COMPARATIVE INVESTIGATIONS OF POPULATION HEALTH IN URBAN MILITARY AND NON-MILITARY COMMUNITIES OF ROMAN BRITAIN

by

Marina Elizabeth Noble

A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Arts in Anthropology

Boise State University

August 2021

BOISE STATE UNIVERSITY GRADUATE COLLEGE

DEFENSE COMMITTEE AND FINAL READING APPROVALS

of the thesis submitted by

Marina Elizabeth Noble

Thesis Title: Comparative Investigations of Population Health in Urban Military and Non-Military Communities of Roman Britain

Date of Final Oral Examination: 03 May 2021

The following individuals read and discussed the thesis submitted by student Marina Elizabeth Noble, and they evaluated her presentation and response to questions during the final oral examination. They found that the student passed the final oral examination.

Cheryl Anderson, Ph.D.	Chair, Supervisory Committee
Mikael Fauvelle, Ph.D.	Member, Supervisory Committee
Pei-Lin Yu, Ph.D.	Member, Supervisory Committee

The final reading approval of the thesis was granted by Cheryl Anderson, Ph.D., Chair of the Supervisory Committee. The thesis was approved by the Graduate College.

DEDICATION

To my found family, Ellie, Ryan, Katie, Sydney, and Cleo. Your unconditional love has made this possible, and your creativity has made my world brighter.

ACKNOWLEDGMENTS

I would like to thank Dr. Cheryl Anderson, Dr. Pei-Lin Yu, and Dr. Mikael Fauvelle, who have been immovable pillars of support throughout the entire process of graduate school. You all have pushed me to generate my best work, have nurtured my interests, and have fed my love for academia and the archaeological discipline, and I thank you all from the bottom of my heart. Finally, I would like to thank my parents and my brother, who have watched me and supported me through my entire academic career. I couldn't have done this without you. Your love has kept me going, even when I've been far from home. I love you.

ABSTRACT

This research compiles and compares the biological health profiles of three urban populations at *Venta Belgarum* (Winchester), *Londinium* (London), and *Eboracum* (York) as a means for assessing health and status differences between military and non-military urban populations in Roman Britain. Data concerning a total of 1,334 individuals representing all ages and both sexes were analyzed between the three cemetery samples. Estimations of mean stature, rates of periosteal reaction, porotic hyperostosis, cribra orbitalia, linear enamel hypoplasias, and trauma are compared here in an effort to discuss relative health, status, and inequality within the wider populations of urban non-military communities (*Venta Belgarum*) and their urban military counterparts (*Londinium* and *Eboracum*). The discussion here hopes to highlight skeletal evidence concerning the prevalence of inequality and possible structural violence within urban sites as connected to the constant presence of military units, and the cultural aspects and access to resources therein.

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LIST OF ABBREVIATIONS

CO	Cribra Orbitalia
PH	Porotic Hyperostosis
LEH	Linear Enamel Hypoplasia(s)
TD	Trenholme Drive
L 67-72	Lankhills 1967 – 72
EL	Eastern London

CHAPTER 1: INTRODUCTION

Investigations into urban locales of Roman Britain have the potential to inform anthropological and archaeological records on social underpinnings of life, inequality, and structural violence within urban spaces. Specifically, skeletal samples from *Eboracum* (Roman York), *Londinium* (Roman London), and *Venta Belgarum* (Roman Winchester), when compared, may provide insight into the different ways that urban populations experienced inequalities and mechanisms of structural violence based upon their social and physical proximity to military centers, and hypotheses concerning such experiences.

These topics are of relevance to modern populations, as there are current groups that experience the effects of colonization and imperialism in their daily lives, both as colonized individuals, and as the agents of colonial expansion. Additionally, many populations throughout time have lived and currently live within social systems that maintain inequality at an intrinsic level between social subgroups within the population. Insights into how these systems have functioned in the past and how victims of structural violence have socially and biologically dealt with the effects of such systems can provide an understanding into how modern systems are built and interact with modern populations. Bioarchaeological investigations into the skeletal remains of populations at *Eboracum*, *Londinium*, and *Venta Belgarum* here will attempt to shed light on the structural inequalities experienced by groups within urban settings where imperial power was concentrated, and where colonial expansion was taking place on a cultural level.

Theoretical Framework

This project is specifically focused on the investigation of themes of inequality and identity within the imperial context of Roman Britain. Thus, a conscious decision has been made to construct this investigation within a broad "Social Theory" framework, with specific emphasis on inequality theory and theories concerning colonialism and imperialism.

Inequality Theory and Structural Violence

Rooted in various concepts such as Marxist theory, economic theory, and political-economic theory, inequality theories attempt to account for social hierarchies and class stratifications within bioarchaeological investigations (Whitehead, 2004). The key aspect of inequality theories is that they attempt to identify the political and economic substructures of inequality, as well as how social structures maintain social stratification within a cultural group (Quinn and Beck, 2016). Within bioarchaeology, the study of these concepts usually involves the analysis of raw skeletal data, and the resulting patterns and asymmetries across subgroups within a population (Martin et al., 2013). From here, bioarchaeologists can contextualize lived experiences, social relationships, and historical contingencies to unravel the constructed social systems responsible for generating and maintaining inequality in the broader population.

Discussions of inequality within societies like Roman Britain lend themselves to discussions of structural violence, a term coined by sociologist Johan Galtung (1969) and used to describe socially constructed systems of interpersonal interaction that suppress agency and impair subgroups of a population from meeting their emotional, physical, or psychological needs (Galtung, 1998). Anthropologist Paul Farmer would further elaborate on the concept of structural violence, highlighting its “structural” nature as a result of its political and economic mechanisms, and its “violent” delineation due to its direct impact upon the human body (Farmer, 1996; Farmer, 2005). More recently, the investigation of underpinnings of structural violence and inequality through bioarchaeological methods may be seen in H.D. Klaus’s work in the Lambayeque Valley of Peru.

To summarize, Klaus’s investigation into inequality and structural violence in pre-Hispanic and post-contact Muchik communities utilized the analysis of frequencies of linear enamel hypoplasias (LEH), porotic hyperostosis (PH), stature as an indicator of subadult growth velocity and terminal adult growth, periosteal reactions, indicators of female fertility, dental pathology, indicators of degenerative joint disease, and traumatic injury (Klaus, 2012). The investigation included samples from cemetery populations at the Chapel of San Pedro de Mórrope (representing the colonial population), and a representative sample of the pre-contact population for the area (Klaus, 2008). In conclusion, a dramatic increase in rates of porotic hyperostosis, a decrease in growth velocity, an increase in rates of LEH, periosteal reactions, degenerative joint disease, and dental pathology all indicate a significant change in rates of structural violence with the advent of Hispanic contact (Klaus, 2012). Indigenous health widely suffered as a result of policies implemented by a superordinate group, which created unhealthy living conditions as a method of control, a monopoly on means of production as a method of restricting access to resources to particular subgroups, and a political economy that further restricted access to land and methods of generating such resources (Klaus, 2012). Similar investigations into inequality and structural violence using bioarchaeological methods have been undertaken in a variety of archaeological contexts, including 18th - 19th century England (Newman and Gowland, 2017), pre-contact Tiwanaku (Torres-Rouff et al., 2015), Copper Age Iberia (Beck, 2016), Qasr Hallabat, Jordan (Montogemry and Perry, 2012), and the North American Southwest (Kuckelman et al., 2002), to name a few.

Theories on Colonialism and Imperialism

Closely related to inequality theories, theories concerning colonial and imperial processes attempt to reveal the behavioral foundations of structural violence and institutionalized inequality, specifically as they relate to the progression of dehumanization and small-scale violence into the eventual acculturation, domination, or extermination of entire human groups (Martin et al., 2013). In an archaeological investigation this involves the contextualization of indicators of daily reality for members of imperial or colonial systems (Dietler, 2005). This has led to archaeological research foci concerning agency (Fernandez-Götz et al., 2020), practice (Lightfoot et al., 1998), and social identity (Voss, 2005). These theories and investigations have changed the way archaeologists and anthropologists understand the recursive relationship between social structure and the calculated actions of individuals, and the subsequent effects such actions have in reproducing and altering the social organization of societies (Stein, 2005).

The archaeology of Roman Britain lends itself to the use of such theories, due to the reality that Rome functioned as an intense colonizing force through the use of military presence and propaganda, thus exerting far-reaching effects on the economy and political organization of late Iron-Age Britain. Additionally, the systems of Roman colonization resulted in the military forces that carried out such actions being subjects of such colonization themselves. Thus, the archaeology of colonization and imperialism within Britain is not simply the archaeology of contact between indigenous groups and colonizing forces, but that of an imperial and colonial social system that feeds itself. The utilization of theory that attempts to account for such systems allows new questions to be asked (Stein, 2005). Recent publications by Cristina Tica exhibit the use of theories concerning imperial and colonial interactions.

In her 2019 publication, Tica investigated differences in overall health between groups along the frontier of the Roman-Byzantine Empire through the third to sixth centuries CE. Bioarchaeological investigation revolved around samples from the Roman town of Ibida, which flourished during the late Roman and Early Byzantine periods, and Târgșor, an indigenous multi-period site with inhumations dating to the third to fourth centuries CE (Tica, 2019). Biological profiles were developed for individuals, including adult age and biological sex estimations, pathology, and trauma (Tica, 2019). In comparison, the results indicated that the "barbarians" or "non-Roman" sample from Târgșor exhibited a higher mortality risk and a lower survivorship rate compared to the sample of "Roman" individuals from Ibida (Tica, 2019). These results agree with hypotheses put forward in previous investigations into the differences in rural and urban health in Roman Britain (Redfern et al., 2015), and may be explained by the relative exposure that the area experienced as a frontier in comparison to other Roman provinces (Tica, 2019). Demographic imbalances, epidemics, and failures of subsistence systems along the Roman frontier of modern Romania may have been influenced by conflict between groups along the frontier, or by internal strife within the imperial structure of the Roman Empire itself (Tica, 2019).

Theories concerning inequality and structural violence have similar underpinnings to those concerning imperial and colonizing behaviors. Combined, these bodies of theory serve as the framework within which the questions of this study are constructed and investigated, with a goal to understand behavioral drivers and systems of inequality within the Romano-British culture as it existed within militarized urban populations and their comparatively non-militarized counterparts.

