citizenship after their lengthy service, these men (and possibly their families) continued to express their original origins through both epigraphy and dress. Epigraphy is especially significant in this context, as it is a primarily Roman practice that both indigenous Britons and other provincials readily adopted as a means of making their "otherness" known. So many individuals chose to announce their foreignness (or indigenous ties) in a capacity that was both visible and comprehensible to Roman citizens after they had been "assimilated" into the Roman Empire, which seems more like an act of rebellion than one of "Romanization."

Texts and works of art like the ones shown above make it clear that physical differences were noted by, and important to, Roman citizens, particularly elite ones. It's also clear that these differences were used for prejudiced propaganda, which helped justify military conquests to the Roman people. And yet, the phenotypic, isotopic, and epigraphic evidence show that a large number of these indigenous Britons and other provincial migrants—who were also once considered to be barbarians—still choose to announce their ethnic and cultural ties. Knowing that all of these forms of cultural identity were held on to—even in the face of discrimination—makes interdisciplinary studies even more relevant. There was a willingness to cling to one's origins and proudly display them, as well as a willingness to display negotiated identities that fall somewhere between provincial and Roman. When interdisciplinary methods are used, archaeologists and anthropologists have the opportunity to not only estimate how diverse populations were, but how important that diversity was to the people of that time and how those people experienced a wave of change that both threatened their previous cultural identity but also provided new opportunities.

Chapter 8

Conclusions

This study has attempted to better understand the experience of migration and diversity in Roman Britain using five main questions:

1. What are the demographics of the population at each site? How do we define differences within a demographic from using both osteological techniques and archaeological analysis?

2. How can craniometric variation speak to the level of diversity within a population without attempting to classify individuals into known populations?

3. What do previous studies on migratory isotopes tell us about the demographics of the population in question? Does this support the level of diversity interpreted from the cranial data?

4. Does the archaeological evidence, specifically that pertaining to expressions of foreignness (such as evidence of dress, epigraphs, and other material culture goods), support the level of diversity suggested by both the isotopic and the craniometric data?

5. How can these different types of data be combined to determine the significance of their interrelationships?

In summary, using cranial phenotypic variation, stable migratory isotope analysis, and epigraphic expressions of diversity, the following conclusions have been drawn:

1. There is ample evidence to suggest that the demographics at most of the sites in this study are ethnically or ancestrally diverse, and that both migrants and indigenous people were living in the same communities.

2. Despite its problematic past, cranial metric variation can be explored in an ethical and scientific manner, so long as traditional classification methods are not used. This study found that cranial phenotypic diversity was present at many of the sites in question by using multivariate statistics.

3. By revisiting the findings of past stable migratory isotope studies, the current study found that individuals migrated from all over the Roman Empire to Roman Britain.

4. Both the isotopic and the phenotypic data suggest that much of the migrant or foreign population of Roman Britain was male, especially at sites that are well-attested military forts.

5. The archaeological and epigraphic evidence support the level of diversity suggested by both the cranial phenotypic and isotopic results, indicating that foreigners and indigenous people in Roman Britain displayed their ethnic origins willingly in the face of imperialism.

8.1 Limitations of the study

While this study has attempted to eliminate many limitations by taking an exploratory and interdisciplinary approach, there are, of course, some lingering constraints. Though the craniometric methods outlined here are meant to be accessible to all, they must be tailored to suit each unique dataset, which requires some knowledge of multivariate statistics and coding language. Of course, there is also the issue of missing data. As mentioned earlier, multivariate analysis generally work best when the number of individuals used exceeds the number of measurements taken per individual (Keefe, Challanáin, and Holst 2015). So, smaller datasets are at a distinct disadvantage.

Furthermore, much of the interpretations presented here are subject to change as more information becomes available. Due to the nature of multivariate statistics, more data will help to provide a clearer picture. Unfortunately, many Romano-British burial grounds have fragmentary cranial remains and can't be examined for future study. However, the same methods can certainly be tested on other locations and time periods.

One of the major limitations of this study is the fact that there are very few individuals who have been sampled for isotopes and have viable crania for a phenotypic analysis. Being able to cross reference individuals in that manner would be extremely beneficial to the ultimate aim of understanding the experience of migrants and their offspring. Essentially, the largest limitation is access to viable data. While Roman Britain is known for its migration and diversity, instances of epigraphy in other provinces far exceed that of Roman Britain. Furthermore, many of the burial sites have too many damaged crania to undertake a viable multivariate analysis. It would be ideal to try these exploratory methods on other assemblages in other provinces with more data.

8.2 Future considerations

There are many options for furthering the scope of this project for future research. First, certain aspects of the project can be expanded upon to continue research on Roman Britain. $\delta^{18}O_{dw}$ isotopes can be collected for the London skeletons, which would allow them to be compared more readily to the remainder of the Romano-British sample. Conversely, Pb isotopic studies can be conducted on the skeletons from Lankhills, Catterick, York, and Gloucester to the same end. Furthermore, more dietary isotopes can be collected and analyzed for these samples, like $\delta^{13}C$ analysis in Muldner and colleagues (2010). Finding that some of the "foreign" individuals from York had probably eaten far more C_3 and C_4 plants than any other individual in the whole of Roman Britain was essential in narrowing down the possible origins of those skeletons (Muldner et al. 2010).

In the same vein, more DNA evidence can be sampled from any of the sites in this project. The study by Martiniano et al. (2016) was an immensely useful addition to understanding the genetic diversity at York and any of the other sites would certainly benefit from the same. Lankhills and Poundbury may be particularly good candidates for this kind of analysis, as they both have well-preserved graves and plenty of viable crania to compare and contrast with the DNA results. Lankhills would be particularly interesting since so many previous studies have wondered if some of its Romano-British inhabitants had origins in Pannonia or, at least, cultural ties to that province (Clarke 1979; Eckardt 2009; Crowder et al. 2016).

Finally, this project was created with an eye to facilitating migration and diversity studies at any site in any time period. Of course, it is vitally important to combine many strands of evidence in order to get the full picture of migration and diversity at any site. Though there were few individuals who had both isotopic and craniometric evidence and lived in an area with sufficient epigraphic evidence, it was still possible to make larger inferences about migration and diversity in Roman Britain as a whole. Considering the relative lack of evidence from Roman Britain compared to other provinces, future studies may have even more success.

On a more technical note, there are some things to keep in mind when attempting to conduct a similar study. In specific regard to the craniometric methods used there, any researchers who wish to implement this method in future works should consider the following reflections. First, it appears that more often than not, the measurements of the mandible are not available in past populations. The mandible also provides the greatest source of error because it is often affected by diet, dental disease, and tooth loss. Therefore, it may not be necessary to include these measurements when collecting data. In addition, the 29 measurements in the CRANID6 database, which do not include the mandible, have been tested on the Bone Clones specimen “Human African Male” (Wright 2012). The cranial measurements for Human African Male are available in the CRANID6 manual, which allows the researcher to practice taking each measurement. This has been an essential resource in maintaining data collection reproducibility. There is more information on measurements and standard data collection for craniometric studies in Appendix A.

The specific code used in R studio for each dataset is included with usage notes in Appendix B. This code can be copied and used for future studies, but there are certain areas that require the researcher to do some trial and error when cleaning the dataset, especially when there are missing values. These parts are described in more detail in Appendix B. It is also important to remember that R Studio is an open source statistical software. It is common for certain statistical tests within the program to be altered slightly. Before performing any statistical test in R Studio, it is highly recommended to research the test. For instance, if using the *mvoutlier* test, enter *?mvoutlier* or *??mvoutlier* into your code. This command should output all of the up-to-date information regarding this test including parameters, input options, expected outputs, etc.

8.3 Final remarks

Ultimately, the exploratory, interdisciplinary approach used in this study was an ideal means of comparing and contrasting the many facets of personal and group identity that go hand-in-hand with migration and diversity. The results of this study have shown that distinct parallels can be drawn between many different markers of migration and diversity over a whole site, even if it is not possible to conduct multiple analyses on single individuals. When comparing the overall migration at a site to the overall phenotypic and expressed diversity, it is possible to explore meaningful pieces of the human experience as it relates to ethnic and ancestral identity. There is potential to conduct this same type of study on countless other geographic areas and time periods, making it an ideal approach for getting to the heart of bioanthropological research: understanding the experiences of past people.

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Appendices

Appendix A

Cranial Phenotypic Data

The following appendix contains the necessary landmark and measurement definitions used in this study. For more information on maintaining standard measuring protocols refer to the CranID manual (Wright 2012). This appendix also contains the cranial measurements for all individuals in this study in order to maintain transparency. Though most of the data was collected by the author, permission to use it must be obtained from the institutions that hold these collections.

Code	Lankmarks
ASB	as-as
AUB	au-au
BBH	ba-br
BNL	ba-na
BPL	ba-pr
DKB	dk-dk
EKB	ek-ek
FMB	fm:a-fm:a
FRC	na-br
FRS	na-br subtense
GNI	id-gn
GOL	g-op
JUB	ju-ju
MAL	pr-alv
NAS	fm:a-fm:a subtense
NLB	max nasal ap.
NLH	na-nasal ap.
NOL	na-op
NPH	na-pr
OBB	dk-ek
OBH	max orbital h.
OCC	la-os
OCS	la-os subtense
PAC	br-la
PAS	br-la subtense
WMH	Min. zy height
XCB	Max. breadth perp. to sagittal suture
XFB	Max. breadth on coronal suture
ZMB	zm:a-zm:a
ZYB	zy-zy

Table A.1: *Cranial measurements and their defining landmarks*

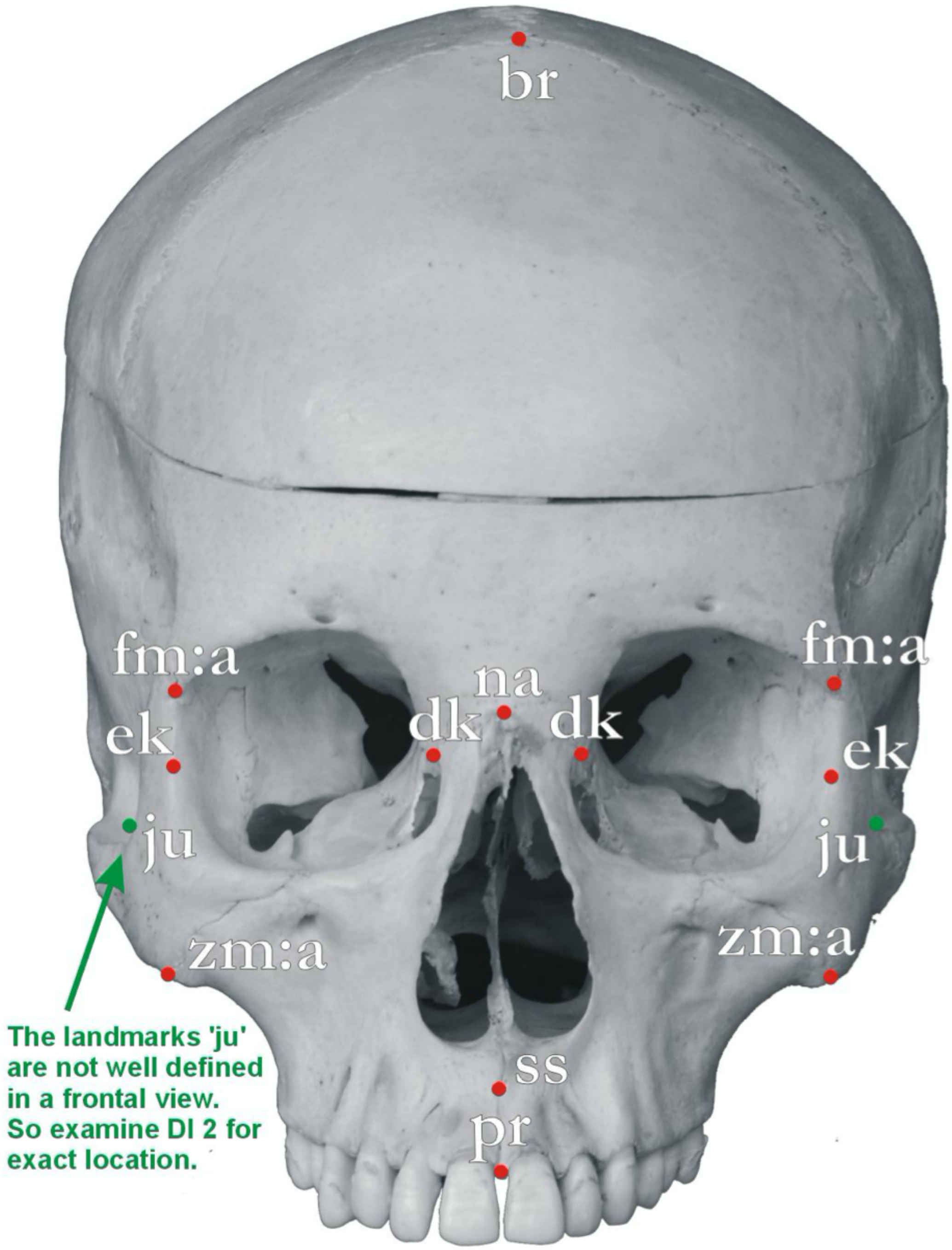


Figure A.1: *Defining illustration 1 (Wright 2012)*

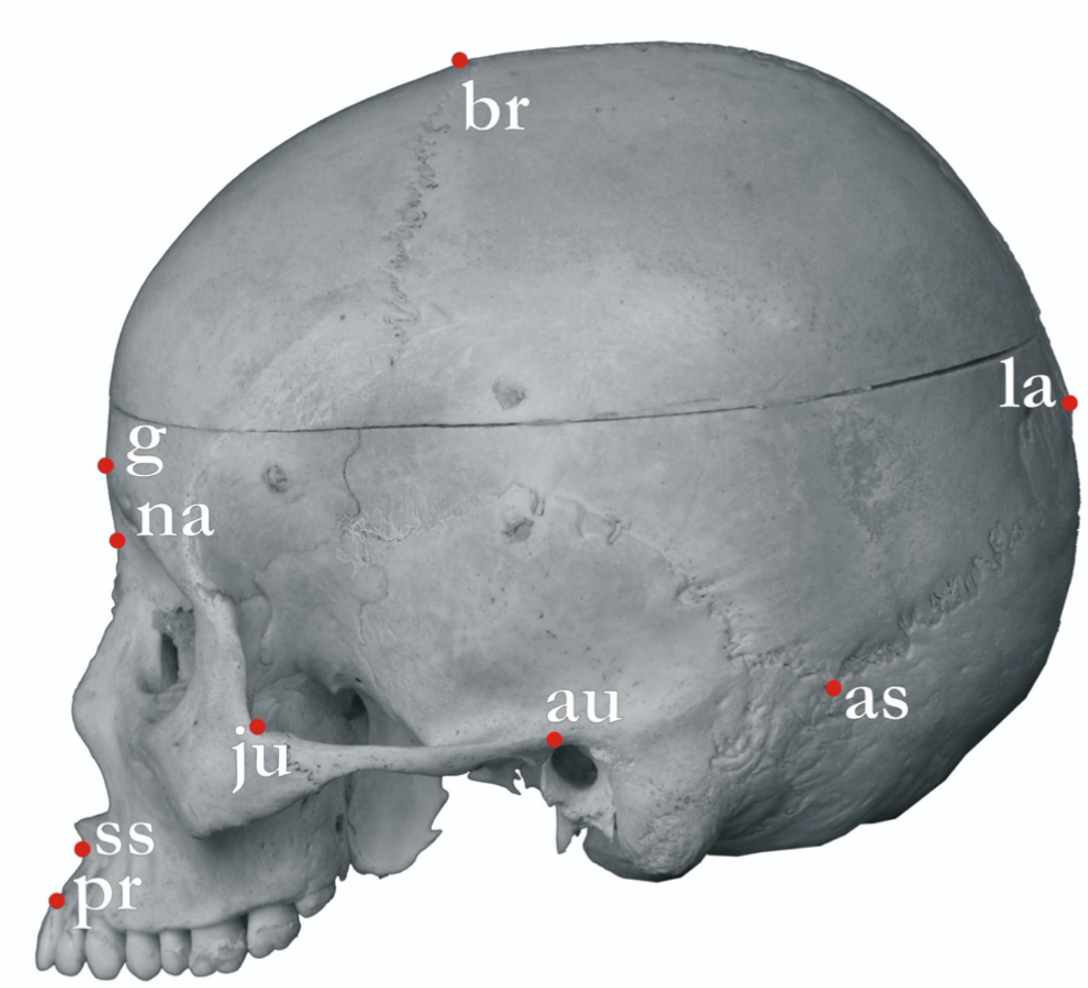


Figure A.2: *Defining illustration 2 (Wright 2012)*

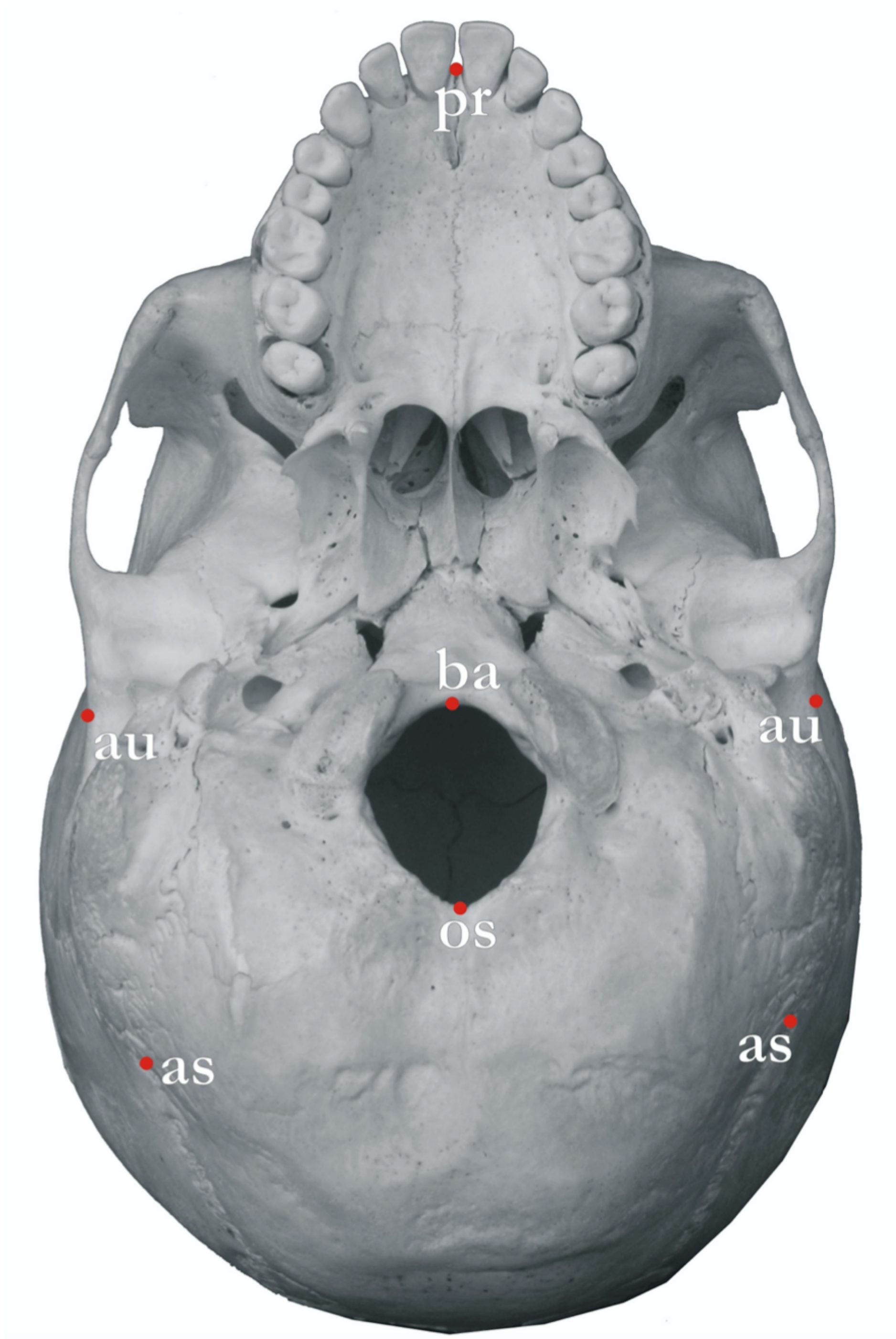
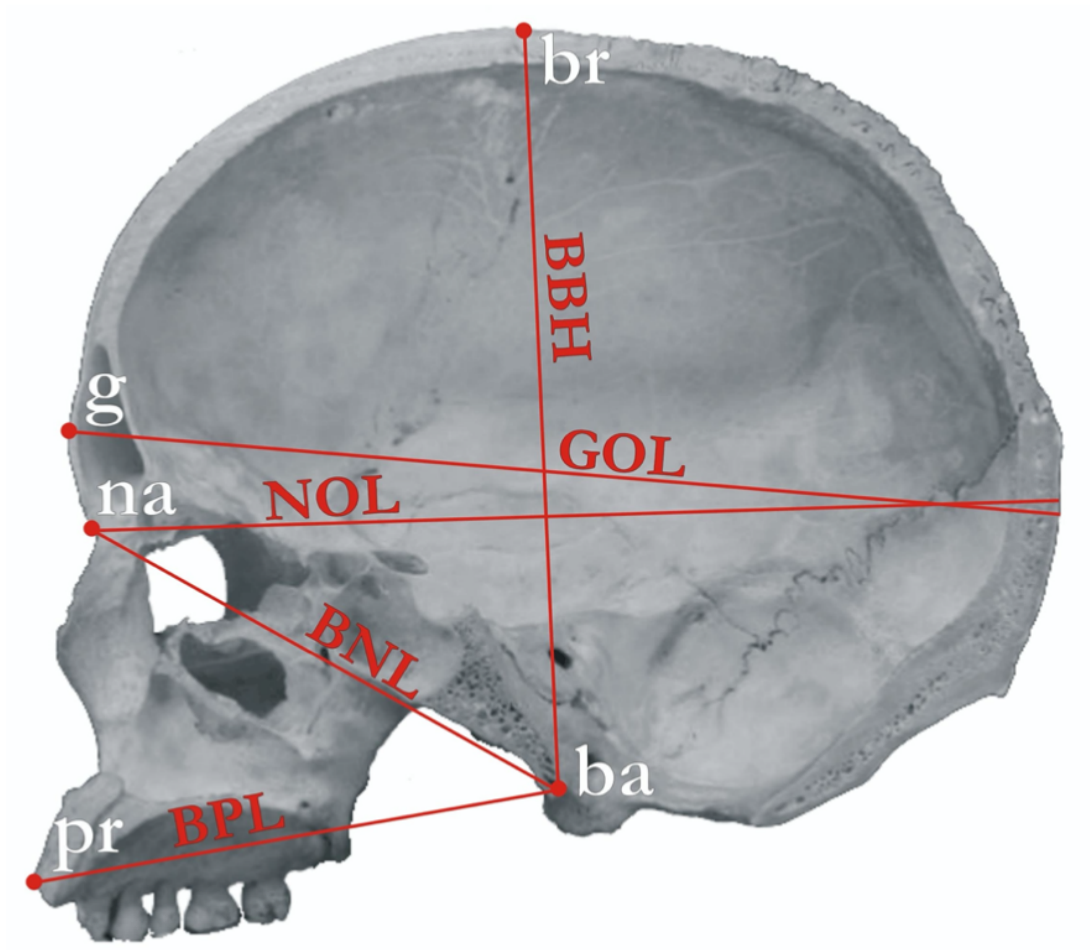