Historical Context

To understand the cultural context of Roman Britain, it is necessary to discuss the broad time period during which it is formally considered to have been in cultural contact with or under the influence of the wider Roman empire. According to textual and historiographic evidence, Julius Caesar made initial conquests into Britain between 55 and 54 BCE (Millett et al., 2016). From this point until 43 CE, trade was maintained between the broader empire and Britain, at which point Claudius led an invasion force of approximately 40,000 men to formally capture the principal indigenous center at *Camulodunum* (Colchester) (Millett et el., 2016). As such, 43 CE has served as a widely accepted date marking the first formal acknowledgement of Britain as a territory of the Roman empire. This classification would hold for some 400 to 500 years, but the cultural implications of such a significantly long and clear association would be felt for centuries more.

Socio-Political and Economic Background

While the invasion of 43 CE did not mark the beginning of trade contact between the Roman empire and Britain, it did see the formal establishment of the provincial government administration, as well as the significant introduction of Roman coinage

(Walton and Moorhead, 2016). Over the following century, this monetary medium would begin to circumvent the provincial systems of barter and social exchange (Walton and Moorhead, 2016). This medium would hold sway within the province of Roman Britain for some 400 years, until power fluctuations in the late fourth century led to the virtual abandonment of the single monetary economy system established by the empire (Walton and Moorhead, 2016). In fact, it has been argued that fourth-century Britain could be described as an agrarian society and tributary empire, akin to the early Roman period in the Mediterranean (Gerrard, 2016; Bang, 2007). This would suggest that the foundation of the economy in Britain during the fourth century would be comprised of agricultural commodities such as livestock or crops (Gerrard, 2016).

While archaeological investigations have largely focused on urban locales of Roman Britain, it should be made clear that Roman Britain was in its majority a rural society (Millett, 2016). Rough estimates based upon 20th-century archaeological survey suggest a population of perhaps 3.6 million people, of which 6.5% were dwelling in urban settings, 3.4% were associated with the military, with the remaining 90% of the population living in rural settlements (Millett, 2016). That being said, Roman imperialism had a profound impact on the lives of people living in both urban and rural settings, including new taxation demands, the imposition of urban and military populations (Mattingly, 2006), and the associated demands of such populations (Millett, 2016). The key interactions between rural communities supporting such urban populations and the empire would come in the form of local elites and their role as the collector of revenue in the form of taxes on behalf of the empire (Gerrard, 2016).

Urban Locales of Roman Britain

The urban locales of Roman Britain are commonly categorized according to their planning, organized appearance, and their economic roles within the region (Mann, 1996; Burnham et al., 2002). However, textual evidence and written records provide a useful legal categorization system as well. Urban settlements could be broken down into a hierarchy, with *coloniae* at the top, *municipia*, and *civitas* nearer to the bottom (Rogers, 2016). The *colonia* was a chartered town, and was generally founded for the explicit settlement of discharged veterans (Rogers, 2016). According to written record and archaeological evidence, the three initial *colonia* settlements at Colchester (*Camulodunum*), Gloucester (*Glevum*), and Lincoln (*Lindum*) had a constitution modelled after Rome, and adopted Roman law (Rogers, 2016). Many inhabitants would have been Roman citizens, but local indigenous populations were common in such settlements (Rogers, 2016). Below this category was the *municipium*, which shared many characteristics with the *colonia*, though far fewer citizens automatically received citizenship, and this category of settlement typically had fewer residents overall compared to the *colonia* (Rogers, 2016). Finally, the lowest-status urban centers are typically termed ***civitas***, and are regarded as the urban centers of *civitates*, the administrative parcels of land as determined by the empire (Rogers, 2016). Like the previous two delineations of urban locales, these settlements were modelled on Rome, with annual magistracies and a town council, though little is known about the finer intricacies of these systems (Rogers, 2016).

Urban Locales of Interest to This Study

Given the topical focus of this study, three samples from *Londinium*, *Eboracum*, and *Venta Belgarum* were selected for comparison. All three locales had a selection of previously published data available for analysis. The following subsections will discuss the historical contexts of each site before they are discussed further in "Materials and Methods".

Figure 1.1 Locations of interest related to this project including modern names, as constructed using Google Earth.

Eboracum/Modern-Day York

Eboracum, a significant urban settlement at modern-day York, was established around between 71 and 72 CE by the Ninth Legion of the Imperial Roman army (Ottaway, 2004). By 120 CE, the Ninth Legion was replaced by the Sixth Legion, which remained the garrisoned force at *Eboracum* until the formal withdrawal of Roman forces in the early fifth century (Ottaway, 2004). By the early third century, *Eboracum* had become a provincial capital, served as the primary bastion of Roman influence near Hadrian's Wall and the Antonine Wall, and had earned the status of *colonia* (Ottaway, 2004). It is speculated that *Eboracum* received this title as a result of imperial favor, as both Septimus Severus (193-211 CE) and Constantius I (293-306 CE) made visits to the settlement, and died in the area (Ottaway, 2004). Following Constantius's death in 306, his son, Constantine I was acclaimed as emperor by the Roman army in York (Ottaway, 2004). Referenced as both a municipium and a *colonia* in written record, York can be described as definitively urban, being a location at which administrative function, trade, and military force met in a constructed space with increased population density.

Londinium/ Modern-Day London

In comparison, the establishment of *Londinium* is much more convoluted. The earliest date of construction in *Londinium* is 47/48 CE, based on dendrochronology of timber used to line drains underneath the road (Brigham et al., 1995). The early settlement was constructed of largely ephemeral materials, which were subsequently destroyed during the East Anglian revolt of 60 CE led by Queen Boudica, as evidenced by the significant burn layer discovered within the remains of *Londinium* (Millett et al., 2016). Over the next decade the local governor, Gaius Suetonius Paulinus established a military presence, and it is debated whether or not the broader settlement grew out of the associated *vicus* (Bidwell, 2018), the extramural settlement comprised of families, merchants, and other individuals that were associated with the military fort (Birley, 2010). By 120 CE, *Londinium* had achieved *colonia* status, and had become a provincial capital in place of *Camulodunum*, similar to what *Eboracum* would achieve later in the Roman period (Bidwell, 2018). The city would fluctuate in population density until its relative abandonment during the fifth century with the withdrawal of most Roman forces (Bidwell, 2018).

Venta Belgarum/Modern-Day Winchester

The third urban location of significance to this study is that of *Venta Belgarum*, or Roman Winchester. Upon Roman establishment of troops in the first century, the indigenous settlement was given its Roman name, and served as the urban center of the local area, thus earning it a categorization of *civita* (Rogers, 2016; Eckardt et al., 2009). While closely associated with *Noviomagus Reginorum* (Chichester) and *Calleva Atrebatum* (Silchester), *Venta Belgarum* had significantly eclipsed the two in urban significance by the latter half of the second century (Cunliffe, 2016). Similar to other urban centers of Roman Britain, *Venta Belgarum* declined in influence with the withdrawal of imperial support at the end of the Roman period in Britain. However, the settlement saw consistent occupation well into the medieval period (Stuckert ed., 2016).

Differentiation Between "Military" and "Non-Military" Populations

As established previously, this project involves the analysis of two urban settlements that were continuously garrisoned with a clear military unit (*Eboracum* and *Londinium*) during the Roman period, and one settlement that did not house such a constant military presence (*Venta Belgarum*). It should be emphasized that the Roman army in Britain shared many characteristics of military units in other provinces, yet also maintained its own particularities (Haynes, 2016). Furthermore, while a small portion of the population in Roman Britain were soldiers, the army of Roman Britain was exceptionally large by provincial standards, and had a profound effect upon the lives of those who interacted with the military in any way (Haynes, 2016). Thus, discussion of the military in Roman Britain is not limited to those individuals designated as soldiers, but involves a much wider range of people, especially those of urban populations.

Inequality in Roman Britain

The concept of inequality in Roman Britain is not an unfamiliar one within the archaeological and anthropological disciplines. Recent bioarchaeological investigations have looked into the relative inequality between rural and urban populations (e.g., Pitts and Griffin, 2012; Rohnbogner and Lewis, 2016; Gowland and Redfern, 2010). Pitts and Griffin (2012), after comparing 30 Late Roman cemeteries, determined that patterns of health during the Late Roman period were heavily conditioned by settlement type, relative connectivity (via road), and diet. Furthermore, despite the paradox of urban centers, those interred in rural cemeteries generally expressed a poorer quality of health compared to those interred in urban cemeteries (Pitts and Griffin, 2012). Finally, this study also concluded that high inequality in the distribution of grave furniture was often associated with poorer health across a range of indicators (Pitts and Griffin, 2012).

Inequality in the Roman Britain urban center is intrinsically linked to the well-established monumentalism (walls, roads, basilicas, forums, forts, etc.), trade, and military presence within such spaces (Pitts, 2016; Revell, 2016). Monumental construction is a well-documented tool of imperial systems regarding labor control and methods of controlling perceptions of the social system itself (Sinopoli, 1994). Socially and physically constructed urban spaces like those discussed here represent similar constructions, especially those centered on military forts. The nature of urban settlements saw a concentration of resources within such spaces, as a result of the tributary nature of Roman Britain as a province, contributing to the differing access to resources across rural and urban settings (Rohnbogner and Lewis, 2016). Additionally, the multicultural hubs at *Eboracum*, *Londinium*, and *Venta Belgarum* would have introduced a variety of population demographics that may have not been as evident in rural communities or along the frontier at Hadrian's Wall and the Antonine Wall.

It should be noted that inequality within Britain was not simply a result of Roman occupation. Investigations of inequality within Iron Age Britain have summarized that systems of inequality were well established within the northern provinces, resulting in differential access to positions of high status and prestige (Cunliffe, 2006; Dent, 2010; Pearson,1999). This resulted in unequal relations of power across a large portion of the population and a much smaller group of elites (Peck, 2013). Inequality within Roman Britain should be discussed with the contextual understanding that while inequalities changed with the advent of Roman arrival and occupation, institutionalized inequality was not a new concept.

Previous Investigations in Roman Britain, *Eboracum*, *Londinium*, and *Venta Belgarum*

This investigation is the natural extension of a variety of topics that have been discussed or are currently being discussed within the context of Roman Britain. Recent work has investigated concepts of inequality and differing access to resources between urban and rural communities of Roman Britain (Pitts and Griffin, 2012; Rohnbogner and Lewis, 2016; Gowland and Redfern, 2010). This research has concluded that the lived experience differed greatly within urban and rural communities of the area, with complex systems of power connecting the two categories. This is partially attributed to the colonizing behavior exhibited by the Roman Empire, which fundamentally reformed many aspects of social behavior within the frontier.