Figure A.3: *Defining illustration 3 (Wright 2012)*



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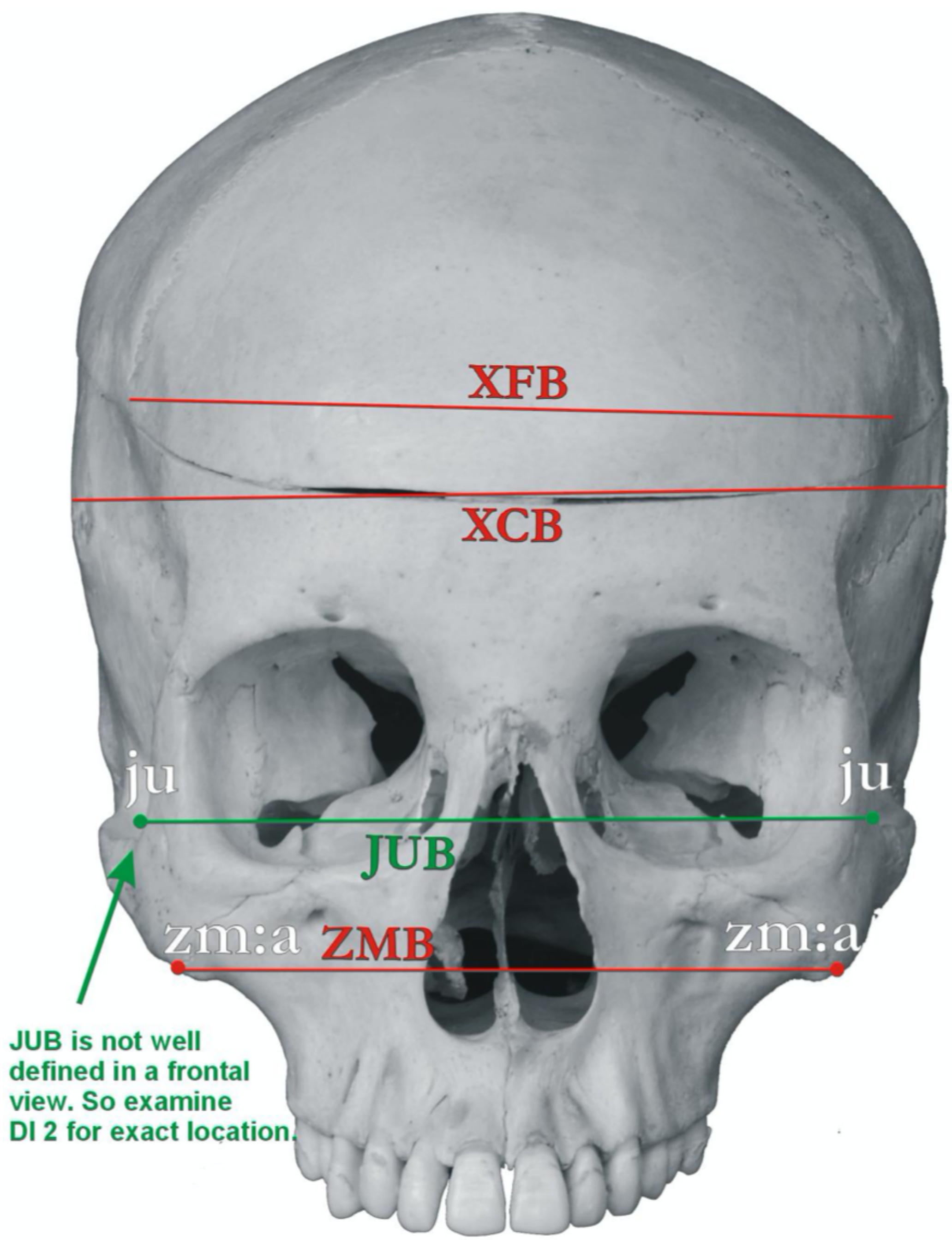

Figure A.5: *Defining illustration 5 (Wright 2012)*

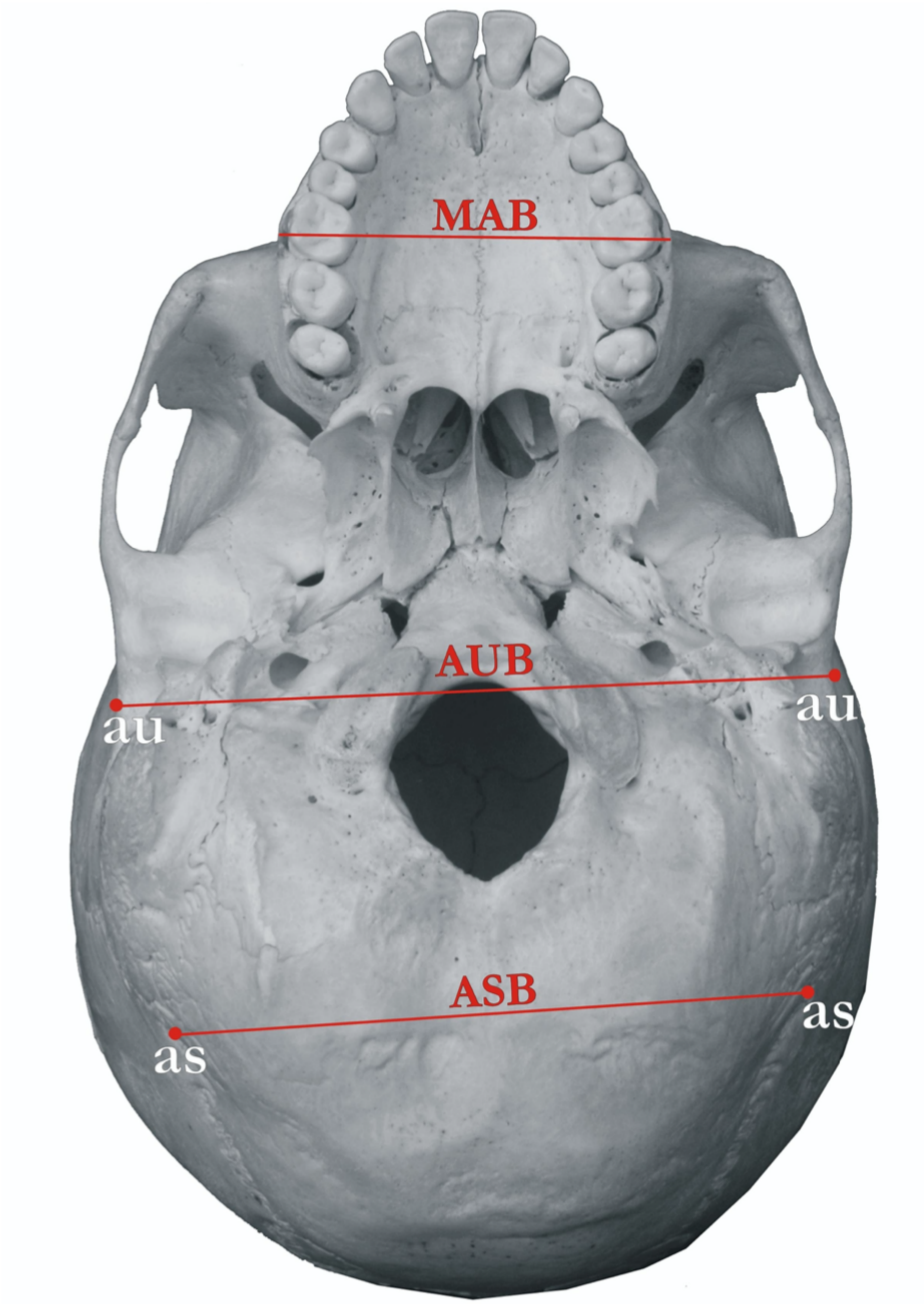

Figure A.6: *Defining illustration 6 (Wright 2012)*

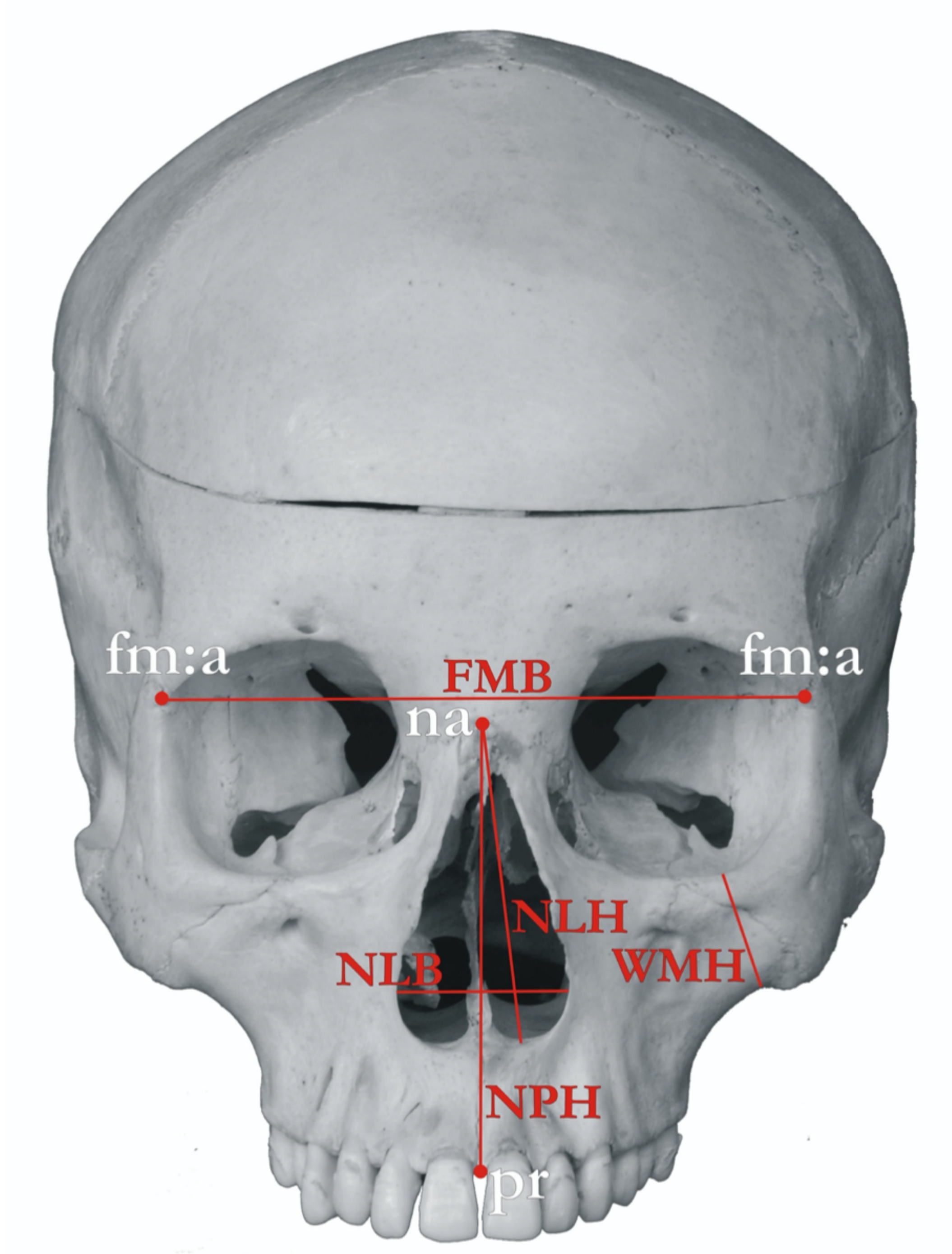

Figure A.7: *Defining illustration 7 (Wright 2012)*

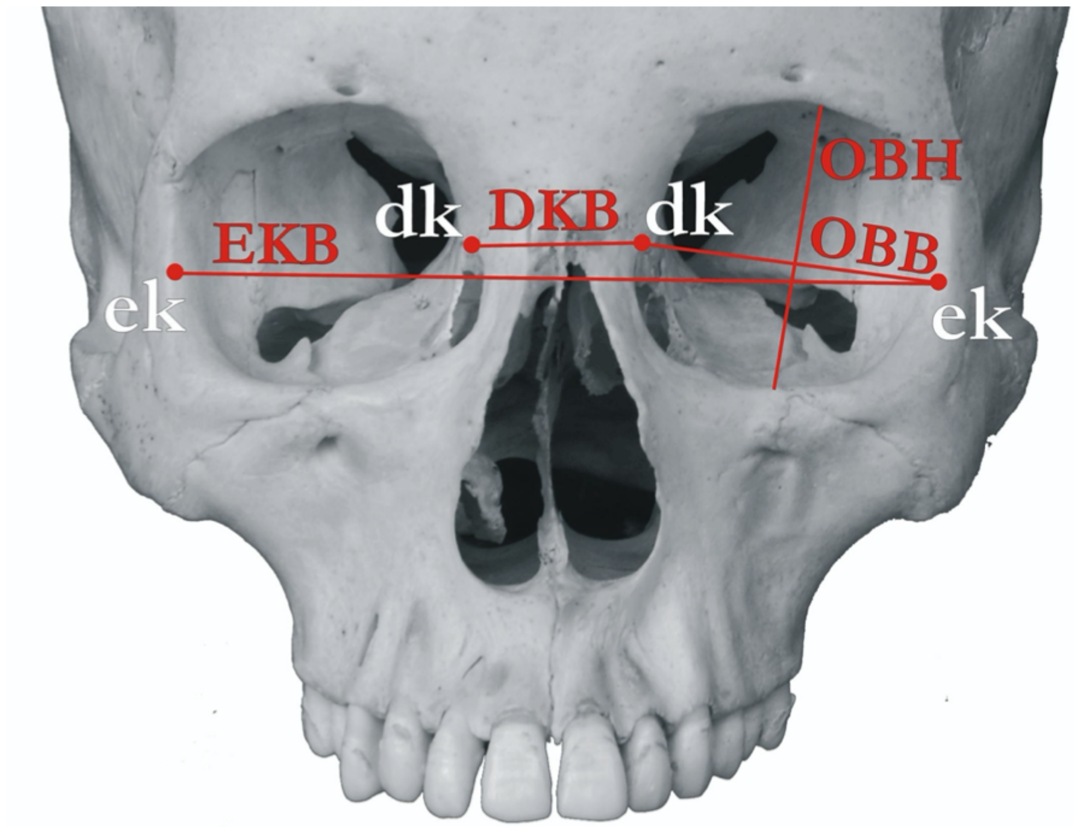

Figure A.8: *Defining illustration 8 (Wright 2012)*

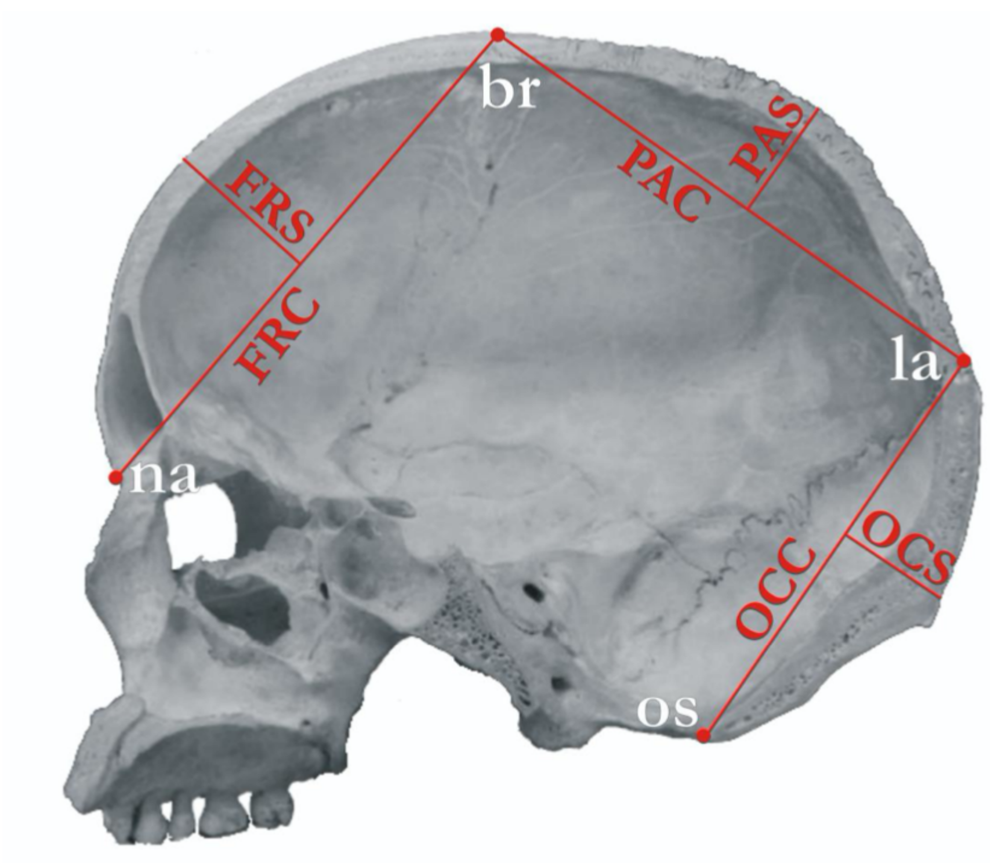

Figure A.9: *Defining illustration 9 (Wright 2012)*

Table A.2: *Lankhills Late-Roman Cemetery Cranial Measurements.*

Sk. No.	Exc.	ASB	AUB	BBH	BNL	BPL	DKB	EKB	FMB	FRC	FRS	GOL	JUB	MAL	NAS	NLB
11	67-72	113	131	143	103	85	NA	99	102	118	27	186	118	51	20	NA
16	67-72	124	126	121	100	97	22	94	95	108	23	195	112	54	17	24
19	67-72	115	125	126	95	85	22	99	99	112	26	178	113	48	16	23
20	67-72	110	123	143	100	92	20	93	94	116	31	193	109	50	14	24
35	67-72	112	121	129	100	98	21	94	94	110	23	185	111	59	15	25
39	67-72	113	125	NA	NA	NA	23	102	105	105	29	195	117	54	16	25
51	67-72	123	133	139	102	100	29	103	107	116	33	190	125	57	16	27
52	67-72	123	139	NA	NA	NA	20	99	102	111	28	188	116	54	17	24
53	67-72	111	126	120	93	91	21	99	101	110	26	183	112	53	17	26
55	67-72	103	114	135	100	94	20	97	99	106	22	170	110	55	18	24
64	67-72	112	111	129	98	92	NA	NA	NA	117	29	187	NA	NA	NA	NA
67	67-72	115	120	121	96	97	18	93	95	110	26	180	109	57	14	21
89	67-72	96	109	125	96	91	19	89	89	109	31	180	104	50	16	21
96	67-72	107	117	125	101	94	20	97	96	110	30	187	111	53	15	21
97	67-72	108	125	135	103	94	22	98	100	119	32	193	115	NA	19	24
107	67-72	112	117	135	104	99	19	94	94	113	27	186	106	56	17	21
119	67-72	108	113	125	96	92	21	96	99	102	22	178	108	54	18	22
133	67-72	104	117	127	96	87	22	94	96	111	27	181	110	48	18	23
141	67-72	113	121	135	103	104	22	99	103	111	29	198	114	59	18	25
150	67-72	98	119	NA	NA	NA	22	98	100	111	25	188	114	NA	20	25
158	67-72	117	123	126	100	97	22	102	103	115	26	194	113	57	19	22
161	67-72	113	124	130	102	92	19	101	102	110	27	184	119	52	15	23
192	67-72	113	121	131	102	97	16	93	95	101	20	181	109	54	16	24
194	67-72	112	124	128	98	96	21	96	97	111	27	184	112	56	17	25
203	67-72	118	124	131	101	99	23	103	105	115	28	195	118	58	18	26
233	67-72	119	122	NA	NA	NA	20	97	97	111	26	184	111	51	17	25
266	67-72	NA	NA	122	85	79	20	91	91	96	25	172	103	49	15	22
270	67-72	NA	NA	NA	NA	NA	22	98	95	104	21	188	108	53	18	25
273	67-72	115	119	124	94	93	22	95	98	106	28	187	109	51	16	25
309	67-72	120	NA	140	109	97	20	107	108	119	25	205	119	56	23	29
330	67-72	108	120	128	100	93	20	98	100	107	26	183	110	52	16	22