Previous bioarchaeological investigations concerning samples from the urban settlement at *Eboracum* have included estimations of population size based upon cemetery samples (McIntyre, 2015) as well as the analysis of indicators of migration, ethnicity, and identity concerning individual burials (Leach et al., 2015). Other investigations have featured the use of remains from *Eboracum* to analyze the biological impact of Roman colonialism on indigenous populations (Peck, 2009) and to determine the validity of methods used to identify gladiatorial remains within the bioarchaeological record (Giles, 2020). In total, samples from *Eboracum* have provided insight into colonial contact, especially within the northern province of occupied Roman Britain.

Investigations concerning skeletal remains from *Venta Belgarum* have been centered on isotopic analyses in an effort to investigate mobility within Roman Britain (Eckardt et al., 2009) and inquiries into local health via the analyses of dental pathology (Bonsall and Pickard, 2015). Additionally, recent investigations have considered the influence of interrelated aspects of gender identity on diet and inequality within late Roman Winchester (Avery et al., 2019). Overall, investigations have provided insight into the nature of habitation over time at Winchester, both before and after Roman occupation. The settlement, possibly as a result of its background and establishment prior to Roman arrival, did not experience an abandonment or significant collapse after 450 CE, as represented by the bioarchaeological record thus examined.

Londinium has been a popular site of bioarchaeological and archaeological investigation for decades. The Eastern London Roman Cemetery is one of many cemeteries connected to the urban settlement, and bioarchaeological inquiries have centered on embodied identities (Gowland, 2017), the study of childhood to adulthood transition within the urban settlement through isotopic analyses (Redfern et al., 2018), and the possible increased exposure to lead that inhabitants experienced during the Roman period (Scott et al., 2020).

Questions and Working Hypotheses

This investigation is interested in the settlements that may be considered "urban", and the differing social realities these groups may have experienced as a result of an established and long-term military presence, or lack thereof. Specifically, this investigation hopes to address two questions:

1. Within the social and spatial contexts of a colonized Roman Britain, how do the biological health profiles of urban military populations differ from their non-military counterparts?
2. Furthermore, do the compiled biological health profiles indicate possible differing experiences and effects of structural violence across populations?

Based upon the contextual evidence reviewed prior to investigation, it is hypothesized that between urban populations, biological health profiles of militarized and non-militarized urban groups will exhibit an observable difference in overall health, though the extremity of such a difference is hard to predict.

CHAPTER 2: MATERIALS AND METHODS

The purpose of this research is to establish comparable and representative biological health profiles of the populations of the interred individuals at *Venta Belgarum*, *Eboracum*, and *Londinium*. This comparison serves to open up discussion concerning status and inequality within the Roman frontier specifically as it may vary between urban settlements that retained an established garrison and those that did not maintain such a clear military force. Data compared in this study was collected between 1951 and 1990 from archaeological projects in modern York (*Eboracum*) (Wenham et al., 1968), Winchester (*Venta Belgarum*) (Stuckert ed., 2016), and London (*Londinium*) (Barber and Bowsher, 2009). A presentation of the analyzed materials and methods follows.

Materials

Trentholme Drive (*Eboracum*)

Excavations between 1951 and 1957 at Trentholme Drive resulted in the recovery of 373 individuals, 329 of which were submitted for analysis concerning sex estimation (Wenham et al., 1968). The remains recovered were considered in good condition at publication (Wenham et al., 1968). The cemetery was determined to be in use from 140 CE to approximately 400 CE (Wenham et al., 1968). According to Wenham et al, the stratigraphic analyses indicate that both inhumation and cremation burial practices were common from 180 CE to approximately 280 CE, and were then followed by majority inhumation burials (1968). Wenham further indicates that the final 200 years of site utilization were riddled with instances of intrusion into earlier burials by later burials, thus contributing to the indicated “confusion of skeletal remains” (Wenham et al., 1968, p. 116).

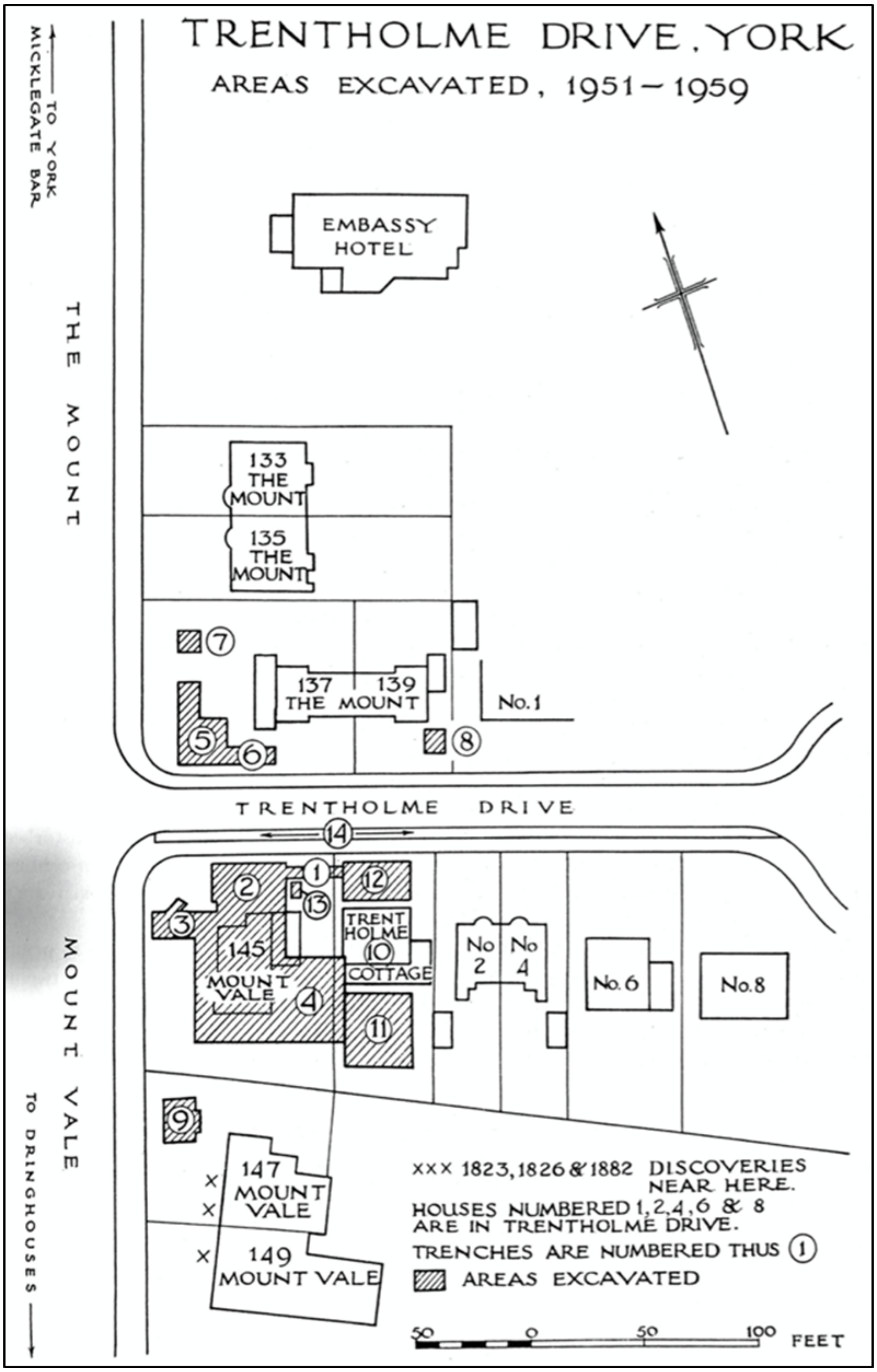

Figure 2.1 Excavation sites at Trentholme Drive as presented in original publication (Wenham et al., 1968, p. 7).

Lankhills Cemetery (*Venta Belgarum*)

Initial excavations of the Roman cemetery on the grounds of the Lankhills School took place from 1967 to 1972, and resulted in the identification of 411 individuals (not including cremated remains) as published (Stuckert ed., 2016). The portion of the cemetery excavated during this time period is estimated to have been in use between 310 and 410 CE, as determined via archaeological contextual information, including the dating of found coins, and the identification of the eastern boundary of the cemetery (Stuckert ed., 2016). According to Stuckert, the overall condition of the Lankhills skeletons from the initial excavations was poor, affecting the quantity and quality of the data that could be collected (Stuckert ed., 2016).

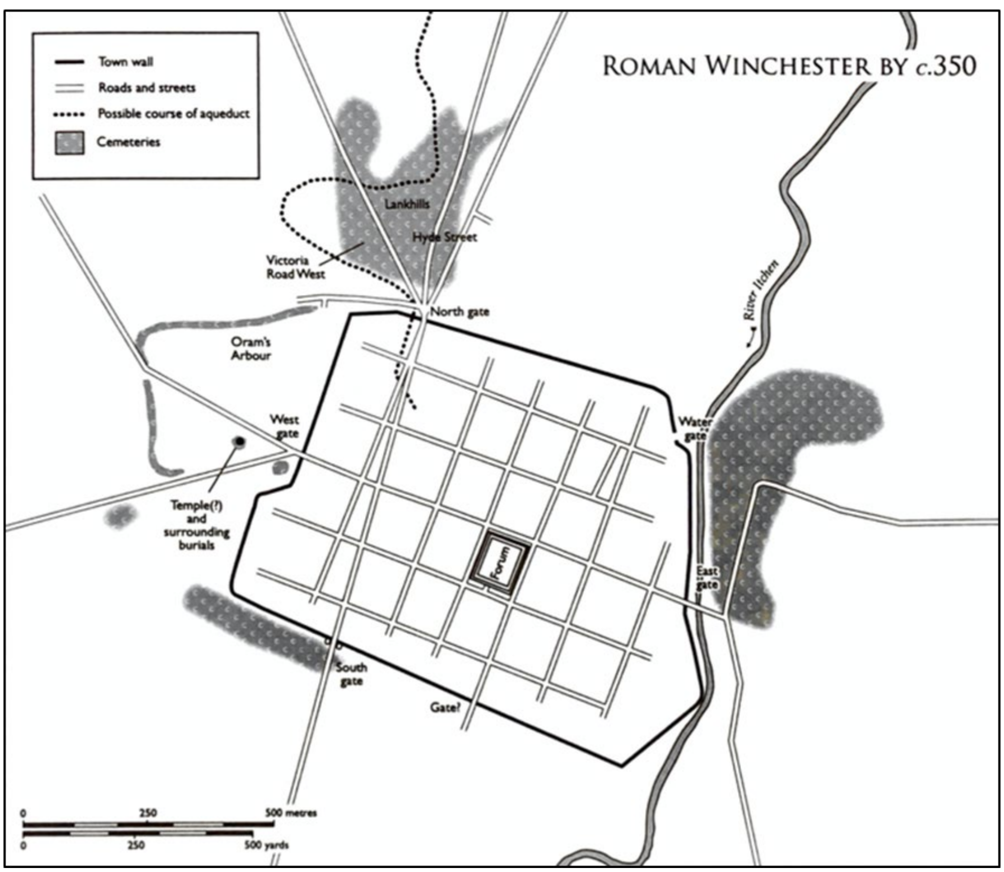

Figure 2.2 Late Roman Winchester near 350 CE as presented in original publication (Stuckert ed., 2016, p. 393)

Eastern London (*Londinium*)

550 individuals were recovered from the 545 inhumation graves excavated across 12 different excavation sites spanning across what is considered the East London Roman cemetery (Barber and Bowsher, 2009). Excavations occurred from 1983 to 1990, and osteological analyses included 4 individuals over the course of 13 years (Barber and Bowsher, 2009). The study area spanning approximately 12 hectares is broadly considered to have been in use from 100 to 500 CE, though 3rd to 4th century burials were particularly well represented in the sample (Barber and Bowsher, 2009).