Table A.2: *Lankhills Late-Roman Cemetery Cranial Measurements Cont. (NLH-ZYB)*

Sk. No.	Exc.	NLH	NOL	NPH	OBB	OBH	OCC	OCS	PAC	PAS	SSS	WMH	XCB	XFB	ZMB	ZYB
11	67-72	54	181	68	46	33	102	24	117	24	19	22	154	137	96	NA
16	67-72	51	193	71	39	35	96	36	119	26	21	27	144	118	93	129
19	67-72	49	177	66	40	34	89	29	110	24	21	19	145	127	91	NA
20	67-72	51	189	71	39	34	97	28	127	31	25	24	135	120	92	NA
35	67-72	51	183	71	38	31	100	29	115	28	25	23	145	122	90	131
39	67-72	54	191	76	41	38	99	29	127	31	NA	22	138	127	91	NA
51	67-72	54	184	76	41	37	95	30	115	24	27	25	158	134	100	NA
52	67-72	52	186	73	40	33	100	30	116	28	26	25	147	120	90	NA
53	67-72	52	183	69	41	34	97	30	110	27	22	24	143	NA	92	NA
55	67-72	51	169	67	39	29	99	25	104	29	24	21	140	120	90	125
64	67-72	54	186	76	42	34	104	37	115	21	NA	27	138	NA	NA	NA
67	67-72	51	179	71	39	34	101	33	100	18	18	18	142	120	93	NA
89	67-72	49	177	67	38	35	89	26	114	26	20	22	129	112	88	NA
96	67-72	57	183	78	41	34	87	29	116	20	21	25	140	126	94	126
97	67-72	52	190	70	40	36	96	27	117	25	19	20	142	120	92	135
107	67-72	50	184	70	38	33	98	31	112	21	24	26	141	115	90	126
119	67-72	50	176	68	39	34	91	22	116	25	22	23	132	112	88	NA
133	67-72	47	179	63	41	34	91	29	113	24	26	22	136	113	93	NA
141	67-72	52	193	74	42	35	94	34	128	29	25	19	138	122	94	NA
150	67-72	52	186	72	42	38	91	34	118	28	NA	22	140	118	89	NA
158	67-72	48	192	69	44	32	101	32	112	18	26	22	147	126	93	127
161	67-72	52	178	68	43	33	88	29	109	20	18	24	136	120	91	134
192	67-72	54	178	71	41	34	90	29	113	25	22	18	NA	111	86	127
194	67-72	53	182	74	38	35	97	29	115	24	21	25	139	116	86	NA
203	67-72	52	192	75	43	34	98	34	123	25	29	23	151	130	96	NA
233	67-72	53	181	73	40	32	88	30	113	26	25	20	144	124	87	NA
266	67-72	51	171	73	38	37	92	31	117	25	21	21	NA	112	85	117
270	67-72	50	189	72	42	33	110	37	108	18	27	21	131	109	96	NA
273	67-72	49	185	66	41	34	95	33	119	22	21	21	145	126	92	NA
309	67-72	56	203	78	49	35	102	36	125	25	32	25	140	124	102	NA
330	67-72	50	181	68	41	31	95	32	113	20	20	20	138	123	89	NA

Table A.2: *Lankhills Late-Roman Cemetery Cranial Measurements Cont. (ASB-NLB)*

Sk. No.	Exc.	ASB	AUB	BBH	BNL	BPL	DKB	EKB	FMB	FRC	FRS	GOL	JUB	MAL	NAS	NLB
343	67-72	106	112	125	98	93	20	90	90	112	27	184	106	51	13	21
365	67-72	113	117	125	94	84	21	96	100	100	24	176	111	50	18	21
410	67-72	119	129	130	100	90	23	102	104	117	27	192	116	50	17	22
413	67-72	119	128	144	108	97	20	101	104	120	31	197	116	51	22	24
25	00-05	NA	NA	NA	NA	NA	18	98	97	107	21	NA	115	56	17	22
32	00-05	112	125	134	103	92	21	95	99	115	28	188	111	49	18	23
61	00-05	122	119	123	98	94	19	97	100	106	24	178	111	53	20	21
84	00-05	111	126	130	93	85	21	95	97	114	29	183	109	52	17	24
108	00-05	117	124	126	96	92	18	97	99	108	26	184	111	54	16	24
271	00-05	118	121	130	95	83	19	93	95	104	26	175	110	NA	15	21
434	00-05	110	126	136	104	94	21	105	108	120	32	193	120	58	20	26
435	00-05	109	115	132	99	93	17	92	93	110	28	186	104	52	21	23
451	00-05	110	117	135	106	101	23	96	99	109	28	186	114	57	18	28
489	00-05	106	122	139	99	90	22	97	98	114	32	187	112	49	17	24
554	00-05	118	126	133	103	101	20	102	107	123	32	199	120	NA	18	26
593	00-05	NA	126	137	100	91	20	97	96	114	30	197	111	NA	13	24
616	00-05	109	121	134	95	90	23	95	97	109	23	182	112	51	16	23
642	00-05	119	127	132	108	101	23	105	107	107	24	190	119	59	20	25
702	00-05	116	128	132	101	98	21	95	96	116	28	186	111	55	15	25
724	00-05	118	124	122	87	87	23	100	100	108	25	179	113	50	13	22
967	00-05	112	124	125	99	89	21	100	102	112	27	188	115	55	19	25
1022	00-05	116	125	133	101	101	21	99	101	115	27	190	112	60	20	26
1474	00-05	120	127	134	94	88	20	95	97	126	30	189	115	51	17	25
1512	00-05	111	115	127	97	91	22	91	93	103	27	178	107	52	16	23
1532	00-05	112	128	133	101	95	25	105	106	113	29	194	119	56	18	22
1640	00-05	125	137	129	97	95	25	109	112	105	22	209	126	62	18	28
1793	00-05	104	113	123	92	88	19	94	91	107	26	176	NA	55	13	21
1852	00-05	114	121	132	93	95	20	94	94	119	28	194	109	60	17	25

Table A.2: *Lankhills Late-Roman Cemetery Cranial Measurements Cont. (NLH-ZYB)*

Sk. No.	Exc.	NLH	NOL	NPH	OBB	OBH	OCC	OCS	PAC	PAS	SSS	WMH	XCB	XFB	ZMB	ZYB
343	67-72	46	182	68	39	31	90	26	114	23	22	23	133	120	87	NA
365	67-72	49	174	70	41	35	92	30	113	26	19	25	138	123	94	NA
410	67-72	50	187	NA	43	34	91	33	120	25	22	22	NA	126	91	NA
413	67-72	56	193	78	44	35	101	33	116	20	24	21	151	124	95	NA
25	00-05	52	NA	71	41	36	NA	NA	NA	NA	24	20	NA	122	93	NA
32	00-05	50	186	67	41	37	100	29	120	25	26	21	150	127	95	137
61	00-05	48	177	71	42	35	87	29	106	23	24	20	148	126	89	130
84	00-05	47	180	70	39	33	97	33	110	25	20	26	143	119	90	127
108	00-05	51	181	71	42	31	98	32	109	25	24	22	147	123	93	131
271	00-05	51	174	69	40	32	96	30	108	24	20	20	140	119	88	126
434	00-05	53	192	80	45	36	100	35	116	21	29	23	147	124	100	NA
435	00-05	49	185	70	40	32	NA	NA	116	25	29	21	135	116	84	124
451	00-05	57	183	76	38	36	97	30	109	21	22	26	134	122	98	NA
489	00-05	52	185	72	39	35	103	25	116	23	26	24	143	125	92	NA
554	00-05	52	195	70	44	37	102	37	123	23	23	24	145	124	96	NA
593	00-05	57	193	75	41	35	96	34	130	36	26	25	142	125	101	NA
616	00-05	48	180	70	38	31	103	32	112	20	22	25	142	117	95	127
642	00-05	56	187	76	43	34	88	33	115	23	22	26	145	115	94	NA
702	00-05	50	184	76	40	36	97	28	111	21	25	24	147	123	100	NA
724	00-05	50	178	69	41	35	93	34	111	26	26	23	145	126	97	132
967	00-05	51	187	74	42	36	95	31	118	24	25	25	140	119	100	131
1022	00-05	50	187	69	42	34	90	32	121	26	NA	21	145	115	93	NA
1474	00-05	51	185	70	39	34	102	35	120	24	20	22	145	120	93	135
1512	00-05	47	176	67	37	30	92	29	113	24	23	23	136	120	88	121
1532	00-05	52	191	75	43	36	92	33	120	24	22	23	NA	118	98	138
1640	00-05	58	206	86	45	38	100	40	142	33	27	27	160	133	106	149
1793	00-05	46	175	67	38	33	94	28	106	26	27	23	127	112	90	NA
1852	00-05	52	190	77	39	32	94	30	124	29	28	21	146	118	94	NA

Table A.3: *Ancaster Late-Roman Cemetery Cranial Measurements.*

Sk. No.	ASB	AUB	BBH	BNL	DKB	EKB	FMB	FRC	FRS	GOL	JUB	NLB
1	115	125	131	101	22	99	102	117	26	194	113	22
2	128	133	138	103	28	101	105	115	30	195	119	26
3	103	121	138	99	20	93	92	117	29	190	106	24
4	111	122	130	97	21	95	97	114	26	191	111	24
5	116	121	124	94	19	95	94	110	30	183	112	22
6	114	120	122	99	22	102	103	111	27	181	113	26
7	109	118	138	96	19	90	91	114	28	185	102	25
8	102	110	134	98	20	90	94	109	28	184	103	21
9	109	130	135	100	18	98	100	113	30	198	114	22
12	109	130	128	104	21	98	103.5	113.5	26	187	117	24
34	116	127	128	100	20	93	97	108	24	191	112	23
38	114	120	131	98	23	98	98	111	27	188	110	25
39	123	133	132	103	23	105	107	119	32	199	NA	24
47	116	130	135	105	20	101	104.5	112	25	186	119	30
49	114	120	128	100	20	98	100	115	29	185	111	24
52	106	119	129	99	21	92	93	110	24	187	103	20
58	107	117	128	97	19	93	96	113	28	186	106	23
65	111	116	141	104	20	96	100	125	32	193	111	23
72	107	116	124	91	25	99	100	115	20	181	112	27
92	115	132	NA	NA	24	106	109	122	28	195	123	24
93	117	119	129	101	23	100	101	120	28	189	115	24
102	115	120	133	106	23	97	99	108	27	189	113	25
106	115	NA	128	98	22	96	100	115	28	187	120	24
115	107	113	128	98	21	96	97	109	27	180	110	29
128	107	114	130	102	18	92	92	110	26	186	105	23
149	105	114	121	93	24	93	96	104	29	173	106	22
152	103	115	119	98	26	95	94	99	25	174	110	25
156	107	119	130	93	22	92	94	110	26	181	113	23
157	112	123	123	98	22	99	99	113	26	193	111	23
168	108	120	125	96	21	97	98	108	27	181	112	24
188	109	129	139	109	22	101	99	117	28	120	117	25
200	118	126	141	107	18	95	101	112	24	189	117	24
202	104	120	125	96	21	97	99	101	30	179	114	23
205	121	128	135	98	22	99	100	114	28	184	114	24
210	107	120	136	100	23	98	101	113	29	179	116	22
211	112	123	130	95	23	97	99	119	33	189	111	24
216	113	125	128	99	19	94	96	113	27	189	113	23
229	112	126	139	102	22	104	106	105	24	176	122	24
231	112	122	137	100	24	101	105	113	27	192	115	23
238	119	125	130	100	18	98	100	108	26	182	114	21

Table A.3: *Ancaster Late-Roman Cemetery Cranial Measurements Cont. (NLH-ZMB)*

Sk. No	NLH	NOL	OBB	OBH	OCC	OCS	PAC	PAS	WMH	XCB	XFB	ZMB
1	53	191	41	33	103	33	107	22	26	145	116	98
2	59	193	38	34	98	33	122	23	27	154	135	97
3	54	188	39	31	101	28	128	35	21	146	116	91
4	55	188	40	35	97	33	120	29	21	147	117	92
5	53	183	40	34	102	33	105	19	20	137	121	86
6	51	180	42	33	90	25	105	22	24	139	119	95
7	50	184	37	34	106	30	116	24	20	143	121	88
8	49	179	38	31	95	29	116	27	23	137	117	85
9	49	193	41	35	98	36	124	25	20	141	119	94
12	57	183	41	36	89	30	108	24	25	142	122	97
34	56	189	40	37	105	34	108	23	24	137	115	95
38	53	186	39	34	98	31	116	23	21.5	138	116	93
39	57	195	44	34	100	31	123	25	21	140	126	99
47	53	184	42	35	104	30	112	29	23	146	122	101
49	57	183	43	38	92	28	113	23	19	140	120	87
52	46	184	38	32	97	27	114	28	21	144	121	85
58	50	186	38	32	105	37	109	21	22	141	119	86
65	57	190	44	36	95	30	117	23	26	144	120	95
72	54	180	39	34	101	26	114	29	22	140	NA	90
92	53	193	43	36	103	33	112	24	25	148	125	98
93	54	185	43	32	89	30	115	26	25	141	122	98
102	54	186	40	35	98	33	108	23	22	140	115	93
106	57	186	41	31	91	39	117	24	25	142	122	102
115	51	178	38	33	98	28	104	18	22	127	113	99
128	52	184	40	33	94	31	114	23	20	130	112	89
149	51	174	36	33	97	26	107	26	26	128	115	91
152	49	173	38	31	87	29	110	22	19	135	123	87
156	54	181	36	31	94	32	119	26	23	141	122	94
157	55	193	41	39	101	37	112	23	23	144	122	100
168	51	178	42	35	94	27	110	24	19	134	NA	93.5
188	57	198	42	36	112	37	110	18	25	146	126	99
200	53	188	41	33	103	30	121	28	26	145	117	93
202	48	174	39	33	95	29	106	21	19	136	121	85
205	48	180	40	31	101	38	99	20	17	158	122	92
210	58	177	41	36	94	28	112	26	23	140	128	89
211	53	188	41	34	92	31	124.5	30	23	148	130	88
216	52	186	40	36	94	38	114	22	19	137	120	88
229	50	174	43	33	99	31	110	23	23	131	115	94
231	54	190	42	39	98	30	117	25	26	147	125	97
238	51	179	41	35	95	28	110	25	21	139	114	91

Table A.4: *Poundbury Late-Roman Cemetery Cranial Measurements*

Sk. No.	GOL	NOL	BNL	BBH	XCB	XFB	AUB	ASB	BPL	NPH	NLH	OBH	OBB	JUB
392	186	181	98	132	144	118	128	106	92	60	47	33	38	114
749	186	185	105	135	145	123	123	109	101	66	51	35	44	113
708	191	191	102	129	146	127	125	110	89	69	53	37	42	106
499	185	185	100	136	141	121	121	109	96	66	52	33	39	113
114	201	196	110	144	148	133	134	121	100	73	56	35	43	123
614	190	186	97	138	152	125	126	120	86	65	50	36	38	112
889	186	186	111	141	148	126	133	117	99	73	52	34	44	121
94	182	177	102	132	140	106	125	109	94	72	53	34	44	122
212	192	189	110	140	139	114	128	115	105	71	52	33	43	125
720	196	193	105	139	157	133	126	116	94	58	47	34	41	120
752	183	180	98	130	137	122	118	109	101	65	51	33	38	110
769	186	186	92	133	145	131	124	110	88	70	53	37	40	113
289	188	187	100	119	145	120	122	113	95	73	60	35	44	120
298	189	187	100	135	151	125	135	110	94	66	51	36	41	117
495	181	179	96	131	144	122	116	107	90	59	47	30	37	106
207	191	186	107	141	141	124	124	108	104	75	51	34	38	115
284	191	191	97	133	144	122	125	121	89	65	53	34	42	119
702	182	178	96	133	140	120	122	111	93	63	49	33	40	111
343	186	183	105	140	146	121	131	120	98	72	51	36	46	126
420	186	185	100	135	148	124	128	110	95	72	55	31	39	113
728	191	186	97	135	149	124	127	107	88	72	51	37	40	115
854	180	179	98	134	153	125	131	105	93	75	58	35	41	121
871	186	185	102	142	145	120	126	119	92	70	54	33	40	120
488	192	192	109	139	145	123	127	119	102	76	56	34	42	108
816	182	181	104	135	150	123	132	102	102	61	52	32	42	120
821	186	186	92	126	144	124	122	106	89	68	52	39	39	106
690	196	193	107	141	138	123	119	117	102	67	54	34	41	116
349	194	189	102	144	148	130	125	116	90	66	53	31	42	114
357	164	165	94	120	135	105	117	104	86	64	53	31	38	109
741	176	173	82	117	145	120	126	109	85	53	43	33	39	107

Table A.4: *Poundbury Late-Roman Cemetery Cranial Measurements Cont. (GOL-JUB)*

Sk. No.	GOL	NOL	BNL	BBH	XCB	XFB	AUB	ASB	BPL	NPH	NLH	OBH	OBB	JUB
793	180	178	95	121	142	113	123	102	90	61	48	33	41	111
276	176	172	90	128	141	110	120	107	85	67	50	35	40	107
309	180	178	95	128	139	115	119	110	95	69	49	35	39	111
543	173	172	92	124	131	106	105	101	86	60	46	36	37	106
734	185	182	91	124	137	116	111	95	84	69	49	36	40	105
750	175	172	89	120	134	114	113	103	86	61	44	34	37	107
923	184	182	88	118	147	119	125	112	90	64	47	34	40	110
736	183	182	92	121	134	117	117	107	85	69	52	35	39	105
796	181	177	91	126	132	117	111	97	81	63	47	33	42	107
100	180	178	92	117	136	112	121	114	90	61	47	34	38	108
398	179	177	96	132	136	119	117	103	93	66	51	33	42	112
626A	180	179	88	126	139	116	116	102	87	61	48	33	37	106
314	186	181	96	129	137	118	125	111	89	58	46	33	42	116
110	184	182	99	130	137	118	115	112	90	67	52	33	39	114
500	184	181	94	134	139	115	127	109	92	62	47	32	39	114
581	178	174	90	131	142	109	120	104	85	60	48	39	37	107
739	195	191	107	135	146	122	131	116	100	70	50	36	46	113
754	177	176	92	133	140	122	121	110	89	62	48	37	41	108
707	187	185	89	125	146	116	118	113	81	63	52	35	40	107