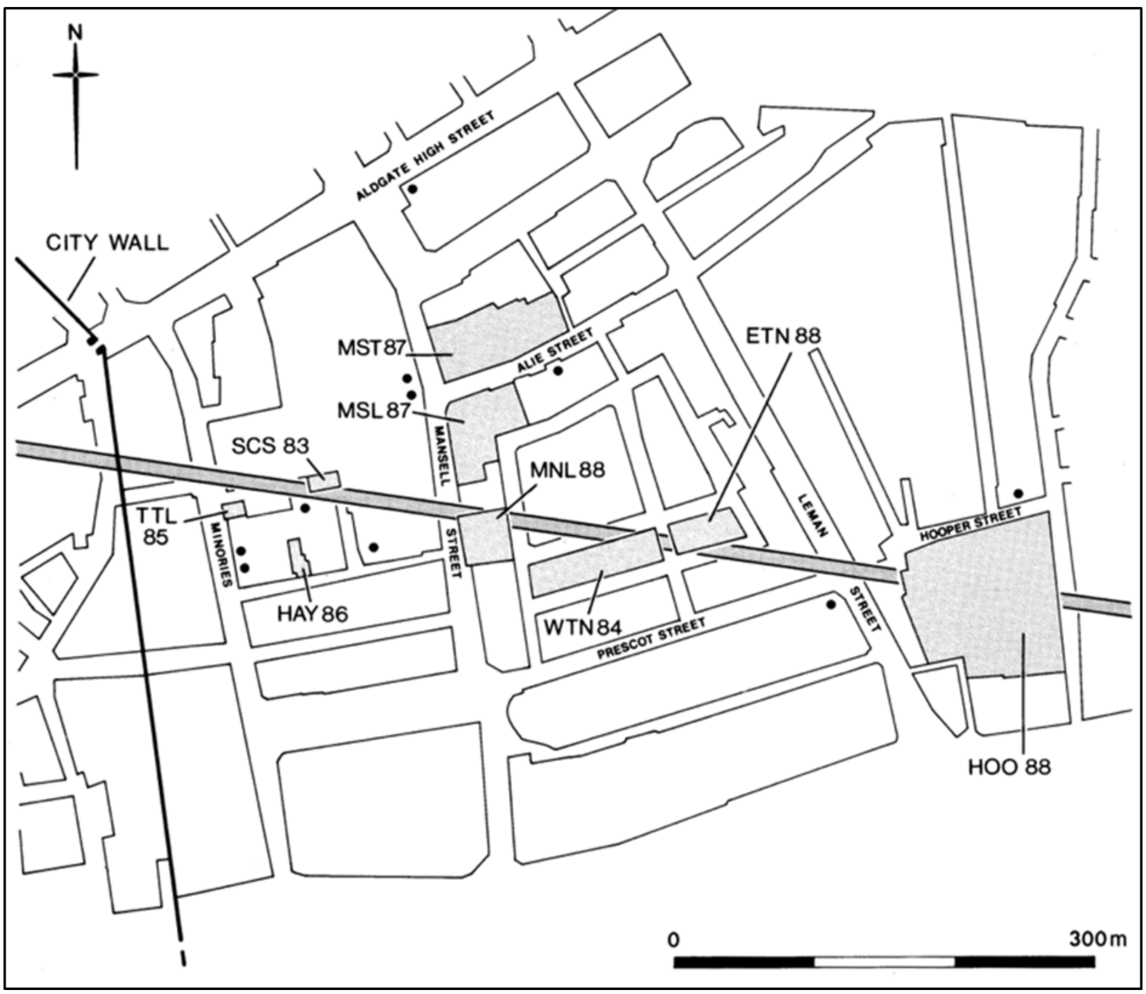

Figure 2.3 Eastern London Cemetery excavation sites (light grey) as presented in Barber et al. 1990 (p. 3).

Methods

Stature Estimation

A common aspect of the overall biological profile, estimations of stature may be generated using a multitude of methods, such as that of Trotter and Gleser (1952, 1958) based on modern North American samples. Growth is an inherently individual characteristic, and can only be studied in archaeological populations as a sample statistic (Brickley and McKinley, 2004). The analyses performed concerning all three populations (Trentholme Drive, Lankhills Cemetery, and Eastern London) utilized the same set of general standards given by Trotter and Gleser in 1952.

Periosteal Reactions

As skeletal lesions of infectious origin, periosteal reactions are identified on a continuum. Initially involving the periosteum, their increased severity may involve cortical bone and/or extension into the medullary cavity (Larsen, 2015). Periostitis represents a basic inflammatory response, resulting in new bone formation via osteoblast stimulation along the subperiosteal membrane (Larsen, 2015). This inflammatory response may result from bacterial infection, trauma, or anything that may disrupt the periosteum (Weston, 2018). The resulting lesions are identified due to their osseous plaques with clear margins, or irregular elevations of bone surfaces (Larsen, 2015).

As a result of the multitude of circumstances that may cause periosteal reactions, they are considered “non-specific” indicators of overall health when considered at the community level (Larsen, 2015). Periosteal reactions should not be directly equated with infection, but may provide insight into broad patterns of health, living circumstances, and biological inflammatory reactions (Larsen, 2015).

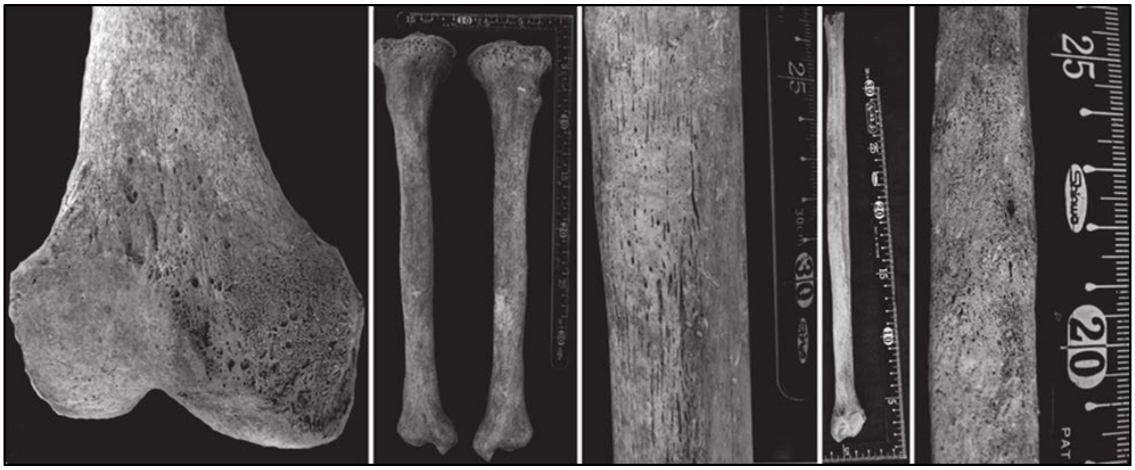

Figure 2.4 Examples of periosteal reactions on long bones from a 11th-13th century sample from southeastern Bulgaria (Russeva, 2012, p. 81).

<u>Porotic Hyperostosis and Cribra Orbitalia</u>

More broadly referred to as Porous Cranial Lesions, cribra orbitalia (CO) and porotic hyperostosis (PH) have been traditionally attributed to megaloblastic and hemolytic anaemias (Larsen, 2015). These particular subtypes of anaemia have been thought to result in the expansion of the cranial vault marrow (diploe) and ultimate resorption of the bone as seen in PH, and its similar counterpart, CO (Larsen, 2015). The latter is found on the roof of the eye orbit(s) in many archaeological remains (Larsen, 2015).

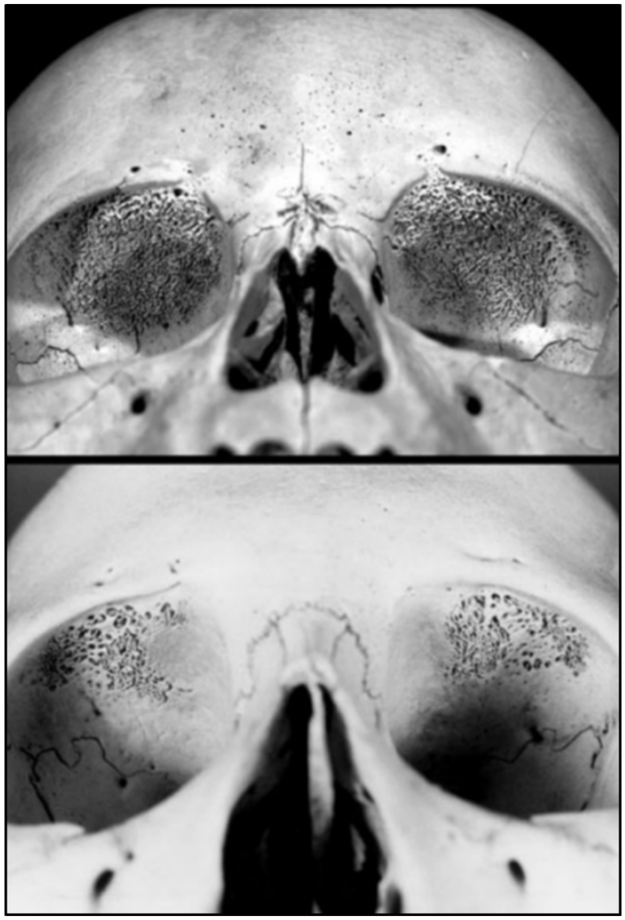

Figure 2.5 Examples of active (above) and healed (below) cribra orbitalia (Walker et al., 2009, p. 110).