Table A.4: *Poundbury Late-Roman Cemetery Cranial Measurements Cont. (NLB-OCC)*

Sk. No.	NLB	MAB	ZMB	SSS	FMB	NAS	EKB	DKB	WMH	FRC	FRS	PAC	PAS	OCC
392	24	58	96	24	98	13	97	23	20	107	28	123	27	89
749	23	63	91	25	95	16	95	20	22	110	28	119	24	94
708	25	56	86	26	99	18	97	24	20	114	28	119	26	92
499	22	68	88	22	97	16	92	19	26	113	23	120	28	96
114	28	68	100	20	107	20	107	28	26	117	30	120	21	98
614	23	59	91	27	102	17	96	22	20	114	32	131	27	100
889	29	70	101	28	106	19	107	25	25	108	24	124	27	90
94	24	65	95	24	102	19	98	19	24	110	26	110	25	94
212	26	68	105	30	104	22	106	24	23	111	23	124	29	98
720	25	59	93	20	104	20	101	25	20	111	32	129	27	103
752	29	61	90	28	98	19	91	22	22	105	29	124	26	91
769	23	62	93	24	101	18	101	25	21	108	31	123	23	90
289	27	64	96	24	105	22	104	20	24	114	26	115	25	90
298	28	66	95	27	99	18	101	21	21	112	28	124	28	91
495	25	55	86	20	91	16	89	22	18	115	27	120	27	93
207	27	63	98	25	97	16	96	20	24	120	33	111	24	100
284	26	62	92	25	103	21	101	24	26	121	27	123	27	96
702	24	56	91	22	98	15	96	21	18	113	28	110	25	96
343	23	67	103	25	110	18	107	22	27	109	27	111	23	95
420	25	65	92	24	97	12	94	21	22	112	27	113	25	98
728	24	56	90	23	94	11	92	20	23	117	31	123	24	92
854	25	66	95	22	100	20	99	22	25	111	26	119	26	89
871	27	65	97	26	100	22	98	23	27	113	26	122	26	96
488	25	59	97	27	100	19	101	23	28	114	25	120	25	101
816	25	65	95	27	110	25	106	26	23	104	25	118	26	93
821	25	60	87	23	92	19	92	22	21	115	28	117	25	88
690	23	60	93	27	103	17	103	23	20	119	30	115	22	98
349	24	60	92	27	103	20	100	24	21	120	30	125	26	96
357	26	64	83	21	90	17	91	18	19	103	24	107	25	84

Table A.4: *Poundbury Late-Roman Cemetery Cranial Measurements Cont. (NLB-OCC)*

Sk. No.	NLB	MAB	ZMB	SSS	FMB	NAS	EKB	DKB	WMH	FRC	FRS	PAC	PAS	OCC
741	24	60	92	20	96	15	91	24	20	108	29	115	23	90
793	26	62	86	19	94	14	97	22	20	110	27	110	23	87
276	22	65	85	20	91	16	91	19	24	112	28	116	25	94
309	24	63	93	29	92	14	95	20	22	111	25	112	27	89
543	23	52	85	24	89	14	90	21	19	101	24	112	23	89
734	21	57	88	27	93	20	91	21	20	112	29	119	25	88
750	21	51	79	19	89	14	90	20	20	106	27	114	28	82
923	25	63	95	24	97	15	97	22	21	112	26	121	31	88
736	24	59	89	23	94	17	99	22	24	109	26	116	22	93
796	22	57	89	25	96	17	96	22	21	108	30	128	25	86
100	25	62	89	26	94	21	92	22	22	99	21	109	21	95
398	25	60	90	23	104	19	101	22	22	110	29	122	29	92
626A	27	60	96	26	90	12	93	20	22	103	26	118	30	91
314	21	61	95	25	104	16	99	21	19	103	26	118	26	96
110	26	59	87	22	98	15	98	21	23	109	27	112	22	94
500	25	63	93	23	99	19	96	23	22	111	29	120	29	96
581	27	60	87	24	92	16	93	24	19	106	24	110	24	99
739	22	60	97	22	101	19	100	21	24	116	31	110	29	97
754	26	53	91	22	97	19	96	24	21	108	29	109	24	95
707	26	55	83	21	95	17	92	17	22	114	29	117	23	93

Table A.5: *Baldock Late-Roman Cemeteries Cranial Measurements*

Sk. No.	ASB	AUB	BBH	BNL	FMB	FRC	FRS	GOL	NLH
46	121	127	135	102	95	112	25	196	51
50	107	122	122	96	NA	106	26	179	NA
347	119	128	130	97	101	106	27	196	53
361	123	124	129	99	105	116	28	188	NA
366	101	114	126	99	98	100	24	173	48
373	107	122	130	103	97	103	21	182	43
396	112	126	136	102	NA	116	30	191	NA
416	115	134	137	99	96	107	26	182	56
426	105	121	136	101	NA	111	25	186	NA
443	109	116	125	92	92	109	27	176	NA
468	107	121	131	100	93	117	30	186	47
522	101	116	131	90	98	104	27	170	48
550	107	119	142	104	98	115	32	190	NA
563	109	119	132	102	95	112	30	185	54
574	108	121	137	106	104	109	23	193	NA
577	106	125	131	NA	101	116	29	182	NA
580	124	123	135	109	99	102	25	192	56
1070	111	120	126	103	105	112	30	187	NA
1111	109	117	124	97	98	112	27	185	50
1122	109	131	137	103	107	107	29	186	NA
1174	111	113	NA	NA	98	107	27	194	53
1300	109	130	138	105	106	113	29	191	NA
1372	115	127	133	114	111	109	26	194	NA
1374	113	126	135	105	96	113	25	189	NA
1386	112	125	143	98	102	113	33	194	48
1426	107	125	133	99	105	110	32	192	NA
1446	106	115	129	100	96	101	28	174	48
1447	103	NA	136	99	95	105	30	177	48
469b	113	129	130	104	102	111	27	190	49
F18 L(2) SK(3)	114	124	131	93	103	116	30	195	52
F475 L(2)	112	126	136	103	102	113	27	185	NA

Table A.4: *Baldock Late-Roman Cemetery Cranial Measurements Cont. (NOL-XFB)*

Sk. No.	NOL	OCC	OCS	PAC	PAS	WMH	WRB	XCB	XFB
46	189	99	31	109	22	21	37	140	118
50	177	98	28	113	29	23	30	141	126
347	193	97	34	113	29	24	NA	136	119
361	187	96	31	111	25	22	36	142	120
366	172	101	33	128	25	25	38	148	126
373	181	92	32	117	128	26	34	143	128
396	189	93	26	106	24	22	35	128	115
416	180	97	28	118	25	22	33	142	116
426	183	99	32	111	22	NA	32	143	124
443	175	99	29	113	26	20	30	145	126
468	182	89	28	112	24	NA	29	138	119
522	167	92	34	119	25	24	34	137	125
550	187	90	29	118	30	18	30	141	122
563	183	95	31	115	24	25	35	132	120
574	191	95	29	114	23	24	31	NA	117
577	181	102	30	116	25	25	35	135	121
580	189	89	28	114	25	25	31	142	130
1070	185	97	35	122	27	21	32	145	130
1111	180	87	31	114	28	NA	28	148	124
1122	181	96	35	102	19	21	27	139	120
1174	190	98	36	120	25	NA	30	NA	136
1300	189	90	34	127	27.5	23	33	132	118
1372	191	101	34	113	22	22	31	141	126
1374	187	97	33	108	20	21	NA	140	112
1386	187	92	30	113	28	NA	NA	142	115
1426	190	105	32	120	26.5	25	30.5	141	122
1446	171	101	34	120	24	NA	31	148	130
1447	176	91	27	109	27	23	33	140	123
469b	186	97	28	109	25	24	28	139	120
F18 L(2) SK(3)	191	96	32	120	26	21	NA	151	130
F475 L(2)	183	94	31	112	21	25	NA	145	123

Appendix B

K-Means cluster analysis code

This appendix will outline the lines of code used in R Studio for each specific site used in craniometric analysis. For those that have not used R Studio in the past, there are fundamental guidelines that are essential for properly using this resource. First, R and R Studio are case-sensitive. For example, below you will see the code *"install.packages()"* in all lower case letters. Entering this code as *"Install.packages()"* or any such variation will result in an error message. Secondly, each line contains a separate code. There are instances below in which lines are indented to indicate that the code from the previous line is continuing. There is no need to indent them once they are copied into R or R Studio, as the programs can recognize when a line of code is continuing on the next line. Finally, anything that follows a number sign in one particular line will be ignored by R. Many users employ this technique to organize chunks of code by introducing their purpose. There is no need to remove these lines from the code outlined below. However, please note that if you upload any spreadsheets or name any data sets, they cannot contain the "#" symbol.

In R and R Studio, all functions are part of packages. Some packages are developed by the R Core Team and do not need to be installed. However, in the case of open-source content, in order to use a certain function, the proper package must first be installed. Once installed, the library for each package must also be read-in using the function *library(x)*, where x is the name of the package in question. After these tasks are complete, all of the functions within that package will be available in the R session. For each new session–meaning each time R is restarted–packages must be installed again.

Likewise, data sets created in spreadsheets outside of R–such as in Excel or Numbers–also need to be read-in using the function *read.csv(" x")* where x is the complete pathway and document name, i.e. Documents/Folder name/File name. Please note that datasets must be saved as .csv, which indicates that each cell represents one value and that all values are separated by commas. Any Excel or Numbers spreadsheet can be converted to a .csv file.

Note that when reading-in something that is external–such as a package that is not included in basic R or a data set–it is essential to use quotation marks around its name. However, once it has been downloaded these quotations are no longer necessary and their use will create error messages.

The code outlined in this appendix can be directly copied into R or R Studio, provided that the file names are changed to reflect your own data. Please note that some packages might become unavailable as future versions of R are released, as not all of them are regularly updated by their creators. If you come across this sort of error message (generally something along the lines of "package x is not supported by R version X.X") you can search for the package using the code *??x*, where x is the name of the unsupported package, to find similar alternatives. The *"??"* feature can also be used to identify and define any packages or functions. This tool allows the user to access information on the usage, arguments, value, and authors of any package or function. In the same vein, it is important to be aware that R and R Studio are collaborative resources–some packages are developed by the R Core Team and some are developed by others. The code *citation("x")*, where x is the name of the package in question, will bring users to the proper journal article associated with the development of the package, if the package has been uploaded by an outside source.

Below is the exact code used for each site in this study. The file names all relate to the Lankhills Late-Roman Cemetery in order to demonstrate how to read-in data sets and how to rename each change to the data set to avoid confusion.

```
#install packages
install.packages("StatMatch")
install.packages("mice")
install.packages("ggplot2")
install.packages("ggpubr")
install.packages("factoextra")
install.packages("NbClust")
install.packages("mvoutlier")
install.packages("ggfortify")
install.packages("vegan")
```

```
#load package libraries
library(“StatMatch”)
library(“mice”)
library(“ggplot2”)
library(“ggpubr”)
library(“factoextra”)
library(“NbClust”)
library(“mvoutlier”)
library(“ggfortify”)
library(“vegan”)

#Read in data set and name it “LankhillsData1”
LankhillsData1 = read.csv(“∼/Documents/My Documents/PhD/Data/
    LankhillsCrania/Lankhills for R Full.csv”)

#Remove skeleton numbers and rename this data set “LankhillsData” in order
    to distinguish it from the data set that includes skeleton numbers
LankhillsData = LankhillsData1[1:52, 3:31]
#Note: the numbers included here are directly related to the number of rows
    and columns in the Lankhills data set. These will need to be replaced with
    the number of rows and columns you wish to include from your own data
    set.

#Check for non-normal distribution
sapply(LankhillsData, function(x) shapiro.test(x)$p.value<0.05)

#Check for missing values both by skeleton and by measurement
pMiss = function(x)sum(is.na(x))/length(x)*100
apply(LankhillsData,2,pMiss)
apply(LankhillsData,1,pMiss)

#At this point, use the output from step 4 to work on removing individuals
    and measurements that have a high number of missing values. This can
    be achieved by removing specific rows and columns, like in step 2. At
    first, remove only measurements that have the highest degree of missing
    values, as there will be fewer individuals with missing values once this is
    achieved. Then repeat step 4 to determine if more data cleaning is needed.
    If so, do the same to individuals that still have higher numbers of missing
```

values. Continue alternating between steps 2 and 4 until each individual and measurement have <5% missing values.

#Impute remaining missing values and name the data set with imputed values "LankhillsRevised"
LankhillsRevised= mice(LankhillsData, m=5, maxit=50, meth='pmm', seed=500)
summary(LankhillsRevised)

#Complete the data set and scale it. Rename it "LankhillsZScores" to indicate that the new data set is scaled.
LankhillsComplete = complete(LankhillsRevised,1)
LankhillsZScores = scale(LankhillsComplete)

#Check that the data has been properly scaled through boxplot comparison
boxplot(LankhillsComplete, xlab = "variables", ylab = "values", main = "Before Scaling")
boxplot(LankhillsZScores, xlab = "variables", ylab = "scaled values", main = "After Scaling")

#Create a Euclidean distance matrix for the data and name it "euc"
euc = dist(LankhillsZScores, method = "euclidean")

#Use this distance matrix to find any significant outliers
cmd = cmdscale(euc, k=2, eig = FALSE, add = FALSE, x.ret = FALSE)
Moutlier(cmd, quantile = 0.95)
#The output of this code will indicate if there are any significant outliers in your dataset. If you choose to remove them, use the same principles as in step 2.

 # Visually confirm outliers in a QQ plot
qqnorm(cmd)
qqline(cmd)

#Find the ideal number of clusters using the Elbow Method
nb = NbClust(LankhillsZScores, diss = NULL, distance = "euclidean", min.nc = 2, max.nc = 15, method = "ward.D", index = "all", alphaBeale = 0.1)
fviz_nbclust(nb, kmeans, method = "wss") + geom_vline(xintercept = 4, linetype = 2) + labs(subtitle = "Elbow method")

```
#Conduct a K-Means Cluster Analysis using the output of the previous step
    to determine the number of clusters
k2 = kmeans(LankhillsZScores, centers = 2, nstart = 25)
k2
#Note: this final step will output cluster assignments for each individual

#Graph the results
p2=fviz_cluster(k2, geom =c("point"), data=LankhillsZScores) +
    ggtitle("k=2")
p2
#To label each point, replace geom = c("point") with geom = c("point",
    "text")
```

This concludes the code used to conduct a K-Means Cluster Analysis on a data set of raw cranial measurements. Provided that the labels are changed, this code can be used to clean, prepare, and carry out a study of cranial phenotypic variation on a group of skeletons, under the assumption that the data set in question follows the guidelines detailed in Chapter 4.

Appendix C

Stable isotope data

Table C.1: *Strontium and Oxygen isotopes all sites*

Sk. No.	Site	Tooth	Sr (ppm)	$^{87}Sr/^{86}Sr$	$\delta^{18}O_p$	± 1 SD	$\delta^{18}O_{dw}$	Source
GLR1103	London Road	M3	114	0.70944	18.4	0.3	-5.1	Chenery et al 2010
GLR1127	London Road	M3	121	0.70967	17.2	0.3	-7.8	Chenery et al 2010
GLR1131	London Road	M3	133	0.71143	17.1	0.3	-8.1	Chenery et al 2010
GLR1181	London Road	M2	76	0.71057	17.6	0.3	-6.9	Chenery et al 2010
GLR1216	London Road	M3	93	0.70941	19.2	0.3	-3.5	Chenery et al 2010
GLR1238	London Road	M3	52	0.70891	17.1	0.1	-7.9	Chenery et al 2010
GLR1328	London Road	M3	57	0.71056	18	0.3	-6.1	Chenery et al 2010
GLR1340	London Road	M2	104	0.7095	17.9	0.3	-6.3	Chenery et al 2010
GLR1360	London Road	M2	133	0.709	19	0.4	-3.9	Chenery et al 2010
GLR1364	London Road	M3	104	0.71138	18.2	0.2	-5.6	Chenery et al 2010
GLR1518	London Road	M2	72	0.71298	17.9	0.3	-6.3	Chenery et al 2010
GLR1520	London Road	M3	130	0.70971	18.6	0.1	-4.7	Chenery et al 2010
GLR1539	London Road	M3	66	0.70878	17.5	0.1	-7.2	Chenery et al 2010
GLR1541	London Road	M3	51	0.71217	17.1	0.2	-8.1	Chenery et al 2010
GLR1544	London Road	M3	102	0.70994	18.2	0.2	-5.7	Chenery et al 2010
GLR1546	London Road	M3	177	0.71086	19.1	0.1	-3.8	Chenery et al 2010
GLR1553	London Road	M3	84	0.70924	17.4	0.4	-7.3	Chenery et al 2010
GLR1560	London Road	M3	114	0.70946	18.7	0.4	-4.5	Chenery et al 2010
GLR1561	London Road	M3	67	0.71344	18.7	0.2	-4.5	Chenery et al 2010
GLR1565	London Road	M2	104	0.70975	19	0.3	-3.9	Chenery et al 2010
GLR1596	London Road	M2	105	0.70904	17.7	0.3	-6.7	Chenery et al 2010
CBF-255	Catterick B. Farm	M2	46	0.71035	17.75	0.1	-6.6	Chenery et al 2011
CBF-277	Catterick B. Farm	M3	114	0.71368	17.28	0.3	-7.7	Chenery et al 2011
CBF-324	Catterick B. Farm	P2	118	0.70923	18.53	0.2	-4.9	Chenery et al 2011
CBF-422	Catterick B. Farm	M3	94	0.70899	17.07	0.1	-8.1	Chenery et al 2011
CBF-475	Catterick B. Farm	M3	75	0.71034	17.94	0.3	-6.2	Chenery et al 2011
CBF-564	Catterick B. Farm	M2	122	0.70925	17.08	0.2	-8.1	Chenery et al 2011
CBF-632	Catterick B. Farm	M2	57	0.71053	18.02	0.4	-6.1	Chenery et al 2011
CBF-678	Catterick B. Farm	M3	89	0.70911	16.92	0.1	-8.4	Chenery et al 2011
CBF-679	Catterick B. Farm	M2	106	0.71367	17.73	0.1	-6.7	Chenery et al 2011

Table C.1: *All Sites Isotopes Cont.*

CBF-687	Catterick B. Farm	M1	94	0.70946	18.95	0.2	-4	Chenery et al 2011
CBF-709	Catterick B. Farm	M2	85	0.70903	18.09	0.1	-5.9	Chenery et al 2011
CBF-746	Catterick B. Farm	M2	90	0.71095	17.13	0	-8	Chenery et al 2011
CBF-756	Catterick B. Farm	P2	74	0.71031	17.91	0.3	-6.3	Chenery et al 2011
CBF-801	Catterick B. Farm	M3	153	0.70955	18.52	0.2	-5	Chenery et al 2011
CBF-812	Catterick B. Farm	M1	64	0.70952	17.89	0.2	-6.3	Chenery et al 2011
CBF-CX732	Catterick B. Farm	M3	50	0.71016	16.81	0.2	-8.7	Chenery et al 2011
CBRI-037	Catterick Bridge	M2	78	0.71016	17.8	0.2	-6.5	Chenery et al 2011
CBRI-077	Catterick Bridge	M3	84	0.71026	17.99	0.1	-6.1	Chenery et al 2011
CBRI-136	Catterick Bridge	M2	61	0.70997	17.26	0.2	-7.7	Chenery et al 2011
CBRI-163	Catterick Bridge	M2	96	0.71005	17.64	0.2	-6.9	Chenery et al 2011
CBRI-166	Catterick Bridge	M3	80	0.71047	17.37	0.2	-7.5	Chenery et al 2011
CBRI-389	Catterick Bridge	M1	50	0.7096	17.84	0.3	-6.4	Chenery et al 2011
CBRI-484	Catterick Bridge	M1	143	0.70947	17.74	0.1	-6.7	Chenery et al 2011
CDS-PIV9	Catterick D. St.	P2	138	0.71026	18.08	0.3	-5.9	Chenery et al 2011
CHP-942	Catterick H. Rd.	P2	87	0.70999	17.51	0.3	-7.1	Chenery et al 2011
LH 1026	Lankhills	M1	78	0.7085	17.9	0.2	-6.2	Eckardt et al 2009
LH 1084	Lankhills	M2	105	0.7092	18.2	0.3	-5.7	Eckardt et al 2009
LH 1091	Lankhills	M2	105	0.7091	18.1	0.2	-5.9	Eckardt et al 2009
LH 1094	Lankhills	P2	42	0.7083	17	0.1	-8.2	Eckardt et al 2009
LH 1114	Lankhills	M2	121	0.7089	19	0.3	-4	Eckardt et al 2009
LH 1119	Lankhills	M2	87	0.7094	15.8	0.3	-10.9	Eckardt et al 2009
LH 1133	Lankhills	M1	52	0.7092	18.5	0.4	-5.1	Eckardt et al 2009
LH 1134	Lankhills	P2	65	0.7086	18	0.2	-6.1	Eckardt et al 2009
LH 118	Lankhills	dI1	77	0.7088	19.1	0.1	-3.7	Eckardt et al 2009
LH 119	Lankhills	M2	100	0.7087	19.5	0.2	-2.8	Eckardt et al 2009
LH 1197	Lankhills	P2	59	0.711	17.8	0.2	-6.6	Eckardt et al 2009
LH 12	Lankhills	P2	103	0.7082	18.2	0	-5.7	Eckardt et al 2009
LH 1207	Lankhills	M2	108	0.7089	17.9	0.2	-6.2	Eckardt et al 2009
LH 1227	Lankhills	M2	73	0.7083	18.3	0.2	-5.4	Eckardt et al 2009
LH 1244	Lankhills	M2	61	0.7086	18.4	0.1	-5.1	Eckardt et al 2009

Table C.1: *All Sites Isotopes Cont.*

LH 1271	Lankhills	M2	67	0.7083	17.7	0.2	-6.7	Eckardt et al 2009
LH 1277	Lankhills	M2	87	0.7115	18.2	0.3	-5.6	Eckardt et al 2009
LH 1289	Lankhills	M2	58	0.7087	18.1	0.1	-5.8	Eckardt et al 2009
LH 1517	Lankhills	P2	81	0.709	18.7	0.2	-4.6	Eckardt et al 2009
LH 1697	Lankhills	M2	95	0.709	18.8	0.1	-4.3	Eckardt et al 2009
LH 1761	Lankhills	M3	80	0.7086	18.3	0.2	-5.5	Eckardt et al 2009
LH 1870	Lankhills	M2	79	0.7087	17.6	0.2	-6.9	Eckardt et al 2009
LH 1894	Lankhills	P2	46	0.7118	18.1	0.1	-6	Eckardt et al 2009
LH 212	Lankhills	P2	66	0.7087	18.3	0.2	-5.4	Eckardt et al 2009
LH 271	Lankhills	M2	139	0.7102	19.4	0.2	-3	Eckardt et al 2009
LH 281	Lankhills	M2	92	0.7115	16.8	0.1	-8.6	Eckardt et al 2009
LH 435	Lankhills	M2	53	0.7089	17.5	0.2	-7.1	Eckardt et al 2009
LH 489	Lankhills	M2	72	0.7112	17.8	0.2	-6.6	Eckardt et al 2009
LH 566	Lankhills	M2	169	0.7095	18.8	0.3	-4.4	Eckardt et al 2009
LH 661	Lankhills	P1	54	0.7085	18.1	0.1	-5.9	Eckardt et al 2009
LH 683	Lankhills	M3	132	0.7094	18.9	0.1	-4.2	Eckardt et al 2009
LH 776	Lankhills	M2	86	0.7096	17.8	0.2	-6.5	Eckardt et al 2009
LH 806	Lankhills	P2	88	0.7087	19.3	0	-3.2	Eckardt et al 2009
LH 812	Lankhills	M2	128	0.7087	19	0	-3.8	Eckardt et al 2009
LH 84	Lankhills	M2	79	0.7086	18.8	0.2	-4.3	Eckardt et al 2009
LH 861	Lankhills	P2	NA	0.7098	18.2	0	-5.7	Eckardt et al 2009
LH 862	Lankhills	M2	118	0.7082	17.8	0.1	-6.6	Eckardt et al 2009
LH 874	Lankhills	M2	81	0.7088	18	0.3	-6	Eckardt et al 2009
LH 926	Lankhills	M2?	104	0.7086	18.3	0.3	-5.5	Eckardt et al 2009
LH 932	Lankhills	M2	67	0.7084	17.9	0.2	-6.4	Eckardt et al 2009
LH 117	Lankhills	P	106	0.7084	17.7	0.09	-6.81	Evans et al 2006
LH 13	Lankhills	C	225	0.7064	15.8	0.23	-10.77	Evans et al 2006
LH 322	Lankhills	M	76.5	0.7116	17.3	0.16	-7.63	Evans et al 2006
LH 323	Lankhills	dM2	146	0.7086	18.9	0.03	-4.23	Evans et al 2006
LH 326	Lankhills	M3?	105	0.7087	18.2	0.14	-5.7	Evans et al 2006
LH 333	Lankhills	dM2	84.1	0.7086	18.8	0.17	-4.35	Evans et al 2006

Table C.1: *All Sites Isotopes Cont.*

LH 351	Lankhills	C	139	0.709	16	0.09	-10.36	Evans et al 2006
LH 357	Lankhills	C	206	0.7091	16.2	0.06	-9.92	Evans et al 2006
LH 382	Lankhills	M2	107	0.7086	18.5	0.13	-5.07	Evans et al 2006
LH 398	Lankhills	P	82.3	0.7085	17	0.11	-8.3	Evans et al 2006
LH 426	Lankhills	P	123	0.7094	15.1	0.2	-12.38	Evans et al 2006
LH 437	Lankhills	M1	56.6	0.7084	17.7	0.05	-6.82	Evans et al 2006
LH 448	Lankhills	M2	74.9	0.7083	18	0.03	-6.01	Evans et al 2006
LH 53	Lankhills	P	81	0.7085	17.9	0.28	-6.29	Evans et al 2006
LH 55	Lankhills	P	120	0.7092	16.4	0.2	-9.61	Evans et al 2006
LH 57	Lankhills	P	136	0.7087	17.3	0.07	-7.52	Evans et al 2006
LH 63	Lankhills	P	58	0.7083	17.1	0.14	-7.99	Evans et al 2006
LH 81	Lankhills	M2	92.2	0.7093	14.7	0.15	-13.24	Evans et al 2006
C8	Clifton	P2	71	0.70995	17.94	0.14	-6.22	Leach et al 2009
CY9	Castle Yard	P2	46	0.70934	18.22	0.08	-5.62	Leach et al 2009
H58	Hospitium	M2	77	0.70897	18.26	0.28	-5.52	Leach et al 2009
MVA	Mount Vale	P2	146	0.70871	17.47	0.14	-7.24	Leach et al 2009
MVC	Mount Vale	P2	112	0.71175	18.13	0.15	-5.79	Leach et al 2009
RE02	The Railway	P2	458	0.70808	18.29	0.01	-5.46	Leach et al 2009
RE10	The Railway	P2	94	0.70996	17.95	0.29	-6.19	Leach et al 2009
RE11	The Railway	P2	96	0.71015	18.57	0.06	-4.85	Leach et al 2009
RE13	The Railway	M2	57	0.71009	17.26	0.26	-7.69	Leach et al 2009
RE14	The Railway	M3	98	0.7097	17.54	0.28	-7.09	Leach et al 2009
RE16	The Railway	M2	65	0.70999	18.75	0.04	-4.46	Leach et al 2009
RE17	The Railway	P2	101	0.70918	17.67	0.43	-6.82	Leach et al 2009
RE18	The Railway	P2	71	0.70994	17.59	0.19	-6.99	Leach et al 2009
RE21	The Railway	P2	45	0.71031	17.31	0.22	-7.59	Leach et al 2009
RE22	The Railway	M2	93	0.70907	18.41	0.1	-5.19	Leach et al 2009
RE23	The Railway	P2	226	0.70931	17.52	0.08	-7.13	Leach et al 2009
RE25	The Railway	P2	108	0.7098	19.36	0.35	-3.12	Leach et al 2009
RE26	The Railway	P2	87	0.70914	18.32	0.05	-5.39	Leach et al 2009
RE27	The Railway	P2	174	0.70824	18.04	0.12	-5.99	Leach et al 2009

Table C.1: *All Sites Isotopes Cont.*

RE28	The Railway	M1	74	0.70841	18.24	0.12	-5.57	Leach et al 2009
RE3	The Railway	M2	107	0.70939	16.92	0.13	-8.43	Leach et al 2009
RE31	The Railway	M2	52	0.71044	18.57	0.25	-4.85	Leach et al 2009
RE33	The Railway	M3	105	0.70996	18.13	0.33	-5.81	Leach et al 2009
RE36	The Railway	M1	76	0.70936	18.55	0.32	-4.89	Leach et al 2009
RE37	The Railway	M1	42	0.7106	16.68	0.11	-8.95	Leach et al 2009
RE4	The Railway	P2	161	0.70967	18.44	0.14	-5.12	Leach et al 2009
RE41	The Railway	M2	112	0.70952	17.35	0.25	-7.49	Leach et al 2009
RE43	The Railway	M2	65	0.70833	17.38	0.12	-7.55	Leach et al 2009
RE45	The Railway	P2	117	0.70932	18.41	0.04	-5.2	Leach et al 2009
RE46	The Railway	M2	190	0.70878	17.11	0.11	-8.01	Leach et al 2009
RE47	The Railway	P2	79	0.70924	18.39	0.09	-5.24	Leach et al 2009
RE48	The Railway	M2	88	0.71117	18.21	0.23	-5.63	Leach et al 2009
RE51	The Railway	P2	117	0.70906	18.87	0.06	-4.21	Leach et al 2009
RE7	The Railway	P2	120	0.71007	18.09	0.36	-5.89	Leach et al 2009
TDC04	Trentholme Dr.	M2	49	0.71041	16.94	0.33	-8.39	Leach et al 2009
TDC153	Trentholme Dr.	P2	93	0.70955	18.38	0.24	-5.25	Leach et al 2009
TDC157	Trentholme Dr.	P2	162	0.70874	17.05	0.14	-8.15	Leach et al 2009
TDC173	Trentholme Dr.	M2	338	0.70848	17.54	0.3	-7.09	Leach et al 2009
TDC288	Trentholme Dr.	M3	170	0.70832	17.87	0.17	-6.38	Leach et al 2009
TDC314	Trentholme Dr.	M2	56	0.70927	17.15	0.19	-7.93	Leach et al 2009
TDC411	Trentholme Dr.	P2	51	0.71312	17.64	0.24	-6.88	Leach et al 2009
TDC466	Trentholme Dr.	M2	146	0.71	17.78	0.21	-6.56	Leach et al 2009
TDC513	Trentholme Dr.	M2	160	0.71018	18.55	0.16	-4.9	Leach et al 2009
TDC516	Trentholme Dr.	P2	284	0.70896	19.48	0.26	-2.87	Leach et al 2009
TDC608	Trentholme Dr.	M2	165	0.71293	18.27	0.25	-5.5	Leach et al 2009
TDC708	Trentholme Dr.	P2	92	0.71066	18.03	0.23	-6.03	Leach et al 2009
TDC710	Trentholme Dr.	P2	103	0.71355	19.74	0.29	-2.31	Leach et al 2009
TDCR38	Trentholme Dr.	M2	103	0.71308	17.38	0.19	-7.44	Leach et al 2009
TM148	The Mount	P2	175	0.70931	17.83	0.11	-6.46	Leach et al 2009
DRIF-10	3 Driffield Terr.	M2	67	0.709563	15	NA	-12.6	Montgomery et al 2011

Table C.1: *All Sites Isotopes Cont.*

DRIF-15	3 Driffield Terr.	M3	73	0.714202	18.9	NA	-4.1	Montgomery et al 2011
DRIF-16	3 Driffield Terr.	M3	71	0.709407	17.7	NA	-6.8	Montgomery et al 2011
DRIF-33	3 Driffield Terr.	M2	131	0.70892	17.4	NA	-7.4	Montgomery et al 2011
DRIF-35	3 Driffield Terr.	M2	67	0.709401	17.4	NA	-7.3	Montgomery et al 2011
DRIF-37	3 Driffield Terr.	M2	42	0.708924	18.2	NA	-5.7	Montgomery et al 2011
6DRIF-1	6 Driffield Terr.	P2	79	0.7104	17	0.2	-8.26	Muldner et al 2011
6DRIF-12	6 Driffield Terr.	P2	85	0.7092	18.1	0.3	-5.87	Muldner et al 2011
6DRIF-14	6 Driffield Terr.	P2	60	0.7109	16.7	0.1	-8.91	Muldner et al 2011
6DRIF-15	6 Driffield Terr.	P2	83	0.7114	16.5	0.3	-9.35	Muldner et al 2011
6DRIF-17	6 Driffield Terr.	P2	51	0.7103	17.1	0.2	-8.04	Muldner et al 2011
6DRIF-18	6 Driffield Terr.	P2	62	0.7091	18.6	0.2	-4.78	Muldner et al 2011
6DRIF-19	6 Driffield Terr.	P2	72	0.7094	18.7	0	-4.57	Muldner et al 2011
6DRIF-2	6 Driffield Terr.	P2	113	0.7113	17.2	0.3	-7.83	Muldner et al 2011
6DRIF-20	6 Driffield Terr.	P2	34	0.7114	16.7	0.3	-8.91	Muldner et al 2011
6DRIF-21	6 Driffield Terr.	P2	90	0.7094	19.8	0.3	-2.17	Muldner et al 2011
6DRIF-22	6 Driffield Terr.	P2	104	0.7092	18.6	0.1	-4.78	Muldner et al 2011
6DRIF-23	6 Driffield Terr.	P2	65	0.7109	16.7	0.3	-8.91	Muldner et al 2011
6DRIF-24	6 Driffield Terr.	P2	56	0.7085	14.7	0.2	-13.2	Muldner et al 2011
6DRIF-4	6 Driffield Terr.	P2	57	0.71	16.6	0.3	-9.13	Muldner et al 2011
6DRIF-6	6 Driffield Terr.	P2	68	0.7092	17.5	0.3	-7.17	Muldner et al 2011
6DRIF-7	6 Driffield Terr.	P2	62	0.7099	18.1	0.1	-5.87	Muldner et al 2011
6DRIF-8	6 Driffield Terr.	P2	55	0.711	17.3	0.2	-7.61	Muldner et al 2011
6DRIF-9	6 Driffield Terr.	P2	43	0.7126	16.9	0.2	-8.48	Muldner et al 2011
30	Cott's House	M2	46	0.70828	NA	NA	NA	Shaw et al 2016
37	Mansell Street	P2	90	0.70933	NA	NA	NA	Shaw et al 2016
150	G. Dover Street	M1	153	0.70924	NA	NA	NA	Shaw et al 2016
163	Mansell Street	M2	95	0.70947	NA	NA	NA	Shaw et al 2016
182	St. Bart. Hosp.	M2	57	0.70909	NA	NA	NA	Shaw et al 2016
325	G. Dover Street	P2	161	0.70928	NA	NA	NA	Shaw et al 2016
390	Mansell Street	P2	50	0.71221	NA	NA	NA	Shaw et al 2016
400	Bishopsgate	M1	120	0.71236	NA	NA	NA	Shaw et al 2016

Table C.1: *All Sites Isotopes Cont.*								
518	Hooper Street	M2	127	0.70899	NA	NA	NA	Shaw et al 2016
599	West Smithfield	P2	112	0.70973	NA	NA	NA	Shaw et al 2016
652	Hooper Street	P2	70	0.70951	NA	NA	NA	Shaw et al 2016
695.5	London Wall	C	137	0.709	NA	NA	NA	Shaw et al 2016
709	West Smithfield	M2	94	0.70968	NA	NA	NA	Shaw et al 2016
724	Mansell Street	P2	130	0.70914	NA	NA	NA	Shaw et al 2016
803.6	London Wall	P2	96	0.71033	NA	NA	NA	Shaw et al 2016
1407	Hooper Street	M2	135	0.7094	NA	NA	NA	Shaw et al 2016
1673	Hooper Street	M2	130	0.70976	NA	NA	NA	Shaw et al 2016
23873	Spitalfield's Mkt	M1	101	0.70951	NA	NA	NA	Shaw et al 2016
34209	Spitalfield's Mkt	M2	88	0.70895	NA	NA	NA	Shaw et al 2016
34245	Spitalfield's Mkt	C	268	0.70896	NA	NA	NA	Shaw et al 2016

Table C.2: *Pb isotope values for London sites*

Sk. No.	Site	Pb (ppm)	$^{206}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{206}Pb$	$^{207}Pb/^{206}Pb$
400	Bishopsgate	4.41	18.336	15.636	38.358	0.85275	2.092
30	Cott's House	2.70	18.446	15.637	38.417	0.84773	2.0827
325	Great Dover Street	10.56	18.4607	15.662	38.617	0.84809	2.0912
150	Great Dover Street	14.65	18.47	15.646	38.517	0.84707	2.0854
518	Hooper Street	4.04	18.486	15.646	38.524	0.84637	2.084
1673	Hooper Street	3.03	18.437	15.638	38.442	0.84817	2.085
652	Hooper Street	2.09	18.403	15.632	38.424	0.84943	2.088
1407	Hooper Street	4.61	18.442	15.636	38.453	0.84779	2.085
803.6	London Wall	0.24	18.443	15.653	38.533	0.84867	2.0894
695.5	London Wall	1.00	18.405	15.634	38.431	0.84947	2.0882
390	Mansell Street	9.35	18.446	15.639	38.444	0.84782	2.0841
37	Mansell Street	3.05	18.4317	15.6353	38.4139	0.8483	2.0842
163	Mansell Street	2.37	18.419	15.633	38.402	0.84874	2.085
724	Mansell Street	1.57	18.47	15.634	38.442	0.84642	2.0812
34245	Spitalfield's Market	2.83	18.57	15.659	38.694	0.84323	2.0838
34209	Spitalfield's Market	1.31	18.435	15.637	38.435	0.84814	2.0849
23873	Spitalfield's Market	2.83	18.46	15.643	38.479	0.84738	2.0844
182	St. Bart. Hospital	1.33	18.466	15.638	38.436	0.84685	2.0815
709	West Smithfield	2.50	18.459	15.636	38.472	0.84708	2.0843
599	West Smithfield	2.17	18.455	15.637	38.473	0.84727	2.0847

Appendix D

Epigraphic evidence

Table D.1: *Epigraphic evidence of foreignness*

RIB	Type	Name	Etymology	Cohort	Place of Origin	Foreign or Indigenous diety	Findplace	date
9	Epitaph	Aulus Alfidius Olussa	unknown	NA	Athens	NA	London, UK	NA
12	Epitaph	Gaius Julius Alpinus Classicianus	Celtic	NA	Gaul	NA	London, UK	NA
19	Epitaph	NA	NA	NA	NA	NA	London, UK	NA
22	Epitaph	Grata, Dagobitus, and Solinus	Latinzed Celtic and Celtic	NA	NA	NA	London, UK	NA
23	Epitaph	Tullia Numidia	African	NA	NA	NA	London, UK	NA
69	Offering	Guild of Peregrini	"Peregrini" means foreigner	NA	NA	NA	Silchester, UK	NA
70	Offering	Guild of Peregrini	"Peregrini" means foreigner	NA	NA	NA	Silchester, UK	NA
71	Offering	Guild of Peregrini	"Peregrini" means foreigner	NA	NA	NA	Silchester, UK	NA
88	Dedication	Antonius Lucretianus	Latin	NA	NA	Italian, Germanic, Gallic, and British Mother goddesses	Winchester, UK	Late 1^{st}-Early 2^{nd} c. AD
103	Dedication	Lucius Septimius	Latin	NA	Remi Tribe	mentions "the old religion" which indicates Paganism in the wake of Christianity (de la Bedoyere 2015: 162)	Cirencester, UK	AD 296-312