Other conditions linked to CO and PH within bioarchaeological literature include leprosy (Møller-Christensen and Sandison, 1963), malaria (Angel, 1966; Rabino Massa et al., 2000), cancer (Grauer, 2019), infection (Camaschella, 2015), and metabolic disorders (Brickley et al., 2020). A recent publication by O'Donnell et al. additionally explores the connections between respiratory infections like bronchitis and pneumonia and the prevalence of CO and PH in modern populations (2020). As such, it is concluded here that evidence of CO and PH may result from circulatory or hematopoietic disruptions, but it is recognized that there may be other causes.

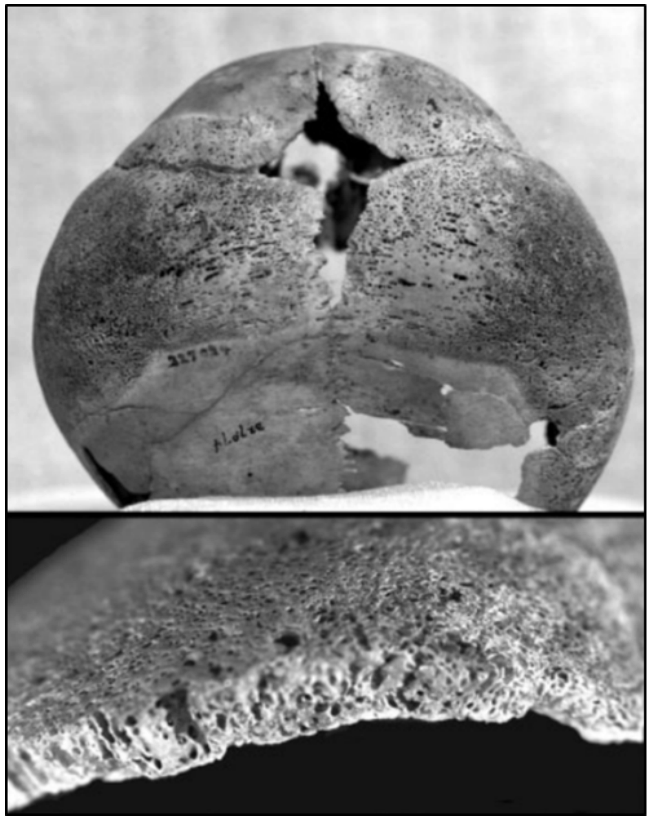

Figure 2.6 Example of porotic hyperostosis in a 3-year-old individual from 950 - 1250 AD (Walker et al., 2009, p. 110).

<u>Linear Enamel Hypoplasias</u>

Linear Enamel Hypoplasias (LEH) are measurable macroscopic defects in the tooth enamel varying in appearance from small pits to deep fissures of missing enamel (Larsen, 2015). These defects result from three acknowledged potential causes, including hereditary anomalies, localized trauma, and systemic metabolic stress (Larsen, 2015). This last potential cause could be the result of illness, disease, malnutrition, or any other situation that may cause significant metabolic stress over time (Larsen, 2015). The record of linear enamel hypoplasias in a population may provide insight into trends of poor living conditions, and associated likelihood of childhood stress and poor health as enamel is deposited (Larsen, 2015).

Figure 2.7 Example of linear enamel hypoplasias in a 12-year-old individual from prehistoric California (White et al., 2011, p. 456).

CHAPTER 3: RESULTS

The following data was compiled from published works, including Winchester Studies 9.i: The People of Early Winchester (Stuckert ed., 2016), The Romano-British Cemetery at Trentholme Drive, York (Wenham et al., 1968), and data in The Eastern Cemetery of Roman London: Excavations 1983-1990 (Barber and Bowsher, 2009) as made available by the Archaeological Data Service of the UK. Data discussed here includes estimations of paleodemography, estimations of stature between male and female adults, periosteal reactions, porotic hyperostosis, cribra orbitalia, linear enamel hypoplasias, and overall trauma.

Paleodemography

Trentholme Drive

Of the 373 individuals identified from excavations at Trentholme Drive, 239 (64.07%) individuals were estimated to be of male or probable male biological sex and adult age, 57 (15.01%) individuals were determined to be of female/probable female biological sex and adult age, and a total of 55 (14.75%) individuals were identified as subadults. While biological sex estimations were made for subadults in the original publication (Wenham et al., 1968), and those estimations have been included here, it should be noted that biological sex estimations made using subadult remains are unreliable.

Table 3.1 Estimated age and biological sex in the Trentholme Drive sample, presented as the number of individuals as compiled from Wenham et al., {1968).

	Male	Undetermined	Female	Total
Child (0-12)	3	13	0	16
Adolescent (13-17)	15	3	4	22
Undetermined Subadult	4	10	3	17
Young Adult (18-25)	46	0	18	64
Adult (26-45)	152	4	24	180
Older Adult (45+)	8	0	3	11
Undetermined Adult	33	9	11	53
Undetermined	3	5	2	10
Total	264	44	65	373

Lankhills Cemetery 1967-72

Of the 411 individuals identified from excavations at Lankhills Cemetery, 129 (31.39%) individuals were estimated to be of male or probable male biological sex and adult age, 123 (29.93%) individuals were determined to be of female/probable female biological sex and adult age, and a total of 113 (27.49%) individuals were identified as subadults.

Table 3.2 Estimated age and biological sex in the Lankhills 1967-72 sample, presented as the number of individuals as compiled from Stuckert (ed.) (2016).

	Male	Undetermined	Female	Total
Child (0-12)	0	95	0	95
Adolescent (13-17)	0	5	3	8
Undetermined Subadult	0	10	0	10
Young Adult (18-25)	24	6	45	75
Adult (26-45)	78	12	62	152
Older Adult (45+)	10	0	2	12
Undetermined Adult	17	28	14	59
Undetermined	0	0	0	0
Total	129	156	126	411

Eastern London

Of the 550 individuals identified from excavations across the Eastern London Cemetery, 186 (33.82%) individuals were estimated to be of male or probable male biological sex and adult age, 109 (19.82%) individuals were determined to be of female/probable female biological sex and adult age, and a total of 129 (23.45%) individuals were identified as subadults. In comparison to the samples from Trentholme Drive and Lankhills Cemetery, biological sex estimations were only undertaken concerning the Eastern London sample when the individual could be identified as an adult, meaning that only 386 individuals were considered for biological sex estimation.

Table 3.3 Estimated age and biological sex in the Eastern London sample, presented as the number of individuals as compiled from Barber and Bowsher (2009).

	Male	Undetermined	Female	Total
Child (0-12)	0	83	0	83
Adolescent (13-17)	0	29	0	29
Undetermined Subadult	0	17	0	17
Young Adult (18-25)	30	7	19	56
Adult (26-45)	91	14	54	159
Older Adult (45+)	32	4	18	54
Undetermined Adult	33	66	18	117
Undetermined	0	35	0	35
Total	186	255	109	550

Estimations of Stature

Trentholme Drive

Of the 373 identified individuals from excavations at Trentholme Drive, 101 adult individuals (estimated to be either of Male, Probable Male, Female, or Probable Female biological sex) had stature estimations made using Trotter and Gleser (1952) prior to their reburial. Based upon these estimations, the average estimated male stature is 171.31 cm (N=81, SD=4.98). The average estimated stature of female individuals is 155.58 cm (N=20, SD=7.52).

Lankhills Cemetery 1967-72

Of the 411 identified individuals from excavations at Lankhills Cemetery, 103 adult individuals (estimated to be of Male, Probable Male, Female, or Probable Female biological sex) had stature estimations made using Trotter and Gleser (1952). Based on these estimations, the average estimated male stature is 171.60 cm (N=60, SD=5.29). The average estimated stature of female individuals is 156.90 cm (N=43, SD=5.17).

Eastern London

Of the 550 identified individuals from excavations across the Eastern London Roman Cemetery, 171 adult individuals (estimated to be of Male, Probable Male, Female, or Probable Female biological sex) had stature estimations made using Trotter and Gleser (1952, 1958). Based on these estimations, the average estimated male stature is 169.61 cm (N=105, SD=6.06). The average estimated stature of female individuals is 157.97 cm (N=66, SD=5.81).

Table 3.4 Mean estimated stature in adults across the samples collected at Trentholme Drive (TD) (Wenham et al., 1968), Lankhills 1967-72 (L 67-72) (Stuckert ed., 2016), and Eastern London (Barber and Bowsher, 2009) as estimated using Trotter and Gleser (1952, 1958). "Adult Males" include those who were determined to be of "male" or "probable male" estimation.

Sample	Adult Male	N	St. Dev.	Range	Adult Female	N	St. Dev.	Range
TD	171.31	81	4.98	157.48-185.42	155.58	20	7.52	143.51-175.26
L 67-72	171.60	60	5.29	161.30-183.90	156.90	43	5.17	147.70-169.40
EL	169.61	105	6.06	155.7-190	157.97	66	5.81	145-172

Periosteal Reactions

Trentholme Drive

Of the 373 total individuals identified, 6 (1.60%) individuals estimated to be adult males (including male and probable male) exhibited evidence of periosteal reactions on long bones. No evidence of periosteal reactions was documented for female or probable female individuals, or for individuals of undetermined biological sex.

Lankhills Cemetery 1967-72

Of the 411 total individuals identified, 7 (1.70%) individuals estimated to be of adult age (including 4 male individuals, 2 female individuals, and 1 individual of Undetermined biological sex) exhibited evidence of periosteal reactions.

Eastern London

Based upon the compiled data, specific numbers of individuals that presented evidence of periosteal reactions are unavailable. However, it was noted that an estimation of approximately 10% of the sample exhibited periostitis of the tibia, equating to approximately 55 individuals.

Table 3.5 Number of individuals exhibiting periosteal reactions as reported in site documentation (Barber and Bowsher, 2009; Stuckert ed., 2016; Wenham et al., 1968).