108	Epitaph	Dannicus	Celtic	NA	Raurici Tribe	NA	Cirencester, UK	NA
109	Epitaph	Sextus Valerius Genialis	Latin	Cavalry Regiment of Thracians	Dedicator: Frisiavone tribesman; Men: Thrace	NA	Cirencester, UK	NA
110	Epitaph	Philus, son of Cassavus	unknown	NA	Sequanian	NA	Cirencester, UK	NA
112	Epitaph	Casta Castrensis	African?	NA	NA	NA	Cirencester, UK	1^{st} c. AD
113	Epitaph	Julia Casta	African	NA	NA	NA	Cirencester, UK	NA
121	Epitaph	Rufus Sita	Thracian	Sixth Cohort of Thracians	Thrace	NA	Gloucester, UK	NA
126	Dedication	NA	NA	NA	NA	Lenus Mars	Chedworth, UK	3^{rd}-4^{th} c. AD
136	Epitaph	Mettus	unknown	NA	"a Getan tribesman"	NA	Beverston, UK	NA
140	Dedication	Peregrinus	name means foreigner	NA	Treveran	Loucetius Mars and Nemetona (both Gallic)	Bath, UK	NA
143	Dedication	Aufidius Eutuches	Greek	NA	NA	Sulis (Indigenous)	Bath, UK	after AD 122
144	Dedication	Marcus Aufidius Lemnus	unknown	NA	NA	Sulis (Indigenous)	Bath, UK	NA
149	Dedication	Priscus	Latin	NA	"a Carnutes Tribesman"	NA	Bath, UK	NA
151	Dedication	Sulinus, son of Brucetus	Indigenous	NA	NA	Suleviae (Celtic)	Bath, UK	NA
154	Curse	Vilbia, Velvinna, Germanilla, Jovina, Exsupereus, Severinus, Augustalis, Comitianus, Catus, and Minianus	possibly Celtic	NA	NA	NA	Bath, UK	NA

155	Epitaph	Calpurnius Receptus and Calpurnia Trifosa	Latinzed Greek name (Trifosa)	NA	NA	NA	Bath, UK	NA
156	Epitaph	Julius Vitalis	Latin	NA	"a Belgic Tribesman"	NA	Bath, UK	NA
157	Epitaph	Gaius Murrius Modestus	Rare, unknown name	NA	Forum Iulii	NA	Bath, UK	AD 71-85
158	Epitaph	Marcus Valerius Latinus	Latin	NA	Equestris	NA	Bath, UK	NA
159	Epitaph	Lucius Vitellius Tacinus	Latin	Cavalry Regiment of Vettones	Caurium	NA	Bath, UK	AD 1^{st} c.
160	Epitaph	Antigonus	Greek?	NA	Nicopolis	NA	Bath, UK	NA
163	Epitaph	Rusonia Aventina	unknown	NA	Mediomatrici	NA	Bath, UK	NA
184	Epitaph	Respecta	unknown	NA	Rome	NA	Charterhouse-on-Mendip, UK	NA
187	Dedication	Iventus Sabinus	unclear	NA	NA	Mars Rigisamus (Gaul)	West Coker, UK	NA
188	Epitaph	Carinus, set up by Romana, Avita, Carina, and Rufinus	unclear	NA	Dumnonii or Roman?	NA	Dorchester, UK	NA
191	Dedication	Lossio Veda, grandson of Vepognus	unclear	NA	Caledonia	NA	Colchester, UK	AD 222-235
192	Dedication	Similis, son of Attus	probably Celtic	NA	"a tribesman of the Cantiaci"	Mother Goddesses Suleviae (Celtic)	Colchester, UK	NA
193	Dedication	Imilico (African) freedman of Aesurilinus (Celtic, possibly Trinovantian)	African and Celtic, respectively	NA	NA	NA	Colchester, UK	NA

194	Dedication	Cintusmus	Celtic	NA	NA	Silvanus Callirius (local)	Colchester, UK	NA
195	Dedication	Hermes	Greek	NA	NA	NA	Colchester, UK	NA
200	Epitaph	Marcus Flavius Facilis	Latin	NA	NA	NA	Colchester, UK	NA
201	Epitaph	Longinus Sdapeze, son of Matucus	Longinus Sdapeze (hybrid) Matucus (presumably Thracian)	First Cavalry Regiment of Thracians	Lucius Sdapeze: Sardica; Men: Thrace	NA	Colchester, UK	NA
215	Dedication	Vassinus	Celtic	NA	NA	NA	Stony Stratford, UK	NA
241	unknown	NA	NA	NA	NA	NA	Wilcote, UK	NA
251	Epitaph	Flavius Helius	Greek hybrid	NA	"a Greek by race"	NA	Lincoln, UK	NA
252	Epitaph	Gaius Julius Calenus	Latin	NA	Lyons	NA	Lincoln, UK	NA
253	Epitaph	Lucius Lucinius Saliga	Latin	NA	Lyons	NA	Lincoln, UK	NA
254	Epitaph	Quintus Cornelius	Latin	NA	NA	NA	Lincoln, UK	NA
255	Epitaph	Gaius Saufeius	unknown	NA	Heraclea	NA	Lincoln, UK	NA
256	Epitaph	Lucius Sempronius Flavinius	Latin	NA	"a Spaniard from Clunia"	NA	Lincoln, UK	NA
257	Epitaph	Gaius Valerius	Latin	NA	NA	NA	Lincoln, UK	NA
258	Epitaph	Titus Valerius Pudens	Latin	NA	Savaria	NA	Lincoln, UK	NA
260	Epitaph	NA	NA	NA	Pisaurum	NA	Lincoln, UK	NA
262	Epitaph	Sacer and Carssouna	Gallic	NA	"a citizen of Senones"	NA	Lincoln, UK	NA
266	Epitaph	NA	NA	First Cohort of Asturians	Hispania	NA	Lincoln, UK	NA
274	Dedication	the Colasuni, Bruccius and Caratius	Latinzed Celtic name	NA	NA	NA	The Foss Dike, UK	mid 2^{nd} c. AD
278	Dedication	Quintus Sittius Caeciianus	African	First Cohort of Aquitanians	Gaul	NA	Bakewell, UK	NA

279	Building insc.	NA	NA	First Cohort of Frisiavonians	Germania Inferior	NA	Melandra Castle, UK	NA
283	Building insc.	NA	NA	First Cohort of Aquitanians	Gaul	NA	Brough-on-Noe, UK	AD 158
288	Dedication	"The Canton of Cornovians"	Indigenous	NA	Local	NA	Wroexeter, UK	AD 129-130
291	Epitaph	Tiberius Claudius Tirintius	Latinized name	First Cohort of Thracians	Thrace	NA	Wroexeter, UK	NA
292	Epitaph	Titus Flaminius	Northern Italian	NA	Faventia	Tartarus (Greek mythology)	Wroexeter, UK	1st c. AD
293	Epitaph	Gaius Mannius Secundus	Latin	NA	Pollentia	NA	Wroexeter, UK	AD 85-125
294	Epitaph	Marcus Petronius	Latin	NA	Vicetia	NA	Wroexeter, UK	late 1^{st} c. AD
304	Dedication	Bellicus	Indigenous	NA	NA	Tridam[. . .]	Michaelchurch, UK	NA
318	Dedication	Cornelius Castus and Julia Belismicus	African and Celtic, respectively	NA	NA	NA	Caerleon, UK	NA
445	Dedication	freedmen and slave household of Titus Pomponius Mamilianius Rufus Antistianus Funisulanus Vettonianus	Spanish	NA	NA	NA	Chester, UK	2^{nd} c. AD
450	Dedication	Flavius Longus and son Longinus	Latin	NA	Samosata	NA	Chester, UK	NA
452	Dedication	Lucius Elufrius Praesens	Latin?	NA	Clunia	Jupiter Tanarus (Celtic)	Chester, UK	NA
461	Dedication	Hermogenes	Greek	NA	NA	NA	Chester, UK	NA
475	Epitaph	Gaius Calventius Celer	Latin	NA	Aprus	NA	Chester, UK	NA

476	Epitaph	Gaius Juventius Capito	Latin	NA	Aprus	NA	Chester, UK	AD 85
477	Epitaph	Lucius Terentius Fuscus	Latin	NA	Aprus	NA	Chester, UK	NA
479	Epitaph	Quintus Valerius Fronto	Latin	NA	Celea	NA	Chester, UK	NA
480	Epitaph	Lucius Valerius Seneca	Latin	NA	Savaria	NA	Chester, UK	NA
482	Epitaph	Voltimesis Pudens	unknown	NA	Augusta	NA	Chester, UK	AD 83
484	Epitaph	NA	NA	NA	Aprus	NA	Chester, UK	NA
486	Epitaph	Sextus Epidus Pudens	Latin	NA	Aequum	NA	Chester, UK	NA
487	Epitaph	Lucius Annius Marcellus	Latin	NA	Veii	NA	Chester, UK	NA
490	Epitaph	Marcus Aurelius Alexander	Latin	NA	"a Syrian from Osroene"	NA	Chester, UK	3^{rd} c. AD
492	Epitaph	Caecilius Avitus	Latin	NA	Emerita Augustus	NA	Chester, UK	NA
493	Epitaph	Lucius Calatus Sextinus	Latin	NA	Lugdunum	NA	Chester, UK	NA
494	Epitaph	Gaius Cestius Teurnicus	Derived from Teurnia in Noricum	NA	NA	NA	Chester, UK	NA
495	Epitaph	Lucius Ecimius Bellicianus Vitalis	Celtic	NA	NA	NA	Chester, UK	NA
498	Epitaph	Gaius Julius Quartus	Latin	NA	Celea	NA	Chester, UK	NA
500	Epitaph	Lucius Lucinius Valens	Latin	NA	Arelate	NA	Chester, UK	NA
501	Epitaph	Gaius Lovesius Cadarus	Spanish	NA	Emerita	NA	Chester, UK	NA
502	Epitaph	Quintus Postumius Solus	unknown	NA	Emerita	NA	Chester, UK	NA
503	Epitaph	Publius Rustius Crescens, heir: Groma	Groma: African	NA	Deceased: Brixia	NA	Chester, UK	NA
504	Epitaph	Marcus Sextus Bellicus	Celtic	NA	Celea	NA	Chester, UK	NA

506	Epitaph	Marcus Ulpius Januarius	Latin	NA	Ulpia Trajana	NA	Chester, UK	NA
508	Epitaph	Quintus Vibius Secundus	Latin	NA	Cremona	NA	Chester, UK	NA
511	Epitaph	NA	NA	NA	Celea	NA	Chester, UK	NA
512	Epitaph	NA	NA	NA	Oia	NA	Chester, UK	NA
518	Epitaph	Lucius Antestius Sabinus	Latin	NA	Corduba	NA	Chester, UK	NA
523	Epitaph	Caecilius Donatus	Latin	NA	“a Bessian Tribesman”	NA	Chester, UK	3^{rd} c. AD
524	Epitaph	Lucius Camulius Albanus	Latin	NA	Taurine district	NA	Chester, UK	NA
525	Epitaph	Decimus Capienus Urbicus	Latin	NA	Vienna	NA	Chester, UK	NA
527	Epitaph	Marcus Cluvius Valentius	Latin	NA	Foro Juli	NA	Chester, UK	NA
530	Epitaph	Quintus Cornelius	Latin	NA	NA	NA	Chester, UK	after 453 AD
531	Epitaph	Quintus Domitius Opatus	Latin	NA	Virunum	NA	Chester, UK	NA
535	Epitaph	Quintus Longinus Laetus	Latin	NA	Lucus	NA	Chester, UK	NA
536	Epitaph	Gaius Publius M[..]	Latin	NA	NA	NA	Chester, UK	NA
538	Epitaph	Sextus Simil[...]	Latin	NA	Brixia	NA	Chester, UK	NA
539	Epitaph	Gaius Valerius	Latin	NA	NA	NA	Chester, UK	NA
540	Epitaph	Gaius Valerius	Latin	NA	NA	NA	Chester, UK	NA
541	Epitaph	Marcus Valerius Martialis	Latin	NA	NA	NA	Chester, UK	NA
542	Epitaph	Lucius Valerius Pud[...]	Latin	NA	Salaria	NA	Chester, UK	NA
546	Epitaph	NA	NA	NA	Savaria	NA	Chester, UK	NA
547	Epitaph	NA	NA	NA	Savaria	NA	Chester, UK	NA
552	Epitaph	NA	NA	NA	NA	NA	Chester, UK	NA
558	Epitaph	Flavius Callimorphus and Serapion, set up by Thesaeus	Greek	NA	NA	NA	Chester, UK	NA
562	Epitaph	Curatia Dinysia	Greek	NA	NA	NA	Chester, UK	NA

576	Dedication	NA	NA	Detachment of Raetians and Noricans	Raetia and Noricum	NA	Chester, UK	AD 197
577	Building insc.	Century of Masavo	Germanic	First Cohort of Frisiavonians	Germania Inferior	NA	Chester, UK	NA
578	Building insc.	Century of Quintianus	Latin	First Cohort of Frisiavonians	Germania Inferior	NA	Chester, UK	NA
579	Building insc.	Century of Cudrenus	Germanic	First Cohort of Frisiavonians	Germania Inferior	NA	Chester, UK	NA
583	Dedication	Aelius Antonius	Latin	Unit of Sarmatian Cavalry	Dedicator: Melitene; Men: Iran	Apollo Maponus (Celtic)	Ribchester, UK	AD 241
594	Epitaph	Aelia Matrona, Marcus Julius Maximus, and Campania Dubitata	Matrona is African, Campania Dubitata is unknown	Cavalry Regiment of Sarmatians	Africa, Iran, unknown	NA	Ribchester, UK	NA
595	Epitaph	NA	NA	Cavalry Regiment of Sarmatians	Iran	NA	Ribchester, UK	NA
606	Epitaph	Lucius Julius Apollinaris	Latin	NA	"a Treveran"	NA	Lancaster, UK	NA
610	Dedication	Vatta	Germanic	NA	NA	Contrebis (Local)	Overborough, UK	NA
619	Epitaph	Cintusmus	Celtic	Fourth Cohort of Gauls	Gaul	NA	Templebrough, UK	NA
620	Epitaph	Crotus, son of Bindex	both Celtic	Fourth Cohort of Gauls	Gaul	NA	Templebrough, UK	NA
621	Epitaph	Verecunda Rufilis, Excingus	Latin and Celtic	NA	"Tribeswoman of Dobunni"	NA	Templebrough, UK	NA
630	Dedication	Cingetissa	Indigenous	NA	NA	Brigantia (Indigenous?)	Adel, UK	NA
632	Epitaph	Candiedinia Fortunata	probably Celtic	NA	NA	NA	Adel, UK	NA
635	Dedication	Claudius Fronto	Latin	Second Cohort of Lingonians	Gaul	Verbeia (Celtic-Britain)	Ilkley, UK	NA
639	Epitaph	Ved[..]ic[..]	NA	NA	"a tribeswoman of the Cornovii"	NA	Ilkley, UK	NA

641	Dedication	Volusius Irenaeus	unknown	NA	NA	Arimanes	York, UK	NA
653	Dedication	Marcus Minicius Audens	Latin	NA	NA	African, Italian, and Gallic mother goddesses	York, UK	NA
658	Dedication	Claudius Hieronymianus	Greek?	NA	NA	Serapis (Egyptian)	York, UK	AD 190-212
662	Dedication	Scribonius Demetrius	Greek	NA	NA	NA	York, UK	NA
663	Dedication	Demetrius	Greek	NA	NA	Ocean and Tethys	York, UK	NA
665	Dedication	NA	NA	Ninth Legion Hispania	Hispania	NA	York, UK	AD 107-108
671	Epitaph	Lucius Bebius Crescens	unknown	NA	Augusta Vindelicum	NA	York, UK	NA
673	Epitaph	Lucius Duccius Rufinus	unknown	NA	Vienna	NA	York, UK	NA
678	Epitaph	Marcus Verecundius Diogenes	unknown	NA	Bituriges Cubi	NA	York, UK	NA
680	Epitaph	Gaius	Latin	Ninth Legion Hispania	Dedicator: Novaria; Men: Hispania	NA	York, UK	NA
681	Epitaph	Hyllus	Greek	NA	NA	NA	York, UK	NA
687	Epitaph	Julia Forunata from husband Verecundius Diogenes	Latin	NA	Sardinia	NA	York, UK	NA
689	Epitaph	Mantinia Maerica, Candida Barita	both Celtic	NA	NA	NA	York, UK	NA
691	Epitaph	Andronica	Greek	NA	NA	NA	York, UK	NA
695	Epitaph	Eglecta, from Antonius Stephanus	Greek	NA	NA	NA	York, UK	NA
706	unknown	NA	NA	NA	NA	NA	York, UK	NA
711	Dedication	Scricus	possibly Greek	NA	NA	Mars Rigas (Gaul?)	Malton, UK	NA

722	Building insc.	NA	NA	Sixth Cohort of Nervians	Gaul	NA	Brough-by-Bainbridge, UK	AD 205-208
723	Building insc.	NA	NA	Sixth Cohort of Nervians	Gaul	NA	Brough-by-Bainbridge, UK	NA
727	Dedication	Aurelius Mucianus	unknown	NA	NA	Veteris (Celtic)	Catterick, UK	NA
730	Dedication	Virius Lupus and Valerius Fronto	Latin	First Cohort of Thracians and Cavalry Regiment of Vettonians	Thrace and Iberian Peninsula	NA	Bowes, UK	AD 197- 3 May 198
732	Dedication	Julius Secundus	Latin	First Cohort of Thracians	Thrace	Vinotonus (Celtic-Britain)	Bowes, UK	NA
733	Dedication	Lucius Coesius Frontinus	Latin	First Cohort of Thracians	Dedicator: Parma; Men: Thrace	Vinotonus (Celtic-Britain)	Bowes, UK	NA
734	Dedication	Lucius Coesius Frontinus	Latin	First Cohort of Thracians	Dedicator: Parma; Men: Thrace	NA	Bowes, UK	NA
740	Dedication	NA	NA	First Cohort of Thracians	Thrace	NA	Bowes, UK	AD 205-208
741	Dedication	NA	NA	First Cohort of Thracians	Thrace	NA	Bowes, UK	NA
758	Epitaph	Hermes	Greek	NA	Commagene	Cimmerian Folk (Greek myhtology)	Brough-under-Stainmore, UK	3rd c. AD
773	Dedication	Baculo	possibly Celtic	NA	NA	Belatucadrus (Celtic)	Brougham, UK	NA
774	Dedication	Audagus	possibly Celtic	NA	NA	Belatucadrus (Celtic)	Brougham, UK	NA
780	Dedication	[. . .] Januarius [..]	Latin	Unit of Stratonician Cavalry	Asia Minor	NA	Brougham, UK	NA
781	Dedication	NA	NA	[. . .] Cohort of Gauls	Gaul	NA	Brougham, UK	NA
783	unknown	NA	NA	NA	“ex Africa domo”	NA	Brougham, UK	NA

784	Epitaph	Annamoris and Ressona	barbarian	NA	NA	NA	Brougham, UK	NA
786	Epitaph	To Pluma from Lunaris	Rare, unknown names	NA	NA	NA	Brougham, UK	NA
797	Dedication	Mamius Nepos	unknown	Second Cohort of Thracians	Thrace	NA	Moresby, UK	NA
798	Dedication	NA	NA	Second Cohort of Thracians	Thrace	Silvanus?	Moresby, UK	NA
800	Dedication	Valerius Lupercus	possibly Gallic	Second Cohort of Lingonians	Gaul	NA	Moresby, UK	NA
803	Building insc.	NA	NA	Second Cohort of Thracians	Thrace	NA	Moresby, UK	NA
804	Epitaph	Smertrius, son of Macer	Gallic	Second Cohort of Thracians	Thrace	NA	Moresby, UK	NA
808	Dedication	Aulus Egnatius Pastor	Latin	NA	NA	Asclepius	Maryport, UK	NA
810	Dedication	Paulus Postumius Acilianus	Spanish	First Cohort of Dalmatians	Dalmatia	NA	Maryport, UK	AD 139-165
812	Dedication	Gaius Cornelius Peregrinus	name means foreigner	NA	Saldae	NA	Maryport, UK	NA
814	Dedication	Marcus Censorius Cornelianus	Latin	First Cohort of Spaniards	Dedicator: Nemausus; Men: Hispania	NA	Maryport, UK	NA
815	Dedication	NA	NA	First Cohort of Spaniards	Hispania	NA	Maryport, UK	NA
816	Dedication	Lucius Antistius Lupus Verianus	Latin	First Cohort of Spaniards	Dedicator: Sicca; Men: Hispania	NA	Maryport, UK	NA
817	Dedication	NA	NA	First Cohort of Spaniards	Hispania	NA	Maryport, UK	NA
822	Dedication	Helstrius Novellus	unknown	First Cohort of Spaniards	Hispania	NA	Maryport, UK	NA
823	Dedication	NA	NA	First Cohort of Spaniards	Hispania	NA	Maryport, UK	AD 123-137
824	Dedication	Marcus Maenius Agrippa	Latin	NA	Camerinum	NA	Maryport, UK	AD 123-137
825	Dedication	Maenius Agrippa	Latin	NA	Camerinum	NA	Maryport, UK	AD 123-137

826	Dedication	Maenius Agrippa	Latin	NA	Camerinum	NA	Maryport, UK	AD 123-137
827	Dedication	NA	NA	First Cohort of Spaniards	Hispania	NA	Maryport, UK	AD 133-135
828	Dedication	NA	NA	First Cohort of Spaniards	Hispania	NA	Maryport, UK	AD 133-135
829	Dedication	NA	NA	First Cohort of Spaniards	Hispania	NA	Maryport, UK	AD 133-135
830	Dedication	Titus Altius Tutor	Celtic	First Cohort of Baestians	Germania Inferior	NA	Maryport, UK	AD 165-185
831	Dedication	NA	NA	First Cohort of Dalmatians	Dalmatia	NA	Maryport, UK	AD 139-165
832	Dedication	Postumius Acilianus	Spanish	First Cohort of Dalmatians	Dedicator: Cordova; Men: Dalmatia	NA	Maryport, UK	AD 139-165
837	Dedication	Titus Altius Tutor	Celtic	First Cohort of Baestians	Germania Inferior	NA	Maryport, UK	AD 165-185
838	Dedication	NA	NA	First Cohort of Baestians	Germania Inferior	NA	Maryport, UK	NA
841	Dedication	Labareus	unknown	NA	"a German"	Setlocenia?	Maryport, UK	NA
842	Dedication	Titus Altius Tutor	Celtic	First Cohort of Baestians	Germania Inferior	NA	Maryport, UK	AD 165-185
843	Dedication	NA	NA	First Cohort of Baestians	Germania Inferior	NA	Maryport, UK	NA
847	Dedication	Postumius Acilianus	Spanish?	First Cohort of Dalmatians	Dedicator: Cordova; Men: Dalmatia	NA	Maryport, UK	AD 139-165
850	Dedication	Paulus Postumius Acilianus	unknown	First Cohort of Dalmatians	Dalmatia	NA	Maryport, UK	NA
861	Epitaph	Morirex	Celtic?	NA	NA	NA	Maryport, UK	NA
862	Epitaph	Rianorix	Celtic?	NA	NA	NA	Maryport, UK	NA
864	Epitaph	NA	NA	NA	Galatia	NA	Maryport, UK	NA
880	Building insc.	NA	NA	Second Cohort of Pannonians	Pannonia	NA	Beckfoot, UK	NA
883	Dedication	NA	NA	NA	Frisians of Aballava	NA	Papcastle, UK	AD 242
887	Dedication	Aurelius Tasulus	Celtic	NA	NA	Belatucadrus (Celtic)	Old Carlisle, UK	NA
888	Dedication	Aurelius Diatova	Celtic?	NA	NA	Belatucadrus (Celtic)	Old Carlisle, UK	NA

894	Dedication	Publius Aelius Magnus	Latin	NA	Mursa	NA	Old Carlisle, UK	AD 191
895	Dedication	Egnatius Verecundus	Celtic?	NA	NA	Jupiter of Dolichenus (Syria)	Old Carlisle, UK	NA
897	Dedication	Aemilius Crispinus	unknown	NA	Tusdrus	NA	Old Carlisle, UK	AD 242
906	Epitaph	Amatius Ingenuus	Celtic	NA	NA	NA	Old Carlisle, UK	NA
908	Epitaph	Tancorix	Celtic?	NA	NA	NA	Old Carlisle, UK	4^{th} c. AD
915	Dedication	NA	NA	Second Cohort of Gauls	Gaul	NA	Old Penrith, UK	AD 244-249
917	Dedication	Titus Domitius Hieron	unknown	Second Cohort of Gauls	Dedicator: Nicomeda; Men: Gaul	NA	Old Penrith, UK	AD 178
919	Dedication	NA	NA	detachment of Marsacians	Germania	Mother Goddesses from Overseas	Old Penrith, UK	AD 222-235
920	Dedication	NA	NA	detachment of Germans	Germania	Mother Goddesses from Overseas	Old Penrith, UK	NA
926	Dedication	Useni Fersomeri Burcanis, Arcavius, Vagda Varcustus, and Pov[...]arus	Germanic	NA	NA	NA	Old Penrith, UK	NA
929	Dedication	Calvisius Rufus	Latin	Second Cohort of Gauls	Gaul	NA	Old Penrith, UK	AD 222-235
934	Epitaph	Crotilo Germanus and Greta, set up by Vindicianus	Germanic	NA	NA	NA	Old Penrith, UK	NA
935	Epitaph	[...]gadunus	possibly Tungrian (Germania Inferior)	NA	Ulpia Trajana	NA	Old Penrith, UK	NA

936	Epitaph	Aicetuos, Lattio, and Limisius	Italian?	NA	NA	NA	Old Penrith, UK	NA
937	Epitaph	Ylas	Greek?	NA	NA	NA	Old Penrith, UK	NA
946	Dedication	Publius Sextanius	Latin	NA	Xanten	NA	Carlisle, UK	AD 192
955	Epitaph	Flavius Antigonus Papias	Greek	NA	"a citizen of Greece"	NA	Carlisle, UK	NA
960	Epitaph	Julia Fortunatus and Aurelia Senecita	African	NA	NA	NA	Carlisle, UK	NA
966	Dedication	Paternius Maternus	Celtic or Briton	First Cohort Nervana	Germania	Cocidius (Northern Britain)	Netherby, UK	NA
967	Dedication	Monime	Greek	NA	NA	NA	Netherby, UK	NA
968	Dedication	NA	NA	First Aelian Cohort of Spaniards	Hispania	NA	Netherby, UK	NA
976	Dedication	Gaius Julius Marcus	Latin	First Aelian Cohort of Spaniards	Hispania	NA	Netherby, UK	AD 213
977	Building insc.	Gaius Julius Marcus	Latin	First Aelian Cohort of Spaniards	Hispania	NA	Netherby, UK	AD 214-216
978	Building insc.	NA	NA	First Aelian Cohort of Spaniards	Hispania	NA	Netherby, UK	AD 222
980	Building insc.	NA	NA	First Aelian Cohort of Spaniards	Hispania	NA	Netherby, UK	NA
984	Epitaph	Titullinia Pussita	unknown	NA	"a Raetian"	NA	Netherby, UK	NA
988	Dedication	Aurunceius Felicessemus	Italian	NA	NA	Cocidius (Northern Britain)	Bewcastle, UK	3^{rd} c. AD
991	Dedication	NA	NA	First Cohort of Dacians	Dacia	NA	Bewcastle, UK	NA

1022	Dedication	Julius Valentinus	Latin	NA	Upper Germany	Jupiter of Dolichenus (Syria)	Piercebridge, UK	AD 217
1026	Epitaph	Gracilis	Latin	NA	Upper Germany	NA	Piercebridge, UK	AD 217
1028	Dedication	Marcus Aurelius [. . .]ocomas	Latin	Cavalry Regiment of Vettonians	Iberian Peninsula	Aesculapius and Salus	Binchester, UK	NA
1030	Dedication	Pomponius Donatus	African	NA	NA	The Mother Goddesses Ollototae	Binchester, UK	NA
1031	Dedication	Tiberius Claudius Quintianus	“not indigenous”	NA	NA	The Mother Goddesses Ollototae	Binchester, UK	NA
1035	Dedication	NA	NA	Cavalry Regiment of Vettonians	Iberian Peninsula	Suleviae (Gallic)	Binchester, UK	NA
1036	Dedication	NA	NA	Cuneus of Frisians	Germania	NA	Binchester, UK	NA
1041	Dedication	Gaius Tetius Veturius Micianus	Latin	Sebosian Cavalry Regiment	Gaul?	Silvanus (Celtic)	Bollihope Common, UK	NA
1046	Dedication	Duihno	Germanic	NA	NA	Veteris (Celtic)	Chester-le-Street, UK	NA
1053	Dedication	Congennicus	Indigenous	NA	NA	Brigantia (Indigenous?)	South Shields, UK	NA
1059	Dedication	NA	NA	Fifth Cohort of Gauls	Gaul	NA	South Shields, UK	NA
1060	Dedication	Marcus Valerianus	Latin	Fifth Cohort of Gauls	Gaul	NA	South Shields, UK	NA
1064	Epitaph	Victor, Freedman of Numeranius	unknown	First Cohort of Asturians	Dedicator: a Moorish Tribesman; Men: Hispania	NA	South Shields, UK	NA
1065	Epitaph	Regina and Barates	Regina: Celtic?; Barates: Palmyran?	NA	Catuyellaunia and Palmyra	NA	South Shields, UK	NA
1074	Dedication	Garmangabis	Germanic	NA	NA	NA	Lanchester, UK	AD 238-244

1075	Dedication	NA	NA	First Cohort of Lingonians	Gaul	NA	Lanchester, UK	NA
1076	Dedication	NA	NA	First Loyal Cohort of Vardullians	Hispania	NA	Lanchester, UK	NA
1078	Dedication	Ascernus	possibly Celtic	NA	NA	NA	Lanchester, UK	NA
1083	Dedication	tribune under Antistius Adventus	NA	First Loyal Cohort of Vardullians	Men: Hispania; Antistius Adventus: Numidia?	NA	Lanchester, UK	NA
1091	Building insc.	NA	NA	First Cohort of Lingonians	Gaul	NA	Lanchester, UK	NA
1092	Building insc.	NA	NA	First Cohort of Lingonians	Gaul	NA	Lanchester, UK	NA
1102	Dedication	Virilis	Germanic	NA	Germania	Vernostonus Cocidius (Celtic-Britain)	Ebchester, UK	NA
1120	Dedication	Quintus Terentius Firmus	Latin	NA	Saena	NA	Corbridge, UK	NA
1124	Dedication	Pulcher	unknown	NA	NA	Astarte (Greek)	Corbridge, UK	NA
1128	Dedication	NA	NA	First Loyal Cohort of Vardullians	Hispania	NA	Corbridge, UK	NA
1129	Dedication	Diodora	unknown	NA	NA	Heracles (greek) of Tyre (Lebanon)	Corbridge, UK	NA
1171	Epitaph	[...]rathes	ending is Greek	NA	Palmyra	NA	Corbridge, UK	NA
1180	Epitaph	Ahteha and Nobilis	Germanic	NA	NA	NA	Corbridge, UK	NA
1181	Epitaph	Ertola, called Vellibia and Sudrenus	Germanic?	NA	NA	NA	Corbridge, UK	NA
1186	Building insc.	Iliomaris	Celtic	First Cohort of Lingonians	Gaul	NA	Corbridge, UK	NA
1198	Dedication	NA	NA	Second Cohort of Nervians	Gaul	NA	Whitley Castle, UK	NA

1202	Dedication	NA	NA	Second Cohort of Nervians	Gaul	NA	Whitley Castle, UK	AD 213
1203	Dedication	NA	NA	Second Cohort of Nervians	Gaul	NA	Whitley Castle, UK	AD 215-216
1215	Dedication	Lucius Aemilius Salvianus	African?	First Cohort of Vangiones	Germania	NA	Risingham, UK	NA
1216	Dedication	Aemilius Aemilianus and Raetian Spearmen	African?	First Cohort of Vangiones	Germania	NA	Risingham, UK	NA
1217	Dedication	Julius Victor and Raetian Spearmen	Raetian	First Cohort of Vangiones	Germania	NA	Risingham, UK	NA
1225	Dedication	Marcus Gavius Secundius	Latin	NA	NA	Mogons Cad[...]	Risingham, UK	NA
1226	Dedication	Inventus	unknown	NA	NA	Mogons Cad[...]	Risingham, UK	NA
1227	Dedication	NA	NA	Fourth Cohort of Gauls	Gaul	NA	Risingham, UK	NA
1229	Dedication	Arruntius Paulinus and Theodotus	Greek?	NA	NA	NA	Risingham, UK	NA
1231	Dedication	Marcus Peregrinus Super	NA	First Cohort of Vangiones	Germania	NA	Risingham, UK	NA
1234	Dedication	Aemilius Salvianus	African	First Cohort of Vangiones	Germanic	NA	Risingham, UK	AD 205-208
1235	Dedication	NA	NA	First Cohort of Vangiones and Raetian Spearmen	Germania	NA	Risingham, UK	NA
1241	Dedication	NA	NA	First Cohort of Vangiones	Germania	NA	Risingham, UK	NA
1248	Epitaph	Satrius Honoratus	Etruscan and African	NA	NA	NA	Risingham, UK	NA
1249	Epitaph	NA	NA	Fourth Cohort of Gauls	Gaul	NA	Risingham, UK	NA
1250	Epitaph	Dionysius Fortunatus	Greek	NA	NA	NA	Risingham, UK	NA
1252	Epitaph	Juliona	Gallic	NA	NA	NA	Risingham, UK	NA

1254	Epitaph	Blescius Diovicus	Celtic	NA	NA	NA	Risingham, UK	NA
1262	Dedication	Egnatius Lucilianus	unknown	First Loyal Cohort of Vardullians	Hispania	NA	High Rochester, UK	AD 238-241
1263	Dedication	Titus Licinius Valerianus	Latin	First Loyal Cohort of Vardullians	Hispania	NA	High Rochester, UK	NA
1271	Dedication	Rufinus, Lucilla, and Eutychus	Greek?	NA	NA	NA	High Rochester, UK	NA
1272	Dedication	Lucius Caecilius Optatus	Latin	First Loyal Cohort of Vardullians	Hispania	NA	High Rochester, UK	AD 213
1273	Dedication	Julius Melanio	unknown	NA	Ephesus?	NA	High Rochester, UK	AD 253
1276	Building insc.	Quintus Lollius Urbicus	Latin	First Cohort of Lingonians	Dedicator: Numidia; Men: Gaul	NA	High Rochester, UK	AD 139-143
1279	Building insc.	NA	NA	First Loyal Cohort of Vardullians	Hispania	NA	High Rochester, UK	AD 216
1280	Building insc.	Tiberius Claudius Paulinus	Latin	First Loyal Cohort of Vardullians	Hispania	NA	High Rochester, UK	AD 1 Jan-9 Dec 220
1281	Building insc.	Claudius Apellinus	Greek	First Loyal Cohort of Vardullians	Hispania	NA	High Rochester, UK	AD 222-235
1288	Epitaph	Rufinus	unknown	First Cohort of Vardulli, First Cohort of Lusitanians, First Cohort of Breuci	Spain and Pannonia	NA	High Rochester, UK	NA
1289	Epitaph	Aurelius Ex[...]	Latin	First Cohort of Dalmatians	Dalmatia	NA	High Rochester, UK	NA

1291	Epitaph	Hermagoras and Honoratus	Greek	NA	NA	NA	High Rochester, UK	NA
1299	Dedication	Julius Honoratus	African	Fourth Cohort of Lingonians	Gaul	NA	Wallsend, UK	NA
1300	Dedication	Aelius Rufus	Latin	Fourth Cohort of Lingonians	Gaul	NA	Wallsend, UK	NA
1303	Dedication	NA	NA	Second Cohort of Nervians	Gaul	NA	Wallsend, UK	NA
1318	Dedication	Aurelius Juvenalis	Latin	NA	NA	"The mother goddesses of his Foreign Land"	Newcastle, UK	NA
1322	Building insc.	Julius Verus	Latin	detachment of men from the two Germanies	Germanic	NA	Newcastle, UK	AD 155-159
1323	Building insc.	NA	NA	First Cohort of Thracians	Thrace	NA	Newcastle, UK	NA
1328	Dedication	Cassianus	unknown	First Cohort of Vangiones	Germanic	Antenocitus (Local Romano-British)	Benwell, UK	NA
1333	Dedication	Vindex	Celtic	NA	NA	NA	Benwell, UK	NA
1334	Building insc.	Titus [...] Agrippa	Latin	First Cavalry Regiment of Asturian Spaniards	Hispania	NA	Benwell, UK	AD 238
1337	Dedication	NA	NA	First Cavalry Regiment of Asturian Spaniards	Hispania	NA	Benwell, UK	AD 205-208
1347	Building insc.	Peregrinus	name means foreigner	Century of Peregrinus	NA	NA	Benwell, UK	NA
1350	Epitaph	Decimus Julius Candidus	Latin	First Cohort of Vangiones	Germania	NA	Benwell, UK	NA
1365	Building insc.	Aelius Dida	unknown	First Aelian Cohort of Dacians	Dacia	NA	Newcastle, UK	NA

1376	Building insc.	Peregrinus	name means foreigner	NA	NA	NA	Newcastle, UK	NA
1397	Dedication	Aponius Rogatianus	African	NA	NA	the sun-god Mithras	Rudchester, UK	NA
1398	Dedication	Lucius Sentius Castus	African	NA	NA	Mithras	Rudchester, UK	NA
1420	Epitaph	Vilidedius	Germanic	NA	NA	NA	Corbridge, UnK	NA
1421	Dedication	NA	NA	First Loyal Cohort of Vardullians	Hispania	NA	Corbridge, UnK	NA
1433	Epitaph	NA	NA	NA	“a Norican tribesman”	NA	Halton Chesters, UK	NA
1439	Building insc.	Statilius Solon	Greek	NA	NA	NA	Hexham, UK	NA
1448	Dedication	NA	NA	NA	NA	Bona Dea Caelestis	Walwick, UK	NA
1449	Dedication	Venenus	Germanic	NA	“a German”	NA	Walwick, UK	NA
1452	Dedication	Galerius Verecundus	Celtic?	NA	NA	Jupiter of Dolichenus (Syria)	Walwick, UK	NA
1463	Building insc.	Ulpius Marcellus	Latin	Second Cavalry Regiment of Asturians	Hispania	NA	Walwick, UK	AD 180-184
1464	unknown	Ulpius Marcellus	Latin	Second Cavalry Regiment of Asturians	Hispania	NA	Walwick, UK	NA
1465	Building insc.	Septimius Nilus	Greek	Second Cavalry Regiment of Asturians	Hispania	NA	Walwick, UK	AD 30 Oct 221
1466	unknown	NA	NA	Second Cavalry Regiment of Asturians	Hispania	NA	Walwick, UK	AD 221-222
1480	Epitaph	Aventius	unknown	Second Cavalry Regiment of Asturians	Hispania	NA	Walwick, UK	NA

1482	Epitaph	Fabia Honorata, Fabius Honoratus, and Aurelia Eglectiane	African	First Cohort of Vangiones	Men: Germanic; Dedicator: African	NA	Walwick, UK	3^{rd} c. AD
1483	Epitaph	Lurio, Ursa, Julia, Canio	Germanic	NA	Germania	NA	Walwick, UK	NA
1499	Building insc.	Lousius Suavis	Celtic	NA	NA	NA	Hexham, UK	NA
1506	Building insc.	Lousius Suavis	Celtic	NA	NA	NA	Hexham, UK	NA
1515	Building insc.	Hellenius	Greek?	NA	NA	NA	Hexham, UK	NA
1522	Dedication	Bellicus	Latinized Celtic name	NA	NA	Coventina (British)	Carrawburgh, UK	NA
1523	Dedication	Mausaeus	unknown	First Cohort Frixiavones	Germanic	Coventina (British)	Carrawburgh, UK	NA
1524	Dedication	Aurelius Campester	Germanic	First Cohort of Cuberians	Germanic	Coventina (British)	Carrawburgh, UK	NA
1525	Dedication	Aurelius Crotus	Germanic	NA	"a German"	Coventina (British)	Carrawburgh, UK	NA
1526	Dedication	Maduhus	Germanic	NA	"a German"	Coventina (British)	Carrawburgh, UK	NA
1528	Dedication	Vinomathus	Germanic	NA	NA	Coventina (British)	Carrawburgh, UK	NA
1532	Dedication	Crotus	Germanic	NA	NA	Coventina (British)	Carrawburgh, UK	NA
1534	Dedication	Titus Cosconianus	unknown	First Cohort of Batavians	Germanic	Coventina (British)	Carrawburgh, UK	NA
1535	Dedication	Aelius Tertius	Latin	First Cohort of Batavians	Germanic	Coventina (British)	Carrawburgh, UK	NA
1536	Dedication	Marcus Flaccinius Marcellus	Latin	First Cohort of Batavians	Germanic	NA	Carrawburgh, UK	NA
1538	Dedication	NA	NA	Second Cohort of Nervians	"the Texandri and Suvevae men of this cohort"	NA	Carrawburgh, UK	NA
1543	Dedication	Venico	possibly indigenous	NA	NA	NA	Carrawburgh, UK	NA