Sample	**Individuals**	**% of Total Sample**
TD	6	1.61% (6/373)
L 67-72	7	1.70% (7/411)
EL	N/A	~10% (55/550)

Porotic Hyperostosis and Cribra Orbitalia

Lankhills Cemetery 1967-72

Of the 204 individuals sampled for cribra orbitalia, 31 (15.19%) individuals presented evidence of the pathology. Of those presenting CO, 20 individuals were estimated to be of adult age, and 11 were estimated to be of subadult age. Of the 20 adult individuals, 11 were estimated to be of female or probable female biological sex, while 9 individuals were estimated to be of male or probable male biological sex. Additionally, porotic hyperostosis was identified in 2 adult male individuals, representing less than 1% of the total sample from Lankhills Cemetery (0.048% of the total sample).

Eastern London

Based upon the compiled data, exact information concerning frequencies of CO and PH were not available for analysis. However, it was estimated that less than 5% of the population of the Eastern London sample exhibited CO explicitly, which would approximate to fewer than 27 individuals.

Table 3.6 Number of individuals exhibiting cribra orbitalia in the Lankhills and Eastern London samples as reported (Barber and Bowsher, 2009; Stuckert ed., 2016).

Sample	**Total Individuals**	**% of Total Sample**	**Adult Individuals**	**Subadult Individuals**
L 67-72	31	15.19% (31/204)	20	11
EL	N/A	<5.0% (27.5/550)	N/A	N/A

Linear Enamel Hypoplasias

Lankhills Cemetery 1967-72

Of the 411 individuals identified, teeth from 131 individuals were submitted for analysis concerning dental pathology, including subadults. Of those submitted for analysis, 41 individuals (31.29%) exhibited evidence of LEH. Of those tested (61

Individuals), 14 individuals (22.95%) of the estimated "female" individuals exhibited LEH, while 27 (38.5%) of the 70 tested estimated "male" individuals exhibited LEH.

Table 3.7 Number of individuals sampled for dental pathology from the Lankhills 1967-72 sample, including subadults (Stuckert ed., 2016).

Total Individuals Sampled	Total Male Individuals	Total Female Individuals
131	70	61

Table 3.8 Prevalence of LEH in individuals sampled for dental pathology from the Lankhills 1967-72 sample, including subadults, as a percentage of individuals sampled (Stuckert ed., 2016).

Sex	Number of Individuals with LEH	Percent of Sample of Same Sex	Percent of Overall Sample
Male	27	38.57%	20.611%
Female	14	22.95%	10.68%

Eastern London

Of the 550 individuals recovered from the excavations at the Eastern London Roman Cemetery, 2031 teeth from 204 adult (estimated to be over the age of 18) individuals were submitted for analysis concerning dental pathology. Overall, 11.9% (242/2031) of the sampled teeth exhibited evidence of LEH. As reported in compiled data, 8.5% of the teeth originating from "male" or "probable male" individuals exhibited LEH, while 11% of teeth originating from "female" or "probable female" individuals did so.

Table 3.9 Number of adult individuals sampled for dental pathology from the Eastern London sample (Barber and Bowsher, 2009).

Total Individuals Sampled	Total Teeth Sampled	Total Adult Male Individuals	Total Adult Undetermined Individuals	Total Adult Female Individuals
204	2031	87	59	58

Table 3.10 Incidence rates of LEH in adult individuals sampled for dental pathology from the Eastern London sample as a percentage of the number of teeth sampled (Barber and Bowsher, 2009).

Biological Sex Estimation	Incidence in Overall Sample
Male	8.5%
Undetermined	4.3%
Female	11.0%

Trauma

<u>Lankhills Cemetery 1967-72</u>

Including instances of joint dislocation, myositis ossificans traumatica, osteochondritis dessicans, ossified haematomas, amputations, fractures, Schmorl's nodes, and decapitations, evidence of "traumatic pathology" was present in 50 individuals (12.17%) out of the 411 individuals in the overall sample.

<u>Eastern London</u>

Of the 550 individuals in the Eastern London cemetery, traumatic pathology, (as discussed above) was observed in 134 individuals (24.36%).

Table 3.11 Incidence rates of traumatic pathology, represented as a percentage of the number of individuals in the overall sample (Stuckert ed., 2016; Barber and Bowsher, 2009).

Sample	**Trauma Prevalence (%)**
L 67-72	12.17%
EL	24.36%

CHAPTER 4: DISCUSSION

Paleodemography

Based upon the biological sex and age estimations employed at each site, the demographic makeup of each sample varies slightly from the others. The samples from Trentholme Drive and the Eastern London Cemetery both exhibit biological sex distributions that are unequal between male and female adults. Trentholme Drive exhibits a much higher concentration of adult males (64.07% of the total population) compared to adult females (15.01%) and subadult individuals (14.75%). Similarly, the sample from the Eastern London Cemetery exhibits a higher concentration of adult male individuals (33.82%) compared to adult female individuals (19.82%), or subadults (23.45%). In comparison, the sample from Lankhills Cemetery exhibited a much more even distribution of adult male individuals (31.39%), adult female individuals (29.93%), and subadults (27.49%). The more "even" nature of the Lankhills Drive sample may suggest that the urban settlement saw the presence of more familial units as a result of its non-military status.

The relative age and sex distributions of each of the sites may be reflective of the patterns of establishment at each site. *Eboracum* was established as a clear military installation, centered on the fort constructed initially by the Ninth Legion, and served as a major military center for the province. This may be reflected in the significantly unequal biological sex distribution reflected in the sample from Trentholme Drive. In comparison, *Londinium* as an urban center is considered to have developed as an extension of the extramural *vicus*, which could account for the more equal sex distribution in the Eastern London sample. Finally, *Venta Belgarum* was an established indigenous site well before Roman forces were introduced to the area, which could contribute to the much more even distribution of biological sex in the Lankhills 1967-72 sample.

Table 4.1 Age at death presented as a percentage of the overall sample at each site (Stuckert ed., 2016; Barber and Bowsher, 2009; and Wenham et al., 1968).

Age Category	Trentholme Drive	Lankhills 1967-72	Eastern London
Child (0-12)	4.30%	23.11%	15.09%
Adolescent (13-17)	5.90%	1.95%	5.27%
Young Adult	17.16%	18.25%	10.18%
Adult	48.26%	36.98%	28.36%
Older Adult	2.95%	2.92%	9.82%

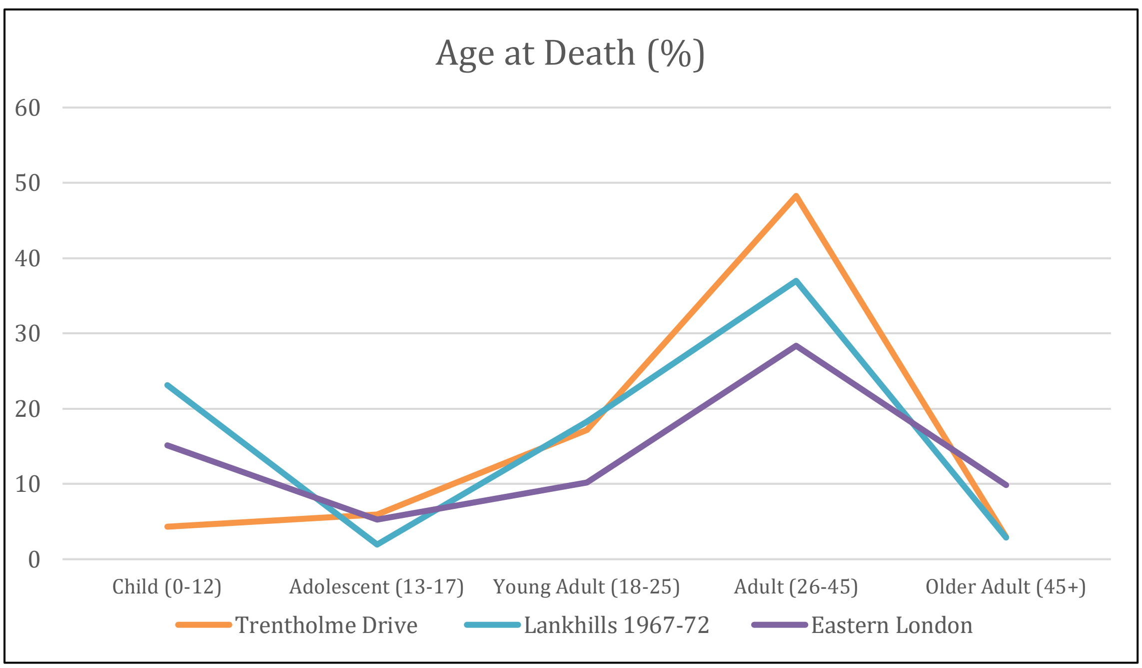

Figure 4.1 Age at death distribution across each site, presented as a percentage of the overall sample (Stuckert ed., 2016; Barber and Bowsher, 2009; and Wenham et al., 1968).

Table 4.2 Biological sex distribution across all sites presented as a percentage of the overall sample at each site (Stuckert ed., 2016; Barber and Bowsher, 2009; and Wenham et al., 1968).

Site	Male	Female
Trentholme Drive	64.07%	15.01%
Lankhills 1967-72	31.39%	29.93%
Eastern London	33.82%	19.82%

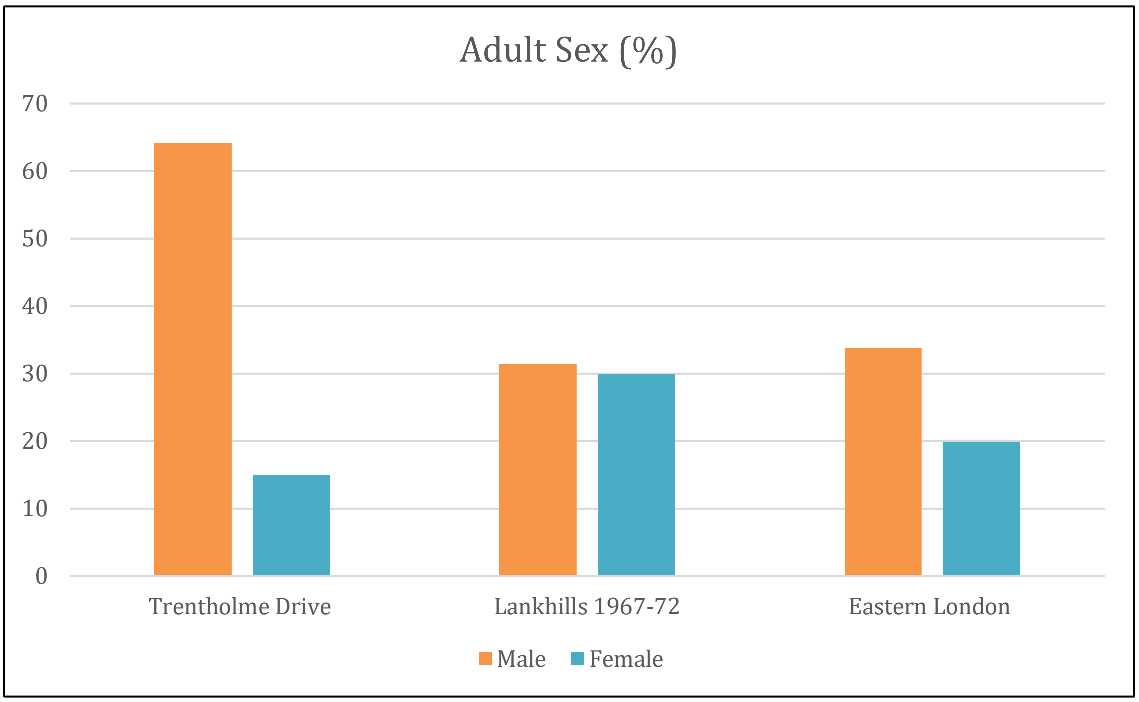

Figure 4.2 Biological sex distribution across sites presented as a percentage of the overall sample at each site (Stuckert ed., 2016; Barber and Bowsher, 2009,; and Wenham et al., 1968).

Estimations of Stature

Based upon the stature estimations employed at each site, the mean stature of both male and female adults was very similar across the three sites. Mean estimated stature for adult male individuals was 171.31 cm at Trentholme Drive, 171.60 cm at Lankhills Cemetery, and 169.61 cm at Eastern London. This could suggest that terminal male growth was higher within the non-militarized population, compared to the locations with defined military presence. Mean estimated stature for adult female individuals, in comparison, were the greatest within the Eastern London Cemetery sample (157.97 cm), lowest at Trentholme Drive (155.58 cm), and middling at Lankhills Cemetery (156.90 cm).

Unfortunately, tests of significance between the three samples could not be performed due to the nature of the data analyzed. However, the evidence present likely suggests that terminal growth in adult individuals was not very different between the urban populations. This could be due to the relative connected status each settlement had, as all were connected via roman road, and were all centers of commerce within their provinces.

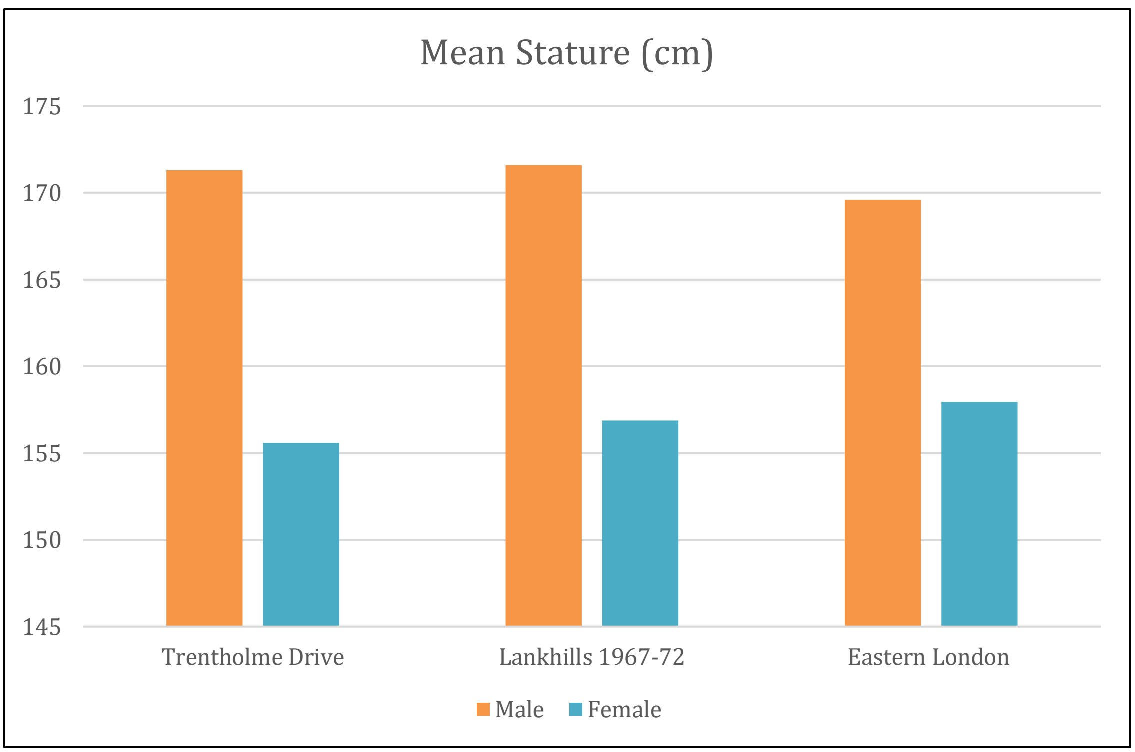

Figure 4.3 Mean stature across male and female adult individuals at each site (Stuckert ed., 2016; Barber and Bowsher, 2009; and Wenham et al., 1968).

Periosteal Reactions

Periosteal reactions were documented in all three samples. The samples from Trentholme Drive and Lankhills Cemetery exhibited comparable rates of periosteal reactions (1.69% and 1.70%, respectively), while the sample from the Eastern London Cemetery exhibited a much higher incidence rate of approximately 10%, as estimated by Barber and Bowsher (2009). Due to the nature of the data, tests of statistical significance could not be performed. However, similar rates of periosteal reactions in both the militarized Trentholme Drive sample and the non-militarized sample from Lankhills Cemetery may suggest a similar state of overall population health between the two urban centers. While not directly comparable, the higher incidence rate of periosteal reactions in the Eastern London sample could suggest a poorer health status of the overall population within the provincial capital to the southeast.

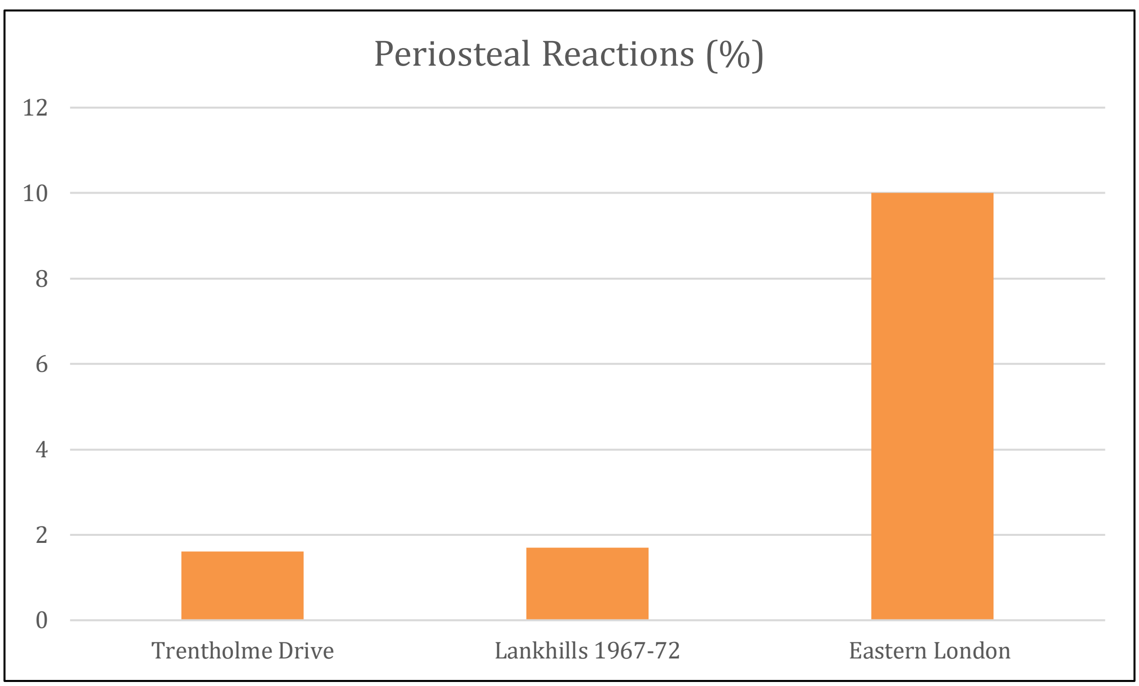

Figure 4.4 Periosteal reactions presented as a percentage of the sampled population at each site (Stuckert ed., 2016; Barber and Bowsher, 2009; and Wenham et al., 1968).

Porotic Hyperostosis and Cribra Orbitalia

While undocumented in the sample from Trentholme Drive, cribra orbitalia was documented in both the analyses for Lankhills Cemetery and the Eastern London Cemetery. Porotic hyperostosis was documented in two individuals from Lankhills Cemetery, but none were explicitly documented in the sample from Eastern London.

In comparison, cribra orbitalia was found in 15.19% of the sample from Lankhills Cemetery, while an estimated less than 5.0% of the sample from Eastern London exhibited the pathology. These results, while difficult to compare given the nature of the data, may indicate that the population at *Venta Belgarum* experienced higher rates of circulatory or hematopoietic disruptions, though this pathology may be the result of other disruptions.