1544	Dedication	Lucius Antonius Proculus	Latin	First Cohort of Batavians	Germanic	Mithras	Carrawburgh, UK	AD 213-222
1545	Dedication	Aulus Cluentius Habitus	Latin	First Cohort of Batavians	Dedicator: Colonia Septimia Aurelia Larinum; Men: Germanic	Mithras	Carrawburgh, UK	AD 198-211
1546	Dedication	Marcus Simplicius Simplex	Germanic	NA	NA	Mithras	Carrawburgh, UK	NA
1548	Dedication	Uccus	"Barbarian"	NA	NA	Veteris (Celtic)	Carrawburgh, UK	NA
1550	unknown	Nepos	NA	First Cohort of Aquitanians	Gaul	NA	Carrawburgh, UK	AD 130
1553	Building insc.	Burrius	unknown	First Cohort of Batavians	Germanic	NA	Carrawburgh, UK	AD 237
1554	Building insc.	Alexander	Greek	Century of Alexander	NA	NA	Carrawburgh, UK	NA
1556	Building insc.	NA	NA	Thruponian Century	Germanic	NA	Carrawburgh, UK	NA
1559	Epitaph	Longinus	Latin	First Cohort of Batavians	Germanic	NA	Carrawburgh, UK	NA
1560	Epitaph	son of Milenus	unknown	First Cohort of Batavians	Germanic	NA	Carrawburgh, UK	NA
1562	Epitaph	Hilario	unknown	First Cohort of Batavians	Germanic	NA	Carrawburgh, UK	NA
1568	Building insc.	Terentius Cantaber	Spanish	NA	NA	NA	Hexham, UK	NA
1572	Building insc.	Gellius Philippus	Greek	NA	NA	NA	Hexham, UK	NA
1576	Dedication	Hnaudifridus	Germanic	NA	NA	Alaisiagae, Baudihillia, and Friagabis (German)	Housesteads, UK	NA
1578	Dedication	Quintus Florius Maternus	possibly indigenous	First Cohort of Tungrians	Germania Inferior	Cocidius (Northern Britain)	Housesteads, UK	3^{rd} c. AD

1579	Dedication	NA	NA	NA	NA	gods and goddesses according to the Oracle of Clarian Apollo (Greek)	Housesteads, UK	NA
1580	Dedication	Publius Aelius Modestus	Latin	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA
1584	Dedication	Quintus Julius Maximus	Latin	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA
1585	Dedication	Quintus Julius Maximus	Latin	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA
1586	Dedication	Quintus Julius Maximus	Latin	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA
1589	Dedication	Desidienus Aemilianus	Dalmatian	NA	NA	NA	Housesteads, UK	AD 258
1591	Dedication	Quintus Florius Maternus	possibly indigenous	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA
1593	Dedication	The Germans	NA	NA	"Tribesmen of the Twenthe"	Mars Thincsus, and the two Alsaisiage, Beda and Fimmilena (all German)	Housesteads, UK	NA
1594	Dedication	The Germans	NA	Cuneus of Frisians	"Tribesmen of the Twenthe"	The two Alaisiagae (German)	Housesteads, UK	NA
1597	Dedication	Calve[...]	NA	NA	"a German"	NA	Housesteads, UK	NA
1598	Dedication	NA	NA	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA
1601	Dedication	Herion	Greek?	NA	NA	the sun god	Housesteads, UK	NA
1603	Dedication	Aspuanis	Germanic	NA	NA	Huitris (German?)	Housesteads, UK	NA
1618	Epitaph	Anicius Ingenuus	unknown	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA
1619	Epitaph	Hurmius, son of Leubasnus	Germanic	First Cohort of Tungrians	Germania Inferior	NA	Housesteads, UK	NA

1620	Epitaph	Romulus, son of Alimahus	German	NA	NA	NA	Housesteads, UK	NA
1620	Epitaph	Venocarus	Celtic	NA	NA	NA	Housesteads, UK	NA
1620	Epitaph	Gratus, son of Fersia	German	NA	NA	NA	Housesteads, UK	NA
1620	Epitaph	Similis, son of Dailus	German	NA	NA	NA	Housesteads, UK	NA
1620	Epitaph	Delfinus, son of Rautio	Germanic	NA	Upper Germany	NA	Housesteads, UK	NA
1620	Epitaph	Mansuetius, son of Senico	unknown	NA	NA	NA	Housesteads, UK	NA
1620	Epitaph	Pervinca, daughter of Quartio	unknown	NA	NA	NA	Housesteads, UK	NA
1632	Building insc.	Julius Candidus	African	NA	NA	NA	Haltwhistle, UK	NA
1646	Building insc.	Julius Candidus	African	NA	NA	NA	Haltwhistle, UK	NA
1648	Building insc.	Claudius Cleonicus	"Eastern"	NA	NA	NA	Haltwhistle, UK	NA
1657	Building insc.	Caecilius Monimus	African	NA	NA	NA	Haltwhistle, UK	NA
1664	Building insc.	Flavius Noricus	"beyond the alps"	NA	NA	NA	Haltwhistle, UK	NA
1667	Epitaph	Dagvalda	Celtic and German hybrid	First Cohort of Pannonians	Germanic	NA	Haltwhistle, UK	NA
1668	Building insc.	Gellius Philippus	Greek	NA	NA	NA	Haltwhistle, UK	NA
1672	Building insc.	"the canton of the Durotriges"	Indigenous	NA	Local	NA	Haltwhistle, UK	AD 369
1674	Building insc.	Julius Candidus	African	NA	NA	NA	Haltwhistle, UK	NA
1681	Building insc.	Lousius Suavis	Celtic	NA	NA	NA	Haltwhistle, UK	NA
1683	Dedication	Decimus Caerellius Victor	Latin	Second Cohort of Nervians	Gaul	Cocidius (Northern Britain)	Vindolanda, UK	NA

1685	Dedication	Pituanius Secundus	Italian	Fourth Cohort of Gauls	Gaul	NA	Vindolanda, UK	NA
1686	Dedication	Quintus Petronius Urbicus	Latin	Fourth Cohort of Gauls	Dedicator: Brixia; Men: Gaul	NA	Vindolanda, UK	AD 213-235
1687	Dedication	NA	NA	Fourth Cohort of Gauls	Gaul	NA	Vindolanda, UK	NA
1688	Dedication	NA	NA	Fourth Cohort of Gauls	Gaul	NA	Vindolanda, UK	NA
1691	Dedication	NA	NA	Third Cohort of Nervians	Gaul	NA	Vindolanda, UK	NA
1695	Dedication	"the Assembly of the Textoverdi"	Indigenous	NA	Northumberland	Sattada (Local)	Vindolanda, UK	NA
1699	Dedication	Senaculus	Latinized Celtic name	NA	NA	Veteris (Celtic)	Vindolanda, UK	NA
1706	Epitaph	Cornelius Victor	Latin	NA	"a Pannonian Tribesman"	NA	Vindolanda, UK	NA
1724	Dedication	Tabellius Victor	Latin	detachment of Raetian Spearment	Germania	NA	Great Chesters, UK	NA
1725	Dedication	Lucius Maximus Gaetulicus	African or Celtic?	NA	NA	Jupiter of Dolichenus (Syria)	Great Chesters, UK	NA
1726	Dedication	Regulus	Latin	NA	NA	Jupiter of Dolichenus (Syria)	Great Chesters, UK	NA
1731	Dedication	Gaius Julius Barbarus	African	Sixth Cohort of Nervians	Gaul	NA	Great Chesters, UK	NA
1737	Dedication	NA	NA	Sixth Cohort of Raetians	Germania	NA	Great Chesters, UK	NA
1747	Epitaph	Pervica	possibly German	NA	NA	NA	Great Chesters, UK	NA
1777	Dedication	NA	NA	NA	NA	Epona (Gaul)	Carvoran, UK	NA

1778	Dedication	Lucius Aelius Caesar Titus Flavius Secundus	African	First Cohort Hamian Archers	Palmyra	NA	Carvoran, UK	AD 136-138
1780	Dedication	Sabinus	Latin	NA	NA	Hammia (Palmyran)	Carvoran, UK	NA
1783	Dedication	Julius Pollio	Latin	NA	NA	Jupiter of Helipolis (Egypt)	Carvoran, UK	NA
1791	Dedication	Marcus Caecilius Donatianus	African	NA	NA	"Syrian goddess" sent the constellation to Libya to be worshipped	Carvoran, UK	AD 197-217
1792	Dedication	Licinius Clemens	Latin	First Cohort of Hammians	Palmyra	Syrian Goddesses	Carvoran, UK	AD 163-166
1793	Dedication	Necalames	"Barbarian" Celtic?	NA	NA	Veteris (Celtic)	Carvoran, UK	NA
1794	Dedication	Necalames	"Barbarian" Celtic?	NA	NA	Veteris (Celtic)	Carvoran, UK	NA
1795	Dedication	Julius Pastor	Latin	Second Cohort of Dalmatians	Dalmatia	Veteris (Celtic)	Carvoran, UK	NA
1796	Dedication	Andiatis	Celtic?	NA	NA	Veteris (Celtic)	Carvoran, UK	NA
1799	Dedication	Menius Dada	Barbarian	NA	NA	Veteris (Celtic)	Carvoran, UK	NA
1801	Dedication	Necalames	Barbarian, Celtic?	NA	NA	Veteris (Celtic)	Carvoran, UK	NA
1810	Dedication	[. . .] Agrippa	Latin	First Cohort of Hammians	Palmyra	NA	Carvoran, UK	NA
1812	Building insc.	Flavius Noricus	"beyond the alps"	NA	NA	NA	Carvoran, UK	NA
1817	Building insc.	Antonius Viator	Latin	NA	Upper Germany	NA	Carvoran, UK	NA
1818	Dedication	Flavius Secundus	African	NA	NA	NA	Carvoran, UK	NA
1820	Dedication	Flavius Secundus	African	NA	NA	NA	Carvoran, UK	NA

1821	Building insc.	Sorio	Barbarian	NA	NA	NA	Carvoran, UK	NA
1823	Building insc.	NA	NA	First Cohort of Batavians	Germania	NA	Carvoran, UK	NA
1826	Epitaph	Gaius Valerius Iullus	Latin	NA	Vienna	NA	Carvoran, UK	NA
1828	Epitaph	Aurelia Ala	Latin	NA	Salonae	NA	Carvoran, UK	NA
1843	Building insc.	The tribe of the Dumnonii	Indigenous	NA	Exeter	NA	Brampton, UK	AD 369
1844	Building insc.	The tribe of the Dumnonii	Indigenous	NA	Exeter	NA	Brampton, UK	AD 369
1859	Building insc.	Lousius Suavis	Celtic	NA	NA	NA	Brampton, UK	NA
1861	Building insc.	Lousius Suavis	Celtic	NA	NA	NA	Brampton, UK	NA
1874	Dedication	Ammonius Victorinus	Latin	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1875	Dedication	Aurelius Faustus	Latin	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	AD 237
1876	Dedication	Aurelius Saturninus	Latin	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1877	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1878	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1879	Dedication	Funisulanus Vettonianus	Latin	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	3^{rd} c. AD
1880	Dedication	Julius Marcellinus	Latin	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1881	Dedication	Julius Saturninus	Latin	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA

1882	Dedication	Marcius Gallicus	Gallic	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1883	Dedication	Marcius Gallicus	Gallic	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	AD 259-268
1884	Dedication	Domitius Honoratus	African	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1885	Dedication	Pompinius Desideratus	"Western provinces"	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	AD 270-273
1886	Dedication	Probius Augendus	"Western provinces"	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	AD 259-268
1887	Dedication	Statius Longus	Latin	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1888	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1889	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1890	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1891	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1892	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1893	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1894	Dedication	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA

1896	Dedication	Flavius Maximianus	Latin	First Aelian Cohort of Dacians	Dacia	Jupiter of Dolichenus (Syria)	Birdoswald, UK	AD 235-238
1898	Dedication	NA	NA	First Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1909	Dedication	Aurelius Julianus	Latin	First Aelian Cohort of Dacians and First Cohort of Thracians	Dacia and Thrace	NA	Birdoswald, UK	AD 205-208
1914	Building insc.	NA	NA	First Aelian Cohort of Dacians	Dacia	NA	Birdoswald, UK	AD 219
1920	Epitaph	Decibalus and Blaseus	Dacian	NA	NA	NA	Birdoswald, UK	NA
1921	Epitaph	Septimius	Latin	First Cohort of Dacians	Dacia	NA	Birdoswald, UK	NA
1962	Building insc.	Tossodio	Indigenous?	NA	"Tribe of the Catuvellauni"	NA	Irthington, UK	NA
1969	Building insc.	Aurunculeius	Italian	NA	NA	NA	Irthington, UK	NA
1984	Dedication	Gaius Verecundius Severus	fabricated nomina of Celtic type	NA	NA	NA	Castlesteads, UK	NA
2013	Building insc.	Julius Subsio	"Barbarian"	NA	NA	NA	Carlisle, UK	NA
2014	Building insc.	NA	NA	Fourth Cohort of Lingonians	Gaul	NA	Carlisle, UK	NA
2022	Building insc.	the Brigantian Canton	Indigenous	NA	Britain	NA	Carlisle, UK	AD 369
2025	Dedication	Asinius Senilis	possibly indigenous	NA	NA	NA	Stanwix, UK	NA
2041	Dedication	Publius Tuscilius [...]asinianus	Latin	First Cohort of Nervians	Northern Gaul	NA	Burgh-by-Sands, UK	NA
2042	Dedication	Flavius Vibianus	Latin	unit of Aurelian Moors	North Africa	NA	Burgh-by-Sands, UK	AD 253-258
2043	Dedication	Lucius, son of Urseius	unknown	NA	NA	Latis (Celtic)	Burgh-by-Sands, UK	NA
2046	Epitaph	Julius	Latin	NA	"a Dacian Tribesman"	NA	Burgh-by-Sands, UK	NA

2053	Building insc.	Vindomorucus	Indigenous	NA	NA	NA	Drumburgh, UK	AD 369
2057	Dedication	Sulpicius Secundianus	Spanish?	NA	NA	NA	Bowness-on-Solway, UK	AD 251-253
2058	Dedication	Sulpicius Secundianus	Spanish?	NA	NA	NA	Bowness-on-Solway, UK	AD 251-253
2062	Dedication	Naevius Hilarus	unknown	Fourth Cohort of Gauls	Gaul	NA	Dumfries, UK	NA
2063	Dedication	Durio, Ramio, Trupo, and Lurio	Germanic	NA	Germans	Maponus (Celtic)	Dumfries, UK	NA
2064	Dedication	Marcus Senecianius V[. . .]	Latin	NA	NA	German Mother Goddesses	Dumfries, UK	NA
2065	Dedication	Apollonius	Greek	NA	NA	Nemesis (Greek)	Dumfries, UK	NA
2082	Building insc.	Octavius Seranus	Celtic or Etruscan	NA	NA	NA	Dumfries, UK	NA
2084	Building insc.	Vesuvius Rufus	Etruscan	NA	NA	NA	Dumfries, UK	NA
2089	unknown	Gnaeus Egnatius	unknown	[. . .] Asturians	Hispania	NA	Dumfries, UK	NA
2092	Dedication	NA	NA	Second Cohort of Tungrians	Germania Inferior	NA	Middlebie, UK	NA
2093	Dedication	NA	NA	First Cohort of Nervians	Northern Gaul	NA	Middlebie, UK	NA
2094	Dedication	Publius Campanius Italicus and Celer	Italian?	Second Cohort of Tungrians	Germania Inferior	NA	Middlebie, UK	NA
2096	Dedication	Gamidiahus	German?	NA	NA	Harimella (German)	Middlebie, UK	NA
2097	Dedication	Lucius Faenius Felix	Latin	First Cohort of Nervians	Northern Gaul	NA	Middlebie, UK	NA
2099	Dedication	Magunna	Germanic	NA	NA	Jupiter of Dolichenus (Syrian)	Middlebie, UK	NA
2100	Dedication	Silvius Auspex	Latin	Second Cohort of Tungrians	Germania Inferior	NA	Middlebie, UK	NA
2104	Dedication	Gaius Silvius Auspex	Latin	Second Cohort of Tungrians	Germania Inferior	NA	Middlebie, UK	NA

2107	Dedication	men of the "Vellavian district"	NA	Second Cohort of Tungrians	"Vellavian District"	Ricagambeda	Middlebie, UK	NA
2108	Dedication	men of the Condrustian District, under Silvius Auspex	NA	Second Cohort of Tungrians	Condrustian district	Viradecthis (German)	Middlebie, UK	NA
2109	Dedication	Frumentius	Germanic	Second Cohort of Tungrians	Germania Inferior	NA	Middlebie, UK	NA
2115	Epitaph	Afutianus, son of Bassus	German?	Second Cohort of Tungrians	Germania Inferior	NA	Middlebie, UK	NA
2117	Dedication	Julius Severinus	Latin	detachment of Raetian Spearment	Germania	NA	Oxnam, UK	NA
2118	Dedication	Gaius Quintis Severus	Latin	First Loyal Cohort of Vardullians	Dedicator: Ravenna; Men: Hispania (Spain	NA	Oxnam, UK	NA
2120	Dedication	Lucius Maximus Gaetulicus	Both Celtic and African	NA	NA	NA	Newstead, UK	NA
2121	Dedication	Aelius Marcus	Latin	Cavalry Regiment of Vocontians	Gaul	NA	Newstead, UK	NA
2134	Dedication	Lucius Minthonius Tertullus	African	Fifth Cohort of Gauls	Gaul	NA	Cramond, UK	AD 140-210
2135	Dedication	NA	NA	Second Cohort of Tungrians	Germania Inferior	Mother Goddesses Alatervae	Cramond, UK	NA
2138	Building insc.	Statilius Telesphorus	Greek	NA	NA	NA	Carriden, UK	NA
2140	Dedication	Valerius Nigrinus	Latin	Cavalry Regiment of Tungrians	Germania Inferior	Hercules Magusanus (Batavian)	Falkirk, UK	NA
2142	Epitaph	Nectovelius, son of Vindex	Indigenous	Second Cohort of Thracians	Deceased: Brigantian by Tribe; Men: Thrace	NA	Falkirk, UK	AD 140-165
2144	Dedication	Flavius Betto	Celtic	Sixth Cohort of Nervians	Gaul	NA	Rough Castle, UK	NA

2145	Building insc.	NA	NA	Sixth Cohort of Nervians	Gaul	NA	Rough Castle, UK	NA
2148	Dedication	NA	NA	NA	Italy and Noricum	NA	Castlecary, UK	NA
2149	Dedication	Trebius Verus	Latin	First Loyal Cohort of Vardullians	Hispania	NA	Castlecary, UK	NA
2151	Dedication	Gaius Julius Speratus	Latin	NA	Mattiacan tribe	NA	Castlecary, UK	NA
2152	Dedication	”Brittons”	Indigenous	NA	NA	NA	Castlecary, UK	NA
2155	Dedication	NA	NA	First Cohort of Tungrians	Germania Inferior	NA	Castlecary, UK	AD 139-161
2166	Dedication	NA	NA	First Cohort of Hammians	Palmyra	Mars Camulus (Gallic)	Bar Hill, UK	NA
2167	Dedication	Caristanius Justanius	unknown	First Cohort of Hamians	Palmyra	NA	Bar Hill, UK	NA
2169	Dedication	NA	NA	First Cohort of Baestians	Germania Inferior	NA	Bar Hill, UK	NA
2172	Epitaph	Gaius Julius Marcellinus	Latin	First Cohort of Hamians	Palmyra	NA	Bar Hill, UK	NA
2183	Epitaph	Verecunda	Celtic?	NA	NA	NA	Kirkentilloch, UK	NA
2195	Dedication	Quintus Pisentius Justus	Latin	Fourth Cohort of Gauls	Gaul	NA	Castlehill, UK	NA
2213	Epitaph	Ammonius, son of Damio	NA	First Cohort of Spaniards	Hispania	NA	Ardoch, UK	NA
2222	Dedication	The canton of Belgae	NA	NA	Belgae	NA	Bitterne, UK	AD 238-244
3195	Dedication	Viducius Placidus	NA	NA	Rouen	NA	York, UK	NA
3231	Epitaph	Nittunis and Talio	barbarian	NA	NA	NA	Brougham, UK	NA
3378	Building insc.	Flavius Noricus	“beyond the Alps”	NA	NA	NA	unknown	NA
3383	Building insc.	Ulpius Volunsenus	Etruscan	NA	NA	NA	unknown	NA
1722a	Epitaph	Brigomalos	Celtic	NA	NA	NA	Vindolanda, UK	NA
250a	Epitaph	Volusia Faustina	Latin	NA	Lindum	NA	Lincoln, UK	NA

250b	Epitaph	Claudia Catio-tuos	possibly Celtic	NA	NA	NA	Lincoln, UK	NA