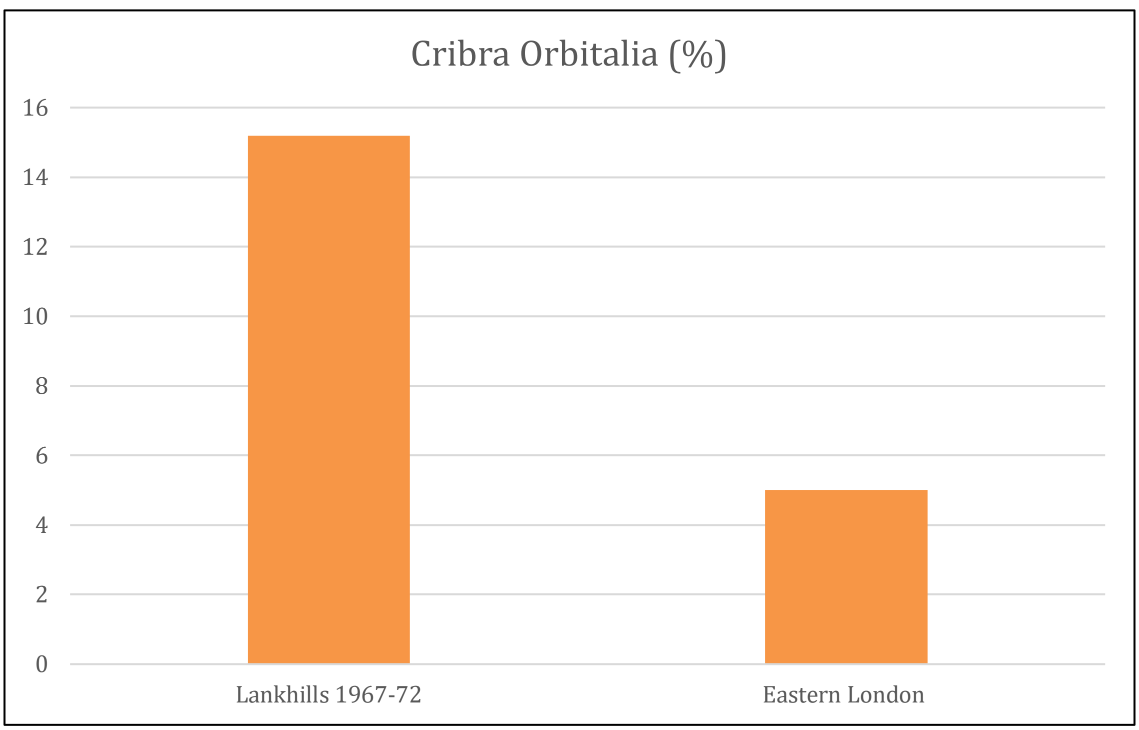

Figure 4.5 Number of individuals exhibiting cribra orbitalia in the Lankhills 1967-72 and Eastern London samples, presented as a percentage of the sample (Stuckert ed., 2016; Barber and Bowsher, 2009).

Linear Enamel Hypoplasias

While not documented in the Trentholme Drive sample, LEH were documented in both the sample from the Eastern London Cemetery and Lankhills Cemetery. Of the individuals from Lankhills Cemetery, 31.29% exhibited LEH, including subadult individuals. In comparison, 11.9% of the teeth sampled from the Eastern London Cemetery exhibited LEH, not including subadults. Unfortunately, the data concerning LEH in each sample was presented very differently, and are thus difficult to directly compare. According to the data and contextual information available, data concerning LEH were not collected for subadult individuals in the Eastern London Cemetery.

Trauma

Within the context of this discussion, “trauma” refers to a variety of pathologies, including fractures, dislocations, instances of myositis ossificans traumatica, amputation, decapitation, bony prominences, trauma related arthritis, and observations of Schmorl’s nodes. Typically, each subtype of trauma would be discussed, but due to the nature of the data presented for the Eastern London Cemetery, the broader category of “trauma” must be discussed here. Trauma was virtually undocumented concerning the Trentholme Drive sample, though incidence rates of trauma were reported for both the Eastern London Cemetery and Lankhills Cemetery.

In comparison, the sample from the Eastern London Cemetery exhibited a higher rate of trauma (24.36%) compared to the sample from Lankhills Cemetery (12.17%). It is possible that this difference in prevalence of trauma could be tied to the paleodemographic differences between the samples. It is also possible that the lower incidence of observed trauma in the Lankhills Cemetery sample may be tied to the "non-militarized" status of *Venta Belgarum*.

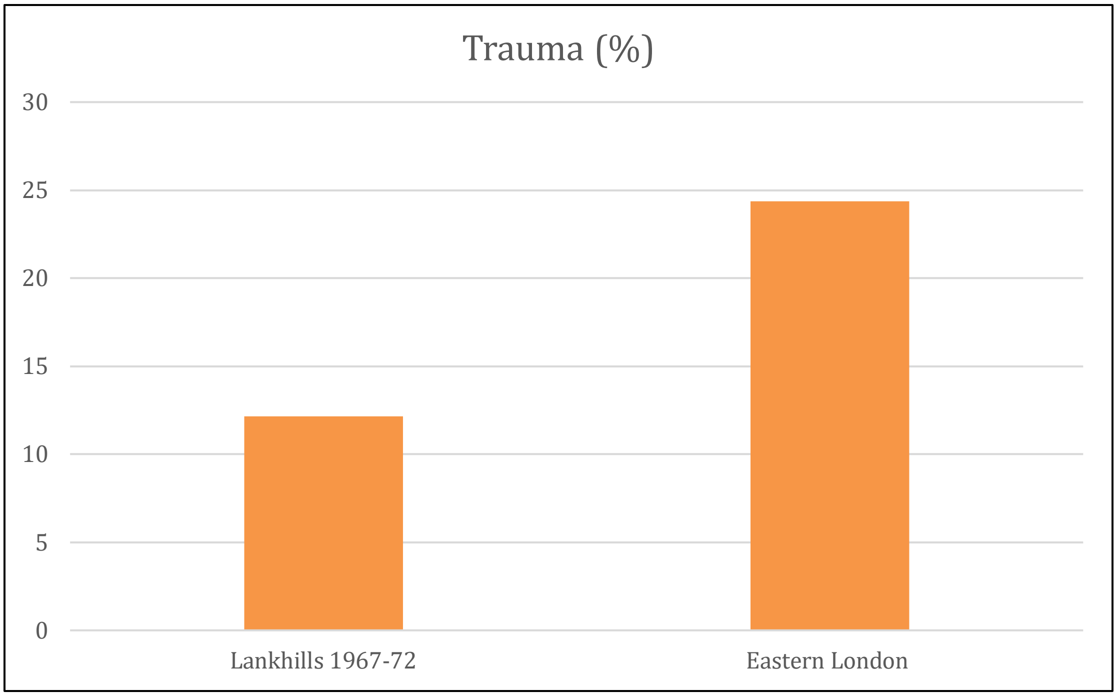

Figure 4.6 Number of individuals presenting trauma, presented as a percentage of the Lankhills 1967-72 sample and the Eastern London sample (Stuckert ed., 2016; Barber and Bowsher, 2009).

Caveats

The data discussed above are difficult to directly compare, as previously discussed. Data from Trentholme Drive was compiled between 1951 and 1968, and represents one of the first osteoarchaeological publications in Britain. In comparison, the data from the Eastern London Cemetery was compiled by 4 different osteoarchaeologists across 13 years and 12 excavation sites. It should be made clear that inter-observer error is a very real caveat within these datasets, and any statements made concerning status and inequality of their respective samples and populations could be strengthened with further comparison of other urban populations within Roman Britain.

Furthermore, the scope of this investigation is limited without the analyses of grave goods and mortuary contexts. The explicit discussion of identity as it relates to individuals concerning military status or cultural affinity requires a highly contextualized dataset that includes information not discussed here. These questions could serve future investigations that are equipped to address them.

Status, Inequality, and Military Populations

Despite the discussed weaknesses, the data collected and compared here may suggest very different living conditions between militarized and non-militarized urban populations within Roman Britain. Urban populations with established military units like *Londinium* and *Eboracum*, as represented here by the samples from the Eastern London Cemetery and Trentholme Drive exhibited higher rates of trauma and paleodemographic imbalance. In comparison, non-militarized urban populations like that present at *Venta Belgarum*, as represented by the sample from Lankhills Cemetery, exhibited higher rates of cribra orbitalia. Overall, the two delineations of urban populations exhibited comparable mean adult stature, suggesting no extreme difference in terminal growth rates, while rates of periosteal reactions varied between the militarized populations, yet remained low in the non-militarized population.

The indicators discussed here are generally considered to be non-specific, thus making definitive statements concerning inequality in populations as represented by cemetery samples difficult. However, the data and analyses presented here lend support to a hypothesis that the “militarized” nature of urban centers like *Londinium* and *Eboracum* may have contributed to the prevalence of inequality and structural violence, as presented in rates of trauma and paleodemographic imbalance. Furthermore, those urban settlements like *Venta Belgarum* may have experienced a less “militarized” social environment, yet a difference in access to resources as a result of this environment.

CHAPTER 5: CONCLUSIONS

The goal of this investigation was to compile and compare the biological health profiles of three urban populations, as represented by samples from excavations at Lankhills Cemetery, the Eastern London Cemetery, and Trentholme Drive. Non-specific indicators of stress, including prevalence of cribra orbitalia, porotic hyperostosis, linear enamel hypoplasias, periosteal reactions, stature, paleodemographic data, and data concerning trauma were discussed in an effort to identify possible differing levels of inequality or structural violence within the three communities, especially concerning their statuses as “militarized” and “non-militarized”.

While data proved difficult to compare, each of the urban samples, both the militarized (Eastern London Cemetery and Trentholme Drive) and non-militarized (Lankhills Cemetery), exhibited characteristics consistent with institutionalized inequality and possible structural violence. Where the “militarized” samples exhibited higher rates of paleodemographic imbalance and trauma, the “non-militarized” sample exhibited higher rates of cribra orbitalia. With the consideration of several non-specific skeletal indicators of stress and illness, it can be concluded that the two delineations of urban communities exhibited differing access to resources, even within their urban and connected contexts. This may have been a result of the prevalence of military connections, though further research, especially comparison with other urban sites, should be undertaken to further explore this relationship. This investigation has highlighted possible implications of social inequality and structural violence as experienced by individuals that were caught in the cycle of imperial expansion and colonization, and further investigations may elucidate the ways in which such groups influenced and were influenced by these circumstances.

Future Directions

Discussions of inequality are an important facet of investigations into lived experiences in the past, especially those rooted in locales with a history of colonization and imperial control. This content has attempted to compare broad biological health profiles from three cemetery samples associated with urban populations in an effort to identify possible patterns of inequality and structural violence across militarized and non-militarized populations. Given the complicated and dated nature of the data utilized here, future insights into these topics would benefit greatly from the utilization of data from other urban centers of Roman Britain such as Colchester (*Camulodunum*), Gloucester (*Glevum*), or Lincoln (*Lindum*), all of which can be categorized as *coloniae*, similar to London (*Londinium*) and York (*Eboracum*). Additional insights could be drawn from samples originating from Silchester (*Calleva Atrebatum*) and Caistor-by-Norwich (*Venta Icenorum*), both of which number among the urban settlements categorized as *civitas*, similar to Winchester (*Venta Belgarum*).

On a larger scale, insights into effects of established military presences within urban centers could be cross-examined across other areas of the frontier of the Roman Empire. While Roman Britain is typically considered within its own context, comparisons of samples from Roman Britain could be compared to samples from the eastern and southern edges of the empire in an effort to investigate shared or differing biological health characteristics as a result of military presences within the respective territories.

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